Technology / Capabilities

- Cased Hole Interpretation: Sigma and C/O Response Equations
- Corrections for Casing Size, Weight, Tubing, Cement, Water, Oil, Gas and CO₂
- Quantitative Interpretation
- Environmental corrections
- Comparison studies of logging tools
- Nuclear R&D and logging tool design

Litho-Density Tool Design

- Design of a small-diameter litho-density tool that logs below the bit.
- Design of a Co-60 density tool.
- Evaluation and performance of different litho-density windows such as Be, titanium and PEEK.
- Spine and ribs algorithms for several density tools.
- Response of a density tool in the presence of rugosity in formations from 2 to 5 g/cc.
- Density-neutron cross plots for a new density-neutron tool string.
- Evaluation of a mineral logging density tool in calibration formations.
- Generation of density sensitivity maps for forward modeling.
- Design of calibration blocks.

Neutron Porosity Tool Design

- Design of a LWD neutron porosity tool using a Cf-252 neutron source.
- Design of a small diameter compensated neutron tool using a Cf-252 source.
- Design of a neutron porosity tool using thermal and epithermal detectors.
- Design of a compensated neutron porosity tool using low pressure He-3 detectors.
- Cased-hole environmental corrections.
- Characterization of a new small diameter compensated neutron tool.
- Design studies between an AmBe neutron porosity tool and a Cf-252 tool.
- Density-neutron cross plots.
- Response of a neutron porosity tool to gas in the borehole.
- Comparison of a single-detector epithermal neutron measurement to a standard CNL measurement.
- Characterization of a pulsed neutron tool using thermal and epithermal detectors.
- Development of a logging simulator for testing tool designs.
Pulsed Neutron Capture (PNC), Sigma

- Design of a LaBr3 PNC logging tool
- Design of a slim diameter NaI PNC tool
- Determination of the optimal gating sequences for a PNC logging tool.
- Comparison of the porosity response of PNC tools vs. CNL tools.
- PNC tool response to methane, "rich" and "lean" gases.
- Tool response in observer, injector and producer wells in a field with CO2 flooding.
- Evaluation of sigma and neutron porosity measurements in the presence of CO2.
- Evaluation of time-lapse PNC logs.
- Comparison of two different PNC tools to calibrate one tool to the other.
- Comparison of the sigma and gas responses of 5 different PNC tools.
- Detailed evaluation of the diffusion effect on PNC sigma measurements.
- Environmental corrections for a PNC tool for hole size, casing size and weight, clay content, water/oil/gas in the formation, and water/oil/gas in the borehole.
- Development of a logging simulator for testing tool designs.

Pulsed Neutron Carbon/Oxygen (C/O)

- C/O response to methane, "rich" and "lean" gases.
- Tool response in observer, injector and producer wells in a field with CO2 flooding.
- Environmental corrections for hole size, casing size and weight, clay content, water/oil/gas in the formation, and water/oil/gas in the borehole.
- PNC C/O response in a gravel pack.
- Development of a logging simulator for testing tool designs.

Design of Source Shields

- Design of neutron and gamma-ray source shields.

Detector Modeling & Physics

- Modeling of the response from NaI, BGO, GSO, LaBr3, YAP, YSO, GYSO, CsI, and LaCl3 detectors.
- Neutron porosity tool response in the University of Houston API Calibration facility.
- Gamma-Ray tool response in the University of Houston TUK Calibration wells.
- Evaluation of tool response in the Callisto calibration facility.
- Evaluation of neutron slowing-down and migration lengths in different formations for AmBe and 14 MeV neutrons.
- Development of a new way to interpret elemental capture spectroscopy data.
- Comparison of simulated density spectra to lab measured spectra.
- Studies of neutron activation (oxygen, silicon, aluminum, iron, etc).

Design of Lab Equipment

- Dose rates in a calibration tank.
- Design of experimental formation tanks.
- Design of calibration fixtures.
Capture Spectroscopy Tool Design

Natural Gamma-Ray Tools (TUK)

General Tool Design & Response

- Design of a BGO elemental capture spectroscopy tool.
- Design of a LaBr3 elemental capture gamma ray tool.
- Design of a new azimuthal LWD GR tool.
- Design of a CsI spectral gamma ray tool.
- Design of a borehole-fluid density tool.
- Design of an oxygen activation tool for measuring water flow behind casing.
- Interpretation of oxygen activation logs for production logging.
- The effect of invasion, thin beds and deviation on nuclear measurements.
- Benchmarking and calibration of older generation logging tools.
- Environmental corrections for a Si-activation measurement in gravel pack.
- Evaluation of an X-ray backscatter measurement.
- Evaluation of an X-ray fluid density measurement.
- Response of tools in CsK formate muds.
- Cased-hole environmental corrections for open-hole tools.

Software

- Software requirements and specifications for nuclear logging tool software.
- iPhone apps.
- VBA code (for Excel).
- Fortran.
- Swift/Xcode.
- Job planners.

iPhone App Under Development

- Spectral processing.
- Sigma processing.
- Environmental corrections.
- Logging simulator.

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