



2016 Rio  
**norm VIII**  
Eighth International Symposium on Naturally  
Occurring Radioactive Material – NORM VIII  
Rio de Janeiro, Brazil, October 18 -21, 2016



# **Radiation from Oil Fields**

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# Objectives and Methodology:

- The aim of this study is to determine the **activity concentration** and to **analyze the radiological hazard** from naturally occurring radioactive material (NORM) and technically enhanced NORM (TENORM) for environmental samples from **Kuwait** and **Qatar**.
- The purpose of samples measurements is to identify the radionuclides and to measure and calculate the activity concentrations from  $^{238}\text{U}$ ,  $^{232}\text{Th}$  series and for no-series radionuclides  $^{40}\text{K}$  and  $^{137}\text{Cs}$ .
- HPGe Detector Characterisation: Energy and Efficiency Calibration by using four different sources with variety of energies from 59.5 keV for  $^{241}\text{Am}$  to 2614.5 keV for  $^{208}\text{Tl}$ .
- The soil samples have been collected from Kuwait and Qatar which are from environment and from oil fields locations.
- Each sample is measured for 48 hours and placed in 550 ml marinelli beakers.
- Absorbed dose rate, annual effective dose equivalent, radium equivalent activity, external and internal hazard index were calculated for all samples which depends on the activity concentration for  $^{226}\text{Ra}$ ,  $^{232}\text{Th}$  and  $^{40}\text{K}$ .

# Summary of Results:

- The activity concentration range for all samples were found from  $6.22 \pm 0.11$  to  $339.31 \pm 3.54$  Bq.Kg<sup>-1</sup> for <sup>238</sup>U and for <sup>232</sup>Th weighted mean was from  $3.2 \pm 0.03$  to  $13.91 \pm 0.14$  Bq.Kg<sup>-1</sup>.
- All samples from Kuwait and Qatar were fall below the limit of UNSCER 2000 except sample 29-X-228 which is significantly above the worldwide range and it was exceed the dose limit for public ( $>1$  mSv.y<sup>-1</sup>).
- the samples from Kuwait and Qatar were measured and analysed and all samples had normal activity concentrations except the samples near to oil fields. The samples which were near to oil fields in Qatar or Kuwait had different enhanced values due to industrial processes in these regions such as disposal of scales and sludge in the pipes to surrounding environment.