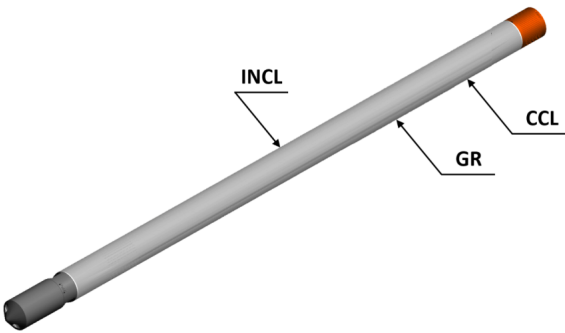


Gamma Ray (GR) Logging Tool

@wikipedia

Deployment	Borehole
Log Name	GR
Measured Property	Intensity of natural gamma ray emission from subsurface rocks
Sensor Type	Scintillation counter
Units	
SI	R/s
Oil Metric	R/hr = $2.8 \cdot 10^{-10}$ R/s
Oil Field	* $GAPI = 4.2 \cdot 10^{-10}$ R/s = 1.5 R/hr

* – for scintillation detectors



Applications

- Depth Matching between cased-hole and open-hole logs
- Pick up radioactive anomalies caused by saline water invasion
- Pick up radioactive anomalies caused by water invasion or radioactive tracers

Sample Logs

Tool Schematic

Mathematical Model

(1)

$$GR = (1 - \phi_e) \cdot GR_m + \phi_e \cdot (s_w \cdot GR_w + s_o \cdot GR_o)$$

(2)

$$GR_m = \sum_i GR_{mi} \cdot V_{mi}/V$$

where

ϕ_e	effective porosity
GR_w	natural gamma radioactivity of formation water
GR_o	natural gamma radioactivity of formation oil
GR_m	natural gamma radioactivity of rocks
GR_{mi}	natural gamma radioactivity of i-th mineral
V_{mi}/V	volume share occupied by i-th mineral
s_w	water saturation
s_o	oil saturation

Typical values

Table 1. Typical GR values for popular minerals		
	Rock Type	GR, GAPI
1	Halite (Rock Salt)	0
2	Coal	0
3	Limestone	5 – 10
4	Sandstone	10 – 20
5	Dolomite	10 – 20
6	Shale	80 – 140
7	Mica	100 – 170
8	Sylvite (KCl)	500

See also

Petroleum Industry / Upstream / Subsurface E&P Disciplines / Petrophysics / Reservoir Data Logs (RDL) @model / Lithology Log Interpretation @model