D6 PHASER

The Benchtop Platform

POWERFUL
SPEED, ACCURACY AND SENSITIVITY

- 1.2 kW with internal cooling
- Time-tested goniometer
- LYNXEYE XE-T detector
- Motorized beam optics

VERSATILE
MEET EVERY NEED

- Reflection and transmission Powder XRD
- Non-ambient diffraction
- GID, XRR, Stress, Texture

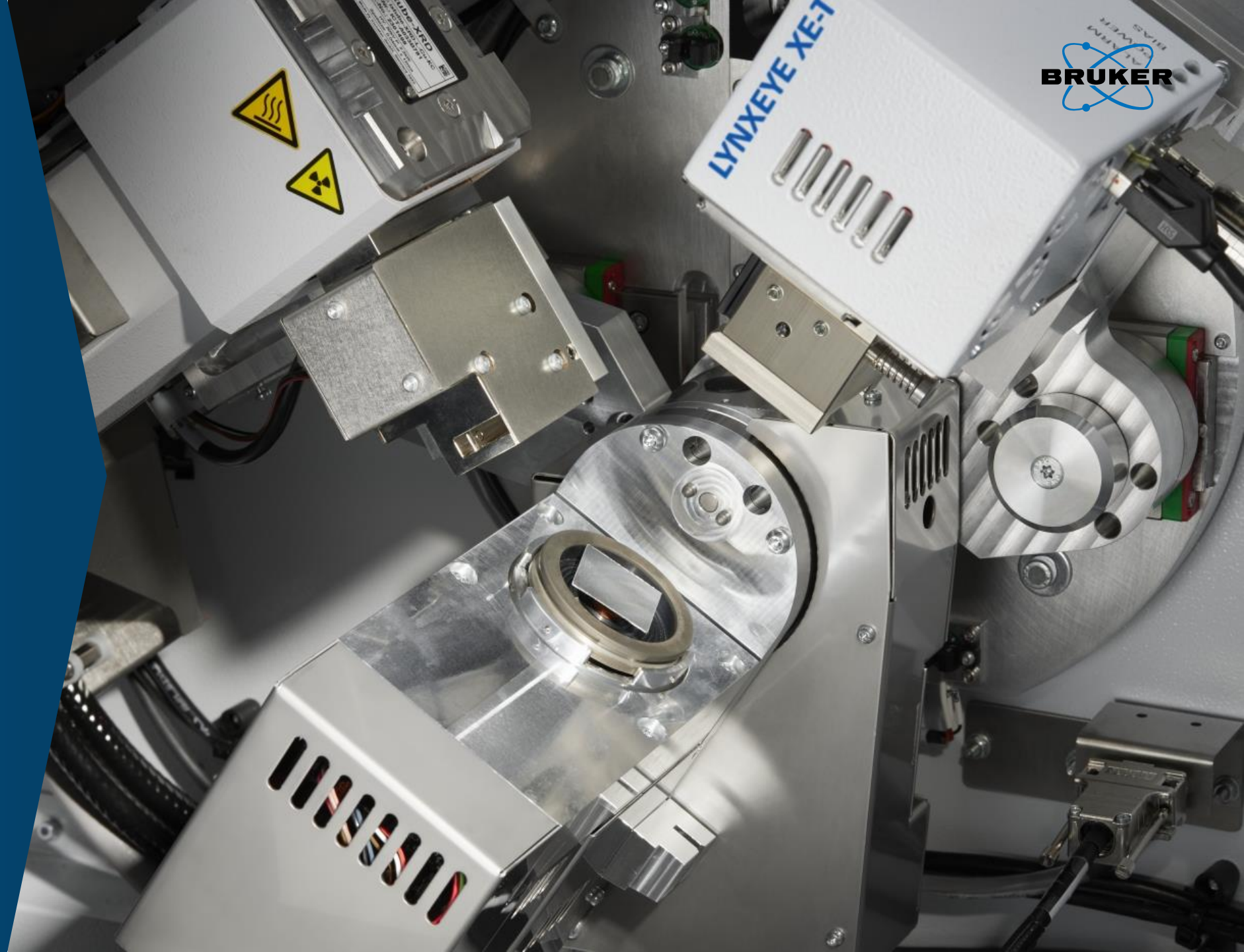
ACCESSIBLE
AUTOMATIC, AFFORDABLE, EASY-TO-USE

- Dynamic Beam Optimization
- Touch panel operation
- Stage and optics exchange

D6 PHASER - THE BENCHTOP PLATFORM

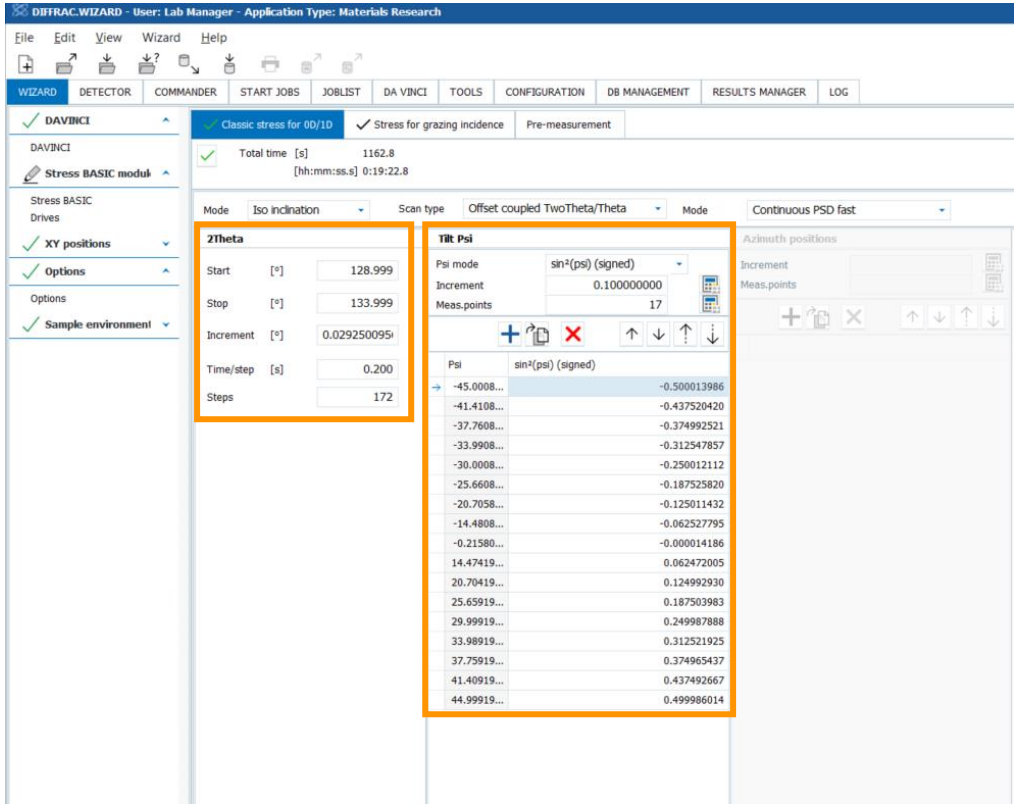
Residual Stress Analysis

Generator 1200W
X-ray Tube Cu or Cr
Incident Optic Advanced Optic with Axial Soller
Sample Stage Universal Stage with Phi Attachment
Air Scatter Control None
Diffracted Beam Optic Axial Soller
Detector LYNXEYE XE-T



Data collection - Uniaxial STRESS
DIFFRAC.WIZARD

Sample:	W
Instrument:	N6
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/30mA
PrimSoller:	2.5deg
Divergence Slit:	0.2 mm
SecSoller:	2.5deg
LE-XE-T, HRM, 1D	fully open
Universal Stage	
Scan:	129-134° 2Θ
Psi tilt:	± 45°, 17 steps
Incr:	0.03° 2Θ
Time:	0.2s/step
Total:	19 min



- WIZARD settings as for D8
- Tilt Psi is achieved with Universal Stage

Data collection
DIFFRAC.WIZARD

Sample:	W Stress Free Reference
Instrument:	N6
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/30mA
PrimSoller:	2.5deg
Divergence Slit:	0.2 mm
SecSoller:	2.5deg
LE-XE-T, HRM, 1D	fully open
Universal Stage	
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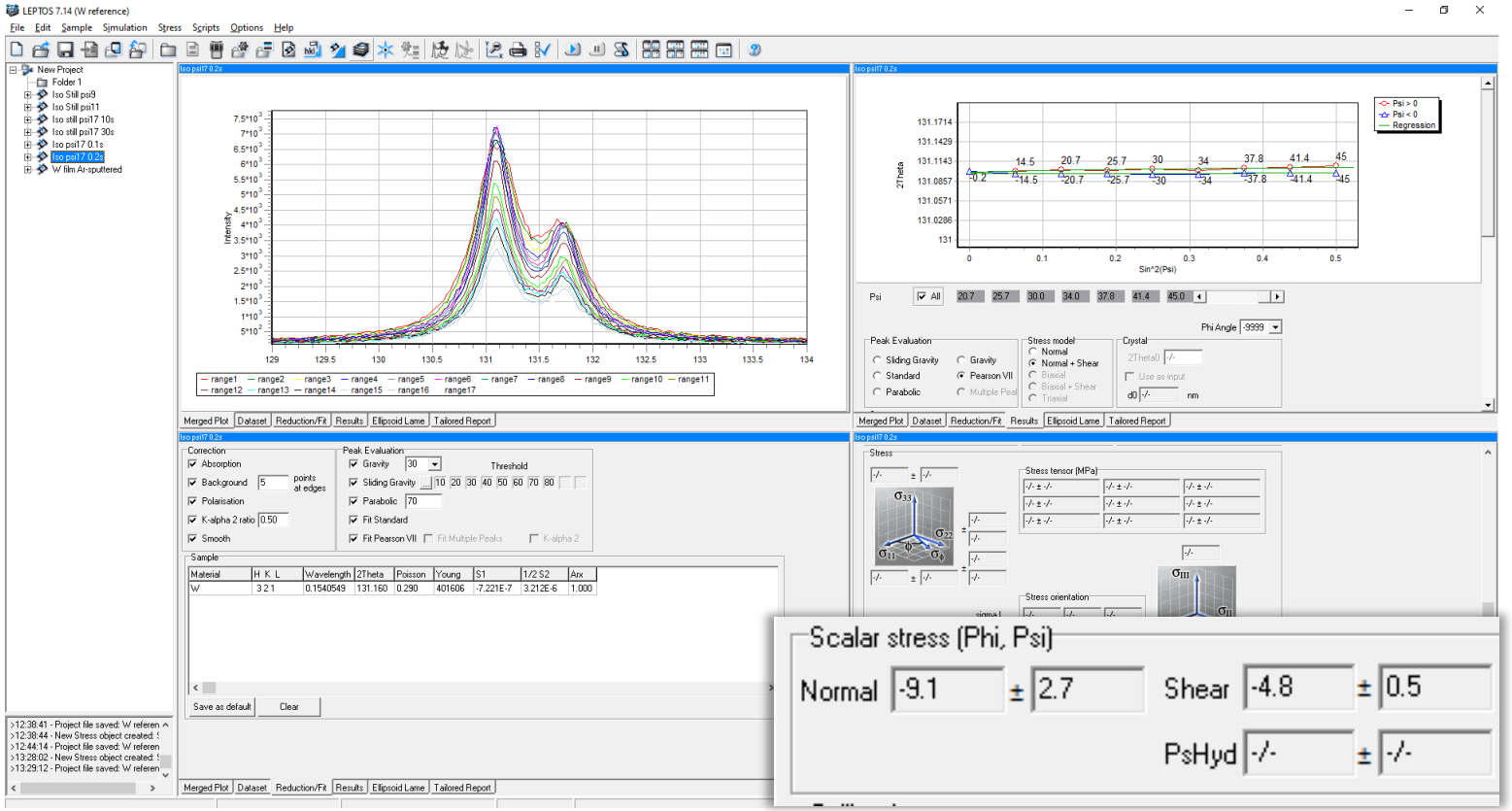
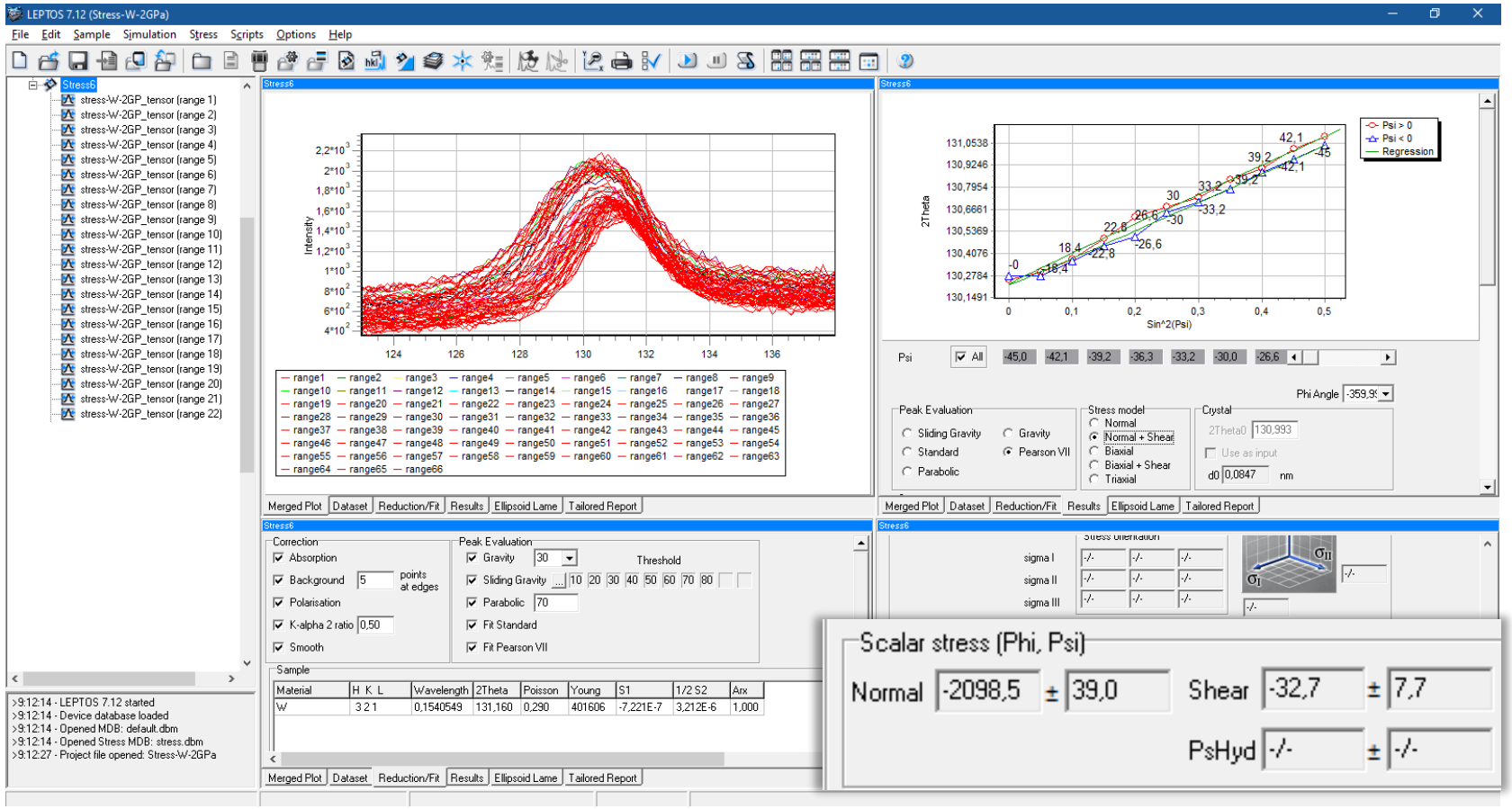


According EN15305 the instrument is qualified for residual stress measurements if the stress free W powder gives a result of $|\sigma| \leq 31$MPa with uncertainty $|u_{(\sigma)}| \leq 31$MPa

STRESS Analysis

DIFFRAC.LEPTOS – Normal/Shear stress only positive ψ

Sample:	W Kr Sputtered on Glass
Instrument:	N5
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/15mA
PrimSoller:	2.5deg
Divergence Slit:	0.2mm
Phi	0°/180°
SecSoller:	2.5deg
LE-XE-T, HRM, 1D	4.95mm
Universal Stage	
Scan:	123-138°2Θ
Psi tilt:	+45°, 11 steps
Incr:	0.2°2Θ
Time:	2s/step
Total:	22x152s

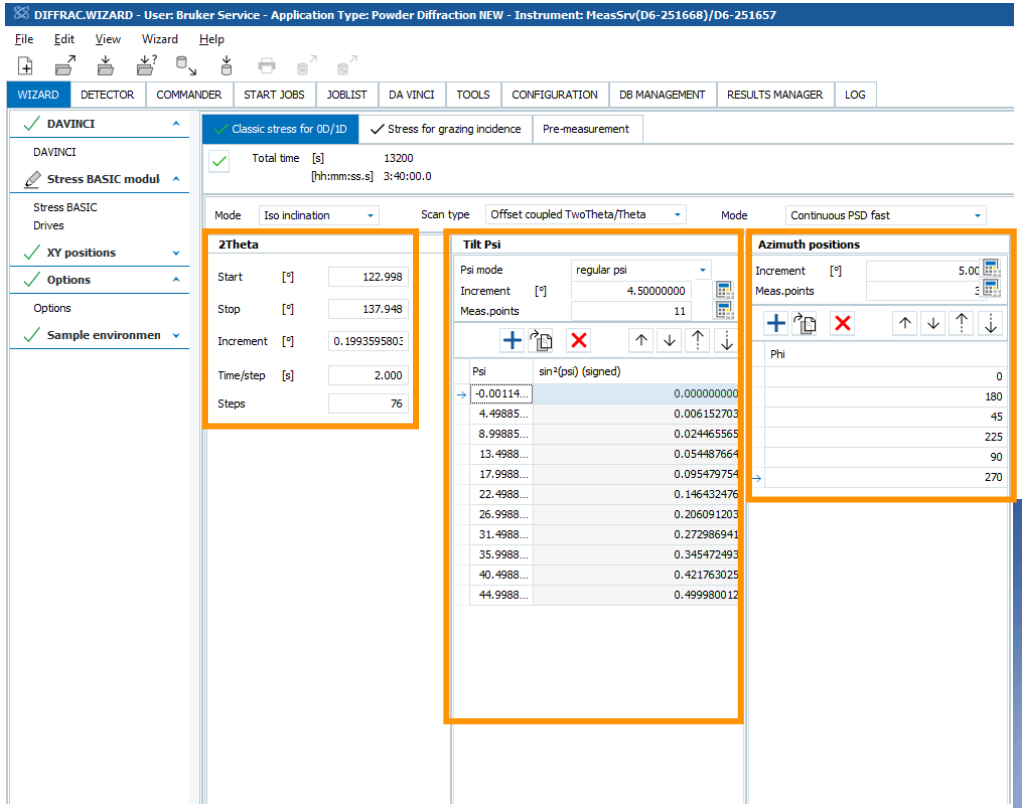


Data collection - Stress Tensor
DIFFRAC.WIZARD

Sample:	W Ar Sputtered on Glass
Instrument:	N5
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/15mA
PrimSoller:	2.5deg
Divergence Slit:	0.2mm
Phi	1) 0°/180° 2) 45°/225° 3) 90°/270°
SecSoller:	2.5deg
LE-XE-T, HRM, 1D	4.95mm

Universal Stage with Phi Attachement

Scan:	123-138°2Θ
Psi tilt:	+45°, 11 steps
Incr:	0.2°2Θ
Time:	2s/step
Total:	66x152s



- WIZARD settings as for D8
- Tilt Psi is achieved with Universal Stage
- Azimuth positions set with Phi attachment

STRESS Analysis

DIFFRAC.LEPTOS - Stress Tensor only positive ψ

Sample:	W Ar Sputtered on Glass
Instrument:	N5
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/15mA
PrimSoller:	2.5deg
Divergence Slit:	0.2mm
Phi	1) 0°/180° 2) 45°/225° 3) 90°/270°
SecSoller:	2.5deg
LE-XE-T, HRM, 1D	4.95mm

Universal Stage with Phi Attachement

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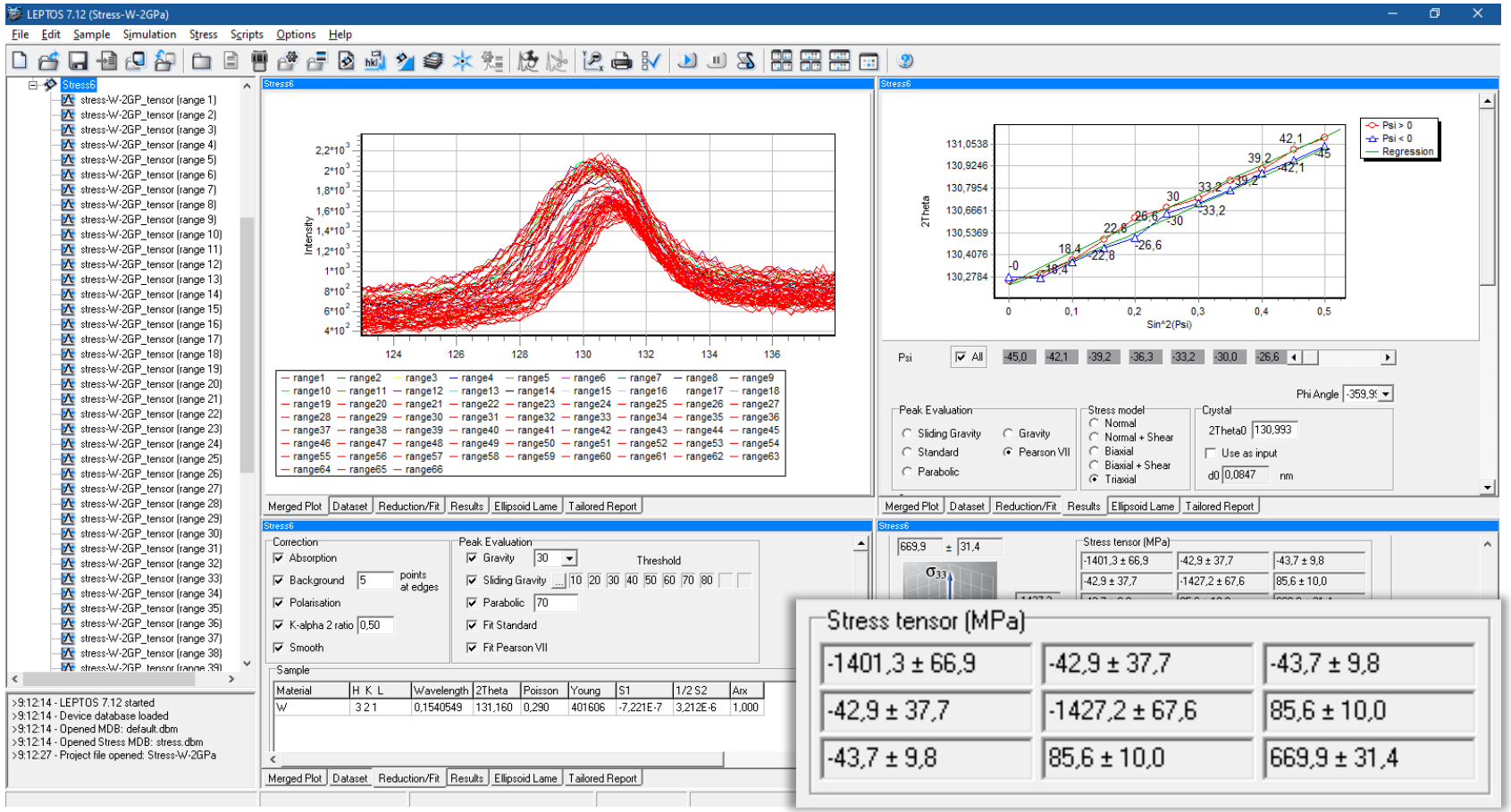
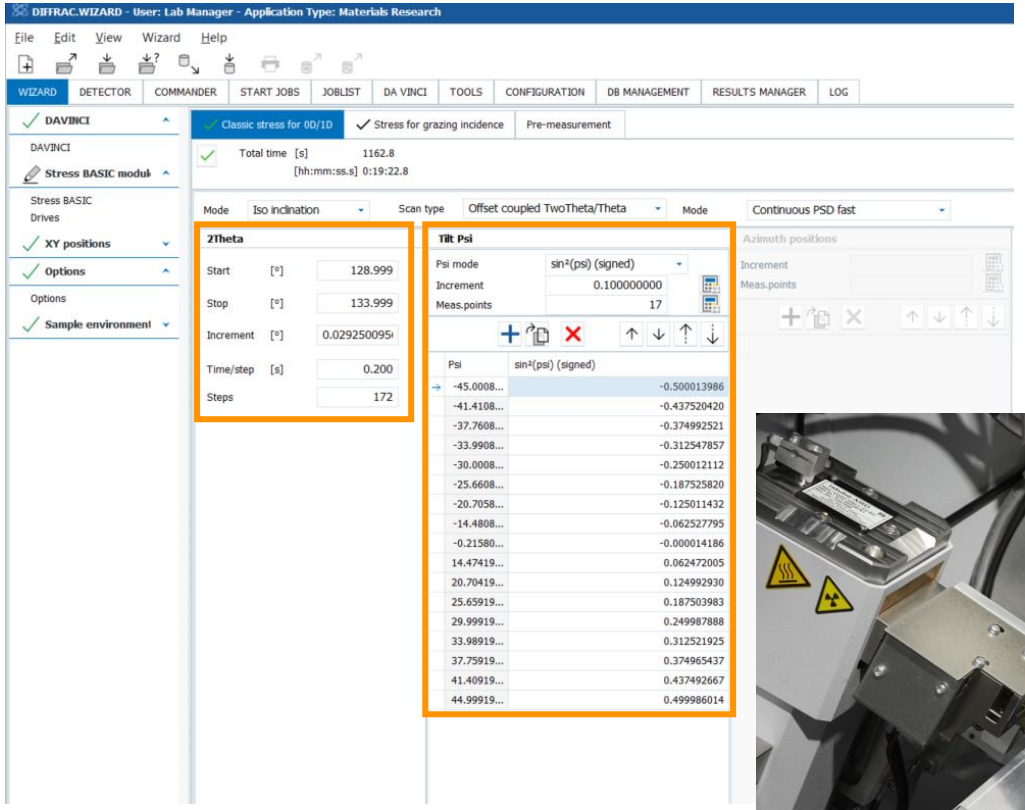
Psi tilt:	+45°, 11 steps
Incr:	0.2°2Θ
Time:	2s/step
Total:	66x152s

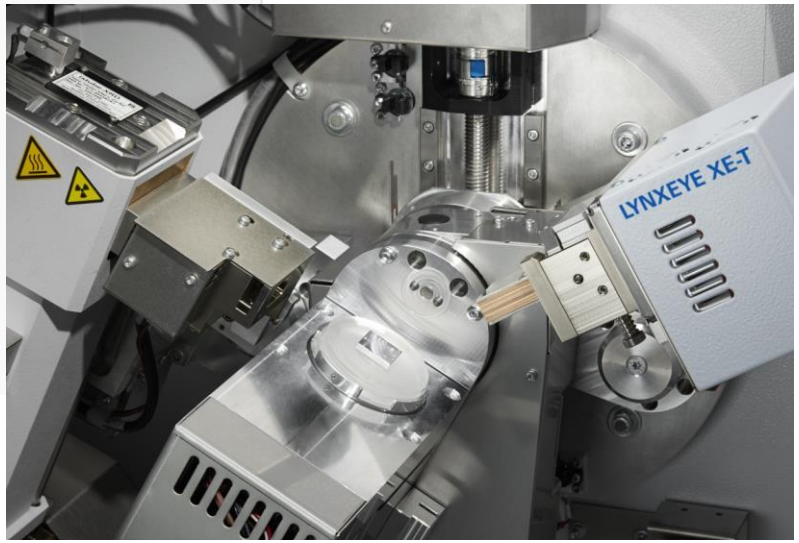


Data collection – Parallel Beam Geometry
DIFFRAC.WIZARD

Sample:	W Kr Sputtered on Glass
Instrument:	N6
Radius:	166.5mm
Tube:	Cu
Generator:	40kV/30mA
PrimSoller:	2.5deg
Divergence Slit:	0.2 mm
SecSoller:	equatorial soller 0.4°
LE-XE-T, HRM, 0D	fully open
Universal Stage	
Scan:	129-134° 2Θ
Psi tilt:	± 45°, 17 steps
Incr:	0.2° 2Θ
Time:	2s/step
Total:	17 min



- WIZARD settings as for D8
- Tilt Psi is achieved with Universal Stage



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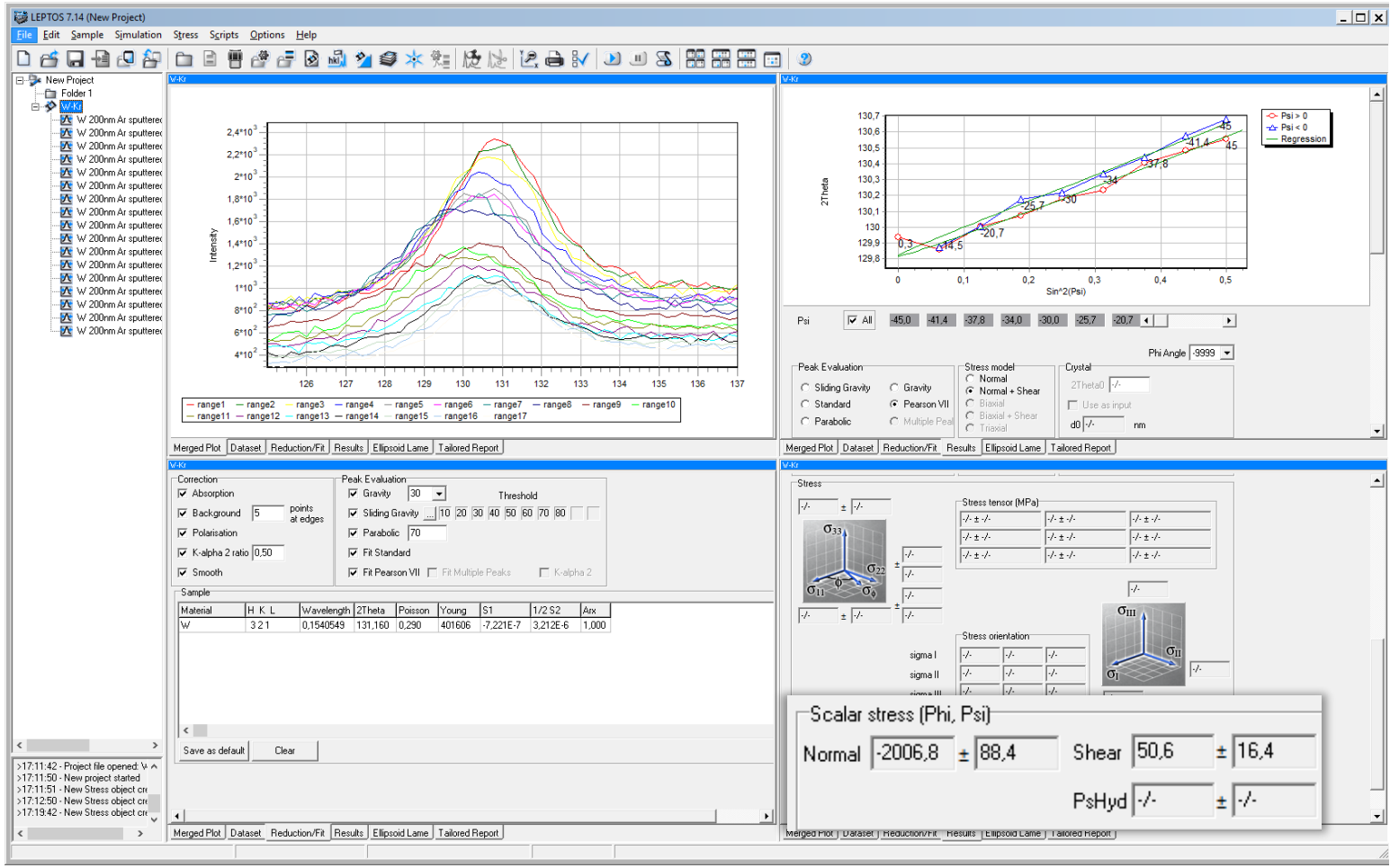
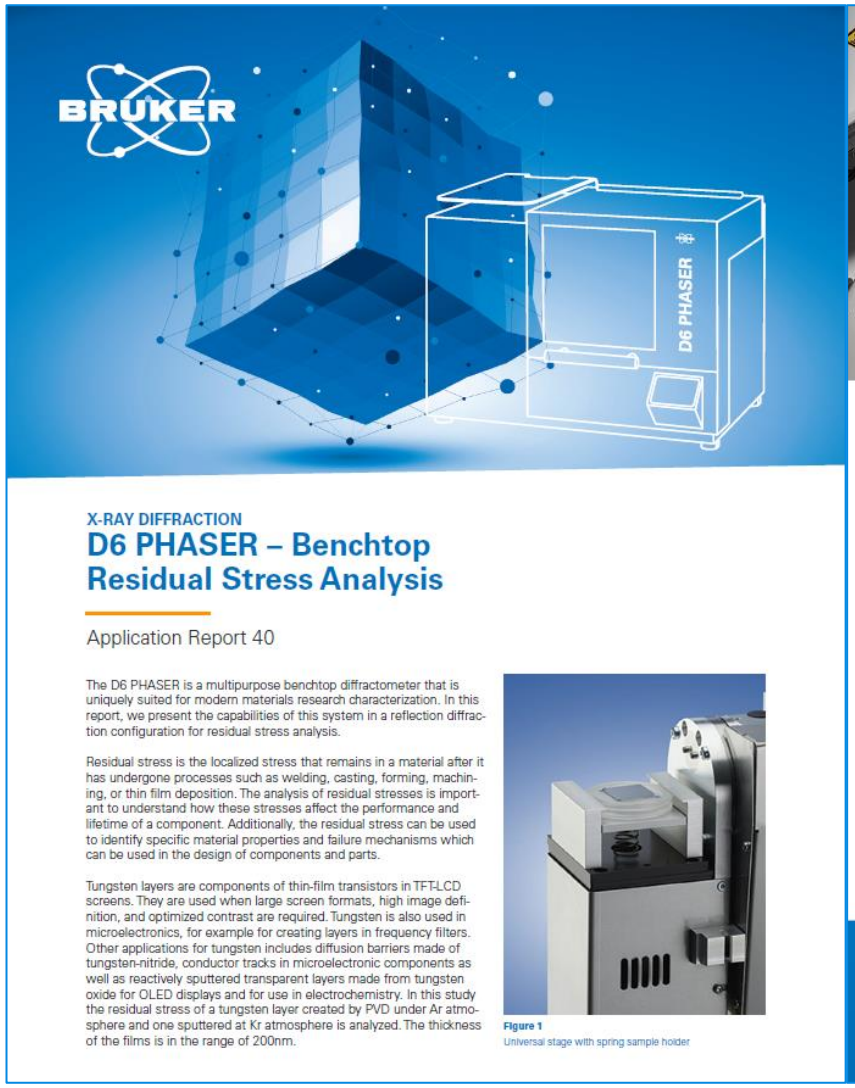


MATERIALS RESEARCH

Residual Stress Analysis

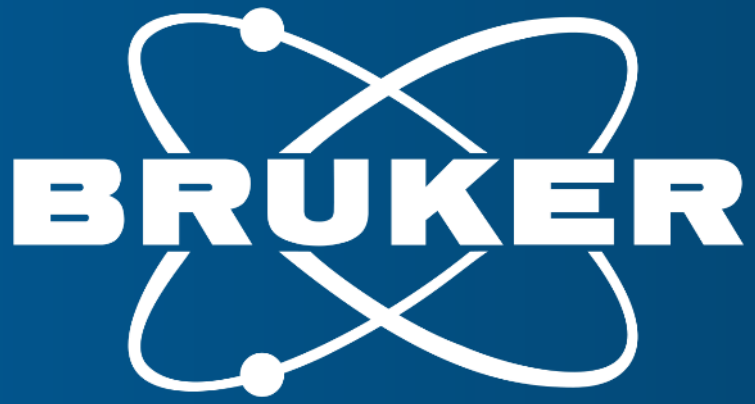
- Stress-free sample (W-Powder) Results according EN 15305
- W Thin Film (one sputtered under Ar-atmosphere the other under Kr-atmosphere)

- Residual Stress Analysis using the Iso-Inclination method is fully implemented!



RESIDUAL STRESS ANALYSIS with D6
Conclusion

- Residual Stress Analysis with D6 can be performed according European Norm for Residual Stress measurements (EN 15305)
- Very good for flat samples
- Line focus allows high intensity -> short data collection
- Control of spot size with fixed sample illumination and height limiting slits



Innovation with Integrity