

# **Linac4 collimation**

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3<sup>rd</sup> SPL workshop, 11-13<sup>th</sup> November 2009

# Linac4 Collimation

- Used halo distribution at 23m downstream of the last PIMS module of Linac4.
- This distribution represents 3% of the total beam particles.
- Beam power of 7.7kW, 2Hz of operation.
- Estimated
  - required gaps for adjustable rectangular collimators (in each transverse plane and separated by ~5 cm) located at ~23m from the PIMS.
  - Dose rates in surrounding areas
- If required, local shielding of collimators can be designed once the acceptable cooling time is decided

**Collimator jaws made of graphite** (low Z material to avoid excessive neutron generation). Length of each jaw set to 20cm.

**Half gaps for each jaw absorbing same power:**

10W: x-hgap=1.28cm, y-hgap=2.25cm

25W: x-hgap=1.15cm, y-hgap=1.80cm

50W: x-hgap=1.08cm, y-hgap=1.46cm

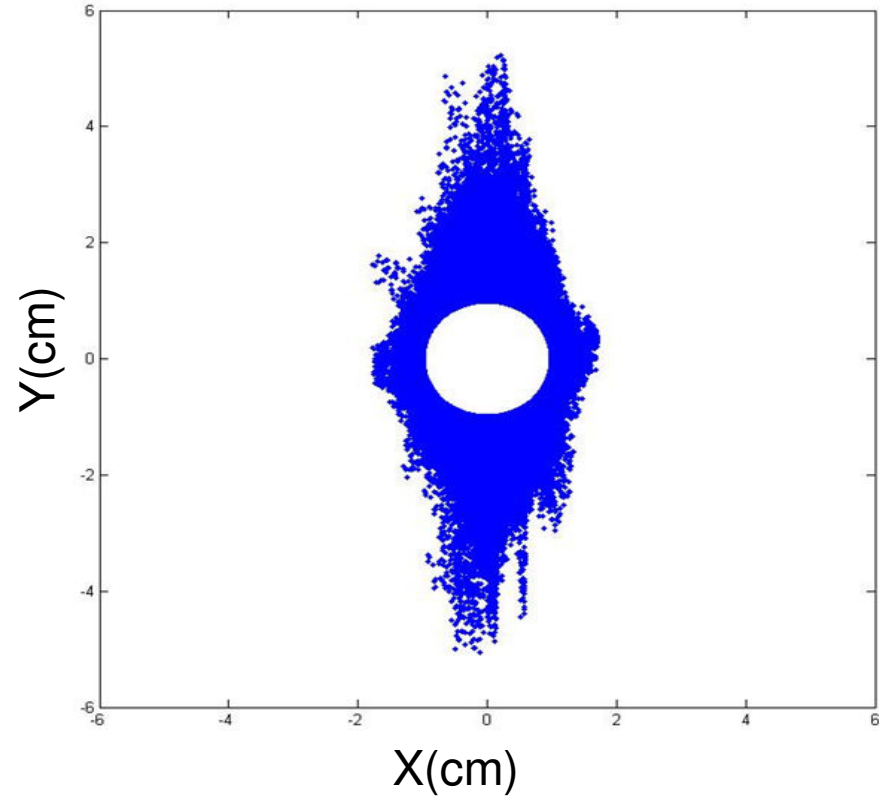
**Equal half gaps:**

10W: x-hgap=1.89cm, y-hgap=1.89cm

25W: x-hgap=1.48cm, y-hgap=1.48cm

50W: x-hgap=1.24cm, y-hgap=1.24cm

Halo distribution at 23m downstream of the last PIMS module of Linac4.



All 10W absorbed by the vertical jaws

96% of the 25W absorbed by the vertical jaws

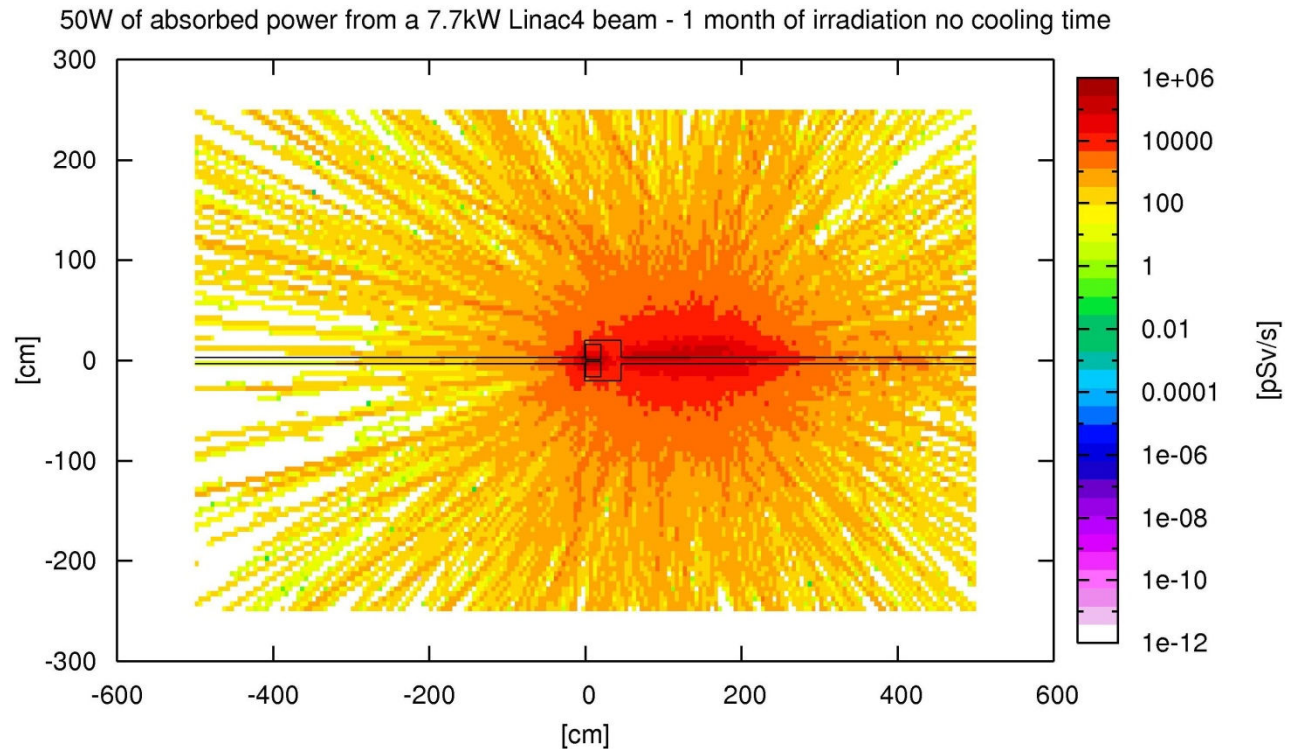
86% of the 50W absorbed by the vertical jaws

Equivalent radiation dose rate after 1 month of operation at 2Hz for 50W power absorption. Dose rate values are similar at 25W and 10W power absorption.

Max equivalent radiation dose rate: 540  $\mu\text{Sv/h}$

Max equiv. rad. dose rate 1 m away radially: 4  $\mu\text{Sv/h}$

**Right after 1 month of constant operation**

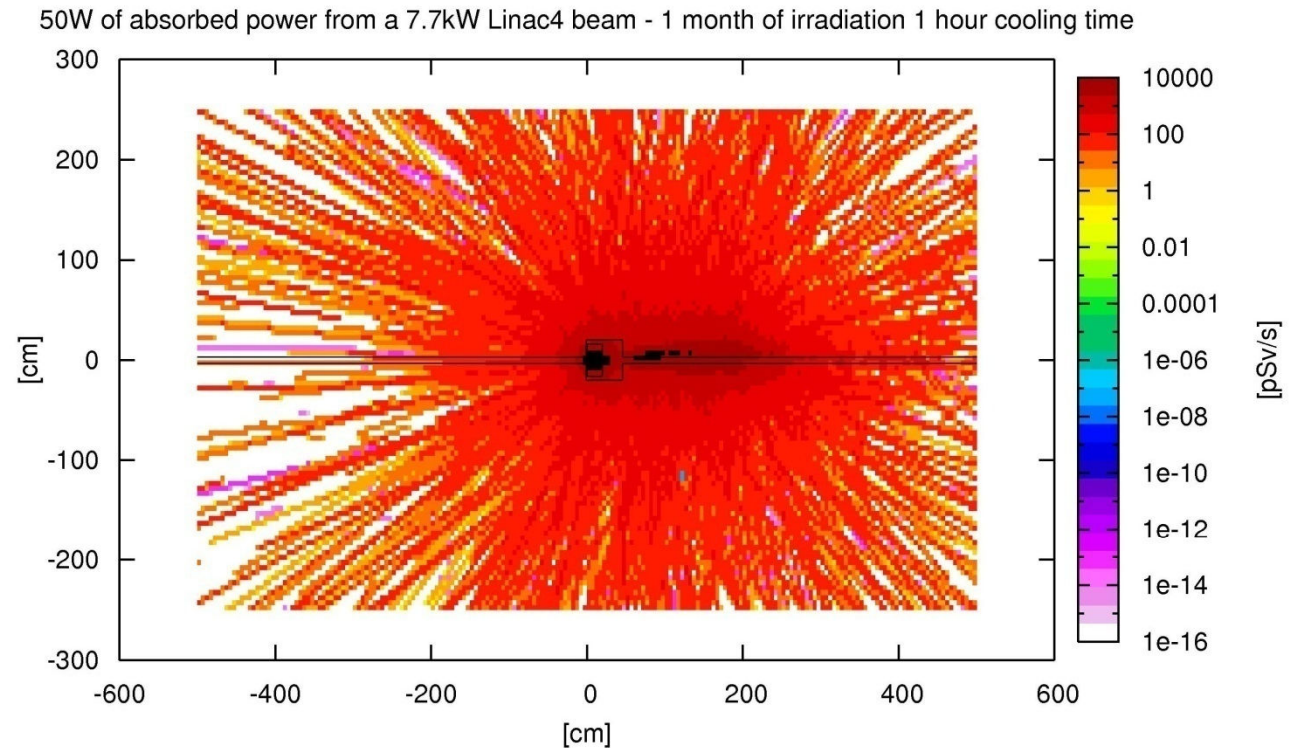


Equivalent radiation dose rate after 1 month of operation at 2Hz for 50W power absorption. Dose rate values are similar at 25W and 10W power absorption.

Max equivalent radiation dose rate: 35  $\mu\text{Sv/h}$

Max equiv. rad. dose rate 1 m away radially: 2  $\mu\text{Sv/h}$

### After 1 hour cooling time

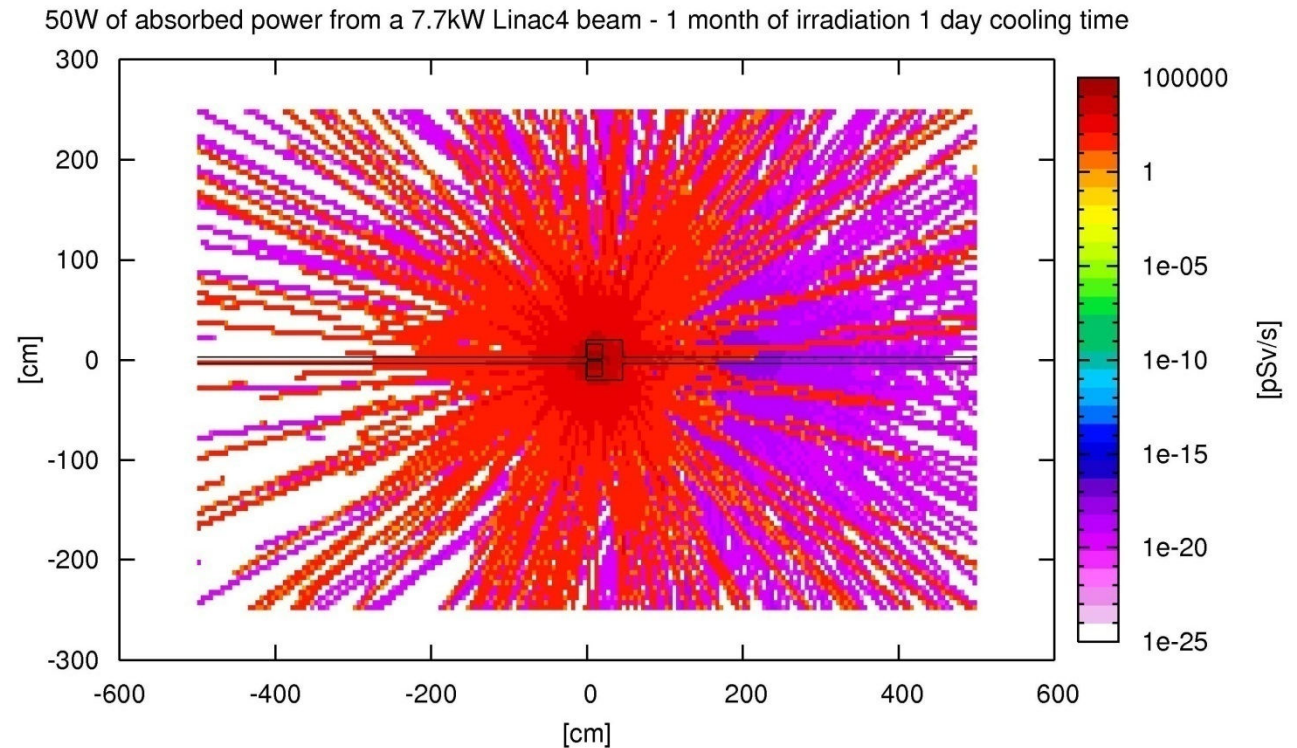


Equivalent radiation dose rate after 1 month of operation at 2Hz for 50W power absorption. Dose rate values are similar at 25W and 10W power absorption.

Max equivalent radiation dose rate: 15  $\mu\text{Sv/h}$

Max equiv. rad. dose rate 1 m away radially: 2  $\mu\text{Sv/h}$

**After 1 day cooling time**



## **Summary and outlook:**

Once a location has been set a more detailed simulation will define the residual dose rates, absorbed dose for neighbouring components and activation of collimator jaws.

In case we want to avoid some components to absorb more dose than it should, local shielding options would be studied.

Another collimator at a different phase will be needed in order to properly collimate the beam.