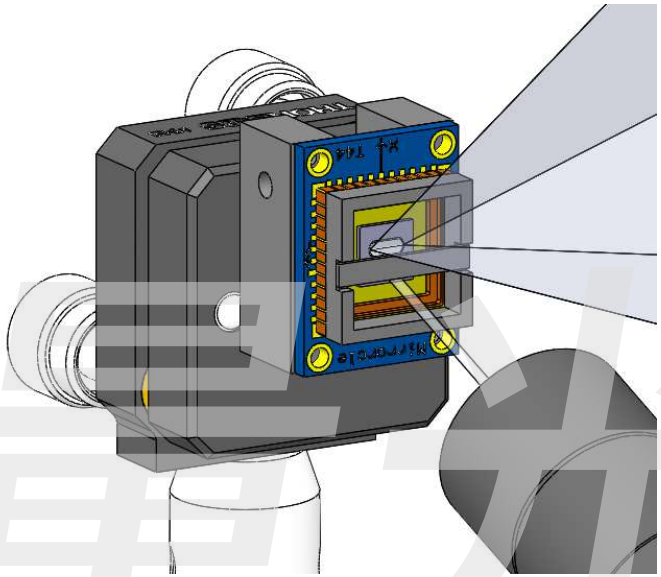


VIDEO RATE PROJECTION AND IMAGING DEMONSTRATOR KIT (DEMO-04)

mirrorcle TECHNOLOGIES, INC.

For DEMO-04 Kits
Last Revised: June 23, 2020

Mirrorcle Technologies, Inc.
Phone: 4006-888-532 WeChat: Auniontech Website: www.auniontech.com E-mail: info@auniontech.com

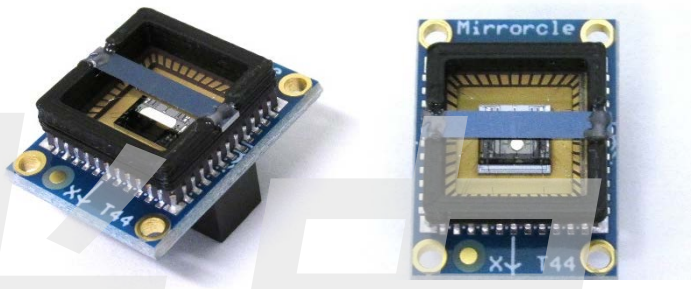
Overview

- DEMO-04 kit combines the following items to provide users with the capability of flexible and programmable video-rate laser projection or laser-based imaging/sensing
  - MEMS Pair Module (MPM) with video-rate scanning MEMS mirrors
  - Laser module with small beam diameter and divergence and video-rate modulation capability
  - FPGA-based USB MEMS Controller
  - Breadboarding for easy experimentation
  - Matlab based GUI application for scan parameter exploration
  - Documentation
  - Software Support Hours

DEMO-04 - Contents

- 2x MPM – Two **MEMS Pair Modules**
  - MEMS1 – 0.9mm mirror
  - MEMS2 – 3.2mm x 1.3mm elongated mirror
- Cable for laser and MEMS mirror
- LM – Laser Module (Monochrome, Single Color)
  - Green ~520nm, ~20-40mW
  - Modulation capability >100MHz
  - Mounted with beam reducer to <0.9mm diameter, also low divergence for sharp projection
- Controller – FPGA-based controller with USB interface
  - Embedded MEMS driver
- Software
  - Matlab-based GUI application for scan parameter exploration
  - Windows-based console demo application

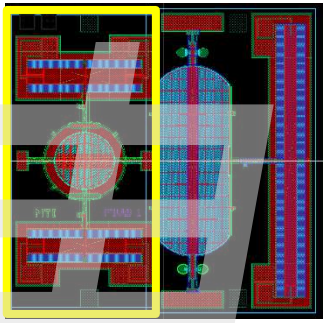
MPM prototype

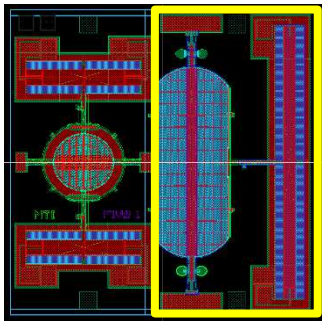


FPGA-based USB MEMS and Laser Controller

MPM Specifications

- **MEMS Pair Module – single die (chip) with two single-axis mirrors** that combine their actuation for video rate raster scanning.
- **MPM P/N: F1V9.2**
  - **MEMS 1**: F1R9.1-900D Integrated, resonant MEMS mirror
    - 0.96mmx0.90mm elliptical mirror, ~23-25kHz resonance, ±6° mech. angle
    - 5.2mm x 5.2mm die size, 0.491mm thick
  - **MEMS 2**: F1Q32.1-3200X1300AL- integrated, quasi-static MEMS mirror
    - 3.2mm x 1.3mm elongated mirror, ~1kHz bandwidth, ±5° mech. angle
    - 5.2mm x 5.2mm die size, 0.491mm thick (**same die with MEMS1**)
    - Fully programmable quasi-static position control, e.g.:
      - Offset to a given line and hold
      - Run sub-segments of a raster or offset rasters
      - 60Hz, 90Hz, 120Hz sawtooth scan (90% duty cycle) capability





Example Scan Specifications

- Scan parameters such as MEMS1 angle, MEMS2 angle, number of lines, number of retrace lines, MEMS1 frequency and others are modifiable from the Matlab GUI – within limits of the devices' capabilities. Examples of scans that could be set are:
- 24°x18° max field of regard or lower (programmable)
- Based on the ~24kHz rate of MEMS1, horizontal axis scans 48000 lines per second with programmable vertical settings. Example configurations:
  - 240p to 400p @ 90Hz
  - 640p @ 60Hz
  - 720p to 800p @ 50Hz

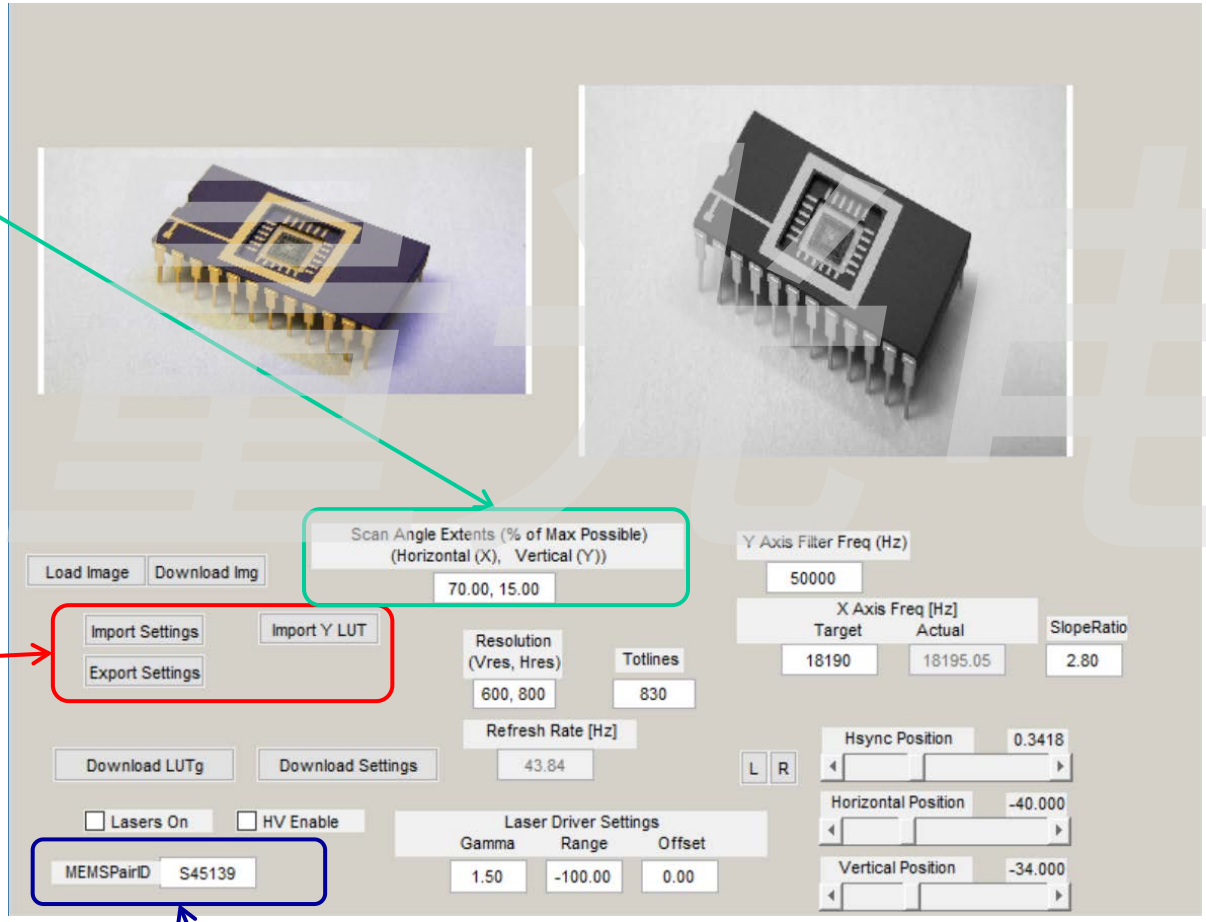
Example Scans

Higher Resolution Scan
(600p, 50Hz)

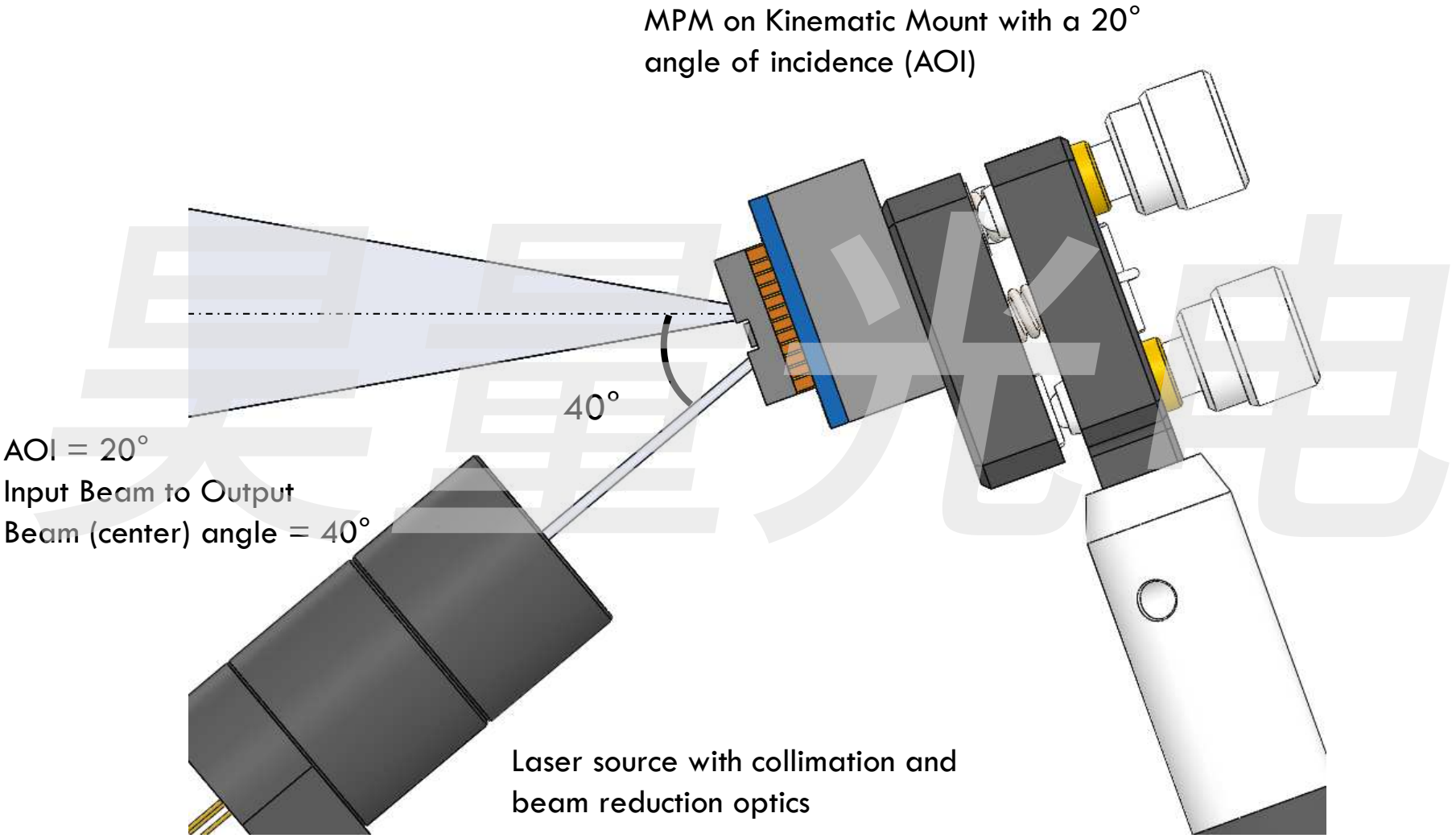
Lower Resolution Scan (240p, 90Hz)

Programmable aspect ratio

GUI-based Application for Scan Parameter Exploration

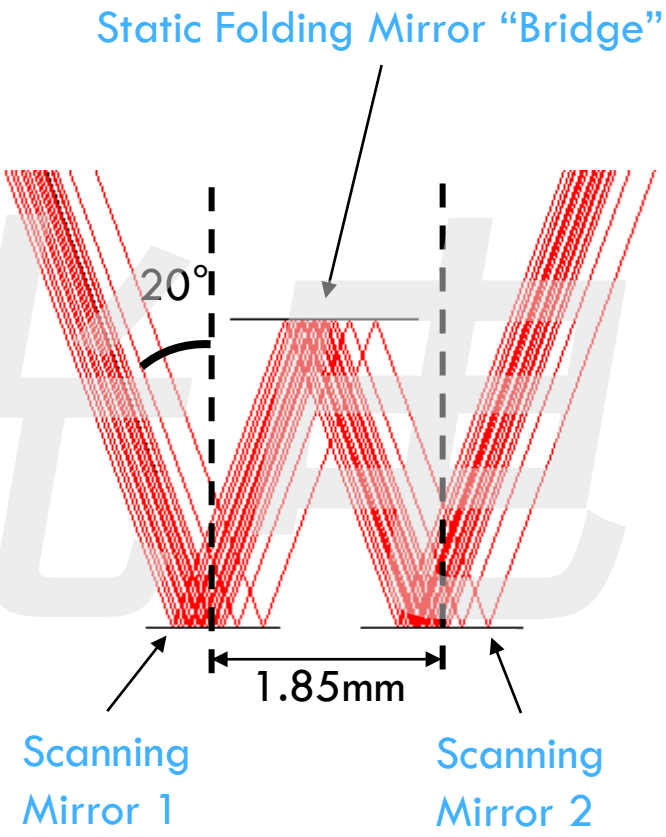


Input and Output Beams



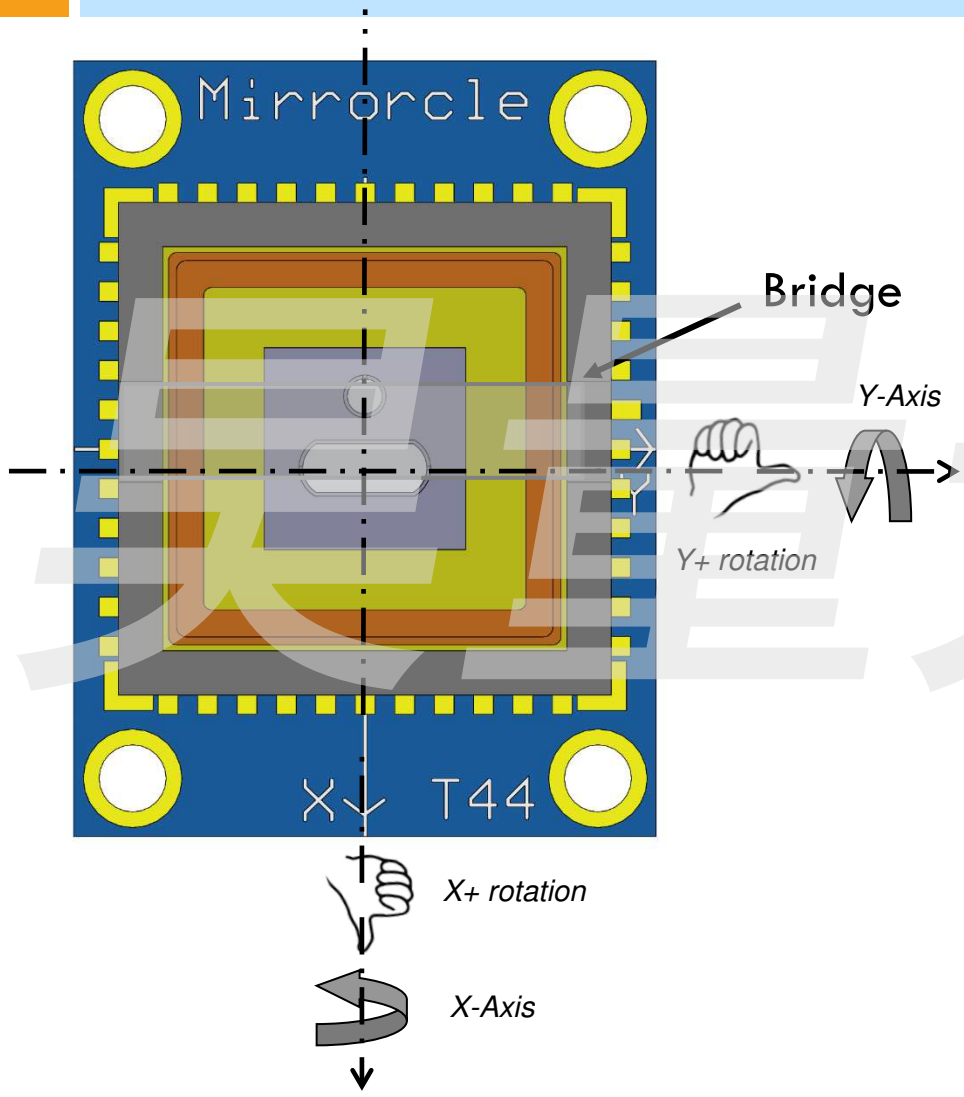
Optical Parameters Overview

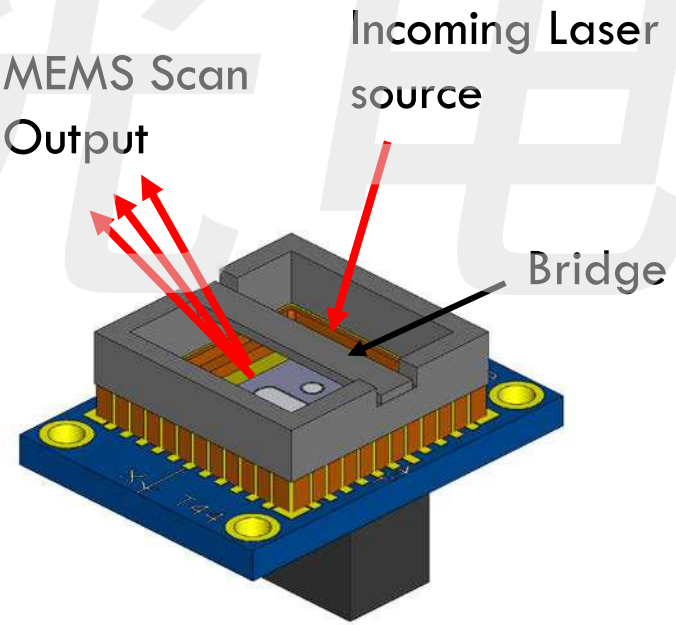
- Laser AOI onto first mirror (nominal): 20°
- Bridge angle (nominal): 0°
- Bridge height: 2.5mm
- Mirror-to-mirror distance: 1.85mm



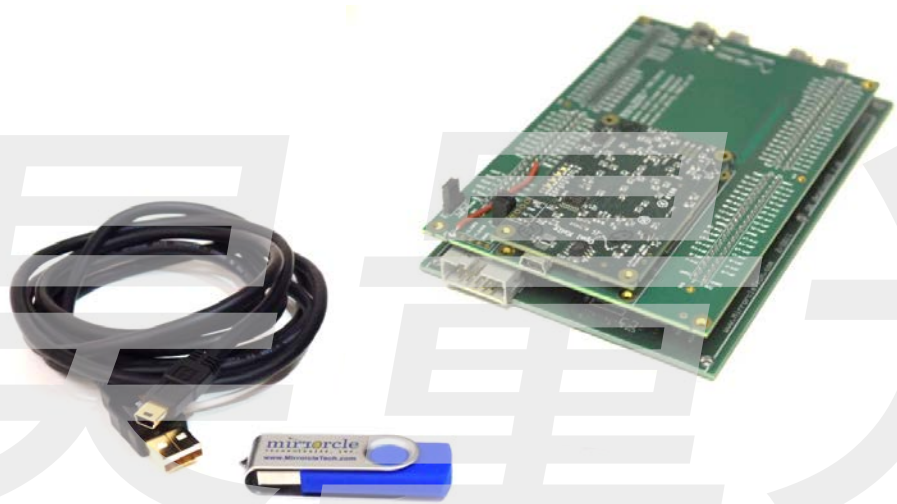
- Note: Demo is built with the shown arrangement, however production versions could have other angles/arrangements of folding mirror, etc.

MPM Orientation and Model

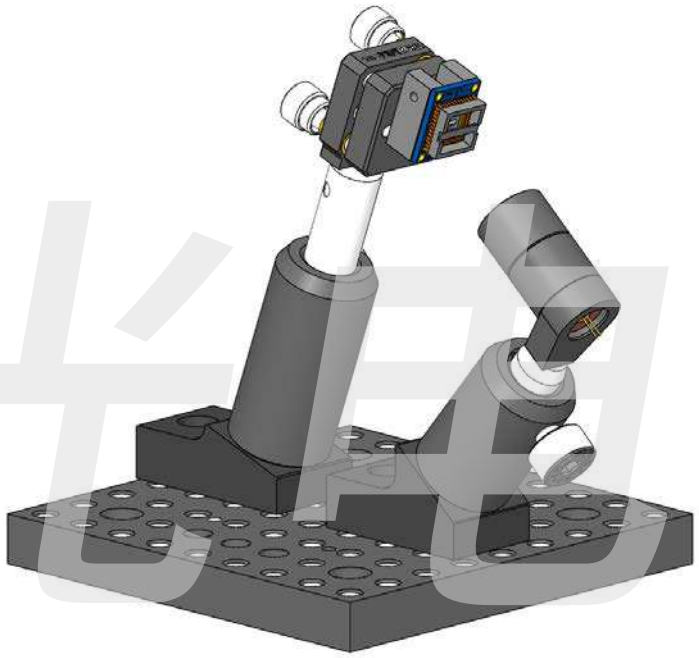




Video Rate Projection and Imaging Demonstrator Kit



FPGA based MEMS Controller
and Software on USB



Optical Breadboarding with
mounting for MPM and laser module

Thank You for Choosing

上海昊量光电设备有限公司 Phone: 4006-888-532 WeChat: Auniontech Website: www.auniontech.com E-mail: info@auniontech.com