

Office of  
Science

Contribution ID: 62

Type: **not specified**

## Studies supporting the derivation of the radioactive waste for European Spallation Source target station

*Monday, 28 April 2014 17:45 (9 minutes)*

European Spallation Source (ESS) is next generation research facility for dynamics and material structure studies. It is common European project taking place in Lund, Sweden. Spallation reaction will be produced in helium cooled tungsten target by pulsed (50 Hz pulse length 2.8 ms) proton beam. Protons will be driven by linear accelerator (Linac) with maximum energy of 2 GeV and average power of 5 MW. Produced neutrons will be moderated and then guided through beamlines to 22 research instruments.

Radioactive waste will be produced as the result of interactions of primary and secondary particles induced by spallation reactions in ESS target station.

The main goal of this work is to perform shielding and activation calculations for the ESS target station in order to derive the radioactive waste and to estimate the source term for environmental impact analysis. Estimation of radioactive waste is mandatory for radiological safety during radioactive waste handling, management and transportation.

The geometry of the target station used in calculations was taken from TDR [1]. Model contains: target, moderator, reflector assembly (TMRA) and the shielding monolith. In this stage a bulk shielding was considered. Calculations were done with Monte Carlo programs MCNPX 2.6.0 and FLUKA. MCNPX used CEM3k nuclear reaction model and was coupled with CINDER'90 for activation calculations. Three main calculations were carried out, using various geometry models for the shielding monolith: lateral to, above and below TMRA. In this respect biasing techniques and sufficient shielding were used to include back-scattered neutron influence. The obtained results include: i) neutron and photon dose equivalent rate around the target shielding to estimate accessible areas during operation; ii) average dose rate at target station building roof for further skyshine estimation; iii) activity levels of the shielding monolith for radioactive waste derivation and iv) soil activation for the estimation of the source term to be used for environmental impact analysis. It was concluded from this analysis that the thicknesses of the shielding are sufficient to comply with the criteria targeted by ESS.

[1] S. Peggs, R. Kreier, ESS Technical Design Report, ESS-doc-274, (2013)

**Primary author:** MARCINKEVIČIUS, Benjaminas (Center for Physical Sciences and Technology, Lithuania)

**Co-author:** ENE, Daniela (European Spallation Source ESS AB)

**Presenter:** MARCINKEVIČIUS, Benjaminas (Center for Physical Sciences and Technology, Lithuania)

**Session Classification:** Poster Session and Reception