



STRONG-2020 ANNUAL MEETING (2022)

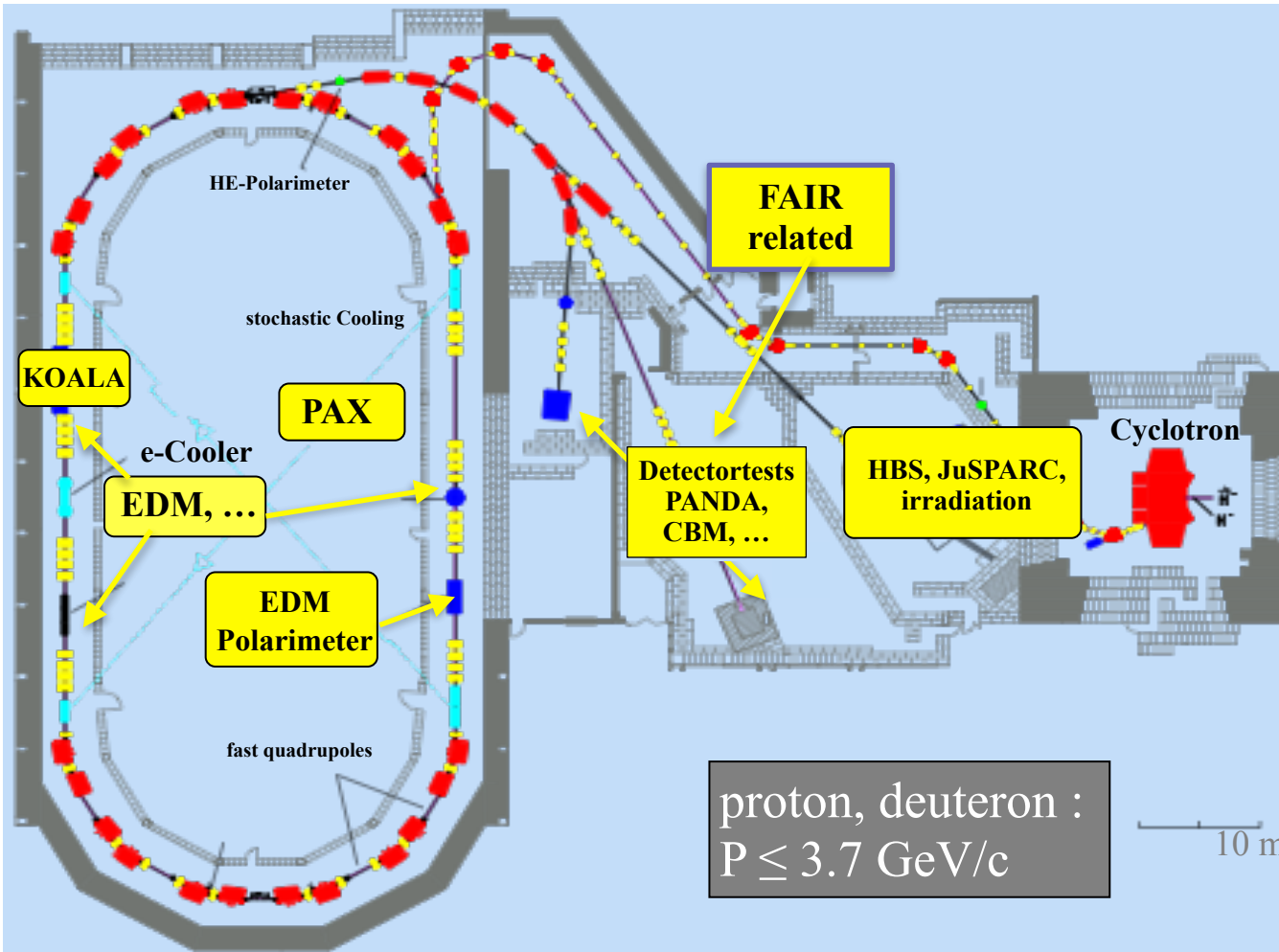
TA1 - COSY

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TA1 - Transnational Access to COSY



Cyclotron < 300 MeV/c

Cooler-Synchrotron COSY < 3.7 GeV/c

$5 \cdot 10^{10}$ stored p,d unpolarized, polarized

phase space cooling, (e-cooler, stochastic)

internal, external target stations

Supported Projects (07/2021 - 06/2022)

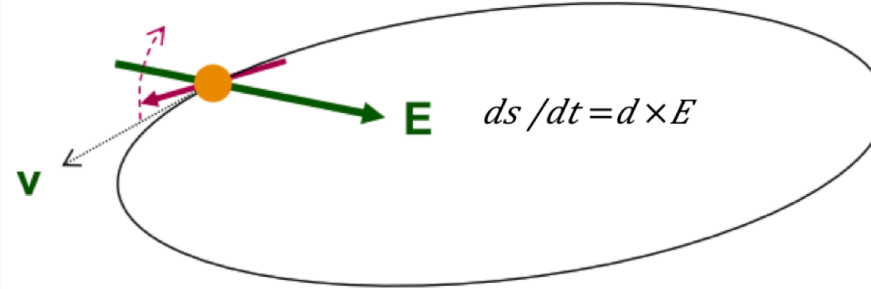
Acronym	Project
D-EDM	First electric dipole moment measurement of the deuteron with the waveguide RF Wien Filter
JEPO2	Complex commissioning of JEDI Polarimeter
PSCT	Measurement and Optimization of the Spin Coherence Time for Protons in COSY
ITOF	Test of HADES inner TOF detector modules
AYPP	Detector test for the proposal D013 concerning Ay measurement of elastic pp-scattering in the CNI region
PTS	Investigation of New Methods in Proton therapy

Search for Electric Dipole Moments of charged particles

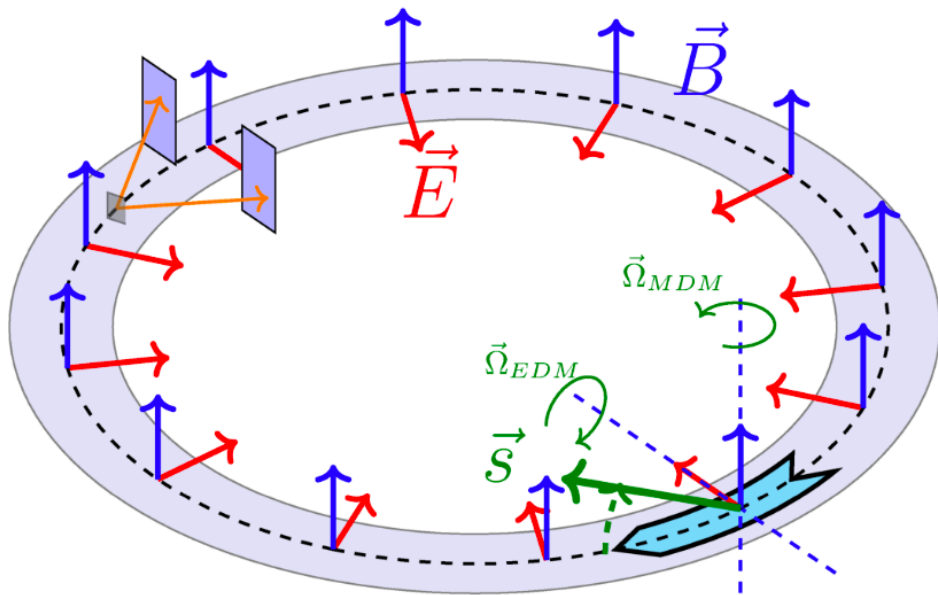
Tests of detector systems

Electric Dipole Moments of Charged Particles in Storage Rings

principle: horizontal polarized beam ;
electric field \rightarrow buildup of vert. pol.



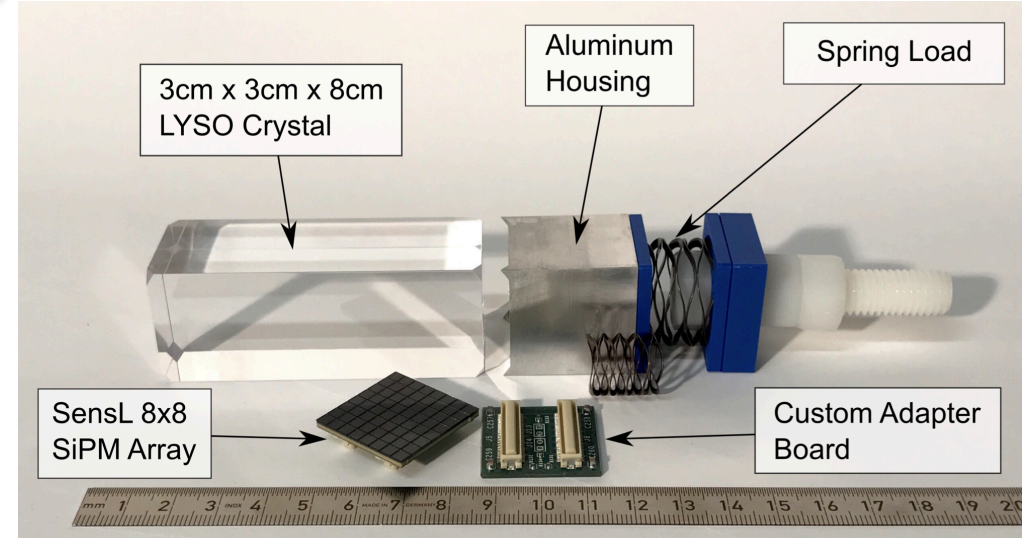
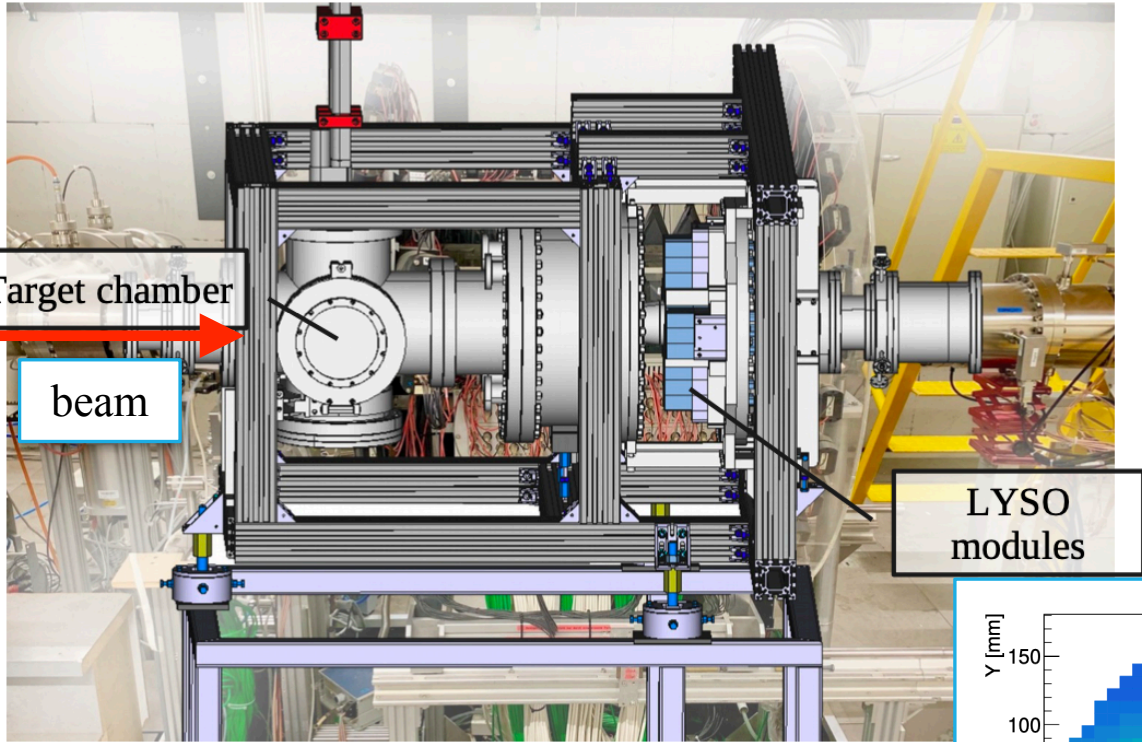
COSY



careful preparations required

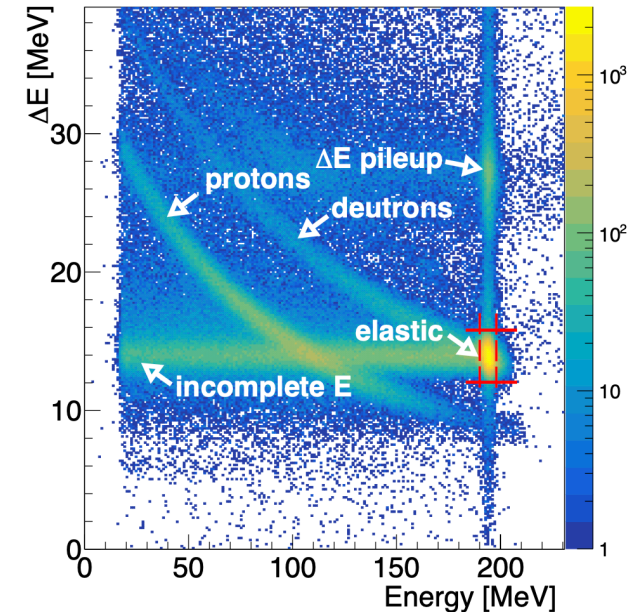
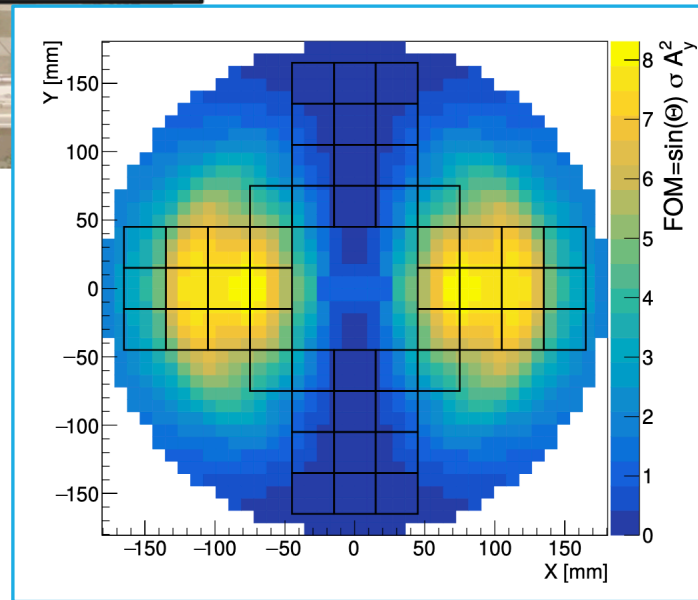
- beam based alignment
- long spin coherence time (≥ 1000 s achieved for d)
- precise polarimetry
- phase locking of spin precession to RF Wien filter
- multi bunch operation (pilot bunch without RF field)
- ...
- spin tracking simulations for analysis

Complex Commissioning of JEDI Polarimeter

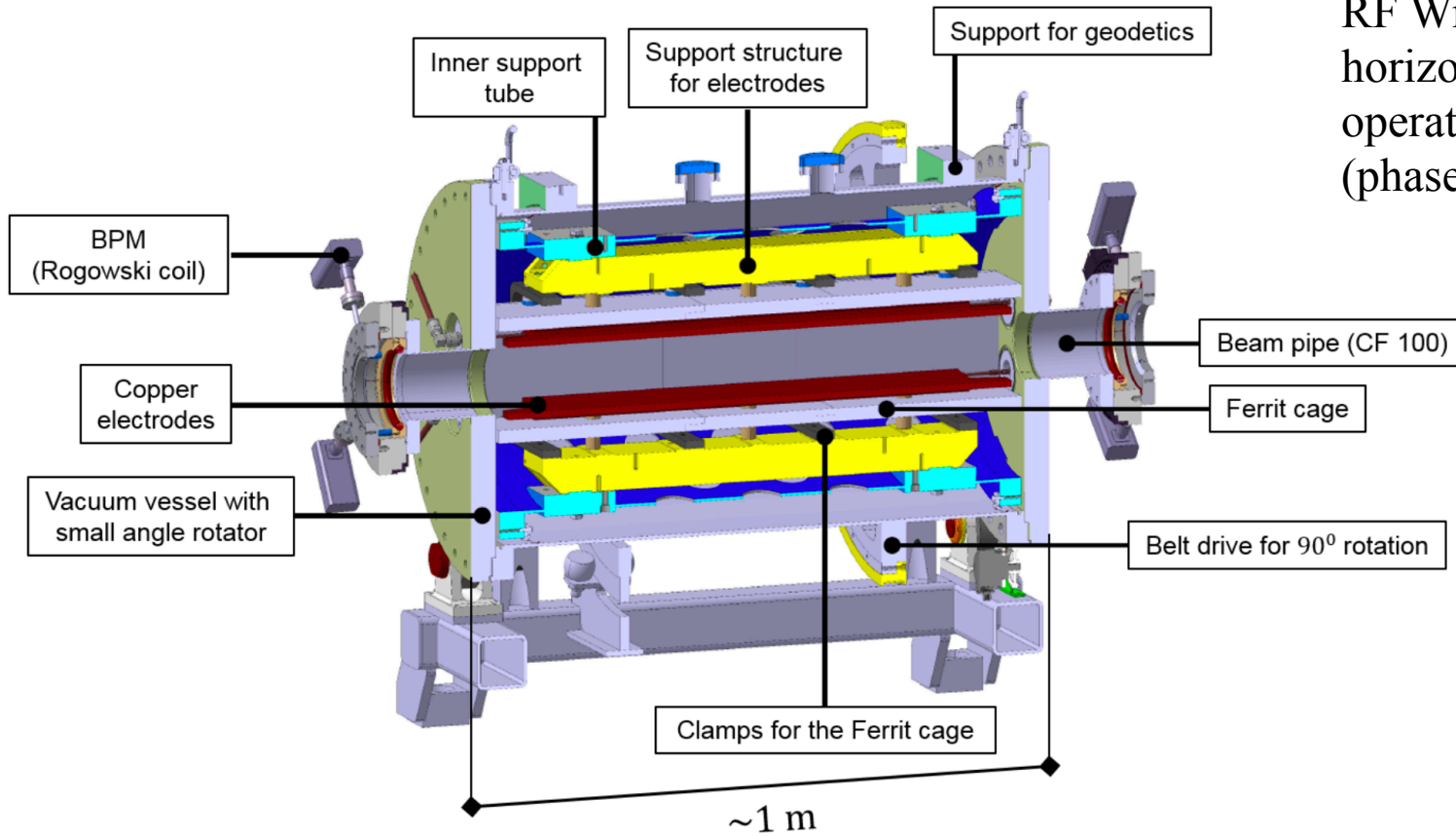


elastic scattering of polarized d on a carbon target,
detection in LYSO(Lu-Y-oxorthosilicate),
additional plastic scintillators for ΔE

JINST 15 (2020) 12, P12005



First Electric Dipole Moment Measurement of the Deuteron with the Waveguide RF Wien Filter



RF Wien filter:
horizontal E-field, vertical B-field
operates on spin precession frequency
(phase-feedback)

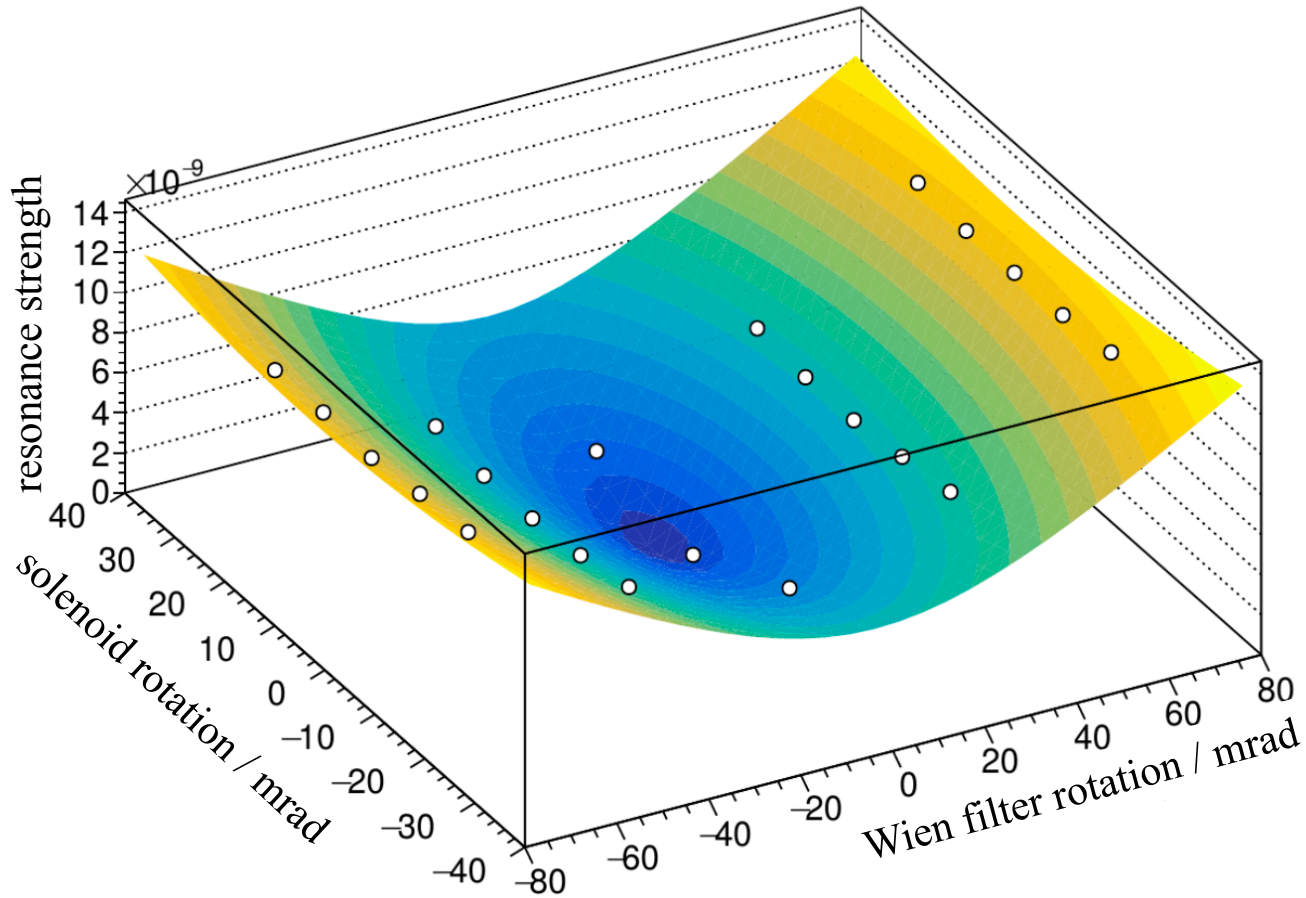
EDM measurement:

determine invariant spin axis
(which will be tilted by EDM)

variation of RF Wien filter rotation angle
→ tilt in x
solonoidal field (Siberian Snake)
→ tilt in z

measure strength of polarization build up

First Electric Dipole Moment Measurement of the Deuteron with the Waveguide RF Wien Filter



invariant spin axis tilted by a few mrad
in longitudinal and radial direction
→ due to systematic effects

→ currently under investigation
by spin tracking simulations

tilt induced by EDM:

$$1 \text{ mrad} \triangleq 10^{-17} \text{ ecm}$$

(in radial direction)

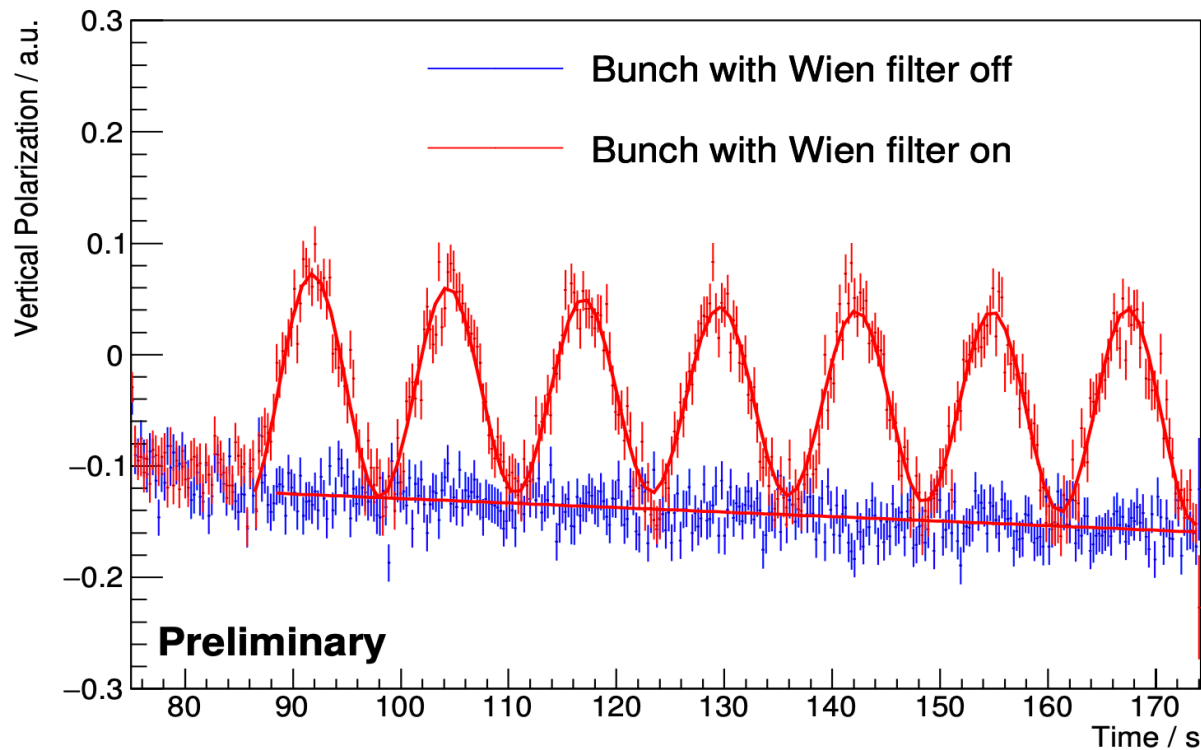
Electric Dipole Moments of Charged Particles in Storage Rings

bunch selective operation of the Wien filter:

two bunches circulating in COSY (750 kHz)

Wien filter field acts on only one bunch

→ reduction of systematic effects



Measurement and Optimization of the Spin Coherence Time for Protons in COSY

more difficult compared to deuteron:

- high precession speed
($G(p) = 1.79$; $G(d) = -0.14$)
- greater abundance of spin resonances

first investigations performed:

online no SCT observable

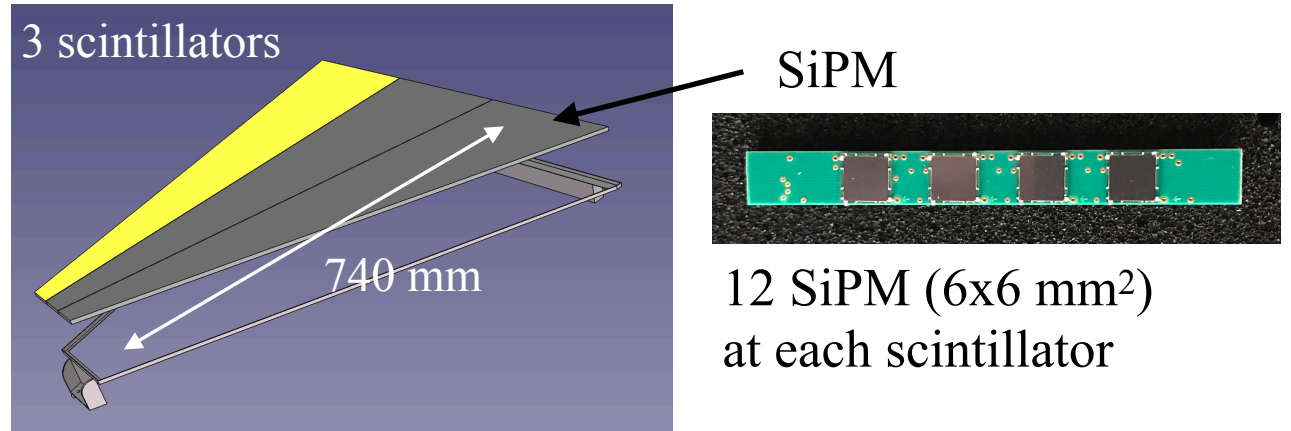
offline analysis combined with further spin tracking studies required to understand the observed behavior

Test of HADES Inner TOF Detector Modules



detector modules installed at HADES / GSI

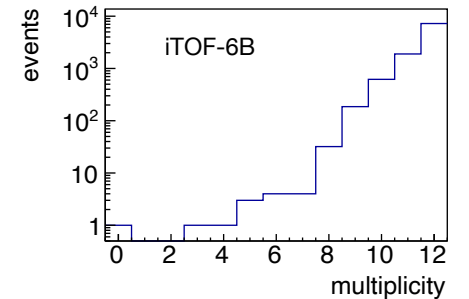
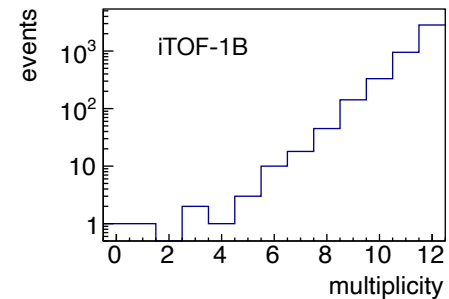
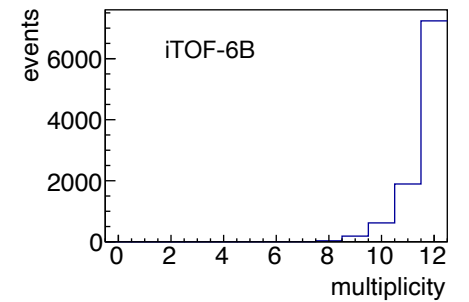
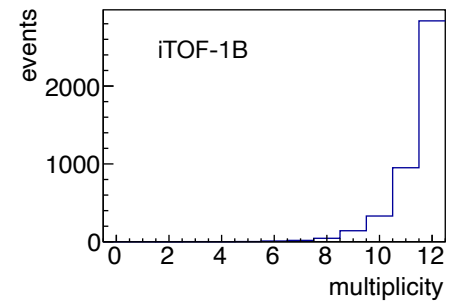
Nucl.Inst.Meth. A, in print



test with
COSY beam

multiplicity
distribution
of SiPM signals

→ high detection
efficiency



TP1 - COSY Work Plan

	GA	Status 31.05.2022	
Access hours	1600	1688	> 100%
User days	672	753	>100%
Travel cost	73808	24754	34 %

No modification of the scientific work plan

For TP1 - COSY there is no need for further extension beyond 30.11.2023

(until 30.11.2023 the remaining travel budget will be used including further access hours)