SUPERCONDUCTING CAVITIES FOR LEP ENERGY UPGRADE

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ABSTRACT

The installation in the LEP collider of 192 superconducting (SC) RF cavities will allow to reach W^-W^+ pair production energy. Cavity prototypes have been developed at CERN, both of Nb sheet and Nb-coated Cu type. The higher performances obtained with Nb-coated Cu cavities have led CERN, have been installed and are operated since 1989. A superconducting cavities installed in the collider.

1. INTRODUCTION

The LEP energy upgrade to W pair production energy requires the installation of 192 superconducting cavities operating at a nominal accelerating field of at least 5 MV/m [1]. The first 12 cavities, 2 made by industry and 10 by CERN, have been installed and are operated since 1989. A second set of 20 Nb sheet cavities has been delivered by industry and is being tested before assembling into modules at CERN. For these cavities a nominal gradient of 5 MV/m and a quality factor of 3 x 10^10 was specified.

In the meantime the Nb-coating of Cu cavities has been pursued (2,3) and is now giving excellent results. It has been decided to order the remaining 150 cavities based on this technology, with a nominal accelerating field of 6 MV/m and a quality factor of 4 x 10^10.

2. THE Nb SHEET CAVITIES

In 1989 a contract was awarded for the construction of 20 Nb sheet cavities for 525 MHz [1]. The cavities are delivered fully assembled in the cryostat and are equipped with frequency tuners, temperature gauges and RF probes but without power couplers and HOM couplers to allow precise measurement of the cavity Q. Separate contracts were awarded for the fabrication of the coaxial power couplers (MC) and of the HOM couplers. So far all the cavities have been delivered and tested. Ten have surpassed the design figures of Eacc = 5 MV/m and Q = 3 x 10^10. Four developed a thermal quench at -4.5 MV/m. As the cavities are already assembled in the production line for the LEP, they will be used for the larger number of tests to provide the feedback to the manufacturers.

Many groups of CERN (AT-CV, MT-ESL, ST-IE) and our technicians (AT-RF, AT-VA, MT-SM) have contributed to the setting up of the test facilities and take part to the preparation and to the tests of the cavities with great competence. Their contribution is greatly acknowledged hereafter.

References

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(*) Air Liquide (F).

(* *) CERCA (F).

(***) Siemens (D).