OE1012
Assignment

Jan – May 2019

By:

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Water Lines

Stations	0	0.5	1	2	3	4	5	6	7	8	8.8	10	11	12	13	13.5	Station Area
-0.5	0	0	0	0	0	0	0	0	0	0	0	2.972	3.379	3.827	4.334	4.477	**0.000**
0	0	0	0	0	0	0	0	0	0	1.5	3.15	3.95	4.5	4.9	5.25	5.45	**3.720**
0.5	0	0	0	0.3	0.6	0.7	0.7	0.75	1.95	3.7	4.4	5.125	5.757	5.95	6.25	6.35	**21.800**
1	0.2	0.7	0.9	1	1.3	1.9	2.25	2.8	3.75	4.85	5.5	6.15	6.525	6.9	7.2	7.3	**43.433**
1.5	0.2	0.95	1.3	1.85	2.25	2.7	3.25	4.15	5.15	6	6.45	7.05	7.45	7.8	8.1	8.25	**60.333**
2	0.4	1.45	1.8	2.5	3.05	3.8	4.5	5.55	6.35	7.05	7.45	8.05	8.4	8.7	9	9.1	**77.767**
3	1.425	2.85	3.55	4.7	5.6	6.45	7.2	7.9	8.4	8.85	9.25	9.55	9.825	10.05	10.35	10.45	**116.658**
4	3.7	5.45	6.2	7.3	8.15	8.85	9.35	9.75	10.1	10.4	10.65	10.85	11.05	11.25	11.45	11.6	**155.400**
5	6.4	8	8.6	9.5	10.1	10.6	10.9	11.15	11.4	11.55	11.7	11.85	12	12.1	12.25	12.3	**186.533**
6	8.025	9.6	10.25	11	11.5	11.8	12	12.15	12.3	12.35	12.45	12.55	12.6	12.7	12.8	12.8	**207.892**
7	9.05	10.55	11.05	11.75	12.25	12.55	12.65	12.75	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**219.867**
8	9.5	10.95	11.5	12.1	12.45	12.75	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**223.067**
9	9.5	10.95	11.5	12.1	12.45	12.75	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**223.067**
10	9.5	10.95	11.5	12.1	12.45	12.75	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**223.067**
11	9.5	10.95	11.5	12.1	12.45	12.75	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**223.067**
12	9.05	10.25	10.9	11.65	11.95	12.25	12.45	12.6	12.725	12.8	12.8	12.8	12.8	12.8	12.8	12.8	**217.083**
13	7.8	9.35	9.95	10.7	11.15	11.55	11.8	12.05	12.275	12.35	12.45	12.6	12.725	12.8	12.8	12.8	**204.683**
14	6.2	7.95	8.65	9.45	10.05	10.55	10.95	11.33	11.725	11.95	12.15	12.4	12.55	12.65	12.8	12.8	**188.463**
15	4.225	6.1	6.8	7.85	8.65	9.15	9.8	10.2	10.65	11	11.3	11.65	12	12.35	12.45	12.55	**164.542**
16	2.4	3.85	4.7	5.8	6.65	7.45	8.1	8.75	9.325	9.75	10.15	10.75	11	11.4	11.7	11.75	**134.167**
17	1.4	2.4	2.9	3.75	4.55	5.25	5.9	6.55	7.15	7.8	8.15	8.8	9.25	9.75	10.15	10.35	**97.733**
18	0.6	1.5	1.85	2.4	2.9	3.25	3.7	4.15	4.575	4.95	5.3	5.9	6.4	6.9	7.45	7.75	**61.817**
18.5	0.275	1.05	1.4	1.85	2.25	2.55	2.8	2.975	3.2	3.3	3.4	3.8	4.3	4.9	5.625	5.95	**44.625**
19	0.125	0.5	1.15	1.555	1.875	2.1	2.2	2.2	2.05	1.85	1.8	1.95	1.55	2.85	3.6	4	**31.772**
19.5	0.1	0.55	0.8	1.2	1.525	1.75	1.9	1.95	1.55	0.9	0.65	0.8	0.8	1.55	2.15	2.4	**24.100**
20	0	0	0.55	0.95	1.25	1.55	1.65	1.65	1.1	0.35	0	0.1	0.4	0.8	1.3	1.6	**17.883**
WP Area	**1,683.283**	**2,117.315**	**2,300.454**	**2,546.274**	**2,725.490**	**2,877.746**	**2,988.494**	**3,091.188**	**3,188.279**	**3,284.400**	**3,361.715**	**3,462.608**	**3,530.650**	**3,612.718**	**3,683.713**	**3,714.860**	

Stem

WL	0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	8.8	10.0	11.0	12.0	13.0	13.5
Distance	-3.60	0.00	1.30	2.90	3.70	4.10	3.85	2.65	1.20	0.30	0.00	0.55	1.30	2.30	3.40	4.05

Stern

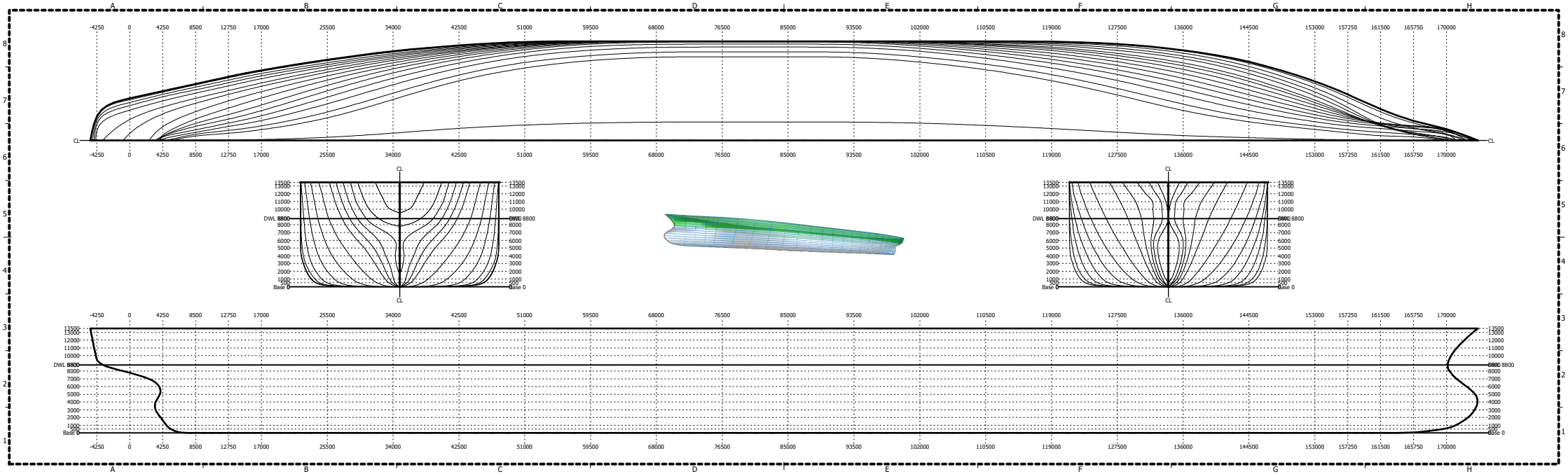
WL	0.00	0.50	1.00	2.00	3.00	4.00	5.00	6.00	7.00	8.00	8.35	8.80	10.00	11.00	12.00	13.00	13.50
Distance	6.30	5.20	4.70	4.00	3.20	3.20	4.05	3.95	2.90	-0.80	-4.00	-4.10	-4.40	-4.60	-4.80	-5.00	-5.10

Hydrostatic Parameters

Draft	0	0.5	1	2	3	4	5	6	7	8	8.8	10	11	12	13	13.5
Volume	0	950	2,075	4,477	7,106	9,919	12,848	15,887	19,027	22,270	25,588	29,001	32,503	36,067	39,716	41,566
Disp	0	974	2,127	4,589	7,284	10,167	13,169	16,284	19,503	22,826	26,228	29,726	33,315	36,969	40,709	42,605
KB	0.000	0.279	0.525	1.064	1.602	2.137	2.680	3.221	3.762	4.304	4.841	5.365	5.934	6.470	7.032	7.301
TPC	17.25	21.70	23.58	26.10	27.94	29.50	30.63	31.68	32.68	33.67	34.46	35.49	36.19	37.03	37.76	38.08
MCT	0.0	157.4	176.9	206.0	229.3	249.7	258.0	276.3	297.3	316.9	332.1	351.4	365.3	390.9	408.4	423.6
KMT	0.0	64.3	35.5	21.1	16.0	13.6	12.1	11.3	10.8	10.6	10.5	10.6	10.8	11.0	11.3	11.4
KML	0	2663	1386	759	538	422	335	289	260	242	225	212	199	194	186	185
IT	37,110	60,834	72,572	89,527	1,02,268	1,13,683	1,21,080	1,27,775	1,34,575	1,40,064	1,45,017	1,51,589	1,57,047	1,62,657	1,67,584	1,69,766
IL	0	25,30,143	28,74,985	33,93,797	38,14,831	41,62,632	42,73,733	45,47,649	48,81,489	52,89,492	56,40,177	59,97,356	62,69,747	67,54,439	71,07,770	74,03,863
CW	0.000	0.587	0.600	0.623	0.642	0.660	0.688	0.716	0.740	0.750	0.754	0.773	0.784	0.797	0.807	0.810
CB	0.000	0.527	0.542	0.548	0.558	0.569	0.591	0.613	0.631	0.636	0.652	0.648	0.656	0.663	0.669	0.671
CP	0.000	0.564	0.577	0.586	0.597	0.611	0.627	0.644	0.658	0.659	0.659	0.667	0.674	0.679	0.684	0.686
LCB	0.00	82.02	81.93	82.27	82.27	81.98	81.90	81.78	81.62	81.41	81.17	80.88	80.65	80.42	80.24	80.16
LCF	82.50	82.90	83.29	83.52	83.69	83.60	83.68	83.46	82.92	81.76	81.01	80.79	80.72	81.26	81.56	81.74
CM	0.000	0.934	0.939	0.934	0.935	0.932	0.943	0.952	0.959	0.964	0.990	0.971	0.974	0.976	0.978	0.979
WSA	0	2,045	2,364	2,817	3,236	3,636	4,015	4,382	4,741	5,096	5,451	5,790	6,134	6,474	6,812	6,980

Station Areas

	Water Lines															
Stations	**0**	**0.5**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**8.8**	**10**	**11**	**12**	**13**	**13.5**
-0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.57	10.18	17.16	25.53	34.40
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.13	3.72	13.43	21.73	31.33	41.48	46.83
0.5	0.00	0.00	0.00	0.30	1.20	2.55	3.93	5.38	7.80	13.31	21.80	31.33	42.24	54.07	66.20	72.50
1	0.00	0.45	1.30	3.20	5.43	8.58	12.87	17.88	24.18	32.93	43.43	54.89	67.85	80.99	95.11	102.36
1.5	0.00	0.58	1.77	4.92	9.07	13.99	19.93	27.28	36.53	47.80	60.33	73.69	88.40	103.46	119.37	127.54
2	0.00	0.93	2.67	6.97	12.57	19.35	27.73	37.73	49.58	63.17	77.67	93.00	109.80	126.57	144.27	153.32
3	0.00	2.14	5.46	13.71	24.09	36.13	49.83	64.93	81.25	98.54	116.66	135.43	154.84	174.70	195.08	205.48
4	0.00	4.58	10.57	24.07	39.60	56.62	74.87	93.98	113.80	134.34	155.40	176.88	198.80	221.08	243.78	255.30
5	0.00	7.20	15.67	33.77	53.47	74.17	95.73	117.79	140.28	163.31	186.53	210.03	233.93	258.00	282.33	294.60
6	0.00	8.81	18.89	40.14	62.73	86.05	109.86	134.02	158.47	183.13	207.89	232.90	258.06	283.34	308.84	321.64
7	0.00	9.80	20.77	43.57	67.63	92.47	117.70	143.10	168.63	194.28	219.87	245.43	271.07	296.63	322.23	335.03
8	0.00	10.23	21.60	45.20	69.83	95.03	120.67	146.28	171.79	197.47	223.07	248.59	274.27	299.79	325.39	338.19
9	0.00	10.23	21.60	45.20	69.83	95.03	120.67	146.28	171.79	197.47	223.07	248.59	274.27	299.79	325.39	338.19
10	0.00	10.23	21.60	45.20	69.83	95.03	120.67	146.28	171.79	197.47	223.07	248.59	274.27	299.79	325.39	338.19
11	0.00	10.23	21.60	45.20	69.83	95.03	120.67	146.28	171.79	197.47	223.07	248.59	274.27	299.79	325.39	338.19
12	0.00	9.65	20.32	42.87	66.62	90.78	115.55	140.61	165.87	191.47	217.08	242.62	268.28	293.82	319.42	332.22
13	0.00	8.58	18.38	39.03	60.98	83.67	107.08	130.93	155.20	179.93	204.68	229.66	255.07	280.53	306.14	318.94
14	0.00	7.08	15.55	33.65	53.22	73.83	95.35	117.63	140.66	164.40	188.46	212.98	238.00	263.15	288.58	301.38
15	0.00	5.16	11.81	26.46	43.04	60.90	79.74	99.78	120.75	142.25	164.54	187.65	211.14	235.65	260.51	273.01
16	0.00	3.13	7.50	18.00	30.53	44.63	60.23	77.08	95.12	114.29	134.17	154.95	176.93	199.05	222.19	233.91
17	0.00	1.90	4.63	11.28	19.60	29.42	40.57	53.02	66.73	81.67	97.73	114.58	132.80	151.62	171.55	181.80
18	0.00	1.05	2.82	7.07	12.38	18.57	25.45	33.30	42.10	51.57	61.81	73.02	85.35	98.62	112.95	120.55
18.5	0.00	0.66	1.96	5.21	9.33	14.15	19.49	25.28	31.45	37.96	44.63	51.78	59.89	69.04	79.55	85.33
19	0.00	0.31	1.09	3.80	7.26	11.25	15.57	19.99	24.26	28.17	31.77	35.47	39.21	42.81	49.53	53.33
19.5	0.00	0.33	1.03	3.03	5.78	9.08	12.73	16.60	20.21	22.71	24.10	25.46	27.20	29.16	32.96	35.24
20	0.00	0.00	0.18	1.68	3.92	6.71	9.98	13.30	16.12	17.67	17.88	17.81	18.42	19.48	21.56	23.01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Design hydrostatics report

OE1012 Assignment

Designer		Dilip Kumar, Vijay Kumar, DVVK Charan	
Created by			
Comment			
Filename		k1_improv.fbm	
Design length	180.00 (m)	Midship location	90.000 (m)
Length over all	179.15 (m)	Relative water density	1.0250
Design beam	25.600 (m)	Mean shell thickness	0.0000 (m)
Maximum beam	25.600 (m)	Appendage coefficient	1.0000
Design draft	8.800 (m)		

Volume properties		Waterplane properties	
Moulded volume	24716.1 (m^3)	Length on waterline	173.59 (m)
Total displaced volume	24716.1 (m^3)	Beam on waterline	25.600 (m)
Displacement	25334.0 (tonnes)	Entrance angle	10.049 (Degr.)
Block coefficient	0.6183	Waterplane area	3342.1 (m^2)
Prismatic coefficient	0.6437	Waterplane coefficient	0.7357
Vert. prismatic coefficient	0.8404	Waterplane center of floatation	81.268 (m)
Wetted surface area	5370.3 (m^2)	Transverse moment of inertia	143439 (m^4)
Longitudinal center of buoyancy	83.278 (m)	Longitudinal moment of inertia	5530176 (m^4)
Longitudinal center of buoyancy	-3.872 %		
Vertical center of buoyancy	4.754 (m)		
Total length of submerged body	177.44 (m)		
Total beam of submerged body	25.600 (m)		

Midship properties		Initial stability	
Midship section area	216.4 (m^2)	Transverse metacentric height	10.558 (m)
Midship coefficient	0.9606	Longitudinal metacentric height	228.50 (m)

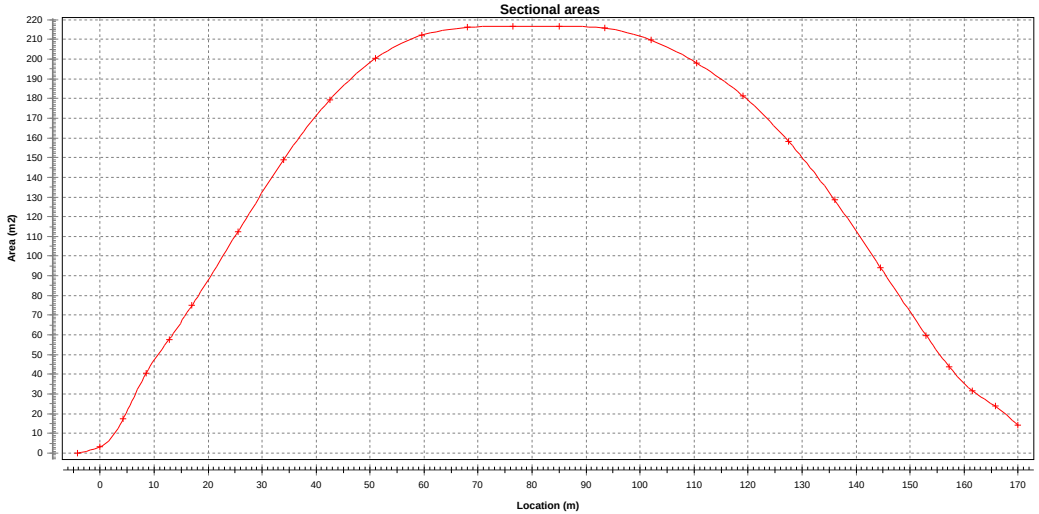
Lateral plane	
Lateral area	1486.2 (m^2)
Longitudinal center of effort	87.541 (m)
Vertical center of effort	4.429 (m)

The following layer properties are calculated for both sides of the ship

Location	Area (m^2)	Thickness (m)	Weight (tonnes)	LCG (m)	TCG (m)	VCG (m)
Layer 0	7147.3	0.000	0.0	84.380	0.000 (CL)	4.858

Sectional areas

Location (m)	Area (m^2)	Location (m)	Area (m^2)	Location (m)	Area (m^2)	Location (m)	Area (m^2)	Location (m)	Area (m^2)
-4.250	0.0	25.500	112.4	76.500	216.6	127.500	158.2	165.750	23.7
0.000	3.3	34.000	149.0	85.000	216.6	136.000	128.6	170.000	14.2
4.250	17.2	42.500	179.2	93.500	215.6	144.500	94.2		
8.500	40.5	51.000	200.3	102.000	209.6	153.000	59.7		
12.750	57.7	59.500	212.0	110.500	197.9	157.250	43.8		
17.000	74.9	68.000	216.1	119.000	181.4	161.500	31.7		



Hydrostatics

Relative water density : 1.0250

Trim: 0.000 (m)

Draft (m)	Displ FW (tonnes)	Displ. (tonnes)	LCB (m)	VCB (m)	TCB (m)	KMt (m)	KMl (m)	MCT (t*m/cm)	It (m^4)	Il (m^4)	BMt (m)	BMl (m)	TpCm (t/cm)
0.000	0.0	0.0	0.000	0.000	0.000	0.000	0.00	0.000	0	0	0.000	0.000	0.000
1.000	1959.3	2008.3	82.948	0.542	0.000	36.362	1311.41	146.26	70184	2568439	35.820	1310.866	23.358
2.000	4370.1	4479.3	83.270	1.075	0.000	21.013	713.74	177.35	87128	3114418	19.938	712.670	25.924
3.000	6994.9	7169.7	83.467	1.612	0.000	15.954	510.19	202.58	100317	3557461	14.342	508.582	27.818
4.000	9785.4	10030.1	83.592	2.152	0.000	13.523	404.66	224.29	111269	3938685	11.371	402.505	29.341
5.000	12706.6	13024.3	83.671	2.692	0.000	12.077	337.95	242.58	119249	4259986	9.385	335.257	30.511
6.000	15733.7	16127.0	83.700	3.233	0.000	11.251	293.14	259.74	126154	4561364	8.018	289.910	31.539
7.000	18857.4	19328.9	83.644	3.775	0.000	10.816	261.18	276.41	132776	4854094	7.041	257.410	32.495
8.000	22073.5	22625.3	83.481	4.318	0.000	10.602	240.29	296.61	138719	5208811	6.284	235.976	33.464
9.000	25386.2	26020.9	83.224	4.864	0.000	10.559	225.82	319.42	144578	5609291	5.695	220.958	34.446
10.000	28790.0	29509.8	82.957	5.412	0.000	10.626	213.13	340.53	150106	5980086	5.214	207.714	35.325
11.000	32272.7	33079.5	82.720	5.961	0.000	10.777	200.84	358.14	155419	6289271	4.816	194.879	36.077
12.000	35831.2	36727.0	82.547	6.512	0.000	11.000	192.20	378.88	160811	6653551	4.488	185.691	36.894
13.000	39468.7	40455.4	82.441	7.064	0.000	11.267	184.83	399.54	165905	7016310	4.203	177.769	37.675

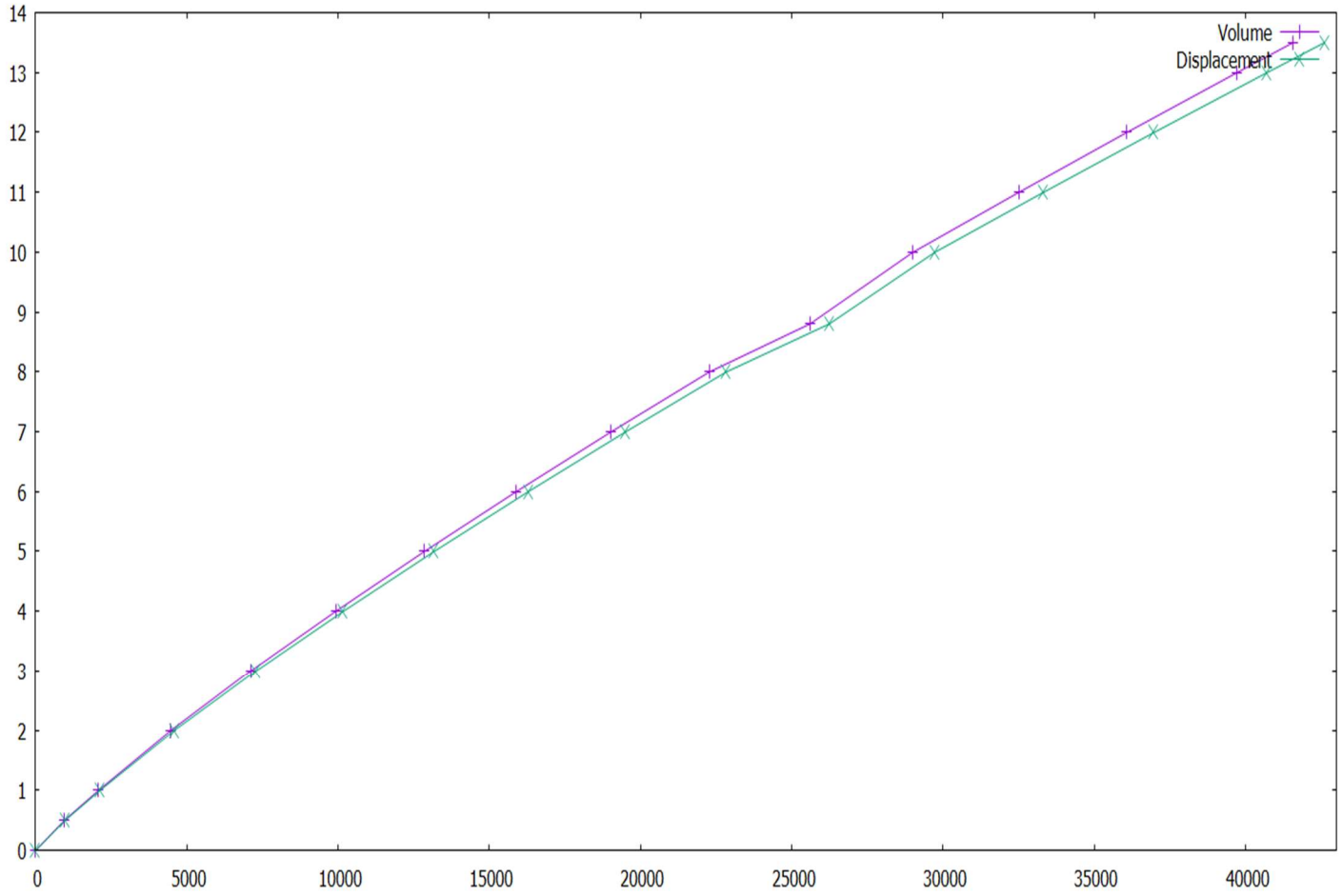
NOTE 1: Draft (and all other vertical heights) is measured from base Z=0.000
NOTE 2: All calculated coefficients based on actual dimensions of submerged body.

Nomenclature

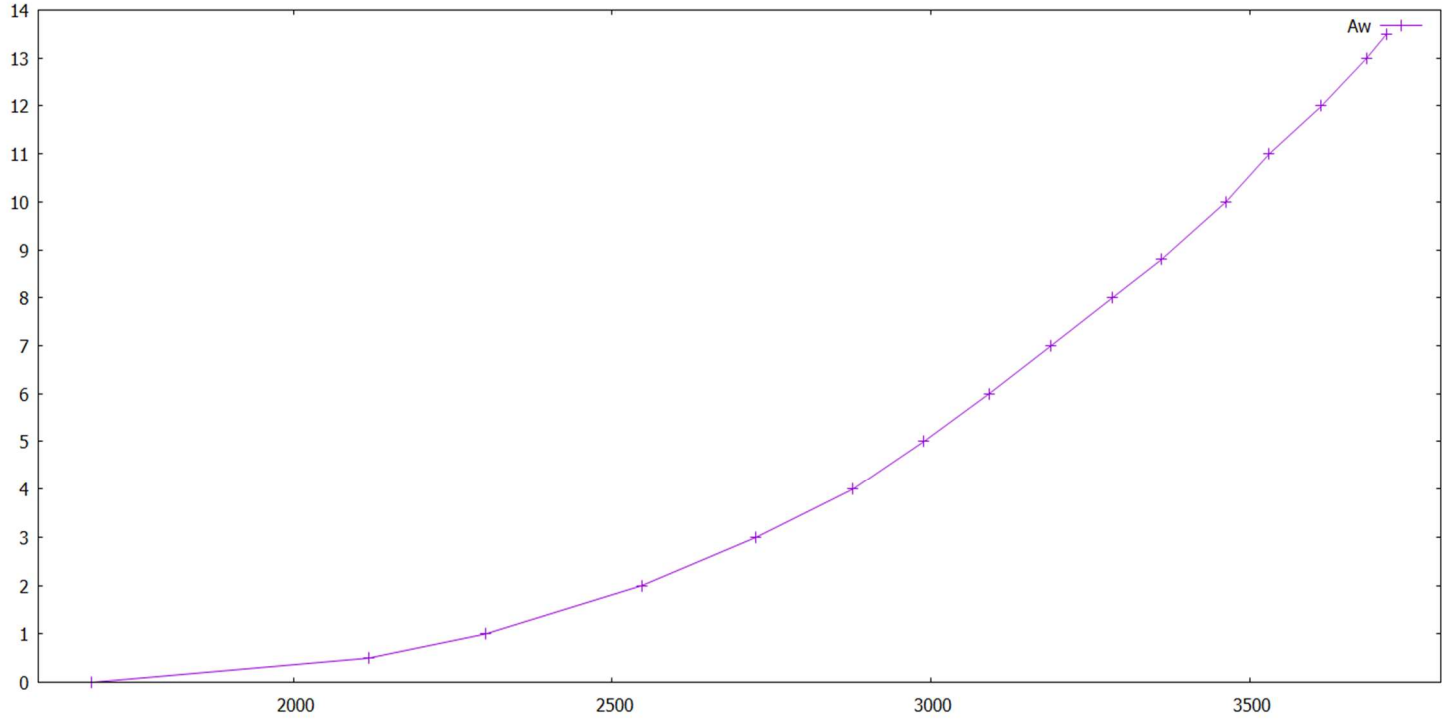
Draft	*Moulded draft, measured from baseline*
Displ FW	*Displacement fresh water*
Displ.	*Displacement*
LCB	*Longitudinal center of buoyancy, measured from the aft perpendicular at X=0.0*
VCB	*Vertical center of buoyancy*
TCB	*Transverse center of buoyancy*
KMt	*Transverse metacentric height*
KMl	*Longitudinal metacentric height*

Hydrostatic Curves

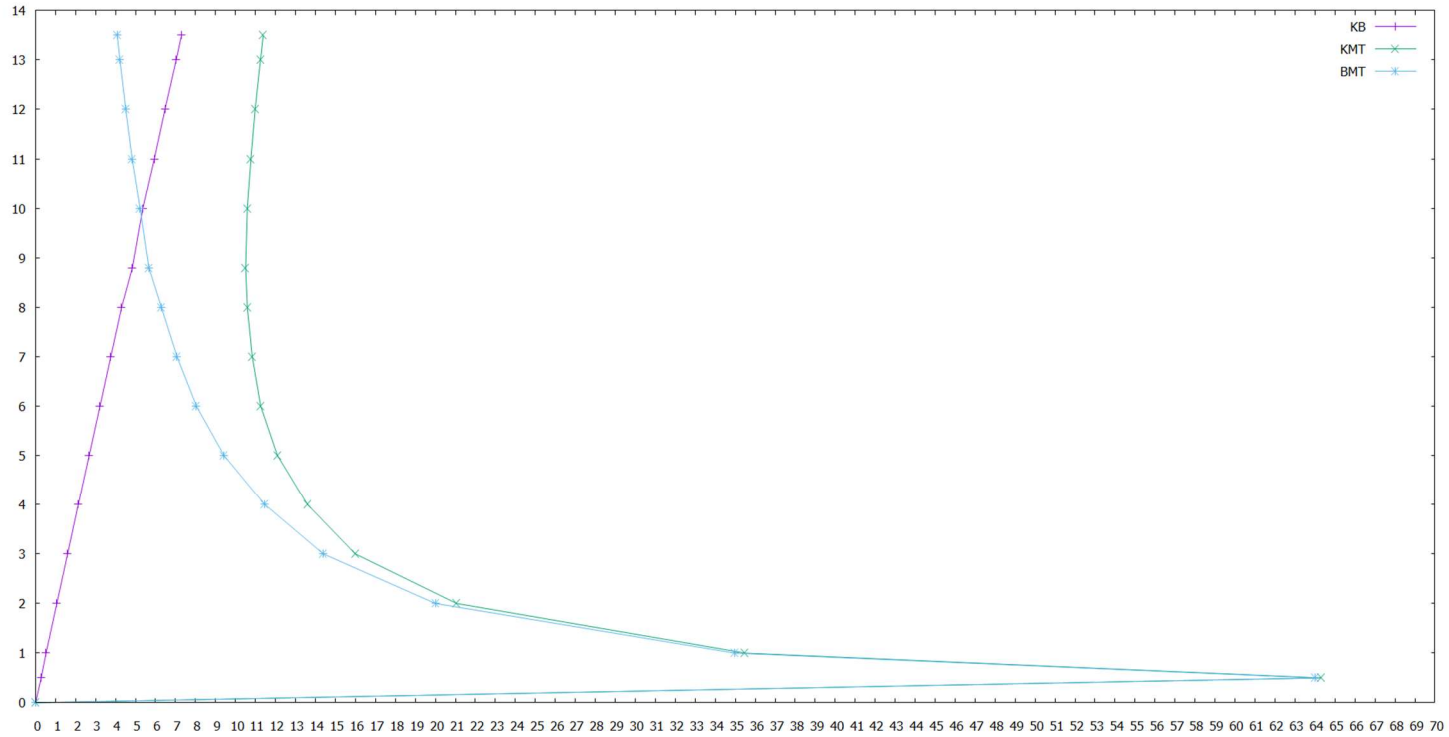
Volume + Displacement:



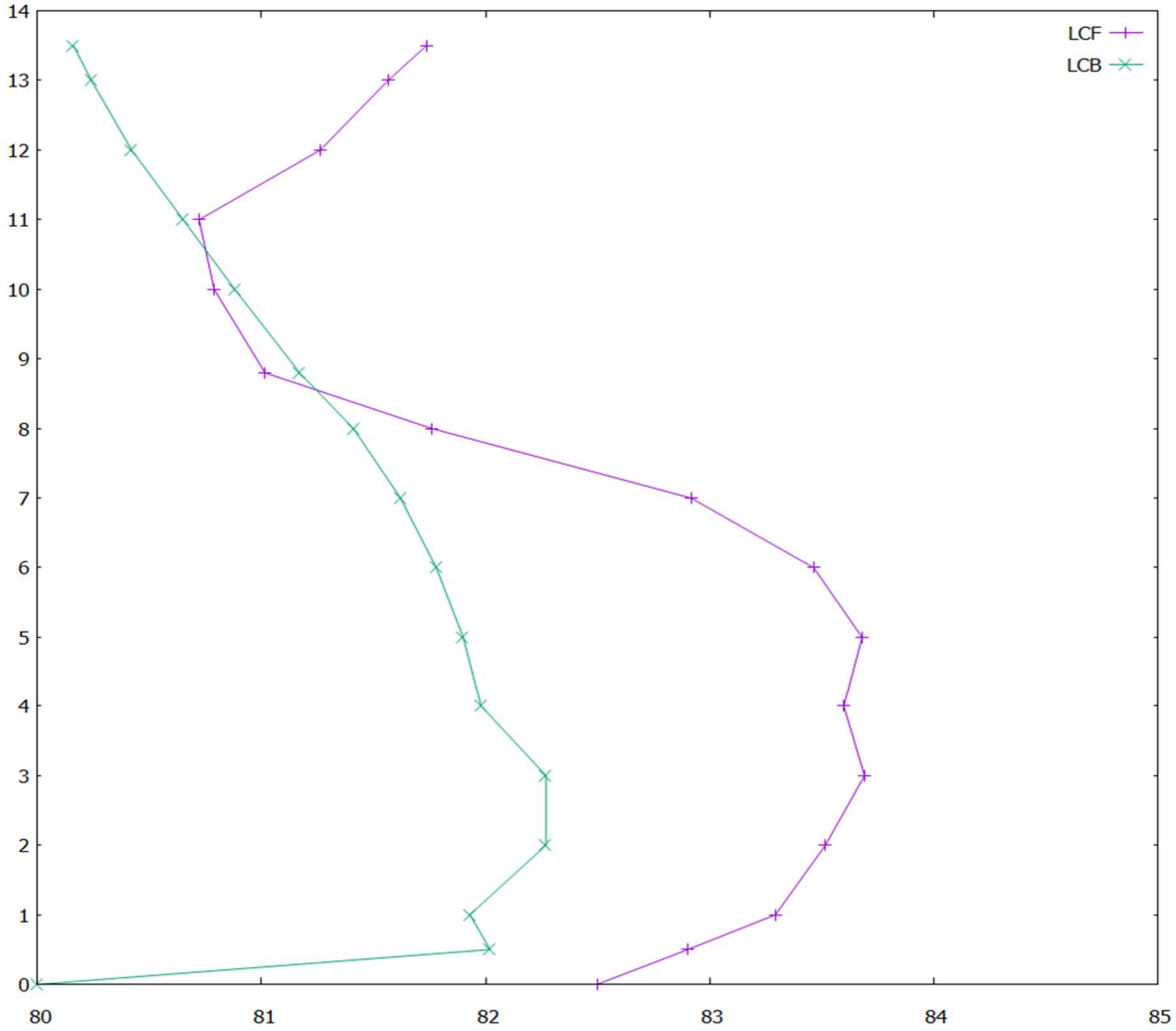
Area of Waterplane:



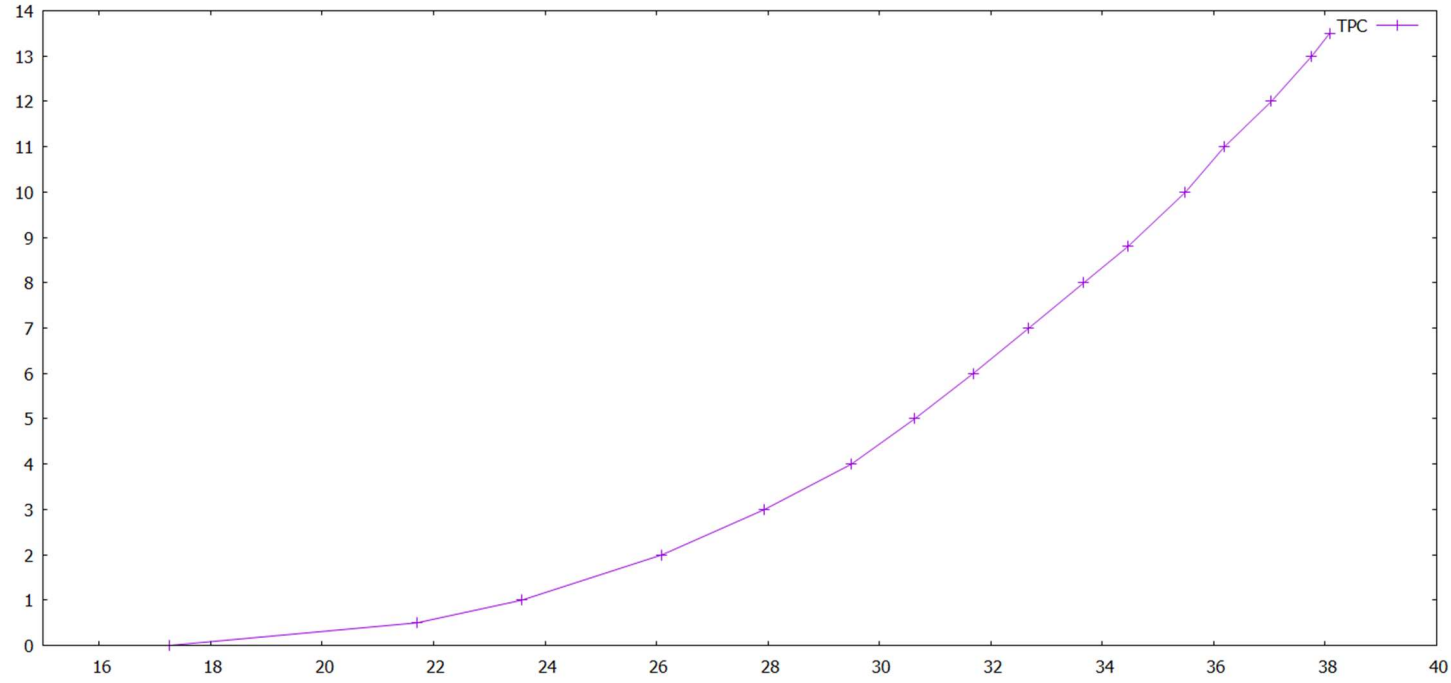
KB + KM_T + BM_T :



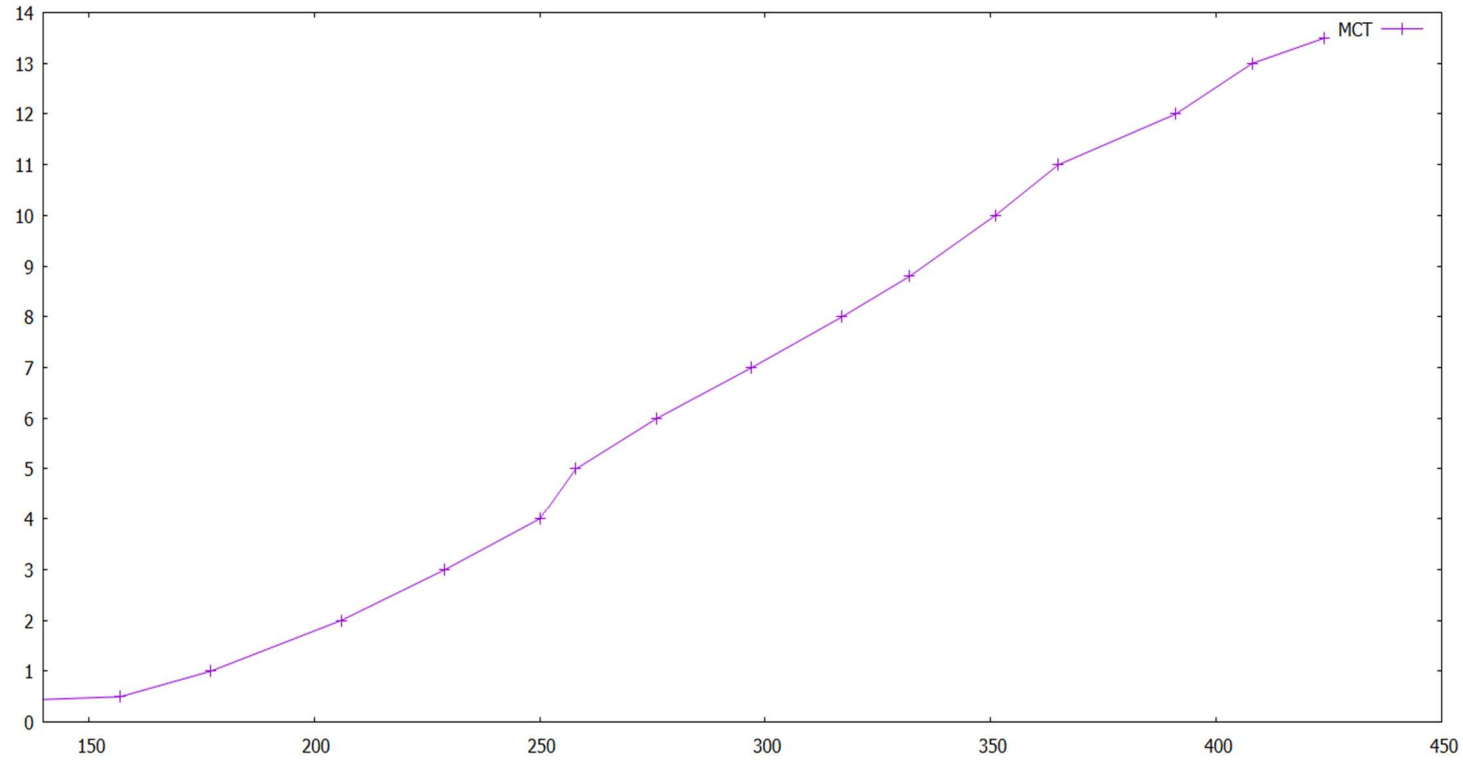
LCB + LCF:



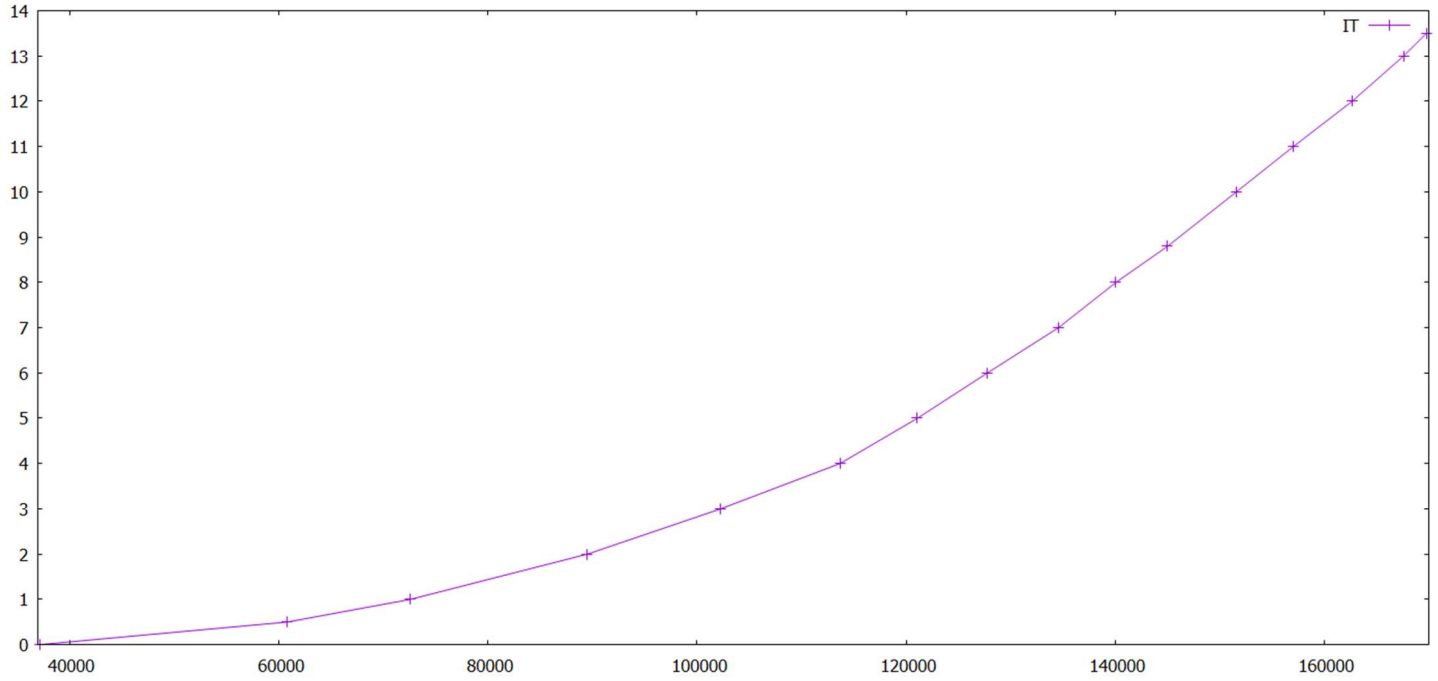
TPC :


TPC
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
16
18
20
22
24
26
28
30
32
34
36
38
40

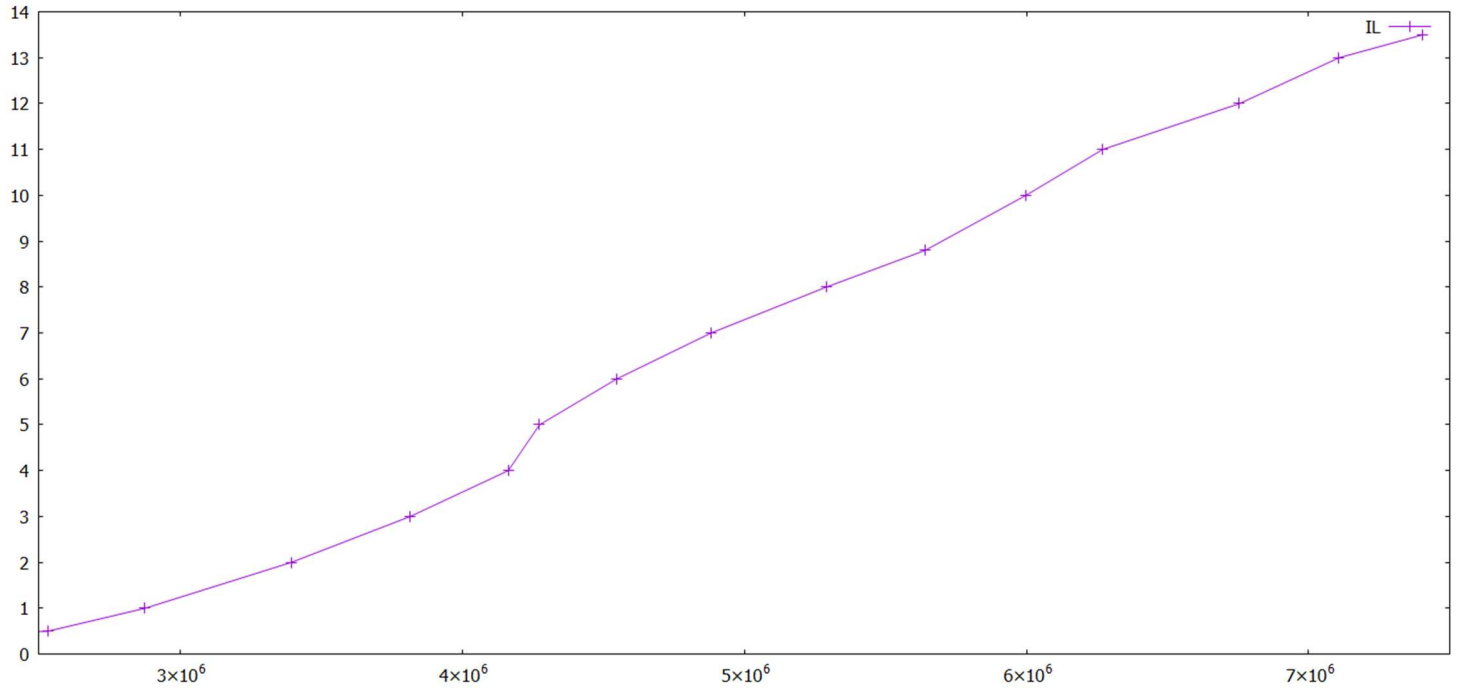
MCT_{1cm} :


MCT
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
150
200
250
300
350
400
450

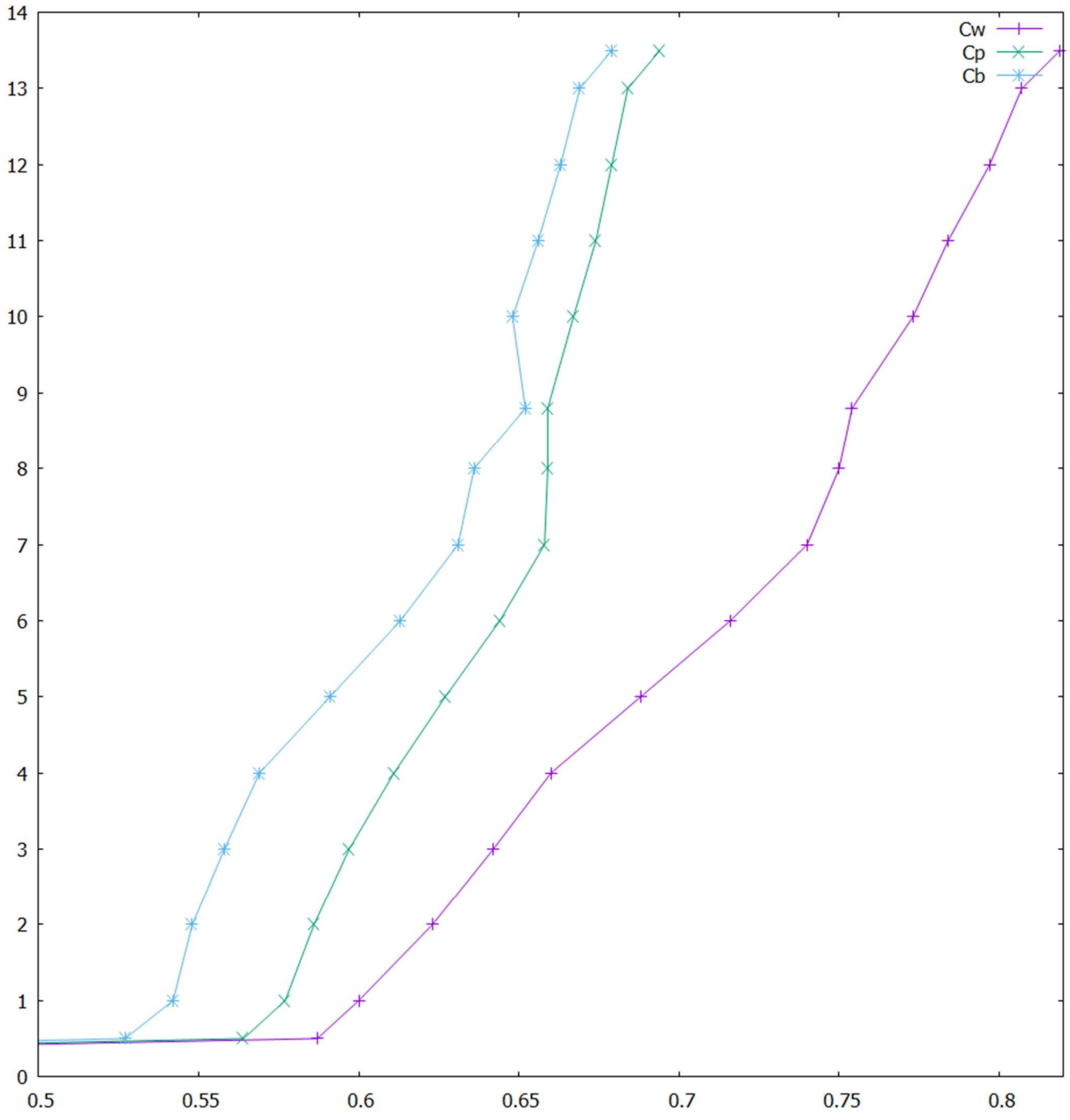
Transverse Moment of Inertia:



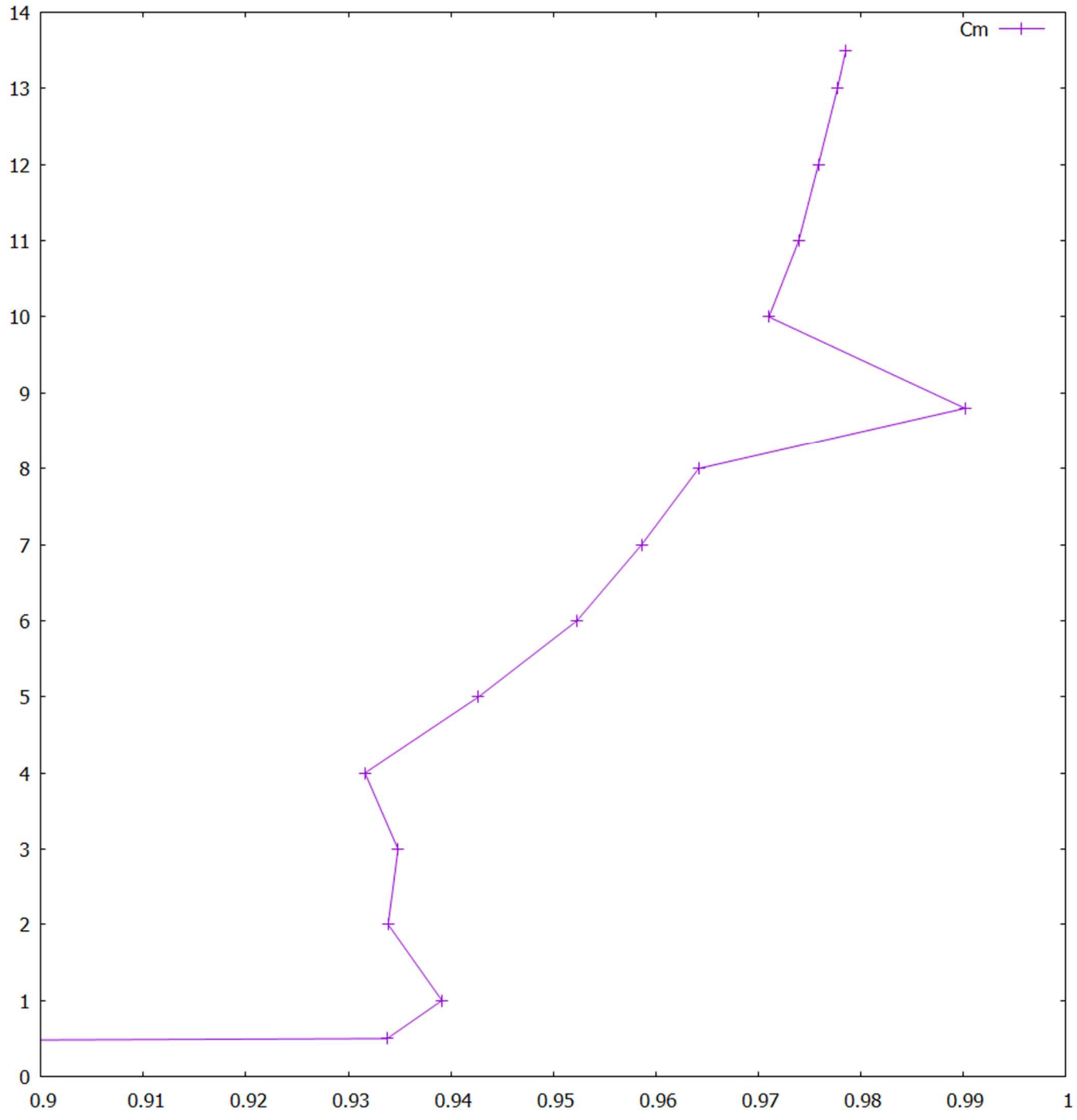
Longitudinal Moment of Inertia:



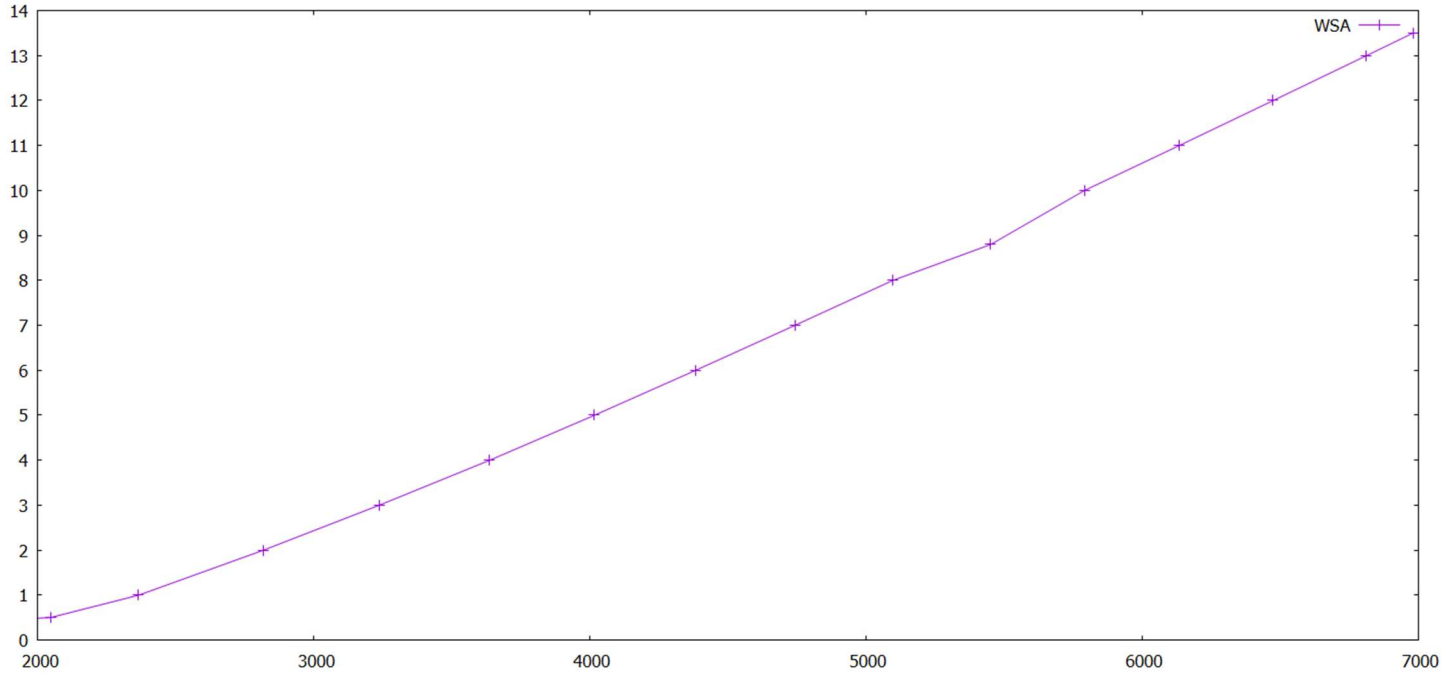
$C_B + C_P + C_W$:



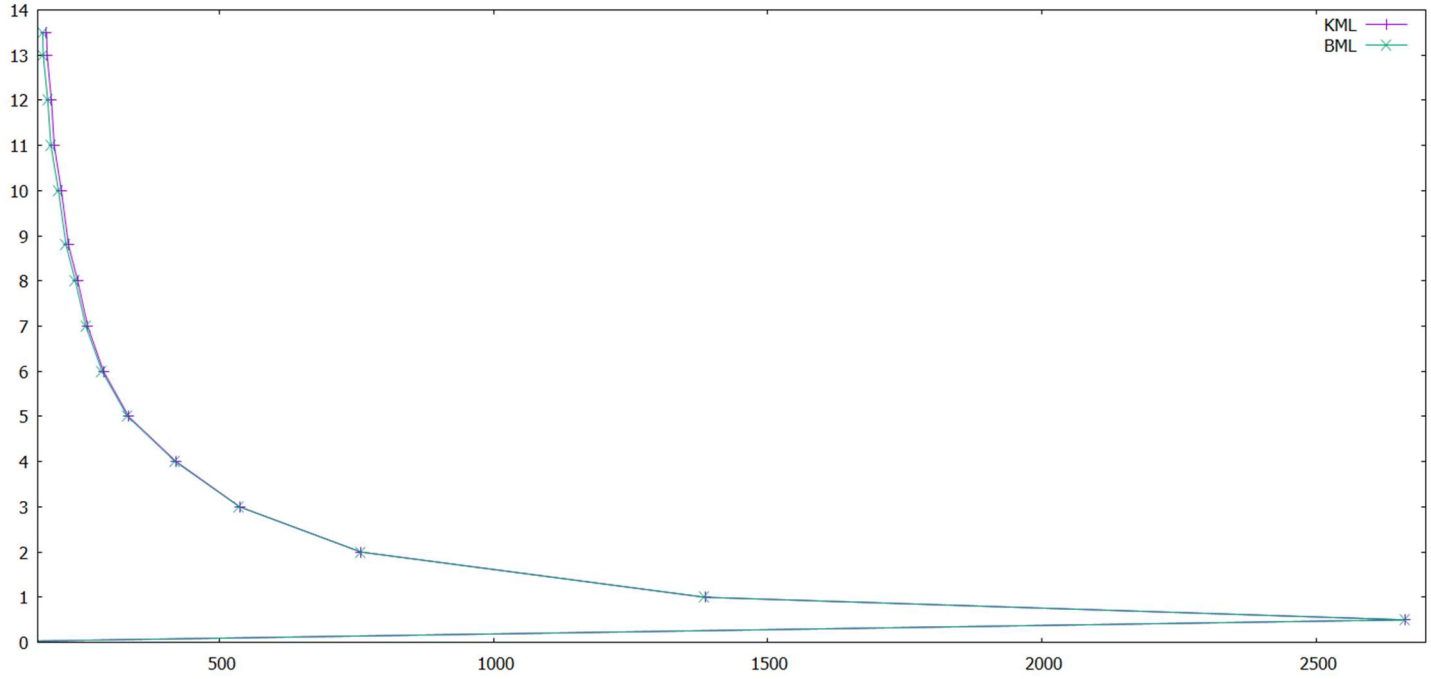
C_M:


Cm
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0.9
0.91
0.92
0.93
0.94
0.95
0.96
0.97
0.98
0.99
1

Wetted Surface Area:

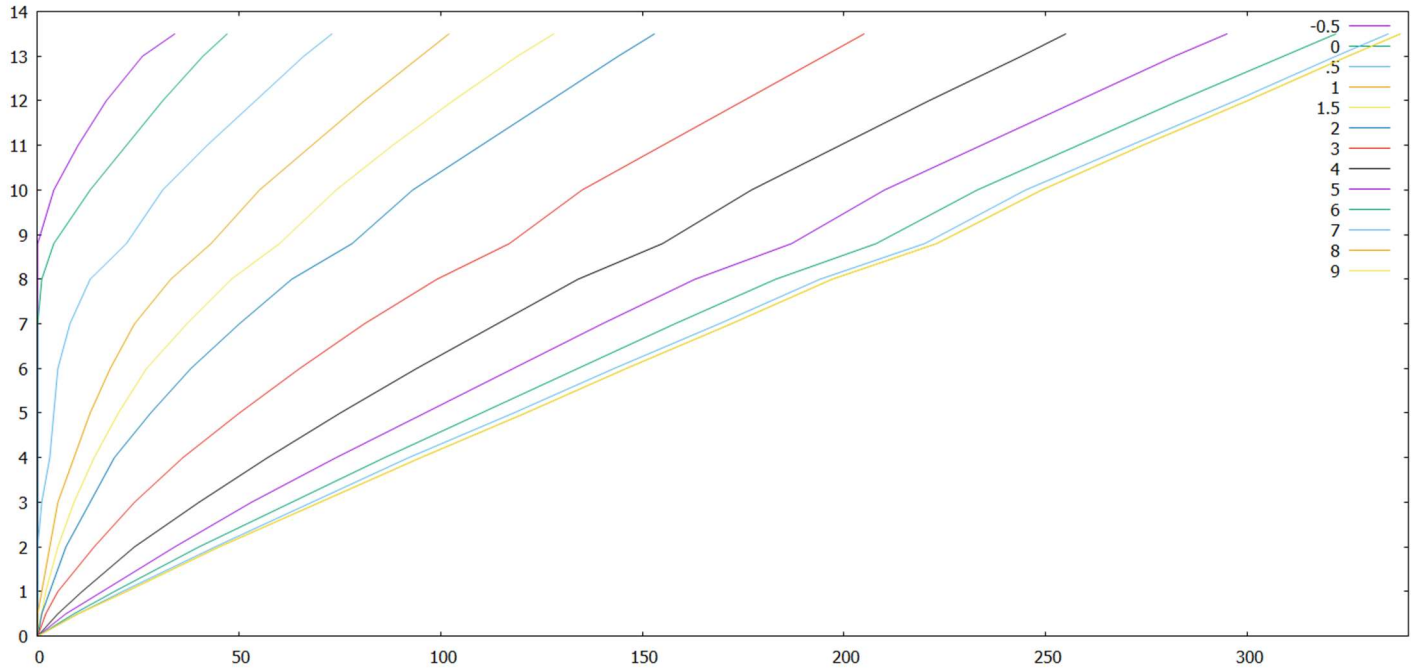


KB + KM_L + BM_L:



Bonjean Curves

Aft Stations:



Forward Stations: