Radiation Source ELBE

Forschungszentrum Rossendorf

RF - COUPLER TESTSTAND AT FZ - ROSSENDORF

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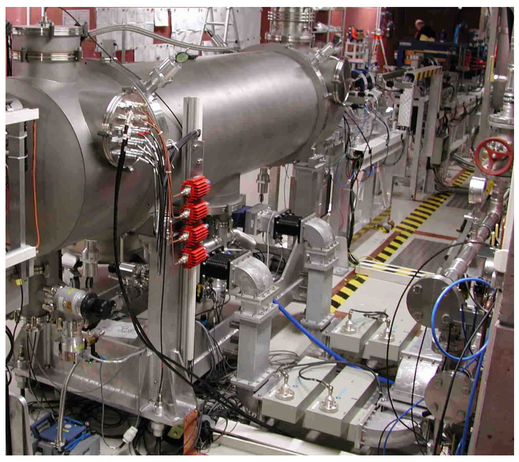
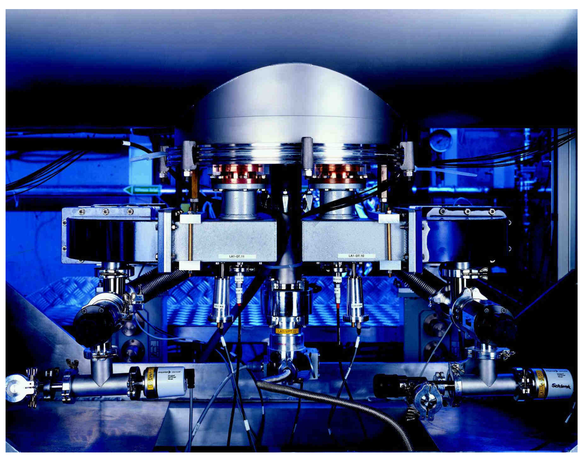
Motivation

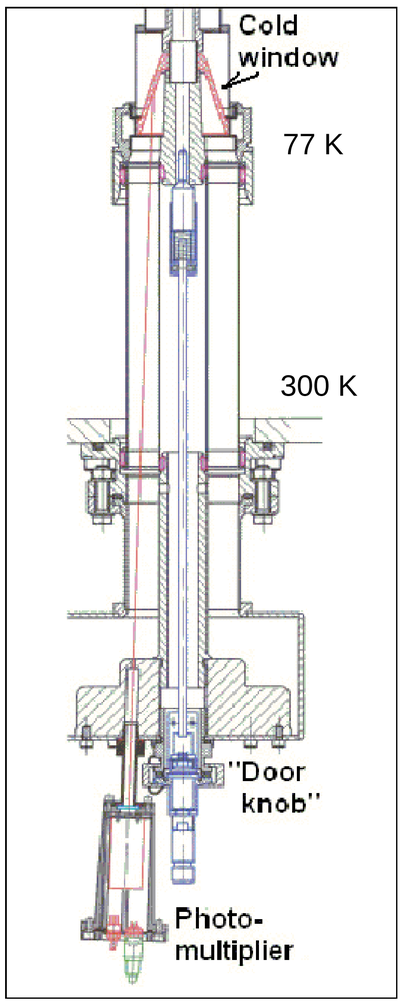
1. The radiation source ELBE is equipped with four superconducting TESLA cavities being individually driven by a 10 kW klystron amplifier (VKL7811St, CPI) in true cw-mode. The rf-main power coupler has a conical ceramic window (M.Champion) between beam line vacuum (10^{-10} mbar) and insulation vacuum (10^{-7} mbar). A waveguide window (WR650) made from polystyrene (Rexolithe) is used as a barrier between air and insulation vacuum. Both kind of windows have to be tested and conditioned before assembling.
2. In the framework of the EUFEL project the assembling of a superconducting photo rf gun is under way. The RF feed of this gun, driven in cw-mode as well, is based on the ELBE design. To ensure stable operation and to give flexibility for further upgrades a teststand has been built and out into operation at FZ-Rossendorf.



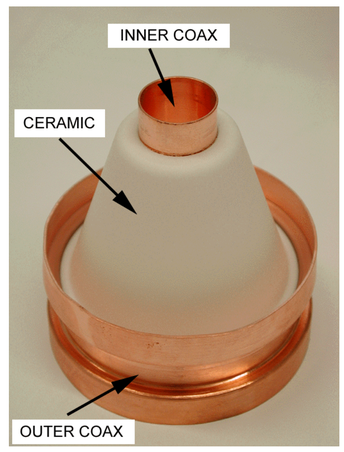
ELBE – CRYOMODULE (20 MeV, 1mA)



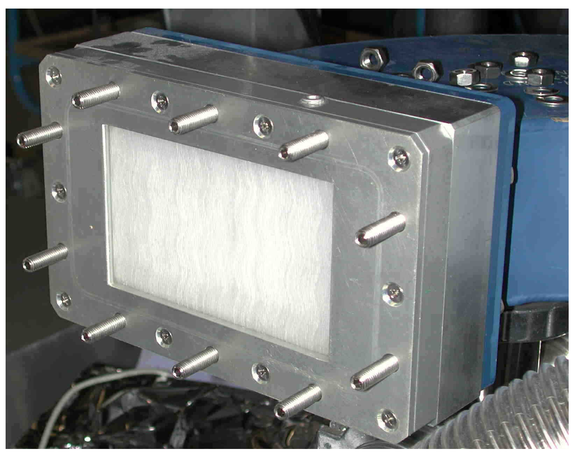
RF-FEED (WR650- Coax Transitions)



The Rossendorf coupler

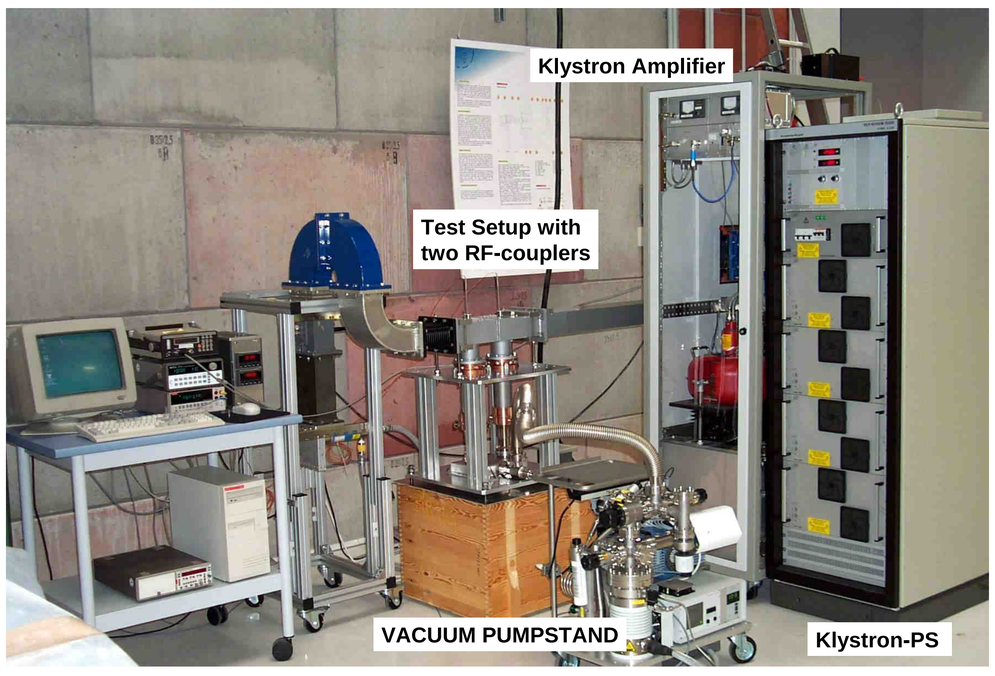


Conical cold window (Alberox)



Waveguide warm window ,Rexolithe (Mega Ind.)

Teststand with sliding short (all phases)

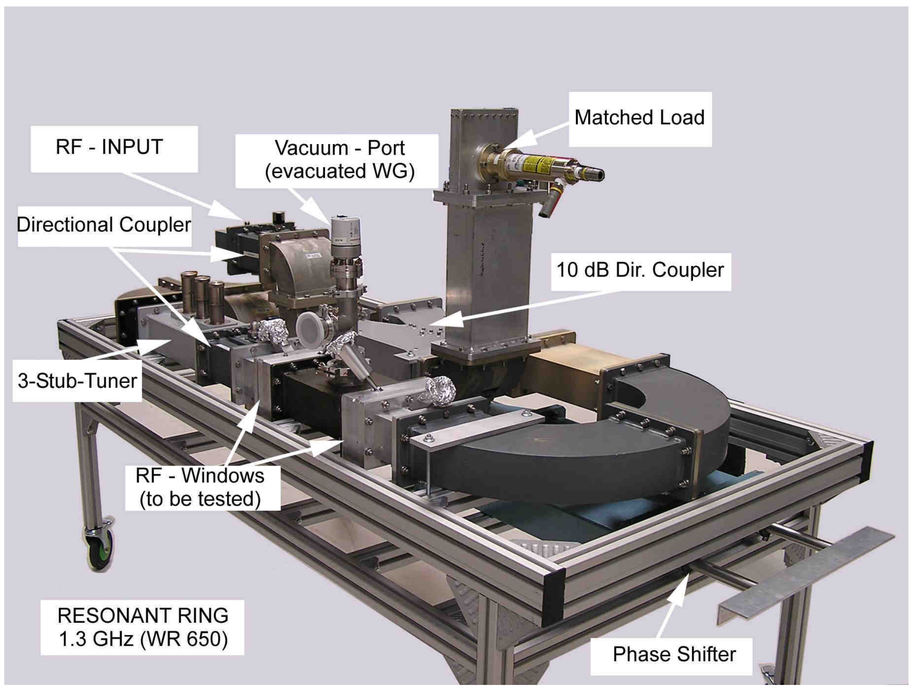


Features:
- **P_{drive}= max. 10 kW (klystron),**
- **Frequency: 1.3 GHz, WR650,**
- **P_{max} at window position: 40kW**
- **standing wave mode,**
- **all phases with sliding short,**
- **pulsed operation: 1ms to 1s, increased in 10 % steps, finally cw,**
- **PC- controlled operation and data acquisition based on LabWin,**

Window Diagnostics (interlocks)
- **IR-sensors , setpoint 70°C,**
- **photo multipliers (light), setpoint 0.5 lux,**

Experience: 8 RF- couplers and windows were tested and trained,

Teststand with Resonant Ring



Features:
- **P_{drive} = max. 10 kW (klystron),**
- **Frequency: 1.3 GHz, WR650,**
- **Gain of the ring: max. 13 dB, depending on insertion loss,**
- **P_{max} (tested): 100 kW at 0.5 dB ins. Loss,**
- **traveling wave mode,**
- **pulsed operation: 1ms to 1s increased in 10 % steps, finally cw,**
- **PC-controlled operation and data acquisition based on LabWin,**

Window Diagnostics (interlocks)
- **IR-sensors , setpoint 70°C,**
- **photo multipliers (light), setpoint 0.5 lux,**

Experience: two windows tested

References

1. A.Büchner, et.al.: The ELBE– project at Dresden-Rossendorf, EPAC 2000, Vienna, 2000.
2. A.Büchner, H.Büttig, J.Stephan: RF Window Diagnoses and Training for the Elbe Superconducting Accelerator, Workshop on High-Power Couplers for Superconducting Accelerators, J-Lab, 2002.
3. M.Krätzig: Aufbau und Optimierung eines resonanten Ringes aus Hohlleiterbauelementen, Diplomarbeit, HTW-Dresden, 2005
4. V. Veshcherevich, Resonant ring for high power tests of RF couplers, Cornell Univ. Ithaca – NY 2003
5. M.Champion: Design, Performance and Prod. Of the Fermilab TESLA RF input couplers, LINAC 96, Geneva 1996,

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