Fundamental mode damper

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Outline

- Fundamental mode damper (FD) requirements
- Design of FD
- Prototype test of FD
- Conclusions

Requirements

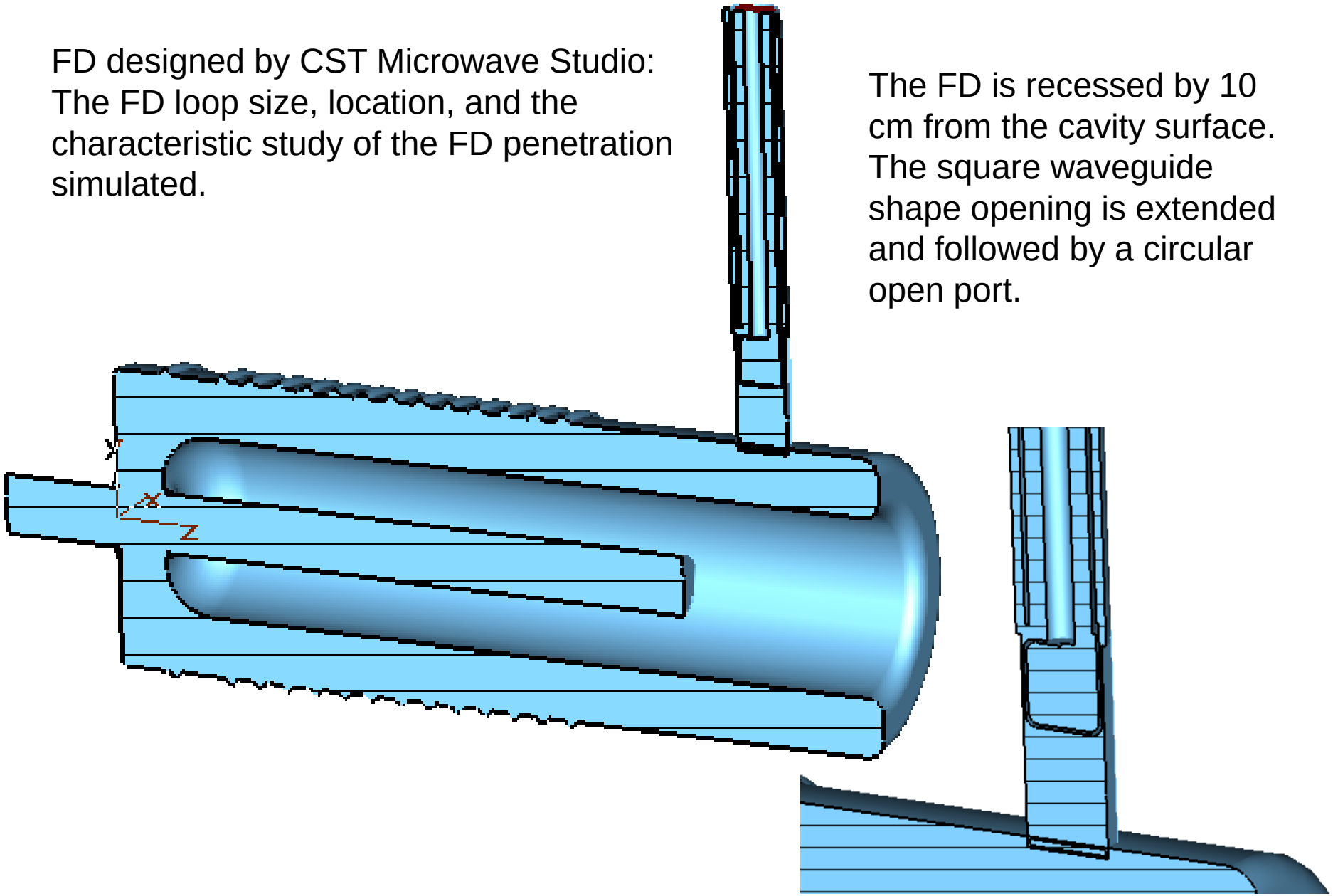
Fundamental mode damper requirements and challenges:

- From injection, a fundamental mode damper will be in because during ramp-up, the beam will go through the cavity's resonance.
- At storage, the damper will be withdrawn. And the cavity frequency will always remain below the beam frequency to fulfill Robinson stability condition.
- During the damper withdrawn, the cavity will experience the frequency shift. The shifted frequency should not cross the beam revolution frequency!!

FD design

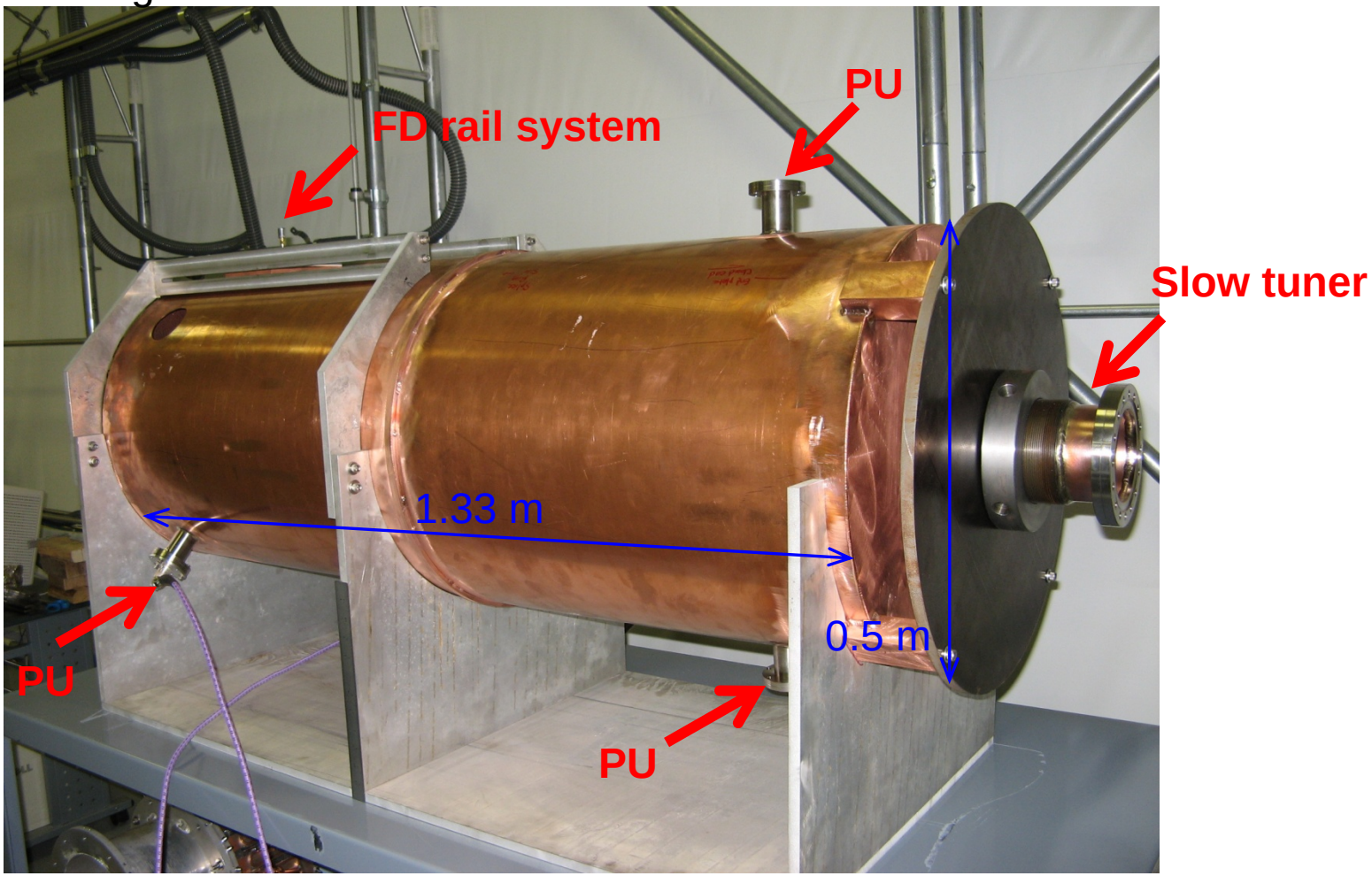
FD designed by CST Microwave Studio: The FD loop size, location, and the characteristic study of the FD penetration simulated.

The FD is recessed by 10 cm from the cavity surface. The square waveguide shape opening is extended and followed by a circular open port.



Prototype Cu cavity

Located in Bldg. 905



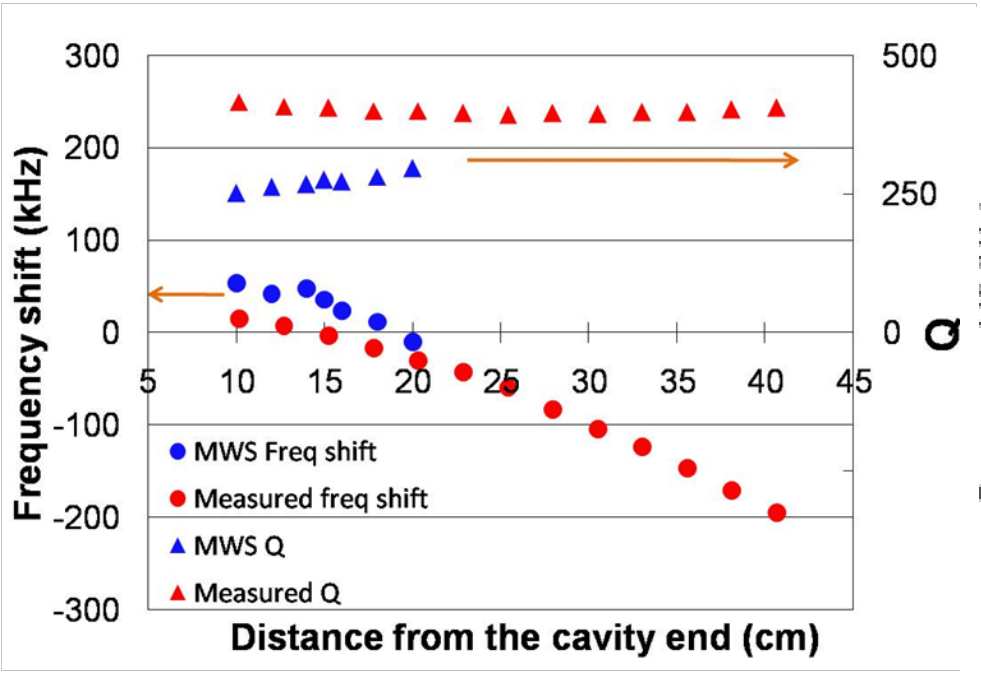
Features:

- The rail system for the fundamental damper
- 2 HOM damper openings, 90 degree each other
- Slow tuner

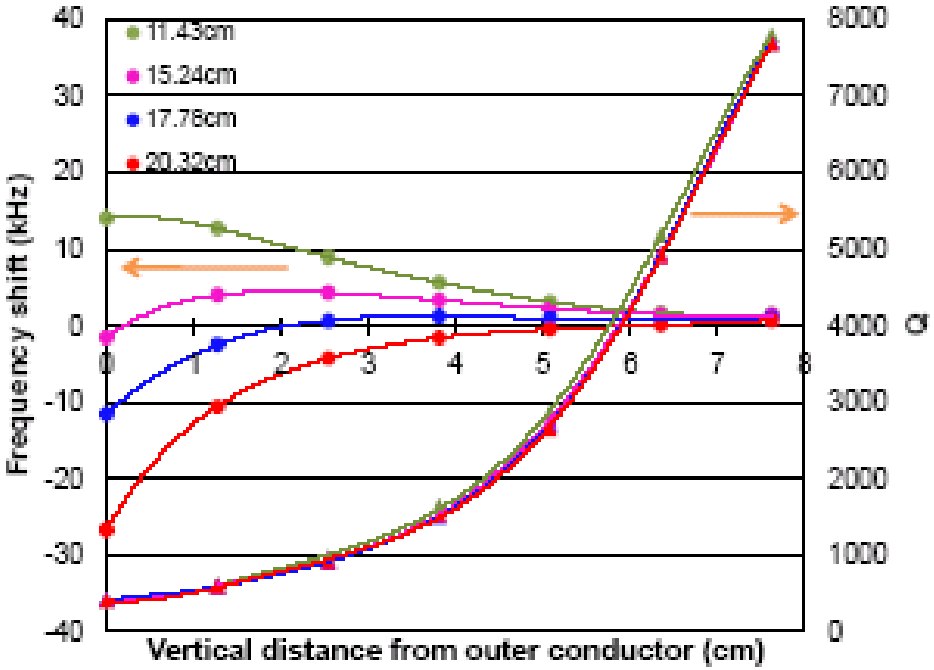
Simulation vs. Exp

Fundamental mode damper

- Inductively coupled loop
- Size and location determined
- Power dissipated to the load is calculated based on Q measurements

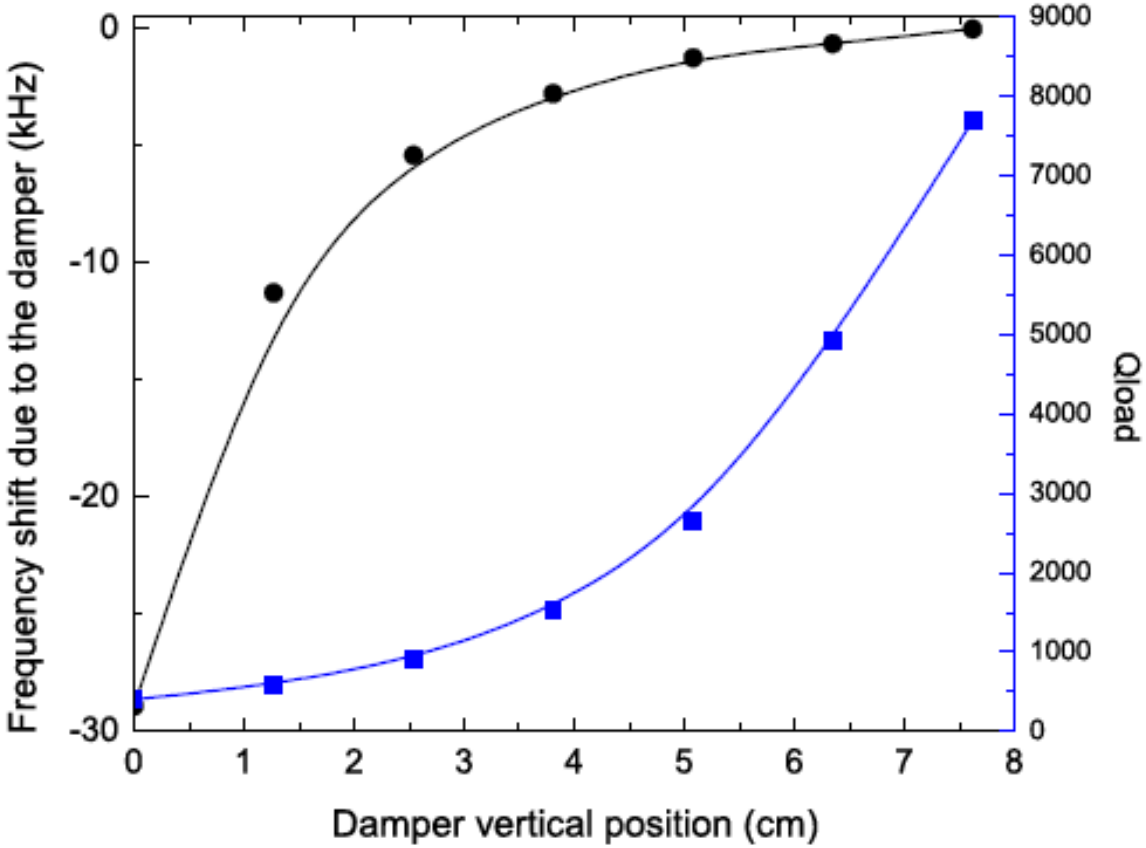


Frequency change and Q measured as the FD axial distance is varied (FD is fully inserted).



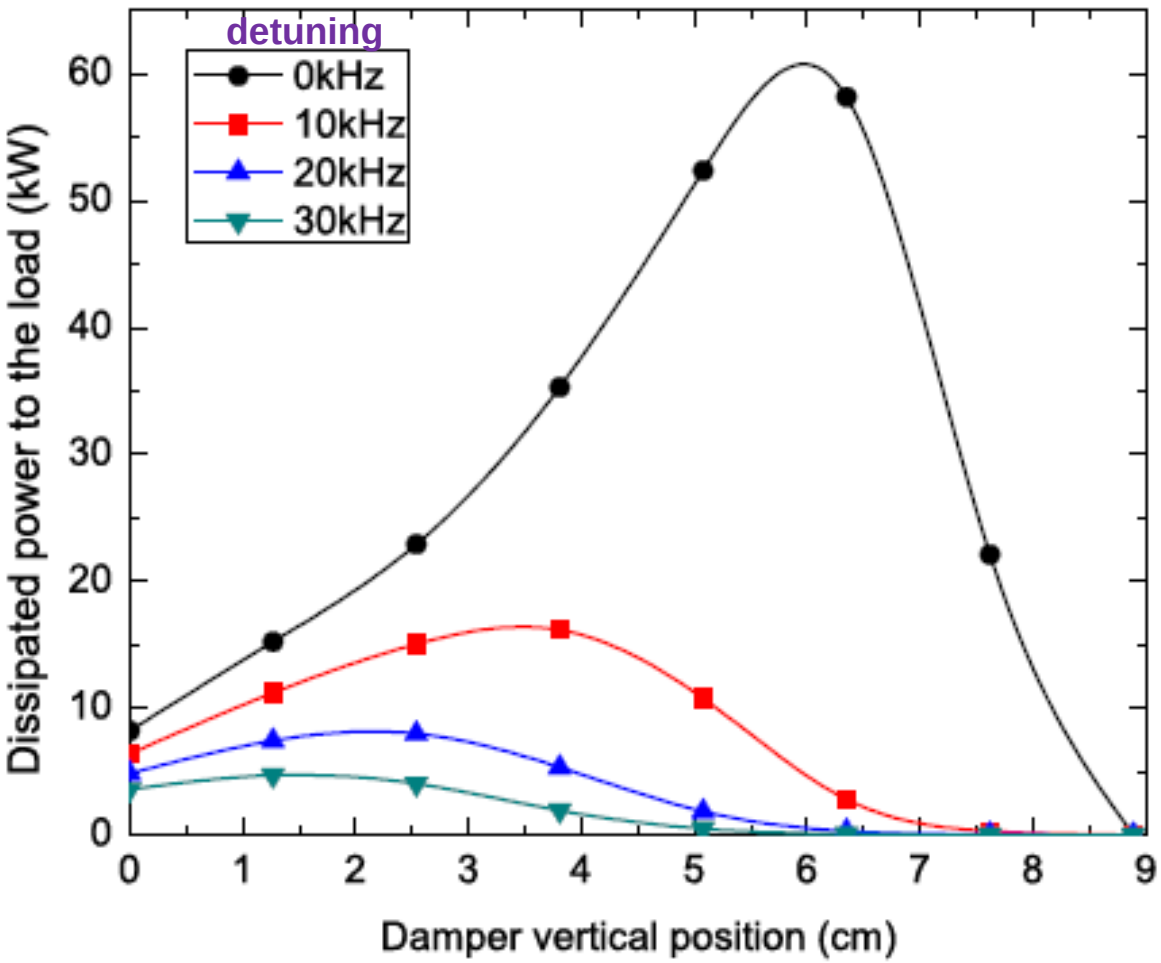
The measured frequency shift and the Q factors as a function of the FD vertical position

Measurements



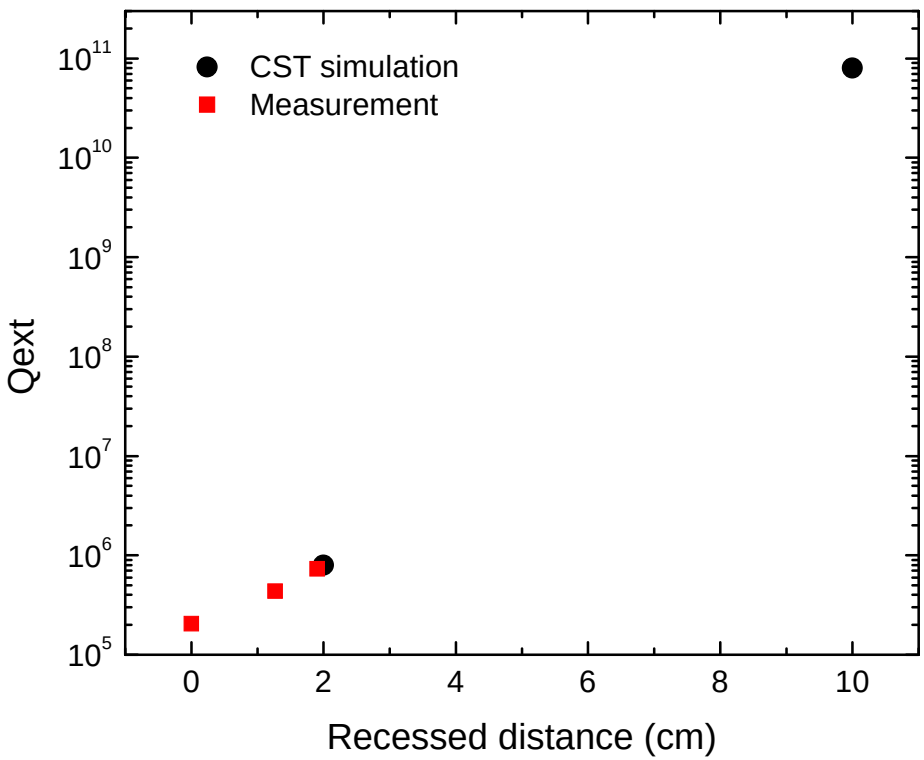
Frequency change and Q measured as the FD vertical position is varied (FD is fully inserted @ 20 cm away from cavity end).

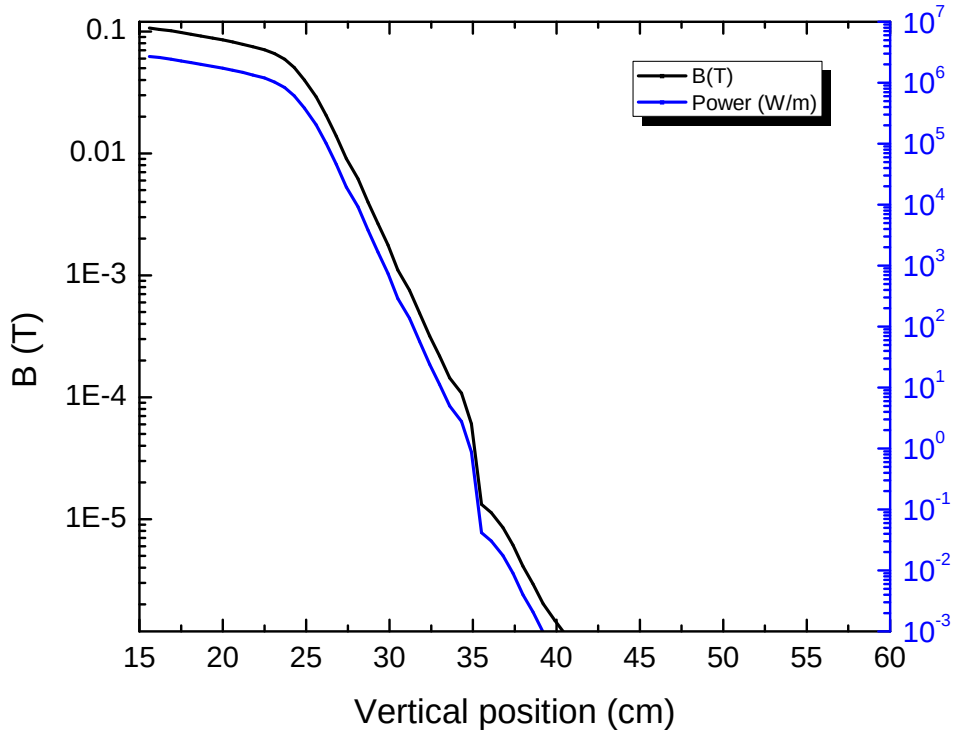
The estimated dissipated power



- Assuming the cavity is located at the common area, which doubles the current.
- The estimated dissipated power based on the measured Q value as a function of the vertical FD position with considering the frequency shift due to the damper.
- When the cavity is detuned by 10 kHz, the maximum Pdiss is around 16 kW.

FD opening port





- There is a square opening for the FD.
- Recessed distance from cavity surface
- The measured data agree with simulation
- The FD will be withdrawn 10 cm away from the cavity surface

The MWS simulated B field and the power deposited on the port surface as a function of the vertical position of the fundamental mode damper. Vertical position = 25 cm represents the cavity surface.

Conclusions

- The fundamental damper was studied via the prototype cavity test and the CST MWS simulation.
- The FD size is 8 x 8 x 4 cm, and 20 cm away from the cavity end plate. The withdrawn position is 10 cm away from cavity surface.
- The FD opening port is determined.