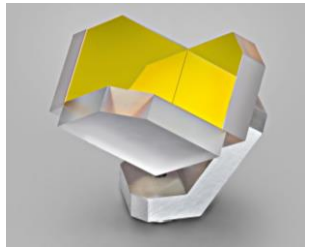
INNOVATIVE OPTICAL SYSTEMS

# PLX technology for Satellite Quantum Communications

WWW.PLXinc.com

**1955**
PLX founded

**1970**
Invention on Hollow retro-reflector



**1975**
NASA Apollo Soyuz gas measurement

**1985**
NASA long distance laser test

**1985**
Abrams Tank M1A1

**1990**
NASA Atmospheric & mirror projects

**1995**
Bradley IBAS TOW Missile ITAS

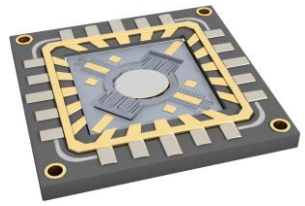
**2000**
M.O.S.T invented

**2005**
Apache Helicopter AH-64D

**2010**
Apache Helicopter AH-64E

**2015** Army Common Sensor Payload (CSP)

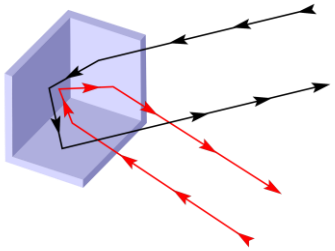
**2020**
Creation of Active optics



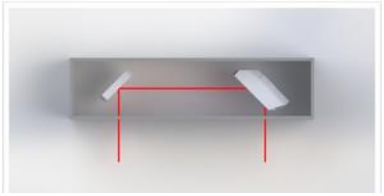
PLX M/OST
INNOVATIVE OPTICAL SYSTEMS *Monolithic Optical Structure Technology™*

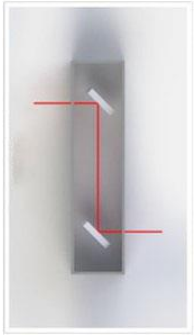
# PLX Monolithic Invariant Optical Assemblies for Laser System Applications

Sub-arcsecond Beam Delivery | Targeting & Boresighting | Beam Folding & Steering | Lasers Systems | Interferometry Systems | Active Optics & Systems

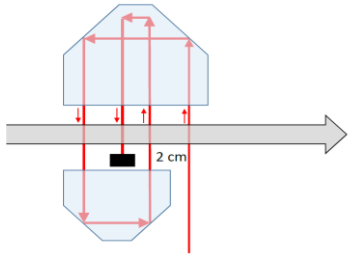


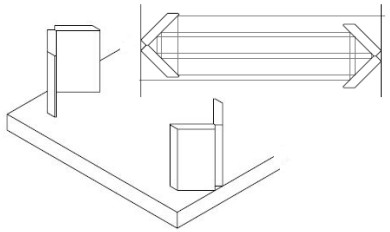
Retroreflector



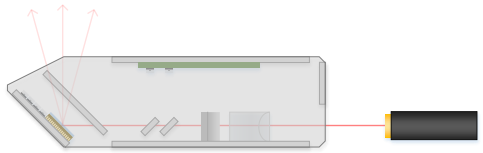


Lateral Transfer Hollow Retroreflector & Periscope (LTHR & LTHP)

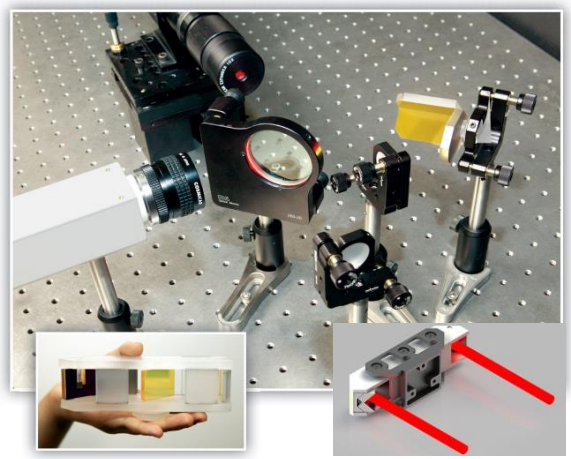


OEM Applications: Atomic Clock & Delay Sys.



The best of Active Optics and M.O.S.T.™



## INTRODUCING M.O.S.T™

### Monolithic Optical Structure Technology

- Bore-sight Tx/Rx optics
- Precision / stable alignment of any optical sub-system for space / cryogenic environments
- Active beam steering correction

| Beam Deviation | Wavelength range |
|---|---|
| as low as 0.20 arc sec | From UV to IR |
| **Shock** | **Sinusoidal Vibration/Acceleration** |
| 250G | 60G |
| **Random Vibration** | **Temperature range** |
| 20 to 2000 Hz, 47Grms | -100°C to + 100°C |

PLX
INNOVATIVE OPTICAL SYSTEMS

***Aerospace***

NASA Ball Ball Aerospace & Technologies Corp.

# AMCS Alignment System (2018)

**Mission Status: Active**

- The Alignment Monitoring and Control System (AMCS) is an alignment instrument for the Advanced Topographic Laser Altimeter System (ATLAS) aboard the **ICESat-2 satellite**.
- PLX developed two Lateral Transfer Retroreflectors in conjunction with Ball Aerospace Technologies.
- The Retroreflectors are used to keep the laser and receiving telescope bore-sighted to each other during orbit.

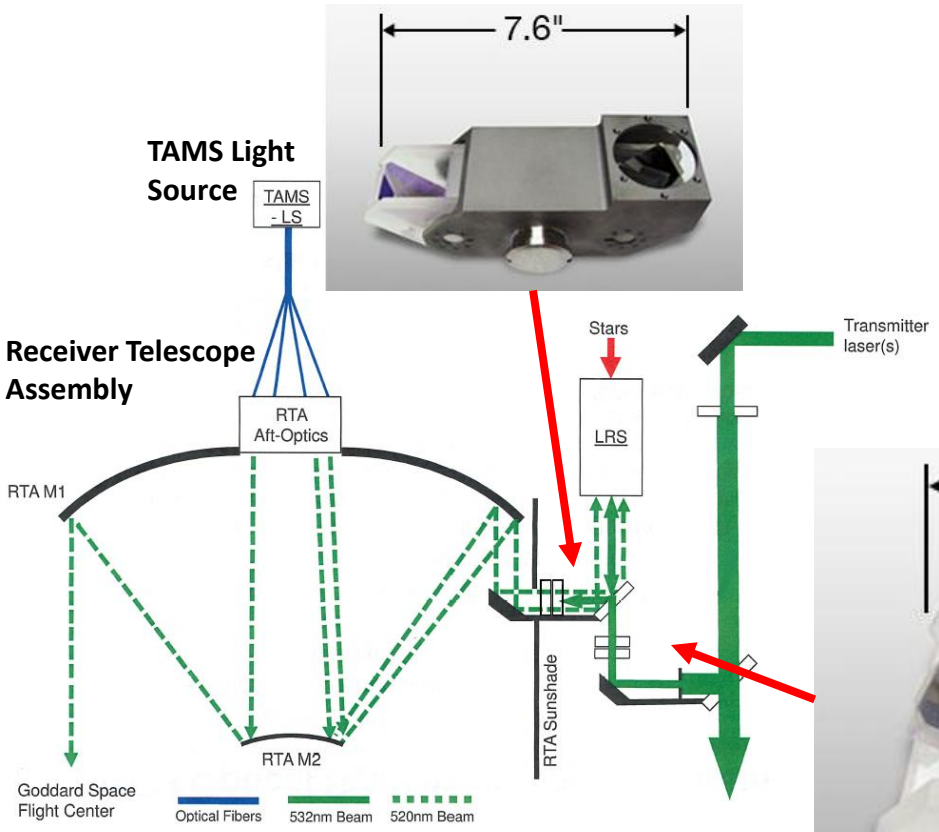
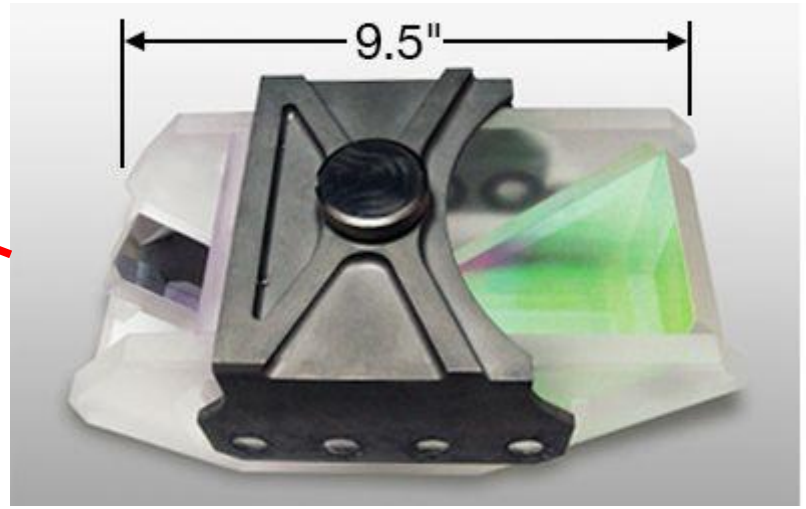



*Image courtesy of NASA*

**TAMS: Telescope Alignment Monitoring System**
**LRS: Laser Reference System**



# Laser Utilizing Communication System (LUCAS) (2020)

**Mission Status: Active**

- The **Laser Communication Terminal (LCT)** uses laser light to deliver broadband data transmission in outer space, it has been provided for the LUCAS being coordinated by the Japan Aerospace Exploration Agency (JAXA).
- The LUCAS system developed by JAXA enables data relaying between Earth observation satellites (LEO satellites) and optical data relay satellites (GEO satellites) by optical communication.
- PLX Inc. provided several retroreflectors fabricated from special low thermal expansion materials (Invar and Corning ULE) to maintain the high accuracy during orbit.

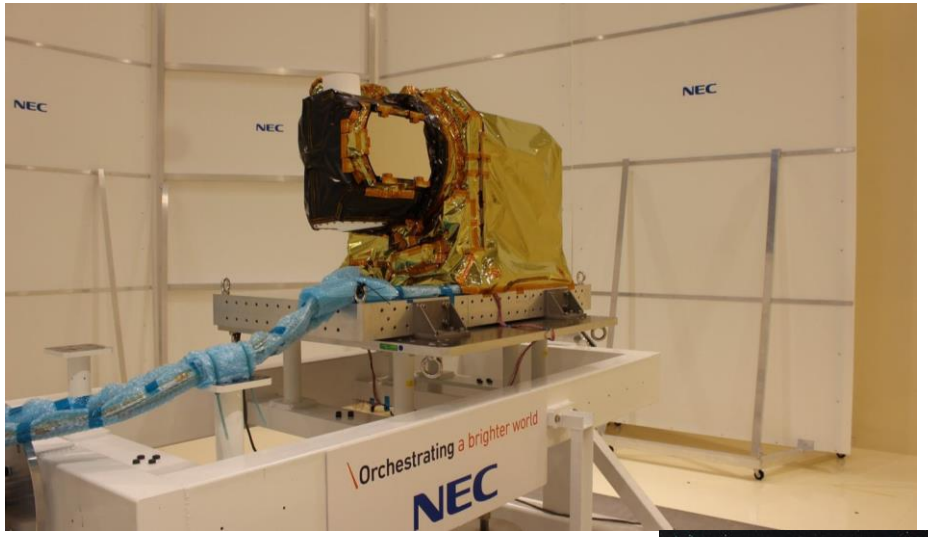



*Image courtesy of JAXA*

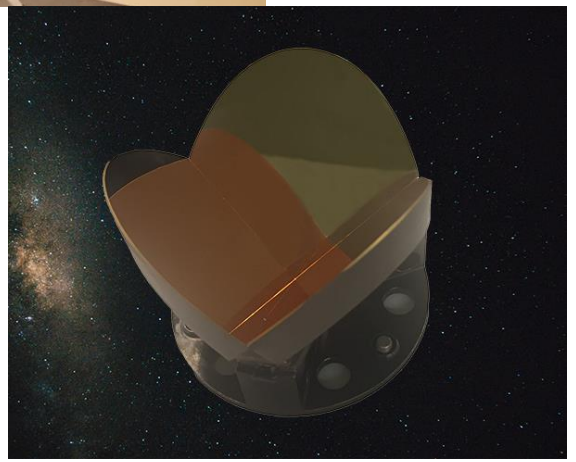


*Image courtesy of PLX Inc.*

INNOVATIVE OPTICAL SYSTEMS

# PLX's novel Beam Steering Technology

**PLX Beam Steering Technology** delivers complete, cutting-edge laser scanning systems for target tracking and metrology applications.

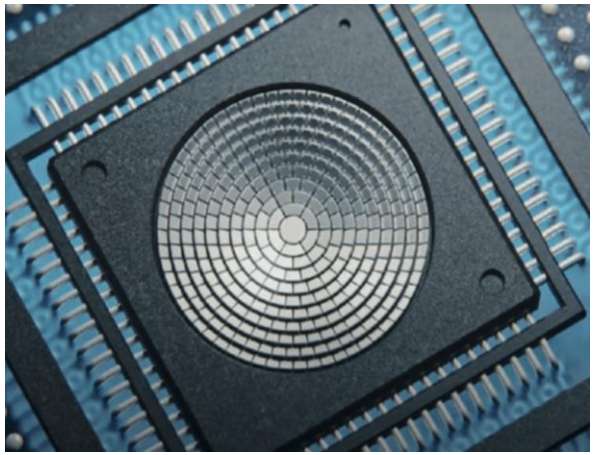
By combining Micro-Electro-Mechanical scanning mirrors (MEMS) with the PLX Monolithic Optical Structure Technology™ (M.O.S.T.) PLX can deliver precision and performance that continues to perform in the harshest operating conditions.

## Superb beam steering performance

- Sub arc second precision.
- High mechanical bandwidth, up to 1000 Hz.
- Low power/size/weight compared to traditional beam steering systems
- No calibration required using PLX invariant optics technology.

## Applications include

- Beam angle adjustment of transmit laser in FSO and tracking applications
- Corrections in beam path between telescope and detector in FSO receivers.
- Tracking satellite relative orientation with co-operative retroreflective target



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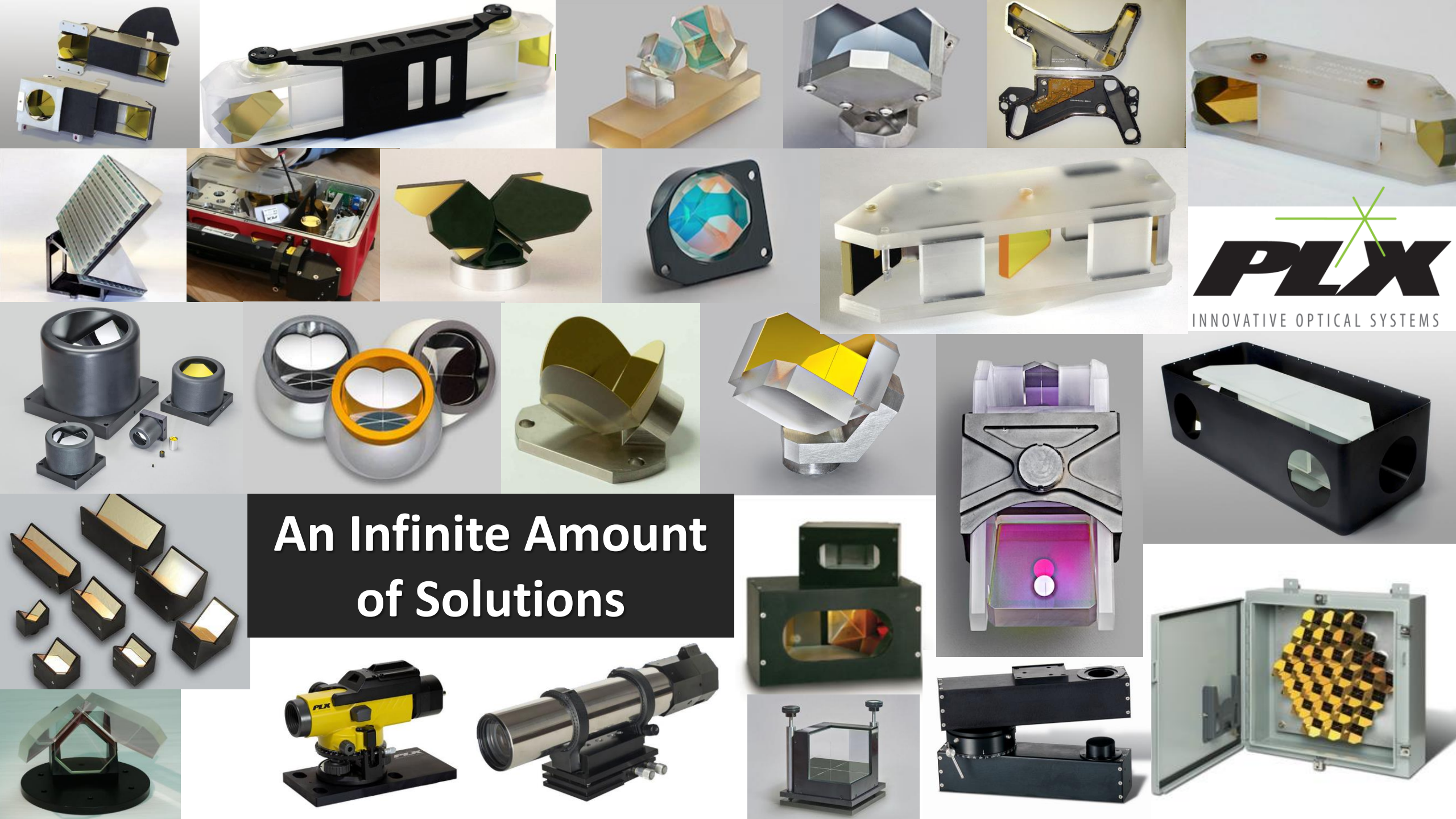
# Opportunities for collaboration

- PLX are looking for partners to further development beam steering technology for space applications
- PLX can offer expertise in precision laser beam steering/scanning/manipulation using MEMS devices and are looking for further applications for this technology
- We can offer precision, flight proven optical systems including bore-sighting, retroreflectors, and lightweight stable optical sub-systems for applications in extreme space and cryogenic conditions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An Infinite Amount of Solutions

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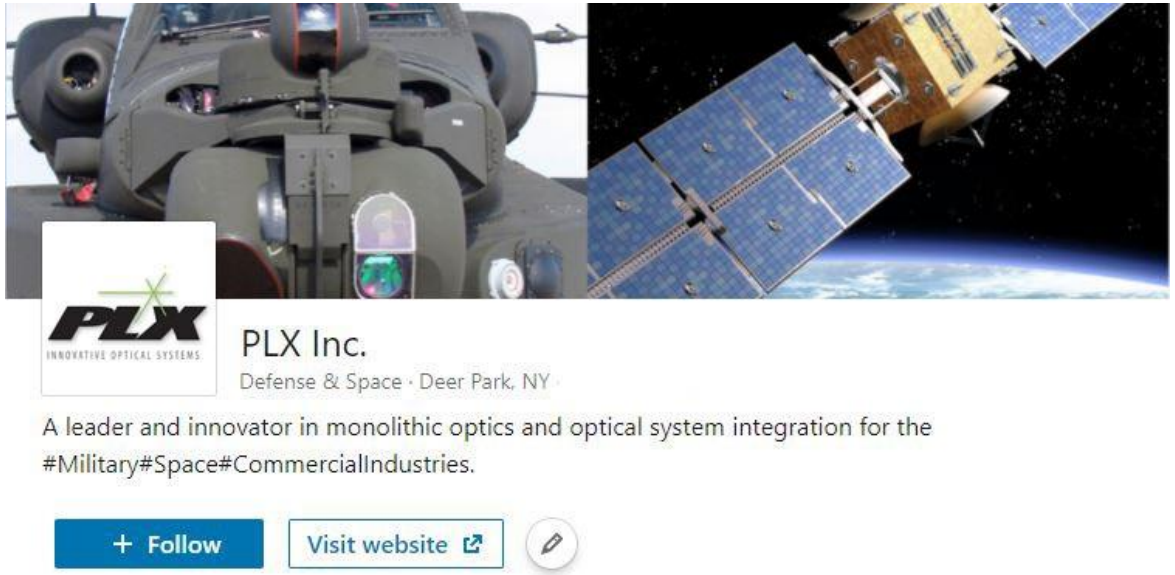


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