THE STATUS OF THE DOUBLE POLARIZED DD-FUSION EXPERIMENT

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A double-polarized dd-fusion experiment is under preparation at PNPI, Gatchina, in collaboration with Forschungszentrum Juelich and INFN University of Ferrara. The experimental setup consists of a polarized ion beam source with the energy range of 10-100 keV, an atomic polarized source, provided by the INFN-Ferrara, as target, a 4-pi detector equipped with PIN-photodiodes, and a Lamb-shift polarimeter.

The experimental program includes measurements of the asymmetry in the differential cross section for the reactions $d + d \rightarrow {}^{3}\text{He} + n$ and $d + d \rightarrow t + p$ in the energy range of 10-100 keV. The total crosssection modification for polarized dd-fusion will also be investigated. An increase by a factor of 1.5 was already established for the $d + {}^{3}\text{He}$ and d + t reactions [1]. The spin-correlation coefficients $C_{z,z}$ and $C_{zz,zz}$ will be measured to determine the quintet-state suppression factor for both reactions, which has quite different theoretical predictions [2] and is very important for building a neutron-lean fusion reactor. In addition, more spin-correlation coefficients can be measured at different energies with this experimental set-up in order to get more information about the dd-fusion process. The screening effect due to atomic electrons which shows up in the astrophysical S-factor [3] may also be investigated in this experiment for different spin combinations of the electron and nucleus. The experimental setup and the future upgrade plans will be described.

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- [3] F. Raiola et al. // Eur. Phys. J. A13, 377 (2002).

^[1] Ch. Leemann et al. // Helv. Phys. Acta 44, 141 (1971).