Vibration Measurements of a TESLA-XFEL Cryomodule

Type-II Tesla Superstruktur Module
**Experimental Setup**

2 Seismometers, one on the vessel top, the other on the ground; simultaneous geophone measurements

Seismometer Güralp CMG-6TD inside Helium Gas Return Pipe (GRP)

Sensor SM-6 vertical geophone placed on the cryostat

Quadrupole support structure (shown without the quad)
Ground to Vessel Top

PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, top/ground ~1.84: support girder not rigid

PSD (horizontal transverse) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, top/ground ~10.0: support girder resonance

Vessel Top to Helium GRP

PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, Helium/top ~1.42: prone to vertical vibrations
Quad to Helium GRP

PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/Helium~1.11: rigid, no resonances

Quad to Top

PSD (horizontal transverse) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/Helium~0.83: rigid, no resonances

PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/top~1.14: rigid
TIF Module 4, Cold measurements with Piezos  
(measured by H. Brueck)

As seen from the coherence of the signals, piezos are noisy below 10 Hz. Quad and the vessel move as a whole. Results are consistent with the warm measurements.

A EuroTeV report on this work is available and is currently under review.

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