PiLas Test Report:

Date: September 09, 2014

Checked by: Dr. Bachert
B. Khoury

Laser Class: **3R**
IEC 60825-1:2007
see manual for laser warning label reproduction

Item:	Characteristics:	
Head	PiL037X	R25=1k, R9/10=145, R11/22=220, R7=122
Serial number:	602B	
Controller	EIG2000DX	max. PRF 1MHz
Serial number:	laboratory unit	
Laserdiode	WT1226	
Chip:	103	
Wavelength:	373.0nm	(measured at 1MHz)
Spectral width:	1.3nm	(measured at 1MHz)
Optics		
Laserdiode Collimator	50CL-A4.5-01	
Focal length:	4.5mm	
Numerical aperture:	0.55	
Beam diameter ($1/e^2$):	3.0mm x 1.3mm @ 0.5m	
Beam divergence ($1/e^2$):	<0.5mrad	
Fiber Coupler	60SMS-1-4-A11-01 (FC/APC)	
Focal length:	11 mm	
Numerical aperture:	0.25	
Fiber	QSMJ-3A3S-400-3/125-3-1	
Index-type:	SI	
core / MFD:	3µm / 3.5µm typ.	
NA:	0.10	
Connectors:	FC/APC-FC/PC	
LD TEC	n/a	
Thermistor:		
NTC value:		

Test measurements:

Setup:
Warm-up time of the entire running system is 10 min, ambient temperature 25 °C.

Optical power measurement:
average power: a) HP8152A power meter + 81520A/81521B optical head (Agilent/Hewlett-Packard) b) Fieldmaster + LM2/LM1 (Coherent)
Measurement is done at the collimated free space output or at fiber end in case of fiber option.
The peak power is calculated by the ratio average power / duty cycle (as taken from the Streak camera or the MSM-photodetector results).

Spectral measurements:
Wavelength and spectral width are measured with OSA Q8381A.

Dynamic measurement:

Optical setup:	Collimated or fiber coupled laser light is coupled in to the 9µm fiber of a 20GHz MSM UltraFast detector.
Photodetector:	20GHz MSM UltraFast detector (A.L.S. GmbH) with 9µm fiber input and FC/PC-connector.
Oscilloscope:	HP54750A + 54752B, 20 and 50 GHz channels (Hewlett-Packard/Agilent).
Streak-camera:	C5680 with C4880 CCD (Hamamatsu) (measurement frequency 100kHz)

1. Frequency scan with oscilloscope, photodetector and optical power meter:

					after SM fiber	after SM fiber	after SM fiber
Frequency	Tune value (%)	FWHM (ps)	RMS - Jitter (ps)	Delay (ns)	Av. power (µW)	Energy (pJ)	Peak power (mW)
1 kHz	50	31	1.6	42.651	0.0103	10	285
10 kHz	50	31	1.5	42.655	0.103	10	285
100 kHz	50	31	1.5	42.600	1.036	10	290
200 kHz	50	31	1.5	42.680	2.08	10	290
500 kHz	50	31	1.5	42.770	5.24	10	290
1 MHz	50	31	1.5	42.788	10.54	11	295

2. Tune scan with oscilloscope or streak camera, photodetector and optical power meter at selected frequency:

Device: Streak Camera

				after SM fiber	after SM fiber	after SM fiber
Frequency	Tune value (%)	FWHM (ps)	relative to norm pulse	Av. power (µW)	Energy (pJ)	Peak power (mW)
100 kHz	80	63.1	below	0.392	4	55
100 kHz	50	30.6	norm pulse	1.036	10	290
100 kHz	20	25.7	above	1.869	19	450

3. Enclosed Views:

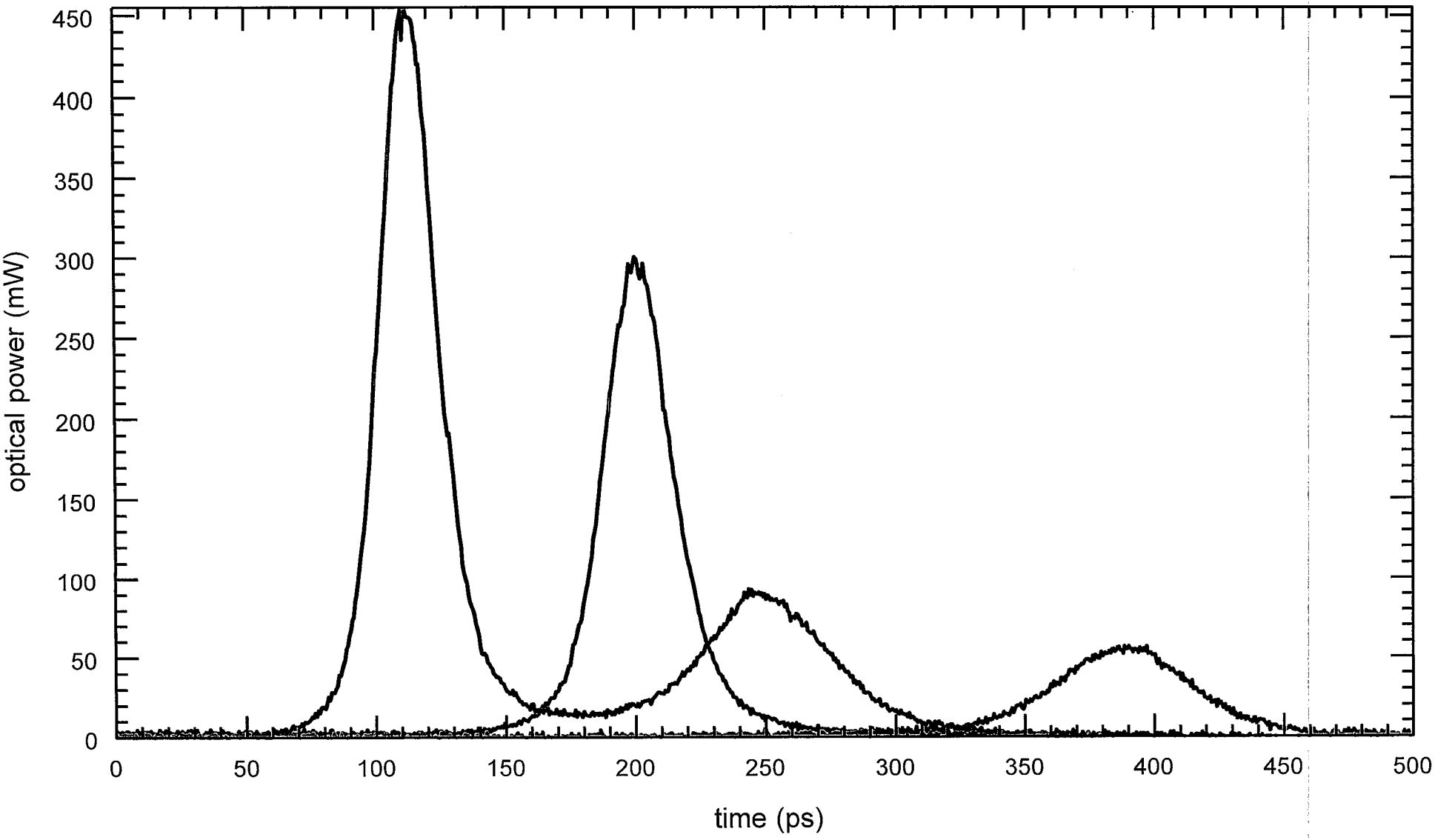
Pulse measurements with Streak: Rep.-rate: 100kHz: Tuning rates 80, 50 and 20% with pulse data.
Pulse measurements with Oscilloscope and photodetector. Rep.-rate: 1MHz, 50%. Time base 50ps.
Jitter measurements with Oscilloscope and photodetector. Rep.-rate: 1MHz, 50%. Time base 50ps.
Optical spectrum at 1MHz norm pulse.

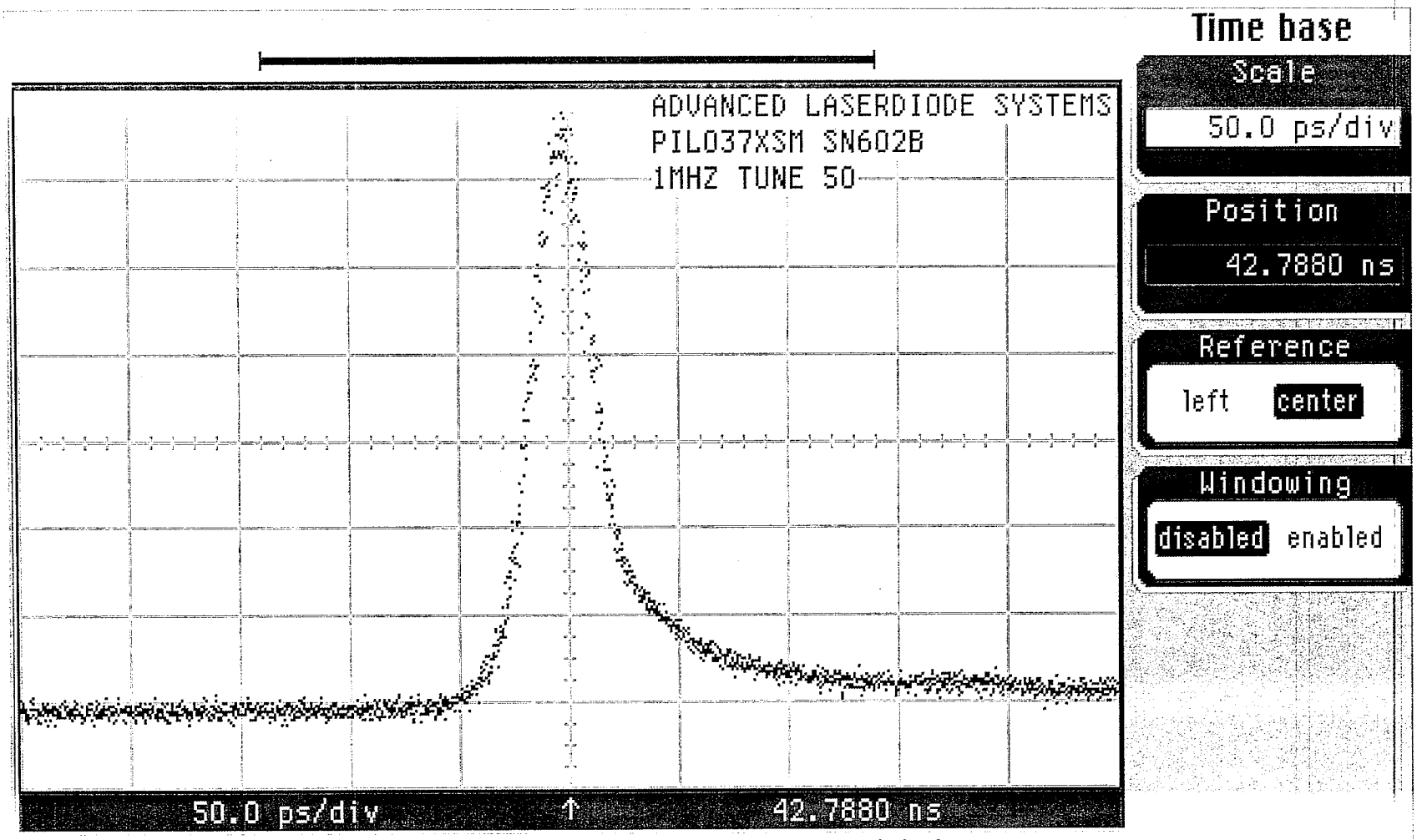
4. Remarks:

TUNE values can be changed if TUNE mode is set to "manual" only. Try to find TUNE value near the automatic one if pulse is not at optimum.
After switching the frequency some time is required for power stabilization.
For higher frequencies we recommend mounting the laser head on a metal platform for additional cooling.
For external triggering start with TTL Trigger input. If no triggering is possible use +5/-5V Trigger input and modify trigger threshold.
For external triggering the corresponding trigger mode must be enabled (ext. TTL or ext. Adj.)
The average power at external triggering should correspond to average power at nearest internal frequency.
Do not apply higher frequencies than maximum ordered one (see purchase information).

PiL037XSM SN 602B streak camera scan at 100kHz after fiber

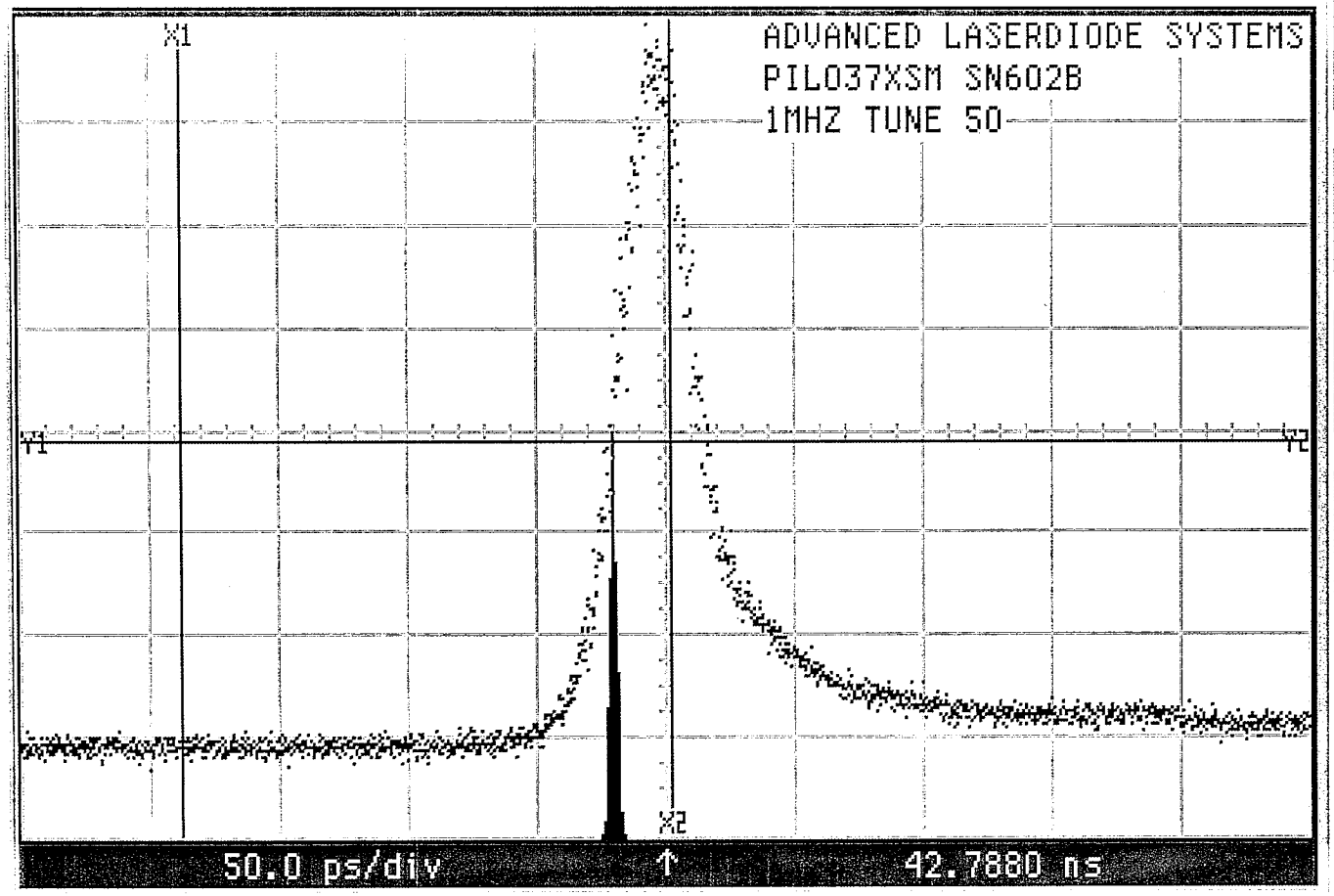
tune 80%: 63ps-55mW (blue), 50%: 31ps-290mW (nominal black) and 20%: 26ps-450mW (red)





	current	mean	std dev
Risetime(1)	23.6 ps	22.9 ps	1.3 ps
Falltime(1)	52.2 ps	52.7 ps	2.8 ps
+ width(1)	33.9 ps	32.7 ps	1.2 ps
V p-p(1)	91.311 mV	91.714 mV	694 µV

Histogram is enabled...



histogram

scale	29 hits/div	offset	0 hits		
mean	42.76787 ns	median	42.76777 ns	μ±1σ	83.2%
std dev	1.4549 ps	hits	370 hits	μ±2σ	97.6%
p-p	10.0 ps	peak	117 hits	μ±3σ	100%

Hist window

Scale source
channel 1

X1 Position
42.6000 ns

Y1 Position
40.00 mV

X2 Position
42.7900 ns

Y2 Position
40.00 mV

Default window

Done

PiL037XSM SN602B, optical Spectrum at 1MHz standard pulse

Advanced Laser Diode Systems

09.09.2014 9:23:24