SUPERCONDUCTING CAVITIES MANUFACTURING

AT CERCA

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1 - INTRODUCTION

CERCA is now well known within the field of accelerator components manufacturing , particularly for SCRF cavities and turn key cryomodules . Its industrial production facilities and main realizations since 1990 are already described in previous papers presented in other WRFS [1] [2] .

This paper summerizes the main production features and results obtained by CERCA's cavities during the passed two years ...

2 - LEP II CRYOMODULES

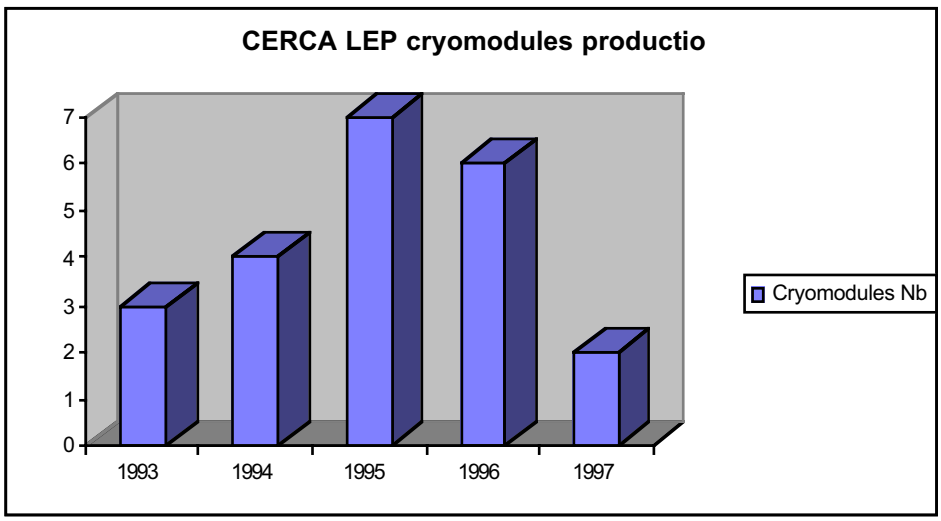
Summer 97 saw the delivery of the last LEP II cryo-units to CERN , after more than 7 years of common work ...

Among several contracts for bulk Nb or Nb/Cu special cryo-units , 22 cryomodules of this 2d generation of cavities were delivered by CERCA during this period : 9 of them were shipped and successfully tested in 1996-1997 , for the completion of this contract .

All 22 reached the nominal accelerating gradient ($E > 6$ MV/m) at the suitable quality factor ($Q > 3.2$ E9) , showing at once that the production of complete turn key cryomodules for large accelerator projects can actually be undertaken on an industrial scale .

Over the technical problems which occured at the beginning of this business (essentially due to the reliability of the tricky chemical treatments on the cavities) the job was performed in a very good close collaboration with CERN .

The final delay of delivery was 4.5 years for 22 cryomodules (almost 5 per year) since the R&D and optimization work was finished .



This distribution shows clearly the power of industry , after a period of learning , for supplying such difficult devices within the required specifications and a reasonable schedule .

3 - TTF 9 CELLS CAVITIES

CERCA also manufactured within the same period a small serie of 9 nine cells bulk Nb cavities for the TTF project : these cavities were ordered by CEA Saclay for the french contribution to this demonstration accelerator .

If the 2 first cavities did not meet the lentgh requirement for the designed cryostat because of excessive deformation (only <2 mm thick Nb sheets) they all reached high accelerating gradients (see attached curves) , except the last one which has still to be measured . The dimensionnal problem was solved after the 3rd one .

So called C24 cavity has reached an accelerating field of 28.5 MV/m at a Q factor of 2E10 , after heat treatment , and is up to now one of the best accelerating structure of the project .

CERCA has just got now a new order from DESY for 6 cavities with quite the same design , which should be delivered before Spring 98 (the first one is awaited before end of 97) .

4 - R&D WORK ON SC CAVITIES

CERCA also participates as much as possible to dedicated R&D works on RF Superconductivity by manufacturing single or 3 - cells cavities for its customers .

Different technical solution for preparing or welding the parts are tried and the cold tests which are performed can inform the community on the advantages of the one or the other (optimization costs / technical performance) .

Among them , EB welding from inside or outside have been compared on parts issued from the same lot of Nb , on single cell cavities : no actual improvement nor degradation on RF performances was seen on the inside welded cavity . But it was technically more difficult (hence more expensive !) to make .

This kind of job was also undertaken on a 3 cells cavity : all the welds were made from outside . This cavity reached without any problem more than 17 MV/m (it had no heat treatment) and no quench occured .

CERCA is now ready for further developments on proton cavities for high intensity linacs , on both bulk Nb or Nb/Cu prototypes .

5 - ACKNOWLEDGEMENTS

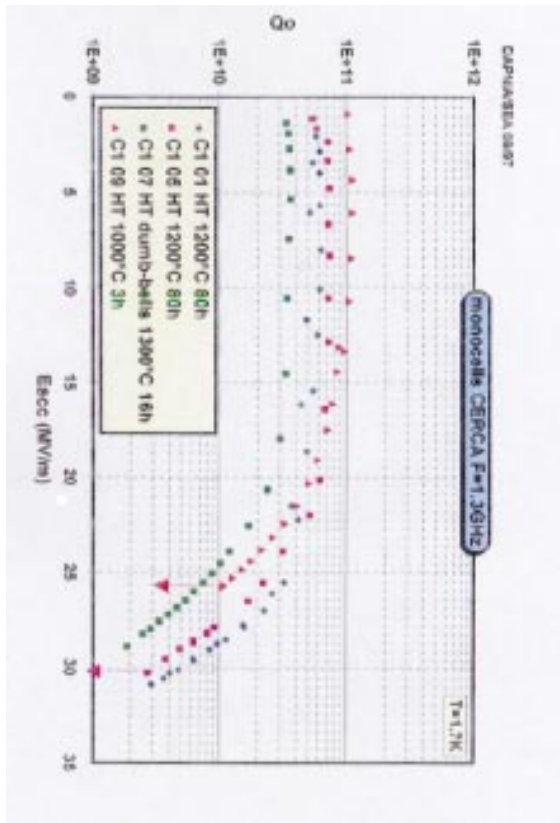
CERCA is very debtful and grateful to CERN for these 7 years lived together on the LEP II project : most things learnt by now skilled CERCA's staff were taught by CERN technicians and engineers . Hope that LHC project makes this fruitful collaboration to continue in the next few years .

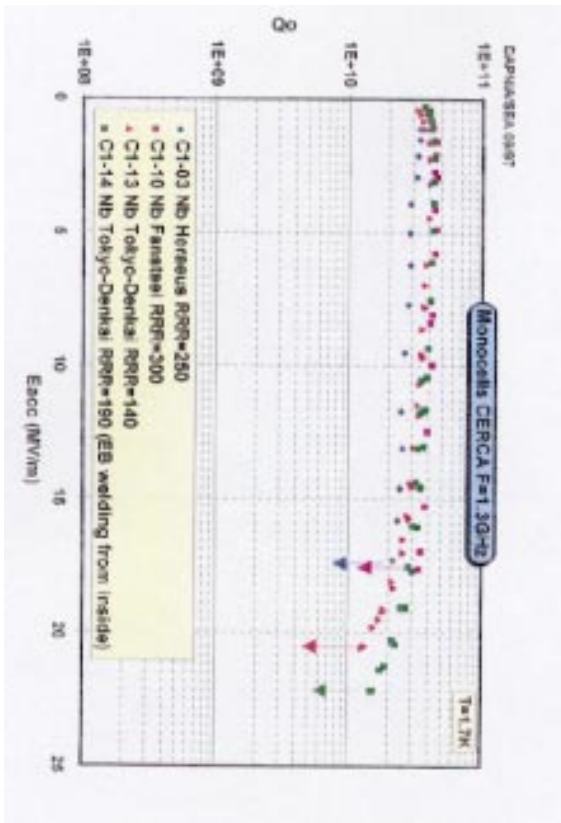
CERCA also wants to thank people from CEA Saclay who helped so much for achieving the very demanding goal of TTF .

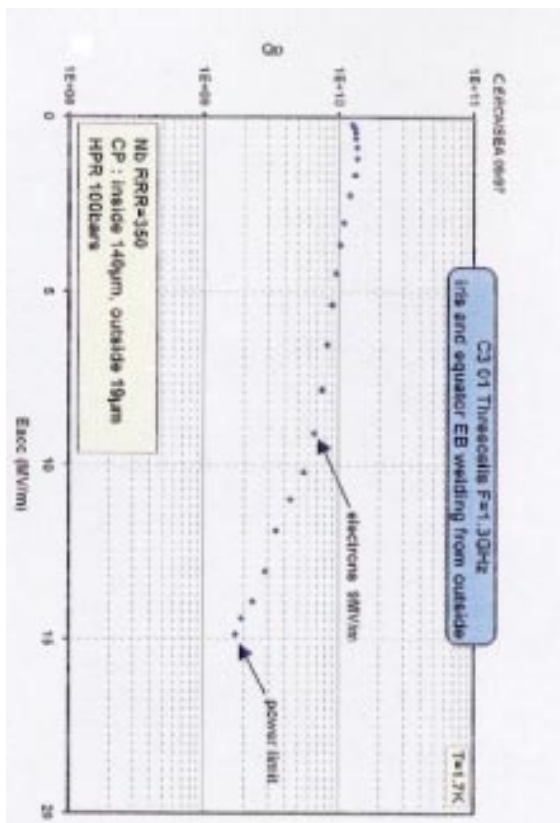
6 - REFERENCES

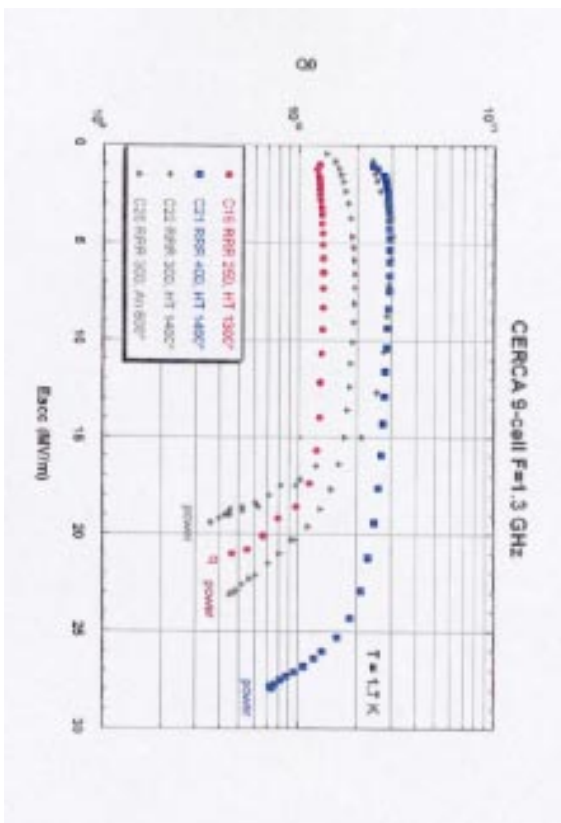
[1] - Progress on the industrial production of SC cavities at CERCA - 6th WRFS

[2] - Industrial production of SCRF accelerating cavities at CERCA - 7th WRFS









Main cold RF results on CERCA Nb 1300 MHz single, three and nine cells cavities