Experience from newcomers to test beam at PSI

P. Iengo on behalf of the Micromegas small-pad group:

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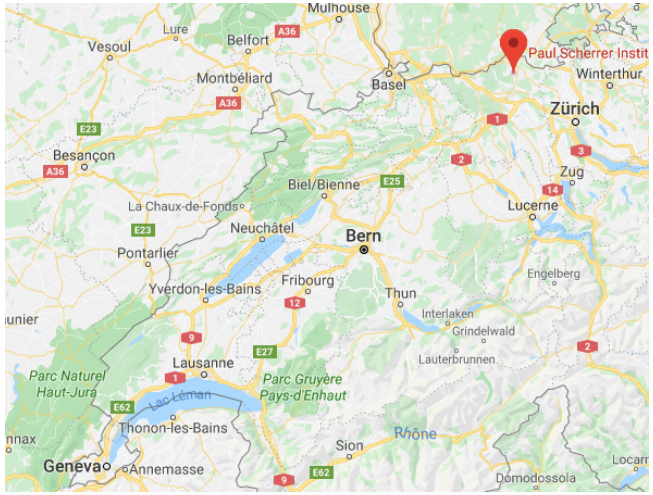
- Feedback from our first experience at PSI

- Outline
  - Logistic
  - Preparation
  - Test conditions
  - Conclusion

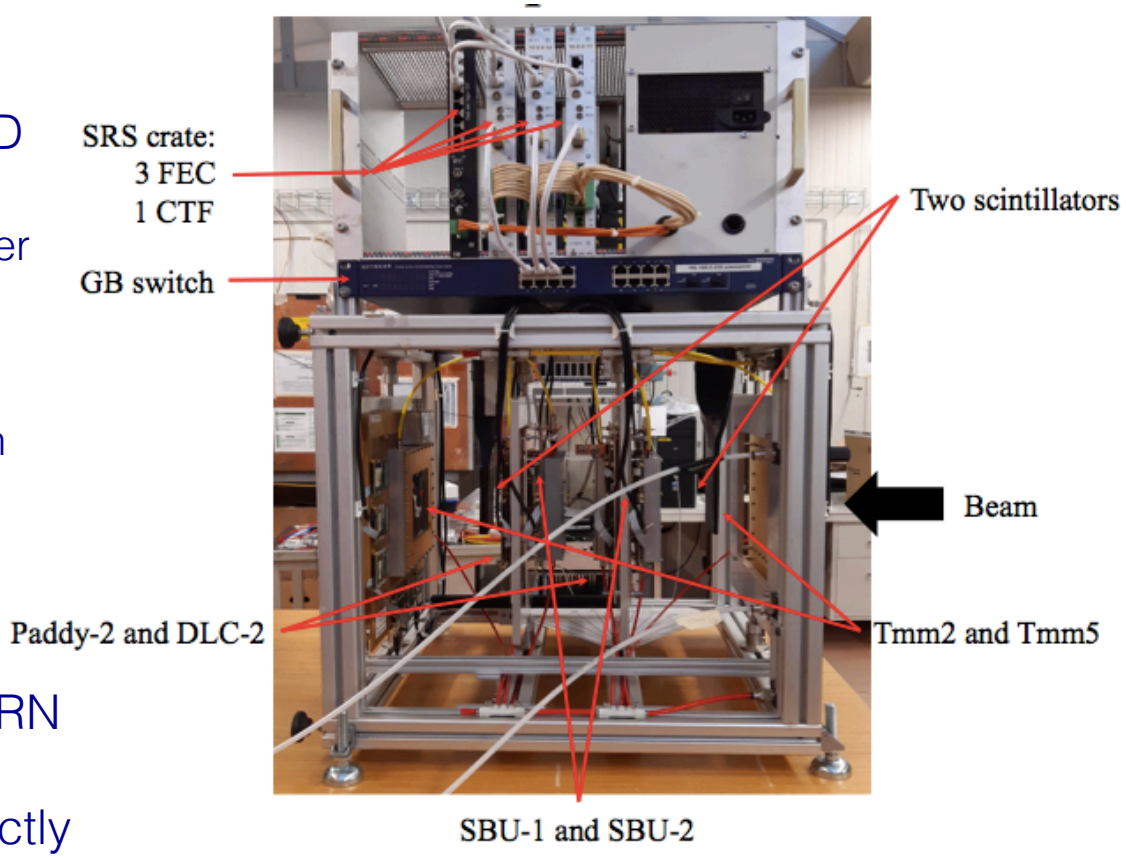
Logistic

- PSI is rather easily accessible from everywhere
  - Bus connection to Brugg railway station (train to Zurich airport; to Geneva etc)
- Quick registration from remote
  - Safety training from PSI webpage
  - Registration for dosimeter
  - Request for a workspace (if needed)
  - Request of a room at the guesthouse
- Quick registration on the site
  - Badge and dosimeter
- Helpful personnel
  - Even in finding an accommodation in hotel
- Cafeteria in the WA (closing at 4:00 pm) and a restaurant in the EA (closing at 8:00 pm)



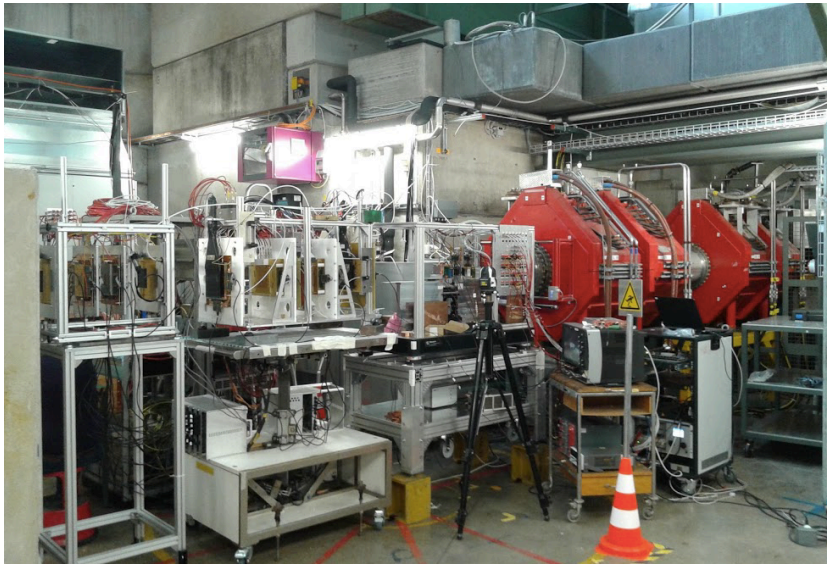
Preparation

- 1 week period: Sun. Sept 29 – Sun. Oct. 6
- Setup prepared at CERN (GDD lab)
  - All detectors (4 MM-PAD under test + 2 resistive bulk MM for tracking + 2 scintillators for triggering)
  - SRS with 3 FECs and a switch mounted on the frame
- NIM crate with modules and a box with tools, cables etc
- Everything but the gas was shipped by us by car from CERN
- Gas ordered from CERN to Carbagas to be delivered directly to PSI. Worked (just on time)



Test conditions

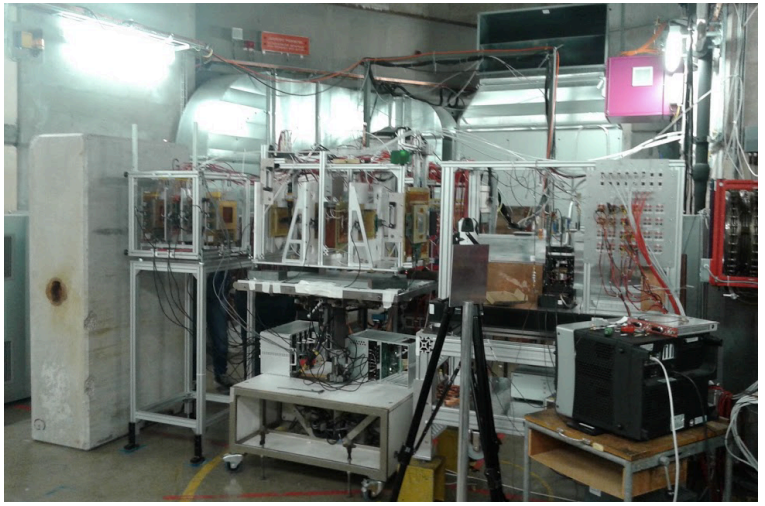
- Test area: πMu1
  - π^+ ~270 MeV (with ~% p contamination)
- Installation in the area was smooth. Good support from the local crane operator team
- Experimental area: clean and very well equipped (tools, soldering station, cabinets with spare NIM modules)
- Easy access to the area (beam on/off etc.)

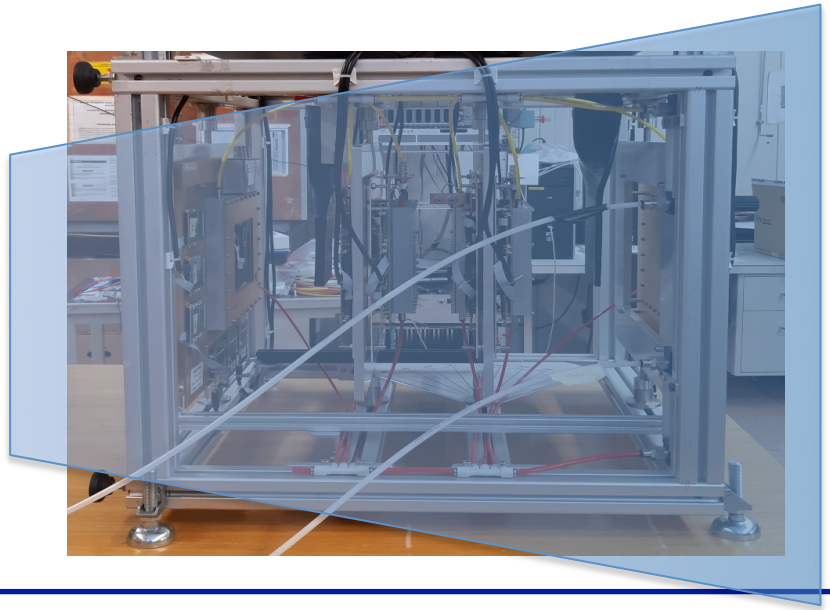


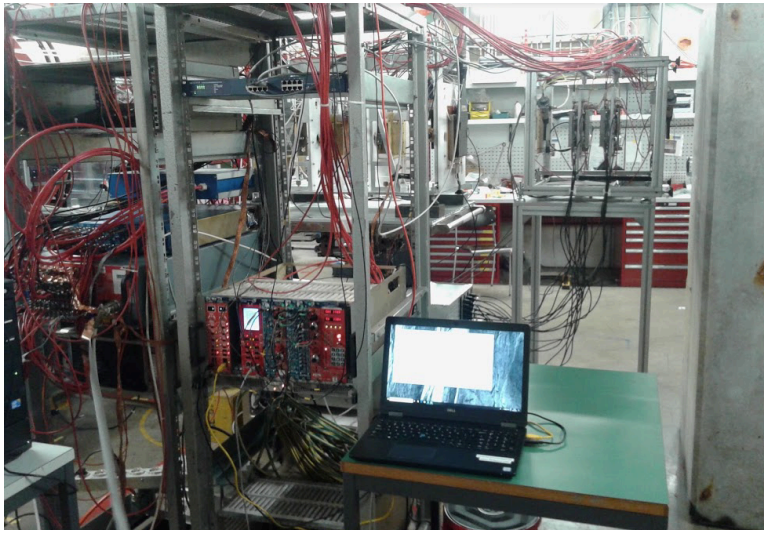
- Counting room quite small (place for max 6 people)
- Lemo cables from exp area to counting room → used for monitoring scintillator counting
- No other cable connection (Ethernet) → PCs (DAQ. DCA) in the area, remotely controlled from the CR

Test conditions

- Our setup was ~3 m downstream the beam focus, with two other systems upstream (Si and GEMs)
- Large beam divergence: rate difference between our first and last detector (50 cm apart) ~2.5
- SRS partially in the beam spot didn't work → had to move ~1m away

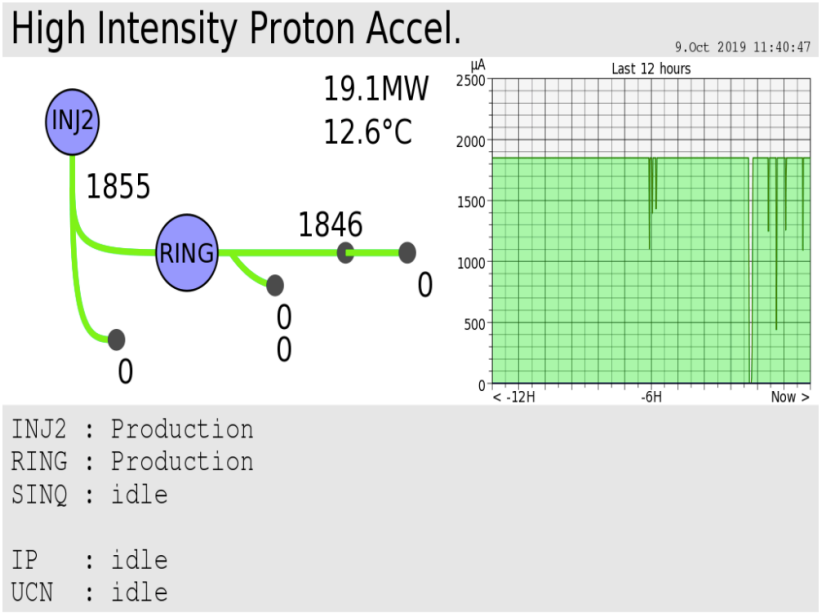


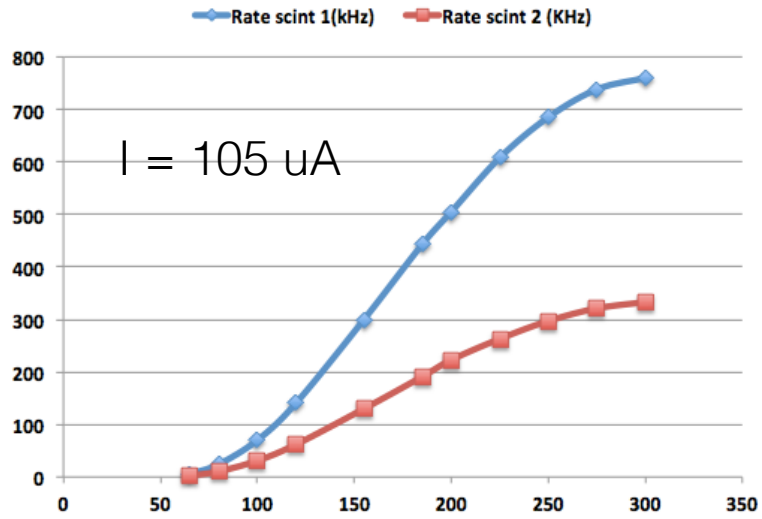




Beam conditions

- No (detector) beam monitor installed in the area. Beam intensity (in uA) available from the machine (online page)
- A slit system (4 slits: L,R, T, B) allows to reduce the beam intensity
- Continuous beam → highly efficient data taking

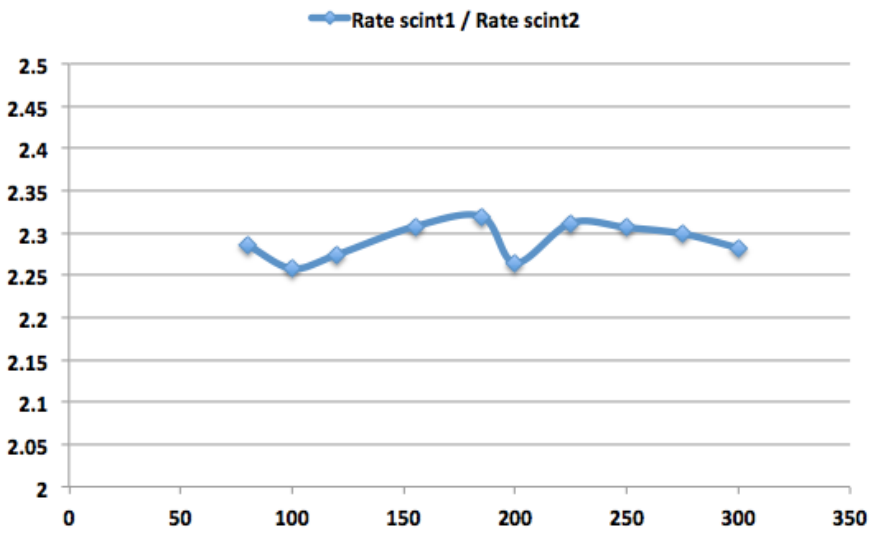


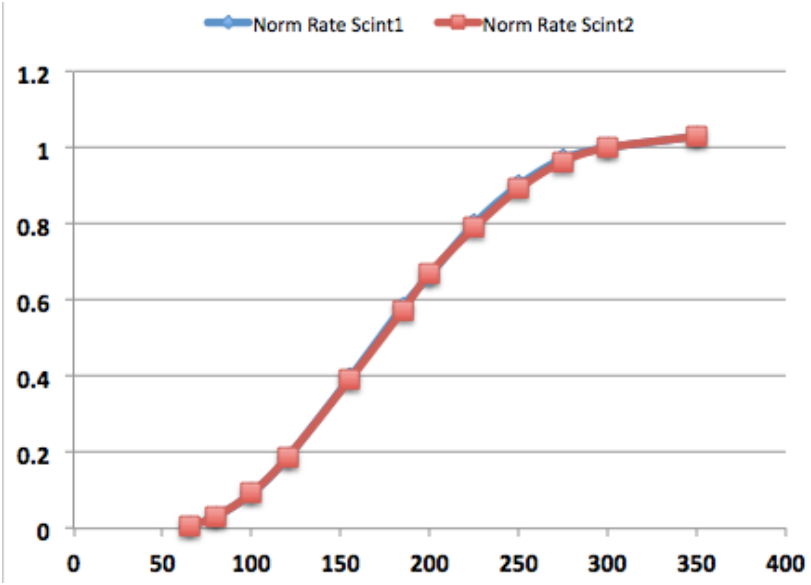


- We profited of the unstable and low intensity beam (105 uA fine scan; 1590 uA rough scan) during the MD on Wed. Oct. 2nd to calibrate the scintillator rate vs slit opening
- Distance between up- and down-stream scintillator ~490 mm

Beam conditions

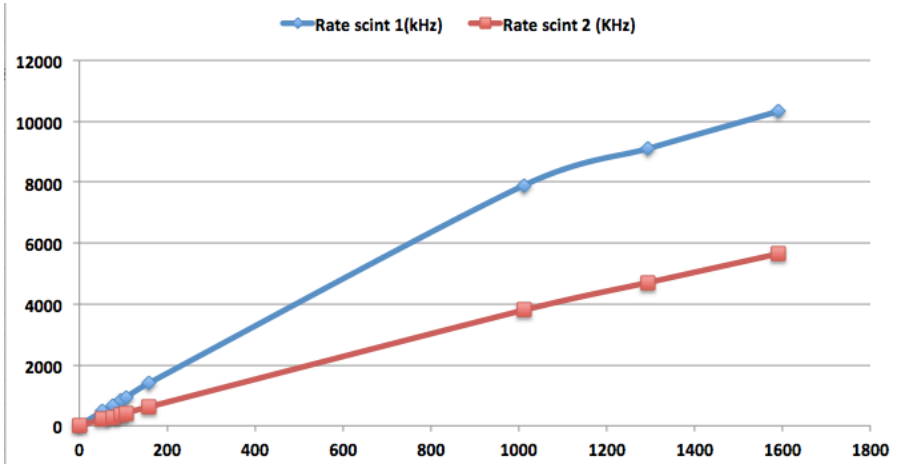
- Ratio between up and dwn scintillators ~constant (up to ~40 kHz/cm2 on up-stream scintillator) → no saturation
- Used as beam monitoring detectors at 'low' rate

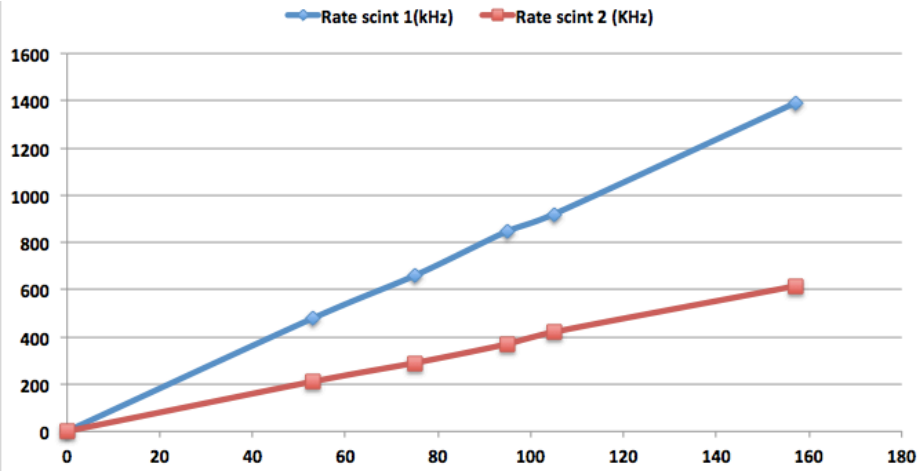




Rate vs beam intensity

- We also profited of the unstable beam during the MD on Wed. Oct. 2nd to calibrate the scintillator rate vs beam intensity at fix slit aperture of 300
- Unfortunately no point in-between 157 and 1012 uA
- Distance between up- and down-stream scintillator ~490 mm
- Linear response up to 160 uA (→ 14 kHz/cm2 on scint1; consistent with slit scan)
- Linear fit to the data points can be used to extrapolate the rate at higher intensity





Problems

- The maximum rate on our setup was much lower than expected
  - <200 kHz/cm2 vs max expected 10-20 MHz/cm2
  - Not ideal to test high rate performance of our MM-PAD detectors
  - Still useful to test the new prototypes (DLC-SBU) with particle beam
  - Main limitation: distance from the beam focus
- Very short stable beam time available: from Thursday to Sunday morning to be shared with other users
  - MD every week on Monday and from Mon to Wed every first Monday of the month → we didn't know about!
- Restaurant at PSI closes at 8:00 pm → we missed it almost every night!

Plans

- Good experience from the fist test beam at PSI, in spite of the encountered problems
- We are considering to apply for a slot in 2020, this time
  - Need to be closer to the magnet (beam focus)
  - Better take into account the MD schedule.

Many thanks to M. Poli Lerner, G. Bencivenni and colleagues for the Useful discussions and hints in preparation of the test period