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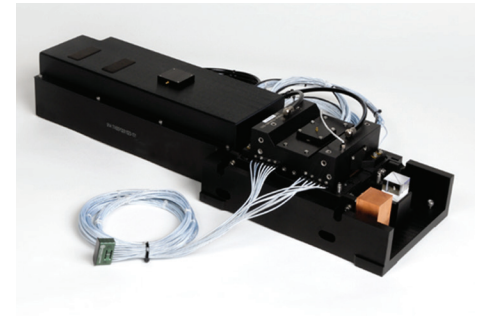
# MULTI-CHANNEL ACOUSTO-OPTIC MODULATOR (AOM) ILLUMINATION MODULE

Precision control of optical beams for quantum state manipulation

L3Harris is leveraging more than 40 years' experience in developing AOM devices and technologies to design illumination modules that control the quantum states of trapped ions with extreme precision. With their low-noise, low-drift and low-cross-talk capabilities, these subsystems are now enabling the multi-channel optical beam control operations needed for quantum computing, quantum state manipulation for applications such as atomic clocks and advanced quantum sensing, and enhanced micromachining. The robust multi-channel AOM illumination module requires a single ultraviolet (UV) (355 nanometer typical) beam input and provides the capability for performing independent modulation of the amplitude and phase of 32 individual beams simultaneously. It enables multi-qubit state transitions and entangling operations needed for ion-trap-based quantum state manipulation.

## PERFORMANCE PARAMETERS

PARAMETER	SPECIFICATION
Number of channels	32
Nominal radio frequency (RF) input impedance	50 ohms
Center frequency	200 MHz
Nominal channel spacing	450 $\mu\text{m}$ c-c
Rise time	<25 ns
Diffraction efficiency	>50%
Optical channel beam waist in AOM	Approximately 150 $\mu\text{m}$ (1/e <sup>2</sup> dia.)
Maximum RF drive power	0.60 W/channel
Optical wavelength	355–364 nm standard, other wavelengths available
Optical material	UV-grade fused silica
Overall dimensions	L: 69 cm x W: 19 cm x H: 11 cm



## APPLICATIONS

- > Micromachining
- > Metrology
- > Quantum computing

## COMPONENTS

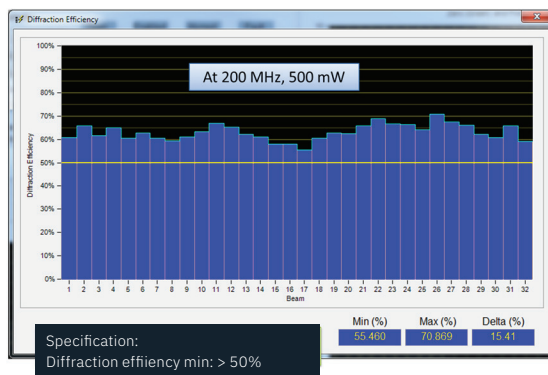
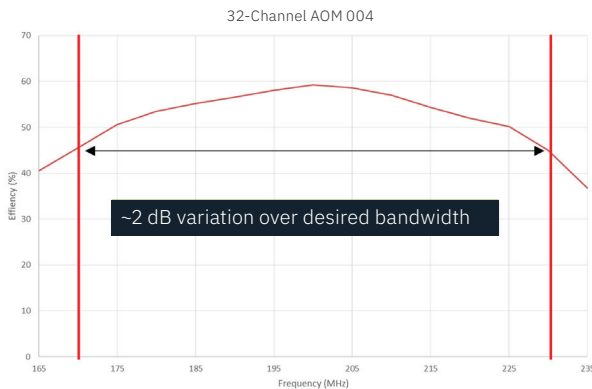
- > 355 nanometer (nm) diffractive optical element (D.O.E., other wavelengths available)
- > Transform telescope for a telecentric input of 32 beams into the module with 32 modulated polarized beams output
- > Stable base mount assembly with a precision optomechanical alignment system and input adjustment
- > Purge cover and purge feeds to prevent dust and particle contamination at on the high-power UV optics
- > Documentation for setup procedure

PARAMETER	SPECIFICATION
Module input beam diameter	1.0 mm +/- 0.1 mm
Distortion (spacing variation)	ABS < 2.7 $\mu$ m
Telecentricity	< 35 $\mu$ Rad
Beam height delta*	< +/- 6 $\mu$ m
AOM throughput timing	130 ns < T < 170 ns
Differential timing*	+/- 1 ns (between any two channels)
Scan first order delta	< 23%
Diffraction efficiency minimum	> 50%
Cross-talk all but 1 off maximum	ABS < 0.2% (typical 0.1%)
1st order polarized maximum	< 0.5%
Maximum discrete scatter	< 1% (0.02% typical)
Dynamic overshoot	ABS < 1%**

\* Measured with regard to transducer surface

\*\* Of channel first order beam intensity

### REPRESENTATIVE PERFORMANCE CURVES



For additional information, email [Acousto-Optics@L3Harris.com](mailto:Acousto-Optics@L3Harris.com) or visit [www.L3Harris.com/Acousto-Optics](http://www.L3Harris.com/Acousto-Optics).

### KEY FEATURES

- > Stable mechanical enclosure assembly with precision optomechanical alignment and adjustment for single standard 1 millimeter beam input
- > Thermally balanced system to minimize thermal beam drift with on-off modulation of channels (chiller required, purchased separately)
- > Base wavelength of 355 nm, but wavelength options from 355 nm to 532 nm (D.O.E., customization required for some wavelengths)
- > Polarization cleanup cube to assure highly polarized output of 32 modulated beams
- > A purge cover and purge feeds for lab nitrogen or filtered dry air to prevent dust and particle contamination of the high-power UV optics
- > Documentation for laser alignment to module
- > Compact RF connector interface (2X 16-channel snap-on RF connectors) for easy disconnect of module with breakout interface board and breakout cable to 32 SMA's for optional available RF driver or customer-supplied test equipment
- > Flexible RF driver option with direct digital synthesizer for lab testing or pass-through amplifiers to support external AWG

### Multi-channel Acousto-Optic Modulator Illumination Module

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### Nonexport-controlled Information

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.



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