UNIVERSITA' DEGLI STUDI DI ROMA TorVergata

Multiphysics Design of a Klystron Buncher

COMSOL CONFERENCE 2015

EH Frontier
Expanding High-frequency Frontier

A. Leggieri[1], D. Passi[1], F. Di Paolo[1] and G. Saggio[1]
[1]Department of Electronic Engineering, University of Rome "Tor Vergata", Italy

Introduction: The Multiphysics design of a 130 GHz klystron Buncher cavity is described in this paper. Thermomechanical effects due to the cathode heating and radiofrequency power dissipation are considered. A cooling airflow is used to control the temperature.

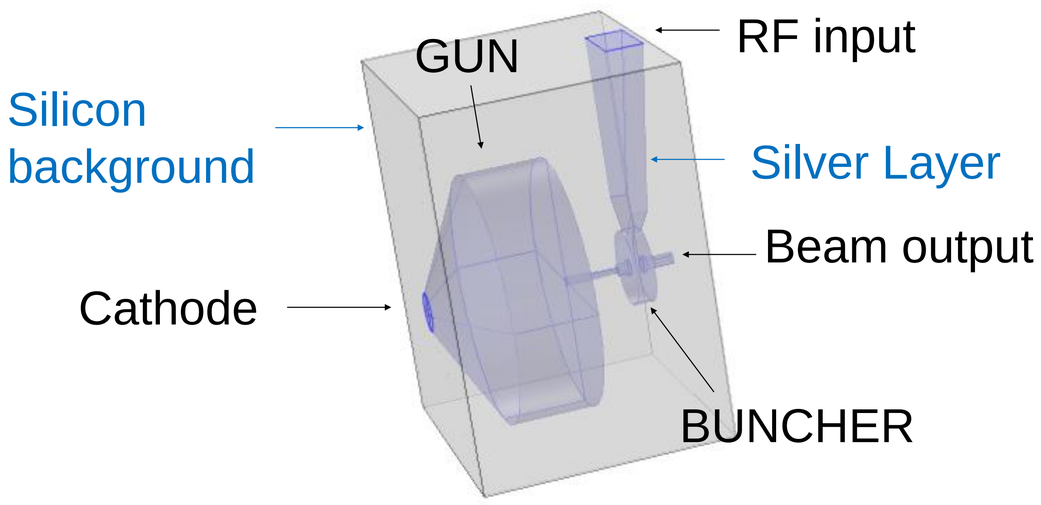


Figure 1. Simulated geometry and materials.

Computational Methods: Heat Transfer (HT), Solid Mechanics (SM), Laminar Flow (LF) and Electromagnetic Waves (EMW) analysis are coupled by Moving Mesh (MM) interface and by sharing temperature and power loss data.

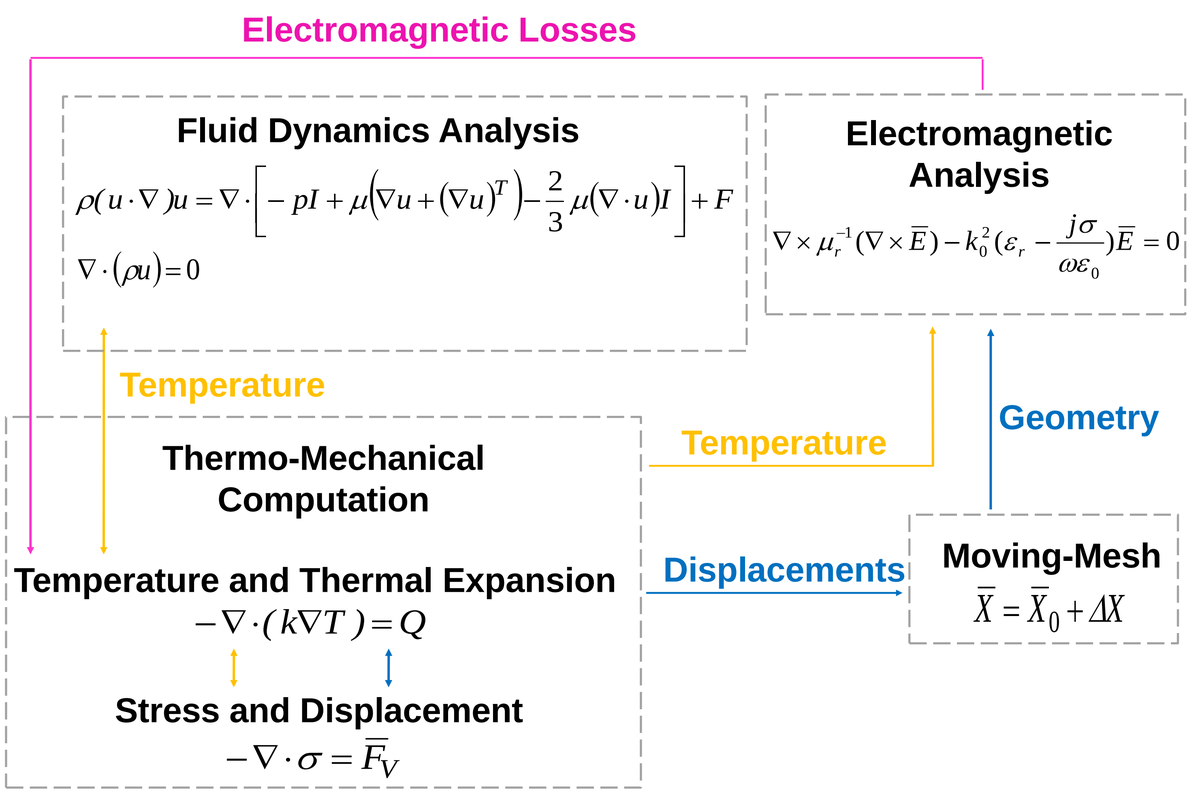
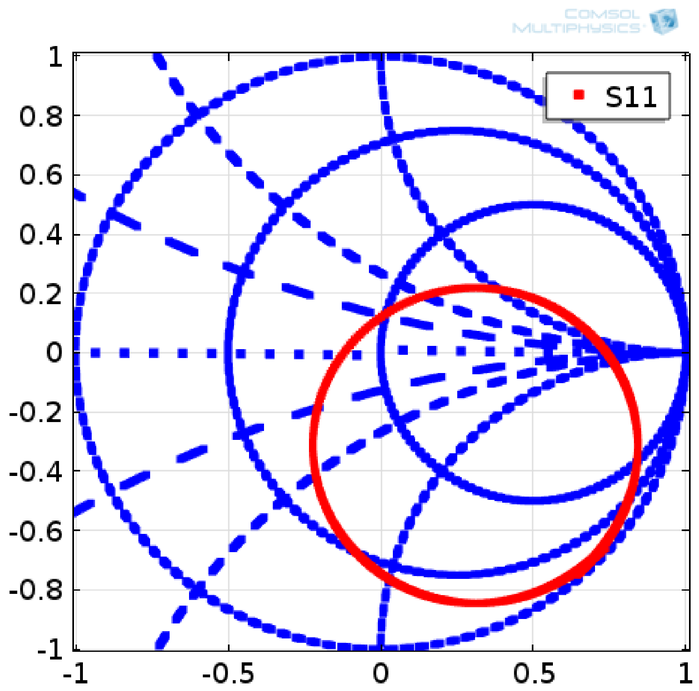


Figure 2. Computation Logical Diagram.

Nyquist plot has been used to plot the Smith Chart evaluating the cavity coupling. EMW sweep frequencies used as arguments of the exp functions.



Results: Electromagnetic behavior has been computed in Thermo mechanical operative conditions.

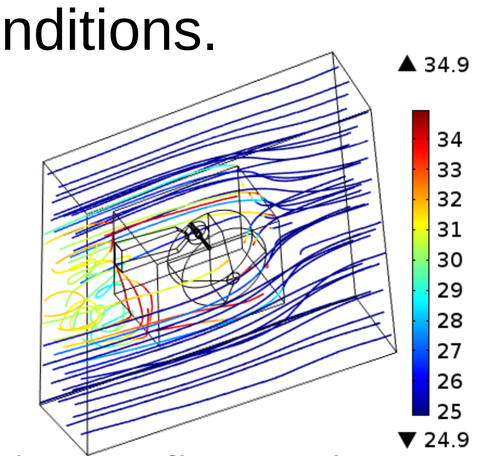


Figure 3. Cooling Airflow with Temperature (°C).

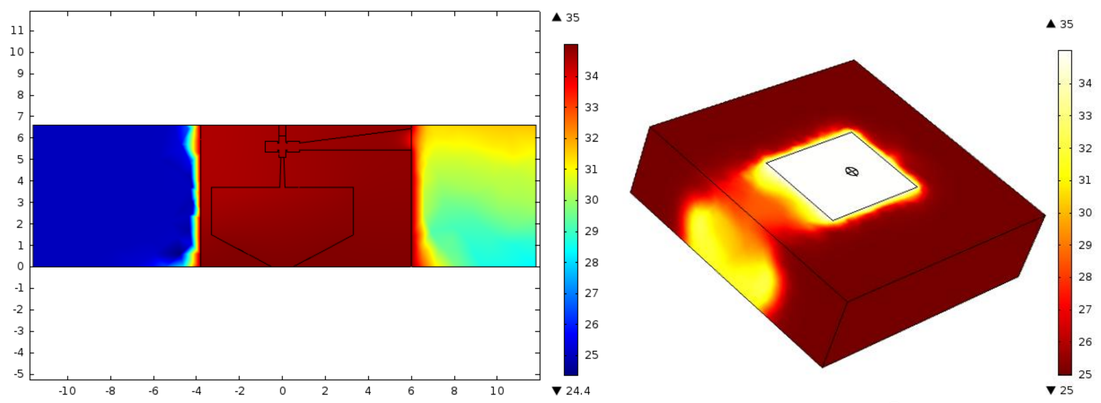


Figure 4. Temperature distribution (°C).

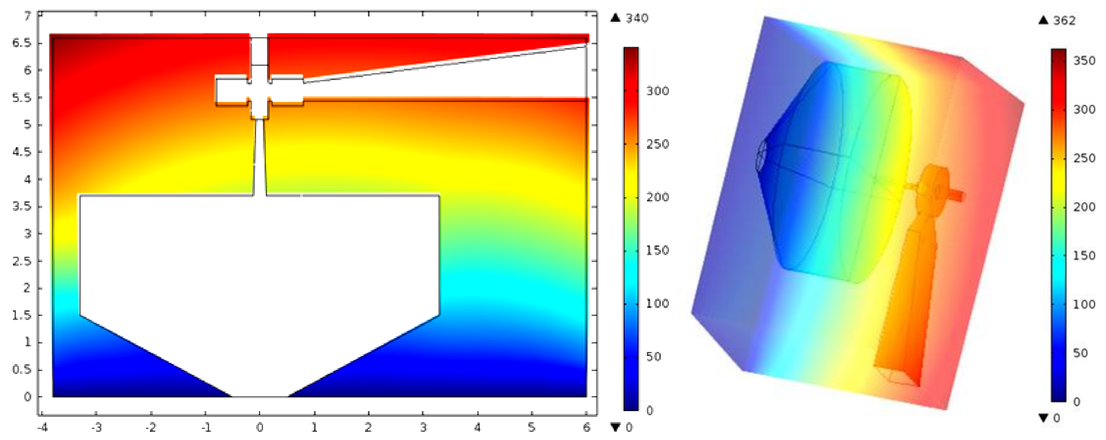


Figure 5. Thermomechanical Displacement (nm)

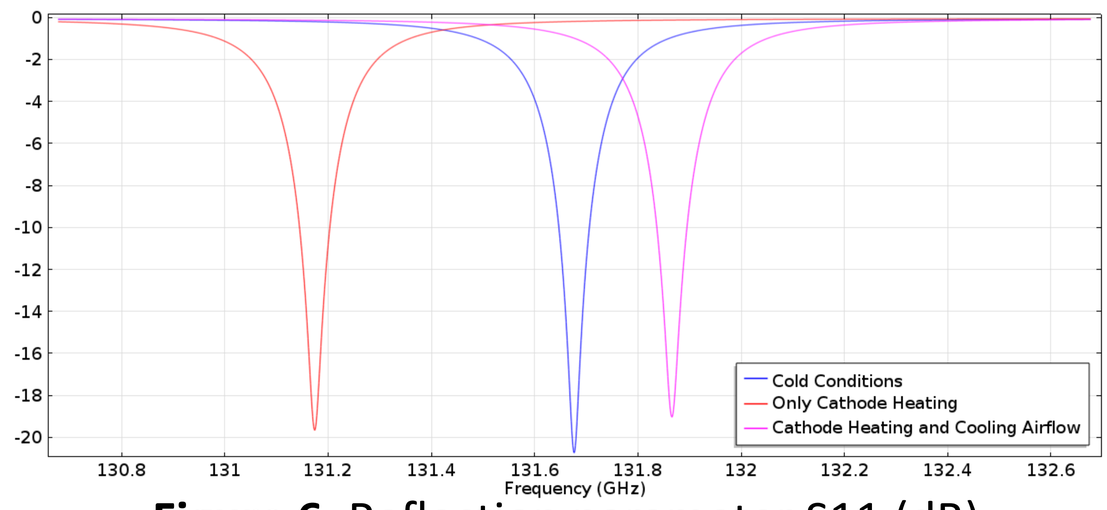


Figure 6. Reflection parameter S11 (dB)

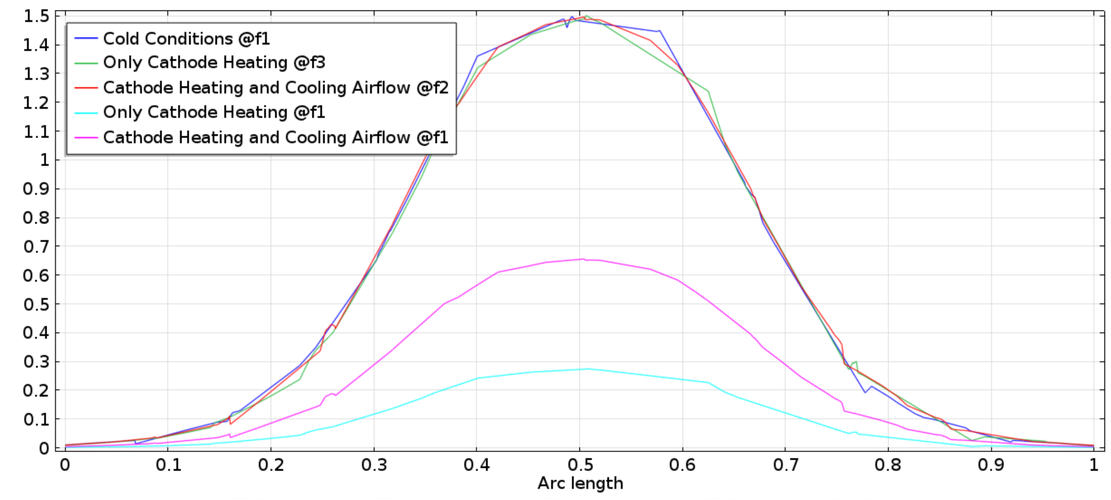


Figure 7. Axial Electric Field (MV/m)

Conclusions: Advantage of using cold cathode and cooling airflow in millimetric klystron is shown. Appropriate materials and geometries have been chosen.