

# MOXTEK Supports NASA Again...



## NASA's Challenge for 4D Technology and Moxtek:

- Develop the most sensitive instrument ever made for measuring mirror flatness.
- Current measurement tools were NOT sensitive enough to verify required flatness of the telescope mirrors.

MOXTEK collaborated with 4D Technology, to develop a wire-grid pixelated polariser for their dynamic laser interferometer which was used to measure the mirrors on NASA's long-awaited James Webb Space Telescope (JWST).

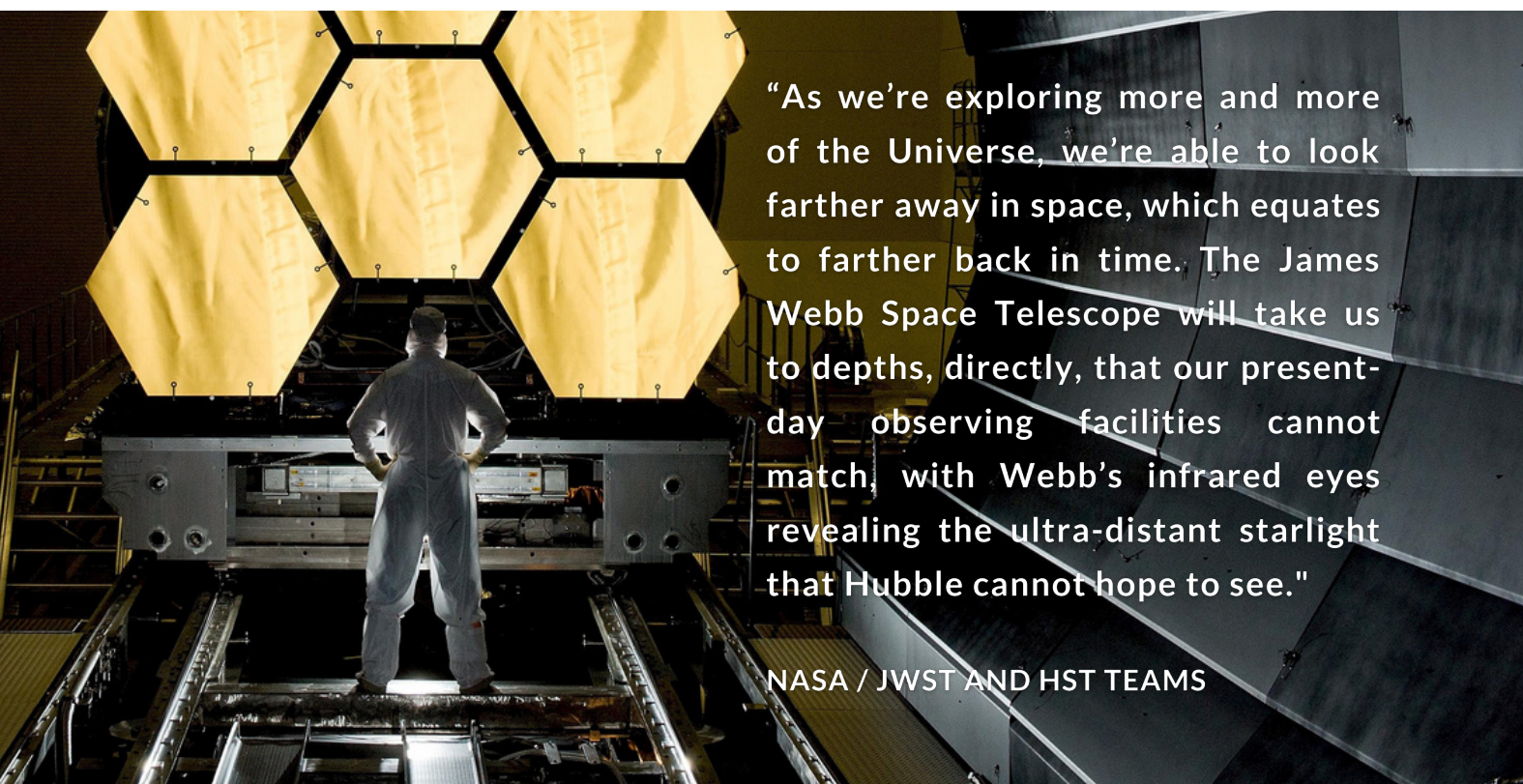
Moxtek became involved with this project over a decade ago when NASA approached 4D Technology to develop an optical tool to measure the flatness of the JWST's telescope mirrors. At that time, there wasn't a measurement tool sensitive enough to measure the required mirror flatness.

4D Technology successfully developed an innovative approach using Moxtek's advanced pixelated polariser, achieving NASA's challenging requirements.



**4D Technology**

An Onto Innovation Subsidiary

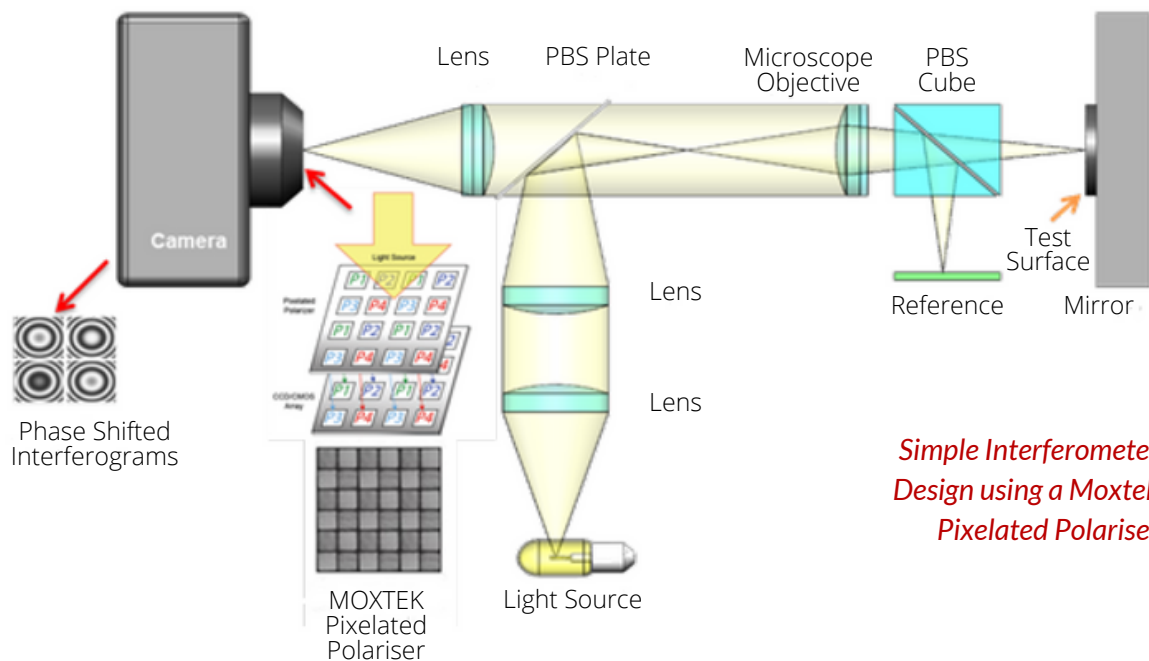


"As we're exploring more and more of the Universe, we're able to look farther away in space, which equates to farther back in time. The James Webb Space Telescope will take us to depths, directly, that our present-day observing facilities cannot match, with Webb's infrared eyes revealing the ultra-distant starlight that Hubble cannot hope to see."

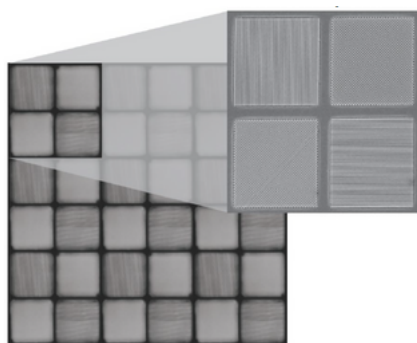
NASA / JWST AND HST TEAMS

## 4D Technology Solution with MOXTEK Polariser:

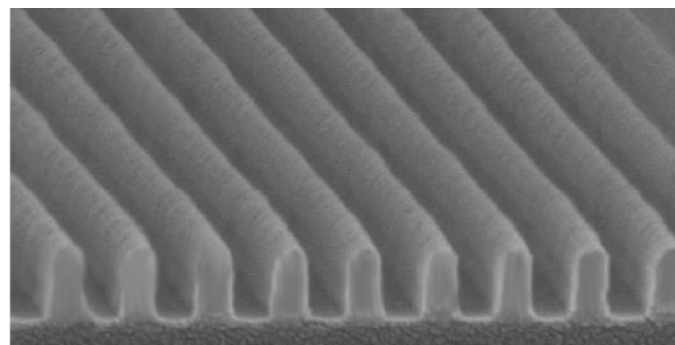
- Developed a high-speed “dynamic” interferometer capable of achieving NASA’s resolution requirements in long path, cryogenic, and vacuum testing environments.
- Interferometer captures 4 polarised phase images instantaneously, instead of capturing 4 separate frames over time and motion.
- Interferometer’s 30 microsecond acquisition speed makes vibration and turbulence invisible.
- Moxtek’s pixelated polariser was essential to make this patented technology possible.



## Moxtek Four-State Pixelated Polariser Array:



What is a polariser? A polariser is an optical filter that passes light waves of a specific polarisation while blocking light waves of other polarisations.



Scanning Electron Microscope (SEM) image of a Moxtek wire-grid polariser. Moxtek wire-grid polariser structures are very small. About 1,000 rib structures will fit inside the diameter of a human hair





# Moxtek in Space, a timeline

In 1996, Moxtek's provided their first space flight component (x-ray window) to NASA/JPL onboard the Mars Sojourner rover. Since then, NASA/JPL has used a Moxtek window on every Mars mission (Sojourner, Spirit, Opportunity, Curiosity, and now the Perseverance).

**2020 Mars Rover - Perseverance**  
(NASA - X-ray Tube & Window)

**2019 OCO-3 Orbiting Carbon Observatory**  
(NASA - Polarisers)

**2019 Chandrayaan-2 XSM**  
(Indian Space Agency - X-ray window)

**2015 Deep Space Climate Observatory**  
(NASA - Polarisers)

**2014 OCO-2 Orbiting Carbon Observatory**  
(NASA - Polarisers)

**2011 Mars Rover - Curiosity**  
(NASA - X-ray Window)

**2003 Mars Rover - Opportunity**  
(NASA - X-ray Window)

**2003 Mars Rover - Spirit**  
(NASA - X-ray Window)

**1999 EPIC Camera - XMM-Newton**  
(ESA - X-ray Window)

**1996 Mars Rover - Sojourner**  
(NASA - X-ray window)



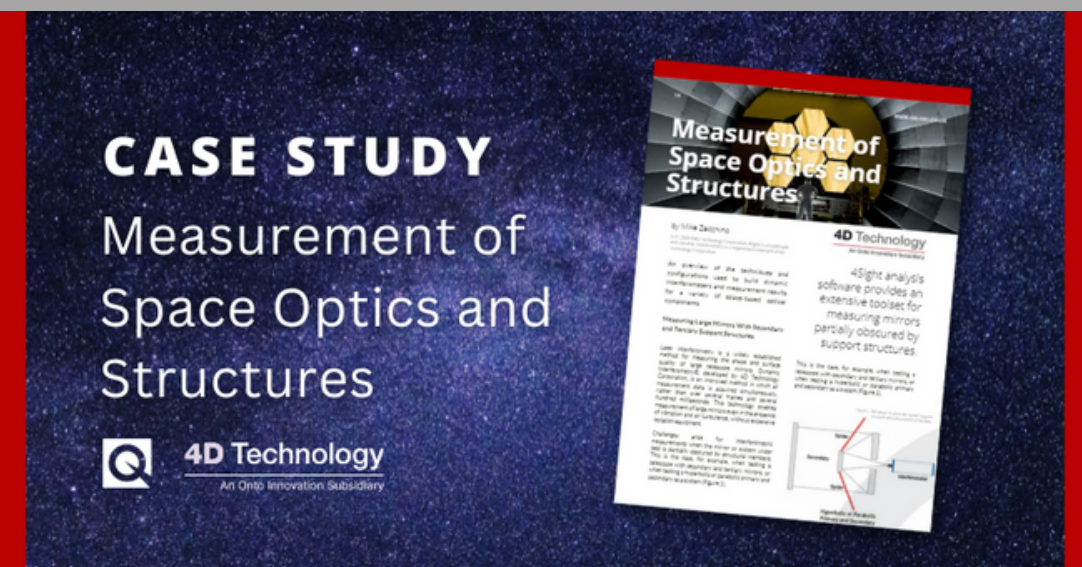
Moxtek polarisers and x-ray sources are available in the UK and Ireland exclusively through QDUKI | [www.qd-uki.co.uk](http://www.qd-uki.co.uk)



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## CASE STUDY

### Measurement of Space Optics and Structures

Read more about our partner 4D Technology's work with NASA on the James Webb Space Telescope from their angle. This case study from 4D Technology focuses on the measurement of space optics and structures.



Join us for this free workshop with our partners at 4D Technology this March. Discover dynamic interferometry for metrology at Glyndwr University in Wales.

