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Development of a New Electromagnetic Extraction channel for the AGOR Cyclotron

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The extraction system of the superconducting AGOR cyclotron consists of an electrostatic deflector and three electromagnetic channels. As the electrostatic deflector has only a moderate field strength (<100 kV/cm), the first electromagnetic channel has to generate a rather strong dipole component resulting in current densities up to 169 A/mm² in water-cooled copper coils.

In the original design the coils consist of sections of hollow conductor, parallel to the beam path, vacuum-brazed to machined “bridges” over the beam aperture. These “bridges” consist of several vacuum brazed parts. Altogether there are over 200 brazings made in three subsequent cycles in the three coils (dipole, quadrupole and first harmonic corrector).

In 25 years of operation two channels of this type have been “consumed”. The channels developed water leaks due to erosion of the copper by the high speed cooling water flow in the “bridge” regions that ultimately could not be repaired anymore.

To remedy this problem the channel has been redesigned using bent conductors. A production technique for small radius bends and a new joining method to avoid vacuum brazing have been developed. The coil support taking up the 10 kN/m Lorentz forces on the windings are now made from insulating material instead of anodized aluminium to prevent grounding errors. The new channel is now in operation for two years without any failure.

A detailed comparison of the old and new design will be presented.

Funding Agency

Footnotes

I have read and accept the Privacy Policy Statement

Yes

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