

Experimental **Micromechanics** Capabilities

Sandia National Laboratories at California has developed experimental micromechanics capabilities to enable research in LIGA fabricated MEMS devices. A suite of test capabilities is available for conducting discovery experiments, developing new microexperimental techniques, characterizing material properties, and evaluating device performance. The details of these capabilities are shown in the chart below.

Item	Type	Specimen or Feature Range	Load Range	Displ Range	Temp Range (during test)	Comments
MTS-Tytron	Device Performance Testing	micron to 300 mm	mN to 250 N axial	micron to 100 mm	-190° C to 1000° C	Uniaxial & Dynamic & Fatigue Loading
MTS- Torsion Master	Device Performance Testing	micron to 250 mm	mN-m to 20 Nm torsion	infinite rotation	-190° C to 1000° C	Torsion with axial preloading
Bionix	Device Performance Testing	mm to cm	2.5 kN axial & 25 Nm torsion	100 mm stroke ±279° rotation	-190° C to 1000° C	Multiaxial: Tension, Compression, Torsion
Instron-Microtester	Material Property Testing	100 micron to mm	MN-1kN	0.1 micron to 10 mm	-50° C to 250° C	Quasi-static & limited dynamic loading. Uniaxial loading (tension, comp, bend, etc.)
SATEC	Material Property Testing	> 1mm	mN-100kN	1 micron to 100 mm	-50° C to 250° C	Quasi-static. Uniaxial loading (tension, comp, bend, etc.)
Precision Microhardness	Local Mechanical Properties	1 micron to 10 micron (indent dimension)	N/A	N/A	N/A	Strength inferred from hardness. Gradient properties in LIGA structures
Nanoindentation	Local Mechanical Properties	100 nm to 50 micron (indent dimen)	N/A	N/A	N/A	Modulus and strength inferred from hardness. Gradient properties in LIGA structures
SEM>Loading	Full Field Strain Measurement/In-Situ Loading	micron to 10 mm	1.5 kN axial	cm	-40° C to 1000° C	Static Tension, Compression Loading