Status of the FLUKA machine models from the RP locations to the DS for IP1 and IP5

Outline:

- The FLUKA LHC models framework;
- The Totem Roman-Pot geometry model for FLUKA;
- Integration of the Totem Roman-Pot in the IR5 model;
- Missing information;
- Time schedule definition;
- Conclusions.

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The FLUKA LHC models

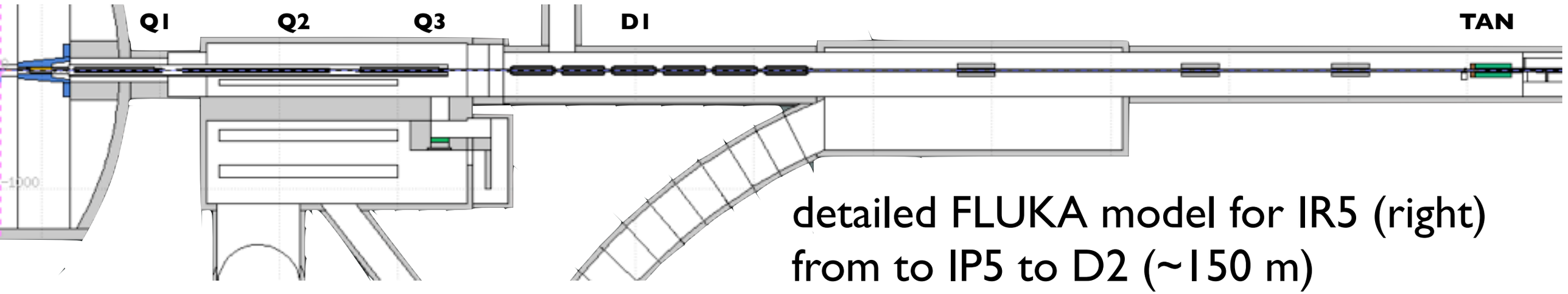
Preparation and construction of the machine models:

- The areas around IP1 and IP5 were already studied in details for different cases (TCT accidental scenario, quenching of the triplet etc...);
- Totem and ALFA roman pots were not considered up to now;
- We will use a new framework for the automatic preparation of the model (builder + element database + TWISS files).

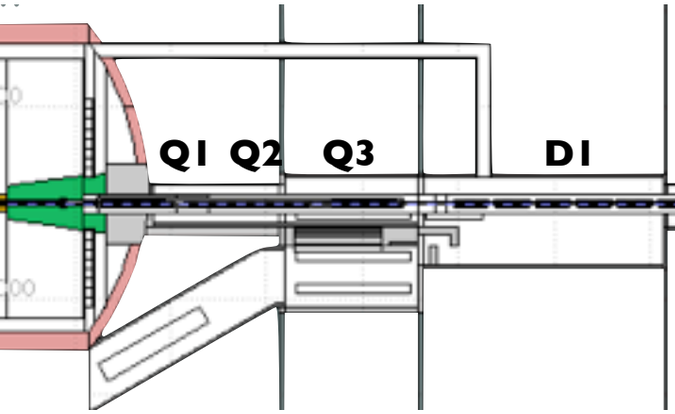
Totem and ALFA will be treated from us as collimators as they are:

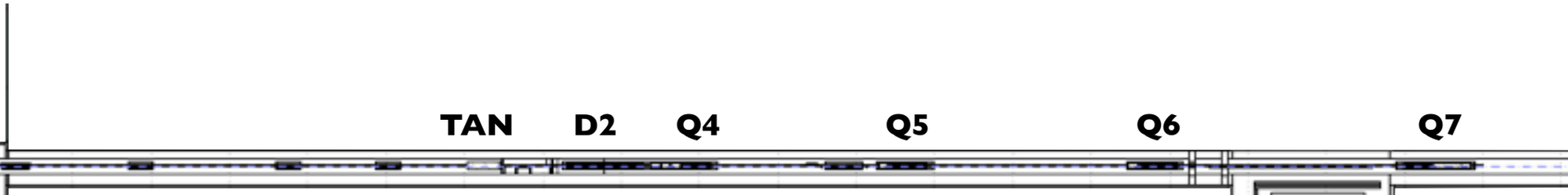
- Moving devices;
- On a single beam;
- Asymmetric (i.e. external IR5.right, internal for IR5.left).

Examples IR5 and IR1

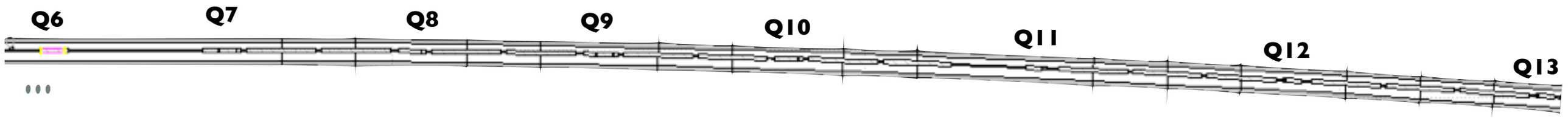


detailed FLUKA model for IR5 (right) from to IP5 to D2 (~150 m)





detailed FLUKA model for IR1 (right) from to IP1 to the beginning of the DS (~280 m)

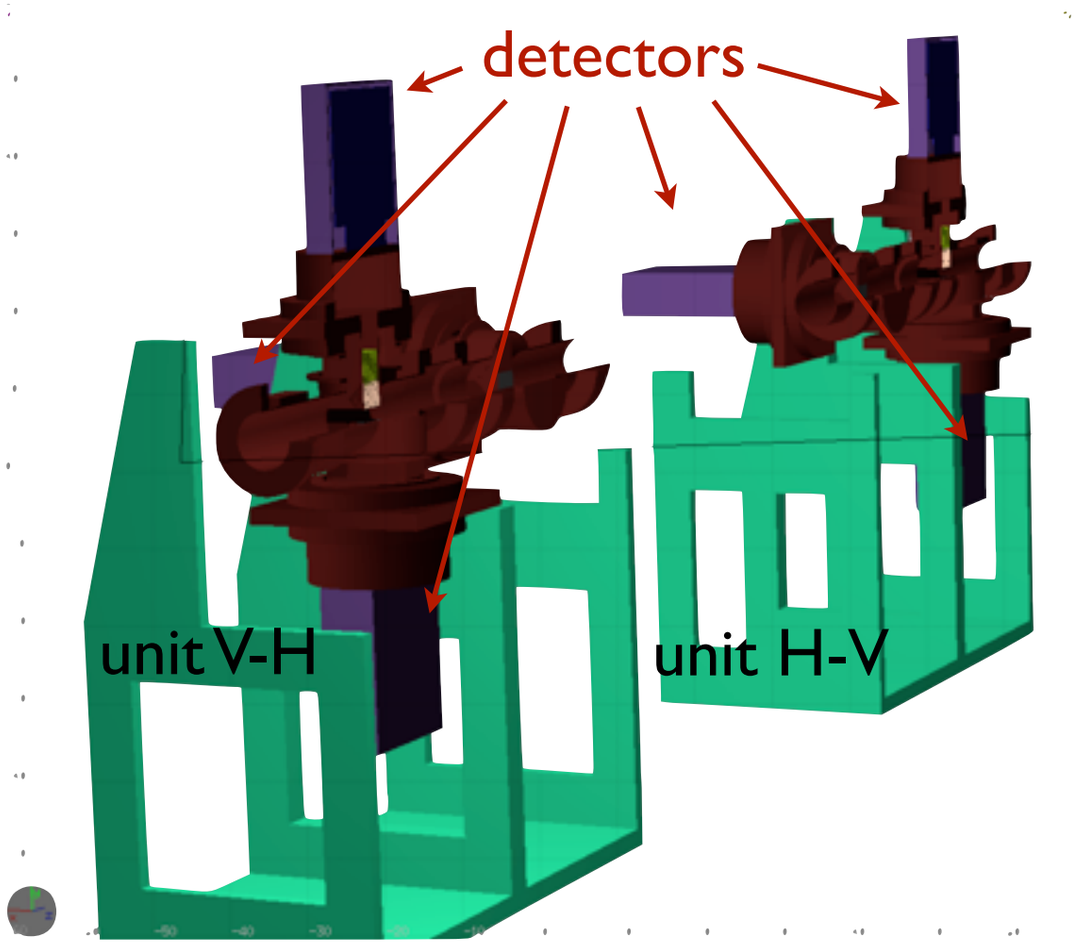


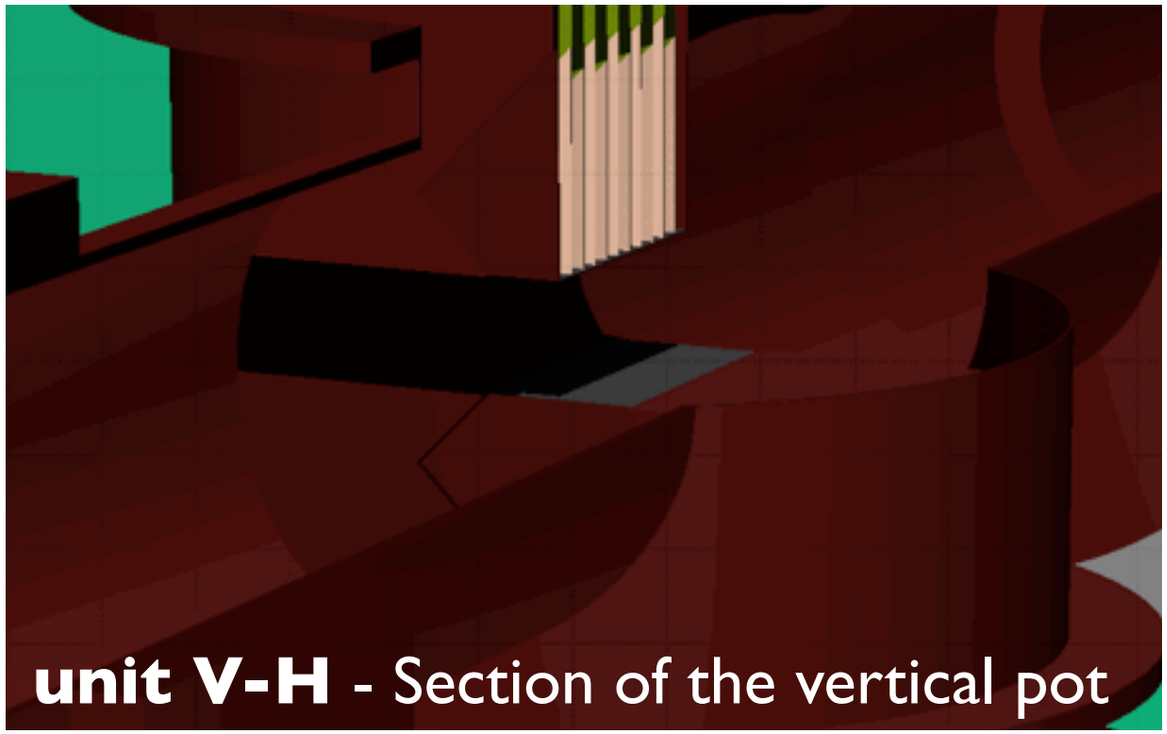
The new LHC models FLUKA framework can extend the IR1and IR5 models to an arbitrary place in the machine (here IR5 right from Q6 to Q13).

The Totem RP FLUKA model

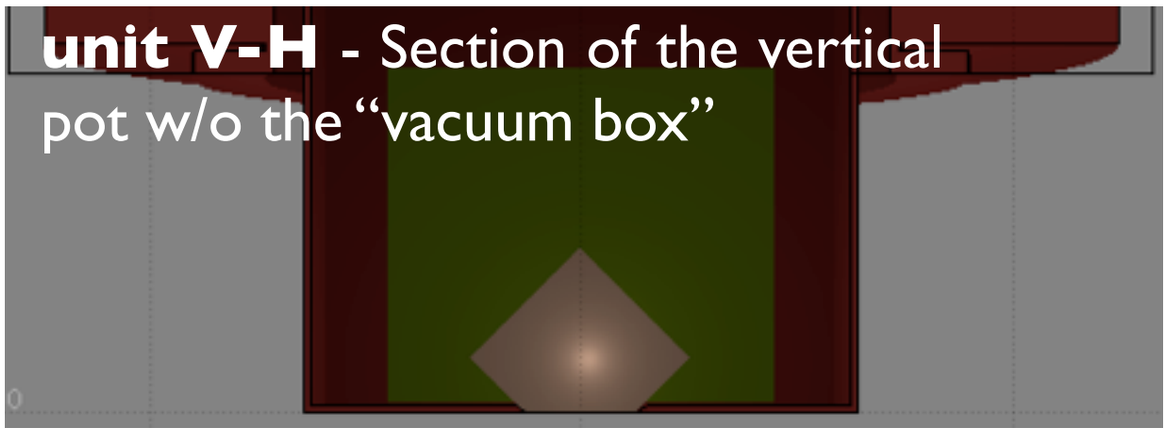
Totem Detector model (V.Boccone and F.Ravotti)

- The Roman Pot model was redone from scratch using the production drawing;
- Modular approach: the models of the two units (V-H and H-V) and the detector are independent;
  - Easy integration in the new LHC Fluka framework (seen as a collimator);
  - Can be used as a stand-alone model;
- Only the relevant details were included;
- More details can be added on request.



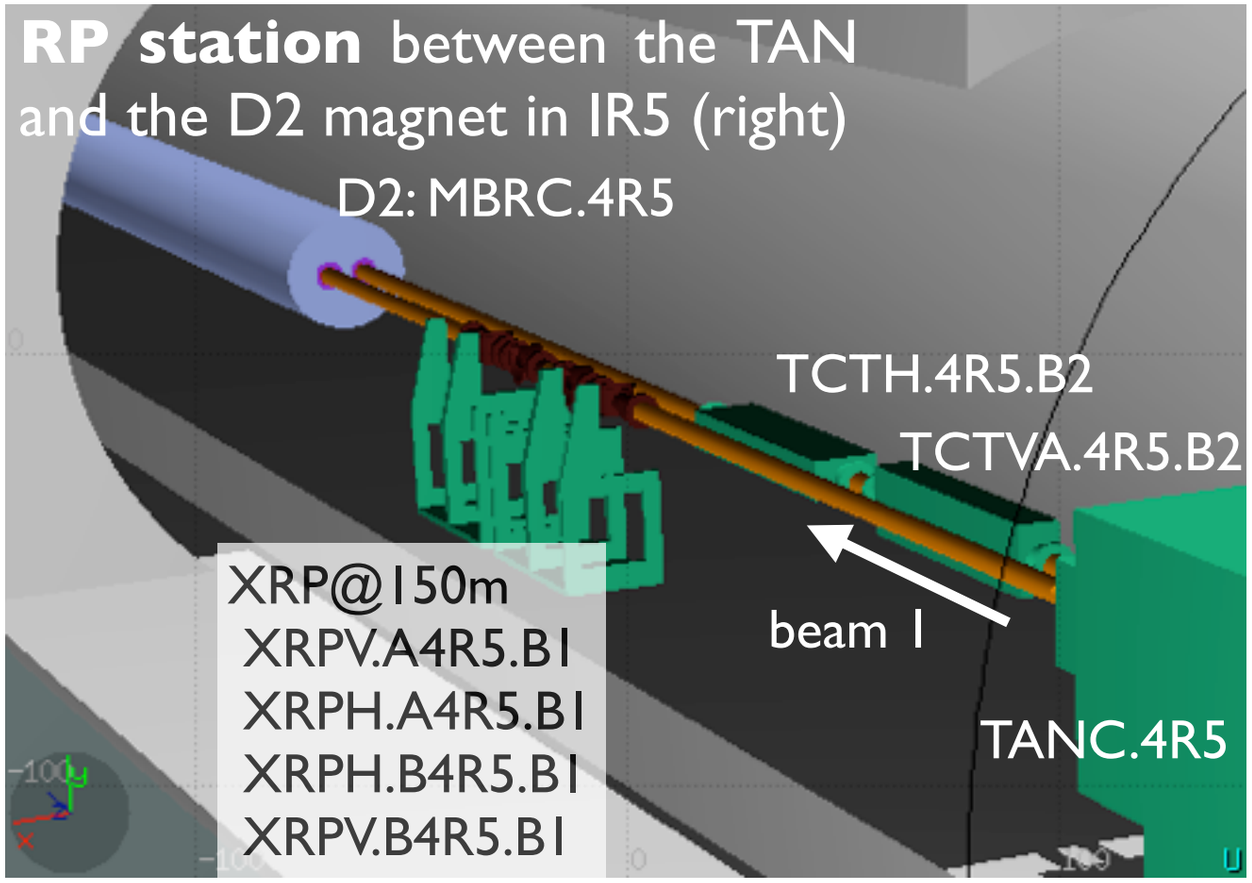


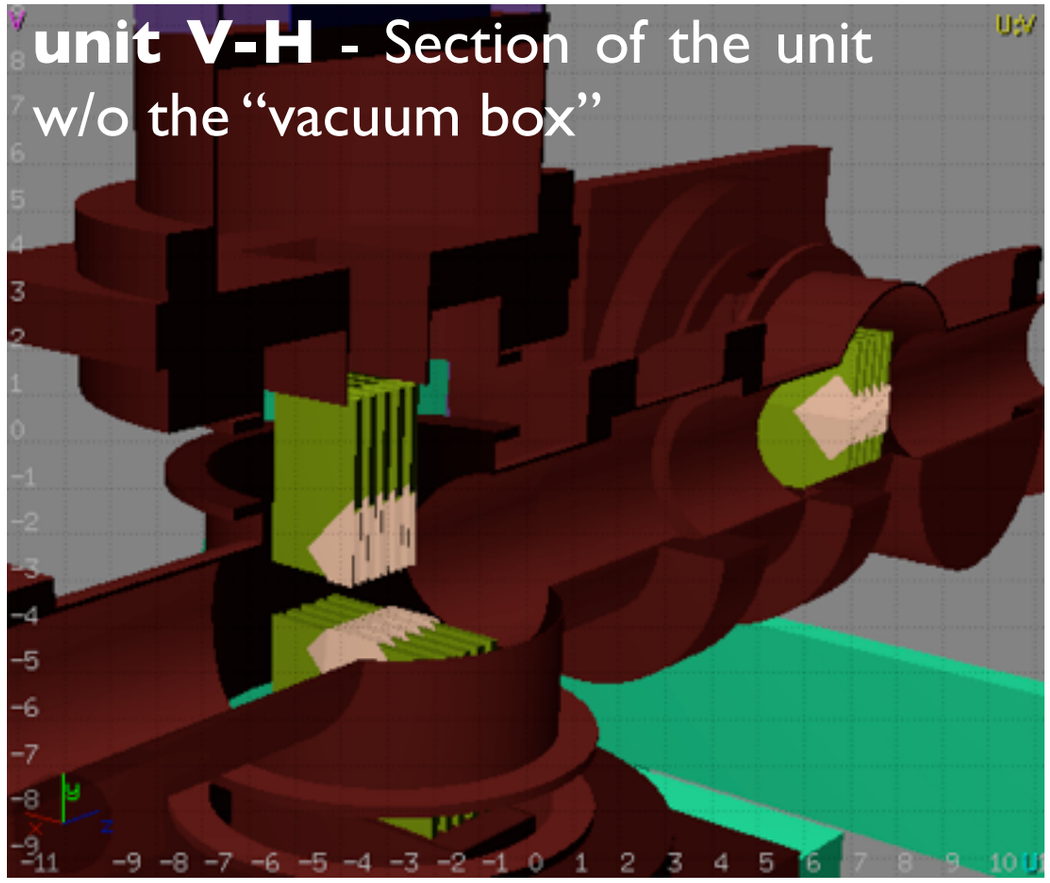
unit V-H - Section of the vertical pot

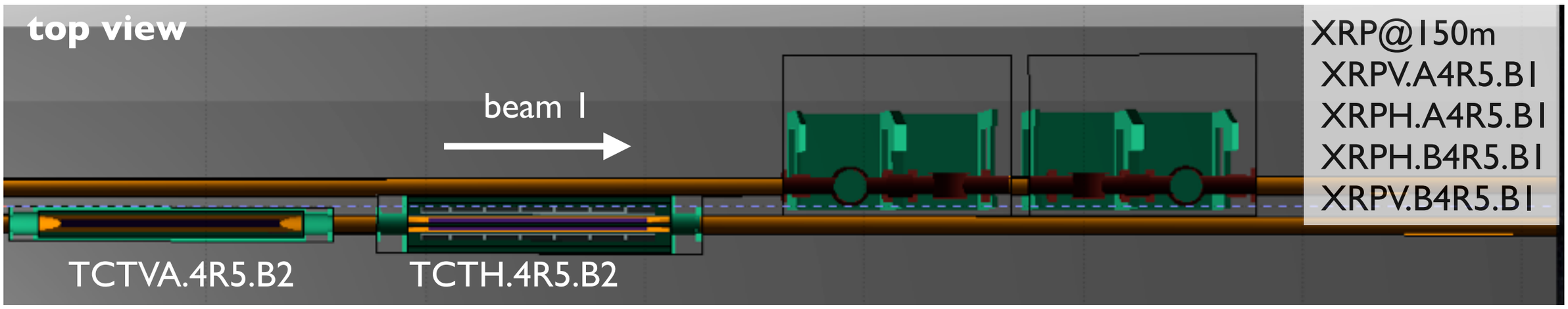


unit V-H - Section of the vertical pot w/o the "vacuum box"

Integration in the IR5 model







BLMs, RadMon and other detectors (together with the relevant simulated responses) can be easily added to the model on request.

Missing information

Requirements:

Mandatory

- for ALFA and Totem:
  - Define the accidental scenarios and the requests (together with MPP);
  - Define the optics cases:
    - Complete thick lens TWISS files (B1 and B2) or in alternative the madX script to generate them;
    - Any beam offset in respect to the ideal orbit?
    - Normalization factor (physics case, number of impinging protons)
    - Aperture/position of the detector in respect to the beam.
- for ALFA only:
  - Is the Totem RP-station valid for ALFA?
  - Detector model, integration and drawings;
  - **We need a contact person for the detector, the drawings, the materials etc...;**

Optional

- Question: Will there be any help in the design of the FLUKA model of the detector from the ALFA/Atlas collaboration?

Time schedule definition

Once the necessary information is received (and the RomanPot models are ready):

Preparation of the model ~1-2 weeks FTE (for Totem **OR** ALFA)

- Includes test of the scoring (energy deposition, dose);
- If reworking of the geometry is required it can go up to 3 weeks FTE.

Simulations (depends on the specific case)

- The time needed for the simulation dramatically depends on the case to simulate (and the up to where we extend the model);
  - i.e. a simple case of ideal direct beam impinging on RP window and quenching study of the DS magnets can take easily >2 months;
- Our approach to the problem will also depends on the case.

Analysis of the results (~1-2 weeks FTE)

- Check statistics;
- Power deposition on the sensitive/critical devices;
- The interaction and the involvement of the MPP and the experiments are required.

Conclusions

- Together with F.Ravotti (PH-DT) we already introduced the Totem Roman Pot Units and its detector in our Fluka Element Data Base.
- The RP were already included in the new P1 and P5 model (w/o inner detector).

- Before deciding the strategy for simulation we need to define:
  - the contact persons for ALFA and Totem for integration, detector, and optics;
  - the contact person for the machine to define the accidental case;
  - the input parameters (optics, physics case, etc....);
  - the MPP requests (devices at risk, etc...);