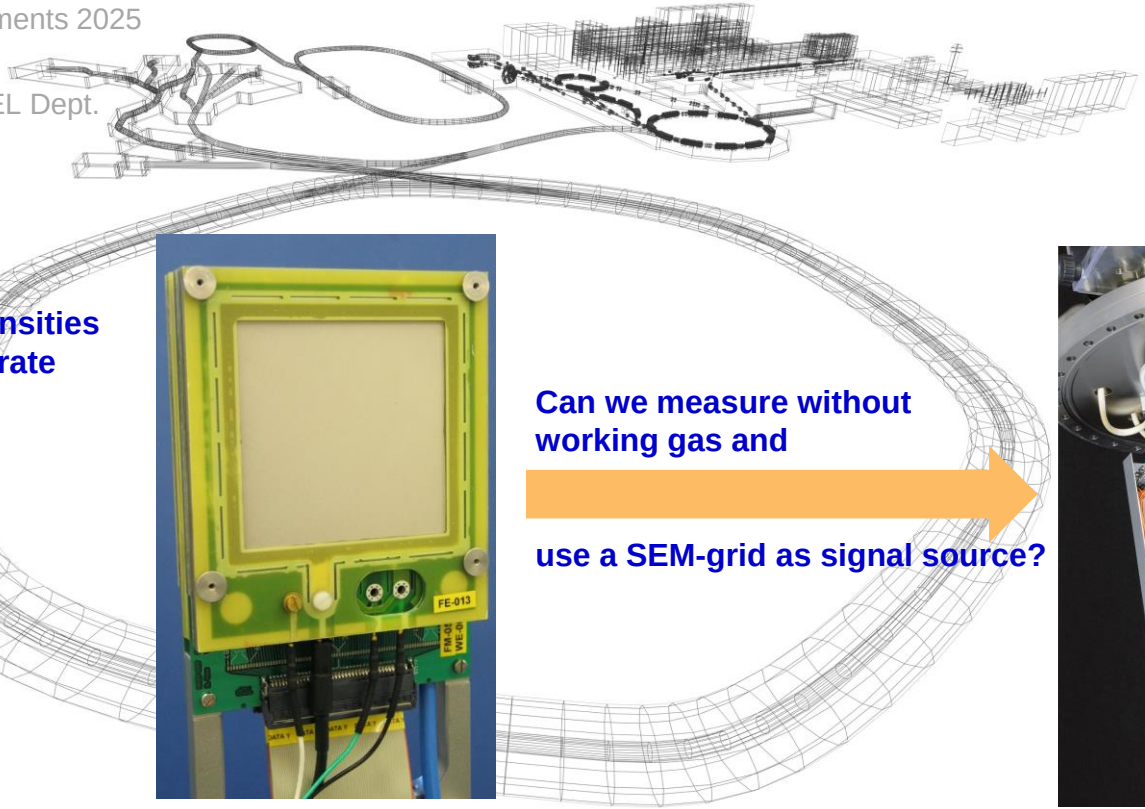
Beam Experiment No. 248: Slow extraction SEM-Grid test
Spokesperson: A. Reiter, S. Löchner, P. Wieczworek

GSI HEST – Machine Experiments 2025

A. Reiter, S. Löchner & EEL Dept.
1st Dec. 2025

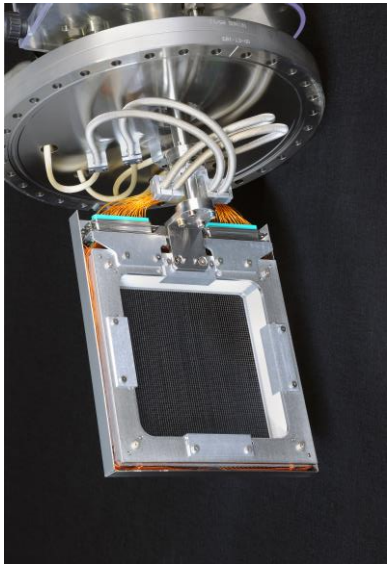


Use case:

Beam extraction monitoring
at higher intensities, i.e. intensities where MWPC detectors saturate

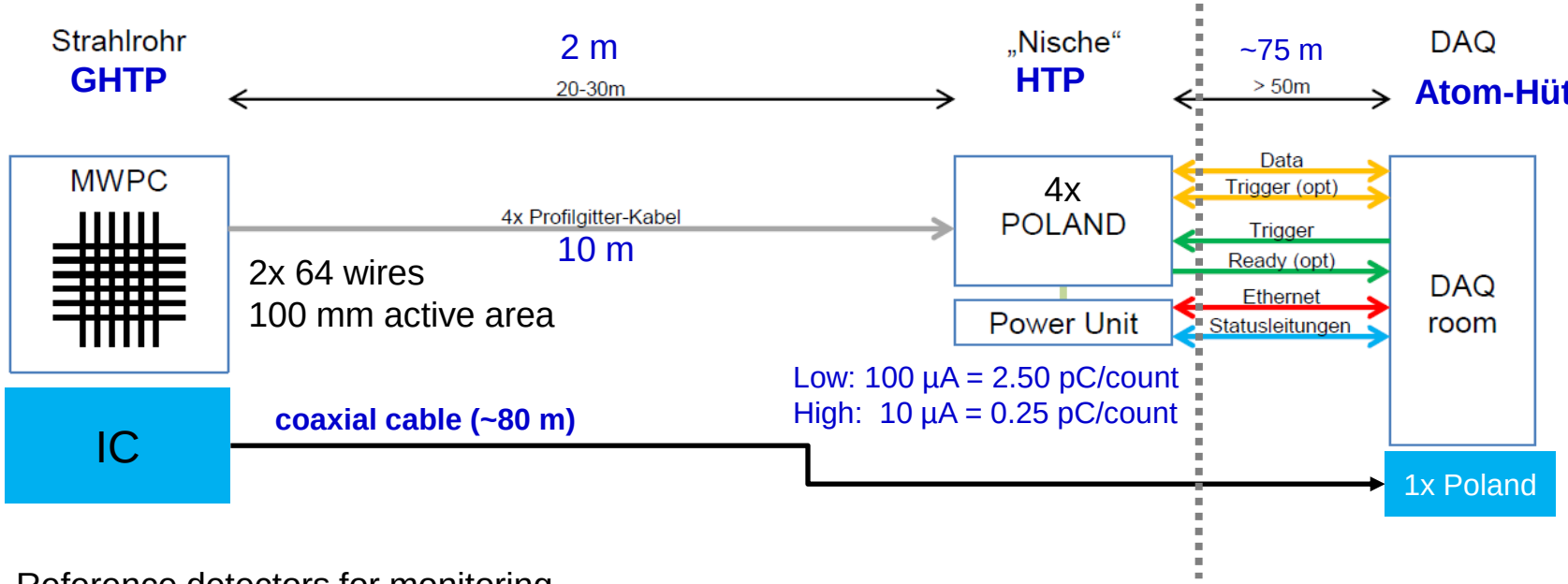
Can we measure without working gas and

use a SEM-grid as signal source?



HTP Setup 2021/2022:

Data Acquisition – MWPC



Reference detectors for monitoring
IC: GHTPDI1I
SEM: GHTPDI1S
with 1 kHz readout in Lassie DAQ system
via IFC3 (current-to-frequ. converter)

Anmerkung: beim gleichzeitigen Einbau einer POLAND SEM sowie POLAND MWPC Einheit wird nur eine Power Unit Einheit benötigt.

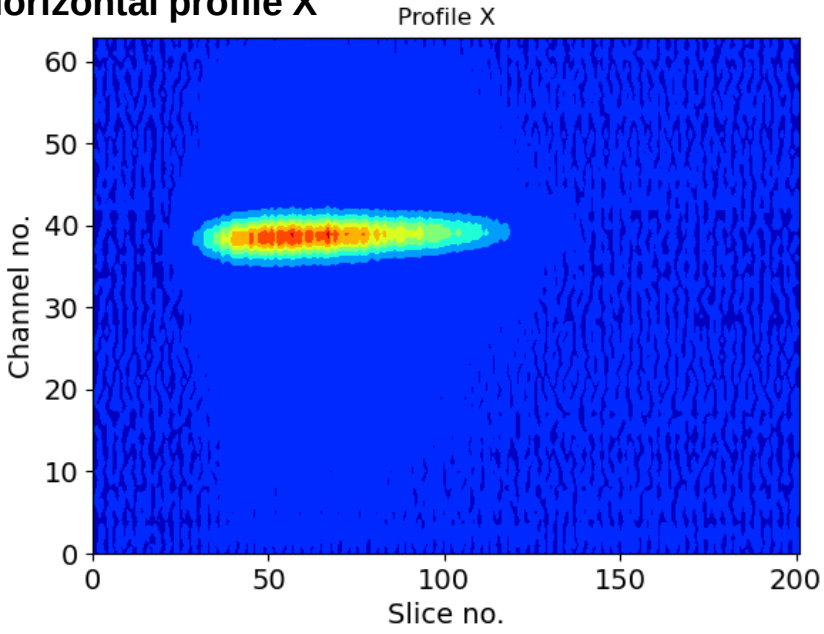
Quelle: POLAND Aufbau und Verbindungsuebersicht.pdf

Stand: 5.9.2018 – S. Löchner, M. Witthaus

Poland Measurement with MWPC in 2021

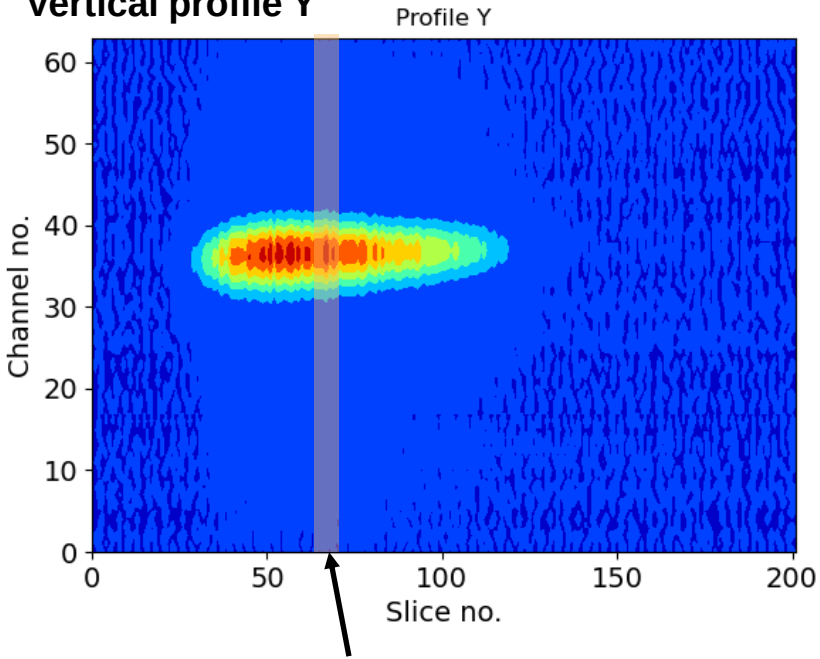
Time-Resolved Profiles – Contour Plot

Horizontal profile X



7.5 ms / slice

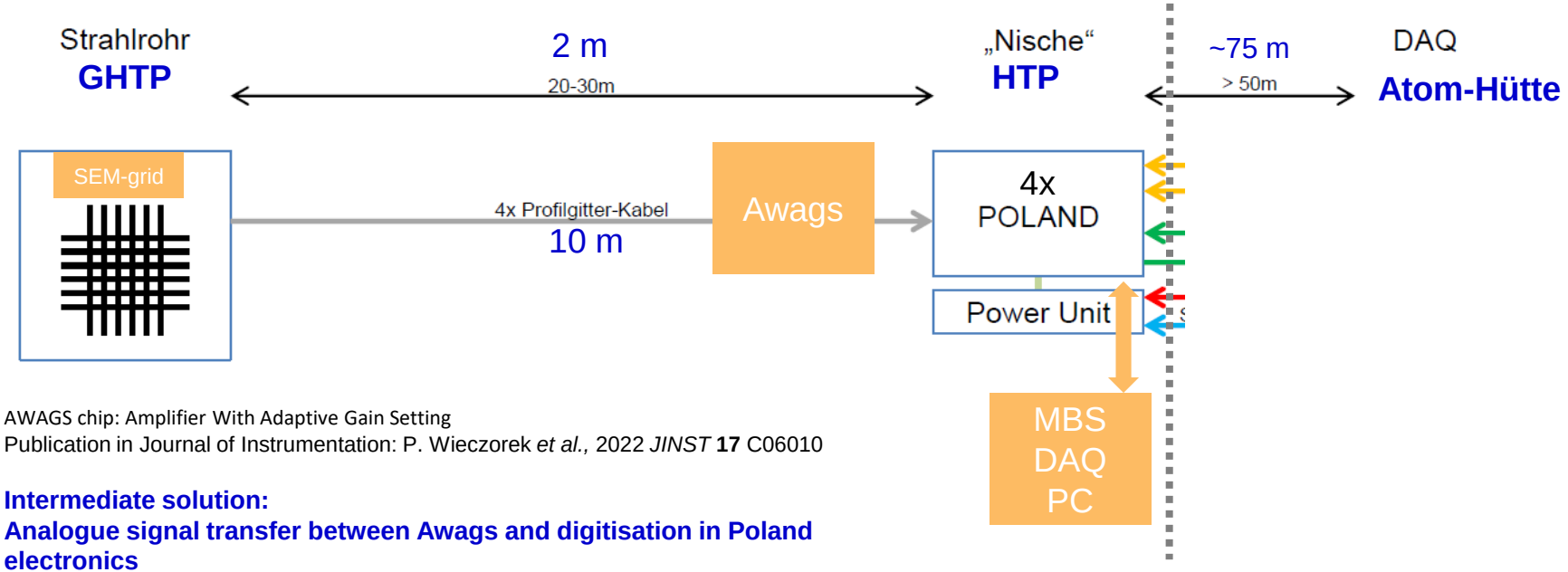
Vertical profile Y



Typ. measurement range with existing GSI integrator electronics

HTP Setup 2025:

Data Acquisition – Intermediate setup



AWAGS chip: Amplifier With Adaptive Gain Setting
Publication in Journal of Instrumentation: P. Wieczorek *et al.*, 2022 *JINST* **17** C06010

Intermediate solution:
Analogue signal transfer between Awags and digitisation in Poland electronics

Final solution:
Direct digitisation of Awags signal with Poland electronics only for communication.

Anmerkung: beim gleichzeitigen Einbau einer POLAND SEM sowie POLAND MWPC Einheit wird nur eine Power Unit Einheit benötigt.

Stand: 5.9.2018 – S. Löchner, M. Witthaus

GHTPDG2
Test Measurements 2025

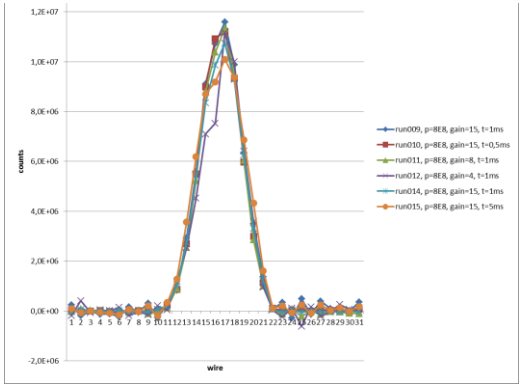
- Beam:
  - U-238, 200 MeV/u, N = [3e7 , 8e8], spill length ~400 ms (with spill feedback)
  - U-238, 900 MeV/u, N ~1.2e7

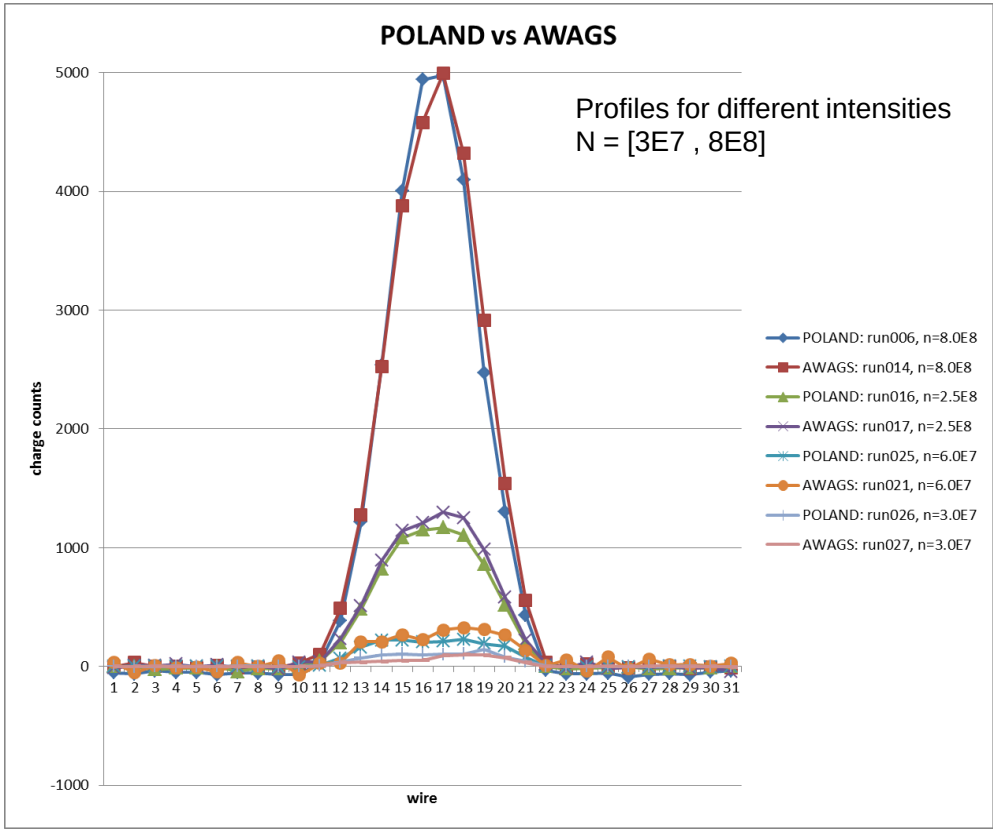
- Aim: “Overlap” measurement between data only measured with the pure POLAND readout system or measured with the AWAGS preamplifier in combination with the POLAND system.

„Result“ 200 MeV/u U-238 beam
Overlap and comparison of Poland & Awags

- Absolute value of colleted charge in agreement with theoretical estimate:
  - Yield ~ 500 e-/ion, coverage factor ~ 0.1
  - N=1E9 => Q = 8 nC
  - Profile integral ~ 27.000 counts (250 fC/count) => Q = 6.75 nC
- Profile shapes in reasonable comparison
- Noise issues required careful subtraction

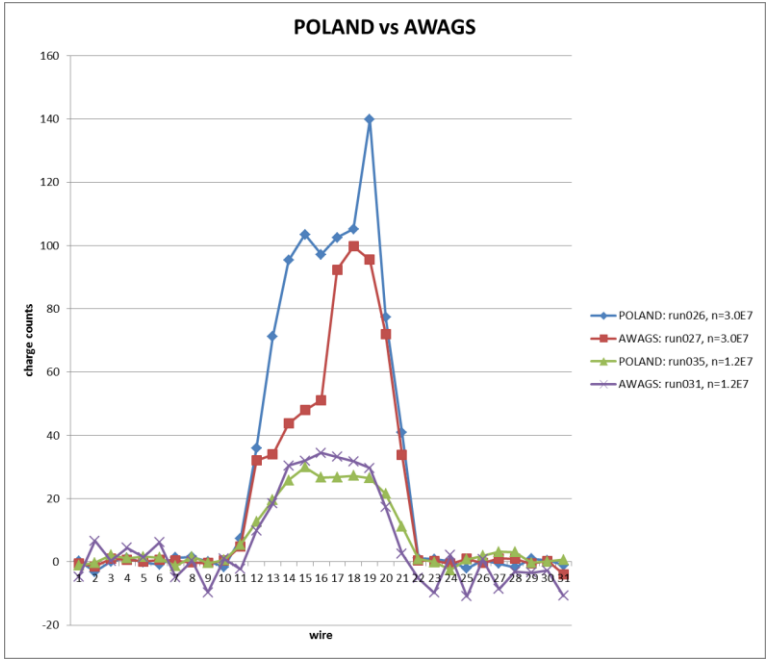
Gain-normalised profiles@8E8 U-238





„Result“ 900 MeV/u U-238 beam; N ~ [1 – 3]E7
Overlap and comparison of Poland & Awags

- Absolute value of colleted charge in agreement with theoretical estimate:
  - Yield ~ 500 e-/ion, coverage factor ~ 0.1
  - N=1.2E7 => Q = 80 pC
  - Profile integral ~ 240 counts (250 fC/count) => Q = 60 pC
- Comparison only partially ok. Some effects in Awags due to long cables.
- Need more data and improved analysis.



Summary
Poland/Awags Readout System

- **Results:**
  - Awags in „roll mode“ (multiple measurements with fast resets) is suitable for slow extraction measurements
  - Low gain operation with longer integration time (1 ms) better than High gain with shorter integration time. Sufficient for slow extraction.
  - HTP measurement yields data set that can be scaled to other beam conditions for prediction of signal strength

- **Next steps:**
  - Integration of Awags boards as optional modules into existing Poland electronics
  - Integration of Awags parameters in FESA class software
  - February 2026: dedicated test system for laboratory tests
  - Production of hardware for FAIR detectors (HEBT, SIS100, SFRS)