Experimental Investigation of the Wave Run Up on a TLP Floating Wind Turbine

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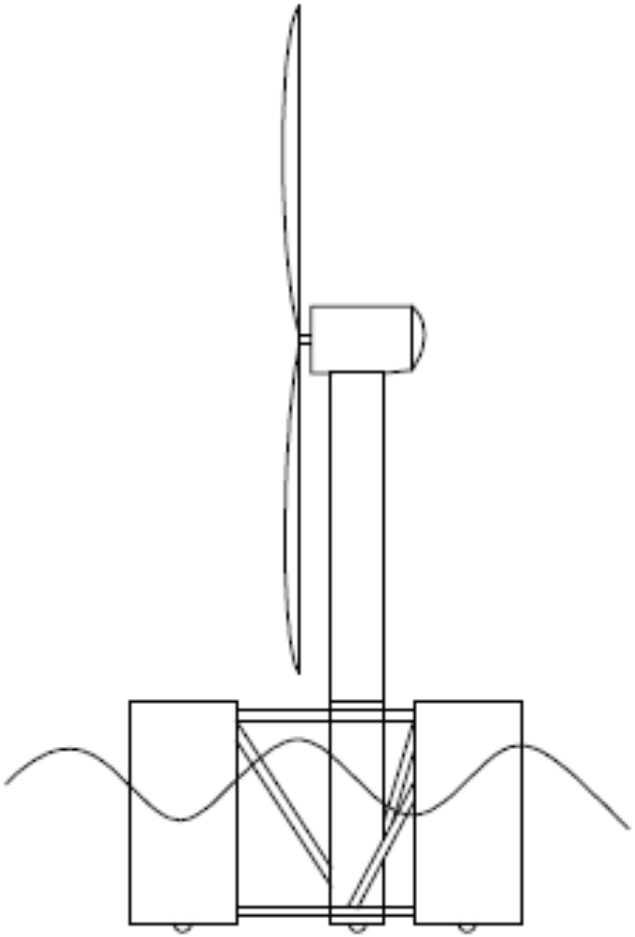
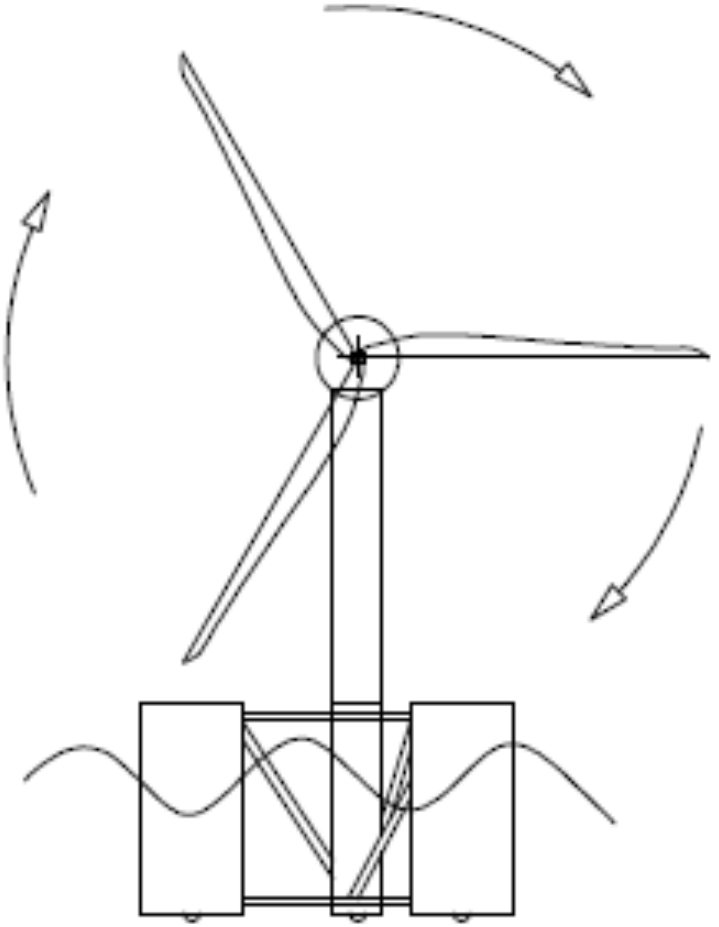
Introduction



Turbine blades in stationary condition



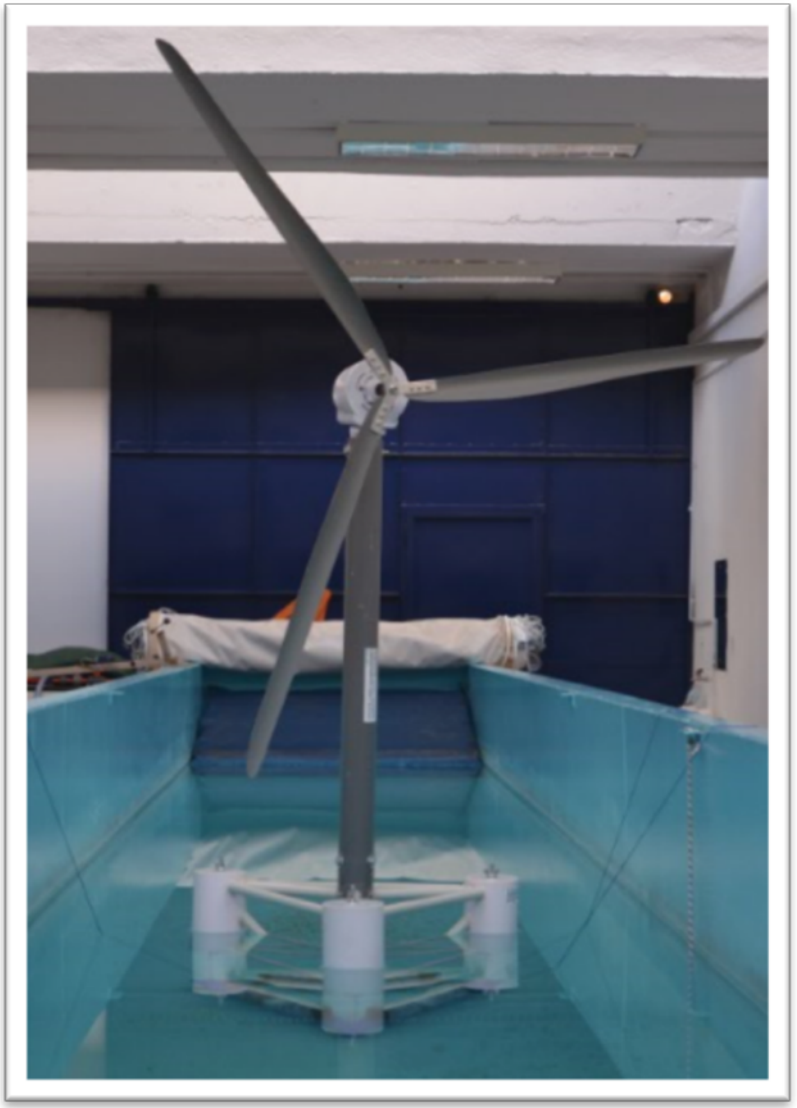
Turbine blades in operating condition

Introduction

- Important for the Environmental
- Abundant Availability of wind
- Tanks & Ballast used in the Offshore oil & Gas Industry
- Depleting Hydrocarbon Resources

Main characteristics of the model

- The central vertical cylinders.
- The cross braces.
- The base of the wind turbine tower.
- The anchor base at the bottom.
- The Vertical tower.
- The Wind Turbine (WT)engine.
- The blades of the wind turbine.



Weight Pre-Calculation

Element		Length [mm]	Quantity	Outside Diameter [mm]	Inside diameter [mm]	Thickness [mm]	weight [gr]	Total weight [Kg]
Central Cylinder	KK	320	1	63	61	2	200	0.2
Inside Cylinder	EAK	320	3	100	98	2	250	0.75
Up Horizontal Arm	AOB	41.4	3	20	18	2	111	0.333
Down Horizontal Arm	KOB	41.4	3	20	18	2	111	0.333
Up Inclined Arm	AKB	22	3	20	18	2	60	0.18
Down Inclined Arm	KKB	22	3	20	18	2	60	0.18
Diagonal Arm	ΔB	30.3	3	20	18	2	111	0.333
Wood screws		10	30	-	-	8	25	0.75
Metal angles		10 x 10	8	-	-	2	15	0.12
Metal hook		-	3	-	-	8	58	0.174
Metal screws		10	11	-	-	6	24	0.264
Metal washer		-	54	12	-	2	5	0.27
Metal nut		-	23	-	-	-	5	0.115
Screw plugs		10	30	-	-	8	7	0.21
						Total [kg]		4.212

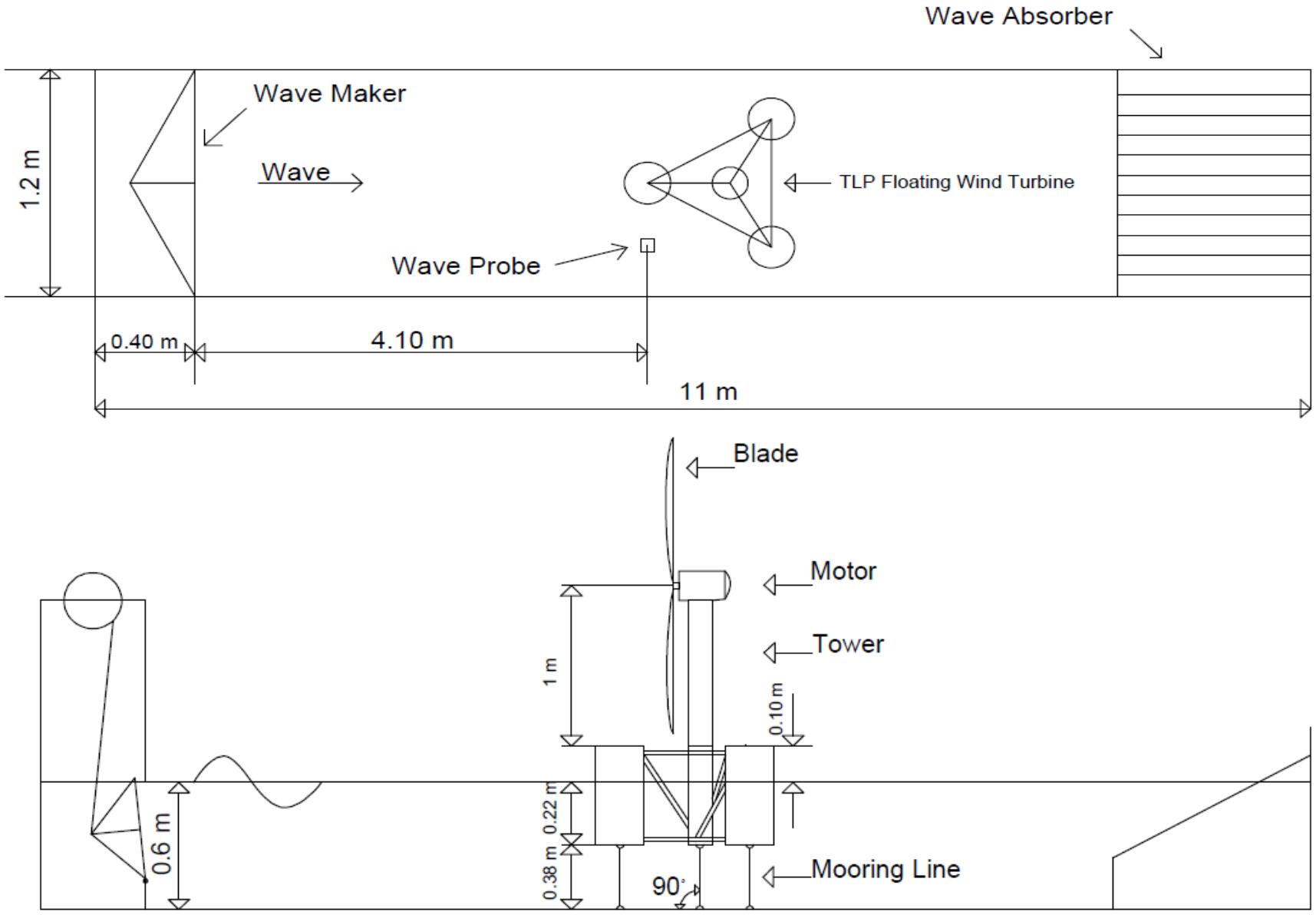
Construction of the model

- Video

Laboratory Equipment

- Video ect

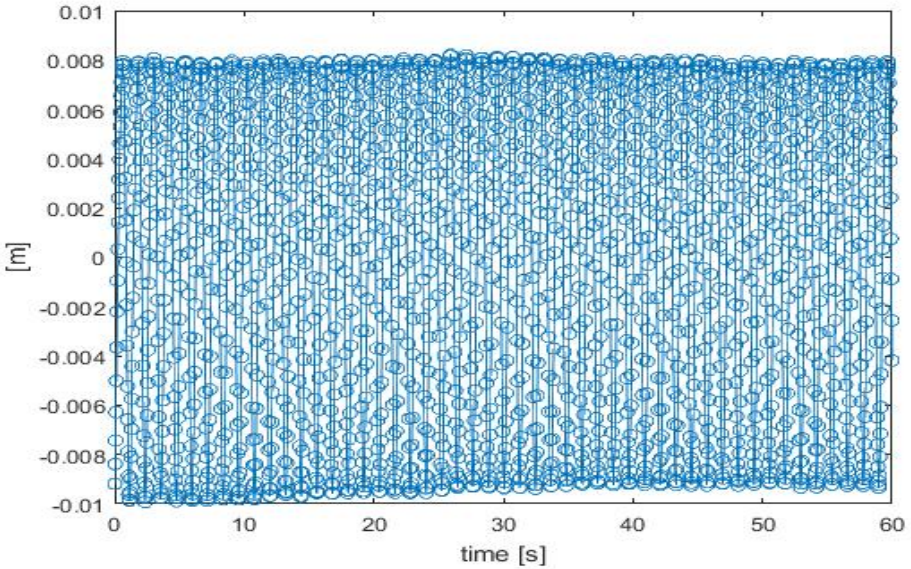
Experimental Campaign 1/2

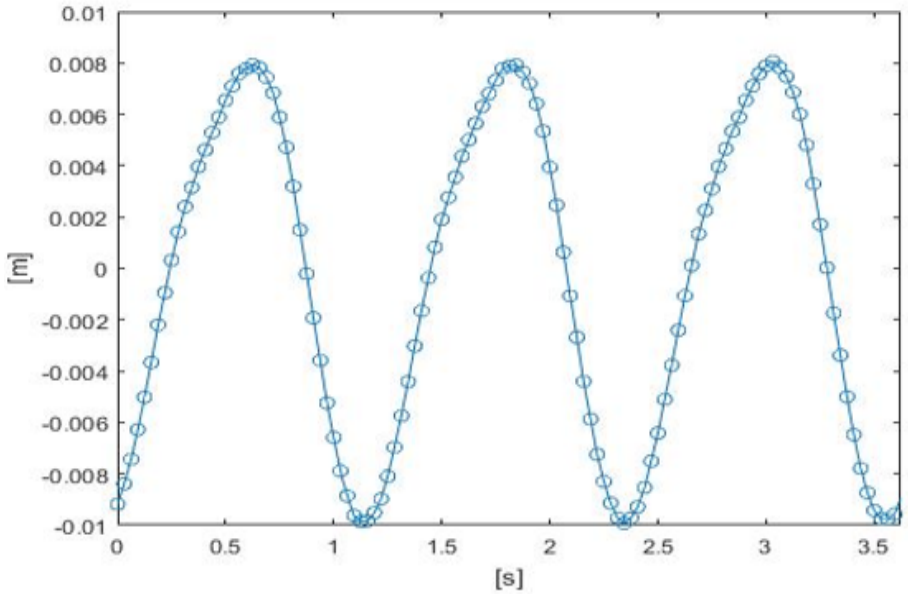


Experimental Campaign 2/2

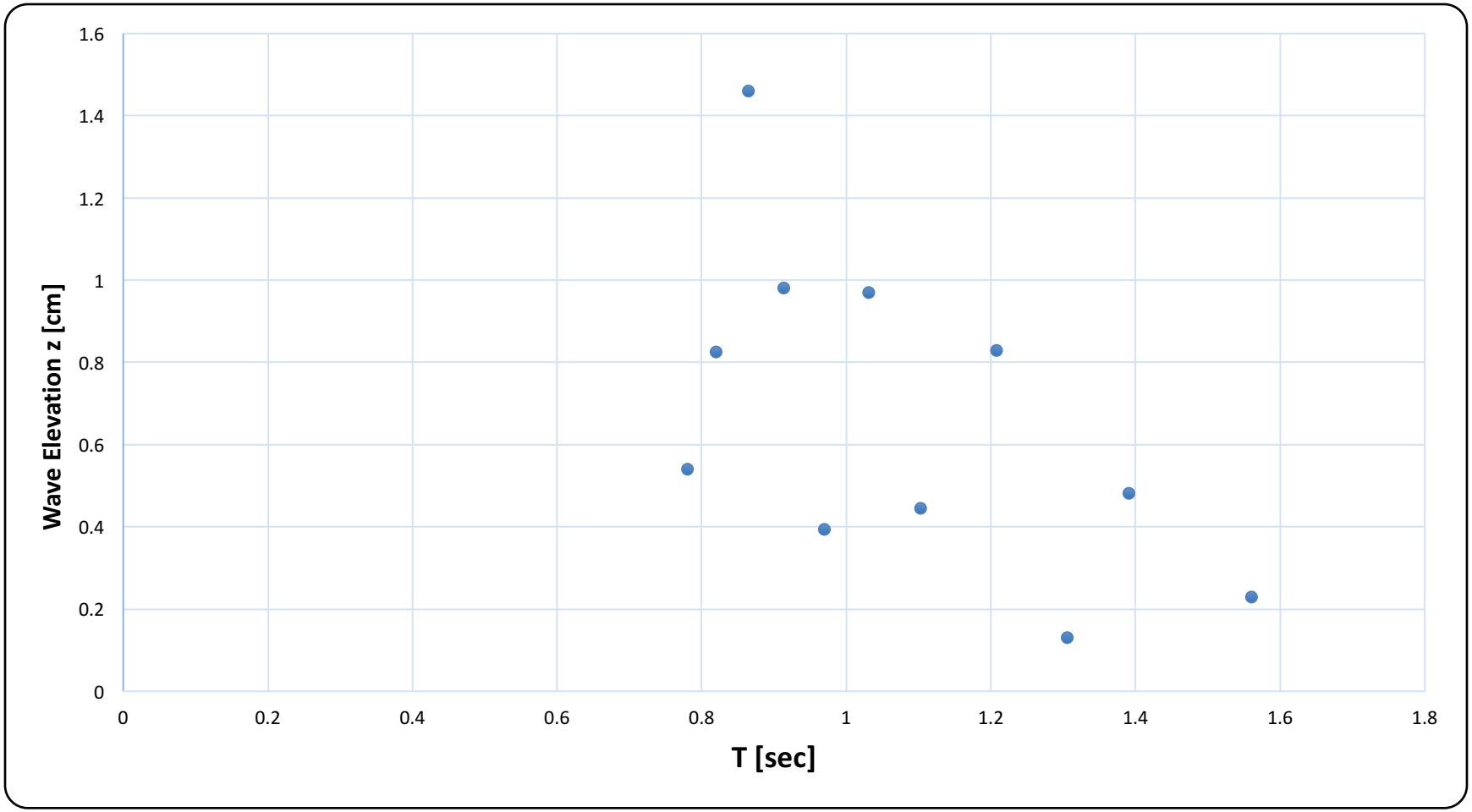
- Video

Wave run up measurements 1/3





Wave run up measurements 2/3



Wave run up Statistics 3/3

T [sec]	min	max	mean	std
1.561	-0.29234	0.267019	0.00	0.192088
1.391	-0.77645	0.251969	0.00	0.363279
1.306	0.47696	0.861381	0.01	0.131719
1.208	-1.98671	-0.17319	-0.01	0.604489
1.103	-1.24299	-0.06533	-0.01	0.405085
1.032	-1.77852	1.08223	0.00	0.983586
0.9697	-0.45769	0.579504	0.00	0.359793
0.9143	-1.26083	1.24016	0.00	0.868691
0.8649	-2.01015	1.07065	0.00	1.037346
0.8205	-1.58267	0.356953	-0.01	0.695835
0.7805	-0.65551	0.738653	0.00	0.466151

Conclusions

- Same wave elevation in any wind condition
- Structure Motion response is small
- TLP systems are more economical in deep waters

Acknowledgments

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