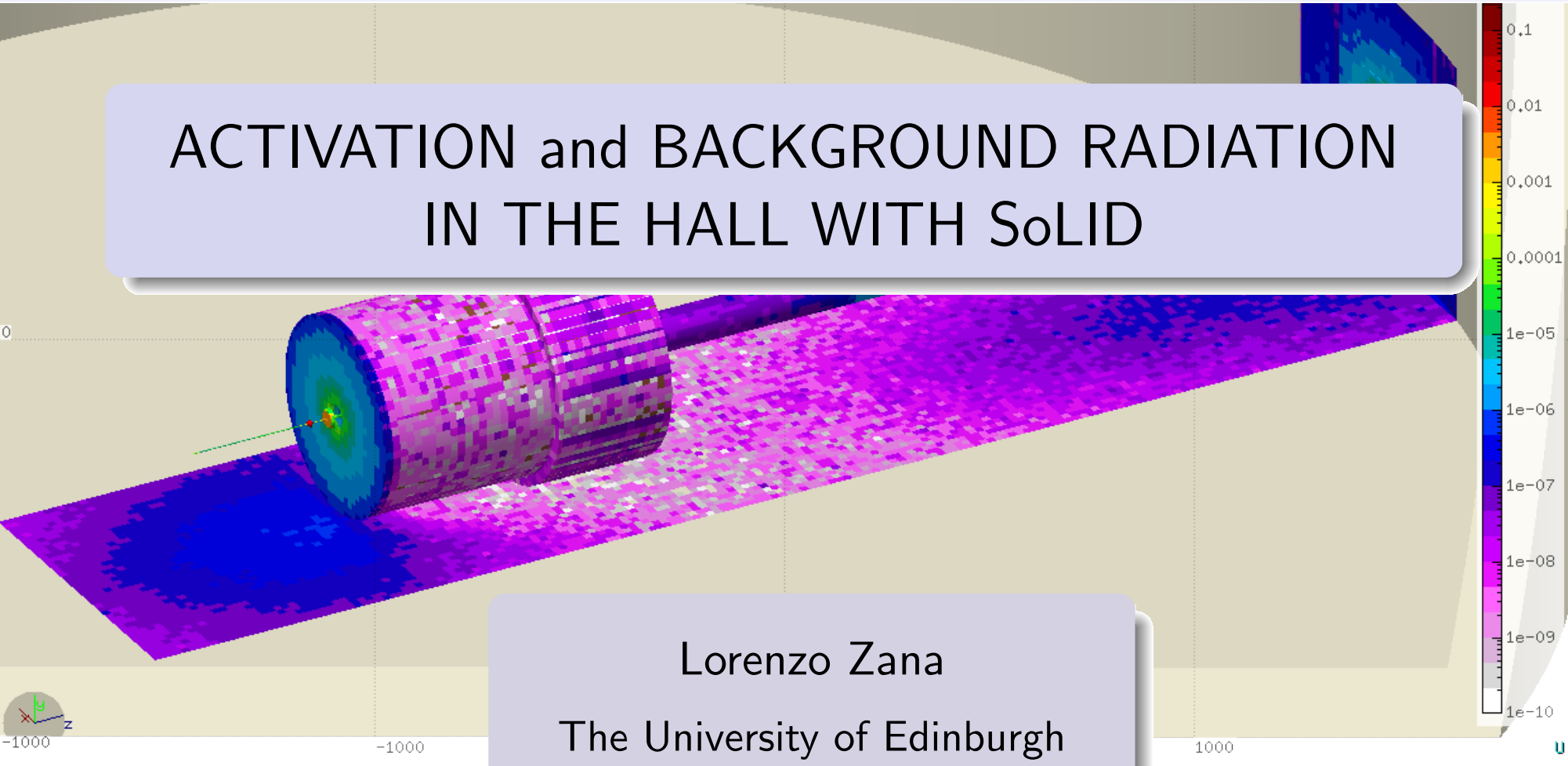


ACTIVATION and BACKGROUND RADIATION IN THE HALL WITH SoLID

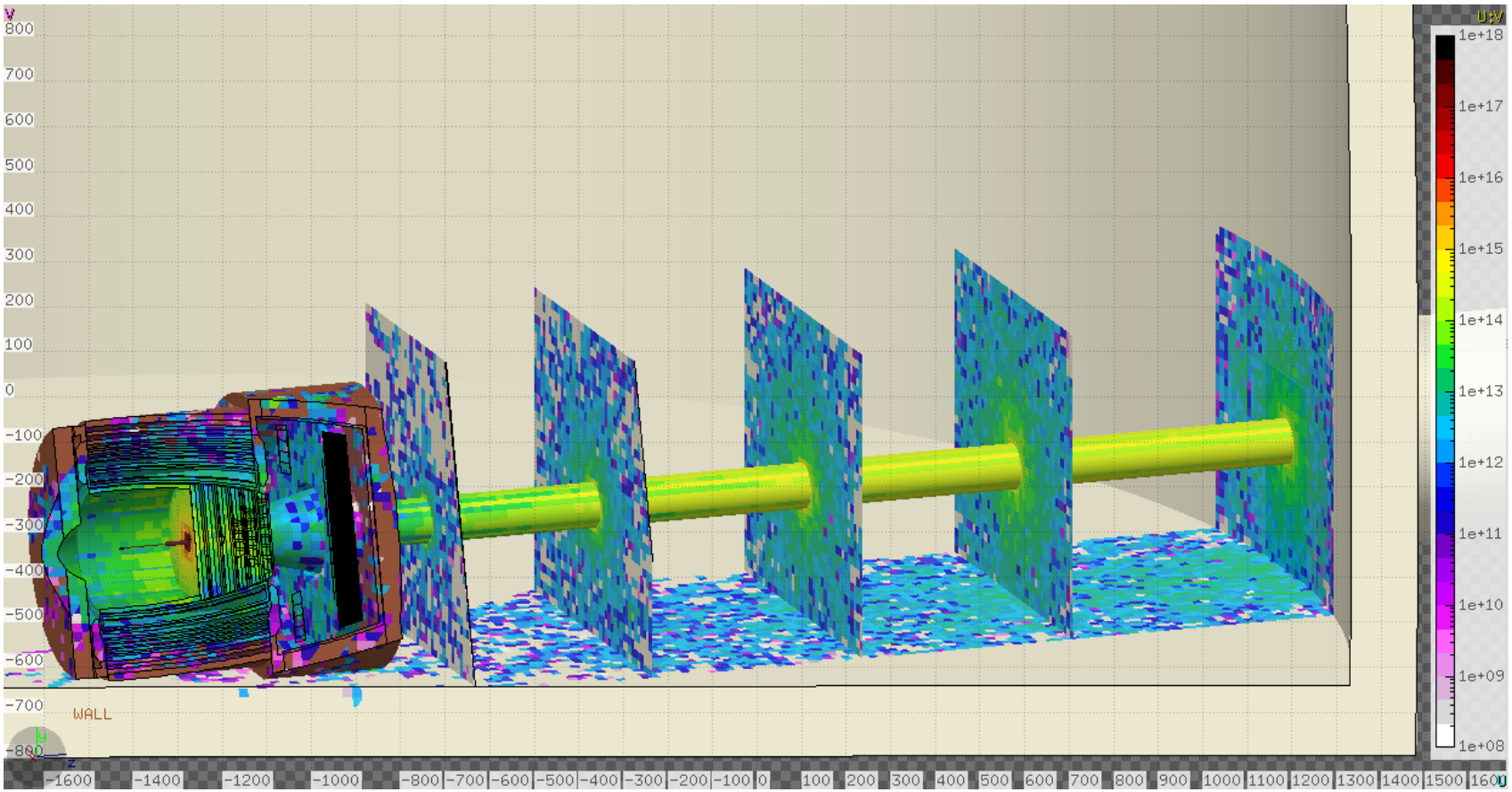
Lorenzo Zana

The University of Edinburgh

August 6 2013

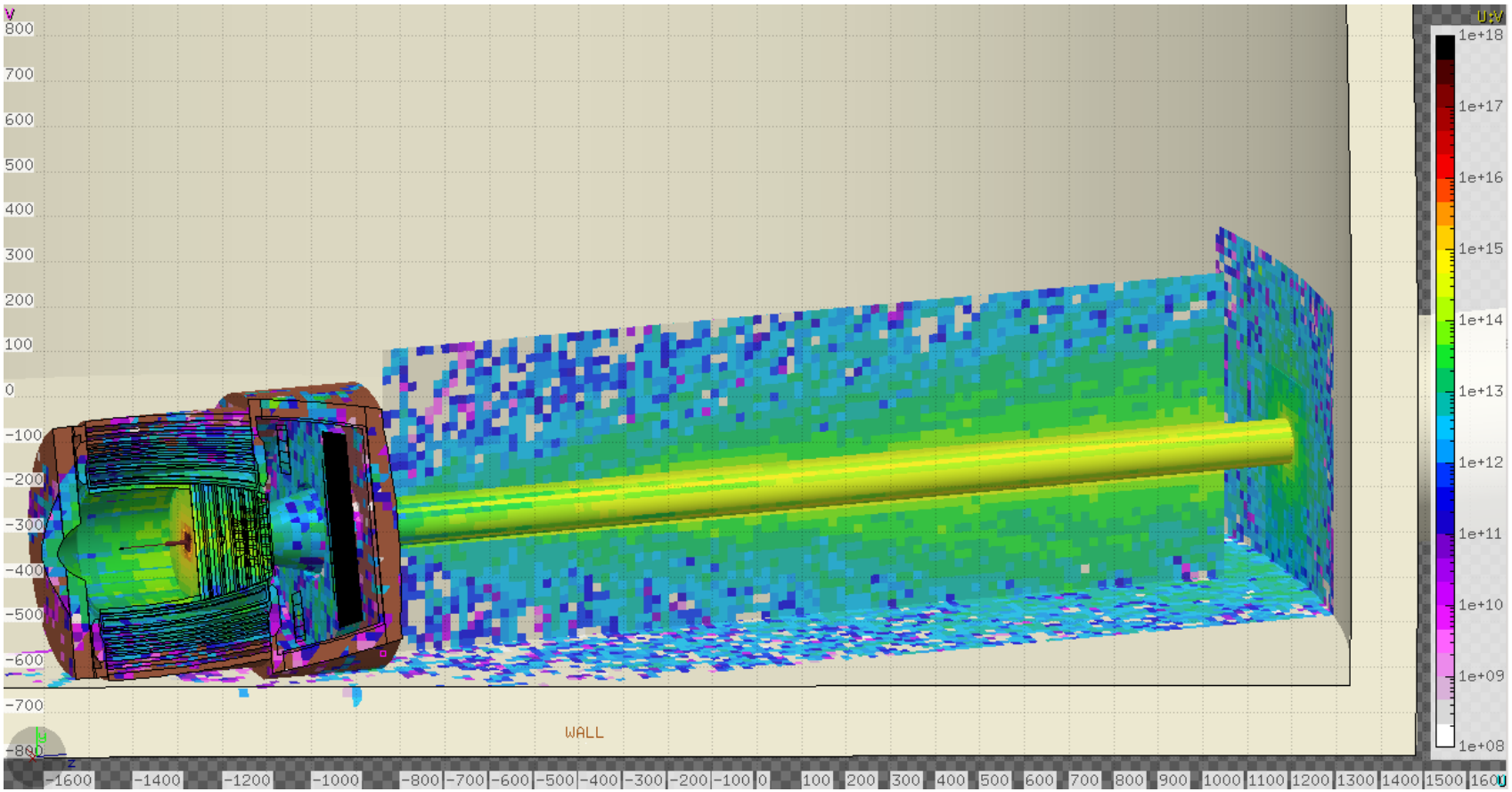
1MeV Neutron equivalent damage on Silicon

PVDIS config 2000h with $100\mu A$: from TG $\Delta z = 6m$, $\Delta z = 10m$, ,$\Delta z = 15m$, $\Delta z = 20m$



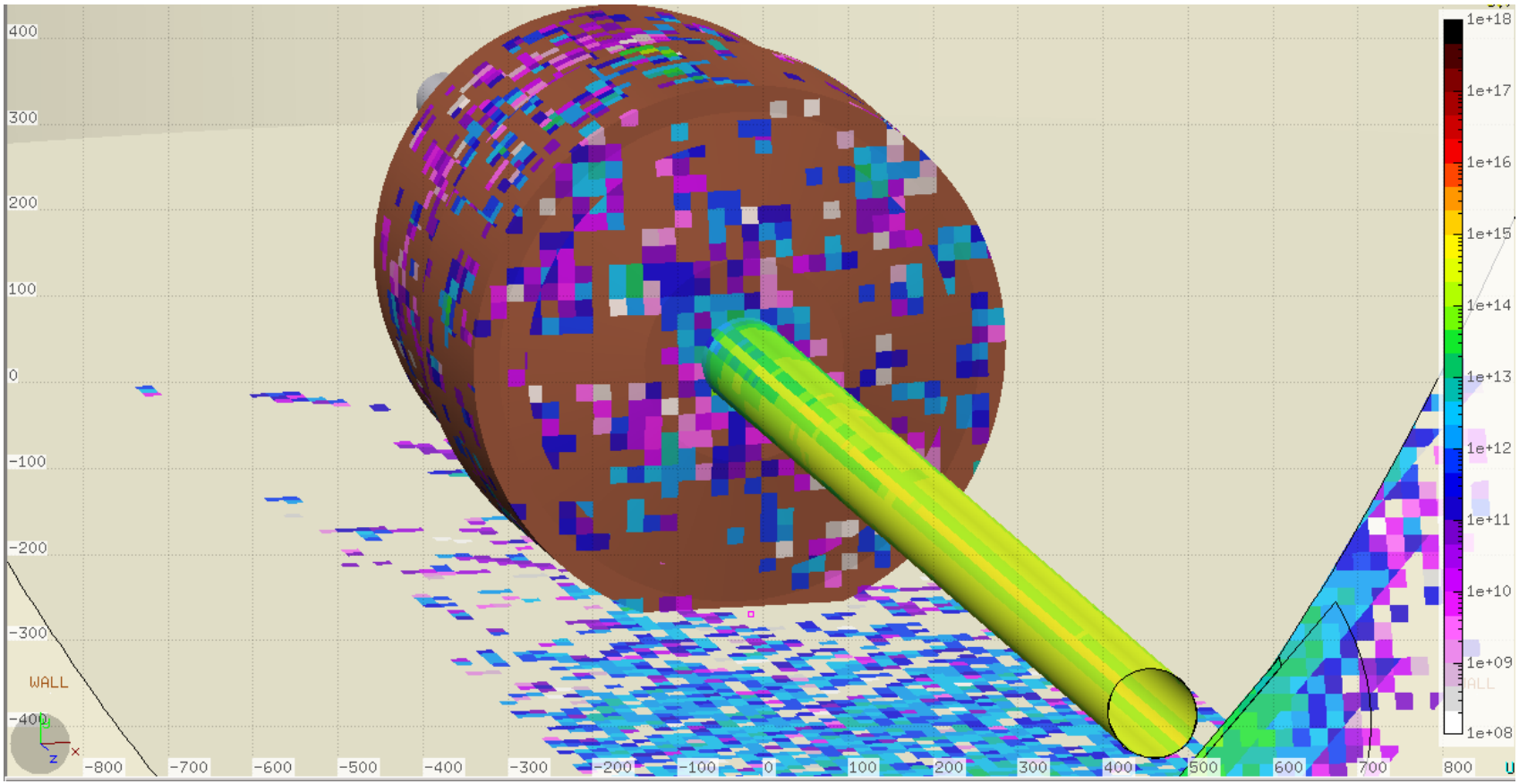
1MeV Neutron equivalent damage on Silicon

PVDIS config 2000h with $100\mu A$: View on the plane $x = 0$



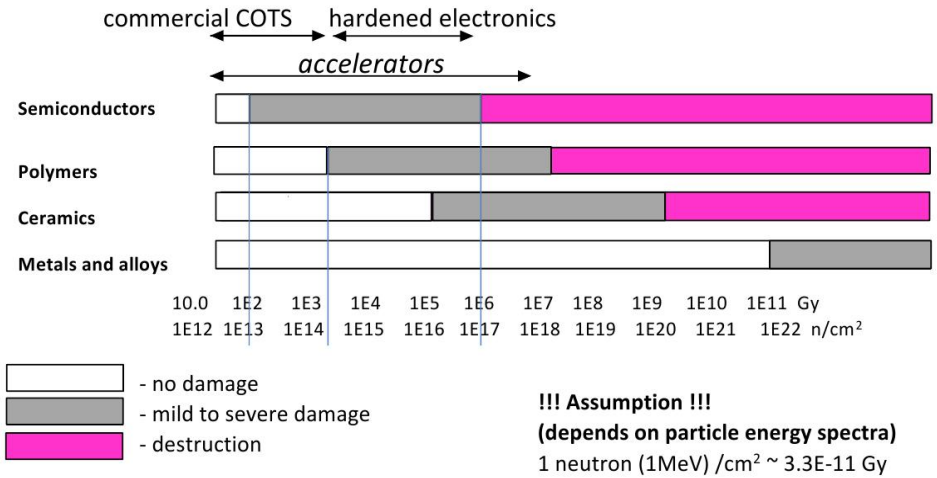
1MeV Neutron equivalent damage on Silicon

PVDIS config 2000h with 100μA: View of the back of the magnet



1MeV Neutron equivalent damage on Silicon

Tolerance of different material



!!! Assumption !!!
(depends on particle energy spectra)
1 neutron (1MeV) /cm^2 ~ 3.3E-11 Gy

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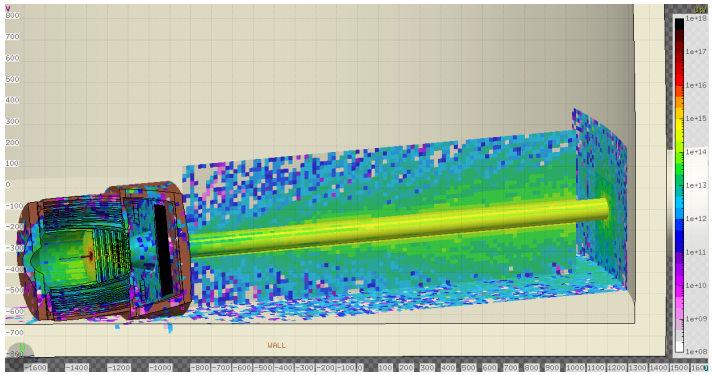
PVDIS config 2000h with $100\mu A$



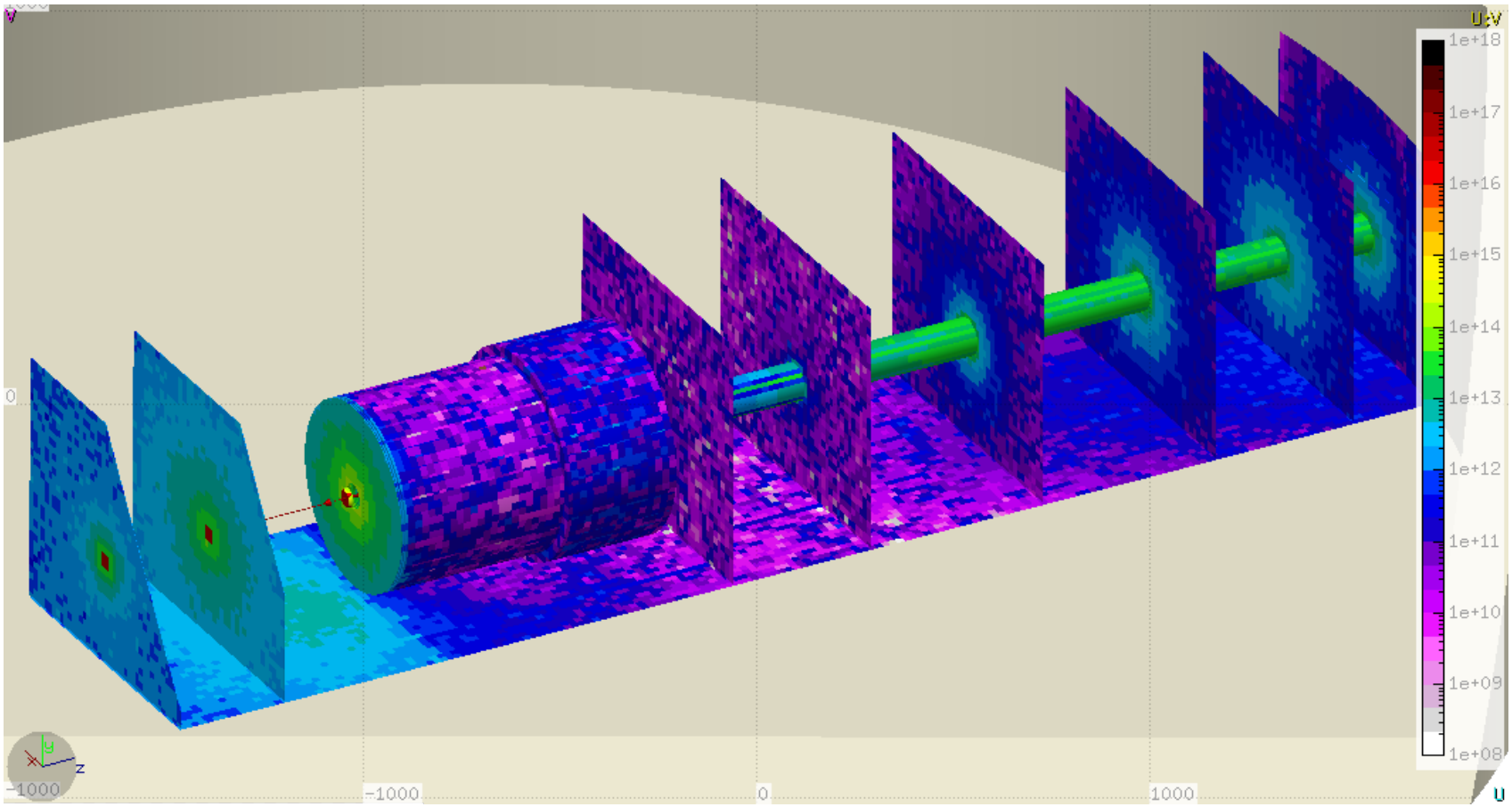
1MeV Neutron equivalent damage on Silicon

PVDIS

- Estimate of radiation damage in the Hall with the SoLID spectrometer and the PVDIS configuration. The leading part of radiation present in the Hall for the SoLID spectrometer is leaking through the downstream part of the beam-line assembly. In this plot is shown the 1MeV Neutron equivalent flux per cm^2 on the volumes surfaces estimated for 2000h of continuous running with a beam current of $100\mu A$ (This is the expected beam-time with the PVDIS configuration).
- The level of radiation leaking increases as one moves farther from the target, reaching a maximum $\leq 10^{15} \frac{N_{1MeV}}{cm^2}$. These levels of radiation is on the "mild to severe" damage range for commercial semiconductors

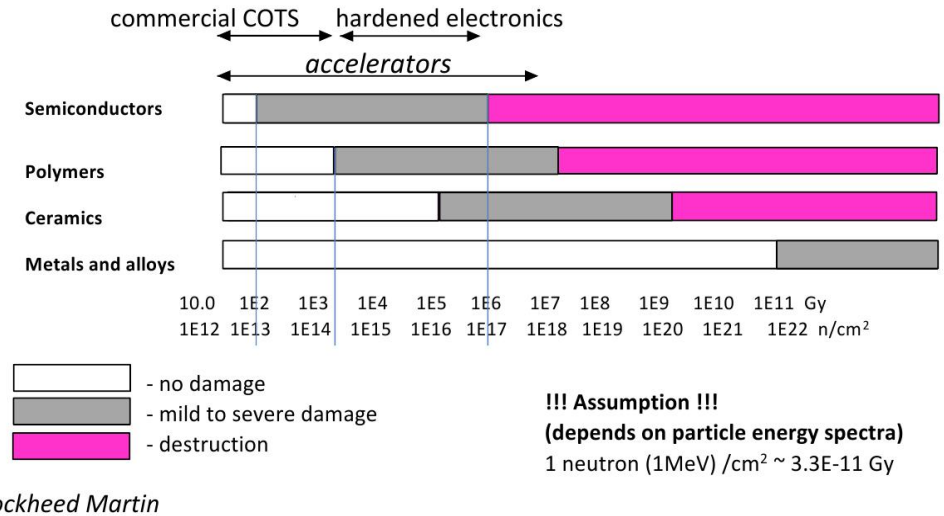
1MeV Neutron equivalent damage on Silicon

SIDIS config 3000h with $15\mu A$: $\Delta z = -10m$, $\Delta z = -6m$, $\Delta z = 6m$, $\Delta z = 10m$, ,$\Delta z = 15m$, $\Delta z = 20m$, $\Delta z = 24m$



1MeV Neutron equivalent damage on Silicon

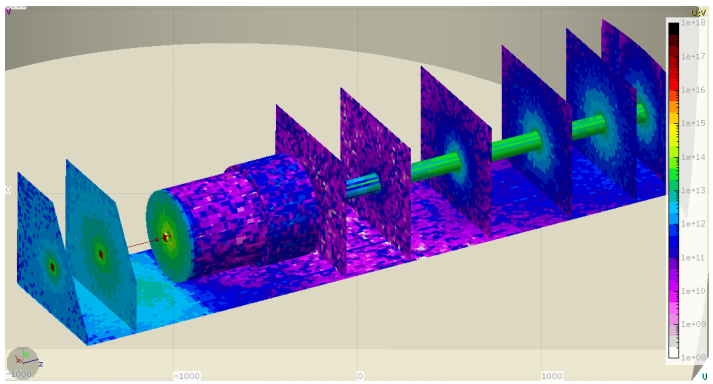
Tolerance of different material



!!! Assumption !!!
(depends on particle energy spectra)
1 neutron (1MeV) /cm² ~ 3.3E-11 Gy

© Lockheed Martin

SIDIS config 3000h with $15\mu A$



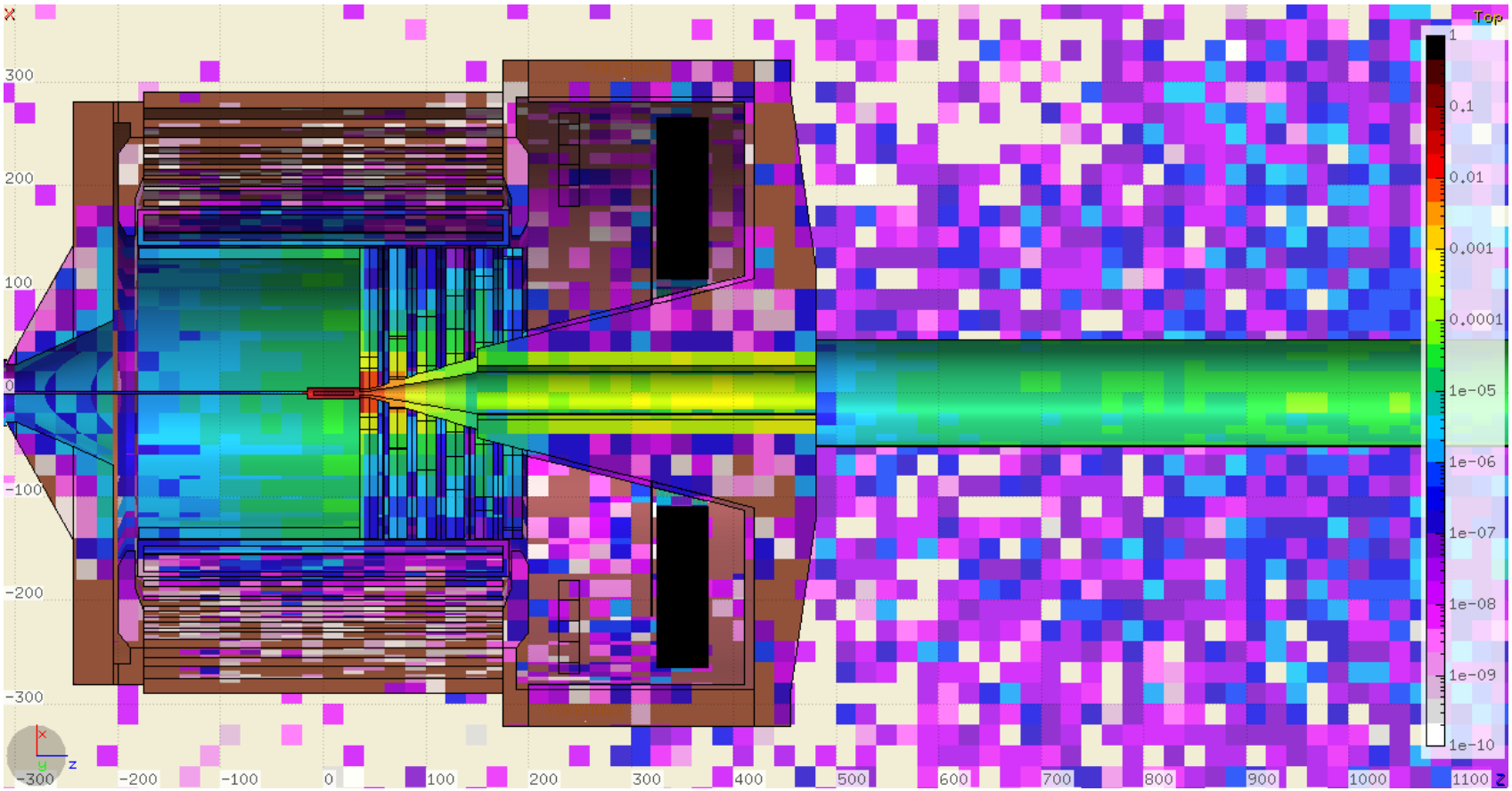
1MeV Neutron equivalent damage on Silicon

SIDIS

- Estimate of radiation damage in the Hall with the SoLID spectrometer and the SIDIS ^3He configuration. The leading part of radiation present in the Hall for the SoLID spectrometer is originating from the target area and the closer surface of the magnet. In this plot is shown the 1MeV Neutron equivalent flux per cm^2 on the volumes surfaces estimated for 3000h of continuous running with a beam current of $15\mu A$
- The level of radiation leaking increases as one moves farther from the target, reaching a maximum $\leq 10^{15} \frac{N_{1MeV}}{cm^2}$. These levels of radiation is on the "mild to severe" damage range for commercial semiconductors

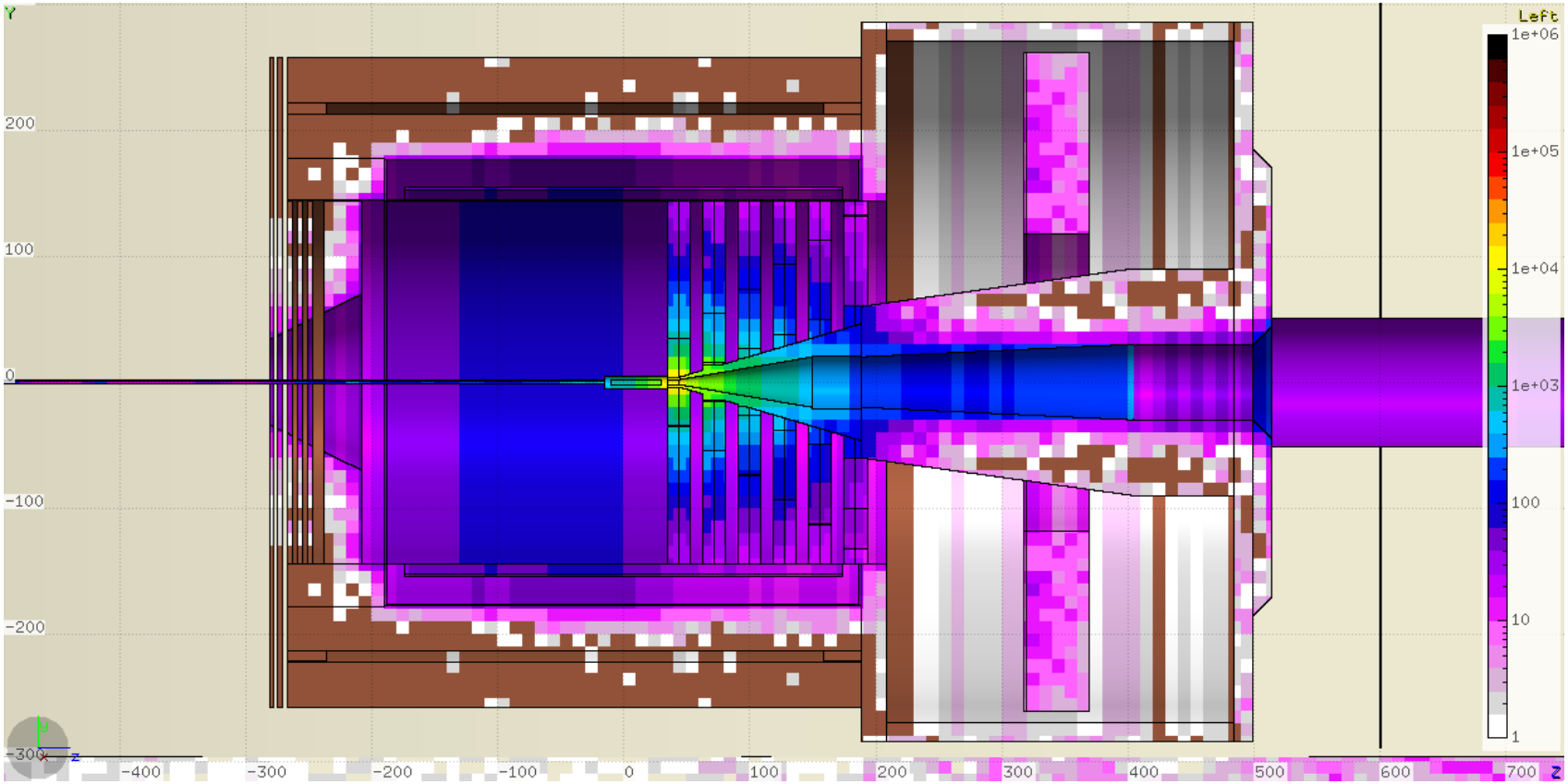
Power deposited and Activation (Magnet Area)

Energy deposited (W) per cm^3 for PVDIS configuration and Liquid Deuterium target



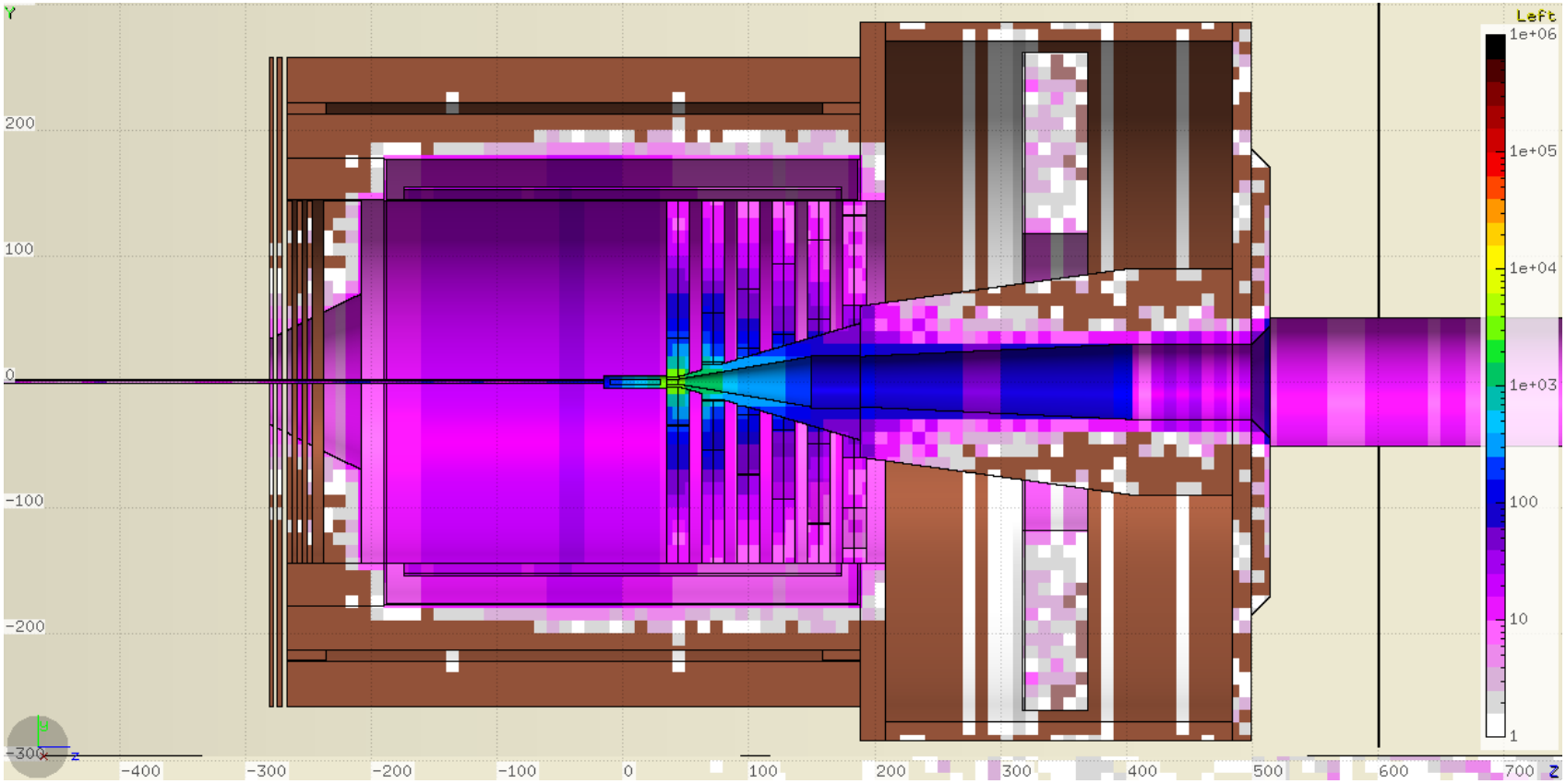
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1hour from beam exposure for PVDIS configuration and Liquid Deuterium target



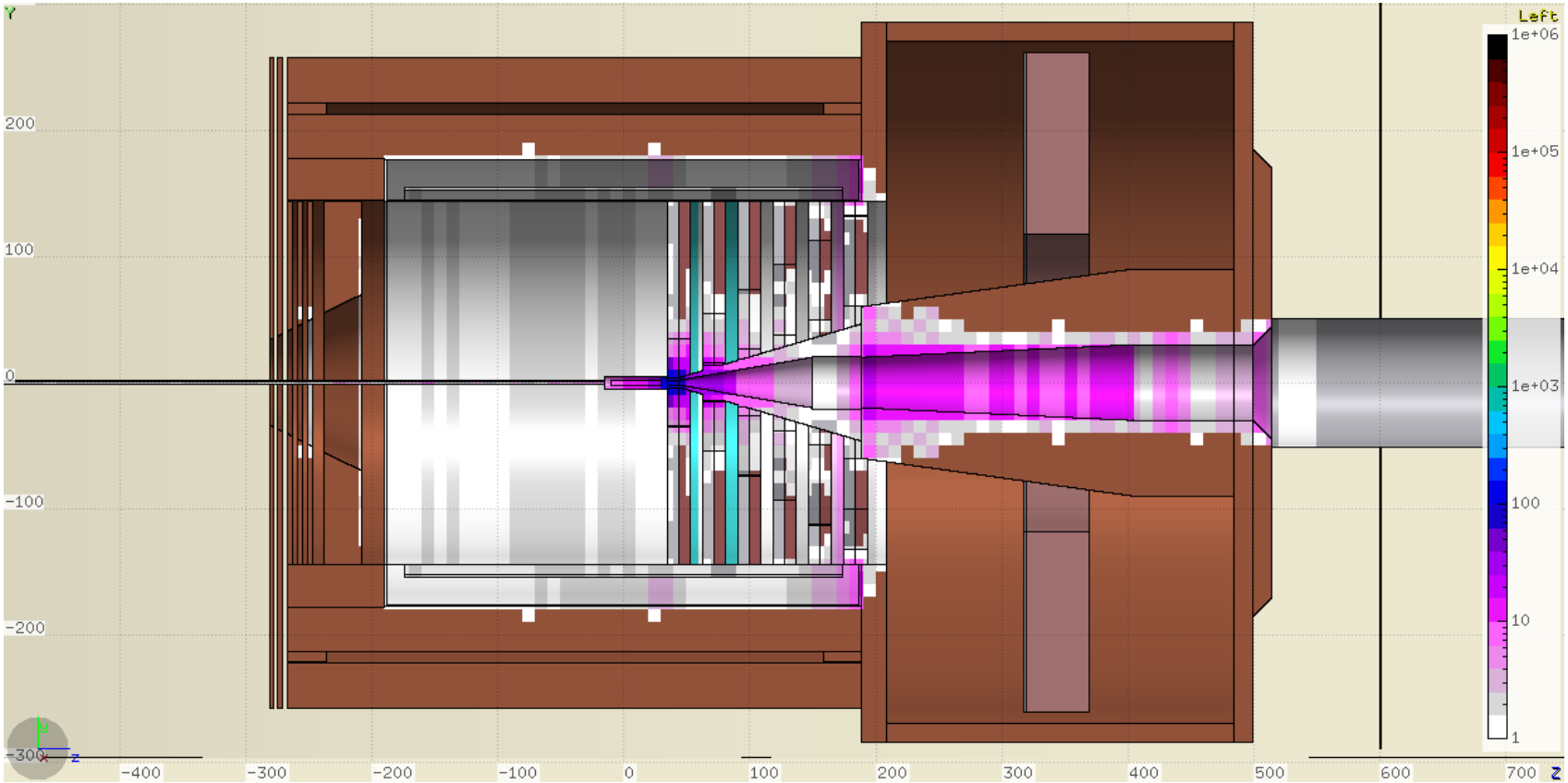
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1day from beam exposure for PVDIS configuration and Liquid Deuterium target



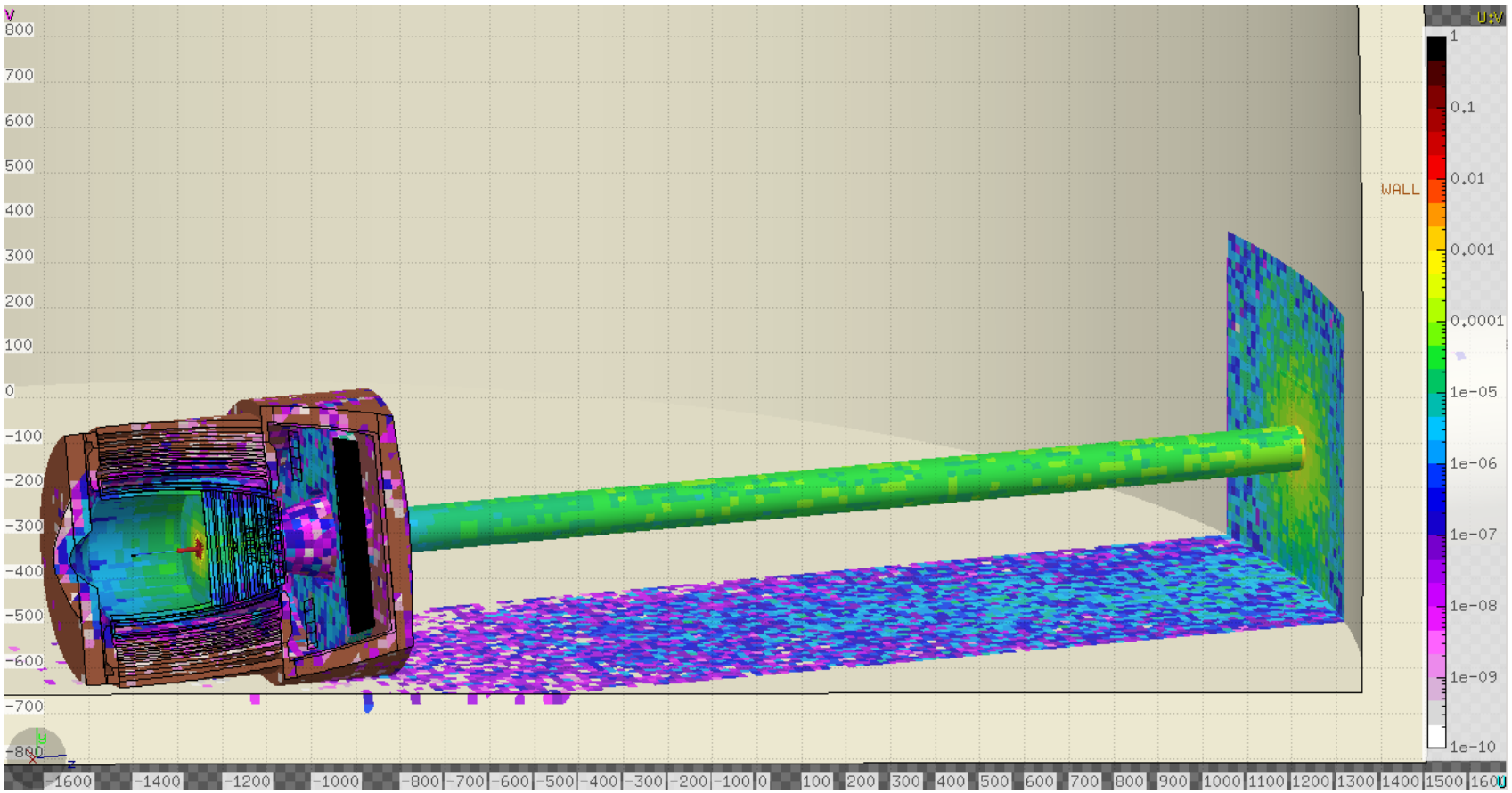
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1month from beam exposure for PVDIS configuration and Liquid Deuterium target



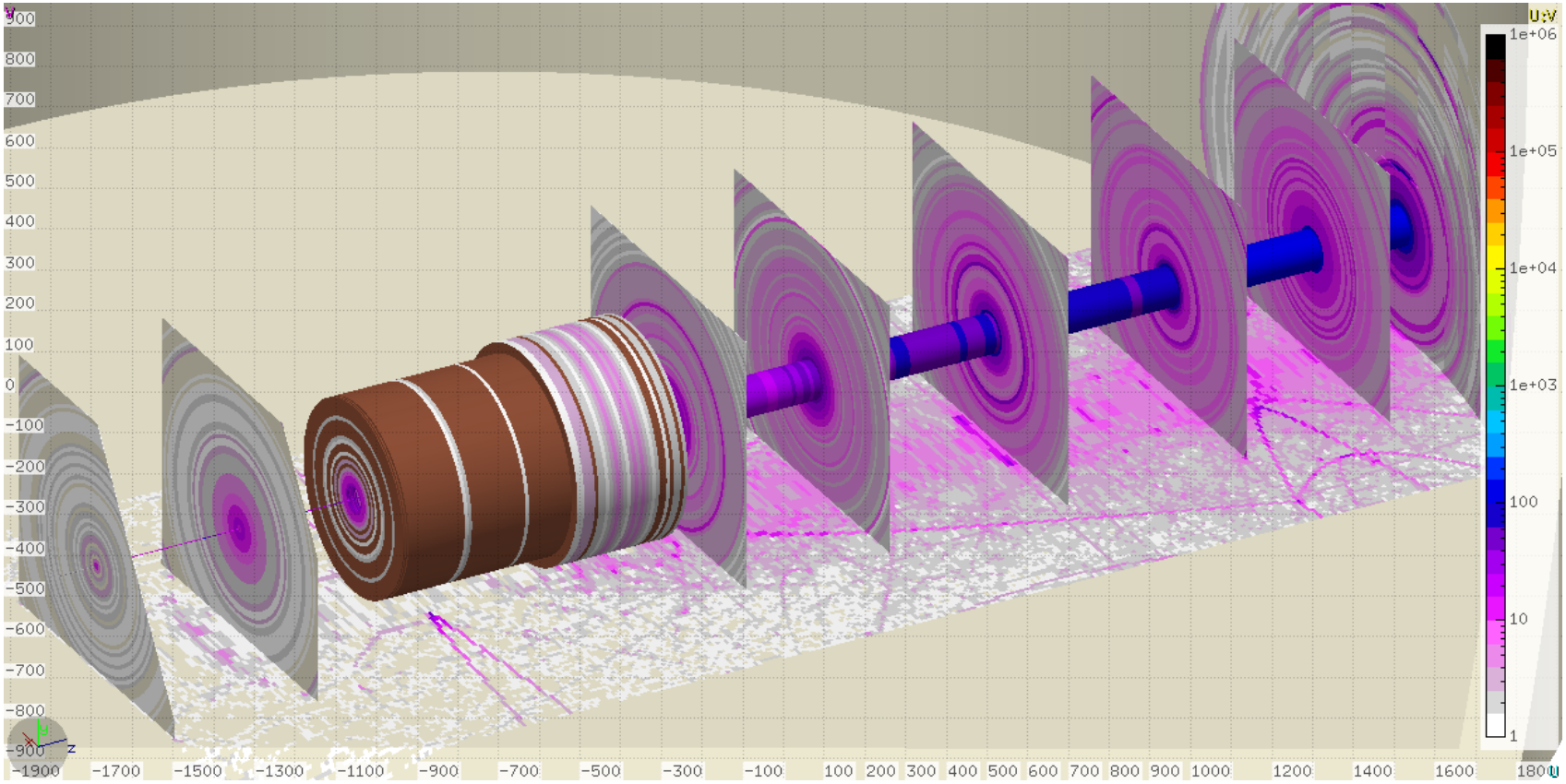
Power deposited and Activation (Hall Area)

Energy deposited (W) per cm^3 for PVDIS configuration and Liquid Deuterium target



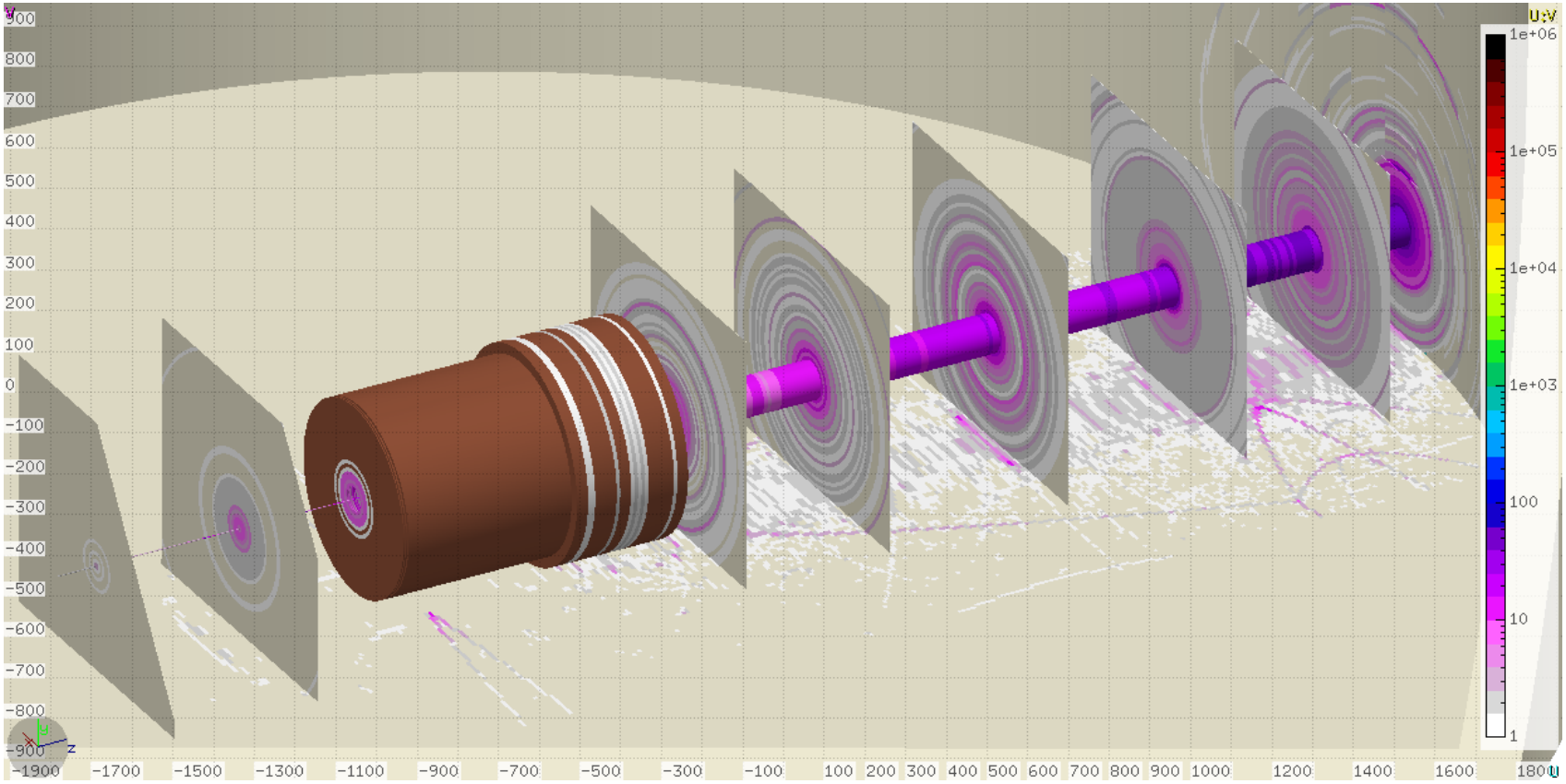
Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1hour from beam exposure for PVDIS configuration and Liquid Deuterium target



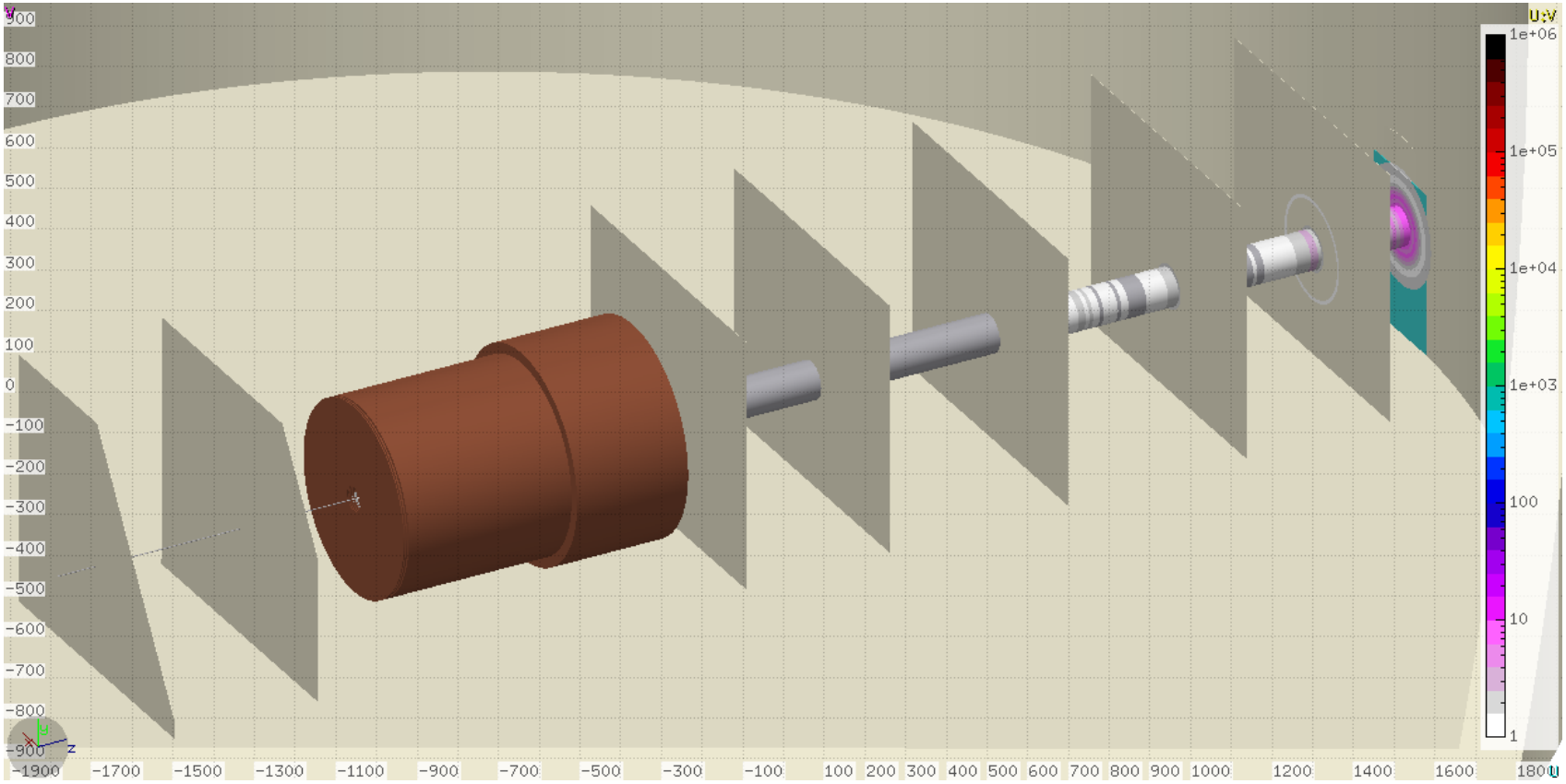
Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1day from beam exposure for PVDIS configuration and Liquid Deuterium target



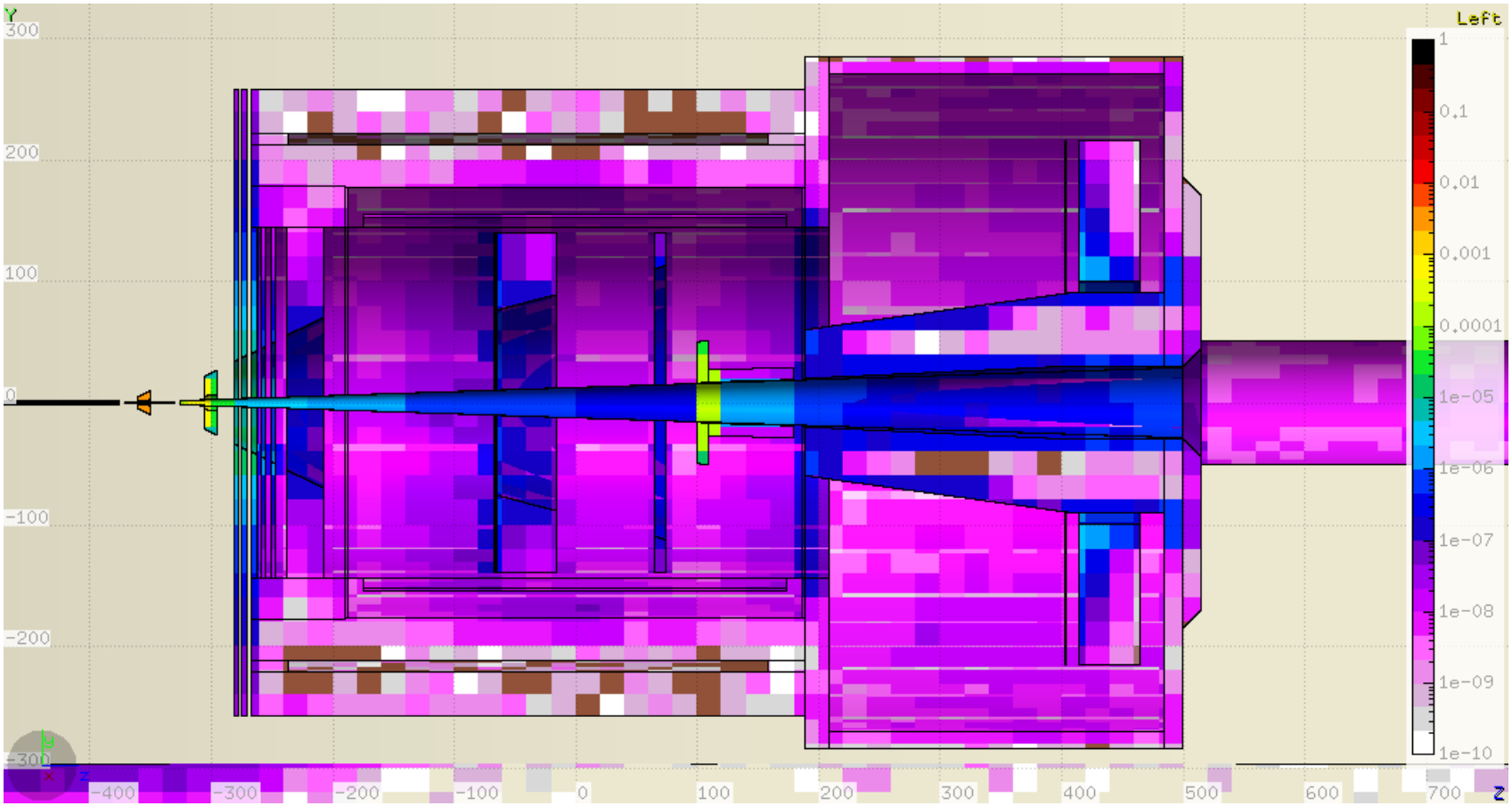
Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1month from beam exposure for PVDIS configuration and Liquid Deuterium target



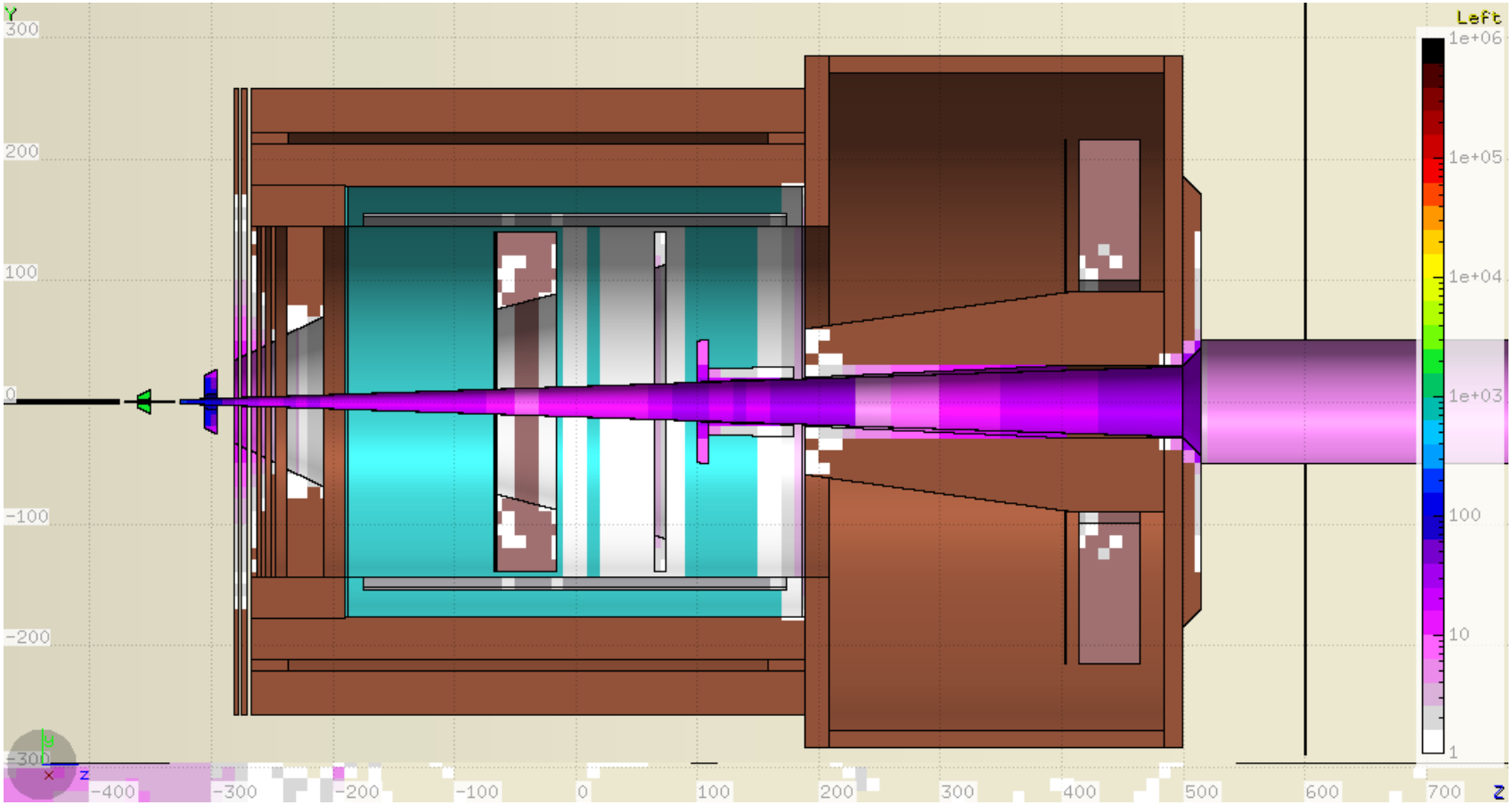
Power deposited and Activation (Magnet Area)

Energy deposited (W) per cm^3 for SIDIS configuration and ^3He target



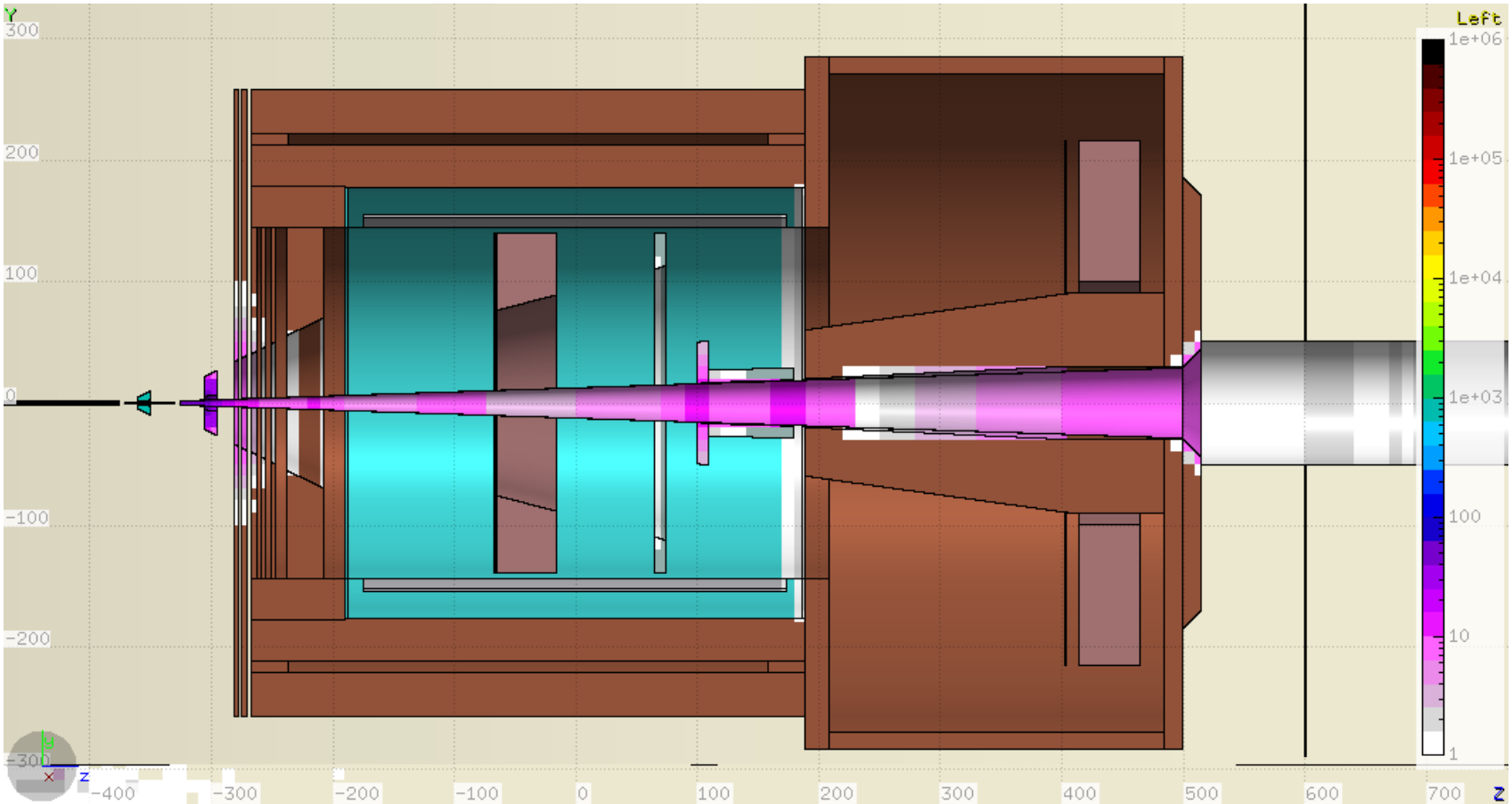
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1hour from beam exposure for SIDIS configuration and ^3He target



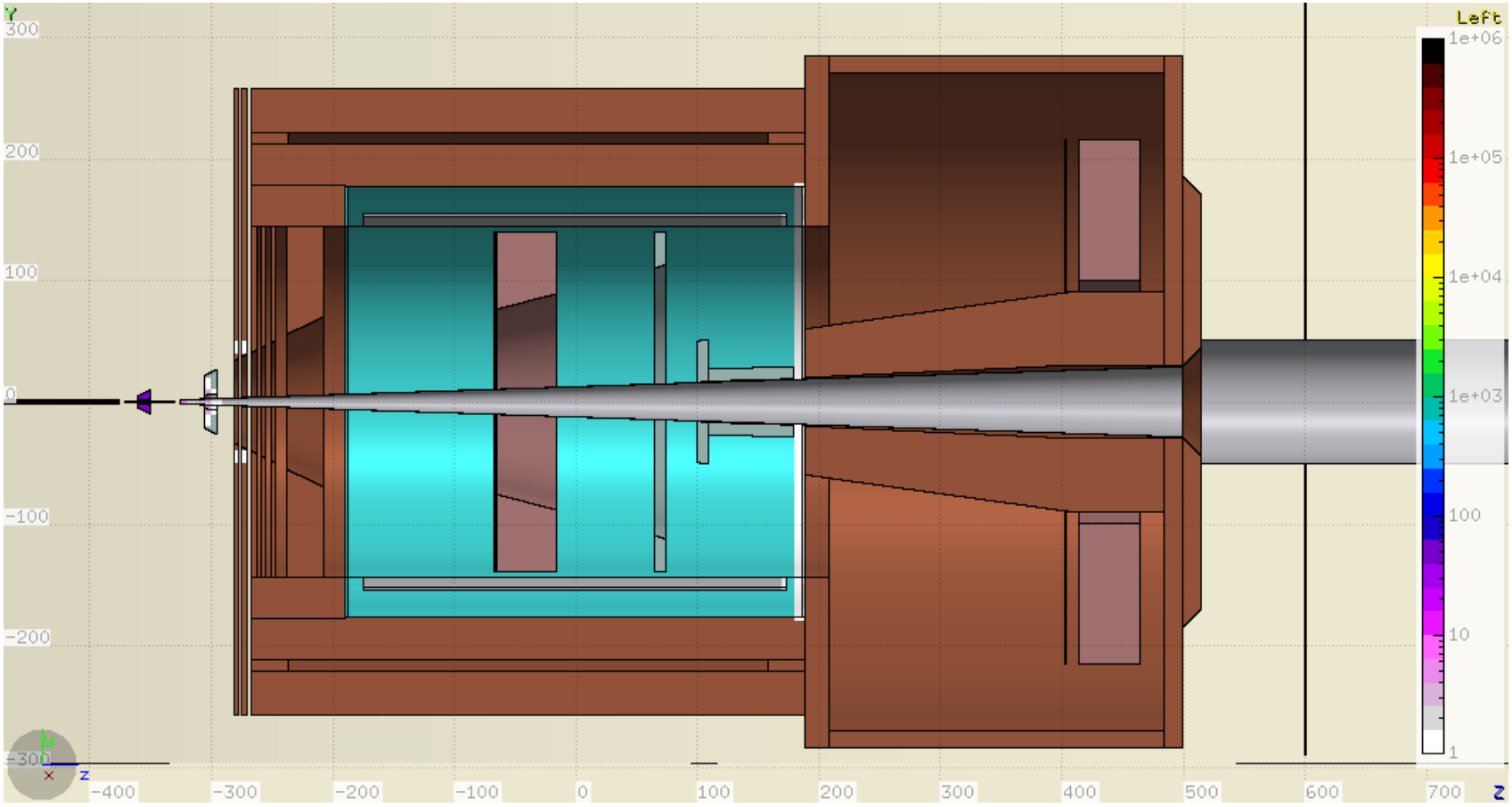
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1day from beam exposure for SIDIS configuration and ^3He target



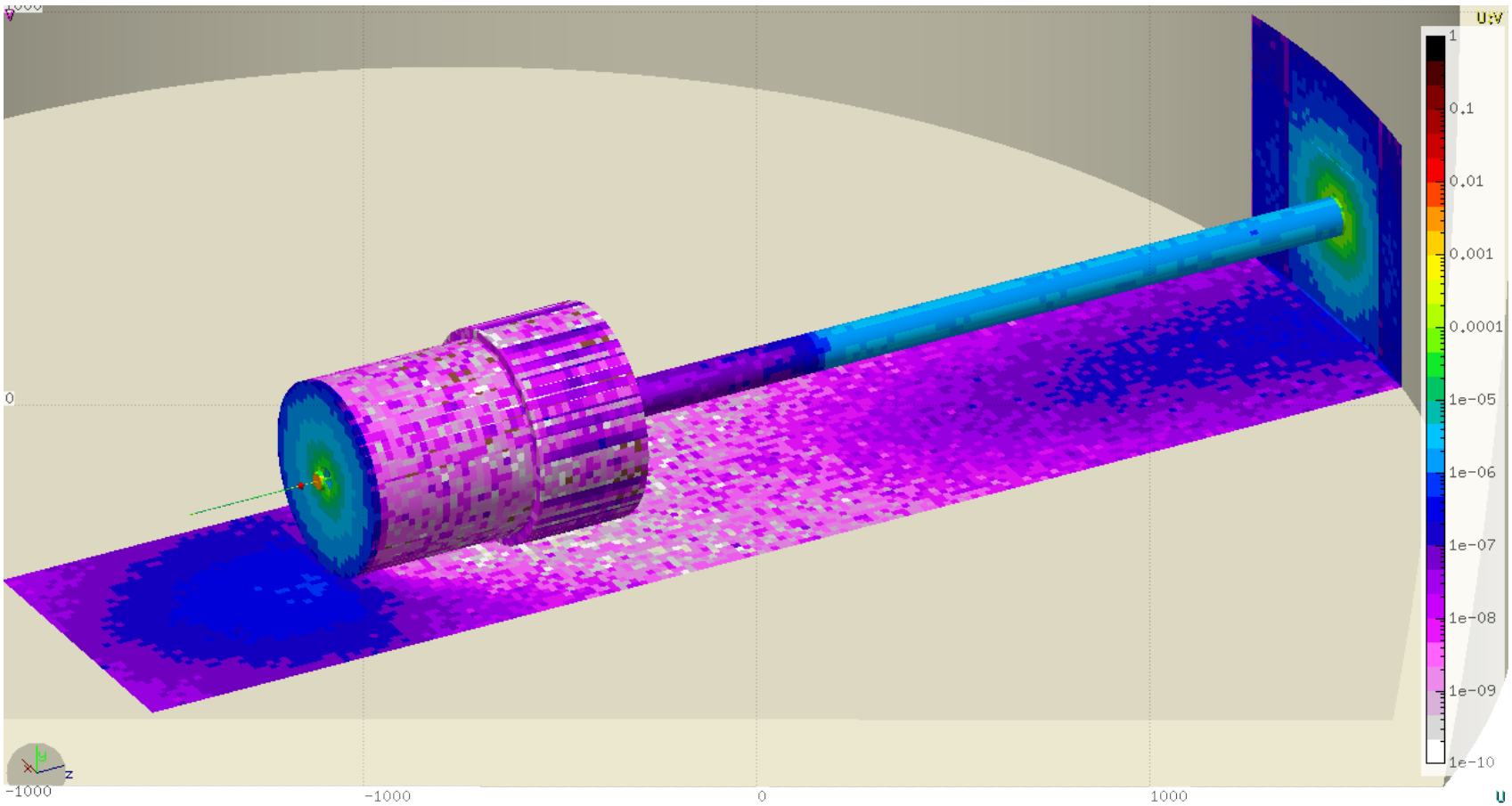
Power deposited and Activation (Magnet Area)

Dose equivalent (mrem) per hour after 1month from beam exposure for SIDIS configuration and ^3He target



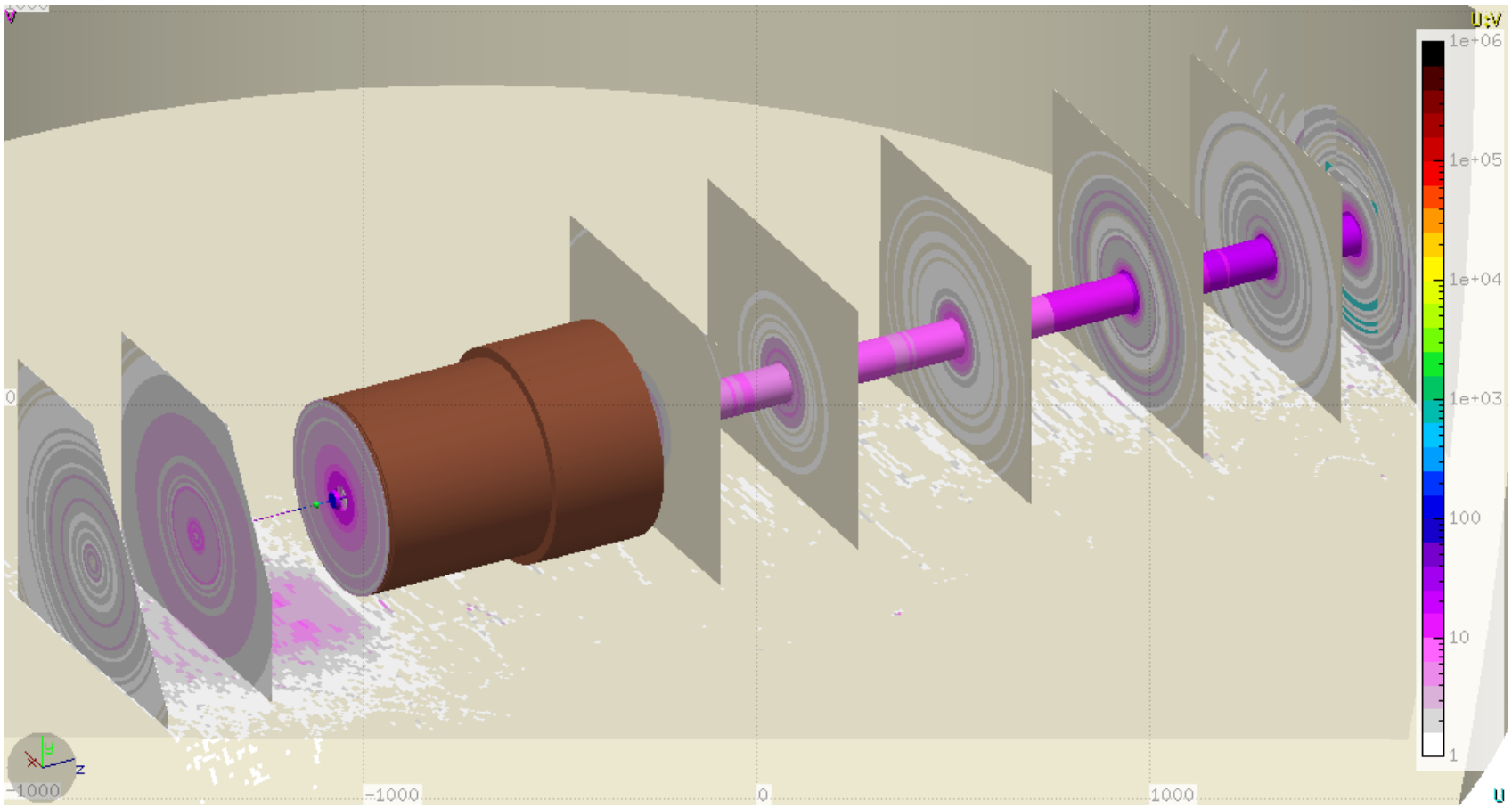
Power deposited and Activation (Hall Area)

Energy deposited (W) per cm^3 for SIDIS configuration and ^3He target



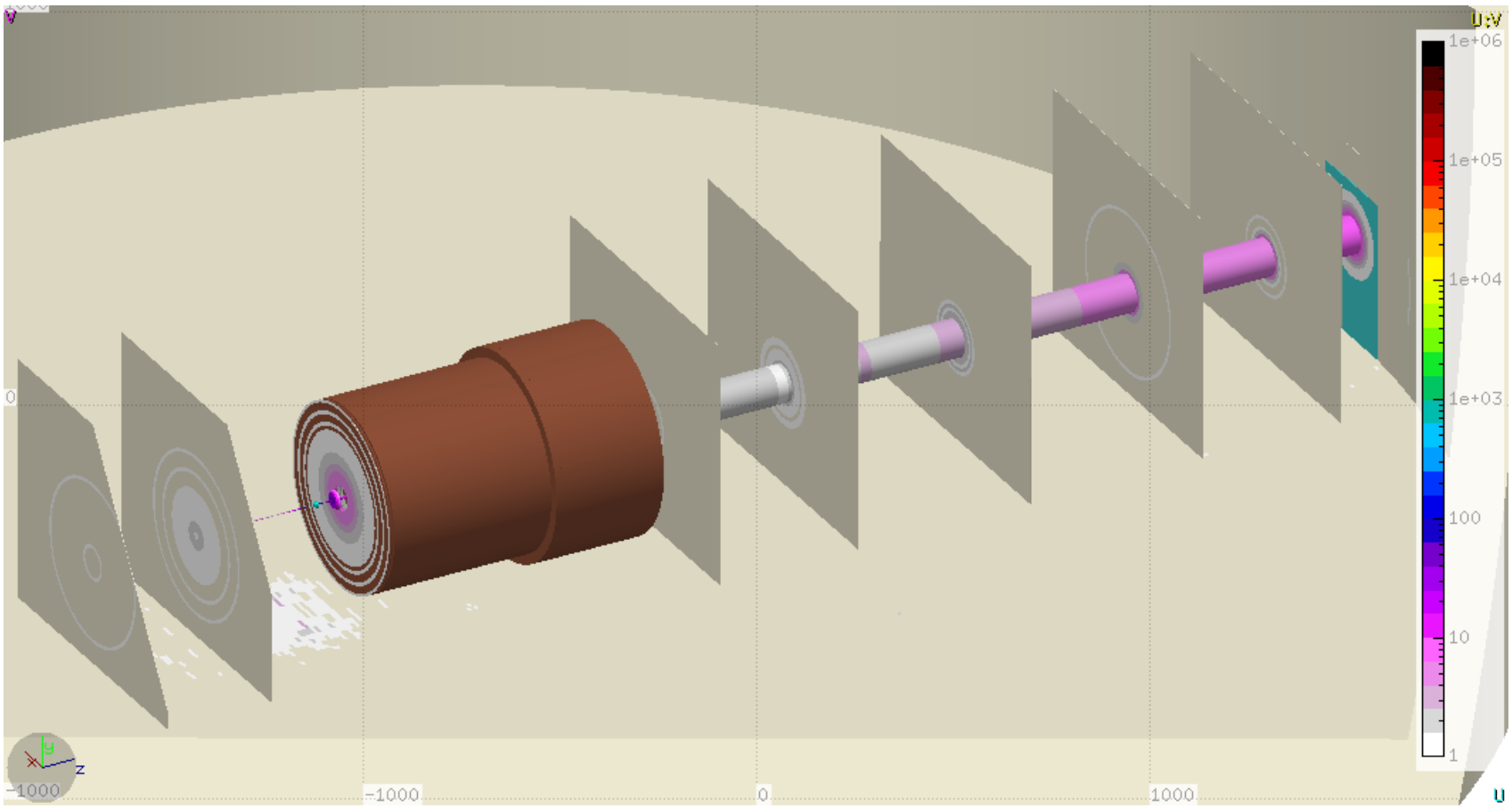
Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1hour from beam exposure for SIDIS configuration and ^3He target



Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1day from beam exposure for SIDIS configuration and ^3He target



Power deposited and Activation (Hall Area)

Dose equivalent (mrem) per hour after 1month from beam exposure for SIDIS configuration and ^3He target