Studies on Transportation of Superconducting Resonators and Beam Position Monitor - Quadrupol Units for the XFEL Project

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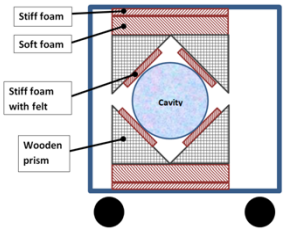
Abstract

For the XFEL project industrial companies in Germany and Italy are in charge of the cavity fabrication and preparation. For the radio frequency acceptance test these cavities have to be transported to the DESY site in Hamburg without losing the performance. The XFEL Beam Position Monitor and Quadrupol Units (BQU) are completed in the DESY clean room. The cavities and the BQU are handed out in the status “ready for assembly” to the string assembly site at CEA Saclay in France. These components have to be transported without risk of damages or reduction of performance. To ensure that the transports over European routes do not influence the performance of cavities or are origin of particulates inside the BQU, individual transport boxes for super conduction cavities and transport fixtures for the BQU are designed and tested.

Transportation routes across Europe for XFEL Cavities

Transport boxes

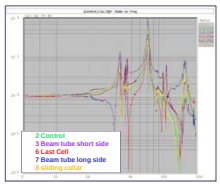
Damping lay-out



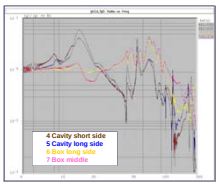
Matter of transport simulations

Test object	Test type	Parameter	Result
Cavity in frame direct fixed on simulator (C24)	Resonant search (Pic. 1)	200 Hz to 4 Hz	Sharp and high peaks at 40/45, **70**, 110 and 180Hz
	Transport simulation	1h Truck and Trailer Level II	No mechanical deformation of the cavity
	Single shocks (Pic. 2)	+ - 4g; +- 5g; +- 6g	Increasing shocks up to 15g
Cavity in transport box (Z138)	Resonant search (Pic. 3)	200 Hz to 4 Hz	Low and smooth peaks at 15, 55 and 70Hz
	Transport simulation	3h Truck and Trailer Level II	No mechanical deformations of the cavity nor the transport box
	Single shocks (Pic. 4)	+ - 4g; +- 5g; +- 6g	Damping shocks down to 2g

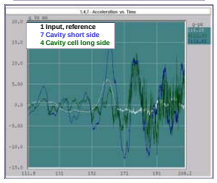
Picture 1: Resonant search cavity C24, no damping



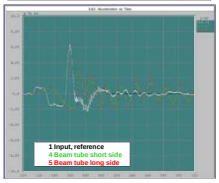
Picture 3: Resonant search cavity Z138, foam damping



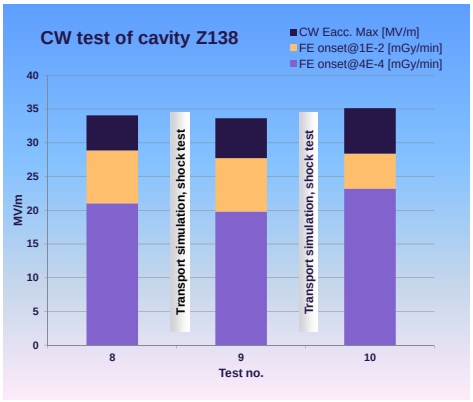
Picture 2: Single shock +6g cavity C24, no damping



Picture 4: Single shock +6g cavity Z138, foam damping



The **RF Test result** before, in-between and after two transport simulations shows no degradation of the maximum gradient and no significant changes in the field emission onset.



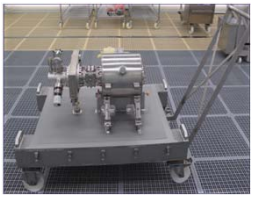
Summary

- **Transport study shows no influence on mechanical stability and RF performance**
- **During real transportation to CEA Saclay, an online running shock log device shows no signal above 0.5g.**
- **The boxes withstand all forces**

Transportation of HiGrade Cavities

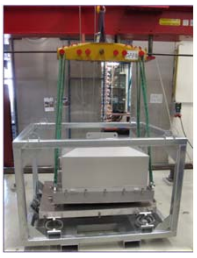
- HiGrade cavities will be delivered without helium tank but in a handlings frame
- The prism of the standard box can be removed and a support for the cavity in frame can be inserted

Transport equipment for the BQU



BQU on platform with handlings cart … - inside clean room

… with dust cover - sealed with rubber gasket



… in transport frame - out side clean room

… with additional lid

Steal wire damper, calculated to absorb a free fall out of 50mm

Summary

- **Transport studies are not finished yet and will be presented in near future**
- **Real transport to CEA Saclay happens without damages**

More information about fixtures and handling of the BQU see poster TUPO018

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