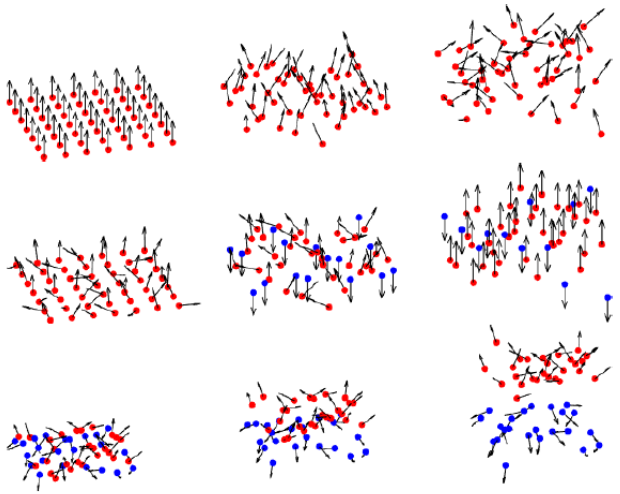
Project: **Laser-induced acceleration of polarized ^{3}He ions from PHELIX and injection into a conventional accelerator of the FAIR facility**

Applicant: **A. Pukhov (HHUD)** in collaboration with:
M. Büscher (FZJ, HHUD) and A. Lehrach (FZJ, RWTH)

Thomas-BMT equation
Sokolov-Ternov effect
Stern-Gerlach effect

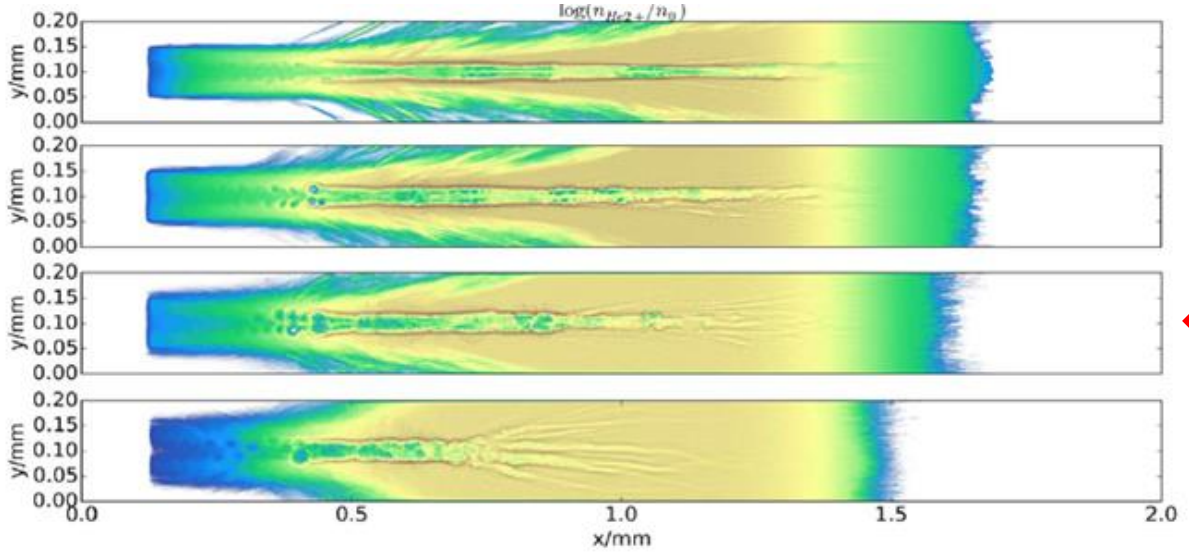


Our expertise & preliminary work: **Theory of polarized beams in Plasmas**

Scaling laws for the depolarization time of relativistic particle beams in strong fields, Phys. Rev. AB 23, 06441 (2020)

Simulation of spin effects with PIC codes (VLPL, EPOCH):

High Power Laser Sc. Eng. 7, e16 (2019); Phys. Rev. E 102, 011201(R) (2020)
New J. Phys. 21 (2019) 073052; Phys. Rev. E 100, 043202 (2019)



Preparation of polarized targets for laser applications

First measurement of proton polarization at Arcturus/HHUD:
PoP 21, 023104 (2014)

^{3}He-ion (unpolarized) acceleration from gas jet at Phelix/GSI:
PPCF 61, 115012 (2019)

PLANNED WORK PACKAGES

- **Simulation of spin effects and ion acceleration in polarized ^{3}He gas targets (using supercomputer facilities at FZJ)**
- **Interpretation of data from PHELIX experiments (unpolarized [2015] and polarized [scheduled for 2021])**
- **Optimization of laser/target parameters for generation of polarized ^{3}He beams**
- **Simulation of polarized ^{3}He beam transfer at FAIR using conventional accelerator components (A. Lehrach, FZJ)**

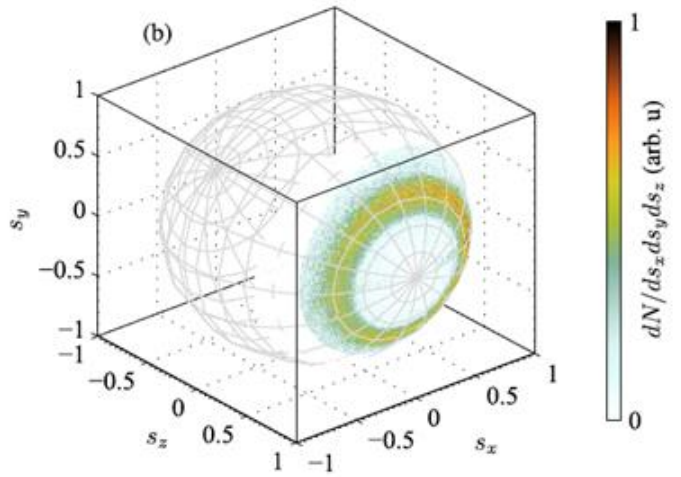


FIG. 2. Snapshots at $t = 330\lambda/c$ of (a) phase-space distribution, and (b) spin spread of protons with energy $\mathcal{E} \geqslant 20$ MeV on the Bloch sphere. Simulation parameters can be found in the text.

Phys. Rev. E 102 R011201 (2020)

Requested funding:

1 Ph.D. position at HHU (Prof. Pukhov)

The position is in theory / simulations in close collaboration with FZJ