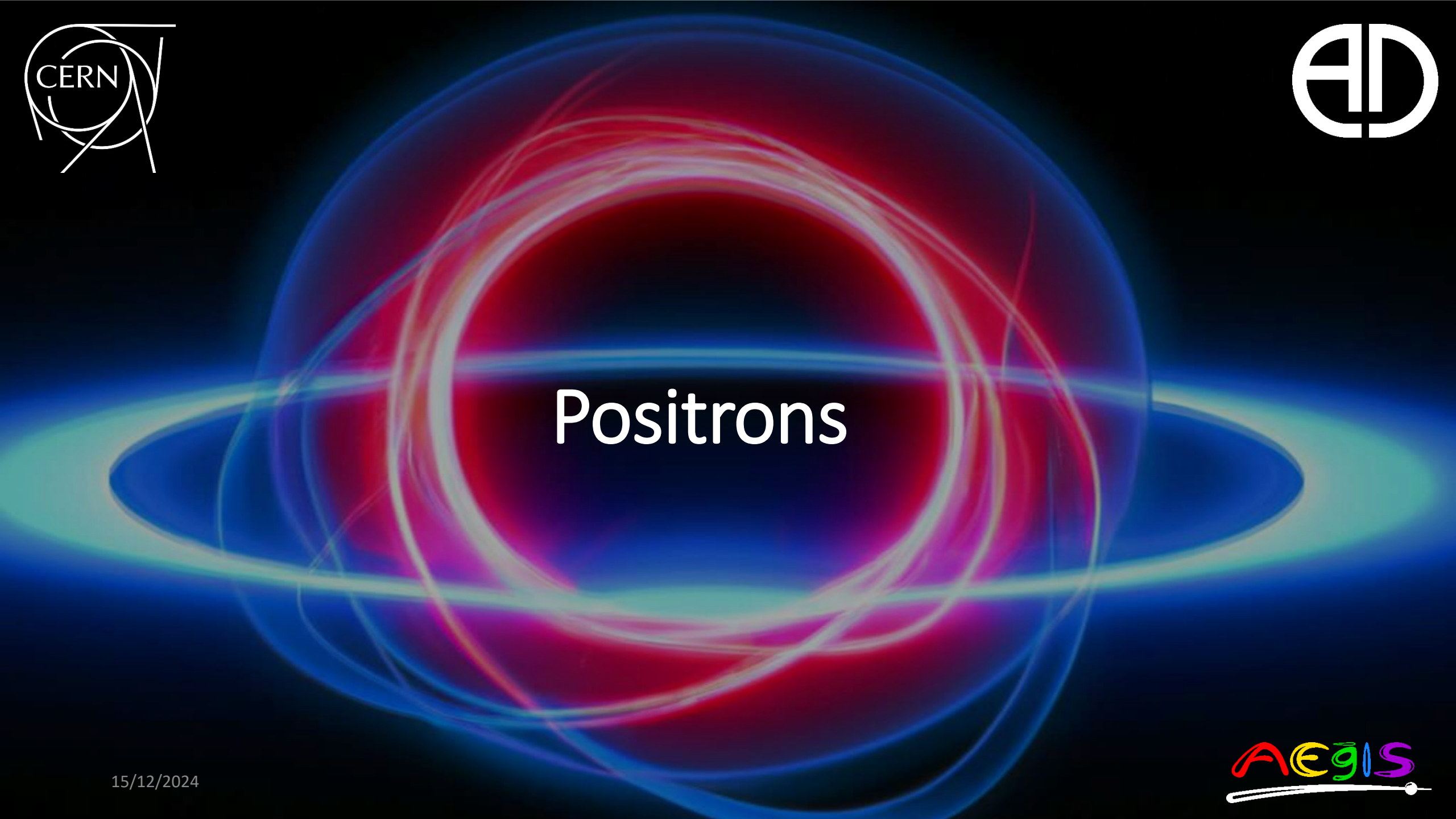
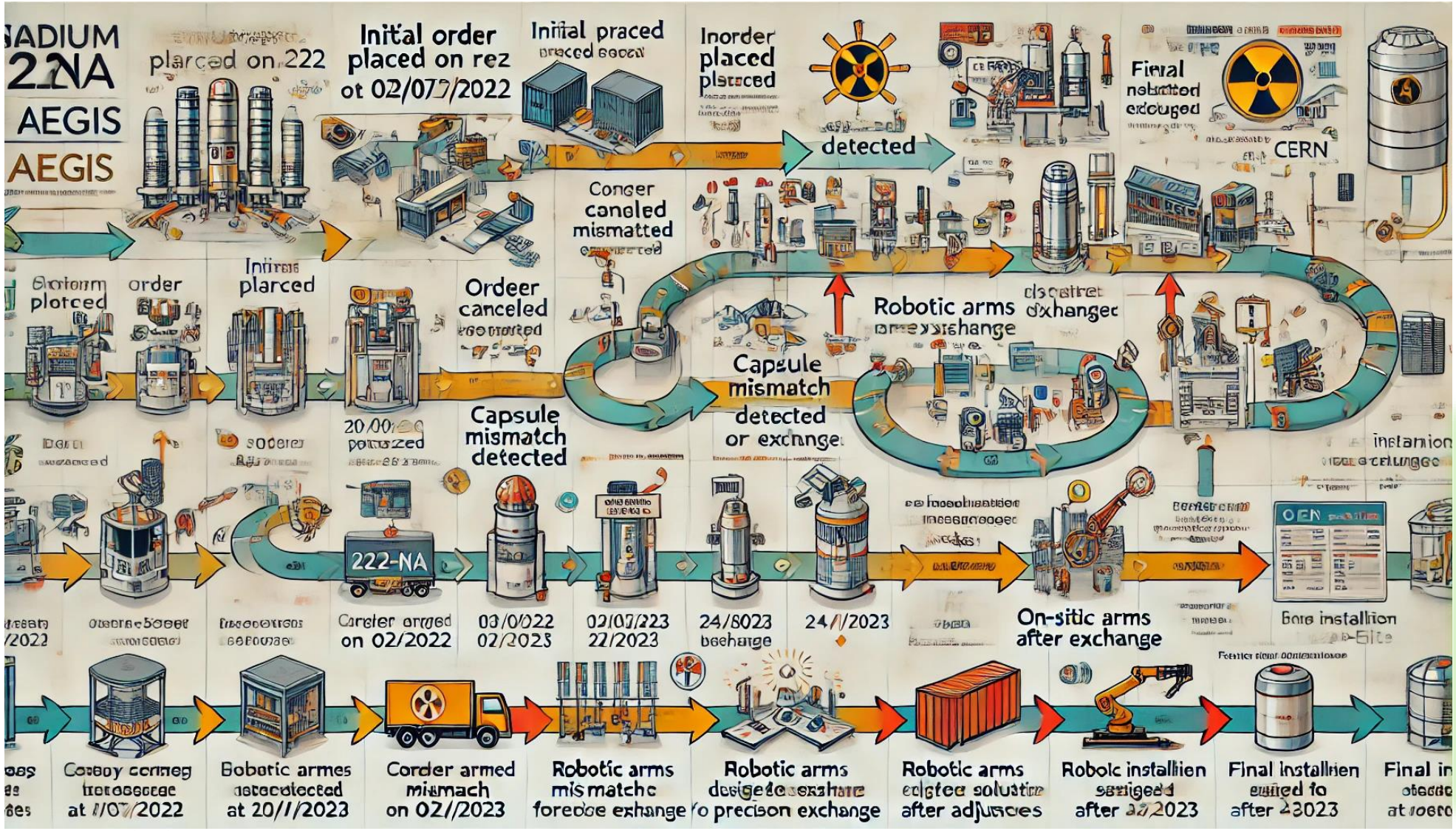
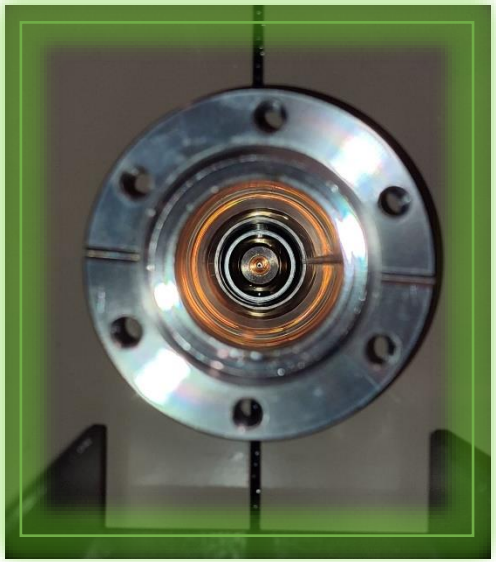
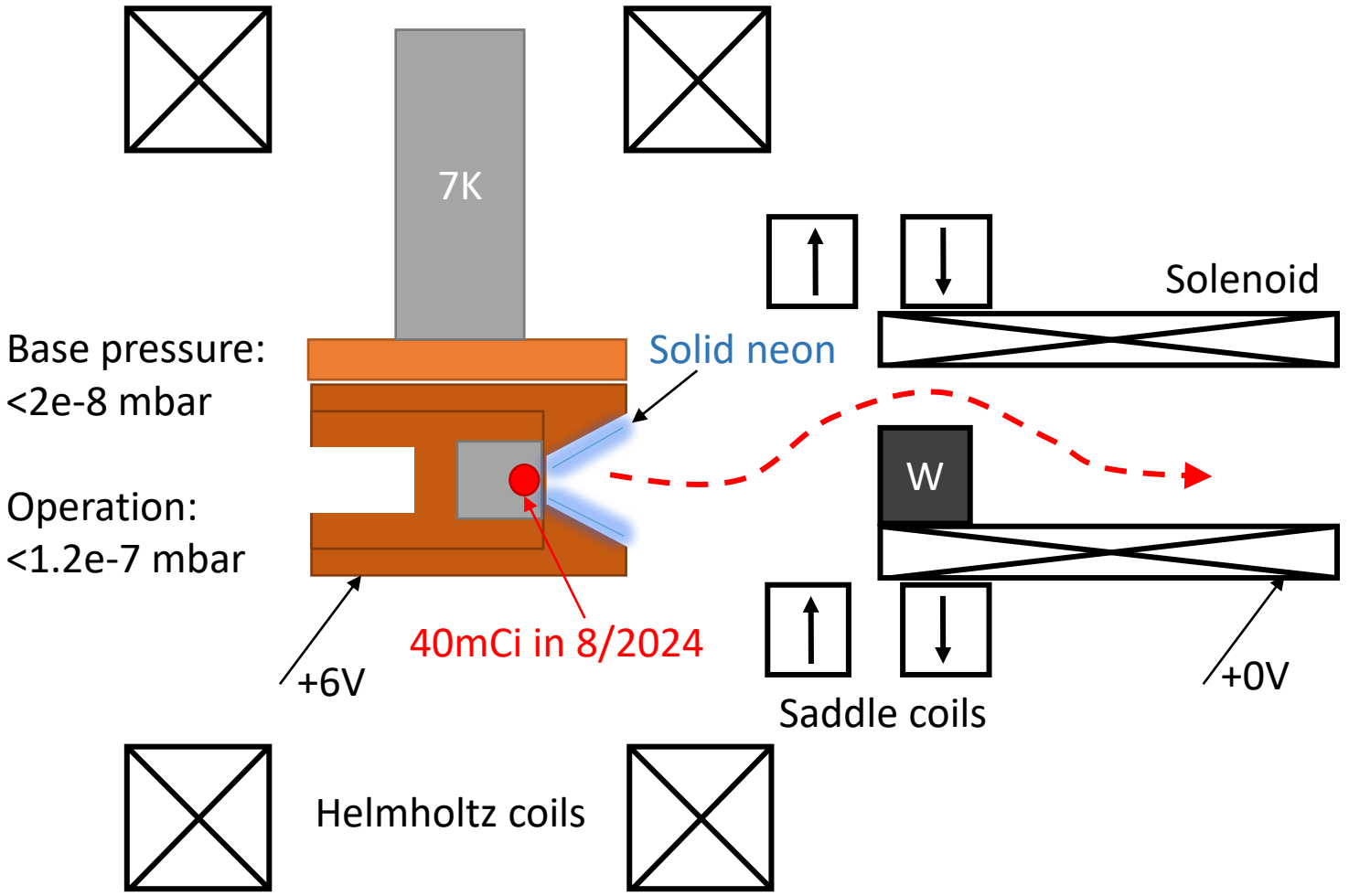

CERN
Positrons
AEgIS

New positron source installation (2022-2024)





SOURCE



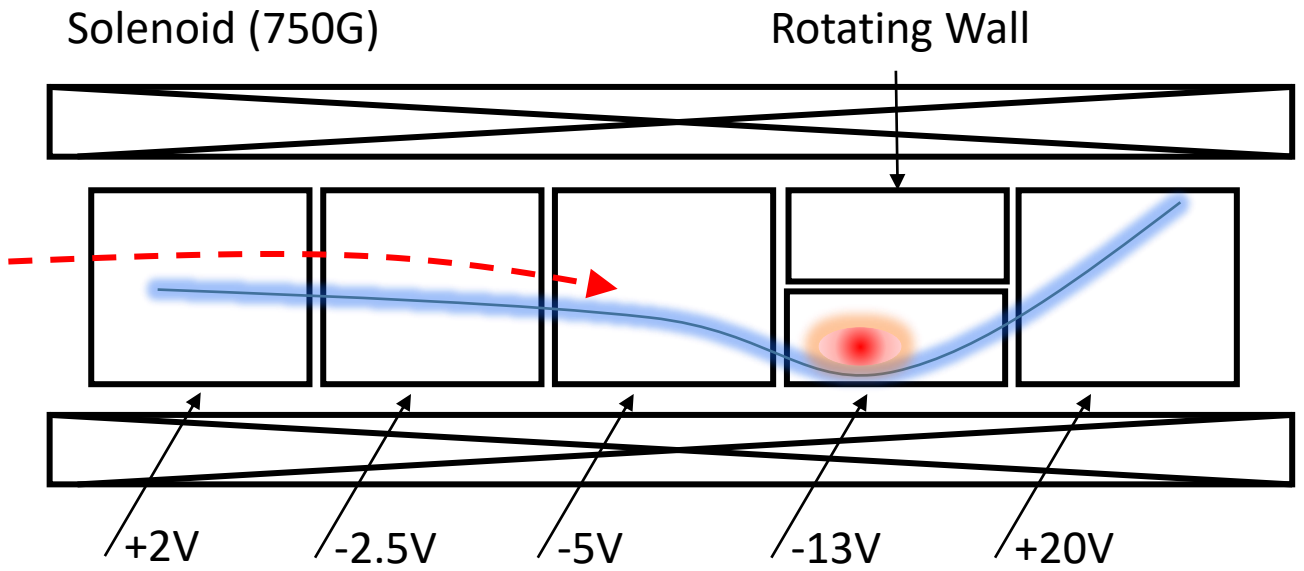
- 40mCi = 1500 MBq
- Positrons: 1.36e9 * 0.9
- Moderated positron beam:
  1.36e9 * 0.9 * 2e-3 = 2.4e6 e+/sec
- Works pretty reliably
- Every 5-6y: source exchange

TRAP

Filling: 150ms

Base pressure:
<3e-8 mbar

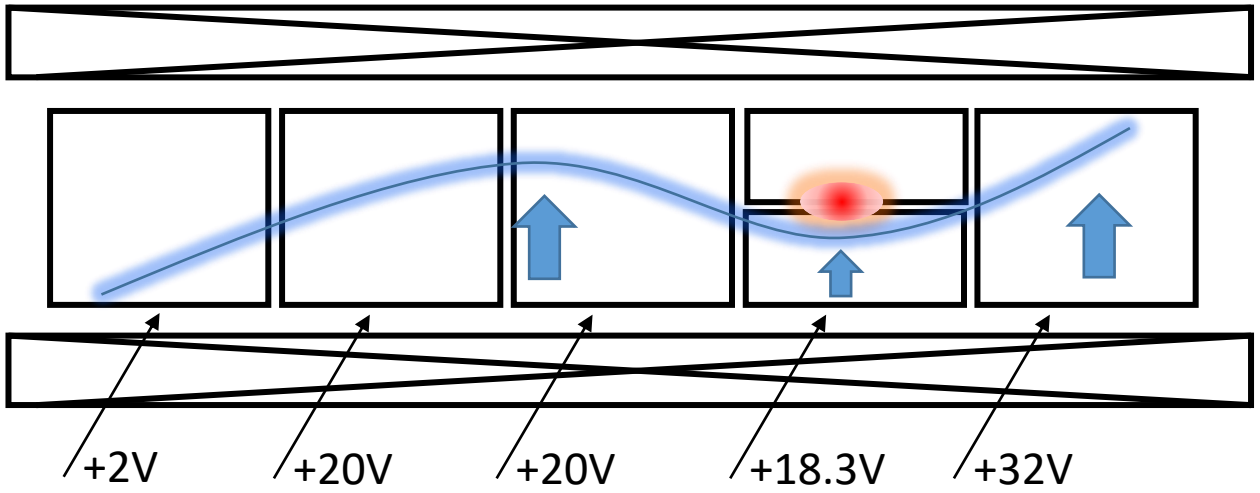
Operation:
5e-6 mbar



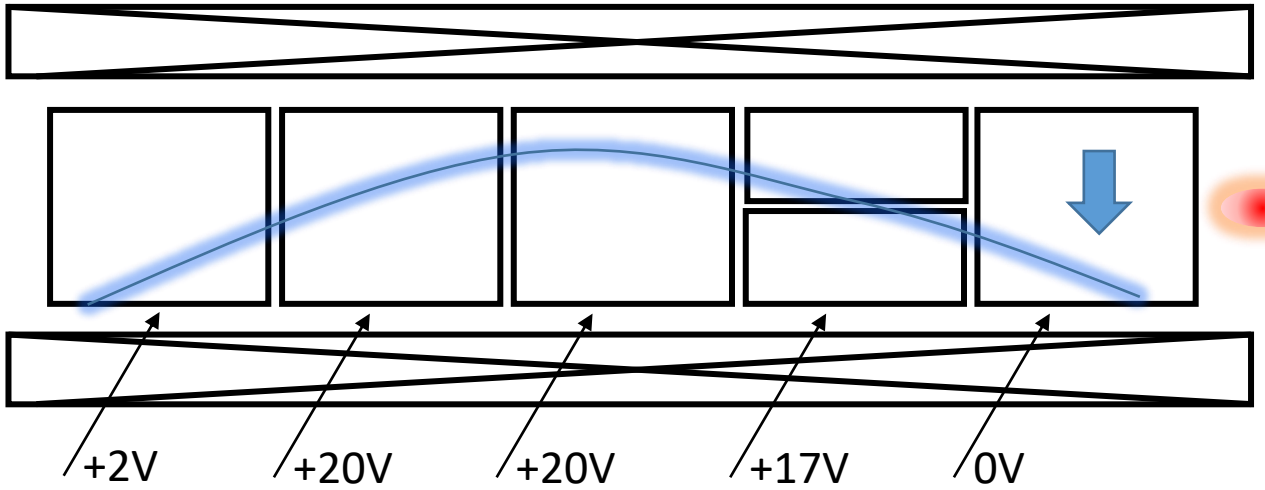
- RW freq: 5.9 MHz
- RW amp: 30% ... 60% of 3V
- Buffer gases for cooling:
  - N_2 (0.40sccm)
  - SF_6 (0.05sccm)
- Positron lifetime: 2000ms
- Part 1 of 3 of the solenoid has ground connection
- Mass flow controllers fixed

TRAP

Storing: 2ms



Dump: 1ms



- Incoming positrons:
  2.4e6 e+/s
- Trapping efficiency 14%
- Pulsing:
  2.4e6 e+/s * 0.150s * 0.14 =

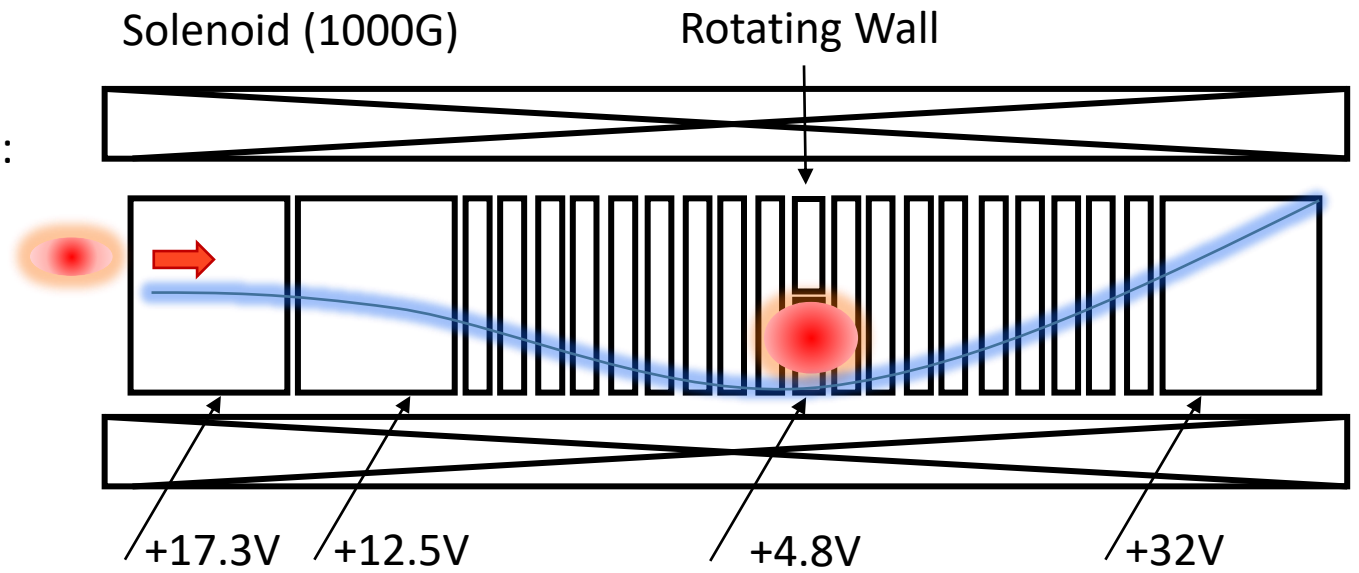
→ 5.16e4 e+/pulse

ACCUMULATOR

Filling: Minutes ...

Base pressure:
<5e-9 mbar

Operation:
6e-8 mbar



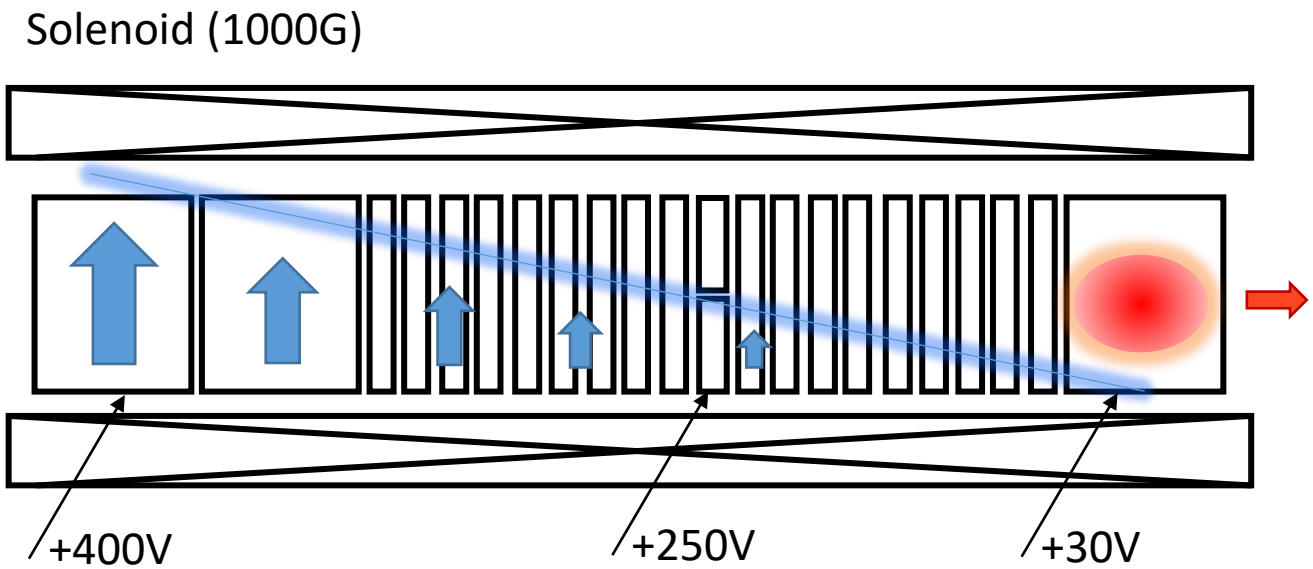
- RW freq: 7.1 MHz
- RW amp: 5% of 3V
- Buffer gases for cooling:
  Spill-over from trap
- Positron lifetime: 700p
- Found and fixed a short of the solenoid to ground
- Bad connector - tbd

ACCUMULATOR

Ejection

Base pressure:
<5e-9 mbar

Operation:
6e-8 mbar

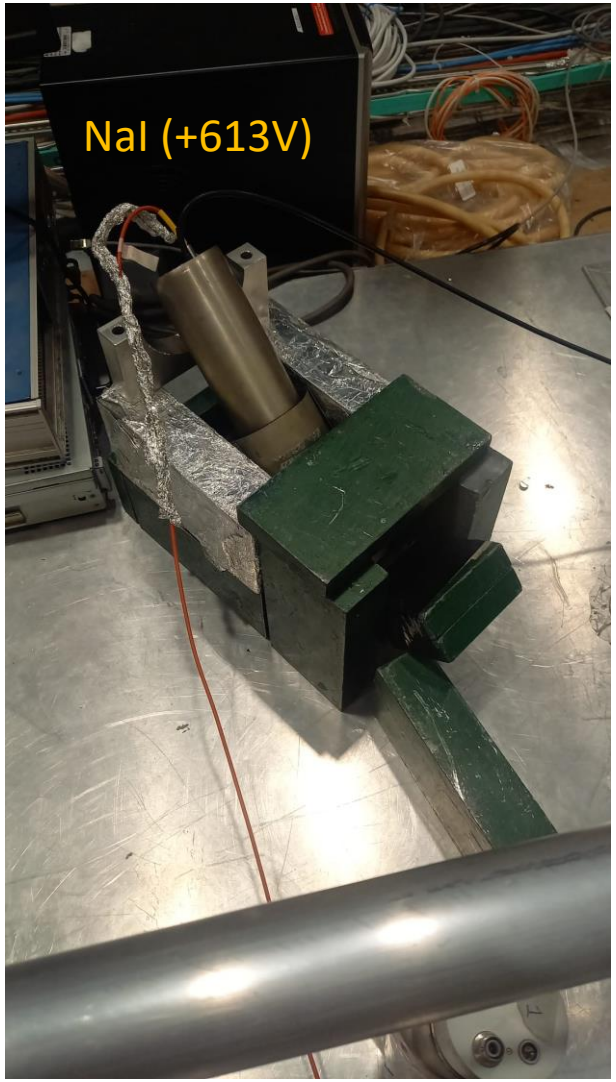


- Accumulation efficiency
  25 ... 75% (base pressure!)
- Positron pulse energy: 250eV
- Time spread: few 10ns
- 5.16e4 e+ * **500p** * 0.35 =

  9e6 e+ (500p in about 80s)

- T-Line efficiency: 75% (?)
  -> 6.7e6 onto target in 1T

MEASUREMENTS: POISSON

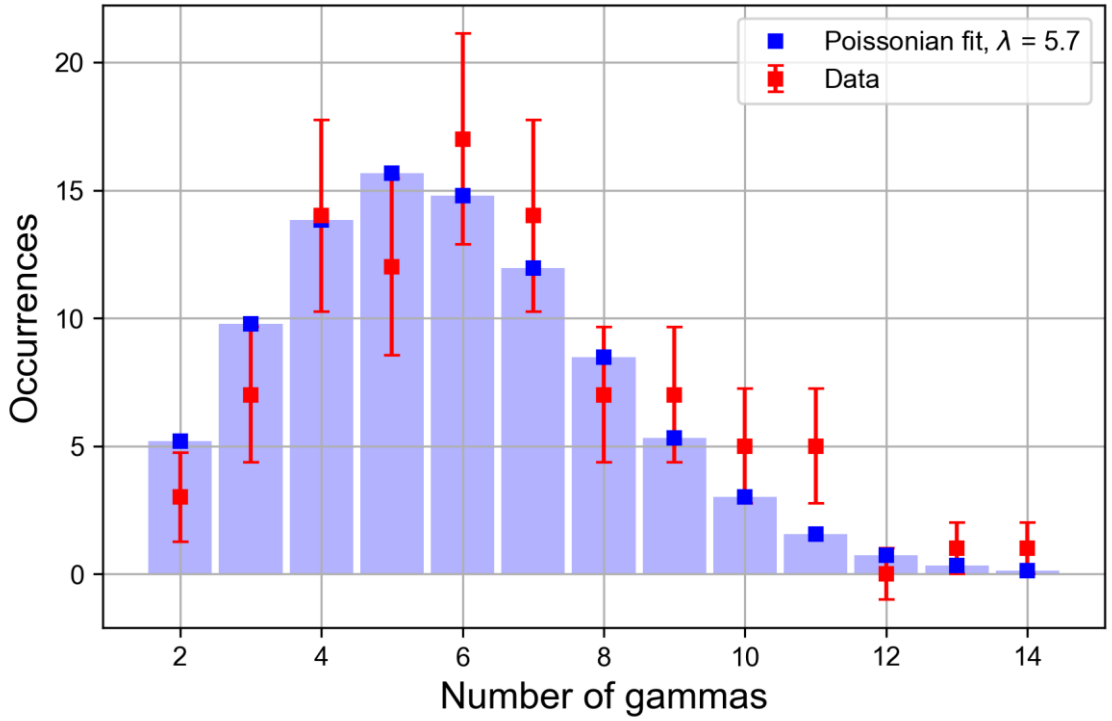


- 20mm aperture
- Distance about 3m => single gammas expected (solid angle)
- Complex geometry (est. mass attenuation 85%)
- Alignment to the target region difficult (pi * eye)
- Unknown contribution of Compton scattered photons
- Earlier results https://doi.org/10.1016/j.nima.2022.166661:
  1 gamma ray with 511 keV produces 20mV

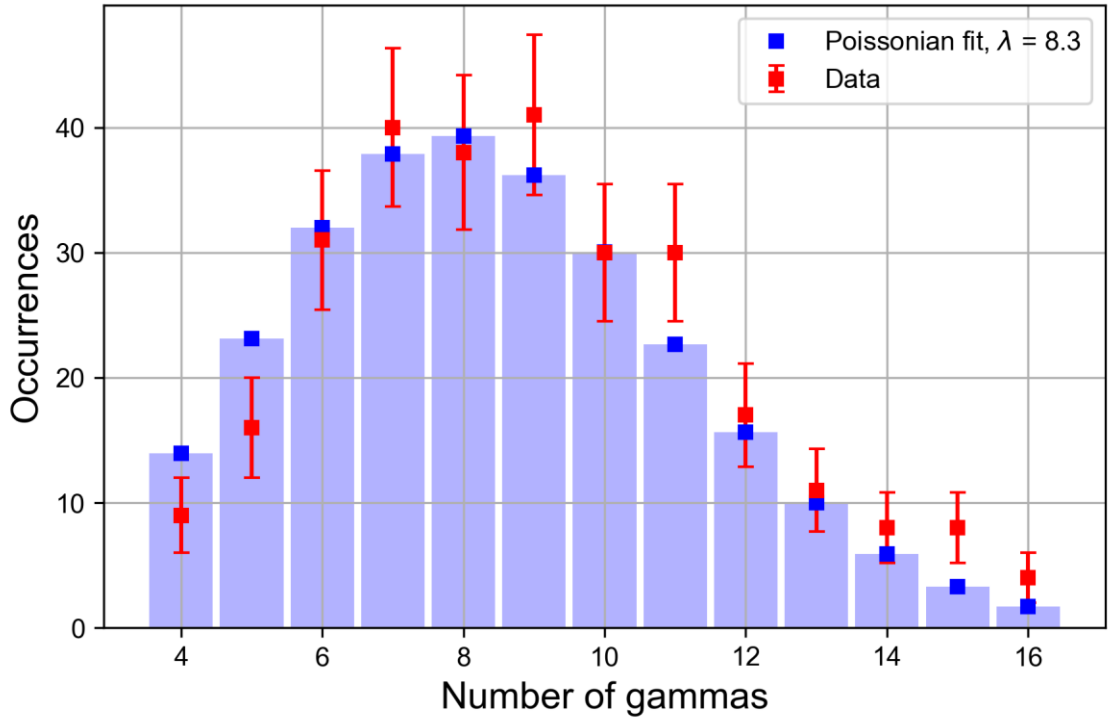
This method can easily get the number of positrons wrong by a factor or 2!

MEASUREMENTS: POISSON

500p, red. chi-squared: 0.9

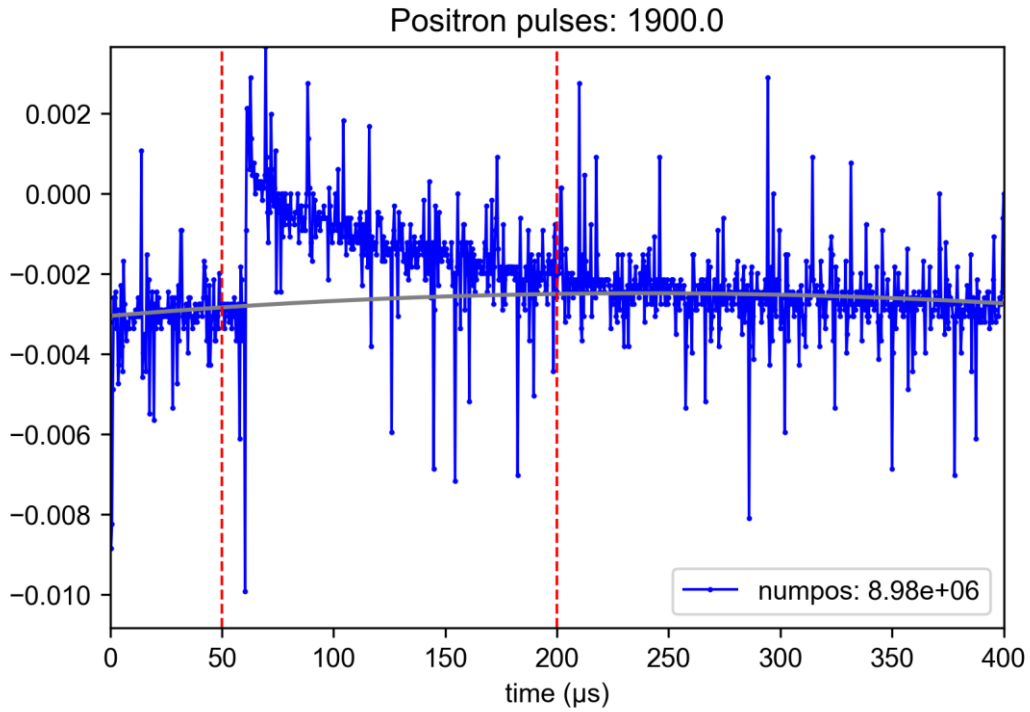


1000p, red. chi-squared: 1.05



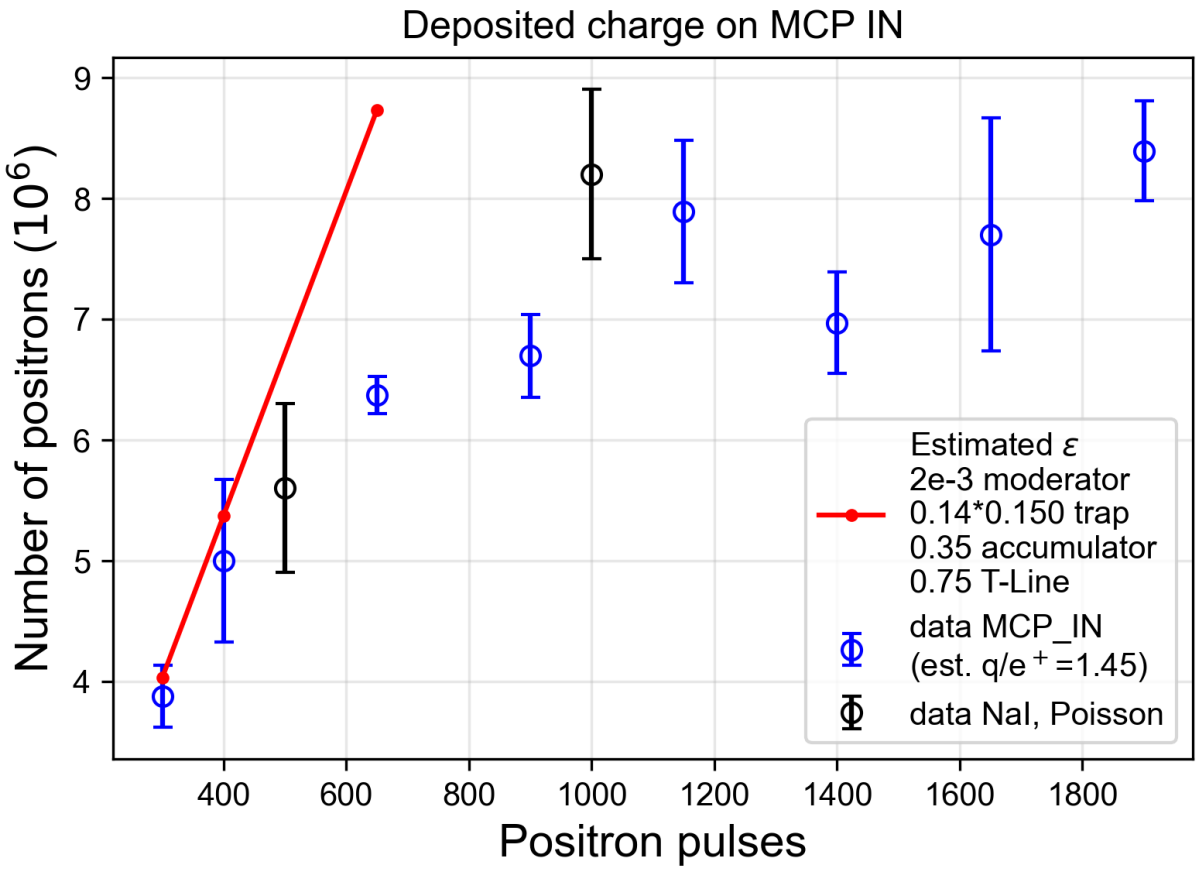
MEASUREMENTS: Charge deposit on MCP

MCPIN - 100283 Ohm - 6133

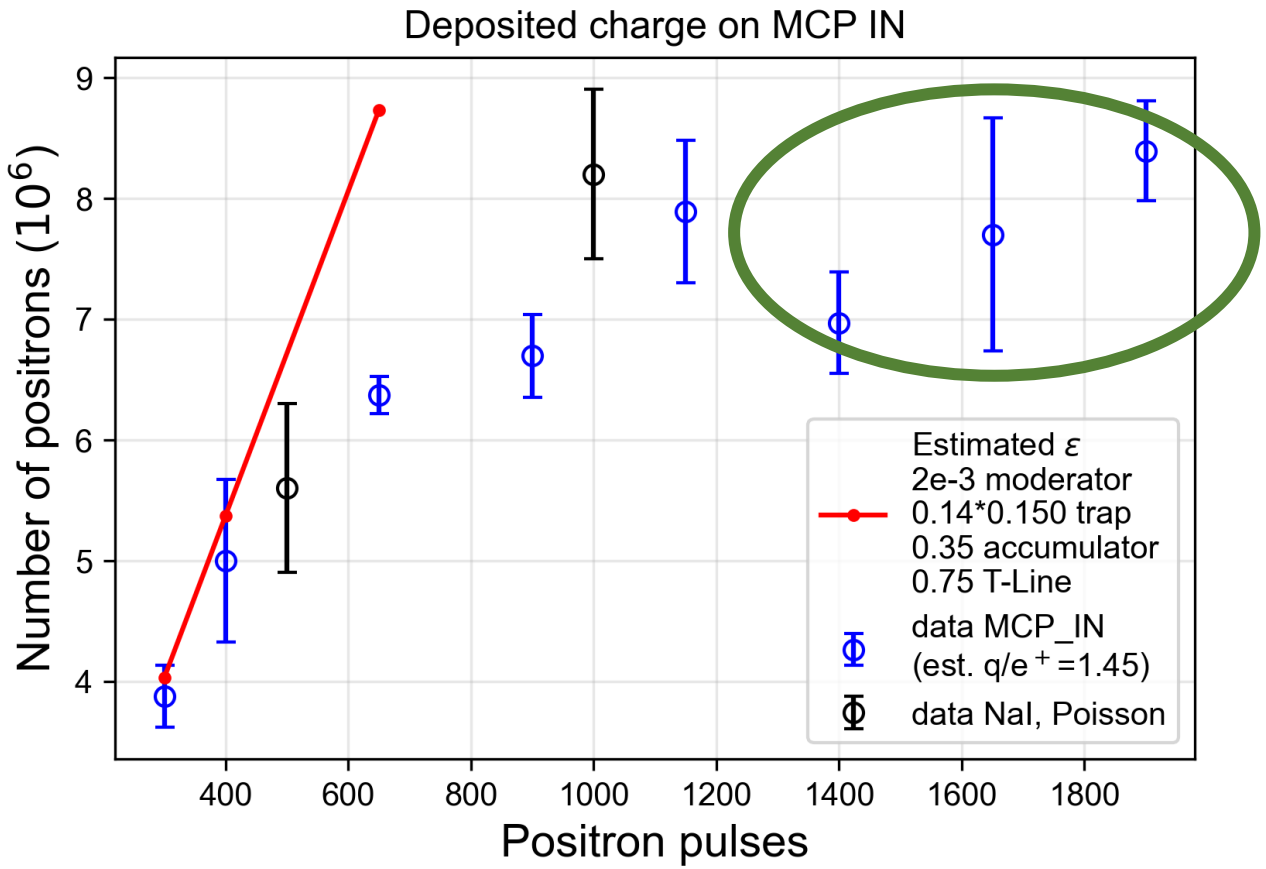


- Low SN-ratio, since 8e6 positrons are not much
- MCP != FC (channels ...)
- Electrons deposit on average 0...1e per e-
- Positrons deposit on average 1...2e per e+
- My guess: 1.45e per e+ (1.6 in PhD Fitzkerley)

MEASUREMENTS



MEASUREMENTS



Setting for Hbar-2 in 2024:

- About 8e6 positrons
- About 8e5 Ps atoms
- About 1e5 Ps*
- About 8e4 Ps* survive B

MEASUREMENTS

Aegis | RunLog | HbarLog | Detectors | RunList | MaintenanceToDo

AEgIS Maintenance To-Do List

New | Edit | Reply | Find | Duplicate | Move to Aegis | Copy to Aegis | Delete | Help

Message ID: 53 Entry time: **Tue Feb 22 14:25:33 2022**

Author:	Benji
Subject:	Projects and maintenance
Status:	To Do
Hardware:	Positrons

High priority

Migrate the old AEGIS-POS into AEGIS-POS7
>> ACCESS PCI-DA 12-16 driver https://accesio.com/drivers-downloads/

Migrate the positron system to a uService infrastructure
>> A PhD student project?

Exchange the TRAP and the ACC potential box and controller with a Fastino and 1 x 8channel HV module
>> Saiva has checked the general specs and this should be sufficient to control all electrodes.

Find a new solution to control the 24V devices (gate valves and HiCube remote control)
>> More and more devices do not get the right voltage and cannot controlled remotely anymore. Problem is not yet clear to me.

Exchange the potential conector that feeds the electrode potentials of the Accumulator in
>> We have to build a proper adapter cable, and fix the other part by some means. At the moment, vibration looses it regularly ...

Benji + someone spending a lot of time on LabView/ Kasli/HW procurement

New BB equipment
>> 2in PbWO4+PMT in new detector cup
>> New laser mirror assembly
>> Design and install new cryostat for cool experiments

Benji + Ahmad, needed for BB measurements in winter

Lower priority

Start to organise the Sumitomo coldhead maintenance
>> we are running into the expiration date ...

Develop a new MCP holder, buy new manual (?) actuator from the bottom.
>> To be operated from the bottom through a CF63 flange (MCP F2222-21P P46(ITO) 300ns decay time already in CR)

Develop a water-cooled transferline for positrons that can withstand 100A continuously, generating a solenoid magnetic field of up to 1000G.

Benji / ?