

2019 NAPS

NORTH AMERICA PERFORATING SYMPOSIUM

AND SAFETY FORUM

DALLAS - FORT WORTH. AUGUST 5-6, 2019.

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Dynamic Behavior, Simulation, and Shock Data for an Ultra-Low-Debris Gun System

- Introduction
 - Operator challenge: ensure survivability of ultra-low-debris gun system

- Advance data and simulation package in use:
 - FEA well dynamics software
 - Pressure and shock loading measuring tool

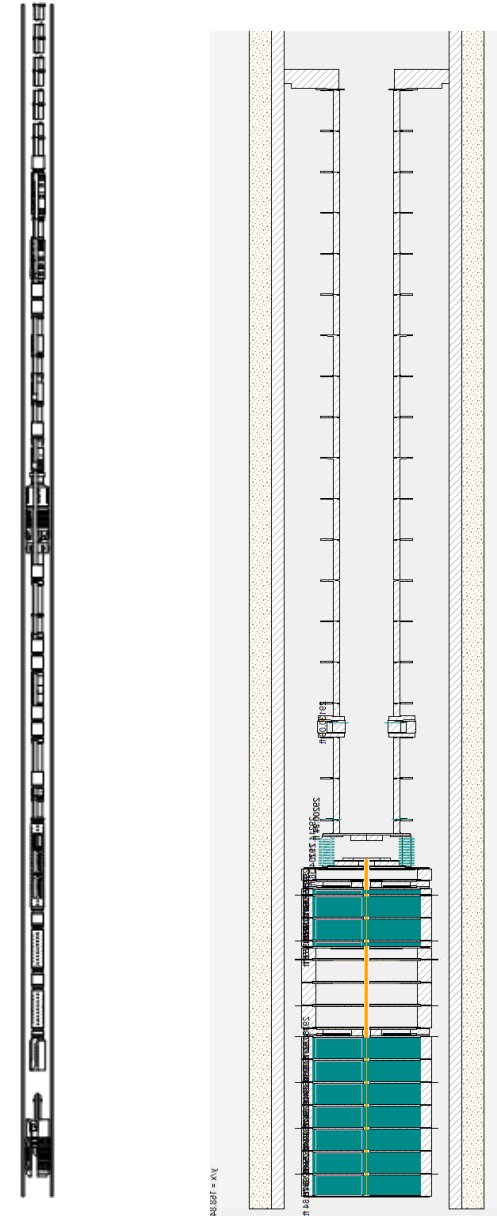
- FEA software
 - Introduction
 - Setup

- Results/data
 - Pressure at sandface between guns
 - Strain between guns
 - Discussion matching/calibration
 - Capability and other nonstandard applications

- Ensure survivability of complex ultra-low-debris gun system in deepwater HP environment
- Develop recommended changes for the string

Benefits

- Very high cost failure prevention
- Understanding dynamics in the wellbore and pressure response at the sandface



Ultra-Low-Debris System

- Reservoir sensitivities
 - Perforation tunnel cleaning using static or dynamic underbalance is impractical
- Downhole system sensitivities
 - Frac- or gravel-pack systems
- Surface equipment sensitivities
 - Circulating systems
 - Producing wells



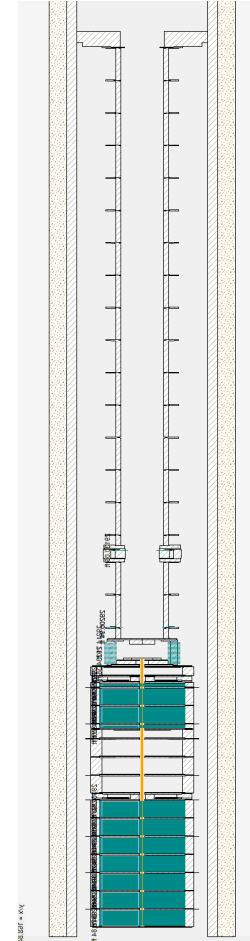
Pressure and Shock Measuring Tool

- Measurements in a shock environment
 - Transient strain
 - Transient pressure
 - Transient acceleration
 - Slow pressure
 - Slow temperature
 - Slow strain



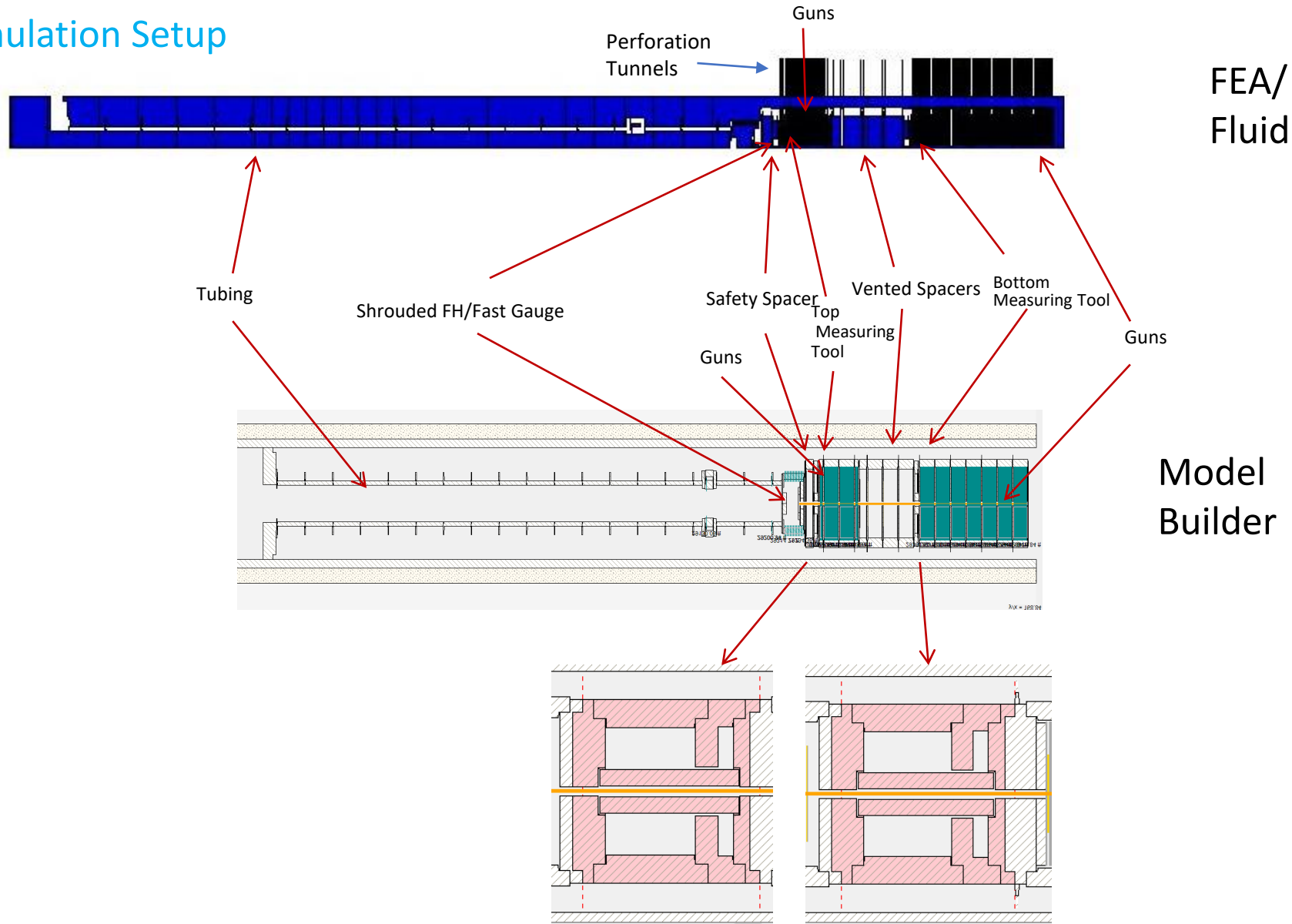
Modeling Software

- Understanding the dynamic shock loading response of the complex completion and perforating gun strings during detonation
 - Crucial to the development of better completion systems and optimal operation designs with maximum reliability
- Proprietary tool database and model generator enables
 - Definition of bottomhole assembly (BHA) geometry and wellbore fluids
 - Tailored for end users without prior finite element analysis (FEA) experience
 - can set up complex models efficiently and reliably



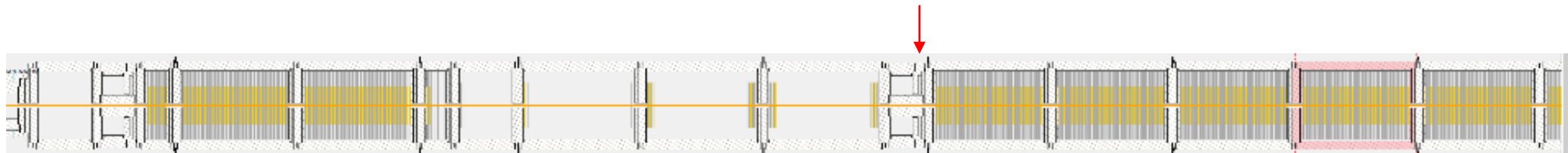
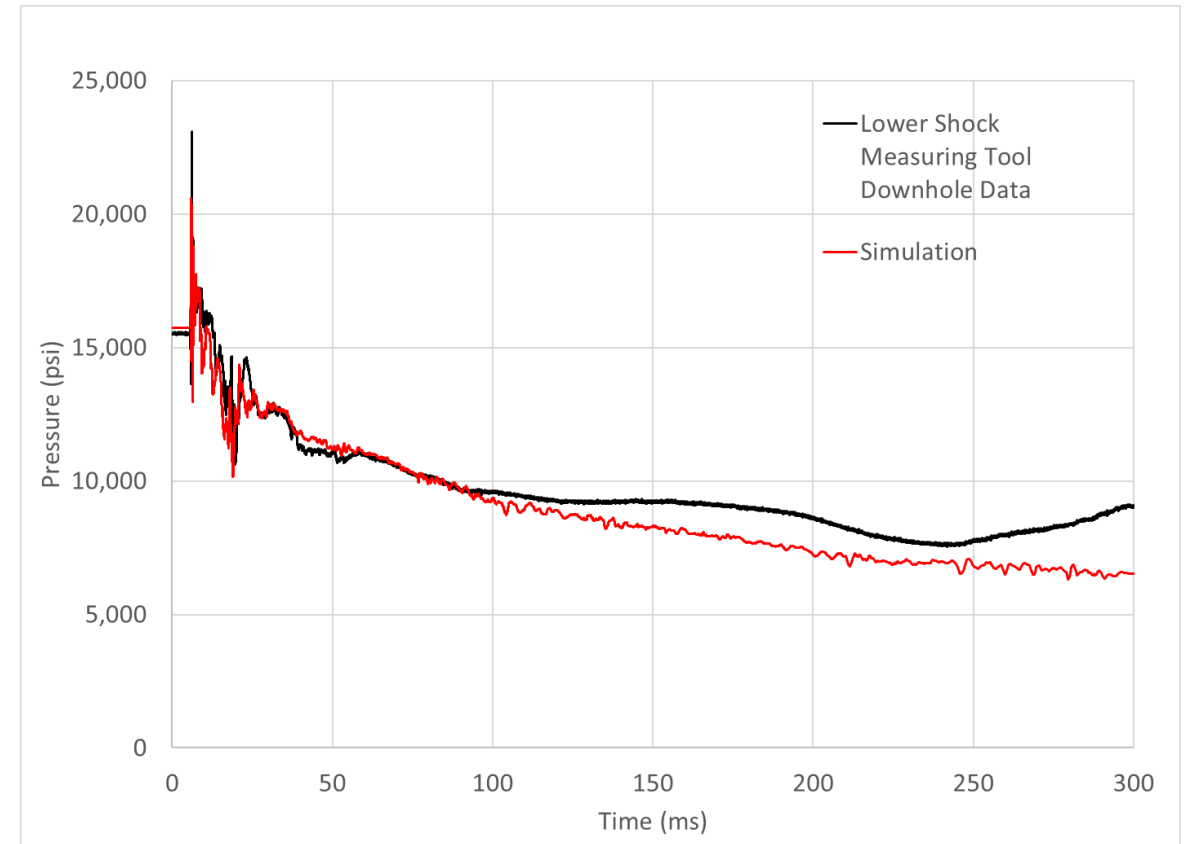
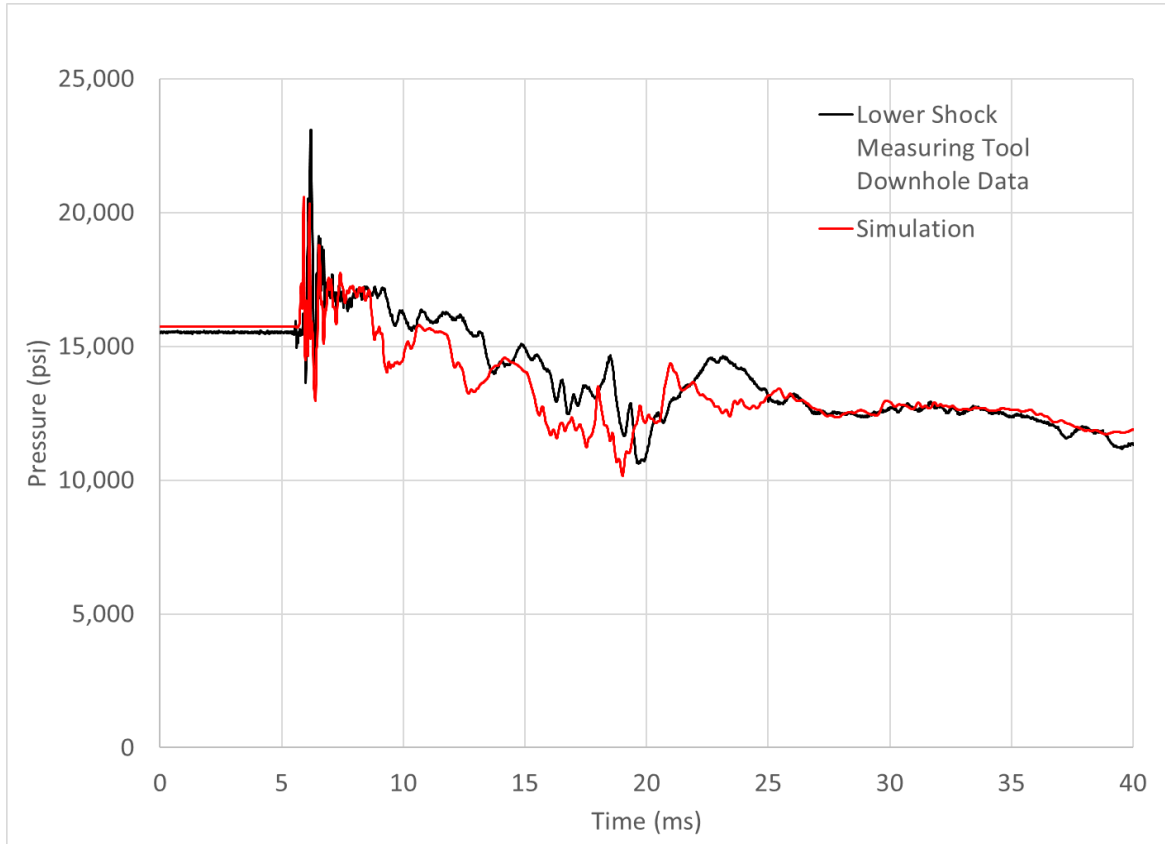
Advanced Dynamic Software Modeling: FEA Software

Simulation Setup



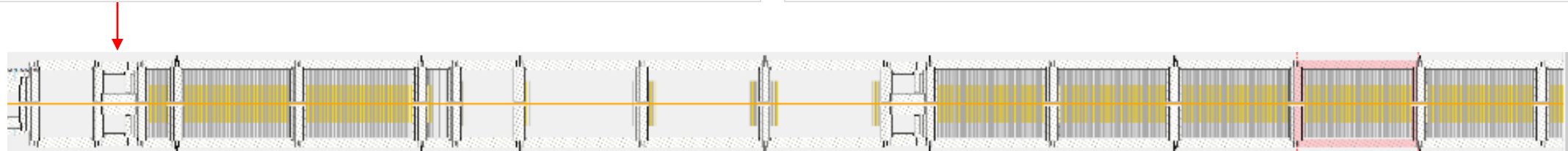
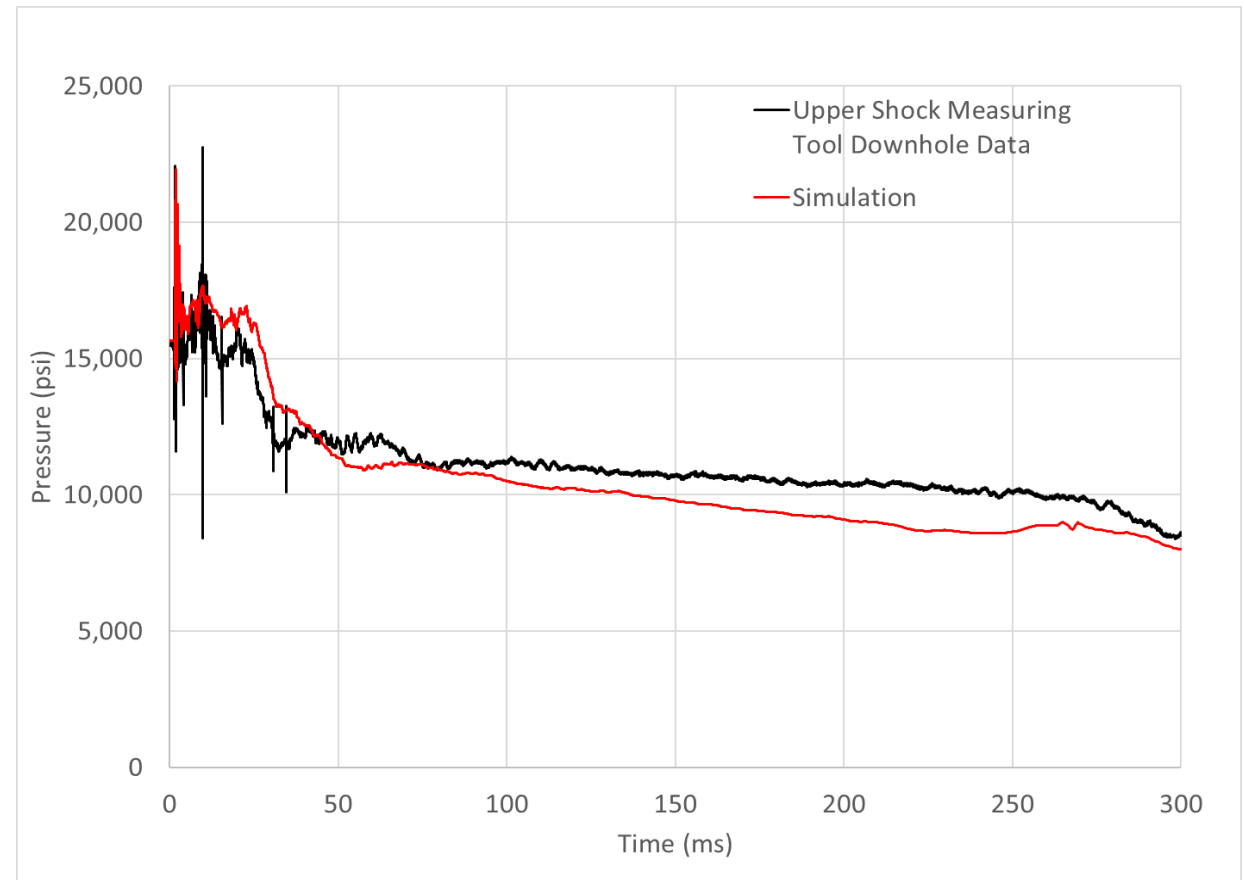
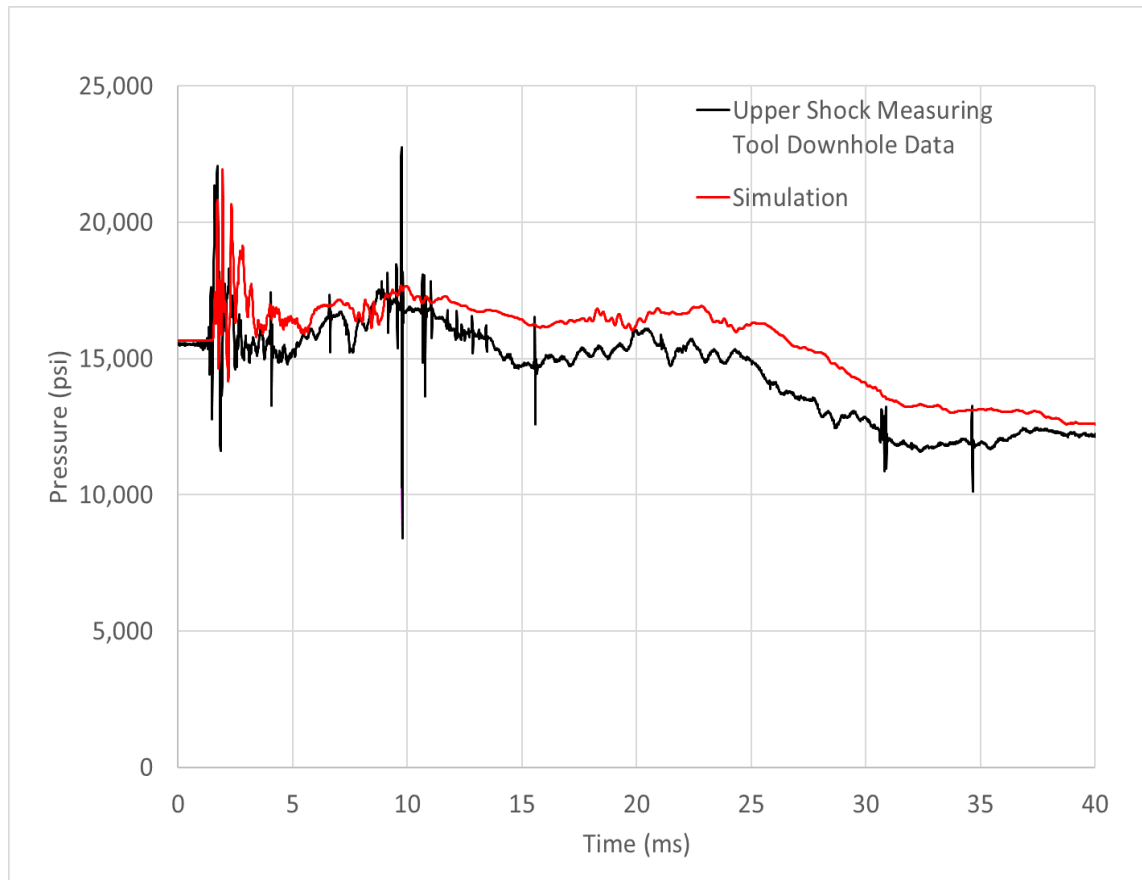
Simulation and Downhole Data Results

Good Simulation Comparison: Lower Shock Data Gathering Tool



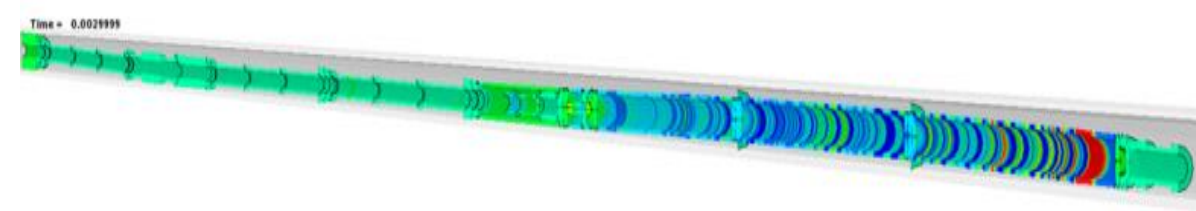
Simulation and Downhole Data Results

Good Simulation Comparison: Upper Shock Data Gathering Tool



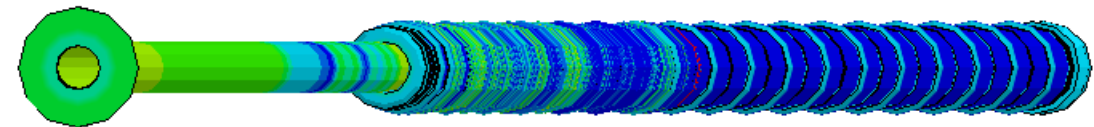
Advances Achieved by Software

- Advanced formation communication effect on wellbore dynamics
- Complex tools simulation
- Complex wellbore configurations
- Advanced perforation tunnel modeling with clean out and fracture



Application

- Highly advanced simulation of complex long perforating strings
 - Live well deployment
 - Side mounted guns
- Simulation for HP/HT environments
- Advance simulation for individually complex tools and guns to help mitigate failure



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QUESTIONS?
THANK YOU

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