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Field investigation into mooring Load Reduction Device performance in hurricane conditions at an offshore test site

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A mooring Load Reduction Device (LRD) was designed, built and tested in the Irish Atlantic in a world first field deployment.

The LRD performance was successfully validated across 1200 hrs field testing including Hurricane Epsilon and Storm Aiden.

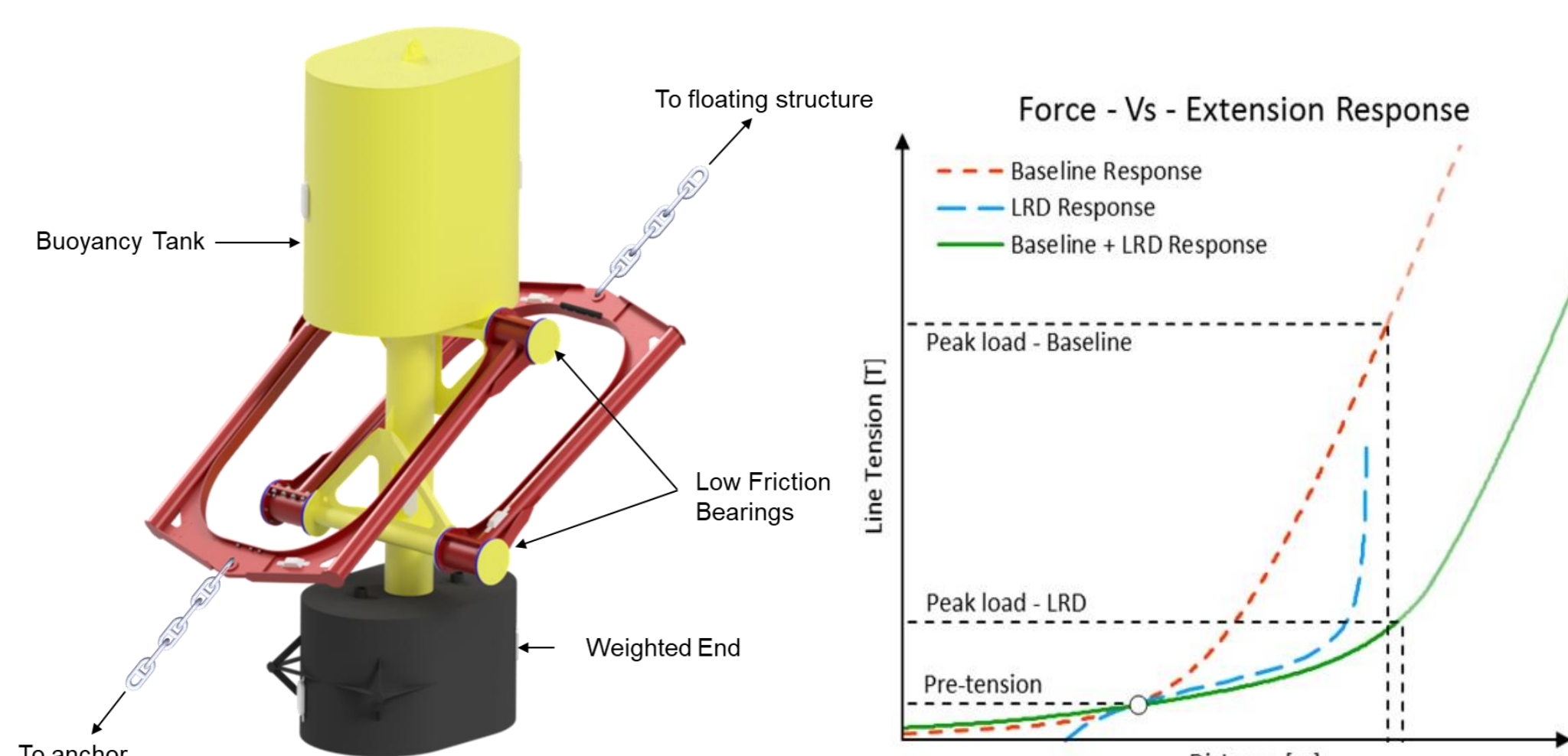
The field testing demonstrated the LRD as a viable part of a low cost, low risk alternative FOW mooring system.

ABSTRACT

Exploitation of Floating Offshore Wind (FOW) is of particular significance to Europe. To keep the FOW competitive, the Levelised Cost of Energy (LCoE) should keep up with projections for economic viability. Reductions in cost of the mooring system for the Floating Offshore Wind Turbine (FOWT) is needed to lower LCoE further. Field investigation into an inline 1:4 scale Mechanical Compliance Device (MCD) is hereby presented aimed at reducing LCoE of mooring lines for a FOWT. The MCD (i.e. Dublin Offshore's Load Reduction Device aka LRD) is not only effective at peak load mitigation in the mooring line but also allows for geometric compliance during operational conditions. The construction of LRD is simple, robust and comprised of easy to source materials.

LOAD REDUCTION DEVICE (LRD)

LRD rotates to provide mooring compliance by balancing buoyancy and self-weight against overturning moment from mooring tension.

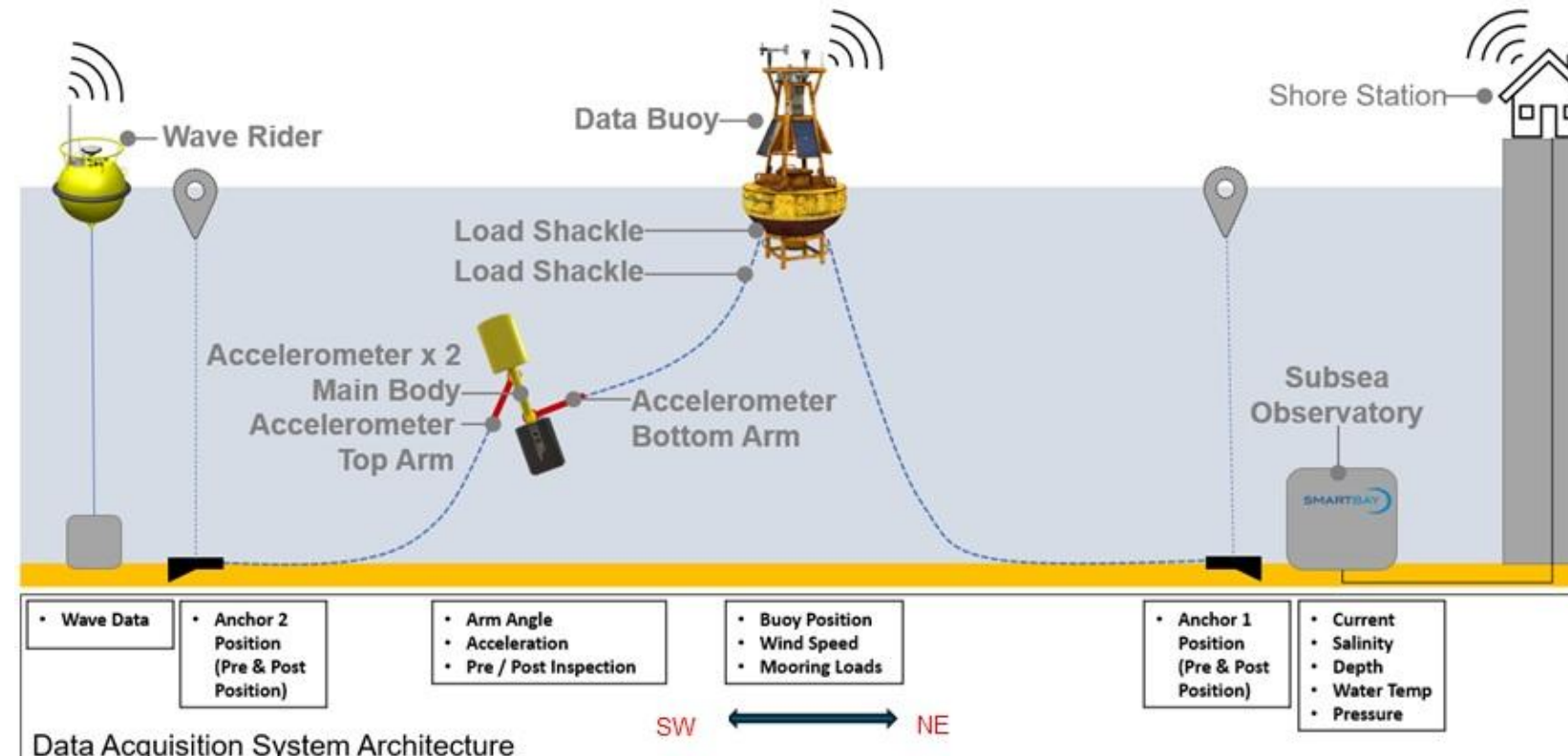


TEST OBJECTIVES

- Verify the scalability of the LRD
- Validate LRD performance
- Verify numerical models used in design

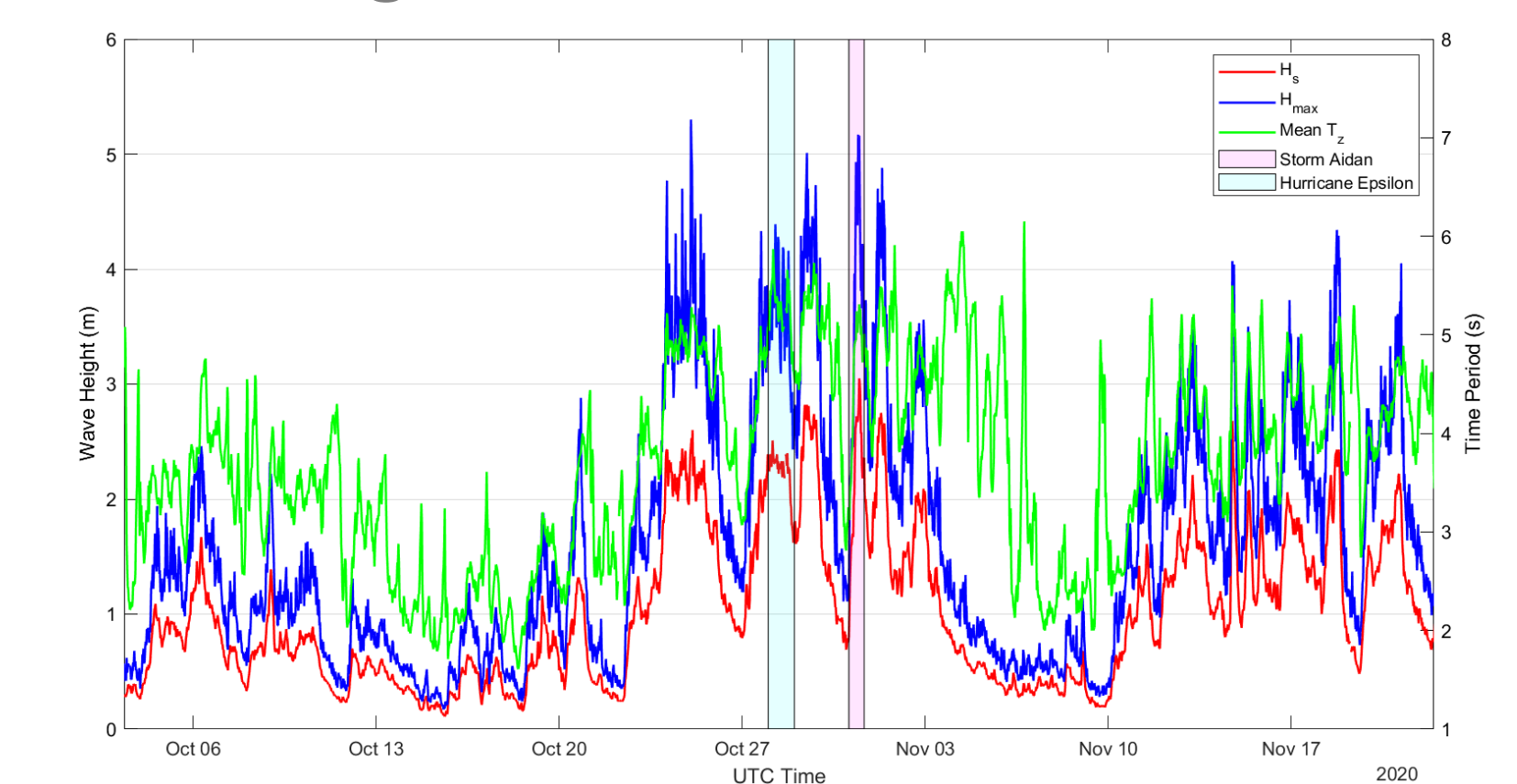
SMART BAY TEST SITE & SET UP

Test site is an equipped observatory 1.5km offshore in Galway Bay, Ireland (min water depth = 20m). Approx. 1200 hours onsite completed during Q4 2020



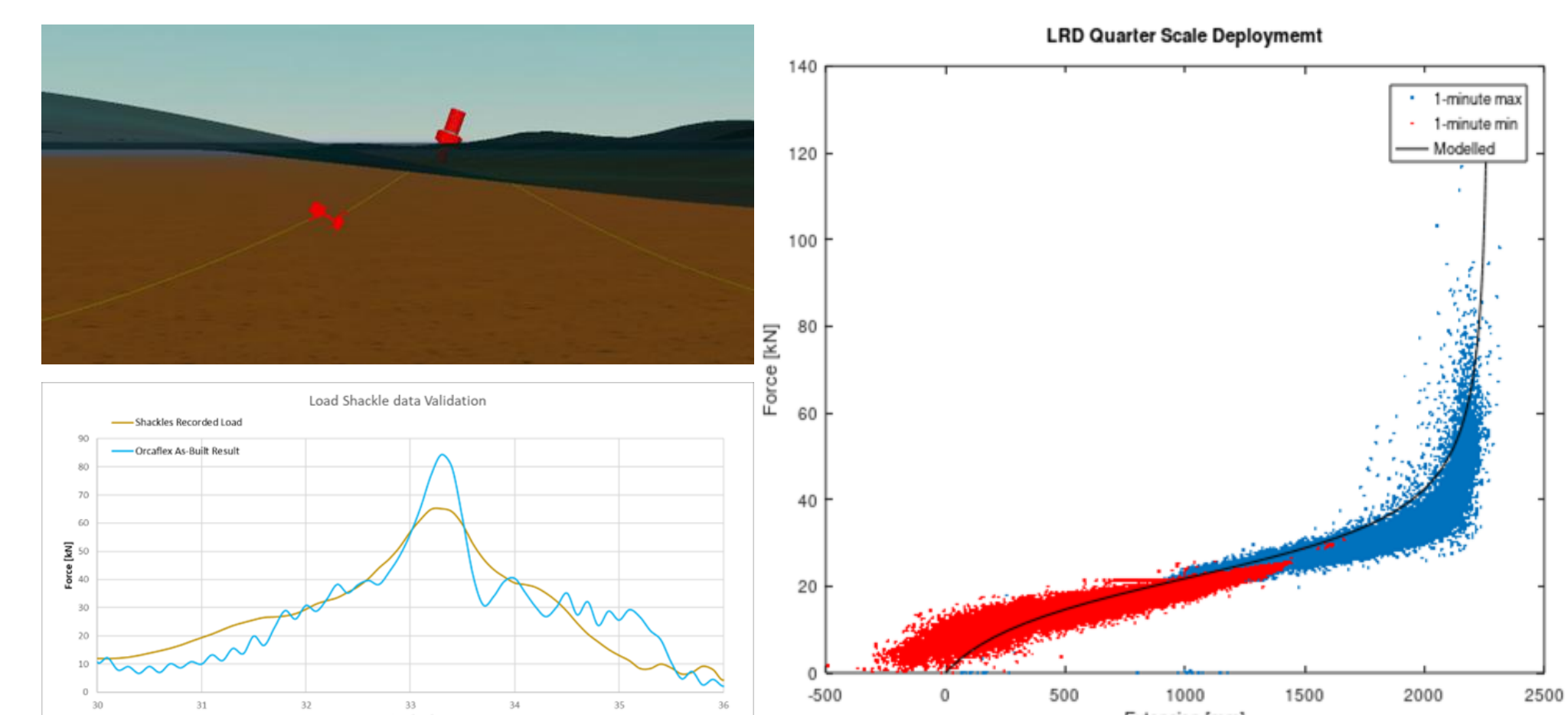
FIELD CONDITIONS

The test period coincided with Hurricane Epsilon and Storm Aiden with maximum wave height above 5m.



RESULTS

Scatter of 1-minute maximums & minimums were used to verify the 3-phase force-extension curve of designed LRD, thereby demonstrating validity of performance. Numerical models match the observed shackle loads.



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