ModBox

The System-FE-1064nm is set to generate short shaped pulses with high extinction ratio at 1064.1 nm. It allows dynamic extinction ratio up to 55 dB with user adjustable pulse duration, repetition rate and temporal pulse shape. It generates high stability and "high extinction ratio" short optical pulses as narrow as 1 ns within repetition rates in the range of 5 Hz up to 1 kHz.

The System-FE-1064nm is a combination of several Modulation and Amplification Units and can be decomposed as:
- a Modulation Unit combined with the seeder, ModBox-FE
- a Power Pulse Amplifier Rack, ModBox-PA
- a Spectrum Broadening Rack, ModBox-SB

FEATURES

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

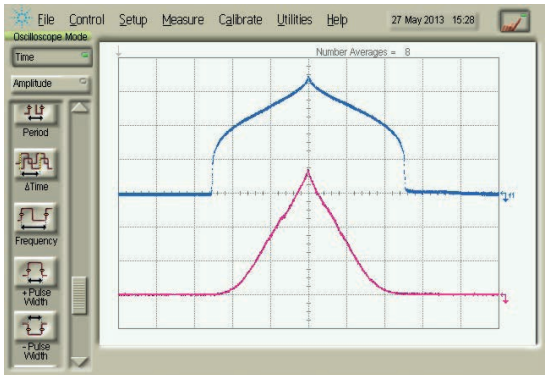
APPLICATIONS

- Inertial confinement fusion
- Interaction of intense light with matter
- Laser plasma interaction
- Laser implosion
- Interaction of ion beam with HP laser

Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength		1064.1 nm	
Pulse contrast		55 dB	
Pulse waveform		Arbitrary, user adjustable	
Pulse width		> 1 ns	
Jitter		< 10 ps	
Output Pulse Energy		10 µJ	

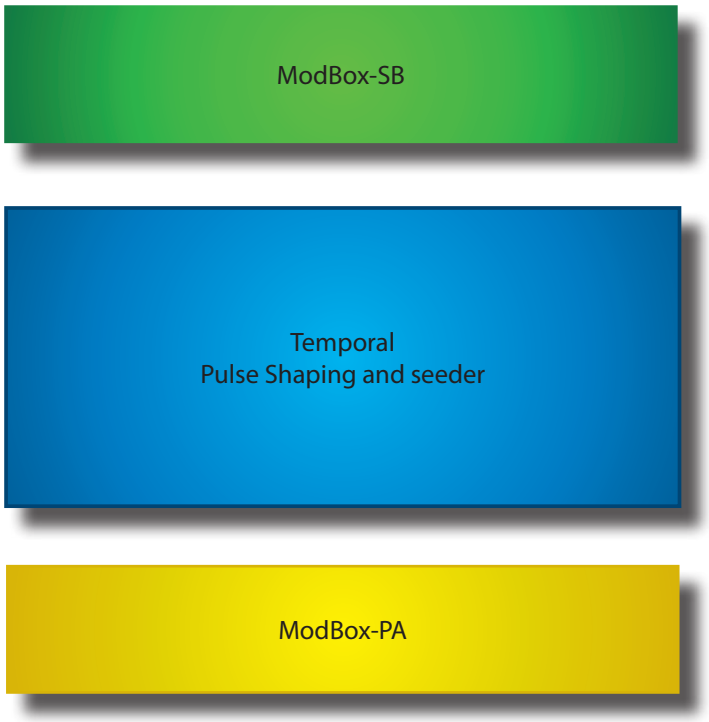
Electrical & Optical Pulse Diagrams



Electrical pulse from AWG (blue curve) with corresponding Optical output (pink curve)

ModBox

Functional Block Diagram



The Modbox-FE is an Optical Modulation Unit to generate short shaped pulses with high extinction ratio in the range of 1064 nm. It allows dynamic extinction ratio with user adjustable pulse duration, repetition rate and temporal pulse shape. One benefit of the Modbox-FEis to pre-compensate the pulse distorsion that occurs in the amplifiers chains that operate in saturated regime. The ModBox-FE is the master rack, it is connected through USB to the rest of the equipment, it distributes the synchronisation and control all the parameters of the systems.

The ModBox-PA is the pulse amplifier to generate the 10 µJ.

The ModBox-SB allows spectral broadening of optical signals to suppress the Stimulated Brillouin Scattering (SBS) caused in optical fibers by high fluxes of highly coherent light. The SBS degrades the signal integrity and prevents the proper transmission through the fiber.
The slave ModBox-SB is triggered by the master ModBox-FE to generate side bands only when optical pulses occured. The two ModBoxes are connected through USB.

SYSTEM MAIN SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Mode	-	-		Pulsed		
Operating wavelength	λ	In air	1063.9	1064.1	1064.3	nm
Optical linewidth	Δλ	W and W/O Spectrum broadening	0.05	-	0.25	nm
Pulse width	PW	-	1	-	512	ns
Output pulse shapes	-	-		Arbitrary, user adjustable		
Number of samples	-	-	-	4 096	-	-
Sample width	-	-	-	125	-	ps
Frequency repetition rate	FRR	Note 1	5	100	1 k	Hz
Output pulse energy	E	-	10	-	-	µJ
Pulse energy stability	%E	RMS for 15' @25 °C, 100 Hz, 50 ns	-	-	1	%
Extinction ratio	SER	-	50	55	-	dB
Polarisation extinction ratio	PER	-	20	-	-	dB
Rise / Fall times	t_r / t_f	-	35	50	70	ps
RMS jitter	J_{RMS}	With Respect to External Trigger	7	10	25	ps
Optical output delivery	Out	-		Collimator		
Optical beam diameter	-	$1/e^2$	-	0.7	-	nm
Optical beam divergence	-	-	-	-	0.3	mrad
Beam quality	-	-	-	-	1.3	M^2
Output optical isolation	-	-	25	-	-	dB
Max power reflection		At the output	-	-	10	dB

Note1: Best effort will be done to achieve long term stable operation at lower repetition rates (close to single shot operation)

DIMENSIONS, INTERFACES AND COMPLIANCE

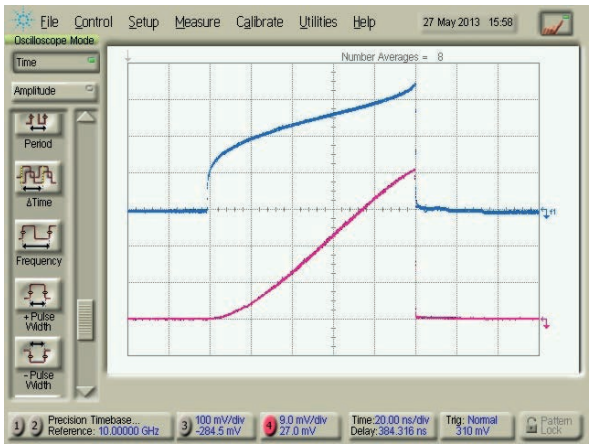
ModBox-FE / ModBox-SB / ModBox-PA

Parameter	Condition	Min	Typ	Max	Unit
RF connection	Front Panel	BNC			
Impedance	-	50 Ω			
Control connection (front panel)	ModBox-PS	Ethernet			
	ModBox-SB / ModBox-PA	USB			
EMC norms	-	EN61326-1 Ed. 2006			
Optical connection	Front Panel	SC/APC			
Optical norm	-	NF EN 60825-1 & EN 60825-2 Ed.2014			
Fiber type	-	PM980			
Power supply	Rear Panel	100-120V/220-240 automatic switch 50-60Hz			
Weight	-	6kg			

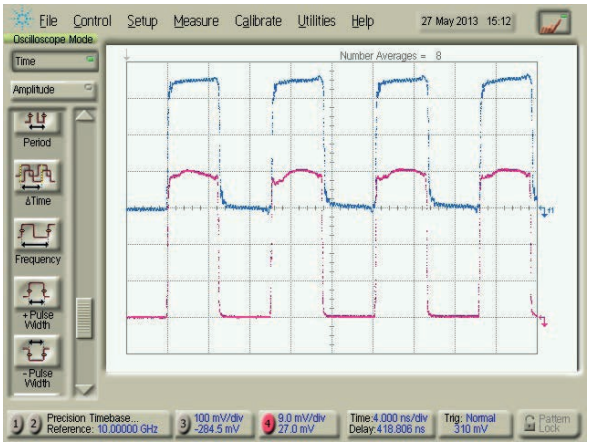
ModBox-PS Electrical and Optical Outputs

The following equipment was used to obtain below results:

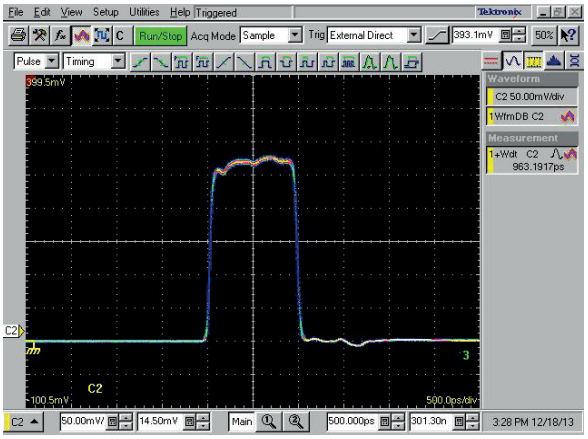
- ModBox-Pulse-Shaper with built-in AWG
- Oscilloscope Agilent 86100B
- Tektronix CSA 8000 oscilloscope



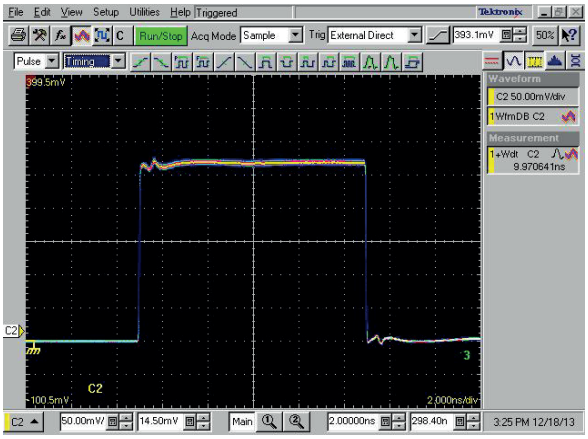
Electrical pulse from AWG (blue curve) with corresponding Optical output (pink curve)



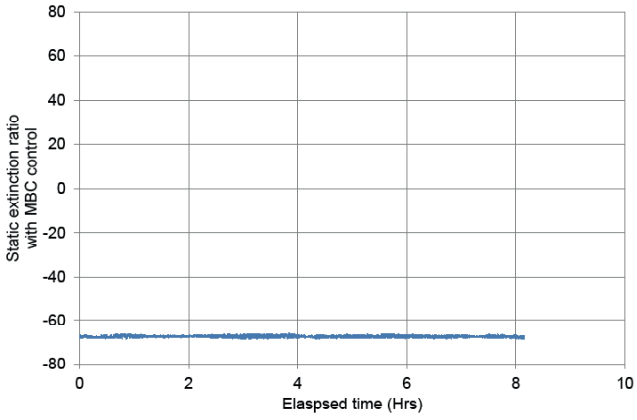
Electrical pulse from AWG (blue curve) with corresponding Optical output (pink curve)



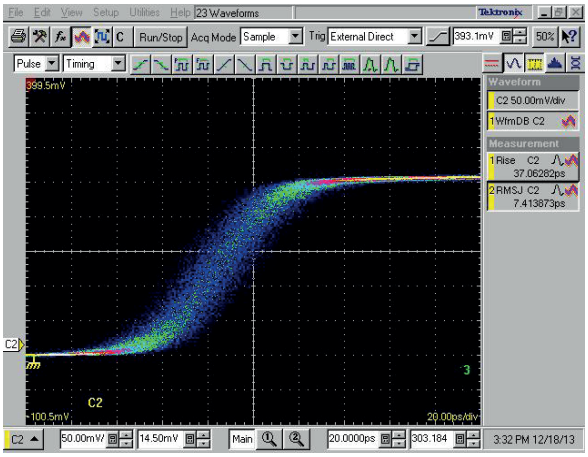
1 ns optical square pulse



10 ns optical square pulse



SER stability



Jitter and rise time measurements, @ 10 ns and 10 kHz repetition rate