4 K and 2 K measurements on the 325 MHz CH-cavity *

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At the Institute for Applied Physics (IAP), Frankfurt University, a superconducting 325 MHz CH-Cavity has been designed and built. The 7-cell cavity features a geometrical β of 0.16, corresponding to a beam energy of 11.4 AMeV. The design gradient is 5 MV/m. Main 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 [1]. After the final preparation steps rf measurements at 4 K and 2 K have been performed at the cryo-lab of the Institute for Applied Physics with promising results.

Setup at IAP Cryo-Lab

In April the 325 MHz CH-Cavity returned to IAP after final BCP and HPR at Research Instruments. Then the fully equipped cavity with 40 TLD and four thermal probes has been lowered down the 3 m deep vertical cryostat for power tests (s. Figure 1). After initial pressure issues due to a potential virtual leakage a final pressure of $8 \cdot 10^{-10}$mbar could be achieved. Multipacting conditioning proceeded smoothly.

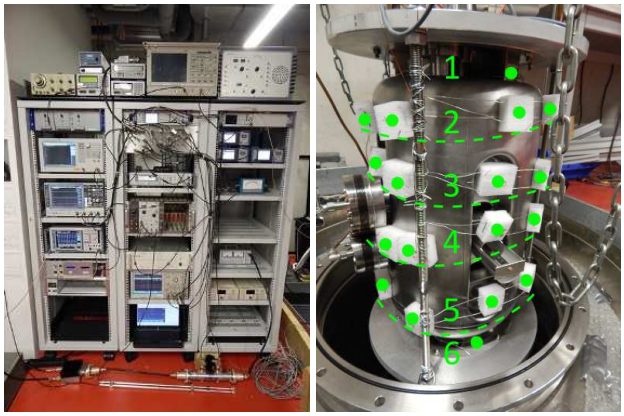

Figure 1: Measurement setup at the cryo-lab. *Left*: Fully equipped racks. *Right*: Array of the TLD on the cavity surface.

Results

The evaluation of the TLD showed only weak radiation events due to field emission after 10 hours of cumulated heavy operation. A small field emitting site is suspected at the bottom of the cavity tank (s. Figure 2). Further surface processing should decrease emission activity continuously. The measured Q vs E curve showed a maximum achievable gradient of 8.5 MV/m at 4 K. After cooling down to 2 K the max field level reached up to 14.1 MV/m limited by thermal quench due to a possible local defect (s. Figure 3) [2].

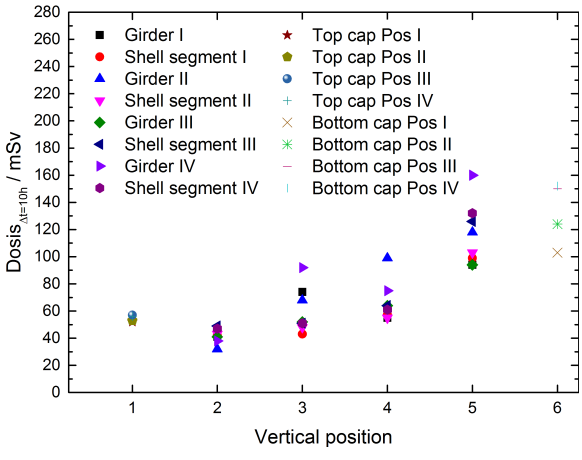

Figure 2: Evaluation of the TLD dosis for the 40 modules.

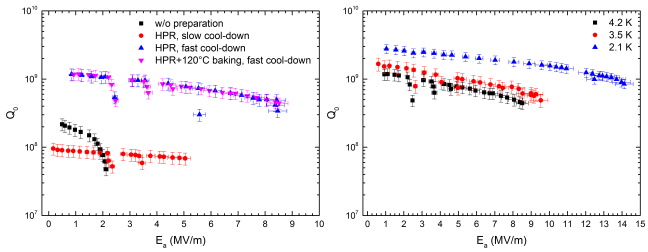

Figure 3: *Left*: Q vs E curve for 4 K measurements and different processed surface qualities. *Right*: Measurements performed at 2 K.

References

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[2] M. Busch, F. Dziuba, H. Podlech, U. Ratzinger, M.Amberg, "Cold Power Tests of the sc 325 MHz CH Cavity", LINAC 2014, Geneva, Switzerland.

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