Contribution ID: **1556** Type: **Poster**

COOLING SYSTEM FOR TPC AND ECAL DETECTOR ON THE MPD UNIT.

Monday 28 October 2024 18:50 (20 minutes)

The aims of the study are to create unique systems for cooling and thermal stabilization of the TPC and ECAL detectors of the MPD experiment (NICA project). The thermal stabilization of the TPC gas mixture Ar/CH4 (90:10) and nitrogen N2 is also an important part for the TPC detector.
The systems are "leakless"type. Cooling water (distilled or deionized) operates at a pressure of up to 0.3 bar (to prevent water leakage inside the MPD experiment). The requirements for cooling pipes are the low radiation length, operation in the radiation environment, pipes must be from nonmagnetic material, small diffusion value through the pipe wall, flexibility for mechanical installation, and low cost. Plastic pipes were chosen.
The FLUKA simulation results for the MPD experiment show that the main problem is neutrons, and 1 MeV neutron equivalent fluence is F = 10 12 n/cm 2 per 10 years of the MPD operation. The candidate pipes were irradiated by neutrons (with an energy max of about 0.6 MeV) with the following fluence values: F1 = 10 9 n/cm2, F2 = 10 10 n/cm2, F3 = 10 11 n/cm2, and F4 = 10 12 n/cm2. A variety of analyses like scanning electron microscopy (SEM), transmission electron microscopy (TEM), Raman spectroscopy, differential scanning calorimetry (DSC), and direct air leak measurement due to diffusion into the vacuumed pipes before and after irradiation. Also, COMSOL modeling has been done for the selected candidate pipes.

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Session Classification: Poster session & Welcome drinks