OMEGA Thomson Scattering System Upgrade

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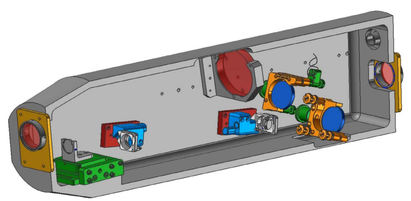
Summary

The Upgraded Thomson–Scattering System is a Robust Diagnostic Platform on the OMEGA Laser

- The Thomson–scattering system measures plasma conditions such as ion and electron temperature, electron density, and plasma-flow velocity
- Fully reflective optical transport provides high-quality imaging for wavelengths ranging from 200 nm to 800 nm
- Improved UV signal throughput allows for the detection of Thomson scattering from electron-plasma wave features using a 263-nm probe beam
- Two streak-camera–coupled spectrometers and a gated optical imager are available to support a variety of experimental objectives

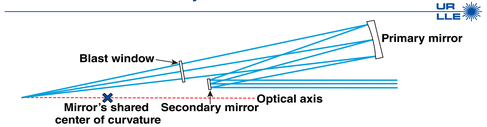
E21091

A New TIM-Based Reflective Telescope Provides High-Quality Imaging of Optical Emission from 200 to 800 nm

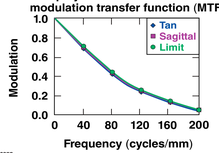


E20931

The TIM-Based Telescope Uses an Unobstructed Section of a Schwarzschild Objective



Thomson-scattering polychromatic diffraction modulation transfer function (MTF)

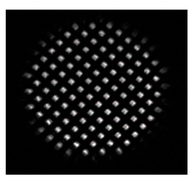


- Diffraction limited
- *f*/10 collection
- Unobstructed
- Spherical optics
- All-reflective transport
- Aluminum coatings
  >80% reflectivity 200 to 800 nm

E20932

Initial Telescope Performance Tests Demonstrate High Spatial Resolution and Diffraction-Limited Spot Sizes

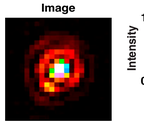
Imaged microscopy mesh grid



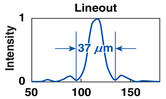
Hole width: 28 μm, bar width: 23 μm
Image magnification: 2.3×
Illumination wavelength: 635 nm

Airy disk formed imaging 4-μm core single-mode fiber

Image



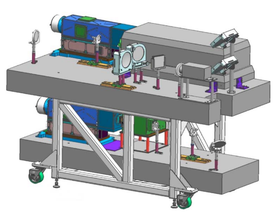
Lineout



Wavelength: 635 nm
Working *f*/#: 23
Calculated airy disk: 35.6 μm

E20933

A New Instrument Platform Houses Diagnostics for Time-Resolved Spectroscopy and Gated 2-D Imaging

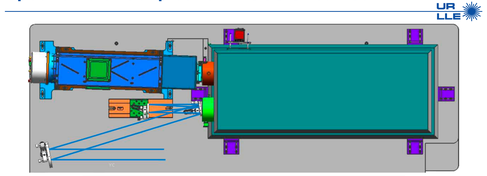


- Ion-acoustic wave system
  - high-resolution spectrometer coupled to ROSS streak camera
- Electron-plasma wave system
  - broadband spectrometer coupled to ROSS streak camera
- Optical imager
  - high-resolution gated charge-coupled–device (CCD) camera

Each of the three detector systems can be independently configured to support a variety of experimental objectives.

E20934

The Ion-Acoustic Wave System Consists of a 1-m Spectrometer Coupled to a ROSS Streak Camera



Spectrometer focal length	1.0 m
Spectral resolution	0.03 to 0.1 nm
Spectral window	4 to 6 nm
Detectable wavelengths	200 to 800 nm
Temporal resolution	200 ps
Sweep speeds	1.5 ns, 5 ns, 15 ns, 25 ns
Maximum field of view at TCC	370 μm
Image magnification	1.4×

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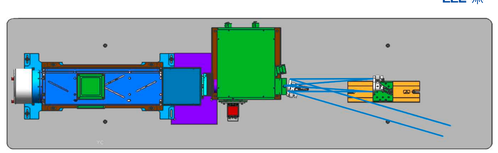
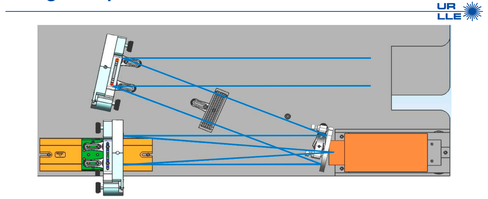
Electron-Plasma Wave System Consists of a 0.3-m Spectrometer Coupled to a ROSS Streak Camera



Spectrometer focal length	0.3 m
Spectral resolution	0.5 to 2.0 nm
Spectral window	75 to 375 nm
Detectable wavelengths	200 to 800 nm
Temporal resolution	100 ps
Sweep speeds	1.5 ns, 5 ns, 15 ns, 25 ns
Maximum field of view at TCC	275 μm
Image magnification	2.1×

E20965

The Optical Imager Consists of a Gated Charge-Coupled–Device Camera



Detector	Pi-Max-3 Gated CCD
Detectable wavelengths	200 to 800 nm
Minimum gate duration	3 ns
Field of view at TCC	1.5 mm
Spatial resolution at TCC	20 μm
Image magnification	3.2×

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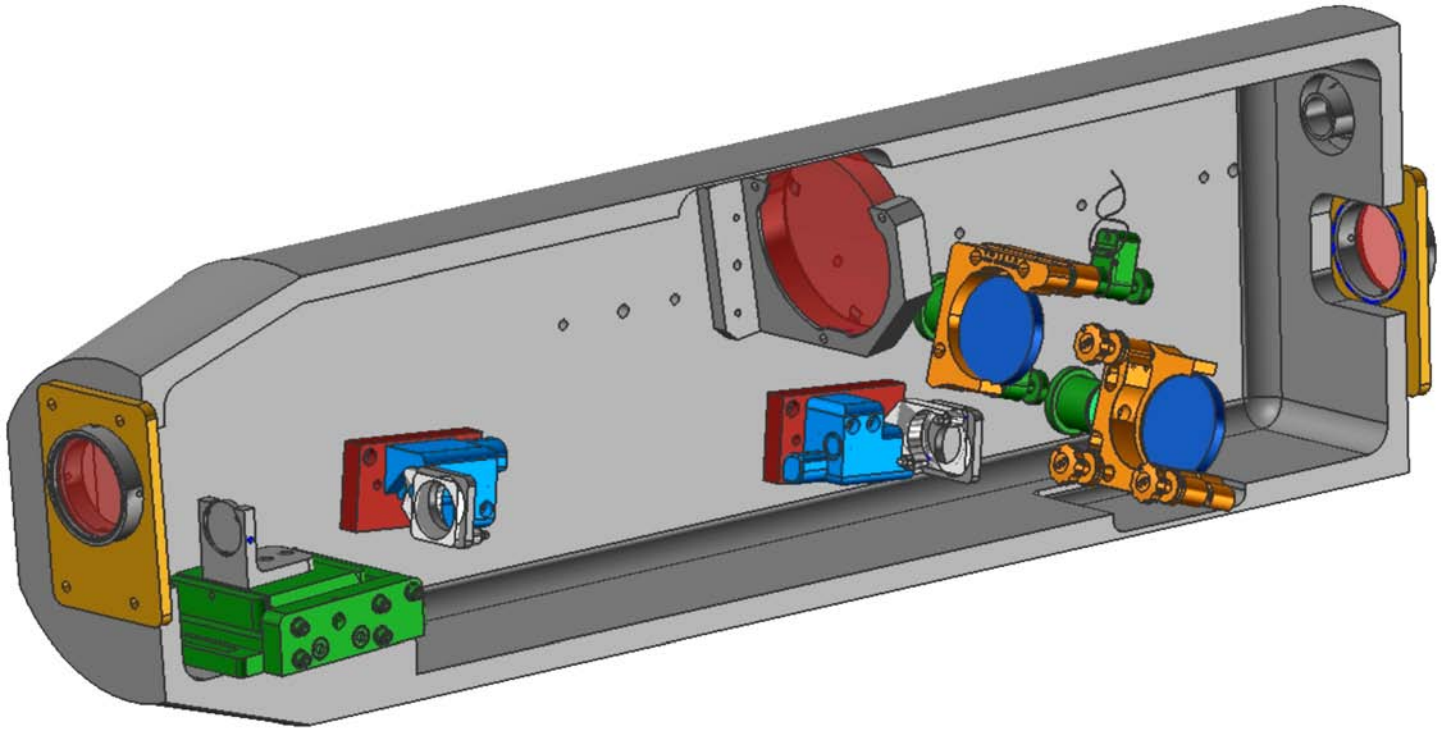

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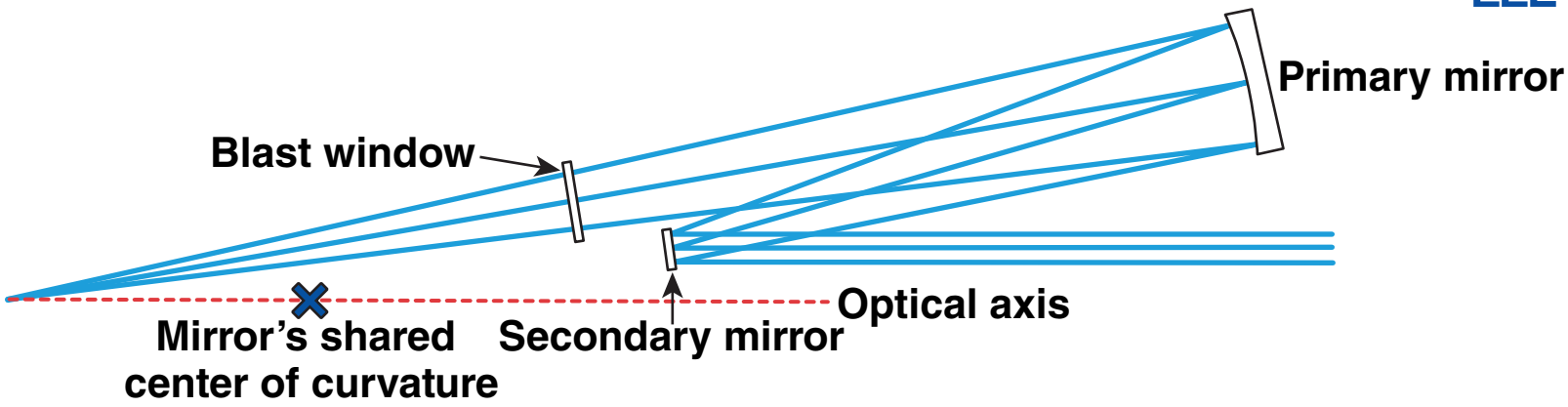

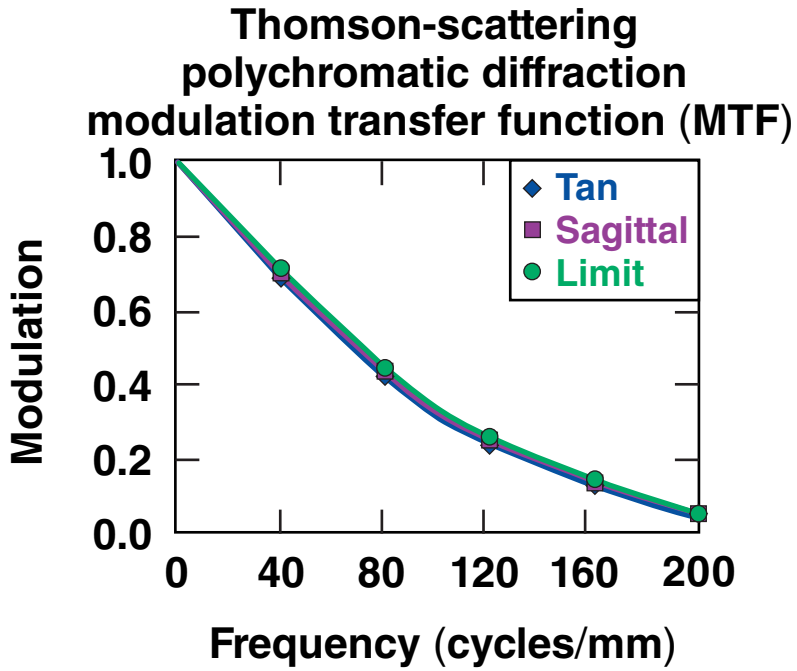

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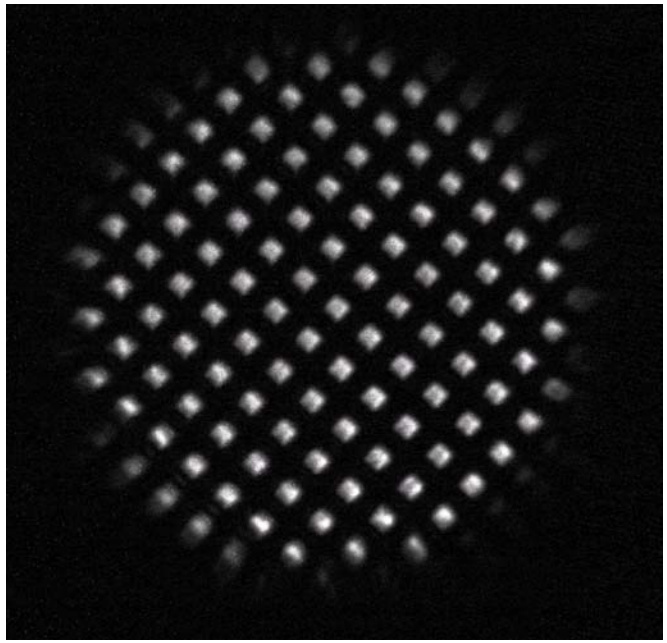

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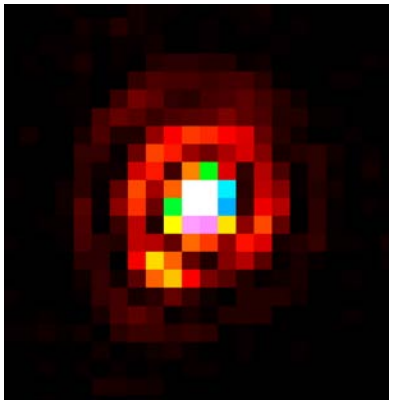

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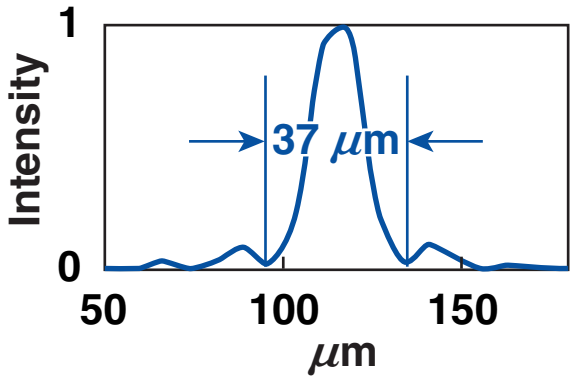

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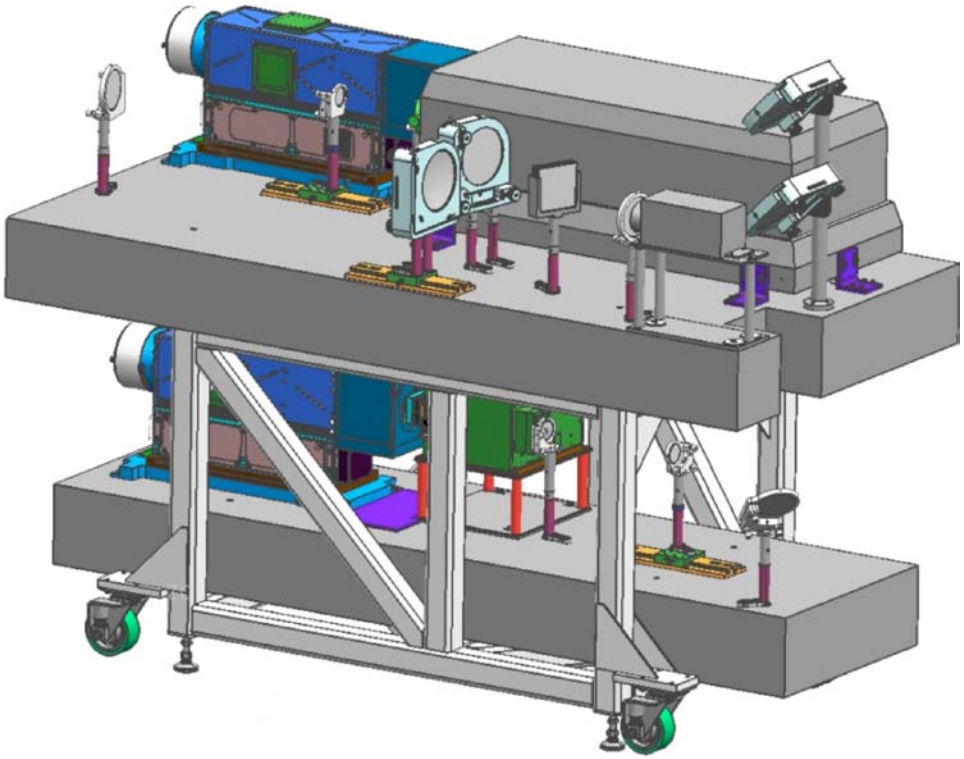

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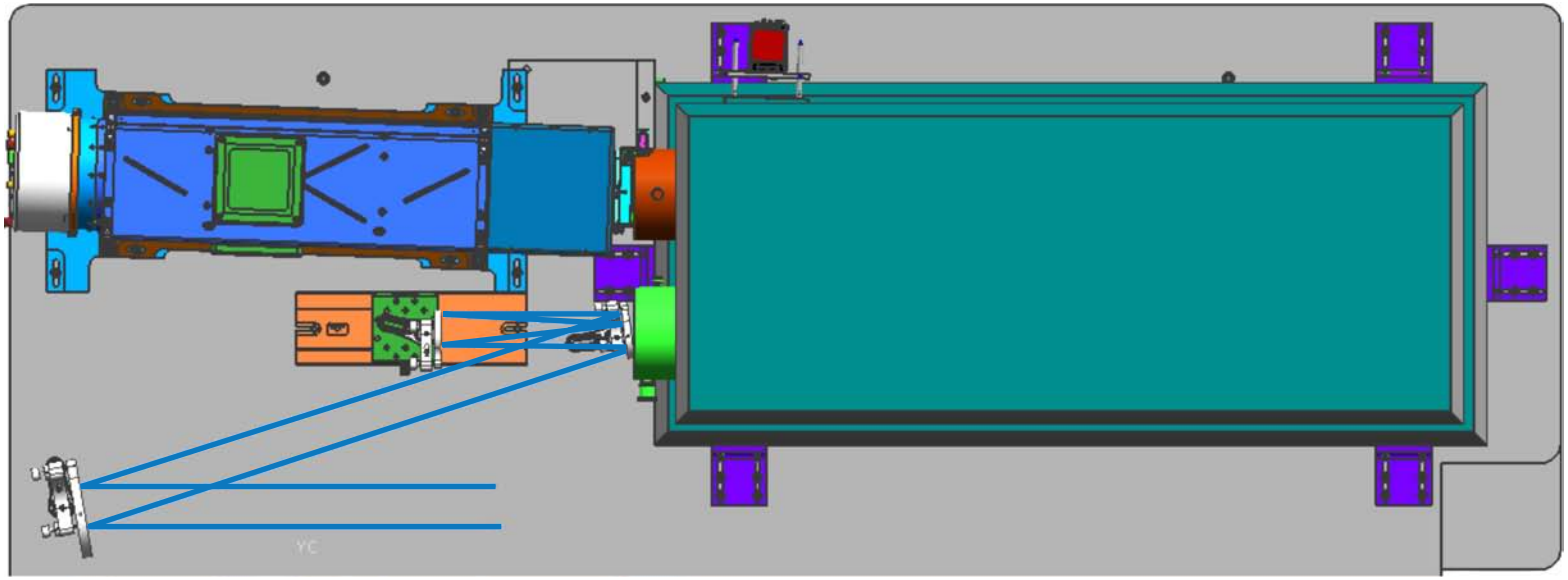

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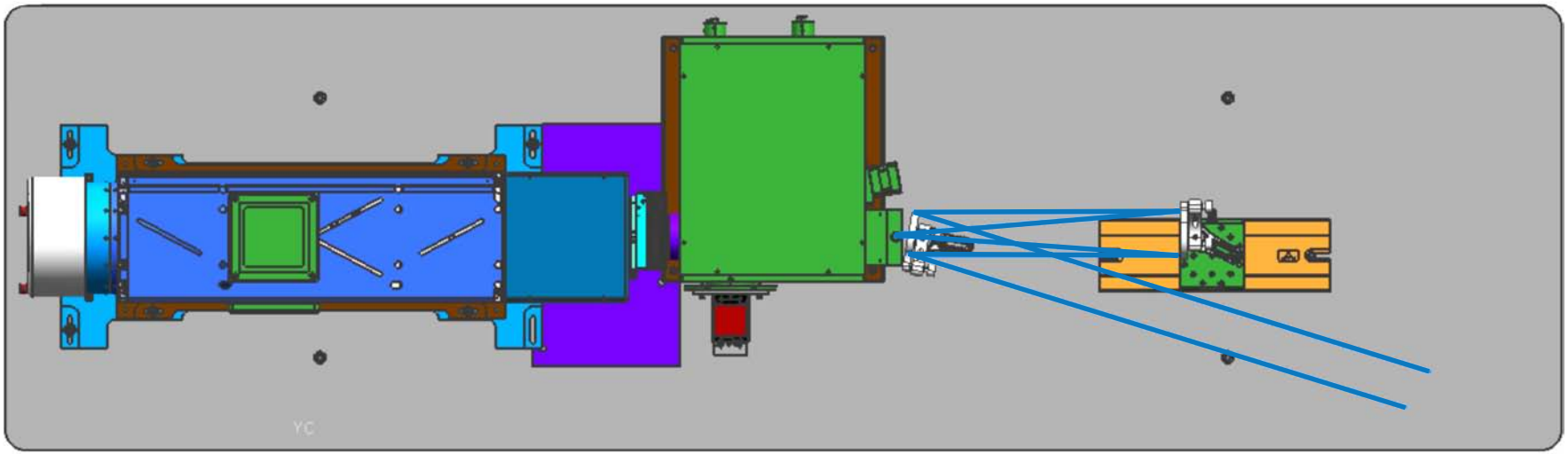

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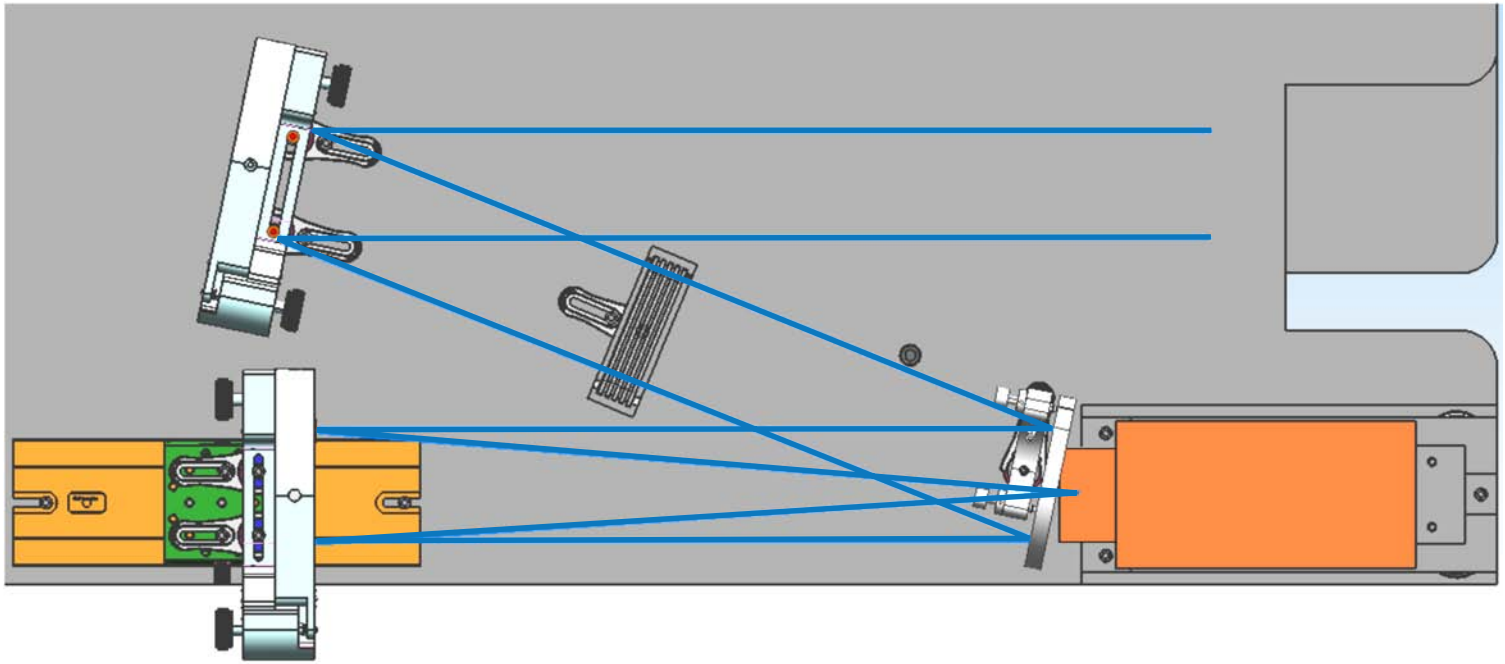

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