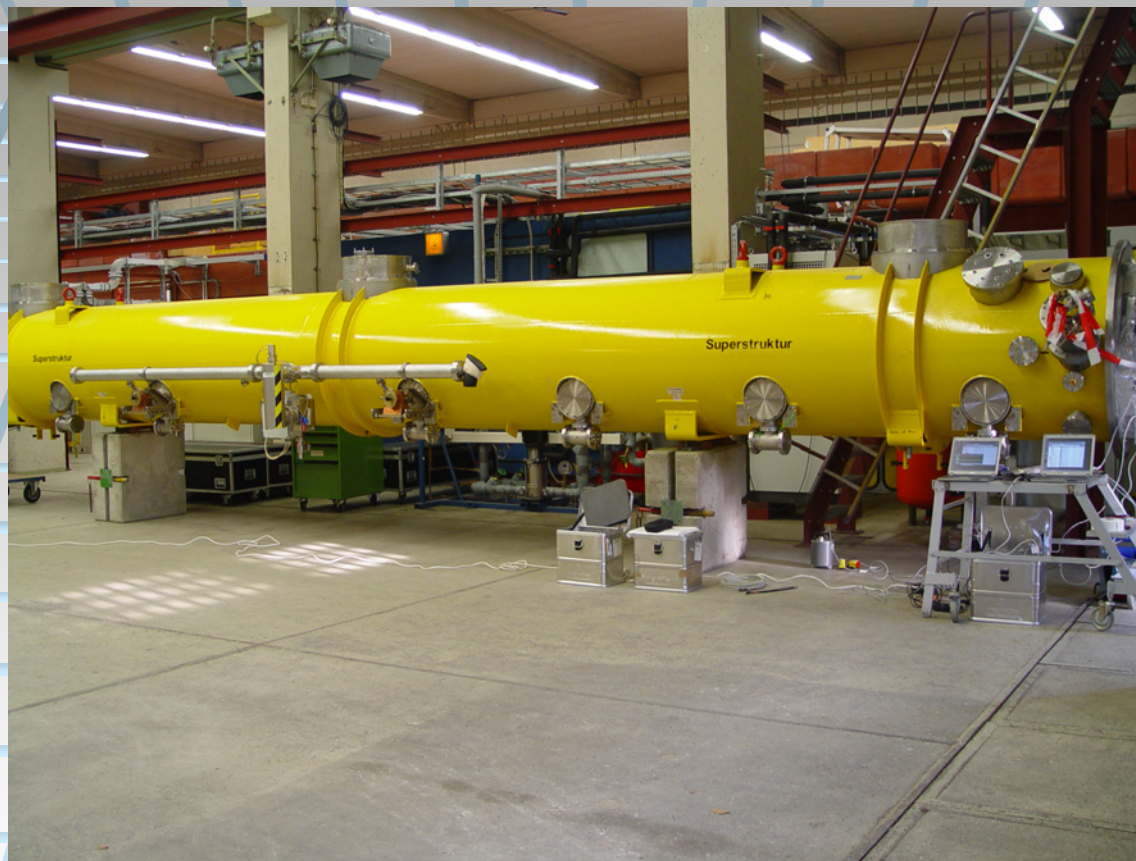


Vibration Measurements of a TESLA-XFEL Cryomodule



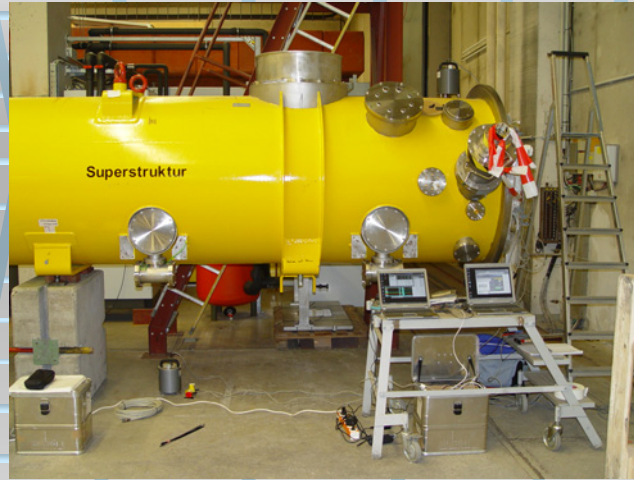
Type-II Tesla Superstruktur Module



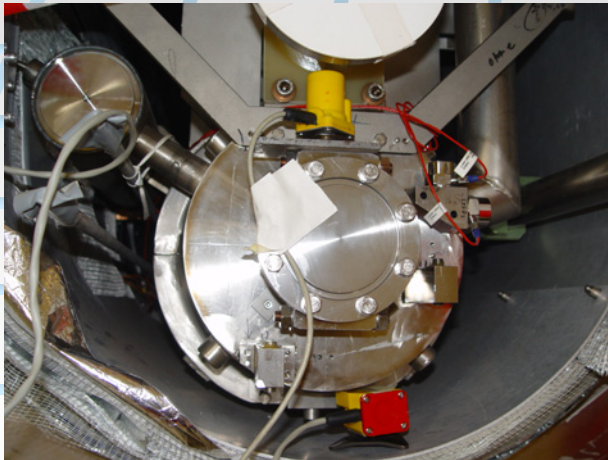
Experimental Setup



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



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

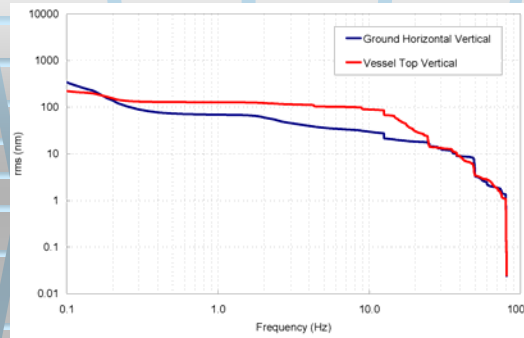
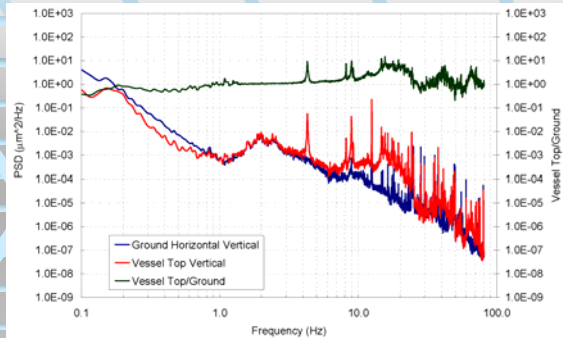


Sensor SM-6 vertical geophone
placed on the cryostat

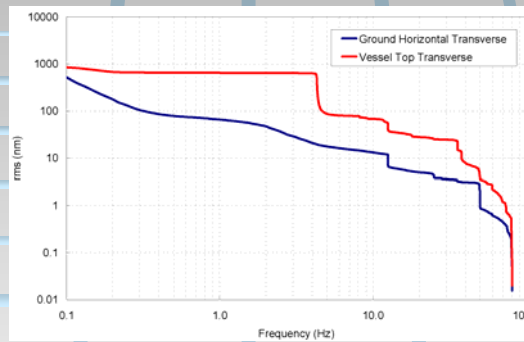
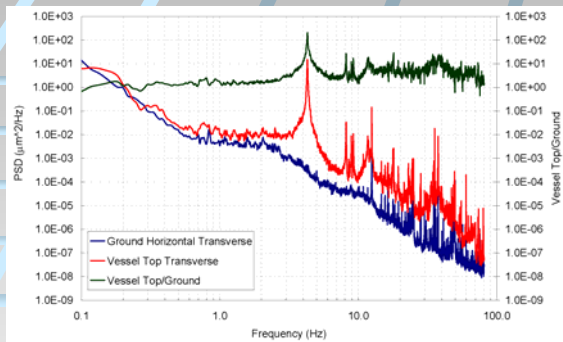


Quadrupole support structure
(shown without the quad)

Ground to Vessel Top

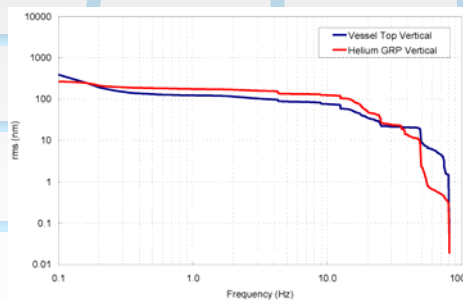
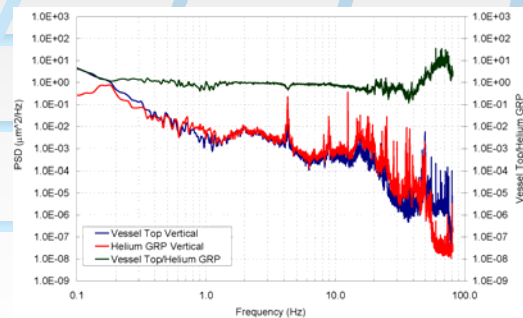


PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, top/ground~1.84: support girder not rigid



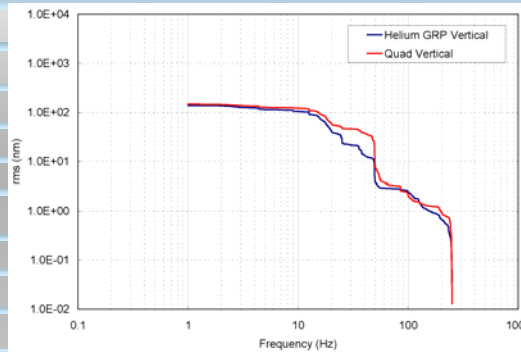
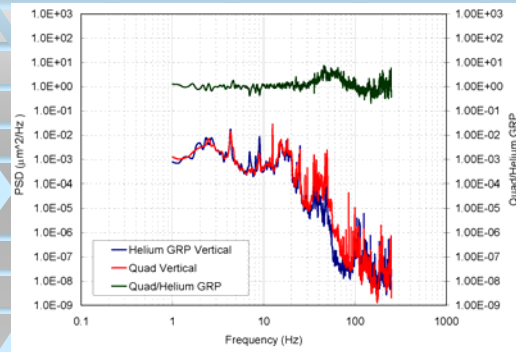
PSD (horizontal transverse) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, top/ground~10.0: support girder resonance

Vessel Top to Helium GRP

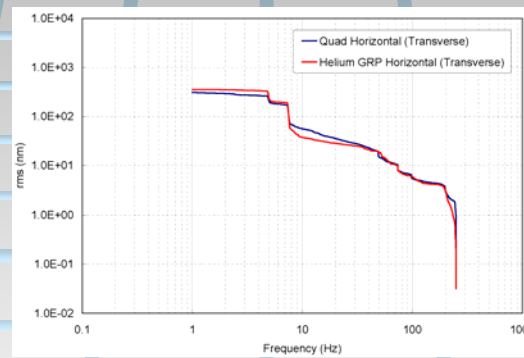
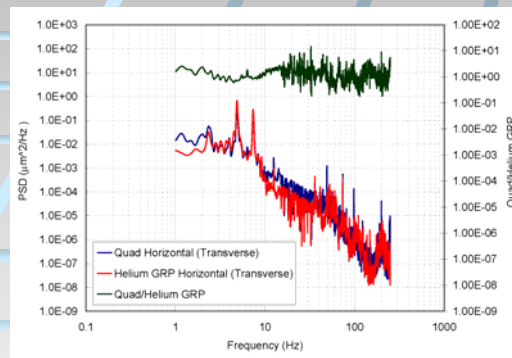


PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, Helium/top~1.42: prone to vertical vibrations

Quad to Helium GRP

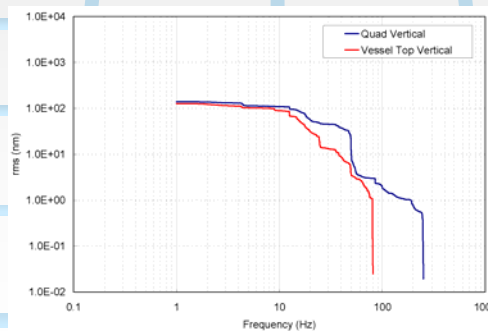
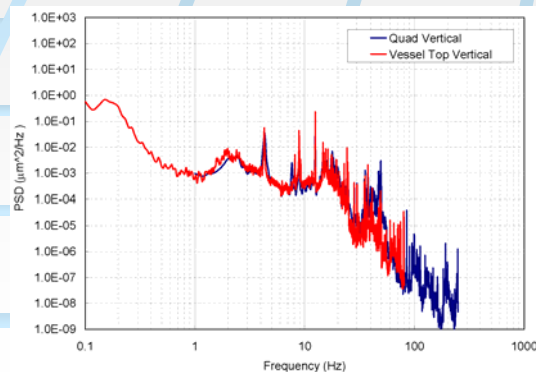


PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/Helium~1.11: rigid, no resonances



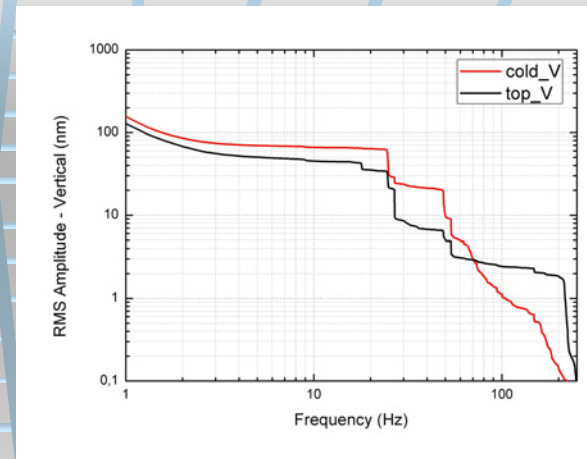
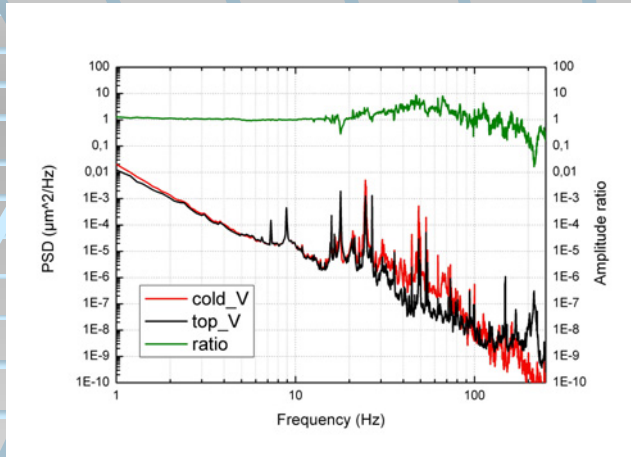
PSD (horizontal transverse) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/Helium~0.83: rigid, no resonances

Quad to Top



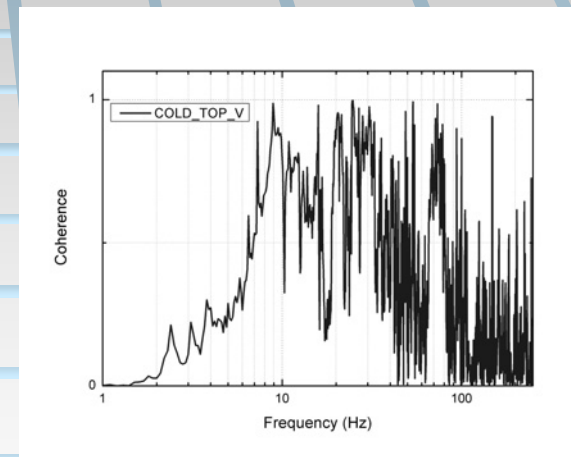
PSD (vertical) and integrated rms of motion > 1 Hz; amplification factor @ 1 Hz, quad/top~1.14: rigid

TTF Module 4, Cold measurements with Piezos (measured by H. Brueck)



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**



As seen from the
coherence of the
signals, piezos are noisy
below 10 Hz