DOSE SIMULATION DURING HANDLING RADIOACTIVE OF SOURCES IN WELL LOGGING TEMPORARY JOBSITES

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INTRODUCTION

The Brazilian nuclear Regulatory Body (CNEN) expanded from 2010 the scope of the regulatory inspection in well logging facilities, including the evaluation of operational and radioprotection procedures in temporary jobsites, has been observed *in-loco* different procedures for transfers of radioactive sources in the shielding for the logging tools in explorations oil and gas well sites.
These different protocols were modeled and subjected to various simulations with the GEANT4 simulator, using an anthropomorphic phantom to estimate the dose equivalent by workers in oil and gas exploration sites during well logging operations.

METHODS

In this work was simulated two operational procedures to transfer radioactive sources between the shipping cask (transport container) and the logging tool in wireline operations.
The usual handling procedure consists in the assembling of the logging tool in the wellhead and the subsequent positioning of the radioactive sources, in their transport container, on the rig platform floor. Later, the radioactive sources are transferred to the logging tools.
During regulatory inspections accomplished in the oil and gas fields in the Brazilian northeast was observed a different procedure in this transfer, with the radioactive sources being transferred to the logging tools in a position below the rig floor, and the logging tool (and the radioactive sources) subsequently placed at the wellhead;
After evaluations, this procedure was prohibited by the regulatory body (CNEN), due to the higher radiation field, and the possibility of loss of control of the radioactive source.
In this work was used the Geant4 toolkit for the simulation of the passage of particles and radiations through matter, using a PhysicsList where the interactions of low energy neutrons (< 20 MeV) were governed by the modeling package High Precision (HP). It should be noted that the use of neutron HP package allows more accurate results, but is needed more computational time to simulate the interaction of neutrons with the surrounding material.

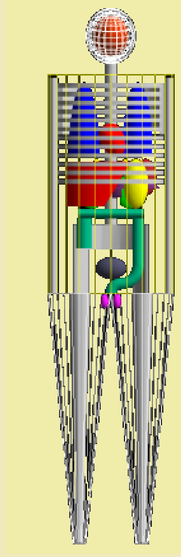

Figure 1 – Anthropomorphic Phantom implemented in Geant4.

Figure 2 – Procedure 1 – Radioactive sources positioned in the rig floor.

Figure 3 – Procedure 2. The radioactive source (red circle), was removed of this shielding below the rig flor level.

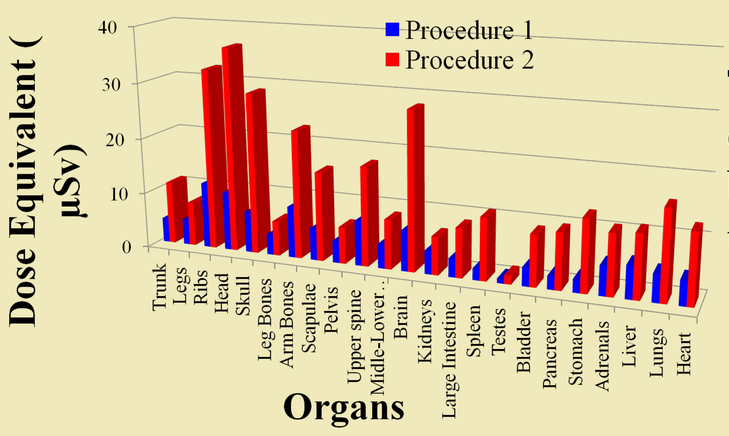

Figure 4 – Radiation dose in distinct procedures.

RESULTS

It is possible to verify that the transfer of the radioactive sources for logging tools below the level of the platform floor is a procedure which increases the radiation dose of workers during well logging operations.

CONCLUSIONS

The results obtained in this work reinforce the consistency in the Brazilian nuclear regulatory body decision when issuing the prohibition of this procedure.

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