# QL40-SGR2G-CeBr3

## Spectral Gamma Ray

January 2023

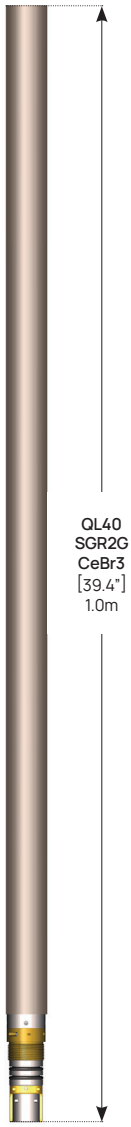
The QL40-SGR2G is the new generation of slimhole Spectral gamma Tool. The new system consists of a completely redesigned and ruggedised mechanical assembly, electronics and gamma module. It implements also the latest ALT telemetry developments to enhance tool performances on long single and multi-conductor wirelines.
The QL40-SGR2G 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, 212Th 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 Oxyde) crystal or with a scintillation CeBr3 (Cerium Bromide) crystal. This brochure refers to the QL40-SGR2G-CeBr3 version.

The QL40-SGR2G implementing the CeBr3 crystal is characterized by a very good spectral resolution and high sensitivity. The short dead time value of the system (less than 1 µs) combined with the latest design of the measuring electronics allows a perfect linearity of the total gamma count even in a high radiation context. It makes the tool ideal for ore grade analysis when a fine spectral resolution is required to identify radioisotopes with narrow energy bands.

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. It is compatible with the ALT/MSI acquisition systems.




## Tool

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

## Sensor

**Scintillation crystal :** CeBr3 (Cerium Bromide)
**Dimensions :** 20.0mm x 96.0mm (0.79" x 3.78")
**Sensitivity (compared to NaI crystal) :** x 1,9
**Spectral Resolution @ Cs (%) :** 6.2
**Dead Time (µs) :** 0.8

## Operating conditions

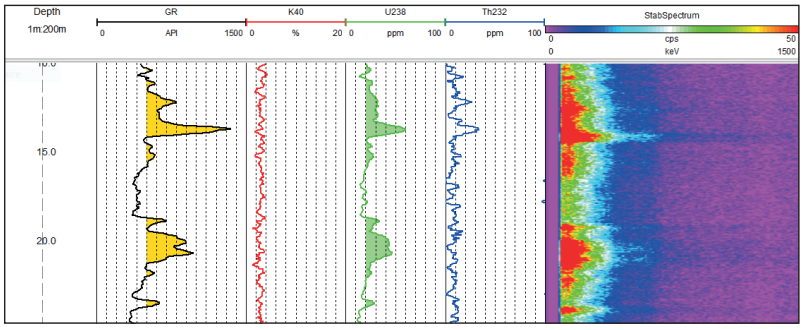
**Cable type :** Mono, multi-conductor, coax
**Compatibility :** Scout Pro / Opal (Scout / Bbox / Matrix)
**Digital data transmission Telemetry :** Variable baudrate telemetry according to cable length/ type & surface system
**Logging speed :** 2m/min
**Centralisation :** Recommended
**Borehole conditions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

## Measurement range

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

## Application

- Recognition of radioactive materials
- Mineral composition
- Uranium exploration
- Ore grade analysis
- Contamination studies
- Lithology characterization
- Well to well correlation




Schlumberger USIT waveforms processed in the CHU workspace to derive thickness and CADI

[1]The Full Spectrum Analysis (FSA) is developped 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.

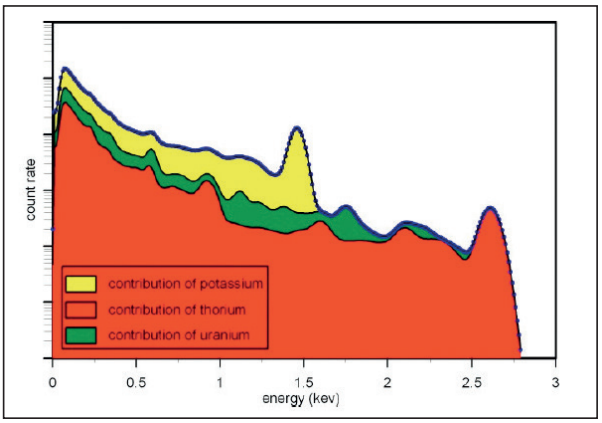
# Principle of measurement

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.

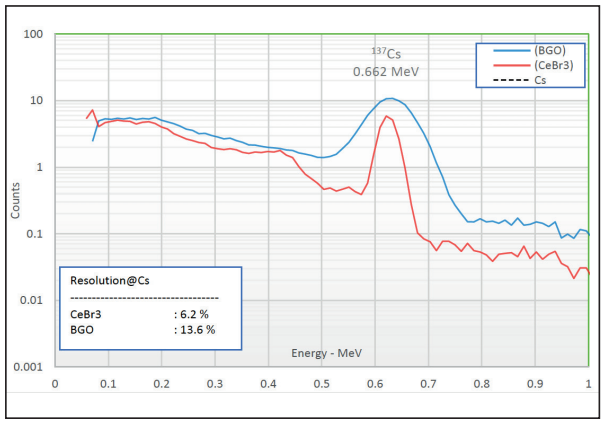
First spectrum stabilization will be performed: each multichannel spectrum in the data set will be converted to a spectrum having all count peaks at the corresponding energy position. This process implies a close comparison with the reference spectra obtained during the calibration process of the spectral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

# Measurements features

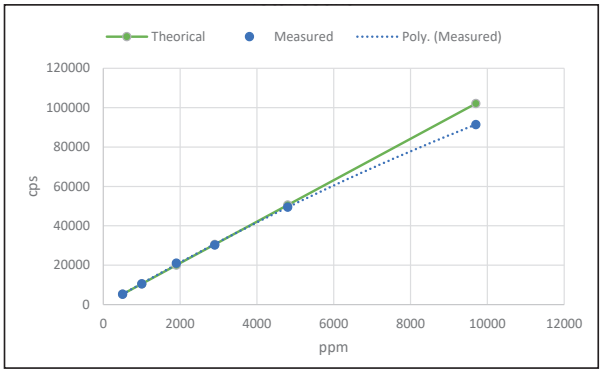
- 2048 channels gamma ray energy spectrum
- Full spectrum analysis and stabilized spectrum
- Total gamma counts [API]
- Concentration of radioisotopes [Bq/kg or ppm]
- Concentration error of radioisotopes [Bq/kg or ppm]



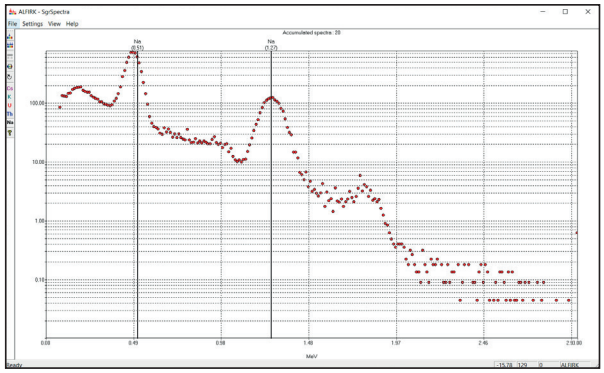

Full Spectrum Analysis by Medusa Systems BV




CeBr3 vs BGO crystal – Spectral resolution comparison (137Cs isotope)




Total count (cps) vs concentration (ppm)



LoggerSuite – Real Time Spectrum (22Na isotope)