Spin tune mapping at COSY
Artem Saleev on behalf of JEDI Collaboration
Institute of Nuclear Physics - Forschungszentrum Jülich

**Motivation:** Systematics at EDM searches

- Magnetic Dipole Moment of particle is much greater than its Electric Dipole Moment
- High precision spin tune: a tool to quantify the systematic effects due to Magnetic Dipole Moment

**Method:** Spin tune mapping

- Two solenoids at COSY switched on
- Spin tune map $\Delta \psi_s(\chi_+, \chi_-)$ consists of the spin tune measurements $\psi_s(\chi_1, \chi_2)$ on the mesh $\chi_1 \times \chi_2$ of solenoid’s spin kicks
- Build the map of spin tune shifts $\Delta \psi_s$

**Scheme for experiment**

- Solenoids on at $\Delta T_2$
- Solenoids off at $\Delta T_1, \Delta T_3$

**Results:** Spin tune map of COSY

- Spin tune shift $\Delta \psi_s$ from nominal value $\psi_s$ is resolved with precision $\delta \psi_s = 3.2 \cdot 10^{-9}$
- Angular precision $2.8 \mu rad$ to the direction of stable spin axis $\vec{c}$ achieved – very sensitive probe of systematics!

**Spin phase analysis**

- Deviation of measured spin phase from assumed value

**Spin tune map**

- A feature: saddle point – non-zero location is a sign of systematic effects

$\chi_{\pm} = \frac{1}{2}(\chi_1 \pm \chi_2)$