

QL40-SGR2G-BGO

Spectral Gamma Ray

The QL40-SGR2G is the new generation of slimhole Spectral Gamma Tool. The new system consists of a completely redesigned and ruggedised mechanical assembly, electronics and gamma module. It implements also the latest telemetry developments to enhance tool performances on long single and multi-conductor wirelines.

The probe measures the total gamma counts in API as well as the full energy spectrum of the natural gamma radiations emitted naturally from within the formations.

A Full Spectrum Analysis (FSA)¹ is performed on the recorded energy spectra. The FSA derives in real time the concentration of the three main radioisotopes ⁴⁰K, ²³⁸U, ²³²Th and thus provides insight into the mineral composition of the formations².

The QL40-SGR2G is a modular platform that can be equipped with a scintillation BGO (Bismuth Germanium Oxide) crystal or with a scintillation CeBr3 (Cerium Bromide) crystal. This brochure refers to the QL40-SGR2G-BGO

The BGO crystal is characterized by a very high scintillation efficiency, good energy resolution, and is mechanically strong. It makes the tool ideal for a wide range of applications listed below.

The QL40-SGR2G is supplied as an inline sub. It can be combined with other logging tools of the QL product line or can be operated as a standalone tool.



TOOL

Diameter	40 mm (1.6")
Length	1.01 m (39.4")
Weight	6 kg (13 lbs)
Max Temp	70 °C (158 °F)
Max. Pressure	200bar (2900psi)

Sensor

- Scintillation crystal : BGO (Bismuth Germanium Oxide)
- Dimensions : 25.4mm x 100.0mm (1.00" x 4.00")
- Sensitivity (compared to NaI crystal) : x 3
- Spectral Resolution @ Cs (%) : 13.6
- Dead Time (µs) : 4.8

OPERATING CONDITIONS

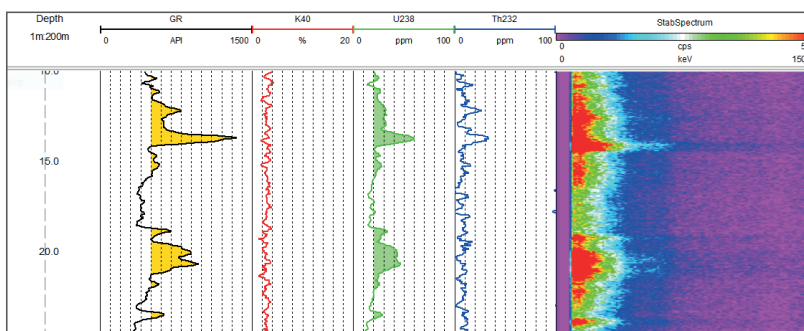
Cable type	Mono, multi-conductor, coax
Compatibility	Scout Pro / Opal (Scout / Bbox / Matrix)
Digital data transmission Telemetry	Variable baudrate telemetry according to cable length/type & surface system
Logging speed	2m/min
Centralisation	Recommended
Borehole conditions	Dry or fluid-filled borehole Open or cased borehole

Measurement range

- Measurement point : 0.25 m (9.9") from bottom
- Measurement range : up to 3 MeV

Application

- Recognition of radioactive materials
- Contamination studies
- Lithology characterization
- Well to well correlation
- Sedimentology - differentiation of facies and depositional environment



Field record - Radioisotope concentrations and stabilized spectrum

¹ The Full Spectrum Analysis (FSA) is developed by Medusa Systems BV in collaboration with the Nuclear Physics Institute of the University of Groningen (Netherlands).

² Other natural or man-made nuclides can be added into the FSA process upon request.

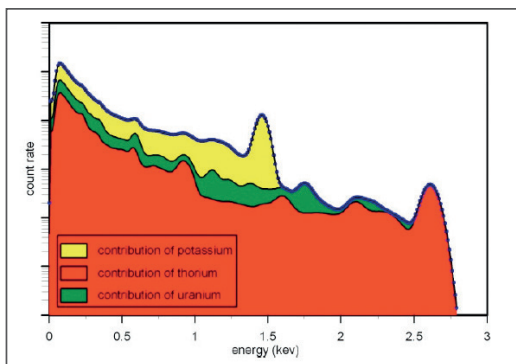
Principle of measurement

The QL40-SGR2G is equipped with a scintillation crystal. When exposed to gamma rays, the crystal emits light as a function of the gamma ray energies. The pulses of light are amplified by a photomultiplier tube and converted into electrical pulses which are distributed into discrete energy channels. Gamma ray analysis is performed in two steps.

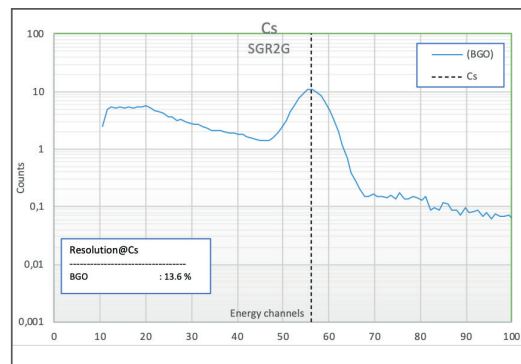
First spectrum stabilization will be performed: each multichannel spectrum in the data set will be converted to a spectrum having all count peaks at the corresponding energy position. This process implies a close comparison with the reference spectra obtained during the calibration process of the spectral gamma tool at the Medusa calibration facility. In a second step the stabilized spectrum will be convoluted into concentrations of naturally occurring radionuclides (^{40}K , ^{238}U , ^{212}Th) or other man-made nuclides like ^{137}Cs or ^{60}Co . Corrections taking borehole diameter, rock density, casing type and thickness, tool position and borehole fluid conditions into account can be applied.

Measurements features

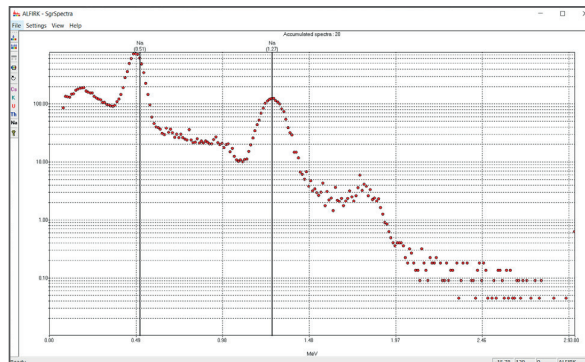
- 256 channels gamma ray energy spectrum
- Full spectrum analysis and stabilized spectrum
- Total gamma counts [API]
- Concentration of radioisotopes [Bq/kg or ppm]
- Concentration error of radioisotopes [Bq/kg or ppm]



Full Spectrum Analysis by Medusa Systems BV



Example of spectrum - ^{137}Cs isotope



LoggerSuite – Real Time Spectrum (^{22}Na isotope)



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