



SRF



CEA-Saclay Tuners Ready for Tests

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Abstract

This is the report supporting the CARE deliverable n°11 in 2005, corresponding to SRF/WP8. Part of this work overlaps WP10 work-package for the tests of the prototype in CRYHOLAB.

Two piezo tuners were designed and fabricated in the framework of CARE/SRF (Figure 1). These new tuners were designed in such a way that they can be mounted on the present TTF cavities and cryomodules without any modification.

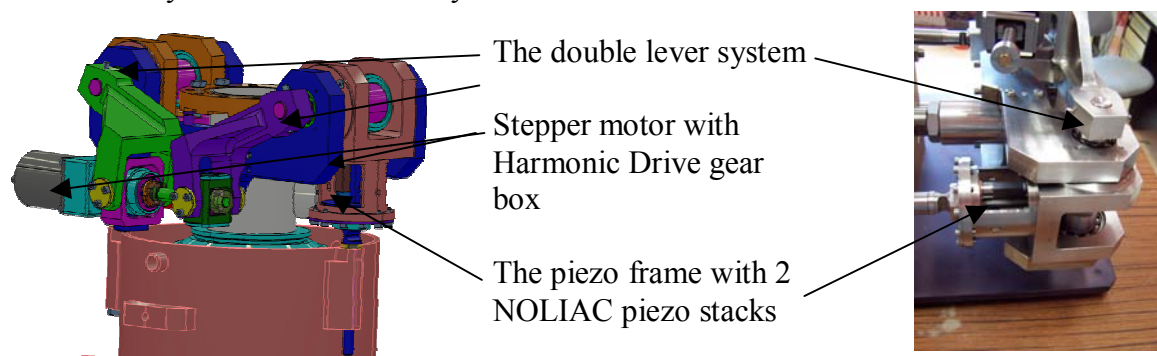


Figure 1: Overview of Piezo Tuner System (PTS) designed at CEA-Saclay.

First tests of the tuners were performed at 300 K on a test bench and on the TTF C45 cavity during summer and autumn 2005 (Figure 2 and 3). The electronics was specially developed for the integrated experiments in CRYHOLAB as scheduled in WP10.



Figure 2: The measured stiffness on this test bench is 35 kN/mm. It is limited by mechanical plays in the ball bearing housings.



Figure 3: The piezo tuner is mounted on C45 TTF cavity with the electronics in the laboratory.

Commissioning of C45 TTF cavity power coupler was performed in CRYHOLAB before mounting the piezo tuner (WP10 work package).

After the RF coupler conditioning (300 K, 1 MW, 1 ms, 3.8 Hz), the pulsed RF power was injected in the 9-cell cavity after cool down at 4K. Curves of the reflected power and the transmitted power signals from pick-up probes are reported on figure 4. In RF pulsed mode (4 K, 900 kW, 250 μ s, 0.8 Hz), the maximum accelerating field reached was 18 MV/m with a power limitation due to a strong field emission with X-rays detected (7 μ sV/h around the cryostat).

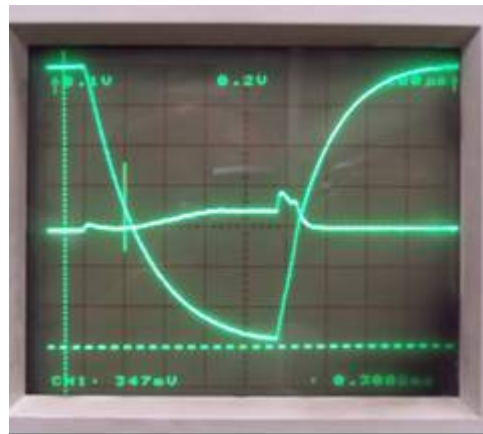


Fig.4 Oscilloscope traces of transmitted (upper) and reflected power (lower).

After RF power coupler commissioning and piezo tuner tests at 300 K, the cavity fully equipped was mounted in CRYHOLAB for integrated tests (Figure 5). Before cooling down, new measurements were performed at 300 K in this new environment, and which are summarized on the following figures and curves.



Figure 5: C45 TTF cavity in CRYHOLAB ready for integrated experiments. The electronics on the left allows characterization of mechanical modes of the cavity assembly: F, Q, piezo to piezo, and piezo to RF frequency transfer functions.

Typical transfer function curves obtained at 300 K in CRYHOLAB are shown in the following figures (Figure 6):

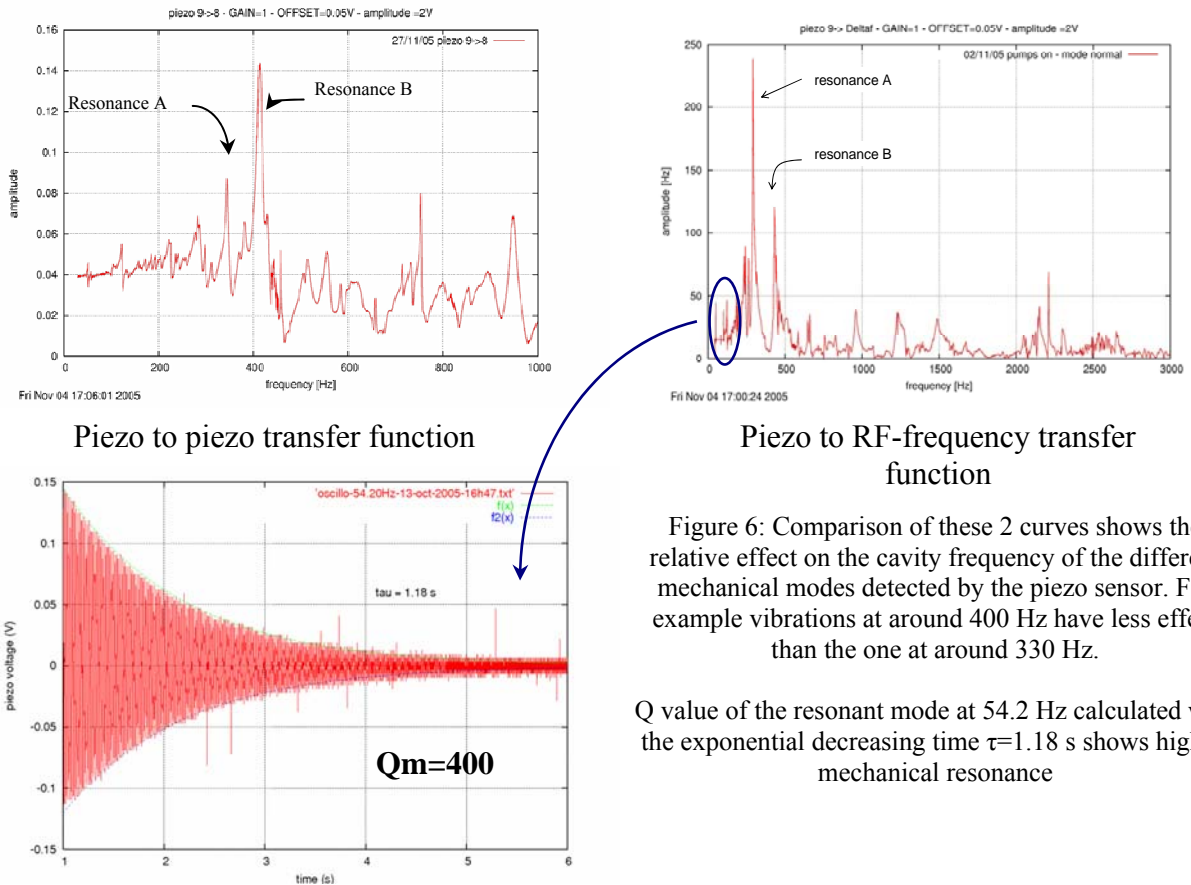


Figure 6: Comparison of these 2 curves shows the relative effect on the cavity frequency of the different mechanical modes detected by the piezo sensor. For example vibrations at around 400 Hz have less effect than the one at around 330 Hz.

Q value of the resonant mode at 54.2 Hz calculated with the exponential decreasing time $\tau=1.18$ s shows high Q mechanical resonance

After cooling down, the transfer functions are modified, as is shown in the following curves of figure 7 corresponding to the piezo to piezo transfer function obtained at 4.2 K

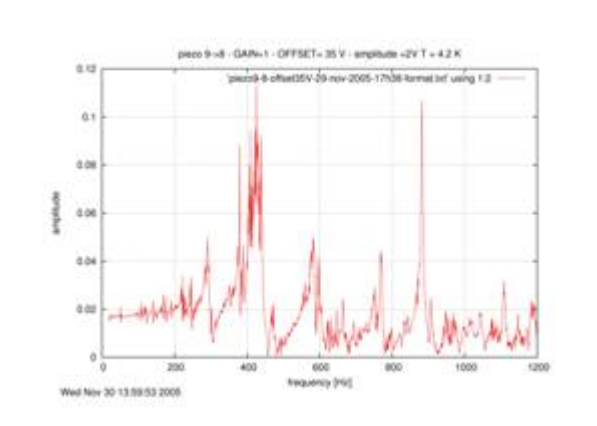


Figure 7: Piezo to piezo transfer function. The RF frequency transfer function measurement is in progress.

The preparation of the integrated experiment in CRYHOLAB is in progress. Last refinement in the electronics is still needed for beginning the experiments of Lorentz forces compensation that should be operational at the beginning of year 2006.

These experiments are being performed with NOLIAC PZT29 stacks 30mm long. Future experiments in CRYHOLAB 2006 with the same tuner mounted with PI piezostacks (40 mm long) characterized by IPN-Orsay.

Acknowledgements

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