

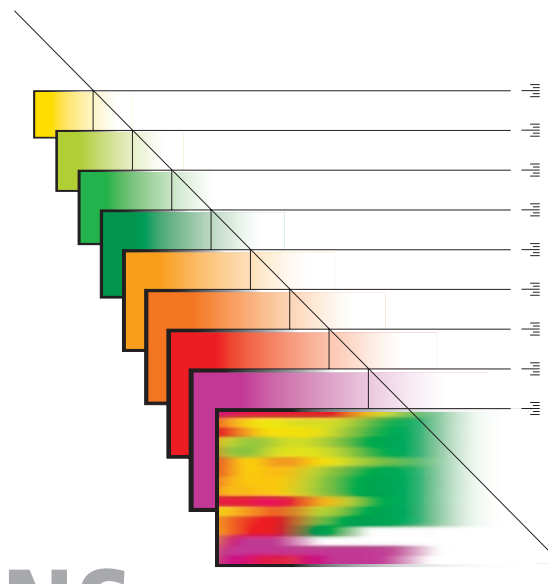
# Measurements to Optimize Stimulation Treatments

## APPLICATIONS

Engineering Challenge	Applied Measurement	Resulting Value
<b>Perforation Strategy</b> <ul style="list-style-type: none"> <li>Limited entry perforating</li> <li>Multiple interval perforating</li> <li>Single source perforating</li> <li>Perforation quality</li> </ul>	SpectraStim / SpectraScan - Diagnostic tracer and imaging services	<ul style="list-style-type: none"> <li>Determine if all intervals and perforations accepted treatment</li> <li>Evaluate limited entry perforating performance</li> </ul>
<b>Zonal Coverage</b> <ul style="list-style-type: none"> <li>Single stage or multi-stage</li> <li>Staging efficiency</li> <li>Staging isolation techniques</li> </ul>	SpectraStim / SpectraScan - Diagnostic tracer and imaging services	<ul style="list-style-type: none"> <li>Ensure all stages were treated effectively</li> <li>Optimize number of stages for effective completion</li> <li>Identify by-passed reserves</li> <li>Validate proper operation of isolation devices</li> </ul>
<b>Fluid System Selection</b> <ul style="list-style-type: none"> <li>Compatibility with reservoir</li> <li>Effective fracture length</li> <li>Frac fluid performance</li> <li>Frac fluid cleanup effectiveness</li> </ul>	Stim-Lab - Proppant and fluid laboratory testing SpectraChem - Chemical tracer services	<ul style="list-style-type: none"> <li>Minimize fluid damage to formation and proppant pack</li> <li>Maximize effective proppant pack conductivity</li> <li>Maximize frac fluid recovery</li> <li>Improve flowback techniques to maximize proppant conductivity</li> </ul>
<b>Wellbore Connectivity</b> <ul style="list-style-type: none"> <li>Proppant placement and distribution at the wellbore</li> <li>Proppant flowback control</li> <li>Placement of tail-in proppants and materials</li> </ul>	SpectraStim / SpectraScan - Diagnostic tracer and imaging services SpectraScan time lapse - Compare different time frame images	<ul style="list-style-type: none"> <li>Optimize tail-in proppant volumes</li> <li>Achieve effective proppant distribution at the wellbore</li> <li>Determine proppant flowback issues</li> <li>Identify over-displacement</li> </ul>
<b>Fracture Geometry</b> <ul style="list-style-type: none"> <li>Frac model calibration</li> <li>Fracture height containment</li> <li>Post-frac BH pressure analysis</li> </ul>	SpectraStim / SpectraScan - Diagnostic tracer and imaging services GOHFER - 3D fracture simulator PROMORE - ERD permanent downhole pressure and temperature	<ul style="list-style-type: none"> <li>Realistic frac determination using measured BH frac pressure and temperature</li> <li>Determine fracture height growth</li> <li>Post-frac geometry determination</li> <li>Accurate BH pressure measurements for real-time frac monitoring</li> </ul>
<b>Mechanical Integrity</b> <ul style="list-style-type: none"> <li>Squeeze perf integrity</li> <li>Cement competency</li> <li>Casing/tubing integrity</li> </ul>	SpectraStim / SpectraScan - Diagnostic tracer and imaging services	<ul style="list-style-type: none"> <li>Identify cement channels behind pipe</li> <li>Determine mechanical integrity</li> <li>Determine stage collar integrity</li> <li>Easily locate casing splits and collar leaks</li> <li>Determine squeeze perf integrity</li> </ul>
<b>Production Evaluation</b> <ul style="list-style-type: none"> <li>Where is production coming from?</li> <li>What zones are producing?</li> <li>What are major gas/oil/water contribution zones?</li> </ul>	Completion Profiler - Combination SpectraScan and full production evaluation tool	<ul style="list-style-type: none"> <li>Evaluate zonal production</li> <li>Establish post-frac production index</li> <li>Determine problem production zones</li> <li>Determine major gas and oil producing zones</li> </ul>

Completion diagnostics from ProTechnics are used by completion engineers to better understand and optimize stimulation treatments. These diagnostic measurements are made using an array of unique tracer injection and imaging services, including SpectraStim™ isotope tracers and SpectraChem™ chemical tracers, the SpectraScan® imager and the Completion Profiler® system.

Measurements made using these technologies are applied as part of an iterative completion diagnostics process to improve stimulation results. This process involves designing treatments with numerical simulators, such as GOHFER® 3D, and measuring actual surface and downhole parameters during and after the treatment. Using these direct measurements, the reservoir and fracture models are calibrated to better predict the stimulation effect and resulting production performance.



# MEASURED SOLUTIONS

### Service Description

ProTechnics provides a wide range of services and technology for completion diagnostics that optimize stimulation treatments, including:

### Tracer Services

**SpectraStim™** – Gamma emitting tracer service

**SpectraChem™** – Chemical tracer services

### Imaging Services

**SpectraScan™** – Memory spectral gamma ray image service

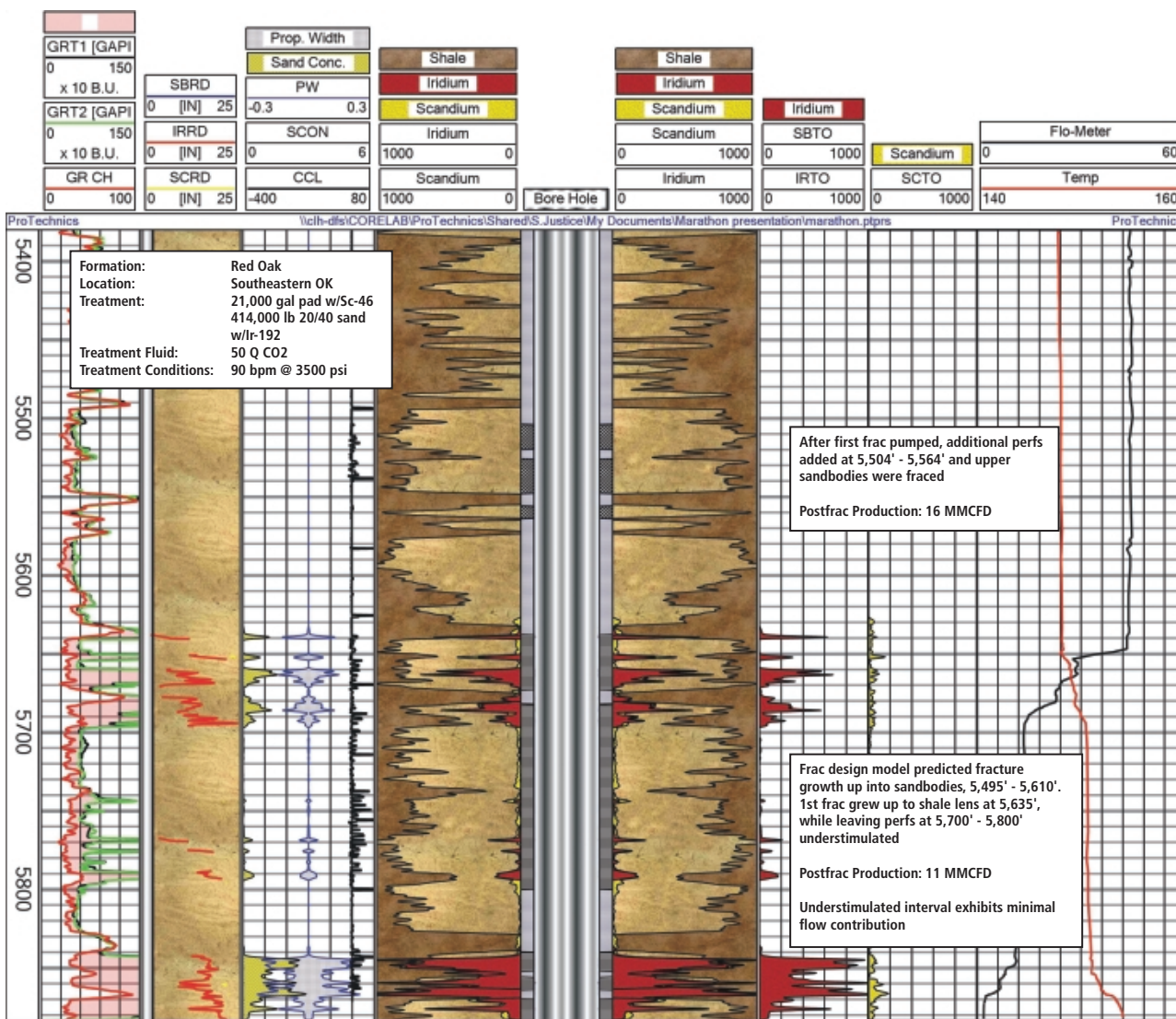
**Completion Profiler™** – Full service production evaluation image; spinner, pressure/temperature, nuclear density and electrical capacitance

### Other Services

**Stim-Lab** – Laboratory services for reservoir fluid compatibility testing, regained permeability testing, fluid performance testing at fracture conditions

**PROMORE** – ERD sensor technology for permanent downhole pressure and temperature gauging systems

**GOHFER®** – 3D fracture simulator



For more information, please visit our website at:

[www.corelab.com/protechnics](http://www.corelab.com/protechnics)

