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Form A
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Participation Form

IAEA Technical Meeting on
***In-situ* Methods for Characterization of Contaminated Sites**

5 – 9 July 2010
IAEA Headquarters, Vienna, Austria

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Title of paper: Use of *in-situ* gamma spectrometry for environmental monitoring of a former disposal site of by-product from monazite chemical processing

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Use of *in-situ* gamma spectrometry for environmental monitoring of a former disposal site of by-product from monazite chemical processing

Monazite is a phosphate mineral which contains rare earth being an important source of thorium, lanthanum and cerium. Moreover, uranium can also be found as a trace element (0,2 – 0,3 %), which in addition to thorium (5 – 6%) leads monazite to be classified as NORM (Naturally occurring radioactive materials). Since 1940 it has been exploited, in Brazil, from beach sands located in Rio de Janeiro and Espirito Santos States while its chemical processing was industrially done at the facilities of Nuclemon/USAM located in the city of São Paulo. Being not profitable, that facility was decommissioned in 1992.

During its operation the Nuclemon/USAM produced one main residue containing thorium daughters' labeled *cake one*, as well as, one main by-product holding thorium (20 – 24 %) and uranium (up to 0,7%) named as *cake two*. The last one was partially (some Mtons) and temporarily (during the seventies) stored at Poços de Caldas Laboratory - LAPOC, a facility which belong to Brazilian Commission for Nuclear Energy – CNEN, located around 300 km far from São Paulo City.

Recently that area was requested by an aluminum company for subsoil bauxite exploitation. Having in mind avoidance of any further questions about previous site contamination, it was decided that a measurement campaign should be done. The whole area (around 2000 m^2) encompasses a concrete pavement of the former shed and the surrounding area which as used by lorries and stacking machines.

To accomplish that objective four measurement techniques were selected and used:

1- External gamma dose rate measurement;
2- *In-situ* high resolution gamma spectrometry using HPGe detector;
3- *In-situ* gamma spectrometry using NaI detector;
4- Soil Sampling and conventional high resolution gamma spectrometry.

The results were assessed using a GIS (Geographic Information System) environment where the in-situ measurements were compared with those obtained in laboratory and maps of external gamma dose rate, as well as, of uranium and thorium concentration were built.

In this paper it will be presented and discussed all details related to the applied techniques including: the sampling grid definition, calibration of *in-situ* gamma detectors, comparison between in-situ and laboratory measurements and GIS tools used for mapping.

Nivaldo Carlos da Silva

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FORM B

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FORM FOR SUBMISSION OF A PAPER

TITLE OF THE PAPER: Use of *in-situ* gamma spectrometry for environmental monitoring of a former disposal site of by-product from monazite chemical processing

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