

Activities of Superconducting Cavities for KEK B-Factory

S.Mitsunobu, K.Akai, K.Asano, E.Ezura, T.Furuya, K.Hara, K.Hosoyama, Y.Ishi*, A.Kabe,
Y.Kijima, Y.Kojima, Y.Morita, H.Nakai, K.Saito, K.Sennyu*, T.Tajima and T.Takahashi

KEK National Laboratory for High Energy Physics, 1-1 Oho Tukuba, Ibaraki, Japan

* Mitsubishi Electric Co.

** Mitsubishi Heavy Industry Co.

In KEKB, we plan to use two type superconducting cavities. One is a dumped structure type accelerating cavity and the other is a crab cavity. The accelerating cavity for high current beam test in accumulation ring has been finished and soon tested in full assembly, and scheduled install AR next March. Active development of crab cavity just started and 1/3 model test will be done soon.

1 Crab Cavity

The R&D work on the crab cavity was carried out in 1991 and 1992 in collaboration with Cornell university. In order to damp the parasitic modes, a new damping scheme that employs a coaxial beam pipe and a notch filter was proposed¹⁾. The high field performance was tested with a one-third scale niobium cavity in helium. A cold measurement showed that the design values of the necessary kick voltage and Q-value were achieved.

At KEK we started an R&D effort for the crab cavity aimed at making full-scale niobium cavities for KEKB in three years.

Two types of design of round cell and squashed cell were studied. Initially, we start to make a squashed cell shown in Fig.1.²⁾ One-third scale niobium model cavity finish and will be tested soon.

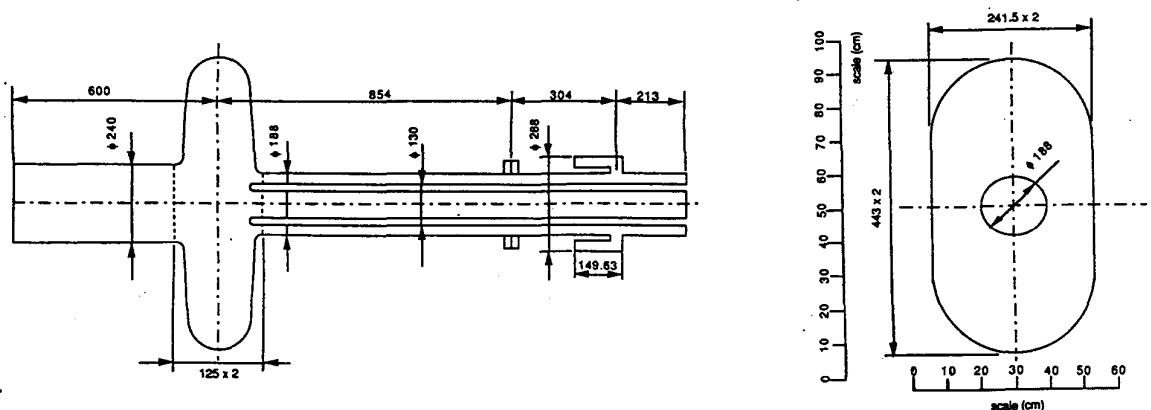


Fig.1 Squashed cell shape of Crab Cavity for KEKB

2 Damped structure accelerating cavity

All components need for superconducting cavity for KEKB have been developed³⁾ and one cryomodule for beam testing at the TRISTAN Accumulation Ring (AR) has been finished⁴⁾. Fig.2 shows the fully assembled cryomodule, and will be tested soon. Next year the module will be installed in AR and tested with beam of 0.5 A. In vertical cold tests of the Nb cavities, a gap voltage of 3 MV has been achieved. Main effort of our study is to stabilize the Nb surfaces by ozonized ultra pure water rinsing⁵⁾. A four days air exposure test for the RF processed cavity which was treated by ozonized ultra pure water indicates no degradation of cavity performance, shown in Fig.3.

HOM dampers made of ferrite are fabricated by the HIP(Hot Isostatic Press). 508 MHz traveling RF power of 15 kW was absorbed to a damper in air and showed no cracking. The damper was tested in TRISTAN with the beam of 4×10^{-8} C/bunch which is 20 times higher than that of HER. NO discharging and cracking was observed.

The input coupler tested upto 800 kW.⁶⁾

Reference

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- 2) K.Hosoyama et.al. this workshop.
- 3) S.Mitsunobu et.al. Proc. 6th Workshop on RF Superconductivity,CEBAF,(1993)
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- 6) S.Mitsunobu et.al. this workshop.

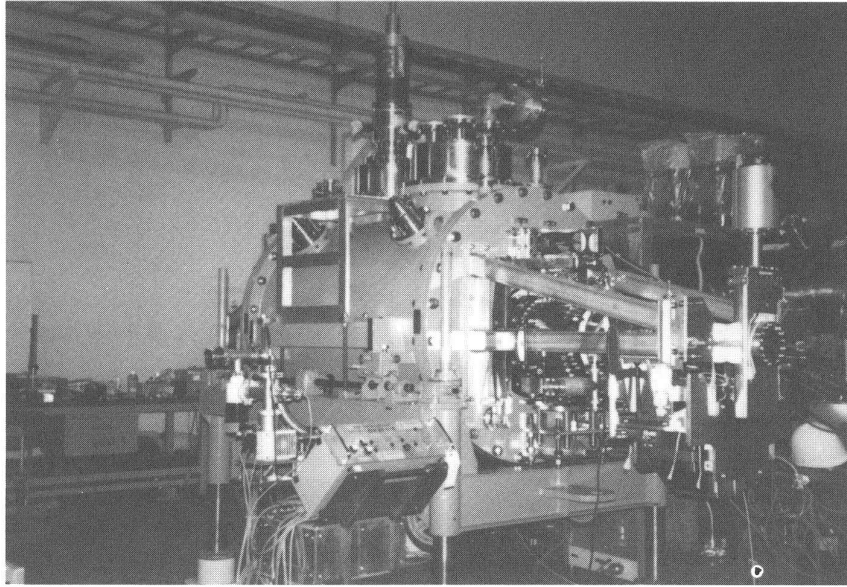


Fig. 2 A fully assembled cryomodule of a SC damped Cavity for beam testing at the AR.

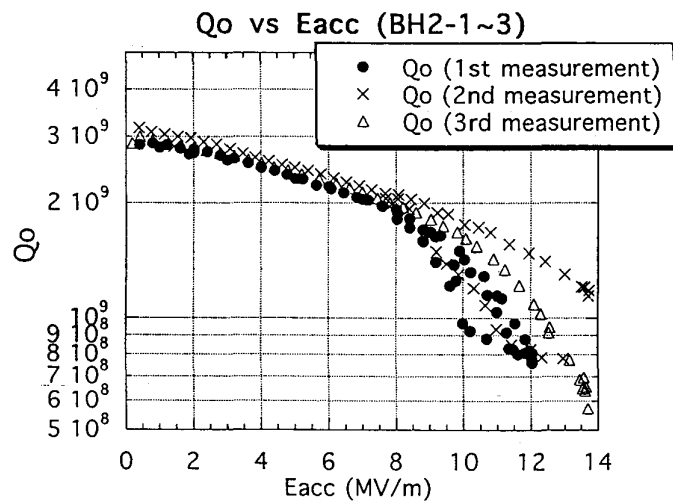


Fig.3 Stable performance of the 508 MHz Nb cavity rinsed by ozonized ultrapure water. The 2nd and 3rd tests were measured after 1 atm air exposures for 23 hours and 69 hours, respectively.