

# Cavity Design, WP

Oct 14, 2015

## RF requirements & 400 MHz cavity design

- Baseline parameters & requirements for hh, ee, he
- RF design optimization including mechanical/thermal aspects (Rostock+CERN)
- Cavity layout, RF staging (ee), tolerances etc..

## Coupler design for hh/ee/he options

- Requirements on FPC for hh/ee/he (movable, RF distribution)
- HOM power and damping requirements - stability
- Damper options and synergy between different operational modes
- New development for ultra high power HOM couplers or alternatives

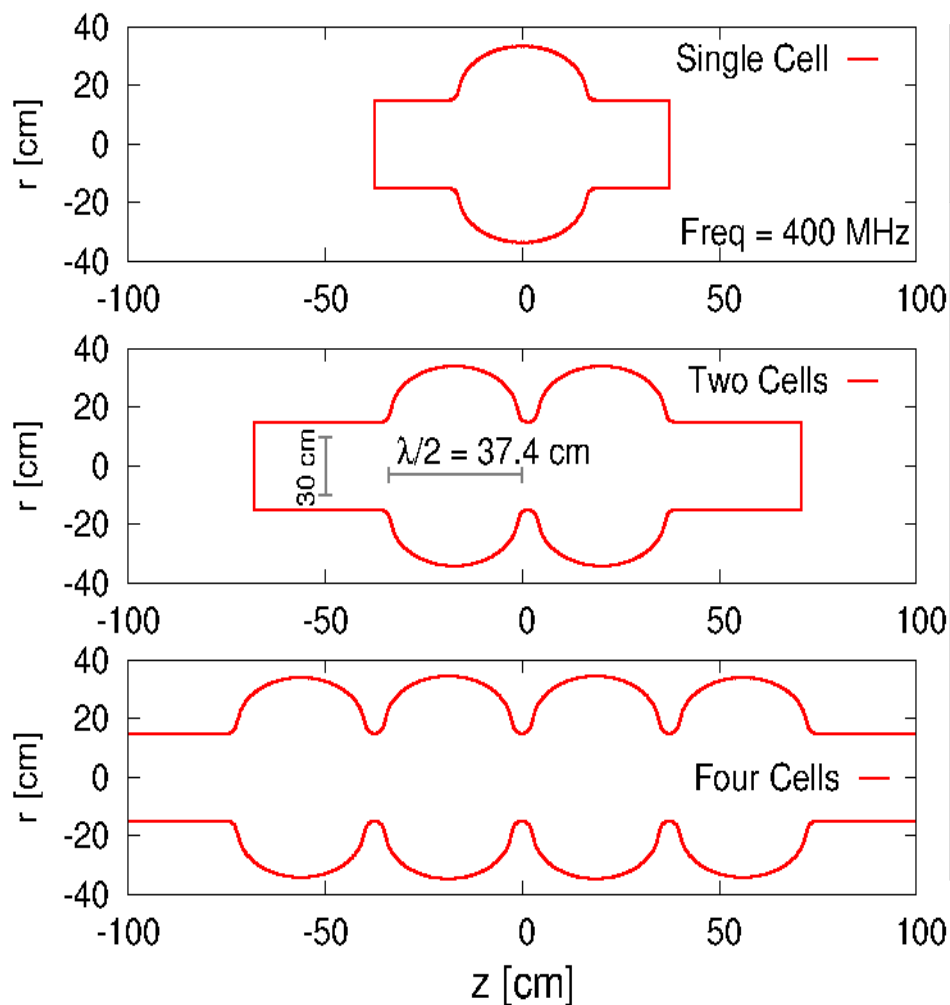
## 2<sup>nd</sup> harmonic 800 MHz cavity design

- Establish the need hh/ee/he and all the above
- Presently based on the 5-cell cavity (high gradient development)
- Single cell development for LHC ongoing

# Cavity Options, 400 MHz

2+2 cells is assumed as a reference – first RF concept at SRF15

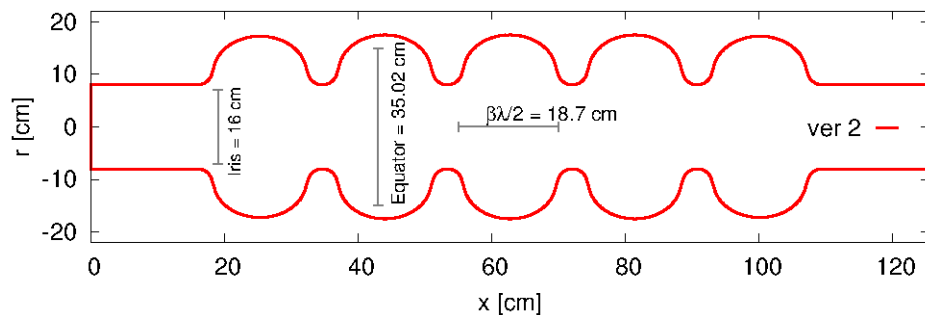
Minimize beam loading & HOM power



	1-Cell	2-Cells	4-Cells
L [m], Active	.374	.748	1.5
V [MV] /cav	3.75	7.5	15
Ep /Ea	3.1	3.3	3.3
Bp [mT]/Ea	4.2	4.7	4.7
R/Q [ $\Omega$ ]	87	169	310
U [J]	0.54	1.3	2.7

RF Files: <http://cern.ch/rcalaga/FCCRF/>

# Cavity Options, 800 MHz



RF Files: <http://cern.ch/rcalaga/HGrad/>

Parameter	Ver 1 (Scaled)	Ver 2
Frequency [MHz]	801.58	801.58
Number of cells	5	5
Active cavity length [mm]	935	935
Voltage [MV]	18.7	18.7
$E_p$ [MV/m]	45.1	48.0
$B_p$ [mT]	95.4	98.3
R/Q [ $\Omega$ ]	430	393
Cell-cell coupling (mid-cell)	4.47%	5.75%
Stored Energy [J]	154	141
Geometry Factor [ $\Omega$ ]	276	283
Field Flatness	97%	96%

Five-cell cavity design in the framework of the CERN-INFN-STFC development

Detailed analysis (RF & Mechanical) to determine geometry and thickness

Goal: Fix the five-cell geometry with the aim of cold testing, therefore mechanical integrity is important (warm/cold tunability + freq stability) possibly w/o stiffeners

We cannot exclude 4.5K operation

Note: Ongoing 800 MHz single-cell development for the LHC is also highly relevant for FCC needs (EDMS CERN-0000150656)