COLD TESTS WITH THE NEW RING CYCLOTRON CAVITY

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The fabrication of the new cavity could be nearly completed by the end of this year. The predicted resonant frequency and Q value could be verified experimentally. The prototype cavity will arrive at PSI in February 2003 and the installation in the ring cyclotron is still foreseen in the shutdown 2003/ 2004.

INTRODUCTION

As can be seen in Fig. 1, the production of the cavity is almost finished. Missing are "only" the TIG welds on the sealing flanges around the beam ports. The quite substantial delay is due to unforeseen welding problems. Thanks to the extreme efforts of SDMS[1] we are quite confident to have the cavity at PSI in February 2003.

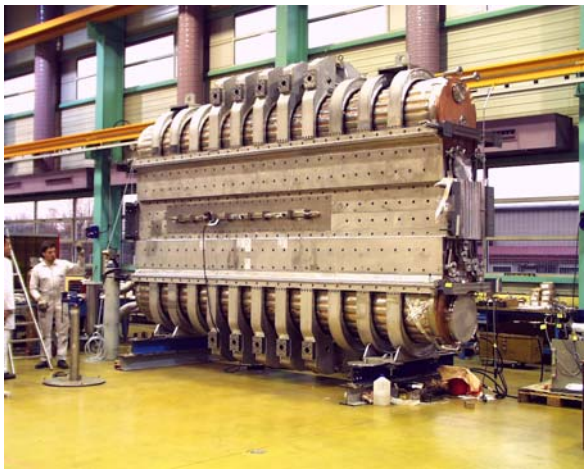
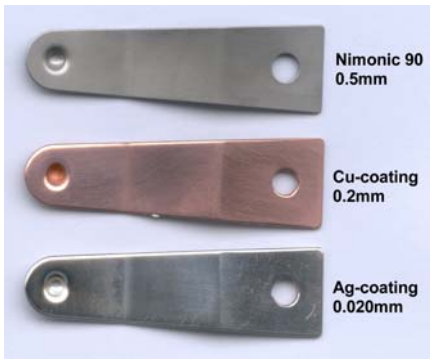


Fig. 1: Cavity at SDMS (December 2002)

During 2002 the mechanical performance of the hydraulic tuning yokes was verified: 23'500 full cycles between 0 and 60 bars at 0.01 Hz and 87'000 small cycles between 54 and 61 bars at 0.25 Hz did not produce any leakage in the oil carrying system. During operation in the ring cyclotron we expect two or three full cycles a week.

A new type of the electrical contacts, used in the high power-coupling loop, were developed and tested. As base material a nickel based super alloy (Nimonic90) is used with a 0.2 mm copper coating and a silver plating of 20 µm. This design structure keeps its mechanical properties up to very high temperatures and has shown improved current carrying properties.



RF COLD TESTS

The coarse adjustment of the resonant frequency is accomplished by getting the proper width of the cavity during the manufacturing process. To guarantee a safe start up of the cavity, we are aiming for a value between 50.4 and 50.5 MHz. The measurement before the final welding showed 50.322 MHz, 80 kHz below the target value (Fig. 2), which can be tolerated.

By changing the oil pressure in the tuning yokes from 0 to 70 bars, the resonant frequency can be adjusted to 50.880 MHz, which results in a tuning range of 558 kHz.

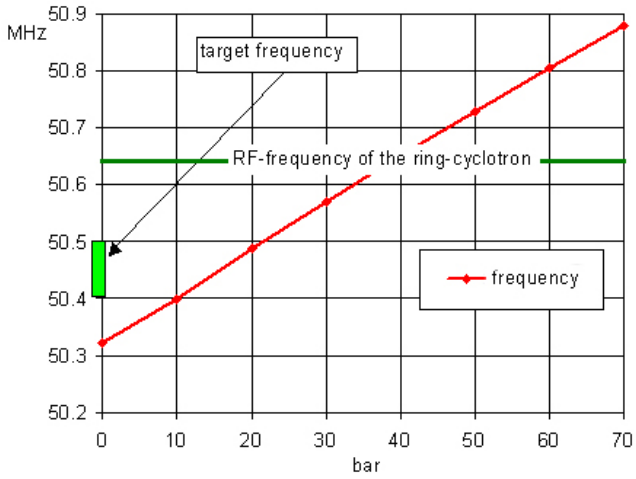


Fig. 2: Frequency range of the tuning system. The pressure in the cavity is 10^{-2} mbar.

The good agreement of the measured Q-value with calculation proves the surface condition of the RF-walls to be OK. The values given below are for a cavity at ambient air pressure.

Resonant-frequency		Q-value	
Calculated	Measured	Calculated	Measured
51.040 MHz	50.993 MHz	46054[2]	45090

REFERENCES

[1] H. Fitze et al., *Progress in the Production of the New Ring Cyclotron Cavity*, PSI Scientific and Technical Report 2001, VI.

[1] SDMS, La chaudronnerie blanche, Saint Romans, France

[2] Calculated with ANSYS. A MAFIA result with a slightly larger value of 48000 was given in the last report [1].