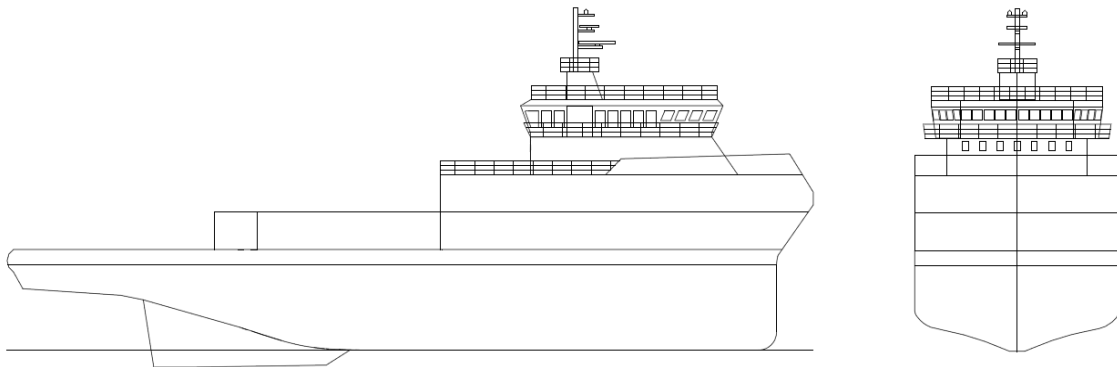


REMOLCADOR DE ALTURA POLIVALENTE
ESCUELA POLITÉCNICA SUPERIOR
UNIVERSIDAD DE A CORUÑA



PROYECTO FIN DE GRADO 2014/2015
GRADO EN INGENIERÍA DE PROPULSIÓN Y SERVICIOS DEL
BUQUE



CUADERNO 1: ELECCIÓN DE LA CIFRA DE MÉRITO Y
DEFINICIÓN DE ALTERNATIVAS. SELECCIÓN DE LA MÁS
FAVORABLE

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DEPARTAMENTO DE INGENIERÍA NAVAL Y OCEÁNICA

GRADO EN INGENIERÍA DE PROPULSIÓN Y SERVICIOS DEL BUQUE

CURSO 2.014-2015

PROYECTO NÚMERO

TIPO DE BUQUE: Remolcador de Altura Polivalente, escolta, lucha contra incendios y lucha contra la contaminación.

CLASIFICACIÓN, COTA Y REGLAMENTOS DE APLICACIÓN: American Bureau of Shipping, Solas, Marpol.

CARACTERÍSTICAS DE LA CARGA: 130 toneladas de tiro a punto fijo, 700 toneladas de carga en cubierta.

VELOCIDAD Y AUTONOMÍA: 15 nudos al 85 % de la MCR, 15 % de margen de mar, autonomía de 8000 millas.

SISTEMAS Y EQUIPOS DE CARGA / DESCARGA: Maquinillas de remolque en proa y popa, gancho giratorio y articulado, los habituales en este tipo de buques.

PROPULSIÓN: Propulsión diésel-eléctrica, propulsores azimutales tipo Schottel.

TRIPULACIÓN Y PASAJE: 14 tripulantes, 60 supervivientes.

OTROS EQUIPOS E INSTALACIONES: Hélice transversal en proa,

Ferrol, 23 de Marzo de 2.015

ALUMNO: D. Mario Teijeiro Prieto.



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1. INTRODUCCIÓN

El objetivo del primer cuadernillo será la elección de la cifra de mérito y la elección de alternativas.

El proyecto trata sobre un buque remolcador de altura polivalente de 130 toneladas a punto fijo con capacidad para la lucha contra incendios, contra la contaminación y para escolta.

Los pasos a seguir serán:

1. **Elaboración de la base de datos:** se elaborará a partir de buques de tiro a punto fijo similar ya que es la característica principal. Se utilizarán tanto buques de salvamento como buques AHTS.
2. **Definición de las dimensiones principales:** a partir de la base de datos se elaborarán una serie de regresiones para obtener las dimensiones iniciales. A partir de estas se obtendrá la cifra de mérito para obtener las dimensiones finales.
3. **Estimación de la potencia propulsora:** se estimará la potencia necesaria para la navegación en aguas libres y la potencia necesaria para los generadores.
4. **Estimación de pesos:** se estimará el peso en rosca, el peso muerto del buque y el desplazamiento.



2. BASE DE DATOS

Para la elaboración de la base de datos, la realización del dimensionamiento preliminar y posteriormente la obtención de la cifra de mérito, se ha obtenido información de diversos buques remolcadores con un tiro a punto fijo similar al del proyecto.

La propulsión del buque es diésel eléctrica a través de propulsores azimutales tipo Schottel. Aunque los remolcadores de la base de datos poseen diversos tipos de propulsión, algunos diferentes a los del buque proyectado, estos buques se encuentran en un rango similar de toneladas de tiro a punto fijo.

Ha sido elegida la propulsión azimutal debido a las ventajas que proporciona para el propósito que va a desarrollar el buque como remolcador de altura polivalente y por las ventajas de simplificación:

- Gran maniobrabilidad debido a que los propulsores pueden girar 360°. Especialmente a bajas velocidades se incorporará una hélice transversal a proa para garantizar la maniobrabilidad.
- Se simplifica la línea de ejes y su instalación. Esto supone un ahorro de espacio, trabajo y dinero que compensa el coste inicial del equipo.
- No hay necesidad de reductora o timón.
- Bajo nivel de ruido y vibraciones.

El rango de toneladas de punto fijo de los buques de la base de datos es:

VALOR	TPF
Mínimo	80
Proyecto	130
Máximo	183



BUQUE	TPF	BHP_main	BHP total	BHP (CV)	K	Lpp	L O. A	B	T	D	L. CCMM	DWT
MARIDIVE 208	80	-	-		-	54	61	15,6	4,6	6,5	-	1350
STAN TUG 4013	80	5100	5100	6938,77551	86,73	40,75	-	12,87	4,9	5,45	-	-
ASD TUG 3213	90	5700	5700	7755,10204	86,17	32,44	-	13,29	5,5	6,3	-	-
SEACOR GRANT	121,6	8000	8000	10884,3537	89,51	71,9	80,8	15,8	4,7	5,8	19	2603
IBAIZABAL 07	122	6711,3	6711,3	9131,02041	74,84	37	39,42	14	6,13	6,7	-	736
PACIFIC VIGILANCE	124	6525,9	6795,9	8878,77551	71,60	57	66	16	6,2	7,3	-	2500
BOURBON ARGOS	136	8000	8560	10884,3537	80,03	61,2	68,6	15,4	6	7	-	2100
SEA EAGLE	151	9000	13600	12244,898	81,09	67,16	75,4	22	6,1	7,5	-	2100
FAR SCIMITAR	180	10800	12000	14693,8776	81,63	68,2	78,3	17,2	6,8	8,3	-	2913
BOURBON ORCA	183	14850	14850	20204,0816	110,40	77	86,2	18,5	7	8,5	-	-



BUQUE	GT	NT	Velocidad	Diseño	Año construcción	SSCC
MARIDIVE 208	1855	612	13,5	-	2006	DNV
STAN TUG 4013	-	-	14	-	-	Lloyd`s
ASD TUG 3213	-	-	14,4	-	2011	Lloyd`s
SEACOR GRANT	2188	799	14,3	-	2008	ABS
IBAIZABAL 07	792	-	9,6	-	2008	BV
PACIFIC VIGILANCE	2147	644	14	IMT 966 AHTS	2009	ABS
BOURBON ARGOS	2343	703	14	CONAN WU	2013	BV
SEA EAGLE	2952	885	15	KHIAM CHUAN Q486	2009	ABS
FAR SCIMITAR	3068	-	18	UT 712 L	2008	-
BOURBON ORCA	4089	1226	17,1	ULSTEIN AX 104	2006	DNV



BUQUE	Tripulantes	Lpp/B	Lpp/D	B/D	Lpp/T	B/T	T/D	D-T
MARIDIVE 208	32	3,46	8,31	2,4	11,74	3,39	0,71	1,9
STAN TUG 4013	-	3,17	7,48	2,36	8,32	2,63	0,90	0,55
ASD TUG 3213	-	2,44	5,15	2,11	5,90	2,42	0,87	0,8
SEACOR GRANT	38	4,55	12,4	2,72	15,3	3,36	0,81	1,1
IBAIZABAL 07	-	2,64	5,52	2,09	6,04	2,28	0,91	0,57
PACIFIC VIGILANCE	30	3,63	8,87	2,44	10,64	2,93	0,83	1,1
BOURBON ARGOS	30	3,97	8,74	2,2	10,2	2,57	0,86	1
SEA EAGLE	40	3,05	10,05	2,93	11,01	3,61	0,81	1,4
FAR SCIMITAR	-	3,97	8,22	2,07	10,03	2,53	0,82	1,5
BOURBON ORCA	35	4,16	9,06	2,18	11	2,64	0,82	1,5



3. DEFINICIÓN DE LAS CARACTERÍSTICAS PRINCIPALES

3.1. Regresiones

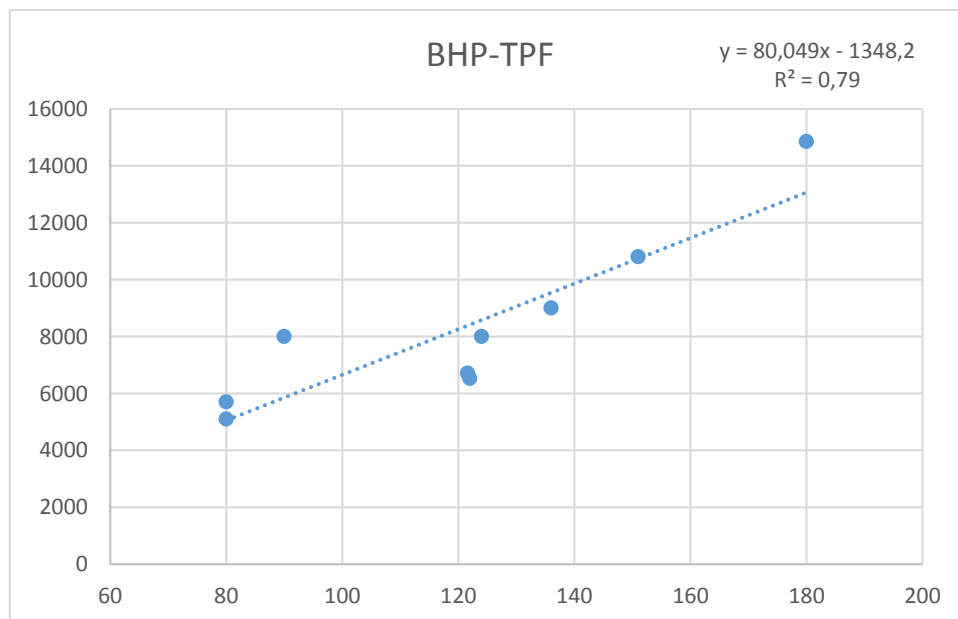
3.1.1. Potencia propulsora

A partir del dato de tiro a punto fijo de 130 toneladas, se determina la potencia necesaria utilizando una recta de regresión que compara las potencias BHP con las toneladas a punto fijo TPF.

Como se observa en la base de datos tenemos dos potencias:

- BHP_main: corresponde a la potencia propulsora del buque.
- BHP total: corresponde a la potencia total generada por el buque para abastecer tanto la propulsión como los demás equipos.

Los buques de propulsión convencional mantienen el valor en ambos apartados mientras que los buques con propulsión diésel-eléctrica aumentan el valor de la potencia ya que necesitan abastecer de energía a todo el buque.



De esta regresión se obtiene la primera estimación de la potencia propulsora de nuestro buque (BHP_main):

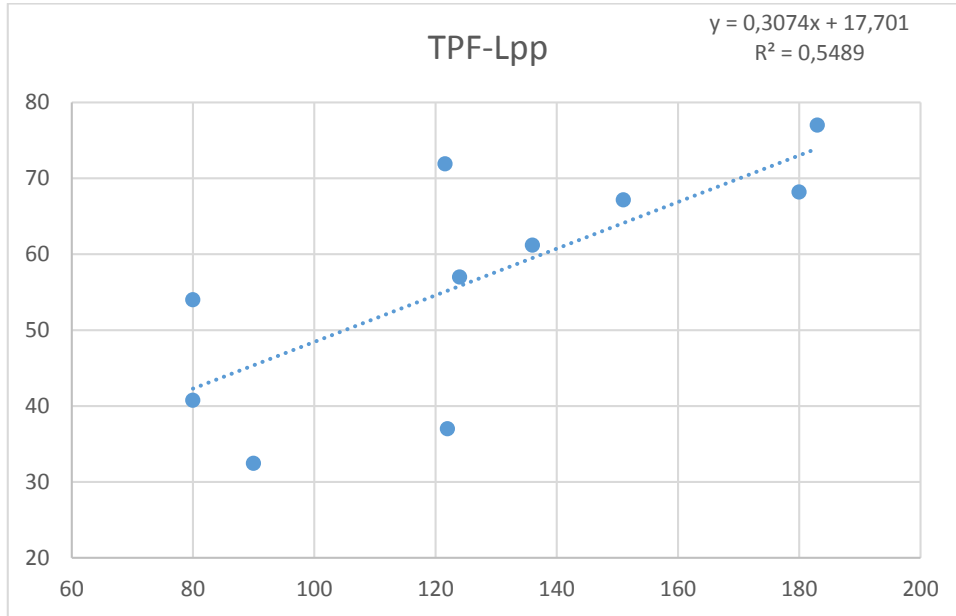
$$BHP = 80,049 * TPF - 1348,2$$

$$BHP = 9058,17 \text{ kW}$$



3.1.2. Eslora entre perpendiculares y eslora total

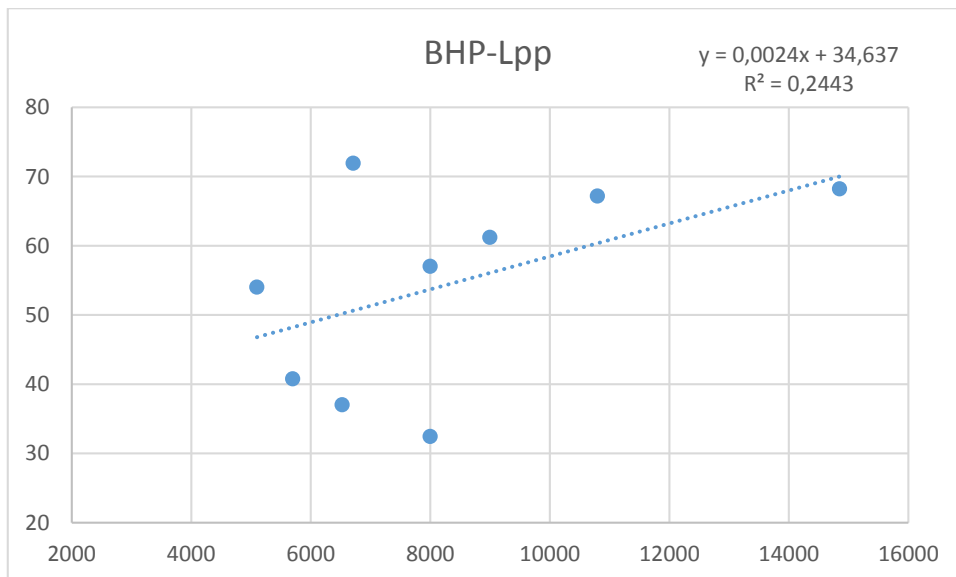
Al igual que con la potencia, se relaciona la eslora entre perpendiculares con el tiro a punto fijo obteniendo la siguiente regresión:



$$LPP = 0,3074 * TPF + 17,701$$

$$LPP = 57,663 \text{ m}$$

A partir de la potencia propulsora calculada anteriormente se obtiene otra regresión para calcular la eslora entre perpendiculares:



$$LPP = 0,0024 * BHP + 34,637$$

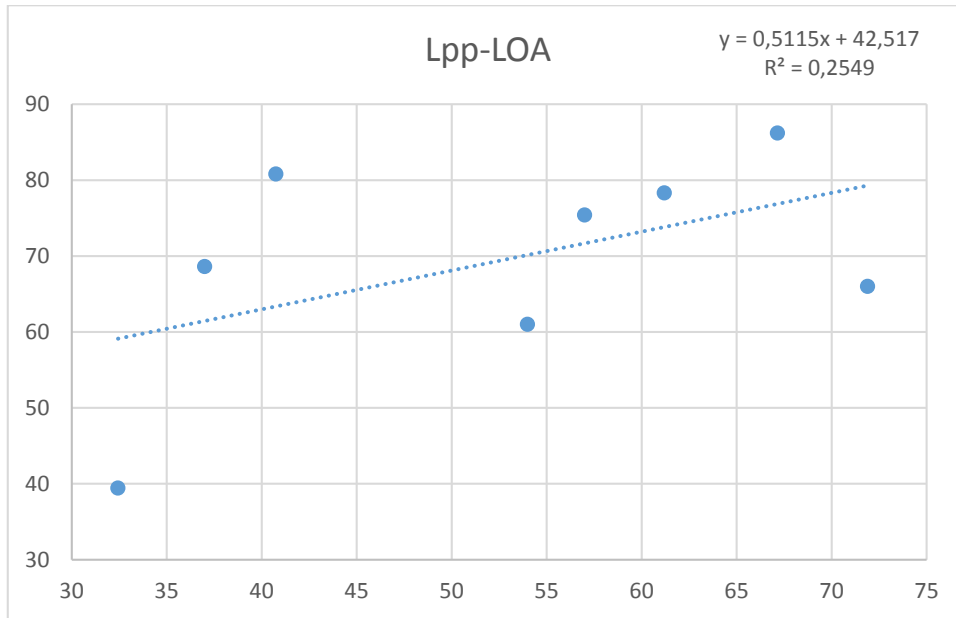
$$LPP = 56,3766 \text{ m}$$



Con los dos valores anteriores se realiza una media para obtener un valor más aproximado:

$$LPP_{medio} = 57,0198 \text{ m}$$

Por último, a través de una regresión que relacione la eslora entre perpendiculares con la eslora total, y utilizando el valor de eslora entre perpendiculares obtenido:

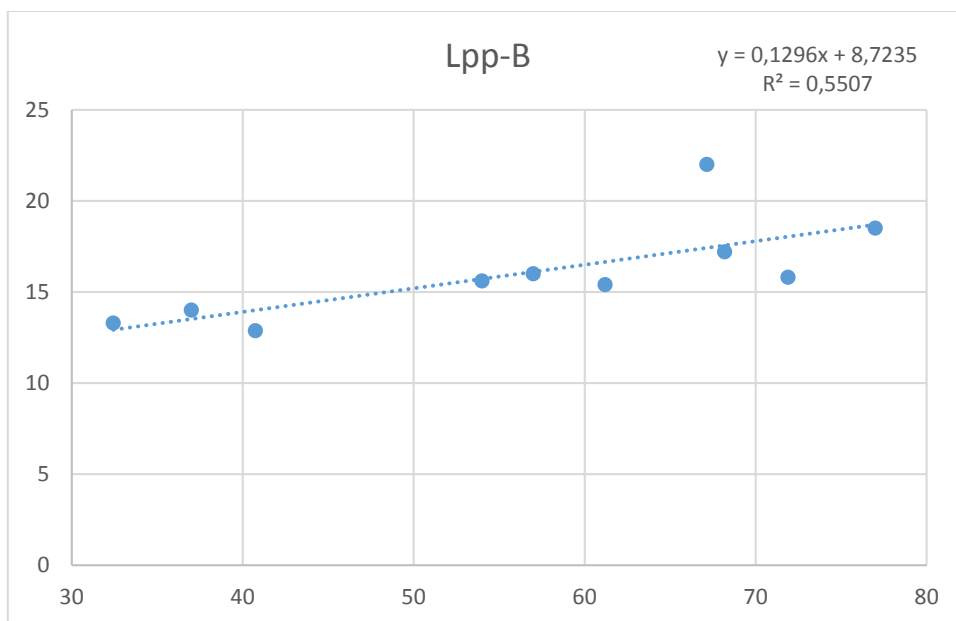


$$LOA = 0,5115 * LPP_{media} + 42,517$$

$$LOA = 71,628 \text{ m}$$

3.1.3. Manga de trazado

Con el dato de la eslora entre perpendiculares se puede obtener una estimación de la manga de trazado:



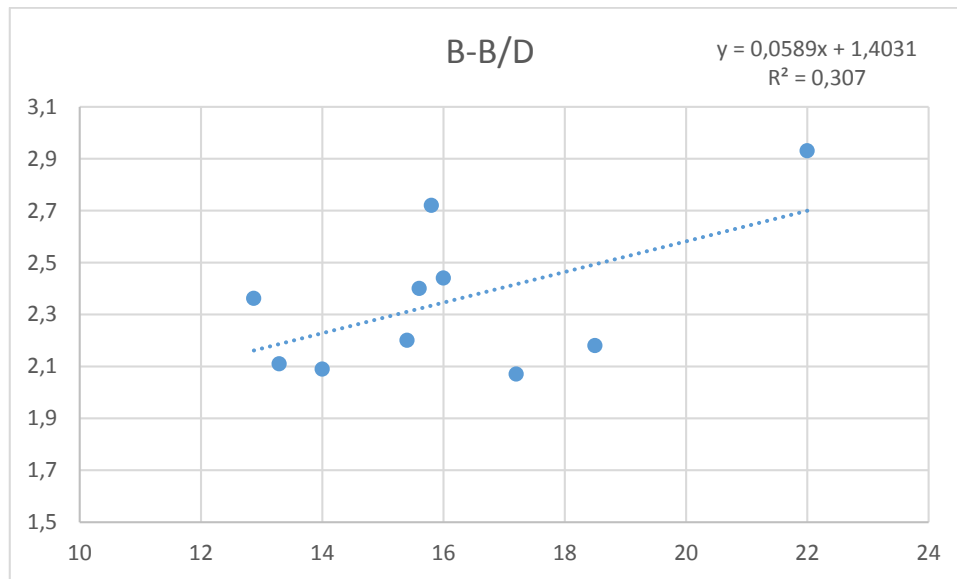


$$B = 0,1296 * LPPmedia + 8,7235$$

$$B = 16,113 m$$

3.1.4. Puntal

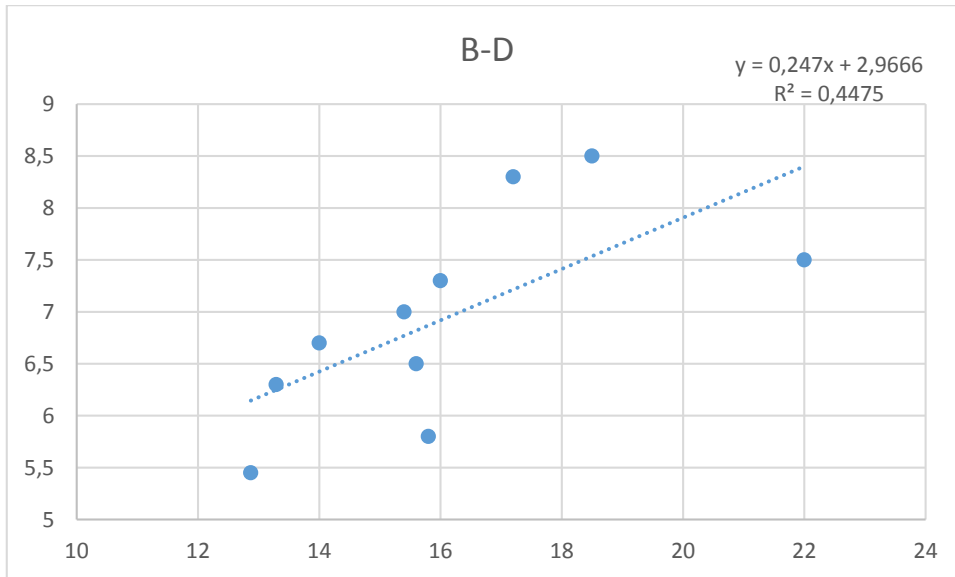
Se calcula el puntal según lo descrito en el libro “El Proyecto básico del buque mercante”, es decir, a partir de la manga. Se relacionarán manga y puntal de dos formas distintas:



$$\frac{B}{D} = 0,0589 * B + 1,4031$$

$$\frac{B}{D} = 2,352$$

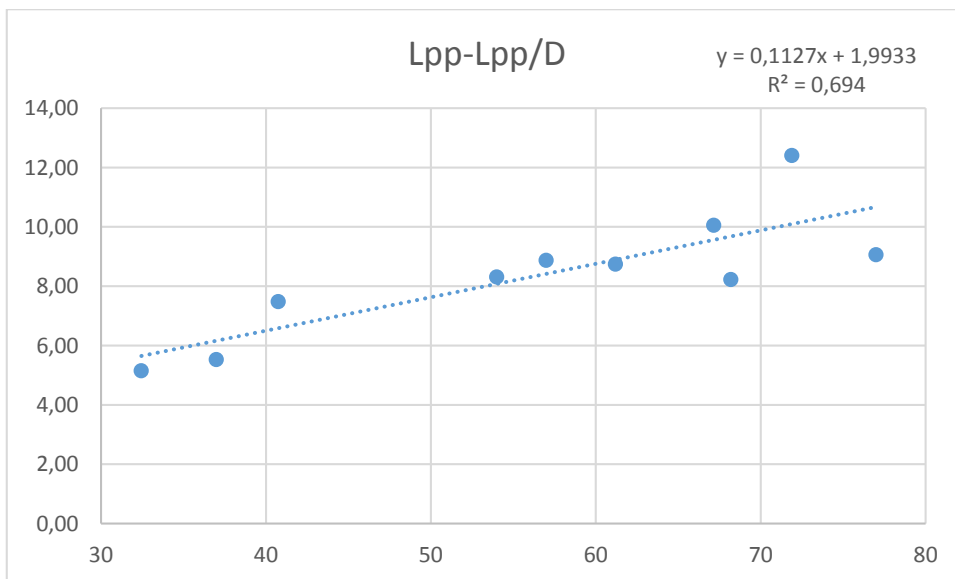
$$D = 6,85 m$$



$$D = 0,247 * B + 2,966$$

$$D = 6,946 \text{ m}$$

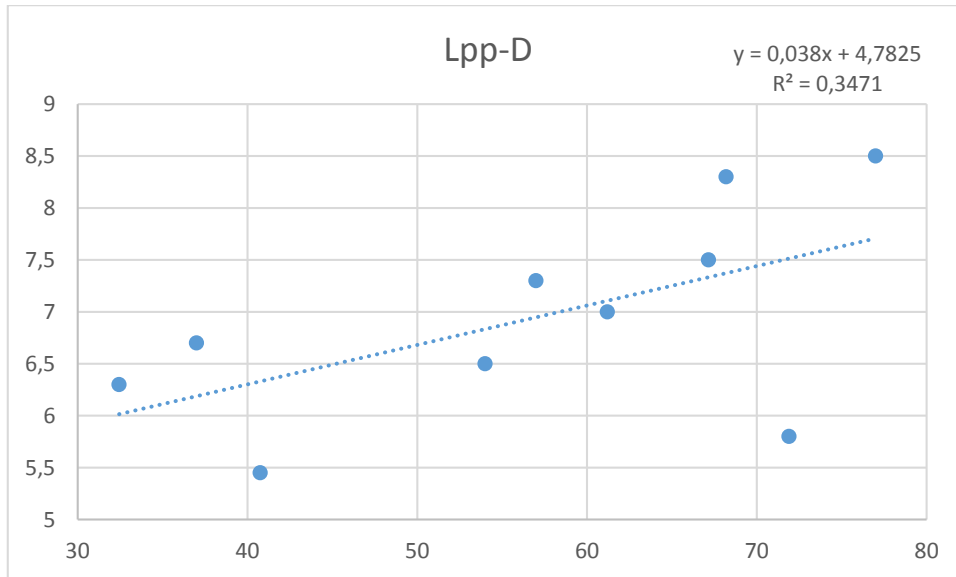
Se comparan los datos de puntal obtenidos con los que se obtienen con la eslora entre perpendiculares:



$$\frac{LPP}{D} = 0,1127 * LPP + 1,9933$$

$$\frac{LPP}{D} = 8,4194$$

$$D = 6,8488 \text{ m}$$



$$D = 0,038 * LPP + 4,7825$$

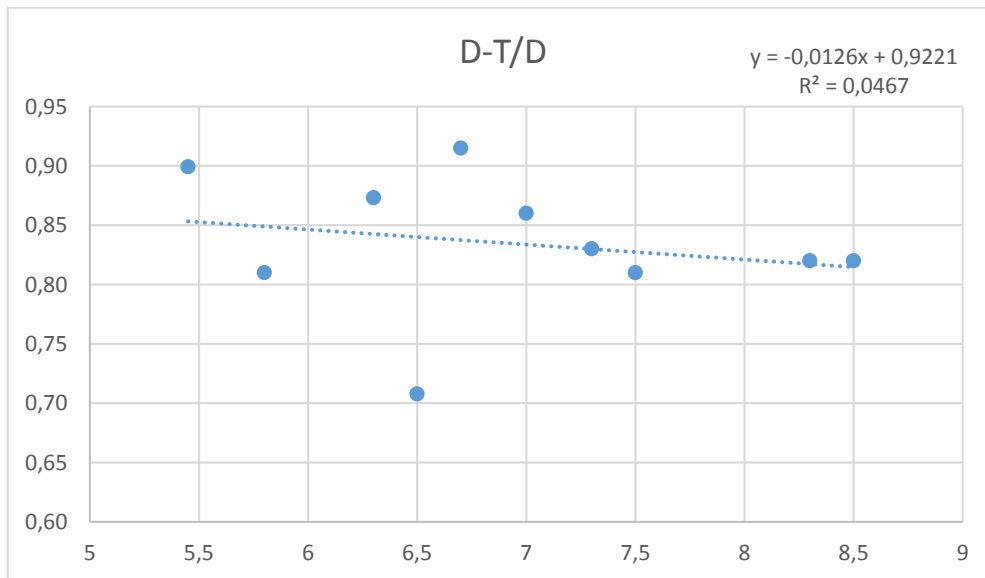
$$D = 6,949$$

A partir de los cuatro datos obtenidos se realiza una media:

$$D_{medio} = 6,898 \text{ m}$$

3.1.5. Calado

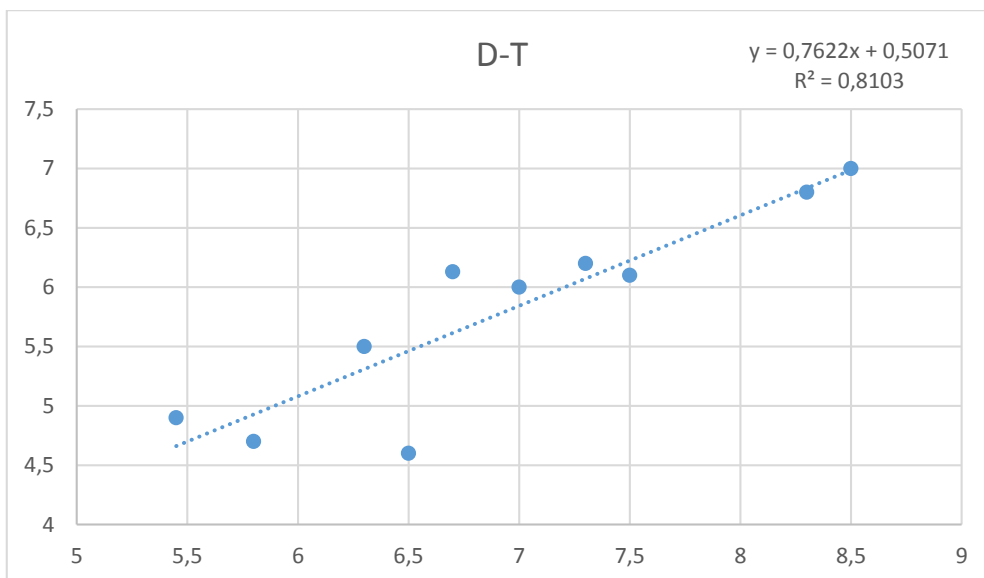
Primero se obtendrá un valor estimado del calado relacionándolo con el puntal:



$$\frac{T}{D} = -0,0126 * D + 0,9221$$

$$\frac{T}{D} = 0,8351$$

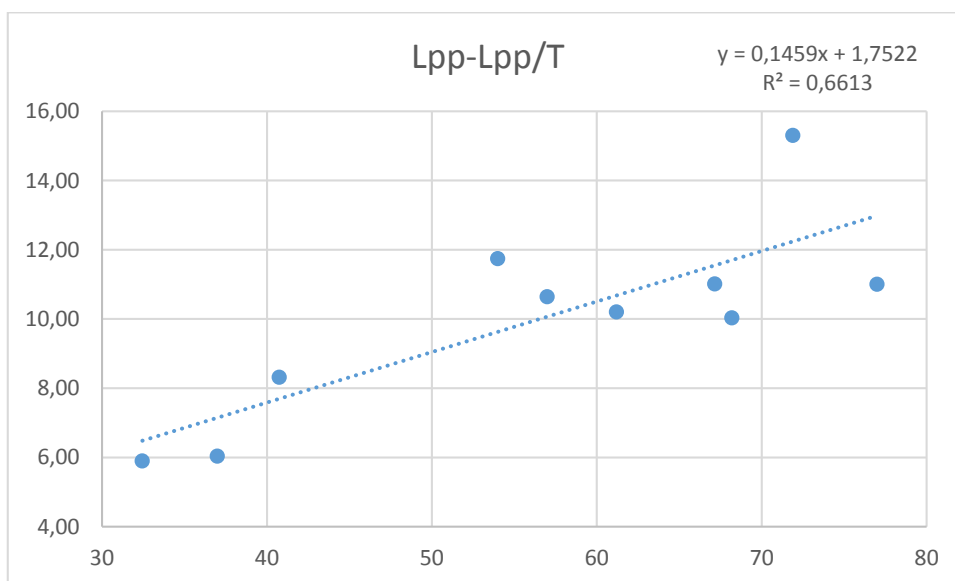
$$T = 5,761 \text{ m}$$



$$T = 0,7622 * D + 0,5071$$

$$T = 5,765 \text{ m}$$

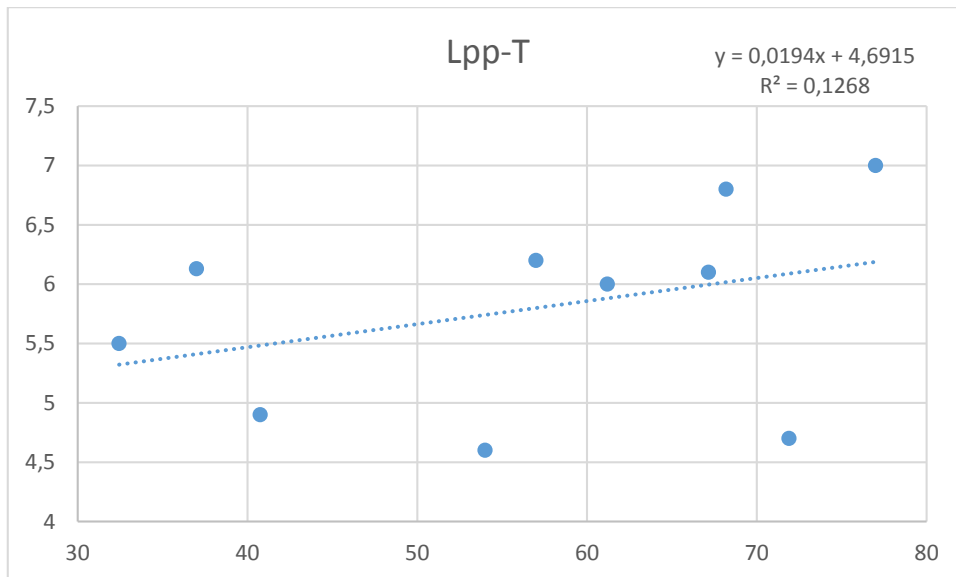
A continuación se relaciona con la eslora entre perpendiculares:



$$\frac{LPP}{T} = 0,1459 * LPP + 1,7522$$

$$\frac{LPP}{T} = 10,0713$$

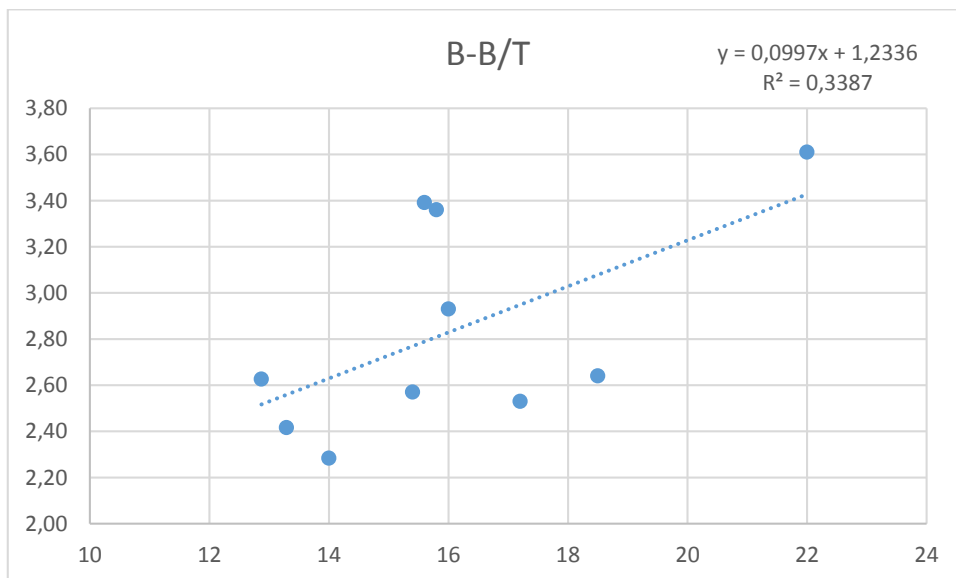
$$T = 5,725 \text{ m}$$



$$T = 0,0194 * LPP + 4,6915$$

$$T = 5,797 \text{ m}$$

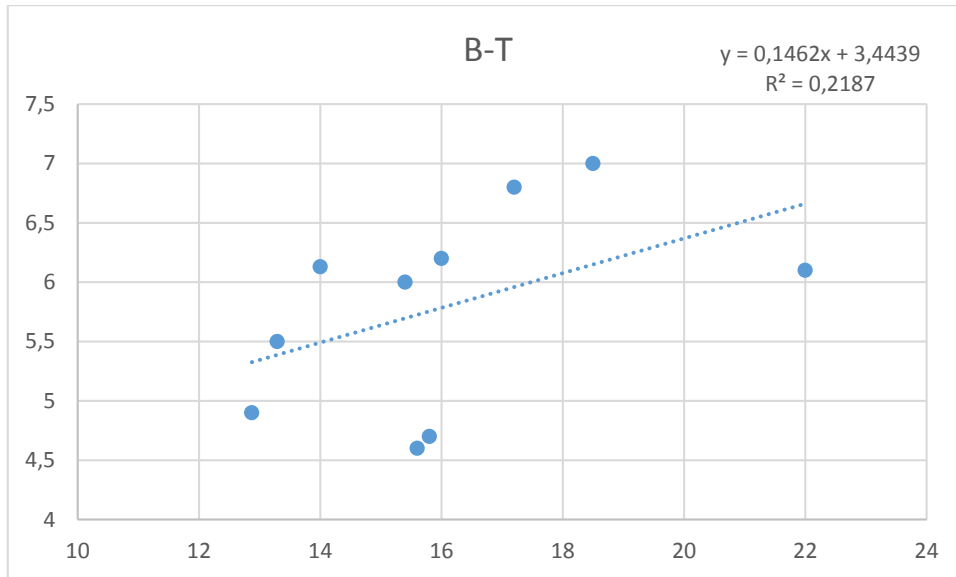
Por último relacionamos el calado con la manga:



$$\frac{B}{T} = 0,0997 * B + 1,2336$$

$$\frac{B}{T} = 2,84$$

$$T = 5,673 \text{ m}$$



$$T = 0,1462 * B + 3,4439$$

$$T = 5,799 \text{ m}$$

Finalmente se realiza una media de los valores obtenidos:

$$T_{\text{medio}} = 5,752 \text{ m}$$

3.2. Comprobación de los resultados

3.2.1. Relaciones entre variables

Los resultados obtenidos tienen que tener valores comprendidos entre los máximos y mínimos de la base de datos:

		Lpp/B	Lpp/D	B/D	Lpp/T	B/T	T/D	D-T
Base de datos	Máximo	4,55	12,4	2,93	11,74	3,61	0,91	1,9
	Mínimo	2,44	5,15	2,07	5,9	2,28	0,71	0,55
Proyecto		3,54	8,27	2,34	9,91	2,80	0,83	1,15

Como puede observarse los datos obtenidos cumplen con lo dicho anteriormente.

3.2.2. Comprobación del francobordo

Como primera aproximación se tomará el francobordo mínimo como:

$$D - T = 0,55 \text{ m}$$

Este valor es el valor mínimo correspondiente a la base de datos.



3.3. Obtención de coeficientes

3.3.1. Coeficiente de bloque

Se obtendrá el coeficiente de bloque según varias fórmulas:

Fórmula de Alexander

En este caso el coeficiente de bloque dependerá de la eslora y la velocidad de servicio. Tomando como dato de eslora el obtenido anteriormente se obtiene:

$$CB = K1 - K2 * Fn$$

Siendo:

$$FN = \frac{V}{\sqrt{g * Lpp}} = 0,326$$

$g \left(\frac{m}{s^2}\right)$	9,81
Lpp (m)	57,019804
V (m/s)	15
K1	1,09
K2	1,68

$$CB = 0,542$$

Fórmula de Towsin

El coeficiente de bloque se define por:

$$CB = 0,7 + 0,125 * atan(25 * (0,23 - Fn))$$

Siendo:

$$FN = \frac{V}{\sqrt{g * Lpp}} = 0,326$$

Se obtiene:

$$CB = 0,553$$



Fórmula de Schneekluth

Se obtienen dos valores de coeficiente de bloque a partir de las siguientes fórmulas:

$$1. \left(\frac{0,14}{Fn}\right) * \frac{\left(\frac{Lpp}{B}\right)+20}{26} = 0,388$$

$$2. \left(\frac{0,23}{Fn}\right) \left(\frac{2}{3}\right) * \frac{\left(\frac{Lpp}{B}\right)+20}{26} = 0,439$$

Fórmula de Katsoulis

Esta fórmula aproxima el valor del coeficiente de bloque a partir de las dimensiones principales del buque y un coeficiente f cuyo valor para remolcadores no está definido por lo que se tomará el correspondiente a un carguero.

$$CB = K * f * (Lpp^a) * (B^b) * (T^c) * (V^d)$$

Siendo:

K	0,8217
a	0,42
b	-0,3072
c	0,1721
d	-0,6135
Lpp (m)	57,019804
B (m)	16,1132666
T (m)	5,75231988
V (m/s)	15
f	0,99

Se obtiene:

$$CB = 0,485$$

Fórmula de Luna

Aproximación con la eslora entre perpendiculares y el número de Froude:

$$CB = 0,88 - 0,7 * Fn + 0,01 * \left(\frac{Lpp - 100}{Lpp}\right)^3$$

Siendo:

$$FN = \frac{V}{\sqrt{g * Lpp}} = 0,326$$

$$CB = 0,647$$



Fórmula de Van Lammeren

Aproximación con la eslora entre perpendiculares y la velocidad de servicio:

$$CB = 1,137 - 0,6 * \frac{V}{\sqrt{Lpp}}$$

$$CB = 0,524$$

Regresión Fn-CB

A partir de los coeficientes de bloque de los buques de la base de datos se aproxima el valor del coeficiente de bloque. A continuación se calculan los coeficientes de bloque a partir de la fórmula de Alexander:

$$CB = K1 - K2 * Fn$$

- Coeficiente de bloque del buque Maridive 208:

Siendo:

g	9,81
Lpp	54
V	13,5
K1	1,09
K2	1,68

$$CB = 0,583$$

- Coeficiente de bloque del buque Stan Tug 4013:

Siendo:

g	9,81
Lpp	40,75
V	14
K1	1,09
K2	1,68

$$CB = 0,484$$

- Coeficiente de bloque del buque ASD TUG 3213:

Siendo:

g	9,81
Lpp	32,44
V	14,4
K1	1,09
K2	1,68



$$CB = 0,392$$

- Coeficiente de bloque del buque Seacor Grant:

Siendo:

g	9,81
Lpp	71,9
V	14,3
K1	1,09
K2	1,68

$$CB = 0,624$$

- Coeficiente de bloque del buque Ibaizabal 07:

Siendo:

g	9,81
Lpp	37
V	9,6
K1	1,09
K2	1,68

$$CB = 0,654$$

- Coeficiente de bloque del buque Pacific Vigilance:

Siendo:

g	9,81
Lpp	57
V	14
K1	1,09
K2	1,68

$$CB = 0,578$$

- Coeficiente de bloque del buque Bourbon Argos:

Siendo:

g	9,81
Lpp	61,2
V	14
K1	1,09
K2	1,68

$$CB = 0,596$$



- Coeficiente de bloque del buque Sea Eagle:

Siendo:

g	9,81
Lpp	67,16
V	15
K1	1,09
K2	1,68

$$CB = 0,585$$

- Coeficiente de bloque del buque Far Scimitar:

Siendo:

g	9,81
Lpp	68,2
V	18
K1	1,09
K2	1,68

$$CB = 0,488$$

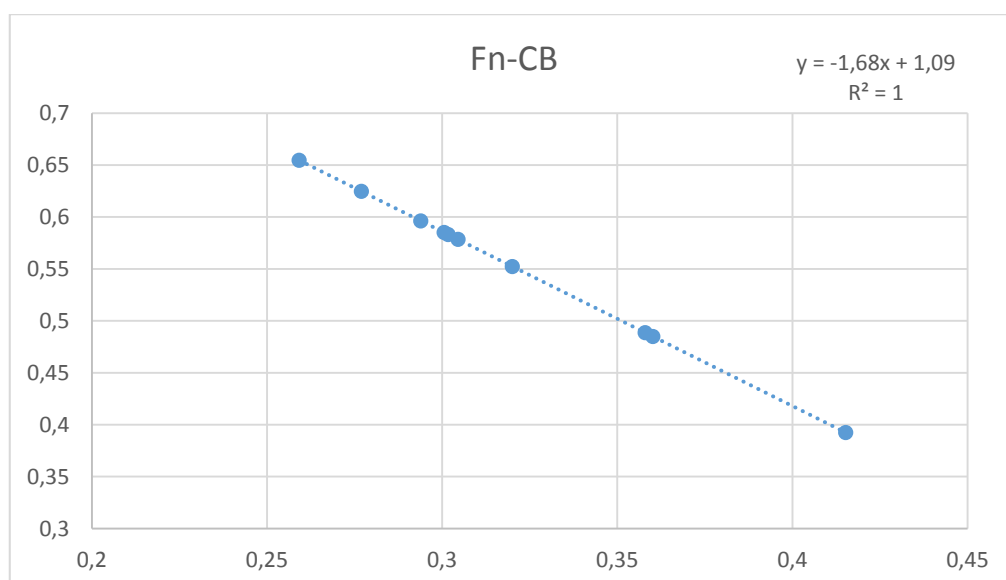
- Coeficiente de bloque del buque Bourbon Orca:

Siendo:

g	9,81
Lpp	77
V	17,1
K1	1,09
K2	1,68

$$CB = 0,552$$

A partir de estos coeficientes de bloque realizamos la recta de regresión y obtenemos la aproximación del coeficiente de bloque:



$$CB = 0,542$$

Elección del coeficiente de bloque

Finalmente a partir de todas las aproximaciones realizadas anteriormente se toma un valor de coeficiente de bloque:

Aproximación	Valor de CB
Alexander	0,542
Towsin	0,553
Schneekluth 1	0,388
Schneekluth 2	0,439
Katsoulis	0,485
Luna	0,647
Van Lammeren	0,524
Regresión Fn-CB	0,542

El valor de coeficiente de bloque será de 0,54 ya que es un valor medio de los más coincidentes. Además uno de estos métodos es la regresión Fn-CB que es más fiable al realizarse a partir de todos los buques de la base de datos.

$$CB = 0,54$$

3.3.2. Coeficiente de la maestra

Una vez obtenido el coeficiente de bloque, el coeficiente de la maestra se obtendrá a partir de las siguientes aproximaciones:

Fórmula de Kerlen

$$CM = 1,006 - 0,0056 * CB^{-3,56}$$

$$CM = 0,955$$



Fórmula del HSVA

$$CM = \frac{1}{1 + (1 - CB)^{3,5}}$$

$$CM = 0,938$$

Fórmula específica de remolcadores

$$CM = 0,526 + \left(\frac{0,49}{CB}\right) - \left(\frac{0,165}{CB^2}\right)$$

$$CM = 0,867$$

Fórmula de Van Lammeren

$$CM = 0,9 + 0,1 * CB$$

$$CM = 0,954$$

Con estos resultados se realiza una media de los más coincidentes:

$$CM = 0,95$$

3.3.3. Coeficiente prismático

Este será el cociente entre el coeficiente de bloque y el coeficiente de la maestra obtenidos anteriormente:

$$CP = \frac{CB}{CM} = \frac{0,54}{0,95}$$

$$CP = 0,57$$

3.3.4. Coeficiente de flotación

El valor del coeficiente de flotación se aproximará suponiendo que la forma del casco es una forma en U y utilizando los valores obtenidos en los siguientes métodos:

Fórmula de Schneekluth

Suponiendo una sección normal:

$$CF = CP^{2/3}$$

$$CF = 0,686$$

Fórmula de Schneekluth y Murray

Suponiendo un casco con forma de U:

$$CF = Af + Bf * CB$$

Siendo:

Af (Forma U)	0,248
Bf	0,778

$$CF = 0,668$$



Fórmula para remolcadores

Según el libro “Apuntes de proyectos”:

$$CF = 0,45 * CB + 0,56$$

$$CF = 0,803$$

Fórmula para buques con formas en U

$$CF = 0,95 * CP + 0,17 * (1 - CP)^{1/3}$$

$$CF = 0,668$$

Para obtener el valor final del coeficiente de flotación se realiza la media de los valores obtenidos:

$$CF = 0,71$$

3.3.5. Desplazamiento

Se realiza una primera aproximación del valor del desplazamiento a partir de las dimensiones del buque y el coeficiente de bloque obtenidos:

$$\Delta = CB * L * B * T$$

$$\Delta = 2925,297 \text{ toneladas}$$

3.4. Resultados

Resultados		
TPF	130	toneladas
BHP	9058,17	kW
Lpp	57,02	m
LOA	71,68	m
B	16,11	m
D	6,90	m
T	5,75	m
CB	0,54	
CM	0,95	
CP	0,57	
CF	0,71	
Δ	2925,30	toneladas



3.5. Definición de la cifra de mérito. Selección de la alternativa más favorable.

Cuando ya se han determinado las dimensiones principales del buque se define como cifra de mérito el coste de construcción del buque.

Para determinar el coste de construcción, los parámetros que tendremos que tener en cuenta serán:

$$CC = CMg + CE + CMo + CVa$$

Siendo:

- $CMg \rightarrow$ Coste de las materias primas $CMg = cmg * PS$

PS = precio del acero

$cmg = cos * cas * cem * ps$ = es el coste de material por unidad de peso

cos = coste de chapas y perfiles

cem = incremento por equipo metálico

ps = precio unitario del acero

- $CE \rightarrow$ Coste de equipos y montaje

$$CE = CEq + CMe = CEc + CEp + Chf + CEr$$

CEq = coste de los equipos

CMe = coste de montaje de los equipos

CEc = coste del equipo de carga

$CEp = cep * BHP$ = coste del equipo de propulsión y auxiliares

Donde:

cep = coste por unidad de potencia

BHP = potencia propulsora

$Chf = chf * nch * NT$ = coste de habilitación

Donde:

chf = coste unitario de la habilitación

nch = nivel de calidad de la habilitación

NT = número de tripulantes

$CEr = cos * ps * PEr$ = coste del equipo restante



Donde:

PEr = peso equipo restante

$$PEr = k * Lpp^{1,3} * B^{0,8} * D^{0,3}$$

- CMo → coste de la mano de obra de las materias primas

$$CMo = chm * csh * PS$$

Donde:

chm = coste horario medio

csh = coeficiente de horas por unidad de peso

- CVa → costes variables

$$CVa = cva * CC$$

Donde:

cva = coeficiente de costes variables

3.5.1. Valor de coeficientes

A continuación se darán valores a los coeficientes definidos con anterioridad según el libro “Apuntes de proyectos”:

Parámetro	Rango	Valor	
cos	1,05 < CCS < 1,1; 1,5	1,1	
cas	1,08 < cas < 1,15	1,08	
cem	1,03 < cem < 1,1	1,1	
ps	-	450	€/ton
csh	20; 30 < csh < 80; 100	100	
chm	21; 25 < chm < 30; 40	40	
cva	0,05 < cva < 0,1	0,1	
cep	300 < cep < 400	400	€/kW
nch	0,9 < nch < 1,2	1,2	
chf	32000; 35000	35000	€/tripulante
NT		14	tripulantes
BHP		9058,17	KW

Los valores tomados son los más desfavorables.



3.5.2. Costes de construcción con datos iniciales

El coste mínimo de construcción para los valores de dimensiones y coeficientes iniciales será:

Costes	CC (€)
CMg	477551,326
CE	4273911,59
CMo	3248317,02
CVa	799977,993
CC	8799757,93

3.5.3. Coste de construcción mínimo

A continuación, se calcula la combinación de variables que hace mínima la función del coste de construcción. Este cálculo puede encontrarse en el Anexo I.

Para encontrar la combinación de variables que hace mínima la función del coste de construcción se establecen unos límites de variación para las variables. Con esto se puede analizar como varía el coste de construcción al modificar las variables dentro de estos límites establecidos.

Límites

- Eslora: $L_{pp} = \pm 5\%$; $\pm 8\%$. Se aplicará como límite superior un 8% y como límite inferior un 5%.

$$L_{pp\max} = 61,58 \text{ m} \quad L_{pp\min} = 54,17 \text{ m}$$

- Manga: $B = \pm 5\%$; $\pm 8\%$. Se aplicará un 8% para ambos límites.

$$B_{\max} = 17,4 \text{ m} \quad B_{\min} = 14,82 \text{ m}$$

- Relaciones adimensionales.

Se toman los máximos y mínimos de la base de datos:

	Lpp/B	Lpp/D	B/D	B/T	T/D	D-T
Máximo	4,55	12,4	2,93	3,61	0,91	1,9
Mínimo	2,44	5,15	2,07	2,28	0,71	0,55

- Francobordo mínimo

También se corresponde con el valor de la base de datos:

$$\text{Francobordo} = D - T = 0,55 \text{ m}$$



- Coeficiente de bloque

Su valor variará un 3% sobre el coeficiente inicial:

$$CB_{min} = 0,524 \quad CB_{máx} = 0,524$$

- Calado

El valor de la relación D/T variará $\pm 1,5\%$:

T/D	
-1,5%	0,82
Inicial	0,83
1,5%	0,85

Producto LBD constante

Además de los límites anteriores se cumplirá que el producto $L*B*D$ será constante.

Resultados

Una vez realizado el cálculo dentro de los límites especificados se descartan las opciones en las que estos no se cumplan. El coste mínimo de construcción dentro de estos límites se da para las siguientes dimensiones:

Dimensiones finales	
Lpp	54,17
B	15,58
D	7,51
T	6,36
CB	0,53
CM	0,862
CP	0,61214455
CF	0,797
Δ	2901,37288

Coste de construcción	
CMg	477551,326
CE	4269785,51
CMo	3248317,02
CVa	799565,386
CC	8795219,24



4. ESTIMACIÓN DE LA POTENCIA PROPULSORA

Para realizar el cálculo de la potencia propulsora es necesario conocer la resistencia del buque al navegar en aguas libres. Se realiza una primera aproximación utilizando el programa NAVCAD, utilizando las dimensiones obtenidas con el coste mínimo de construcción. Además de estas, se introducen las dimensiones del thruster de proa y del skeg. Estas han sido tomadas a partir de un buque base. El buque base utilizado ha sido el Pacific Vigilance cuyos datos se adjuntan en el Anexo II. Se ha escogido este buque porque es el que posee el tiro a punto fijo y las dimensiones que más se aproximan a las del buque proyectado. Una vez introducidos estos datos se calcula la resistencia que tendrá el buque al navegar en aguas libres a 15 nudos utilizando el método de predicción Oortmerssen ya que es el utilizado para remolcadores y la línea de fricción ITTC-78. Se aplica además, un margen de mar del 15%.

Resistance

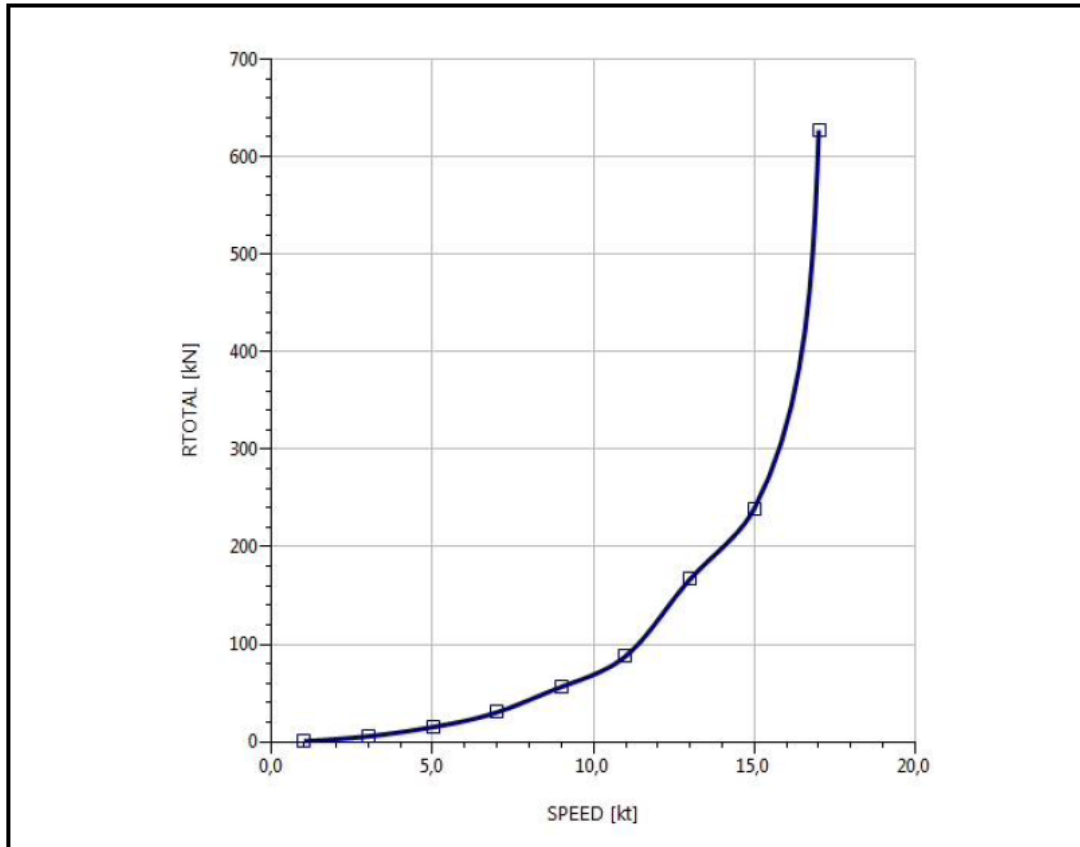
28 sep 2015 12:01
HydroComp NavCad 2012

Project ID Proyecto
Description
File name Proyecto.hcnc

Analysis parameters

Vessel drag		Added drag	
Technique:	ITTC-78 (C1)	Appendage:	[Calc] Holtrop (Component)
Prediction:	[Calc] Prediction	Wind:	[Off]
Reference ship:	Oortmerssen	Seas:	[Off]
Model LWL:		Shallow/channel:	[Off]
Expansion:	Standard	Margin:	[Calc] Hull + added drag [15%]
Friction line:	ITTC-57	Water properties	
Hull form factor:	[On] 1,318	Water type:	Salt
Speed corr:	[Off]	Density:	1026,00 kg/m3
Spray drag corr:	[Off]	Viscosity:	1,18920e-6 m2/s
Corr allowance:	ITTC-78 (v2008)		
Roughness [mm]:	[Off]		

Predicted resistance





Resistance
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Project ID Proyecto
Description
File name Proyecto.hcnc

Analysis parameters

Vessel drag		ITTC-78 (CT)		Added drag	
Technique:	[Calc] Prediction	Oortmerssen		Appendage:	[Calc] Holtrop (Component)
Prediction:				Wind:	[Off]
Reference ship:				Seas:	[Off]
Model LWL:				Shallow/channel:	[Off]
Expansion:	Standard			Margin:	[Calc] Hull + added drag [15%]
Friction line:	ITTC-57			Water properties	
Hull form factor:	[On] 1,318			Water type:	Salt
Speed corr:	[Off]			Density:	1026,00 kg/m3
Spray drag corr:	[Off]			Viscosity:	1,18920e-6 m2/s
Corr allowance:	ITTC-78 (v2008)				
Roughness [mm]:	[Off]				

Prediction method check [Oortmerssen]

Parameters	FN [design]	CP	LWL/BWL	BWL/T	XCB/LWL	IE	CX
Value	0,33	0,56	3,48	2,45	0,480	21,1	0,93
Range	0,05-0,50	0,51-0,69	3,50-6,30	1,90-3,40	0,467-0,537	10,0-38,0	0,73-0,97

Prediction results

SPEED [kt]	SPEED COEFS		ITTC-78 COEFS						
	FN	FV	RN	CF	[CV/CF]	CR	dCF	CA	CT
1,00	0,022	0,044	2,34e7	0,002601	1,318	0,000001	0,000000	0,000463	0,003892
3,00	0,067	0,131	7,03e7	0,002194	1,318	0,000001	0,000000	0,000649	0,003541
5,00	0,112	0,218	1,17e8	0,002036	1,318	0,000001	0,000000	0,000682	0,003367
7,00	0,156	0,306	1,64e8	0,001942	1,318	0,000205	0,000000	0,000690	0,003454
9,00	0,201	0,393	2,11e8	0,001875	1,318	0,000770	0,000000	0,000689	0,003931
11,00	0,246	0,481	2,58e8	0,001825	1,318	0,001036	0,000000	0,000685	0,004126
13,00	0,290	0,568	3,05e8	0,001784	1,318	0,002703	0,000000	0,000679	0,005733
+ 15,00 +	0,335	0,655	3,52e8	0,001750	1,318	0,003237	0,000000	0,000672	0,006215
17,00	0,379	0,743	3,98e8	0,001722	1,318	0,010099	0,000000	0,000665	0,013032
RESISTANCE AND EFFECTIVE POWER									
SPEED [kt]	RBARE [kN]	RAPP [kN]	RWIND [kN]	RSEAS [kN]	RCHAN [kN]	RMARGIN [kN]	RTOTAL [kN]	PEBARE [kW]	PETOTAL [kW]
1,00	0,55	0,06	0,00	0,00	0,00	0,09	0,70	0,3	0,4
3,00	4,50	0,49	0,00	0,00	0,00	0,75	5,74	6,9	8,9
5,00	11,88	1,32	0,00	0,00	0,00	1,98	15,19	30,6	39,1
7,00	23,90	2,52	0,00	0,00	0,00	3,96	30,38	86,1	109,4
9,00	44,95	4,08	0,00	0,00	0,00	7,35	56,39	208,1	261,1
11,00	70,48	6,00	0,00	0,00	0,00	11,47	87,96	398,8	497,7
13,00	136,77	8,27	0,00	0,00	0,00	21,76	166,79	914,7	1115,5
+ 15,00 +	197,42	10,88	0,00	0,00	0,00	31,25	239,55	1523,4	1848,5
17,00	531,70	13,84	0,00	0,00	0,00	81,83	627,37	4650,0	5486,7
OTHER									
SPEED [kt]	CTLR	CTLT							
1,00	0,00001	0,03877							
3,00	0,00001	0,03527							
5,00	0,00001	0,03354							
7,00	0,00204	0,03440							
9,00	0,00767	0,03915							
11,00	0,01032	0,04109							
13,00	0,02691	0,05709							
+ 15,00 +	0,03223	0,06190							
17,00	0,10057	0,12979							

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Resistance

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Project ID Proyecto
Description
File name Proyecto.hcnc

Hull data

General		Planing	
Configuration:	Monohull	Proj chine length:	0,000 m
Chine type:	Single/hard	Proj bottom area:	0,0 m2
Length on WL:	54,170 m	LCG fwd TR:	[XCG/LP 0,000] 0,000 m
Max beam on WL:	[LWL/BWL 3,477] 15,580 m	VCG below WL:	0,000 m
Max molded draft:	[BWL/T 2,450] 6,360 m	Aft station (fwd TR):	0,000 m
Displacement:	[CB 0,527] 2901,37 t	Chine beam:	0,000 m
Wetted surface:	[CWS 5,200] 1039,8 m2	Chine ht below WL:	0,000 m
ITTC-78 (CT)		Deadrise:	0,00 deg
LCB fwd TR:	[XCB/LWL 0,480] 26,002 m	Fwd station (fwd TR):	0,000 m
LCF fwd TR:	[XCF/LWL 0,520] 28,168 m	Chine beam:	0,000 m
Max section area:	[CX 0,932] 92,4 m2	Chine ht below WL:	0,000 m
Waterplane area:	[CWP 0,666] 562,0 m2	Deadrise:	0,00 deg
Bulb section area:	0,0 m2	Propulsor type:	SPP
Bulb ctr below WL:	0,000 m	Propeller diameter:	3700,0 mm
Bulb nose fwd TR:	0,000 m	Shaft angle to WL:	0,00 deg
Transom area:	[ATR/AX 0,000] 0,0 m2	Position fwd TR:	0,000 m
Transom beam WL:	[BTR/BWL 0,000] 0,000 m	Position below WL:	0,000 m
Transom immersion:	[TTR/T 0,000] 0,000 m		
Half entrance angle:	21,10 deg		
Bow shape factor:	[AVG flow] 0,0		
Stern shape factor:	[AVG flow] 0,0		

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Appendage data

General		Skeg/Keel	
Definition:	Component	Count:	1
Percent of hull drag:	5,00 %	Type:	Skeg
Planing influence		Mean length:	11,860 m
LCE fwd TR:	0,000 m	Mean width:	1,033 m
VCE below WL:	0,000 m	Height aft:	1,140 m
Shafting		Height mid:	1,970 m
Count:	2	Height fwd:	4,040 m
Max prop diam:	3700,0 mm	Projected area:	25,8 m2
Shaft angle to WL:	0,00 deg	Wetted surface:	63,9 m2
Exposed shaft length:	0,000 m	Stabilizer	
Shaft diameter:	0,000 m	Count:	0
Wetted surface:	0,0 m2	Root chord:	0,000 m
Strut bossing length:	0,000 m	Tip chord:	0,000 m
Bossing diameter:	0,000 m	Span:	0,000 m
Wetted surface:	0,0 m2	T/C ratio:	0,000
Hull bossing length:	0,000 m	LE sweep:	0,00 deg
Bossing diameter:	0,000 m	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Projected area:	0,0 m2
Strut (per shaft line)		Dynamic multiplier:	1,00
Count:	0	Bilge keel	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 mm	Mean length:	0,000 m
Span:	0,000 m	Mean base width:	0,000 m
T/C ratio:	0,000	Mean projection:	0,000 m
Projected area:	0,0 m2	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Tunnel thruster	
Exposed palm depth:	0,000 m	Count:	1
Exposed palm width:	0,000 m	Diameter:	1,580 m
Rudder		Sonar dome	
Count:	0	Count:	0
Rudder location:	Behind propeller	Wetted surface:	0,0 m2
Type:	Balanced foil	Miscellaneous	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 m	Drag area:	0,0 m2
Span:	0,000 m	Drag coef:	0,00
T/C ratio:	0,000		
LE sweep:	0,00 deg		
Projected area:	0,0 m2		
Wetted surface:	0,0 m2		



Environment data

Wind		Seas	
Wind speed:	0,00 kt	Significant wave ht:	0,000 m
Angle off bow:	0,00 deg	Modal wave period:	0,0 sec
Gradient correction:	Off	Shallow/channel	
Exposed hull		Water depth:	0,000 m
Transverse area:	0,0 m2	Type:	Shallow water
VCE above WL:	0,000 m	Channel width:	0,000 m
Profile area:	0,0 m2	Channel side slope:	0,00 deg
Superstructure		Hull girth:	0,000 m
Superstructure shape:	Cargo ship		
Transverse area:	0,0 m2		
VCE above WL:	0,000 m		
Profile area:	0,0 m2		

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Resistance

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File name Proyecto.hcnc

Symbols and values

<p>FN = Froude number [LWL] FV = Froude number [VOL] RN = Reynolds number [LWL] CF = Frictional resistance coefficient CV/CF = Viscous/frictional resistance coefficient ratio [dynamic form factor] CR = Residuary resistance coefficient dCF = Added frictional resistance coefficient for roughness CA = Correlation allowance [dynamic] CT = Total bare-hull resistance coefficient</p> <p>RBARE = Bare-hull resistance RAPP = Additional appendage resistance RWIND = Additional wind resistance RSEAS = Additional sea-state resistance RCHAN = Additional shallow/channel resistance RMARGIN = Resistance margin RTOTAL = Total vessel resistance</p> <p>CTLR = Telfer residuary resistance coefficient CTLT = Telfer total bare-hull resistance coefficient PEBARE = Bare-hull effective power PETOTAL = Total effective power</p> <p>+ = Design speed indicator * = Exceeds parameter limit</p>
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Resultados

Navegación en aguas libres (15 nudos)		
Resistencia	239,55	kN
Potencia por propulsor	1848,5	kW

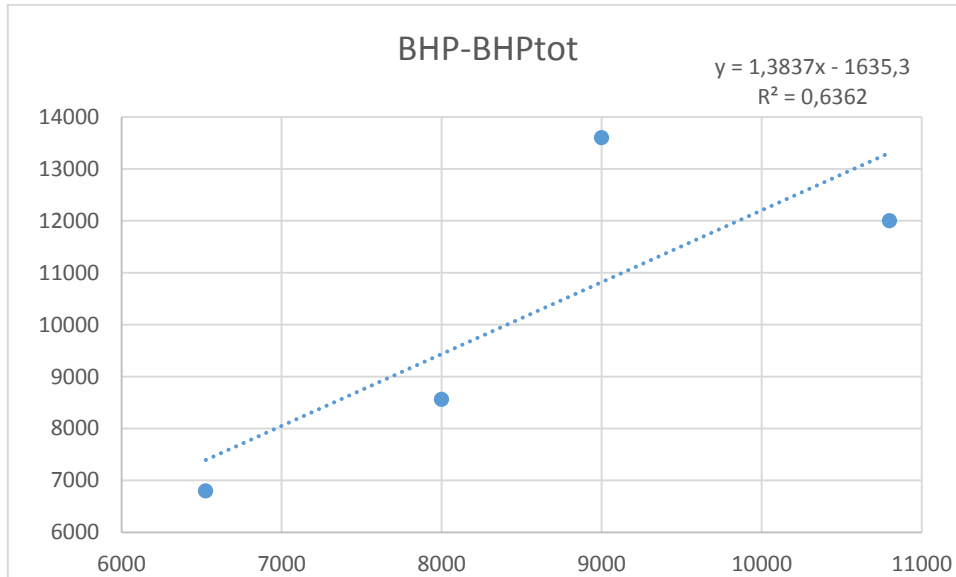
La potencia propulsora por propulsor será de 1848 kW por lo que la potencia total necesaria será:

$$Potencia\ total\ navegación\ aguas\ libres = 3688,819\ kW$$



Demanda eléctrica y potencia de generadores

A continuación, se calculará una estimación de la demanda eléctrica utilizando una regresión con los datos de los buques de la base de datos:



$$BHP_{total} = 1,3837 * BHP - 1635,3$$

$$BHP_{total} = 10898,489 \text{ kW}$$

Los buques que se han utilizado para realizar esta regresión son únicamente aquellos que utilizan una propulsión diésel-eléctrica. A partir de la BHP estimada en la condición de remolque a partir de rectas de regresión, se calcula la potencia que tendrán que desarrollar los generadores para abastecer a todo el buque. Finalmente la demanda eléctrica será:

$$Demanda \text{ eléctrica} = BHP_{total} - BHP = 10898,489 - 9058,17$$

$$Demanda \text{ eléctrica} = 1840,32 \text{ kW}$$

En la condición de navegación en aguas libres, se utilizarán dos generadores para suministrar la potencia necesaria y se dejará uno se reserva.

En la condición de remolque se utilizarán los tres generadores para suministrar la potencia que será BHPtotal.



Condición	Nº generadores en funcionamiento	Potencia por generador (kW)	% Funcionamiento
Navegación en aguas libres	2	-	51%
Remolque	3	3632,83	100%

5. ESTIMACIÓN DE PESOS

Una vez estimadas las dimensiones del buque a partir de la cifra de mérito se estimará el peso en rosca, el peso muerto y el desplazamiento.

5.1. Estimación del peso en rosca

Para la estimación del peso en rosca es necesario conocer el peso del acero, el de la maquinaria y el del equipo y la habilitación.

5.1.1. Peso del acero

Este ya se ha estimado para el cálculo de la cifra de mérito:

$$PS = 812,079 \text{ toneladas}$$

5.1.2. Peso de la maquinaria

Al no conocerse aún los elementos necesarios para la propulsión y auxiliares se utilizará a modo de aproximación la fórmula para remolcadores del libro “Proyecto Básico del Buque Mercante”.

$$Peso \text{ maquinaria} = 3 * Peso \text{ motor principal}$$

El peso que se utilizará para este cálculo será el peso de los generadores. A partir de la potencia calculada para los generadores se elige el generador Wärtsilä W 8L32 cuya potencia es 3840 kW y su peso 43,6 toneladas.

$$Peso \text{ maquinaria} = 3 * 43,6 * 3 \text{ generadores}$$

$$Peso \text{ maquinaria} = 392,4 \text{ toneladas}$$



5.1.3. Peso de la habilitación y equipos

Se utilizará la fórmula del libro “Proyecto Básico del Buque Mercante” específica para remolcadores:

$$\text{Peso habilitación y equipos} = K * Lpp * B * D$$

Donde:

k	0,06
Lpp	54,17
B	15,58
D	7,51

$$\text{Peso habilitación y equipos} = 380,3 \text{ toneladas}$$

5.1.4. Resultado

$$\text{Peso en rosca total} = \text{Peso acero} + \text{Peso maquinaria} + \text{Peso habilitación y eq.}$$

$$\text{Peso en rosca total} = 1584,78 \text{ toneladas}$$

5.2. Estimación del peso muerto

La estimación del peso muerto también se realizará a partir de lo descrito en el libro “El Proyecto Básico del Buque Mercante”.

El peso muerto se dividirá en el peso del combustible, peso del aceite, peso del agua dulce, peso de la tripulación y el peso de los víveres.

5.2.1. Peso del combustible

El peso del combustible se estimará a partir de los datos obtenidos del generador Wärtsilä W 8L32 a la potencia de navegación en aguas libres:

ρ combustible	890	kg/m ³
SFOC	184	g/KWh
Autonomía	8000	millas
V	15	nudos
Potencia	3688,82	KW



$$\text{Peso de combustible} = \frac{\text{Consumo (g)}}{kW * h} * \text{horas de servicio} * \text{Potencia (kW)}$$

$$\text{Peso del combustible} = 362 \text{ toneladas}$$

El peso ha sido calculado utilizando a potencia de remolque. Este cálculo se alejará mucho de la realidad debido a que la mayoría del tiempo el buque estará en la condición de navegación en aguas libres. Se ha elegido calcularlo con la potencia de remolque porque es la situación más desfavorable.

5.2.2. Peso del aceite

Para el cálculo de peso de aceite se estimará que este será un 3% del peso del combustible:

$$\text{Peso del aceite} = 10,96 \text{ toneladas}$$

5.2.3. Peso del agua dulce

Se estimará mediante la siguiente fórmula:

$$\text{Peso de agua dulce} = \frac{k * d * N}{1000}$$

Donde:

k (consumo de agua por persona y día)	175	l/día
N (Nº de personas)	14	tripulantes
d (Autonomía en días)	22,22	días

$$\text{Peso de agua dulce} = 54,44 \text{ toneladas}$$

5.2.4. Peso de la tripulación

Se considerará un peso por persona de 125 kg:

$$\text{Peso de la tripulación} = \frac{\text{Kg}}{\text{Persona}} * N$$

Donde:

Kg/Persona	125	kg
Tripulación	14	personas

$$\text{Peso de la tripulación} = 1,75 \text{ toneladas}$$



5.2.5. Peso de víveres

Se estimará un peso de 5 kg de víveres por persona y día:

$$\text{Peso de víveres} = \frac{\text{Kg}}{\text{Persona} \cdot \text{día}} * \text{días} * \text{Personas}$$

$$= \frac{5 \text{ kg} * 14 \text{ personas} * 22,22 \text{ días}}{1000}$$

Donde:

kg/persona	5	kg
tripulación	14	personas
d (Autonomía en días)	22,22	días

$$\text{Peso de víveres} = 1,55 \text{ toneladas}$$

5.2.6. Resultado

$$\text{Peso muerto} = 430,7 \text{ toneladas}$$

5.3. Cálculo del desplazamiento

Se realizará una nueva estimación del desplazamiento como suma del peso en rosca y el peso muerto obtenidos:

$$\Delta = \text{Peso en rosca} + \text{Peso muerto}$$

$$\Delta = 2015,48 \text{ toneladas}$$

5.3.1. Comparación de desplazamientos

Por último se compara el desplazamiento obtenido en el cálculo de la cifra de mérito con el obtenido con el peso en rosca y el peso muerto.

Δ (pesos)	2015,48	toneladas
Δ (cifra de mérito)	2901,37288	toneladas

Los valores de desplazamiento aun siendo similares, no son iguales debido al cálculo aproximado de los pesos.



ANEXO I
CÁLCULO DE LA CIFRA DE MÉRITO



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
54,17	14,82	7,89	3,65	6,86	1,88	6,48	6,58	6,68	2,28667028	2,25	2,22	1,41	1,31	1,21	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	14,91	7,85	3,63	6,90	1,90	6,45	6,54	6,64	2,31266251	2,28	2,24	1,40	1,30	1,21	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	14,99	7,80	3,61	6,94	1,92	6,41	6,51	6,61	2,33875099	2,30	2,27	1,39	1,30	1,20	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,08	7,76	3,59	6,98	1,94	6,37	6,47	6,57	2,36498579	2,33	2,30	1,39	1,29	1,19	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,16	7,72	3,57	7,02	1,96	6,34	6,44	6,53	2,39136692	2,36	2,32	1,38	1,28	1,19	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,24	7,68	3,55	7,06	1,99	6,30	6,40	6,50	2,41789437	2,38	2,35	1,37	1,28	1,18	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,33	7,63	3,53	7,10	2,01	6,27	6,37	6,46	2,44456815	2,41	2,37	1,36	1,27	1,17	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,41	7,59	3,51	7,13	2,03	6,24	6,33	6,43	2,47138825	2,43	2,40	1,36	1,26	1,17	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,50	7,55	3,50	7,17	2,05	6,20	6,30	6,39	2,49835467	2,46	2,42	1,35	1,25	1,16	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	No
54,17	15,58	7,51	3,48	7,21	2,07	6,17	6,26	6,36	2,52546742	2,49	2,45	1,34	1,25	1,15	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si
54,17	15,66	7,47	3,46	7,25	2,10	6,14	6,23	6,32	2,55272649	2,51	2,48	1,33	1,24	1,15	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si
54,17	15,75	7,43	3,44	7,29	2,12	6,10	6,20	6,29	2,58013189	2,54	2,50	1,33	1,23	1,14	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si
54,17	15,83	7,39	3,42	7,33	2,14	6,07	6,16	6,26	2,60768361	2,57	2,53	1,32	1,23	1,14	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si
54,17	15,91	7,35	3,40	7,37	2,16	6,04	6,13	6,22	2,63538166	2,60	2,56	1,31	1,22	1,13	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si
54,17	16,00	7,31	3,39	7,41	2,19	6,01	6,10	6,19	2,66322603	2,62	2,58	1,31	1,22	1,12	5205,81	5285,09	5364,37	2815,61801	2858,49545	2901,37288	0,528	Si

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
54,70	14,82	7,82	3,69	7,00	1,90	6,42	6,52	6,62	2,30902119	2,27438588	2,24077426	1,40	1,30	1,20	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	14,91	7,77	3,67	7,04	1,92	6,38	6,48	6,58	2,33526699	2,30023798	2,26624432	1,39	1,29	1,19	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	14,99	7,73	3,65	7,08	1,94	6,35	6,44	6,54	2,36161046	2,32618631	2,29180917	1,38	1,28	1,19	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,08	7,69	3,63	7,12	1,96	6,31	6,41	6,51	2,38810169	2,35228017	2,3175174	1,37	1,28	1,18	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,16	7,64	3,61	7,16	1,98	6,28	6,37	6,47	2,41474067	2,37851956	2,34336903	1,37	1,27	1,17	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,24	7,60	3,59	7,20	2,01	6,24	6,34	6,43	2,44152741	2,4049045	2,36936404	1,36	1,26	1,17	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,33	7,56	3,57	7,24	2,03	6,21	6,30	6,40	2,4684619	2,43143497	2,39550244	1,35	1,26	1,16	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,41	7,52	3,55	7,27	2,05	6,18	6,27	6,36	2,49554415	2,45811099	2,42178422	1,34	1,25	1,16	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	No
54,70	15,50	7,48	3,53	7,31	2,07	6,14	6,24	6,33	2,52277415	2,48493254	2,44820939	1,34	1,24	1,15	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	15,58	7,44	3,51	7,35	2,09	6,11	6,20	6,30	2,5501519	2,51189962	2,47477795	1,33	1,24	1,14	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	15,66	7,40	3,49	7,39	2,12	6,08	6,17	6,26	2,57767741	2,53901225	2,5014899	1,32	1,23	1,14	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	15,75	7,36	3,47	7,43	2,14	6,04	6,14	6,23	2,60535067	2,56627041	2,52834524	1,31	1,22	1,13	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	15,83	7,32	3,46	7,47	2,16	6,01	6,10	6,20	2,63317169	2,59367412	2,55534396	1,31	1,22	1,12	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	15,91	7,28	3,44	7,51	2,19	5,98	6,07	6,16	2,66114046	2,62122336	2,58248607	1,30	1,21	1,12	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si
54,70	16,00	7,24	3,42	7,55	2,21	5,95	6,04	6,13	2,68925699	2,64891813	2,60977156	1,29	1,20	1,11	5205,81	5285,09	5364,37	2830,17585	2873,27498	2916,3741	0,530	Si



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
55,23	14,82	7,74	3,73	7,13	1,91	6,36	6,46	6,55	2,33137211	2,29640153	2,26246456	1,38	1,29	1,19	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	14,91	7,70	3,70	7,17	1,94	6,32	6,42	6,52	2,35787147	2,32250339	2,28818068	1,38	1,28	1,18	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	14,99	7,66	3,68	7,21	1,96	6,29	6,38	6,48	2,38446993	2,34870288	2,31399299	1,37	1,27	1,18	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	15,08	7,61	3,66	7,25	1,98	6,25	6,35	6,44	2,41121759	2,37504932	2,33995007	1,36	1,27	1,17	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	15,16	7,57	3,64	7,30	2,00	6,22	6,31	6,41	2,43811442	2,40154271	2,36605193	1,35	1,26	1,16	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	15,24	7,53	3,62	7,34	2,02	6,18	6,28	6,37	2,46516045	2,42818304	2,39229856	1,35	1,25	1,16	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	15,33	7,49	3,60	7,38	2,05	6,15	6,24	6,34	2,49235565	2,45497032	2,41868997	1,34	1,24	1,15	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	No
55,23	15,41	7,45	3,58	7,42	2,07	6,12	6,21	6,30	2,51970004	2,48190454	2,44522615	1,33	1,24	1,14	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,50	7,41	3,56	7,46	2,09	6,08	6,18	6,27	2,54719362	2,50898572	2,47190711	1,32	1,23	1,14	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,58	7,37	3,55	7,50	2,11	6,05	6,14	6,23	2,57483638	2,53621384	2,49873284	1,32	1,22	1,13	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,66	7,33	3,53	7,54	2,14	6,02	6,11	6,20	2,60262833	2,5635889	2,52570335	1,31	1,22	1,13	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,75	7,29	3,51	7,58	2,16	5,99	6,08	6,17	2,63056946	2,59111091	2,55281863	1,30	1,21	1,12	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,83	7,25	3,49	7,62	2,18	5,95	6,04	6,14	2,65865977	2,61877987	2,58007869	1,30	1,20	1,11	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	15,91	7,21	3,47	7,66	2,21	5,92	6,01	6,10	2,68689927	2,64659578	2,60748353	1,29	1,20	1,11	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si
55,23	16,00	7,17	3,45	7,70	2,23	5,89	5,98	6,07	2,71528795	2,67455863	2,63503314	1,28	1,19	1,10	5205,81	5285,09	5364,37	2844,52384	2887,84146	2931,15908	0,533	Si

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
55,76	14,82	7,67	3,76	7,27	1,93	6,30	6,39	6,49	2,35372302	2,31841717	2,28415485	1,37	1,27	1,18	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	14,91	7,63	3,74	7,31	1,96	6,26	6,36	6,45	2,38047594	2,3447688	2,31011705	1,36	1,27	1,17	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	14,99	7,58	3,72	7,35	1,98	6,23	6,32	6,42	2,40732941	2,37121946	2,33617681	1,35	1,26	1,17	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	15,08	7,54	3,70	7,39	2,00	6,19	6,29	6,38	2,43433348	2,39781848	2,36238274	1,35	1,25	1,16	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	15,16	7,50	3,68	7,44	2,02	6,16	6,25	6,35	2,46148818	2,42456585	2,38873483	1,34	1,25	1,15	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	15,24	7,46	3,66	7,48	2,04	6,12	6,22	6,31	2,48879348	2,45146158	2,41523308	1,33	1,24	1,15	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	No
55,76	15,33	7,42	3,64	7,52	2,07	6,09	6,18	6,28	2,51624941	2,47850566	2,4418775	1,33	1,23	1,14	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,41	7,38	3,62	7,56	2,09	6,06	6,15	6,24	2,54385594	2,5056981	2,46866808	1,32	1,23	1,13	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,50	7,34	3,60	7,60	2,11	6,03	6,12	6,21	2,57161309	2,5330389	2,49560483	1,31	1,22	1,13	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,58	7,30	3,58	7,64	2,14	5,99	6,08	6,18	2,59952086	2,56052805	2,52268773	1,30	1,21	1,12	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,66	7,26	3,56	7,68	2,16	5,96	6,05	6,14	2,62757924	2,58816555	2,5499168	1,30	1,21	1,12	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,75	7,22	3,54	7,72	2,18	5,93	6,02	6,11	2,65578824	2,61595141	2,57729203	1,29	1,20	1,11	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,83	7,18	3,52	7,76	2,20	5,90	5,99	6,08	2,68414785	2,64388563	2,60481343	1,28	1,19	1,10	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	15,91	7,14	3,50	7,81	2,23	5,87	5,96	6,05	2,71265807	2,6719682	2,63248099	1,28	1,19	1,10	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si
55,76	16,00	7,11	3,49	7,85	2,25	5,84	5,92	6,01	2,74131891	2,70019913	2,66029471	1,27	1,18	1,09	5205,81	5285,09	5364,37	2858,66697	2902,19997	2945,73297	0,536	Si



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
56,29	14,82	7,60	3,80	7,41	1,95	6,24	6,33	6,43	2,37607393	2,34043282	2,30584515	1,36	1,26	1,17	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	14,91	7,55	3,78	7,45	1,97	6,20	6,30	6,39	2,40308042	2,36703421	2,33205341	1,35	1,26	1,16	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	14,99	7,51	3,75	7,49	2,00	6,17	6,26	6,36	2,43018888	2,39373604	2,35836063	1,34	1,25	1,15	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	15,08	7,47	3,73	7,54	2,02	6,13	6,23	6,32	2,45744938	2,42058764	2,38481541	1,33	1,24	1,15	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	15,16	7,43	3,71	7,58	2,04	6,10	6,19	6,29	2,48486193	2,447589	2,41141773	1,33	1,23	1,14	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	15,24	7,39	3,69	7,62	2,06	6,07	6,16	6,25	2,51242652	2,47474012	2,43816761	1,32	1,23	1,14	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	No
56,29	15,33	7,35	3,67	7,66	2,09	6,03	6,13	6,22	2,54014316	2,50204101	2,46506503	1,31	1,22	1,13	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,41	7,31	3,65	7,70	2,11	6,00	6,09	6,18	2,56801184	2,52949166	2,49211001	1,31	1,21	1,12	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,50	7,27	3,63	7,75	2,13	5,97	6,06	6,15	2,59603257	2,55709208	2,51930254	1,30	1,21	1,12	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,58	7,23	3,61	7,79	2,16	5,94	6,03	6,12	2,62420534	2,58484226	2,54664262	1,29	1,20	1,11	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,66	7,19	3,59	7,83	2,18	5,90	5,99	6,08	2,65253016	2,6127422	2,57413025	1,28	1,19	1,10	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,75	7,15	3,57	7,87	2,20	5,87	5,96	6,05	2,68100702	2,64079191	2,60176543	1,28	1,19	1,10	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,83	7,11	3,56	7,91	2,23	5,84	5,93	6,02	2,70963593	2,66899139	2,62954817	1,27	1,18	1,09	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	15,91	7,08	3,54	7,95	2,25	5,81	5,90	5,99	2,73841688	2,69734063	2,65747845	1,26	1,18	1,09	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si
56,29	16,00	7,04	3,52	8,00	2,27	5,78	5,87	5,96	2,76734988	2,72583963	2,68555628	1,26	1,17	1,08	5205,81	5285,09	5364,37	2872,61006	2916,35539	2960,10072	0,538	Si

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
56,82	14,82	7,53	3,83	7,55	1,97	6,18	6,27	6,37	2,39842484	2,36244847	2,32753544	1,34	1,25	1,16	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	No
56,82	14,91	7,48	3,81	7,59	1,99	6,15	6,24	6,33	2,4256849	2,38929962	2,35398978	1,34	1,24	1,15	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	No
56,82	14,99	7,44	3,79	7,64	2,01	6,11	6,20	6,30	2,45304835	2,41625262	2,38054446	1,33	1,24	1,14	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	No
56,82	15,08	7,40	3,77	7,68	2,04	6,08	6,17	6,26	2,48056528	2,4433568	2,40724808	1,32	1,23	1,14	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	No
56,82	15,16	7,36	3,75	7,72	2,06	6,04	6,14	6,23	2,50823568	2,47061214	2,43410063	1,31	1,22	1,13	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	No
56,82	15,24	7,32	3,73	7,76	2,08	6,01	6,10	6,19	2,53605956	2,49801866	2,46110213	1,31	1,22	1,12	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,33	7,28	3,71	7,81	2,11	5,98	6,07	6,16	2,56403691	2,52557636	2,48825257	1,30	1,21	1,12	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,41	7,24	3,69	7,85	2,13	5,95	6,04	6,13	2,59216774	2,55328522	2,51555194	1,29	1,20	1,11	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,50	7,20	3,67	7,89	2,15	5,91	6,00	6,09	2,62045204	2,58114526	2,54300026	1,29	1,20	1,11	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,58	7,16	3,65	7,93	2,18	5,88	5,97	6,06	2,64888982	2,60915647	2,57059751	1,28	1,19	1,10	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,66	7,12	3,63	7,98	2,20	5,85	5,94	6,03	2,67748107	2,63731886	2,5983437	1,27	1,18	1,09	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,75	7,08	3,61	8,02	2,22	5,82	5,91	6,00	2,7062258	2,66563241	2,62623883	1,27	1,18	1,09	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,83	7,05	3,59	8,06	2,25	5,79	5,88	5,96	2,73512401	2,69409715	2,6542829	1,26	1,17	1,08	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	15,91	7,01	3,57	8,11	2,27	5,76	5,85	5,93	2,76417568	2,72271305	2,68247591	1,25	1,16	1,08	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si
56,82	16,00	6,97	3,55	8,15	2,29	5,73	5,81	5,90	2,79338084	2,75148013	2,71081786	1,25	1,16	1,07	5205,81	5285,09	5364,37	2886,3578	2930,31248	2974,26717	0,541	Si



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
57,35	14,82	7,46	3,87	7,69	1,99	6,12	6,22	6,31	2,42077576	2,38446412	2,34922573	1,33	1,24	1,15	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	No
57,35	14,91	7,41	3,85	7,73	2,01	6,09	6,18	6,27	2,44828937	2,41156503	2,37592614	1,32	1,23	1,14	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	No
57,35	14,99	7,37	3,83	7,78	2,03	6,06	6,15	6,24	2,47590782	2,4387692	2,40272828	1,32	1,23	1,13	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	No
57,35	15,08	7,33	3,80	7,82	2,06	6,02	6,11	6,20	2,50368117	2,46612595	2,42968074	1,31	1,22	1,13	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	No
57,35	15,16	7,29	3,78	7,87	2,08	5,99	6,08	6,17	2,53160943	2,49363529	2,45678354	1,30	1,21	1,12	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,24	7,25	3,76	7,91	2,10	5,96	6,05	6,14	2,55969259	2,5212972	2,48403665	1,30	1,20	1,11	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,33	7,21	3,74	7,95	2,13	5,92	6,01	6,10	2,58793066	2,5491117	2,5114401	1,29	1,20	1,11	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,41	7,17	3,72	8,00	2,15	5,89	5,98	6,07	2,61632363	2,57707878	2,53899387	1,28	1,19	1,10	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,50	7,13	3,70	8,04	2,17	5,86	5,95	6,04	2,64487151	2,60519844	2,56669797	1,27	1,19	1,10	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,58	7,09	3,68	8,08	2,20	5,83	5,92	6,00	2,6735743	2,63347068	2,5945524	1,27	1,18	1,09	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,66	7,06	3,66	8,13	2,22	5,80	5,88	5,97	2,70243199	2,66189551	2,62255715	1,26	1,17	1,08	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,75	7,02	3,64	8,17	2,24	5,76	5,85	5,94	2,73144458	2,69047292	2,65071223	1,25	1,17	1,08	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,83	6,98	3,62	8,21	2,27	5,73	5,82	5,91	2,76061208	2,7192029	2,67901764	1,25	1,16	1,07	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	15,91	6,95	3,60	8,26	2,29	5,70	5,79	5,88	2,78993449	2,74808547	2,70747337	1,24	1,15	1,07	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si
57,35	16,00	6,91	3,58	8,30	2,32	5,67	5,76	5,85	2,8194118	2,77712062	2,73607943	1,23	1,15	1,06	5205,81	5285,09	5364,37	2899,91469	2944,07583	2988,23696	0,543	Si

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
57,88	14,82	7,39	3,90	7,83	2,01	6,07	6,16	6,25	2,44312667	2,40647977	2,37091603	1,32	1,23	1,14	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	No
57,88	14,91	7,35	3,88	7,88	2,03	6,03	6,13	6,22	2,47089385	2,43383044	2,3978625	1,31	1,22	1,13	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	No
57,88	14,99	7,31	3,86	7,92	2,05	6,00	6,09	6,18	2,49876729	2,46128578	2,4249121	1,31	1,21	1,12	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	No
57,88	15,08	7,26	3,84	7,97	2,08	5,97	6,06	6,15	2,52679707	2,48889511	2,45211341	1,30	1,21	1,12	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,16	7,22	3,82	8,01	2,10	5,93	6,02	6,11	2,55498318	2,51665843	2,47946644	1,29	1,20	1,11	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,24	7,18	3,80	8,06	2,12	5,90	5,99	6,08	2,58332563	2,54457574	2,50697118	1,28	1,19	1,10	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,33	7,15	3,78	8,10	2,15	5,87	5,96	6,05	2,61182441	2,57264705	2,53462763	1,28	1,19	1,10	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,41	7,11	3,76	8,14	2,17	5,84	5,93	6,01	2,64047953	2,60087234	2,5624358	1,27	1,18	1,09	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,50	7,07	3,74	8,19	2,19	5,80	5,89	5,98	2,66929099	2,62925162	2,59039569	1,26	1,17	1,09	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,58	7,03	3,72	8,23	2,22	5,77	5,86	5,95	2,69825878	2,6577849	2,61850729	1,26	1,17	1,08	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,66	6,99	3,70	8,28	2,24	5,74	5,83	5,92	2,7273829	2,68647216	2,6467706	1,25	1,16	1,07	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,75	6,95	3,68	8,32	2,26	5,71	5,80	5,89	2,75666337	2,71531342	2,67518563	1,24	1,16	1,07	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,83	6,92	3,66	8,37	2,29	5,68	5,77	5,85	2,78610016	2,74430866	2,70375238	1,24	1,15	1,06	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	15,91	6,88	3,64	8,41	2,31	5,65	5,74	5,82	2,8156933	2,7734579	2,73247083	1,23	1,14	1,06	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si
57,88	16,00	6,85	3,62	8,45	2,34	5,62	5,71	5,79	2,84544276	2,80276112	2,76134101	1,22	1,14	1,05	5205,81	5285,09	5364,37	2913,28512	2957,64986	3002,01461	0,546	Si



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85					
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
58,41	14,82	7,32	3,94	7,98	2,03	6,01	6,10	6,20	2,46570677	2,42872117	2,39282874	1,31	1,22	1,12	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	No
58,41	14,91	7,28	3,92	8,02	2,05	5,98	6,07	6,16	2,49349833	2,45609585	2,41979887	1,30	1,21	1,12	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	No
58,41	14,99	7,24	3,90	8,07	2,07	5,95	6,04	6,13	2,52162676	2,48380236	2,44709592	1,29	1,20	1,11	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,08	7,20	3,87	8,11	2,09	5,91	6,00	6,09	2,54991296	2,51166427	2,47454608	1,29	1,20	1,11	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,16	7,16	3,85	8,16	2,12	5,88	5,97	6,06	2,57835693	2,53968158	2,50214934	1,28	1,19	1,10	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,24	7,12	3,83	8,20	2,14	5,85	5,94	6,03	2,60695867	2,56785429	2,5299057	1,27	1,18	1,09	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,33	7,08	3,81	8,25	2,16	5,82	5,90	5,99	2,63571816	2,59618239	2,55781516	1,27	1,18	1,09	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,41	7,04	3,79	8,29	2,19	5,78	5,87	5,96	2,66463543	2,6246659	2,58587773	1,26	1,17	1,08	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,50	7,00	3,77	8,34	2,21	5,75	5,84	5,93	2,69371046	2,6533048	2,6140934	1,25	1,16	1,08	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,58	6,97	3,75	8,38	2,24	5,72	5,81	5,90	2,72294326	2,68209911	2,64246218	1,24	1,16	1,07	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,66	6,93	3,73	8,43	2,26	5,69	5,78	5,86	2,75233382	2,71104881	2,67098405	1,24	1,15	1,06	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,75	6,89	3,71	8,47	2,28	5,66	5,75	5,83	2,78188215	2,74015392	2,69965903	1,23	1,15	1,06	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,83	6,86	3,69	8,52	2,31	5,63	5,72	5,80	2,81158824	2,76941442	2,72848711	1,22	1,14	1,05	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	15,91	6,82	3,67	8,56	2,33	5,60	5,69	5,77	2,8414521	2,79883032	2,7574683	1,22	1,13	1,05	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si
58,41	16,00	6,78	3,65	8,61	2,36	5,57	5,66	5,74	2,87147373	2,82840162	2,78660258	1,21	1,13	1,04	5205,81	5285,09	5364,37	2926,60762	2971,17525	3015,74288	0,548	Si

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85					
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
58,94	14,82	7,25	3,98	8,12	2,04	5,96	6,05	6,14	2,48805769	2,45073682	2,41451904	1,30	1,21	1,11	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	No
58,94	14,91	7,21	3,95	8,17	2,07	5,93	6,02	6,11	2,5161028	2,47836126	2,44173523	1,29	1,20	1,11	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	14,99	7,17	3,93	8,22	2,09	5,89	5,98	6,07	2,54448623	2,50631894	2,46927974	1,28	1,19	1,10	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,08	7,13	3,91	8,26	2,11	5,86	5,95	6,04	2,57302886	2,53443343	2,49697875	1,27	1,19	1,10	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,16	7,09	3,89	8,31	2,14	5,83	5,92	6,00	2,60173068	2,56270472	2,52483224	1,27	1,18	1,09	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,24	7,06	3,87	8,35	2,16	5,79	5,88	5,97	2,6305917	2,59113283	2,55284022	1,26	1,17	1,08	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,33	7,02	3,85	8,40	2,18	5,76	5,85	5,94	2,65961192	2,61971774	2,5810027	1,25	1,17	1,08	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,41	6,98	3,82	8,45	2,21	5,73	5,82	5,91	2,68879133	2,64845946	2,60931966	1,25	1,16	1,07	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,50	6,94	3,80	8,49	2,23	5,70	5,79	5,87	2,71812993	2,67735799	2,63779112	1,24	1,15	1,07	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,58	6,90	3,78	8,54	2,26	5,67	5,76	5,84	2,74762774	2,70641332	2,66641706	1,23	1,15	1,06	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,66	6,87	3,76	8,58	2,28	5,64	5,73	5,81	2,77728474	2,73562546	2,6951975	1,23	1,14	1,06	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,75	6,83	3,74	8,63	2,31	5,61	5,69	5,78	2,80710093	2,76499442	2,72413243	1,22	1,14	1,05	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,83	6,79	3,72	8,67	2,33	5,58	5,66	5,75	2,83707632	2,79452018	2,75322185	1,21	1,13	1,04	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	15,91	6,76	3,70	8,72	2,35	5,55	5,63	5,72	2,86721091	2,82420274	2,78246576	1,21	1,12	1,04	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si
58,94	16,00	6,72	3,68	8,77	2,38	5,52	5,61	5,69	2,89750469	2,85404212	2,81186416	1,20	1,12	1,03	5205,81	5285,09	5364,37	2939,61588	2984,38161	3029,14733	0,551	Si



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
59,46	14,82	7,19	4,01	8,27	2,06	5,91	6,00	6,09	2,51003124	2,47238077	2,43584313	1,28	1,19	1,11	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	No
59,46	14,91	7,15	3,99	8,32	2,09	5,87	5,96	6,05	2,53870728	2,50062667	2,4636716	1,28	1,19	1,10	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	14,99	7,11	3,97	8,36	2,11	5,84	5,93	6,02	2,56734571	2,52883552	2,49146357	1,27	1,18	1,09	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,08	7,07	3,94	8,41	2,13	5,81	5,90	5,98	2,59614476	2,55720259	2,51941141	1,26	1,17	1,09	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,16	7,03	3,92	8,46	2,16	5,77	5,86	5,95	2,62510443	2,58572787	2,54751514	1,26	1,17	1,08	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,24	6,99	3,90	8,50	2,18	5,74	5,83	5,92	2,65422474	2,61441137	2,57577475	1,25	1,16	1,07	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,33	6,95	3,88	8,55	2,20	5,71	5,80	5,89	2,68350567	2,64325308	2,60419023	1,24	1,16	1,07	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,41	6,92	3,86	8,60	2,23	5,68	5,77	5,85	2,71294723	2,67225302	2,63276159	1,24	1,15	1,06	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,50	6,88	3,84	8,64	2,25	5,65	5,74	5,82	2,74254941	2,70141117	2,66148883	1,23	1,14	1,06	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,58	6,84	3,82	8,69	2,28	5,62	5,71	5,79	2,77231222	2,73072753	2,69037195	1,22	1,14	1,05	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,66	6,81	3,80	8,74	2,30	5,59	5,67	5,76	2,80223565	2,76020212	2,71941095	1,22	1,13	1,05	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,75	6,77	3,78	8,78	2,33	5,56	5,64	5,73	2,83231971	2,78983492	2,74860583	1,21	1,12	1,04	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,83	6,73	3,76	8,83	2,35	5,53	5,61	5,70	2,8625644	2,81962593	2,77795658	1,20	1,12	1,03	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	15,91	6,70	3,74	8,88	2,38	5,50	5,58	5,67	2,89296971	2,84957517	2,80746322	1,20	1,11	1,03	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI
59,46	16,00	6,66	3,72	8,92	2,40	5,47	5,56	5,64	2,92353565	2,87968262	2,83712573	1,19	1,11	1,02	5205,81	5285,09	5364,37	2952,23477	2997,19266	3042,15055	0,553	SI

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
59,99	14,82	7,13	4,05	8,42	2,08	5,85	5,94	6,03	2,53238215	2,49439642	2,45753342	1,27	1,18	1,10	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	14,91	7,09	4,02	8,47	2,10	5,82	5,91	6,00	2,56131176	2,52289208	2,48560796	1,27	1,18	1,09	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	14,99	7,05	4,00	8,51	2,13	5,79	5,88	5,96	2,59020518	2,5513521	2,51364739	1,26	1,17	1,08	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,08	7,01	3,98	8,56	2,15	5,76	5,84	5,93	2,61926065	2,57997174	2,54184408	1,25	1,16	1,08	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,16	6,97	3,96	8,61	2,18	5,72	5,81	5,90	2,64847819	2,60875101	2,57019804	1,25	1,16	1,07	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,24	6,93	3,94	8,66	2,20	5,69	5,78	5,87	2,67785778	2,63768991	2,59870927	1,24	1,15	1,07	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,33	6,89	3,91	8,70	2,22	5,66	5,75	5,83	2,70739942	2,66678843	2,62737776	1,23	1,15	1,06	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,41	6,86	3,89	8,75	2,25	5,63	5,72	5,80	2,73710312	2,69604658	2,65620352	1,22	1,14	1,05	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,50	6,82	3,87	8,80	2,27	5,60	5,69	5,77	2,76696888	2,72546435	2,68518655	1,22	1,13	1,05	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,58	6,78	3,85	8,85	2,30	5,57	5,65	5,74	2,7969967	2,75504175	2,71432684	1,21	1,13	1,04	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,66	6,75	3,83	8,89	2,32	5,54	5,62	5,71	2,82718657	2,78477877	2,7436244	1,21	1,12	1,04	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,75	6,71	3,81	8,94	2,35	5,51	5,59	5,68	2,85753849	2,81467542	2,77307923	1,20	1,11	1,03	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,83	6,67	3,79	8,99	2,37	5,48	5,56	5,65	2,88805248	2,84473169	2,80269132	1,19	1,11	1,03	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	15,91	6,64	3,77	9,04	2,40	5,45	5,54	5,62	2,91872852	2,87494759	2,83246068	1,19	1,10	1,02	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI
59,99	16,00	6,60	3,75	9,08	2,42	5,42	5,51	5,59	2,94956661	2,90532312	2,86238731	1,18	1,10	1,01	5205,81	5285,09	5364,37	2964,9015	3010,05229	3055,20307	0,556	SI



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
60,52	14,82	7,07	4,08	8,57	2,10	5,80	5,89	5,98	2,55473307	2,51641207	2,47922372	1,26	1,17	1,09	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	14,91	7,02	4,06	8,62	2,12	5,77	5,86	5,95	2,58391623	2,54515749	2,50754433	1,26	1,17	1,08	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	14,99	6,99	4,04	8,66	2,15	5,74	5,82	5,91	2,61306465	2,57386868	2,53583121	1,25	1,16	1,07	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,08	6,95	4,01	8,71	2,17	5,71	5,79	5,88	2,64237655	2,6027409	2,56427675	1,24	1,15	1,07	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,16	6,91	3,99	8,76	2,19	5,67	5,76	5,85	2,67185194	2,63177416	2,59288094	1,23	1,15	1,06	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,24	6,87	3,97	8,81	2,22	5,64	5,73	5,81	2,70149081	2,66096845	2,62164379	1,23	1,14	1,06	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,33	6,83	3,95	8,86	2,24	5,61	5,70	5,78	2,73129317	2,69032378	2,6505653	1,22	1,14	1,05	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,41	6,80	3,93	8,91	2,27	5,58	5,67	5,75	2,76125902	2,71984013	2,67964545	1,21	1,13	1,04	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,50	6,76	3,91	8,95	2,29	5,55	5,64	5,72	2,79138835	2,74951753	2,70888426	1,21	1,12	1,04	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,58	6,72	3,88	9,00	2,32	5,52	5,61	5,69	2,82168117	2,77935596	2,73828173	1,20	1,12	1,03	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,66	6,69	3,86	9,05	2,34	5,49	5,58	5,66	2,85213748	2,80935542	2,76783785	1,19	1,11	1,03	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,75	6,65	3,84	9,10	2,37	5,46	5,55	5,63	2,88275728	2,83951592	2,79755263	1,19	1,11	1,02	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,83	6,62	3,82	9,15	2,39	5,43	5,52	5,60	2,91354056	2,86983745	2,82742606	1,18	1,10	1,02	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	15,91	6,58	3,80	9,20	2,42	5,40	5,49	5,57	2,94448732	2,90032001	2,85745814	1,18	1,09	1,01	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No
60,52	16,00	6,55	3,78	9,25	2,44	5,38	5,46	5,54	2,97559758	2,93096361	2,88764888	1,17	1,09	1,01	5205,81	5285,09	5364,37	2977,40164	3022,74278	3068,08392	0,558	No

Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85			0,82	0,83	0,85
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
61,05	14,82	7,00	4,12	8,72	2,12	5,75	5,84	5,93	2,57708398	2,53842772	2,50091401	1,25	1,16	1,08	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	14,91	6,96	4,10	8,77	2,14	5,72	5,81	5,89	2,60652071	2,5674229	2,52948069	1,24	1,16	1,07	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	14,99	6,92	4,07	8,82	2,16	5,69	5,77	5,86	2,63592412	2,59638526	2,55801503	1,24	1,15	1,06	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,08	6,89	4,05	8,87	2,19	5,66	5,74	5,83	2,66549245	2,62551006	2,58670942	1,23	1,14	1,06	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,16	6,85	4,03	8,92	2,21	5,62	5,71	5,80	2,69522569	2,6547973	2,61556385	1,22	1,14	1,05	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,24	6,81	4,01	8,96	2,24	5,59	5,68	5,76	2,72512385	2,68424699	2,64457832	1,22	1,13	1,05	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,33	6,77	3,98	9,01	2,26	5,56	5,65	5,73	2,75518692	2,71385912	2,67375283	1,21	1,13	1,04	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,41	6,74	3,96	9,06	2,29	5,53	5,62	5,70	2,78541492	2,74363369	2,70308738	1,20	1,12	1,04	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,50	6,70	3,94	9,11	2,31	5,50	5,59	5,67	2,81580783	2,77357071	2,73258198	1,20	1,11	1,03	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,58	6,66	3,92	9,16	2,34	5,47	5,56	5,64	2,84636565	2,80367017	2,76223662	1,19	1,11	1,02	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,66	6,63	3,90	9,21	2,36	5,44	5,53	5,61	2,8770884	2,83393207	2,7920513	1,18	1,10	1,02	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,75	6,59	3,88	9,26	2,39	5,41	5,50	5,58	2,90797606	2,86435642	2,82202603	1,18	1,10	1,01	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,83	6,56	3,86	9,31	2,41	5,39	5,47	5,55	2,93902864	2,89494321	2,85216079	1,17	1,09	1,01	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	15,91	6,52	3,84	9,36	2,44	5,36	5,44	5,52	2,97024613	2,92569244	2,8824556	1,17	1,08	1,00	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No
61,05	16,00	6,49	3,82	9,41	2,47	5,33	5,41	5,49	3,00162854	2,95660411	2,91291045	1,16	1,08	1,00	5205,81	5285,09	5364,37	2989,7388	3035,26782	3080,79684	0,560	No



Lpp	B	D	Lpp/B	Lpp/D	B/D	T/D			T/D			T/D			T/D			CB	Cumple			
						0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85	0,82	0,83	0,85					
						T1	T2	T3	B/T	B/T	B/T	D-T	D-T	D-T	LBT	LBT	LBT			Δ	Δ	Δ
61,58	14,82	6,94	4,15	8,87	2,13	5,70	5,79	5,88	2,59943489	2,56044337	2,5226043	1,24	1,15	1,07	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	14,91	6,90	4,13	8,92	2,16	5,67	5,76	5,84	2,62912519	2,58968831	2,55141705	1,23	1,15	1,06	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	14,99	6,87	4,11	8,97	2,18	5,64	5,72	5,81	2,65878359	2,61890184	2,58019886	1,23	1,14	1,06	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,08	6,83	4,08	9,02	2,21	5,61	5,69	5,78	2,68860834	2,64827922	2,60914209	1,22	1,13	1,05	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,16	6,79	4,06	9,07	2,23	5,58	5,66	5,75	2,71859944	2,67782045	2,63824675	1,21	1,13	1,04	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,24	6,75	4,04	9,12	2,26	5,55	5,63	5,71	2,74875688	2,70752553	2,66751284	1,21	1,12	1,04	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,33	6,72	4,02	9,17	2,28	5,52	5,60	5,68	2,77908068	2,73739447	2,69694036	1,20	1,12	1,03	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,41	6,68	4,00	9,22	2,31	5,49	5,57	5,65	2,80957082	2,76742725	2,72652931	1,19	1,11	1,03	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,50	6,64	3,97	9,27	2,33	5,46	5,54	5,62	2,8402273	2,79762389	2,7562797	1,19	1,10	1,02	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,58	6,61	3,95	9,32	2,36	5,43	5,51	5,59	2,87105013	2,82798438	2,78619151	1,18	1,10	1,02	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,66	6,57	3,93	9,37	2,38	5,40	5,48	5,56	2,90203931	2,85850872	2,81626475	1,17	1,09	1,01	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,75	6,54	3,91	9,42	2,41	5,37	5,45	5,53	2,93319484	2,88919692	2,84649943	1,17	1,09	1,00	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,83	6,50	3,89	9,47	2,43	5,34	5,42	5,50	2,96451671	2,92004896	2,87689553	1,16	1,08	1,00	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	15,91	6,47	3,87	9,52	2,46	5,31	5,39	5,47	2,99600493	2,95106486	2,90745306	1,16	1,07	0,99	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No
61,58	16,00	6,43	3,85	9,57	2,49	5,28	5,36	5,44	3,0276595	2,98224461	2,93817203	1,15	1,07	0,99	5205,81	5285,09	5364,37	3001,9165	3047,63096	3093,34543	0,563	No



COSTE DE CONSTRUCCIÓN

Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
54,17	14,82	7,89	6,48	0,53	2815,61801	115,319127	801,058545	1,44957374	0,11338812	809,545868	476061,543	3238183,47	57082,9677	4268350,968	7982595,98	798259,598	8780855,58	No
54,17	14,91	7,85	6,45	0,53	2815,61801	115,64405	805,589615	1,44957374	0,11338812	810,043899	476354,415	3240175,6	57243,8047	4268511,805	7985041,82	798504,182	8783546	No
54,17	14,99	7,80	6,41	0,53	2815,61801	115,968816	810,120684	1,44957374	0,11338812	810,557668	476656,542	3242230,67	57404,5639	4268672,564	7987559,78	798755,978	8786315,76	No
54,17	15,08	7,76	6,37	0,53	2815,61801	116,292675	814,651754	1,44957374	0,11338812	811,071438	476958,67	3244285,75	57564,8742	4268832,874	7990077,3	799007,73	8789085,02	No
54,17	15,16	7,72	6,34	0,53	2815,61801	116,615635	819,182823	1,44957374	0,11338812	811,585207	477260,797	3246340,83	57724,7393	4268992,739	7992594,37	799259,437	8791853,8	No
54,17	15,24	7,68	6,30	0,53	2815,61801	116,937703	823,713893	1,44957374	0,11338812	812,098977	477562,924	3248395,91	57884,1629	4269152,163	7995110,99	799511,099	8794622,09	No
54,17	15,33	7,63	6,27	0,53	2815,61801	117,258886	828,244962	1,44957374	0,11338812	812,612746	477865,052	3250450,98	58043,1486	4269311,149	7997627,19	799762,719	8797389,9	No
54,17	15,41	7,59	6,24	0,53	2815,61801	117,579192	832,776032	1,44957374	0,11338812	813,126516	478167,179	3252506,06	58201,7001	4269469,7	8000142,94	800014,294	8800157,24	No
54,17	15,50	7,55	6,20	0,53	2815,61801	117,898628	837,307102	1,44957374	0,11338812	813,640285	478469,306	3254561,14	58359,8207	4269627,821	8002658,27	800265,827	8802924,09	No
54,17	15,58	7,51	6,17	0,53	2815,61801	118,2172	841,838171	1,44957374	0,11338812	814,154055	478771,433	3256616,22	58517,5141	4269785,514	8005173,17	800517,317	8805690,48	Si
54,17	15,66	7,47	6,14	0,53	2815,61801	118,534917	846,369241	1,44957374	0,11338812	814,667824	479073,561	3258671,3	58674,7837	4269942,784	8007687,64	800768,764	8808456,4	Si
54,17	15,75	7,43	6,10	0,53	2815,61801	118,851784	850,90031	1,44957374	0,11338812	815,181594	479375,688	3260726,37	58831,6329	4270099,633	8010201,69	801020,169	8811221,86	Si
54,17	15,83	7,39	6,07	0,53	2815,61801	119,167808	855,43138	1,44957374	0,11338812	815,695363	479677,815	3262781,45	58988,0651	4270256,065	8012715,33	801271,533	8813986,87	Si
54,17	15,91	7,35	6,04	0,53	2815,61801	119,482997	859,962449	1,44957374	0,11338812	816,209132	479979,942	3264836,53	59144,0834	4270412,083	8015228,56	801522,856	8816751,41	Si
54,17	16,00	7,31	6,01	0,53	2815,61801	119,797356	864,493519	1,44957374	0,11338812	816,722902	480282,07	3266891,61	59299,6913	4270567,691	8017741,37	801774,137	8819515,51	Si
54,17	14,82	7,89	6,58	0,53	2858,49545	115,319127	801,058545	1,4561375	0,11324234	808,505035	475449,471	3234020,14	57082,9677	4268350,968	7977820,58	797782,058	8775602,64	No
54,17	14,91	7,85	6,54	0,53	2858,49545	115,64405	805,589615	1,4561375	0,11324234	809,002426	475741,967	3236009,71	57243,8047	4268511,805	7980263,48	798026,348	8778289,82	No
54,17	14,99	7,80	6,51	0,53	2858,49545	115,968816	810,120684	1,4561375	0,11324234	809,515535	476043,706	3238062,14	57404,5639	4268672,564	7982778,41	798277,841	8781056,25	No
54,17	15,08	7,76	6,47	0,53	2858,49545	116,292675	814,651754	1,4561375	0,11324234	810,028644	476345,445	3240114,58	57564,8742	4268832,874	7985292,9	798529,29	8783822,19	No
54,17	15,16	7,72	6,44	0,53	2858,49545	116,615635	819,182823	1,4561375	0,11324234	810,541753	476647,183	3242167,01	57724,7393	4268992,739	7987806,94	798780,694	8786587,63	No
54,17	15,24	7,68	6,40	0,53	2858,49545	116,937703	823,713893	1,4561375	0,11324234	811,054862	476948,922	3244219,45	57884,1629	4269152,163	7990320,53	799032,053	8789352,59	No
54,17	15,33	7,63	6,37	0,53	2858,49545	117,258886	828,244962	1,4561375	0,11324234	811,567971	477250,661	3246271,88	58043,1486	4269311,149	7992833,69	799283,369	8792117,06	No
54,17	15,41	7,59	6,33	0,53	2858,49545	117,579192	832,776032	1,4561375	0,11324234	812,08108	477552,4	3248324,32	58201,7001	4269469,7	7995346,42	799534,642	8794881,06	No
54,17	15,50	7,55	6,30	0,53	2858,49545	117,898628	837,307102	1,4561375	0,11324234	812,594189	477854,139	3250376,76	58359,8207	4269627,821	7997858,71	799785,871	8797644,59	No
54,17	15,58	7,51	6,26	0,53	2858,49545	118,2172	841,838171	1,4561375	0,11324234	813,107298	478155,877	3252429,19	58517,5141	4269785,514	8000370,58	800037,058	8800407,64	Si
54,17	15,66	7,47	6,23	0,53	2858,49545	118,534917	846,369241	1,4561375	0,11324234	813,620407	478457,616	3254481,63	58674,7837	4269942,784	8002882,03	800288,203	8803170,23	Si
54,17	15,75	7,43	6,20	0,53	2858,49545	118,851784	850,90031	1,4561375	0,11324234	814,133516	478759,355	3256534,06	58831,6329	4270099,633	8005393,05	800539,305	8805932,36	Si
54,17	15,83	7,39	6,16	0,53	2858,49545	119,167808	855,43138	1,4561375	0,11324234	814,646624	479061,094	3258586,5	58988,0651	4270256,065	8007903,66	800790,366	8808694,02	Si
54,17	15,91	7,35	6,13	0,53	2858,49545	119,482997	859,962449	1,4561375	0,11324234	815,159733	479362,833	3260638,93	59144,0834	4270412,083	8010413,85	801041,385	8811455,23	Si
54,17	16,00	7,31	6,10	0,53	2858,49545	119,797356	864,493519	1,4561375	0,11324234	815,672842	479664,572	3262691,37	59299,6913	4270567,691	8012923,63	801292,363	8814216	Si
54,17	14,82	7,89	6,68	0,53	2901,37288	115,319127	801,058545	1,46260355	0,11309916	807,48281	474848,341	3229931,24	57082,9677	4268350,968	7973130,55	797313,055	8770443,61	No
54,17	14,91	7,85	6,64	0,53	2901,37288	115,64405	805,589615	1,46260355	0,11309916	807,979572	475140,467	3231918,29	57243,8047	4268511,805	7975570,56	797557,056	8773127,62	No
54,17	14,99	7,80	6,61	0,53	2901,37288	115,968816	810,120684	1,46260355	0,11309916	808,492033	475441,825	3233968,13	57404,5639	4268672,564	7978082,52	797808,252	8775890,77	No
54,17	15,08	7,76	6,57	0,53	2901,37288	116,292675	814,651754	1,46260355	0,11309916	809,004493	475743,182	3236017,97	57564,8742	4268832,874	7980594,03	798059,403	8778653,43	No
54,17	15,16	7,72	6,53	0,53	2901,37288	116,615635	819,182823	1,46260355	0,11309916	809,516953	476044,539	3238067,81	57724,7393	4268992,739	7983105,09	798310,509	8781415,6	No
54,17	15,24	7,68	6,50	0,53	2901,37288	116,937703	823,713893	1,46260355	0,11309916	810,029413	476345,897	3240117,65	57884,1629	4269152,163	7985615,71	798561,571	8784177,28	No
54,17	15,33	7,63	6,46	0,53	2901,37288	117,258886	828,244962	1,46260355	0,11309916	810,541873	476647,254	3242167,49	58043,1486	4269311,149	7988125,9	798812,59	8786938,49	No
54,17	15,41	7,59	6,43	0,53	2901,37288	117,579192	832,776032	1,46260355	0,11309916	811,054333	476948,611	3244217,33	58201,7001	4269469,7	7990635,65	799063,565	8789699,21	No
54,17	15,50	7,55	6,39	0,53	2901,37288	117,898628	837,307102	1,46260355	0,11309916	811,566794	477249,969	3246267,17	58359,8207	4269627,821	7993144,96	799314,496	8792459,46	No
54,17	15,58	7,51	6,36	0,53	2901,37288	118,2172	841,838171	1,46260355	0,11309916	812,079254	477551,326	3248317,02	58517,5141	4269785,514	7995653,86	799565,386	8795219,24	Si
54,17	15,66	7,47	6,32	0,53	2901,37288	118,534917	846,369241	1,46260355	0,11309916	812,591714	477852,683	3250366,86	58674,7837	4269942,784	7998162,32	799816,232	8797978,56	Si
54,17	15,75	7,43	6,29	0,53	2901,37288	118,851784	850,90031	1,46260355	0,11309916	813,104174	478154,041	3252416,7	58831,6329	4270099,633	8000670,37	800067,037	8800737,41	Si
54,17	15,83	7,39	6,26	0,53	2901,37288	119,167808	855,43138	1,46260355	0,11309916	813,616634	478455,398	3254466,54	58988,0651	4270256,065	8003178	800317,8	8803495,8	Si
54,17	15,91	7,35	6,22	0,53	2901,37288	119,482997	859,962449	1,46260355	0,11309916	814,129094	478756,755	3256516,38	59144,0834	4270412,083	8005685,22	800568,522	8806253,74	Si
54,17	16,00	7,31	6,19	0,53	2901,37288	119,797356	864,493519	1,46260355	0,11309916	814,641555	479058,113	3258566,22	59299,6913	4270567,691	8008192,02	800819,202	8809011,22	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
54,70	14,82	7,82	6,42	0,5304	2830,17585	116,447742	810,172466	1,45181342	0,11333833	810,230129	476463,93	3240920,52	57641,6322	4268909,632	7986294,08	798629,408	8784923,49	No
54,70	14,91	7,77	6,38	0,5304	2830,17585	116,775852	814,755088	1,45181342	0,11333833	810,733936	476760,199	3242935,75	57804,047	4269072,047	7988767,99	798876,799	8787644,79	No
54,70	14,99	7,73	6,35	0,5304	2830,17585	117,103797	819,337709	1,45181342	0,11333833	811,253323	477065,629	3245013,29	57966,3796	4269234,38	7991313,3	799131,33	8790444,63	No
54,70	15,08	7,69	6,31	0,5304	2830,17585	117,430826	823,92033	1,45181342	0,11333833	811,77271	477371,06	3247090,84	58128,2588	4269396,259	7993858,16	799385,816	8793243,97	No
54,70	15,16	7,64	6,28	0,5304	2830,17585	117,756947	828,502951	1,45181342	0,11333833	812,292096	477676,49	3249168,38	58289,6885	4269557,689	7996402,56	799640,256	8796042,82	No
54,70	15,24	7,60	6,24	0,5304	2830,17585	118,082166	833,085572	1,45181342	0,11333833	812,811483	477981,921	3251245,93	58450,6724	4269718,672	7998946,52	799894,652	8798841,18	No
54,70	15,33	7,56	6,21	0,5304	2830,17585	118,406493	837,668193	1,45181342	0,11333833	813,330869	478287,351	3253323,48	58611,2141	4269879,214	8001490,04	800149,004	8801639,05	No
54,70	15,41	7,52	6,18	0,5304	2830,17585	118,729934	842,250814	1,45181342	0,11333833	813,850256	478592,782	3255401,02	58771,3172	4270039,317	8004033,12	800403,312	8804436,43	No
54,70	15,50	7,48	6,14	0,5304	2830,17585	119,052496	846,833435	1,45181342	0,11333833	814,369643	478898,212	3257478,57	58930,9854	4270198,985	8006575,77	800657,577	8807233,34	Si
54,70	15,58	7,44	6,11	0,5304	2830,17585	119,374186	851,416057	1,45181342	0,11333833	814,889029	479203,642	3259556,12	59090,2222	4270358,222	8009117,98	800911,798	8810029,78	Si
54,70	15,66	7,40	6,08	0,5304	2830,17585	119,695012	855,998678	1,45181342	0,11333833	815,408416	479509,073	3261633,66	59249,031	4270517,031	8011659,77	801165,977	8812825,74	Si
54,70	15,75	7,36	6,04	0,5304	2830,17585	120,01498	860,581299	1,45181342	0,11333833	815,927802	479814,503	3263711,21	59407,4152	4270675,415	8014201,13	801420,113	8815621,24	Si
54,70	15,83	7,32	6,01	0,5304	2830,17585	120,334098	865,16392	1,45181342	0,11333833	816,447189	480119,934	3265788,76	59565,3783	4270833,378	8016742,07	801674,207	8818416,28	Si
54,70	15,91	7,28	5,98	0,5304	2830,17585	120,652371	869,746541	1,45181342	0,11333833	816,966576	480425,364	3267866,3	59722,9237	4270990,924	8019282,59	801928,259	8821210,85	Si
54,70	16,00	7,24	5,95	0,5304	2830,17585	120,969807	874,329162	1,45181342	0,11333833	817,485962	480730,795	3269943,85	59880,0545	4271148,054	8021822,7	802182,27	8824004,97	Si
54,70	14,82	7,82	6,52	0,5304	2873,27498	116,447742	810,172466	1,45837719	0,1131927	809,189045	475851,71	3236756,18	57641,6322	4268909,632	7981517,52	798151,752	8779669,27	No
54,70	14,91	7,77	6,48	0,5304	2873,27498	116,775852	814,755088	1,45837719	0,1131927	809,692205	476147,598	3238768,82	57804,047	4269072,047	7983988,46	798398,846	8782387,31	No
54,70	14,99	7,73	6,44	0,5304	2873,27498	117,103797	819,337709	1,45837719	0,1131927	810,210924	476452,636	3240843,7	57966,3796	4269234,38	7986530,71	798653,071	8785183,78	No
54,70	15,08	7,69	6,41	0,5304	2873,27498	117,430826	823,92033	1,45837719	0,1131927	810,729643	476757,674	3242918,57	58128,2588	4269396,259	7989072,51	798907,251	8787979,76	No
54,70	15,16	7,64	6,37	0,5304	2873,27498	117,756947	828,502951	1,45837719	0,1131927	811,248362	477062,712	3244993,45	58289,6885	4269557,689	7991613,85	799161,385	8790775,24	No
54,70	15,24	7,60	6,34	0,5304	2873,27498	118,082166	833,085572	1,45837719	0,1131927	811,767082	477367,75	3247068,33	58450,6724	4269718,672	7994154,75	799415,475	8793570,22	No
54,70	15,33	7,56	6,30	0,5304	2873,27498	118,406493	837,668193	1,45837719	0,1131927	812,285801	477672,788	3249143,2	58611,2141	4269879,214	7996695,21	799669,521	8796364,73	No
54,70	15,41	7,52	6,27	0,5304	2873,27498	118,729934	842,250814	1,45837719	0,1131927	812,80452	477977,826	3251218,08	58771,3172	4270039,317	7999235,22	799923,522	8799158,75	No
54,70	15,50	7,48	6,24	0,5304	2873,27498	119,052496	846,833435	1,45837719	0,1131927	813,323239	478282,864	3253292,96	58930,9854	4270198,985	8001774,81	800177,481	8801952,29	Si
54,70	15,58	7,44	6,20	0,5304	2873,27498	119,374186	851,416057	1,45837719	0,1131927	813,841959	478587,902	3255367,83	59090,2222	4270358,222	8004313,96	800431,396	8804745,36	Si
54,70	15,66	7,40	6,17	0,5304	2873,27498	119,695012	855,998678	1,45837719	0,1131927	814,360678	478892,94	3257442,71	59249,031	4270517,031	8006852,68	800685,268	8807537,95	Si
54,70	15,75	7,36	6,14	0,5304	2873,27498	120,01498	860,581299	1,45837719	0,1131927	814,879397	479197,978	3259517,59	59407,4152	4270675,415	8009390,98	800939,098	8810330,08	Si
54,70	15,83	7,32	6,10	0,5304	2873,27498	120,334098	865,16392	1,45837719	0,1131927	815,398116	479503,016	3261592,47	59565,3783	4270833,378	8011928,86	801192,886	8813121,75	Si
54,70	15,91	7,28	6,07	0,5304	2873,27498	120,652371	869,746541	1,45837719	0,1131927	815,916836	479808,054	3263667,34	59722,9237	4270990,924	8014466,32	801446,632	8815912,95	Si
54,70	16,00	7,24	6,04	0,5304	2873,27498	120,969807	874,329162	1,45837719	0,1131927	816,435555	480113,092	3265742,22	59880,0545	4271148,054	8017003,37	801700,337	8818703,7	Si
54,70	14,82	7,82	6,62	0,5304	2916,3741	116,447742	810,172466	1,46484323	0,11304967	808,166579	475250,439	3232666,32	57641,6322	4268909,632	7976826,39	797682,639	8774509,03	No
54,70	14,91	7,77	6,58	0,5304	2916,3741	116,775852	814,755088	1,46484323	0,11304967	808,669104	475545,953	3234676,41	57804,047	4269072,047	7979294,42	797929,442	8777223,86	No
54,70	14,99	7,73	6,54	0,5304	2916,3741	117,103797	819,337709	1,46484323	0,11304967	809,187168	475850,606	3236748,67	57966,3796	4269234,38	7981833,66	798183,366	8780017,02	No
54,70	15,08	7,69	6,51	0,5304	2916,3741	117,430826	823,92033	1,46484323	0,11304967	809,705231	476155,258	3238820,93	58128,2588	4269396,259	7984372,44	798437,244	8782809,69	No
54,70	15,16	7,64	6,47	0,5304	2916,3741	117,756947	828,502951	1,46484323	0,11304967	810,223295	476459,911	3240893,18	58289,6885	4269557,689	7986910,78	798691,078	8785601,86	No
54,70	15,24	7,60	6,43	0,5304	2916,3741	118,082166	833,085572	1,46484323	0,11304967	810,741359	476764,564	3242965,44	58450,6724	4269718,672	7989448,67	798944,867	8788393,54	No
54,70	15,33	7,56	6,40	0,5304	2916,3741	118,406493	837,668193	1,46484323	0,11304967	811,259423	477069,216	3245037,69	58611,2141	4269879,214	7991986,12	799198,612	8791184,73	No
54,70	15,41	7,52	6,36	0,5304	2916,3741	118,729934	842,250814	1,46484323	0,11304967	811,777487	477373,869	3247109,95	58771,3172	4270039,317	7994523,13	799452,313	8793975,45	No
54,70	15,50	7,48	6,33	0,5304	2916,3741	119,052496	846,833435	1,46484323	0,11304967	812,29555	477678,521	3249182,2	58930,9854	4270198,985	7997059,71	799705,971	8796765,68	Si
54,70	15,58	7,44	6,30	0,5304	2916,3741	119,374186	851,416057	1,46484323	0,11304967	812,813614	477983,174	3251254,46	59090,2222	4270358,222	7999595,85	799959,585	8799555,44	Si
54,70	15,66	7,40	6,26	0,5304	2916,3741	119,695012	855,998678	1,46484323	0,11304967	813,331678	478287,827	3253326,71	59249,031	4270517,031	8002131,57	800213,157	8802344,73	Si
54,70	15,75	7,36	6,23	0,5304	2916,3741	120,01498	860,581299	1,46484323	0,11304967	813,849742	478592,479	3255398,97	59407,4152	4270675,415	8004666,86	800466,686	8805133,55	Si
54,70	15,83	7,32	6,20	0,5304	2916,3741	120,334098	865,16392	1,46484323	0,11304967	814,367806	478897,132	3257471,22	59565,3783	4270833,378	8007201,73	800720,173	8807921,91	Si
54,70	15,91	7,28	6,16	0,5304	2916,3741	120,652371	869,746541	1,46484323	0,11304967	814,885869	479201,784	3259543,48	59722,9237	4270990,924	8009736,19	800973,619	8810709,8	Si
54,70	16,00	7,24	6,13	0,5304	2916,3741	120,969807	874,329162	1,46484323	0,11304967	815,403933	479506,437	3261615,73	59880,0545	4271148,054	8012270,22	801227,022	8813497,25	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
55,23	14,82	7,74	6,36	0,5331	2844,52384	117,570139	819,247749	1,45400958	0,11328955	810,88704	476850,233	3243548,16	58197,2186	4269465,219	7989863,61	798986,361	8788849,97	No
55,23	14,91	7,70	6,32	0,5331	2844,52384	117,904711	823,902216	1,45400958	0,11328955	811,414343	477160,318	3245657,37	58362,832	4269630,832	7992448,52	799244,852	8791693,37	No
55,23	14,99	7,66	6,29	0,5331	2844,52384	118,235826	828,536286	1,45400958	0,11328955	811,939334	477469,045	3247757,34	58526,7338	4269794,734	7995021,12	799502,112	8794523,23	No
55,23	15,08	7,61	6,25	0,5331	2844,52384	118,566016	833,170355	1,45400958	0,11328955	812,464326	477777,771	3249857,3	58690,178	4269958,178	7997593,25	799759,325	8797352,58	No
55,23	15,16	7,57	6,22	0,5331	2844,52384	118,895289	837,804425	1,45400958	0,11328955	812,989317	478086,498	3251957,27	58853,1682	4270121,168	8000164,94	800016,494	8800181,43	No
55,23	15,24	7,53	6,18	0,5331	2844,52384	119,223653	842,438494	1,45400958	0,11328955	813,514309	478395,225	3254057,24	59015,7083	4270283,708	8002736,17	800273,617	8803009,79	No
55,23	15,33	7,49	6,15	0,5331	2844,52384	119,551115	847,072563	1,45400958	0,11328955	814,039301	478703,951	3256157,2	59177,8019	4270445,802	8005306,96	800530,696	8805837,65	No
55,23	15,41	7,45	6,12	0,5331	2844,52384	119,877682	851,706633	1,45400958	0,11328955	814,564292	479012,678	3258257,17	59339,4527	4270607,453	8007877,3	800787,73	8808665,03	Si
55,23	15,50	7,41	6,08	0,5331	2844,52384	120,203362	856,340702	1,45400958	0,11328955	815,089284	479321,404	3260357,14	59500,6644	4270768,664	8010447,21	801044,721	8811491,93	Si
55,23	15,58	7,37	6,05	0,5331	2844,52384	120,528163	860,974772	1,45400958	0,11328955	815,614276	479630,131	3262457,1	59661,4405	4270929,44	8013016,67	801301,667	8814318,34	Si
55,23	15,66	7,33	6,02	0,5331	2844,52384	120,85209	865,608841	1,45400958	0,11328955	816,139267	479938,858	3264557,07	59821,7845	4271089,784	8015585,71	801558,571	8817144,28	Si
55,23	15,75	7,29	5,99	0,5331	2844,52384	121,175151	870,242911	1,45400958	0,11328955	816,664259	480247,584	3266657,04	59981,6998	4271249,7	8018154,32	801815,432	8819969,75	Si
55,23	15,83	7,25	5,95	0,5331	2844,52384	121,497353	874,87698	1,45400958	0,11328955	817,189251	480556,311	3268757	60141,19	4271409,19	8020722,5	802072,25	8822794,75	Si
55,23	15,91	7,21	5,92	0,5331	2844,52384	121,818704	879,51105	1,45400958	0,11328955	817,714242	480865,037	3270856,97	60300,2582	4271568,258	8023290,26	802329,026	8825619,29	Si
55,23	16,00	7,17	5,89	0,5331	2844,52384	122,139208	884,145119	1,45400958	0,11328955	818,239234	481173,764	3272956,94	60458,908	4271726,908	8025857,61	802585,761	8828443,37	Si
55,23	14,82	7,74	6,46	0,5331	2887,84146	117,570139	819,247749	1,46057335	0,11314407	809,84573	476237,88	3239382,92	58197,2186	4269465,219	7985086,02	798508,602	8783594,62	No
55,23	14,91	7,70	6,42	0,5331	2887,84146	117,904711	823,902216	1,46057335	0,11314407	810,372356	476547,567	3241489,42	58362,832	4269630,832	7987667,82	798766,782	8786434,6	No
55,23	14,99	7,66	6,38	0,5331	2887,84146	118,235826	828,536286	1,46057335	0,11314407	810,896673	476855,898	3243586,69	58526,7338	4269794,734	7990237,32	799023,732	8789261,06	No
55,23	15,08	7,61	6,35	0,5331	2887,84146	118,566016	833,170355	1,46057335	0,11314407	811,420991	477164,228	3245683,96	58690,178	4269958,178	7992806,37	799280,637	8792087	No
55,23	15,16	7,57	6,31	0,5331	2887,84146	118,895289	837,804425	1,46057335	0,11314407	811,945308	477472,558	3247781,23	58853,1682	4270121,168	7995374,96	799537,496	8794912,45	No
55,23	15,24	7,53	6,28	0,5331	2887,84146	119,223653	842,438494	1,46057335	0,11314407	812,469626	477780,888	3249878,5	59015,7083	4270283,708	7997943,1	799794,31	8797737,41	No
55,23	15,33	7,49	6,24	0,5331	2887,84146	119,551115	847,072563	1,46057335	0,11314407	812,993943	478089,218	3251975,77	59177,8019	4270445,802	8000510,79	800051,079	8800561,87	No
55,23	15,41	7,45	6,21	0,5331	2887,84146	119,877682	851,706633	1,46057335	0,11314407	813,51826	478397,548	3254073,04	59339,4527	4270607,453	8003078,04	800307,804	8803385,85	Si
55,23	15,50	7,41	6,18	0,5331	2887,84146	120,203362	856,340702	1,46057335	0,11314407	814,042578	478705,878	3256170,31	59500,6644	4270768,664	8005644,85	800564,485	8806209,34	Si
55,23	15,58	7,37	6,14	0,5331	2887,84146	120,528163	860,974772	1,46057335	0,11314407	814,566895	479014,209	3258267,58	59661,4405	4270929,44	8008211,23	800821,123	8809032,35	Si
55,23	15,66	7,33	6,11	0,5331	2887,84146	120,85209	865,608841	1,46057335	0,11314407	815,091213	479322,539	3260364,85	59821,7845	4271089,784	8010777,17	801077,717	8811854,89	Si
55,23	15,75	7,29	6,08	0,5331	2887,84146	121,175151	870,242911	1,46057335	0,11314407	815,61553	479630,869	3262462,12	59981,6998	4271249,7	8013342,69	801334,269	8814676,96	Si
55,23	15,83	7,25	6,04	0,5331	2887,84146	121,497353	874,87698	1,46057335	0,11314407	816,139848	479939,199	3264559,39	60141,19	4271409,19	8015907,78	801590,778	8817498,56	Si
55,23	15,91	7,21	6,01	0,5331	2887,84146	121,818704	879,51105	1,46057335	0,11314407	816,664165	480247,529	3266656,66	60300,2582	4271568,258	8018472,45	801847,245	8820319,69	Si
55,23	16,00	7,17	5,98	0,5331	2887,84146	122,139208	884,145119	1,46057335	0,11314407	817,188483	480555,859	3268753,93	60458,908	4271726,908	8021036,7	802103,67	8823140,37	Si
55,23	14,82	7,74	6,55	0,5331	2931,15908	117,570139	819,247749	1,46703939	0,11300119	808,823051	475636,483	3235292,2	58197,2186	4269465,219	7980393,9	798039,39	8778433,29	No
55,23	14,91	7,70	6,52	0,5331	2931,15908	117,904711	823,902216	1,46703939	0,11300119	809,349011	475945,779	3237396,04	58362,832	4269630,832	7982972,65	798297,265	8781269,92	No
55,23	14,99	7,66	6,48	0,5331	2931,15908	118,235826	828,536286	1,46703939	0,11300119	809,872666	476253,72	3239490,66	58526,7338	4269794,734	7985539,12	798553,912	8784093,03	No
55,23	15,08	7,61	6,44	0,5331	2931,15908	118,566016	833,170355	1,46703939	0,11300119	810,396322	476561,661	3241585,29	58690,178	4269958,178	7988105,13	798810,513	8786915,64	No
55,23	15,16	7,57	6,41	0,5331	2931,15908	118,895289	837,804425	1,46703939	0,11300119	810,919977	476869,602	3243679,91	58853,1682	4270121,168	7990670,68	799067,068	8789737,75	No
55,23	15,24	7,53	6,37	0,5331	2931,15908	119,223653	842,438494	1,46703939	0,11300119	811,443632	477177,542	3245774,53	59015,7083	4270283,708	7993235,78	799323,578	8792559,36	No
55,23	15,33	7,49	6,34	0,5331	2931,15908	119,551115	847,072563	1,46703939	0,11300119	811,967288	477485,483	3247869,15	59177,8019	4270445,802	7995800,44	799580,044	8795380,48	No
55,23	15,41	7,45	6,30	0,5331	2931,15908	119,877682	851,706633	1,46703939	0,11300119	812,490943	477793,424	3249963,77	59339,4527	4270607,453	7998364,65	799836,465	8798201,11	Si
55,23	15,50	7,41	6,27	0,5331	2931,15908	120,203362	856,340702	1,46703939	0,11300119	813,014598	478101,365	3252058,39	59500,6644	4270768,664	8000928,42	800092,842	8801021,27	Si
55,23	15,58	7,37	6,23	0,5331	2931,15908	120,528163	860,974772	1,46703939	0,11300119	813,538254	478409,306	3254153,02	59661,4405	4270929,44	8003491,76	800349,176	8803840,94	Si
55,23	15,66	7,33	6,20	0,5331	2931,15908	120,85209	865,608841	1,46703939	0,11300119	814,061909	478717,246	3256247,64	59821,7845	4271089,784	8006054,67	800605,467	8806660,13	Si
55,23	15,75	7,29	6,17	0,5331	2931,15908	121,175151	870,242911	1,46703939	0,11300119	814,585565	479025,187	3258342,26	59981,6998	4271249,7	8008617,15	800861,715	8809478,86	Si
55,23	15,83	7,25	6,14	0,5331	2931,15908	121,497353	874,87698	1,46703939	0,11300119	815,10922	479333,128	3260436,88	60141,19	4271409,19	8011179,2	801117,92	8812297,12	Si
55,23	15,91	7,21	6,10	0,5331	2931,15908	121,818704	879,51105	1,46703939	0,11300119	815,632875	479641,069	3262531,5	60300,2582	4271568,258	8013740,83	801374,083	8815114,91	Si
55,23	16,00	7,17	6,07	0,5331	2931,15908	122,139208	884,145119	1,46703939	0,11300119	816,156531	479949,009	3264626,12	60458,908	4271726,908	8016302,04	801630,204	8817932,24	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
55,76	14,82	7,67	6,30	0,5357	2858,66697	118,697286	828,352549	1,45616356	0,11324176	811,576013	477255,39	3246304,05	58755,1565	4270023,157	7993582,6	799358,26	8792940,86	No
55,76	14,91	7,63	6,26	0,5357	2858,66697	119,035042	833,058517	1,45616356	0,11324176	812,108925	477568,774	3248435,7	58922,3457	4270190,346	7996194,82	799619,482	8795814,3	No
55,76	14,99	7,58	6,23	0,5357	2858,66697	119,369331	837,744086	1,45616356	0,11324176	812,639527	477880,8	3250558,11	59087,8188	4270355,819	7998794,73	799879,473	8798674,2	No
55,76	15,08	7,54	6,19	0,5357	2858,66697	119,702687	842,429656	1,45616356	0,11324176	813,170129	478192,826	3252680,52	59252,8298	4270520,83	8001394,17	800139,417	8801533,59	No
55,76	15,16	7,50	6,16	0,5357	2858,66697	120,035116	847,115225	1,45616356	0,11324176	813,700731	478504,852	3254802,92	59417,3826	4270685,383	8003993,16	800399,316	8804392,48	No
55,76	15,24	7,46	6,12	0,5357	2858,66697	120,366628	851,800795	1,45616356	0,11324176	814,231333	478816,878	3256925,33	59581,4809	4270849,481	8006591,69	800659,169	8807250,86	No
55,76	15,33	7,42	6,09	0,5357	2858,66697	120,697229	856,486364	1,45616356	0,11324176	814,761935	479128,904	3259047,74	59745,1285	4271013,129	8009189,77	800918,977	8810108,75	Si
55,76	15,41	7,38	6,06	0,5357	2858,66697	121,026927	861,171933	1,45616356	0,11324176	815,292538	479440,93	3261170,15	59908,3291	4271176,329	8011787,41	801178,741	8812966,15	Si
55,76	15,50	7,34	6,03	0,5357	2858,66697	121,35573	865,857503	1,45616356	0,11324176	815,82314	479752,956	3263292,56	60071,0863	4271339,086	8014384,6	801438,46	8815823,06	Si
55,76	15,58	7,30	5,99	0,5357	2858,66697	121,683644	870,543072	1,45616356	0,11324176	816,353742	480064,981	3265414,97	60233,4037	4271501,404	8016981,35	801698,135	8818679,49	Si
55,76	15,66	7,26	5,96	0,5357	2858,66697	122,010676	875,228642	1,45616356	0,11324176	816,884344	480377,007	3267537,38	60395,2848	4271663,285	8019577,67	801957,767	8821535,44	Si
55,76	15,75	7,22	5,93	0,5357	2858,66697	122,336835	879,914211	1,45616356	0,11324176	817,414946	480689,033	3269659,78	60556,7333	4271824,733	8022173,55	802217,355	8824390,91	Si
55,76	15,83	7,18	5,90	0,5357	2858,66697	122,662126	884,599781	1,45616356	0,11324176	817,945548	481001,059	3271782,19	60717,7524	4271985,752	8024769	802476,9	8827245,91	Si
55,76	15,91	7,14	5,87	0,5357	2858,66697	122,986557	889,28535	1,45616356	0,11324176	818,47615	481313,085	3273904,6	60878,3456	4272146,346	8027364,03	802736,403	8830100,44	Si
55,76	16,00	7,11	5,84	0,5357	2858,66697	123,310134	893,97092	1,45616356	0,11324176	819,006753	481625,111	3276027,01	61038,5164	4272306,516	8029958,64	802995,864	8832954,5	Si
55,76	14,82	7,67	6,39	0,5357	2902,19997	118,697286	828,352549	1,46272733	0,11309642	810,534428	476642,876	3242137,71	58755,1565	4270023,157	7988803,74	798880,374	8787684,12	No
55,76	14,91	7,63	6,36	0,5357	2902,19997	119,035042	833,058517	1,46272733	0,11309642	811,066656	476955,858	3244266,62	58922,3457	4270190,346	7991412,83	799141,283	8790554,11	No
55,76	14,99	7,58	6,32	0,5357	2902,19997	119,369331	837,744086	1,46272733	0,11309642	811,596577	477267,483	3246386,31	59087,8188	4270355,819	7994009,61	799400,961	8793410,57	No
55,76	15,08	7,54	6,29	0,5357	2902,19997	119,702687	842,429656	1,46272733	0,11309642	812,126498	477579,108	3248505,99	59252,8298	4270520,83	7996605,93	799660,593	8796266,52	No
55,76	15,16	7,50	6,25	0,5357	2902,19997	120,035116	847,115225	1,46272733	0,11309642	812,656419	477890,734	3250625,68	59417,3826	4270685,383	7999201,79	799920,179	8799121,97	No
55,76	15,24	7,46	6,22	0,5357	2902,19997	120,366628	851,800795	1,46272733	0,11309642	813,18634	478202,359	3252745,36	59581,4809	4270849,481	8001797,2	800179,72	8801976,92	No
55,76	15,33	7,42	6,18	0,5357	2902,19997	120,697229	856,486364	1,46272733	0,11309642	813,716261	478513,985	3254865,05	59745,1285	4271013,129	8004392,16	800439,216	8804831,38	Si
55,76	15,41	7,38	6,15	0,5357	2902,19997	121,026927	861,171933	1,46272733	0,11309642	814,246183	478825,61	3256984,73	59908,3291	4271176,329	8006986,67	800698,667	8807685,34	Si
55,76	15,50	7,34	6,12	0,5357	2902,19997	121,35573	865,857503	1,46272733	0,11309642	814,776104	479137,236	3259104,42	60071,0863	4271339,086	8009580,74	800958,074	8810538,81	Si
55,76	15,58	7,30	6,08	0,5357	2902,19997	121,683644	870,543072	1,46272733	0,11309642	815,306025	479448,861	3261224,1	60233,4037	4271501,404	8012174,36	801217,436	8813391,8	Si
55,76	15,66	7,26	6,05	0,5357	2902,19997	122,010676	875,228642	1,46272733	0,11309642	815,835946	479760,486	3263343,78	60395,2848	4271663,285	8014767,56	801476,756	8816244,31	Si
55,76	15,75	7,22	6,02	0,5357	2902,19997	122,336835	879,914211	1,46272733	0,11309642	816,365867	480072,112	3265463,47	60556,7333	4271824,733	8017360,31	801736,031	8819096,35	Si
55,76	15,83	7,18	5,99	0,5357	2902,19997	122,662126	884,599781	1,46272733	0,11309642	816,895788	480383,737	3267583,15	60717,7524	4271985,752	8019952,64	801995,264	8821947,91	Si
55,76	15,91	7,14	5,96	0,5357	2902,19997	122,986557	889,28535	1,46272733	0,11309642	817,42571	480695,363	3269702,84	60878,3456	4272146,346	8022544,55	802254,455	8824799	Si
55,76	16,00	7,11	5,92	0,5357	2902,19997	123,310134	893,97092	1,46272733	0,11309642	817,955631	481006,988	3271822,52	61038,5164	4272306,516	8025136,03	802513,603	8827649,63	Si
55,76	14,82	7,67	6,49	0,5357	2945,73297	118,697286	828,352549	1,46919337	0,11295369	809,511485	476041,324	3238045,94	58755,1565	4270023,157	7984110,42	798411,042	8782521,46	No
55,76	14,91	7,63	6,45	0,5357	2945,73297	119,035042	833,058517	1,46919337	0,11295369	810,043041	476353,911	3240172,16	58922,3457	4270190,346	7986716,42	798671,642	8785388,06	No
55,76	14,99	7,58	6,42	0,5357	2945,73297	119,369331	837,744086	1,46919337	0,11295369	810,572293	476665,143	3242289,17	59087,8188	4270355,819	7989310,13	798931,013	8788241,15	No
55,76	15,08	7,54	6,38	0,5357	2945,73297	119,702687	842,429656	1,46919337	0,11295369	811,101546	476976,375	3244406,18	59252,8298	4270520,83	7991903,39	799190,339	8791093,73	No
55,76	15,16	7,50	6,35	0,5357	2945,73297	120,035116	847,115225	1,46919337	0,11295369	811,630798	477287,607	3246523,19	59417,3826	4270685,383	7994496,18	799449,618	8793945,8	No
55,76	15,24	7,46	6,31	0,5357	2945,73297	120,366628	851,800795	1,46919337	0,11295369	812,16005	477598,839	3248640,2	59581,4809	4270849,481	7997088,52	799708,852	8796797,37	No
55,76	15,33	7,42	6,28	0,5357	2945,73297	120,697229	856,486364	1,46919337	0,11295369	812,689303	477910,071	3250757,21	59745,1285	4271013,129	7999680,41	799968,041	8799648,45	Si
55,76	15,41	7,38	6,24	0,5357	2945,73297	121,026927	861,171933	1,46919337	0,11295369	813,218555	478221,303	3252874,22	59908,3291	4271176,329	8002271,85	800227,185	8802499,04	Si
55,76	15,50	7,34	6,21	0,5357	2945,73297	121,35573	865,857503	1,46919337	0,11295369	813,747807	478532,536	3254991,23	60071,0863	4271339,086	8004862,85	800486,285	8805349,14	Si
55,76	15,58	7,30	6,18	0,5357	2945,73297	121,683644	870,543072	1,46919337	0,11295369	814,27706	478843,768	3257108,24	60233,4037	4271501,404	8007453,41	800745,341	8808198,75	Si
55,76	15,66	7,26	6,14	0,5357	2945,73297	122,010676	875,228642	1,46919337	0,11295369	814,806312	479155	3259225,25	60395,2848	4271663,285	8010043,53	801004,353	8811047,89	Si
55,76	15,75	7,22	6,11	0,5357	2945,73297	122,336835	879,914211	1,46919337	0,11295369	815,335564	479466,232	3261342,26	60556,7333	4271824,733	8012633,22	801263,322	8813896,55	Si
55,76	15,83	7,18	6,08	0,5357	2945,73297	122,662126	884,599781	1,46919337	0,11295369	815,864817	479777,464	3263459,27	60717,7524	4271985,752	8015222,48	801522,248	8816744,73	Si
55,76	15,91	7,14	6,05	0,5357	2945,73297	122,986557	889,28535	1,46919337	0,11295369	816,394069	480088,696	3265576,28	60878,3456	4272146,346	8017811,32	801781,132	8819592,45	Si
55,76	16,00	7,11	6,01	0,5357	2945,73297	123,310134	893,97092	1,46919337	0,11295369	816,923322	480399,928	3267693,29	61038,5164	4272306,516	8020399,73	802039,973	8822439,7	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
56,29	14,82	7,60	6,24	0,5383	2872,61006	119,824433	837,45735	1,45827668	0,11319492	812,270957	477664,059	3249083,83	59313,0945	4270581,094	7997328,98	799732,898	8797061,88	No
56,29	14,91	7,55	6,20	0,5383	2872,61006	120,165372	842,214817	1,45827668	0,11319492	812,809478	477980,742	3251237,91	59481,8593	4270749,859	7999968,51	799996,851	8799965,37	No
56,29	14,99	7,51	6,17	0,5383	2872,61006	120,502836	846,951887	1,45827668	0,11319492	813,34569	478296,067	3253382,76	59648,9038	4270916,904	8002595,73	800259,573	8802855,31	No
56,29	15,08	7,47	6,13	0,5383	2872,61006	120,839357	851,688956	1,45827668	0,11319492	813,881903	478611,392	3255527,61	59815,4817	4271083,482	8005222,48	800522,248	8805744,73	No
56,29	15,16	7,43	6,10	0,5383	2872,61006	121,174943	856,426026	1,45827668	0,11319492	814,418115	478926,717	3257672,46	59981,597	4271249,597	8007848,77	800784,877	8808633,65	No
56,29	15,24	7,39	6,07	0,5383	2872,61006	121,509603	861,163095	1,45827668	0,11319492	814,954327	479242,042	3259817,31	60147,2536	4271415,254	8010474,6	801047,46	8811522,06	No
56,29	15,33	7,35	6,03	0,5383	2872,61006	121,843344	865,900165	1,45827668	0,11319492	815,490539	479557,367	3261962,16	60312,4551	4271580,455	8013099,98	801309,998	8814409,98	Si
56,29	15,41	7,31	6,00	0,5383	2872,61006	122,176173	870,637234	1,45827668	0,11319492	816,026751	479872,691	3264107,01	60477,2054	4271745,205	8015724,9	801572,49	8817297,39	Si
56,29	15,50	7,27	5,97	0,5383	2872,61006	122,508097	875,374303	1,45827668	0,11319492	816,562964	480188,016	3266251,85	60641,5081	4271909,508	8018349,38	801834,938	8820184,32	Si
56,29	15,58	7,23	5,94	0,5383	2872,61006	122,839125	880,111373	1,45827668	0,11319492	817,099176	480503,341	3268396,7	60805,3669	4272073,367	8020973,41	802097,341	8823070,75	Si
56,29	15,66	7,19	5,90	0,5383	2872,61006	123,169263	884,848442	1,45827668	0,11319492	817,635388	480818,666	3270541,55	60968,7852	4272236,785	8023597	802359,7	8825956,7	Si
56,29	15,75	7,15	5,87	0,5383	2872,61006	123,498519	889,585512	1,45827668	0,11319492	818,1716	481133,991	3272686,4	61131,7667	4272399,767	8026220,16	802622,016	8828842,18	Si
56,29	15,83	7,11	5,84	0,5383	2872,61006	123,826899	894,322581	1,45827668	0,11319492	818,707813	481449,316	3274831,25	61294,3148	4272562,315	8028842,88	802884,288	8831727,17	Si
56,29	15,91	7,08	5,81	0,5383	2872,61006	124,15441	899,05965	1,45827668	0,11319492	819,244025	481764,641	3276976,1	61456,4331	4272724,433	8031465,17	803146,517	8834611,69	Si
56,29	16,00	7,04	5,78	0,5383	2872,61006	124,48106	903,79672	1,45827668	0,11319492	819,780237	482079,966	3279120,95	61618,1247	4272886,125	8034087,04	803408,704	8837495,74	Si
56,29	14,82	7,60	6,33	0,5383	2916,35539	119,824433	837,45735	1,46484045	0,11304973	811,229081	477051,373	3244916,32	59313,0945	4270581,094	7992548,79	799254,879	8791803,67	No
56,29	14,91	7,55	6,30	0,5383	2916,35539	120,165372	842,214817	1,46484045	0,11304973	811,766911	477367,65	3247067,64	59481,8593	4270749,859	7995185,15	799518,515	8794703,67	No
56,29	14,99	7,51	6,26	0,5383	2916,35539	120,502836	846,951887	1,46484045	0,11304973	812,302435	477682,57	3249209,74	59648,9038	4270916,904	7997809,22	799780,922	8797590,14	No
56,29	15,08	7,47	6,23	0,5383	2916,35539	120,839357	851,688956	1,46484045	0,11304973	812,83796	477997,491	3251351,84	59815,4817	4271083,482	8000432,81	800043,281	8800476,09	No
56,29	15,16	7,43	6,19	0,5383	2916,35539	121,174943	856,426026	1,46484045	0,11304973	813,373484	478312,411	3253493,94	59981,597	4271249,597	8003055,95	800305,595	8803361,54	No
56,29	15,24	7,39	6,16	0,5383	2916,35539	121,509603	861,163095	1,46484045	0,11304973	813,909009	478627,332	3255636,03	60147,2536	4271415,254	8005678,62	800567,862	8806246,48	No
56,29	15,33	7,35	6,13	0,5383	2916,35539	121,843344	865,900165	1,46484045	0,11304973	814,444533	478942,252	3257778,13	60312,4551	4271580,455	8008300,84	800830,084	8809130,92	Si
56,29	15,41	7,31	6,09	0,5383	2916,35539	122,176173	870,637234	1,46484045	0,11304973	814,980058	479257,173	3259920,23	60477,2054	4271745,205	8010922,61	801092,261	8812014,87	Si
56,29	15,50	7,27	6,06	0,5383	2916,35539	122,508097	875,374303	1,46484045	0,11304973	815,515582	479572,093	3262062,33	60641,5081	4271909,508	8013543,93	801354,393	8814898,32	Si
56,29	15,58	7,23	6,03	0,5383	2916,35539	122,839125	880,111373	1,46484045	0,11304973	816,051106	479887,014	3264204,43	60805,3669	4272073,367	8016164,81	801616,481	8817781,29	Si
56,29	15,66	7,19	5,99	0,5383	2916,35539	123,169263	884,848442	1,46484045	0,11304973	816,586631	480201,934	3266346,52	60968,7852	4272236,785	8018785,24	801878,524	8820663,77	Si
56,29	15,75	7,15	5,96	0,5383	2916,35539	123,498519	889,585512	1,46484045	0,11304973	817,122155	480516,855	3268488,62	61131,7667	4272399,767	8021405,24	802140,524	8823545,77	Si
56,29	15,83	7,11	5,93	0,5383	2916,35539	123,826899	894,322581	1,46484045	0,11304973	817,65768	480831,775	3270630,72	61294,3148	4272562,315	8024024,81	802402,481	8826427,29	Si
56,29	15,91	7,08	5,90	0,5383	2916,35539	124,15441	899,05965	1,46484045	0,11304973	818,193204	481146,696	3272772,82	61456,4331	4272724,433	8026643,94	802664,394	8829308,34	Si
56,29	16,00	7,04	5,87	0,5383	2916,35539	124,48106	903,79672	1,46484045	0,11304973	818,728728	481461,616	3274914,91	61618,1247	4272886,125	8029262,65	802926,265	8832188,92	Si
56,29	14,82	7,60	6,43	0,5383	2960,10072	119,824433	837,45735	1,47130649	0,11290714	810,205858	476449,657	3240823,43	59313,0945	4270581,094	7987854,18	798785,418	8786639,6	No
56,29	14,91	7,55	6,39	0,5383	2960,10072	120,165372	842,214817	1,47130649	0,11290714	810,74301	476765,535	3242972,04	59481,8593	4270749,859	7990487,43	799048,743	8789536,18	No
56,29	14,99	7,51	6,36	0,5383	2960,10072	120,502836	846,951887	1,47130649	0,11290714	811,277859	477080,058	3245111,44	59648,9038	4270916,904	7993108,4	799310,84	8792419,24	No
56,29	15,08	7,47	6,32	0,5383	2960,10072	120,839357	851,688956	1,47130649	0,11290714	811,812708	477394,581	3247250,83	59815,4817	4271083,482	7995728,9	799572,89	8795301,78	No
56,29	15,16	7,43	6,29	0,5383	2960,10072	121,174943	856,426026	1,47130649	0,11290714	812,347557	477709,104	3249390,23	59981,597	4271249,597	7998348,93	799834,893	8798183,82	No
56,29	15,24	7,39	6,25	0,5383	2960,10072	121,509603	861,163095	1,47130649	0,11290714	812,882406	478023,628	3251529,62	60147,2536	4271415,254	8000968,51	800096,851	8801065,36	No
56,29	15,33	7,35	6,22	0,5383	2960,10072	121,843344	865,900165	1,47130649	0,11290714	813,417255	478338,151	3253669,02	60312,4551	4271580,455	8003587,63	800358,763	8803946,39	Si
56,29	15,41	7,31	6,18	0,5383	2960,10072	122,176173	870,637234	1,47130649	0,11290714	813,952104	478652,674	3255808,42	60477,2054	4271745,205	8006206,3	800620,63	8806826,92	Si
56,29	15,50	7,27	6,15	0,5383	2960,10072	122,508097	875,374303	1,47130649	0,11290714	814,486953	478967,198	3257947,81	60641,5081	4271909,508	8008824,52	800882,452	8809706,97	Si
56,29	15,58	7,23	6,12	0,5383	2960,10072	122,839125	880,111373	1,47130649	0,11290714	815,021802	479281,721	3260087,21	60805,3669	4272073,367	8011442,29	801144,229	8812586,52	Si
56,29	15,66	7,19	6,08	0,5383	2960,10072	123,169263	884,848442	1,47130649	0,11290714	815,556651	479596,244	3262226,6	60968,7852	4272236,785	8014059,63	801405,963	8815465,6	Si
56,29	15,75	7,15	6,05	0,5383	2960,10072	123,498519	889,585512	1,47130649	0,11290714	816,0915	479910,767	3264366	61131,7667	4272399,767	8016676,53	801667,653	8818344,19	Si
56,29	15,83	7,11	6,02	0,5383	2960,10072	123,826899	894,322581	1,47130649	0,11290714	816,626349	480225,291	3266505,39	61294,3148	4272562,315	8019293	801929,3	8821222,3	Si
56,29	15,91	7,08	5,99	0,5383	2960,10072	124,15441	899,05965	1,47130649	0,11290714	817,161198	480539,814	3268644,79	61456,4331	4272724,433	8021909,04	802190,904	8824099,94	Si
56,29	16,00	7,04	5,96	0,5383	2960,10072	124,48106	903,79672	1,47130649	0,11290714	817,696047	480854,337	3270784,19	61618,1247	4272886,125	8024524,65	802452,465	8826977,11	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
56,82	14,82	7,53	6,18	0,5409	2886,3578	120,951581	846,562151	1,46035017	0,11314901	812,971682	478076,127	3251886,73	59871,0324	4271139,032	8001101,89	800110,189	8801212,08	No
56,82	14,91	7,48	6,15	0,5409	2886,3578	121,295703	851,371118	1,46035017	0,11314901	813,515812	478396,108	3254063,25	60041,373	4271309,373	8003768,73	800376,873	8804145,6	No
56,82	14,99	7,44	6,11	0,5409	2886,3578	121,636341	856,159688	1,46035017	0,11314901	814,057634	478714,732	3256230,54	60209,9887	4271477,989	8006423,26	800642,326	8807065,58	No
56,82	15,08	7,40	6,08	0,5409	2886,3578	121,976027	860,948257	1,46035017	0,11314901	814,599456	479033,356	3258397,82	60378,1336	4271646,134	8009077,31	800907,731	8809985,04	No
56,82	15,16	7,36	6,04	0,5409	2886,3578	122,314771	865,736826	1,46035017	0,11314901	815,141278	479351,98	3260565,11	60545,8114	4271813,811	8011730,9	801173,09	8812903,99	No
56,82	15,24	7,32	6,01	0,5409	2886,3578	122,652578	870,525396	1,46035017	0,11314901	815,683099	479670,603	3262732,4	60713,0262	4271981,026	8014384,03	801438,403	8815822,43	Si
56,82	15,33	7,28	5,98	0,5409	2886,3578	122,989458	875,313965	1,46035017	0,11314901	816,224921	479989,227	3264899,69	60879,7818	4272147,782	8017036,69	801703,669	8818740,36	Si
56,82	15,41	7,24	5,95	0,5409	2886,3578	123,325418	880,102534	1,46035017	0,11314901	816,766743	480307,851	3267066,97	61046,0818	4272314,082	8019688,91	801968,891	8821657,8	Si
56,82	15,50	7,20	5,91	0,5409	2886,3578	123,660465	884,891104	1,46035017	0,11314901	817,308565	480626,475	3269234,26	61211,93	4272479,93	8022340,66	802234,066	8824574,73	Si
56,82	15,58	7,16	5,88	0,5409	2886,3578	123,994606	889,679673	1,46035017	0,11314901	817,850387	480945,099	3271401,55	61377,33	4272645,33	8024991,98	802499,198	8827491,17	Si
56,82	15,66	7,12	5,85	0,5409	2886,3578	124,32785	894,468243	1,46035017	0,11314901	818,392209	481263,722	3273568,84	61542,2856	4272810,286	8027642,84	802764,284	8830407,13	Si
56,82	15,75	7,08	5,82	0,5409	2886,3578	124,660202	899,256812	1,46035017	0,11314901	818,934031	481582,346	3275736,12	61706,8002	4272974,8	8030293,27	803029,327	8833322,6	Si
56,82	15,83	7,05	5,79	0,5409	2886,3578	124,991671	904,045381	1,46035017	0,11314901	819,475853	481900,97	3277903,41	61870,8773	4273138,877	8032943,26	803294,326	8836237,58	Si
56,82	15,91	7,01	5,76	0,5409	2886,3578	125,322264	908,833951	1,46035017	0,11314901	820,017674	482219,594	3280070,7	62034,5205	4273302,52	8035592,81	803559,281	8839152,09	Si
56,82	16,00	6,97	5,73	0,5409	2886,3578	125,651986	913,62252	1,46035017	0,11314901	820,559496	482538,217	3282237,99	62197,7331	4273465,733	8038241,94	803824,194	8842066,13	Si
56,82	14,82	7,53	6,27	0,5409	2930,31248	120,951581	846,562151	1,46691394	0,11300396	811,929499	477463,261	3247717,99	59871,0324	4271139,032	7996320,29	799632,029	8795952,32	No
56,82	14,91	7,48	6,24	0,5409	2930,31248	121,295703	851,371118	1,46691394	0,11300396	812,472931	477782,832	3249891,72	60041,373	4271309,373	7998983,93	799898,393	8798882,32	No
56,82	14,99	7,44	6,20	0,5409	2930,31248	121,636341	856,159688	1,46691394	0,11300396	813,014058	478101,047	3252056,23	60209,9887	4271477,989	8001635,27	800163,527	8801798,8	No
56,82	15,08	7,40	6,17	0,5409	2930,31248	121,976027	860,948257	1,46691394	0,11300396	813,555186	478419,262	3254220,74	60378,1336	4271646,134	8004286,14	800428,614	8804714,75	No
56,82	15,16	7,36	6,14	0,5409	2930,31248	122,314771	865,736826	1,46691394	0,11300396	814,096313	478737,478	3256385,25	60545,8114	4271813,811	8006936,54	800693,654	8807630,19	No
56,82	15,24	7,32	6,10	0,5409	2930,31248	122,652578	870,525396	1,46691394	0,11300396	814,63744	479055,693	3258549,76	60713,0262	4271981,026	8009586,48	800958,648	8810545,13	Si
56,82	15,33	7,28	6,07	0,5409	2930,31248	122,989458	875,313965	1,46691394	0,11300396	815,178567	479373,908	3260714,27	60879,7818	4272147,782	8012235,96	801223,596	8813459,56	Si
56,82	15,41	7,24	6,04	0,5409	2930,31248	123,325418	880,102534	1,46691394	0,11300396	815,719695	479692,124	3262878,78	61046,0818	4272314,082	8014884,98	801488,498	8816373,48	Si
56,82	15,50	7,20	6,00	0,5409	2930,31248	123,660465	884,891104	1,46691394	0,11300396	816,260822	480010,339	3265043,29	61211,93	4272479,93	8017533,56	801753,356	8819286,91	Si
56,82	15,58	7,16	5,97	0,5409	2930,31248	123,994606	889,679673	1,46691394	0,11300396	816,801949	480328,554	3267207,8	61377,33	4272645,33	8020181,68	802018,168	8822199,85	Si
56,82	15,66	7,12	5,94	0,5409	2930,31248	124,32785	894,468243	1,46691394	0,11300396	817,343077	480646,77	3269372,31	61542,2856	4272810,286	8022829,36	802282,936	8825112,3	Si
56,82	15,75	7,08	5,91	0,5409	2930,31248	124,660202	899,256812	1,46691394	0,11300396	817,884204	480964,985	3271536,82	61706,8002	4272974,8	8025476,6	802547,66	8828024,26	Si
56,82	15,83	7,05	5,88	0,5409	2930,31248	124,991671	904,045381	1,46691394	0,11300396	818,425331	481283,2	3273701,32	61870,8773	4273138,877	8028123,4	802812,34	8830935,74	Si
56,82	15,91	7,01	5,85	0,5409	2930,31248	125,322264	908,833951	1,46691394	0,11300396	818,966458	481601,416	3275865,83	62034,5205	4273302,52	8030769,77	803076,977	8833846,75	Si
56,82	16,00	6,97	5,81	0,5409	2930,31248	125,651986	913,62252	1,46691394	0,11300396	819,507586	481919,631	3278030,34	62197,7331	4273465,733	8033415,71	803341,571	8836757,28	Si
56,82	14,82	7,53	6,37	0,5409	2974,26717	120,951581	846,562151	1,47337998	0,11286151	810,905982	476861,372	3243623,93	59871,0324	4271139,032	7991624,33	799162,433	8790786,76	No
56,82	14,91	7,48	6,33	0,5409	2974,26717	121,295703	851,371118	1,47337998	0,11286151	811,448729	477180,539	3245794,92	60041,373	4271309,373	7994284,83	799428,483	8793713,31	No
56,82	14,99	7,44	6,30	0,5409	2974,26717	121,636341	856,159688	1,47337998	0,11286151	811,989174	477498,354	3247956,7	60209,9887	4271477,989	7996933,04	799693,304	8796626,34	No
56,82	15,08	7,40	6,26	0,5409	2974,26717	121,976027	860,948257	1,47337998	0,11286151	812,529619	477816,168	3250118,48	60378,1336	4271646,134	7999580,78	799958,078	8799538,86	No
56,82	15,16	7,36	6,23	0,5409	2974,26717	122,314771	865,736826	1,47337998	0,11286151	813,070064	478133,982	3252280,26	60545,8114	4271813,811	8002228,05	800222,805	8802450,86	No
56,82	15,24	7,32	6,19	0,5409	2974,26717	122,652578	870,525396	1,47337998	0,11286151	813,610509	478451,796	3254442,04	60713,0262	4271981,026	8004874,86	800487,486	8805362,35	Si
56,82	15,33	7,28	6,16	0,5409	2974,26717	122,989458	875,313965	1,47337998	0,11286151	814,150955	478769,61	3256603,82	60879,7818	4272147,782	8007521,21	800752,121	8808273,33	Si
56,82	15,41	7,24	6,13	0,5409	2974,26717	123,325418	880,102534	1,47337998	0,11286151	814,6914	479087,425	3258765,6	61046,0818	4272314,082	8010167,11	801016,711	8811183,82	Si
56,82	15,50	7,20	6,09	0,5409	2974,26717	123,660465	884,891104	1,47337998	0,11286151	815,231845	479405,239	3260927,38	61211,93	4272479,93	8012812,55	801281,255	8814093,8	Si
56,82	15,58	7,16	6,06	0,5409	2974,26717	123,994606	889,679673	1,47337998	0,11286151	815,77229	479723,053	3263089,16	61377,33	4272645,33	8015457,54	801545,754	8817003,3	Si
56,82	15,66	7,12	6,03	0,5409	2974,26717	124,32785	894,468243	1,47337998	0,11286151	816,312735	480040,867	3265250,94	61542,2856	4272810,286	8018102,09	801810,209	8819912,3	Si
56,82	15,75	7,08	6,00	0,5409	2974,26717	124,660202	899,256812	1,47337998	0,11286151	816,85318	480358,681	3267412,72	61706,8002	4272974,8	8020746,2	802074,62	8822820,82	Si
56,82	15,83	7,05	5,96	0,5409	2974,26717	124,991671	904,045381	1,47337998	0,11286151	817,393625	480676,495	3269574,5	61870,8773	4273138,877	8023389,87	802338,987	8825728,86	Si
56,82	15,91	7,01	5,93	0,5409	2974,26717	125,322264	908,833951	1,47337998	0,11286151	817,934071	480994,31	3271736,28	62034,5205	4273302,52	8026033,11	802603,311	8828636,42	Si
56,82	16,00	6,97	5,90	0,5409	2974,26717	125,651986	913,62252	1,47337998	0,11286151	818,474516	481312,124	3273898,06	62197,7331	4273465,733	8028675,92	802867,592	8831543,51	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
57,35	14,82	7,46	6,12	0,5435	2899,91469	122,078728	855,666952	1,46238522	0,11310399	813,678005	478491,488	3254712,02	60428,9703	4271696,97	8004900,48	800490,048	8805390,53	No
57,35	14,91	7,41	6,09	0,5435	2899,91469	122,426034	860,527419	1,46238522	0,11310399	814,227743	478814,767	3256910,97	60600,8866	4271868,887	8007594,63	800759,463	8808354,09	No
57,35	14,99	7,37	6,06	0,5435	2899,91469	122,769846	865,367488	1,46238522	0,11310399	814,775174	479136,689	3259100,7	60771,0737	4272039,074	8010276,46	801027,646	8811304,11	No
57,35	15,08	7,33	6,02	0,5435	2899,91469	123,112698	870,207558	1,46238522	0,11310399	815,322606	479458,611	3261290,42	60940,7854	4272208,785	8012957,82	801295,782	8814253,6	No
57,35	15,16	7,29	5,99	0,5435	2899,91469	123,454598	875,047627	1,46238522	0,11310399	815,870037	479780,534	3263480,15	61110,0259	4272378,026	8015638,71	801563,871	8817202,58	Si
57,35	15,24	7,25	5,96	0,5435	2899,91469	123,795553	879,887696	1,46238522	0,11310399	816,417468	480102,456	3265669,87	61278,7989	4272546,799	8018319,13	801831,913	8820151,04	Si
57,35	15,33	7,21	5,92	0,5435	2899,91469	124,135572	884,727766	1,46238522	0,11310399	816,964899	480424,378	3267859,6	61447,1084	4272715,108	8020999,08	802099,908	8823098,99	Si
57,35	15,41	7,17	5,89	0,5435	2899,91469	124,474663	889,567835	1,46238522	0,11310399	817,51233	480746,301	3270049,32	61614,9581	4272882,958	8023678,58	802367,858	8826046,44	Si
57,35	15,50	7,13	5,86	0,5435	2899,91469	124,812832	894,407904	1,46238522	0,11310399	818,059761	481068,223	3272239,05	61782,3518	4273050,352	8026357,62	802635,762	8828993,38	Si
57,35	15,58	7,09	5,83	0,5435	2899,91469	125,150087	899,247974	1,46238522	0,11310399	818,607192	481390,146	3274428,77	61949,2932	4273217,293	8029036,21	802903,621	8831939,83	Si
57,35	15,66	7,06	5,80	0,5435	2899,91469	125,486436	904,088043	1,46238522	0,11310399	819,154624	481712,068	3276618,49	62115,7859	4273383,786	8031714,35	803171,435	8834885,78	Si
57,35	15,75	7,02	5,76	0,5435	2899,91469	125,821886	908,928112	1,46238522	0,11310399	819,702055	482033,99	3278808,22	62281,8336	4273549,834	8034392,04	803439,204	8837831,25	Si
57,35	15,83	6,98	5,73	0,5435	2899,91469	126,156444	913,768182	1,46238522	0,11310399	820,249486	482355,913	3280997,94	62447,4397	4273715,44	8037069,3	803706,93	8840776,23	Si
57,35	15,91	6,95	5,70	0,5435	2899,91469	126,490117	918,608251	1,46238522	0,11310399	820,796917	482677,835	3283187,67	62612,6079	4273880,608	8039746,11	803974,611	8843720,72	Si
57,35	16,00	6,91	5,67	0,5435	2899,91469	126,822912	923,44832	1,46238522	0,11310399	821,344348	482999,757	3285377,39	62777,3414	4274045,341	8042422,49	804242,249	8846664,74	Si
57,35	14,82	7,46	6,22	0,5435	2944,07583	122,078728	855,666952	1,46894899	0,11295908	812,6355	477878,432	3250542	60428,9703	4271696,97	8000117,4	800011,74	8800129,14	No
57,35	14,91	7,41	6,18	0,5435	2944,07583	122,426034	860,527419	1,46894899	0,11295908	813,184533	478201,297	3252738,13	60600,8866	4271868,887	8002808,32	800280,832	8803089,15	No
57,35	14,99	7,37	6,15	0,5435	2944,07583	122,769846	865,367488	1,46894899	0,11295908	813,731263	478522,807	3254925,05	60771,0737	4272039,074	8005486,93	800548,693	8806035,63	No
57,35	15,08	7,33	6,11	0,5435	2944,07583	123,112698	870,207558	1,46894899	0,11295908	814,277993	478844,317	3257111,97	60940,7854	4272208,785	8008165,07	800816,507	8808981,58	No
57,35	15,16	7,29	6,08	0,5435	2944,07583	123,454598	875,047627	1,46894899	0,11295908	814,824723	479165,826	3259298,89	61110,0259	4272378,026	8010842,74	801084,274	8811927,02	Si
57,35	15,24	7,25	6,05	0,5435	2944,07583	123,795553	879,887696	1,46894899	0,11295908	815,371453	479487,336	3261485,81	61278,7989	4272546,799	8013519,95	801351,995	8814871,94	Si
57,35	15,33	7,21	6,01	0,5435	2944,07583	124,135572	884,727766	1,46894899	0,11295908	815,918182	479808,846	3263672,73	61447,1084	4272715,108	8016196,68	801619,668	8817816,35	Si
57,35	15,41	7,17	5,98	0,5435	2944,07583	124,474663	889,567835	1,46894899	0,11295908	816,464912	480130,356	3265859,65	61614,9581	4272882,958	8018872,96	801887,296	8820760,26	Si
57,35	15,50	7,13	5,95	0,5435	2944,07583	124,812832	894,407904	1,46894899	0,11295908	817,011642	480451,866	3268046,57	61782,3518	4273050,352	8021548,79	802154,879	8823703,66	Si
57,35	15,58	7,09	5,92	0,5435	2944,07583	125,150087	899,247974	1,46894899	0,11295908	817,558372	480773,376	3270233,49	61949,2932	4273217,293	8024224,16	802422,416	8826646,57	Si
57,35	15,66	7,06	5,88	0,5435	2944,07583	125,486436	904,088043	1,46894899	0,11295908	818,105101	481094,886	3272420,41	62115,7859	4273383,786	8026899,08	802689,908	8829588,98	Si
57,35	15,75	7,02	5,85	0,5435	2944,07583	125,821886	908,928112	1,46894899	0,11295908	818,651831	481416,396	3274607,32	62281,8336	4273549,834	8029573,55	802957,355	8832530,91	Si
57,35	15,83	6,98	5,82	0,5435	2944,07583	126,156444	913,768182	1,46894899	0,11295908	819,198561	481737,906	3276794,24	62447,4397	4273715,44	8032247,59	803224,759	8835472,35	Si
57,35	15,91	6,95	5,79	0,5435	2944,07583	126,490117	918,608251	1,46894899	0,11295908	819,745291	482059,416	3278981,16	62612,6079	4273880,608	8034921,19	803492,119	8838413,3	Si
57,35	16,00	6,91	5,76	0,5435	2944,07583	126,822912	923,44832	1,46894899	0,11295908	820,29202	482380,926	3281168,08	62777,3414	4274045,341	8037594,35	803759,435	8841353,78	Si
57,35	14,82	7,46	6,31	0,5435	2988,23696	122,078728	855,666952	1,47541503	0,11281676	811,611673	477276,36	3246446,69	60428,9703	4271696,97	7995420,02	799542,002	8794962,02	No
57,35	14,91	7,41	6,27	0,5435	2988,23696	122,426034	860,527419	1,47541503	0,11281676	812,160015	477598,818	3248640,06	60600,8866	4271868,887	7998107,77	799810,777	8797918,54	No
57,35	14,99	7,37	6,24	0,5435	2988,23696	122,769846	865,367488	1,47541503	0,11281676	812,706056	477919,923	3250824,22	60771,0737	4272039,074	8000783,22	800078,322	8800861,54	No
57,35	15,08	7,33	6,20	0,5435	2988,23696	123,112698	870,207558	1,47541503	0,11281676	813,252097	478241,028	3253008,39	60940,7854	4272208,785	8003458,2	800345,82	8803804,02	No
57,35	15,16	7,29	6,17	0,5435	2988,23696	123,454598	875,047627	1,47541503	0,11281676	813,798138	478562,133	3255192,55	61110,0259	4272378,026	8006132,71	800613,271	8806745,98	Si
57,35	15,24	7,25	6,14	0,5435	2988,23696	123,795553	879,887696	1,47541503	0,11281676	814,344179	478883,238	3257376,72	61278,7989	4272546,799	8008806,75	800880,675	8809687,43	Si
57,35	15,33	7,21	6,10	0,5435	2988,23696	124,135572	884,727766	1,47541503	0,11281676	814,89022	479204,343	3259560,88	61447,1084	4272715,108	8011480,33	801148,033	8812628,36	Si
57,35	15,41	7,17	6,07	0,5435	2988,23696	124,474663	889,567835	1,47541503	0,11281676	815,436261	479525,448	3261745,04	61614,9581	4272882,958	8014153,45	801415,345	8815568,79	Si
57,35	15,50	7,13	6,04	0,5435	2988,23696	124,812832	894,407904	1,47541503	0,11281676	815,982302	479846,552	3263929,21	61782,3518	4273050,352	8016826,11	801682,611	8818508,72	Si
57,35	15,58	7,09	6,00	0,5435	2988,23696	125,150087	899,247974	1,47541503	0,11281676	816,528343	480167,657	3266113,37	61949,2932	4273217,293	8019498,32	801949,832	8821448,15	Si
57,35	15,66	7,06	5,97	0,5435	2988,23696	125,486436	904,088043	1,47541503	0,11281676	817,074384	480488,762	3268297,53	62115,7859	4273383,786	8022170,08	802217,008	8824387,09	Si
57,35	15,75	7,02	5,94	0,5435	2988,23696	125,821886	908,928112	1,47541503	0,11281676	817,620425	480809,867	3270481,7	62281,8336	4273549,834	8024841,4	802484,14	8827325,54	Si
57,35	15,83	6,98	5,91	0,5435	2988,23696	126,156444	913,768182	1,47541503	0,11281676	818,166466	481130,972	3272665,86	62447,4397	4273715,44	8027512,27	802751,227	8830263,5	Si
57,35	15,91	6,95	5,88	0,5435	2988,23696	126,490117	918,608251	1,47541503	0,11281676	818,712506	481452,077	3274850,03	62612,6079	4273880,608	8030182,71	803018,271	8833200,98	Si
57,35	16,00	6,91	5,85	0,5435	2988,23696	126,822912	923,44832	1,47541503	0,11281676	819,258547	481773,181	3277034,19	62777,3414	4274045,341	8032852,71	803285,271	8836137,98	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
57,88	14,82	7,39	6,07	0,5460	2913,28512	123,205875	864,771752	1,46438299	0,11305984	814,389751	478910,037	3257559	60986,9083	4272254,908	8008723,95	800872,395	8809596,34	No
57,88	14,91	7,35	6,03	0,5460	2913,28512	123,556364	869,68372	1,46438299	0,11305984	814,945097	479236,614	3259780,39	61160,4003	4272428,4	8011445,4	801144,54	8812589,94	No
57,88	14,99	7,31	6,00	0,5460	2913,28512	123,903351	874,575289	1,46438299	0,11305984	815,498137	479561,835	3261992,55	61332,1586	4272600,159	8014154,54	801415,454	8815570	No
57,88	15,08	7,26	5,97	0,5460	2913,28512	124,249368	879,466858	1,46438299	0,11305984	816,051177	479887,055	3264204,71	61503,4373	4272771,437	8016863,2	801686,32	8818549,52	Si
57,88	15,16	7,22	5,93	0,5460	2913,28512	124,594425	884,358428	1,46438299	0,11305984	816,604217	480212,276	3266416,87	61674,2403	4272942,24	8019571,39	801957,139	8821528,52	Si
57,88	15,24	7,18	5,90	0,5460	2913,28512	124,938528	889,249997	1,46438299	0,11305984	817,157257	480537,497	3268629,03	61844,5716	4273112,572	8022279,1	802227,91	8824507,01	Si
57,88	15,33	7,15	5,87	0,5460	2913,28512	125,281687	894,141566	1,46438299	0,11305984	817,710297	480862,718	3270841,19	62014,435	4273282,435	8024986,34	802498,634	8827484,98	Si
57,88	15,41	7,11	5,84	0,5460	2913,28512	125,623908	899,033135	1,46438299	0,11305984	818,263337	481187,938	3273053,35	62183,8344	4273451,834	8027693,12	802769,312	8830462,43	Si
57,88	15,50	7,07	5,80	0,5460	2913,28512	125,965199	903,924705	1,46438299	0,11305984	818,816377	481513,159	3275265,51	62352,7737	4273620,774	8030399,44	803039,944	8833439,39	Si
57,88	15,58	7,03	5,77	0,5460	2913,28512	126,305568	908,816274	1,46438299	0,11305984	819,369417	481838,38	3277477,67	62521,2564	4273789,256	8033105,31	803310,531	8836415,84	Si
57,88	15,66	6,99	5,74	0,5460	2913,28512	126,645023	913,707843	1,46438299	0,11305984	819,922458	482163,6	3279689,83	62689,2863	4273957,286	8035810,72	803581,072	8839391,79	Si
57,88	15,75	6,95	5,71	0,5460	2913,28512	126,98357	918,599413	1,46438299	0,11305984	820,475498	482488,821	3281901,99	62856,867	4274124,867	8038515,68	803851,568	8842367,25	Si
57,88	15,83	6,92	5,68	0,5460	2913,28512	127,321217	923,490982	1,46438299	0,11305984	821,028538	482814,042	3284114,15	63024,0022	4274292,002	8041220,19	804122,019	8845342,21	Si
57,88	15,91	6,88	5,65	0,5460	2913,28512	127,65797	928,382551	1,46438299	0,11305984	821,581578	483139,263	3286326,31	63190,6953	4274458,695	8043924,27	804392,427	8848316,69	Si
57,88	16,00	6,85	5,62	0,5460	2913,28512	127,993838	933,274121	1,46438299	0,11305984	822,134618	483464,483	3288538,47	63356,9498	4274624,95	8046627,9	804662,79	8851290,69	Si
57,88	14,82	7,39	6,16	0,5460	2957,64986	123,205875	864,771752	1,47094676	0,11291506	813,346909	478296,783	3253387,64	60986,9083	4272254,908	8003939,33	800393,933	8804333,26	No
57,88	14,91	7,35	6,13	0,5460	2957,64986	123,556364	869,68372	1,47094676	0,11291506	813,901544	478622,942	3255606,18	61160,4003	4272428,4	8006657,52	800665,752	8807323,27	No
57,88	14,99	7,31	6,09	0,5460	2957,64986	123,903351	874,575289	1,47094676	0,11291506	814,453876	478947,746	3257815,5	61332,1586	4272600,159	8009363,41	800936,341	8810299,75	No
57,88	15,08	7,26	6,06	0,5460	2957,64986	124,249368	879,466858	1,47094676	0,11291506	815,006208	479272,551	3260024,83	61503,4373	4272771,437	8012068,82	801206,882	8813275,7	Si
57,88	15,16	7,22	6,02	0,5460	2957,64986	124,594425	884,358428	1,47094676	0,11291506	815,55854	479597,355	3262234,16	61674,2403	4272942,24	8014773,75	801477,375	8816251,13	Si
57,88	15,24	7,18	5,99	0,5460	2957,64986	124,938528	889,249997	1,47094676	0,11291506	816,110871	479922,159	3264443,49	61844,5716	4273112,572	8017478,22	801747,822	8819226,04	Si
57,88	15,33	7,15	5,96	0,5460	2957,64986	125,281687	894,141566	1,47094676	0,11291506	816,663203	480246,963	3266652,81	62014,435	4273282,435	8020182,21	802018,221	8822200,43	Si
57,88	15,41	7,11	5,93	0,5460	2957,64986	125,623908	899,033135	1,47094676	0,11291506	817,215535	480571,768	3268862,14	62183,8344	4273451,834	8022885,74	802288,574	8825174,32	Si
57,88	15,50	7,07	5,89	0,5460	2957,64986	125,965199	903,924705	1,47094676	0,11291506	817,767867	480896,572	3271071,47	62352,7737	4273620,774	8025588,81	802558,881	8828147,69	Si
57,88	15,58	7,03	5,86	0,5460	2957,64986	126,305568	908,816274	1,47094676	0,11291506	818,320199	481221,376	3273280,8	62521,2564	4273789,256	8028291,43	802829,143	8831120,57	Si
57,88	15,66	6,99	5,83	0,5460	2957,64986	126,645023	913,707843	1,47094676	0,11291506	818,872531	481546,18	3275490,12	62689,2863	4273957,286	8030993,59	803099,359	8834092,95	Si
57,88	15,75	6,95	5,80	0,5460	2957,64986	126,98357	918,599413	1,47094676	0,11291506	819,424863	481870,985	3277699,45	62856,867	4274124,867	8033695,3	803369,53	8837064,83	Si
57,88	15,83	6,92	5,77	0,5460	2957,64986	127,321217	923,490982	1,47094676	0,11291506	819,977194	482195,789	3279908,78	63024,0022	4274292,002	8036396,57	803639,657	8840036,23	Si
57,88	15,91	6,88	5,74	0,5460	2957,64986	127,65797	928,382551	1,47094676	0,11291506	820,529526	482520,593	3282118,1	63190,6953	4274458,695	8039097,39	803909,739	8843007,13	Si
57,88	16,00	6,85	5,71	0,5460	2957,64986	127,993838	933,274121	1,47094676	0,11291506	821,081858	482845,397	3284327,43	63356,9498	4274624,95	8041797,78	804179,778	8845977,56	Si
57,88	14,82	7,39	6,25	0,5460	3002,01461	123,205875	864,771752	1,4774128	0,11277288	812,322758	477694,521	3249291,03	60986,9083	4272254,908	7999240,46	799924,046	8799164,51	No
57,88	14,91	7,35	6,22	0,5460	3002,01461	123,556364	869,68372	1,4774128	0,11277288	812,876695	478020,269	3251506,78	61160,4003	4272428,4	8001955,45	800195,545	8802150,99	No
57,88	14,99	7,31	6,18	0,5460	3002,01461	123,903351	874,575289	1,4774128	0,11277288	813,428331	478344,665	3253713,33	61332,1586	4272600,159	8004658,15	800465,815	8805123,96	No
57,88	15,08	7,26	6,15	0,5460	3002,01461	124,249368	879,466858	1,4774128	0,11277288	813,979968	478669,06	3255919,87	61503,4373	4272771,437	8007360,37	800736,037	8808096,4	Si
57,88	15,16	7,22	6,11	0,5460	3002,01461	124,594425	884,358428	1,4774128	0,11277288	814,531604	478993,455	3258126,42	61674,2403	4272942,24	8010062,11	801006,211	8811068,32	Si
57,88	15,24	7,18	6,08	0,5460	3002,01461	124,938528	889,249997	1,4774128	0,11277288	815,08324	479317,85	3260332,96	61844,5716	4273112,572	8012763,38	801276,338	8814039,72	Si
57,88	15,33	7,15	6,05	0,5460	3002,01461	125,281687	894,141566	1,4774128	0,11277288	815,634877	479642,246	3262539,51	62014,435	4273282,435	8015464,19	801546,419	8817010,61	Si
57,88	15,41	7,11	6,01	0,5460	3002,01461	125,623908	899,033135	1,4774128	0,11277288	816,186513	479966,641	3264746,05	62183,8344	4273451,834	8018164,53	801816,453	8819980,98	Si
57,88	15,50	7,07	5,98	0,5460	3002,01461	125,965199	903,924705	1,4774128	0,11277288	816,738149	480291,036	3266952,6	62352,7737	4273620,774	8020864,41	802086,441	8822950,85	Si
57,88	15,58	7,03	5,95	0,5460	3002,01461	126,305568	908,816274	1,4774128	0,11277288	817,289786	480615,431	3269159,14	62521,2564	4273789,256	8023563,83	802356,383	8825920,21	Si
57,88	15,66	6,99	5,92	0,5460	3002,01461	126,645023	913,707843	1,4774128	0,11277288	817,841422	480939,827	3271365,69	62689,2863	4273957,286	8026262,8	802626,28	8828889,08	Si
57,88	15,75	6,95	5,89	0,5460	3002,01461	126,98357	918,599413	1,4774128	0,11277288	818,393059	481264,222	3273572,23	62856,867	4274124,867	8028961,32	802896,132	8831857,46	Si
57,88	15,83	6,92	5,85	0,5460	3002,01461	127,321217	923,490982	1,4774128	0,11277288	818,944695	481588,617	3275778,78	63024,0022	4274292,002	8031659,4	803165,94	8834825,34	Si
57,88	15,91	6,88	5,82	0,5460	3002,01461	127,65797	928,382551	1,4774128	0,11277288	819,496331	481913,013	3277985,32	63190,6953	4274458,695	8034357,03	803435,703	8837792,74	Si
57,88	16,00	6,85	5,79	0,5460	3002,01461	127,993838	933,274121	1,4774128	0,11277288	820,047968	482237,408	3280191,87	63356,9498	4274624,95	8037054,23	803705,423	8840759,65	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
58,41	14,82	7,32	6,01	0,5485	2926,60762	124,344581	873,969916	1,4663645	0,11301608	815,114132	479336,016	3260456,53	61550,5675	4272818,567	8012611,11	801261,111	8813872,22	No
58,41	14,91	7,28	5,98	0,5485	2926,60762	124,686695	878,84002	1,4663645	0,11301608	815,664532	479659,685	3262658,13	61719,9139	4272987,914	8015305,73	801530,573	8816836,3	No
58,41	14,99	7,24	5,95	0,5485	2926,60762	125,036856	883,78309	1,4663645	0,11301608	816,223178	479988,202	3264892,71	61893,2436	4273161,244	8018042,16	801804,216	8819846,38	Si
58,41	15,08	7,20	5,91	0,5485	2926,60762	125,386039	888,726159	1,4663645	0,11301608	816,781825	480316,72	3267127,3	62066,0891	4273334,089	8020778,11	802077,811	8822855,92	Si
58,41	15,16	7,16	5,88	0,5485	2926,60762	125,734252	893,669228	1,4663645	0,11301608	817,340471	480645,237	3269361,88	62238,4547	4273506,455	8023513,58	802351,358	8825864,93	Si
58,41	15,24	7,12	5,85	0,5485	2926,60762	126,081503	898,612297	1,4663645	0,11301608	817,899117	480973,755	3271596,47	62410,3442	4273678,344	8026248,57	802624,857	8828873,43	Si
58,41	15,33	7,08	5,82	0,5485	2926,60762	126,427801	903,555367	1,4663645	0,11301608	818,457764	481302,273	3273831,05	62581,7616	4273849,762	8028983,09	802898,309	8831881,4	Si
58,41	15,41	7,04	5,78	0,5485	2926,60762	126,773153	908,498436	1,4663645	0,11301608	819,01641	481630,79	3276065,64	62752,7108	4274020,711	8031717,14	803171,714	8834888,85	Si
58,41	15,50	7,00	5,75	0,5485	2926,60762	127,117567	913,441505	1,4663645	0,11301608	819,575056	481959,308	3278300,23	62923,1955	4274191,196	8034450,73	803445,073	8837895,8	Si
58,41	15,58	6,97	5,72	0,5485	2926,60762	127,46105	918,384574	1,4663645	0,11301608	820,133703	482287,825	3280534,81	63093,2196	4274361,22	8037183,86	803718,386	8840902,24	Si
58,41	15,66	6,93	5,69	0,5485	2926,60762	127,803609	923,327644	1,4663645	0,11301608	820,692349	482616,343	3282769,4	63262,7867	4274530,787	8039916,53	803991,653	8843908,18	Si
58,41	15,75	6,89	5,66	0,5485	2926,60762	128,145254	928,270713	1,4663645	0,11301608	821,250995	482944,86	3285003,98	63431,9005	4274699,9	8042648,74	804264,874	8846913,62	Si
58,41	15,83	6,86	5,63	0,5485	2926,60762	128,485989	933,213782	1,4663645	0,11301608	821,809642	483273,378	3287238,57	63600,5646	4274868,565	8045380,51	804538,051	8849918,56	Si
58,41	15,91	6,82	5,60	0,5485	2926,60762	128,825824	938,156852	1,4663645	0,11301608	822,368288	483601,895	3289473,15	63768,7827	4275036,783	8048111,83	804811,183	8852923,01	Si
58,41	16,00	6,78	5,57	0,5485	2926,60762	129,164764	943,099921	1,4663645	0,11301608	822,926934	483930,413	3291707,74	63936,5581	4275204,558	8050842,71	805084,271	8855926,98	Si
58,41	14,82	7,32	6,10	0,5485	2971,17525	124,344581	873,969916	1,47292827	0,11287144	814,070935	478722,554	3256283,74	61550,5675	4272818,567	8007824,86	800782,486	8808607,35	No
58,41	14,91	7,28	6,07	0,5485	2971,17525	124,686695	878,84002	1,47292827	0,11287144	814,620631	479045,808	3258482,52	61719,9139	4272987,914	8010516,25	801051,625	8811567,87	No
58,41	14,99	7,24	6,04	0,5485	2971,17525	125,036856	883,78309	1,47292827	0,11287144	815,178562	479373,905	3260714,25	61893,2436	4273161,244	8013249,4	801324,94	8814574,34	Si
58,41	15,08	7,20	6,00	0,5485	2971,17525	125,386039	888,726159	1,47292827	0,11287144	815,736494	479702,002	3262945,97	62066,0891	4273334,089	8015982,07	801598,207	8817580,27	Si
58,41	15,16	7,16	5,97	0,5485	2971,17525	125,734252	893,669228	1,47292827	0,11287144	816,294425	480030,1	3265177,7	62238,4547	4273506,455	8018714,25	801871,425	8820585,68	Si
58,41	15,24	7,12	5,94	0,5485	2971,17525	126,081503	898,612297	1,47292827	0,11287144	816,852356	480358,197	3267409,43	62410,3442	4273678,344	8021445,97	802144,597	8823590,56	Si
58,41	15,33	7,08	5,90	0,5485	2971,17525	126,427801	903,555367	1,47292827	0,11287144	817,410288	480686,294	3269641,15	62581,7616	4273849,762	8024177,21	802417,721	8826594,93	Si
58,41	15,41	7,04	5,87	0,5485	2971,17525	126,773153	908,498436	1,47292827	0,11287144	817,968219	481014,391	3271872,88	62752,7108	4274020,711	8026907,98	802690,798	8829598,78	Si
58,41	15,50	7,00	5,84	0,5485	2971,17525	127,117567	913,441505	1,47292827	0,11287144	818,52615	481342,488	3274104,6	62923,1955	4274191,196	8029638,29	802963,829	8832602,11	Si
58,41	15,58	6,97	5,81	0,5485	2971,17525	127,46105	918,384574	1,47292827	0,11287144	819,084082	481670,585	3276336,33	63093,2196	4274361,22	8032368,13	803236,813	8835604,95	Si
58,41	15,66	6,93	5,78	0,5485	2971,17525	127,803609	923,327644	1,47292827	0,11287144	819,642013	481998,682	3278568,05	63262,7867	4274530,787	8035097,52	803509,752	8838607,27	Si
58,41	15,75	6,89	5,75	0,5485	2971,17525	128,145254	928,270713	1,47292827	0,11287144	820,199945	482326,779	3280799,78	63431,9005	4274699,9	8037826,46	803782,646	8841609,1	Si
58,41	15,83	6,86	5,72	0,5485	2971,17525	128,485989	933,213782	1,47292827	0,11287144	820,757876	482654,876	3283031,5	63600,5646	4274868,565	8040554,94	804055,494	8844610,44	Si
58,41	15,91	6,82	5,69	0,5485	2971,17525	128,825824	938,156852	1,47292827	0,11287144	821,315807	482982,974	3285263,23	63768,7827	4275036,783	8043282,99	804328,299	8847611,28	Si
58,41	16,00	6,78	5,66	0,5485	2971,17525	129,164764	943,099921	1,47292827	0,11287144	821,873739	483311,071	3287494,95	63936,5581	4275204,558	8046010,58	804601,058	8850611,64	Si
58,41	14,82	7,32	6,20	0,5485	3015,74288	124,344581	873,969916	1,47939431	0,1127294	813,046443	478120,091	3252185,77	61550,5675	4272818,567	8003124,43	800312,443	8803436,87	No
58,41	14,91	7,28	6,16	0,5485	3015,74288	124,686695	878,84002	1,47939431	0,1127294	813,595447	478442,938	3254381,79	61719,9139	4272987,914	8005812,64	800581,264	8806393,9	No
58,41	14,99	7,24	6,13	0,5485	3015,74288	125,036856	883,78309	1,47939431	0,1127294	814,152676	478770,623	3256610,7	61893,2436	4273161,244	8008542,57	800854,257	8809396,83	Si
58,41	15,08	7,20	6,09	0,5485	3015,74288	125,386039	888,726159	1,47939431	0,1127294	814,709905	479098,307	3258839,62	62066,0891	4273334,089	8011272,02	801127,202	8812399,22	Si
58,41	15,16	7,16	6,06	0,5485	3015,74288	125,734252	893,669228	1,47939431	0,1127294	815,267134	479425,991	3261068,54	62238,4547	4273506,455	8014000,98	801400,098	8815401,08	Si
58,41	15,24	7,12	6,03	0,5485	3015,74288	126,081503	898,612297	1,47939431	0,1127294	815,824364	479753,675	3263297,45	62410,3442	4273678,344	8016729,47	801672,947	8818402,42	Si
58,41	15,33	7,08	5,99	0,5485	3015,74288	126,427801	903,555367	1,47939431	0,1127294	816,381593	480081,359	3265526,37	62581,7616	4273849,762	8019457,49	801945,749	8821403,24	Si
58,41	15,41	7,04	5,96	0,5485	3015,74288	126,773153	908,498436	1,47939431	0,1127294	816,938822	480409,044	3267755,29	62752,7108	4274020,711	8022185,04	802218,504	8824403,55	Si
58,41	15,50	7,00	5,93	0,5485	3015,74288	127,117567	913,441505	1,47939431	0,1127294	817,496051	480736,728	3269984,2	62923,1955	4274191,196	8024912,13	802491,213	8827403,34	Si
58,41	15,58	6,97	5,90	0,5485	3015,74288	127,46105	918,384574	1,47939431	0,1127294	818,05328	481064,412	3272213,12	63093,2196	4274361,22	8027638,75	802763,875	8830402,63	Si
58,41	15,66	6,93	5,86	0,5485	3015,74288	127,803609	923,327644	1,47939431	0,1127294	818,61051	481392,096	3274442,04	63262,7867	4274530,787	8030364,92	803036,492	8833401,41	Si
58,41	15,75	6,89	5,83	0,5485	3015,74288	128,145254	928,270713	1,47939431	0,1127294	819,167739	481719,78	3276670,96	63431,9005	4274699,9	8033090,64	803309,064	8836399,7	Si
58,41	15,83	6,86	5,80	0,5485	3015,74288	128,485989	933,213782	1,47939431	0,1127294	819,724968	482047,465	3278899,87	63600,5646	4274868,565	8035815,9	803581,59	8839397,49	Si
58,41	15,91	6,82	5,77	0,5485	3015,74288	128,825824	938,156852	1,47939431	0,1127294	820,282197	482375,149	3281128,79	63768,7827	4275036,783	8038540,72	803854,072	8842394,79	Si
58,41	16,00	6,78	5,74	0,5485	3015,74288	129,164764	943,099921	1,47939431	0,1127294	820,839426	482702,833	3283357,71	63936,5581	4275204,558	8041265,1	804126,51	8845391,61	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
58,94	14,82	7,25	5,96	0,5509	2939,61588	125,471728	883,074717	1,46829059	0,11297359	815,836281	479760,683	3263345,12	62108,5054	4273376,505	8016482,31	801648,231	8818130,54	No
58,94	14,91	7,21	5,93	0,5509	2939,61588	125,817025	887,996321	1,46829059	0,11297359	816,392292	480087,651	3265569,17	62279,4276	4273547,428	8019204,25	801920,425	8821124,67	Si
58,94	14,99	7,17	5,89	0,5509	2939,61588	126,170361	892,99089	1,46829059	0,11297359	816,956546	480419,467	3267826,19	62454,3285	4273722,329	8021967,98	802196,798	8824164,78	Si
58,94	15,08	7,13	5,86	0,5509	2939,61588	126,522709	897,985459	1,46829059	0,11297359	817,520801	480751,282	3270083,2	62628,741	4273896,741	8024731,23	802473,123	8827204,35	Si
58,94	15,16	7,09	5,83	0,5509	2939,61588	126,874079	902,980029	1,46829059	0,11297359	818,085055	481083,098	3272340,22	62802,6691	4274070,669	8027493,99	802749,399	8830243,39	Si
58,94	15,24	7,06	5,79	0,5509	2939,61588	127,224479	907,974598	1,46829059	0,11297359	818,64931	481414,913	3274597,24	62976,1169	4274244,117	8030256,27	803025,627	8833281,89	Si
58,94	15,33	7,02	5,76	0,5509	2939,61588	127,573916	912,969167	1,46829059	0,11297359	819,213564	481746,728	3276854,26	63149,0883	4274417,088	8033018,07	803301,807	8836319,88	Si
58,94	15,41	6,98	5,73	0,5509	2939,61588	127,922398	917,963736	1,46829059	0,11297359	819,777818	482078,544	3279111,27	63321,5871	4274589,587	8035779,4	803577,94	8839357,35	Si
58,94	15,50	6,94	5,70	0,5509	2939,61588	128,269934	922,958306	1,46829059	0,11297359	820,342073	482410,359	3281368,29	63493,6174	4274761,617	8038540,27	803854,027	8842394,29	Si
58,94	15,58	6,90	5,67	0,5509	2939,61588	128,616531	927,952875	1,46829059	0,11297359	820,906327	482742,175	3283625,31	63665,1827	4274933,183	8041300,67	804130,067	8845430,73	Si
58,94	15,66	6,87	5,64	0,5509	2939,61588	128,962196	932,947444	1,46829059	0,11297359	821,470582	483073,99	3285882,33	63836,287	4275104,287	8044060,6	804406,06	8848466,66	Si
58,94	15,75	6,83	5,61	0,5509	2939,61588	129,306937	937,942013	1,46829059	0,11297359	822,034836	483405,806	3288139,34	64006,9339	4275274,934	8046820,08	804682,008	8851502,09	Si
58,94	15,83	6,79	5,58	0,5509	2939,61588	129,650762	942,936583	1,46829059	0,11297359	822,599091	483737,621	3290396,36	64177,1271	4275445,127	8049579,11	804957,911	8854537,02	Si
58,94	15,91	6,76	5,55	0,5509	2939,61588	129,993677	947,931152	1,46829059	0,11297359	823,163345	484069,437	3292653,38	64346,8701	4275614,87	8052337,69	805233,769	8857571,46	Si
58,94	16,00	6,72	5,52	0,5509	2939,61588	130,33569	952,925721	1,46829059	0,11297359	823,727599	484401,252	3294910,4	64516,1665	4275784,166	8055095,82	805509,582	8860605,4	Si
58,94	14,82	7,25	6,05	0,5509	2984,38161	125,471728	883,074717	1,47485435	0,11282908	814,792719	479147,006	3259170,88	62108,5054	4273376,505	8011694,39	801169,439	8812863,83	No
58,94	14,91	7,21	6,02	0,5509	2984,38161	125,817025	887,996321	1,47485435	0,11282908	815,348019	479473,556	3261392,08	62279,4276	4273547,428	8014413,06	801441,306	8815854,37	Si
58,94	14,99	7,17	5,98	0,5509	2984,38161	126,170361	892,99089	1,47485435	0,11282908	815,911552	479804,947	3263646,21	62454,3285	4273722,329	8017173,48	801717,348	8818890,83	Si
58,94	15,08	7,13	5,95	0,5509	2984,38161	126,522709	897,985459	1,47485435	0,11282908	816,475084	480136,338	3265900,34	62628,741	4273896,741	8019933,42	801993,342	8821926,76	Si
58,94	15,16	7,09	5,92	0,5509	2984,38161	126,874079	902,980029	1,47485435	0,11282908	817,038617	480467,729	3268154,47	62802,6691	4274070,669	8022692,87	802269,287	8824962,15	Si
58,94	15,24	7,06	5,88	0,5509	2984,38161	127,224479	907,974598	1,47485435	0,11282908	817,60215	480799,12	3270408,6	62976,1169	4274244,117	8025451,84	802545,184	8827997,02	Si
58,94	15,33	7,02	5,85	0,5509	2984,38161	127,573916	912,969167	1,47485435	0,11282908	818,165682	481130,511	3272662,73	63149,0883	4274417,088	8028210,33	802821,033	8831031,36	Si
58,94	15,41	6,98	5,82	0,5509	2984,38161	127,922398	917,963736	1,47485435	0,11282908	818,729215	481461,902	3274916,86	63321,5871	4274589,587	8030968,35	803096,835	8834065,18	Si
58,94	15,50	6,94	5,79	0,5509	2984,38161	128,269934	922,958306	1,47485435	0,11282908	819,292748	481793,293	3277170,99	63493,6174	4274761,617	8033725,9	803372,59	8837098,49	Si
58,94	15,58	6,90	5,76	0,5509	2984,38161	128,616531	927,952875	1,47485435	0,11282908	819,85628	482124,684	3279425,12	63665,1827	4274933,183	8036482,99	803648,299	8840131,29	Si
58,94	15,66	6,87	5,73	0,5509	2984,38161	128,962196	932,947444	1,47485435	0,11282908	820,419813	482456,075	3281679,25	63836,287	4275104,287	8039239,61	803923,961	8843163,58	Si
58,94	15,75	6,83	5,69	0,5509	2984,38161	129,306937	937,942013	1,47485435	0,11282908	820,983346	482787,466	3283933,38	64006,9339	4275274,934	8041995,78	804199,578	8846195,36	Si
58,94	15,83	6,79	5,66	0,5509	2984,38161	129,650762	942,936583	1,47485435	0,11282908	821,546878	483118,857	3286187,51	64177,1271	4275445,127	8044751,5	804475,15	8849226,65	Si
58,94	15,91	6,76	5,63	0,5509	2984,38161	129,993677	947,931152	1,47485435	0,11282908	822,110411	483450,248	3288441,64	64346,8701	4275614,87	8047506,76	804750,676	8852257,44	Si
58,94	16,00	6,72	5,61	0,5509	2984,38161	130,33569	952,925721	1,47485435	0,11282908	822,673944	483781,639	3290695,78	64516,1665	4275784,166	8050261,58	805026,158	8855287,74	Si
58,94	14,82	7,25	6,14	0,5509	3029,14733	125,471728	883,074717	1,4813204	0,11268717	813,767874	478544,336	3255071,5	62108,5054	4273376,505	8006992,34	800699,234	8807691,57	No
58,94	14,91	7,21	6,11	0,5509	3029,14733	125,817025	887,996321	1,4813204	0,11268717	814,322476	478870,475	3257289,9	62279,4276	4273547,428	8009707,81	800970,781	8810678,59	Si
58,94	14,99	7,17	6,07	0,5509	3029,14733	126,170361	892,99089	1,4813204	0,11268717	814,8853	479201,449	3259541,2	62454,3285	4273722,329	8012464,98	801246,498	8813711,48	Si
58,94	15,08	7,13	6,04	0,5509	3029,14733	126,522709	897,985459	1,4813204	0,11268717	815,448124	479532,424	3261792,49	62628,741	4273896,741	8015221,66	801522,166	8816743,83	Si
58,94	15,16	7,09	6,00	0,5509	3029,14733	126,874079	902,980029	1,4813204	0,11268717	816,010948	479863,398	3264043,79	62802,6691	4274070,669	8017977,86	801797,786	8819775,64	Si
58,94	15,24	7,06	5,97	0,5509	3029,14733	127,224479	907,974598	1,4813204	0,11268717	816,573771	480194,372	3266295,09	62976,1169	4274244,117	8020733,57	802073,357	8822806,93	Si
58,94	15,33	7,02	5,94	0,5509	3029,14733	127,573916	912,969167	1,4813204	0,11268717	817,136595	480525,346	3268546,38	63149,0883	4274417,088	8023488,82	802348,882	8825837,7	Si
58,94	15,41	6,98	5,91	0,5509	3029,14733	127,922398	917,963736	1,4813204	0,11268717	817,699419	480856,32	3270797,68	63321,5871	4274589,587	8026243,58	802624,358	8828867,94	Si
58,94	15,50	6,94	5,87	0,5509	3029,14733	128,269934	922,958306	1,4813204	0,11268717	818,262243	481187,295	3273048,97	63493,6174	4274761,617	8028997,88	802899,788	8831897,67	Si
58,94	15,58	6,90	5,84	0,5509	3029,14733	128,616531	927,952875	1,4813204	0,11268717	818,825067	481518,269	3275300,27	63665,1827	4274933,183	8031751,72	803175,172	8834926,89	Si
58,94	15,66	6,87	5,81	0,5509	3029,14733	128,962196	932,947444	1,4813204	0,11268717	819,387891	481849,243	3277551,56	63836,287	4275104,287	8034505,09	803450,509	8837955,6	Si
58,94	15,75	6,83	5,78	0,5509	3029,14733	129,306937	937,942013	1,4813204	0,11268717	819,950715	482180,217	3279802,86	64006,9339	4275274,934	8037258,01	803725,801	8840983,81	Si
58,94	15,83	6,79	5,75	0,5509	3029,14733	129,650762	942,936583	1,4813204	0,11268717	820,513538	482511,191	3282054,15	64177,1271	4275445,127	8040010,47	804001,047	8844011,52	Si
58,94	15,91	6,76	5,72	0,5509	3029,14733	129,993677	947,931152	1,4813204	0,11268717	821,076362	482842,166	3284305,45	64346,8701	4275614,87	8042762,49	804276,249	8847038,73	Si
58,94	16,00	6,72	5,69	0,5509	3029,14733	130,33569	952,925721	1,4813204	0,11268717	821,639186	483173,14	3286556,74	64516,1665	4275784,166	8045514,05	804551,405	8850065,46	Si



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
59,46	14,82	7,19	5,91	0,5533	2952,23477	126,579845	892,025798	1,47015089	0,11293259	816,551053	480181,012	3266204,21	62657,0235	4273925,023	8020310,25	802031,025	8822341,27	No
59,46	14,91	7,15	5,87	0,5533	2952,23477	126,947356	897,152622	1,47015089	0,11293259	817,130039	480521,491	3268520,15	62838,9413	4274106,941	8023148,59	802314,859	8825463,44	SI
59,46	14,99	7,11	5,84	0,5533	2952,23477	127,303866	902,198691	1,47015089	0,11293259	817,699904	480856,606	3270799,62	63015,4135	4274283,413	8025939,64	802593,964	8828533,6	SI
59,46	15,08	7,07	5,81	0,5533	2952,23477	127,65938	907,24476	1,47015089	0,11293259	818,26977	481191,721	3273079,08	63191,3929	4274459,393	8028730,19	802873,019	8831603,21	SI
59,46	15,16	7,03	5,77	0,5533	2952,23477	128,013906	912,290829	1,47015089	0,11293259	818,839636	481526,836	3275358,54	63366,8835	4274634,884	8031520,26	803152,026	8834672,29	SI
59,46	15,24	6,99	5,74	0,5533	2952,23477	128,367454	917,336899	1,47015089	0,11293259	819,409501	481861,951	3277638,01	63541,8895	4274809,89	8034309,85	803430,985	8837740,83	SI
59,46	15,33	6,95	5,71	0,5533	2952,23477	128,72003	922,382968	1,47015089	0,11293259	819,979367	482197,067	3279917,47	63716,4149	4274984,415	8037098,95	803709,895	8840808,84	SI
59,46	15,41	6,92	5,68	0,5533	2952,23477	129,071643	927,429037	1,47015089	0,11293259	820,549233	482532,182	3282196,93	63890,4635	4275158,463	8039887,58	803988,758	8843876,33	SI
59,46	15,50	6,88	5,65	0,5533	2952,23477	129,422301	932,475106	1,47015089	0,11293259	821,119098	482867,297	3284476,39	64064,0392	4275332,039	8042675,73	804267,573	8846943,3	SI
59,46	15,58	6,84	5,62	0,5533	2952,23477	129,772012	937,521175	1,47015089	0,11293259	821,688964	483202,412	3286755,86	64237,1459	4275505,146	8045463,41	804546,341	8850009,76	SI
59,46	15,66	6,81	5,59	0,5533	2952,23477	130,120783	942,567244	1,47015089	0,11293259	822,25883	483537,527	3289035,32	64409,7874	4275677,787	8048250,63	804825,063	8853075,7	SI
59,46	15,75	6,77	5,56	0,5533	2952,23477	130,468621	947,613314	1,47015089	0,11293259	822,828695	483872,643	3291314,78	64581,9674	4275849,967	8051037,39	805103,739	8856141,13	SI
59,46	15,83	6,73	5,53	0,5533	2952,23477	130,815534	952,659383	1,47015089	0,11293259	823,398561	484207,758	3293594,24	64753,6895	4276021,69	8053823,69	805382,369	8859206,06	SI
59,46	15,91	6,70	5,50	0,5533	2952,23477	131,16153	957,705452	1,47015089	0,11293259	823,968427	484542,873	3295873,71	64924,9575	4276192,957	8056609,54	805660,954	8862270,49	SI
59,46	16,00	6,66	5,47	0,5533	2952,23477	131,506616	962,751521	1,47015089	0,11293259	824,538292	484877,988	3298153,17	65095,7748	4276363,775	8059394,93	805939,493	8865334,43	SI
59,46	14,82	7,19	6,00	0,5533	2997,19266	126,579845	892,025798	1,47671466	0,11278821	815,50712	479567,117	3262028,48	62657,0235	4273925,023	8015520,62	801552,062	8817072,68	No
59,46	14,91	7,15	5,96	0,5533	2997,19266	126,947356	897,152622	1,47671466	0,11278821	816,085365	479907,16	3264341,46	62838,9413	4274106,941	8018355,56	801835,556	8820191,12	SI
59,46	14,99	7,11	5,93	0,5533	2997,19266	127,303866	902,198691	1,47671466	0,11278821	816,654502	480241,846	3266618,01	63015,4135	4274283,413	8021143,27	802114,327	8823257,59	SI
59,46	15,08	7,07	5,90	0,5533	2997,19266	127,65938	907,24476	1,47671466	0,11278821	817,223639	480576,533	3268894,56	63191,3929	4274459,393	8023930,48	802393,048	8826323,53	SI
59,46	15,16	7,03	5,86	0,5533	2997,19266	128,013906	912,290829	1,47671466	0,11278821	817,792776	480911,22	3271171,1	63366,8835	4274634,884	8026717,21	802671,721	8829388,93	SI
59,46	15,24	6,99	5,83	0,5533	2997,19266	128,367454	917,336899	1,47671466	0,11278821	818,361913	481245,907	3273447,65	63541,8895	4274809,89	8029503,45	802950,345	8832453,79	SI
59,46	15,33	6,95	5,80	0,5533	2997,19266	128,72003	922,382968	1,47671466	0,11278821	818,93105	481580,594	3275724,2	63716,4149	4274984,415	8032289,21	803228,921	8835518,13	SI
59,46	15,41	6,92	5,77	0,5533	2997,19266	129,071643	927,429037	1,47671466	0,11278821	819,500188	481915,28	3278000,75	63890,4635	4275158,463	8035074,49	803507,449	8838581,94	SI
59,46	15,50	6,88	5,74	0,5533	2997,19266	129,422301	932,475106	1,47671466	0,11278821	820,069325	482249,967	3280277,3	64064,0392	4275332,039	8037859,3	803785,93	8841645,24	SI
59,46	15,58	6,84	5,71	0,5533	2997,19266	129,772012	937,521175	1,47671466	0,11278821	820,638462	482584,654	3282553,85	64237,1459	4275505,146	8040643,65	804064,365	8844708,01	SI
59,46	15,66	6,81	5,67	0,5533	2997,19266	130,120783	942,567244	1,47671466	0,11278821	821,207599	482919,341	3284830,4	64409,7874	4275677,787	8043427,52	804342,752	8847770,28	SI
59,46	15,75	6,77	5,64	0,5533	2997,19266	130,468621	947,613314	1,47671466	0,11278821	821,776736	483254,027	3287106,94	64581,9674	4275849,967	8046210,94	804621,094	8850832,03	SI
59,46	15,83	6,73	5,61	0,5533	2997,19266	130,815534	952,659383	1,47671466	0,11278821	822,345873	483588,714	3289383,49	64753,6895	4276021,69	8048993,9	804899,39	8853893,29	SI
59,46	15,91	6,70	5,58	0,5533	2997,19266	131,16153	957,705452	1,47671466	0,11278821	822,91501	483923,401	3291660,04	64924,9575	4276192,957	8051776,4	805177,64	8856954,04	SI
59,46	16,00	6,66	5,56	0,5533	2997,19266	131,506616	962,751521	1,47671466	0,11278821	823,484147	484258,088	3293936,59	65095,7748	4276363,775	8054558,45	805455,845	8860014,3	SI
59,46	14,82	7,19	6,09	0,5533	3042,15055	126,579845	892,025798	1,4831807	0,11264642	814,481916	478964,235	3257927,66	62657,0235	4273925,023	8010816,92	801081,692	8811898,61	No
59,46	14,91	7,15	6,05	0,5533	3042,15055	126,947356	897,152622	1,4831807	0,11264642	815,059434	479303,851	3260237,74	62838,9413	4274106,941	8013648,53	801364,853	8815013,38	SI
59,46	14,99	7,11	6,02	0,5533	3042,15055	127,303866	902,198691	1,4831807	0,11264642	815,627856	479638,117	3262511,42	63015,4135	4274283,413	8016432,95	801643,295	8818076,25	SI
59,46	15,08	7,07	5,98	0,5533	3042,15055	127,65938	907,24476	1,4831807	0,11264642	816,196277	479972,383	3264785,11	63191,3929	4274459,393	8019216,89	801921,689	8821138,57	SI
59,46	15,16	7,03	5,95	0,5533	3042,15055	128,013906	912,290829	1,4831807	0,11264642	816,764699	480306,649	3267058,8	63366,8835	4274634,884	8022000,33	802200,033	8824200,36	SI
59,46	15,24	6,99	5,92	0,5533	3042,15055	128,367454	917,336899	1,4831807	0,11264642	817,333121	480640,915	3269332,48	63541,8895	4274809,89	8024783,29	802478,329	8827261,62	SI
59,46	15,33	6,95	5,89	0,5533	3042,15055	128,72003	922,382968	1,4831807	0,11264642	817,901542	480975,181	3271606,17	63716,4149	4274984,415	8027565,77	802756,577	8830322,34	SI
59,46	15,41	6,92	5,85	0,5533	3042,15055	129,071643	927,429037	1,4831807	0,11264642	818,469964	481309,447	3273879,86	63890,4635	4275158,463	8030347,77	803034,777	8833382,54	SI
59,46	15,50	6,88	5,82	0,5533	3042,15055	129,422301	932,475106	1,4831807	0,11264642	819,038386	481643,713	3276153,54	64064,0392	4275332,039	8033129,29	803312,929	8836442,22	SI
59,46	15,58	6,84	5,79	0,5533	3042,15055	129,772012	937,521175	1,4831807	0,11264642	819,606807	481977,979	3278427,23	64237,1459	4275505,146	8035910,35	803591,035	8839501,39	SI
59,46	15,66	6,81	5,76	0,5533	3042,15055	130,120783	942,567244	1,4831807	0,11264642	820,175229	482312,245	3280700,92	64409,7874	4275677,787	8038690,95	803869,095	8842560,04	SI
59,46	15,75	6,77	5,73	0,5533	3042,15055	130,468621	947,613314	1,4831807	0,11264642	820,74365	482646,511	3282974,6	64581,9674	4275849,967	8041471,08	804147,108	8845618,19	SI
59,46	15,83	6,73	5,70	0,5533	3042,15055	130,815534	952,659383	1,4831807	0,11264642	821,312072	482980,777	3285248,29	64753,6895	4276021,69	8044250,76	804425,076	8848675,83	SI
59,46	15,91	6,70	5,67	0,5533	3042,15055	131,16153	957,705452	1,4831807	0,11264642	821,880494	483315,043	3287521,97	64924,9575	4276192,957	8047029,98	804702,998	8851732,97	SI
59,46	16,00	6,66	5,64	0,5533	3042,15055	131,506616	962,751521	1,4831807	0,11264642	822,448915	483649,309	3289795,66	65095,7748	4276363,775	8049808,75	804980,875	8854789,62	SI



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
59,99	14,82	7,13	5,85	0,5556	2964,9015	127,706993	901,130599	1,47201027	0,11289164	817,282854	480611,355	3269131,42	63214,9614	4274482,961	8024225,73	802422,573	8826648,31	SI
59,99	14,91	7,09	5,82	0,5556	2964,9015	128,077687	906,308922	1,47201027	0,11289164	817,867444	480955,129	3271469,78	63398,4549	4274666,455	8027091,36	802709,136	8829800,49	SI
59,99	14,99	7,05	5,79	0,5556	2964,9015	128,437371	911,406492	1,47201027	0,11289164	818,442917	481293,542	3273771,67	63576,4984	4274844,498	8029909,71	802990,971	8832900,68	SI
59,99	15,08	7,01	5,76	0,5556	2964,9015	128,79605	916,504061	1,47201027	0,11289164	819,01839	481631,954	3276073,56	63754,0447	4275022,045	8032727,56	803272,756	8836000,31	SI
59,99	15,16	6,97	5,72	0,5556	2964,9015	129,153733	921,60163	1,47201027	0,11289164	819,593863	481970,367	3278375,45	63931,098	4275199,098	8035544,92	803554,492	8839099,41	SI
59,99	15,24	6,93	5,69	0,5556	2964,9015	129,510429	926,699199	1,47201027	0,11289164	820,169336	482308,78	3280677,34	64107,6622	4275375,662	8038361,78	803836,178	8842197,96	SI
59,99	15,33	6,89	5,66	0,5556	2964,9015	129,866144	931,796768	1,47201027	0,11289164	820,744809	482647,192	3282979,23	64283,7415	4275551,741	8041178,17	804117,817	8845295,98	SI
59,99	15,41	6,86	5,63	0,5556	2964,9015	130,220888	936,894337	1,47201027	0,11289164	821,320282	482985,605	3285281,13	64459,3398	4275727,34	8043994,07	804399,407	8848393,48	SI
59,99	15,50	6,82	5,60	0,5556	2964,9015	130,574669	941,991907	1,47201027	0,11289164	821,895755	483324,017	3287583,02	64634,461	4275902,461	8046809,5	804680,95	8851490,45	SI
59,99	15,58	6,78	5,57	0,5556	2964,9015	130,927493	947,089476	1,47201027	0,11289164	822,471228	483662,43	3289884,91	64809,1091	4276077,109	8049624,45	804962,445	8854586,89	SI
59,99	15,66	6,75	5,54	0,5556	2964,9015	131,279369	952,187045	1,47201027	0,11289164	823,0467	484000,843	3292186,8	64983,2878	4276251,288	8052438,93	805243,893	8857682,83	SI
59,99	15,75	6,71	5,51	0,5556	2964,9015	131,630305	957,284614	1,47201027	0,11289164	823,622173	484339,255	3294488,69	65157,0008	4276425,001	8055252,95	805525,295	8860778,24	SI
59,99	15,83	6,67	5,48	0,5556	2964,9015	131,980307	962,382183	1,47201027	0,11289164	824,197646	484677,668	3296790,59	65330,252	4276598,252	8058066,51	805806,651	8863873,16	SI
59,99	15,91	6,64	5,45	0,5556	2964,9015	132,329384	967,479752	1,47201027	0,11289164	824,773119	485016,081	3299092,48	65503,0449	4276771,045	8060879,6	806087,96	8866967,56	SI
59,99	16,00	6,60	5,42	0,5556	2964,9015	132,677542	972,577322	1,47201027	0,11289164	825,348592	485354,493	3301394,37	65675,3832	4276943,383	8063692,25	806369,225	8870061,47	SI
59,99	14,82	7,13	5,94	0,5556	3010,05229	127,706993	901,130599	1,47857404	0,11274739	816,238529	479997,23	3264954,12	63214,9614	4274482,961	8019434,31	801943,431	8821377,74	SI
59,99	14,91	7,09	5,91	0,5556	3010,05229	128,077687	906,308922	1,47857404	0,11274739	816,822372	480340,564	3267289,49	63398,4549	4274666,455	8022296,51	802229,651	8824526,16	SI
59,99	14,99	7,05	5,88	0,5556	3010,05229	128,437371	911,406492	1,47857404	0,11274739	817,39711	480678,544	3269588,44	63576,4984	4274844,498	8025111,48	802511,148	8827622,63	SI
59,99	15,08	7,01	5,84	0,5556	3010,05229	128,79605	916,504061	1,47857404	0,11274739	817,971847	481016,524	3271887,39	63754,0447	4275022,045	8027925,96	802792,596	8830718,55	SI
59,99	15,16	6,97	5,81	0,5556	3010,05229	129,153733	921,60163	1,47857404	0,11274739	818,546585	481354,505	3274186,34	63931,098	4275199,098	8030739,94	803073,994	8833813,94	SI
59,99	15,24	6,93	5,78	0,5556	3010,05229	129,510429	926,699199	1,47857404	0,11274739	819,121322	481692,485	3276485,29	64107,6622	4275375,662	8033553,44	803355,344	8836908,78	SI
59,99	15,33	6,89	5,75	0,5556	3010,05229	129,866144	931,796768	1,47857404	0,11274739	819,69606	482030,465	3278784,24	64283,7415	4275551,741	8036366,45	803636,645	8840003,09	SI
59,99	15,41	6,86	5,72	0,5556	3010,05229	130,220888	936,894337	1,47857404	0,11274739	820,270798	482368,445	3281083,19	64459,3398	4275727,34	8039178,98	803917,898	8843096,87	SI
59,99	15,50	6,82	5,69	0,5556	3010,05229	130,574669	941,991907	1,47857404	0,11274739	820,845535	482706,425	3283382,14	64634,461	4275902,461	8041991,03	804199,103	8846190,13	SI
59,99	15,58	6,78	5,65	0,5556	3010,05229	130,927493	947,089476	1,47857404	0,11274739	821,420273	483044,406	3285681,09	64809,1091	4276077,109	8044802,61	804480,261	8849282,87	SI
59,99	15,66	6,75	5,62	0,5556	3010,05229	131,279369	952,187045	1,47857404	0,11274739	821,995011	483382,386	3287980,04	64983,2878	4276251,288	8047613,72	804761,372	8852375,09	SI
59,99	15,75	6,71	5,59	0,5556	3010,05229	131,630305	957,284614	1,47857404	0,11274739	822,569748	483720,366	3290278,99	65157,0008	4276425,001	8050424,36	805042,436	8855466,8	SI
59,99	15,83	6,67	5,56	0,5556	3010,05229	131,980307	962,382183	1,47857404	0,11274739	823,144486	484058,346	3292577,94	65330,252	4276598,252	8053234,54	805323,454	8858558	SI
59,99	15,91	6,64	5,54	0,5556	3010,05229	132,329384	967,479752	1,47857404	0,11274739	823,719223	484396,327	3294876,89	65503,0449	4276771,045	8056044,27	805604,427	8861648,69	SI
59,99	16,00	6,60	5,51	0,5556	3010,05229	132,677542	972,577322	1,47857404	0,11274739	824,293961	484734,307	3297175,84	65675,3832	4276943,383	8058853,53	805885,353	8864738,89	SI
59,99	14,82	7,13	6,03	0,5556	3055,20307	127,706993	901,130599	1,48504008	0,11260573	815,212948	479394,126	3260851,79	63214,9614	4274482,961	8014728,88	801472,888	8816201,77	SI
59,99	14,91	7,09	6,00	0,5556	3055,20307	128,077687	906,308922	1,48504008	0,11260573	815,796056	479737,029	3263184,23	63398,4549	4274666,455	8017587,71	801758,771	8819346,48	SI
59,99	14,99	7,05	5,96	0,5556	3055,20307	128,437371	911,406492	1,48504008	0,11260573	816,370072	480074,585	3265480,29	63576,4984	4274844,498	8020399,37	802039,937	8822439,31	SI
59,99	15,08	7,01	5,93	0,5556	3055,20307	128,79605	916,504061	1,48504008	0,11260573	816,944087	480412,14	3267776,35	63754,0447	4275022,045	8023210,53	802321,053	8825531,59	SI
59,99	15,16	6,97	5,90	0,5556	3055,20307	129,153733	921,60163	1,48504008	0,11260573	817,518103	480749,696	3270072,41	63931,098	4275199,098	8026021,21	802602,121	8828623,33	SI
59,99	15,24	6,93	5,87	0,5556	3055,20307	129,510429	926,699199	1,48504008	0,11260573	818,092118	481087,251	3272368,47	64107,6622	4275375,662	8028831,39	802883,139	8831714,53	SI
59,99	15,33	6,89	5,83	0,5556	3055,20307	129,866144	931,796768	1,48504008	0,11260573	818,666134	481424,807	3274664,54	64283,7415	4275551,741	8031641,08	803164,108	8834805,19	SI
59,99	15,41	6,86	5,80	0,5556	3055,20307	130,220888	936,894337	1,48504008	0,11260573	819,240149	481762,362	3276960,6	64459,3398	4275727,34	8034450,3	803445,03	8837895,33	SI
59,99	15,50	6,82	5,77	0,5556	3055,20307	130,574669	941,991907	1,48504008	0,11260573	819,814165	482099,918	3279256,66	64634,461	4275902,461	8037259,04	803725,904	8840984,94	SI
59,99	15,58	6,78	5,74	0,5556	3055,20307	130,927493	947,089476	1,48504008	0,11260573	820,38818	482437,473	3281552,72	64809,1091	4276077,109	8040067,3	804006,73	8844074,03	SI
59,99	15,66	6,75	5,71	0,5556	3055,20307	131,279369	952,187045	1,48504008	0,11260573	820,962196	482775,029	3283848,78	64983,2878	4276251,288	8042875,1	804287,51	8847162,61	SI
59,99	15,75	6,71	5,68	0,5556	3055,20307	131,630305	957,284614	1,48504008	0,11260573	821,536211	483112,584	3286144,85	65157,0008	4276425,001	8045682,43	804568,243	8850250,67	SI
59,99	15,83	6,67	5,65	0,5556	3055,20307	131,980307	962,382183	1,48504008	0,11260573	822,110227	483450,14	3288440,91	65330,252	4276598,252	8048489,3	804848,93	8853338,23	SI
59,99	15,91	6,64	5,62	0,5556	3055,20307	132,329384	967,479752	1,48504008	0,11260573	822,684242	483787,696	3290736,97	65503,0449	4276771,045	8051295,71	805129,571	8856425,28	SI
59,99	16,00	6,60	5,59	0,5556	3055,20307	132,677542	972,577322	1,48504008	0,11260573	823,258258	484125,251	3293033,03	65675,3832	4276943,383	8054101,67	805410,167	8859511,83	SI



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
60,52	14,82	7,07	5,80	0,5580	2977,40164	128,83414	910,2354	1,47383742	0,11285144	818,019309	481044,435	3272077,23	63772,8993	4275040,899	8028162,57	802816,257	8830978,83	No
60,52	14,91	7,02	5,77	0,5580	2977,40164	129,208017	915,465223	1,47383742	0,11285144	818,609502	481391,504	3274438,01	63957,9686	4275225,969	8031055,48	803105,548	8834161,03	No
60,52	14,99	6,99	5,74	0,5580	2977,40164	129,570876	920,614292	1,47383742	0,11285144	819,190582	481733,213	3276762,33	64137,5834	4275405,583	8033901,12	803390,112	8837291,24	No
60,52	15,08	6,95	5,71	0,5580	2977,40164	129,93272	925,763361	1,47383742	0,11285144	819,771662	482074,923	3279086,65	64316,6966	4275584,697	8036746,27	803674,627	8840420,89	No
60,52	15,16	6,91	5,67	0,5580	2977,40164	130,29356	930,912431	1,47383742	0,11285144	820,352741	482416,633	3281410,97	64495,3124	4275763,312	8039590,91	803959,091	8843550	No
60,52	15,24	6,87	5,64	0,5580	2977,40164	130,653404	936,0615	1,47383742	0,11285144	820,933821	482758,343	3283735,29	64673,4349	4275941,435	8042435,06	804243,506	8846678,57	No
60,52	15,33	6,83	5,61	0,5580	2977,40164	131,012259	941,210569	1,47383742	0,11285144	821,514901	483100,053	3286059,6	64851,0681	4276119,068	8045278,73	804527,873	8849806,6	No
60,52	15,41	6,80	5,58	0,5580	2977,40164	131,370134	946,359638	1,47383742	0,11285144	822,095981	483441,763	3288383,92	65028,2161	4276296,216	8048121,9	804812,19	8852934,09	No
60,52	15,50	6,76	5,55	0,5580	2977,40164	131,727036	951,508707	1,47383742	0,11285144	822,677061	483783,472	3290708,24	65204,8829	4276472,883	8050964,6	805096,46	8856061,06	No
60,52	15,58	6,72	5,52	0,5580	2977,40164	132,082974	956,657776	1,47383742	0,11285144	823,258141	484125,182	3293032,56	65381,0723	4276649,072	8053806,82	805380,682	8859187,5	No
60,52	15,66	6,69	5,49	0,5580	2977,40164	132,437956	961,806845	1,47383742	0,11285144	823,839221	484466,892	3295356,88	65556,7881	4276824,788	8056648,56	805664,856	8862313,42	No
60,52	15,75	6,65	5,46	0,5580	2977,40164	132,791988	966,955914	1,47383742	0,11285144	824,420301	484808,602	3297681,2	65732,0343	4277000,034	8059489,84	805948,984	8865438,82	No
60,52	15,83	6,62	5,43	0,5580	2977,40164	133,14508	972,104983	1,47383742	0,11285144	825,001381	485150,312	3300005,52	65906,8144	4277174,814	8062330,65	806233,065	8868563,71	No
60,52	15,91	6,58	5,40	0,5580	2977,40164	133,497237	977,254053	1,47383742	0,11285144	825,58246	485492,022	3302329,84	66081,1323	4277349,132	8065171	806517,1	8871688,1	No
60,52	16,00	6,55	5,38	0,5580	2977,40164	133,848468	982,403122	1,47383742	0,11285144	826,16354	485833,732	3304654,16	66254,9915	4277522,992	8068010,88	806801,088	8874811,97	No
60,52	14,82	7,07	5,89	0,5580	3022,74278	128,83414	910,2354	1,48040119	0,11270732	816,97458	480430,071	3267898,32	63772,8993	4275040,899	8023369,29	802336,929	8825706,22	No
60,52	14,91	7,02	5,86	0,5580	3022,74278	129,208017	915,465223	1,48040119	0,11270732	817,564019	480776,697	3270256,08	63957,9686	4275225,969	8026258,74	802625,874	8828884,62	No
60,52	14,99	6,99	5,82	0,5580	3022,74278	129,570876	920,614292	1,48040119	0,11270732	818,144357	481117,971	3272577,43	64137,5834	4275405,583	8029100,98	802910,098	8832011,08	No
60,52	15,08	6,95	5,79	0,5580	3022,74278	129,93272	925,763361	1,48040119	0,11270732	818,724695	481459,244	3274898,78	64316,6966	4275584,697	8031942,72	803194,272	8835136,99	No
60,52	15,16	6,91	5,76	0,5580	3022,74278	130,29356	930,912431	1,48040119	0,11270732	819,305032	481800,517	3277220,13	64495,3124	4275763,312	8034783,96	803478,396	8838262,36	No
60,52	15,24	6,87	5,73	0,5580	3022,74278	130,653404	936,0615	1,48040119	0,11270732	819,88537	482141,791	3279541,48	64673,4349	4275941,435	8037624,71	803762,471	8841387,18	No
60,52	15,33	6,83	5,70	0,5580	3022,74278	131,012259	941,210569	1,48040119	0,11270732	820,465708	482483,064	3281862,83	64851,0681	4276119,068	8040464,96	804046,496	8844511,46	No
60,52	15,41	6,80	5,67	0,5580	3022,74278	131,370134	946,359638	1,48040119	0,11270732	821,046046	482824,338	3284184,18	65028,2161	4276296,216	8043304,74	804330,474	8847635,21	No
60,52	15,50	6,76	5,64	0,5580	3022,74278	131,727036	951,508707	1,48040119	0,11270732	821,626383	483165,611	3286505,53	65204,8829	4276472,883	8046144,03	804614,403	8850758,43	No
60,52	15,58	6,72	5,61	0,5580	3022,74278	132,082974	956,657776	1,48040119	0,11270732	822,206721	483506,884	3288826,88	65381,0723	4276649,072	8048982,84	804898,284	8853881,13	No
60,52	15,66	6,69	5,58	0,5580	3022,74278	132,437956	961,806845	1,48040119	0,11270732	822,787059	483848,158	3291148,24	65556,7881	4276824,788	8051821,18	805182,118	8857003,3	No
60,52	15,75	6,65	5,55	0,5580	3022,74278	132,791988	966,955914	1,48040119	0,11270732	823,367397	484189,431	3293469,59	65732,0343	4277000,034	8054659,05	805465,905	8860124,96	No
60,52	15,83	6,62	5,52	0,5580	3022,74278	133,14508	972,104983	1,48040119	0,11270732	823,947734	484530,705	3295790,94	65906,8144	4277174,814	8057496,46	805749,646	8863246,1	No
60,52	15,91	6,58	5,49	0,5580	3022,74278	133,497237	977,254053	1,48040119	0,11270732	824,528072	484871,978	3298112,29	66081,1323	4277349,132	8060333,4	806033,34	8866366,74	No
60,52	16,00	6,55	5,46	0,5580	3022,74278	133,848468	982,403122	1,48040119	0,11270732	825,10841	485213,252	3300433,64	66254,9915	4277522,992	8063169,88	806316,988	8869486,87	No
60,52	14,82	7,07	5,98	0,5580	3068,08392	128,83414	910,2354	1,48686724	0,11256578	815,948607	479826,738	3263794,43	63772,8993	4275040,899	8018662,07	801866,207	8820528,27	No
60,52	14,91	7,02	5,95	0,5580	3068,08392	129,208017	915,465223	1,48686724	0,11256578	816,537306	480172,928	3266149,22	63957,9686	4275225,969	8021548,12	802154,812	8823702,93	No
60,52	14,99	6,99	5,91	0,5580	3068,08392	129,570876	920,614292	1,48686724	0,11256578	817,116915	480513,773	3268467,66	64137,5834	4275405,583	8024387,02	802438,702	8826825,72	No
60,52	15,08	6,95	5,88	0,5580	3068,08392	129,93272	925,763361	1,48686724	0,11256578	817,696524	480854,618	3270786,1	64316,6966	4275584,697	8027225,41	802722,541	8829947,95	No
60,52	15,16	6,91	5,85	0,5580	3068,08392	130,29356	930,912431	1,48686724	0,11256578	818,276133	481195,463	3273104,53	64495,3124	4275763,312	8030063,31	803006,331	8833069,64	No
60,52	15,24	6,87	5,81	0,5580	3068,08392	130,653404	936,0615	1,48686724	0,11256578	818,855742	481536,308	3275422,97	64673,4349	4275941,435	8032900,71	803290,071	8836190,78	No
60,52	15,33	6,83	5,78	0,5580	3068,08392	131,012259	941,210569	1,48686724	0,11256578	819,435351	481877,153	3277741,4	64851,0681	4276119,068	8035737,62	803573,762	8839311,39	No
60,52	15,41	6,80	5,75	0,5580	3068,08392	131,370134	946,359638	1,48686724	0,11256578	820,01496	482217,997	3280059,84	65028,2161	4276296,216	8038574,05	803857,405	8842431,46	No
60,52	15,50	6,76	5,72	0,5580	3068,08392	131,727036	951,508707	1,48686724	0,11256578	820,594569	482558,842	3282378,28	65204,8829	4276472,883	8041410	804141	8845551	No
60,52	15,58	6,72	5,69	0,5580	3068,08392	132,082974	956,657776	1,48686724	0,11256578	821,174178	482899,687	3284696,71	65381,0723	4276649,072	8044245,47	804424,547	8848670,02	No
60,52	15,66	6,69	5,66	0,5580	3068,08392	132,437956	961,806845	1,48686724	0,11256578	821,753787	483240,532	3287015,15	65556,7881	4276824,788	8047080,47	804708,047	8851788,51	No
60,52	15,75	6,65	5,63	0,5580	3068,08392	132,791988	966,955914	1,48686724	0,11256578	822,333396	483581,377	3289333,58	65732,0343	4277000,034	8049914,99	804991,499	8854906,49	No
60,52	15,83	6,62	5,60	0,5580	3068,08392	133,14508	972,104983	1,48686724	0,11256578	822,913005	483922,222	3291652,02	65906,8144	4277174,814	8052749,06	805274,906	8858023,96	No
60,52	15,91	6,58	5,57	0,5580	3068,08392	133,497237	977,254053	1,48686724	0,11256578	823,492614	484263,066	3293970,45	66081,1323	4277349,132	8055582,65	805558,265	8861140,92	No
60,52	16,00	6,55	5,54	0,5580	3068,08392	133,848468	982,403122	1,48686724	0,11256578	824,072223	484603,911	3296288,89	66254,9915	4277522,992	8058415,79	805841,579	8864257,37	No



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
61,05	14,82	7,00	5,75	0,5603	2989,7388	129,961287	919,340201	1,47563325	0,11281197	818,76028	481480,17	3275041,12	64330,8373	4275598,837	8032120,13	803212,013	8835332,14	No
61,05	14,91	6,96	5,72	0,5603	2989,7388	130,338348	924,621524	1,47563325	0,11281197	819,356077	481830,534	3277424,31	64517,4822	4275785,482	8035040,32	803504,032	8838544,36	No
61,05	14,99	6,92	5,69	0,5603	2989,7388	130,70438	929,822093	1,47563325	0,11281197	819,942763	482175,541	3279771,05	64698,6683	4275966,668	8037913,26	803791,326	8841704,59	No
61,05	15,08	6,89	5,66	0,5603	2989,7388	131,069391	935,022662	1,47563325	0,11281197	820,52945	482520,548	3282117,8	64879,3485	4276147,348	8040785,69	804078,569	8844864,26	No
61,05	15,16	6,85	5,62	0,5603	2989,7388	131,433387	940,223231	1,47563325	0,11281197	821,116136	482865,555	3284464,54	65059,5268	4276327,527	8043657,63	804365,763	8848023,39	No
61,05	15,24	6,81	5,59	0,5603	2989,7388	131,796379	945,4238	1,47563325	0,11281197	821,702822	483210,562	3286811,29	65239,2075	4276507,208	8046529,06	804652,906	8851181,96	No
61,05	15,33	6,77	5,56	0,5603	2989,7388	132,158373	950,624369	1,47563325	0,11281197	822,289509	483555,569	3289158,04	65418,3947	4276686,395	8049400	804940	8854340	No
61,05	15,41	6,74	5,53	0,5603	2989,7388	132,519379	955,824938	1,47563325	0,11281197	822,876195	483900,575	3291504,78	65597,0925	4276865,092	8052270,45	805227,045	8857497,49	No
61,05	15,50	6,70	5,50	0,5603	2989,7388	132,879404	961,025507	1,47563325	0,11281197	823,462882	484245,582	3293851,53	65775,3047	4277043,305	8055140,41	805514,041	8860654,46	No
61,05	15,58	6,66	5,47	0,5603	2989,7388	133,238455	966,226077	1,47563325	0,11281197	824,049568	484590,589	3296198,27	65953,0354	4277221,035	8058009,9	805800,99	8863810,89	No
61,05	15,66	6,63	5,44	0,5603	2989,7388	133,596542	971,426646	1,47563325	0,11281197	824,636255	484935,596	3298545,02	66130,2885	4277398,288	8060878,9	806087,89	8866966,79	No
61,05	15,75	6,59	5,41	0,5603	2989,7388	133,953672	976,627215	1,47563325	0,11281197	825,222941	485280,603	3300891,76	66307,0677	4277575,068	8063747,43	806374,743	8870122,18	No
61,05	15,83	6,56	5,39	0,5603	2989,7388	134,309852	981,827784	1,47563325	0,11281197	825,809627	485625,609	3303238,51	66483,3769	4277751,377	8066615,5	806661,55	8873277,05	No
61,05	15,91	6,52	5,36	0,5603	2989,7388	134,66509	987,028353	1,47563325	0,11281197	826,396314	485970,616	3305585,26	66659,2197	4277927,22	8069483,09	806948,309	8876431,4	No
61,05	16,00	6,49	5,33	0,5603	2989,7388	135,019394	992,228922	1,47563325	0,11281197	826,983	486315,623	3307932	66834,5999	4278102,6	8072350,22	807235,022	8879585,25	No
61,05	14,82	7,00	5,84	0,5603	3035,26782	129,961287	919,340201	1,48219702	0,11266796	817,715135	480865,562	3270860,54	64330,8373	4275598,837	8027324,94	802732,494	8830057,43	No
61,05	14,91	6,96	5,81	0,5603	3035,26782	130,338348	924,621524	1,48219702	0,11266796	818,310171	481215,479	3273240,68	64517,4822	4275785,482	8030241,64	803024,164	8833265,81	No
61,05	14,99	6,92	5,77	0,5603	3035,26782	130,70438	929,822093	1,48219702	0,11266796	818,896108	481560,045	3275584,43	64698,6683	4275966,668	8033111,15	803311,115	8836422,26	No
61,05	15,08	6,89	5,74	0,5603	3035,26782	131,069391	935,022662	1,48219702	0,11266796	819,482046	481904,612	3277928,18	64879,3485	4276147,348	8035980,14	803598,014	8839578,16	No
61,05	15,16	6,85	5,71	0,5603	3035,26782	131,433387	940,223231	1,48219702	0,11266796	820,067983	482249,178	3280271,93	65059,5268	4276327,527	8038848,64	803884,864	8842733,5	No
61,05	15,24	6,81	5,68	0,5603	3035,26782	131,796379	945,4238	1,48219702	0,11266796	820,653921	482593,745	3282615,68	65239,2075	4276507,208	8041716,64	804171,664	8845888,3	No
61,05	15,33	6,77	5,65	0,5603	3035,26782	132,158373	950,624369	1,48219702	0,11266796	821,239858	482938,311	3284959,43	65418,3947	4276686,395	8044584,14	804458,414	8849042,55	No
61,05	15,41	6,74	5,62	0,5603	3035,26782	132,519379	955,824938	1,48219702	0,11266796	821,825796	483282,878	3287303,18	65597,0925	4276865,092	8047451,15	804745,115	8852196,27	No
61,05	15,50	6,70	5,59	0,5603	3035,26782	132,879404	961,025507	1,48219702	0,11266796	822,411733	483627,444	3289646,93	65775,3047	4277043,305	8050317,68	805031,768	8855349,45	No
61,05	15,58	6,66	5,56	0,5603	3035,26782	133,238455	966,226077	1,48219702	0,11266796	822,997671	483972,01	3291990,68	65953,0354	4277221,035	8053183,73	805318,373	8858502,1	No
61,05	15,66	6,63	5,53	0,5603	3035,26782	133,596542	971,426646	1,48219702	0,11266796	823,583608	484316,577	3294334,43	66130,2885	4277398,288	8056049,3	805604,93	8861654,23	No
61,05	15,75	6,59	5,50	0,5603	3035,26782	133,953672	976,627215	1,48219702	0,11266796	824,169546	484661,143	3296678,18	66307,0677	4277575,068	8058914,39	805891,439	8864805,83	No
61,05	15,83	6,56	5,47	0,5603	3035,26782	134,309852	981,827784	1,48219702	0,11266796	824,755483	485005,71	3299021,93	66483,3769	4277751,377	8061779,02	806177,902	8867956,92	No
61,05	15,91	6,52	5,44	0,5603	3035,26782	134,66509	987,028353	1,48219702	0,11266796	825,341421	485350,276	3301365,68	66659,2197	4277927,22	8064643,18	806464,318	8871107,5	No
61,05	16,00	6,49	5,41	0,5603	3035,26782	135,019394	992,228922	1,48219702	0,11266796	825,927359	485694,842	3303709,43	66834,5999	4278102,6	8067506,88	806750,688	8874257,56	No
61,05	14,82	7,00	5,93	0,5603	3080,79684	129,961287	919,340201	1,48866306	0,11252654	816,688759	480261,992	3266755,04	64330,8373	4275598,837	8022615,87	802261,587	8824877,45	No
61,05	14,91	6,96	5,89	0,5603	3080,79684	130,338348	924,621524	1,48866306	0,11252654	817,283048	480611,469	3269132,19	64517,4822	4275785,482	8025529,14	802552,914	8828082,06	No
61,05	14,99	6,92	5,86	0,5603	3080,79684	130,70438	929,822093	1,48866306	0,11252654	817,86825	480955,603	3271473	64698,6683	4275966,668	8028395,27	802839,527	8831234,8	No
61,05	15,08	6,89	5,83	0,5603	3080,79684	131,069391	935,022662	1,48866306	0,11252654	818,453452	481299,737	3273813,81	64879,3485	4276147,348	8031260,89	803126,089	8834386,98	No
61,05	15,16	6,85	5,80	0,5603	3080,79684	131,433387	940,223231	1,48866306	0,11252654	819,038654	481643,871	3276154,62	65059,5268	4276327,527	8034126,01	803412,601	8837538,62	No
61,05	15,24	6,81	5,76	0,5603	3080,79684	131,796379	945,4238	1,48866306	0,11252654	819,623856	481988,005	3278495,43	65239,2075	4276507,208	8036990,64	803699,064	8840689,7	No
61,05	15,33	6,77	5,73	0,5603	3080,79684	132,158373	950,624369	1,48866306	0,11252654	820,209058	482332,139	3280836,23	65418,3947	4276686,395	8039854,77	803985,477	8843840,24	No
61,05	15,41	6,74	5,70	0,5603	3080,79684	132,519379	955,824938	1,48866306	0,11252654	820,79426	482676,273	3283177,04	65597,0925	4276865,092	8042718,41	804271,841	8846990,25	No
61,05	15,50	6,70	5,67	0,5603	3080,79684	132,879404	961,025507	1,48866306	0,11252654	821,379463	483020,407	3285517,85	65775,3047	4277043,305	8045581,56	804558,156	8850139,72	No
61,05	15,58	6,66	5,64	0,5603	3080,79684	133,238455	966,226077	1,48866306	0,11252654	821,964665	483364,541	3287858,66	65953,0354	4277221,035	8048444,23	804844,423	8853288,66	No
61,05	15,66	6,63	5,61	0,5603	3080,79684	133,596542	971,426646	1,48866306	0,11252654	822,549867	483708,675	3290199,47	66130,2885	4277398,288	8051306,43	805130,643	8856437,07	No
61,05	15,75	6,59	5,58	0,5603	3080,79684	133,953672	976,627215	1,48866306	0,11252654	823,135069	484052,809	3292540,27	66307,0677	4277575,068	8054168,15	805416,815	8859584,97	No
61,05	15,83	6,56	5,55	0,5603	3080,79684	134,309852	981,827784	1,48866306	0,11252654	823,720271	484396,942	3294881,08	66483,3769	4277751,377	8057029,4	805702,94	8862732,34	No
61,05	15,91	6,52	5,52	0,5603	3080,79684	134,66509	987,028353	1,48866306	0,11252654	824,305473	484741,076	3297221,89	66659,2197	4277927,22	8059890,19	805989,019	8865879,21	No
61,05	16,00	6,49	5,49	0,5603	3080,79684	135,019394	992,228922	1,48866306	0,11252654	824,890675	485085,21	3299562,7	66834,5999	4278102,6	8062750,51	806275,051	8869025,56	No



Lpp	B	D	T	CB	Δ	PEr	λ	u	Cs	PS	CMg	CMo	CEr	CE	CC1	Cva	CC	Cumple
61,58	14,82	6,94	5,70	0,5626	3001,9165	131,088435	928,445001	1,47739861	0,11277319	819,505638	481918,486	3278022,55	64888,7752	4276156,775	8036097,81	803609,781	8839707,6	No
61,58	14,91	6,90	5,67	0,5626	3001,9165	131,468679	933,777825	1,47739861	0,11277319	820,107038	482272,145	3280428,15	65076,9959	4276344,996	8039045,29	803904,529	8842949,82	No
61,58	14,99	6,87	5,64	0,5626	3001,9165	131,837885	939,029894	1,47739861	0,11277319	820,699331	482620,448	3282797,32	65259,7533	4276527,753	8041945,52	804194,552	8846140,08	No
61,58	15,08	6,83	5,61	0,5626	3001,9165	132,206061	944,281963	1,47739861	0,11277319	821,291623	482968,752	3285166,49	65442,0003	4276710	8044845,24	804484,524	8849329,77	No
61,58	15,16	6,79	5,58	0,5626	3001,9165	132,573215	949,534032	1,47739861	0,11277319	821,883916	483317,055	3287535,66	65623,7412	4276891,741	8047744,46	804774,446	8852518,91	No
61,58	15,24	6,75	5,55	0,5626	3001,9165	132,939354	954,786101	1,47739861	0,11277319	822,476208	483665,359	3289904,83	65804,9802	4277072,98	8050643,17	805064,317	8855707,49	No
61,58	15,33	6,72	5,52	0,5626	3001,9165	133,304488	960,03817	1,47739861	0,11277319	823,068501	484013,663	3292274	65985,7214	4277253,721	8053541,39	805354,139	8858895,53	No
61,58	15,41	6,68	5,49	0,5626	3001,9165	133,668624	965,290239	1,47739861	0,11277319	823,660793	484361,966	3294643,17	66165,9688	4277433,969	8056439,11	805643,911	8862083,02	No
61,58	15,50	6,64	5,46	0,5626	3001,9165	134,031771	970,542308	1,47739861	0,11277319	824,253086	484710,27	3297012,34	66345,7266	4277613,727	8059336,34	805933,634	8865269,97	No
61,58	15,58	6,61	5,43	0,5626	3001,9165	134,393937	975,794377	1,47739861	0,11277319	824,845379	485058,573	3299381,51	66524,9986	4277792,999	8062233,09	806223,309	8868456,4	No
61,58	15,66	6,57	5,40	0,5626	3001,9165	134,755129	981,046446	1,47739861	0,11277319	825,437671	485406,877	3301750,68	66703,7889	4277971,789	8065129,35	806512,935	8871642,29	No
61,58	15,75	6,54	5,37	0,5626	3001,9165	135,115356	986,298515	1,47739861	0,11277319	826,029964	485755,181	3304119,86	66882,1011	4278150,101	8068025,14	806802,514	8874827,65	No
61,58	15,83	6,50	5,34	0,5626	3001,9165	135,474625	991,550584	1,47739861	0,11277319	826,622256	486103,484	3306489,03	67059,9393	4278327,939	8070920,45	807092,045	8878012,49	No
61,58	15,91	6,47	5,31	0,5626	3001,9165	135,832944	996,802653	1,47739861	0,11277319	827,214549	486451,788	3308858,2	67237,3071	4278505,307	8073815,29	807381,529	8881196,82	No
61,58	16,00	6,43	5,28	0,5626	3001,9165	136,19032	1002,05472	1,47739861	0,11277319	827,806842	486800,091	3311227,37	67414,2082	4278682,208	8076709,67	807670,967	8884380,63	No
61,58	14,82	6,94	5,79	0,5626	3047,63096	131,088435	928,445001	1,48396238	0,11262931	818,460064	481303,625	3273840,26	64888,7752	4276156,775	8031300,66	803130,066	8834430,72	No
61,58	14,91	6,90	5,76	0,5626	3047,63096	131,468679	933,777825	1,48396238	0,11262931	819,060697	481656,833	3276242,79	65076,9959	4276344,996	8034244,62	803424,462	8837669,08	No
61,58	14,99	6,87	5,72	0,5626	3047,63096	131,837885	939,029894	1,48396238	0,11262931	819,652234	482004,692	3278608,93	65259,7533	4276527,753	8037141,38	803714,138	8840855,52	No
61,58	15,08	6,83	5,69	0,5626	3047,63096	132,206061	944,281963	1,48396238	0,11262931	820,24377	482352,552	3280975,08	65442,0003	4276710	8040037,63	804003,763	8844041,4	No
61,58	15,16	6,79	5,66	0,5626	3047,63096	132,573215	949,534032	1,48396238	0,11262931	820,835307	482700,411	3283341,23	65623,7412	4276891,741	8042933,38	804293,338	8847226,72	No
61,58	15,24	6,75	5,63	0,5626	3047,63096	132,939354	954,786101	1,48396238	0,11262931	821,426844	483048,27	3285707,38	65804,9802	4277072,98	8045828,63	804582,863	8850411,49	No
61,58	15,33	6,72	5,60	0,5626	3047,63096	133,304488	960,03817	1,48396238	0,11262931	822,018381	483396,129	3288073,52	65985,7214	4277253,721	8048723,38	804872,338	8853595,71	No
61,58	15,41	6,68	5,57	0,5626	3047,63096	133,668624	965,290239	1,48396238	0,11262931	822,609918	483743,988	3290439,67	66165,9688	4277433,969	8051617,63	805161,763	8856779,39	No
61,58	15,50	6,64	5,54	0,5626	3047,63096	134,031771	970,542308	1,48396238	0,11262931	823,201455	484091,848	3292805,82	66345,7266	4277613,727	8054511,39	805451,139	8859962,53	No
61,58	15,58	6,61	5,51	0,5626	3047,63096	134,393937	975,794377	1,48396238	0,11262931	823,792992	484439,707	3295171,97	66524,9986	4277792,999	8057404,67	805740,467	8863145,14	No
61,58	15,66	6,57	5,48	0,5626	3047,63096	134,755129	981,046446	1,48396238	0,11262931	824,384529	484787,566	3297538,12	66703,7889	4277971,789	8060297,47	806029,747	8866327,22	No
61,58	15,75	6,54	5,45	0,5626	3047,63096	135,115356	986,298515	1,48396238	0,11262931	824,976066	485135,425	3299904,26	66882,1011	4278150,101	8063189,79	806318,979	8869508,77	No
61,58	15,83	6,50	5,42	0,5626	3047,63096	135,474625	991,550584	1,48396238	0,11262931	825,567603	485483,284	3302270,41	67059,9393	4278327,939	8066081,63	806608,163	8872689,8	No
61,58	15,91	6,47	5,39	0,5626	3047,63096	135,832944	996,802653	1,48396238	0,11262931	826,159139	485831,144	3304636,56	67237,3071	4278505,307	8068973,01	806897,301	8875870,31	No
61,58	16,00	6,43	5,36	0,5626	3047,63096	136,19032	1002,05472	1,48396238	0,11262931	826,750676	486179,003	3307002,71	67414,2082	4278682,208	8071863,92	807186,392	8879050,31	No
61,58	14,82	6,94	5,88	0,5626	3093,34543	131,088435	928,445001	1,49042842	0,11248801	817,433274	480699,811	3269733,09	64888,7752	4276156,775	8026589,68	802658,968	8829248,65	No
61,58	14,91	6,90	5,84	0,5626	3093,34543	131,468679	933,777825	1,49042842	0,11248801	818,033152	481052,575	3272132,61	65076,9959	4276344,996	8029530,18	802953,018	8832483,2	No
61,58	14,99	6,87	5,81	0,5626	3093,34543	131,837885	939,029894	1,49042842	0,11248801	818,623947	481399,998	3274495,79	65259,7533	4276527,753	8032423,54	803242,354	8835665,89	No
61,58	15,08	6,83	5,78	0,5626	3093,34543	132,206061	944,281963	1,49042842	0,11248801	819,214742	481747,421	3276858,97	65442,0003	4276710	8035316,39	803531,639	8838848,03	No
61,58	15,16	6,79	5,75	0,5626	3093,34543	132,573215	949,534032	1,49042842	0,11248801	819,805537	482094,844	3279222,15	65623,7412	4276891,741	8038208,73	803820,873	8842029,6	No
61,58	15,24	6,75	5,71	0,5626	3093,34543	132,939354	954,786101	1,49042842	0,11248801	820,396331	482442,267	3281585,33	65804,9802	4277072,98	8041100,57	804110,057	8845210,63	No
61,58	15,33	6,72	5,68	0,5626	3093,34543	133,304488	960,03817	1,49042842	0,11248801	820,987126	482789,689	3283948,5	65985,7214	4277253,721	8043991,92	804399,192	8848391,11	No
61,58	15,41	6,68	5,65	0,5626	3093,34543	133,668624	965,290239	1,49042842	0,11248801	821,577921	483137,112	3286311,68	66165,9688	4277433,969	8046882,77	804688,277	8851571,04	No
61,58	15,50	6,64	5,62	0,5626	3093,34543	134,031771	970,542308	1,49042842	0,11248801	822,168716	483484,535	3288674,86	66345,7266	4277613,727	8049773,12	804977,312	8854750,44	No
61,58	15,58	6,61	5,59	0,5626	3093,34543	134,393937	975,794377	1,49042842	0,11248801	822,759511	483831,958	3291038,04	66524,9986	4277792,999	8052663	805266,3	8857929,3	No
61,58	15,66	6,57	5,56	0,5626	3093,34543	134,755129	981,046446	1,49042842	0,11248801	823,350305	484179,381	3293401,22	66703,7889	4277971,789	8055552,39	805555,239	8861107,63	No
61,58	15,75	6,54	5,53	0,5626	3093,34543	135,115356	986,298515	1,49042842	0,11248801	823,9411	484526,803	3295764,4	66882,1011	4278150,101	8058441,31	805844,131	8864285,44	No
61,58	15,83	6,50	5,50	0,5626	3093,34543	135,474625	991,550584	1,49042842	0,11248801	824,531895	484874,226	3298127,58	67059,9393	4278327,939	8061329,75	806132,975	8867462,72	No
61,58	15,91	6,47	5,47	0,5626	3093,34543	135,832944	996,802653	1,49042842	0,11248801	825,12269	485221,649	3300490,76	67237,3071	4278505,307	8064217,72	806421,772	8870639,49	No
61,58	16,00	6,43	5,44	0,5626	3093,34543	136,19032	1002,05472	1,49042842	0,11248801	825,713485	485569,072	3302853,94	67414,2082	4278682,208	8067105,22	806710,522	8873815,74	No



ANEXO II
FICHAS DE LOS BUQUES



ULSTEIN®

T U R N I N G V I S I O N S I N T O R E A L I T Y



M/V "BOURBON ORCA"

Anchor Handling Tug Supply Vessel with ULSTEIN X-BOW®

ULSTEIN AX104

Hull no. 273

Designed by Ulstein Design AS

Delivered 2006 by Ulstein Verft AS

Built for Bourbon Offshore Norway

M/V "BOURBON ORCA" is an Anchor Handling Tug Supply Vessel with **ULSTEIN X-BOW®** designed by Ulstein Design AS. The vessel is built to serve the oil exploration and oil production industry world wide. The vessel is equipped with a diesel electric power plant, large azimuth main thrusters, high capacity AHT winches and safe anchor handling equipment, ensuring the vessel to obtain the best operating characteristics in both sailing, anchor handling and DP/manoeuvring modes.

BOURBON ORCA – ULSTEIN X-BOW® hull design advantages as compared to conventional foreship with flare:

- Higher transit speed in calm water due to low angles of entry and increased waterline length

- No bow flare, eliminating bow impact and / or slamming in foreship
- Reduced noise and vibration levels in foreship due to soft entries in waves
- Less spray due to water not being thrown forward
- Negligible occurrences of green water on bridge deck
- Working deck and deck equipment better protected due to hull extended to full beam in accommodation area
- Higher transit speed in head sea, giving reduced power consumption and / or higher fuel efficiency both in waves and in still water
- Lower pitch and heave accelerations due to foreship volume distribution and slender hull lines

BOURBON ORCA is designed and arranged for heavy duty offshore operations like:

- Handling of anchors and rig mooring lines in deep water
- Anchor handling and towing winches with large capacity, especially for dynamic braking
- ODIM Safe Anchor Handling System (SAHS) for work deck
- Four off large capacity rig chain lockers

M/V "BOURBON ORCA" is built, equipped, and painted (tanks and exterior) in drydock inside covered dockhall, thus ensuring controllable atmosphere and the best quality of work.



BOURBON

Shipbuilding by Ulstein Verft AS: Ulstein builds sophisticated vessels with a strong focus on innovative technological solutions and methods



MAIN DIMENSIONS

Length over all	approx. 86,2	m
Length between p.p.	77,0	m
Breadth moulded	18,5	m
Depth to main deck	8,5	m
Draught max	7,0	m
Design draught	6,0	m

CAPACITIES

Fuel oil (MDO)	1486	m ³
Fresh water	503	m ³
Ballast water	2482	m ³
Brine	558	m ³
Liquid mud, 4 tanks, 2,5 t/m ³	530	m ³
Slop	167	m ³
Base oil	447	m ³
Dry bulk tanks (4 off)	254	m ³
Rig chain lockers (4 off)	626	m ³
Cargo deck area (35,0 m x 15,4 m)	540	m ²
Cargo deck aft of fr. 48	10	t/m ²
Deck load (VCG 1,0 m above main deck)	1200	ton
Deadweight at max draught 7,0 m	3180	ton
Gross tonnage, international	4089	GRT
Net tonnage, international	1226	NRT

CLASSIFICATION / FLAG

DnV ✱1A1, Supply Vessel SF, Tug, E0, DynPos AUTR, CLEAN, COMF-V(3), DK(+), HL(+), NAUT-OSV (LOC).
Flag: NOR. NLS Certificate

PERFORMANCE

Max speed (at d=6.0m)	approx. 17.1	knots
Bollard pull	approx. 183	tonnes

ACCOMMODATION

Hotel compliment of high standards and with capacity for 35 persons.

- Two one-bed state cabins with day-room and bedroom
- Three one-bed state cabins
- Nine one-bed cabins
- Ten two-bed cabins
- Sick bay (on main deck)
- Day room on C-deck
- Galley, mess / cafeteria, and day room on A-deck
- Lobby, laundry, conference room, office, and trim room on main deck
- Dry provisions, cooler, and freezer rooms adjacent to galley
- Low noise and vibration levels
- The wheelhouse has excellent visibility in all directions
- Direct view of cargo deck area from day room
- Arrangements acc. to ISPS code

TECHNICAL DATA

Deck Cranes

- One knuckle boom crane, 10 t - 16 m
- Two deck cranes travelling on cargo rail, 3 t - 10 m

Dry bulk plant

- Four tanks, each of 63.5 m³
- Duplex BHS compressor, 2 x 30 m³/min, 6 bar
- Two dust cyclones with receivers for vent lines
- Two segregated discharge systems

Liquid Cargo Discharge Systems

- One fresh water pump, 150 m³/h – 9 bar, centrifugal
- One brine pump, 75 – 24, screw spindle
- Two ballast / DW pump, 250 – 9, screw spindle
- One fuel oil pumps, 250 – 9, screw spindle
- One base oil pump, 100 – 9, centrifugal
- Two mud pumps, 75 – 24, eccentric screw
- One slop pump, 50 – 5, centrifugal
- All pumps are electric driven with freq. control
- Four agitators, el. driven, for mud and slop tanks
- Tank cleaning system for mud, brine, and slop tanks
- Flowmeter for FO

Side Thrusters forward

- One tunnel thruster, 1200 kW, cpp, frequency controlled
- Retractable steerable thruster, 1800 kW, cpp, freq. contr.

Manoeuvring/Positioning

- Joystick
- Dynamic Positioning System dual redundant (IMO Class II) with: Position reference systems: DPS 700, laser reference system. Hydro acoustic reference unit

Navigation / Communication

- S-band ARPA radar and X-band ARPA radar
- Digital chart system ECDIS (duplo)
- Conning station, VDR, AIS
- Radio installation according to GMDSS – area A3

Internal Communication

- ULSTEIN COM automatic telephone, data network, and satellite TV antenna signal to all offices and cabins
- TV satellite antenna

Deck Winches

- One combined windlass / mooring winch
- Two tugger winches, pull 20 t, remote control.
- Two capstans aft, pull 15 t, remote control.
- Two towing / working drums
Capacity: 2500 m of 77 mm dia. wire
Brake holding load: 500 tonnes on 1st layer
Duty in hoist: 400 T at 0 – 18,7 m/min. on 1st layer
Duty dynamic braking: 90-480 T at 0-88 m/min.
- Two spooling devices for the towing/working drums, side load 40 tonnes
- One anchor handling drum with dividing flange socket part
Capacity: 5000 m of 77 mm dia. wire
Duty in hoist: 400 T at 0 – 18,7 m/min. on 1st layer
Duty dynamic braking: 90-480 T at 0-88 m/min.
- One spooling device for the AH drum, side load 60 tonnes

- Two secondary winches with dividing flange socket part 138 tonnes pull, 170 tonnes dynamic braking at 70 m/min.
Capacity: approx. 1600 m of 8 in. dia. synthetic rope
- Two spooling devices for secondary winches, side load 20 tonnes
- One storage winch for spare tow wire, pull 10 tonnes
Capacity: 1700 m of 76 mm dia. wire rope

Shark Jaws and Towing Pins

- Two anchor handling forks, Ø500 mm, SWL 500 tonnes
- Four towing pins with flaps for horizontal locking, Ø450 mm

Safe Anchor Handling System (SAHS)

- Two tugger cranes, travelling on top of cargo rail, tugger winch 15 t, crane winch 3 t, max outreach 10 m.
- Stern ram, L6000, B13950, Static max load: 500 t, Dynamic max load: 400 t at 50 m/min.
Twin inboard stern rollers, L2*3000, D1800
Twin outboard stern rollers, L2*2000, D1800
- Pennant catcher
- Positioning tool, roller height 600 mm
- Two wire spin tools
- Two chain pulling and laying devices (10 t pulling force)
- Remote control and radio remote control

Machinery / Propulsion System

- Diesel electric power and propulsion plant
- Four main generator engines, each of MCR 2880 kW at 720 rpm
- Two main generator engines, each of MCR 1665 kW at 900 rpm
- Tandem electric propulsion motors arrangement:
Two el. motors, variable speed, 0-3000 kW, 0-720 rpm
Two el. motors, fixed speed, 2000 kW, 720 rpm
- Twin installation main azimuth thrusters with nozzles, controllable pitch, variable speed, each of 5000 kW diameter 3600 mm, speed 0-173 rpm

Fire Detection System

Addressable fire detection central

Video and monitoring system

A colour video camera system (11 cameras) for surveillance of AHT winch, pump room, propulsion room, stern ramp. Surveillance acc. to international ISPS.

Fire Fighting System

- CO2 protection system for engine room
- Local water mist protection system

Electric Power Plant (690 Volt AC – 60 Hz)

- Four main generators, each of 3070 kVA, 720 rpm, cosφ 0,9
- Two main generators, each of 1756 kVA, 900 rpm, cosφ 0,9
- Emergency / harbour generator, 370 kW
- Integrated Alarm and monitoring System (IAS)

ULSTEIN VERFT AS

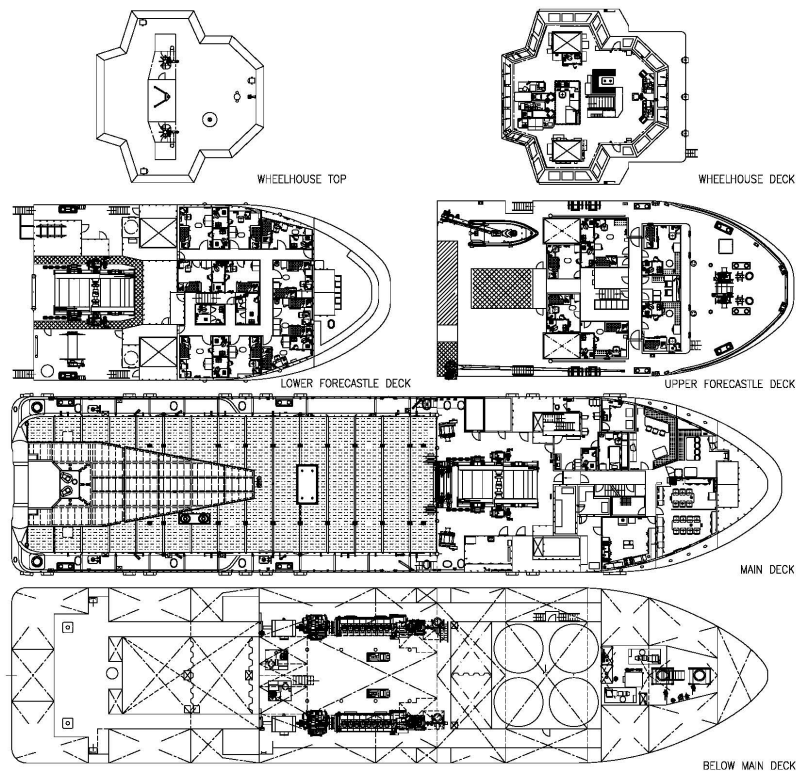


BOURBON ARGOS

DP 2 Anchor handling tug supply vessel
136 Metric ton bollard pull
250 Metric ton line pull winch



This medium size Anchor Handling Tug Supply Vessel has been designed by CONAN WU to carry out general services for the offshore industry. It was fitted with a class 2 DP system, Fi-Fi I system, and easy to upgrade for stand-by/service duties. It is equipped with a waterfall double drum winch with large capacity suitable for towing, anchor handling and offshore terminal operations.



ANCHOR HANDLING TUG SUPPLY VESSEL

REGISTRATION

Vessel Name: **BOURBON ARGOS**
Type: **AHTS 120 t. DP2 vessel.**
Year: **2013 / Flag: Luxemburg**
Owner: **Bourbon PS SASU**

Builder: **Bharati shipyard - India.**
Class: **BV. Class 1 , +Hull, +Mach, Tug, Supply Vessel, Unrestricted navigation, Fire fighting ship I - water spraying, LHNS - Oil product +AUT-UMS, +DYNAPOS - AM/AT-R.**

Updated: 26-07-2013



MAIN PARTICULARS

DIMENSIONS

Length overall:	68.60 m
Breadth moulded:	15.40 m
Depth:	7.00 m
Draft:	6.00 m
Deadweight:	2,100 mt
Bollard pull:	136 mt
Gross / Net tonnage:	2,343 / 703

CAPACITIES

Deck area: (5.0 t/m2).....	(35.00 x 12.00 m) 420 m2
Deck cargo:	1,200 mt
Cargo fuel oil (98%):	594 m3
Domestic fuel oil (98%):	463 m3
Drill water/Water ballast (100%):	517 m3
Fresh water (100%):	263 m3
Dry bulk/Cement (98%):	245 m3
Liquid mud /LHNS (98%):	393 m3
Brine/chain locker (98%):	195 m3
Dispersant:	16 m3
Foam:	21 m3

DELIVERY RATES

Fuel oil:	150 m3/h at 7 bars
Drill water:	150 m3/h at 7 bars
Fresh water:	150 m3/h at 7 bars
Liquid mud:	75 m3/h at 15 bars
Dry Bulk/Cement:	2 x 1,800 m3/h at 5.6 bars
Chain locker / DW/ Brine:	75 m3/h at 15 bars

ACCOMMODATIONS

Accommodations for:	30 pers
Single cabins:	6
2 man cabins:	8
4 man cabins:	2
Hospital:	1
Mess / Day rooms, Laundry, Galley, stores, Office.	
Fully air conditioned.	

MACHINERY / PERFORMANCE

PROPULSION - MACHINERY

Main engines:	2 x 4,000 kW
Propellers:	2 types CPP in kort nozzles
Bow thrusters:	2 x 600 kW
Stern thruster:	600 kW
Shaft generators:	2 x 1,600 kW
Auxiliary generators:	2 x 350 kVA
Emergency generator:	72 kW

SPEED / CONSUMPTION

Maximum speed (100%):	37 t/day at 14 knots
Service speed (85%):	28 t/day at 12 knots
Economic speed (75%):	18 t/day at 10 knots

EQUIPMENT & ELECTRONICS

DECK EQUIPMENT

Main winch:	1 electro-hydraulic low pressure winch
- 2 declutchable drums in waterfall arrangement.	
- Rated pull:	250 mt @ 8.7 m/min
- Brake holding load:	300 mt
- Drum size:.....	1050/2,650 mm x 2,650 mm length
- Drum capacity:	2,000 m of 3"
Windlass:	1 combined mooring and windlass winch
Stern roller:	300 mt SWL
Towing pins:	1 pair 300 mt SWL
Shark jaws:	2 of 300 mt SWL
Tuggers:	2 x 11 mt at 18 m/min
Capstans:	2 x 10 mt at 15 m/min
Deck provisions crane:	2 mt at 15 m

SAFETY EQUIPMENT

Fire-Fighting (Fi-Fi 1):	2 pumps of 1,500 m3/h
.....	2 monitors of 1,200 m3/h
MOB boat with davit.	
Life rafts / Life saving arrangement.	
Stand-by rescue equipment for 150 survivors:	(optional)

ELECTRONICS

NAVIGATION

2 radars
3 gyrocompasses, 1 magnetic compass
1 digital echo-sounder, 2 Anemometers
1 autopilot system
1 GPS Receiver
Search lights (electric control)

COMMUNICATION

1 radio system compliant with GMDSS A3
1 SSB Duplex DSC
2 INMARSAT C
5 VHF
1 EPIRB, 2 SART
1 INMARSAT M
Fleet 77, Vsat

DYNAMIC POSITIONING SYSTEM

Type:	Class DP2.
- Sensors and monitoring as per class 2 requirements.	

All particulars believed to be correct but not guaranteed

FAR SCIMITAR

UT 712 L



Built / Yard	2008 / Aker Brevik / Yard No. 62
Main Class	+1A1, SF, E0, DK(+), HL(2,5), TUG, SUPPLY VESSEL, CLEAN, DYNPOS-AUTR, FiFi I, TMON
LOA	78.3m
Breadth Moulded	17.2m
Draft (max)	6.989m + 1.02m Skeg/Nozzle
Deadweight	2913mt (d=6,989m)
Gross Register Tonnage	3068
Deck Dimensions	540m ² (37,5m x 14,4m)
Deck Load	900mt
Deck Strength	10mt/m ²
Deck Strength Aft	N/A
Fuel Oil	1087m ³ / 6837bbbls
Pot Water	741m ³ / 4661bbbls
Drill Water / WB	1231m ³ / 7743bbbls
Mud	538m ³ / 3384bbbls
Brine	414m ³ / 2604bbbls
Base Oil	538m ³ / 3384bbbls

Methanol	N/A
Dry Bulk	225m ³ / 7945cuft (4 tanks)
Washing System	Yes Hot
Main Crane	1 x SWL 5mt@ 16m - -m wire & Not AHC - placed on Stb Side
Deck Cranes	2 x SWL 3mt@13m - Sliding with 2 manipulators
Main Engines	4 x 2700KW = 14688BHP
Catalytic Converters	N/A
Bow Thrusters	1 x 1200BHP
Stern Thrusters	1 x 1200BHP
Azimuth Thrusters (Bow)	1 x 1200BHP
Bollard Pull	180mt
Consumption at Service Speed	22m ³ / 24hrs @ 12Knots
Consumption at Economy Speed	15m ³ / 24hrs @ 10Knots
Winch Type	Hydraulic Double Drum
Special Handling Winch Capacity	N/A
Special Handling Brake (Static/Band Brake)	N/A
Towing/Working Winch Brake (Static/Band Brake)	550mt
Towing/Working Winch No 2 Brake (Static/Band Brake)	550mt
Secondary Winch Fibre Capacity - 160mm	1 x 2190m of 160mm
Rope / Reel Storage	1 x 1400m of 81mm
Chain Locker	4x98m ³ = 392m ³
Tow Pins	4 x 250mt MWL - Karm
Shark Jaws	2 x 750mt MWL - Karm
Stern Rollers	2 x 3m x Ø3,5m - MWL 500mt
Total Capacity	28 Persons

FLEX CLASS



SEACOR GRANT DIESEL ELECTRIC DP-2 ANCHOR HANDLER (METHANOL/ROV)

MAIN PARTICULARS:

LENGTH OVERALL	265 ft	80.8 m
BEAM	52 ft	15.8 m
DEPTH	19 ft	5.8 m
DESIGN DRAFT	14.5 ft	4.4 m
LOADED DRAFT	15.5 ft	4.7 m
TONNAGE (ITC)		
	GT	2,188 Mt
	NT	799 Mt

CAPACITIES:

DRILL WATER (100%), includes ballast	186,896 USG	707 m ³
FUEL OIL (98%)	140,105 USG	530 m ³
LIQUID MUD (98%)	5,116 BBLs	815 m ³
METHANOL/MUD/BRINE (98%)	2,421 BBLs	385 m ³
DRY BULK (100%)	7,500 ft ³	212 m ³
DEADWEIGHT @ 14'6"	2,199 Lt	2,234 Mt
DEADWEIGHT @ 15'6"	2,557 Lt	2,598 Mt

CARGO DECK:

TONNAGE	1,600 Lt	1,626 Mt
STRENGTH	1,024 lb/ft ²	5 Mt/m ²
LENGTH	162 ft	49 m
WIDTH	41 ft	13 m
CLEAR AREA	6,836 ft ²	635 m ²

MACHINERY:

MAIN GENERATOR ENGINES	Caterpillar 3 x 3516B & 1 x 3516C
TOTAL INSTALLED POWER	8,000 kW (10,728 HP)
MAIN GENERATORS	3 x 1,825 kW, 1 x 2,100 kW, 690 V, 60 Hz, 3 Ø
AUX. GENERATORS	1 x 425 kW, 690 V, 60 Hz, 3 Ø
SOLAS EMERGENCY GEN-SET	1 x 174 kW, 480 V, 60 Hz, 3 Ø
REDUCTION GEARS	Reintjes
PROPELLERS	Fixed Pitch Propeller (FPP) in nozzles
RUDDERS	Twin independent Fish Tail Rudders
BOW THRUSTER I	Brunvoll FU63 CPP, 800HP(600KW), 9 Mt thrust
BOW THRUSTER II	Brunvoll FU63 CPP, 800HP (600KW), 9 Mt thrust
STERN THRUSTER	HRP FPP, 800HP(600KW), 9 Mt thrust

TOWING & ANCHOR HANDLING:

CHAIN CAPACITY	10,594 ft ³	300 m ³
WINCH MODEL	Rolls Royce Brattvaag, Electro-Hydraulic	
TYPE/LINE PULL	Two Drum Reverse Waterfall / 295 Lt, 300 Mt	
WINCH WIRE CAPACITY	76 mm x 2,000 m, (3" x 6,600') each drum	
BRAKE CAPACITY	393 Lt, 400 Mt	
BOLLARD PULL	121.6 Mt continuous	
STORAGE REELS	76 mm x 2,000 m, (3" x 6,600') each drum	
TUGGER WINCHES	2 x 10.8 Lt, 11 Mt	
STERN ROLLER	SWL 350 Mt (16' x 8')	
SHARK JAW	2 x Karmfork, 295 Lt, 300 Mt	
TOWING PINS	2 Pair x Karmøy hyd w/ locking flaps	

PERFORMANCE:

MAXIMUM SPEED		14.3 knots
CRUISING SPEED		12 knots
ECONOMICAL SPEED		10 knots
MAXIMUM FUEL CONSUMPTION	At 14.3 Knots	29.4 MT/Day
CRUISING FUEL CONSUMPTION	At 12 Knots	14.5 MT/Day
ECONOMICAL FUEL CONSUMPTION	At 10 Knots	7.5 MT/Day

DISCHARGE RATES:

	GPM	@ FT	M3/HR	@ M
DRILL WATER	440	246	100	75
FRESH WATER	440	246	100	75
FUEL OIL (2 Speed)	440	246	100	75
LIQUID MUD (2 Speed)	2 x 1,000	246	227	75
DRY BULK (Free Air)	2 x 750 ft ³ /min	80 psi	21.2 m ³ /min	5.5 bar
METHANOL	2 x 330 gal/min	246	75	75

ACCOMMODATION:

	Cabins: 16	Berths: 38
MASTER	1 person w/ head	
CHIEF ENGINEER	1 person w/ head	
OFFICER/VIP	2 x 2 person w/ head	
CREW	4 x 2 person w/head	
CREW	1 x 4 person w/head	
CREW	6 x 2 person	
CREW	1 x 4 person	
HOSPITAL or 4 man Crew	w/ head	
SMOKING LOUNGE		
NON SMOKING LOUNGE		
MESS ROOM		

ELECTRONICS & CONTROLS:

FULLY INTEGRATED CONVERTEAM DIESEL ELECTRIC PACKAGE	
NAVIGATION PACKAGE	Furuno
ENGINE CONTROL	Converteam
DGPS	2 x C-NAV
CYSCAN	Multi Target Laser Based Positioning System
HYDRO ACOUSTIC REFERENCE SYSTEM	Sonardyne Ranger (Available Option)
GYRO	2 x TSS Meridian
DYNAMIC POSITIONING	Converteam Class DPS 2
RADAR	1 x S and 1 x X Band; ARPA
RADIO SYSTEM	GMDSS; Area A3
STEERING	EMI Electro-Hydraulic
INTERNET EMAIL	Yes
WEATHER RADIO	Yes
SATELLITE COMMUNICATIONS	VSAT

ROV CAPABILITY:

DESIGNED TO ACCOMMODATE	
OCEANEERING - MILLENIUM PLUS ROV (150 HP) SPREAD	
DEDICATED POWER SUPPLY (400A, 300A, 60A, 40A AND 30A, 3phase, 480V)	
DEDICATED DP ALERT AND COMMUNICATIONS HOOK-UP TO ROV CONTROL VANS	

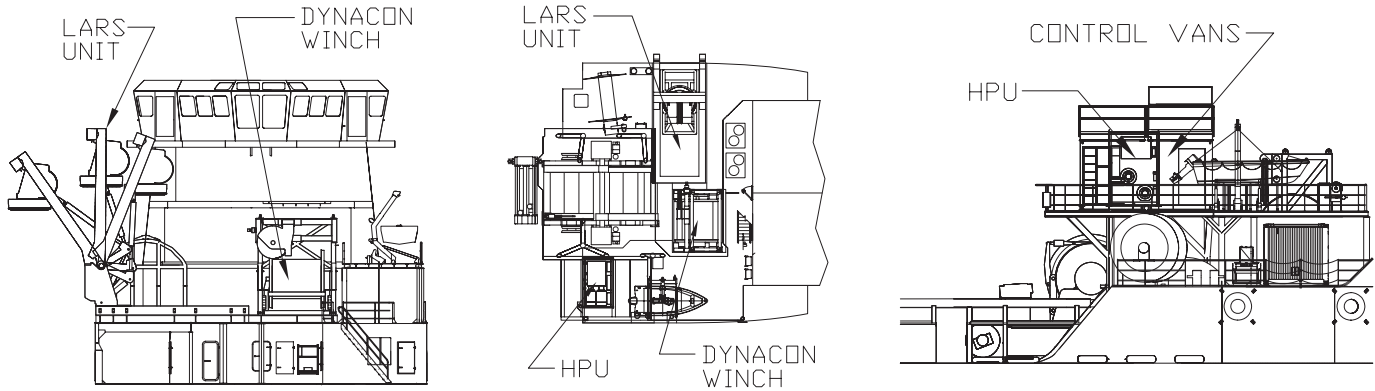
SPECIAL EQUIPMENT:

ANCHOR WINDLASS	Rolls Royce 11.5 Mt at 15m/min
ANCHOR & CHAIN	2 x 1,590 Kg (439 m x 38 mm Ø chain)
EXTERNAL FIFI	2 x 1,200 m ³ /hr
DISCHARGE METERS	Potable Water & Fuel (with printer)
SURVIVAL CRAFT	6 x 25 person inflatable liferafts
RESCUE BOAT	6 man - Meeting SOLAS regulations
LIQUID MUD CIRCULATION	Flygt Agitators (2) per tank
CONTAINER/DECK POWER	480 V, 63A, 3Ø & 2 x 220 V, 32A, 1Ø at 60 HZ

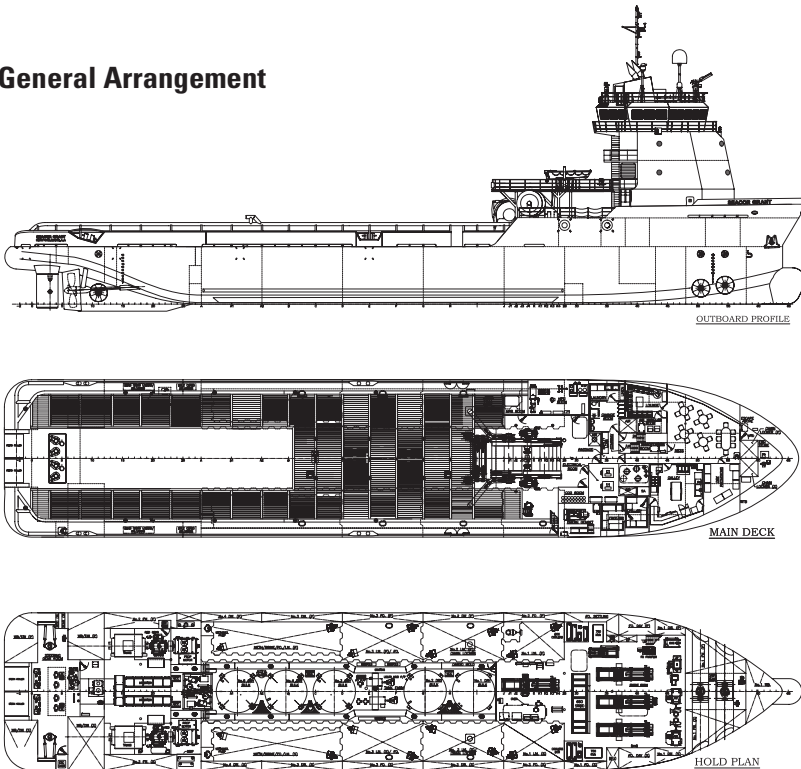
CLASS AND REGULATORY:

CLASS	ABS +A1, (E), Towing Vessel, + AMS, DPS-2
USCG	OSV, SubCh L & I Vessel
BUILT	2008
FLAG	Marshall Islands
SOLAS	Full

Optional ROV Arrangement

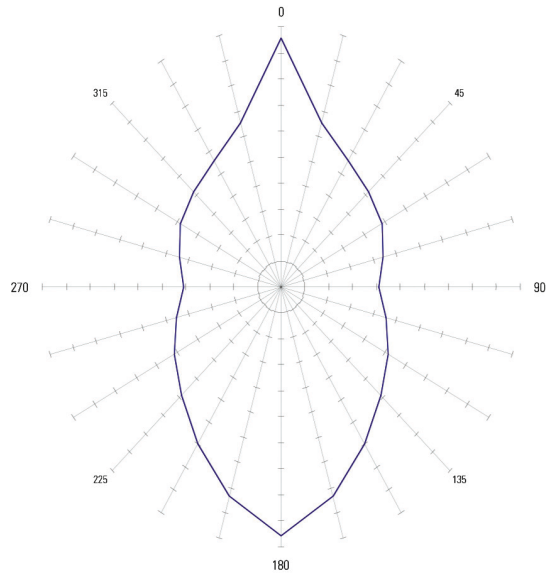


General Arrangement



Capability Plot

Wind angle is stepped from 0 – 360 degrees.



- Flexible Hull Design
- Innovative Layout
- Dynamic Positioning (ABS Class DP-2)
- Environmentally Friendly Diesel Electric Power Plant
- Fuel Oil System Fitted with Dedicated Overflow Tank
- Very Low Emissions
- Reduced Noise and Vibration in Accordance with IMO Reg A468
- Cost Effective with High Fuel Efficiency
- Fitted with FiFi 1 Monitors & Pumps
- U.S. Flag



M/V Pacific Vigilance

- ▶ **Bollard Pull** 120-124 tonnes
- ▶ **Brake Horsepower** 8,810 BHP
- ▶ **Clear Deck Space** 425 m²
- ▶ **Winch Line Pull** 250 tonnes

M/V Pacific Vigilance

Bollard Pull	120-124 tonnes	Brake Horsepower	8,810 BHP
Clear Deck Space	425 m ²	Winch Line Pull	250 tonnes

General Information

Built:	PT Nanindah Mutiara Shipyard, Batam, Indonesia, March 2010
Flag:	Singapore
Call Sign:	9V7215
IMO No.:	9443528
Classification:	ABS *A1, Towing Vessel, Offshore Support Vessel, Circle E, *AMS, *ACCU, *DPS-2

Dimensions

Length, overall:	66.0 metres
Length, BP:	57.0 metres
Breadth, moulded:	16.0 metres
Depth, main deck:	7.3 metres
Maximum draft midship:	6.2 metres
GRT:	2,147 Tonnes
NRT:	644 Tonnes

Capacities

Deadweight (maximum):	approximately 2,500 tonnes @ 6.2 m draft
Clear Deck Area:	33 m x 12.8 m = 425 m ²
Deck Strength:	5t/m ²
Deck Cargo:	870 tonnes
Fuel:	771 m ³ (dedicated) 1,615 m ³ (including the combined use Mud/Brine tanks and the combined use Rig Chain locker)
Potable Water:	432 m ³
Ballast Water:	928 m ³
Brine / DMA / Glycol / Liquid Mud:	124 m ³ (in 2 dedicated tanks) 593 m ³ (including the combined use Mud tanks - s.g. of 2.5)
Liquid Mud:	589 m ³ (in 6 dedicated tanks) 593 m ³ (including the combined use Brine tanks - s.g. of 2.5)
Dry Bulk:	185 m ³ (approximately 6,500 cubic feet) total capacity in 4 tanks
Ship's Stores:	Freezer (-25 degrees Celsius) - approximately 12 m ³ Cooler (+4 degrees Celsius) - approximately 12 m ³ Dry Stores - approximately 26 m ³

Machinery

Main Engines:	2 x 4,405 BHP = 8,810 BHP
Propulsion:	2 x MAN B&W Alpha CPP Propellers in MAN AHT Kort nozzles
Bow Thrusters:	2 x 600 kW (805 BHP) Brunvoll Tunnel Thrusters, approximately 9.0 tonnes thrust each
Stern Thrusters:	2 x 600 kW (805 BHP) Brunvoll Tunnel Thrusters, approximately 9.0 tonnes thrust each
Shaft Generators:	2 x Leroy Somer shaft generators, 1300 kW, 1600 kVA each, 440 V, 60 Hz

M/V Pacific Vigilance

Bollard Pull	120-124 tonnes	Brake Horsepower	8,810 BHP
Clear Deck Space	425 m ²	Winch Line Pull	250 tonnes

Auxiliary Generators:	1 x Caterpillar 3406 Diesel Generator, 270 kW, 440 V, 60 Hz
Emergency Generators:	1 x air cooled Caterpillar 3406 Diesel Generator, 270 kW, 440 V, 60 Hz

Towing and Anchor Handling

Bollard Pull:	123.9 tonnes (continuous)
Main Winch:	1 x Hydrakraft 250 tonne variable pressure waterfall winch
Load Capacity:	Towing and Anchor Handling Drums: Pulling Force - 1st layer - 255 tonnes, mid layer - 165 tonnes, outer layer - 122 tonnes (low speed) Pulling Speed - 1st layer - 11.4 m/min, mid layer - 17.6 m/min, outer layer - 23.8 m/min (low speed) Pulling force - 1st layer - 127 tonnes, mid layer - 82 tonnes, outer layer - 61 tonnes (high speed) Pulling speed - 1st layer - 22.8 m/min, mid layer - 35.2 m/min, outer layer - 47.6 m/min (high speed) The Anchor Handling Drum and Towing Drum are capable of 250 tonnes pull on 1st layer simultaneously
Brake Capacity:	Brake Force: 1st layer - 320 tonnes mid layer - 207 tonnes outer layer - 153 tonnes
Tow Drum Wire Capacity:	1500 m x 71 mm diameter
Work Drum Capacity:	1500 m x 71 mm diameter
Chain Gypsy Cable Lifter:	1 x 76 mm, 1 x 84 mm mounted on each side of anchor handling drum
Rig Chain Locker:	195 cubic metres chain capacity
Stern Roller:	Rolls Royce, SWL 350 tonnes, 5.5 m x 2.0 m diameter
Tow Pins / Guide Pins:	1 pair of retractable Karmoy guide pins with horizontal locking tops
Wire Chain Stopper:	2 x retractable Karm forks, SWL 300 tonnes for wire/chain up to 102 mm
Spare Reel Capacity:	1 x Hydrakraft variable pressure, 20 tonnes pull on 1st layer, 1400 m x 71 mm diameter
Pennant Storage Reels:	2 x Hydrakraft variable pressure, 20 tonnes pull on 1st layer, 1000 m x 76 mm diameter

Deck Machinery

Tuggers:	2 x 10 tonnes Hydrakraft
Capstans:	2 x 16 tonne (warping head) / 10 tonne (wire drum) Hydrakraft
Windlass:	1 x 10 tonne Hydrakraft, 2100 kg anchors with 440 m x 36 mm chain each side, plus 1 spare anchor
Bow Mooring:	2 x mooring drums, capacity of 200 m x 56 mm rope each
Smit Towing Bracket:	1 x 200 tonnes SWL located on the Forecastle
Crane Capacity:	TTS, 5 tonnes at 13 m radius

Electronics

Main Radar:	1 x Furuno FAR-2117 X Band ARPA Radar with 21" LCD display
Auxiliary Radar:	1 x Furuno FAR-2137S S Band ARPA Radar with 21" LCD display

M/V Pacific Vigilance

Bollard Pull	120-124 tonnes	Brake Horsepower	8,810 BHP
Clear Deck Space	425 m ²	Winch Line Pull	250 tonnes

Auto Pilot:	1 x Tokimec PR 6000 Series
Gyro Compass:	3 x Tokimec TG8000 with repeaters in wheelhouse and steering gear room
Magnetic Compass:	1 x Cassen & Plath REFLECTA 1
Echo Sounder:	1 x Skipper GDS102, Dual Frequency, 1500 m water depth
DGPS :	1 x Furuno GP 150
	2 x Veripos LD3
Anemometer :	3 x Gill ultrasonic unit
Speed Log:	1 x Furuno DS-80 Doppler Speed log
Communications:	1 x Furuno G.M.D.S.S. (Global Maritime Distress & Safety System) Area A3 set
	1 x Furuno FS-2570 (250 W) MH/HF Radio
	1 x Furuno FM-8800S (25 W) VHF DSC
	1 x Furuno FM-8800D (25 W) VHF DSC
	1 x Furuno FELCOM-15 Inmarsat-C
	1 x Furuno FELCOM-15 Inmarsat-C/SSAS
	1 x Furuno NX-700B Navtex Receiver
	3 x McMurdo Portable GMDSS VHF Radios
	1 x McMurdo EPIRB
	2 x McMurdo SART
Weather Fax:	1 x Furuno
AIS:	1 x Furuno FA 150

Discharge Pumps

Fuel Oil:	1 x 100 cubic metres/hr - 7.0 bar
Potable Water:	1 x 150 cubic metres/hr - 7.0 bar
Drill Water:	1 x 150 cubic metres/hr - 7.0 bar
Liquid Mud:	1 x 75 cubic metres/hr - 18.0 bar
Brine / Mud:	1 x 75 cubic metres/hr - 18.0 bar
Dry Bulk:	80 cbm/hr - 5.6 bar (2 compressors)
Cargo Flow Meters :	Fuel Oil and Potable Water

Performance

Speed / Fuel Consumption:	At 100% MCR, approximate consumption is 34 tonnes / day
	Economical speed 10-12 knots, approximate consumption is 12 tonnes / day
	Idle at sea: approximate consumption 4 tonnes / day
	Idle in port: approximate consumption 0.8 tonnes / day

Dynamic Positioning

Type:	DP 2
Reference Systems:	1 x Cyscan laser complete with 2 reflectors, 2 x Veripos DGPS
Control Modes:	Joystick manual heading, Joystick auto heading, Dynamic Positioning, Model Control (dead reckoning), DP minimum power, Ship follow, Auto track, Auto Pilot, Auto Sail, ROV follow, Simulation (for training purposes)

M/V Pacific Vigilance

Bollard Pull	120-124 tonnes	Brake Horsepower	8,810 BHP
Clear Deck Space	425 m ²	Winch Line Pull	250 tonnes

External Fire Fighting

Capacity:	2 x 1,500 cubic metres/hr = 3,000 cubic metres/hr
Monitors:	2 x 1,200 cubic metres/hr, Kvaerner, each fitted on wheelhouse top and remotely controlled from within the wheelhouse
Throw Length:	120 m
Throw Height:	50 m

Standby Rescue Equipment

1. FRDC - MP-1111 FRDC TWJ
Davit – Hydramarine HMD G100
Max POB – 12
2 x Yanmar inboard engines with jet drive
2. Rescue Zones on both Port and Starboard side of main deck, with scramble nets and personnel transfer swing ropes

Anti-Pollution

Dispersant Tank:	9.4 cubic metres
Spray Booms:	2 x Booms with nozzles for both diluted and neat operation fitted

Accommodation

Berths:	8 x single cabins 4 x 2 man cabins (including hospital) 4 x 4 man cabins 1 x Library 1 x Messroom 1 x Lounge
---------	---

Environmental Features

1. Mud tank of free flowing design with external stiffening, sloped floors and dedicated recirculation
2. Low residue design bulk tanks
3. 1 x oily water separator with 15 ppm monitor. Compliant with IMO - Resolution MEPC 107(49)
4. 1 x sewage treatment plant
5. Galley macerator
6. Cargo load/discharge station with save all to inboard tank

Miscellaneous

1. Design complies to latest rules and regulations from SOLAS 74, with amendments in force and IMO 469 (XII) "Guidelines for the design and construction of offshore supply vessel"

M/V Pacific Vigilance

Bollard Pull	120-124 tonnes	Brake Horsepower	8,810 BHP
Clear Deck Space	425 m2	Winch Line Pull	250 tonnes

2. Hose connections:
 - Fuel - 4 inches (Camlock / Avery Hardol)
 - Potable Water - 4 inches (Camlock)
 - Drill Water - 4 inches (Camlock)
 - Mud - 5 inches (Camlock)
 - Brine - 5 inches (Camlock)
 - Dry Bulk - 5 inches (Camlock)
 - Adapters 5" to 4" reducer, 4" to 3" reducer
3. Fitted with 2 x Halogen searchlights, each 2,000 W, fitted on the wheelhouse top and remotely controlled from inside the wheelhouse
4. Fitted with 6 x 1,000 W high pressure sodium lights for the aft deck cargo area and 2 x 1,000 W high pressure sodium lights in the crash rails to illuminate Anchor Handling area
5. Removable section of crash rail, 6 m long, on Port and Starboard side forward to allow for fitting of ROV spread, etc
6. Wood sheathed main deck except for the aft area, which is steel plated for Anchor Handling
7. Welding and cutting equipment and lathe in workshop
8. Fresh water ultra violet steriliser
9. Flume passive roll damping system
10. Fire detection system fitted to the accommodation, all store rooms and machinery spaces throughout the vessel
11. CO2 fixed fire extinguishing system for Machinery Space, Emergency Generator Room, Paint Locker and Hydraulic Pump Room
12. Local water spray Fire Fighting system according to SOLAS regulations
13. Statutory liferafts, life-jackets and pyrotechnics
14. Deck power supplies for ROV equipment / Charterer's equipment: 2 x 500 A, 440 V, 3 ph; 1 x 63 A, 440 V, 3 ph; 1 x 32 A, 440 V, 3 ph
15. Deck power supplies for Refrigerated containers: 6 x 440 V, 63 A, 3 ph



DAMEN STAN TUG[®] 4013

GENERAL

BASIC FUNCTIONS

Towing, anchor handling, Ø fire fighting and Ø pollution control, stand-by safety rescue

CLASSIFICATION

Lloyd's Register
 ✕ 100 A1 Tug [✕] LMC
 Ø ✕ 100 A1 Tug [✕] LMC Fire Fighting Ship 1
 Epoxy paint system

PAINTING

DIMENSIONS

LENGTH O.A.	40.75 m
BEAM O.A.	12.87 m
DEPTH AT SIDES	4.90 m
DRAUGHT AFT	5.45 m
DISPLACEMENT	1435 ton

TANK CAPACITIES

FUEL OIL	392.4 m ³
FRESH WATER	84.1 m ³
Ø FOAM	27.7 m ³
Ø DISPERSANT	12.3 m ³
BILGE WATER	13.6 m ³
LUBRICATION OIL	7.5 m ³
DIRTY OIL	7.7 m ³
SEWAGE	6.0 m ³
SLUDGE	4.1 m ³

PERFORMANCES

BOLLARD PULL	80.0 ton (m)
SPEED	14.0 knots

PROPULSION SYSTEM

MAIN ENGINES	2x MTU 16V 4000 M63L
TOTAL POWER	4480 bKW (6008 bhp) at 1800 rpm
GEARBOXES	2x Reintjes LGF 1963 10.115:1
PROPULSION	2x Schottel 3000mm CPP
NOZZLES	2x 3000 mm Van de Giessen Optima
STEERING GEAR/SYSTEM	Independent HP rudders, powered hydr. steering
BOWTHRUSTER	1500 mm, 400 kW hydraulic

AUXILIARY EQUIPMENT

MAIN GENERATOR SETS	2x Caterpillar C9, 188 kVA, 230/400, 50Hz
EMERGENCY GEN. SET	Caterpillar C4.4 TA, 103 kVA, 230/400 V, 50Hz
BILGE PUMPS	2x Sterling AKHA 6101, 34 m ³ /hr at 10 m.w.g.
BILGE WATER SEPARATOR	Facet CPS 2.5BMkIII, EBM, 0.5 m ³ /hr
FUEL OIL PURIFIER	Westfalia OTC 3-02-137, 1740 l/hr
FRESH WATER PRESSURE SET	Sterling HBK 111 / AOHA 3101, 110 liter Gesta, 120 litres
FRESH WATER HEATER	Aquamar, 4.8 m ³ /day
FRESH WATER MAKER	Hamworthy ST3A-C, 4660 l/day
SEWAGE PLANT	Diesel main engine driven pump 1200 m ³ /hr, 2400 m ³ /hr
FIRE FIGHTING	

DECK LAY-OUT

ANCHOR	2x 675 kg Pool (High Holding Power)
ANCHOR WINCH	Electric 3 ton at 10 m/min
AH/TOWING WINCH	Double drum waterfall type 40t/10m/min, with 1000 meter towing wire, 48 mm diam. Mampaey SWL, 1000 kN
TOWING HOOK	Heila HLRM 35-5SL, 1.250 kg at 16.22 mr
DECK CRANE	2x 5 ton at 15 m/min
CAPSTAN	2x 18.0 ton at 60 m/min
TUGGER WINCHES	Karmoy 2x Ø fork (SWL 300 ton)
TOWING PINS	2x Ø pin (SWL 150 ton)

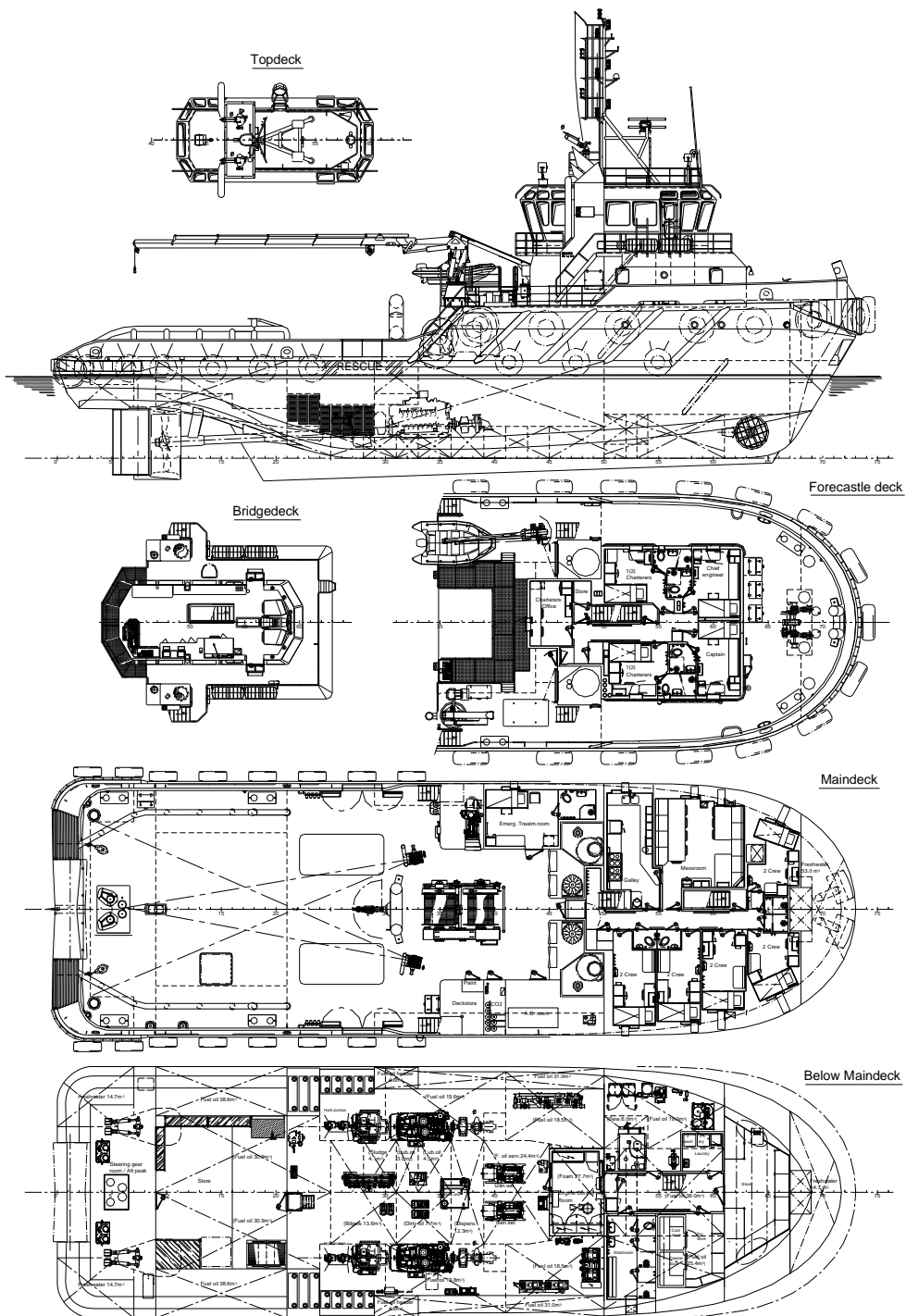
ACCOMMODATION

Air-conditioned accommodation for 16 persons, completely insulated and finished with durable modern linings, acoustical Dampa ceiling in the wheelhouse and Bolidt floating floors. Captain cabin, chief engineer cabin, two double officers cabins, five double crew cabins, galley, mess room and sanitary facilities.

NAUTICAL AND COMMUNICATION EQUIPMENT

SEARCHLIGHT	Pesch 1000 W / Ø 2x Pesch 450 W Xenon
RADAR SYSTEM	Furuno FAR-2117
COMPASS	Magnetic Kotter type
AUTOPILOT	Simrad AP-70
GPS	Furuno GP-150
ECHOSOUNDER	Furuno LS-6100
VHF	2x Sailor 6222, 25 W
AIS / Ø SSB	Furuno FA-150 / Ø Furuno FS-1575
SPEED LOG	Furuno DS-80
Ø INMARSAT	2x Furuno Felcom 18, 1x with LRIT
NAVTEX	Furuno NX-700
EPIRB / SART	Jotron Tron-40S / Jotron Tron Sart
Ø ANEMOMETER	Obsermet OMC-115

* PHOTOGRAPH SHOWS SIMILAR VESSEL



DAMEN STAN TUG® 4013

DAMEN

DAMEN SHIPYARDS GORINCHEM

Member of the DAMEN SHIPYARDS GROUP



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Technical Specification SEA EAGLE 1



DEEP SEA SUPPLY



IMO No.: 9494890
 ABS ID No.: 9182570
 MMSI : 533130059
 Call Sign : 9WNA9
 Official No.: 900024

MAIN DESCRIPTION	MEASUREMENT
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Type :	Khiam Chuan Q486	Lenght oa :	75,40 m
Classification :	A1E Offshore Support Vessel AH FIFI 1+AMS+DPS2+ACCU	Lenght bpp :	67,16 m
Yard :	Jaya Shipbuilding & Eng.	Breath moulded :	16,80 m
Yard built No.:	878	Depth moulded :	7,50 m
Country built :	Singapore	Draught max:	6,10 m
Delivered :	2009	Correspondign DWT :	2100
Flag :	Malaysia	Gross tonnage GT :	2952
Port of registry :	Labuan	Net tonnage NT :	885
Owner :	Deep Sea Supply Labuan Ltd	Air draft @ 6,50 mt EK:	25,95
Company Registration :	LL09133	Speed svc/max.	12/15 knot
Company IMO No. :	5695490	ISM-Responsible :	Deep Sea Supply Management (Malaysia) Sdn Bhd
SMC/ ISSC Issue :	ABS		

CARGO CAPACITY	DISCHARGE RATE
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Deck cargo:	800 t	Loading / Discharging station :	Aft/ Staboard and port Mid. Ship
Deck area:	600 m2	Fuel discharge rate :	1 x 200 m3/h @ 9 bar
Clear deck area:	485 m2	Mud discharge rate :	2 x 75 m3/h @ 24 bar
Deck strength:	7,5 t/m2	Drillwater discharge rate :	1 x 200 m3/h @ 9 bar
Fuel (gasoil) :	1240 m3	Dry bulk discharge rate :	2 x 20 m3/min @ 80 psi
Liquid Mud :	560 m3	Base Oil discharge rate :	1 x 61 m3/h @ 9 bar
Drillwater / Ballast :	510 m3	Fresh Water discharge rate :	1 x 150 m3/h @ 9 bar
Base Oil:	130 m3		
Dry Bulk :	226 m3 (4 x 2000 cu ft)		
Fresh Water :	490 m3		
Foam/ Detergent:	7,5 m3/ 7.5 m3		

MACHINERY / PROPULSION			
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Main Engine set 1 :	1 x 4500 kw (6120 BHP) @ 750 rpm	Bow Thruster:	2 x 680 kw
Main Engine set 2 :	1 x 4500 kw (6120 BHP) @ 750 rpm	Stern Thruster :	1 x 680 kw
Propulsion Aft :	2 x Wartsila-Lips CCP	Generators :	2 x 2300 kw
Rudders :	2 x Becker Rudder S-A 2050/253 F2	Diesel Generators :	2 x 410 kw @ 1800 rpm
Total BHP :	12240	Emergency Generator :	1x 60 kw @ 1800 rpm
Total Kw:	9000	Shore Connection:	440V 3 Phase 60 Hz

PERFORMANCE / CONSUMPTION

Bollard Pull continous :	151
Max Speed / Consumption:	15,0 kn @ 44 m3/day
Service Speed / Consumption:	12,0 kn @ 22 m3/day
Economical Speed / Consumption:	10,0 kn @ 18 m3/day
DP Standby Mode Consumption:	5 m3/day
Port Consumption :	2 m3/day

ACCOMMODATION

Cabins :	10x1 berth + 15x2 berth
Accommodation for maximum :	40 persons
Air conditioning system :	All cabins
Mess / Dayroom :	1 mess/ 1 dayroom
Cool store / Freezer :	11,5 m3/ 11,5 m3
Dry Provision :	15 m3

DECK / AHL EQUIPMENT

Tugger Winches :	2 x Brattvaag 10 tons	Shark Jaws:	1 x 300 karm fork
Crane 1:	1 x 5,6 tn @ 6m/2,2 tn at 12,2 m	Towing Wire:	1500m of 76mm
Windlass:	2 x Brattvaag 17 tons	Spare Tow Wire :	1500m of 76 mm
Capstans:	2 x Brattvaag 10 tons	Work Wire A/H :	800m of 76mm
Anker Handling/Tow winch:	1 x Brattvaag 300 ts pull/450 break &	Grappels for Chain :	4 Prong Grapnel 250 ton SWL
	1 x Brattvaag 300 ts pull/450 break &	Forged J Chaser:	250 ton SWL
Rope reels:	6,7 tn suit for 2000m 76mm wire	Wire spooling:	Anker Handling/Tow Winch
	6,7 tn suit for 2000m 76mm wire		
Rig Chain Gipsies:	2 x 90 mm chain size		
Chain Lockers:	162,88 m3/ 176,43 m3		
Towing Pins:	One (1) set of 2 tow pins		
Stern Roller:	4,5 m x 2,3 m diam SWL 500 t		

RESCUE EQUIPMENT

Hospital :	Yes	Survival Suits :	58 x IMPERIAL
Fire Fighting equipment :	FiFi Class 1	GMDSS :	A3
MOB Boats:	1 x Narwhal SV 480	Life jackets :	63 x Viking PV-9500
Radar transponders :	2 x Mc Murdo	Life rafts:	6 x Viking 25DK
Emergency Beacon:	1 x Mc Murdo		

NAVIGATION AND COMMUNICATION EQUIPMENT

Radar 3 cm:	Furuno FR-2115	GMDSS Sea Area:	A3
Radar 10 cm:	Furuno FR-2135S	MF/HF Radio:	Furuno RC-1800T
Radar Slave:	1 conn. FR-2135S	DSC Receiver:	FS 2570
Direction Finder:	2 x ARP26	VHF 1:	Furuno FN-8800S
Gyro:	C Plath Navigat	VHF 2:	Furuno FN-8800S
Autopilot:	Anschuetz Pilot Star D	VHF 3:	
Navtex :	Furuno NX-700	UHF:	N.A.
Joystick:	Kongsberg C-joy	Portable UHF:	N.A.
AIS:	Furuno FA-100	Mobile Telephone:	Nokia
Echo Sounder:	Furuno FE-700	Iridium:	N.A.
Speed log:	Doppler log Furuno DS-80	Mini-M:	N.A.
Satellite Navigator (GPS):	Furuno GP-150	Sat C 1:	1 x Furuno Felcom 15
Wind Sensors:	Yes	V Sat:	Shipequip
DP:	Kongsberg DP2	Intercom System:	Yes



ANEXO III
ANÁLISIS DE RESISTENCIA EN AGUAS LIBRES

Resistance

28 sep 2015 12:01

HydroComp NavCad 2012

Project ID **Proyecto**

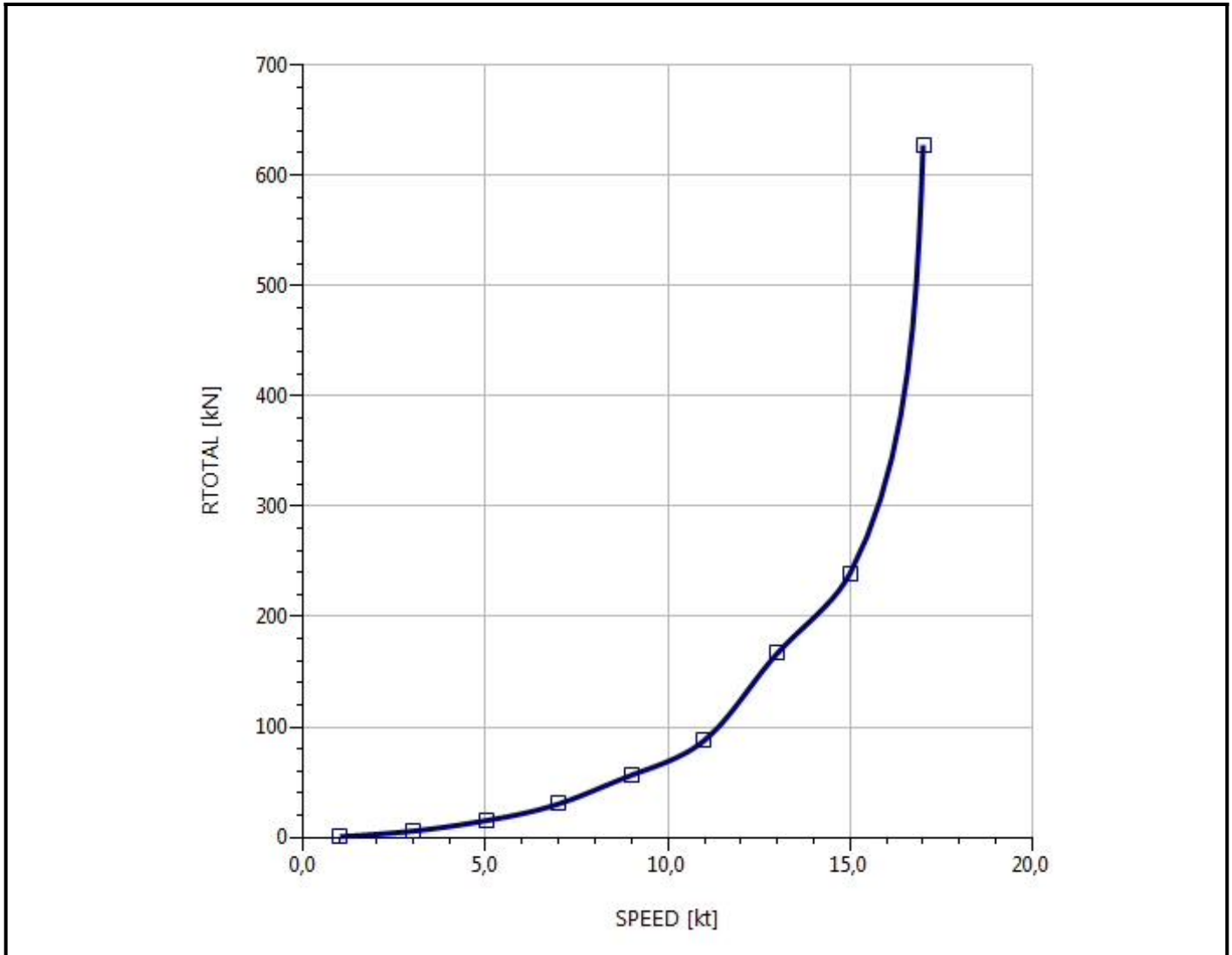
Description

File name **Proyecto.hcnc**

Analysis parameters

Vessel drag		ITTC-78 (CT)	Added drag	
Technique:	[Calc]	Prediction	Appendage:	[Calc] Holtrop (Component)
Prediction:		Oortmerssen	Wind:	[Off]
Reference ship:			Seas:	[Off]
Model LWL:			Shallow/channel:	[Off]
Expansion:		Standard	Margin:	[Calc] Hull + added drag [15%]
Friction line:		ITTC-57	Water properties	
Hull form factor:	[On]	1,318	Water type:	Salt
Speed corr:	[Off]		Density:	1026,00 kg/m3
Spray drag corr:	[Off]		Viscosity:	1,18920e-6 m2/s
Corr allowance:		ITTC-78 (v2008)		
Roughness [mm]:	[Off]			

Predicted resistance



Resistance

28 sep 2015 12:01

HydroComp NavCad 2012

Project ID **Proyecto**

Description

File name **Proyecto.hcnc**

Analysis parameters

Vessel drag		ITTC-78 (CT)		Added drag	
Technique:	[Calc] Prediction	Oortmerssen		Appendage:	[Calc] Holtrop (Component)
Prediction:				Wind:	[Off]
Reference ship:				Seas:	[Off]
Model LWL:				Shallow/channel:	[Off]
Expansion:	Standard			Margin:	[Calc] Hull + added drag [15%]
Friction line:	ITTC-57			Water properties	
Hull form factor:	[On] 1,318			Water type:	Salt
Speed corr:	[Off]			Density:	1026,00 kg/m3
Spray drag corr:	[Off]			Viscosity:	1,18920e-6 m2/s
Corr allowance:	ITTC-78 (v2008)				
Roughness [mm]:	[Off]				

Prediction method check [Oortmerssen]

Parameters	FN [design]	CP	LWL/BWL	BWL/T	XCB/LWL	IE	CX
Value	0,33	0,56	3,48	2,45	0,480	21,1	0,93
Range	0,05-0,50	0,51-0,69	3,50-6,30	1,90-3,40	0,467-0,537	10,0-38,0	0,73-0,97

Prediction results

SPEED [kt]	SPEED COEFS		ITTC-78 COEFS						
	FN	FV	RN	CF	[CV/CF]	CR	dCF	CA	CT
1,00	0,022	0,044	2,34e7	0,002601	1,318	0,000001	0,000000	0,000463	0,003892
3,00	0,067	0,131	7,03e7	0,002194	1,318	0,000001	0,000000	0,000649	0,003541
5,00	0,112	0,218	1,17e8	0,002036	1,318	0,000001	0,000000	0,000682	0,003367
7,00	0,156	0,306	1,64e8	0,001942	1,318	0,000205	0,000000	0,000690	0,003454
9,00	0,201	0,393	2,11e8	0,001875	1,318	0,000770	0,000000	0,000689	0,003931
11,00	0,246	0,481	2,58e8	0,001825	1,318	0,001036	0,000000	0,000685	0,004126
13,00	0,290	0,568	3,05e8	0,001784	1,318	0,002703	0,000000	0,000679	0,005733
+ 15,00 +	0,335	0,655	3,52e8	0,001750	1,318	0,003237	0,000000	0,000672	0,006215
17,00	0,379	0,743	3,98e8	0,001722	1,318	0,010099	0,000000	0,000665	0,013032
RESISTANCE AND EFFECTIVE POWER									
SPEED [kt]	RBARE [kN]	RAPP [kN]	RWIND [kN]	RSEAS [kN]	RCHAN [kN]	RMARGIN [kN]	RTOTAL [kN]	PEBARE [kW]	PETOTAL [kW]
1,00	0,55	0,06	0,00	0,00	0,00	0,09	0,70	0,3	0,4
3,00	4,50	0,49	0,00	0,00	0,00	0,75	5,74	6,9	8,9
5,00	11,88	1,32	0,00	0,00	0,00	1,98	15,19	30,6	39,1
7,00	23,90	2,52	0,00	0,00	0,00	3,96	30,38	86,1	109,4
9,00	44,95	4,08	0,00	0,00	0,00	7,35	56,39	208,1	261,1
11,00	70,48	6,00	0,00	0,00	0,00	11,47	87,96	398,8	497,7
13,00	136,77	8,27	0,00	0,00	0,00	21,76	166,79	914,7	1115,5
+ 15,00 +	197,42	10,88	0,00	0,00	0,00	31,25	239,55	1523,4	1848,5
17,00	531,70	13,84	0,00	0,00	0,00	81,83	627,37	4650,0	5486,7
OTHER									
SPEED [kt]	CTLR	CTLT							
1,00	0,00001	0,03877							
3,00	0,00001	0,03527							
5,00	0,00001	0,03354							
7,00	0,00204	0,03440							
9,00	0,00767	0,03915							
11,00	0,01032	0,04109							
13,00	0,02691	0,05709							
+ 15,00 +	0,03223	0,06190							
17,00	0,10057	0,12979							

Resistance

28 sep 2015 12:01

HydroComp NavCad 2012

Project ID **Proyecto**

Description

File name **Proyecto.hcnc**

Hull data

General		Planing	
Configuration:	Monohull	<i>Proj chine length:</i>	0,000 m
Chine type:	Single/hard	<i>Proj bottom area:</i>	0,0 m2
Length on WL:	54,170 m	<i>LCG fwd TR:</i>	[XCG/LP 0,000] 0,000 m
Max beam on WL:	[LWL/BWL 3,477] 15,580 m	<i>VCG below WL:</i>	0,000 m
Max molded draft:	[BWL/T 2,450] 6,360 m	<i>Aft station (fwd TR):</i>	0,000 m
Displacement:	[CB 0,527] 2901,37 t	<i>Chine beam:</i>	0,000 m
Wetted surface:	[CWS 5,200] 1039,8 m2	<i>Chine ht below WL:</i>	0,000 m
ITTC-78 (CT)		<i>Deadrise:</i>	0,00 deg
LCB fwd TR:	[XCB/LWL 0,480] 26,002 m	<i>Fwd station (fwd TR):</i>	0,000 m
LCF fwd TR:	[XCF/LWL 0,520] 28,168 m	<i>Chine beam:</i>	0,000 m
Max section area:	[CX 0,932] 92,4 m2	<i>Chine ht below WL:</i>	0,000 m
Waterplane area:	[CWP 0,666] 562,0 m2	<i>Deadrise:</i>	0,00 deg
Bulb section area:	0,0 m2	<i>Propulsor type:</i>	SPP
Bulb ctr below WL:	0,000 m	<i>Propeller diameter:</i>	3700,0 mm
Bulb nose fwd TR:	0,000 m	<i>Shaft angle to WL:</i>	0,00 deg
Transom area:	[ATR/AX 0,000] 0,0 m2	<i>Position fwd TR:</i>	0,000 m
Transom beam WL:	[BTR/BWL 0,000] 0,000 m	<i>Position below WL:</i>	0,000 m
Transom immersion:	[TTR/T 0,000] 0,000 m		
Half entrance angle:	21,10 deg		
Bow shape factor:	[AVG flow] 0,0		
Stern shape factor:	[AVG flow] 0,0		

Resistance

28 sep 2015 12:01

HydroComp NavCad 2012

Project ID **Proyecto**

Description

File name **Proyecto.hcnc**

Appendage data

General		Skeg/Keel	
Definition:	Component	Count:	1
Percent of hull drag:	5,00 %	Type:	Skeg
Planing influence		Mean length:	11,860 m
LCE fwd TR:	0,000 m	Mean width:	1,033 m
VCE below WL:	0,000 m	Height aft:	1,140 m
Shafting		Height mid:	1,970 m
Count:	2	Height fwd:	4,040 m
Max prop diam:	3700,0 mm	Projected area:	25,8 m2
Shaft angle to WL:	0,00 deg	Wetted surface:	63,9 m2
Exposed shaft length:	0,000 m	Stabilizer	
Shaft diameter:	0,000 m	Count:	0
Wetted surface:	0,0 m2	Root chord:	0,000 m
Strut bossing length:	0,000 m	Tip chord:	0,000 m
Bossing diameter:	0,000 m	Span:	0,000 m
Wetted surface:	0,0 m2	T/C ratio:	0,000
Hull bossing length:	0,000 m	LE sweep:	0,00 deg
Bossing diameter:	0,000 m	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Projected area:	0,0 m2
Strut (per shaft line)		Dynamic multiplier:	1,00
Count:	0	Bilge keel	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 mm	Mean length:	0,000 m
Span:	0,000 m	Mean base width:	0,000 m
T/C ratio:	0,000	Mean projection:	0,000 m
Projected area:	0,0 m2	Wetted surface:	0,0 m2
Wetted surface:	0,0 m2	Tunnel thruster	
Exposed palm depth:	0,000 m	Count:	1
Exposed palm width:	0,000 m	Diameter:	1,580 m
Rudder		Sonar dome	
Count:	0	Count:	0
Rudder location:	Behind propeller	Wetted surface:	0,0 m2
Type:	Balanced foil	Miscellaneous	
Root chord:	0,000 m	Count:	0
Tip chord:	0,000 m	Drag area:	0,0 m2
Span:	0,000 m	Drag coef:	0,00
T/C ratio:	0,000		
LE sweep:	0,00 deg		
Projected area:	0,0 m2		
Wetted surface:	0,0 m2		

Environment data

Wind		Seas	
Wind speed:	0,00 kt	Significant wave ht:	0,000 m
Angle off bow:	0,00 deg	Modal wave period:	0,0 sec
Gradient correction:	Off	Shallow/channel	
Exposed hull		Water depth:	0,000 m
Transverse area:	0,0 m2	Type:	Shallow water
VCE above WL:	0,000 m	Channel width:	0,000 m
Profile area:	0,0 m2	Channel side slope:	0,00 deg
Superstructure		Hull girth:	0,000 m
Superstructure shape:	Cargo ship		
Transverse area:	0,0 m2		
VCE above WL:	0,000 m		
Profile area:	0,0 m2		

Resistance

28 sep 2015 12:01

HydroComp NavCad 2012

Project ID **Proyecto**

Description

File name **Proyecto.hcnc**

Symbols and values

FN = Froude number [LWL]
FV = Froude number [VOL]
RN = Reynolds number [LWL]
CF = Frictional resistance coefficient
CV/CF = Viscous/frictional resistance coefficient ratio [dynamic form factor]
CR = Residuary resistance coefficient
dCF = Added frictional resistance coefficient for roughness
CA = Correlation allowance [dynamic]
CT = Total bare-hull resistance coefficient

RBARE = Bare-hull resistance
RAPP = Additional appendage resistance
RWIND = Additional wind resistance
RSEAS = Additional sea-state resistance
RCHAN = Additional shallow/channel resistance
RMARGIN = Resistance margin
RTOTAL = Total vessel resistance

CTLR = Telfer residuary resistance coefficient
CTLT = Telfer total bare-hull resistance coefficient
PEBARE = Bare-hull effective power
PETOTAL = Total effective power

+ = Design speed indicator
* = Exceeds parameter limit

Resistance

28 sep 2015 12:00

HydroComp NavCad 2012

Project ID **Proyecto**

Description

File name **Proyecto.hcnc**

Analysis parameters

Vessel drag		ITTC-78 (CT)		Added drag	
Technique:	[Calc] Prediction	Oortmerssen		Appendage:	[Calc] Holtrop (Component)
Prediction:				Wind:	[Off]
Reference ship:				Seas:	[Off]
Model LWL:				Shallow/channel:	[Off]
Expansion:	Standard			Margin:	[Calc] Hull + added drag [15%]
Friction line:	ITTC-57			Water properties	
Hull form factor:	[On] 1,318			Water type:	Salt
Speed corr:	[Off]			Density:	1026,00 kg/m3
Spray drag corr:	[Off]			Viscosity:	1,18920e-6 m2/s
Corr allowance:	ITTC-78 (v2008)				
Roughness [mm]:	[Off]				

Prediction method check [Oortmerssen]

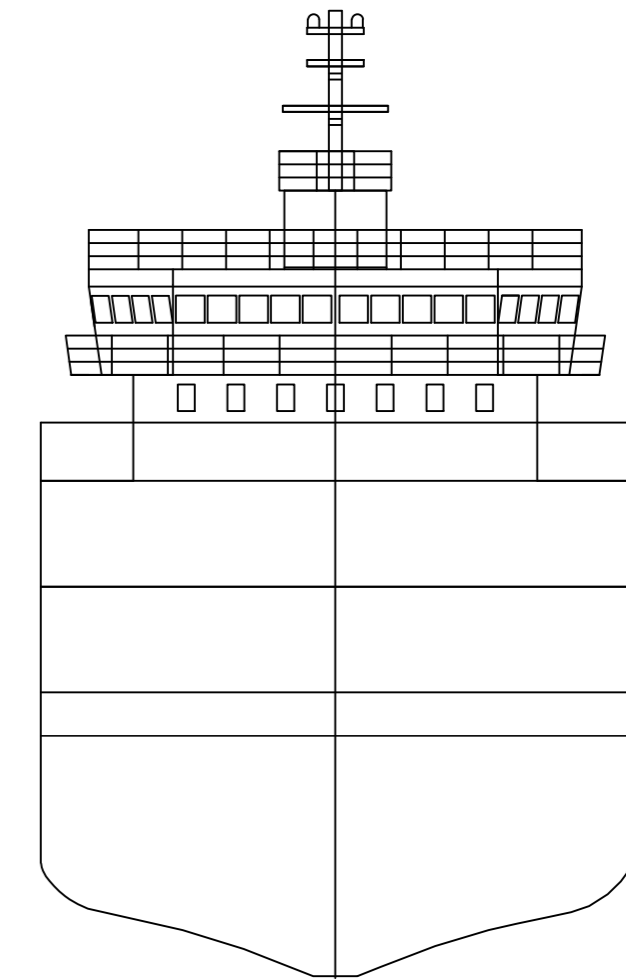
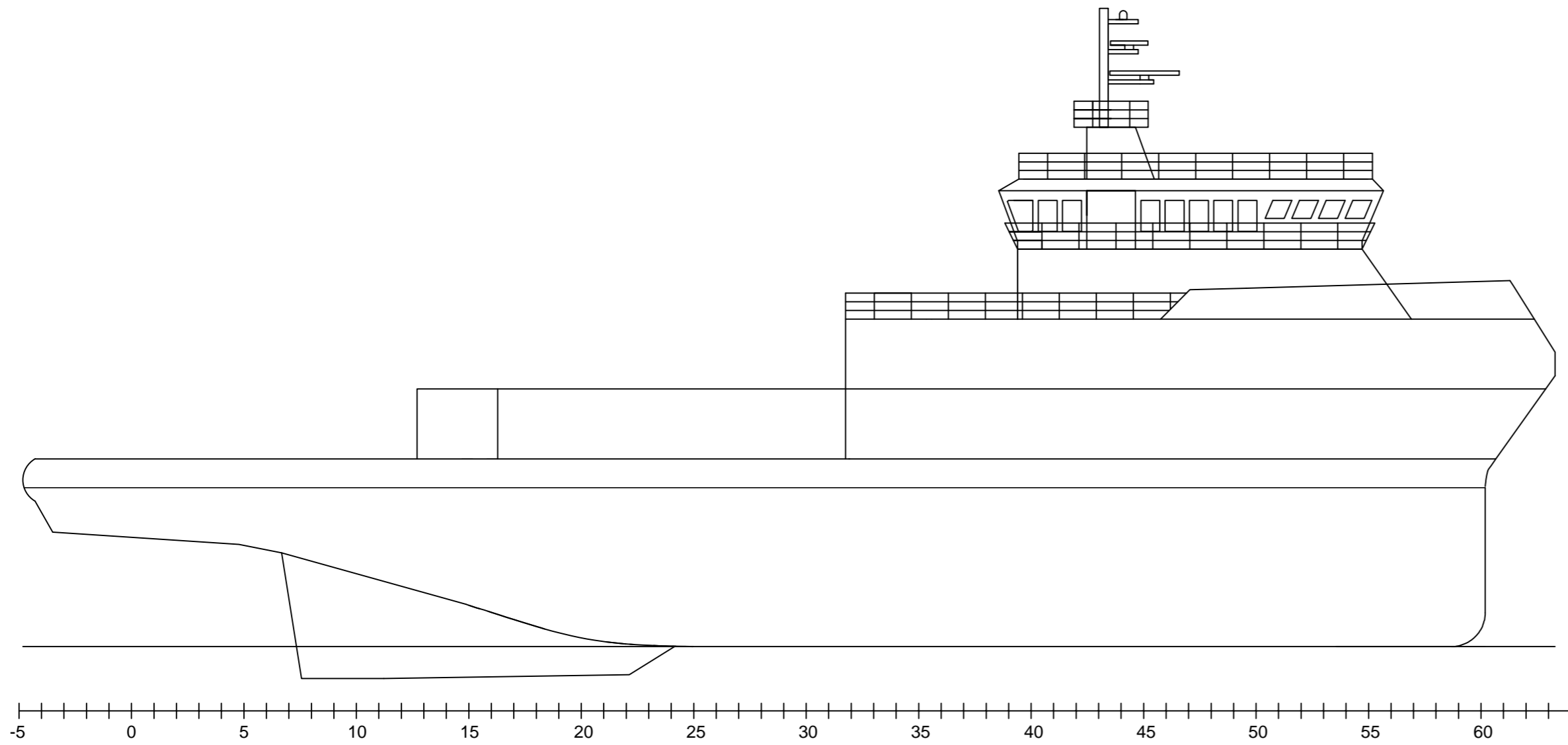
Parameters	FN [design]	CP	LWL/BWL	BWL/T	XCB/LWL	IE	CX
Value	0,33	0,56	3,48	2,45	0,480	21,1	0,93
Range	0,05-0,50	0,51-0,69	3,50-6,30	1,90-3,40	0,467-0,537	10,0-38,0	0,73-0,97

Prediction results

SPEED [kt]	SPEED COEFS		ITTC-78 COEFS						
	FN	FV	RN	CF	[CV/CF]	CR	dCF	CA	CT
1,00	0,022	0,044	2,34e7	0,002601	1,318	0,000001	0,000000	0,000463	0,003892
3,00	0,067	0,131	7,03e7	0,002194	1,318	0,000001	0,000000	0,000649	0,003541
5,00	0,112	0,218	1,17e8	0,002036	1,318	0,000001	0,000000	0,000682	0,003367
7,00	0,156	0,306	1,64e8	0,001942	1,318	0,000205	0,000000	0,000690	0,003454
9,00	0,201	0,393	2,11e8	0,001875	1,318	0,000770	0,000000	0,000689	0,003931
11,00	0,246	0,481	2,58e8	0,001825	1,318	0,001036	0,000000	0,000685	0,004126
13,00	0,290	0,568	3,05e8	0,001784	1,318	0,002703	0,000000	0,000679	0,005733
+ 15,00 +	0,335	0,655	3,52e8	0,001750	1,318	0,003237	0,000000	0,000672	0,006215
17,00	0,379	0,743	3,98e8	0,001722	1,318	0,010099	0,000000	0,000665	0,013032
RESISTANCE AND EFFECTIVE POWER									
SPEED [kt]	RBARE [kN]	RAPP [kN]	RWIND [kN]	RSEAS [kN]	RCHAN [kN]	RMARGIN [kN]	RTOTAL [kN]	PEBARE [kW]	PETOTAL [kW]
1,00	0,55	0,06	0,00	0,00	0,00	0,09	0,70	0,3	0,4
3,00	4,50	0,49	0,00	0,00	0,00	0,75	5,74	6,9	8,9
5,00	11,88	1,32	0,00	0,00	0,00	1,98	15,19	30,6	39,1
7,00	23,90	2,52	0,00	0,00	0,00	3,96	30,38	86,1	109,4
9,00	44,95	4,08	0,00	0,00	0,00	7,35	56,39	208,1	261,1
11,00	70,48	6,00	0,00	0,00	0,00	11,47	87,96	398,8	497,7
13,00	136,77	8,27	0,00	0,00	0,00	21,76	166,79	914,7	1115,5
+ 15,00 +	197,42	10,88	0,00	0,00	0,00	31,25	239,55	1523,4	1848,5
17,00	531,70	13,84	0,00	0,00	0,00	81,83	627,37	4650,0	5486,7
OTHER									
SPEED [kt]	CTLR	CTLT							
1,00	0,00001	0,03877							
3,00	0,00001	0,03527							
5,00	0,00001	0,03354							
7,00	0,00204	0,03440							
9,00	0,00767	0,03915							
11,00	0,01032	0,04109							
13,00	0,02691	0,05709							
+ 15,00 +	0,03223	0,06190							
17,00	0,10057	0,12979							



ANEXO IV
CROQUIS DEL PERFIL Y SECCIÓN
TRANSVERSAL



ESCALA 1 : 200	SISTEMA 	FORMATO UNE A-2		UNIVERSIDADE DA CORUÑA ESCOLA POLITÉCNICA SUPERIOR DE FERROL GRADO EN INGENIERÍA DE PROPULSIÓN Y SERVICIOS DEL BUQUE	
	AUTOR Mario Teijeiro Prieto	FECHA 12/2015	FIRMA	PROYECTO Remolcador de altura polivalente	
	COMPROBADO				
	USO DE NORMAS				
TUTOR DEL PROYECTO Don Raul Villa Caro				PLANO Croquis perfil y sección transversal	HORA 1 DE 1
ARCHIVO	SUSTITUIDO POR		SUSTITUIDA		

