

Elemental Capture Tool (ECT)

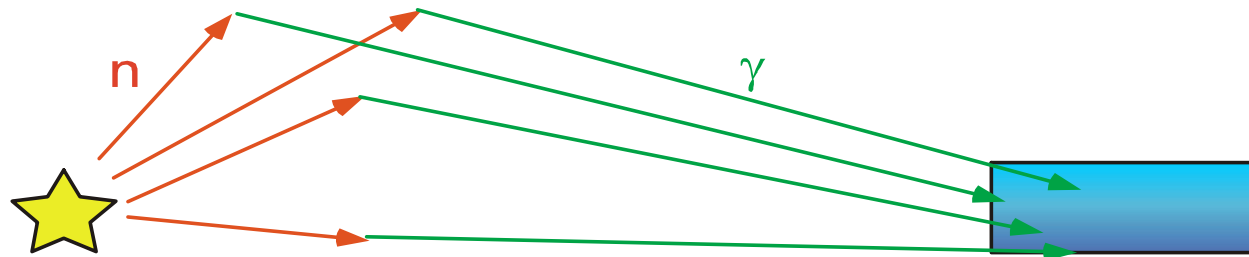
Introduction

The Elemental Capture Tool (ECT) combined with Telemetry/ Spectralog/ Orientation Tool (TSO) provide lithological and quantitative mineralogical information about the formations that surround the borehole.

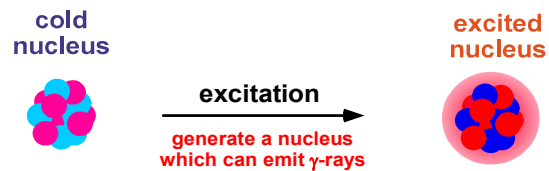
These formations include sandstone, limestone, dolomite, and clay, as well as other possible minerals. The identification of these matrix lithologies is achieved using the principles of neutron-induced gamma ray spectroscopy.

The TSO uses a crystal detector that measures naturally occurring gamma rays produced by the radioactive decay of Thorium (Th), Potassium (K), and Uranium (U) emitted from the subsurface formations.

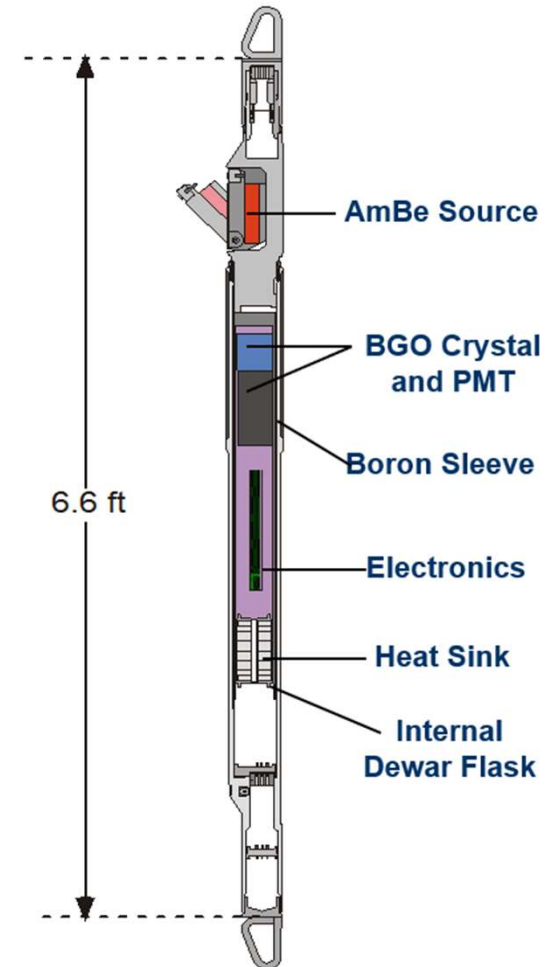
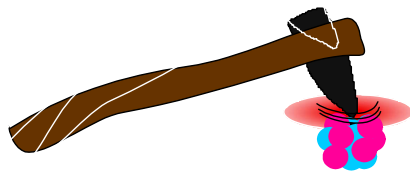
The ECT uses a standard americium beryllium (AmBe) neutron source ^{18}Ci and a large bismuth germanate (BGO) detector to measure relative elemental yields based on neutron-induced capture gamma ray spectroscopy.



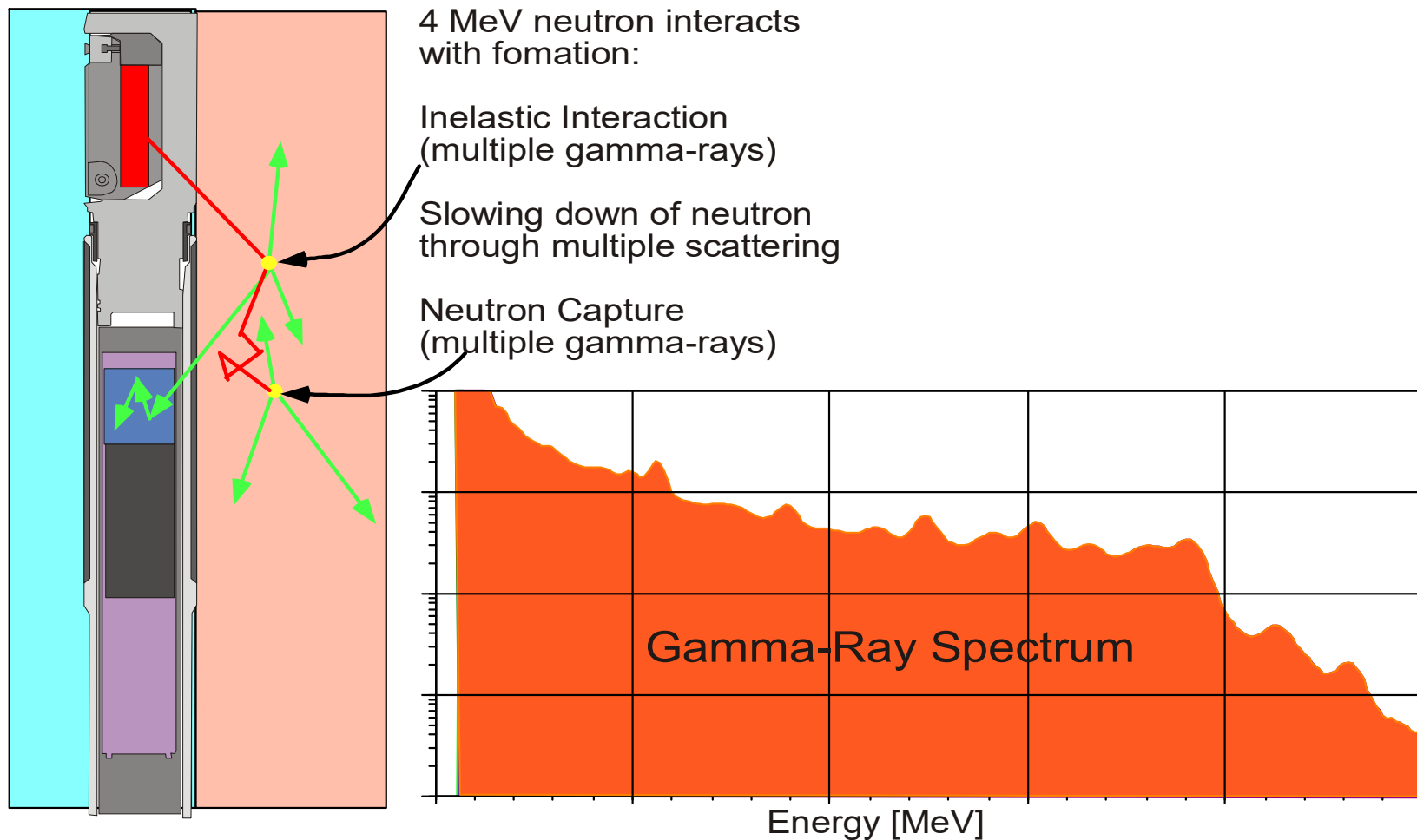
The scattered and absorbed neutrons cause the atoms of the various formation elements to emit gamma rays with identifiable energies. The energies of these signature gamma rays are measured with the help of a flasked BGO scintillation detector, resulting in both inelastic and capture gamma ray energy spectra.



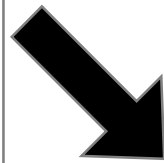
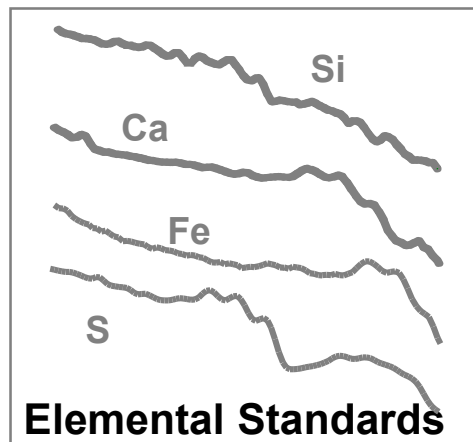
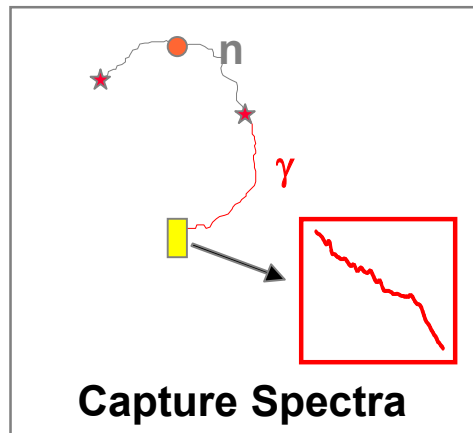
How do we get the nucleus excited ?



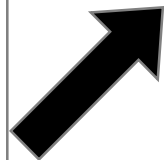
The spectral fitting of the measured pulse height spectrum allows for obtaining the relative contributions of the gamma-rays from the various elements to the total spectrum (elemental yields).



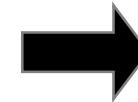
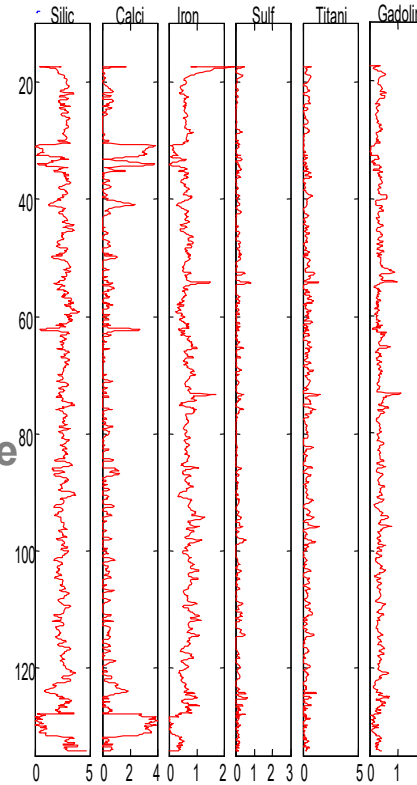
Capture Gamma-Ray Spectroscopy



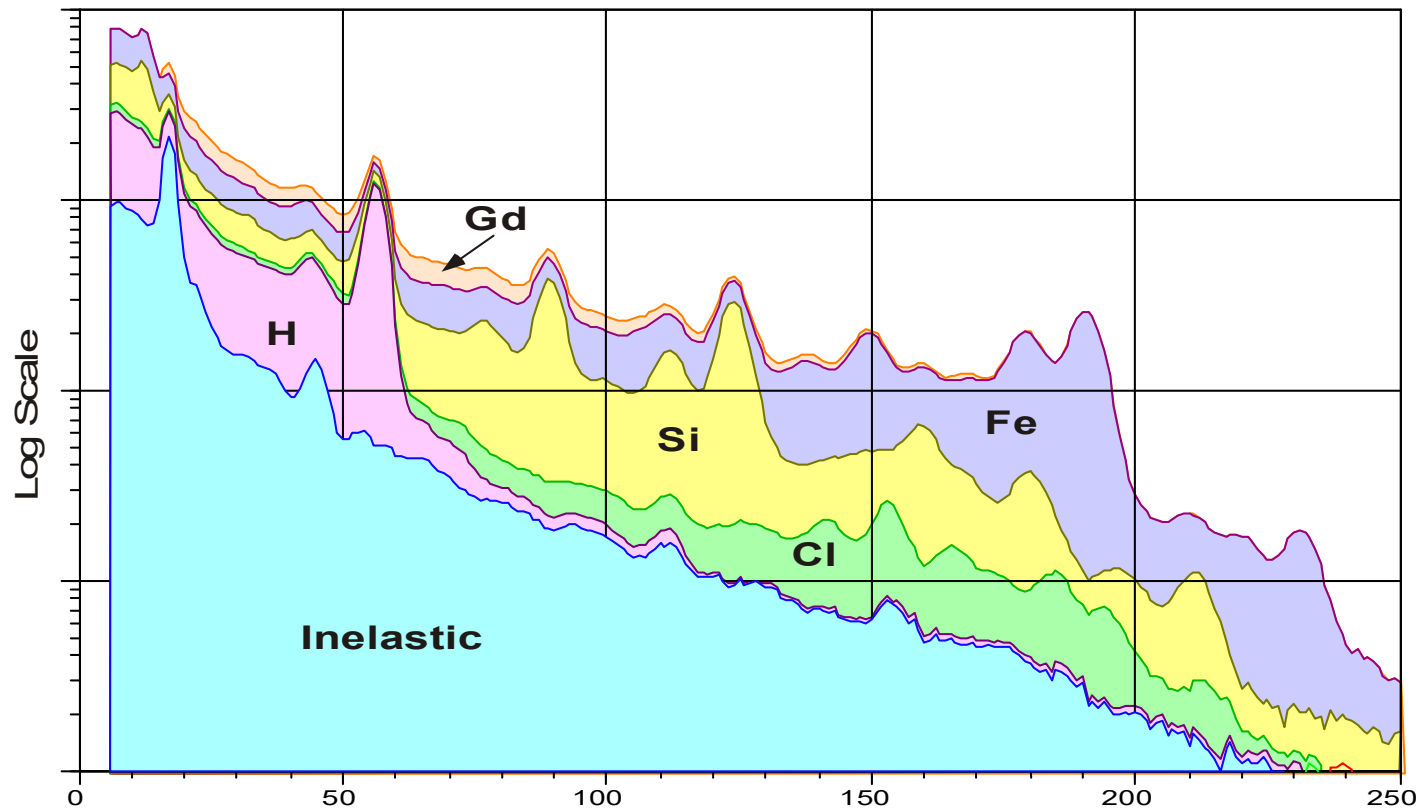
Relative
Yields



Oxides
Closure



Wellsite processing uses the 254-channel gamma ray energy spectrum to produce dry-weight elements, lithology, and matrix properties. The first step involves spectral deconvolution of the composite gamma ray energy spectrum by using a set of elemental standards to produce relative elemental yields. The relative yields are then converted to dry-weight elemental concentration logs for the elements Si, Fe, Ca, S, Ti, and Gd using an oxides closure method.



Application:

- Provide direct carbon measurement in conventional and unconventional reservoirs
- Determine total organic content in unconventional shale reservoirs
- Mineralogy-based permeability estimates
- Provide precise lithology and mineralogy data to improve geomechanical analysis

Benefits:

- Improve porosity determination with more accurate matrix properties
- Improve clay typing and total clay volume determination

Features:

- Enhance reservoir characterization with improved stratigraphic correlation and lithofacies identification
- Identify heavy oil and bitumen
- Generate detailed mineralogy analysis in complex reservoirs

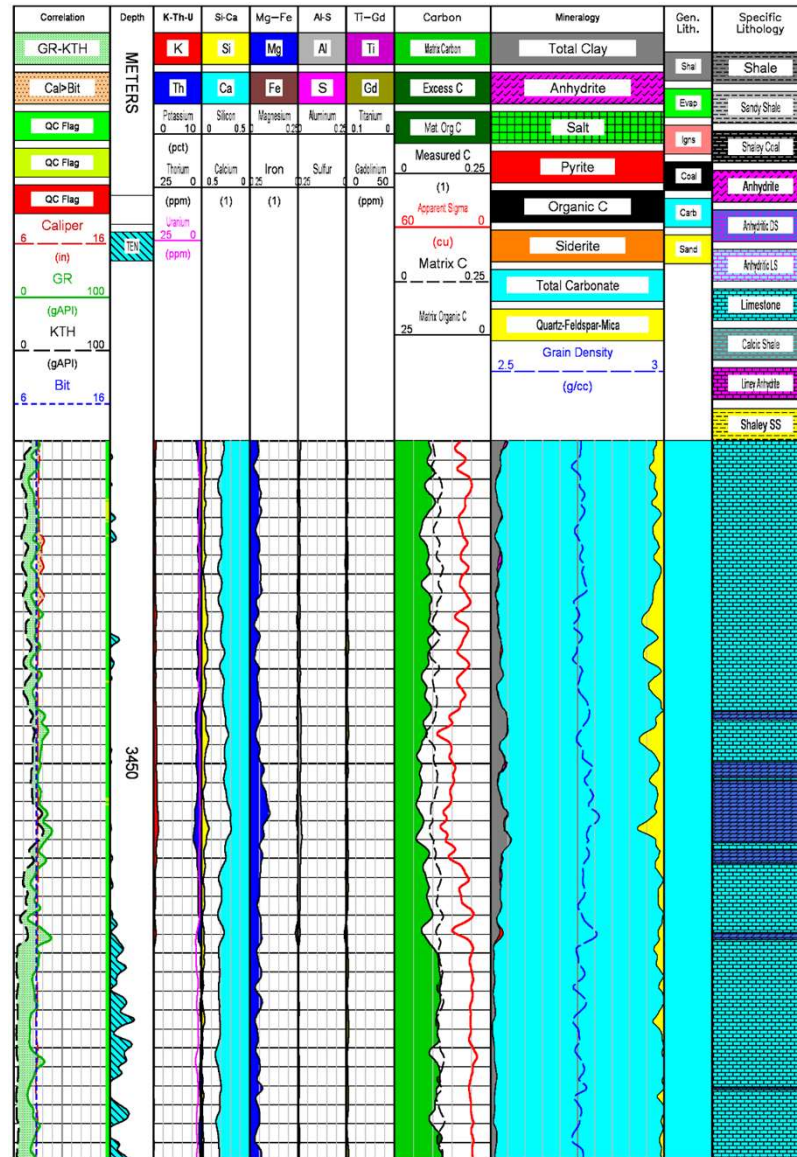


Specifications:

Maximum Temperature	350°F(177°C)
Maximum Pressure	20,000 psi (137.9 MPa)
Tool Diameter	5 in. (127 mm)
Length	6.6 ft. (2.01 m)
Weight	267 lb. (121 kg)
Hole Size	6 in. to 20 in.
Hole Deviation	Vertical to Horizontal
Recommended Logging Speed	30 ft/min.(9.1 m/min)
Output	Elemental yields, dry-weight elemental fractions, dry-weight SpectroLith lithology, matrix properties
Range of measurement	600 keV to 8 MeV
Vertical resolution	18 in.
Depth of investigation	9 in
Accuracy	2% – coherence to standards computed
Maximum Compressive Force	20,000 lb (9,067 kg)
Maximum Tensile Force	50,000 lb (22,667 kg)
Wireline Requirements	7-conductor cable



TSO



ECT

