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Tue-Mo-Po2.08-02 [55]: Radiation resistant magnets for the Super-FRS of the FAIR project

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The radioactive dose rate in the area behind the target of the Super-Fragment Separator (Super-FRS) will be so high that most organic materials will be destroyed in a short period of time. After 20 years of operation an accumulated dose of more than 280 MGy is expected at the most critical parts. Special magnets consisting of radiation resistant materials must be used. Three dipoles, three quadrupoles, and two sextupoles are required inside the target area.
One radiation resistant dipole with its adjustable support frame already exists. The yoke of the dipole mainly consists of 100-120 mm thick iron blocks. The coil is wound of mineral insulated cables (MIC) without cooling channels. The water cooling is realized with layers of radiators between double pancakes of cables.
After the operation of the Super-FRS is started, direct access to the magnets is impossible because of the high radiation. Misalignment due to settlement must be corrected with remote alignment. A one meter thick plate of steel above the magnets will separate the high radiation area from a temporary accessible service tunnel above the steel shield. The remote alignment will be done with bars and angle gears from the service tunnel. The water and current supply will be also carried out through the 1000 mm shield with tubes and copper bars. The connections at their radiation resistant interfaces will be joined remotely too.
Several magnetic and thermal tests have been successfully done with the existing dipole. But unexpected problems appeared during the tests and development of the adjustable support frame below the massive 90 tons magnet.
The knowledge gained from these tests has been incorporated in the specifications of the other radiation resistant magnets. The test results, the problems, the solutions, and the characteristics of these magnets will be presented.

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