ADAMAS17

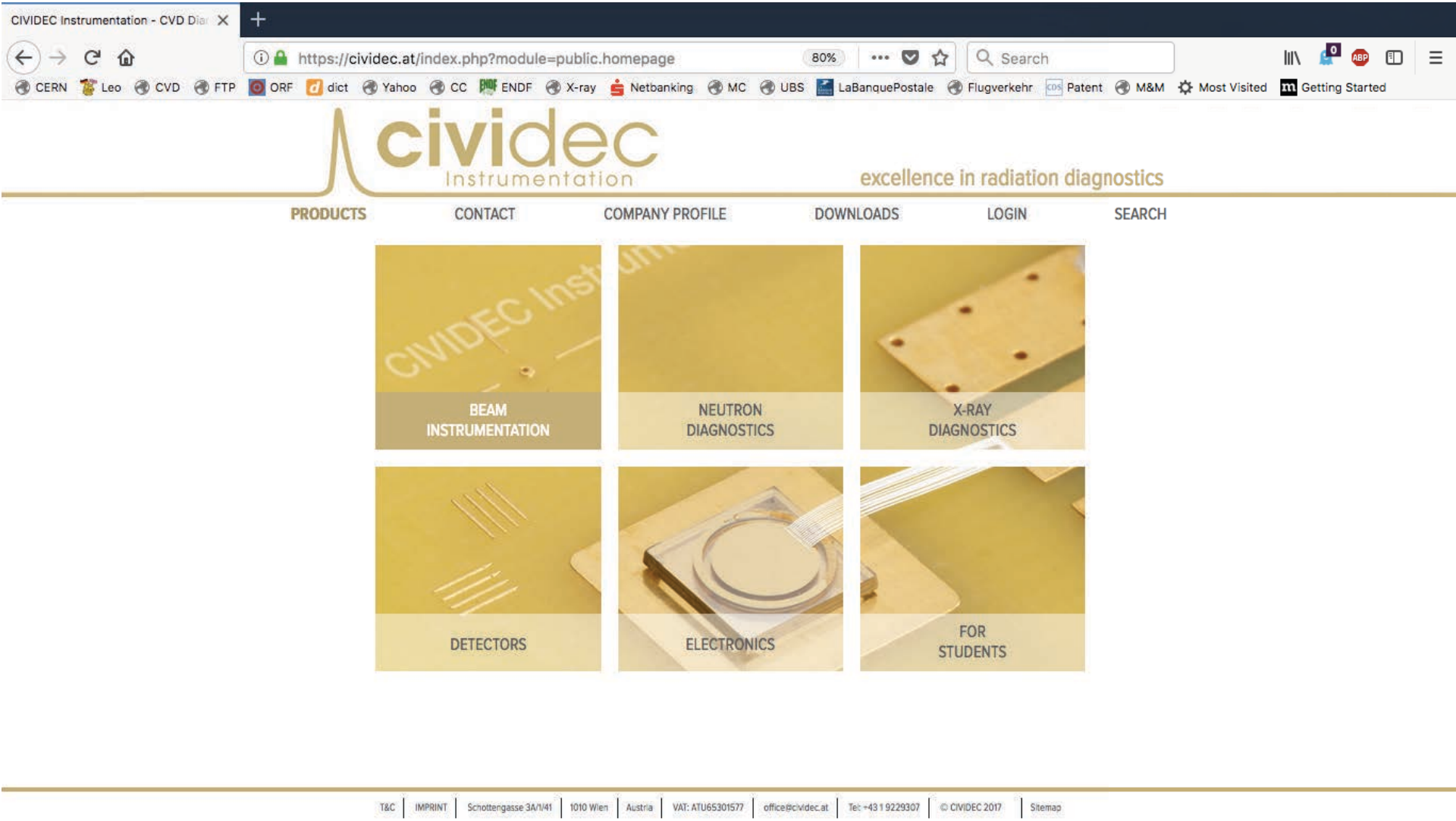
Zagreb, 28.11.2017

Erich Griesmayer, CIVIDEC Instrumentation

Overview

- New developments
- R&D in 2017
  - Neutrons
  - X-rays
  - Anti-matter

New Products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turn-key solutions for beam diagnostics

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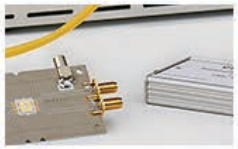
Products / Beam Instrumentation

A1

Diamond Beam Loss Monitor

Machine Protection – Bunch-by-Bunch

1e5 Standard
1e9 Hi-Rad
1 ns, 5 ns
AC / DC



A2

Diamond Beam Position Monitor

Locating Charged Particle Beams

Hi-Rad
1 um
AC and DC

A5

Diamond Spectrometer

The Heavy-Ion Spectroscope

Heavy Ions
20 keV FWHM
Rate: 1e6

A6

Diamond Phase Monitor

Medical Machine Tuning

±20 ps
1° at 100 MHz

0

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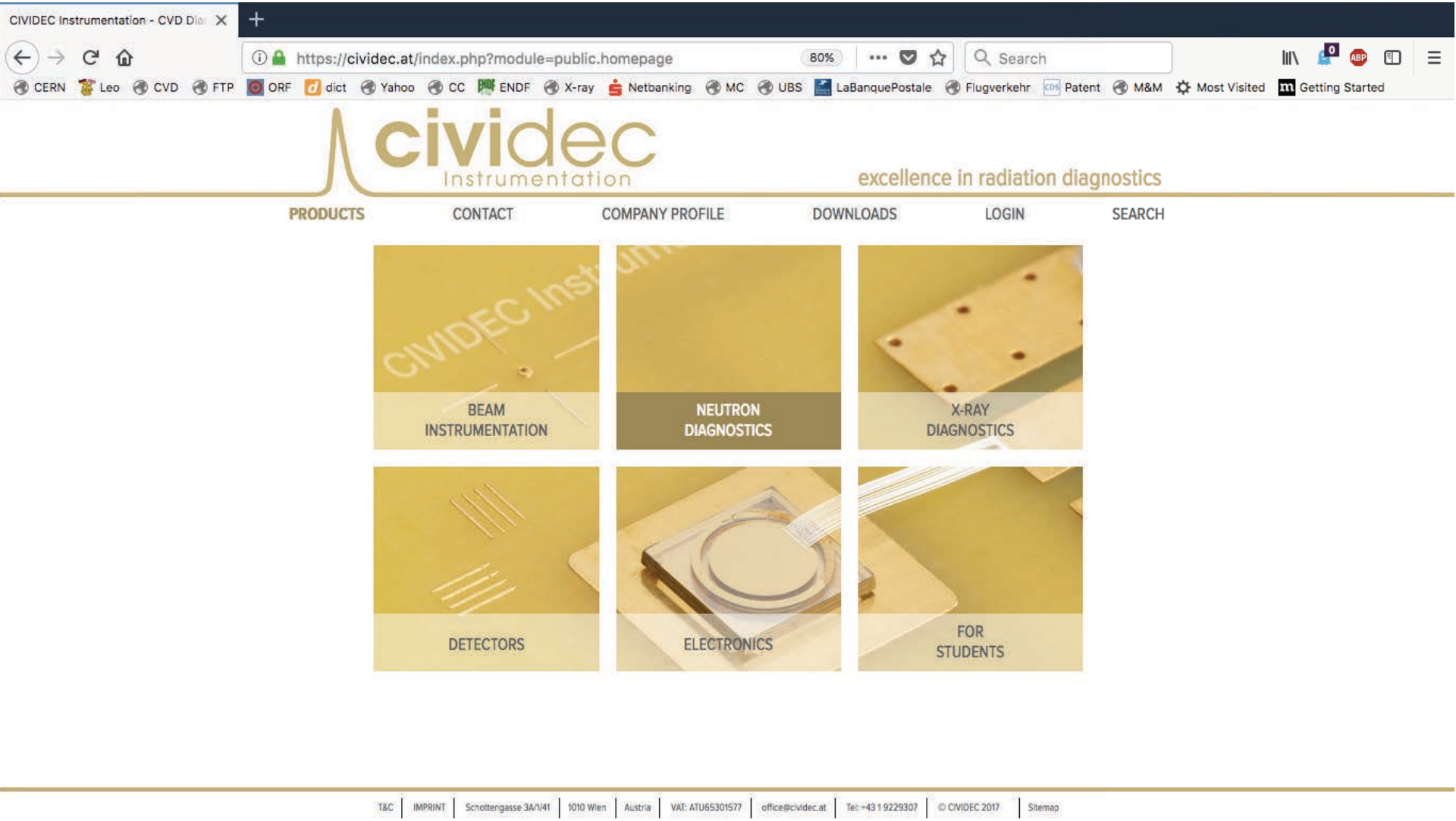
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Products / Neutron Diagnostics

A3

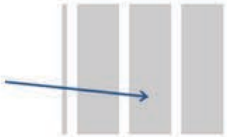
Diamond Fast-Neutron Monitor

The Fast-Neutron Counter

A7

Diamond Thermal-Neutron Monitor

The Thermal-Neutron Counter



A8

Diamond Proton Recoil Telescope

Fast-Neutron Spectroscopy

$n^+ > 6$ MeV
1 MHz
Background rejection

$n^- < 1$ MeV
1 MHz
Gamma rejection

Fast neutrons
3 - 22 MeV
1 MHz

0

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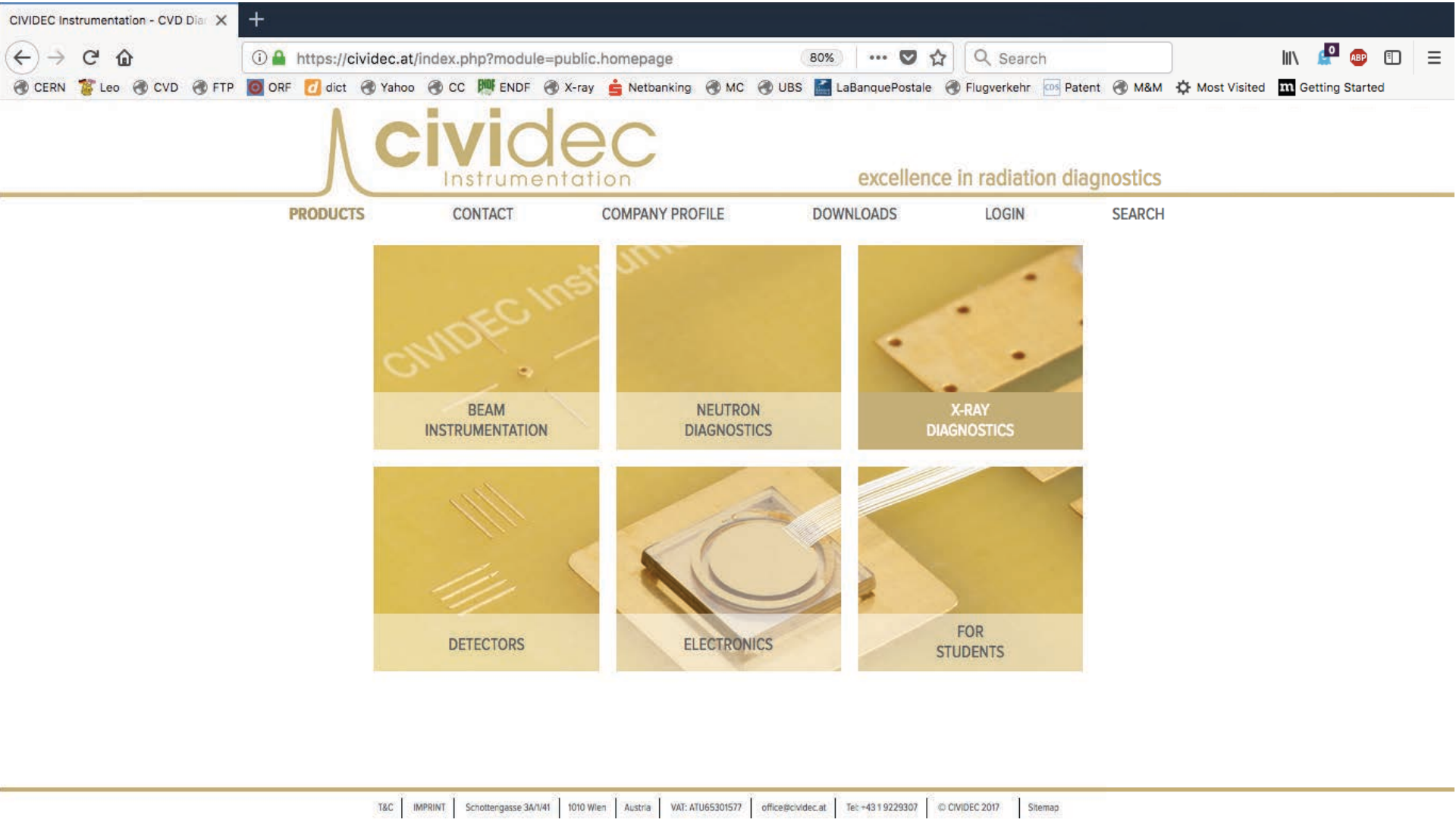
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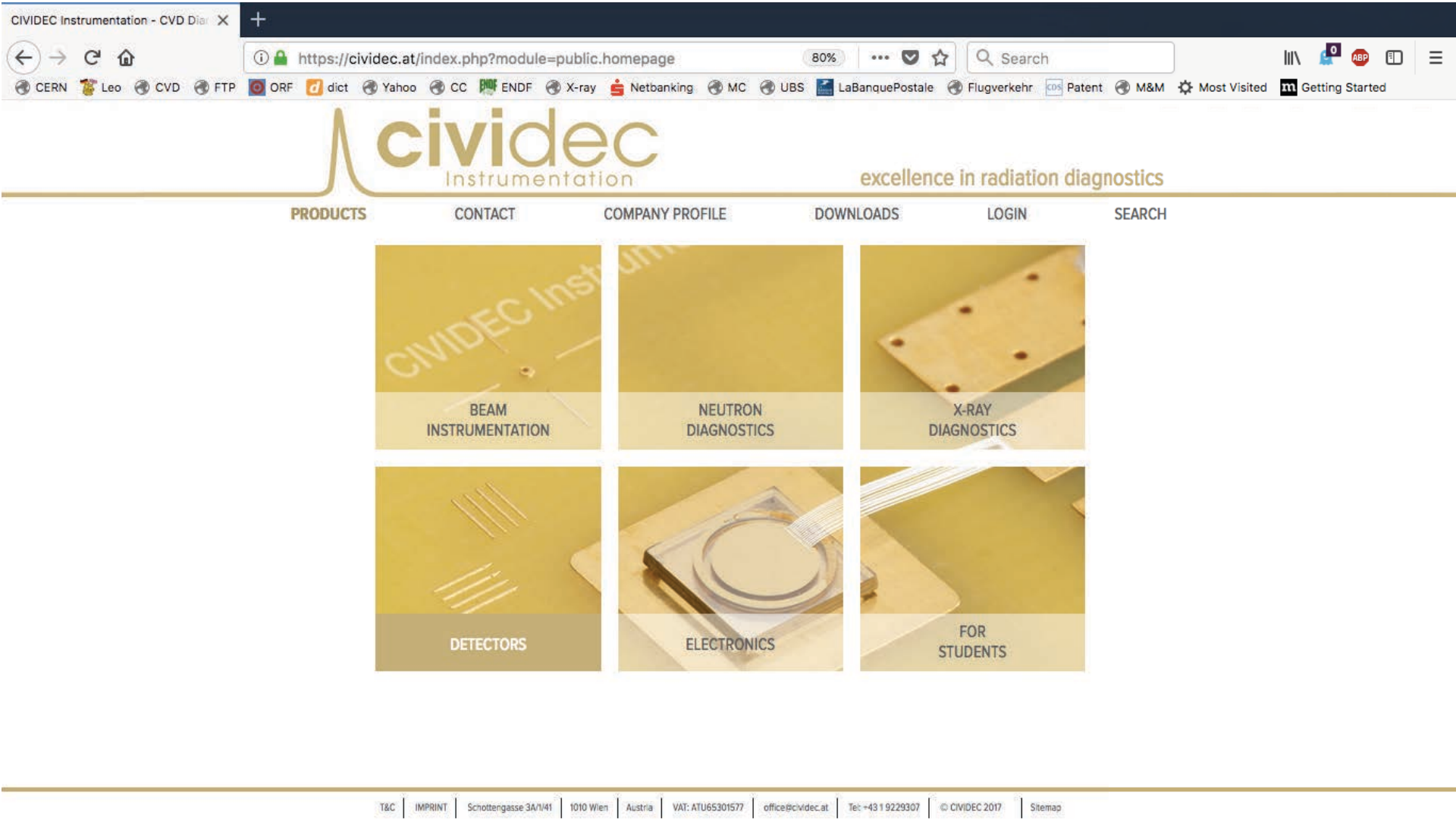
XBPM System

- XBPM 50 um thick
- 4 pads, 2 um separation
- Real-time readout 10 kHz
- Pico-Nano-Micro Amplifiers with low input impedance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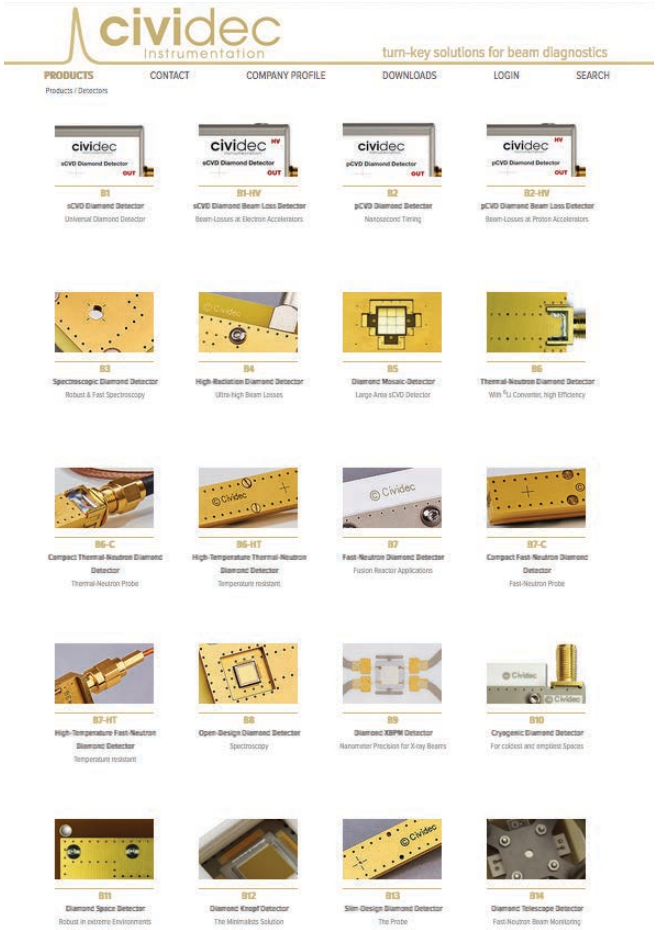
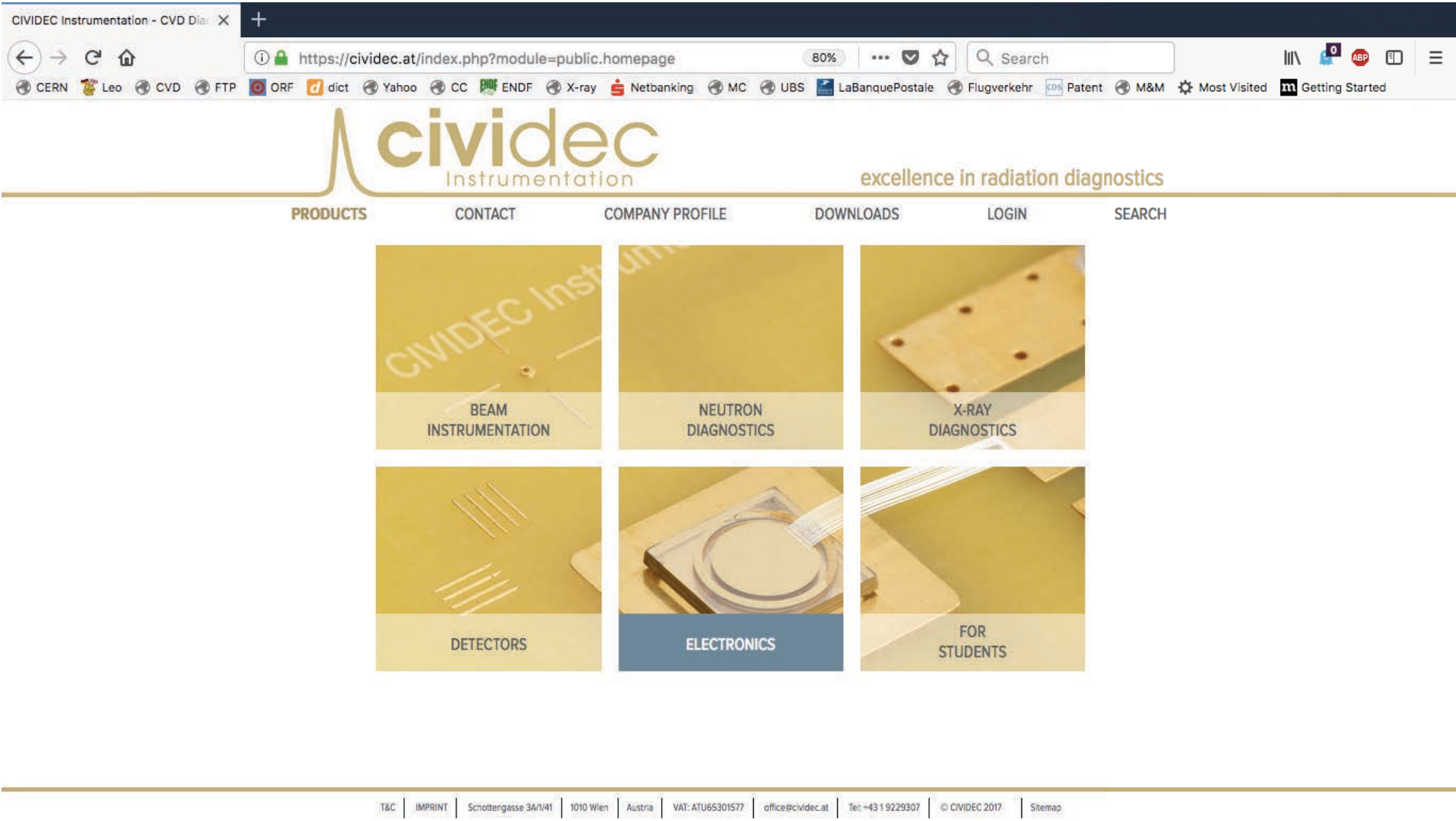
Detectors



- Standard
- High radiation
- Slim-design
- High-temperature
- UHV solutions
- Open design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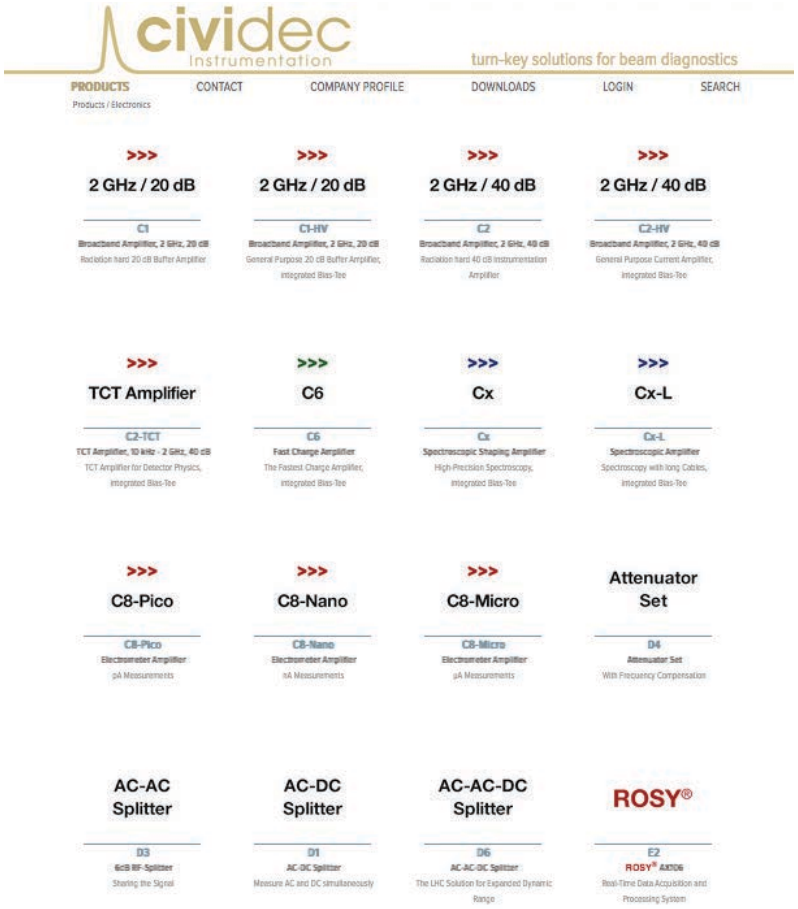
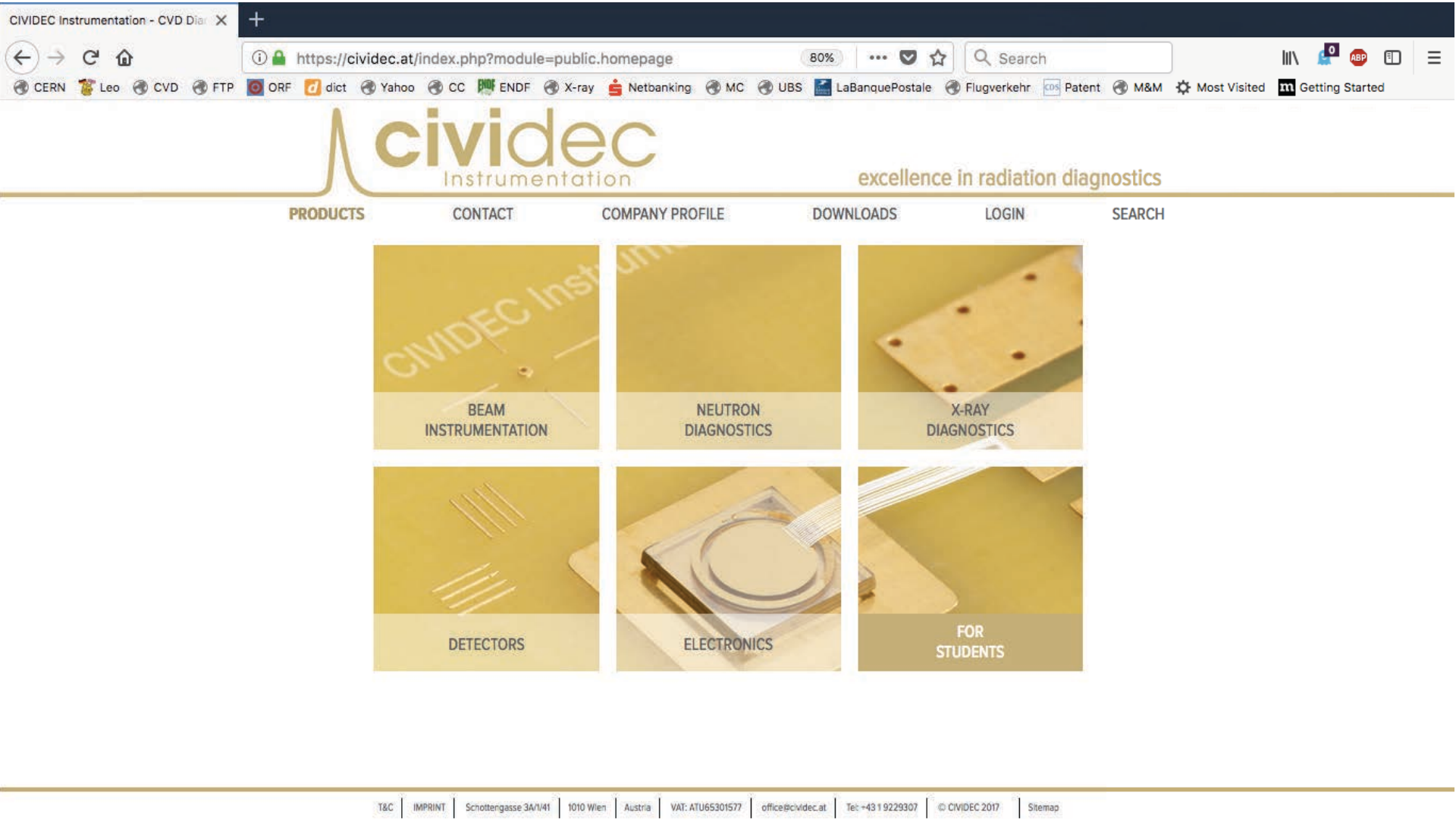
Electronics



- Broadband amplifiers:
  - 20 dB/ 40 dB / 2 GHz
  - Hi radiation
  - TCT
  - Timing
- Spectroscopy amplifiers.
  - Low noise
  - High gain
  - Gaussian shaping
  - 10 ns, 180 ns, 1.2 us
  - High temperature (175°C)
- Electrometer amplifiers:
  - Pico
  - Nano
  - Micro
- Passive components
- **ROSY®** readout system

Amplifiers

- Broadband Amplifier
  - Beam Loss (1 MGy)
  - TCT (3 kHz) **new 2017**
  - Timing (ps time resolution) **new 2017**
- Spectroscopic Amplifier
  - 10 ns / 30 pF
  - 180 ns / 200 pF
  - High-temperature (175°C) **new 2017**
- Electrometer Amplifier
  - Low noise
  - Low impedance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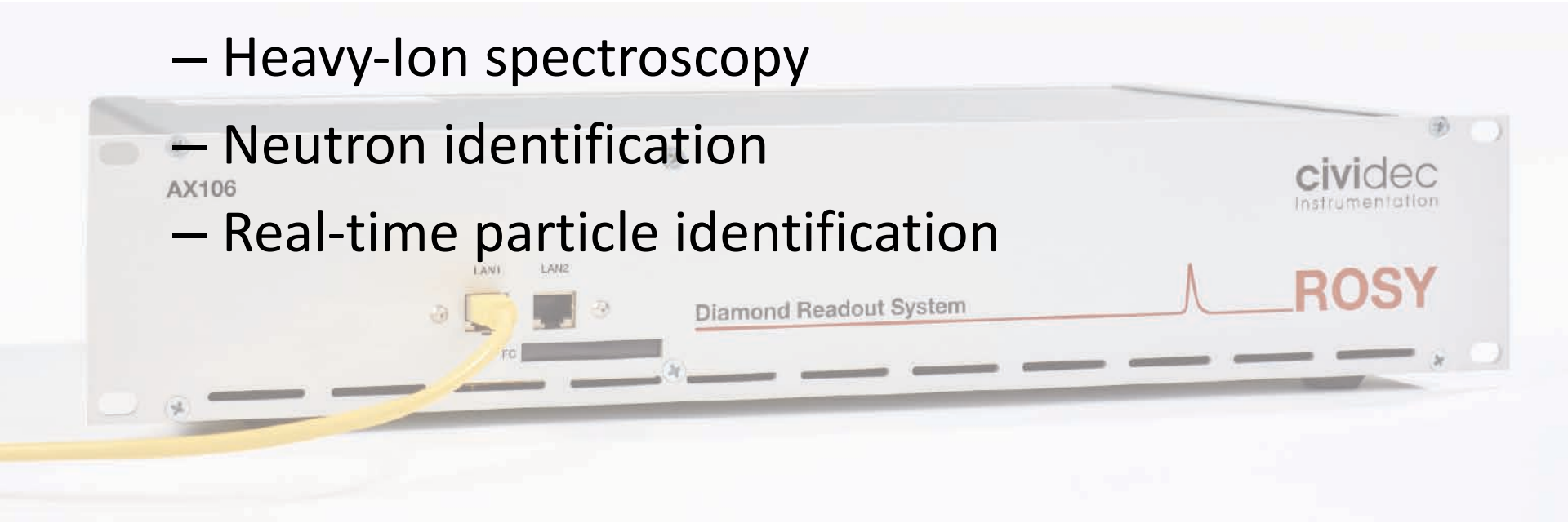
Data Readout

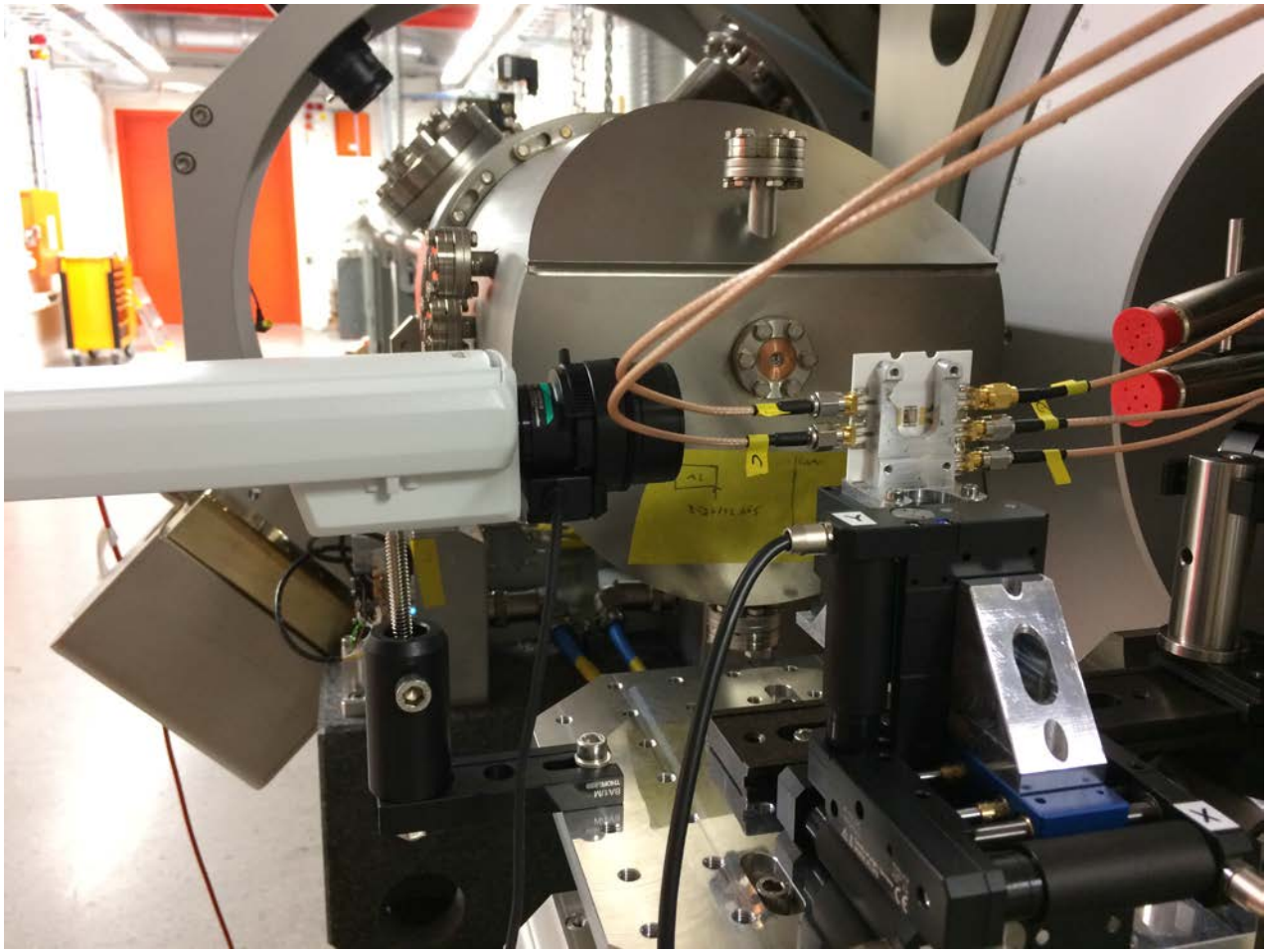
- **ROSY®**:
  - Beam loss measurements
  - Timing measurements
  - Heavy-Ion spectroscopy
  - Neutron identification
  - Real-time particle identification



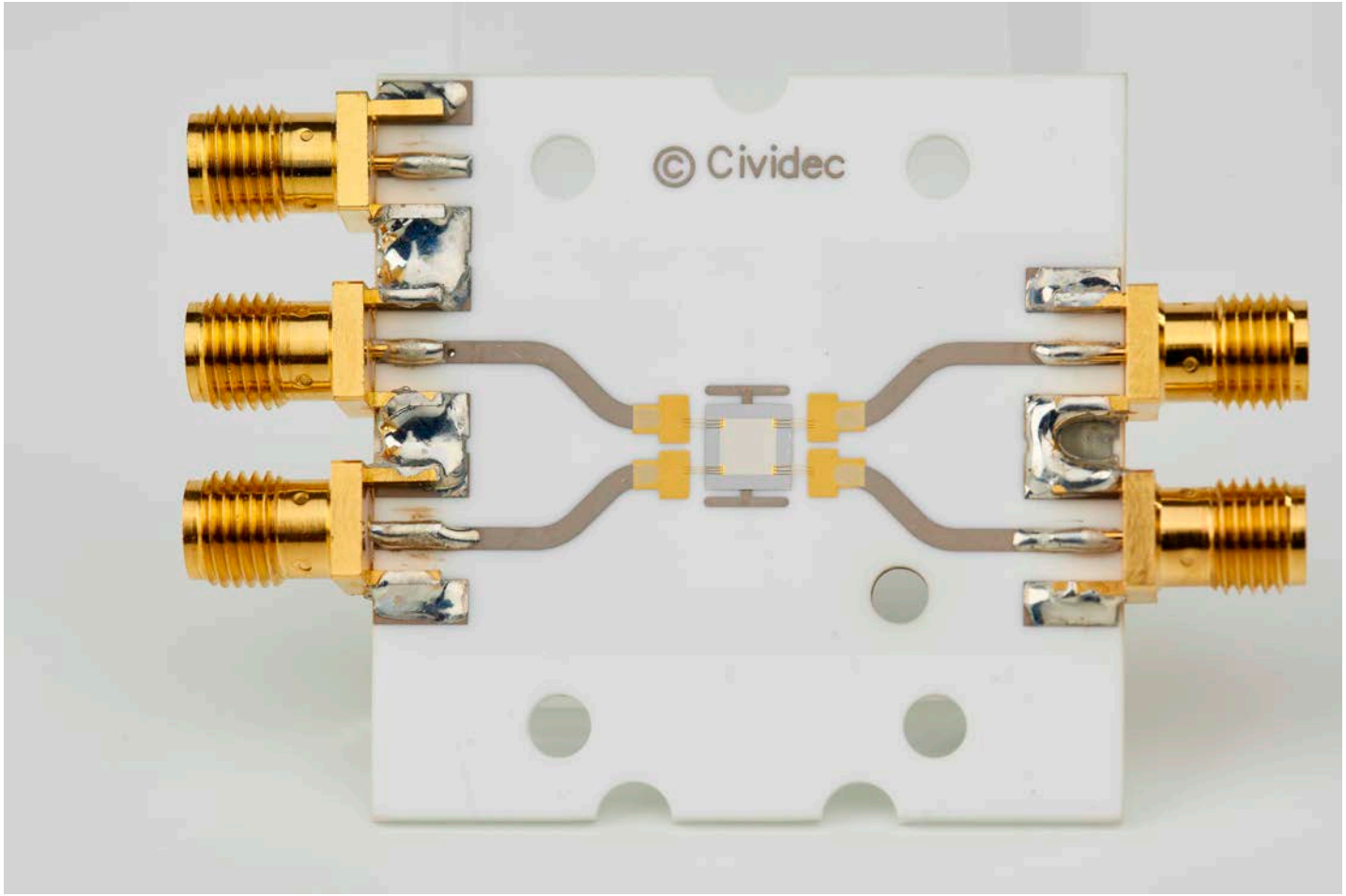
R&D in 2017

X-Rays

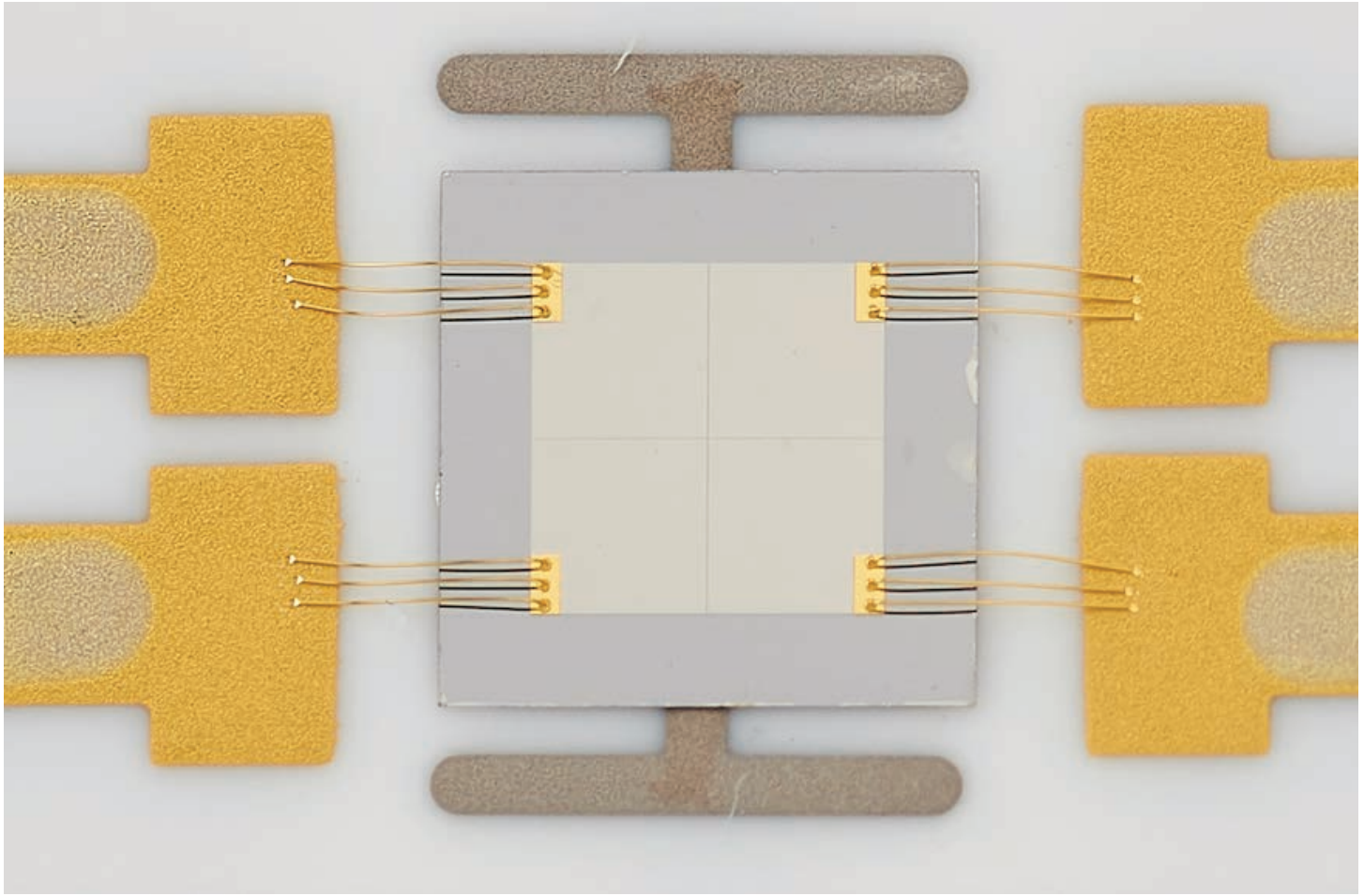
Max IV -- Nano Beamline



XBPM

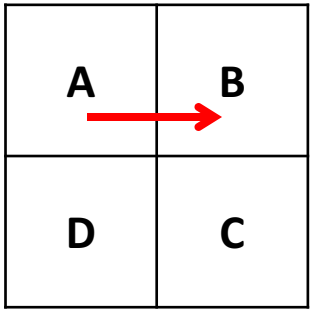


XBPM -- 2u gap

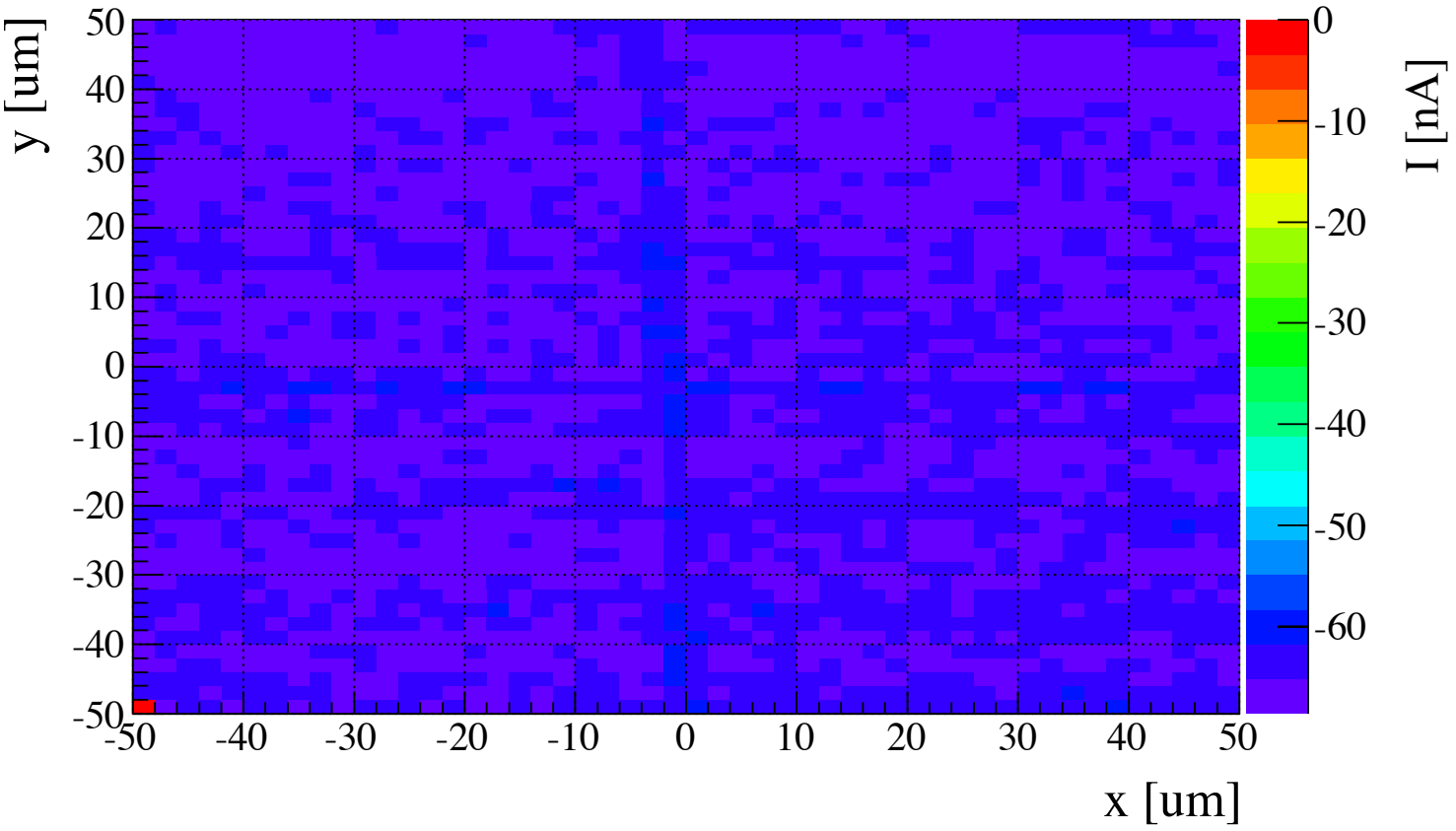


Test at Max IV - Lund

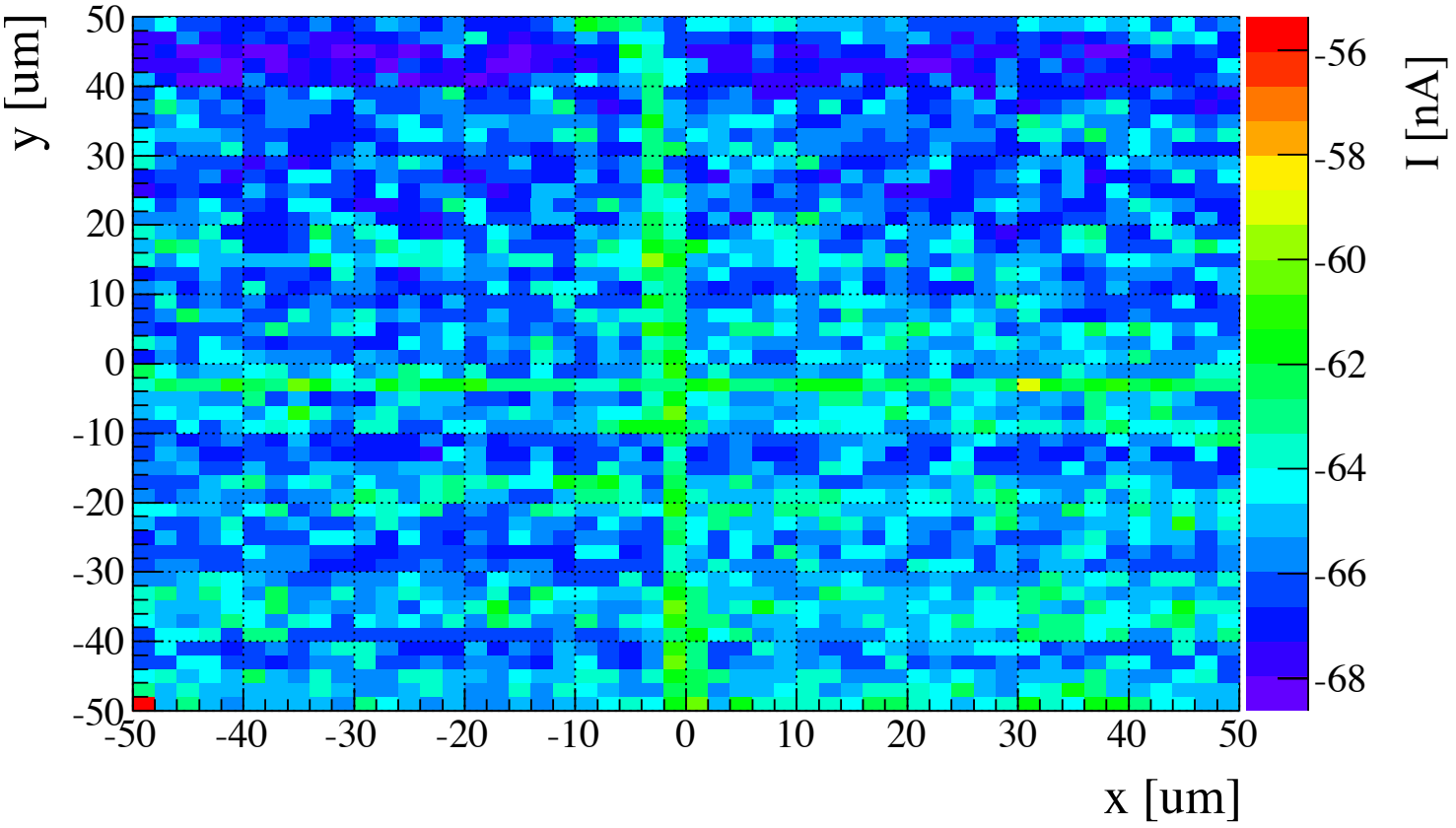
- 13 keV photons
- 100 nm beam
- Horizontal 1D-scan
- 25 nm step size

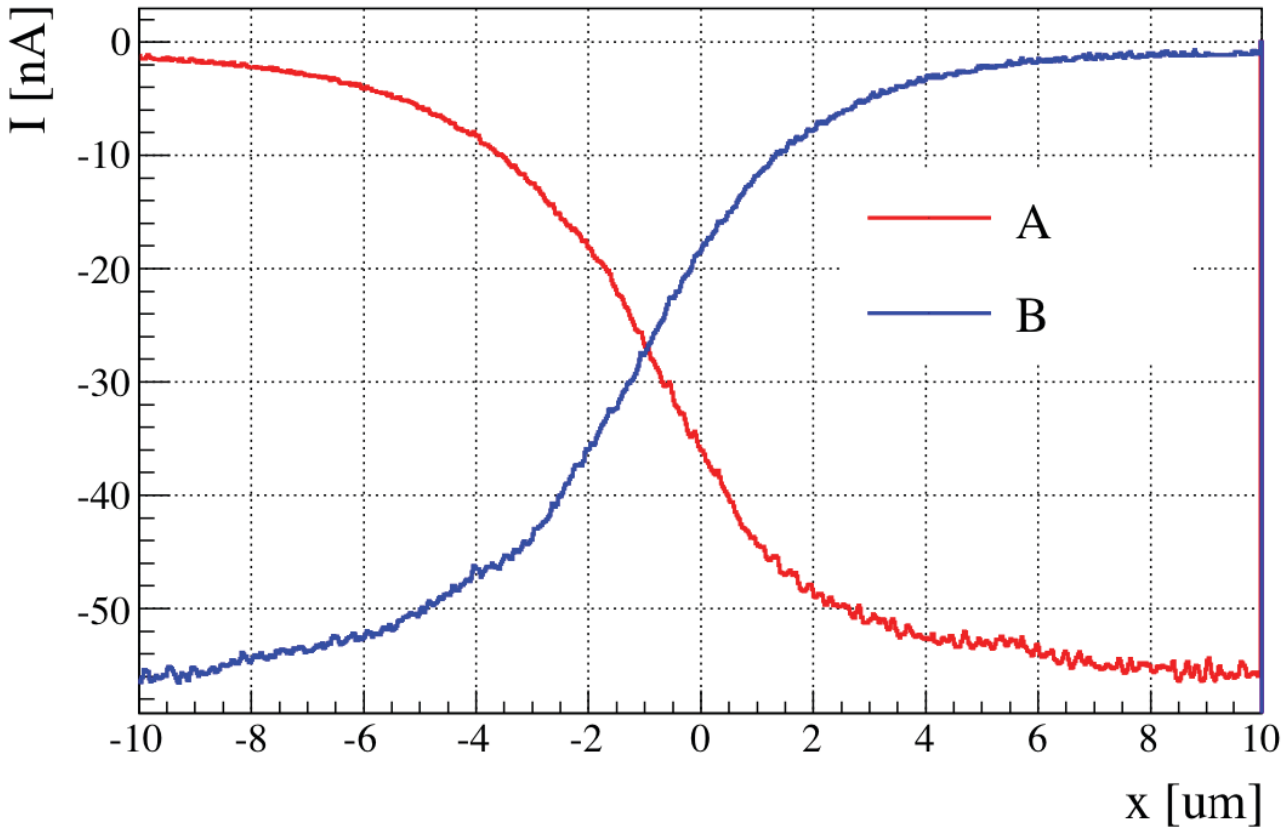


Intensity

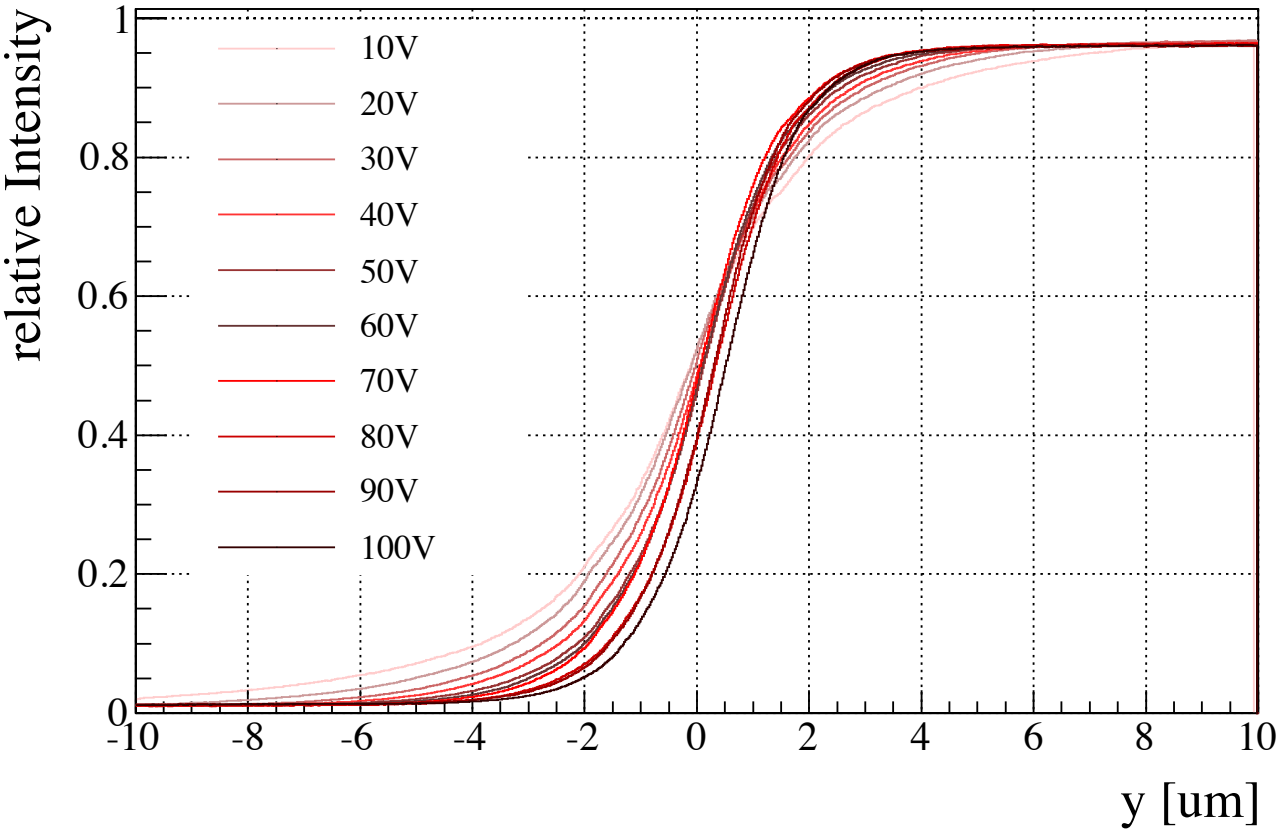


Intensity Zoom

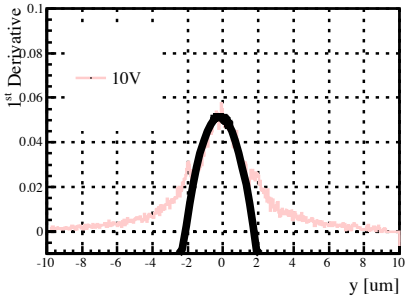


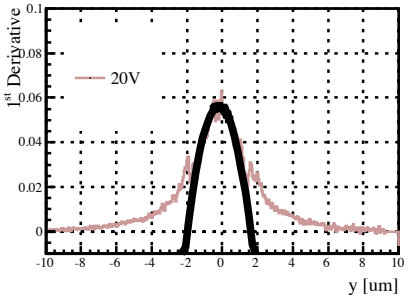


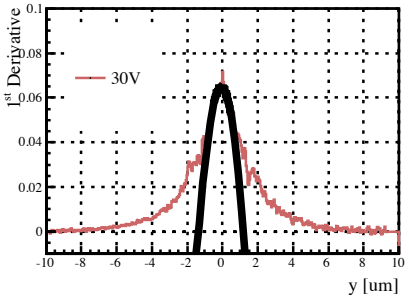
Voltage Scan

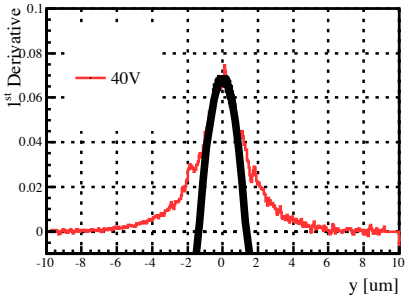


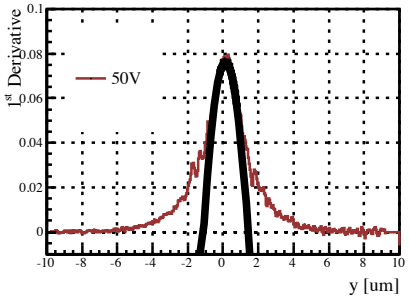
Parabolic Fit

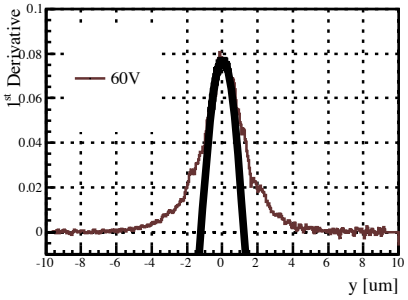


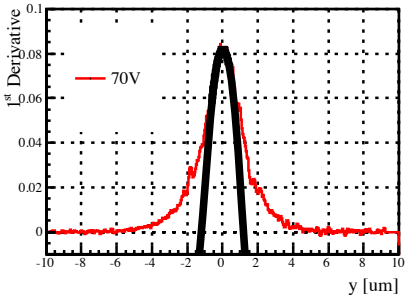


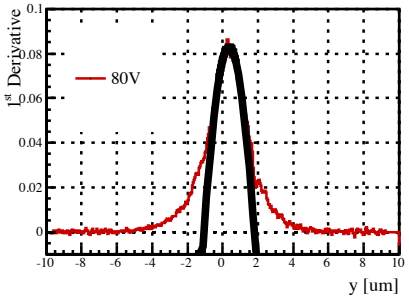


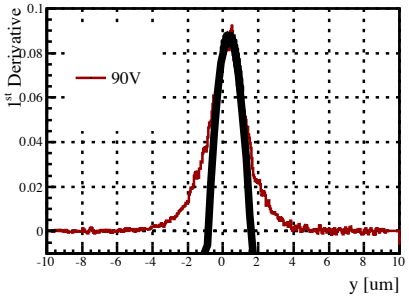


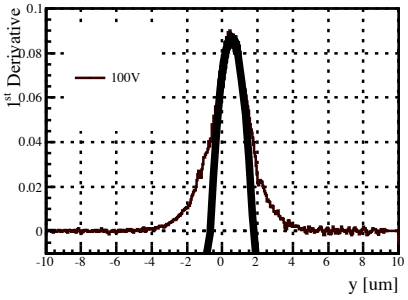




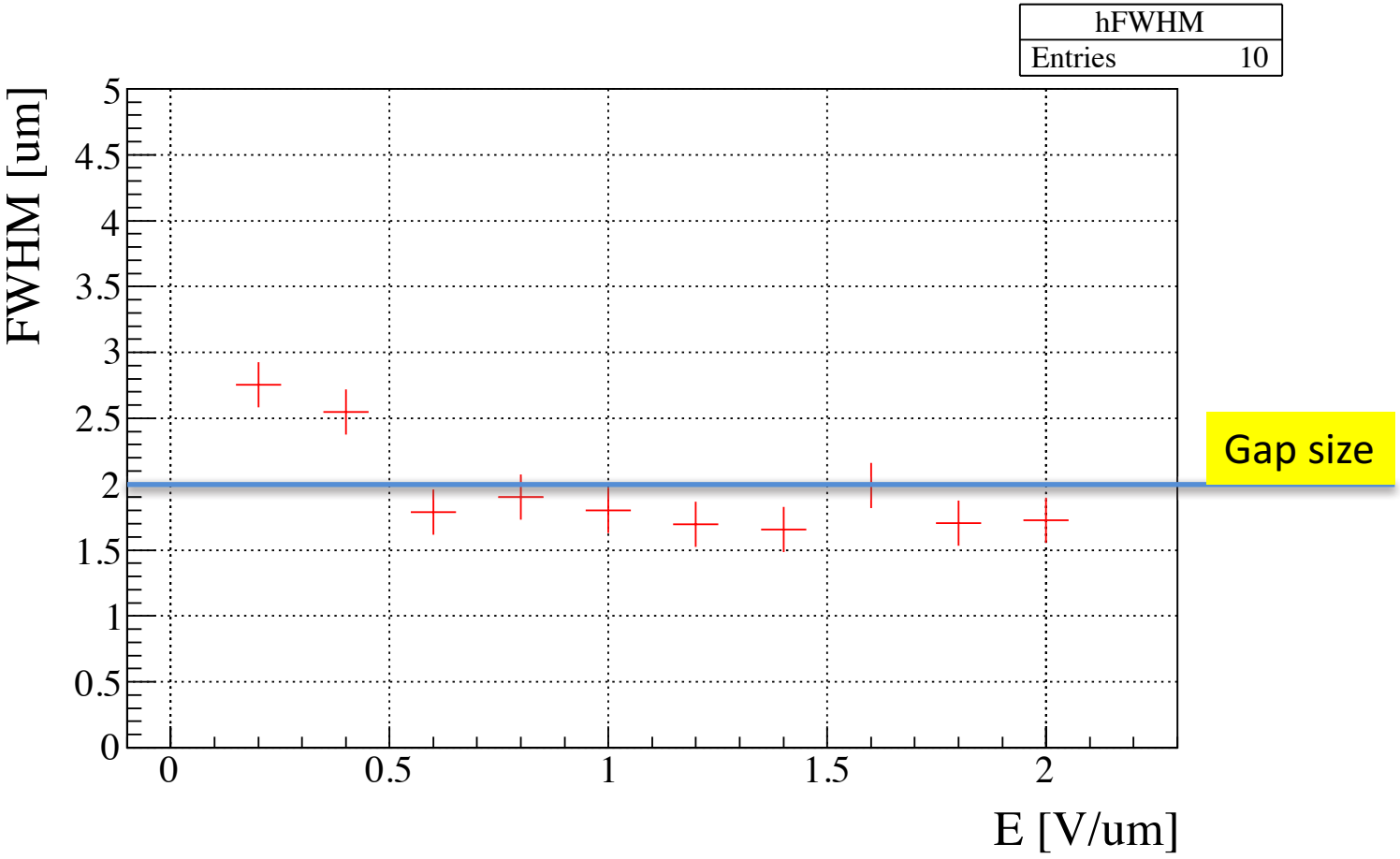






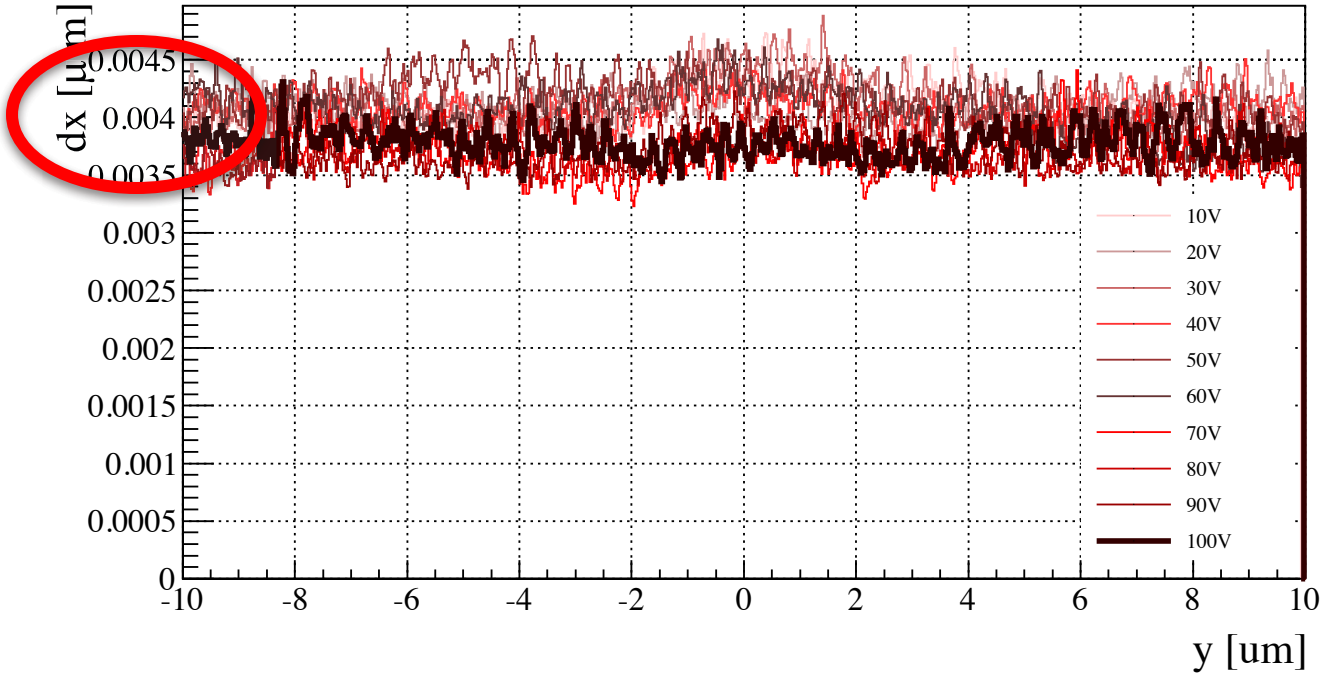


FWHM



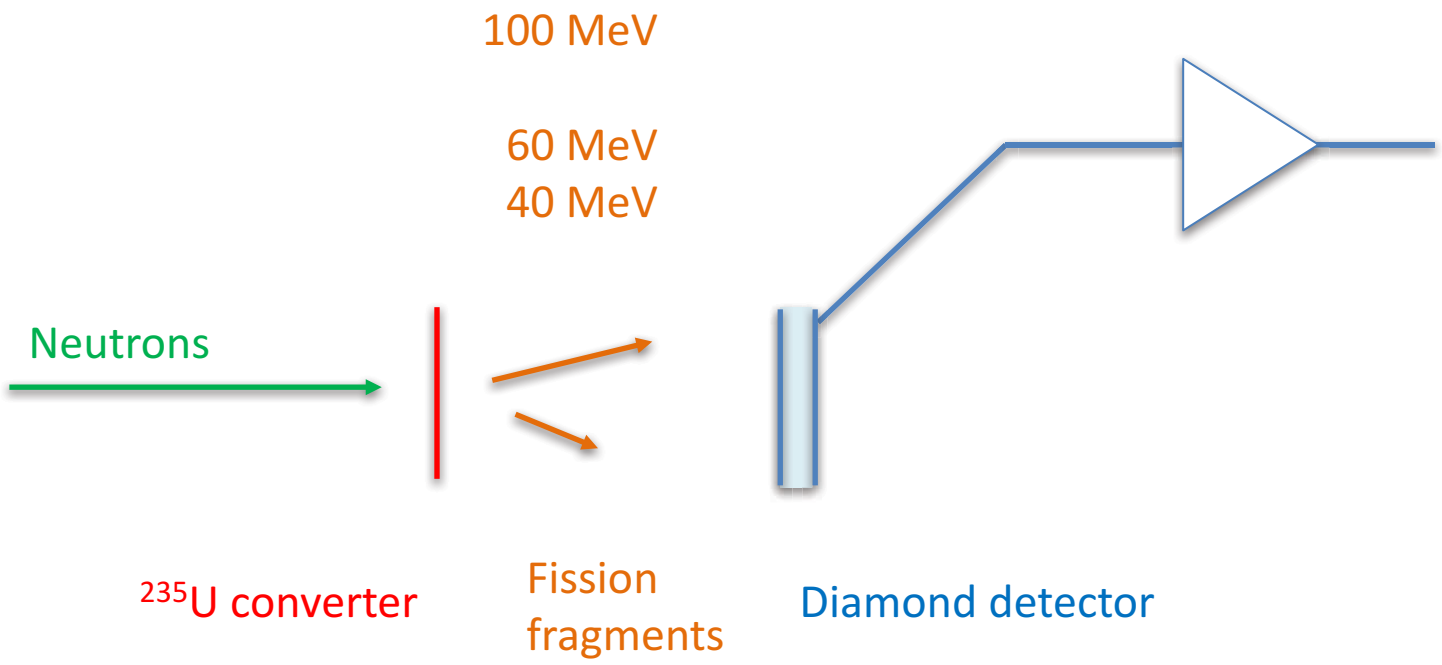
Position Uncertainty

±4 nm

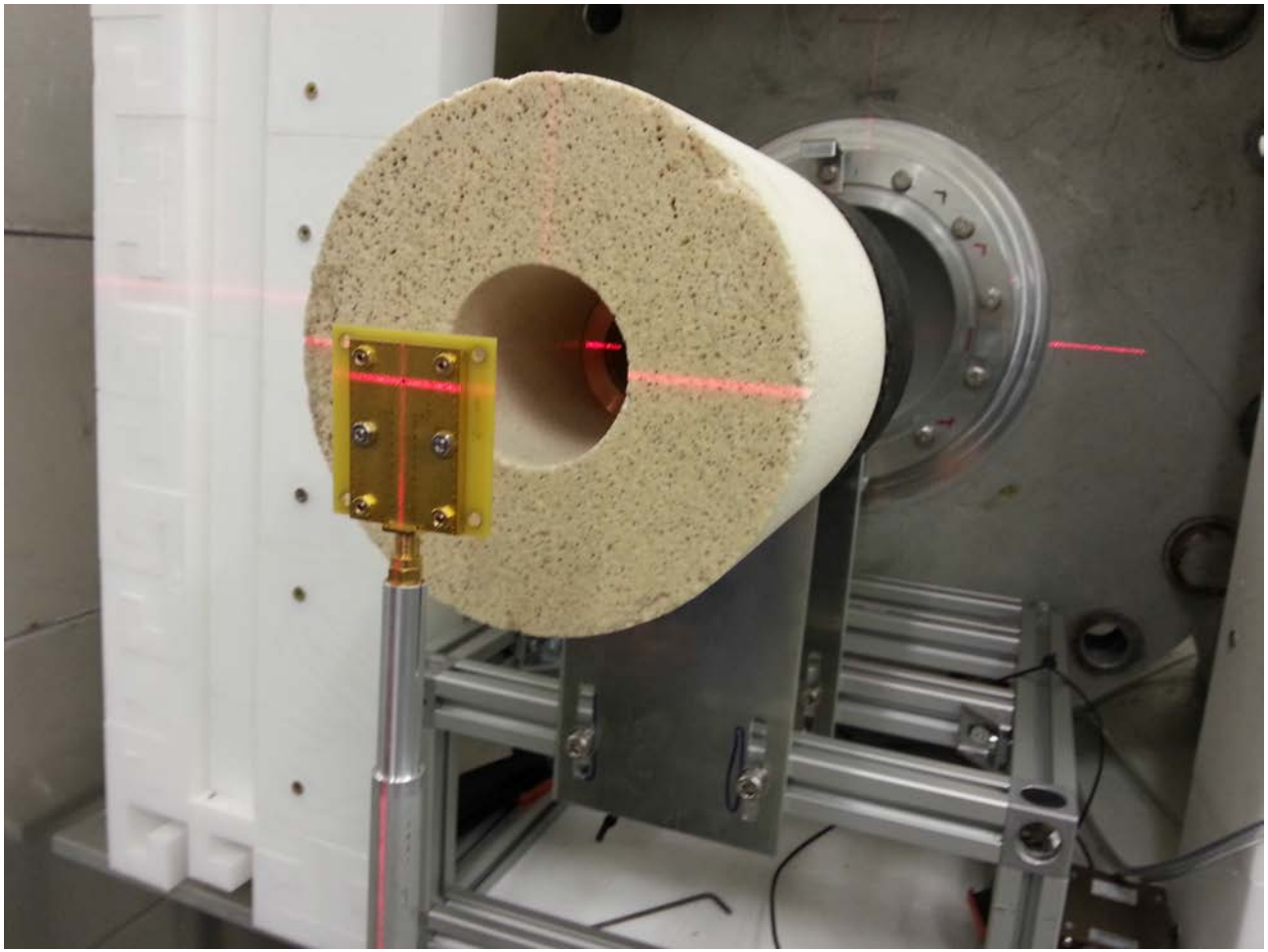


Nuclear Fission

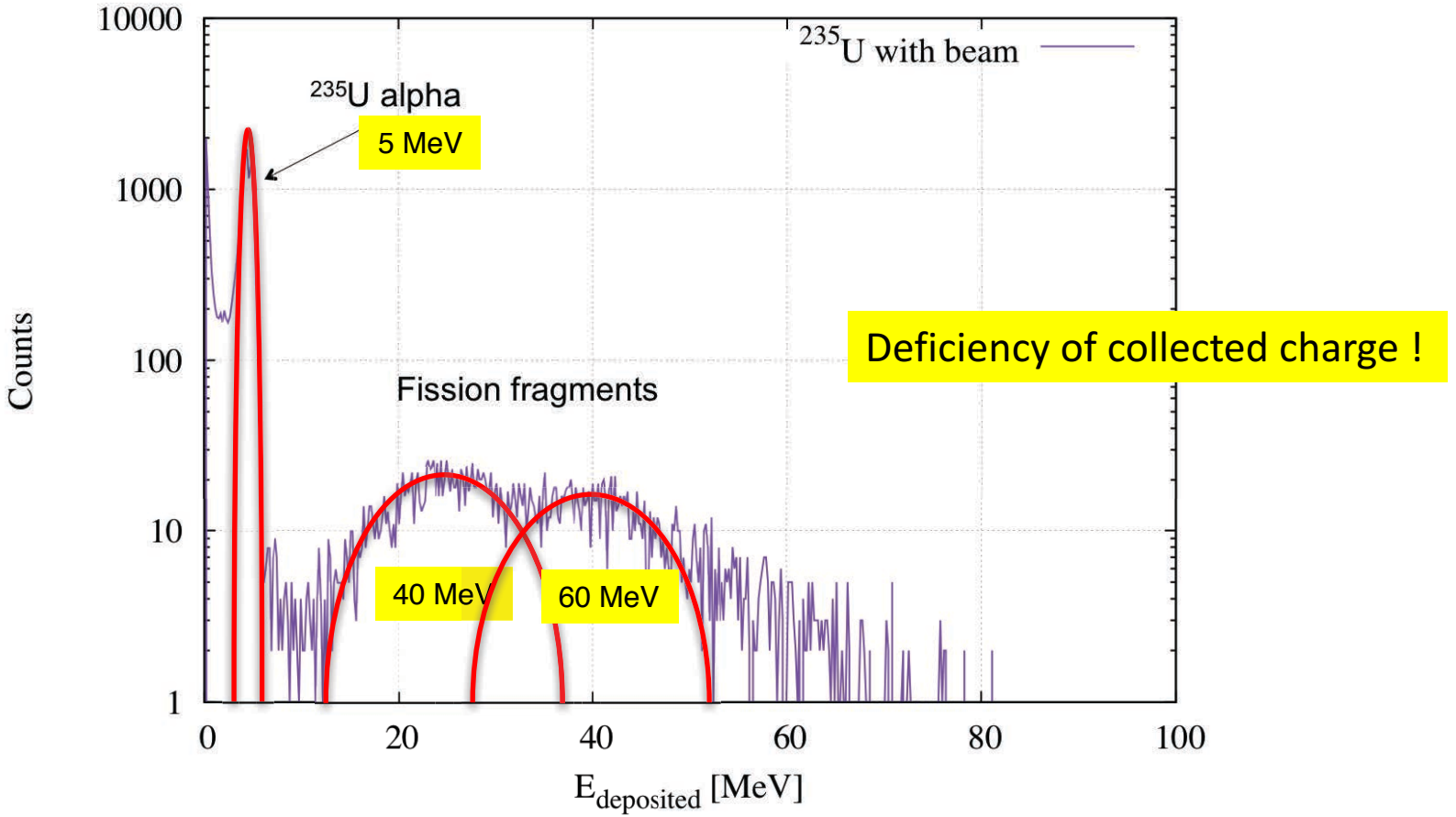
Spent Fuel Detector



EC-JRC Neutron Beam Line

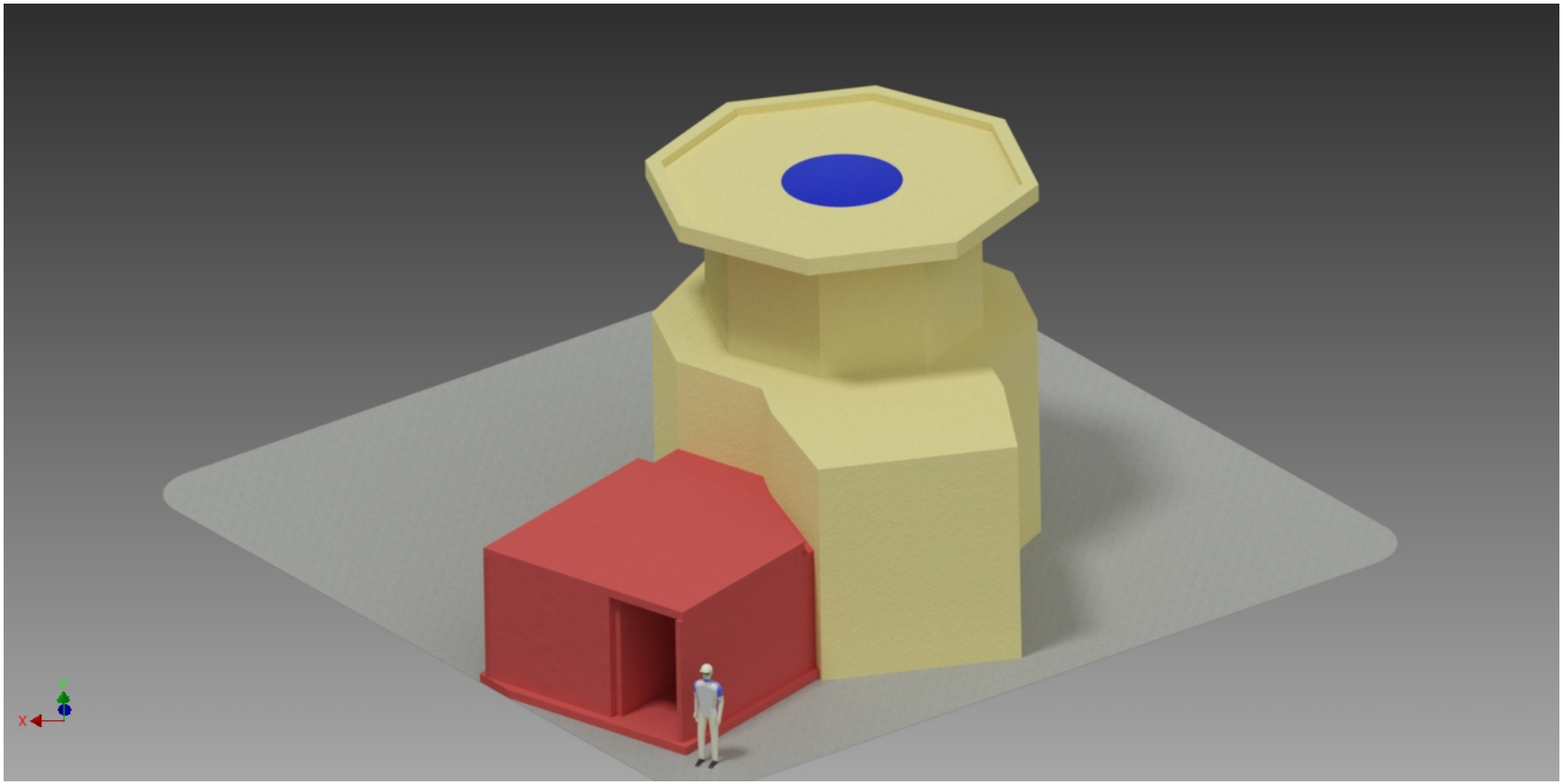


Measured Spectrum

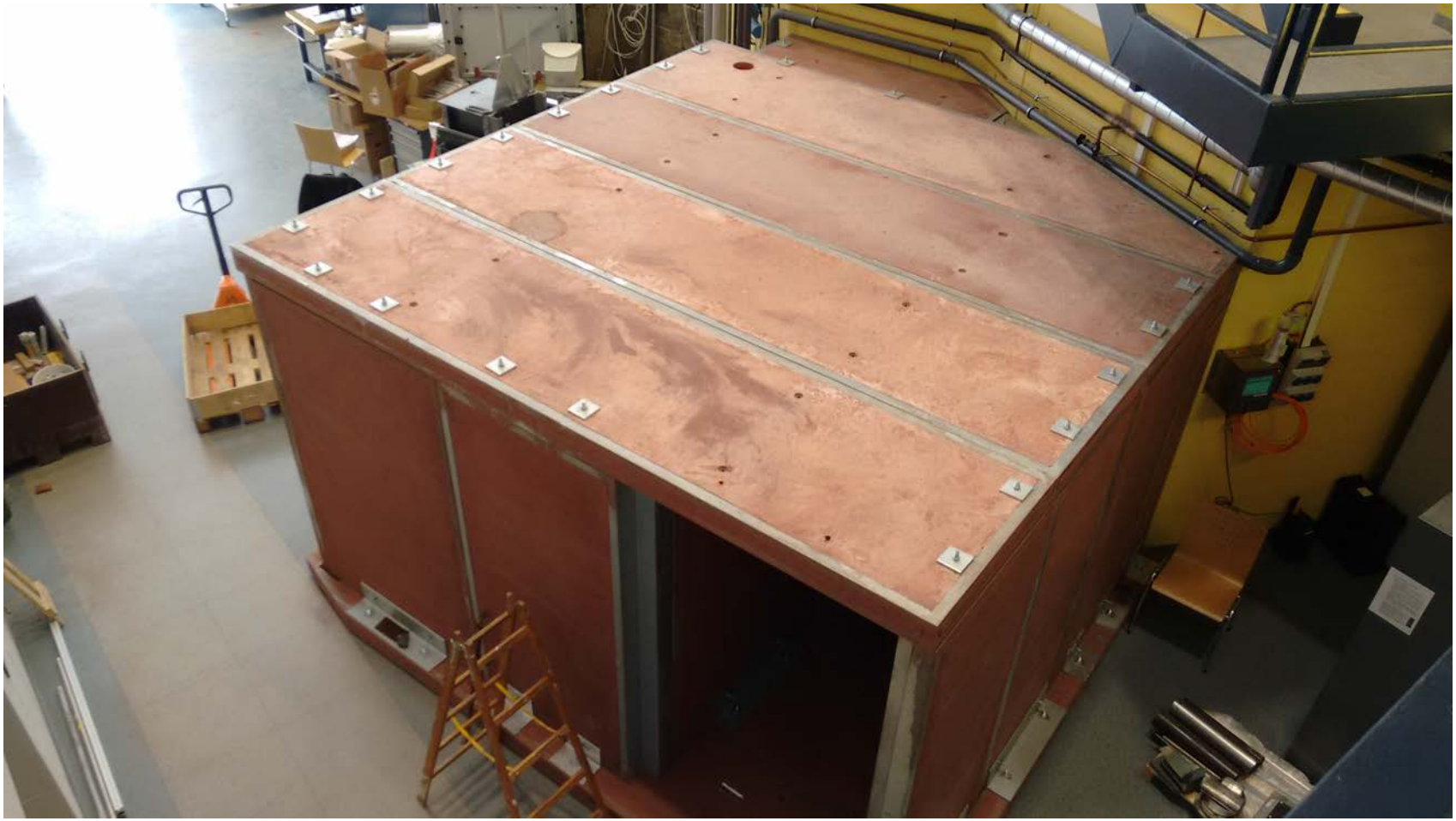


Nuclear Reactor

TRIGA Reactor in Vienna

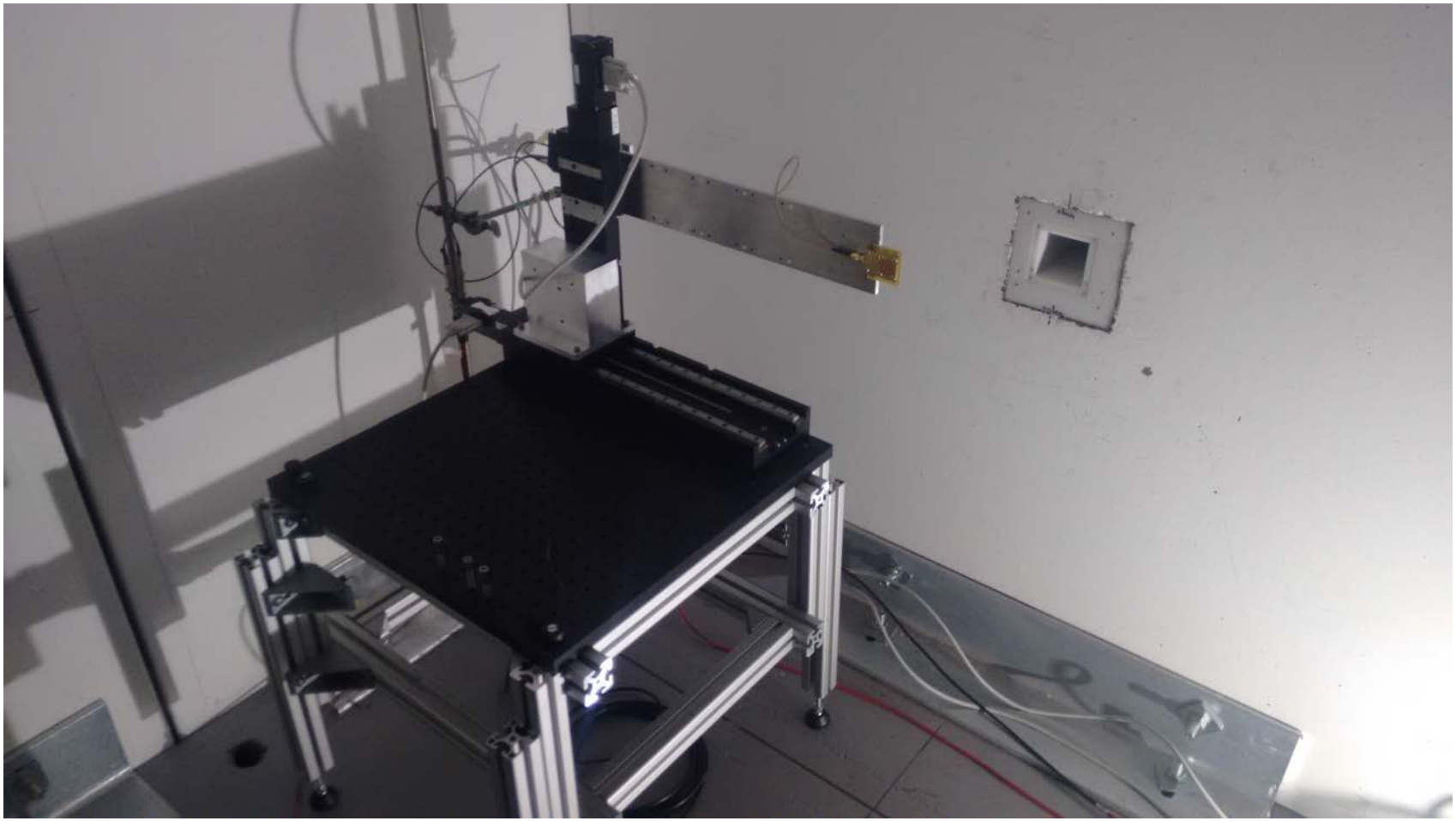


New White Beam Line

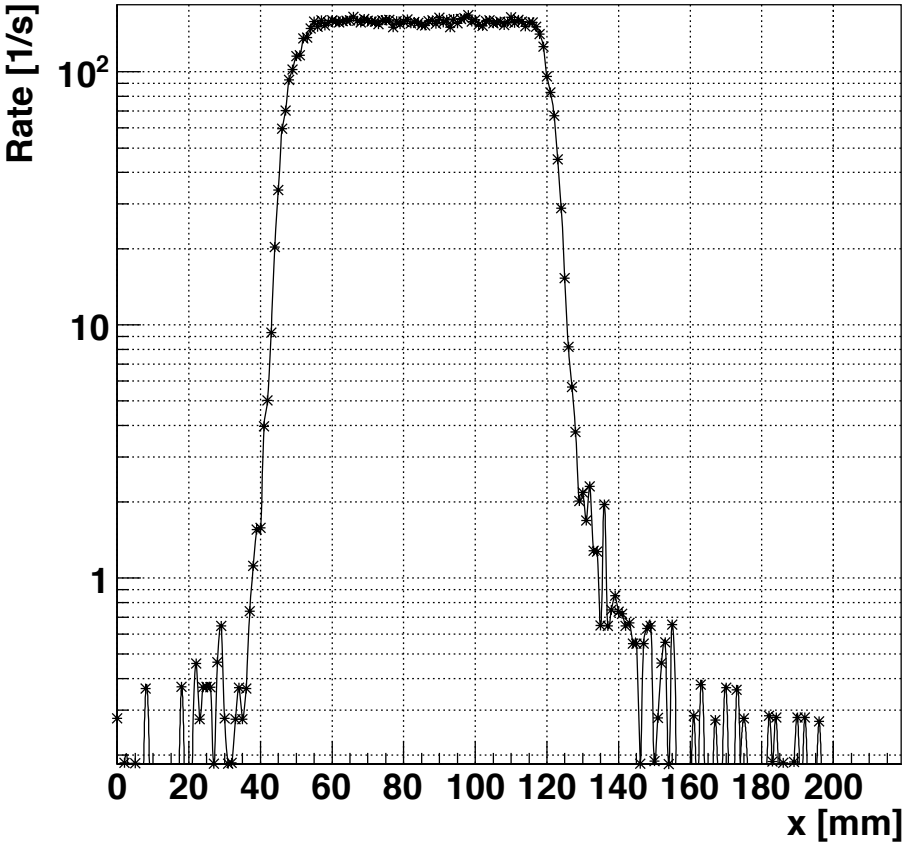


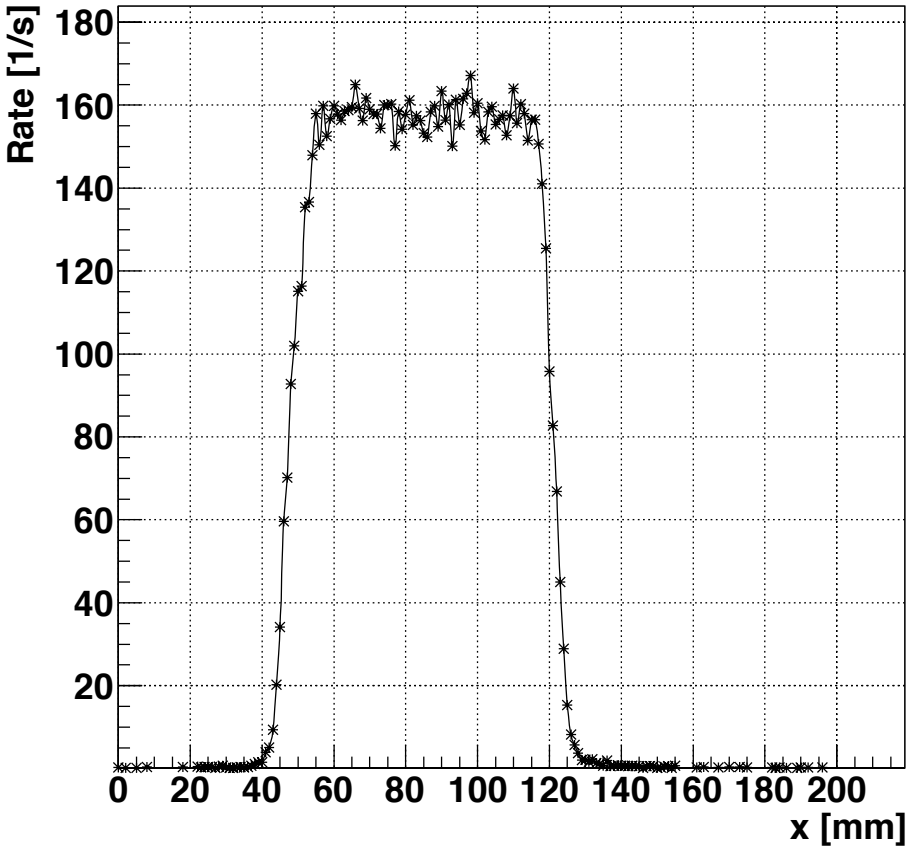
Measurement Setup

X-Y Table

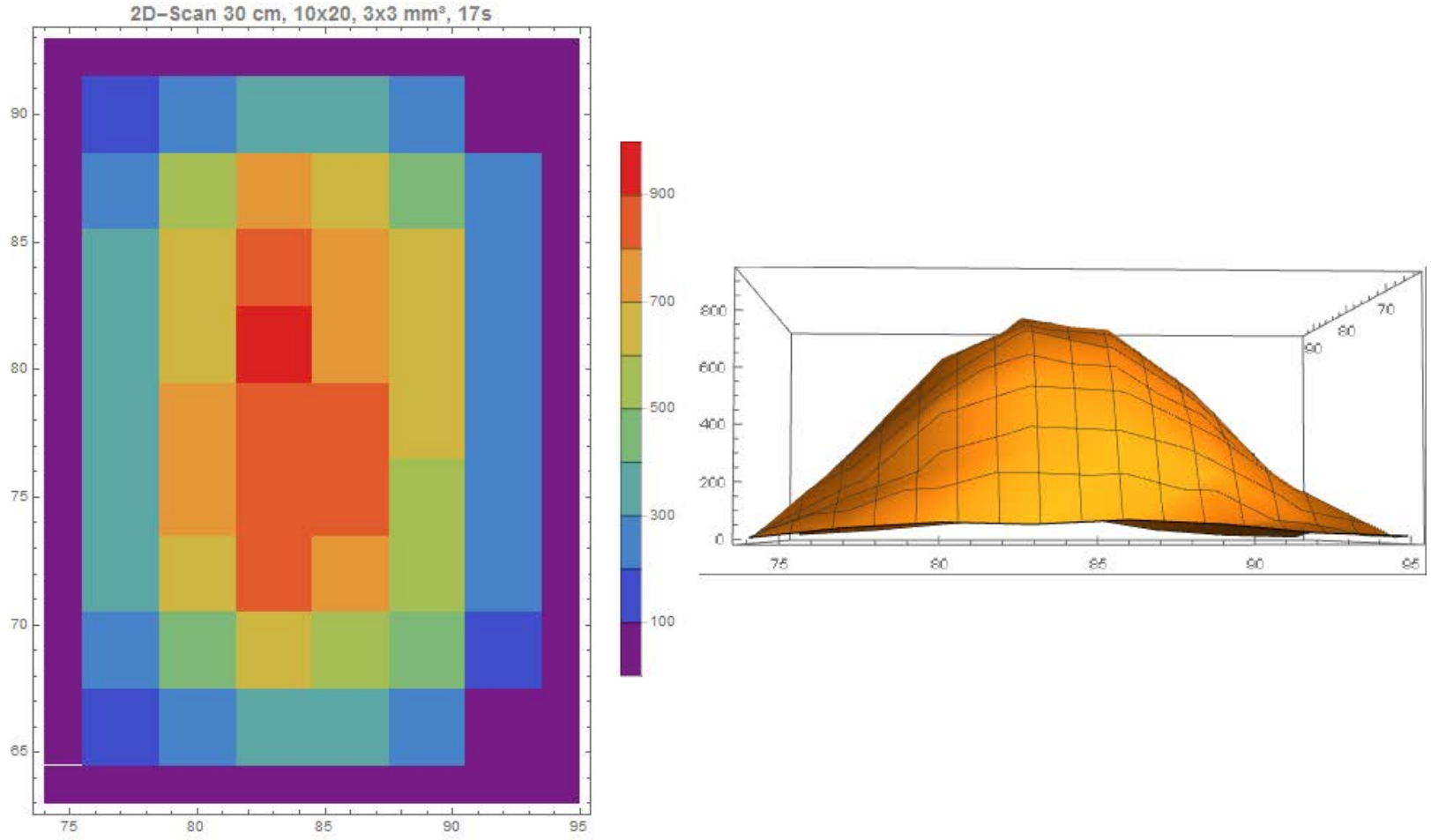


Beam Profile

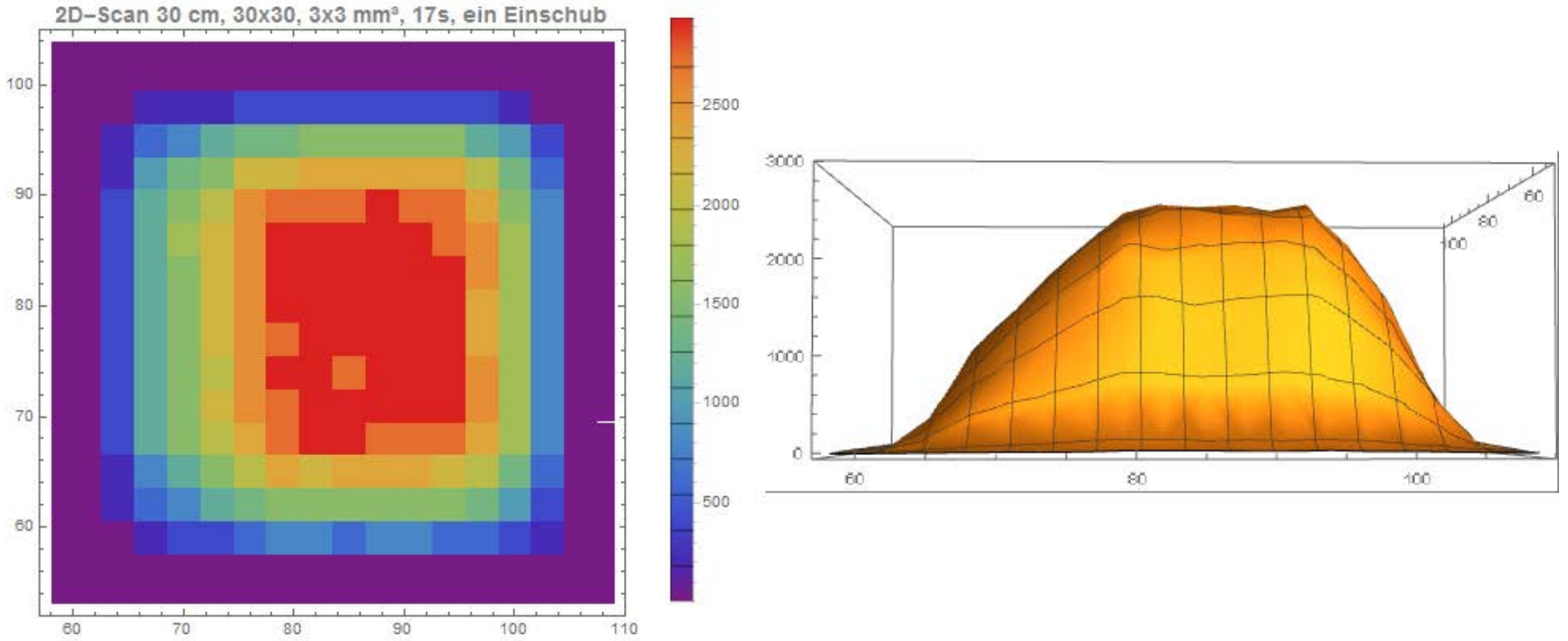




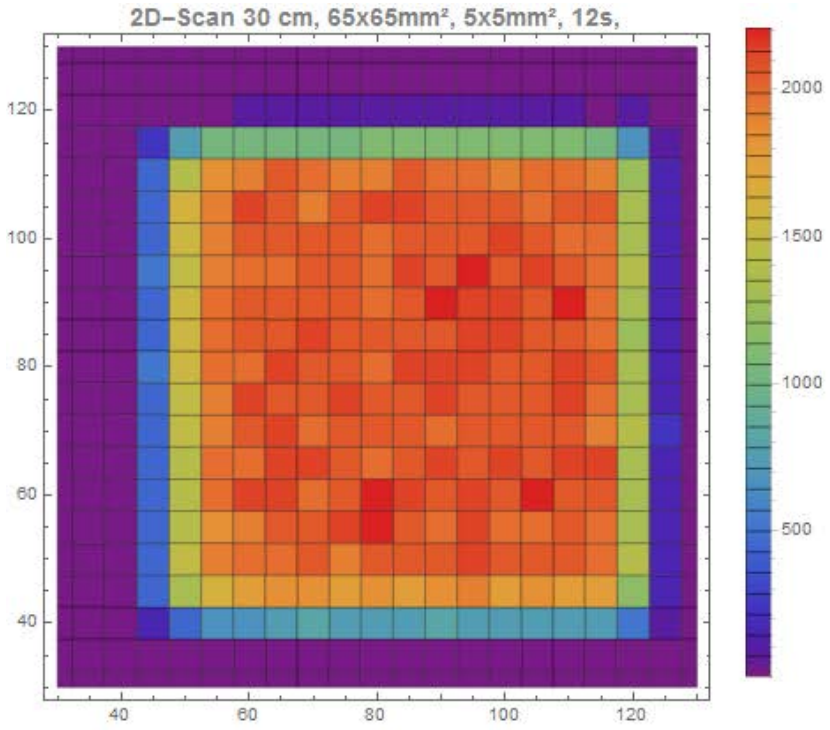
2D Beam Profile

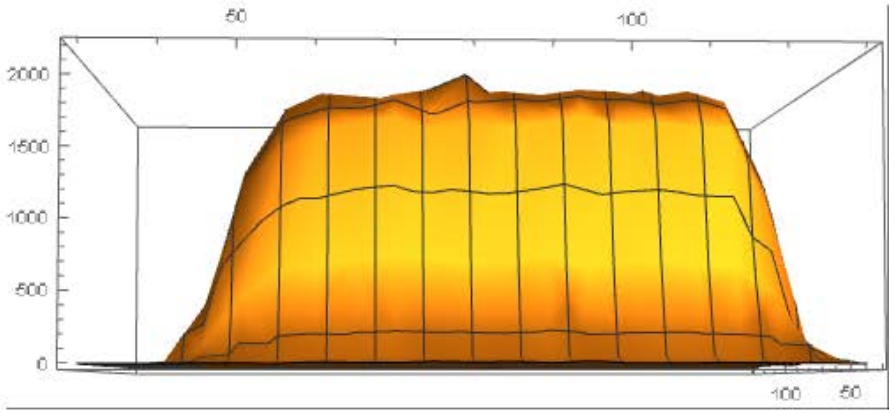


2D Beam Profile



2D Beam Profile



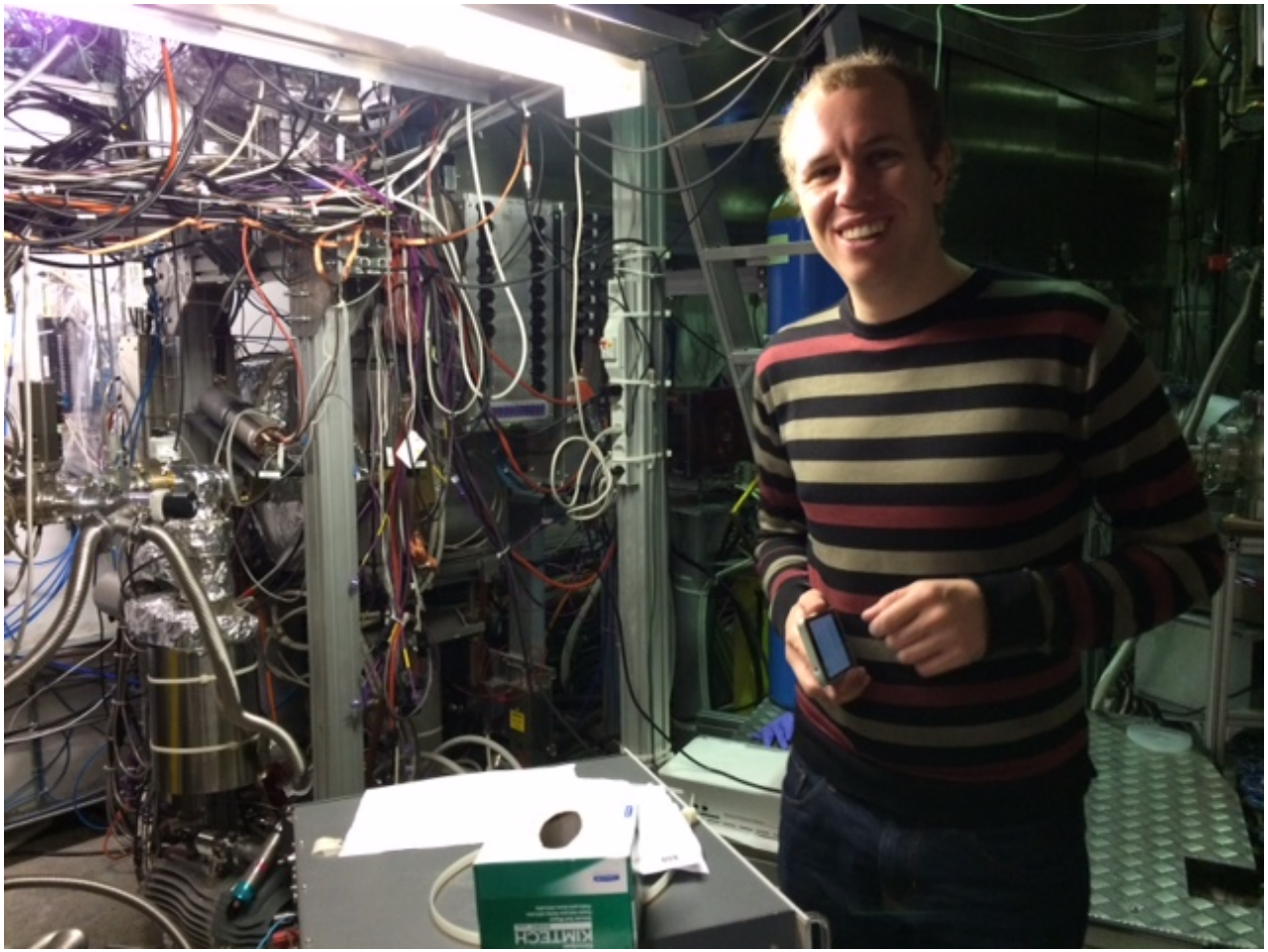


Anti-Protons

Measured at the Antiproton Decelerator Facility at CERN

AD Hall

Miha Cerv at AEGIS at CERN

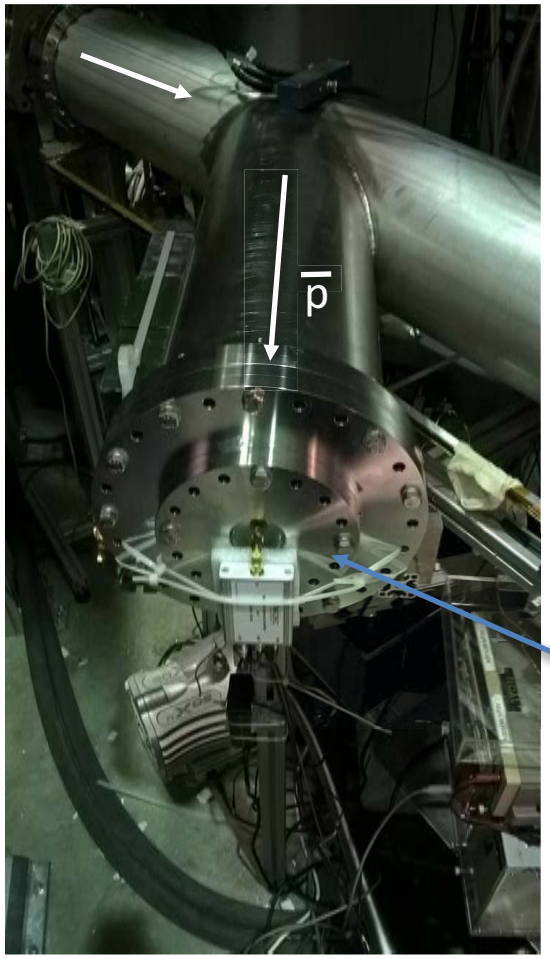


AVA Project

This work is carried out in the frame of the EC funded Marie Sklodowska-Curie Innovative Training Network:

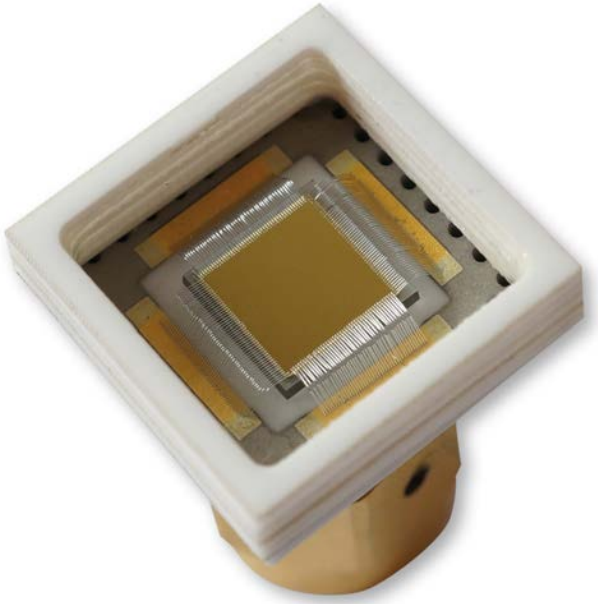
- AVA - Accelerator Validating Antimatter Physics
- Grant Agreement 721559 AVA
- Our PhD fellow: Miha Červ (Slowenia)
- Funded for three years, 1.4.2017 – 30.3.2020
- TU Wien, Faculty of Electrical Engineering

Antiprotons



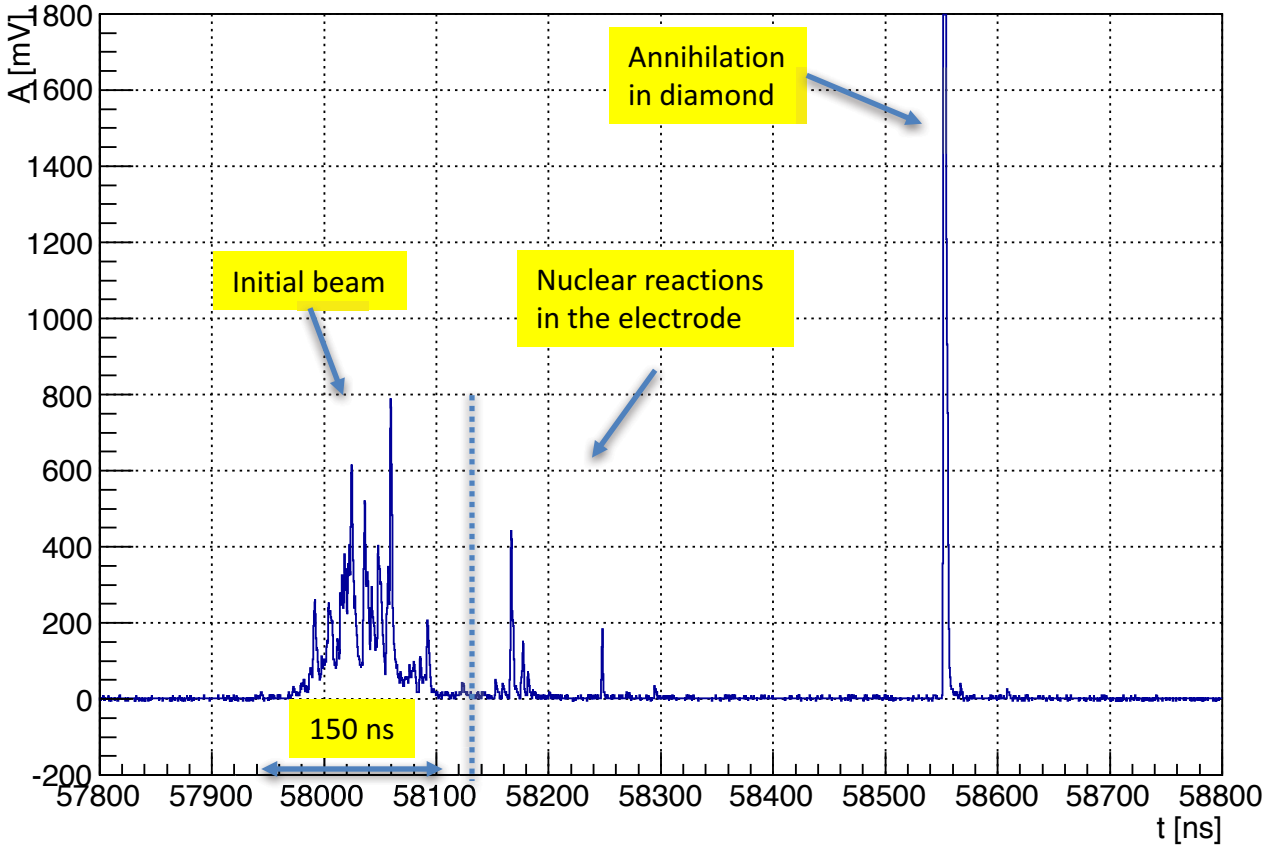
Detector in vacuum
Amplifier outside
ROSY readout

Knopf Detector



sCVD diamond (E6)
500 um thick
4 mm x 4 mm electrodes,
250 nm thick (Ti-Pt-Au)

Detector Response



Courtesy Angela Gligorova Stefan Meier Institut, Wien, Michael Doser, CERN

Data taking and analysis ongoing → ADAMAS 2018.

cividec
Instrumentation

www.cividec.at