

Progress on the Industrial Production of SC Cavities at CERCA (F)

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Abstract :

Superconducting accelerating cavities are produced at CERCA on an actual industrial scale for 3 years. Not only bulk Nb cavities, but also Nb coated Cu cavities, fully equipped and assembled in class 100 clean room, are delivered to customers facilities ready for RF measurements.

The manufacturing of 16 SC Cavities modules for LEP 200 (CERN) and 5 prototypes for TESLA (CEA) is now in progress at Romans plant.

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INTRODUCTION

Since 1990, superconducting accelerating units (bulk Nb and Nb coated Cu cavities) are manufactured by CERCA (FRAMATOME Group) for LEP upgrade.

Technology transfer and beginning of the industrialization are described elsewhere [1] [2] [3] and references therein.

Now, CERCA has got a new notoriety within the world of RF Superconductivity, and not only produces fully equipped SC modules for CERN, but also takes an active part in TESLA developments thanks to its collaboration with CEA.

1. LEP 200 Bulk Nb Superconducting Cavities

20 bulk Nb SC cavities have been successfully manufactured by CERCA in 1991.

Fully equipped units (cavity, cryostats, tuners, antennas, ...) have been delivered to CERN : the 4 units modules have been assembled at CERN.

CERCA obtained very good results for the RF test of each singular unit, but only one of the 5 modules is now running in the LEP tunnel. The other ones are still to be assembled, because some modifications on the cooling circuit have to be performed, due to a new conception for the cryogenic distribution around the cavity.

Cavit s Nb CERCA - cryostat horizontal - 350 MHz - 4.2 K

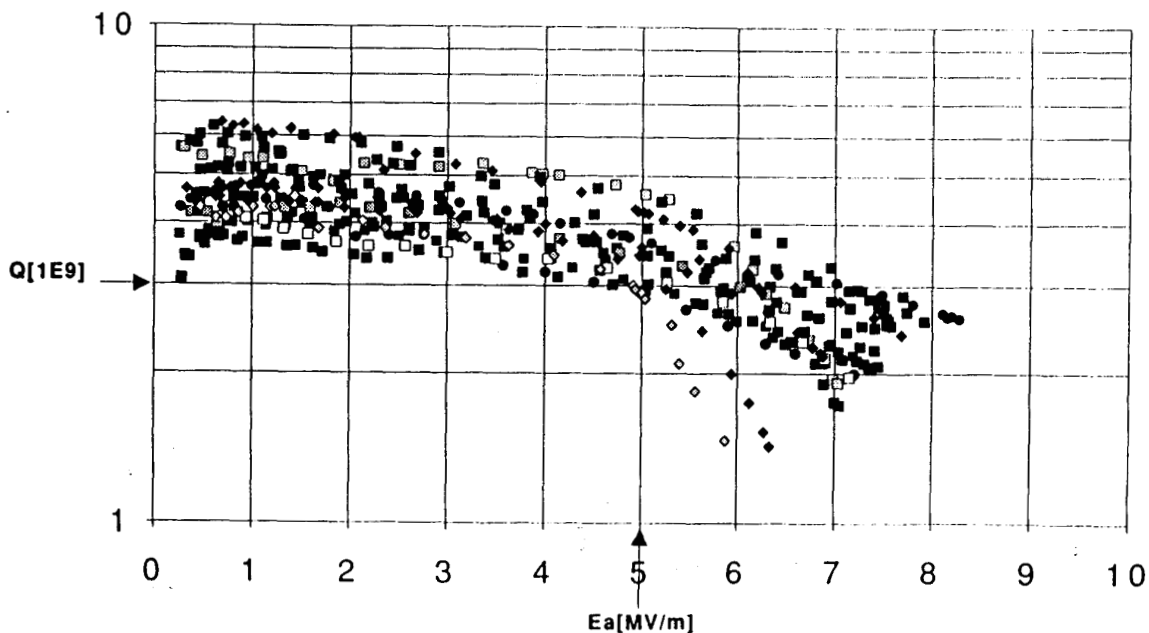
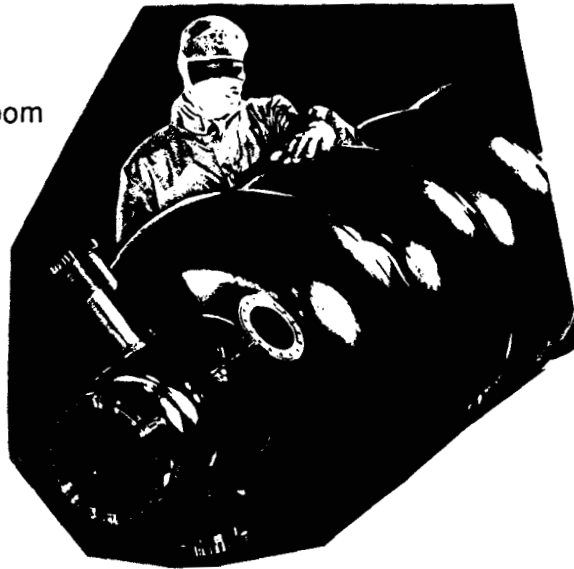


Fig 1 : $Q = f(E)$ curves for 20 bulk Nb cavities manufactured by CERCA in 1992

Fig 2 : 350 MHz SC Cavity in clean room



2. LEP 200 Nb / Cu Superconducting Cavities Modules

Up to now 19 "bare" cavities have reached the acceptance criterion defined by CERN. The average yield for the acceptance of "bare cavities" (success of the tricky chemical treatments - PVD sequence) is still about 50 %, but a new procedure might soon enhance this value ...

3 four Nb / Cu SC Cavities modules have been accepted by CERN. 2 other ones are under completion at CERCA's workshops in Romans (F) and will be delivered by the end of year 93.

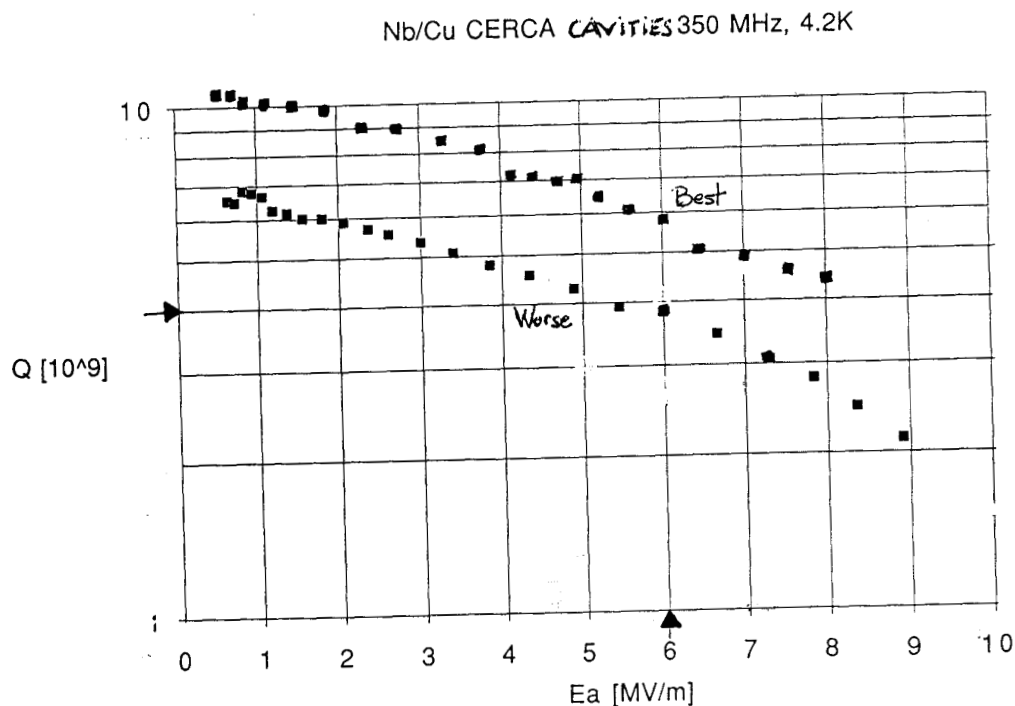
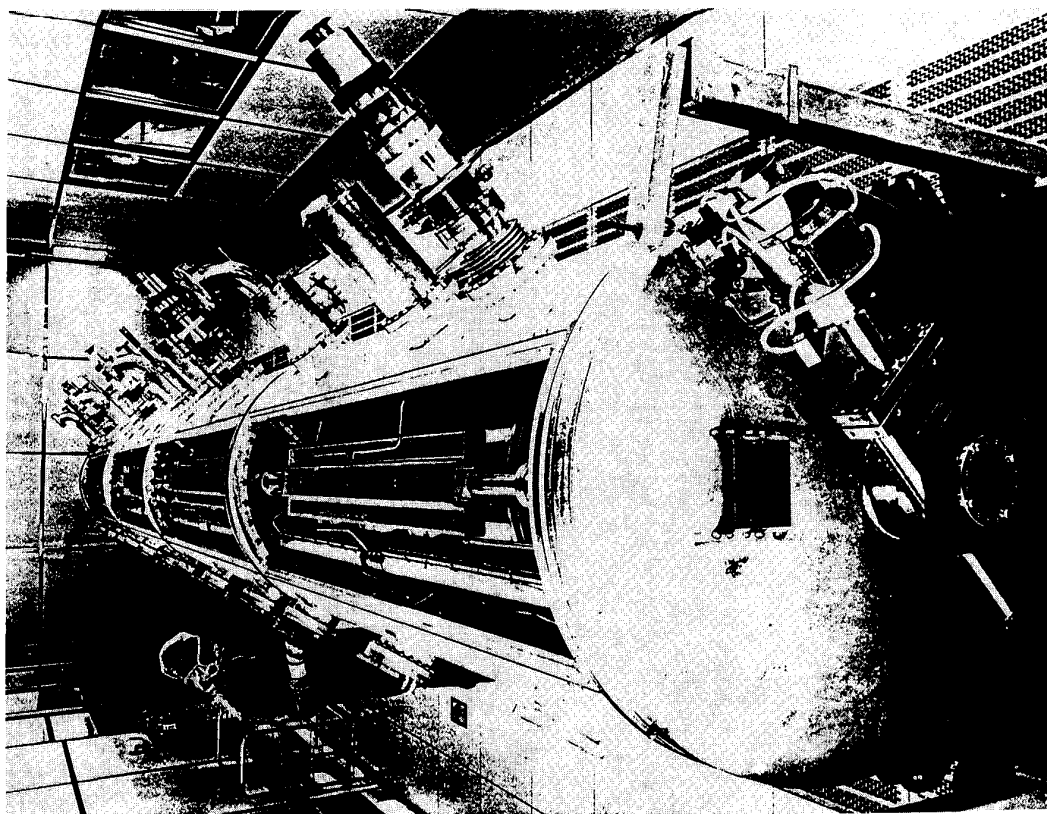


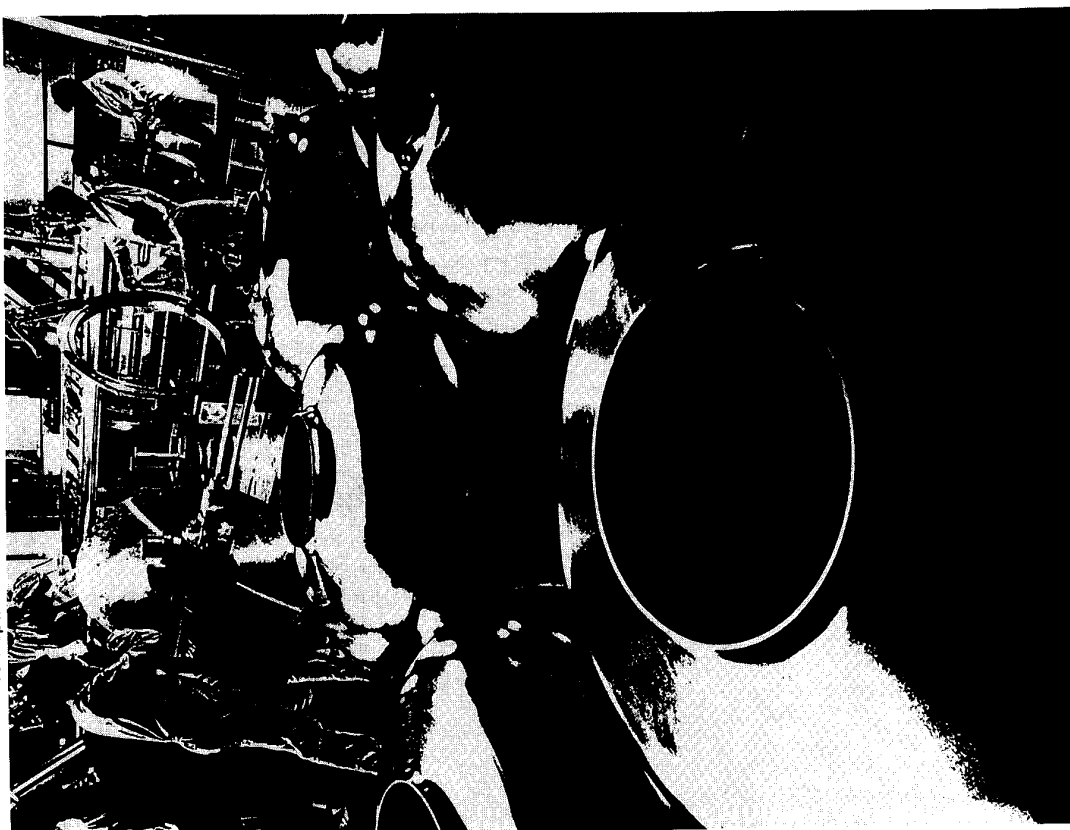
Fig 3 : $Q = f(E)$ curves for the 19 first Nb/Cu cavities manufactured by CERCA since June 1992 (only the worse and the best ones are shown)

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Final assembly of a 4 cavities module in the class 100 clean room (as far as internal vacuum is concerned : beam ports, RF couplers ...)

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View of the clean workshop during the production of SC Cavities : EB welded cells, a vacuum tank structure, a cavity in its cryostat and a complete cavity are shown.

Fig 4 : Part view of CERCA's workshops for SC cavities at Romans plant (F)

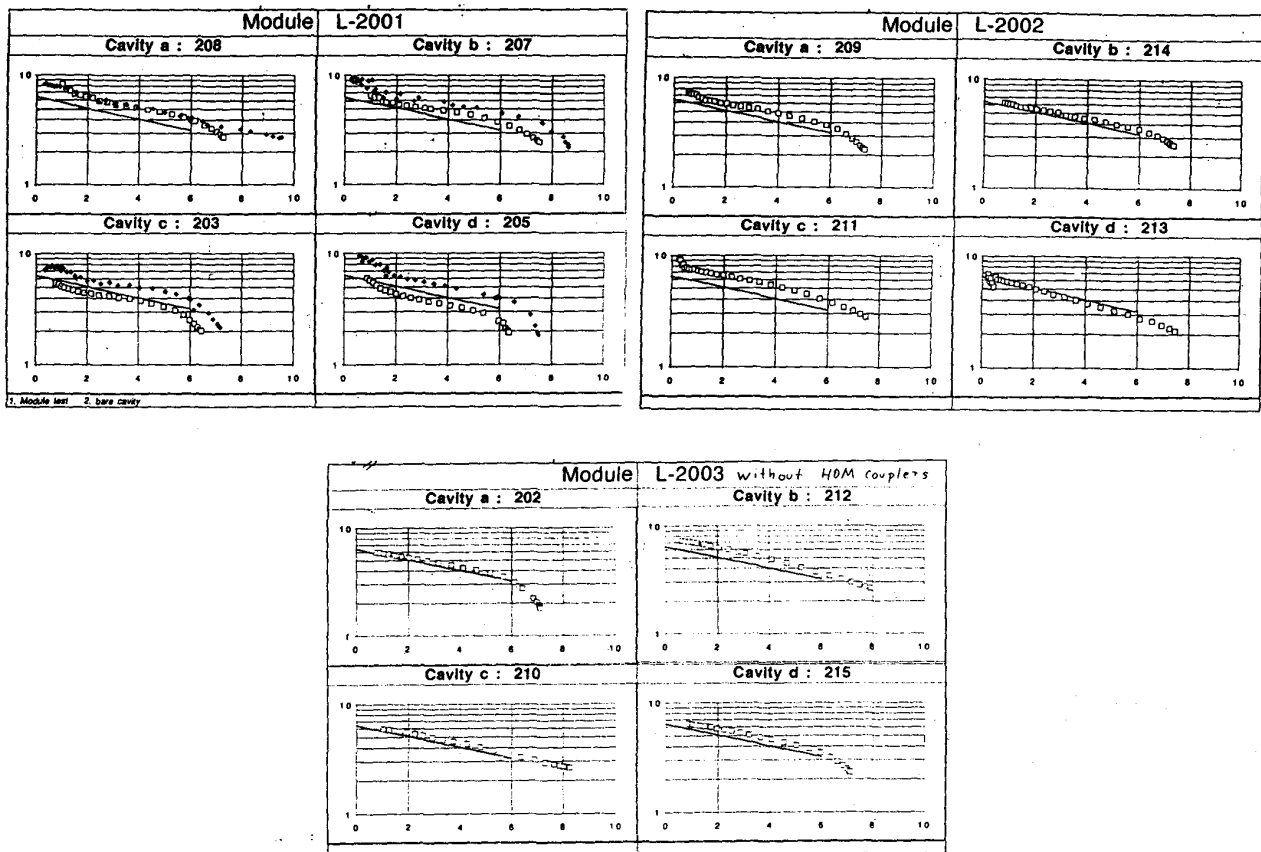


Fig 5 : RF results of the 3 first SCC modules assembled by CERCA and accepted by CERN since beginning 93 until september 1993

If the manufacture and the clean assembly of these SC modules is now actually mastered by CERCA, it remains a problem with the RF couplers supplied by CERN, which can limit or even lower the achievable RF performances (compared to previous test)

3. TESLA Bulk Nb Superconducting Cavities

5 TESLA bulk Nb monocell prototypes are produced for CEA R & D work, and will be delivered in November 1993.

More over R & D work is carried out at CERCA for hydroforming Cu and Nb tubes with TESLA design.

CONCLUSION

The production of LEP 200 SC modules is now stabilized (but its yield must be improved). Care must be always taken at all stages of the manufacturing process in order to avoid any quality drift.

R & D work on TESLA project is just beginning at CERCA, combined with prototype cavities production for CEA.

The results obtained by CERCA show that complete SC modules can be delivered with a good reproducibility and with minimum guaranteed RF performances, on an actual industrial scale.

Acknowledgments :

CERCA thanks all the CERN and CEA staff involved in SC Cavities development for fruitful discussions and good collaboration.

References :

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|-----|---------------------|----------------|------------------|------|
| [1] | S. CAVALLARI et al. | Proc. HEACC 92 | Hambourg (D) | 1992 |
| [2] | P. MACCIONI et al. | Proc. HEACC 92 | Hambourg (D) | 1992 |
| [3] | P. MACCIONI et al. | Proc. PAC 93 | Washington (USA) | 1993 |