Thermal simulation of BOC

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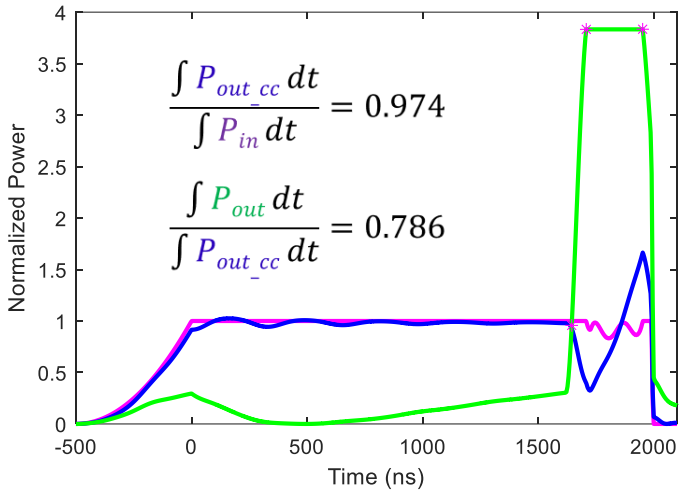
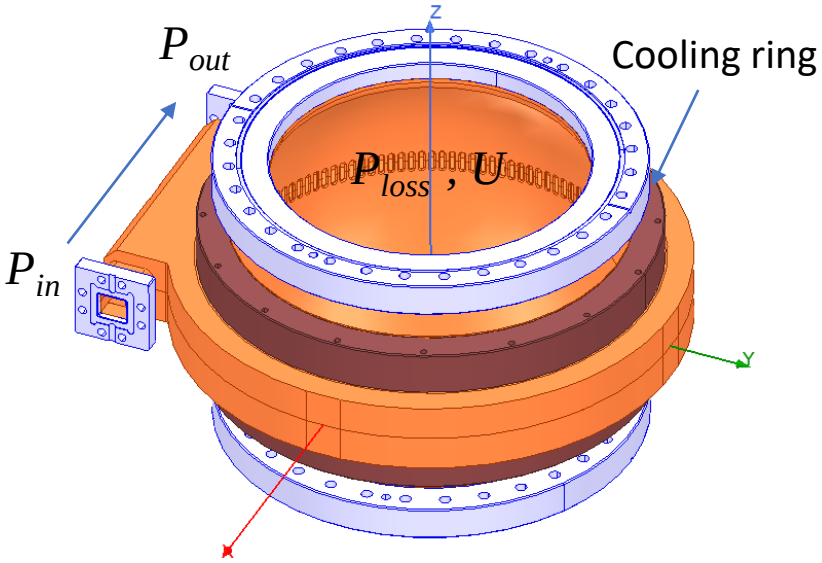
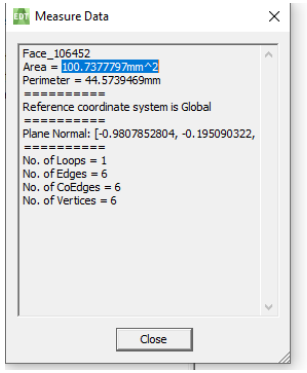
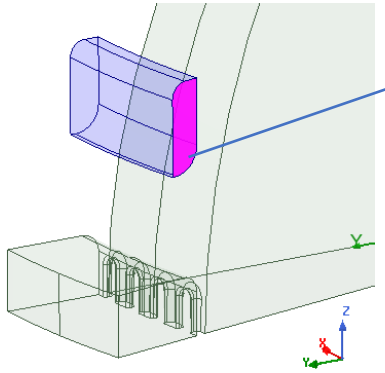
Parameters of the klystron	
Peak power [MW]	50
Pulse length [μs]	2.5
Repetition rate [Hz]	50
Average power [kW]	6.25





$$P_{loss\_boc} = P_{in}\frac{\int P_{out\_cc}\,dt}{\int P_{in}\,dt}\left(1-\frac{\int P_{out}\,dt}{\int P_{out\_cc}\,dt}\right) \approx 0.21P_{in} = 1.3\ \text{kW}$$

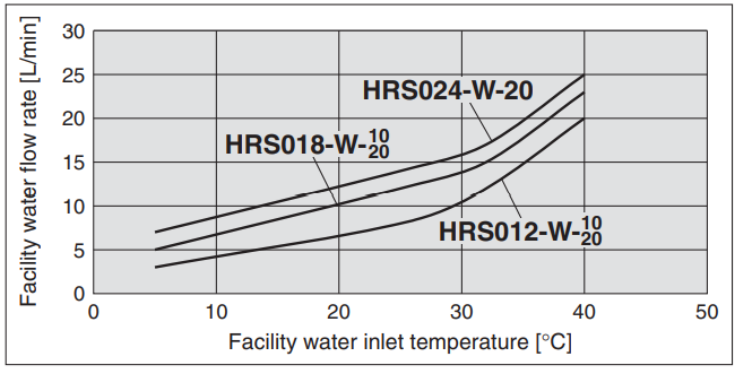




- Water speed: 1 m/s
- Cross Section: 100.7 mm2
- Water flow: 6.04 L/min
  < 10 L/min@20C°(HRS018-W)
- Water temperature: 22C°

Required Facility Water Flow Rate

HRS012-W-$^{10}_{20}$, HRS018-W-$^{10}_{20}$, HRS024-W-20



* This is the facility water flow rate at the circulating fluid rated flow rate and the cooling capacity listed in the "Cooling Capacity" specifications.

- Water speed: 1 m/s
- Convection Cu&Water: 5000 W/m2K
- Convection Air = 10 W/m2K

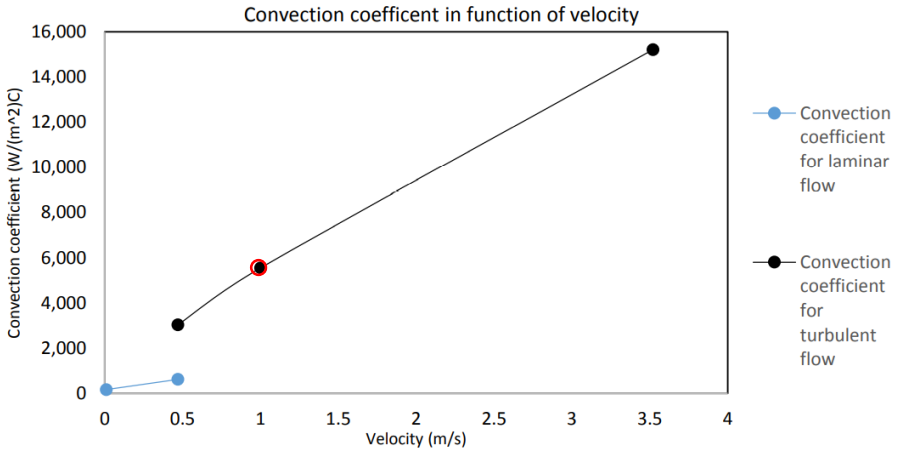
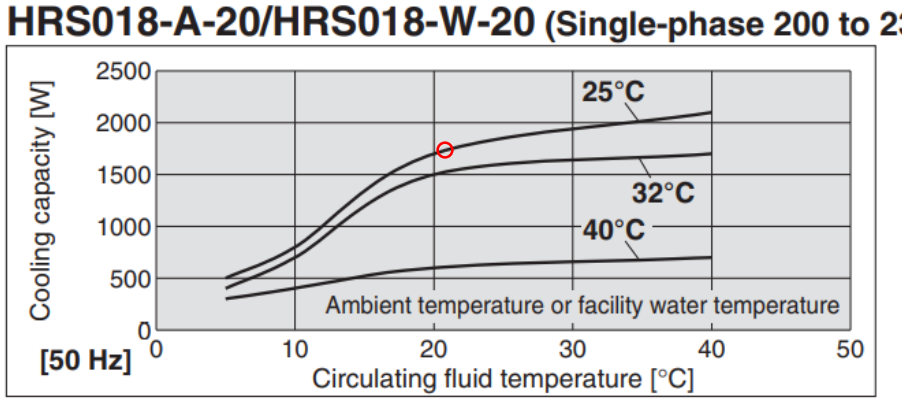


Figure5.3.3. *Convection coefficient of the cooling system in function of velocity.*

- 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

$\Delta T = Q\,\Delta t/(A*v*\Delta t*\rho*Cp) = Q/(A*v*\rho*Cp) =$ **3.1 °C**



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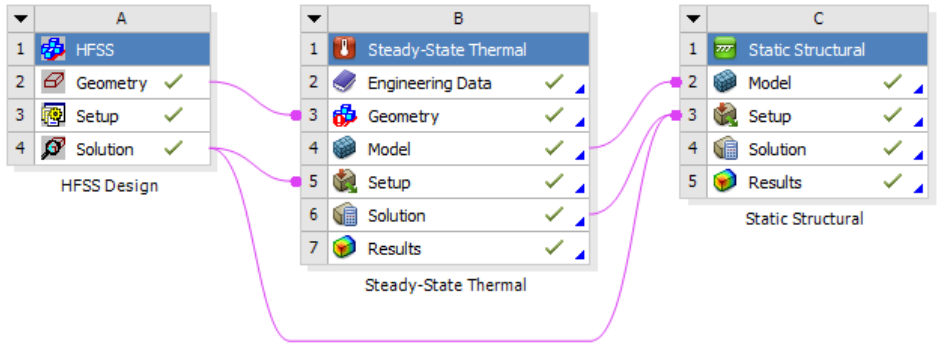
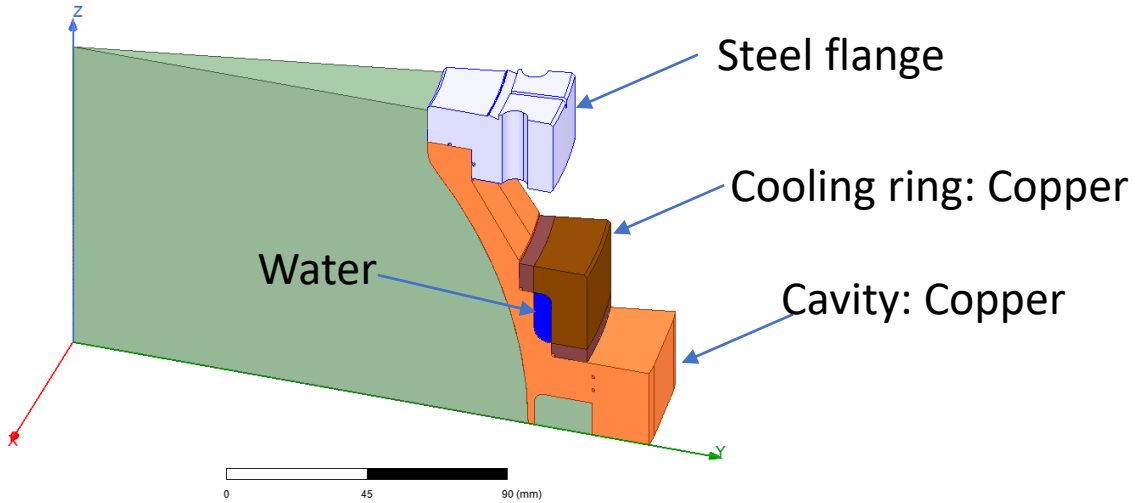
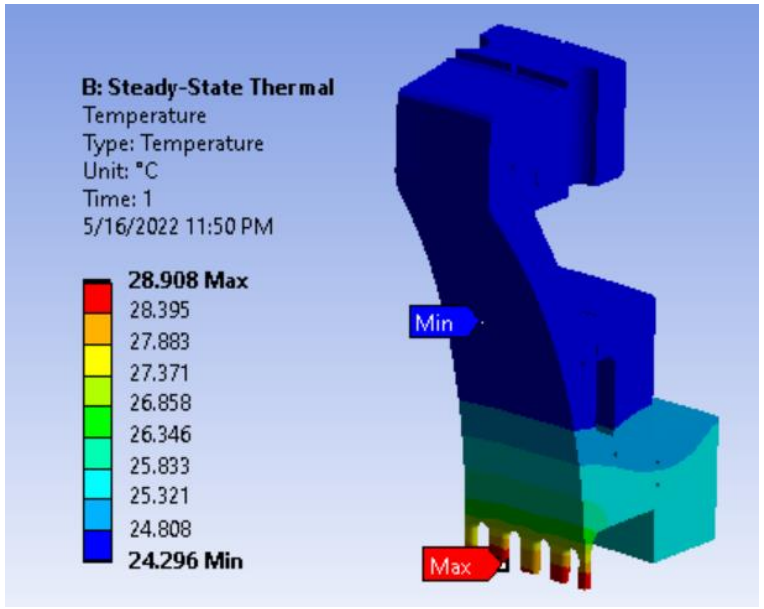
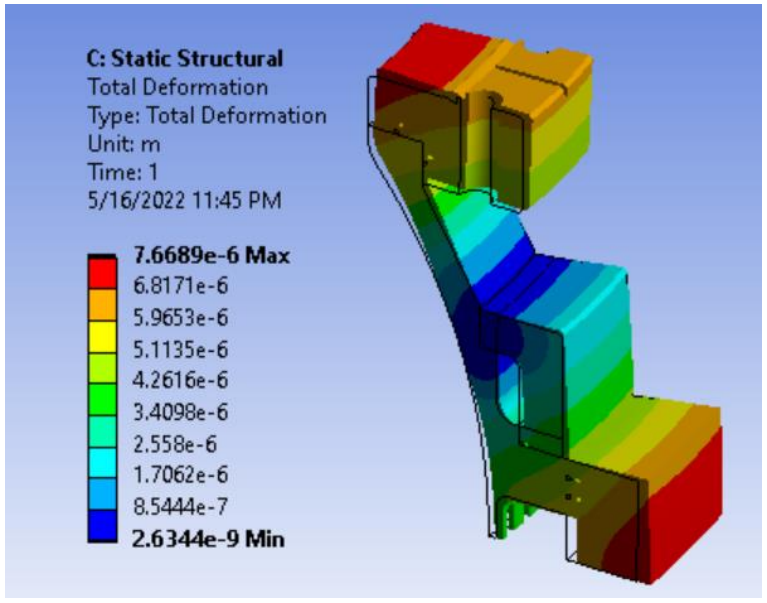
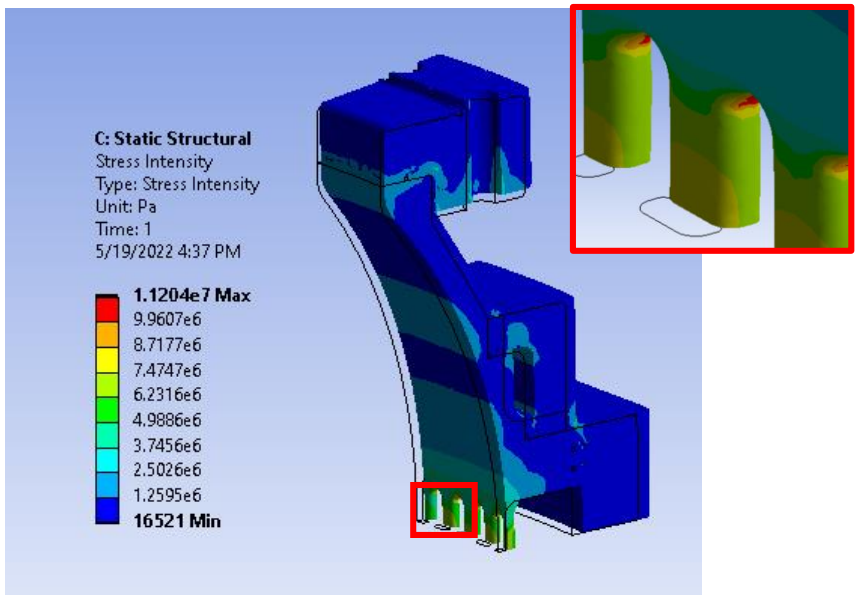

A
1 HFSS
2 Geometry
3 Setup
4 Solution
HFSS Design
B
1 Steady-State Thermal
2 Engineering Data
3 Geometry
4 Model
5 Setup
6 Solution
7 Results
Steady-State Thermal
C
1 Static Structural
2 Model
3 Setup
4 Solution
5 Results
Static Structural


Z
Steel flange
Cooling ring: Copper
Water
Cavity: Copper
0
45
90 (mm)


B: Steady-State Thermal
Temperature
Type: Temperature
Unit: °C
Time: 1
5/16/2022 11:50 PM
28.908 Max
28.395
27.883
27.371
26.858
26.346
25.833
25.321
24.808
24.296 Min
Min
Max


C: Static Structural
Total Deformation
Type: Total Deformation
Unit: m
Time: 1
5/16/2022 11:45 PM
7.6689e-6 Max
6.8171e-6
5.9653e-6
5.1135e-6
4.2616e-6
3.4098e-6
2.558e-6
1.7062e-6
8.5444e-7
2.6344e-9 Min


C: Static Structural
Stress Intensity
Type: Stress Intensity
Unit: Pa
Time: 1
5/19/2022 4:37 PM
1.1204e7 Max
9.9607e6
8.7177e6
7.4747e6
6.2316e6
4.9886e6
3.7456e6
2.5026e6
1.2595e6
16521 Min

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