UPGRADE OF THE 1.3 GHZ RESONANT RING FOR HIGH POWER RF TEST OF ACCELERATOR COMPONENTS

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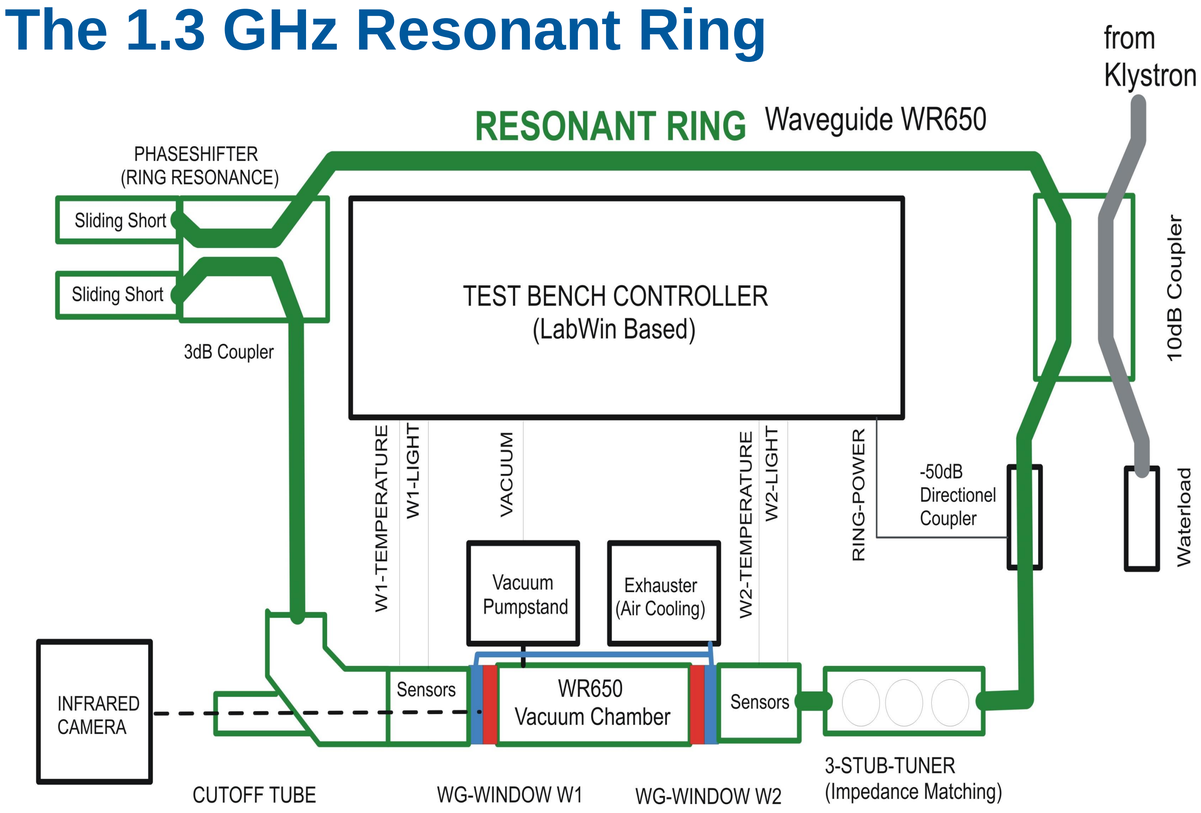
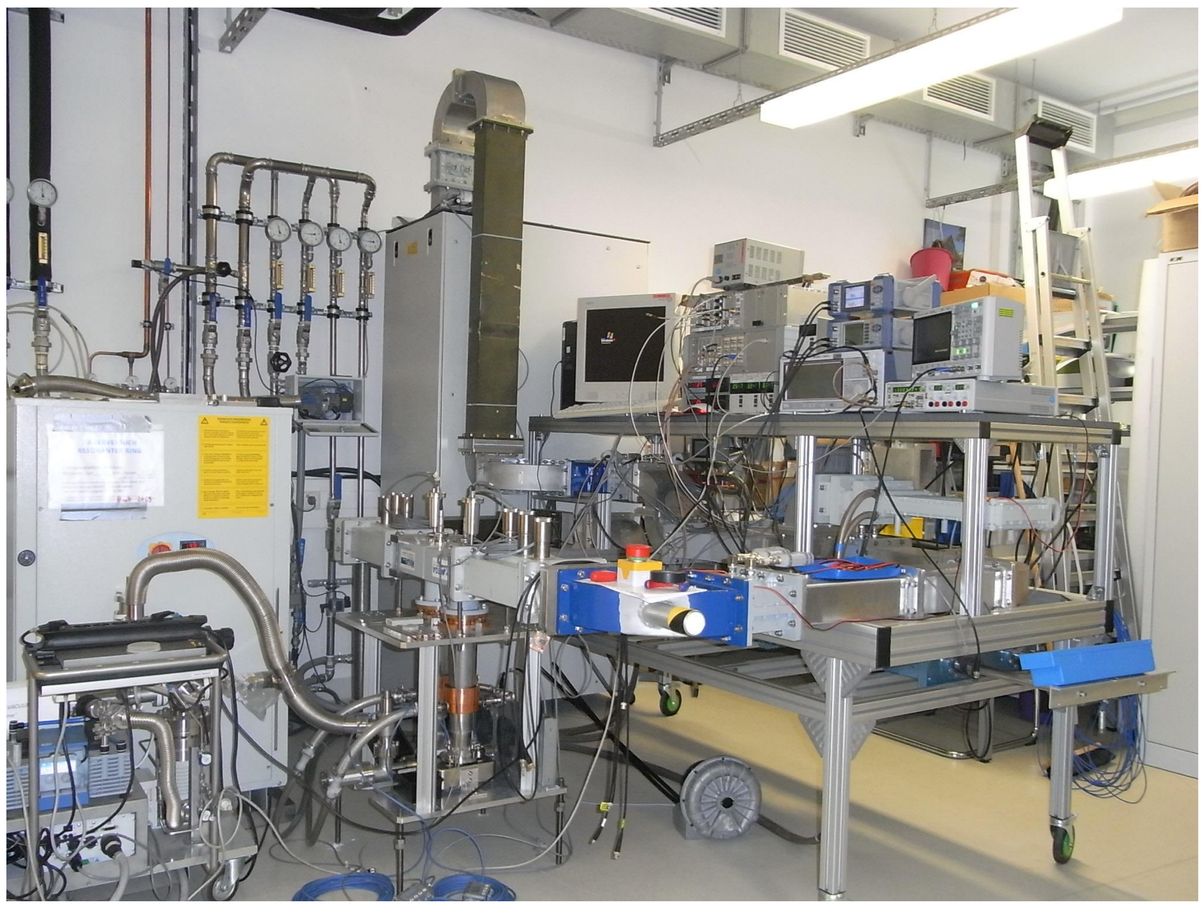
Introduction

The 1.3 Resonant Ring is in use at ELBE to test waveguide windows and RF-couplers. To get reproducible results the RF-power in the ring has to be independently from thermal drifts of its resonance frequency. The insertions have to be matched proper to ensure desired travelling wave operation.

The 1.3 GHz Resonant Ring



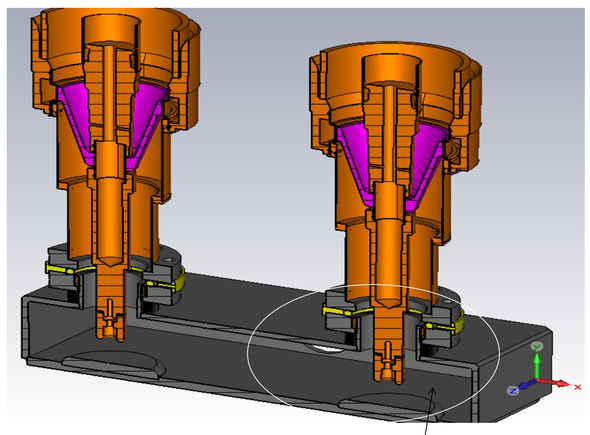
Block diagram



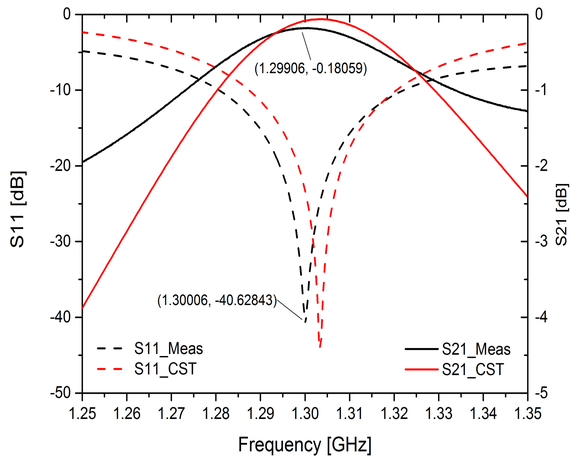
The 1.3 GHz Resonant Ring at ELBE

Adjustable Test Waveguide

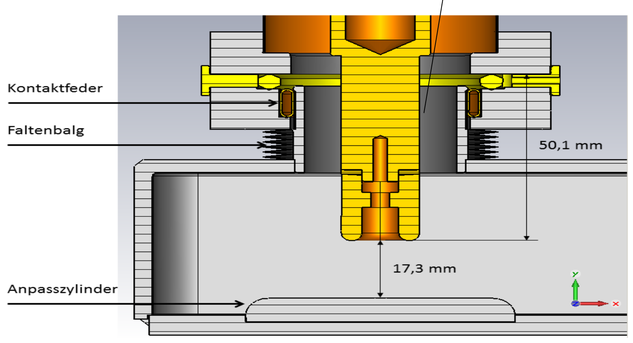
- Operation of the Resonant ring (Travelling wave structure) require proper match of the inserted components.
- The adjustable test wave guide enables coupler tests with different antenna tip length in the Resonant ring.
- Redesign of a DESY coupler test box using CST
- Good agreement between CST, NWA-test and operation



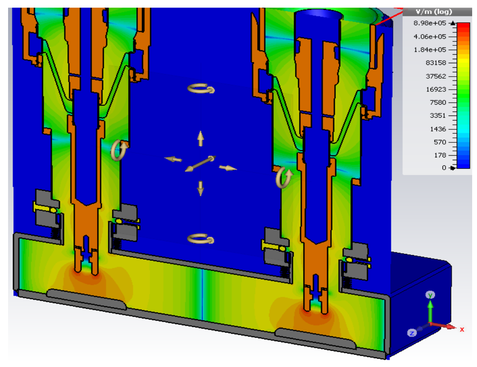
Test Waveguide



Model and Measurement

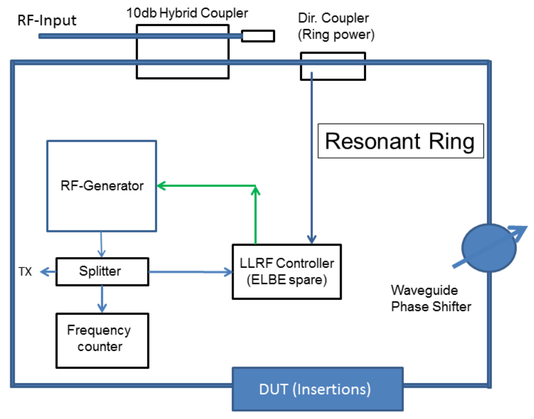


Antenna tip (detail)

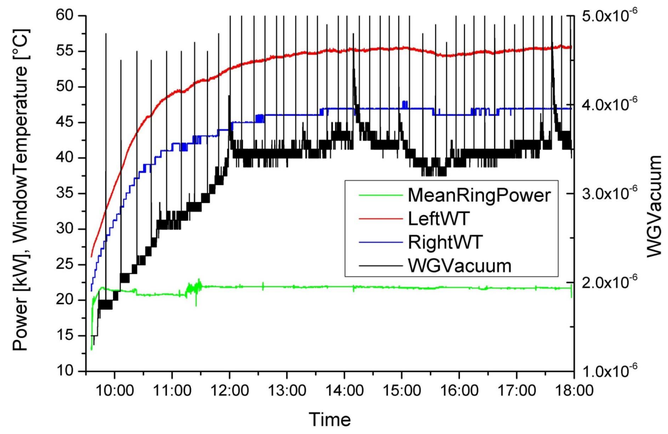


Electrical field strength for 10kW

PLL Ring power control



- Dissipation in the ring changes the resonance frequency , also the Q drops and the power of the travelling wave in the Resonant ring becomes reduced.
- Using a PLL(or AFC) the loaded ring controls the generator
- and keeps the working point on resonancy.
  The RF-power is stabilized by the amplitude controller.



Test of 2 WG windows with stabilized RF-power

References

H.Büttig et al., Study of the ELBE RF-couplers with a new 1.3 GHz RF- coupler test bench driven by a resonant ring , NIM-A A 612(2010), 427-437.
A.Arnold, Adjustable test waveguide, HZDR/FWKE Internal report 31.03.2016
G.Staats, A.Arnold, H.Büttig, Test of waveguide Windows and Power Couplers for TARLA, HZDR/FWKE Internal report 07.05.2015

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