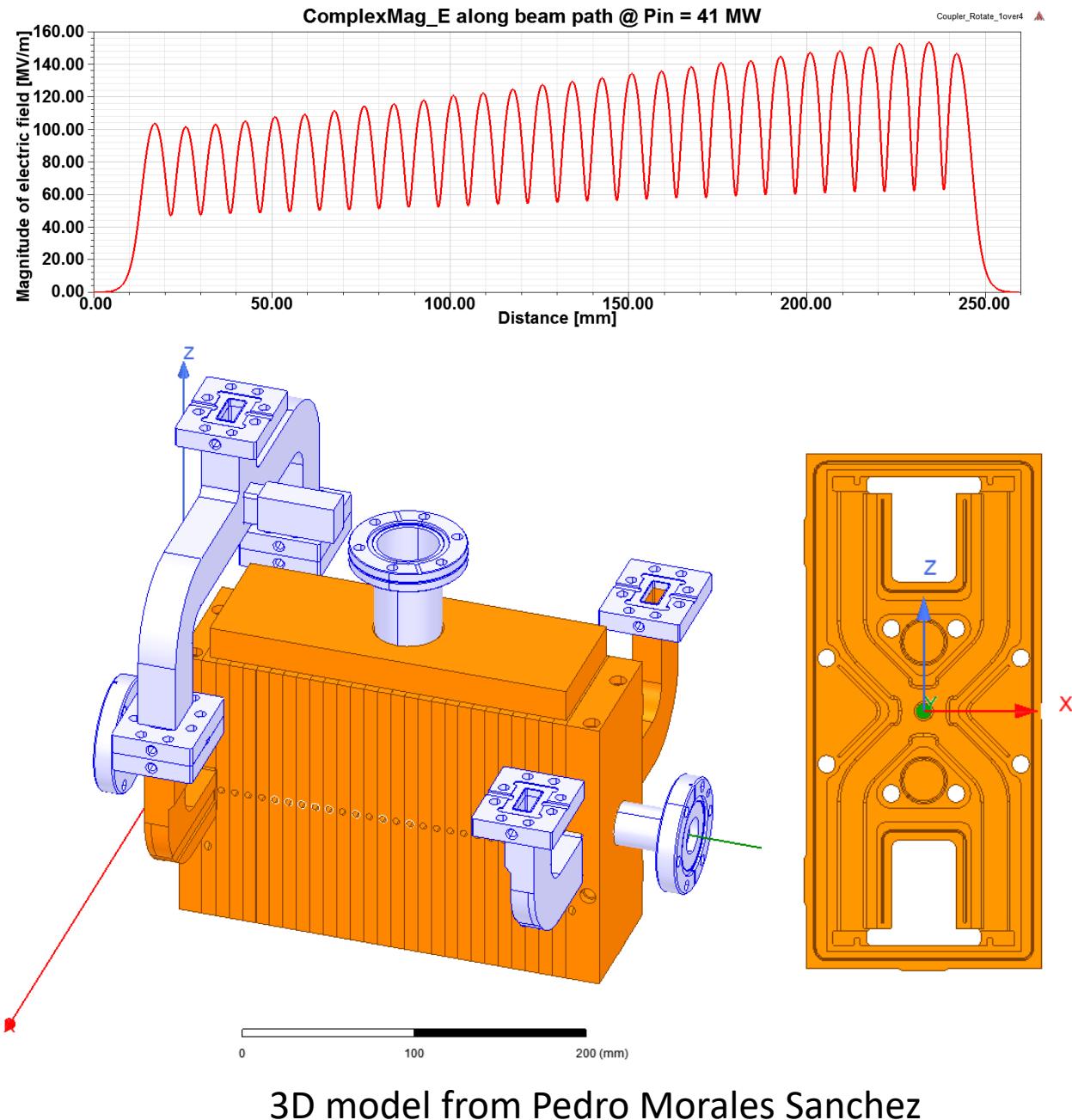
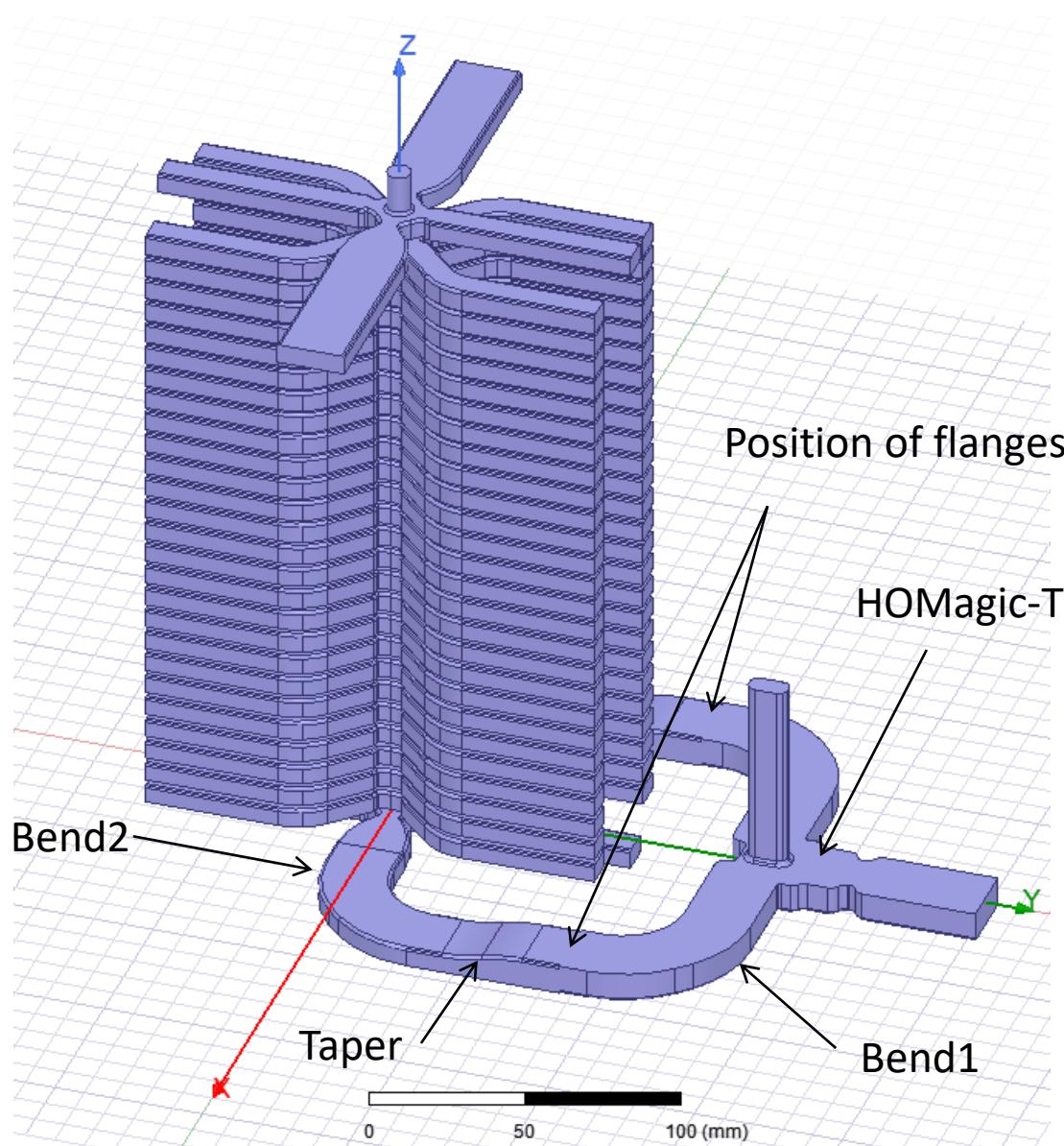


Accelerating structure and BOC pulse compressor for klystron-based CLIC

Ping Wang, Alexej Grudiev

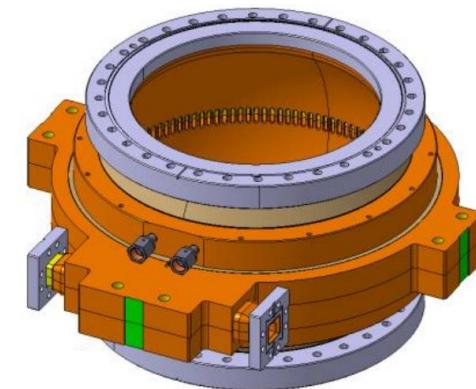
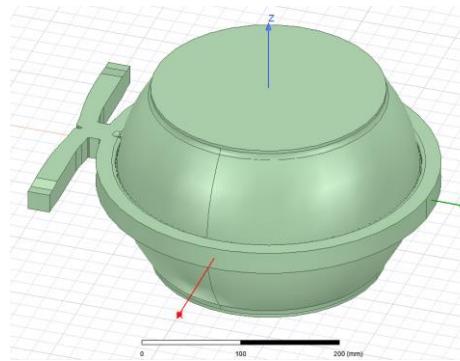
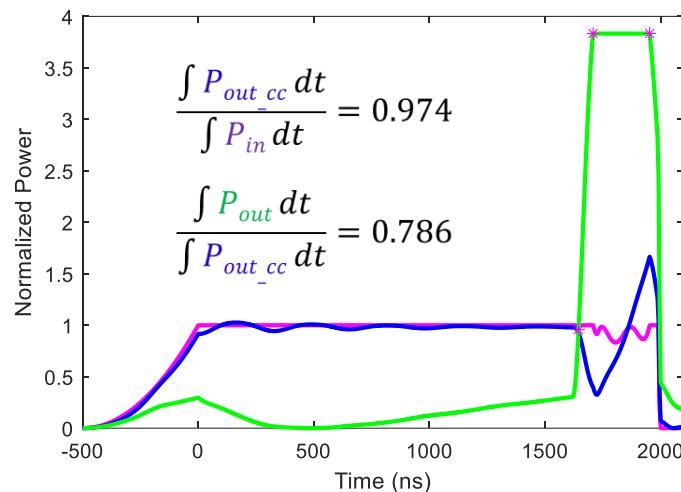
16.11.2021

RF design of the CLIC-K structure



BOC pulse compressor

Parameters of the klystron	
Peak power [MW]	50
Pulse length [μ s]	2.5
Repetition rate [Hz]	50
Average power [kW]	6.25



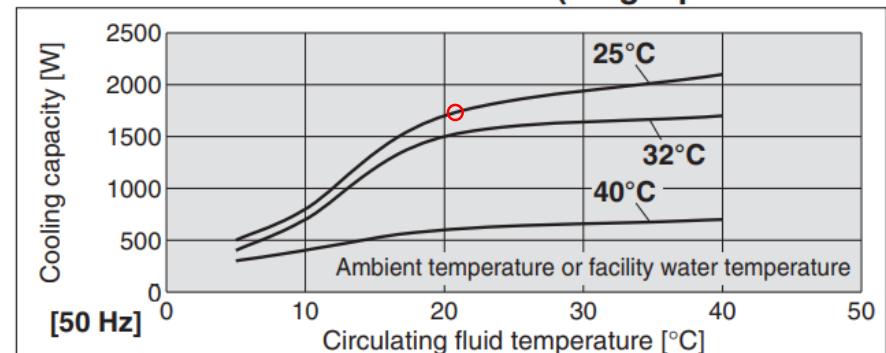
3D model from
Emmanuel Berthome

$$P_{loss_boc} = P_{in} \frac{\int P_{out_cc} dt}{\int P_{in} dt} \left(1 - \frac{\int P_{out} dt}{\int P_{out_cc} dt} \right) \approx 0.21 P_{in} = 1.3 \text{ kW}$$

- Heat Q: 1300 W
- Water speed v: 1 m/s
- Cross Section A: 100.7 mm²
- heat capacity of water Cp: 4182 J/(kg°C)
- Water density ρ: 997 kg/m³

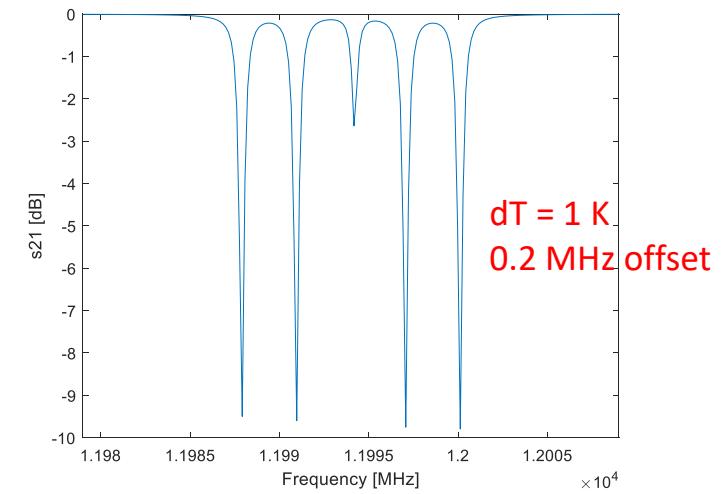
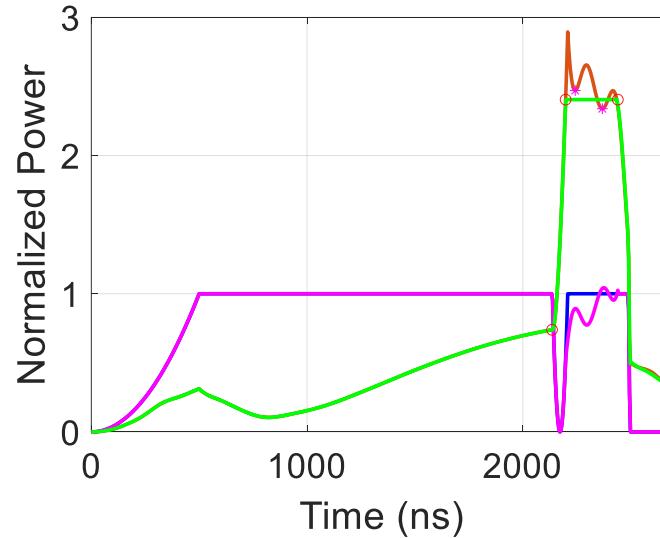
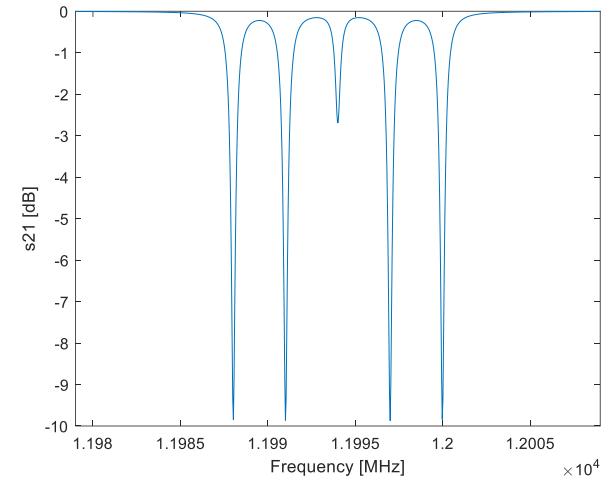
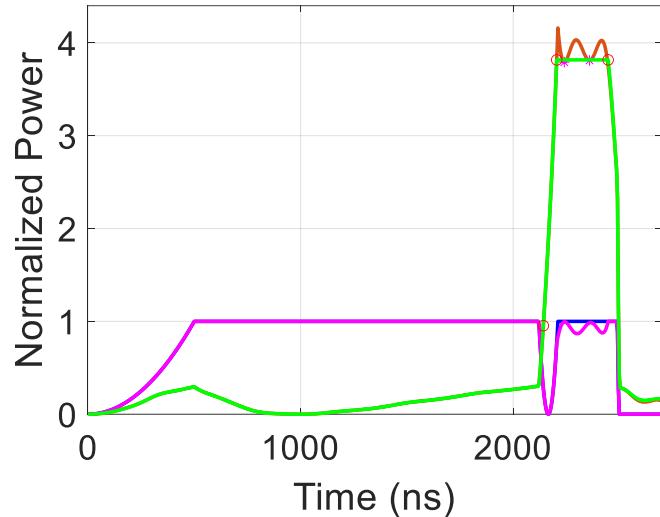
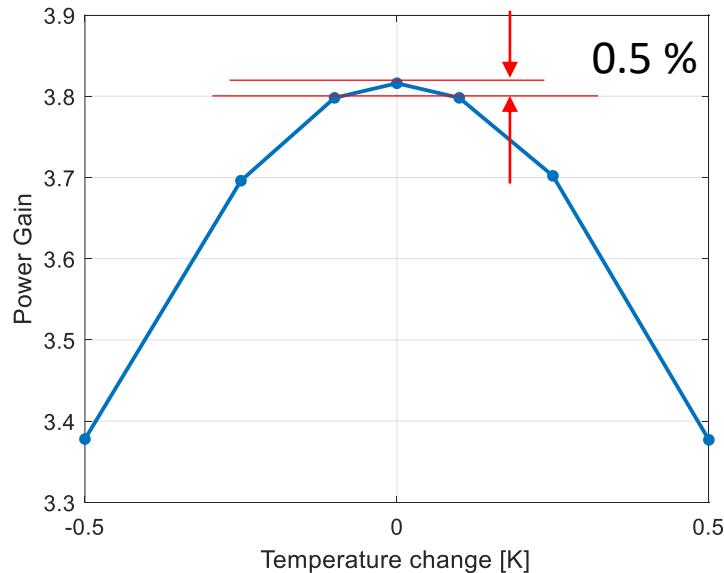
$$\Delta T = Q \Delta t / (A * v * \Delta t * \rho * C_p) = Q / (A * v * \rho * C_p) = 3.1^\circ\text{C}$$

HRS018-A-20/HRS018-W-20 (Single-phase 200 to 230



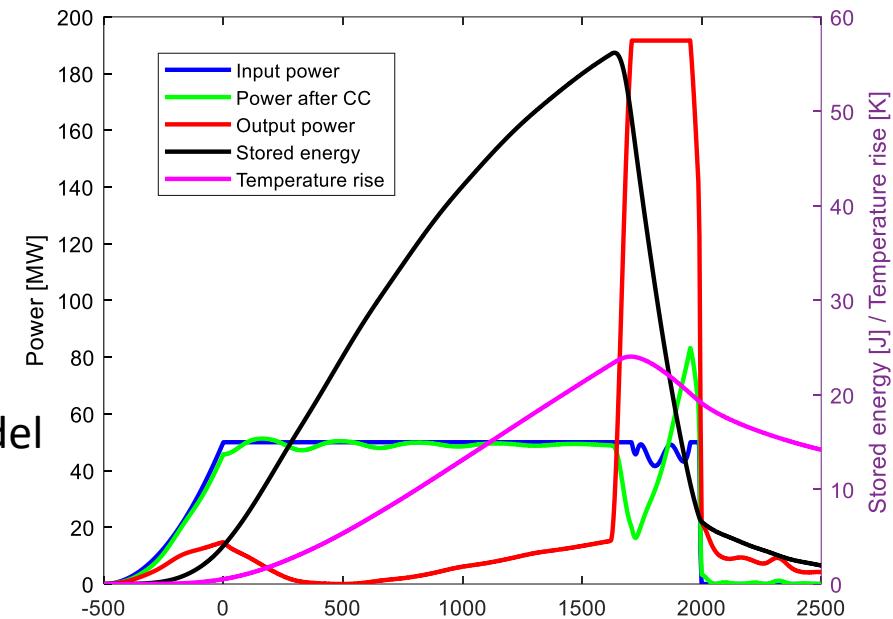
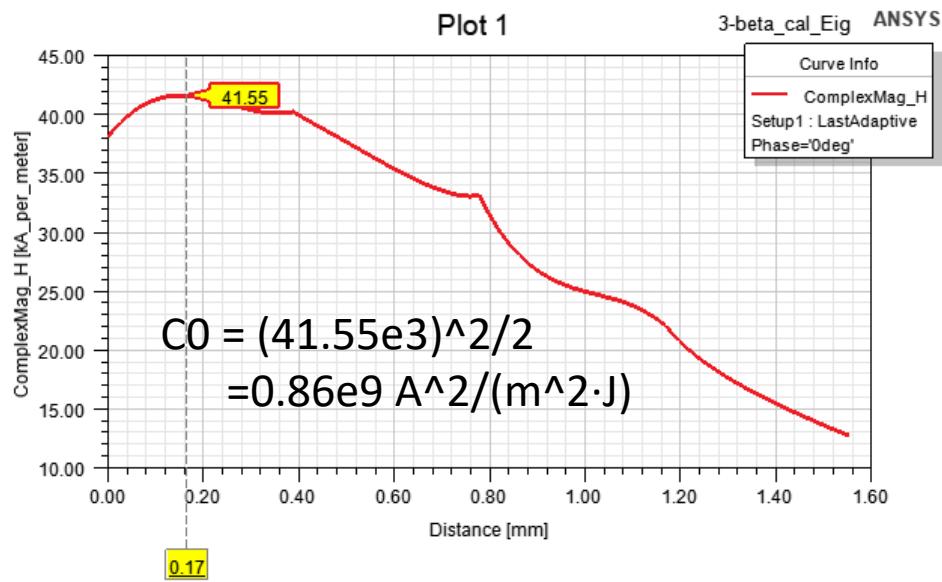
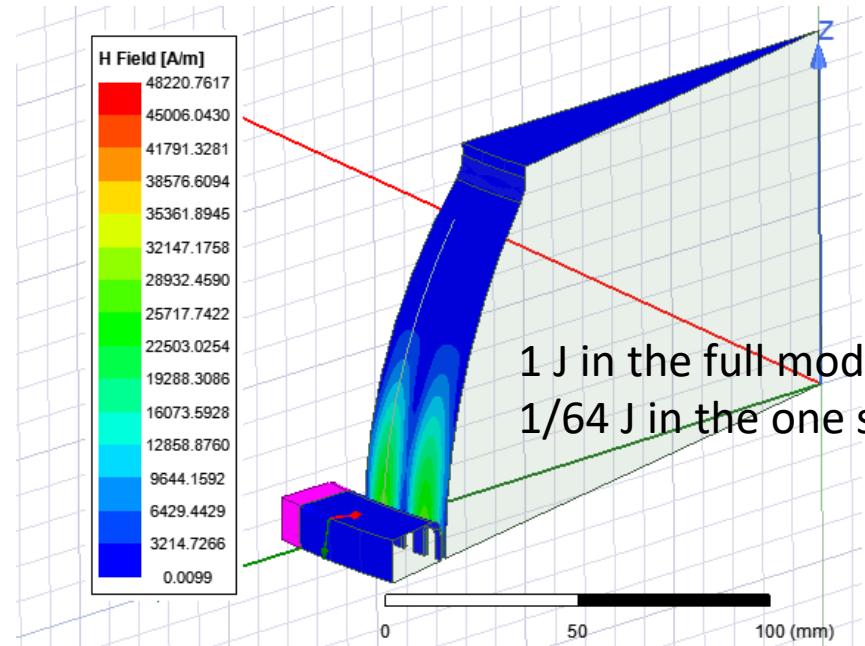
Frequency control requirement

- $\alpha = 17 \text{ } \mu\text{m/m/K}$
- Temperature range: $\pm 5 \text{ K}$
- $R_{\text{cav}} = 154.104 \text{ mm}$
- $154.104 \times 10^{-3} \times 17 \times \pm 5 = \pm 13 \text{ } \mu\text{m}$
- $77.8(\text{MHz/mm}) \times \pm 13 \text{ } \mu\text{m} = \pm 1 \text{ MHz}$



If P_g reduction is smaller than 0.005, the temperature change should be smaller than 0.1 K

Surface fields parameters



	50MW	100MW	Limit
Max E field [MV/m]	9.9	10.4	100
Max Sc [MW/mm ²]	0.33	0.66	2.0-4.0
Temperature rise [K]	24	48	40-50