

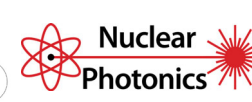
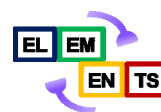
Status S-DALINAC



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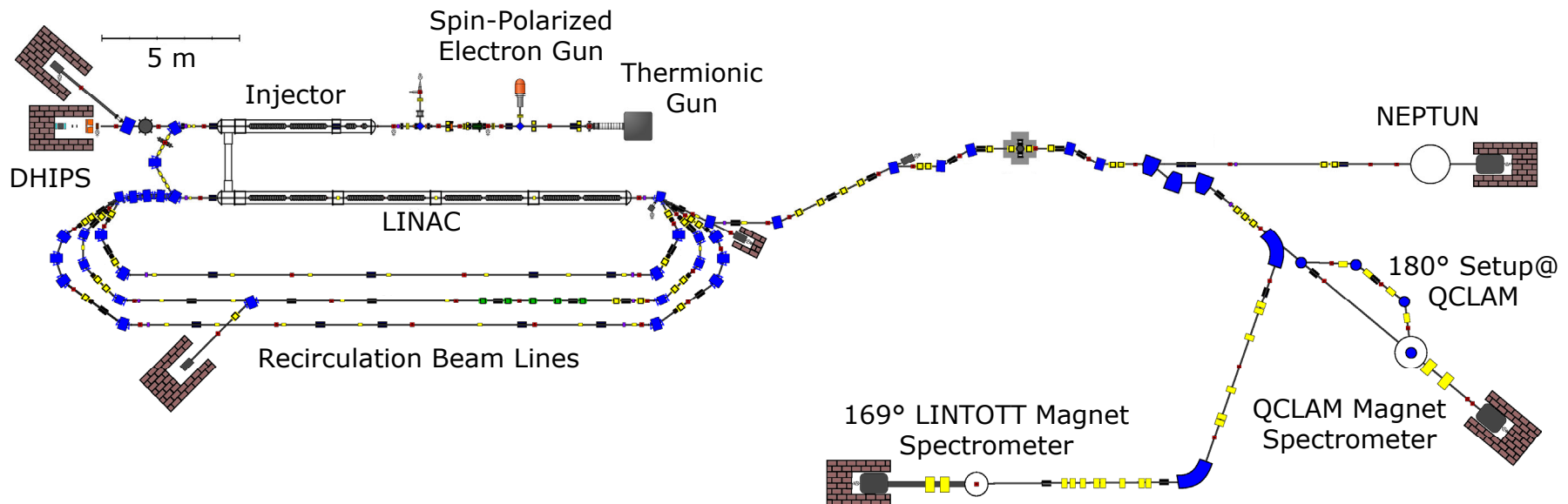


Photo: Jan-Christoph Hartung



S-DALINAC

Superconducting-**D**armstadt-**L**INear-**A**ccelerator



Thrice recirculating operation

Energy gain injector: 10 MeV

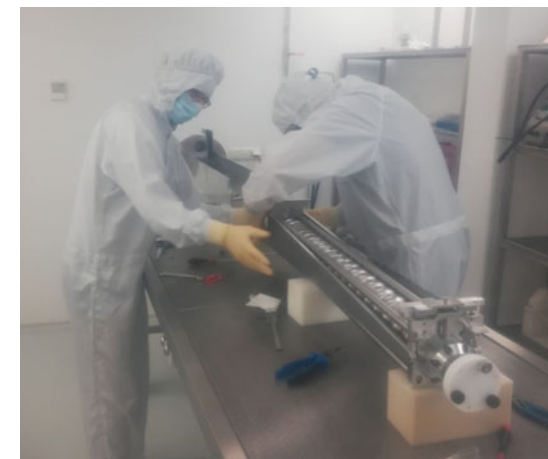
Energy gain LINAC: 30.4 MeV

Beam current: 20 μ A

ERL mode possible since
upgrade in 2015/2016

2020: Operation under pandemic conditions

- Decision March 2020:
“Run as long as possible!”
- Split of operational team in 2 sub-groups
- Oil-problem lingering in 2020
- Reduced cooling power (HX)
 - Initial NRF campaign
 - NEPTUN campaign (CoViD)
 - 2 QCLAM campaigns
 - 180-degree / $(e, e'\gamma)$

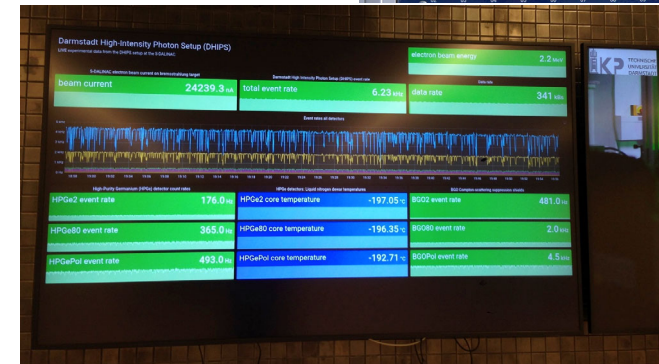
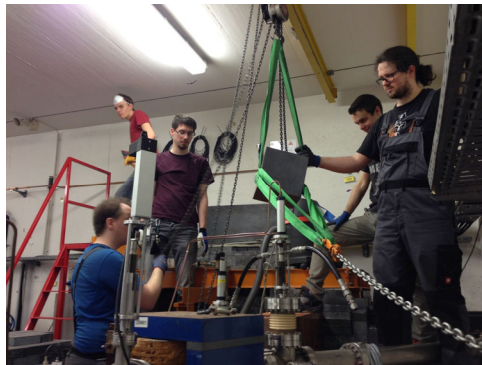
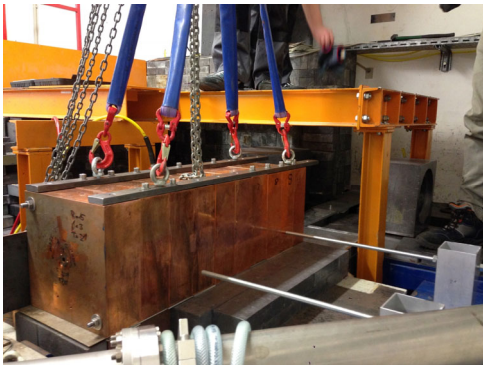


March to May 2020: NRF Beamtime

Commissioning of improved DHIPS:

Realigned collimator based on geodesic measurements (2019/ Jan'20)

New digital drasi-based
DAQ
(replacing outdated
analog DAQ)



March to May 2020: NRF Beamtime

About eight weeks of NRF experiments in March – May 2020:

- ^{116}Sn vs. ^{112}Sn @ 2.1 MeV

continuation ^{112}Sn experiment
(M.Beuschlein)

- ^{82}Kr @ 5.2 and 9.2 MeV

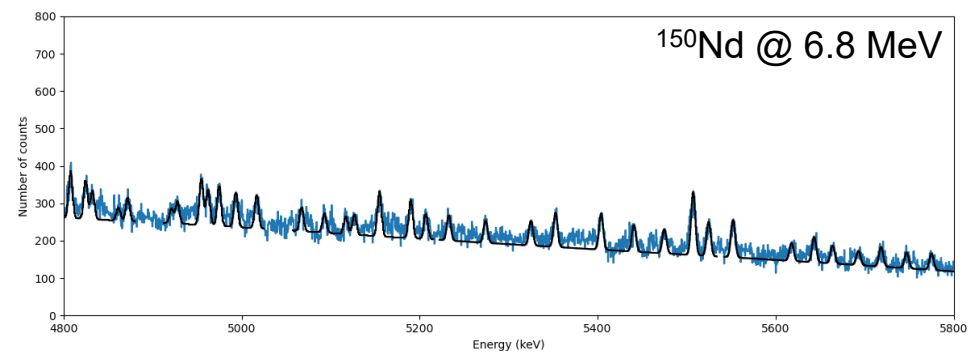
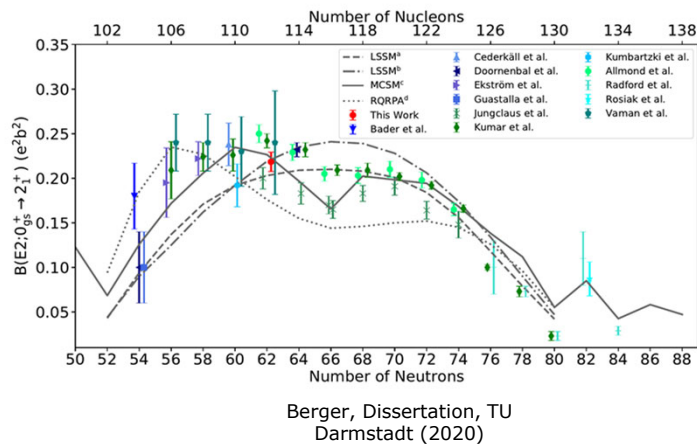
complementary to $\text{HI}\gamma\text{S}$
experiment (V.Werner + N.N.)

- ^{150}Nd @ 6.8 MeV

complementary to $\text{HI}\gamma\text{S}$
experiment (O.Papst)

- ^{76}Ge @ 5.5 and 9.2 MeV

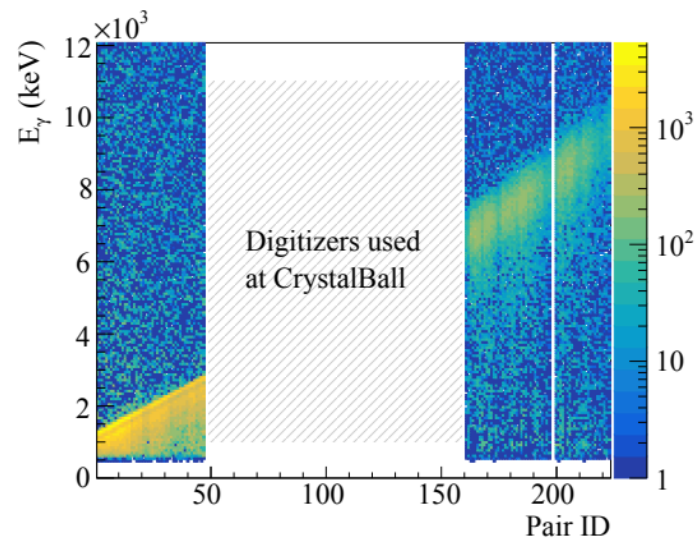
complementary to $\text{HI}\gamma\text{S}$
experiment (J.Kleemann)



NEPTUN: Developments in 2020

Experiment 2020:

- low energy beam (20 MeV)
- Commissioning of
 - PROTEUS target changer
 - MiniPIX gamma beam monitor



Production-beamtime in Nov.'20 postponed to '21 due to CoViD case

Preparations for 2021:

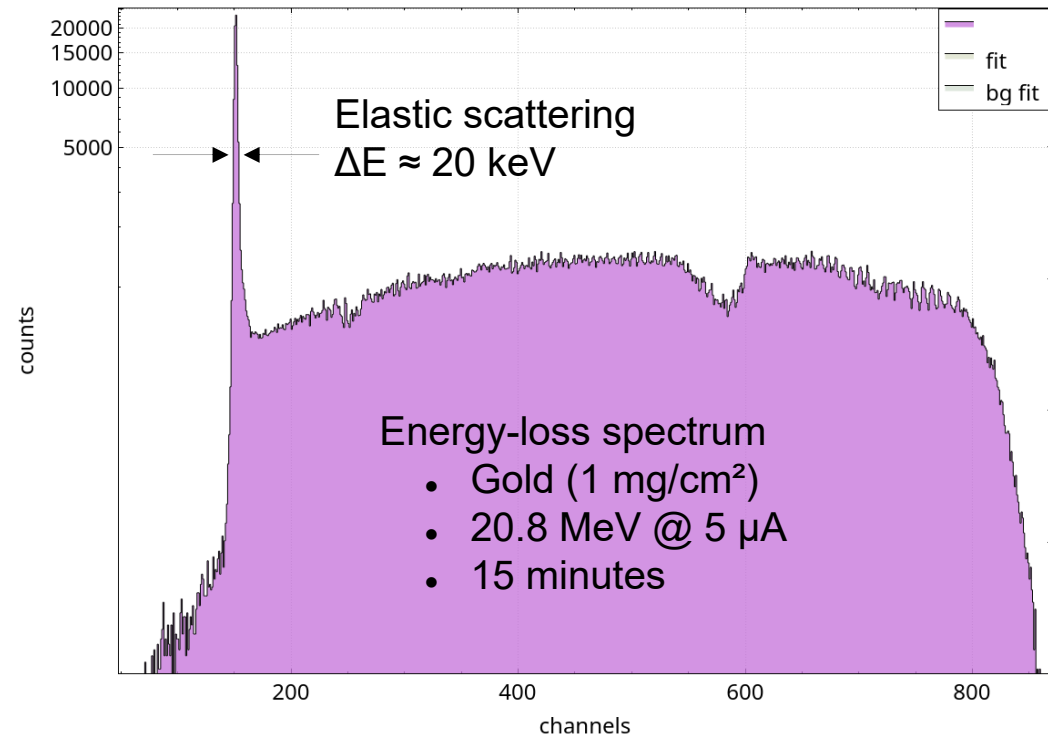
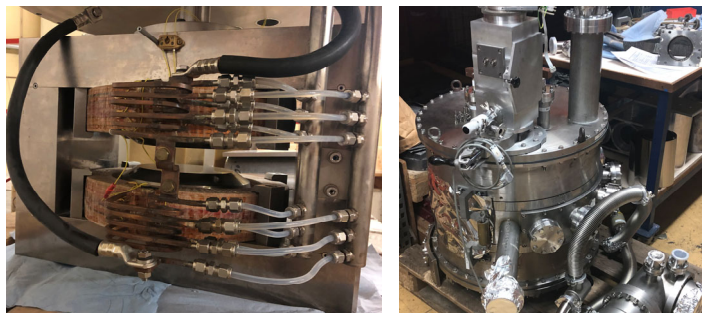
- ^{48}Ca photo-absorption measurements
- 7 targets (total mass: 1.3 g) prepared at GSI
- Design of mounting and transport system



QCLAM 180°: Review and achievements of 2020

Commissioning of the 180°
system:

- ✓ Mechanical setup of the 180°
chicane at the QCLAM
- ✓ New dipole separation magnet
- ✓ Data acquisition

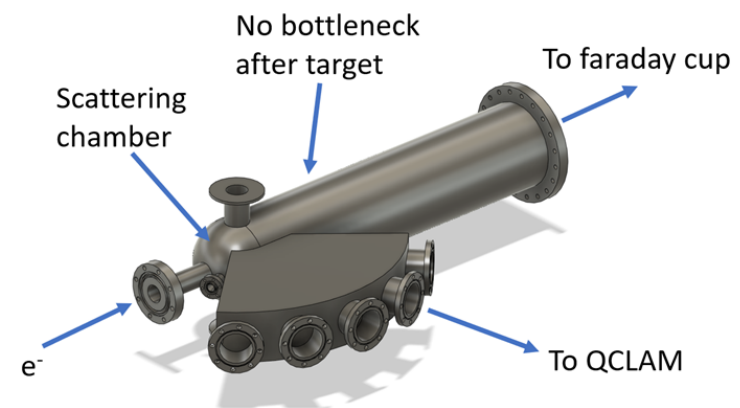
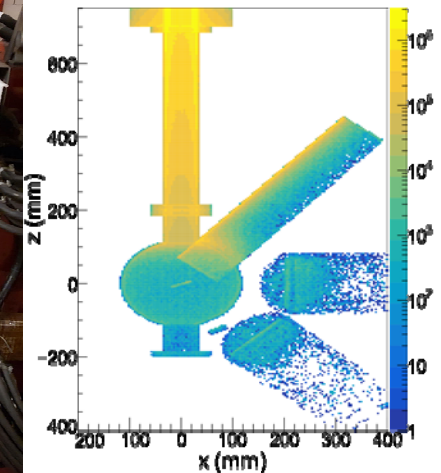
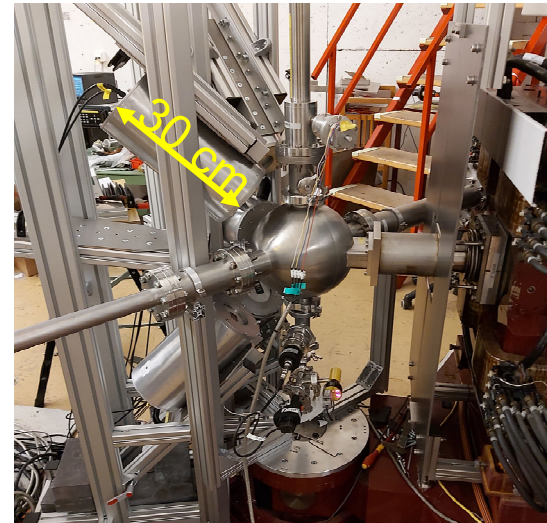


Functionality demonstrated!

Production requires 85 MeV: 2021

$(e, e'\gamma)$: New Setup Implemented

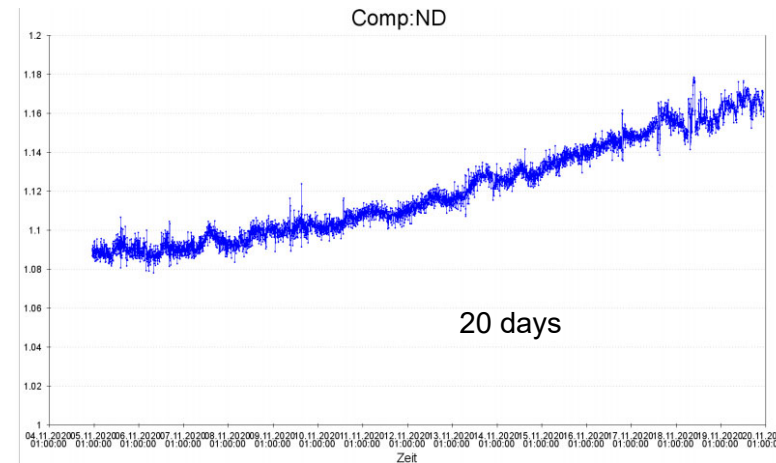
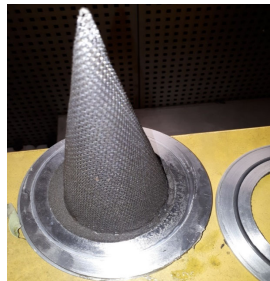
- LaBr:Ce detector array
 - New holding structure
 - Magnetic shielding
- Commissioning beamtime
- Coincidence DAQ @ QCLAM
 - High rates (157 kcps @ 5 nA)
 - Pileup-recovery established
- Identification of background sources by GEANT4 simulation
- Design optimized shielding
- → Redesign scattering chamber



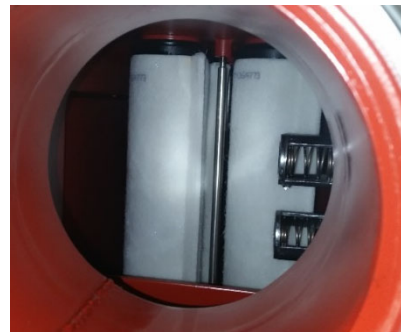
Oil Problem – Brief Summary

Oil is jamming a filter in front of the compressor:

- June: ~ 1120 mbar
- Sept.: ~ 1150 mbar
- Nov.: ~ 1165 mbar
- Hard limit at ~ 1160 mbar



- Leybold knows about the problem since fall 2018
- Multiple replacements of filter elements of pumping stages



Statement of “experts”
from Leybold:
*“We do not know how this
could have ever worked!”*

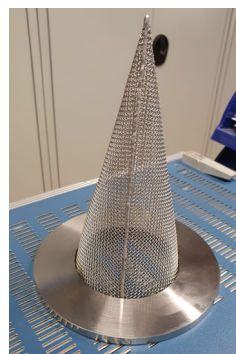
Oil Problem – 3 Measures

Coarse oil removal system

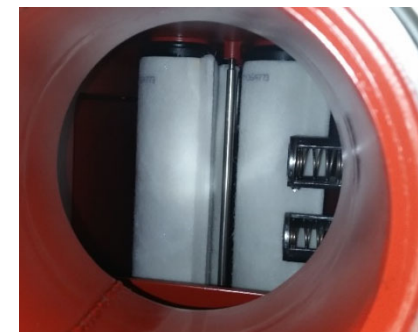
- ~ 57 k€, thereof 30 k€ by Leybold
- > 0.5 t, limited space
- Installation time in total: 2.5 weeks
- Commissioning started yesterday



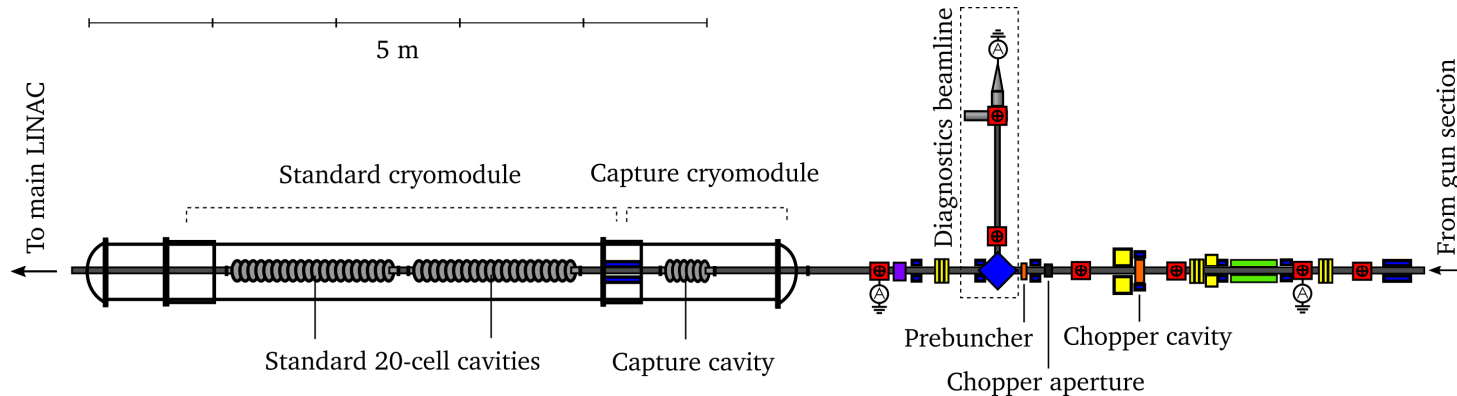
Filter (in front of compressor) with larger mesh size (63 μm \rightarrow 1.5 mm)



Filter elements with 25% improved performance (Leybold)



Injector Upgrade: 6-Cell Capture Cavity



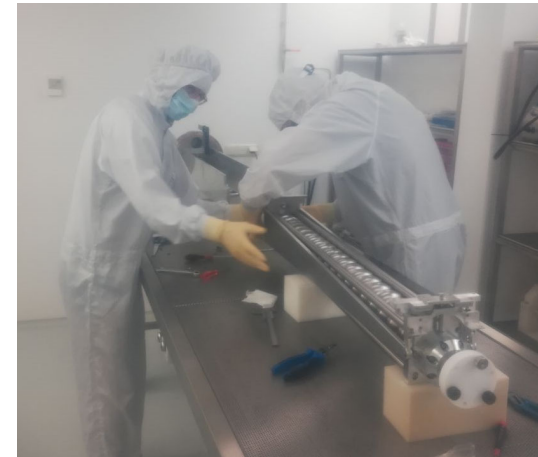
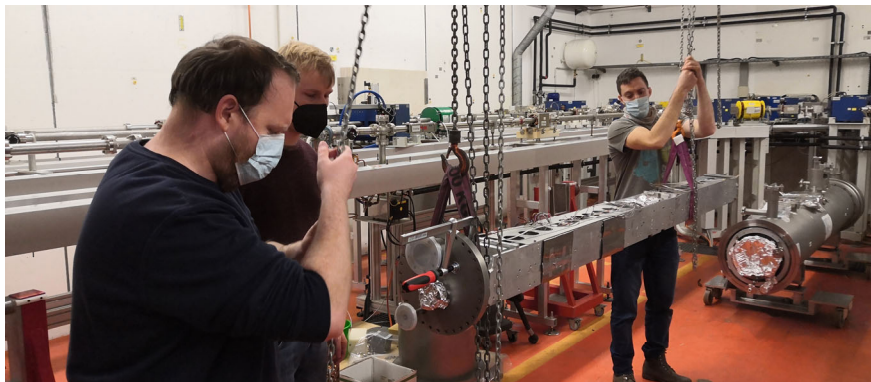
- Field flatness tuning
- Cold test
- Hydrogen bake-out, surface preparation
- Optimization of tuner frame
- Installed in S-DALINAC
- Cool-down next week

New capture cavity:
6-cell, $\beta=0.86$
(~120 k€ GRK overhead)



Maintenance – Major Projects

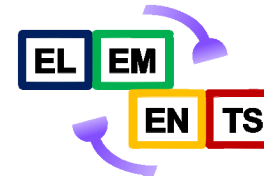
- Refurbishment A1SC03 → operable again



- Installation 6 cell (see next slides)
- Optimization I0 section
- Alignment work on cryomoduls, vacuum chambers, newly assembled I0, QCLAM
- A long list of “minor things” to improve S-DALINAC and its operation



S-DALINAC Upgrades within



Beam spot of about $100 \mu\text{m}$ (3σ), stabilized: **350 k€**

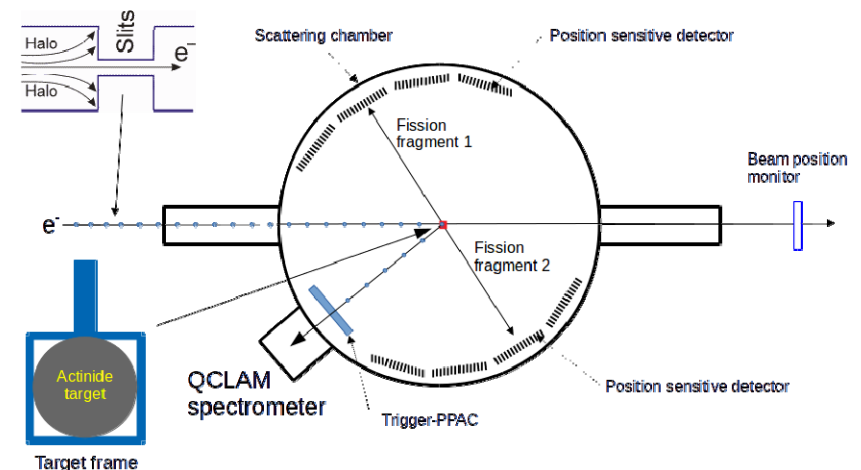
- Stabilization of RF-system (e.g. temperature), 3 GHz master oscillator (60 k€)
- Optimization of 6D emittance, streak camera station (290 k€)



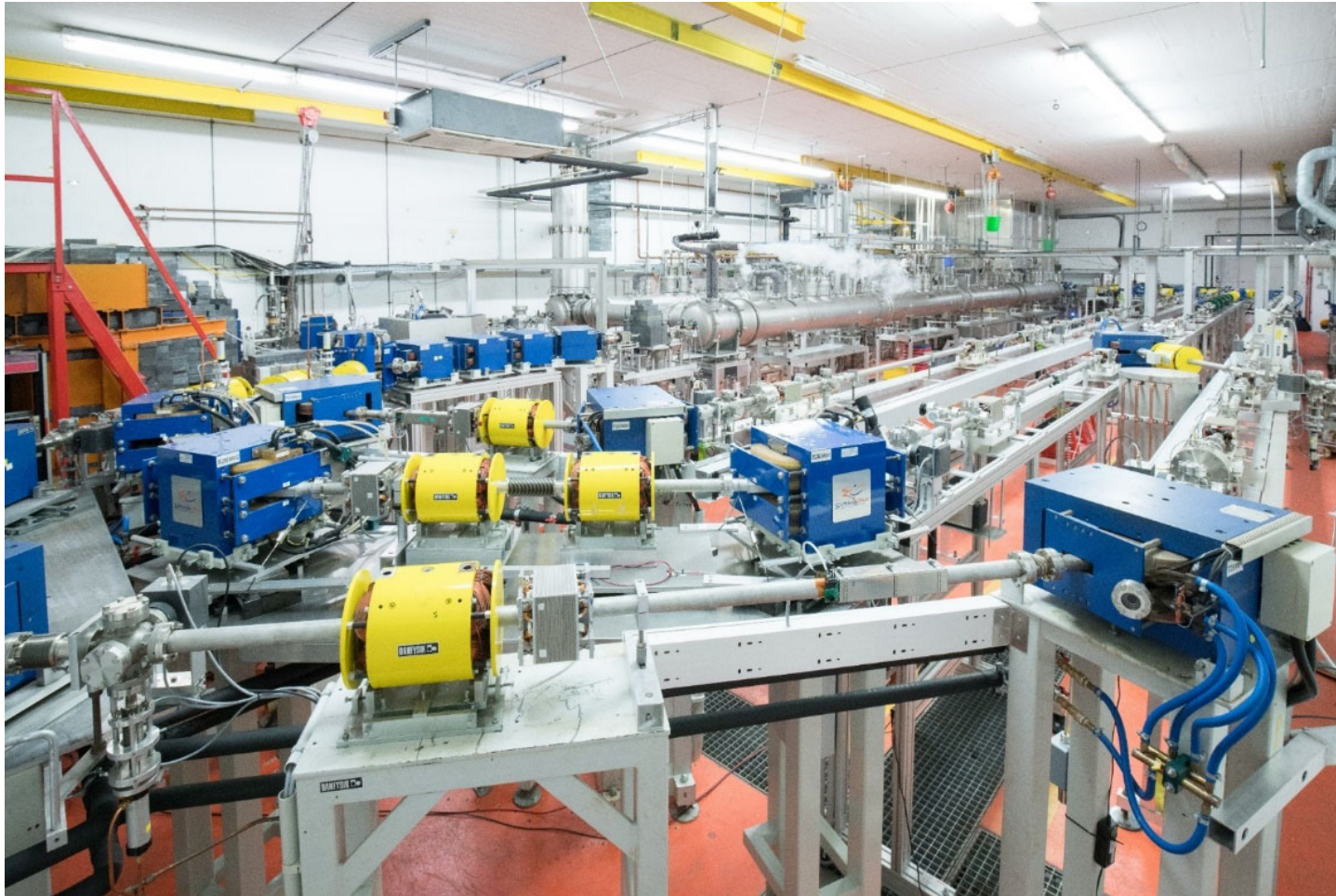
E.g.: Universal streak camera, Hamamatsu, 1 ps resolution

(e,e'f) setup @ QCLAM: **650 k€**

- Complemented by 650 k€ FUGG, DFG → 1,300 k€ in total
- Fission chamber incl. goniometer (80 k€)
- Detectors (bunch and fragment identification) (1,220 k€)



Thank you for your attention!



Picture: Jan-Christoph Hartung