New design of a damped an tapered accelerating structure for CLIC

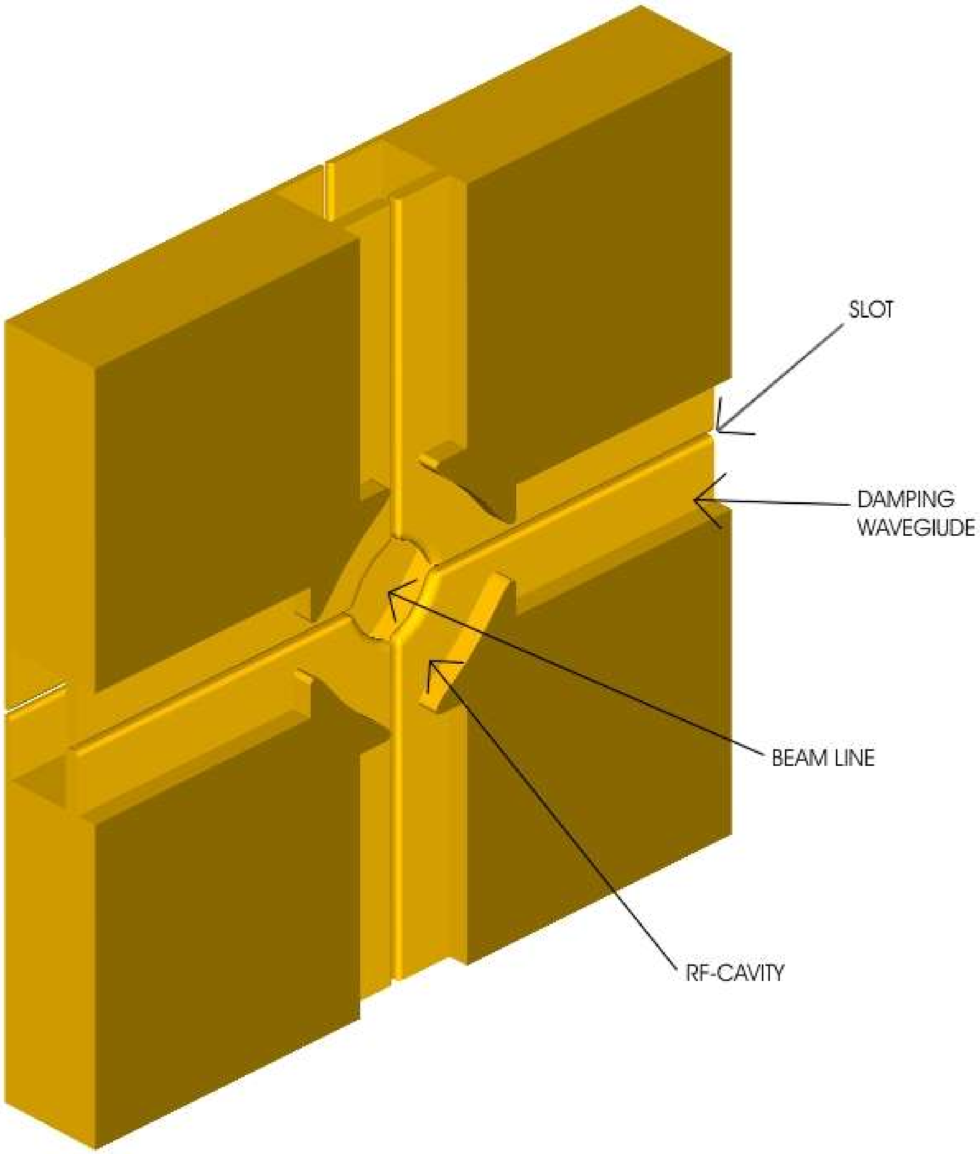
Alexej Grudiev
CERN AB/RF

Structure parameters for average accelerating gradient of 150 MV/m

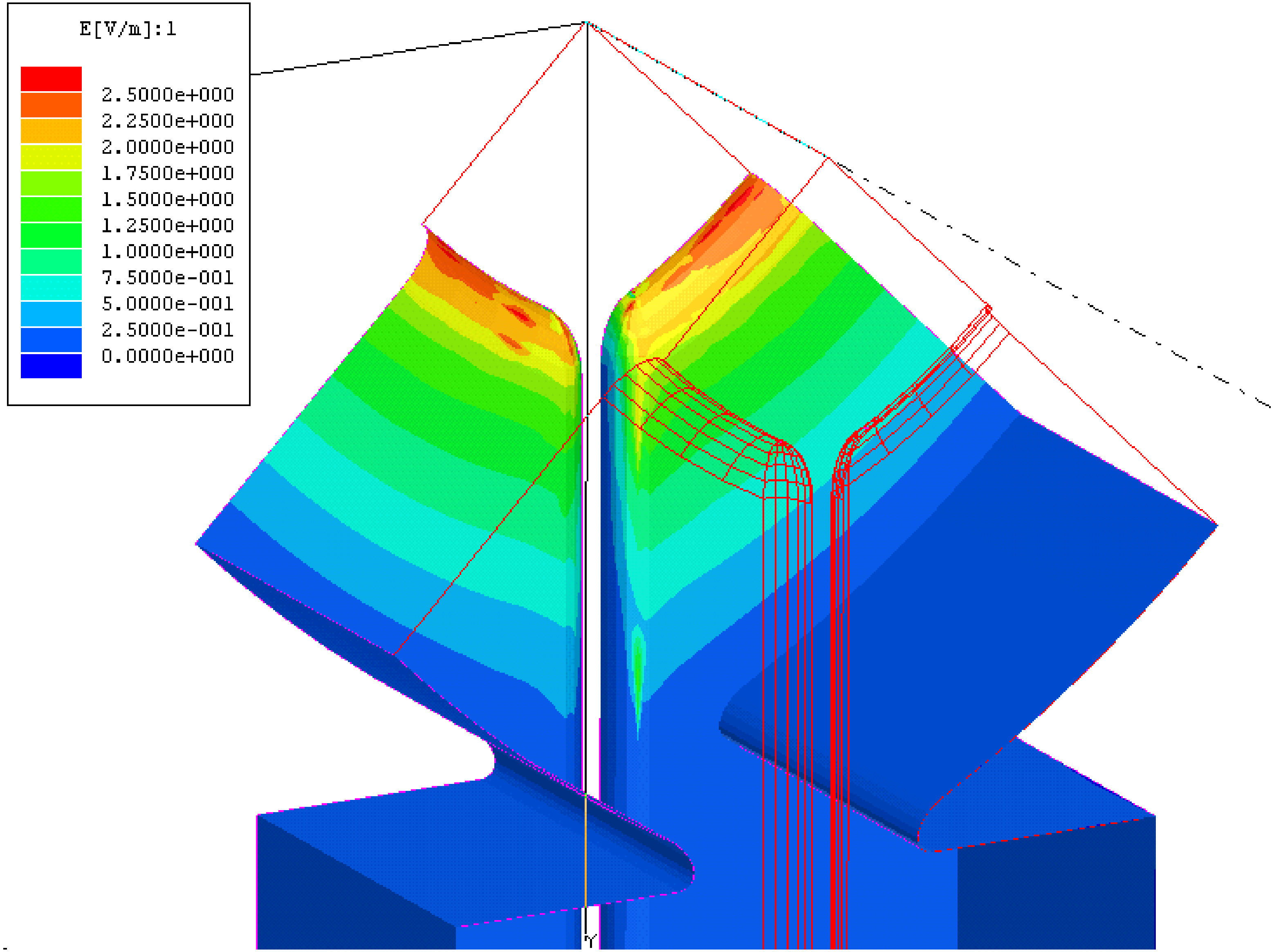
	TDS	XDS	CDS	HDS
Number of cells	150	77	50	49
E_{surf} [MV/m]	480	345	350	410 (340)
ΔT [K] (130 ns)	>>250	122	115	67 (50)
$\eta_{RF\text{-}beam}$ [%]	23.8	24.2	24.4	26.3
P_{in} [MW]	250	130	80	73
a [mm]	2.25-1.75	2-1.5	1.7-1.5	1.56-1.5
d [mm]	0.55	0.8-0.55	0.55-0.8	0.55-0.8
Q_1	~16	44-21	16-14	9-10
δf_1 [GHz]	2	3.2	1.3	0.8
Q_2	~150	49-?	100-90	100-60
δf_2 [GHz]	1.8	?	4.0	3.3
W[V/pC/mm/m](2nd bunch)	10	45		

Geometry of XDS cell

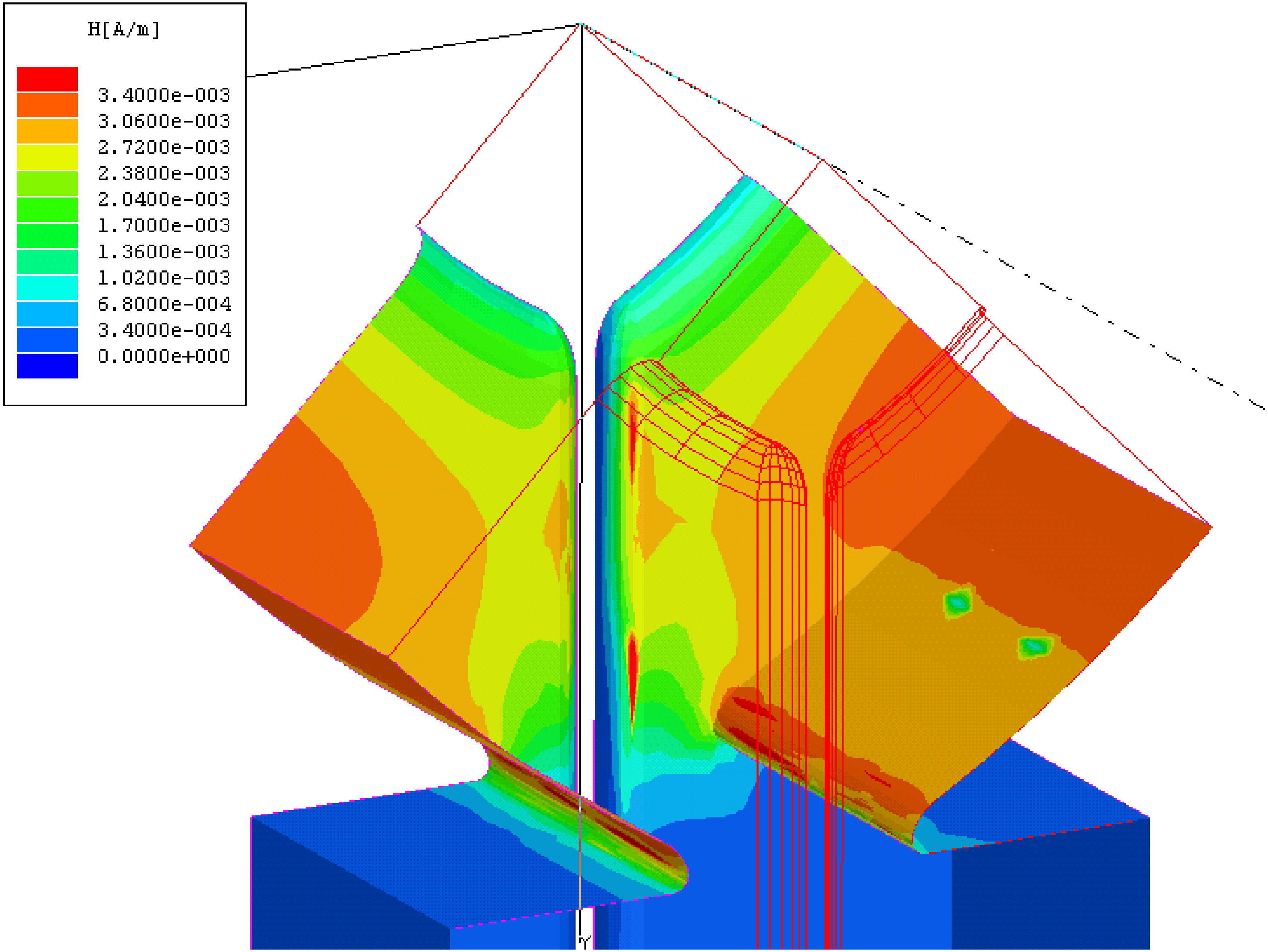
Geometry of HDS cell



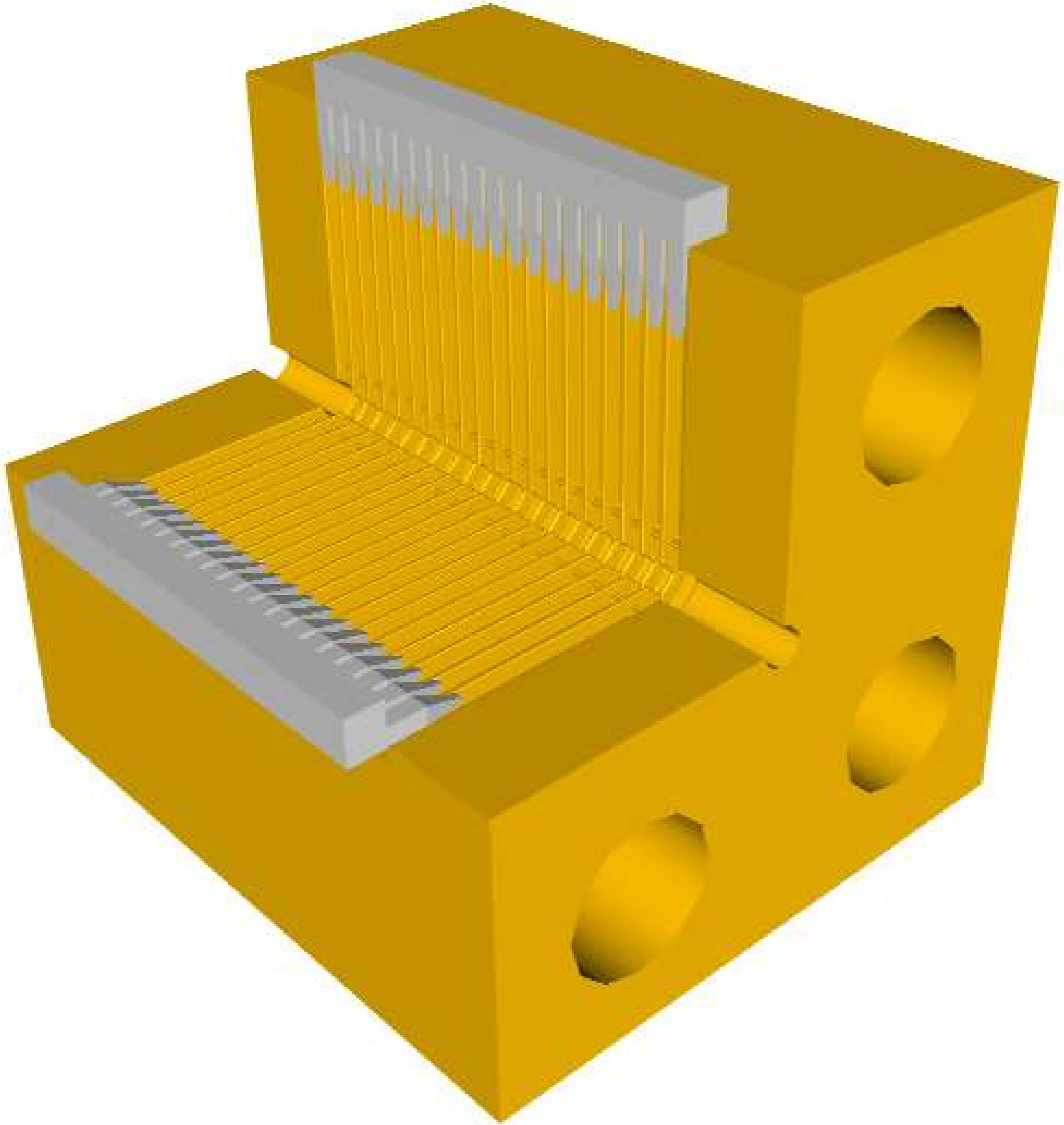
Surface electric field in HDS cell



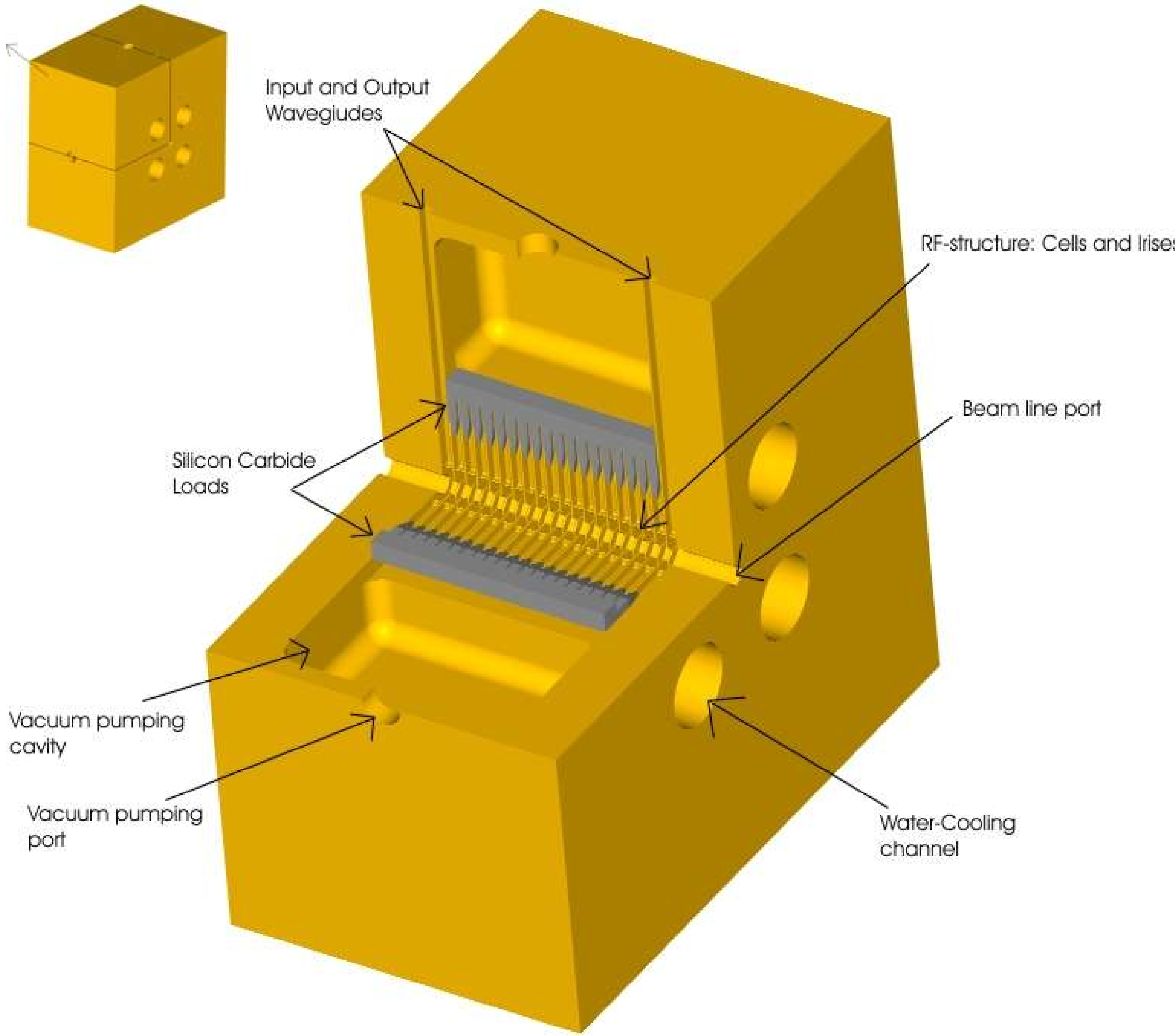
Surface magnetic field in HDS cell



Geometry of HDS with loads



Geometry of assembled HDS



Advantages and disadvantages

PRO

+ Excellent damping

+ $\Delta T/\Delta T_{min}$ is only ~1.3

+ Surface electric field enhancement in the slot is reduced by proper shape of the iris

+ 4 Cu pieces per structure (or per several structures)

+ No brazing is necessary

+ Better water cooling

+ No water/vacuum joints

+ No vacuum can is necessary

+ Good pumping capabilities

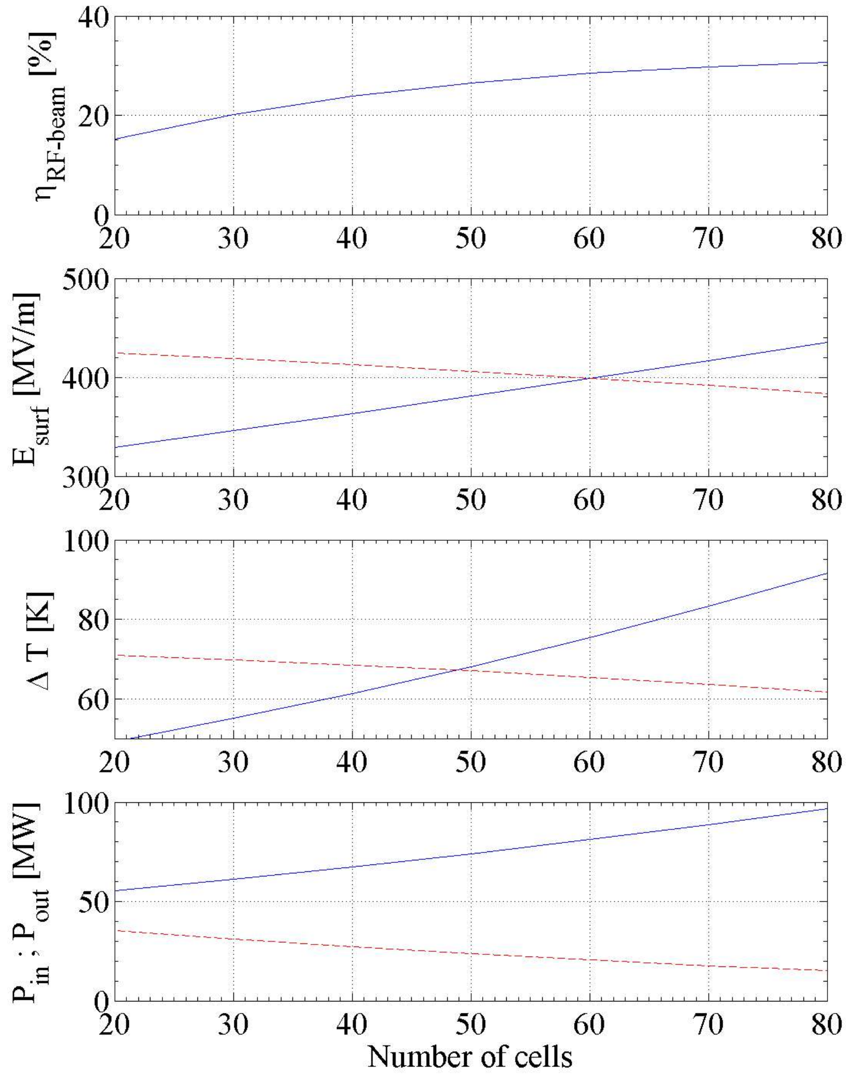
CONTRA

- new technology needs to be shown (machinability, tolerances, etc.)

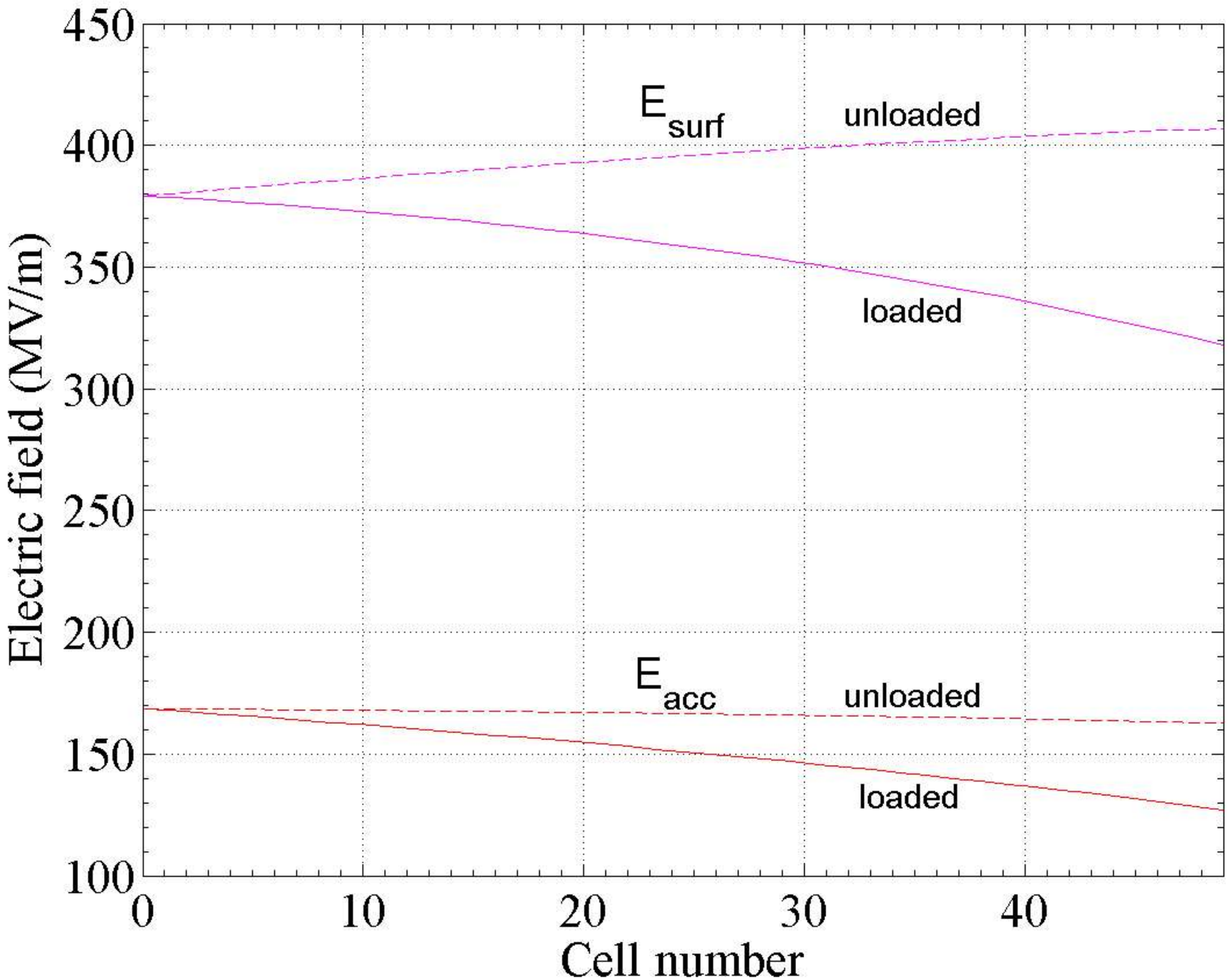
- potential danger of coupling the main mode to the load in the case of breakdown

Outlook

- To calculate wakefields using GdfidL
- To use parameters of CuZr alloy instead of Cu in the structure design
- To increase a/λ



$\eta_{RF\text{-}beam}$ [%]
E_{surf} [MV/m]
Δ T [K]
P_{in} ; P_{out} [MW]
Number of cells



450
400
350
300
250
200
150
100
0
10
20
30
40
Electric field (MV/m)
Cell number
E_{surf}
unloaded
loaded
E_{acc}
unloaded
loaded