

Robustness test of carbon collimators

Material destruction tests

Helmut Vincke TIS-RP

Due to the location (TT40) which is planned to be used for these tests, both tests do not comply with the **PRP17**:

Radiation Protection Procedure concerning Radiation Safety rules for Test Irradiations of Materials and Components at CERN

This procedure foresees only three locations for these tests:

- Isolde
- PS East Area
- SPS-TCC2

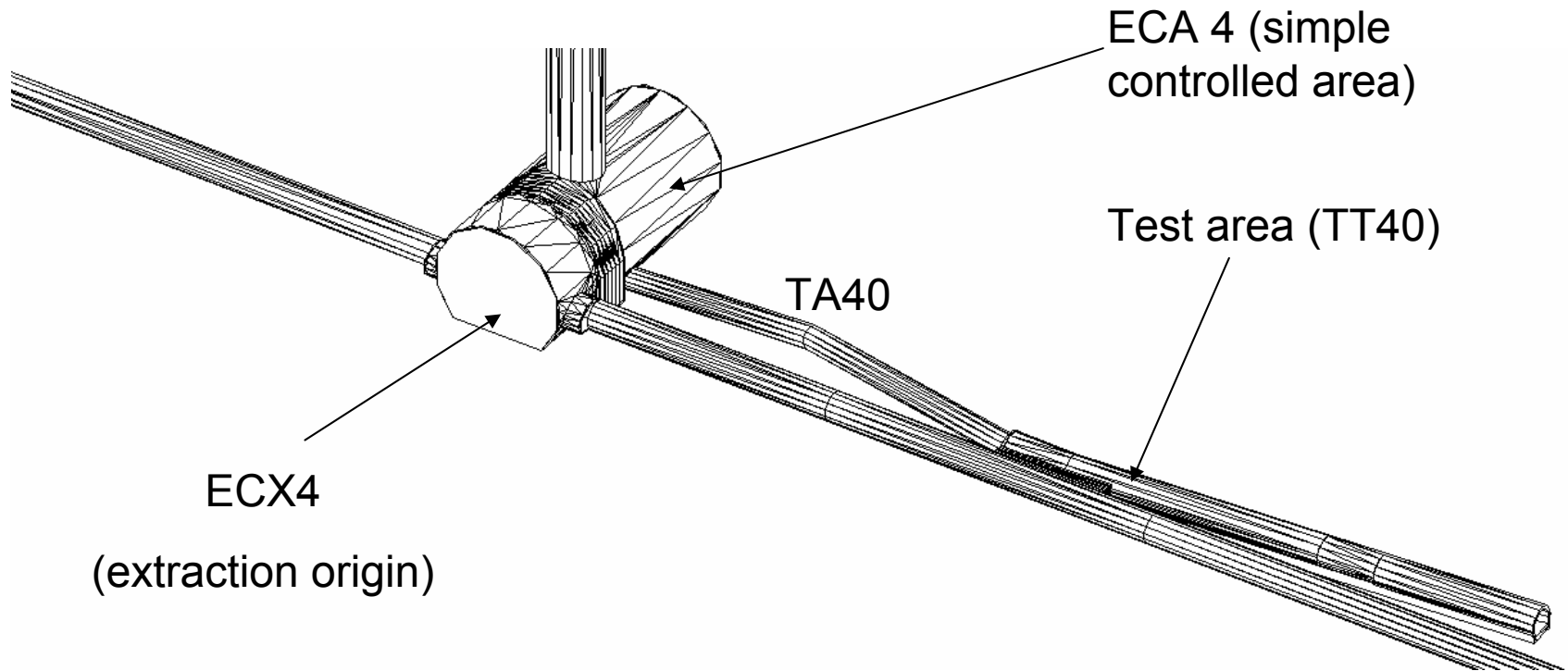
Rough radiation assessment for the robustness tests

beam parameter:

intensity: $3E13$ protons in about 20s \rightarrow $1.5E12$ p/s

momentum: 450 GeV/c

integral intensity: up to 10 shots \rightarrow $3E14$ protons



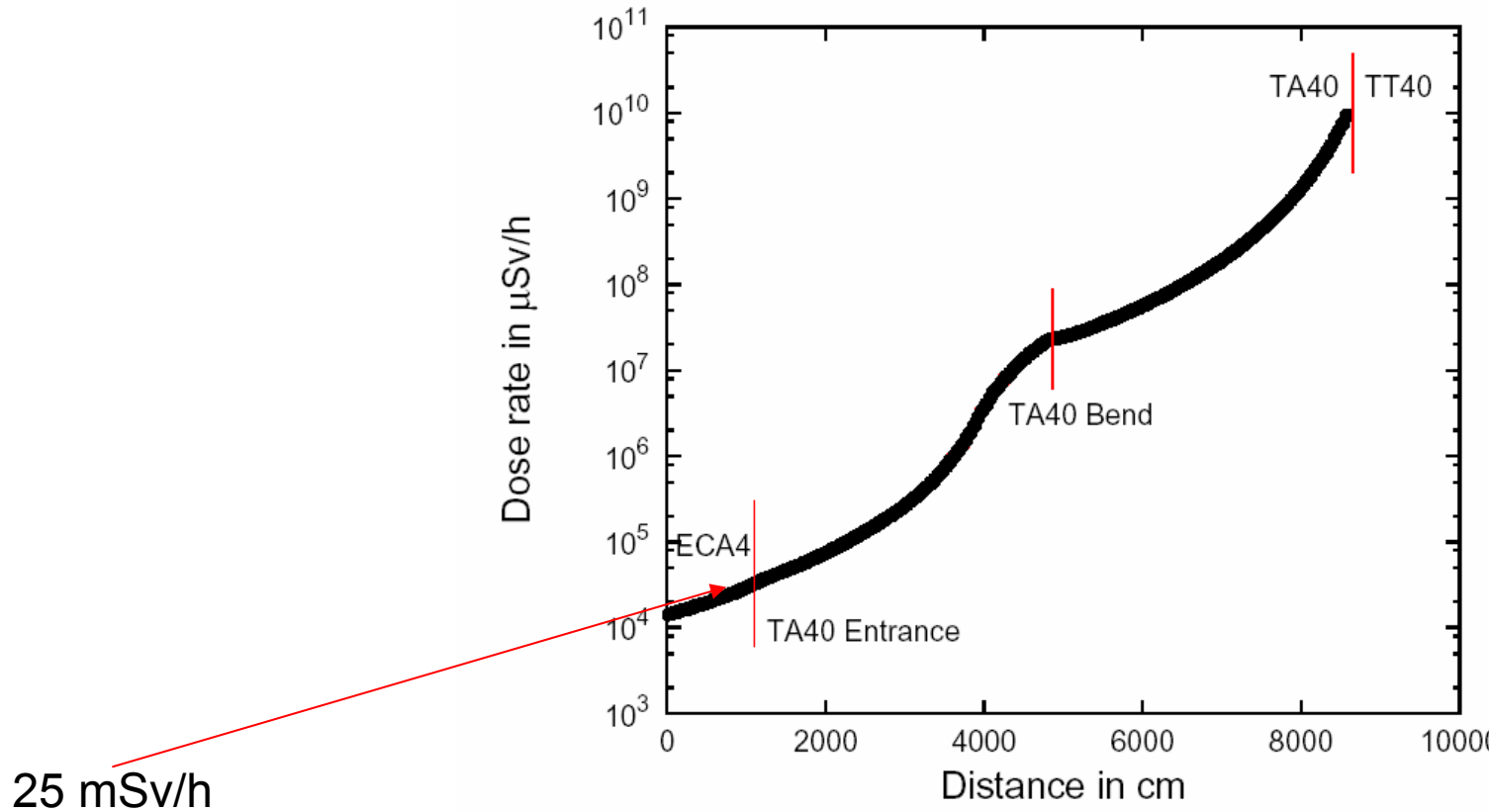
Prompt radiation

Rough assessment achieved by the use of two papers:

- 1) Studies of the Dose Rate in ECA4 due to Beam Losses in TT40,
Graham R. Stevenson and Helmut Vincke
- 2) Radiation in ECA4 caused by beam losses in the dummy protection unit installed in ECX4, *Helmut Vincke, Graham R. Stevenson, Doris Forkel-Wirth*

Four steps to achieve result

Step 1) Dose rate in ECA4 in case of a CNGS beam loss ($1.2E13p/s$) in an optimum target at the **beginning** of TT40:



Step 2) Attenuation between collimator position (close to TED) and position of the loss point used for optimum target calculation: ~ factor 100

Step 3) Scaling of the intensity from $1.2E13p/s$ to $1.5E12p/s$: factor 8

→ → 32 $\mu\text{Sv/h}$

Step 4) Plus additional dose rate coming from ECX 4 (extraction origin) in case we assume a loss rate of 0.1 % in LSS4 protection unit: ~ 5 $\mu\text{Sv/h}$

→ → Rough estimate of dose rate of 37 $\mu\text{Sv/h}$ during test operation

Access to ECA4 should be closed during test operation

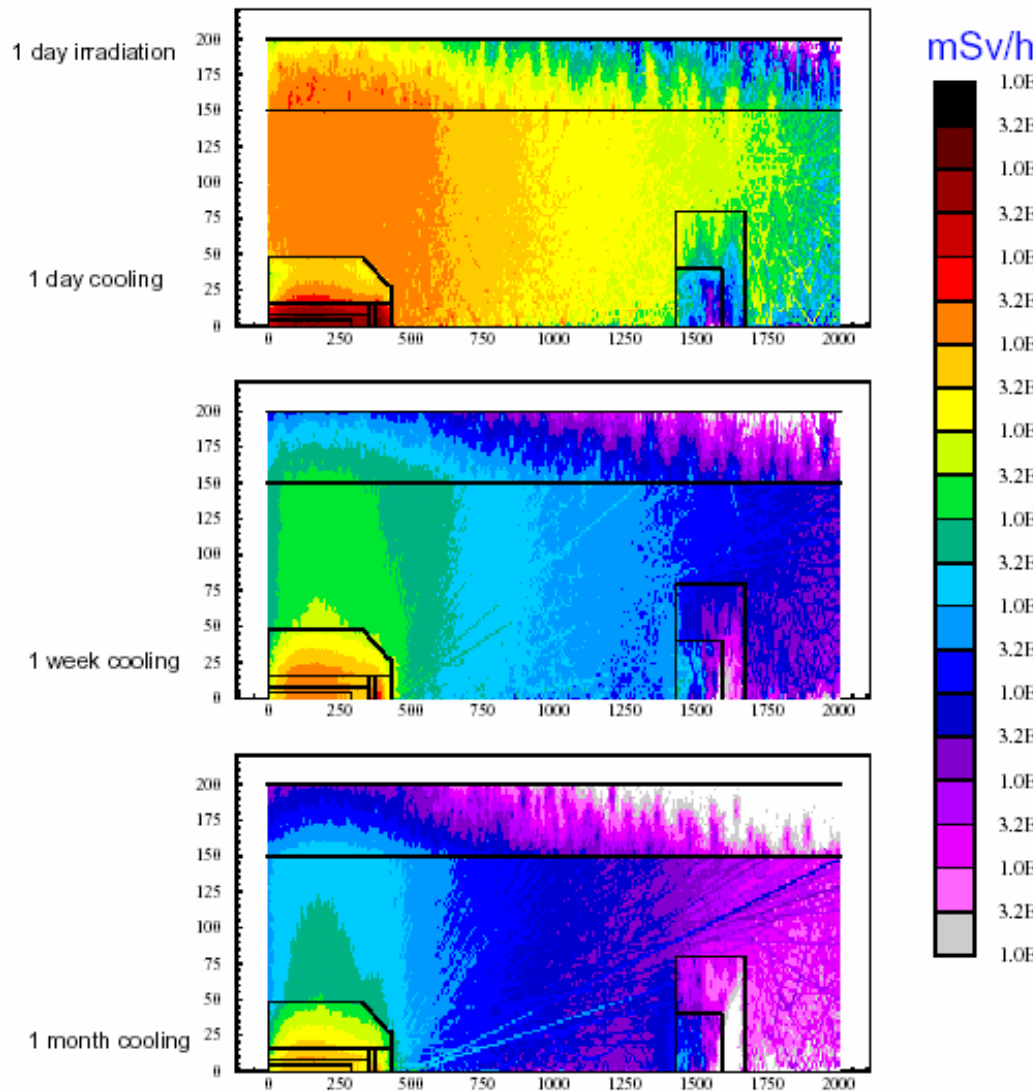
Remnant dose of surroundings after test

Rough estimate over dump operation
scenario which lasts one day

Integrated intensity: $5.4E14$ protons

In order to apply these results
to our scenario, 24 hours
have to be added to the
shown cooling time.

Test operation has to be
performed under vacuum in order
to prevent ignition of carbon



Material destruction tests

- Experimenter has to find out if he/she can take results of previously performed tests to achieve given goals.

Radiation assessment

- If test position and intensity is similar to the one of the robustness tests the prompt dose rate in ECA4 can be assumed to be similar to the one of robustness test → access to ECA4 should not be permitted.
- much higher contamination risk → test has to be performed in confined area. Required parameters concerning this confinement have to be defined

General requirements for all tests

Test area (floor, wall) has to be painted to facilitate contamination tests and (if required) decontamination.

Obey the guidelines given in PRP 17

(see: <https://edms.cern.ch/file/338324/1/PRP17.doc>)

This paper gives details about:

- Irradiation permit
- TIS and RSO has to be informed
- Work has to be performed according to ALARA
- Composition of irradiated materials must be known → traceability
- Log book concerning details of irradiation
- Post irradiation procedures of material