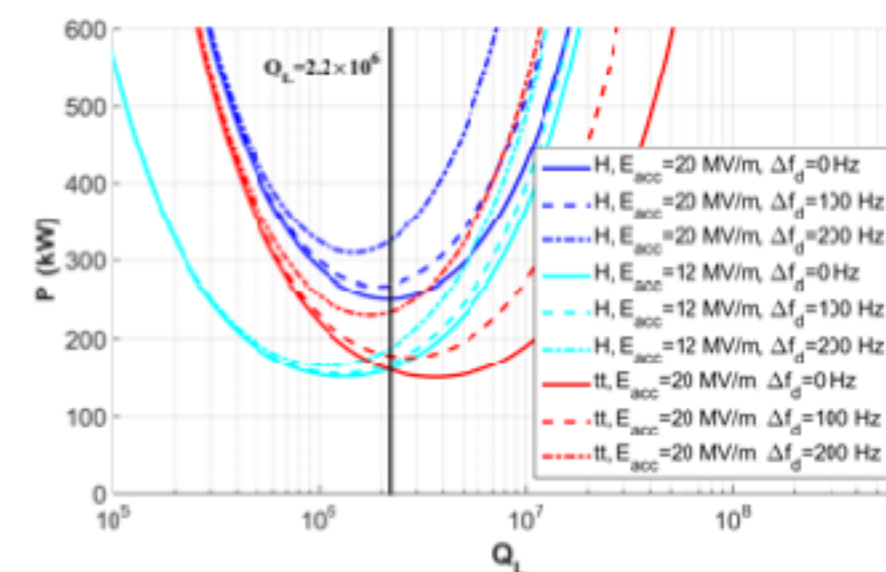
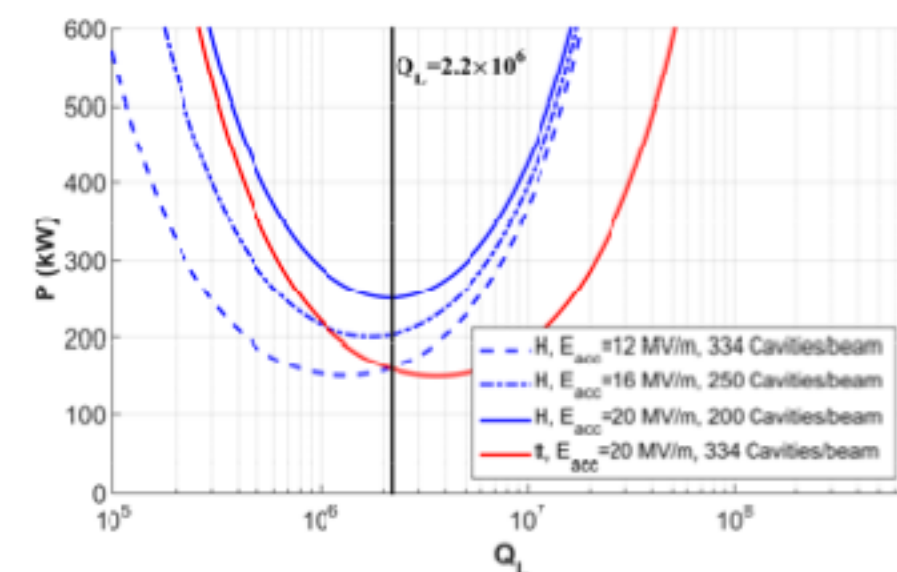
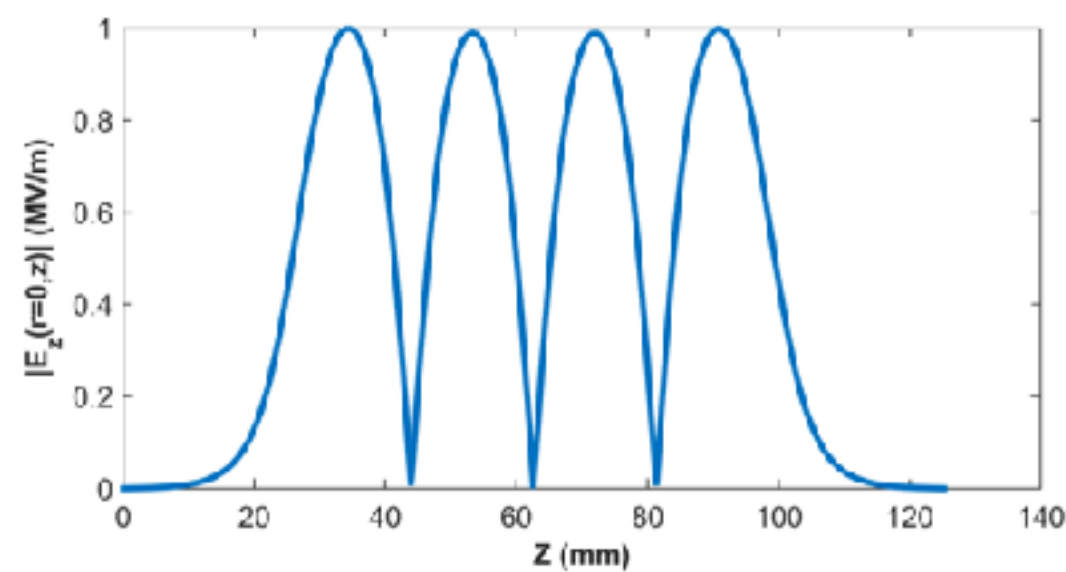


Rostock collaboration:

“preliminary cavity design for the Higgs running mode of FCC-ee”
supervised by Rama Calaga and Ulla van Rienen

- Design report (27 pages): EDMS 1612380, FCC-ACC-RPT-0005
- Optimised design for 800 MHz, 4-cell cavity, 20 MV/m.
- Optimum $Q_L = 2.2 \times 10^6$ for H (12 MV/m, 334 cavities) and tt (20 MV/m, 334 cavities).
- $\Delta f < 100$ Hz to keep additional generator power $< 12\%$.

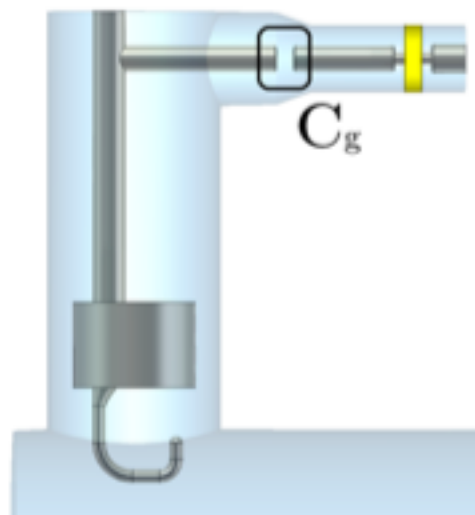
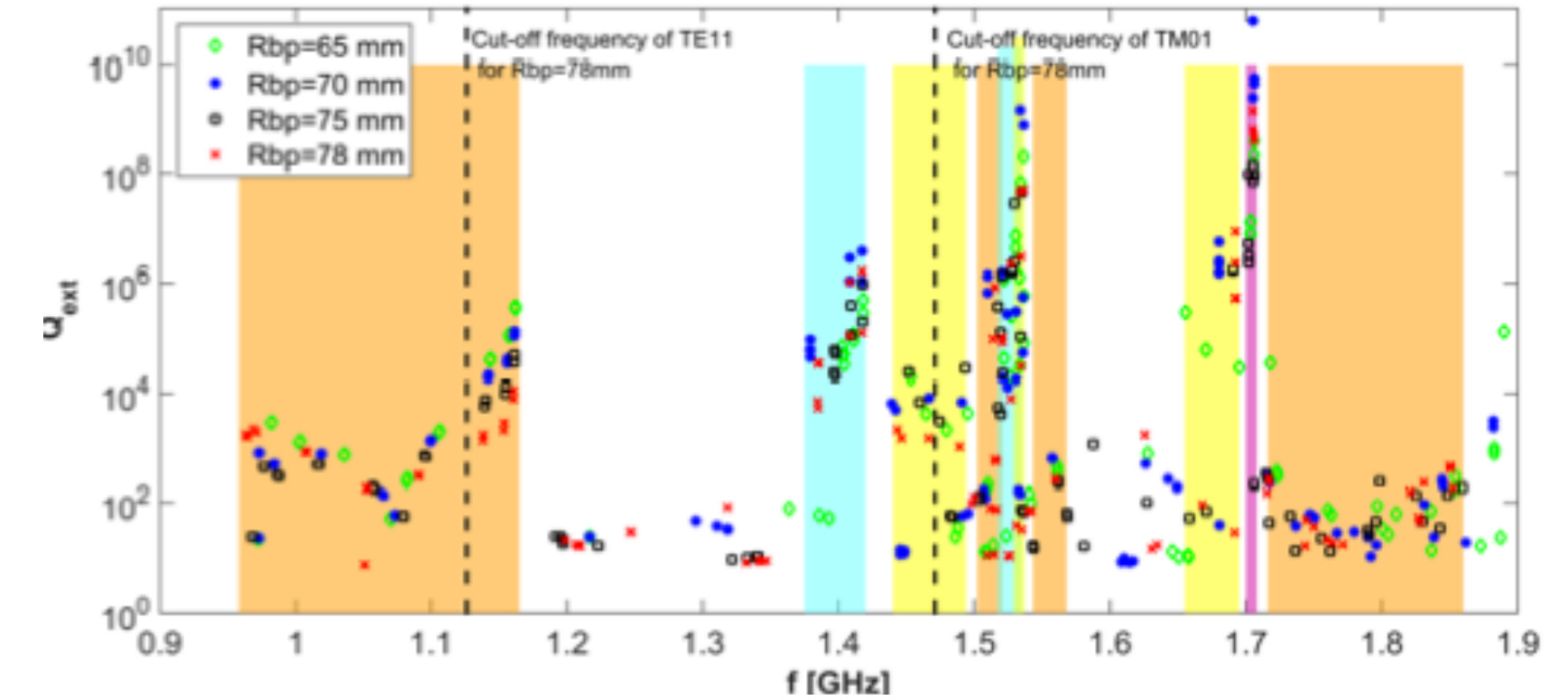
Parameters	Value
Frequency [MHz]	801.58
Number of Cells	4
R/Q [Ω]	411.8
Geometry Factor [Ω]	273.2
H_{pk}/E_{acc} [mT/(MV/m)]	4.35
E_{pk}/E_{acc}	2.06
Cavity Active Length [mm]	732.5
Cell to cell coupling of mid cells [%]	2.25
Field Flatness [%]	99
$k_{ }(\sigma_z = 2\text{mm})$ [V/pC]	2.79
$k_{\perp}(\sigma_z = 2\text{mm})$ [V/pC/m]	3.1
HOM Power for H beam [kW]	0.84
E_{acc} [MV/m]	20
No. of cavities needed for H machine	200
Q_{ext} [10^6]	2.2



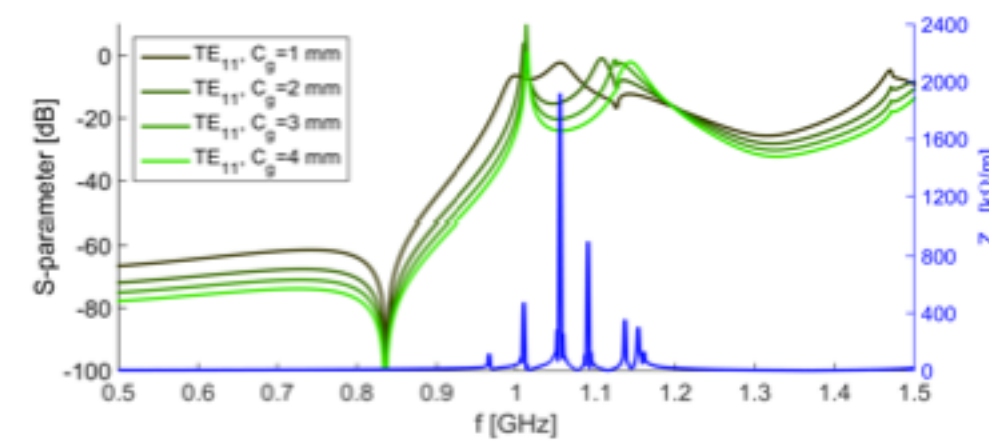
a) $P-Q_L$ curve for different values of E_{acc} (b) $P-Q_L$ for different values of detuning Δf_d
Figure 8: Forward power as a function of Q_L with optimal detuning for H and tt energy options.

HOM coupler design

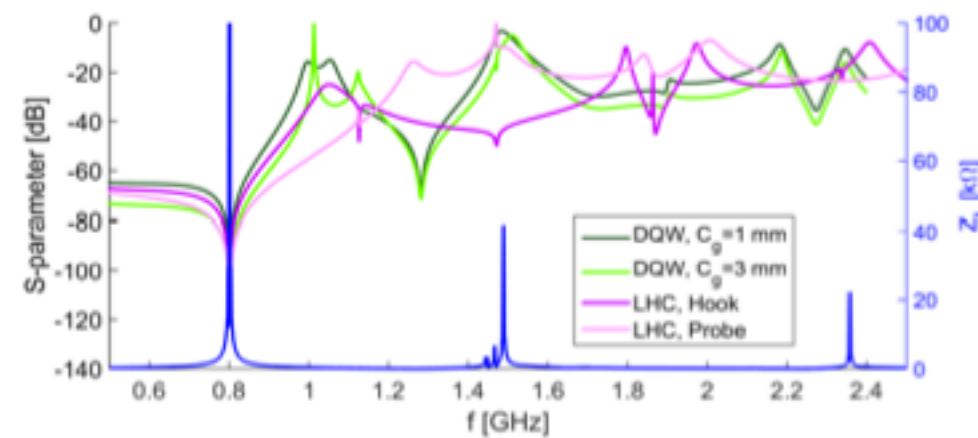
- Design goal: $P_{\text{HOM}} < 1 \text{ kW}$,
- comparison of LHC-type and Crab DQW-type HOM couplers (4 per cavity).
- DQW type preferred as only one type of HOMs can do the job.



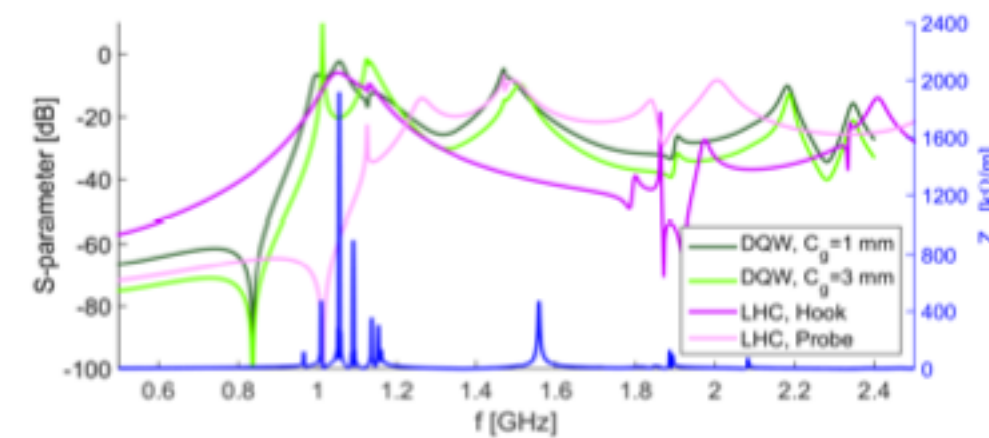
(a) Side view of DQW HOM coupler [18, 19].



(b) Parameter sweep on parameter C_g .



(c) TM01-TEM transmission (Monopole coupling).



(d) TE11-TEM transmission (Dipole coupling).

Parameters	Description	Z	W	H	tt
E [GeV]	Energy	45.6	80	120	175
v_s	Synchrotron oscillation tune	0.025	0.037	0.056	0.075
I_0 [mA]	Beam Current	1450	152	30	6.6x2
α_p [10 ⁻⁵]	Momentum compaction factor	0.7	0.7	0.7	0.7
τ_z [turns]	Longitudinal damping time	1320	243	72	23
τ_{xy} [turns]	Transverse damping time	2640	486	144	46
f_{rev} [kHz]	Revolution frequency	3	3	3	3
β_{xy} [m]	Beta function at cavity region	50	50	50	50
N_c	Total number of cavities	54	107	200	668
Z_{Th}^{\parallel} [k Ω]	Longitudinal impedance threshold	$\frac{9.4}{f \text{ [GHz]}}$	$\frac{642}{f \text{ [GHz]}}$	$\frac{13324}{f \text{ [GHz]}}$	$\frac{55434}{f \text{ [GHz]}}$
Z_{Th}^{\perp} [k Ω /m]	Transverse Impedance Threshold	8.8	405	5556	17258

what else...

- Analysis of 5-cell 800 MHz, compared with 4-cells.
- Analysis of 4-cell 400 MHz for the W beam.
- To do: finalisation of report + contribution to CDR.