



Preparing for the Trento TB



A.S.

Aim

➔ Principal aim:

- Calibration and test of the Dose Profiler (DP) detector. After an initial phase of testing of DP response using high energy protons, an inter-calibration of the SiPMs response will be made followed by a working point study and an efficiency study (using protons of different energies).

➔ Side activities:

- Test of MONDO prototype (Penelope) on proton beam with two different readouts (FBK and MultiAnode). Aim of the test is to measure the detector response (charge) using protons of different energies.
- Test of FOOT ToF/DE detectors (Margherita and Scintillator Wall). Aim of the test is to measure the time and energy loss resolution performances of the detectors that are foreseen in FOOT.

➔ The three activities are organised in order to proceed in parallel, with top priority given to the DP related studies.

Mechanics

- **z**: beam axis, **y** vertical axis, **x** horizontal axis
- Orange Table: movable from remote only along x.
- Green Table: fixed table (placed in the figure with the small side along z. can be also placed with **long** side along z)

→ Detectors:

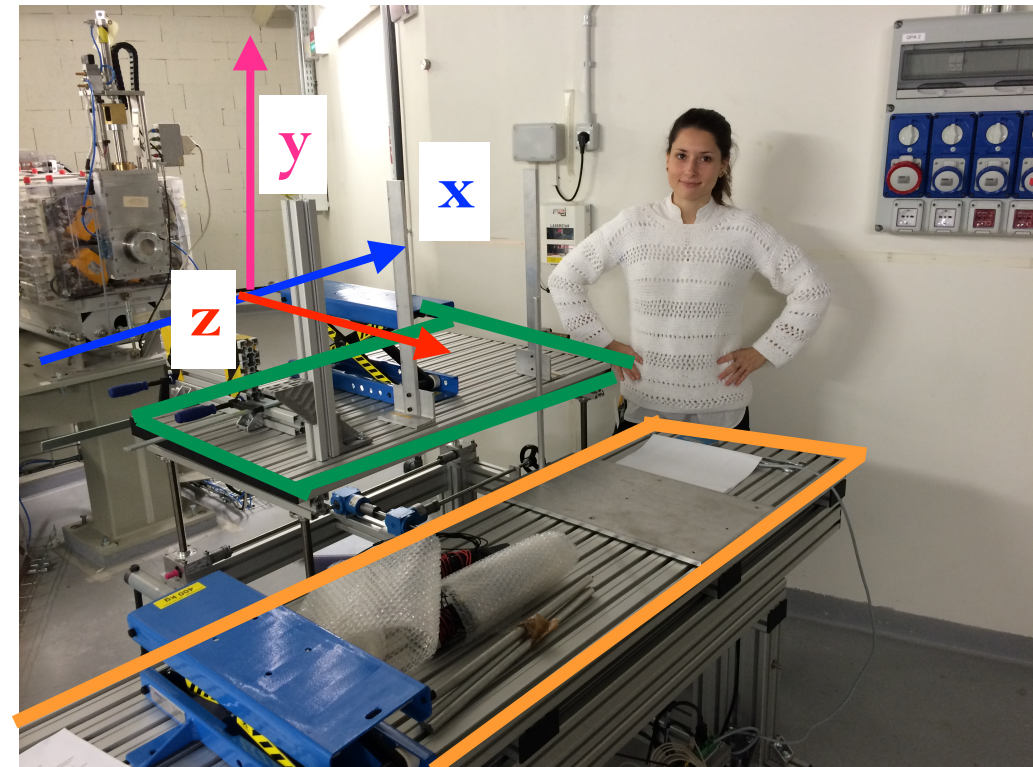
- 2 STS for rough tof/
triggering measurements.

- Penelope

- Pisa Scint.

- Margherita

- Profiler



Beam

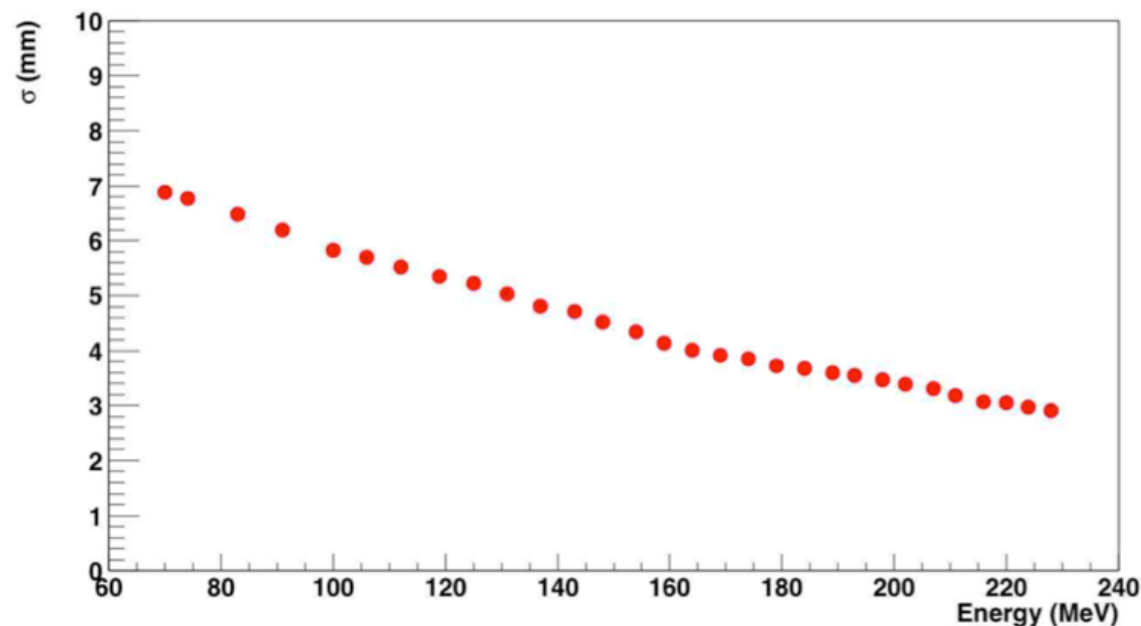
→ Available beam time:

- **5*3 h** : from 19 to 22 mon - fri.
- 4 h sat morning.

→ Protons.

Below 70 MeV one can use a plastic degrader with different thick. to achieve the following energies (starting from a 70 MeV beam):

- 5 mm > 64 MeV
- 10 mm -> 58 MeV
- 16 mm -> 51 MeV
- 20 mm -> 46 MeV
- 25 mm -> 37 MeV



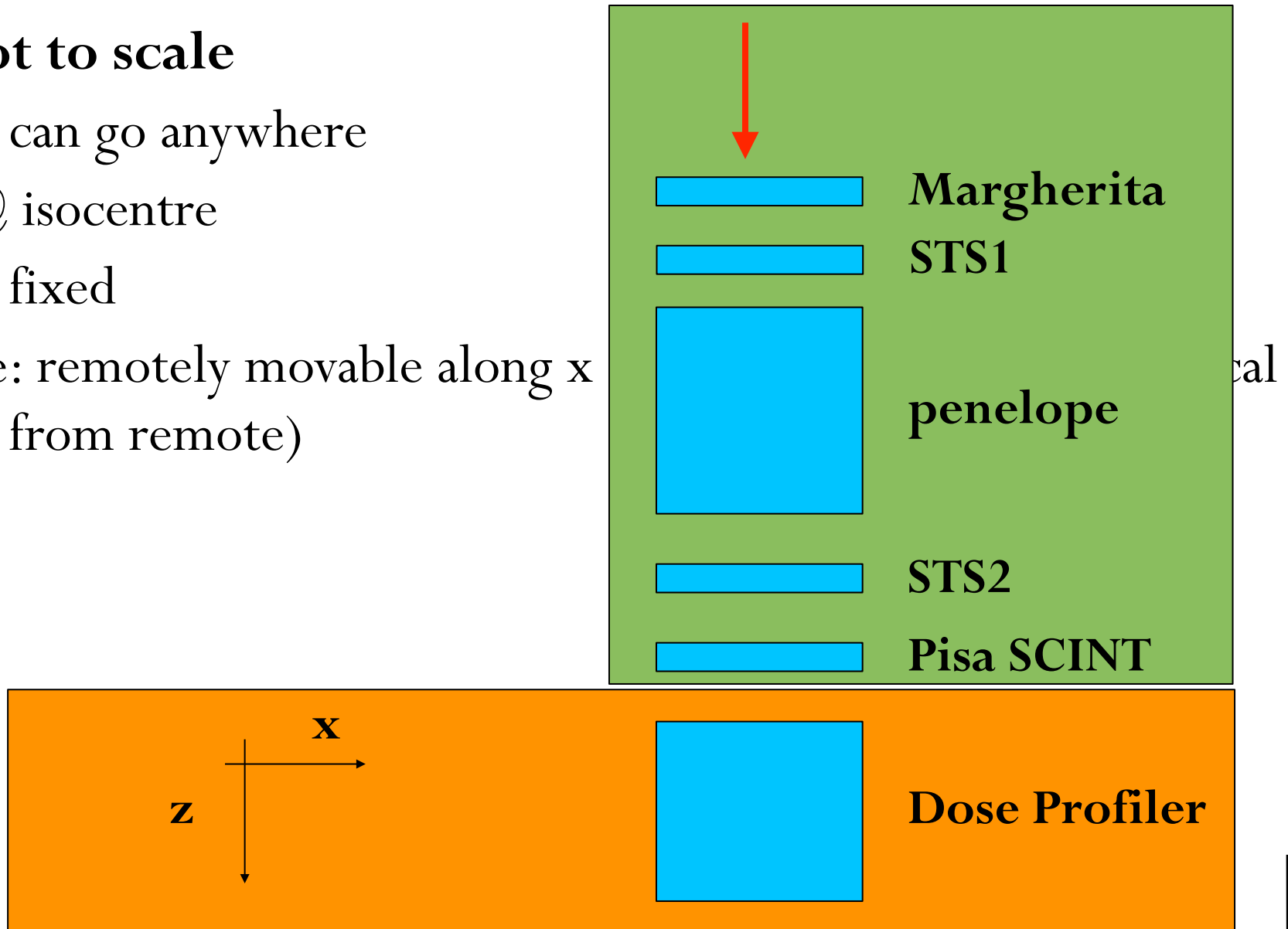
Thicknesses: Margherita 250 μm , STS 1cm each, Penelope 5 cm, SCINTs 3mm each.

Total th before Dose Profiler: 7.325 cm (different materials!!!)

The lowest interesting energy set is defined by the energy of the protons traversing Margherita + STSs + Penelope + SCINTs from Pisa... so it is really unlikely that we will need to go below 70 MeVs

A possible setup

- Top view, **not to scale**
- Pisa SCINTs can go anywhere
- Penelope: (@ isocentre
- Green table: fixed
- Orange table: remotely movable along x axis] but not from remote)



Going in parallel!

- ➔ Profiler: 1 dedicated DAQ
- ➔ FOOT measurements: Margherita: VME & Scope (2 independent DAQ)
- ➔ Penelope: VME (shared with Margherita) and FBK (independent)
- ➔ PISA scint: MEG daq
- ➔ A total of 5 independent DAQs will be running. It is ok as we have 8 eth. sockets connected from the patch panel (in cave - control room).
- ➔ The Margherita signals will have to be split if we want to have them in the different DAQs (PISA, Scope, VME). So far, Margherita is the only detector that seems to go in different places (Scope, VME SBAI, Pisa). The other detectors are independent.
- ➔ There is no clear evidence, for now, for the need of sync. or interdependence of the different DAQs. Each DAQ can have its own trigger and different trigger strategies can be implemented. IF there's a need to 'connect' some DAQs, we need to carefully design the system, to propagate the signals.

Close up on.. DP

→ The #teamProfiler DP measurement goals are:

- See the protons :) This will be accomplished with our first day of data. We will arrive @ Trento with a working point optimised using cosmic rays. After a quick update of the working parameters (needed to possibly adapt the thresholds to the new environment) an inter-calibration of the gain of the different SiPMs will be performed to equalise the charge response of all the channels
- day 2-3 Optimise the working point in a treatment like scenario (protons of ≤ 100 MeV): a scan as a function of the global setting parameters will be performed trying to optimise the overall detector response (tracking efficiency vs noise)
- day 4-5-6 Evaluate the DP response (efficiency) as a function of the protons energy and inter-plane calibration @ different angles.

Scan in y will have to be performed changing the DP height by hand (shut down the beam, enter the cave, change y, cave closure, beam request)

Close up on... FOOT

→ Margherita detector:

- We need to measure the timing response of the detector. Currently 3 different DAQs are under discussion: the VME - SBAI, the Scope, the integration with the Pisa one (to measure ToF resolution for FOOT)

→ Pisa SCINTs:

- Both timing and energy response for different proton energies will be of interest. There's no need of a real 'ToF' measurements: the timing resolution would be enough to assess the capabilities of the ToF measurement technology foreseen in FOOT. The SCINTs can therefore be placed everywhere.

Close up on MONDO

→ Penelope:

- The detector response (charge) for different proton energies will be of interest: we can have access only to the last dynode of the multianode (integrated signal of ALL the pixels).
- The FBK readout will be available only on a small detector portion ($0.5 \times 1 \text{ cm}^2$): crucial is the positioning with respect to the beam (detector should be placed @isocentre to ease the positioning).
- A measurement of the detector efficiency will be performed using the two STSs detector. Attention has to be made to design the trigger strategy in order to minimise the impact of multiple incoming particle occurrence and the possible relative bias on the detector efficiency measurements (underestimation of denominator).

Simulation

- ➔ Currently V. Giacometti is taking care of understanding what happens to the protons of different energy that go through the full setup and then reach the DP. We need to know:
 - The energy @ different detector entrance windows
 - The MS undergone by the protons and the spot size @ different detectors.

Tentative schedule

→ 7 May:

- @6 AM: departure from SBAI
- @13 arrival @Trento
- Until 19: setup of the mechanics

→ 8 May:

- morning: Setup of different DAQs
- @18: be ready for beam

Tentative schedule

→ 9-10-11-12 May:

- morning: Data analysis
- @14:30: meeting to understand where we are
- @18: be ready for beam

→ 13 May:

- morning: Last beam time.
- @14: lunch
- @15: radiation checks [performed with F. Tommasino], pack up
- @20: last supper

→ 14 May:

- In the morning: heading back home.