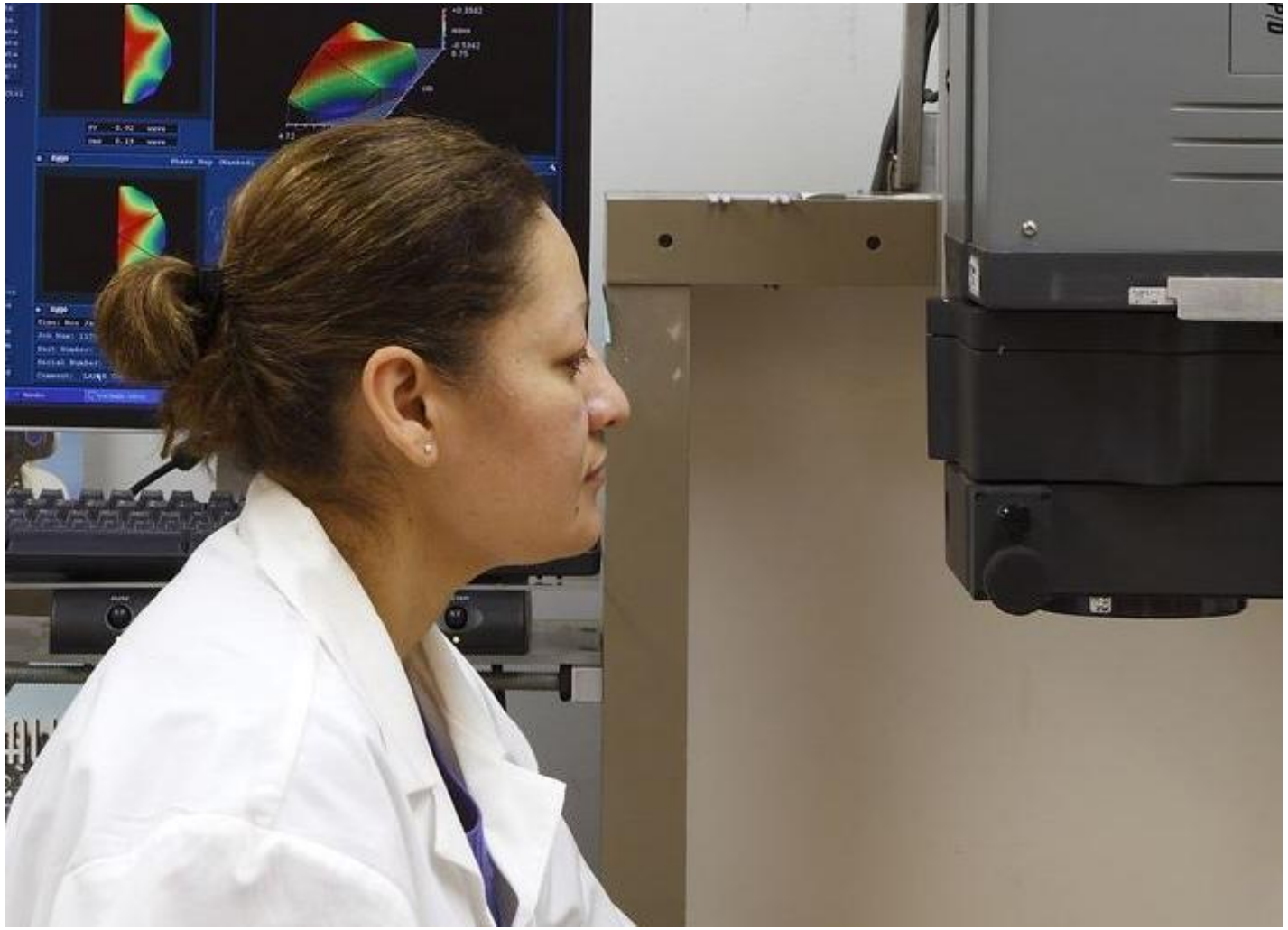
Disruptive Laser Metrology in Robotics

WWW.PLXinc.com

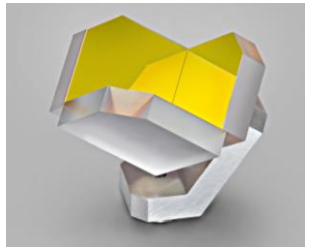
Malcolm Humphrey –
Program Director Active Optics

- Who is PLX inc?
- State of the art Monolithic Optical Structure Technology
- PLX acquire Reflex imaging
- Active Optics in PLX



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

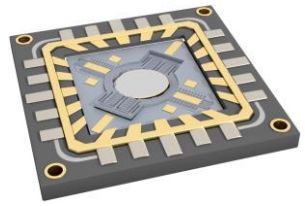
2000
M.O.S.T invented

2005
Apache Helicopter AH-64D

2010
Apache Helicopter AH-64E

2015 Army Common Sensor Payload (CSP)

2020
Creation of Active optics



Monolithic Optical Structure Technology (M.O.S.T)

- All of the elements of a complex optical setup into a single monolithic unit.
- Superb optical stability, unsurpassed shock and vibration resistance.
- Sub-arc second accuracy between optical elements.
- Integrates different glass types and exotic materials such as KBr, ZnSe and CaF2, into one assembly.
- Permanently aligned so you will never need to adjust it and also lasts indefinitely.
- Use in interferometer configurations, laser cavities, beam dividers, beam delivery systems, Boresighting and more.

PLX Acquire Reflex Imaging

Reflex Imaging approaches PLX

Suggested collaboration with the Monolithic Optical-Structure Technology™ (M.O.S.T™) and the O-LAMM metrology system.

PLX acquires Reflex outright

Both companies quickly identified synergies between PLX and Reflex imaging's technology and expertise.

Future technology

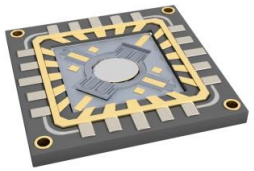
The collaboration has already yielded the new technologies that combine the best of both companies expertise

What's new: Active Optics and Systems

MEMS based active optical devices

Industrial Metrology Systems

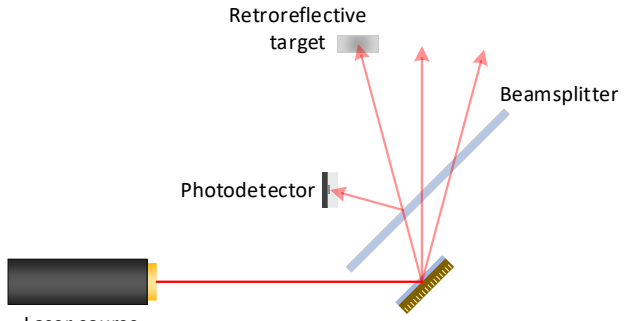
Electronic and electro-optic systems



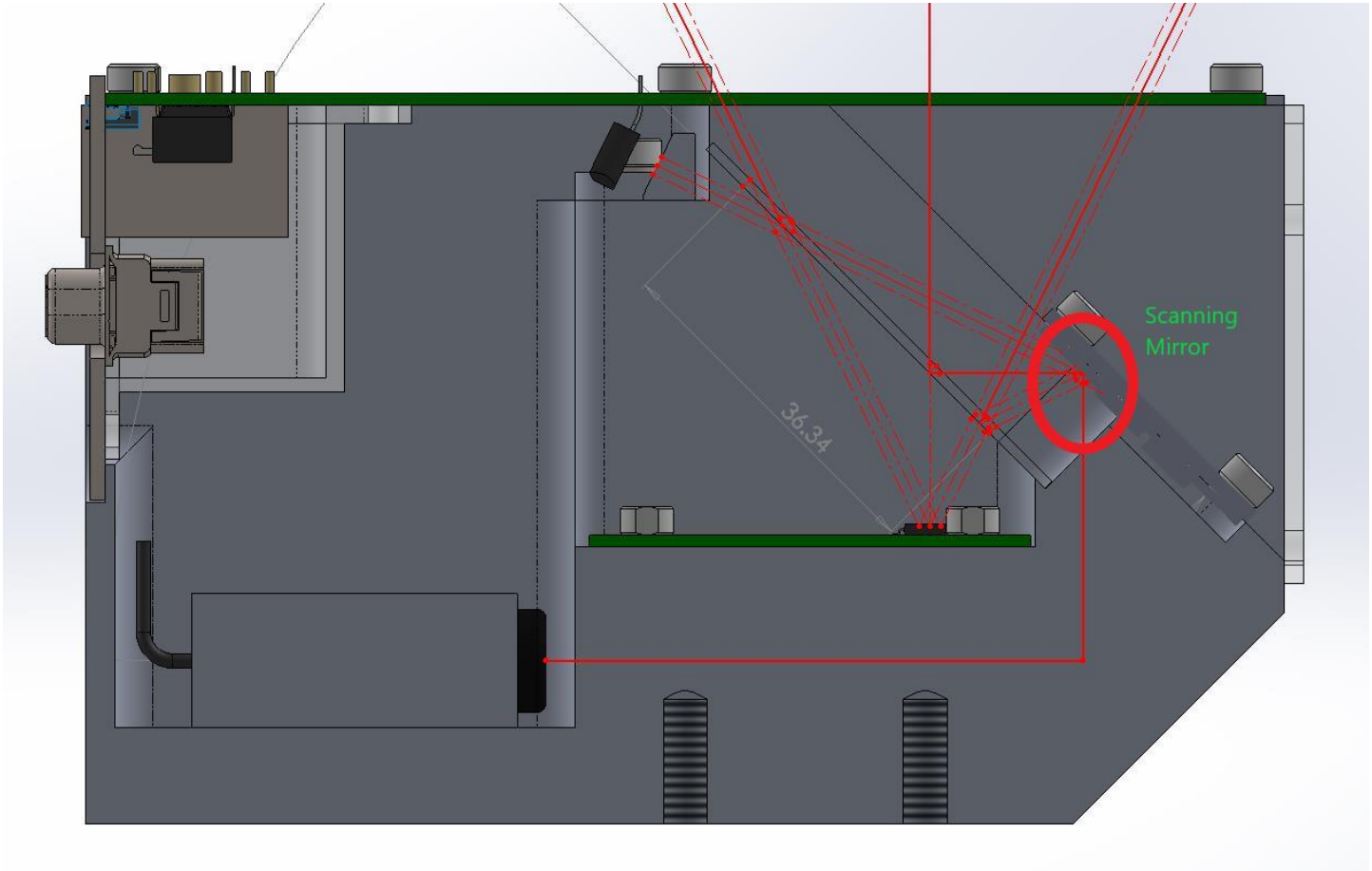
MEMs scanning mirror

LAMM scanning laser tracker

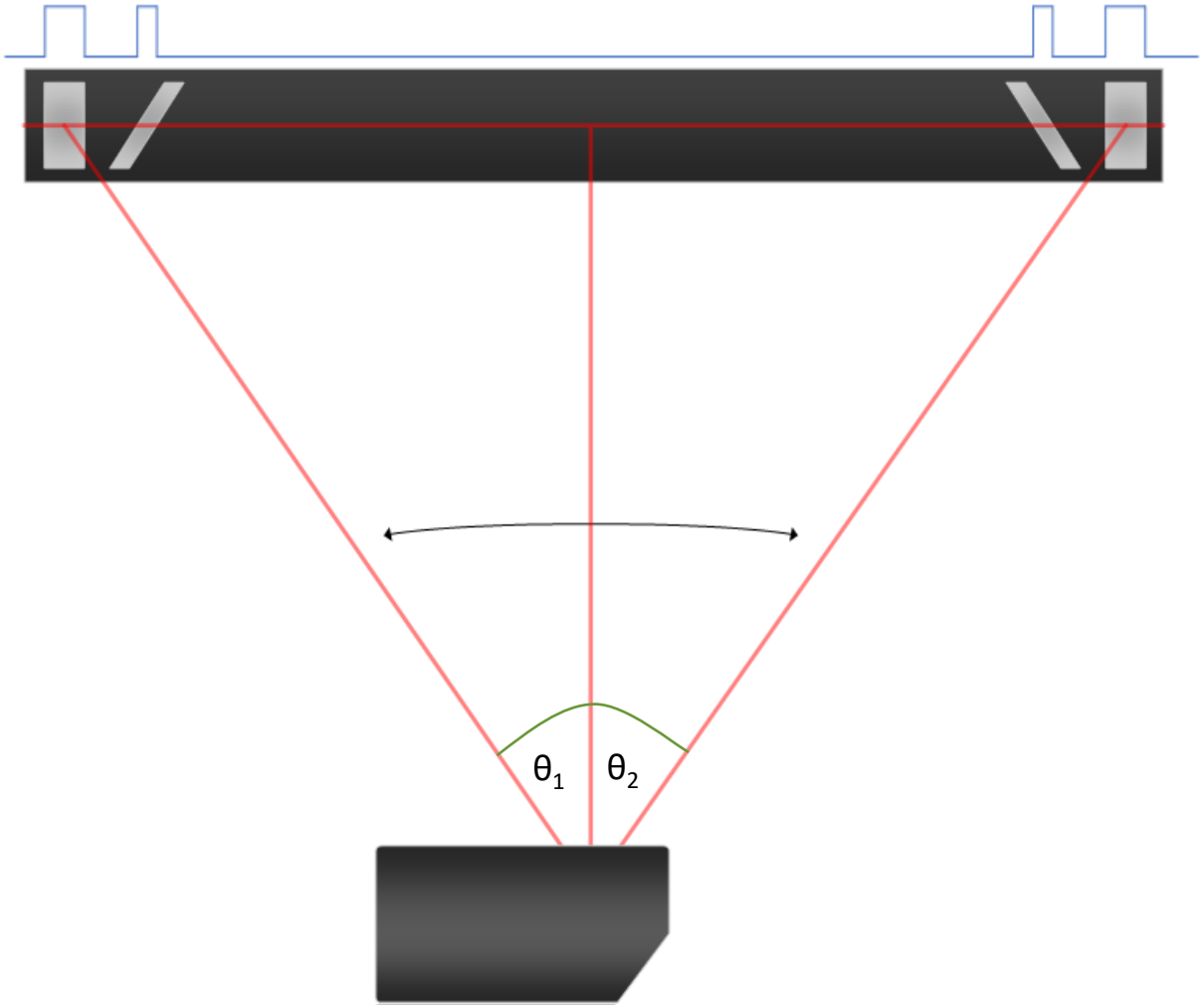
Simplified Optical layout of scanning laser tracker



LAMM optics



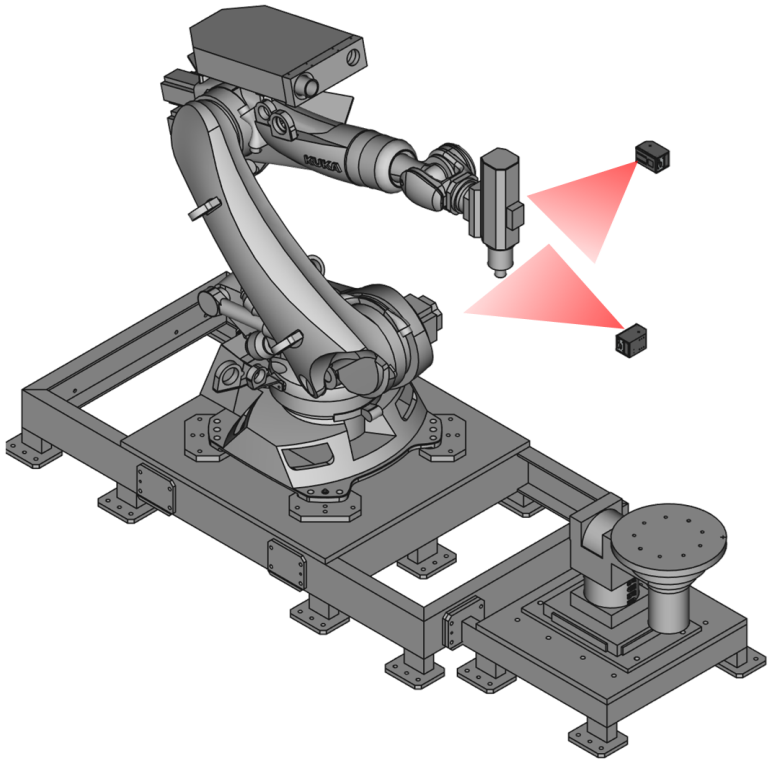
LAMM Operation



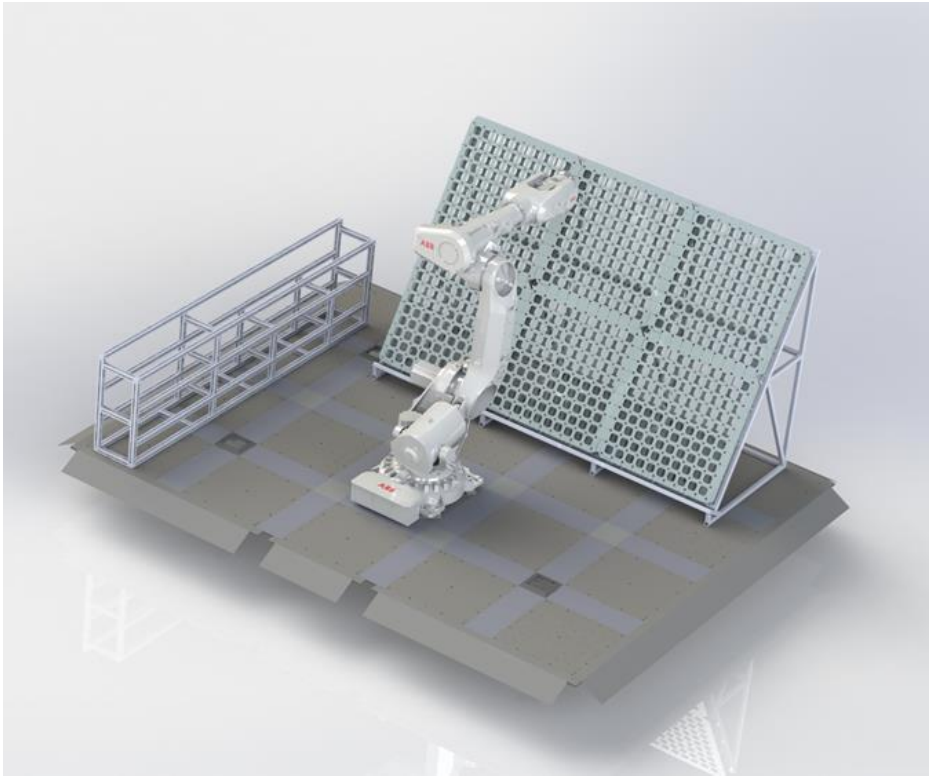
Applications for High Value Manufacturing

Investigations with AMRC provided 2 potential applications:

Real-time robot tracking

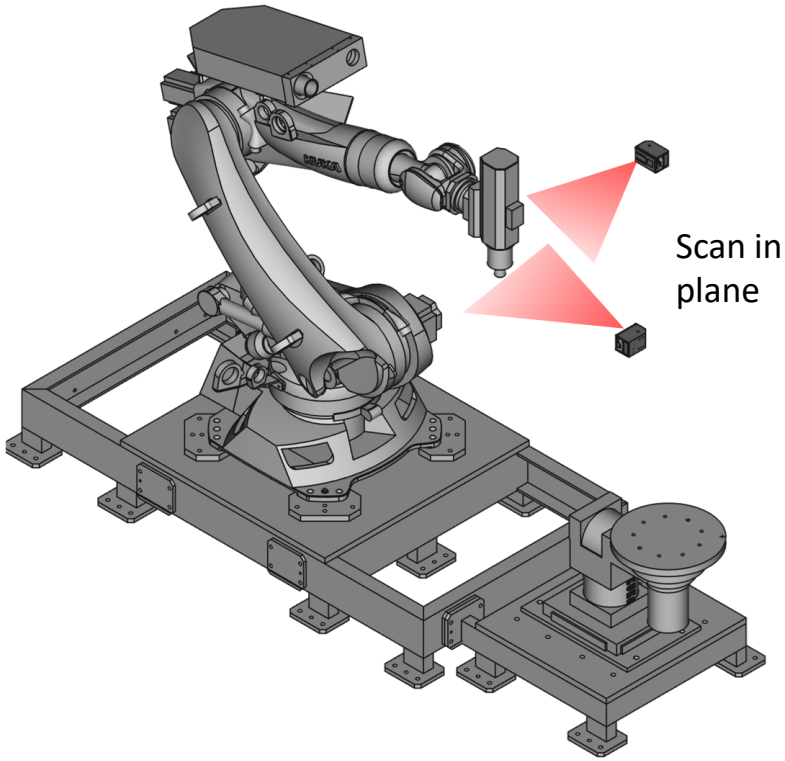


Assembly fixture verification



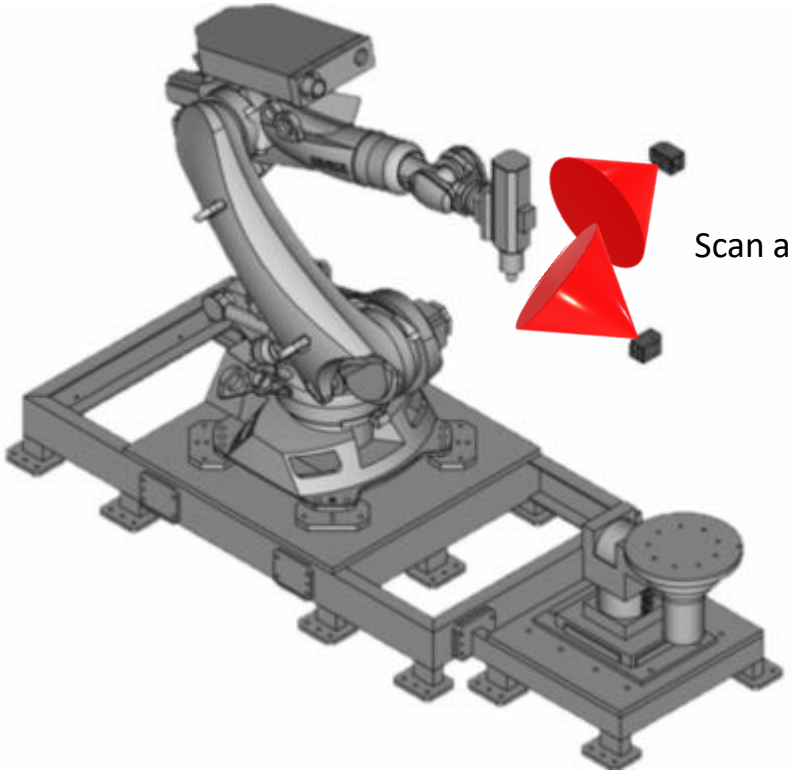
LAMM vs O-LAMM

LAMM



Scan in a single plane

O-LAMM



Scan a volume

PLX
INNOVATIVE OPTICAL SYSTEMS

Comparison of technologies;

Parameter	O-LAMM	Photogrammetry	Laser Tracker
Sample Rate	500Hz, 256 targets	50Hz multiple targets	1000 Hz Single target
Accuracy at 5m	± 0.029mm	± 0.075mm	±0.032mm
Resolution	1.2 arc seconds	3 arc seconds	1.3 arc second
Latency	<200µs	>50ms	>50ms
Field of view	Dynamic, nominally 50° x 60°	Fixed 38° x 32° typical	360° x 130°
Range	30m	10m	80m
Control unit	None required	Laptop or PC	Laptop or PC
Max units	Limited only by network	1	1

Features and Benefits

Accuracy
Patented single axis source and reflector architecture and Ultra high speed time-averaged sampling

Stability
No drift seen over years of operation

Reduce downtime
Continuous monitoring of a manufacturing cell will instantly show any deviations in 3D space which can be corrected

Safety
Internal hardware monitoring with Auto laser shutoff

Modular
Plug and play out of the box with this fully scalable solution

LOW COST
Significantly lower cost than Photogrammetry or laser tracking systems

PLX
INNOVATIVE OPTICAL SYSTEMS

Opportunities for collaboration

- PLX are looking for Robotic integrators to participate in the O-LAMM development to help develop end applications and systems using the O-LAMM technology
- There will be opportunities to develop kit parts such as calibration/verification tools etc to go with the O-LAMM
- PLX can offer expertise in precision laser beam steering/scanning/manipulation using MEMS devices and are looking for further applications for this technology

Thank You for Listening

WWW.PLXinc.com