



New Beam Profile Monitoring System for the Proton Irradiation Facility at the CERN PS East Area

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Overview



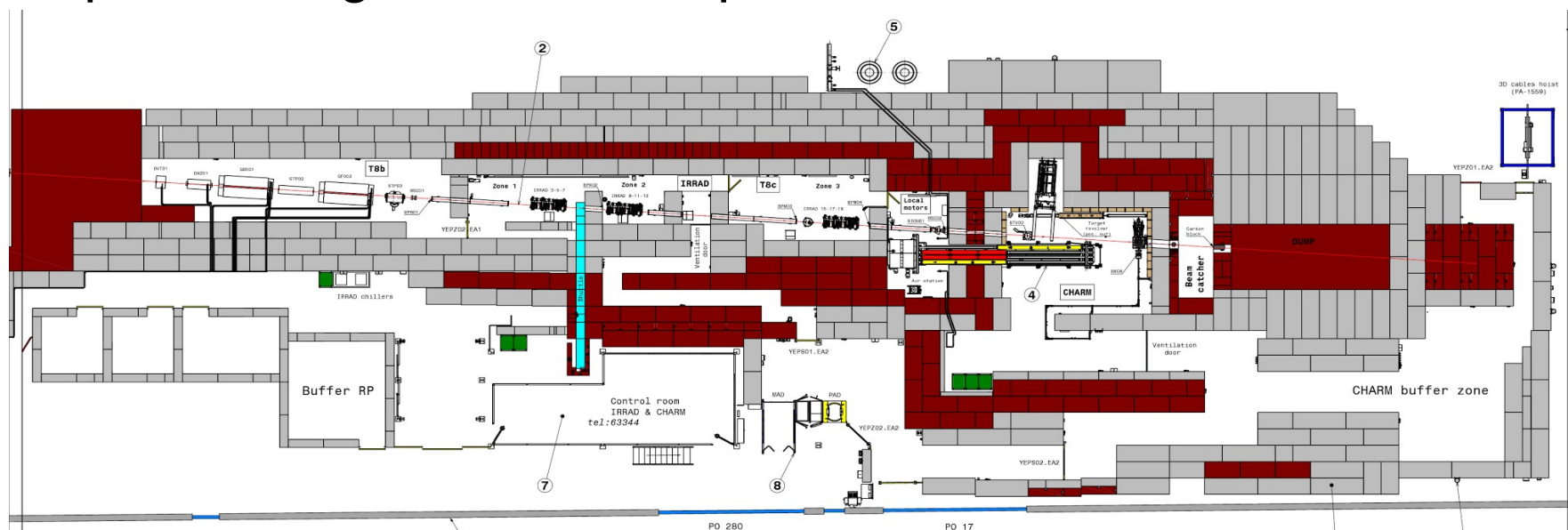
- Proton Synchrotron (PS) East Area Irradiation Facility
- New Beam Profile Monitoring (BPM) System
- System performance



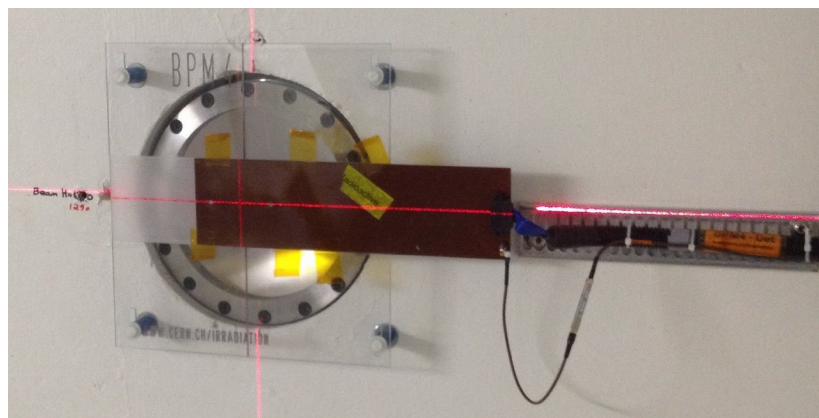
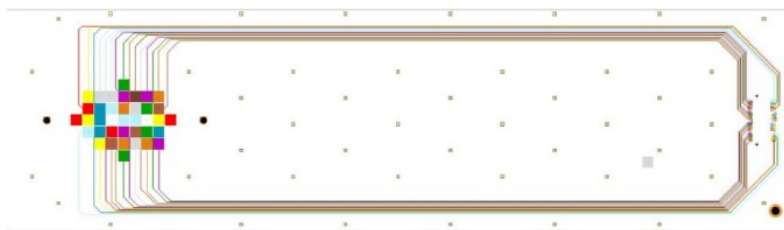
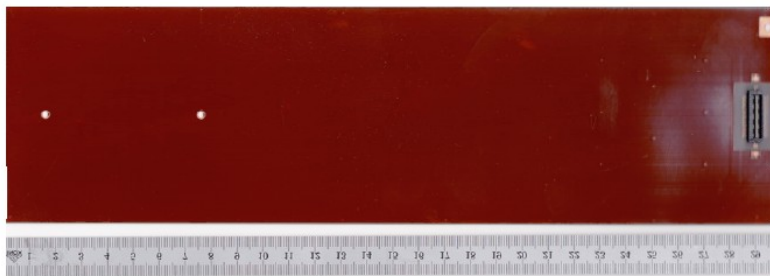
PS East Area Irradiation Facility



- Located in building 157 at CERN
- PS T8 beam line (24 GeV/c protons) dumped into PS East Area Irrad
- Several motorized tables available for movement into and out of the beam, and alignment
- New beam position monitors installed at these tables for precise alignment of samples in beam



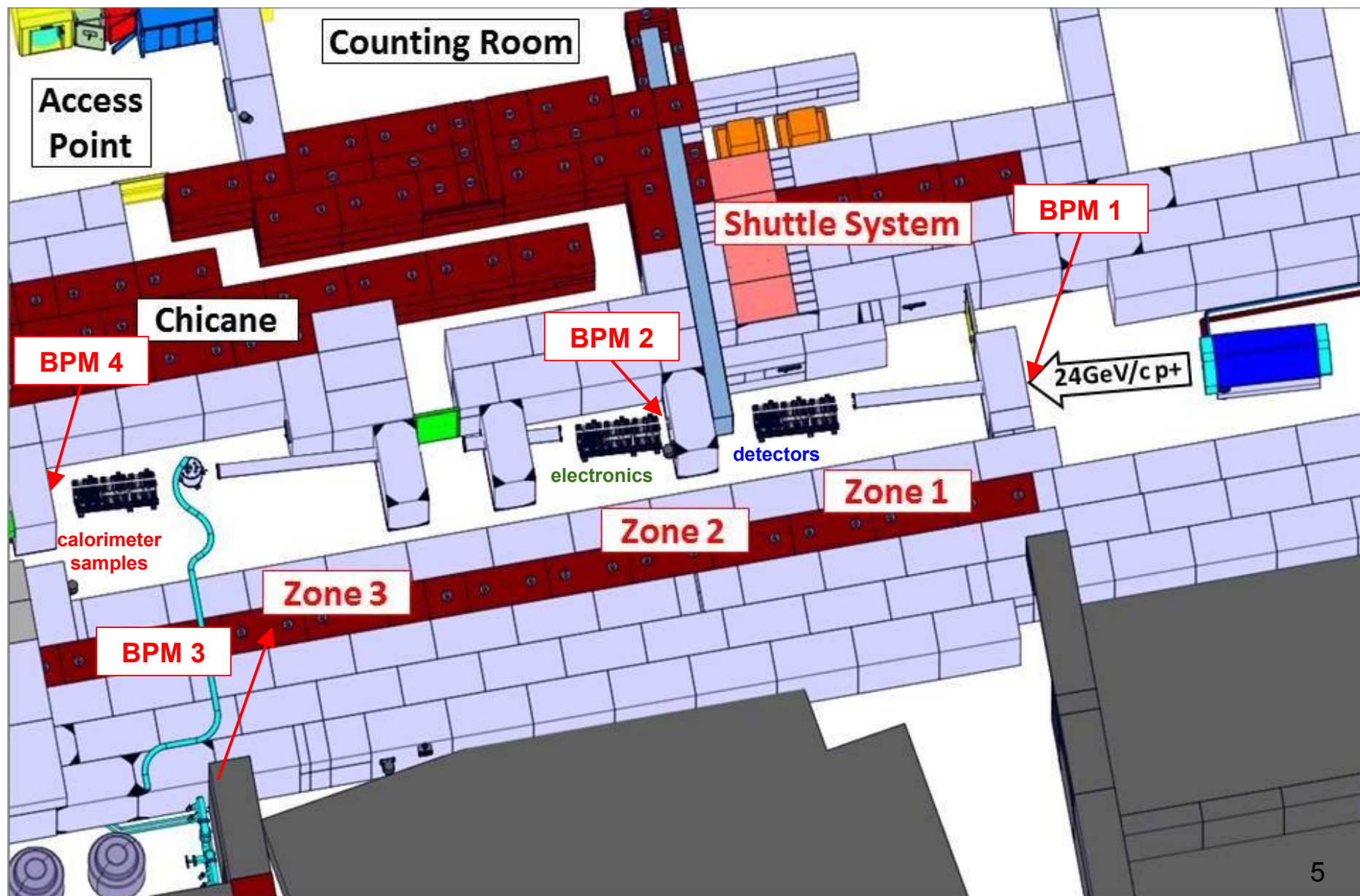
New Beam Profile Monitor Detector



- Principle of operation: high flux proton beams produce readily detectable charges (currents) in biased pads.
- 39 separate 4x4 mm² pads
- 0.5 mm spacing between pads
- Covers a 36 mm x 27 mm (x,y) area
- 6 Layer Kapton/Cu flex circuit
 - Top and bottom layer shields
 - Pads on internal layers connected through vias
- Pad thickness (Cu) 1.75 μm / layer
- Kapton thickness 120 μm / layer
- Overall thickness ~ 700 μm



Beam Profile Monitor Positions





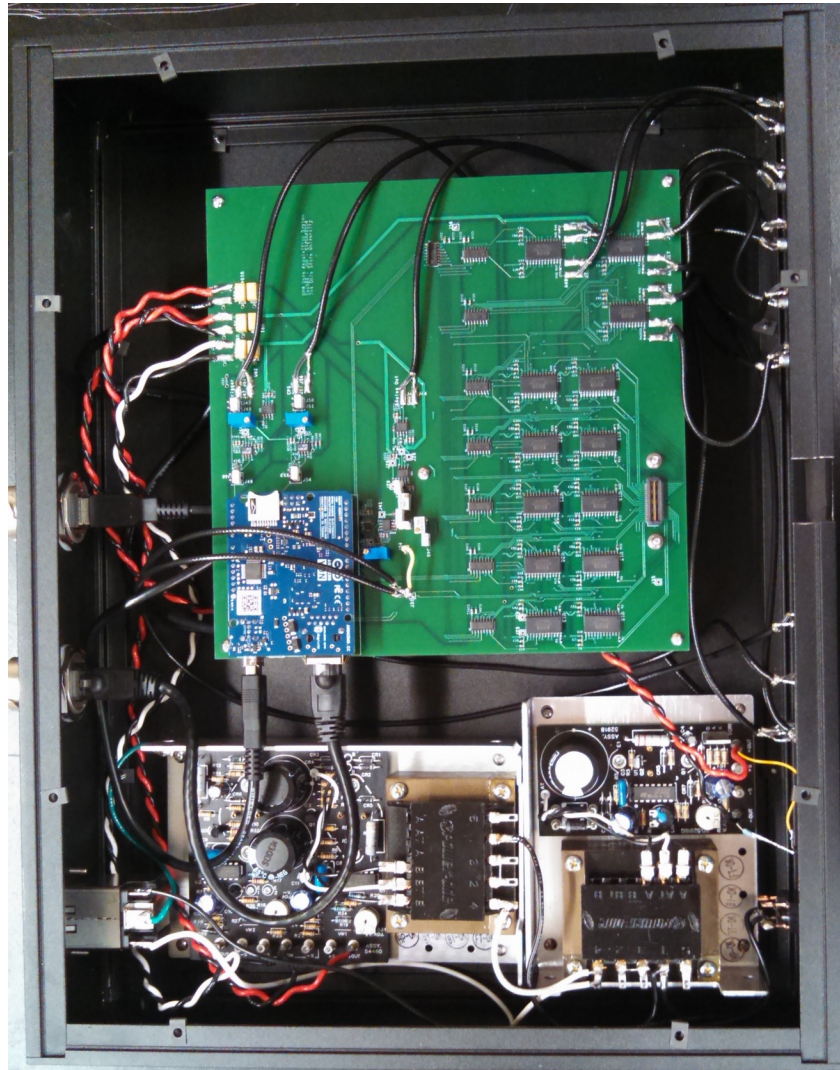
Data Acquisition System

- Digitizes BPM detector signals in the 10 pA to 500 pA
 - Dynamic Range Adjustable
- Uses commercial off the shelf, low-noise switched integrators to amplify the BPM signals
 - Texas Instruments ACF2101
- 50 Channels
 - 40 via a 20 meter mico-coaxial cable to the BPM detector
 - 10 auxiliary LEMOs





Data Acquisition System



- 16 bit ADC, 2-3 bits noise
- Controlled by an Arduino Yún
- Communicates data over Ethernet



Operation and Performance



- Beam positions are recorded in a database for later analysis
- Real time information posted to a website for users to check beam quality
- BPMs used by PS operators to tune the T8 beam
- Total flux through irradiated samples can be estimated using only the BPM data





Conclusion



- Updated facilities for 24 GeV/c proton irradiations at CERN are now operational
- Successful installation of four new BPM detectors and data acquisition systems provide real time feedback on the beam conditions and positioning of samples
- Updated database and software allows facility users to view current and historical profiles of the proton beam position and intensity