Acousto-Optic RF drivers Custom solutions

AA OPTO-ELECTRONIC proposes the most complete range of Acousto-Optic devices covering wavelengths from 180 nm up to 11 µm including all associated Radio Frequency drivers and power amplifiers.

- Modulators - Pulses pickers
- Polychromatic modulators
- Fixed & variable frequency shifters
- Deflectors - AOTF
- Q-Switches - Cavity Dumpers
- Fiber pigtailed devices
- Power Amplifiers
- Fixed and variable frequency sources
- Custom developments

AA OPTO-ELECTRONIC
Components and Innovations for demanding applications...

AA was founded in 1979, under the name «Automates et Automatismes». It became a limited company in 1988 under the new name of AA Sa, specialising in acousto-optic components and their associated RF drivers. AA is a world leader in the manufacturing of quality Acousto-optic and radio frequency devices. Close collaboration with universities and research institutes, provided invaluable knowledge and experience in the design and manufacturing processes of Acousto-optic devices and radio-frequency sources. Continuous R&D keeps pace with advances in laser and electronic technology to ensure AA continues to offer state-of-the-arts products. AA offers its customers solutions from prototype design to large volume manufacturing thanks to its internal resources and In-house capabilities. Our Headquarter is located in ORSAY, near Paris. This is also our optical manufacturing center. All RF drivers are manufactured in our St Avertin plant, located 200 kms south of Paris.

Diffraction Efficiency

$$\frac{I_1}{I_0} = \sin^2\left(\frac{\pi}{2}\sqrt{\frac{P}{P_0}}\right) \qquad with\ P_0 = \frac{\lambda_c^2}{2M_2}\frac{H}{L}$$

Rise time

$$T_r = \frac{\Phi}{V} \times 0.66$$

AM Bandwidth (Analog -3dB)

$$F_{-3dB} \approx \frac{0.48}{T_r}$$

Scan Angle

$$\Delta\Theta = \frac{\lambda \Delta F}{V}$$

Static Resolution

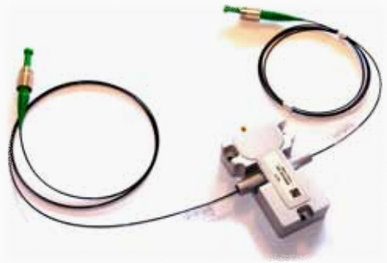
$$N = \frac{\pi}{4}\Delta F \frac{\ell}{V}$$

Dynamic Resolution

$$N_d = N\left(1 - \frac{T_a}{T}\right) + 1$$

1. I_1: Laser Intensity in 1st order
2. I_0: Laser Intensity in 0th order
3. P: RF power
4. P_0: RF power at max efficiency
5. λ: wavelength
6. M_2: Figure of Merite
7. H: Active Aperture Height
8. L: Interaction Length
9. Φ: Beam diameter ($1/e^2$)
10. ΔF: RF Frequency range
11. Δθ: Scan angle
12. V: Acoustic Velocity
13. Ta: Access Time
14. T: Sweeping time

Acousto-Optic Pulse Pickers



A **pulse picker** is an electrically controlled optical switch used to extract single pulses from a fast pulse train.
Short and Ultrashort pulses are in most cases generated by a mode-locked laser in the form of a pulse train with a pulse repetition rate of the order of 10 MHz – few GHz.
For various reasons, it is often necessary to pick certain pulses from such a pulse train, i.e., to transmit only certain pulses and block all the others. This can be done with a pulse picker, which is essentially an electrically controlled optical gate.

FIBER PIGTAILED

Fiber Pigtailed Pulse Pickers

Model	Wavelength (nm)	Fibre Type	Carrier Frequency (MHz)	Rise Time (ns)	Max Repetition rate with Duty cycle (MHz)	Max Laser Power (W)	Losses nom (dB)
MT250-IR6-FIO	1000-1100	PM, SM	250	6	80	0.5	4
MT200-IR10-FIO	1000-1100	PM, SM	200	10	48	1	3.5
MT160-IIR10-FIO	1300-1600	PM, SM	160	10	48	1	4
MT80-FIR40-FIO	1900-2100	PM, SM	80	40	12	5	4
MT200--NIR10-FIO	780-820	PM, SM	200	10	48	1	3.5

FREE SPACE

TeO2 General purpose Pulse Pickers

Model	Wavelength nm	Aperture mmxmm	Polarisation	Beam diameter mm	Rise Time ns	Max Repetition rate with Duty cycle < 1/10 MHz	Separation angle (0-1) mrd	Efficiency %
MT200-A0.5-800	700-950	0.5 x 1	Linear	0.06 - 0.3	10 - 48	3.3 - 0.69	38 @800nm	75 - 85
MT200-A0.5-1064	980-1100	0.4 x 1	Linear	0.09 - 0.3	15 - 48	2.2 - 0.69	50.6 @1064nm	75 - 85
MT250-A0.12-800	700-950	0.12 x 1	Linear	0.04 - 0.1	6 - 16	5.5 - 2	47.6 @800nm	70 - 85
MT250-A0.12-1064	980-1100	0.12 x 1	Linear	0.05 - 0.1	8 - 16	4.1 - 2	63.3 @1064nm	70 - 85

High Damage Threshold Pulse Pickers

Model	Wavelength nm	Aperture mmxmm	Polarisation	Beam diameter mm	Rise Time ns	Max Repetition rate with Duty cycle < 1/100 KHz	Separation angle (0-1)	Efficiency %
MCQ80-A2-1064	1000-1100	2 x 2	Linear	0.5-1.5	55-165			75 - 85
MQ80-A0.7-1064	1000-1100	0.7 x 1	Linear	0.3 - 0.5	33 - 55	100 - 60	14.3 @1064nm	75 - 85
MQ80-A0.3-1064	1000-1100	0.3 x 1	Linear	0.08 - 0.2	15 - 22	370 - 150	26.8 @1064nm	50 - 70

Pulse Pickers Associated RF drivers

These drivers based on quartz oscillators, produce a fixed RF frequency signal. Pulse is controlled thanks to a TTL signal while amplitude is controlled with an analog signal.
Standard MODA driver can also be used in combination with pulse pickers.

Model	Carrier Frequency	Max RF Power	Rise Time	Controls	Exctinction Ratio	Power Supply	Class
MODAXX-2W PPK	160, 200, 250 MHz	2 W /50 Ω	3 ns	0-5 V / 1KΩ for AM +TTL/1 K 1KΩ for pulse	45 dB 60 dB on request	24 VDC or 110/230 VAC	AB

PPK: Synchro driver for fast pulse pickers

These drivers have been designed in order to offer the highest possible performance in high speed Pulse Picking applications.
They include a programmable built-in signal generator synchronized on the laser repetition rate.
These systems are perfectly adapted to fibre pigtailed pulse pickers, but is equally suitable for use with AA's range of free space devices.

Features

- High stability system with Pulse to Pulse Stability contribution <0.5% (PPKAc)
- Dedicated to 80 MHz repetition rate lasers (PPKA) and lower (PPKS)
- Input reference clock from Laser
- With Built-in High accuracy signal generator
- Including Digital delay and window gate adjustments
- Consecutive pulse extinction ratio (CPER) optimisation
- Bluetooth Remote control, USB, RS32 communication for set up
- RoHS compliant

Model	Laser Repetition Rate	Carrier Frequency	Delay range/ step	Pulse Width range	AO Models / Fiber Pigtailed
PPKAc250-B-xx-20*	75-85 MHz	Adapted to RR	20ns (0.1ns)	20ns (0.1ns)	MT250-IR6-Fio-PM-Ic
PPKA250-B-xx-20	40-75 MHz	250 MHz	25ns (0.1ns)	15ns (0.1ns)	MT250-IR6-Fio-PM-Ic
PPKS250-B-xx-128	5-60 MHz	250 MHz	200ns (1ns)	56ns (1ns)	MT250-IR6-Fio-PM-Ic
PPKS200-B-xx-128	5-55 MHz	200 MHz	200ns (1ns)	56ns (1ns)	MT200-IR10-Fio-PM-Ic
PPKS200-B-xx-640	1-30 MHz	200 MHz	1224ns (5ns)	56ns (5ns)	MT200-IR10-Fio-PM-Ic
PPKS80-B-xx-640	1-20 MHz	80 MHz	1080ns (5ns)	200ns (5ns)	MT80-IIR30-Fio-PM-Ic2

Model	Laser Repetition rate	Carrier frequency	Delay Range*	Pulse width range	AO Models Free space
PPKAc250-B-xx-20*	75-85 MHz	Adapted to RR	20ns (0.1ns)	20ns (0.1ns)	MT250-A0.12-1064
PPKA250-B-xx-20	40-75 MHz	250 MHz	20ns (0.1ns)	20ns (0.1ns)	MT250-A0.12-1064
PPKS250-B-xx-128	0,01-60 MHz	250 MHz	128ns (1ns)	128ns (1ns)	MT250-A0.12-1064
PPKS200-B-xx-128	0,01-55 MHz	200 MHz	128ns (1ns)	128ns (1ns)	MT200-A0.4-1064
PPKS80-B-34-640	0,01-20 MHz	80 MHz	640ns (5ns)	640ns (5ns)	MT80-A1-1064 MT80-A0.4-2000

xx=30: 1 watt version, xx=34: 2.5 watts version, xx=36: 4 watts version, xx=42: 15 watts version
* With Synchronized carrier frequency (High Stability). Other carrier frequencies on request.
**Main delay range obtained by laser beam translation inside pulse picker

Acousto-Optic Modulators

and Fixed Frequency Shifters

Acousto-optic **modulators** are used to vary and control laser beam intensity in first order. The rise time of the modulator is simply deduced by the necessary time for the acoustic wave to travel through the laser beam. For highest speeds the laser beam will be focused down, forming a beam waist as it passes through the modulator.

The first order beam of a modulator is frequency shifted by the amount of the RF carrier frequency : it acts like as fixed frequency shifter.

Model	Material	Wavelength nm	Aperture mm²	Freq (Shift) MHz	Polar	Rise Time* ns	Modul BW MHz (AM)	Efficiency %
MQ200-A1,5-244.266-B	Fused silica	244-266	1,5 x 2	200	Linear	60	8	85
MQ200-A1,5-266.300	Fused silica	266-300	1,5 x 2	200	Linear	60	8	85
MQ180-A0,2-266.300	Fused silica	266-300	0,2 x 1	180	Linear	10	48	85
MQ180-A0,2-UV	Fused silica	325-442	0,2 x 1	180	Linear	10	48	80
MQ110-A3-UV	Fused silica	325-442	3 x 3	110	Linear	50	10	90
MQ240-A0,2-UV	Fused silica	325-442	0,2 x 1	240	Linear	6	80	70
MTS130-A3-400.442	TeO2	400-442	3 x 3	130	Linear	1000	0,4	85
MQ180-A0,25-VIS	Fused silica	440-650	0,25 x 1	180	Linear	10	48	70
MCQ110-A2-VIS	Quartz	488-633	2 x 2	110	Linear	50	8	85
MT350-A0,12-VIS	TeO2	450-700	0,12 x 1	350	Linear	5	96	80
MT250-A0,5-VIS	TeO2	450-700	0,5 x 2	250	Linear	6	80	85
MT200-A0,5-VIS	TeO2	450-700	0,5 x 2	200	Linear	8	60	85
MT110-A1-VIS	TeO2	450-700	1 x 2	110	Linear	15	32	85
MT110-A1,5-VIS	TeO2	450-700	1,5 x 2	110	Linear	50	9	85
MT80-A1-VIS	TeO2	450-700	1 x 2	80	Linear	23	21	85
MT80-A1,5-VIS	TeO2	450-700	1,5 x 2	80	Linear	50	9	85
MTS110-A3-VIS	TeO2	458-633	3 x 3	110	Linear	1000	0,4	85
MTS40-A2-VIS	TeO2	532-700	2 x 2	40	Linear	1000	0,4	85
MTS40-A3-IR	TeO2	750-850	3 x 3	40	Linear	1000	0,4	85
MT110-A1,5-IR-Hk (Ti:sa)	TeO2	690-1064	1,5 x 2	110	Linear	50	9	80
MT350-A0,2-800	TeO2	700-950 (1100)	0,2 x 1	350	Linear	5	96	80
MT250-A0,5-800	TeO2	700-950 (1100)	0,2 x 2	250	Linear	6	80	80
MT200-A0,5-800	TeO2	700-950 (1100)	0,5 x 2	200	Linear	8	60	85
MT110-A1-IR	TeO2	700-950 (1100)	1 x 2	110	Linear	15	32	85
MT110-A1,5-IR	TeO2	700-950 (1100)	1,5 x 2	110	Linear	50	9	85
MT80-A1-IR	TeO2	700-950 (1100)	1 x 2	80	Linear	23	21	85
MT80-A1,5-IR	TeO2	700-950 (1100)	1,5 x 2	80	Linear	50	9	85
MT200-A0,5-1064	TeO2	980-1100	0,5 x 2	200	Linear	8	60	80
MT200-A0,2-1064	TeO2	980-1100	0,2 x 1	200	Linear	8	60	80
MT110-A1-1064	TeO2	980-1100	1 x 2	110	Linear	15	32	85
MT80-A1-1064	TeO2	980-1100	1 x 2	80	Linear	23	21	85
MT80-A1,5-1064	TeO2	1000-1100	1,5 x 2	80	Linear	50	9	85
MTS80-A3-1064Ac	TeO2	1030-1080	3 x 3	80	Linear	500	1	85
MQ80-A0.7-L1030.1080	SiO2	1030-1080	0.7 x 1	80	Linear	120	14	85
MCQ40-A1.5-L1064	Quartz	1030-1080	1.5 x 1.5	40	Linear	50	9	85
MQ40-A3-L1064-W	SiO2	1030-1080	3 x 3	40	Linear	120	4	85
MCQ40-A2.5-1064	Quartz	1030-1080	2.5 x 2.5	40	Linear	180	2,5	85
MT80-A0.7-1300.1600	TeO2	1300-1600	0.7 x 1	80	Linear	50	9	80
MTS40-A3-1550	TeO2	1500-1600	3 x 3	40	Linear	500	1	85
MGAS40-A1	Doped Glass	1300-1600	1 x 2	40	Random	50	10	85
MGAS80-A1	Doped Glass	1300-1600	1 x 2	80	Random	50	10	85
MGAS110-A1	Doped Glass	1300-1600	1 x 2	110	Random	25	20	85
MT80-A0.4-2000	TeO2	1900-2100	0.4 x 1	80	Linear	25	20	65
MG40-A6-9300	germanium	9300	6 x 10	40	Linear	120	4	75
MG40-A8-9300	germanium	9300	8 x 10	40	Linear	120	4	75
MG40-A6-10600	germanium	10600	6 x 10	40	Linear	120	4	75
MG40-A8-10600	germanium	10600	8 x 10	40	Linear	120	4	75

*Rise time is beam dimeter dependent

Fixed Frequency drivers

These drivers based on quartz oscillators, produce a fixed RF frequency signal. Drivers can be provided at any frequency from 10 MHz to 3 GHz. All models use crystal controlled oscillators.
The RF output can be externally modulated. The rise time varies from 2 ns to 50 ns depending on the fixed frequency and RF power. Usually the driver is coupled internally to a power amplifier; if the output power required is very high then the amplifier will be provided separately, offering RF powers up to 500 W CW.

MODAXX	MODAGXX
Fixed Frequencies Adapted at factory to AO device Standard: 35, 40, 68, 80, 110, 160, 180, 200, 250, 350 MHz (Other on request)	**Fixed Frequencies** Any frequency in [10-400]MHz Accuracy 1KHz
Modulation Input (AM) Analog 0-1V / 50 Ohms or 0-5 V / 50 Ohms or Digital TTL Dual AM controls Analog + Digital	**Modulation Input** Analog 0-1V / 50 Ohms or 0-5 V / 50 Ohms or Digital TTL Dual AM controls Analog + Digital
Extinction ratio Standard 45dB - High Extinction ratio on request	**Extinction ratio** Standard 45dB - High Extinction ratio on request
Power Supply 24VDC or Laboratory 110-230 VAC	**Power Supply** 24VDC or Laboratory 110-230 VAC
Output RF Power 1, 2, 4, 10, 20, 50, 70, 100 Watts	**Output RF Power** 1, 2, 4, 10, 20, 50, 70, 100 Watts

Acousto-Optic Fiber Pigtailed

Modulators, Shifters, Pulse Pickers, Q-switches

These **fiber pigtailed** devices can be used depending on the models as modulators, fixed frequency shifters or Q-switches.Our standard versions are proposed with a single mode fiber with polarization maintaining, However on request, we can offer different types of fibers or connectors.These devices are dedicated for telecommunication applications, as well as for printing, microscopy, Q-switching or any other application.

VSF, Versatile Scientific Fibre range of devices

Any wavelength from 400 up to 2100 nm
Any frequency from 35 up to 425 MHz
Any type of fibre PM, SM, LMA...
Any type of jacket
Any fibre connectors

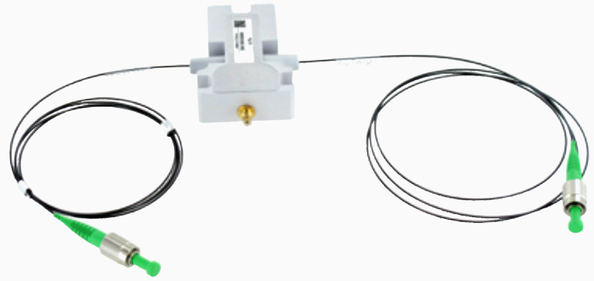
Model	Wavelength nm	Fibre Type	Configuration	Freq (Shift) MHz	Rise Time ns	Max Laser Power W	Losses nom dB
MT180-G430-Fio-MM	532	Multimode	2 ports*	180	430	0.5	3
MT200-BG(9-18)-Fio	488-532	SM, PM	2 ports*	200	9, 18	0.05	3
MT80-G60-Fio	488-532	SM,PM	2 ports*	80	60	0.5	3
MT200-R(9-18)-Fio	630-700	SM, PM	2 ports*	200	9, 18	0.1	3
MQ180-G9-Fio	488-532	PM	2 ports*	180	9	0.1	3
MT80-NIR60-Fio	780-870	SM, PM	2 ports*	80	60	0.5, 5	2
MT110-NIR20-FIO	780-870	SM, PM	2 ports*	110	20	0.5, 5	2.5
MT200-NIR10-Fio	780-870	SM, PM	2 ports*	200	10	0.5	3.5
MT80-IR60-Fio	1000-1100	SM, PM	2 ports*	80	60	0.5, 5	2
MT110-IR20-Fio	1000-1100	SM, PM	2 ports*	110	20	0.5, 5	2.5
MT200-IR10-Fio	1000-1100	SM, PM	2 ports*	200	10	1	3
MT250-IR6-Fio	1000-1100	SM, PM	2 ports*	250	6	0.5	3.5
MT80-IIR30-Fio	1300, 1550	SM, PM	2 ports*	80	30	0.5, 5	2.5
MT110-IIR20-Fio	1300, 1550	SM, PM	2 ports*	110	20	0.5, 5	3.5
MT160-IIR10-Fio	1300, 1550	SM, PM	2 ports*	160	10	1	4
MA40-IIR120-Fio	1300, 1550	SM, PM	2 ports*	40	120	0.5	2
MT80-FIR40-2000-Fio	1900-2100	SM, PM	2 ports	80	40	0.5	6

Associated RF drivers: MODAxx or DRFAxx (VCO based) / DDSPAxx + Power Amplifier

ICF Compact AOM, Pulse Pickers for Industrial applications

Industrial Compact design

- Pulses pickers 1064 nm, 6 ns, 250 MHz
- Pulse pickers 1064 nm, 10ns, 200 MHz
- Fast AO Modulators
- Frequency Shifters 1064nm
- Q-Switches 1064 nm
- AO Modulator 1550 nm, 30 ns
- Frequency shifter, 80 MHz



Model	Wavelength (nm)	Fibre Type	Carrier Frequency (MHz)	Rise Time (ns)	Max Repetition rate with Duty cycle (MHz)	Max Laser Power (W)	Losses nom (dB)
MT250-IR6-FIO	1000-1100	PM, SM	250	6	80	0.5	4
MT200-IR10-FIO	1000-1100	PM, SM	200	10	48	1	3.5
MT160-IIR10-FIO	1300-1600	PM, SM	160	10	48	1	4
MT200--NIR10-FIO	780-820	PM, SM	200	10	48	1	3.5

3 Fio: 3 ports fiber versions

Any wavelength from 400 up to 2100 nm
Any frequency from 35 up to 425 MHz
Any type of fibre PM, SM, LMA...
Any type of jacket
Any fibre connectors

Model	Wavelength (nm)	Fibre Type	Carrier Frequency (MHz)	Rise Time (ns)	Max Repetition rate with Duty cycle (MHz)	Max Laser Power (W)	Losses nom (dB)
MT110-IR25-3Fio	1000-1100	SM, PM	3 ports*	110	25	0.5, 5	2.5
MT110-IIR25-3FIO	1300-1550	SM, PM	3 ports*	110	25	0.5, 5	3
MT80-IIR40-3FIO	1300-1550	SM, PM	3 ports*	80	40	10	3

Acousto-Optic Deflectors

and Variable Frequency Shifters

A Bragg configuration gives a single first order output beam, whose intensity is directly linked to the power of RF control signal, and whose angle is directly linked to the RF frequency. By varying the frequency, the output laser beam angle is modified. A deflector is used to scan a laser beam over a range of angles, or to control with accuracy the output angle of the laser beam.
By varying the frequency, the first order beam is also frequency shifted by the amount of the RF carrier frequency : it acts like a variable frequency shifter.
The main parameters to qualify a deflector are
1.Deflection angle range and
2.Resolution. The deflection angle range is the maximum angle variation of the laser beam : it is linked to the frequency range of the device.
The resolution of a deflection is the number of distinct directions which can be addressed by the deflector : it is linked to the deflection angle range and laser divergence.
Two deflectors can be used in series and at right angles to give full two-dimensional scanning.

High Resolution	Material	Wavelength nm	Aperture mmxmm	Freq (Shift) MHz	Polarisation	Resolution T.DF	Deflexion angle range	Efficiency %
DTSX-250	TeO2	405-1600*	4,5 x 4,5	f(λ)	Linear	300@633nm	48@633nm	> 70
DTSX-400	TeO2	405-1600*	7,5 x 7,5	f(λ)	Linear	500@633nm	48@633nm	> 70
DTSXY-250	2 Axis TeO2	405-1600*	4,5 x 4,5	f(λ)	Linear	300x300@633nm	41 x 41@532nm	> 50
DTSXY-400	2 Axis TeO2	405-1600*	7,5 x 7,5	f(λ)	Linear	500x500@633nm	41 x 41@532nm	> 50
DT230-B120A0,5-UV	TeO2	400-450	0,5 x 17,5	230+/-60	Linear	500	11,4@400nm	> 50
DT230-B120A0,5-VIS	TeO2	450-670	0,5 x 17,5	230+/-60	Linear	500	15@532nm	> 50

Low resolution	Material	Wavelength nm	Aperture mmxmm	Freq (Shift) MHz	Polarisation	Resolution TΔF	Deflexion angle	Efficiency %
MQ110-B30A1-UV	Fused Silica	325-425	1 x 2	110+/-15	Linear	10	1.8@355nm	> 60
MT200-B50A0,5-400.442	TeO2	400-442	0,5 x 2	200+/-25	Linear/random	23	5,4 @458nm	> 80
MT200-B100A0,5-VIS	TeO2	450-700	0,5 x 2	200+/-50	Linear/random	47	12,6@532nm	> 70@633nm
MT110-B50A1,5-VIS	TeO2	450-700	1,5 x 2	110+/-25	Linear/random	23	6,3@532nm	> 65@633nm
MT80-B30A1,5-VIS	TeO2	450-700	1,5 x 2	80+/-15	Linear/random	14	3,8@532nm	> 65
MT200-B100A0,5-800	TeO2	750-950	0,5 x 2	200+/-50	Linear/random	47	18,6 @785nm	> 60
MT200-B40A1-800	TeO2	750-950	1 x 2	200+/-20	Linear/random	19	7,4 @800nm	> 70@785nm
MT250-B100A0,5-800	TeO2	750-950	0,5 x 2	250+/-50	Linear/random	47	19@800nm	> 60
MT200-B100A0,5-800	TeO2	750-950	0,5 x 2	200+/-50	Linear/random	47	19@800nm	> 60@785nm
MT110-B50A1,5-IR	TeO2	700-1100	1,5 x 2	110+/-25	Linear/random	23	9,5@800nm	> 60@785nm
MT80-B30A1,5-IR	TeO2	700-1100	1,5 x 2	80+/-15	Linear/random	14	5,7@800nm	> 70@765nm
MT200-B100A0,5-1064	TeO2	980-1100	0,4 x 2	200+/-50	Linear/random	47	25,3@1064nm	> 35
MT110-B30A1,5-1064	TeO2	960-1100	1,5 x 2	110+/-15	Linear/random	14	7,6@1064nm	> 60
MT80-B30A1,5-1064	TeO2	980-1100	1,5 x 2	80+/-15	Linear/random	14	7,6@1064nm	> 60
MT80-B30A0.7-1300.1600	TeO2	1300-1600	0.7 x 1	80+/-15	Linear/random	14	9.3@1300nm	>65

Variable Frequency RF drivers

VCO drivers

(Voltage Controlled Oscillator)

These drivers are suitable for general purpose applications (raster scan, or random access...). The VCO can be modulated (amplitude) from an external signal.

The frequency is externally controlled by an analog signal. An external medium power amplifier will be required to generate the RF power levels required by the AO device.

DRFA10Y-XX

Frequency range
Adapted at factory to AO device
Max 50-110, 60-150, 90-210, 150-300, 200-350 MHz
(Other on request)

Frequency control
0-10 V/ 10 Kohms

Modulation Input
0-5 V / 50 Ohms

Sweeping Time
≤1 µs

Power Supply
24VDC or 110-230 VAC

Output RF Power
Nominal 0 dBm (to be matched with AA power amplifier)

--> On request DRFA1.5Y 85-135 MHz, sweeping time 150 ns

DDSPA-XX

Frequency range
Max 10-350 MHz (400 MHz on request)

Frequency control
15, 23 or 31 bits (1 bit E/D)

Frequency Step
15 KHz, 59 Hz, 0.23 Hz

Modulation Input
0-5 V / 50 Ohms (8 bits on request)

Access Time
40, 64, 80 ns

Power Supply
24VDC or 110-230 VAC

Output RF Power
Nominal 0 dBm (to be matched with AA power amplifier)

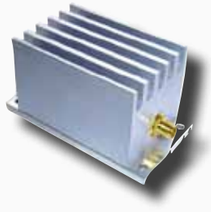
--> On request USB Controller for PC, designed to drive 1 or 2 DDSPA through USB port (Windows XP/NT)

DDS drivers

(Direct Digital Synthesizer)

To get a high resolution driver with fast switching time, AA has designed direct digital synthesizers based on monolithic IC circuits. 3 models have already been released, and different units can be designed to specific requirements.
These models offer high frequency accuracy and stability and extremely fast switching times, generally of a few tens of nanoseconds. The DAC circuits have been designed with utmost care to obtain clean RF signals, with minimum spurious noise.

RF Power amplifiers



AA's acousto-optic **amplifiers** are linear with large bandwidth and medium power. The models below cover a variety of bandwidths from 1MHz to 3 GHz.
Output powers up to 80 W are available. Each amplifier is supplied with its heat sink and all are stable and reliable under all conditions.For High power amplifiers, AA proposes models up to 500 W CW.

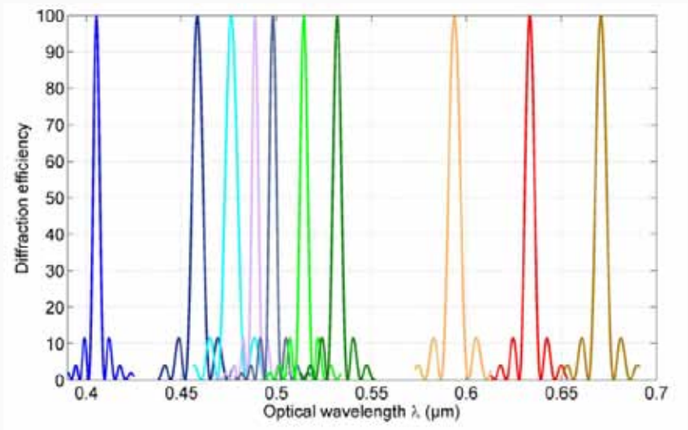
Model	Frequency Range	Gain nom	Output Power	Flatness	Power Supply
AMPA-B-30	20-450 MHz	34 dB	1 watt	+/- 0,5 dB	24 VDC
AMPA-B-34	20-450 MHz	36 dB	2.5 watts	+/- 0,75 dB	24 VDC
AMPA-B-36	20-210 MHz	40 dB	4 watts	+/- 1 dB	24 VDC
AMPA-B-40	50-150 MHz	41 dB	10 watts	+/- 1 dB	24 VDC
AMPA-B-43	60-105, 110-150 150-210 MHz	44 dB	20 watts	+/- 0.75 dB	24 VDC
AMPA-B-47	35-45 MHz	48 dB	50 watts	+/-0.75 dB	24 VDC

Acousto-Optic Polychromatic Modulators

The **AOTFnC** is a special acousto-optic tunable filter which uses the anisotropic interaction inside a tellurium dioxide crystal to control independently or simultaneously different lines from an incoming UV or VISIBLE laser light (White laser, Ar+, Kr+, HeNe, DPSS, Dye...).
Up to 8 distinct lines can be mixed and separately modulated in order to generate different colorimetric patterns.
The specific crystal cut of the AOTF.nC produces good diffraction efficiency (> 90%), narrow resolution (1-2 nm), a low cross-talk between lines, and high extinction ratio.

The large separation angle between 0 and 1st orders, as well as the excellent output chromatic colinearity (<0.2 to <0.3 mrd) make this AOTF a powerful tool for free space or fiber pigtailed applications.
Its associated thermal stabilisation maintains stable diffraction efficiency and reduces dramatically beam drift with single mode fiber pigtailing. This is a major advantage for high sensitivity applications.

AOTFnC*	VIS	VIS Low Res	Low -VIS	IR
Number of channels / Lines	8	4	8	4
Optical wavelength range	450-700 nm	450-700 nm	400-650 nm	700-1100 nm
Transmission	> 95 %	> 95 %	> 90 %	> 95%
Input Light polarization	Linear orthogonal	Linear orthogonal	Linear orthogonal	Linear parallel
Output Light polarization	Linear parallel	Linear parallel	Linear parallel	Linear orthogonal
Active aperture	3 x 3 mm^2	3 x 3 mm^2	3 x 3 mm^2	2.5 x 2.5 mm^2
Spectral resolution (FWHM)	nom 1-2 nm	nom 4-9 nm	nom 1-4 nm	nom 3.5-9 nm
Separation angle (orders 0-1)	> 4,6 degrees	> 4,6 degrees	> 4 degrees	> 4 degrees
Chromatic colinearity (order 1)	< 0,2 mrd	< 0,2 mrd	< 0,3 mrd	< 0.1 mrd
Temperature stabilization	TN	TN	TN	TN
AO Efficiency	>= 90 % /line	>= 90 % /line	>= 90 % /line	>= 85% /line
Rise time	1010 ns / mm	1010 ns / mm	1000 ns /mm	1010 ns/mm
Max accepted RF power	< 1 W all lines	< 1 W all lines	nom 1 W all lines	nom 1 W all lines



Associated RF drivers

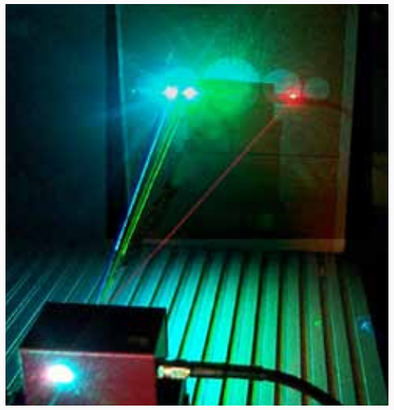
MPDSnC - MULTI PURPOSES DIGITAL SYNTHESIZERS

Product Overview
These drivers based on Direct Digital Synthesizers (DDS), produce multiple fixed stable and accurate RF frequency signals for polychromatic modulators or modulators. Their design with "on the edge" technology offers unique performance in term of accuracy, speed and stability (single/multi-line), thanks to their internal temperature correction and high linearity design.
The built in amplifier delivers the necessary RF power to drive the acousto-optic devices, with reduced power consumption (AA "COLD DESIGN"). In case of Powers higher than 4 Watts, the association with an external power amplifier will be necessary.
The RF power per output can be individually modulated (MOD IN signals) or simultaneously modulated (BLANKING signal). AA focussed on a ultra low crosstalk version with superior fast and fall time.
The adjustments of the driver (Frequency & Power) can be done with a remote control, USB or through RS 232 communication to allow user flexibility in power control or frequency scanning.

MPDSnCXX
Number of channels 1 to 8
Frequency range in [20-200] MHz adapted to AO device at factory
External Modulation Input per channel Analog 0-10 V / 10 KOhms or 0-5 V / 10 KOhms
External Blanking Analog 0-10 V / 10 KOhms or 0-5 V / 10 KOhms
Extinction ratio nom 120 dB
Communication USB, RS232, RC03
Power Supply 24VDC or 110-230 VAC Rack 19 inch - Current <1A
Output RF Power Total 1, 2, 4 Watts

Features
- Based on DDS (Direct Digital Synthesizer)
- 1 to 8 channels
- Full USB/RS232 control – Analog/Digital external controls
- Low Noise
- Bluetooth Remote control
- Embedded automatic Controls
- Compact size - Low heat dissipation / High reliability
- RoHS Compliant – CE Compliant

Applications
- Suitable to control simultaneously multi-line lasers
- Suitable to drive simultaneously multi-channel devices
- Biomedical, marking, material processing, printing…



Acousto-Optic AOTF

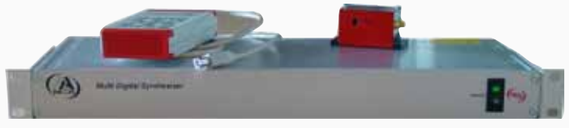
Tunable Filters

An **AOTF** is a solid-state, electronically tunable bandpass filter, which uses the acousto-optic interaction inside an anisotropic medium. These filters can be used with multi-lines sources (mixed gas lasers, Laser diodes...) or with broad-band light sources (Xenon, Halogen lamps...). They allow to select and transmit a single wavelength from the incoming light.

AA proposes a whole range of AOTFs based on TeO2 with shear acoustic mode. The filters are designed so as to get the best performances in each wavelength range and to satisfy most of the applications: resolution down to 1 nm, Field of view up to 20 degrees, apertures up to 10 mm...
In most cases, the filtered output from the tunable filter is made collinear to make easier the use of these devices, and to satisfy fiber pigtailing conditions. A random input polarization will be separated into two orthogonal polarizations (order -1 and +1).

Model	Source	Wavelength nm	Aperture mmxmm	Field of View degrees	Tuning Time µs	Polarization	Resolution nm -3dB	Efficiency %
AOTFnC-UV	Laser	350-430	2 x 2	1	<2	Linear	1-2	85
AOTFnC-400.650	Laser	400-650	3 x 3	1	<4	Linear	1-4	85
AOTFnC-VIS	Laser	450-700	3 x 3	1	<4	Linear	1-2	85
AOTF3-LR	Laser/Lamp	400-700	6 x 6	4	<9	Linear/Random	5-25	85
AOTF3-MR	Lamp	400-700	4 x 4	4	<6	Linear/Random	3,5-17	85
AOTF3-HR	Lamp	400-700	3,5 x 3,5	3	<5	Linear/Random	2,5-12	85
AOTF-A2-500.850	laser/Lamp	500-850	3 x 3	4	<4	Linear	5-15	85
AOTFnC-IR	Laser/Lamp	700-1100	2.5 x 2.5	4	<3	Linear	3-9	85
AOTF10	Lamp	1250-2500	3 x 3	20	<4,5	Linear/Random	2-10	70-30

Associated RF drivers: DRFAxx (VCO based) or DDSPAxx + Power Amplifier / MPDSnC



Acousto-Optic Q-Switches &Associated RF drivers

Air cooled and Water cooled

AA propose a complete line of Acousto-optic **Q-switches** and associated RF drivers, for a wide range of applications. They are manufactured from the highest quality materials, with optimized hard coatings for high damage threshold and long term operation. All AA Q-switches are designed so as to optimize heat dissipation and beam stability with a unique glueing and mechanical technology which reduces stress during operation.

Air-cooled Q-Qwitches: Compact solutions for short cavities, or low gain cavities

Model	Material	Polarization	Carrier Freq. MHz	Aperture mm x mm	Losses %	Optional Length mm
QCQ40-A1.5-L1064*	QUARTZ	Linear	40.68	1.5 x 2	> 80	32
QCQ80-A1.2-L1064*	QUARTZ	Linear	80	1.2 x 1.22	> 80	32
QCQ80-A2-L1064*	QUARTZ	Linear	80	2 x 2	> 80	32

*Products available only on special request

Q-Switches RF drivers

Reliable and Stable drivers for Industry...

QMODP0xx [10-20 Watts]	
Frequency	24, 27.12, 40.68, 68, 80, 110 MHz
Power Supply	15 VDC or 24 VDC, Class A
Modulation Input Control	TTL + Analog 0-5 V
Rise/Fall Time	< 20 ns
Max RF power	20 Watts
Extinction Ratio	45 dB nom
Heat Exchange	Conduction through baseplate + Fan + Heatsink

QMODP1xx [20-70 Watts]	
Frequency	24, 27.12, 40.68, 68, 80, 110 MHz
Power Supply	15 VDC or 24 VDC, Class A
Modulation Input Control	TTL + Analog 0-5 V
Rise/Fall Time	< 20 ns
Max RF power	20, 35, 50, 70 Watts
Extinction Ratio	45 dB nom
Security Signals	Thermal QST + driver security Output power/Return power signal
Heat Exchange	Conduction through baseplate

QMODP2Axx [10-20 Watts] Compact	
Frequency	24, 27.12, 40.68, 68, 80, 110 MHz
Power Supply	15 VDC or 24 VDC, Class A
Modulation Input Control	TTL + Analog 0-5 V
Rise/Fall Time	< 20 ns
Max RF power	20 Watts
Extinction Ratio	45 dB nom
Heat Exchange	Conduction through baseplate

QMODP3xx [120 Watts]	
120 Watts for	24, 27.12, 40.68 MHz Water cooled QST

QMODP4xx [2 x 30 and 2 x 60 Watts]	
Dual Outputs driver	for dual Q-switches 2x30 and 2x60 Watts

Acousto-Optic RF drivers New Products

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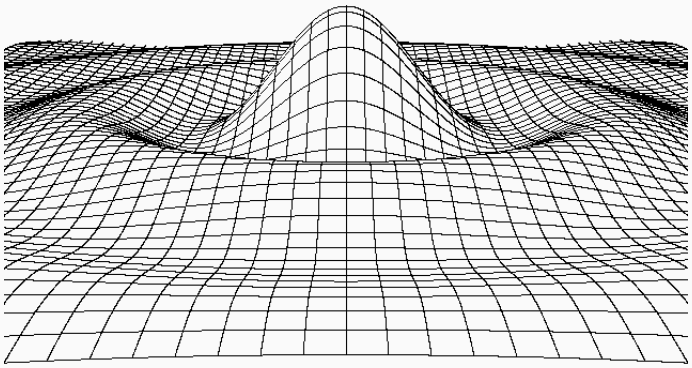

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