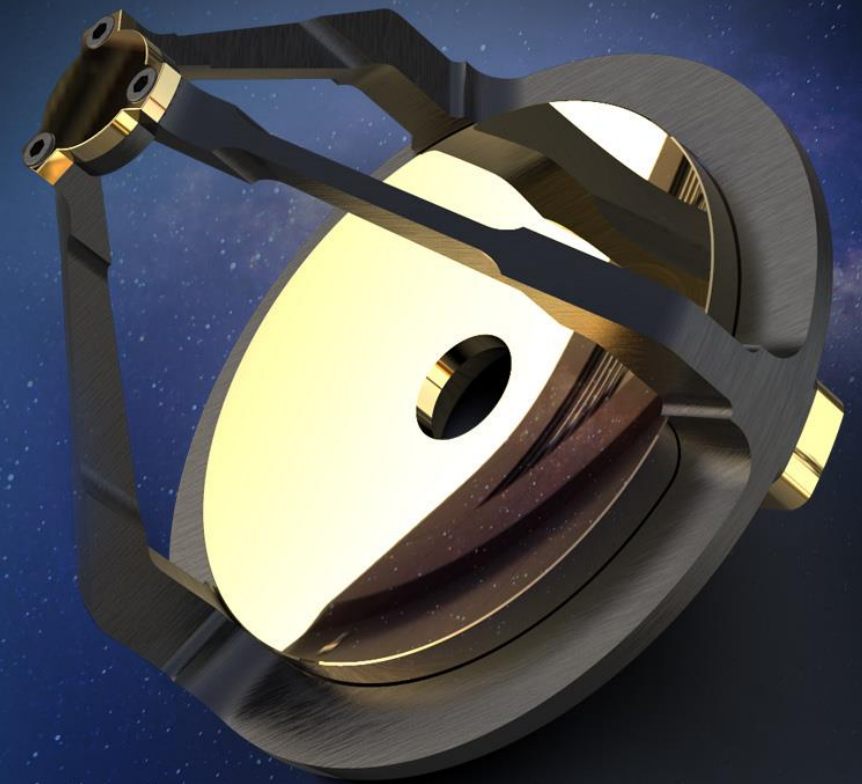


Manufacturing of Ultra High Precision Metal Mirrors


EPIC Technology Meeting on Photonics for New Space

Dr. Benjamin Bulla – Managing Director
May 9th 2020



Company Profile



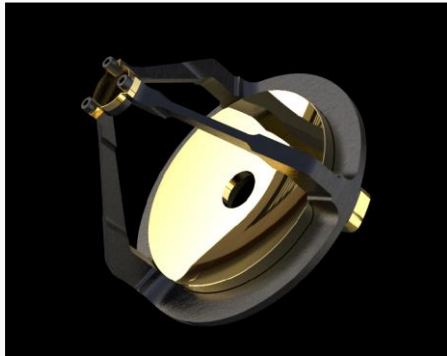
 Designed, manufactured and assembled in Germany

- son-x GmbH founded in 2011 as a spin-off from Fraunhofer
- Based in Aachen, Germany
- Focus on ultra precision manufacturing
 - Ultrasonic Tooling Systems (UTS)
 - Ultra Precision Machining
- Optical component manufacturing:
 - Mirrors
 - Mould inserts
 - Plastic lenses
 - Infrared Lenses

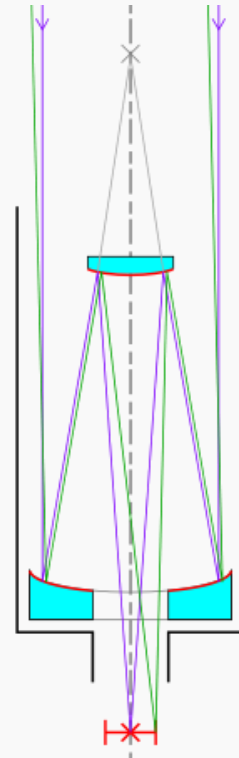
Ultra High Precision Metal Mirrors

Typical mirror configurations for space applications such as satellite communication

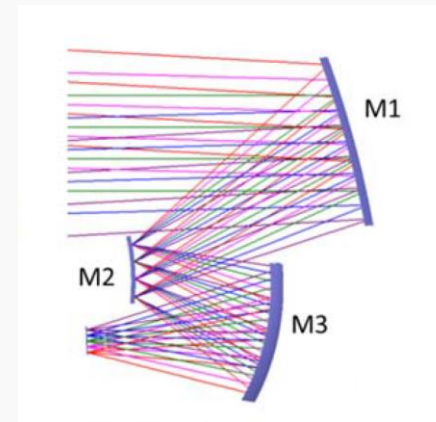
➤ Cassegrain



- Symmetric mirrors
- At least two mirrors and one mechanical assembly structure



➤ Three Mirror Anastigmat (TMA)



- Non symmetric mirrors (typically)
- Critical positioning of mirrors
- No spherical aberration, coma or anastigmatism
- Compact & light

Process Chain at son-x

Optical and
Mechanical Design



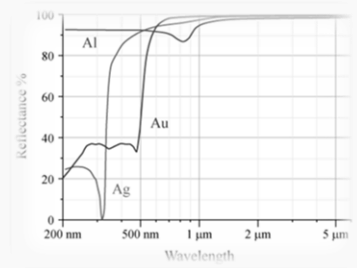
Pre machining



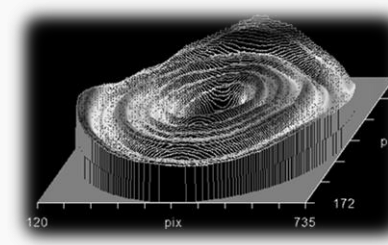
Ultra Precision
Manufacturing



Coating



Qualification



Sub assembly



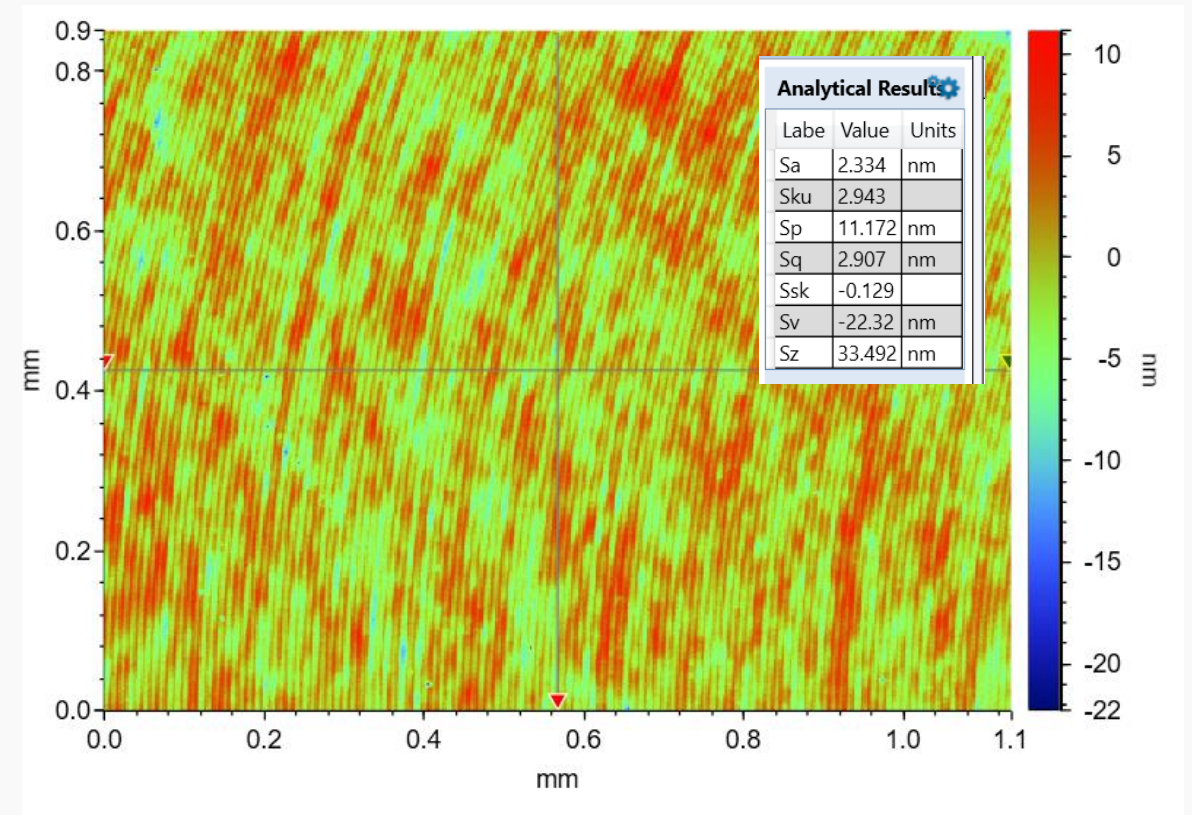
Full Production Chain for Ultra High Precision Mirror Manufacturing

From Prototype
1 pieces



To large series
1000's of pieces

Off-axis Metal Mirror



↳ 500 mm aperture off-axis parabola machined on-axis as a freeform surface

Benefits of Metal Mirror



- 500 mm aperture off-axis parabola machined on-axis as a freeform surface

Benefit of metal mirrors:

- Flexibility on optical geometry
parabolic, aspheric, off-axis, freeform
- Mechanical fixtures with high accuracy
machined together with the optical surface/axis
- Fast alignment
- Light weight
- Reflective Coatings (Al, Ag, Au...)
- Fast manufacturing and possible to scale up

Son-x offers ultra precision metal mirrors from prototype to high volume

CONTACT

son-x GmbH

Dr. Benjamin Bulla

Managing Director

ADDRESS son-x GmbH, Gewerbepark Brand 15, 52078 Aachen

EMAIL benjamin.bulla@son-x.com

WEBSITE www.son-x.com