Albert Einstein Center for Fundamental Physics

UNIVERSITÄT BERN

Gilberto Colangelo

CHIPP Plenary Meeting 2021

Spiez, 10-11.06.2021

What is a “Center” at Unibe?

- Centers of competence are horizontal and temporary (4yrs, renewable) structures
- Focused on “problems” rather than on discipline
- *Interdisciplinary* by design
- Unibe currently has 9

Albert Einstein Center

Created in 2011 – building on LHEP(exp) and ITP(theory) - with the following mission

- *Strengthen particle and fundamental physics*
- *Create and promote medical applications as well as other interdisciplinary activities*
- *Promote and exploit synergies between theory and experiment*

Albert Einstein Center

AEC Plenary Meeting 03.09.2019

Scientific Board

Saverio Braccini
Igor Kreslo
Mikko Laine
Florian Piegsa (P)
Susanne Reffert
Uwe-Jens Wiese (VP)

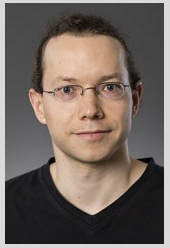
International Advisory Committee

Poul Damgaard (Niels Bohr Inst.)
Takaaki Kajita (Tokyo, Nobel Prize)
Peter Jenni (CERN)
Aneesh Manohar (UCSD)
Richard Wigmans (Texas Tech)
Giulia Zanderighi (MPI Physik)

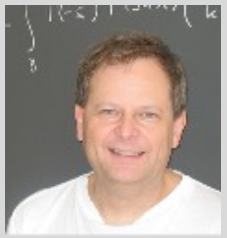
Director: *yours truly*
Vice-Director: Michele Weber

Theoretical activities (ITP)

G. Colangelo

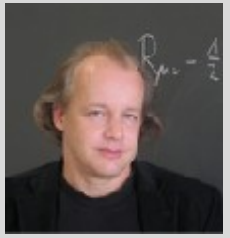


M. Hoferichter



C. Greub

T. Becher



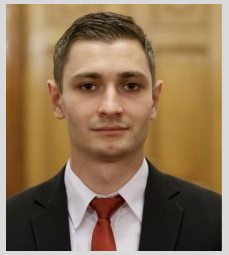
M. Blau

U.-J. Wiese

U. Wenger

M. Laine

A. Greljo



S. Reffert

Experimental Activities (LHEP)

H.P. Beck

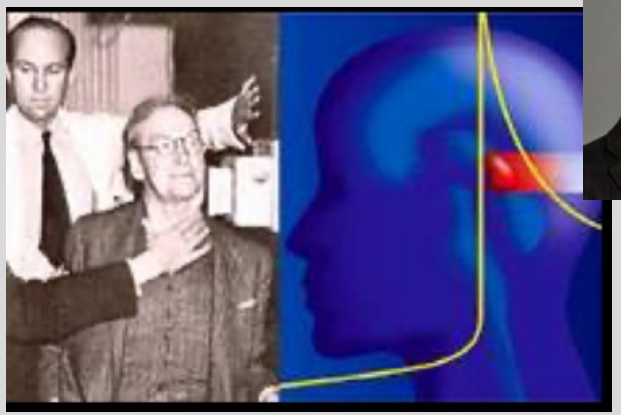
M. Weber

Collider physics; ATLAS (CERN)

Neutrino physics (SBN, DUNE)

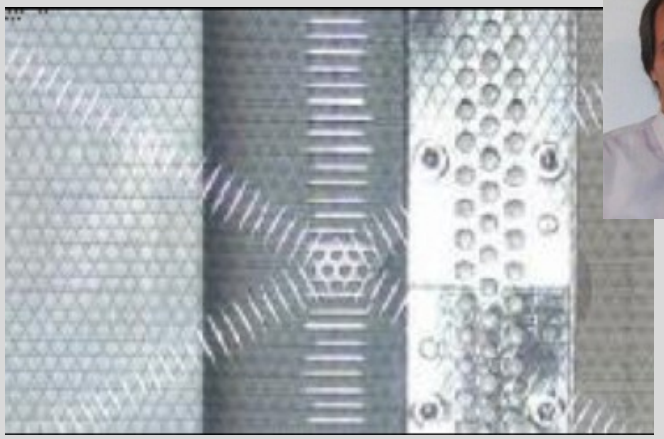
F. Piegsa

Neutron physics (n(2)EDM, BeamEDM)



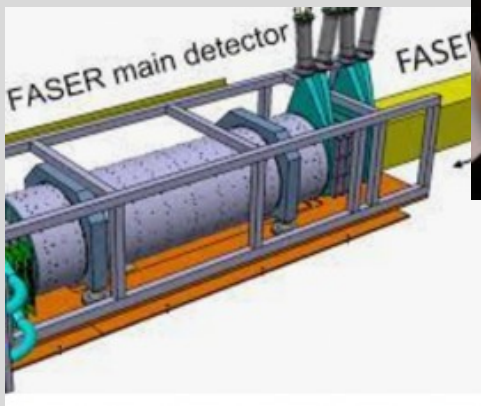
S. Braccini

Application in medicine



I. Kreslo

Detector R&D (Pixel, LArTPC, novel light readout)



A. Ariga

FASERnu

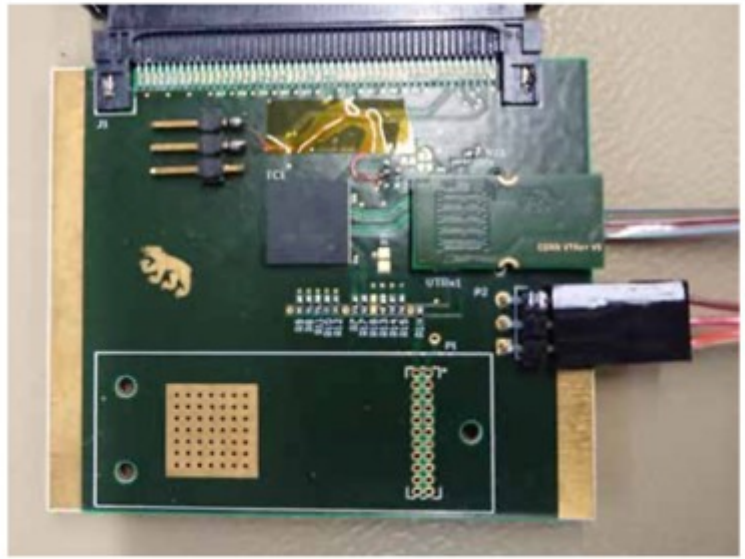
Backup Slides

The AEC Computing Center

Gianfranco Sciacca

- Very large computing center at UNIBE: 5000 CPU cores, 1 petabyte storage
- ATLAS TIER2: in the first half of 2019, 1.5 million jobs with 8 million of CPUs used
- Serving neutrino experiments, as well

Current Bern group hardware developments



Optoboard V0 prototype

03.05.2019 | News | Press release | CHIPP

Every second fifty terabits of data

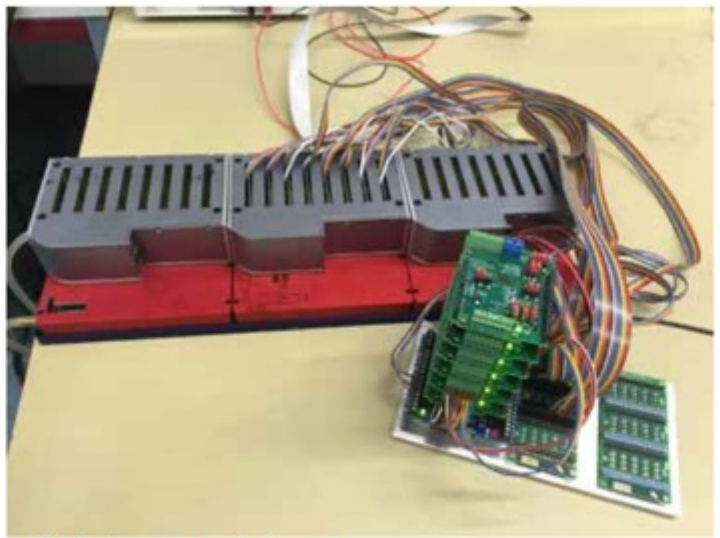
Junior Researcher Armin Fehr is working at the University of Bern on the upgrade of a large CERN experiment

Image: B. Vogel, CHIPP, Switzerland

From 2026, the performance of the large-scale experiments at the European particle physics laboratory, CERN, in Geneva will be significantly increased. The preliminary work for the upgrade of the large particle accelerator LHC and the associated detectors is currently in full swing. An important contribution is made by the University of Bern, where doctoral student Armin Fehr (26) and his colleagues are working on a component for the ATLAS detector. This component will enable the read-out of the greatly increased data rates from 2026 onwards.

In the media: Articles on naturalsciences.ch and in Uniaktuell

Working on testing the complete readout chain in-house



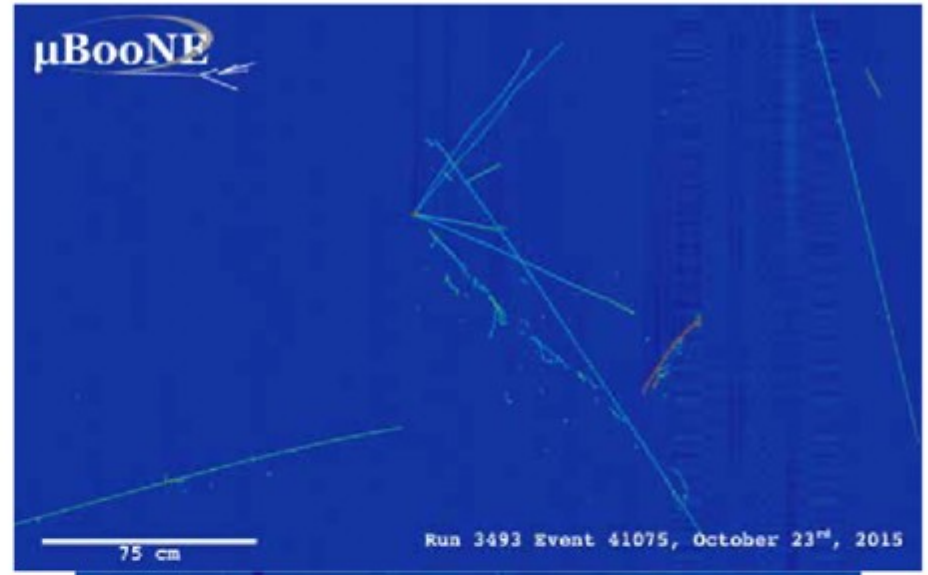
Optobox prototype

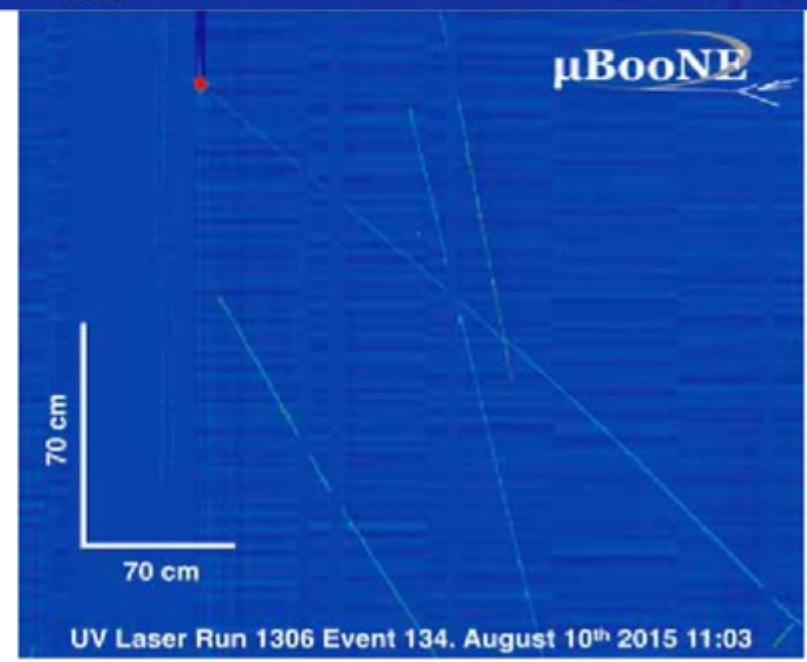
MicroBooNE: Bern hardware highlights

Cosmic-ray tagger (CRT) system ~200 m²

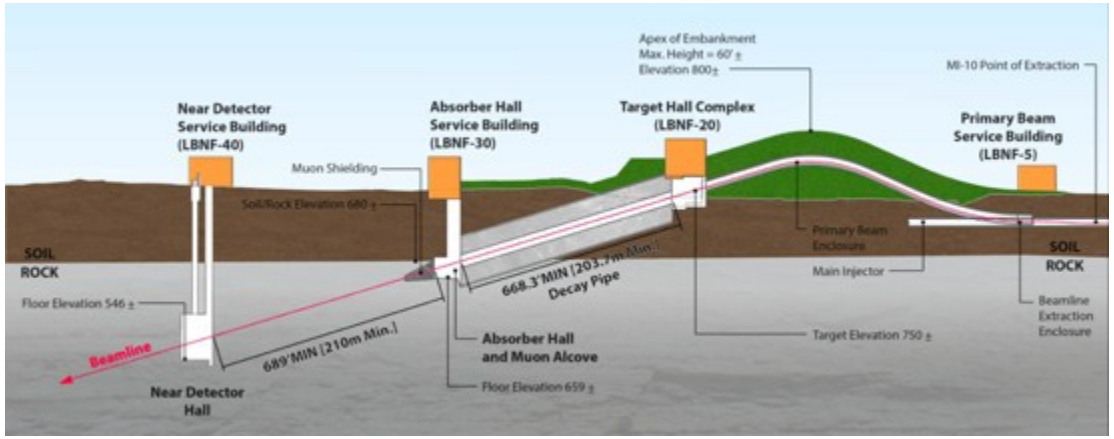
Both systems, designed, funded and built (in house) by the Bern group

UV-laser system

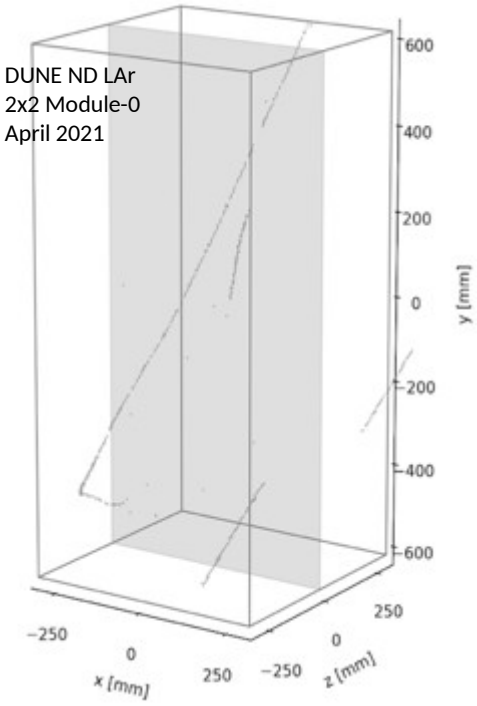




Bern developed the technology for the DUNE Near Detector



Successful prototype run in April 2021

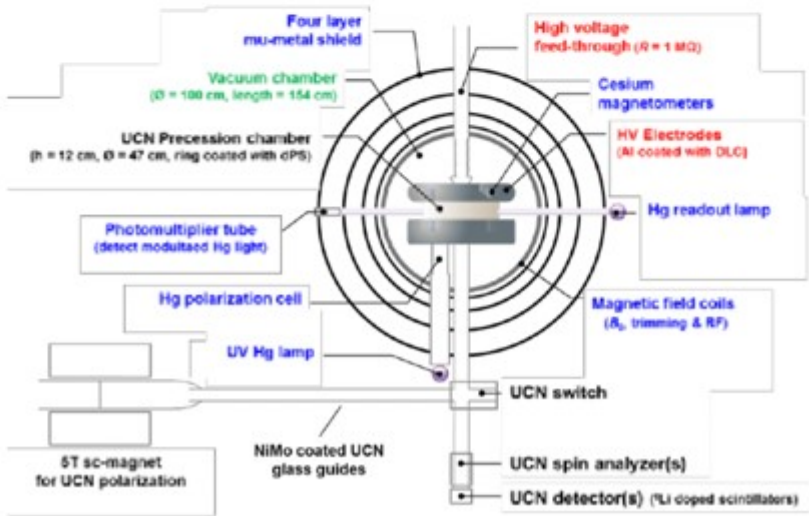


nEDM

Final results end 2019
(sensitivity at the 10^{-26} level)

n2EDM

Commissioning 2020
(x10 sensitivity increase)

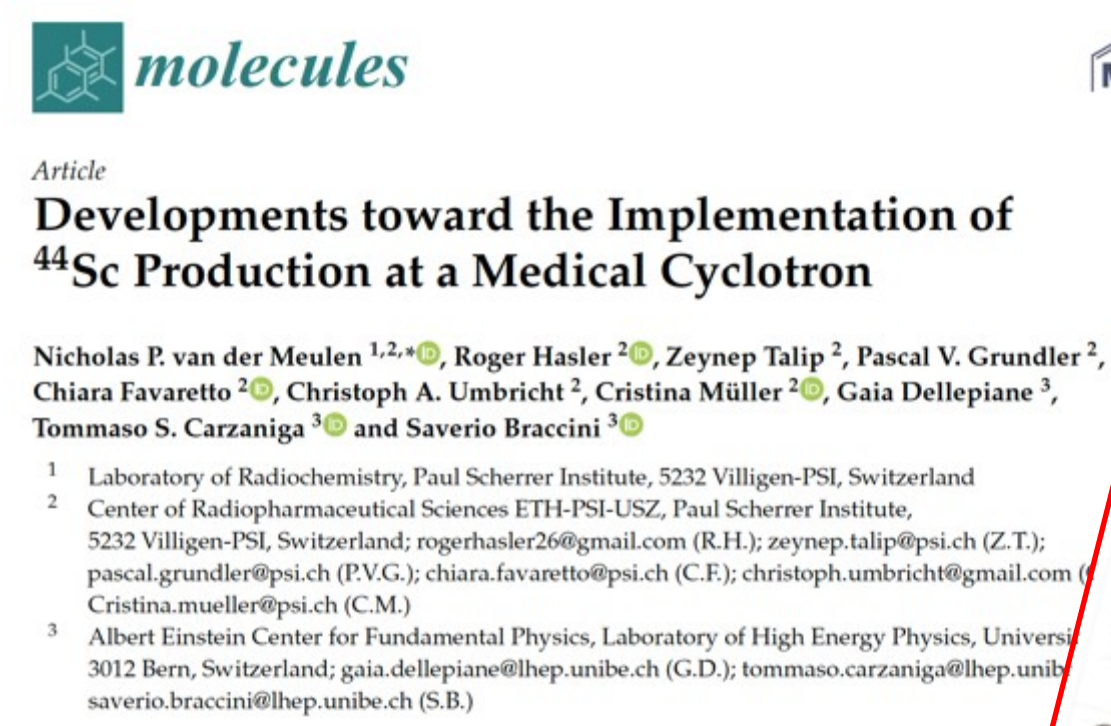


Bern medical cyclotron

Automatic Focusing System (AFS)
for enhanced medical radioisotope production

^{44}Sc is ready for clinical applications

Collaboration with PSI



molecules

Article

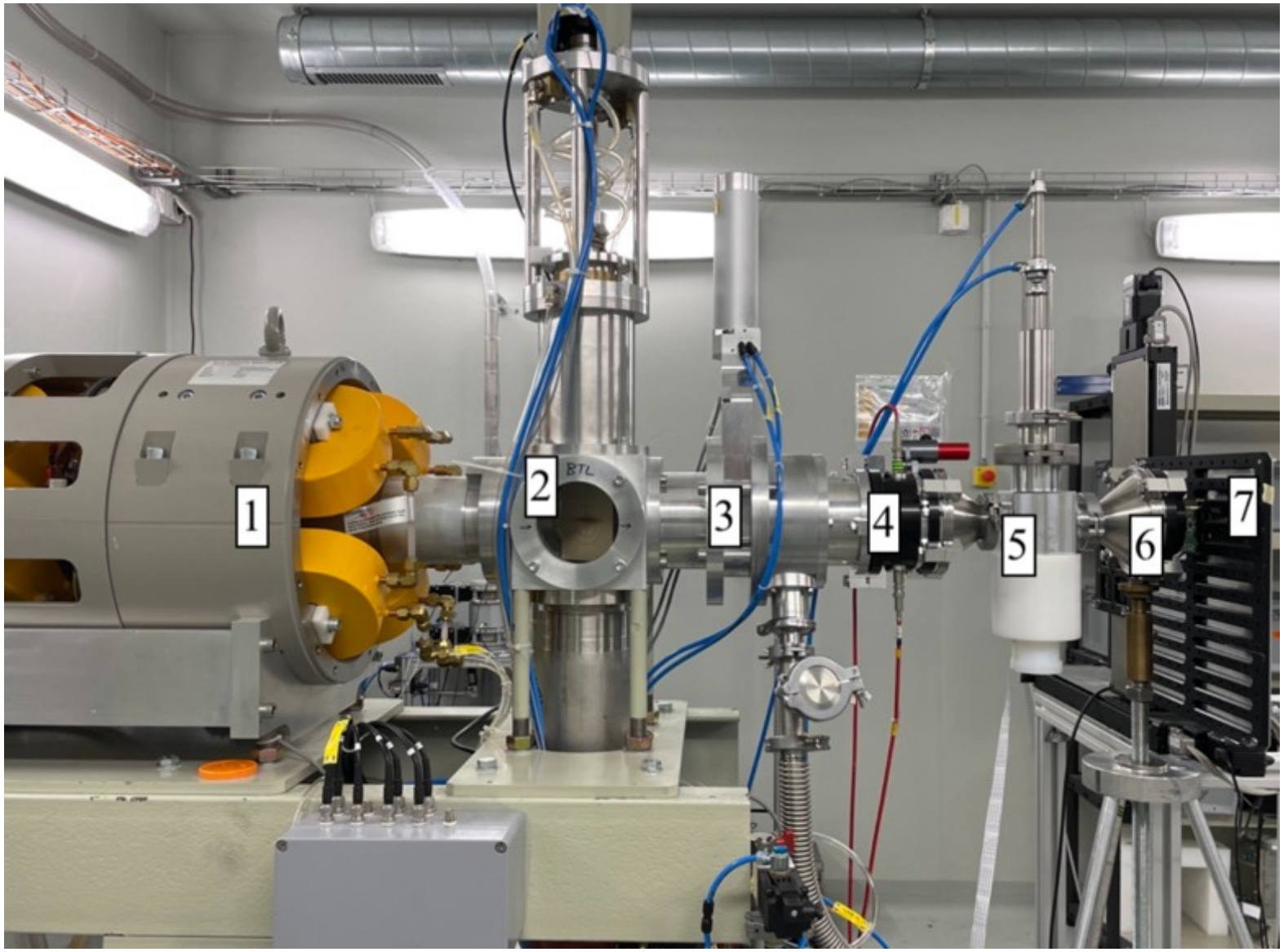
Developments toward the Implementation of ^{44}Sc Production at a Medical Cyclotron

Nicholas P. van der Meulen [1,2,*], Roger Hasler [2], Zeynep Talip [2], Pascal V. Grundler [2], Chiara Favaretto [2], Christoph A. Umbricht [2], Cristina Müller [2], Gaia Dellepiane [3], Tommaso S. Carzaniga [3] and Saverio Braccini [3]

1 Laboratory of Radiochemistry, Paul Scherrer Institute, 5232 Villigen-PSI, Switzerland
2 Center of Radiopharmaceutical Sciences ETH-PSI-USZ, Paul Scherrer Institute, 5232 Villigen-PSI, Switzerland; rogerhasler26@gmail.com (R.H.); zeynep.talip@psi.ch (Z.T.); pascal.grundler@psi.ch (P.V.G.); chiara.favaretto@psi.ch (C.F.); christoph.umbricht@gmail.com (
Cristina.mueller@psi.ch (C.M.)
3 Albert Einstein Center for Fundamental Physics, Laboratory of High Energy Physics, Universi
3012 Bern, Switzerland; gaia.dellepiane@lhep.unibe.ch (G.D.); tommaso.carzaniga@lhep.unib
saverio.braccini@lhep.unibe.ch (S.B.)

MDPI

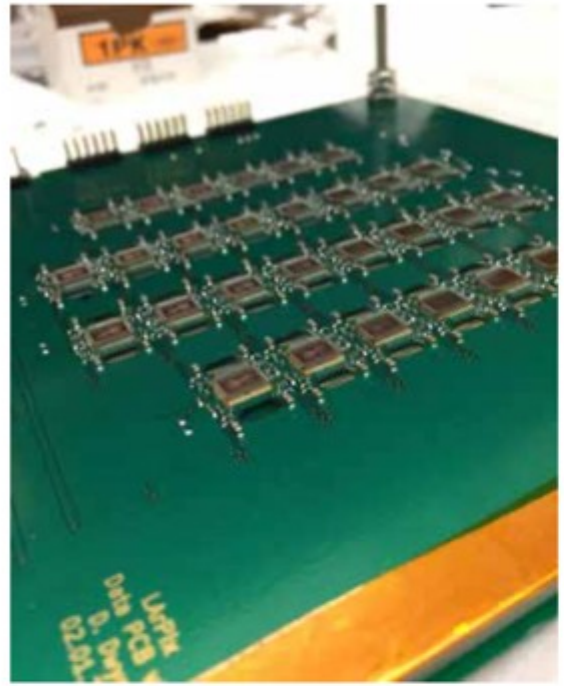
IBA Award 2020

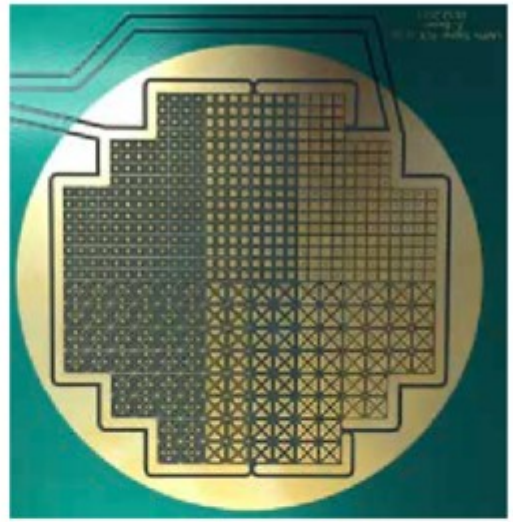


Radiation hardness set-up at the Bern medical cyclotron, used e.g. for ATLAS but also space experiments.

Related R&D

Pixel readout electronics





Novel LAr scintillation light readout schemes