



FORWARD ENGINEERS



**3, Gabriel Industrial Estate, Opp. I.N.D Colony, Off. LBS Marg, Kanjur Marg(W),
Mumbai -4000078, Maharashtra, INDIA**

THE TEST RIG PLATFORM

The Test Rig platform is precisely engineered, designed & tested for ease of use and excellent repeatability. Its major feature is the flat and uniform T-Slot arrangement that allows quick adjustments for a variety of testing modules. After the initial installation the system never has to be leveled straightened or aligned again. Precision T-nuts and central guide key can be simply locked on to the platform and would be automatically aligned and ready to test. This design of the platform can be expanded to any desired length and can mount various accessories to its universal rail system.

SALIENT FEATURES

- Carbon steel H- Section beams for high rigidity.
- Mounting legs fabricated for carbon steel hollow square section.
- Bed -duly machined and ground for best levelling.
- T-Slot grooves for perfect centring, clamping and mounting of bar supports.
- Levelling screws on bed for proper alignment.
- Grouting and height adjustment provision at the base.
- Bottom damping pads to resist vibrations.
- T-Slot grooves for perfect centring, clamping and mounting of bar supports.



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☎ 9833380283

✉ arnoldpinto4u@gmail.com



THE LAUNCHER

The Gas Launcher is used to consistently accelerate striker bars to required velocities for dynamic tests. These Launchers are precisely to accelerate striker bars of different lengths for tension and compression tests. These launchers are tested at high pressures ranging from 4500 psi to 6000 psi. The reservoir & the barrel is made from non-corrodable stainless steel of 316 grade for long life & ultimate stability. The pressurised gas is released with the help of pneumatically actuated ball valves via the firing button at the control panel. The Velocities can be controlled and repeated to within 1% accuracy. These launchers can actuate the striker bars between 20 m/s to 1000 m/s which can be used to test materials of varying hardness.

SALIENT FEATURES

- Gas gun max operating pressure 2MPa (290 psi.)
- Gas Gun MOC- Stainless Steel SS304 Grade
- Solenoid Quick Release Valve- Festo Make for Quick Release of Air. MOC
- Pressure gauges for input pressure MOC .S.S.304
- Air- Compressor, ELGI Make.
- Velocities - 20 m/s to 100m/s
- Repeatability within 1% Accuracy.
- Hose Tubes for charging cylinder - 6000 psi tested.

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BAR AND BAR MOUNTS

Bars of various materials ranging from acrylic, Alumunium, Polymer to Alloy Steel can be provided as per test requirement.

Following bars are provided with the system:-

- Striker Bar, Incident Bar, Transmitter Bar & Momentum Trapper Bar.

The Bar mounts are precisionely machined for high level of alignment and movement.

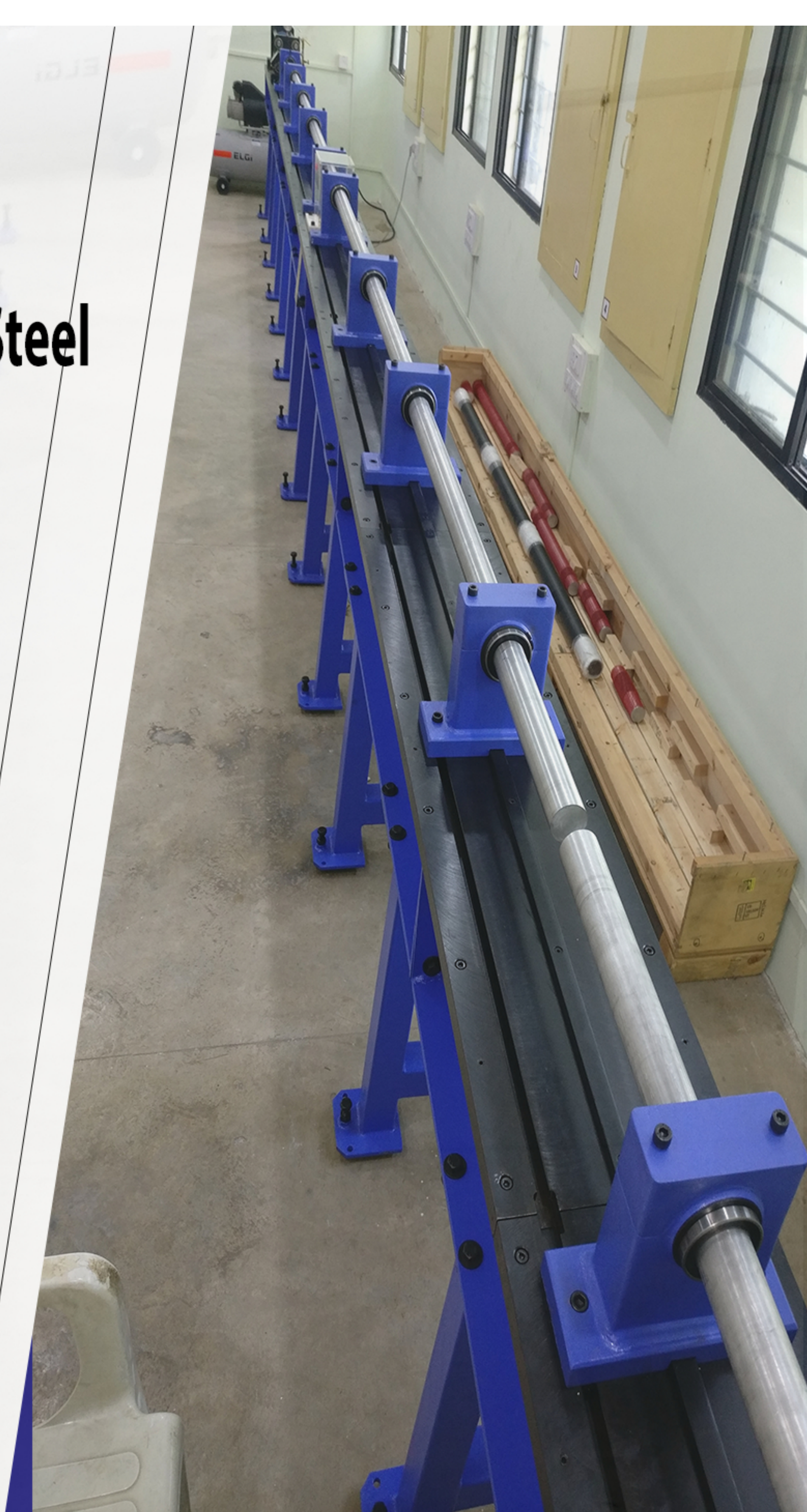
SALIENT FEATURES

BARS

- Acrylic, Alumunium, Polymer to Alloy Steel
- All bars duly cylindrically ground.
- Straightness value of 0.1mm/mtr.
- Striker bars with sabot arrangement.
- Bottom damping pads to resist vibrations.

BAR MOUNT

- Precision machined bar mounts for perfect alignment.
- Carbon steel mount for better rigidity
- Linear Bearings for negligible friction between support and bars.
- Slotted base for centring
- Dissecting design for easy replacement of bars.



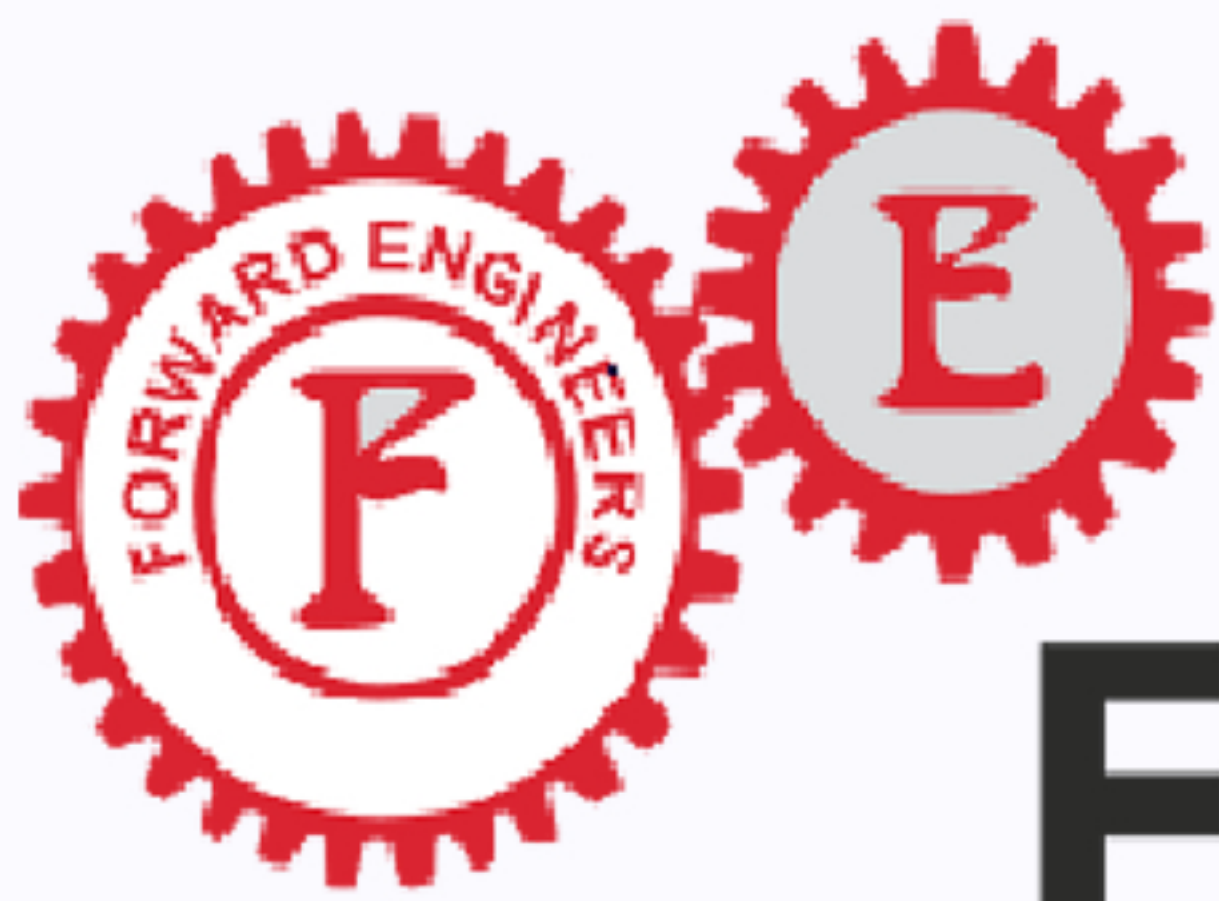
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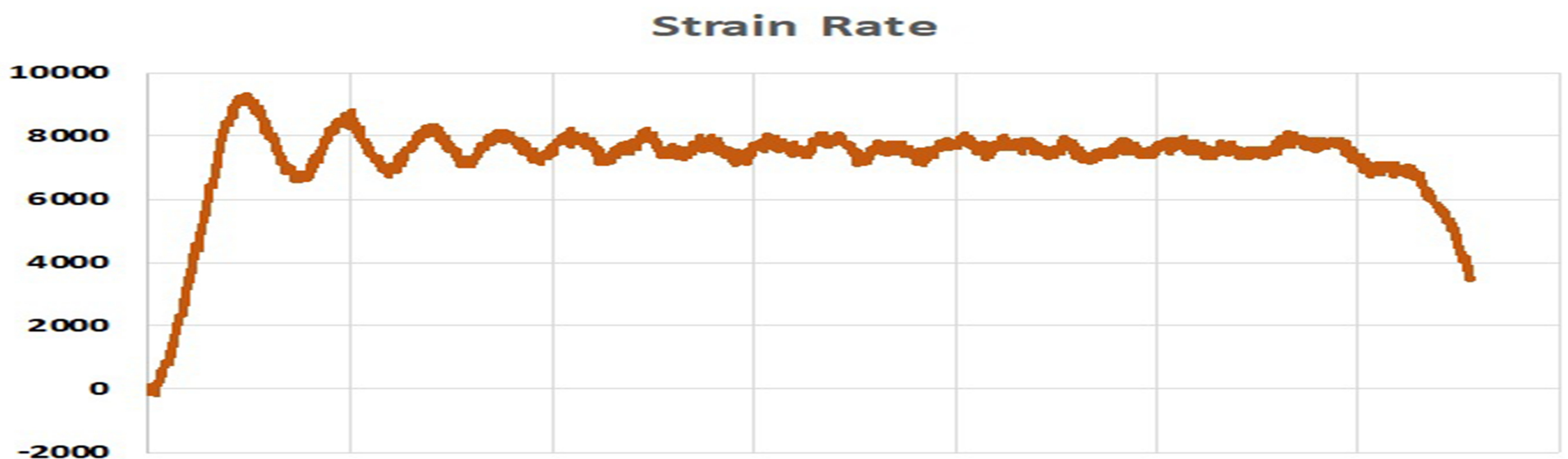
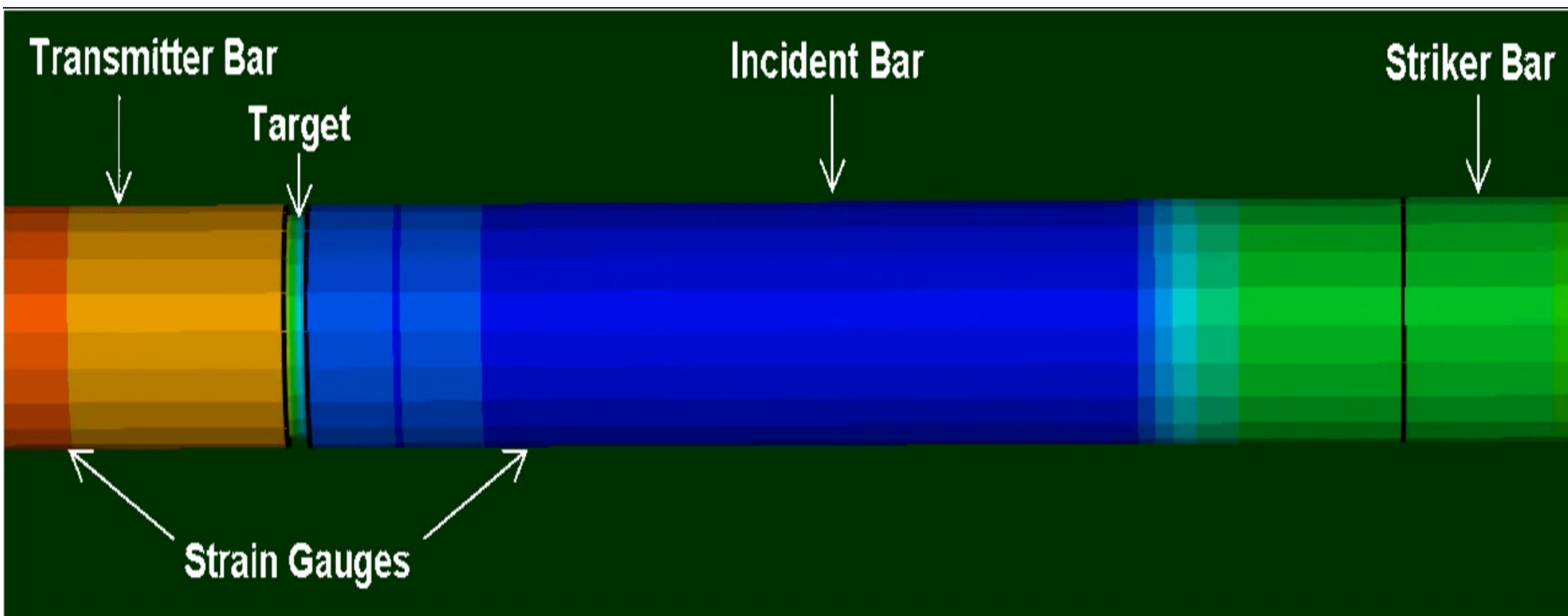
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DATA ACQUISITION SYSTEM



TEST SYSTEMS

HIGH STRAIN RATE EQUIPMENT & TESTING

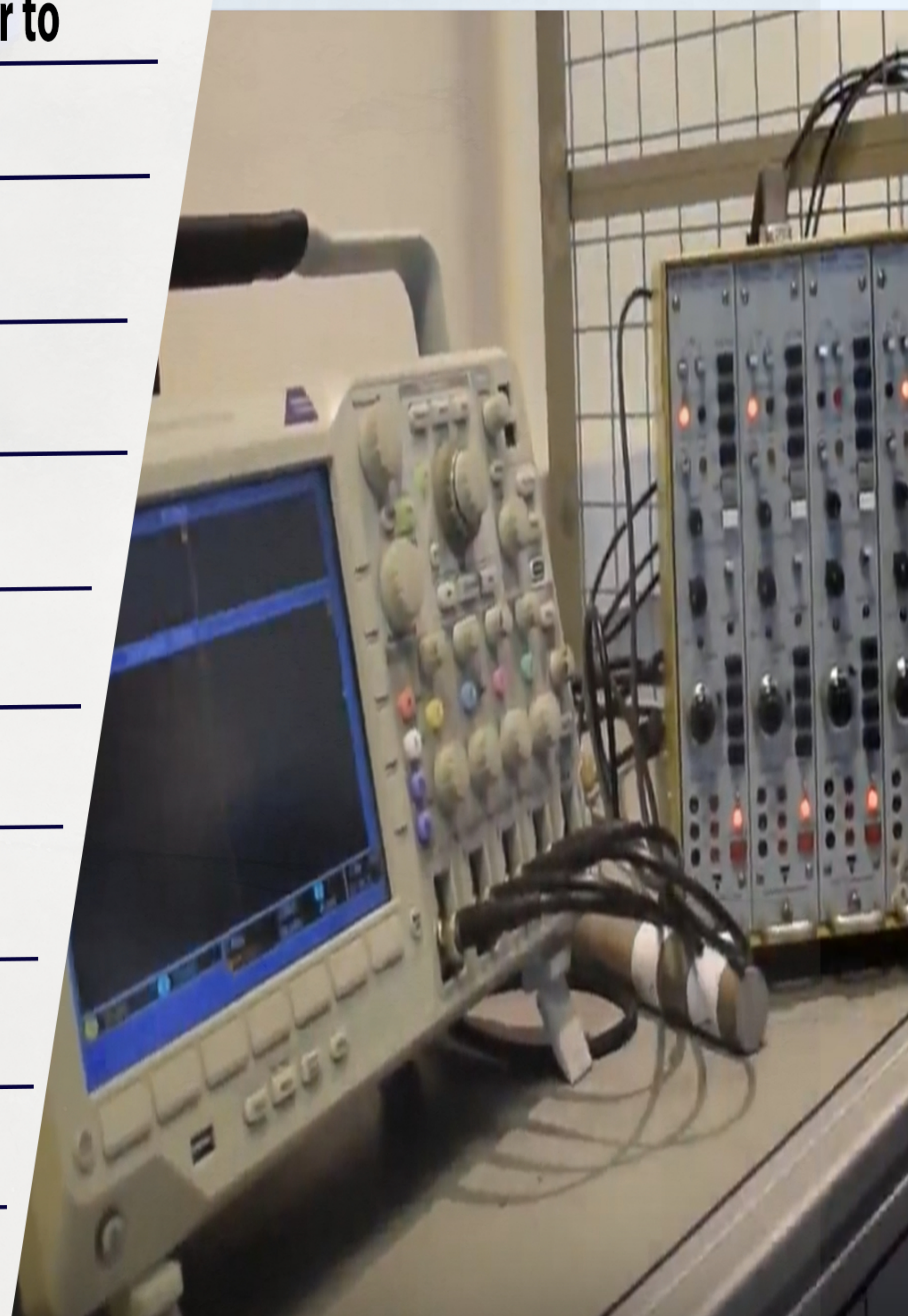


DATA ACQUISITION SYSTEM FOR HIGH STRAIN RATE DATA COLLECTION

This Data Acquisition System is carefully selected components designed to collect High-Strain test data in a efficient manner. The System is compact and mounted on a cabinet assembly for ease of recording data on the given test rig. The system includes strain gauges, signal conditioning amplifiers, compactible bridge boxes, digital oscilloscopes, computer, cables, connectors & tools. The system contains stain guage mounting equipment and collection of strain signals for multiple channels. The signal conditioning amplifiers and bridge boxes are conveniently housed in a rack type electronic enclosure.

SALIENT FEATURES

- Highly Accurate Speed Sensors for velocity measurement of striker bar to test upto 3000m/s.
- Built-in metric unit conversion for speed.
- DC type Dynamic Strain meter
- High speed – 200 KHz.
- 2 – Channel
- Compatible with strain gauges from 120 ohms to 1000 ohms
- Measuring Range $\pm 100000 \times 10^{-6}$ Strain
- Bridge excitation can be switched in 6 steps.
- Auto Balancing feature to zero the bridge
- Filters – Low pass and High Pass.



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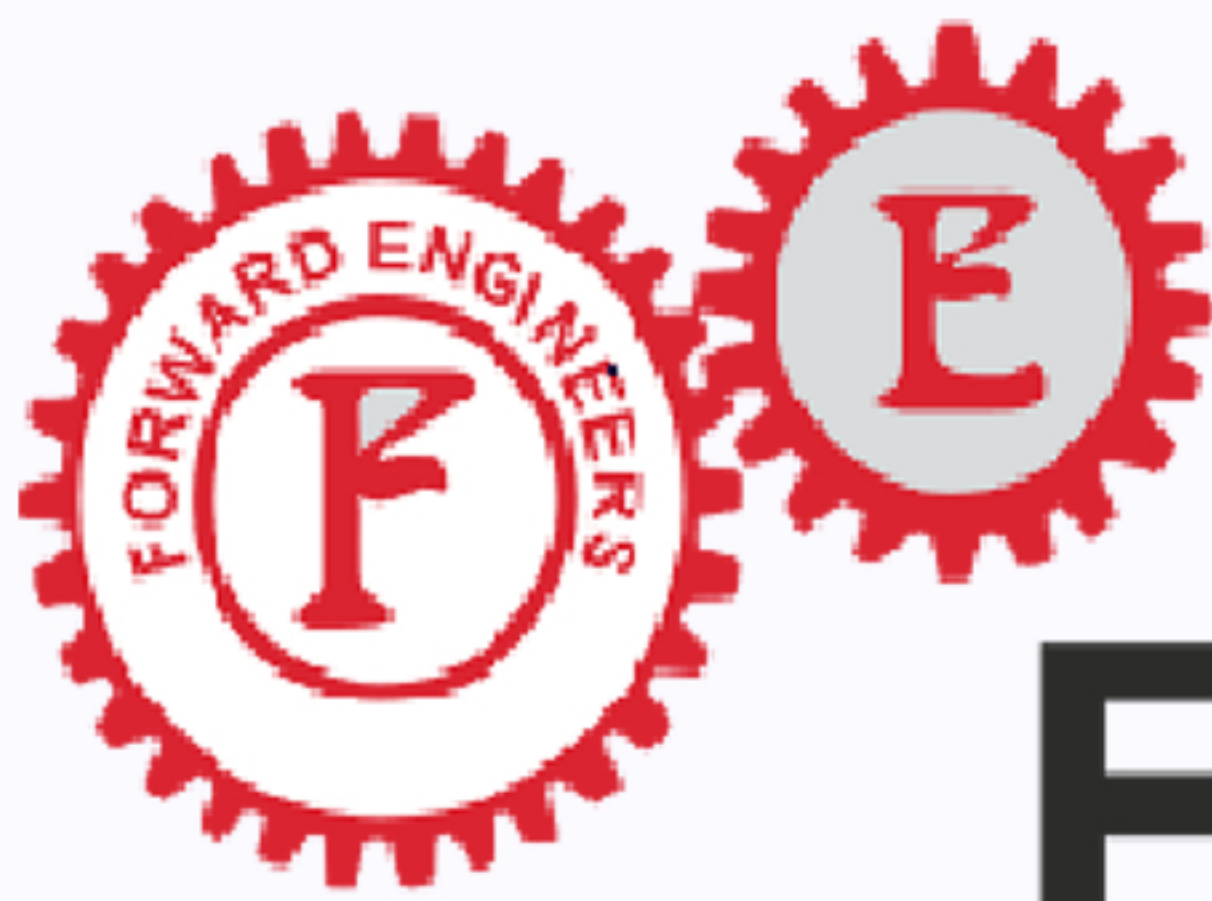


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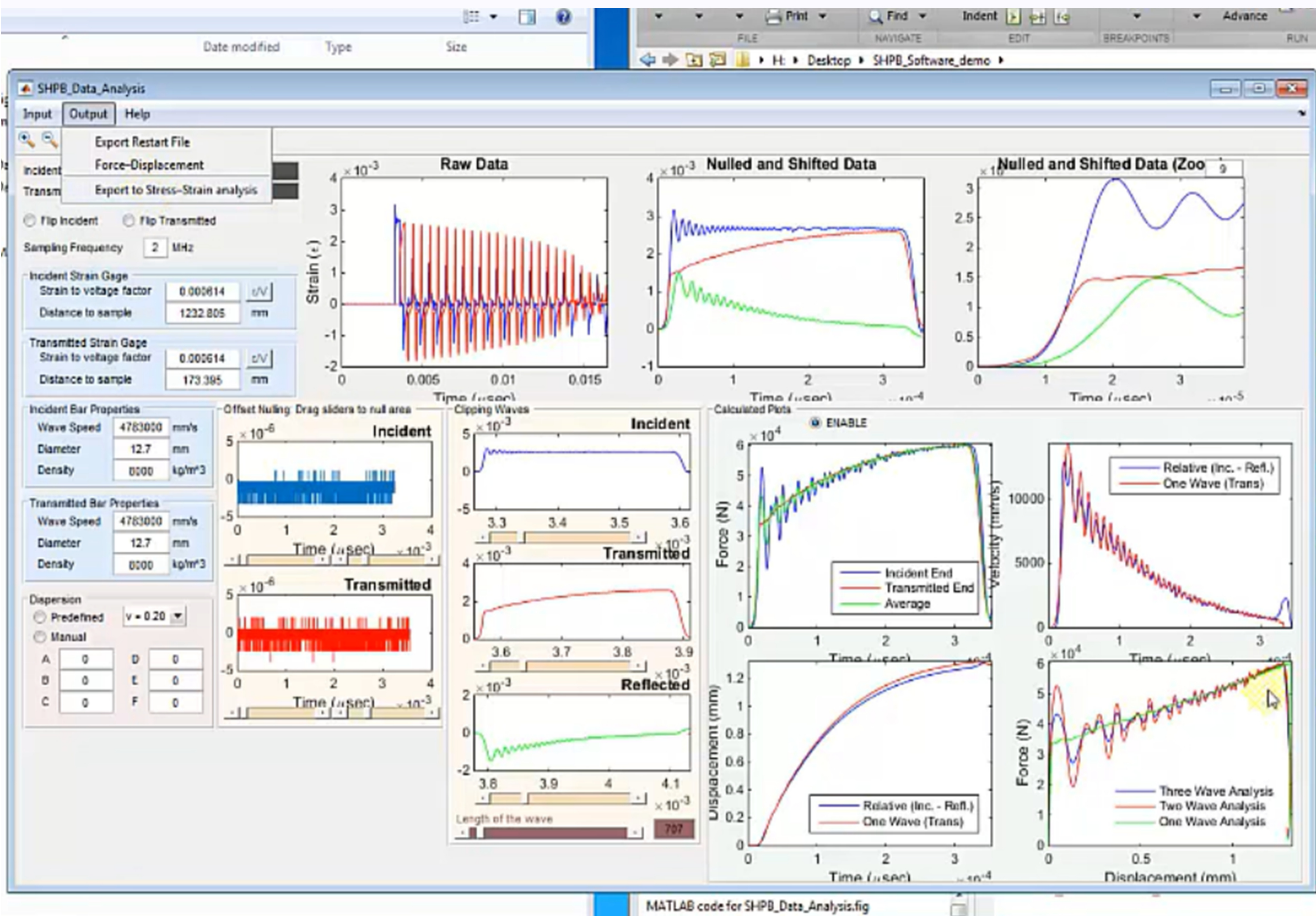
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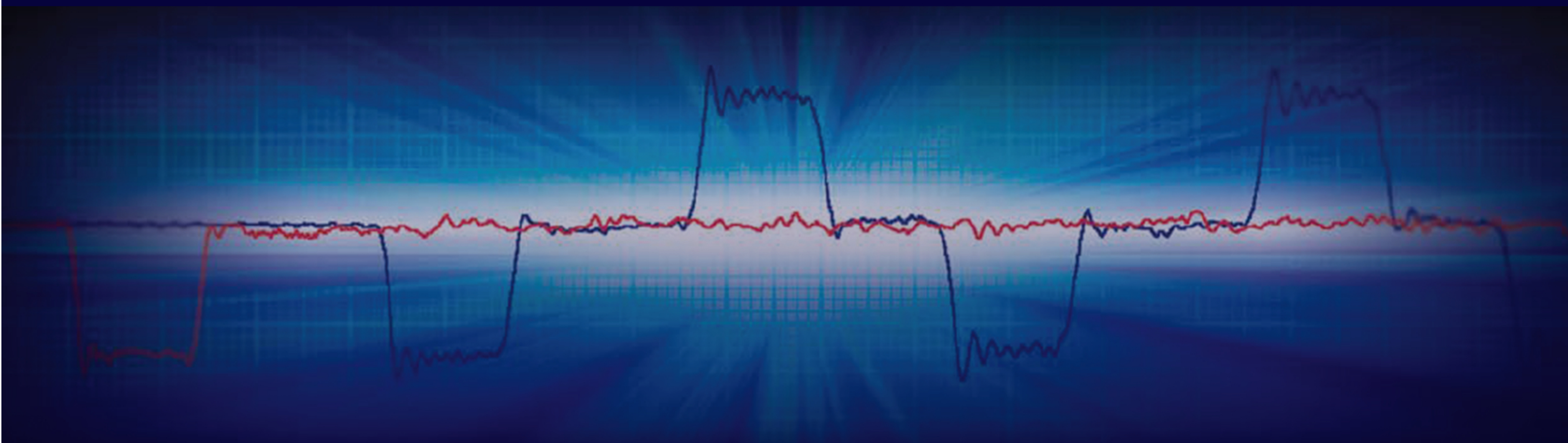
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DATA PROCESSING SYSTEM



TEST SYSTEMS

HIGH STRAIN RATE EQUIPMENT & TESTING



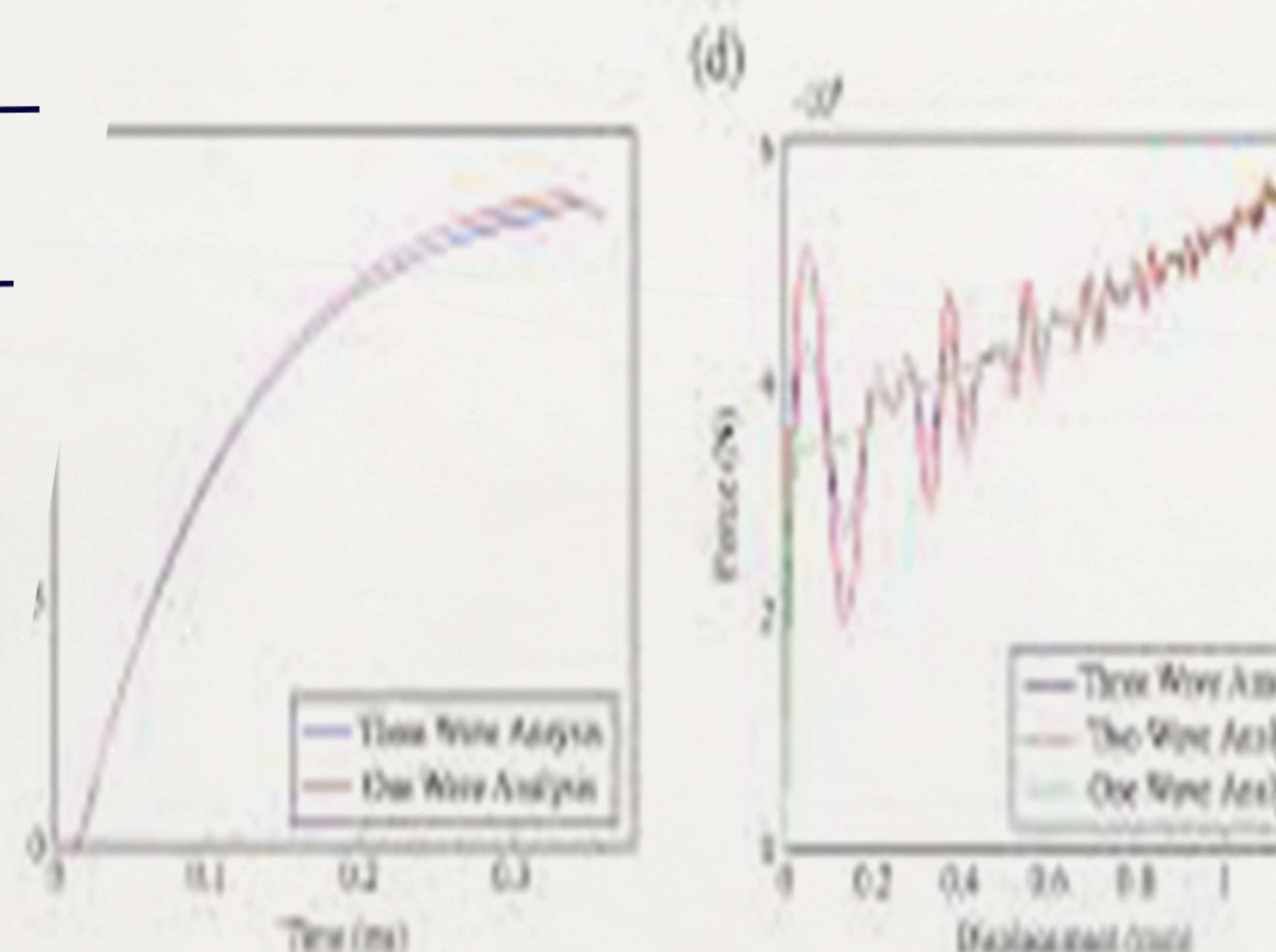
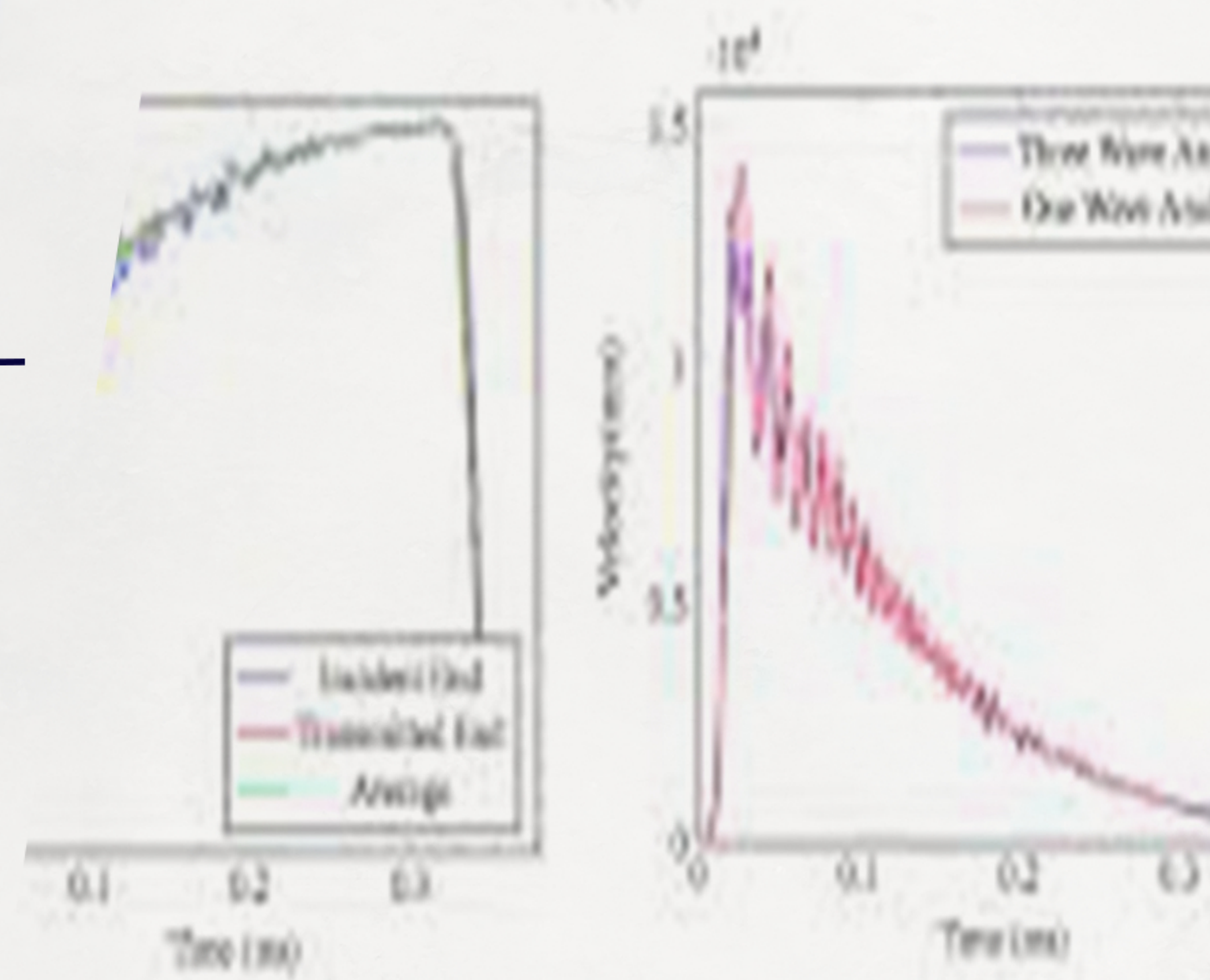
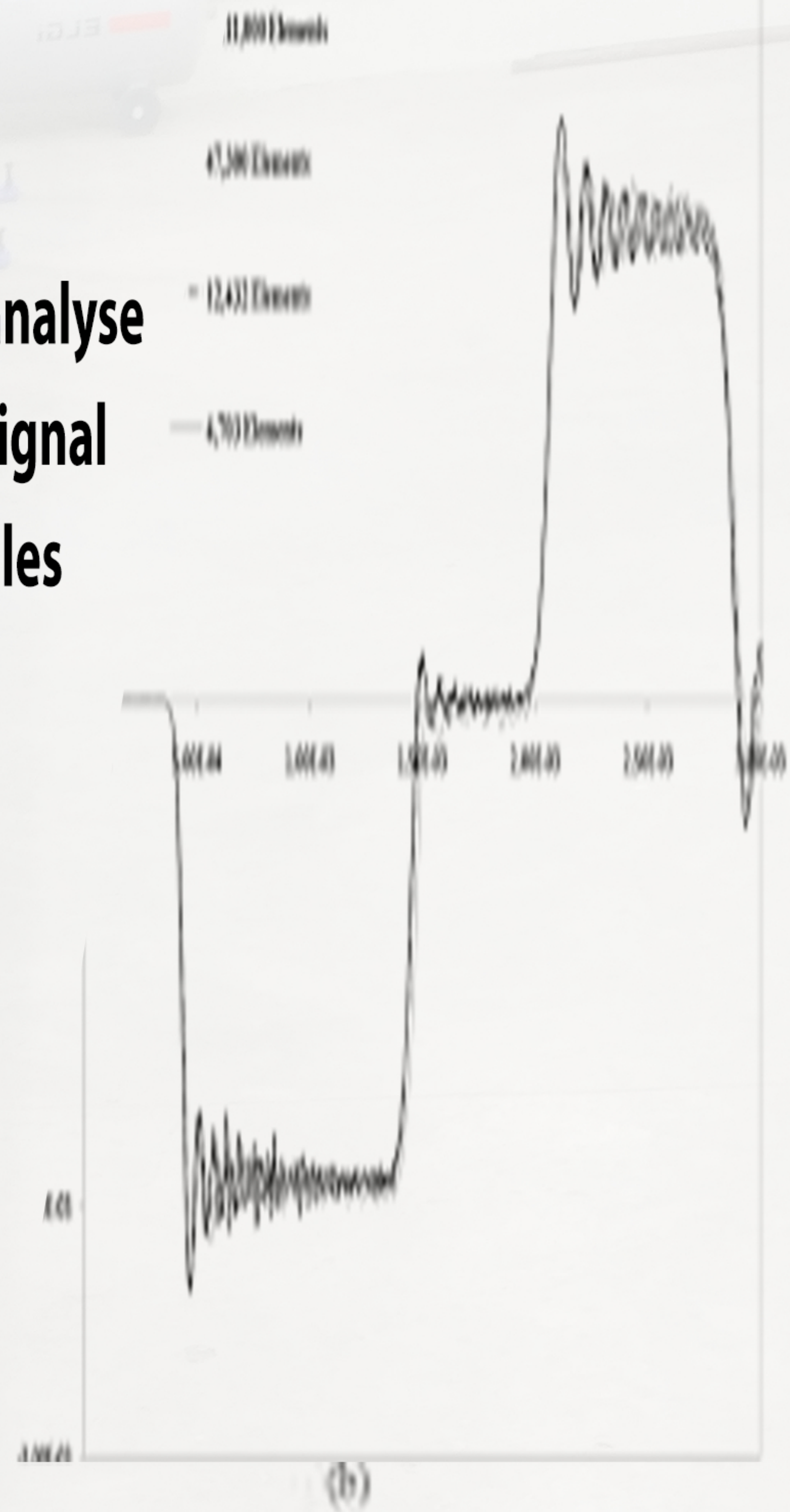
DATA PROCESSING AND ANALYSIS SOFTWARE

Forward Engineers Software is a Java based software suitable to collect and analyse the recorded pulse. It streamlines the raw data input and displays variety of signal types. It can be used to display, edit, and filter recorded data. Once the data files are captured and trimmed using the GUI, they can be saved analysed and exported to other formats (CSV, Excel etc.)

The control software has features like wave dispersion correction, Post processing the data to present it as engineering stress-strain curve as well as true stress-strain curve, strain rate measurement, adiabatic Temperature correction, etc, and Suitable display system to indicate incident and Transmitted pulses.

SALIENT FEATURES

- Automatic statistical calculations for given region
- Quick sample comparison feature
- Load/Displacement, time domain strain rate output, Stress/Strain
- Export to CSV, Excel, Text
- Easy to use GUI
- Custom configurations for quick reference



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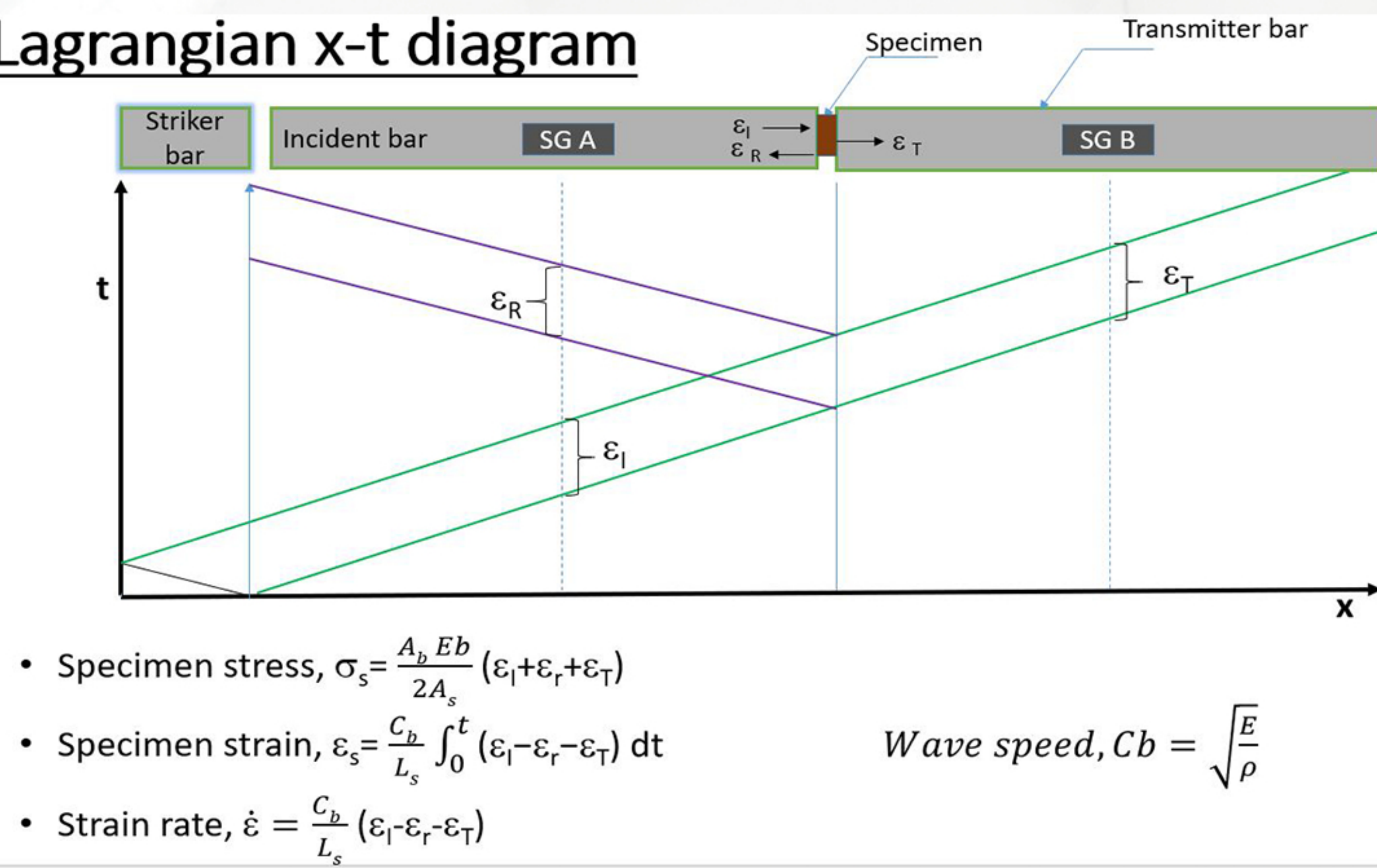
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Lagrangian x-t diagram

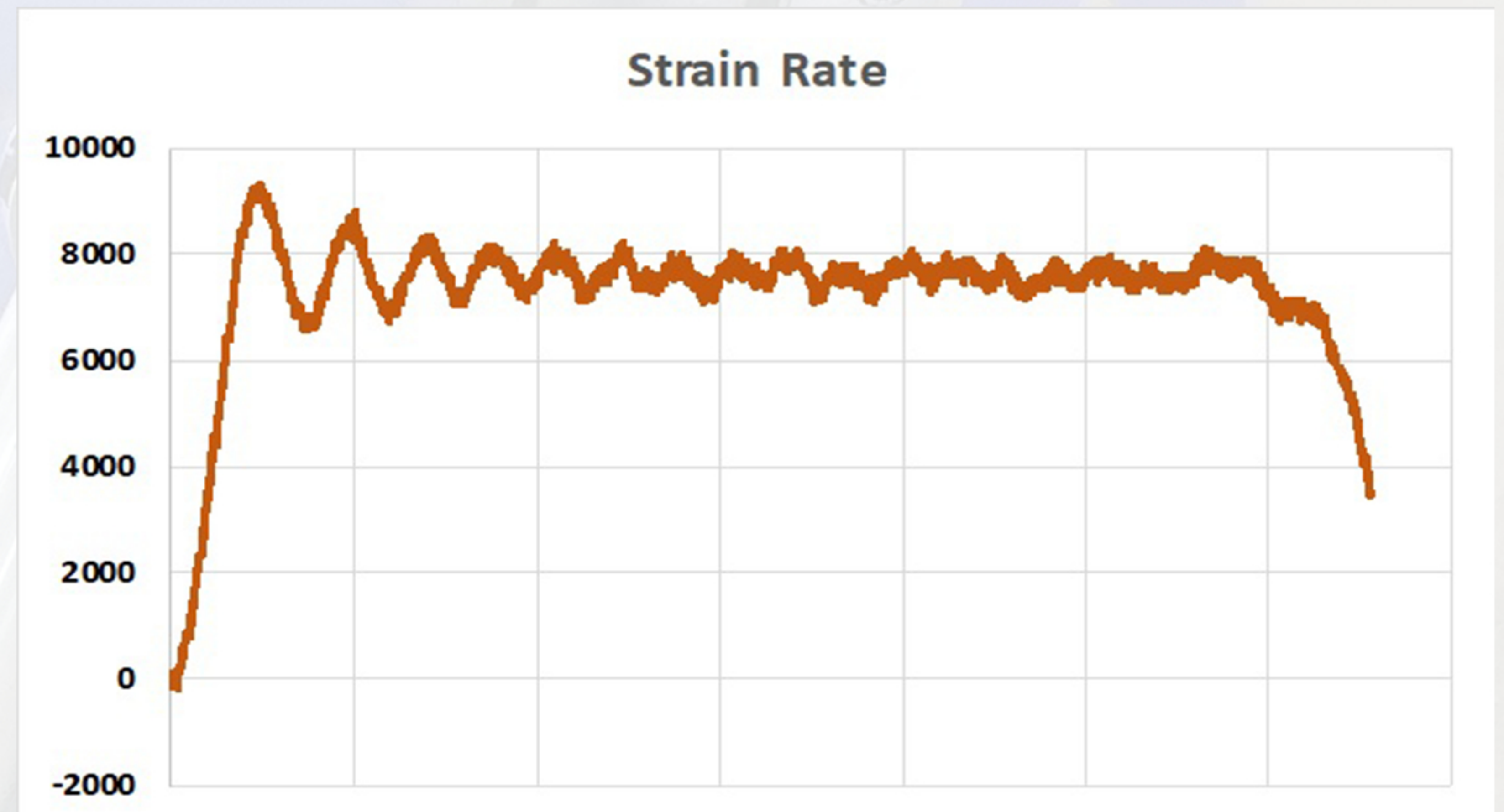


X-T DIAGRAM

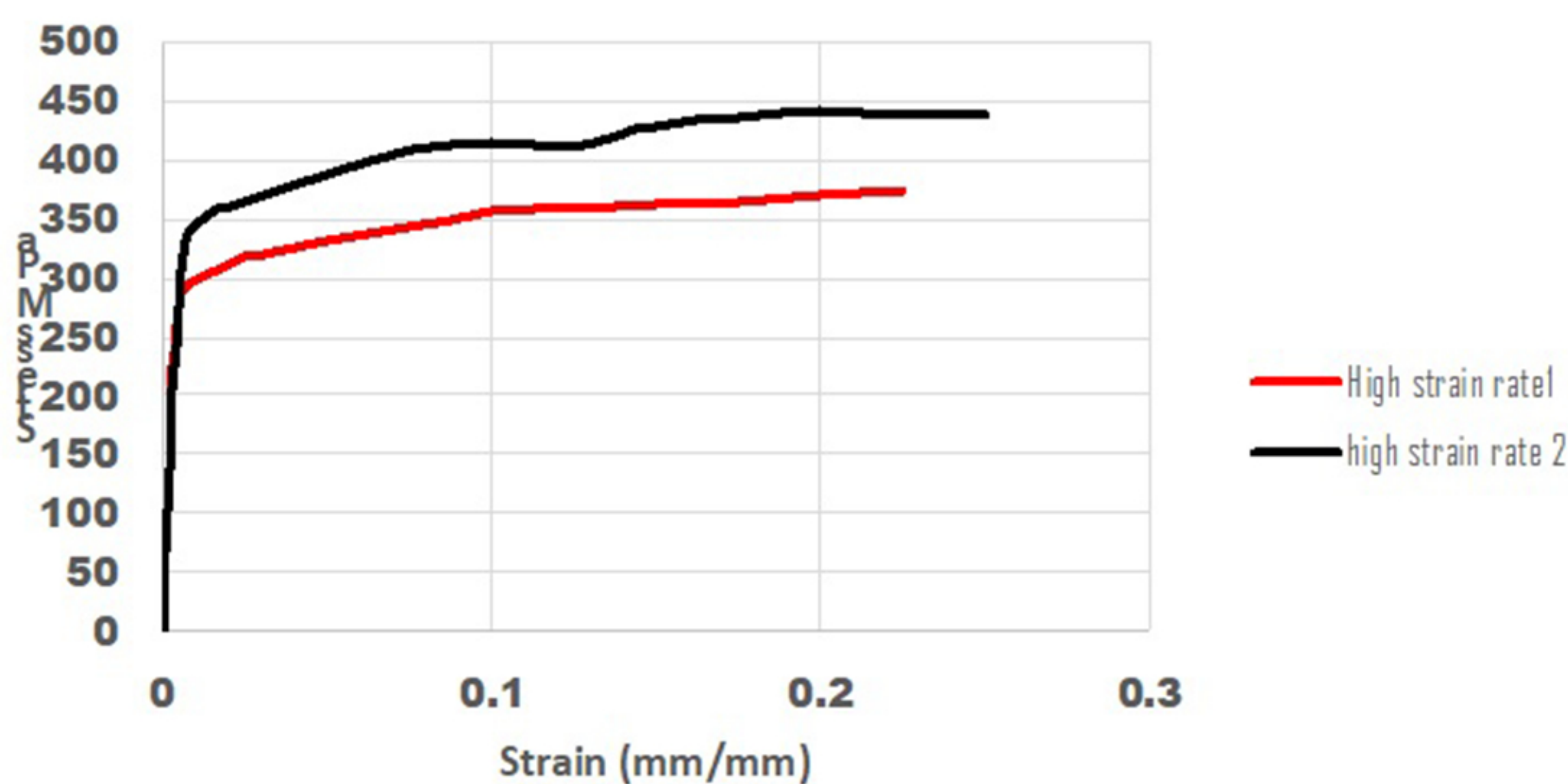
Helps in positioning the strain gauges at proper location to avoid overlap of incident and reflected pulses. Also it helps in choosing the appropriate dimensions for bars and gives position of pulse with respect to time throughout the event of operation.

STRAIN RATE

The strain rate plot is recorded for the aluminum 6061-T6 sample tested using miraging steel 350 bar system on Compression Hopkinson bar.



Aluminum 6061-T6

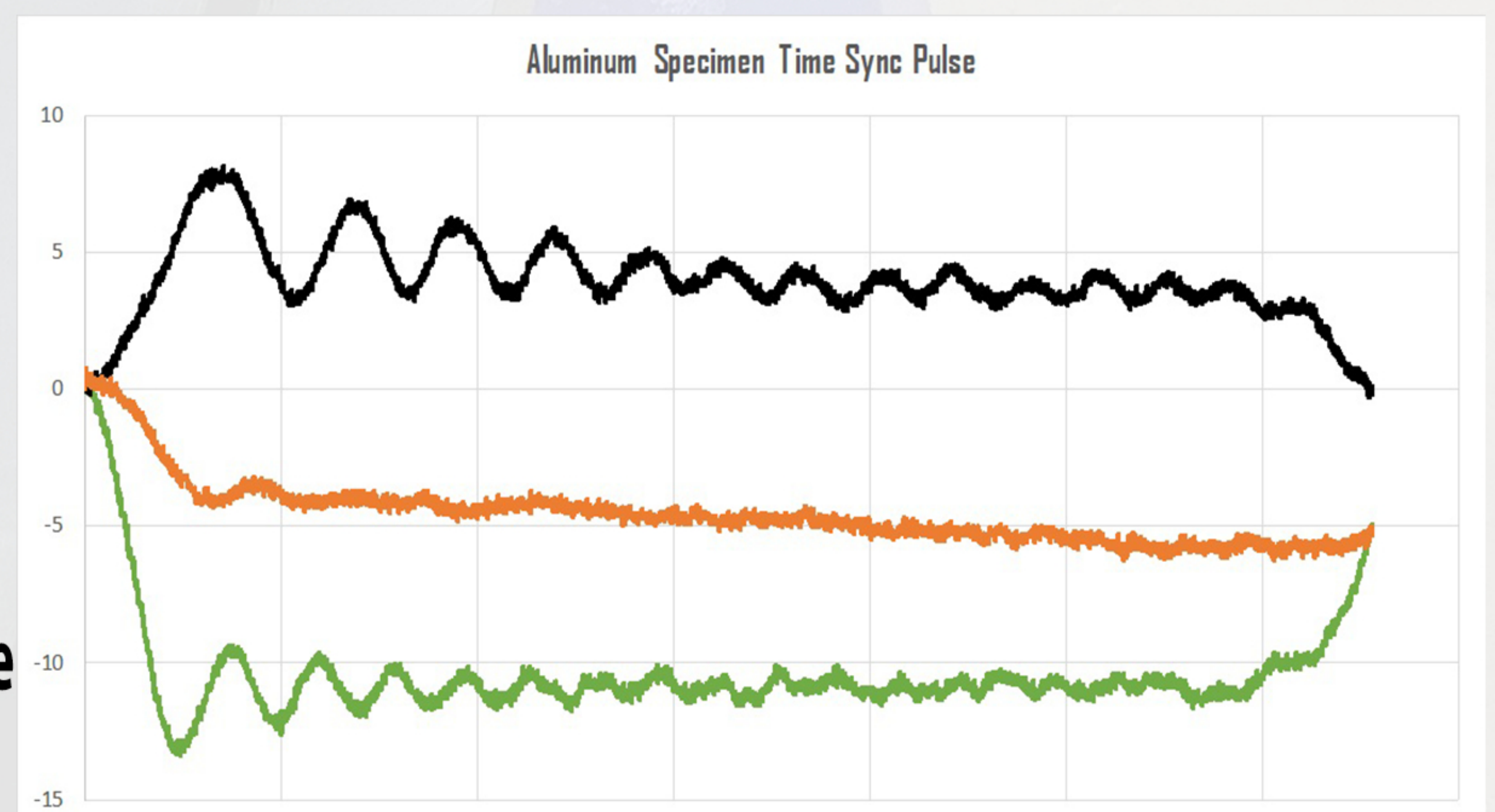


AL-6061 T6 STRESS STRAIN

Al-6061 T6 is tested at static and dynamic rates. The rate dependent behavior is clear from the given plot. These curves help in determining the Johnson-Cook constitutive model parameters.

CALIBRATION PULSES

This helps in identifying the alignment issues in the shpb system. Ideally the incident and transmitted has to be of same magnitude if the bars are properly aligned. The setup does not generate reflection as the impedance of incident and transmitted pulses match.



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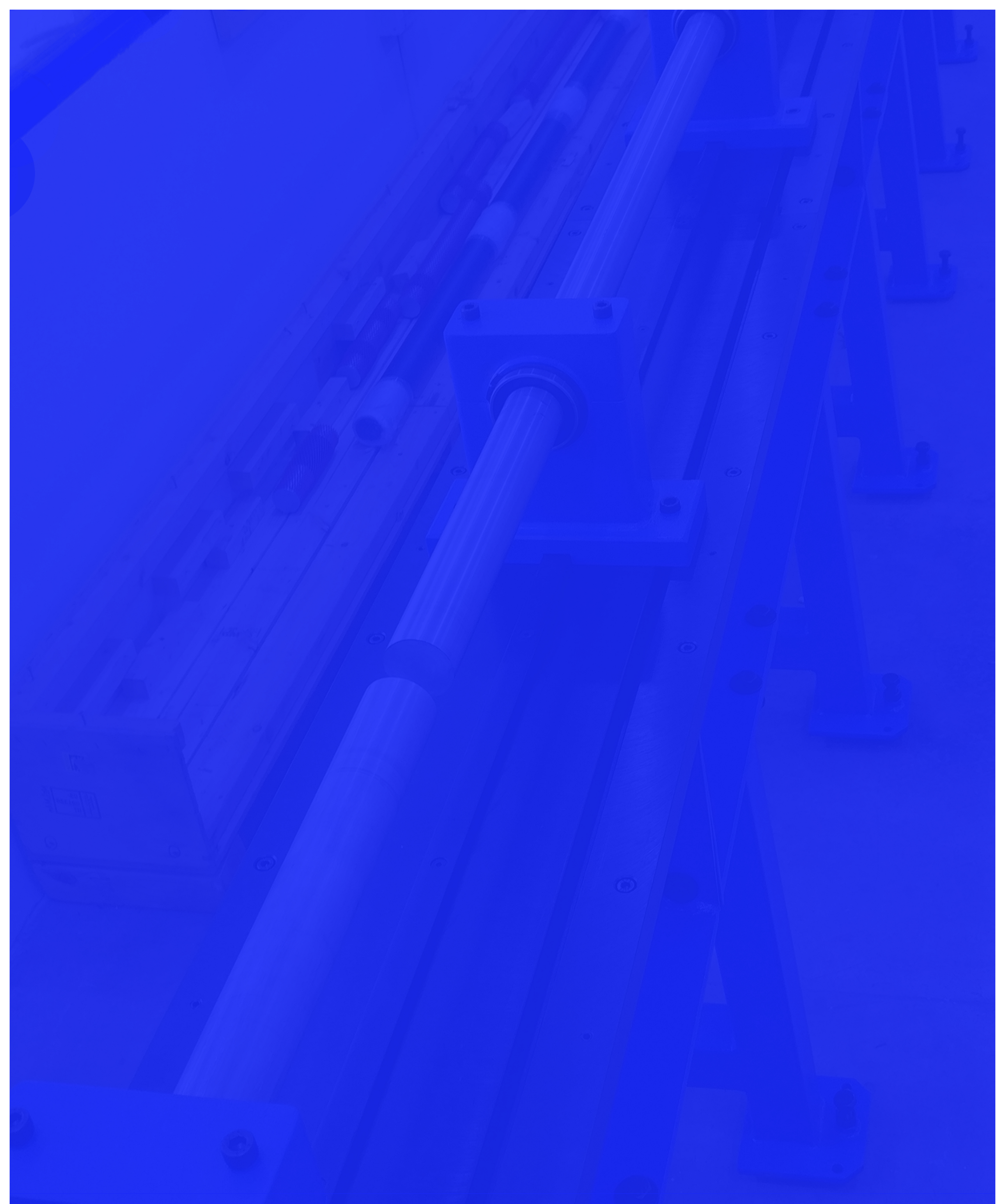
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