ModBox

ModBox-FE-NIR-8Gs

ModBox Pulse shaper sub-ns

The Exail ModBox-FE-NIR-8Gs is a complete front end laser system designed to be used as a seed source in solid state and fiber laser. The system is available at various wavelength and allows to generate 125 ps to 100 ns, custom shapped optical pulses with high stability and high extinction ratio (40 dB or 60 dB)

The short pulse generation is based on the combination of a high performance continuous laser source combined with a large bandwidth modulation stage based on a high extinction ratio external $LiNbO_3$ modulator. An automatic bias control circuitry (MBC) guarantees the extinction ratio stability over time and the optical pulses are carved out thanks to a high resolution Arbitrary Waveform Generator. A multi year collaboration experience with famous intense laser facilities all over the world allows Exail to propose high performance, reliable and easy to use systems perfectly suited to the various applications related with high energy optical pulse generation.



FEATURES

- Optical waveform flexibility
- Low jitter
- Low rise & fall times
- Very high extinction ratio
- Proven solution
- Versatile solution

APPLICATIONS

- Inertial confinement fusion
- Interaction of intense light with matter
- OPCPA pump laser

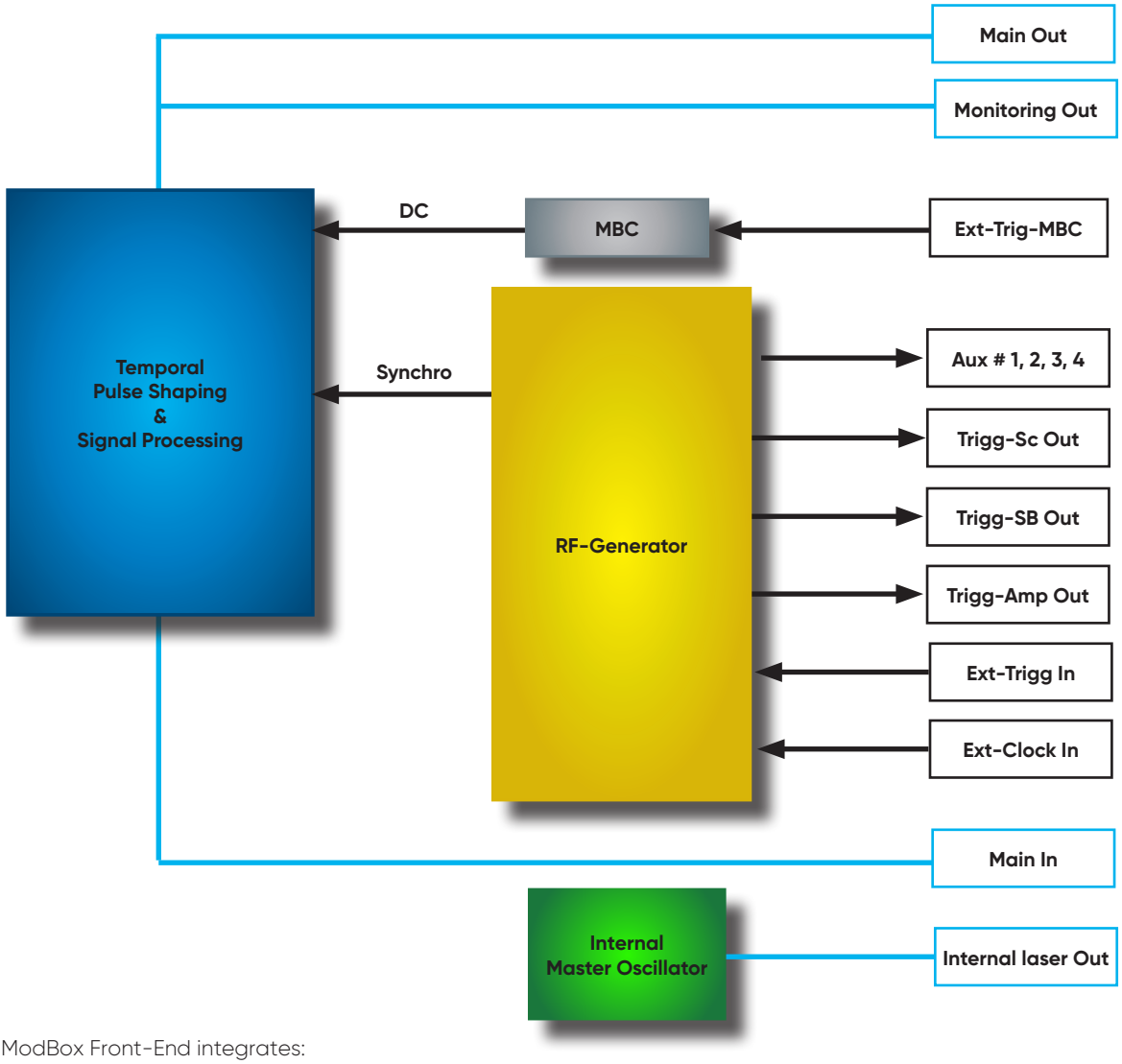
PERFORMANCE HIGHLIGHTS

Operating wavelength	1030 nm / 1053 nm / 1064 nm
Pulse contrast	40 dB / 60 dB
Pulse waveform	Arbitrary, user adjustable
Pulse width	From 125 ps
Optical Jitter	12 ps RMS

GRAPHICAL USER INTERFACE



FUNCTIONAL BLOCK DIAGRAM



The ModBox Front-End integrates:

- a temporal pulse shaping block based on a modulator set to ensure a very high optical pulse extinction ratio and flexible pulse shaping,
- an advanced calibration feature to increase pulse shaping linearity,
- an automatic Modulator Bias Control circuitry (MBC) to garantee high extinction ratio stability over time,
- a RF-Generator with an arbitrary waveform capability,
- a master oscillator,
- an optical isolator at the output stage for protection of optical back reflection.

The ModBox offers several electrical outputs and input:

- a "Trigg-Sc" : for scope synchronization,
- a "Trigg-SB" : for pulse synchronization with the ModBox-Spectrum-Broadening,
- a "Trigg-Amp" : for optical amplifier synchronization,
- an "Ext-Trigg In" : external trigger input,
- an "Ext-Clock In": external clock input,
- an "Ext-Trigg-MBC": external trigger for MBC
- a "Monitoring Out": main out monitoring output
- four additional auxiliary trigger outputs

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ELECTRICAL INPUT SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
External trigg input	-	+5 V -50 Ω - Pos or Neg slop	0	-	100	kHz
MBC trigg input	-	+5 V -50 Ω - Pos slop > 500 µs width	0	-	1	kHz

ELECTRICAL OUTPUT SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
		Trigg-SC / Trigg-SB / Trigg-Amp outputs				
Delay range	-	-	0	-	10	s
Delay resolution	R	Trigg-Amp / Trigg-SB	-	1	-	ps
		Trigg-Sc (optional)	-	1.25	-	ns
Delay RMS jitter	J_{RMS}	Internal trigger w/o additionnal delay	-	10	-	ps
		External trigger w/o additional delay	-	-	25	ps
Delay accuracy	-	-	-	-	150	ps
Trigger delay	-	(Insertion Delay)	-	-	100	ns

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OPTICAL OUTPUT SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating wavelength	λ	In air / select wavelength		1030 / 1053 / 1064		nm
Wavelength tunability	dλ	By temperature	-	1	-	nm
Linewidth [1]	Δλ	-	-	1	10	MHz
Ouptut pulse shapes	-	-	Arbitrary, user adjustable			
Time resolution	-	-	-	125	-	ps
Number of samples	-	Per pulse	-	800	-	-
Pulse width	PW	Remotely adjustable	125 p	-	100 n	s
		Optimized value		10		ns
Frequency repetition rate	FRR	Adustable by the trigger frequency	Single shot	-	100 k	Hz
Vertical resolution	-	-	-	12	-	bit
Rise time / Fall time	t_r/t_f	20 % - 80 % / 10 % - 90 %	-	60 / 80	-	ps
Extinction ratio	ER	40 dB / 60 dB	35 / 55	40 / 60	-	dB
Extinction ratio stability	ΔSER	Over 8 hours 40 dB / 60 dB	-	0.5 / 1	1 / 2	dB
Polarization extension ratio	PER	-	20	-	-	dB
Jitter	J_{RMS}	Internal / External trigger, < 10 kHz	-	7 / 15	10 / 25	ps
Pulse energy (1 ns)	E	40 dB / 60 dB	700 / 250	800 / 300	-	pJ
Pulse enery stability	ΔE	100 Hz over 1 min	-	0.3	0.5	%rms
Average power stability	ΔP	Rectangular pulse over 8 hours	-	0.5	0.8	%rsm

[1] *kHz linewidth seed available as an option*

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PANELS

Parameter		Condition
Local supervisory control	Human-machine interface	Touch-screen user interface / Embedded windows PC
	Remote	Ethernet port / Compatible with EPIC framework
	LEDs indicator	LED reports On/Off operations, Alarms
	USB port	Keyboard, mouse, memory stick (to download waveforms)
	Rear panel	
Optical ports	«Main Out»	Isolated, gland and armed cable, 5 m fiber length [2], connector FC/APC
	«Main In», «Monitoring Out», «Internal laser Out»	FC/APC connector
Optical fiber	-	Polarization maintaining fiber, Corning PM98-U25A
Trigg output	«Trigg-SB», «Trigg-SC», «Trigg-Amp», «Aux»	BNC connector
Trigger & clock input	«Trigg In», «Clock In», Trigg-MBC»	BNC connector
Main power socket	-	IEC 60320, C14 inlet

[2] 10m or 15m fiber length available as an option

ENVIRONMENT

Parameter	Condition	Min	Typ	Max	Unit
Operating / storage Temp	-	+20 / -10	-	+25 / +30	°C
Operating / storage humidity	-		30 to 60 / 30 to 80		%

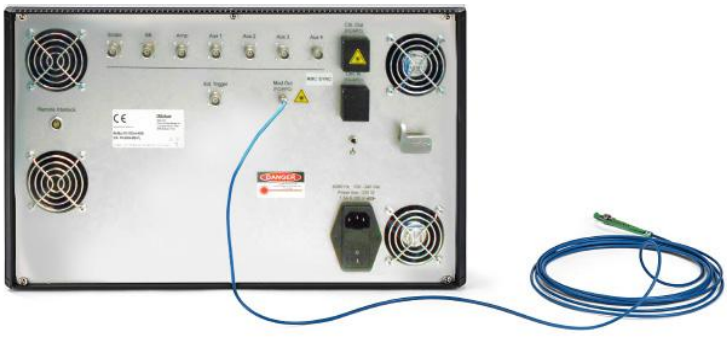
COMPLIANCE AND SAFETY

Parameter	Condition	Min	Typ	Max	Unit
Compliance	-	BS EN 60825 - CE certified			
Interlock response time	From laser system	-	-	1	ms
Remote interlock	-	LEMO dry contact			
Laser safety	-	Class 3B 			

DIMENSIONS

Parameter	
Size	19 inches 6U
Weight	18 kg
Power supply	100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz



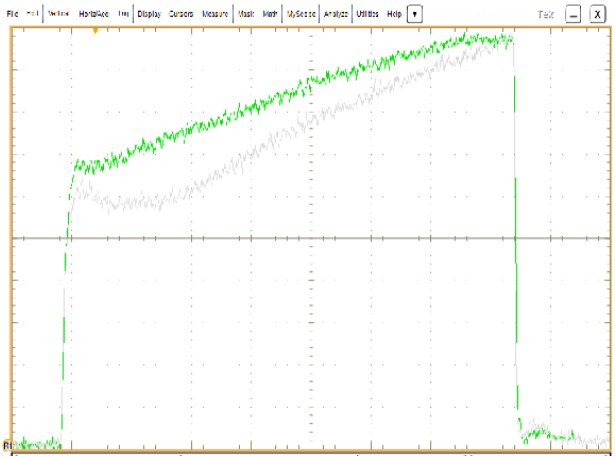


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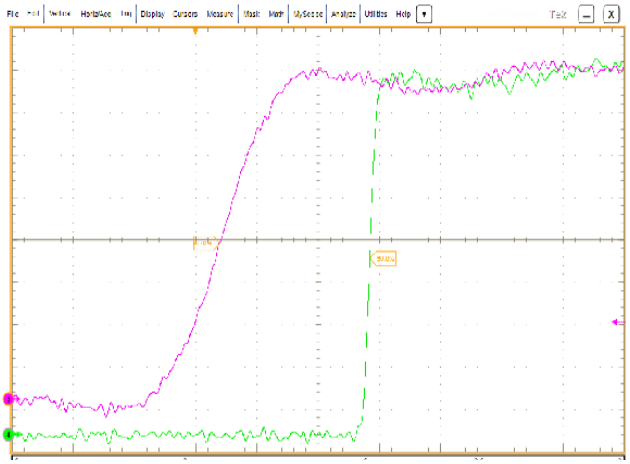
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MODBOX ELECTRICAL AND OPTICAL OUTPUTS

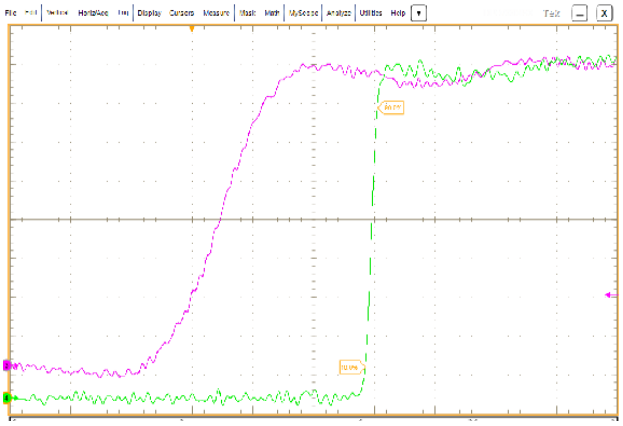
The following equipment was used to obtain below results:
- Oscilloscope Agilent 86100B
- Tektronix CSA 8000 oscilloscope



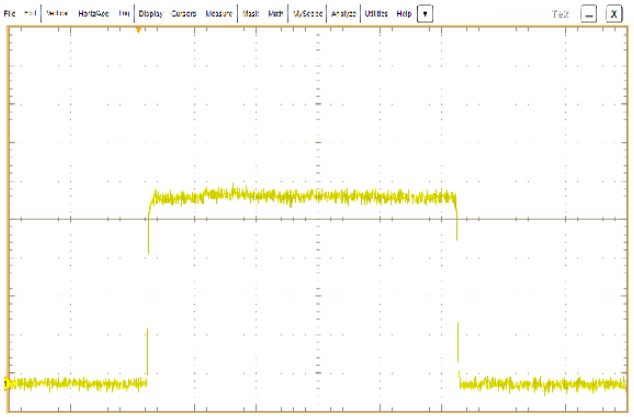
Trapezoidal shape with (green) and without (grey) advanced pulse shaping



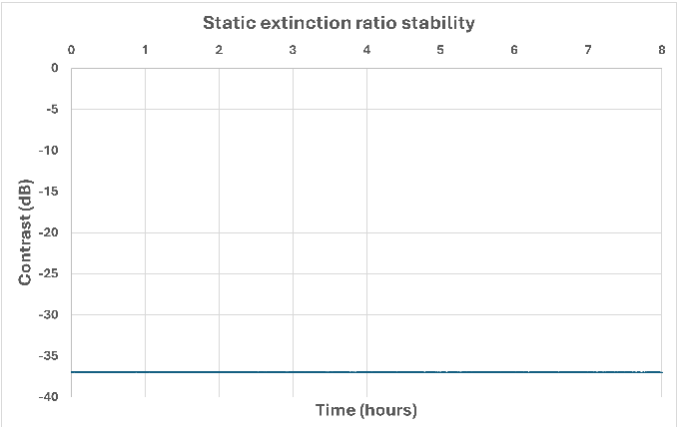
Jitter with external trigger



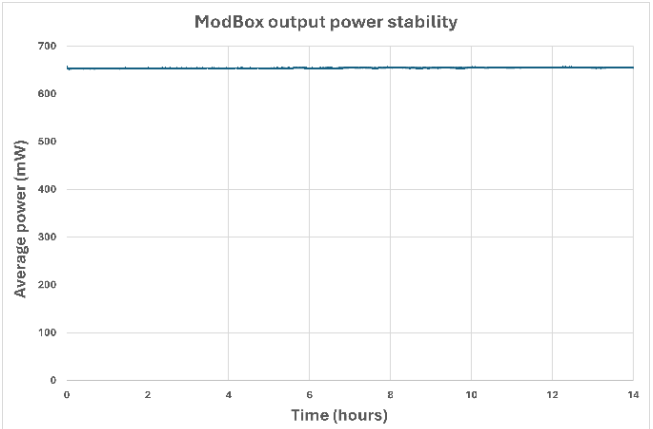
Pulse rise time



20 ns square pulse



SER stability over 8 hours



Power stability over 14 hours

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