

THE THERMOLUMINESCENCE CRITICALITY DOSIMETRY AT COGEMA

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1 - Introduction

Through its activities, and in particular in enrichment, fabrication and nuclear fuel reprocessing, COGEMA has to master the dosimetry in case of a criticality accident event.

The COGEBADGE®, equipped with a film and a 4 dosimeter (2LiF600, 2 LiF700) thermoluminescent card provides with satisfaction routine dosimetry for beta, gamma and neutron rays.

Other COGEBADGE® éléments (ebonite, gold (naked and cadmium shielded)) are also available for criticality dosimetry. This personal dosimetry system is completed by an area one, using the SNAC 2, a neutron spectrometer by target activation and counting.

The counting and spectrometry operations of the targets last for a long time in order to obtain the dosimetric quantities, neutron, kerma and photon dose.

So, COGEMA in collaboration with IPSN (National Safety and Protection Institute) and ETCA (Etablissement Central de l'Armement) have carried out a series of critical experiments, using the SILENE reactor (in VALDUC Nuclear center) especially devoted to this task.

In the SILENE cell, different screens in nature and size, have been disposed in order to simulate as closer as possible a criticality accident event. Two configurations have been used, unshielded and lead shielded Silene. The main goal has been to test the thermoluminescence dosimetry capacity in the field of the criticality personal dosimetry.

2 - Procedures and results

The reference values (neutron kerma and photon dose) have been given by the IPSN and ETCA.

A special procedure has been set off for the dosimeter treatment. It uses, in particular, a light signal attenuation filter (1/100) in the reading procedure.

Results

For the different configurations studied, giving rise to a ratio (neutron kerma/photon dose) ranging from 0.21 to 4.17, the results are as follow :

the neutron kerma response R_n (calculated/reference) = $1.03 \pm 35 \%$

the photon dose response R_γ (calculated/reference) = $1 \pm 15 \%$

3 - Conclusion

In regards to the above described experiences and results obtained, the thermoluminescence technics allows a first assessment of the dosimetric quantities in a rapid and simple way.

One hour after the arrival of the dosimeters in the laboratory, the dosimetric quantities, for about 50 persons, at the location of the dosimeter, can be obtained under the following conditions :

k_n (Gy) within $\pm 35 \%$

D_γ (Gy) within $\pm 15 \%$

24 hours later, these above performances are improved by the results coming from the use of the different targets (ebonite and gold) of COGEBADGE[®] and of the criticality belt.