

POWER TESTS WITH THE NEW RING CYCLOTRON CAVITY

H. Fitze, M. Bopp

The prototype cavity was delivered to PSI with a substantial delay in February 2003. A test installation in the ring cyclotron and power runs in the RF test bed were successfully carried out. The cavity is ready for operation in the cyclotron.

INTRODUCTION

In shutdown 2003, a test installation of the prototype cavity in the ring cyclotron was carried out. At the same time, the functioning of the inflatable vacuum seal was proved.

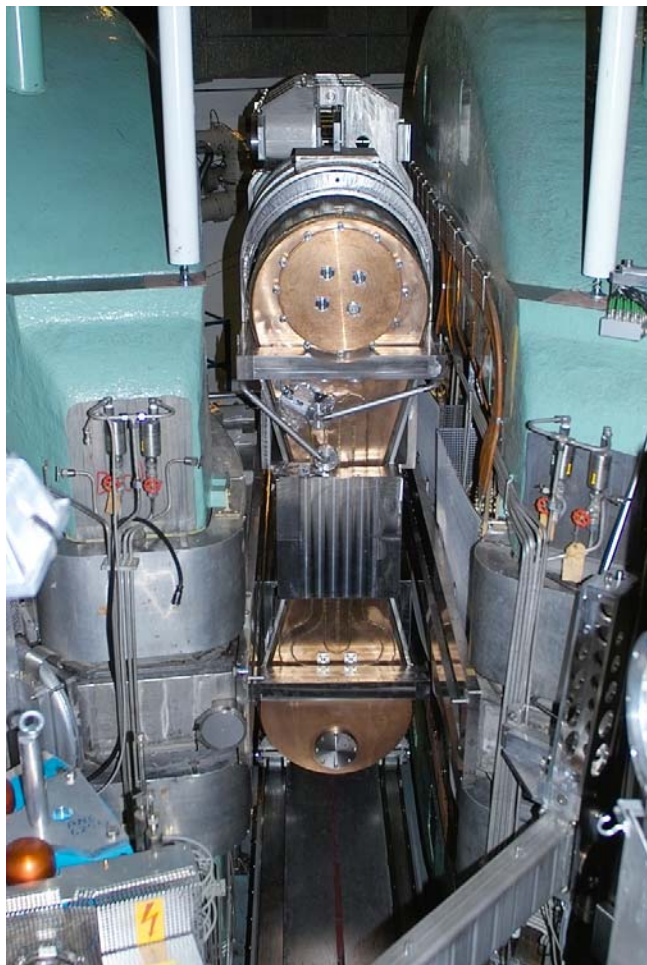


Fig. 1: Test installation in the ring cyclotron.

POWER TESTS (SITE ACCEPTANCE TEST)

The site acceptance test [1] consisted of a 24-hour power run dissipating the nominal 500 kW of RF power. Fig. 2 shows the gap voltage, calibrated with a simulated shunt impedance of 1.7 M Ω , and the dissipated thermal power in the cavity. The loss of gap voltage is caused by breakdowns in the cavity.

The hydraulic pressure of the cavity tuning system varied between 28.5 bar and 36.5 bar (the maximum is 70 bar) to compensate a drift of the resonant frequency of 64 kHz. This was better than expected, since the simulation showed a value of 96 kHz [2]. The discrepancy can be explained by boundary conditions deviating from the test environment, such

as ambient air temperature and cooling water temperature.

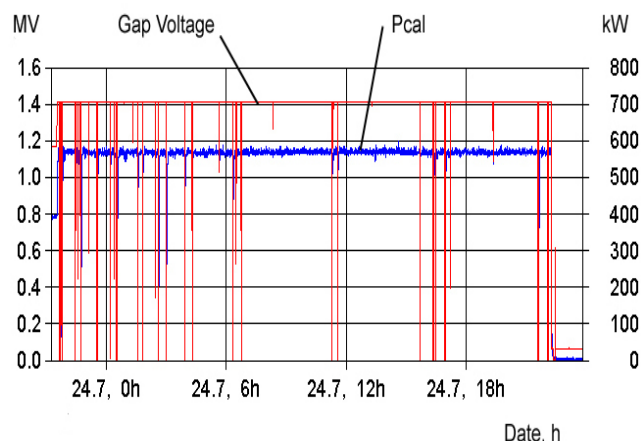


Fig. 2: Gap voltage and dissipated power

The measured wall temperatures of the cavity were within the expected range and reached a maximum of 65°C. The highest temperature of 92°C was found at the stainless steel flange (NW500) connecting the cavity to the vacuum pump. RF fields leaking through the pumping port cause this temperature raise. RF shorting bars, installed later, led to a lower temperature.

After the 24-hour test and with the turbo and cryogenic pumps running, the vacuum in the cavity reached 10⁻⁷mbar, an order of magnitude better than specified.

No major problems occurred during the power tests. The test results will allow us to make a few minor improvements on the remaining three cavities [4].

NEXT STEPS

In January 2004, the cavity will be installed in the ring cyclotron and RF power tests will confirm the functionality of the cavity in the accelerator.

REFERENCES

- [1] M. Bopp et al., *Site acceptance test report*, NK-010, PSI internal report.
- [2] M. Bopp et al., *Coupled field analysis of the new ring cyclotron*, PSI Scientific and Technical Report, VI, 2001.
- [3] H. Fitze et al., *Cold tests with the new ring cyclotron cavity*, PSI Scientific and Technical Report, VI, 2002.
- [4] M. Bopp, *Changes and improvements of the prototype cavity*, NK-011, PSI internal report.