European XFEL

E-XFEL Module HOM Couplers Experience.

(WG 1 Module Tests and Procedures)

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DESY

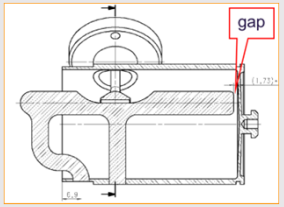
HELMHOLTZ ASSOCIATION

The two main aspects of HOM Coupler operation

Fundamental Mode (1.3 GHz)

- HOM Couplers have to be “closed” for fundamental mode to prevent overheating of cryogenic system

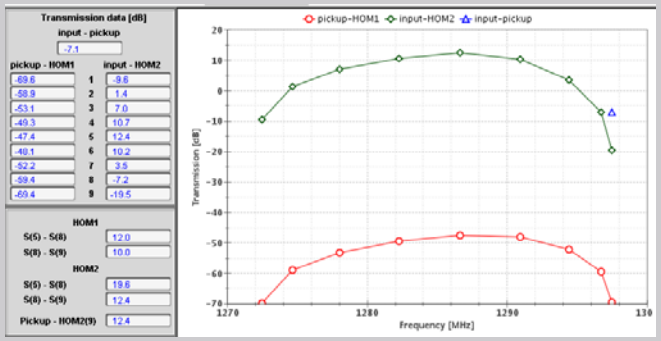
Filter adjustment is done for both HOM Couplers before:
- cavity test;
- module assembly.



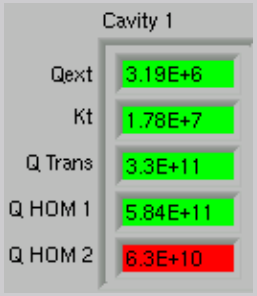
Then finally controlled during module test.

Quality control:

in cavity (room temperature)



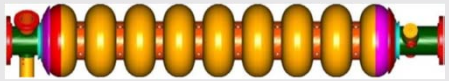
in Module / cavity (2k)

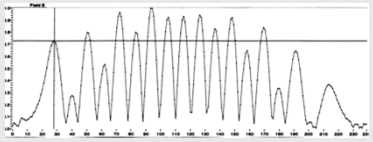


High Order Modes (1.6 – 2.5 GHz)

- effective extraction of HOM provides a stable beam dynamic and reduces cryogenic losses

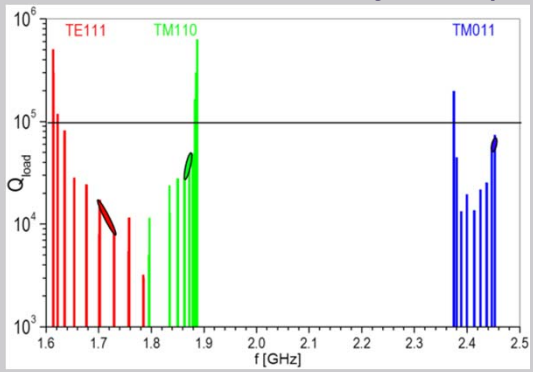
Efficiency of HOM extraction is very sensitive to cavity geometry and existence of the trapped modes



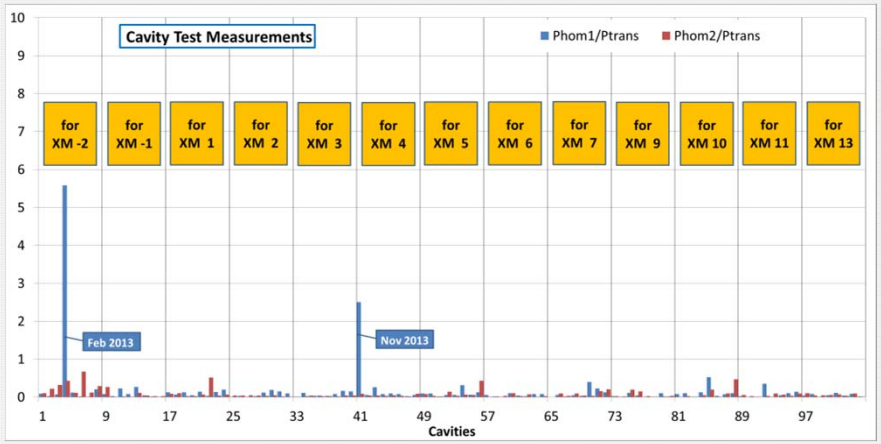


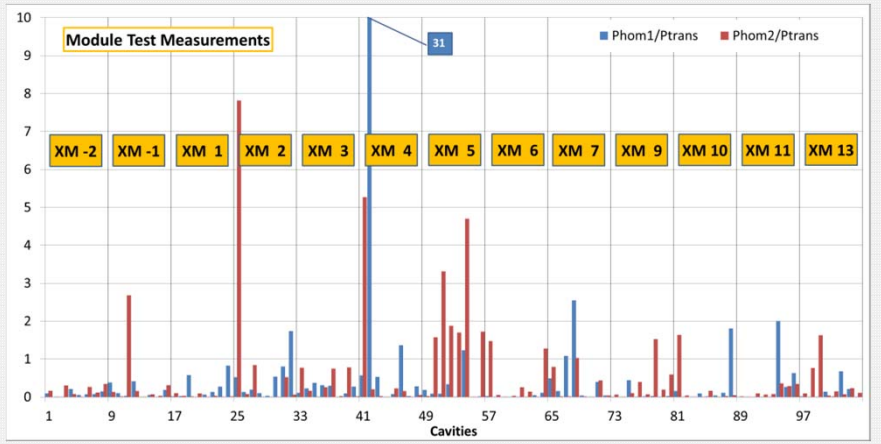
Quality control:

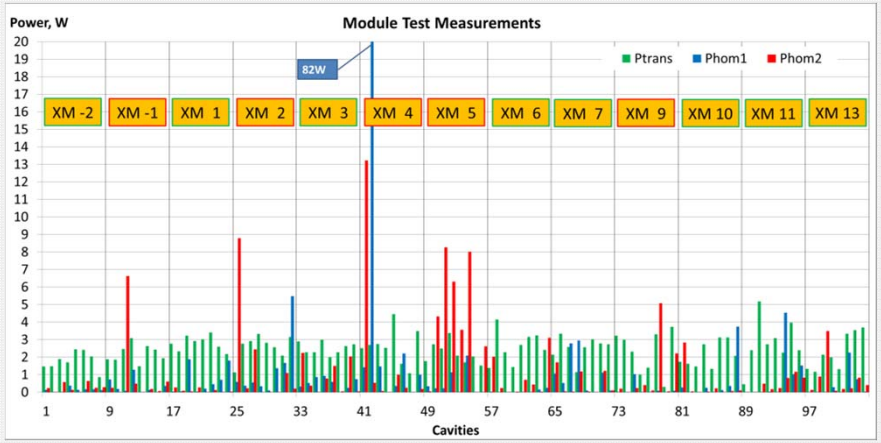
in Module or/and Cavity Test (2k)

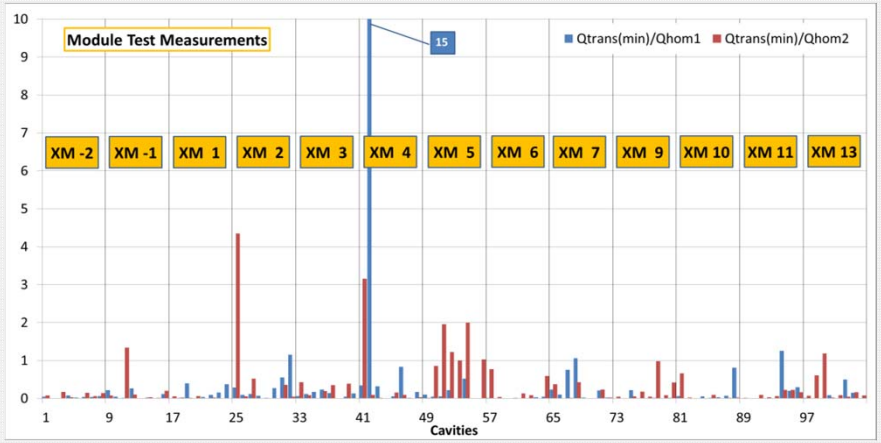


Fundamental Mode (1.3 GHz)



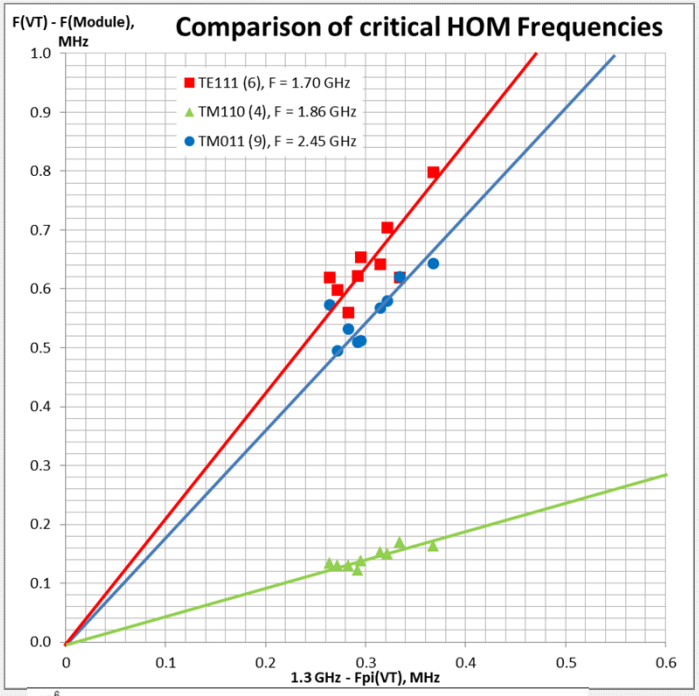


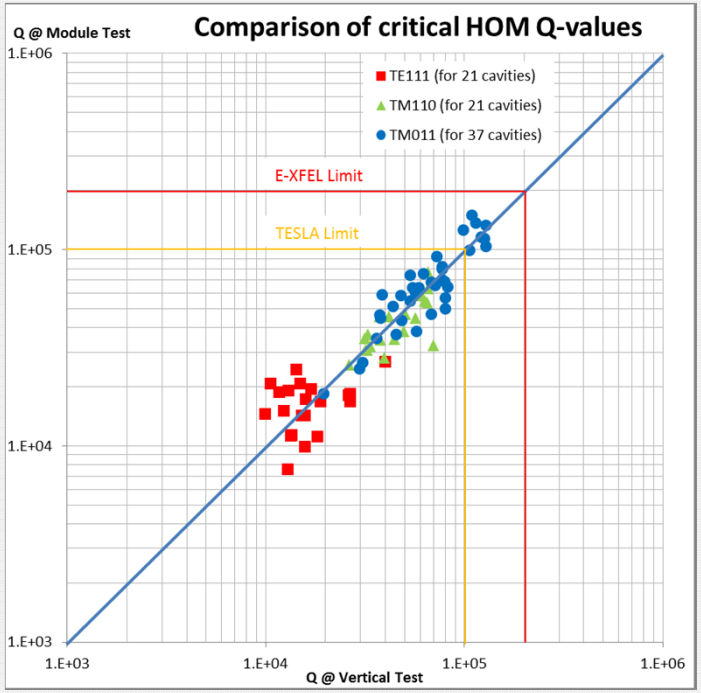


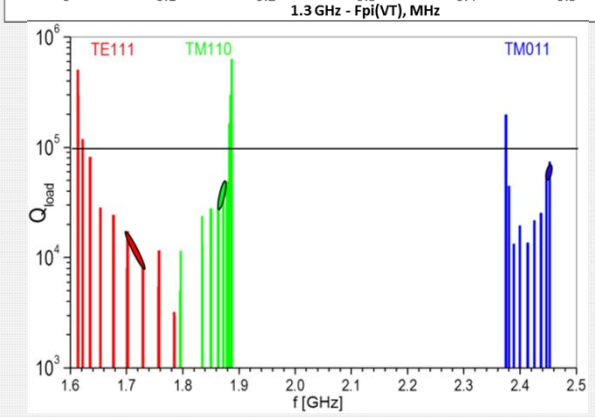


1. Mean value of **Phom/Ptrans = Qtrans/Qhom = 0.12** for HOM Couplers during cold Cavity Test.
2. Ratio of **Qtrans(max)/Qtrans(min) = 5.52E+11 / 1.93E+11 ≈ 2.9** for “Modules” and **4.47E+11 / 1.97E+11 ≈ 2.2** for “Vertical test”.
3. Analysis in terms of relative values does not depend on value of accelerating gradient.

High Order Modes (1.6 – 2.5 GHz)







1. Comparison of frequencies shows that their deviations depend linearly on the operational frequency change during cavity tuning to 1.3 GHz.
2. Q values measurements results during Module test are very close to Vertical Test values.
3. Both previous statements allow us to judge about possibility to replace the measurements in Module by similar one during cold Vertical test.