Measurements on the 325 MHz Superconducting CH Cavity*

M. Busch†[1], *H. Podlech*[1], *U. Ratzinger*[1], *W. Barth*[2,3], *and M. Amberg*[3,4]

[1]Institut für Angewandte Physik, Goethe Universität, Frankfurt, Germany; [2]GSI, Darmstadt, Germany; [3]HIM, Mainz; [4]Johannes Gutenberg Universität, Mainz

Abstract

At the Institute for Applied Physics (IAP), Frankfurt University, a superconducting 325 MHz CH-Cavity has been designed and built. This 7-cell cavity has a geometrical β of 0.16 corresponding to a beam energy of 11.4 AMeV. The design gradient is 5 MV/m. Novel features of this resonator are a compact design, low peak fields, easy surface processing and power coupling. Furthermore a new tuning system based on bellow tuners inside the resonator will control the frequency during operation. First tests on the cavity have been performed including a cold test achieving a gradient of up to 2.3 MV/m.

Measurements

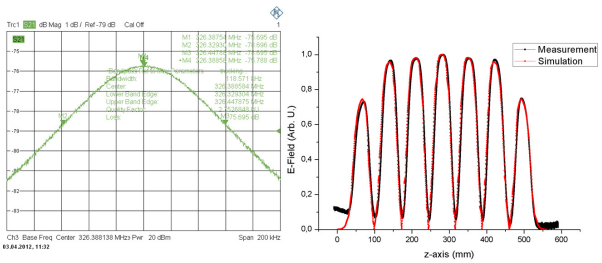

Figure 1: Left: Frequency of Mode 1. Right: Bead pull measurement and simulation.

Prior to the final fabrication steps of the cavity first measurements have been done at Research Instruments ensuring the envisaged design goals [1].

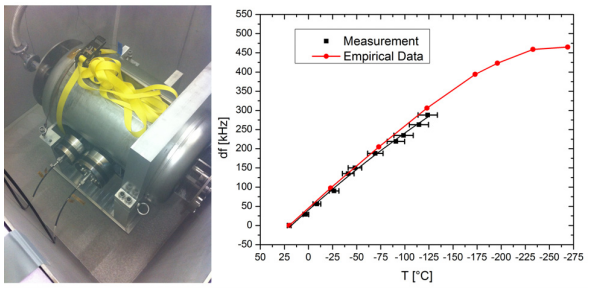

Figure 2: Cold test setup (left), temperature vs. frequency shift (right).

First the frequency and the electric field on axis have been measured with affixed end caps and without static tuners (see fig. 1). Determining the frequency shift of the static tuners by the use of provisional dummy tuners the final niobium tuners were welded into the cavity step-by-step. After welding of the end caps and three of the four static tuners into the cavity a preliminary cold test was set up to investigate the thermal response of the CH-Cavity (see fig. 2).

Subsequently the effect of the dynamic bellow tuners on the frequency as well as the mechanical rigidity of the cavity under evacuation have been studied (see fig. 3).

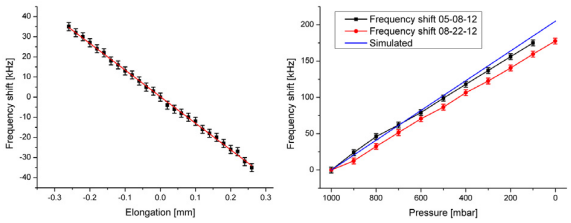

Figure 3: Bellow tuner elongation vs. frequency shift (left), pressure vs. frequency shift (right).

Finally the last static tuner has been fixed, a buffered chemical polishing treatment was performed and the cavity was delivered to IAP for a first test under LHe conditions. After experiencing multipacting barriers the achieved field gradient yielded $\approx 2.3\ MV/m$ (see fig. 4) limited by field emission due to a moderate surface purity of the cavity.

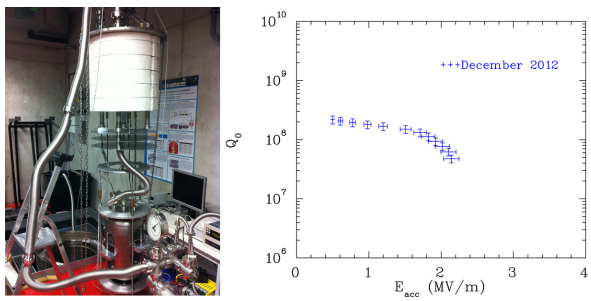

Figure 4: Measurement at IAP @4 K (left), E vs. Q curve (right).

References

[1] M. Busch, F. Dziuba, H. Podlech, U. Ratzinger, W. Barth, S. Mickat, M.Amberg, M. Pekeler, "First Measurements on the 325 MHz Superconducting CH Cavity", Linac 2012, Tel-Aviv, Israel.

* Work supported by GSI, BMBF Contr. No. 06FY7102, 06FY9089I

† busch@iap.uni-frankfurt.de