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Packing Slip

Bill To:	California Institute of Technology Payment Services 1200 E. California Blvd. Mail Code 103-6 Pasadena, CA 91125	Ship to:	California Institute of Technology Attention: Koji Arai 391 S. Holliston Avenue Pasadena, CA 91125 Pasadena, CA 91125
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Shipment Date	Your Order #	Our Order #	Packing Slip Number
November 8, 2018	75-S392697	3494	4271
IncoTerms	Ship Via	Freight	Payment Terms
EXW	UPS ground	Pre-pay & add	Net 30

ITEM	UNITS	DESCRIPTION	QTY ORDERED	PRIOR SHPMNT	THIS SHPMNT	BALANCE DUE
RIO0195-5-08-3	EA	RIO planex laser Wavelength: 1064.00nm +/- 1nm PM fiber with FC/APC connector Output power: >20mW Phase noise: Grade 3 Linewidth: <5kHz Lorentzian	4	0	4	0

Serial number(s): 110740, 110750, 110752, 110847

*These commodities, technologies, or software were exported from the United States in accordance with the Export Administration. Diversion contrary to U.S. law is prohibited. **The ECCN is 6A995.***



 Signature

November 8, 2018

 Date



Test Report

RIO PLANEX™ Laser

Serial Number	110740
Part Number	RIO0195-5-08-3
Test Date	11/7/2018
Operator	PB
QA	GM

Parameter	Value	Units
Operating Temperature (Tset)*	22	°C
Operating Bias Current (Ibias)	98	mA
Maximum Bias Current (Imax)	110	mA
Output Power at Tset and Ibias	20.5	mW
Threshold Current	20	mA
Center Wavelength at Tset and Ibias	1064.890	nm
Side Mode Suppression Ratio at Tset and Ibias	58	dB
Linewidth**	3.2	kHz

* Thermistor resistance: 11.463 kΩ at Tset

** Linewidth obtained by measuring and integrating frequency noise

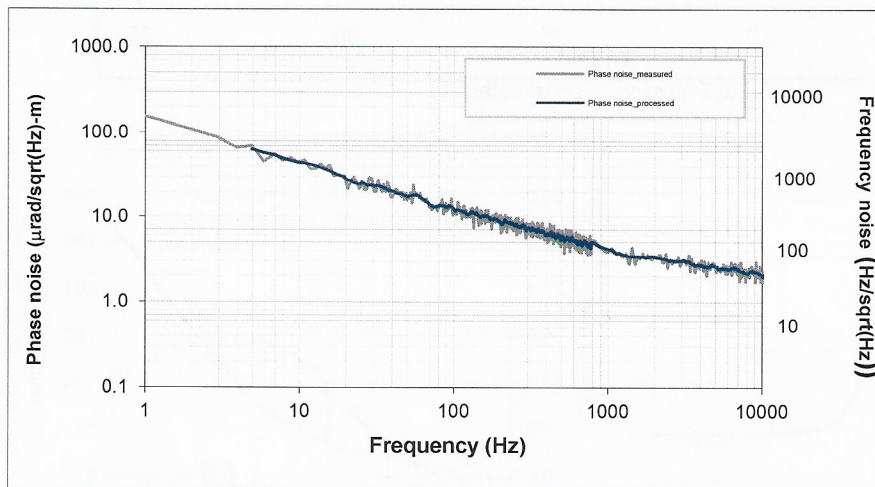


Fig.1: Phase Noise at Rset, Ibias, normalized to 1m path difference

Rev.4.1.0

Proprietary Information

OptaSense, Inc. DBA Redfern Integrated Optics

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110740



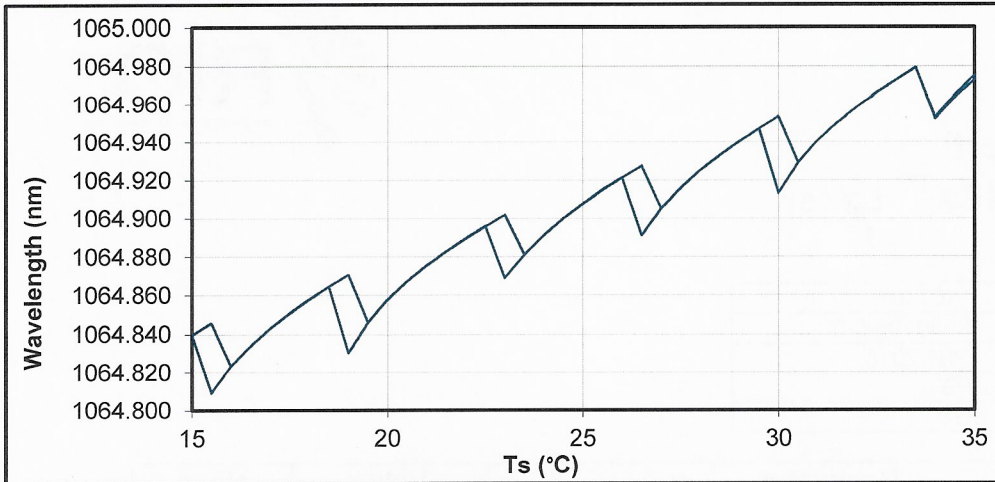


Fig.2: Wavelength vs. Tset at Ibias

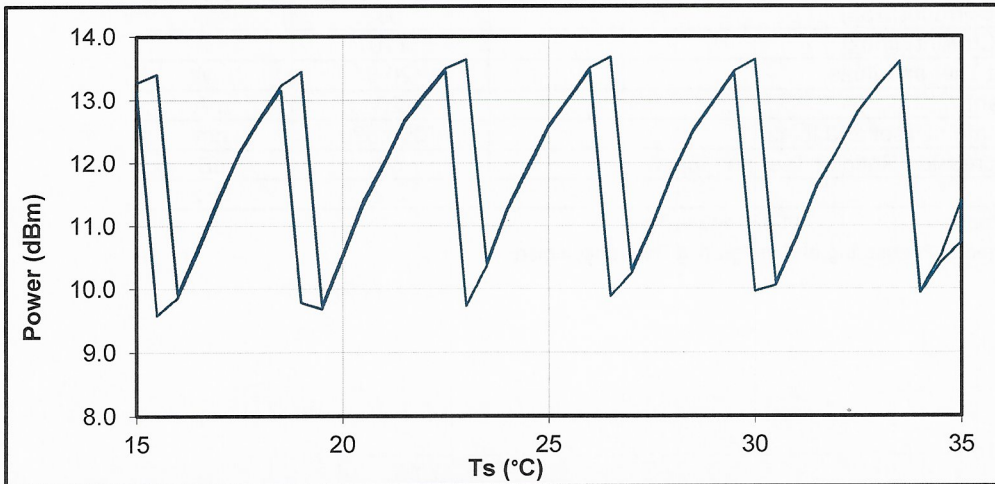


Fig.3: Power vs. Tset at Ibias

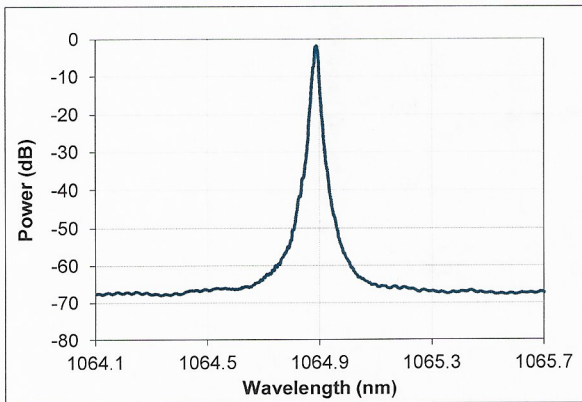


Fig.4: Spectrum (CW, Rset, Ibias)

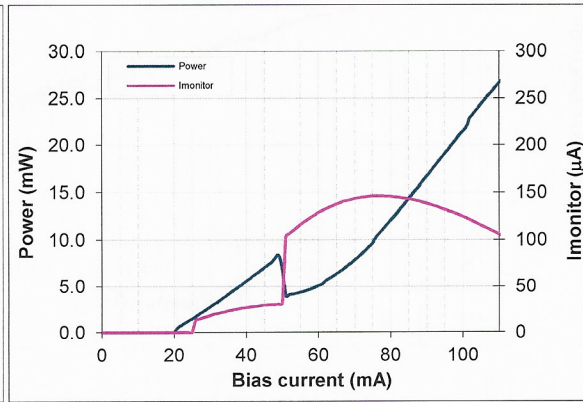


Fig.5: Laser Output Power and Imonitor vs. Bias Current at Tset

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110740





Test Report

RIO PLANEX™ Laser

Serial Number	110750
Part Number	RIO0195-5-08-3
Test Date	11/7/2018
Operator	PB
QA	GM

Parameter	Value	Units
Operating Temperature (Tset)*	21	°C
Operating Bias Current (Ibias)	100	mA
Maximum Bias Current (I _{max})	120	mA
Output Power at Tset and Ibias	21.3	mW
Threshold Current	19	mA
Center Wavelength at Tset and Ibias	1064.104	nm
Side Mode Suppression Ratio at Tset and Ibias	60	dB
Linewidth**	3.6	kHz

* Thermistor resistance: 11.984 kΩ at Tset

** Linewidth obtained by measuring and integrating frequency noise

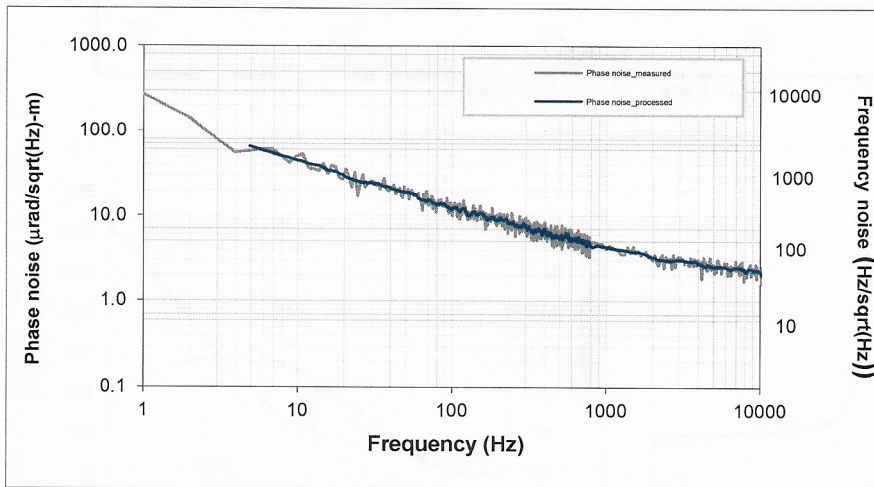


Fig.1: Phase Noise at Rset, Ibias, normalized to 1m path difference

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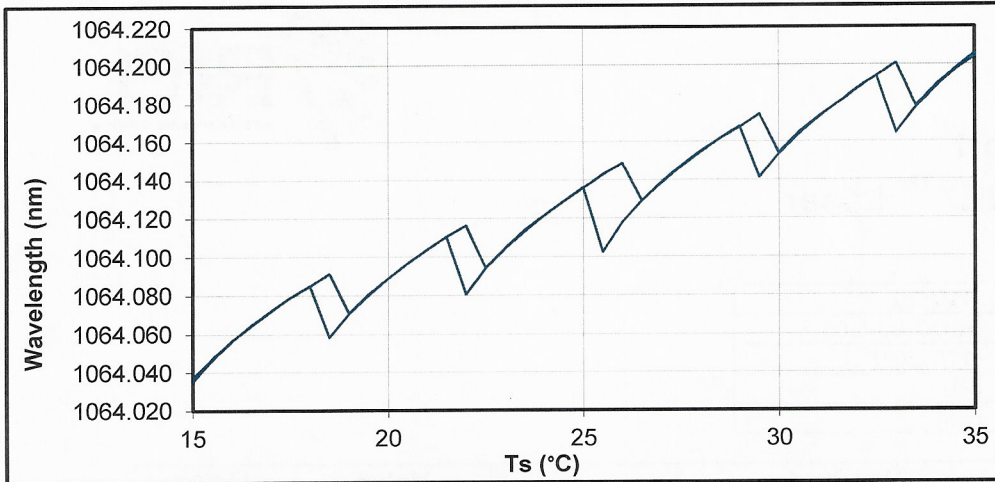


Fig.2: Wavelength vs. Tset at Ibias

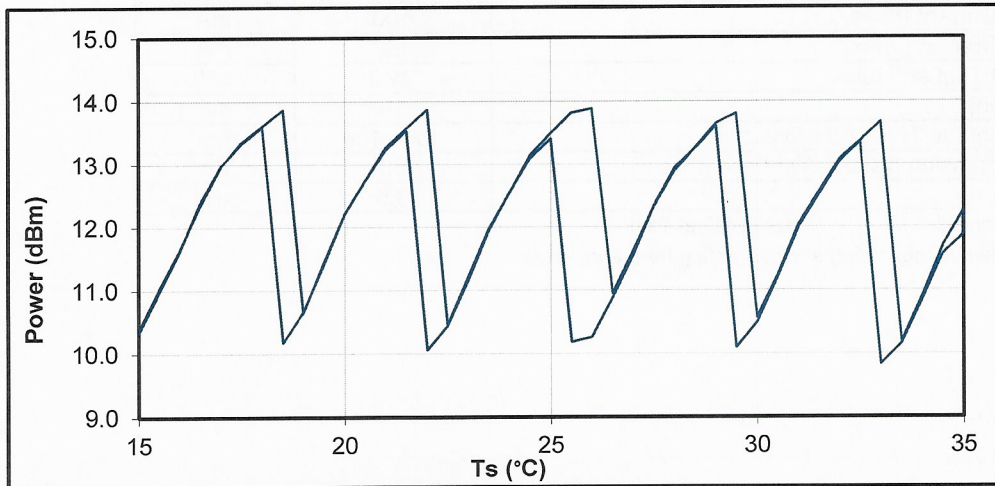


Fig.3: Power vs. Tset at Ibias

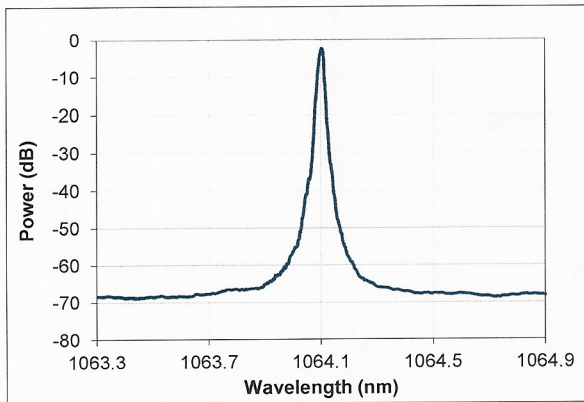


Fig.4: Spectrum (CW, Rset, Ibias)

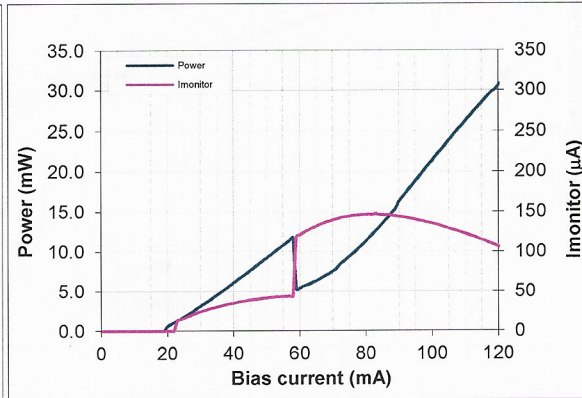


Fig.5: Laser Output Power and Imonitor vs. Bias Current at Tset

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110750





Test Report

RIO PLANEX™ Laser

Serial Number	110752
Part Number	RIO0195-5-08-3
Test Date	11/7/2018
Operator	PB
QA	GM

Parameter	Value	Units
Operating Temperature (Tset)*	22.5	°C
Operating Bias Current (Ibias)	100	mA
Maximum Bias Current (Imax)	110	mA
Output Power at Tset and Ibias	20.9	mW
Threshold Current	19	mA
Center Wavelength at Tset and Ibias	1064.059	nm
Side Mode Suppression Ratio at Tset and Ibias	58	dB
Linewidth**	2.1	kHz

* Thermistor resistance: 11.212 kΩ at Tset

** Linewidth obtained by measuring and integrating frequency noise

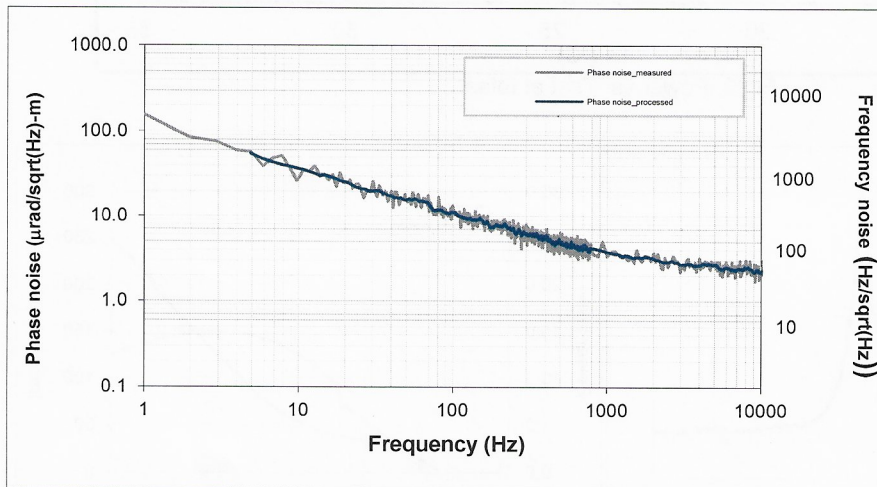


Fig.1: Phase Noise at Rset, Ibias, normalized to 1m path difference

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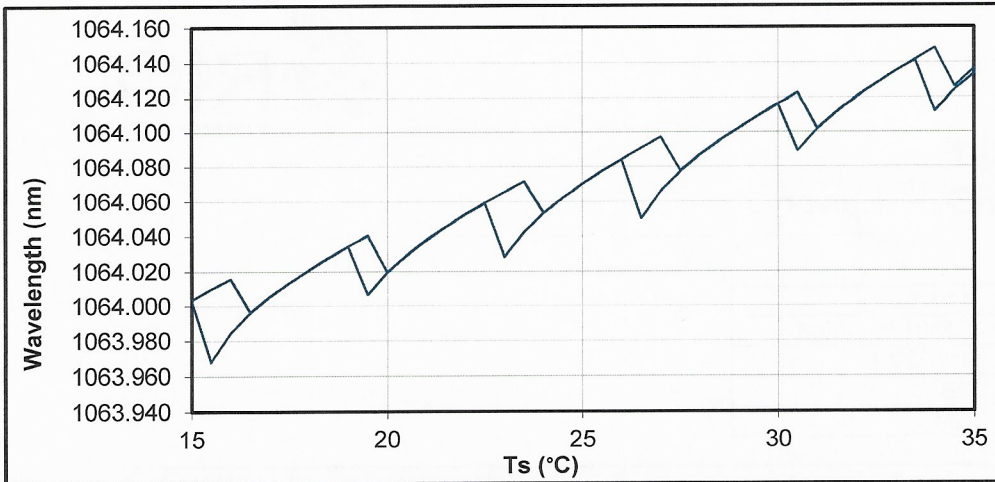


Fig.2: Wavelength vs. Tset at I_{bias}

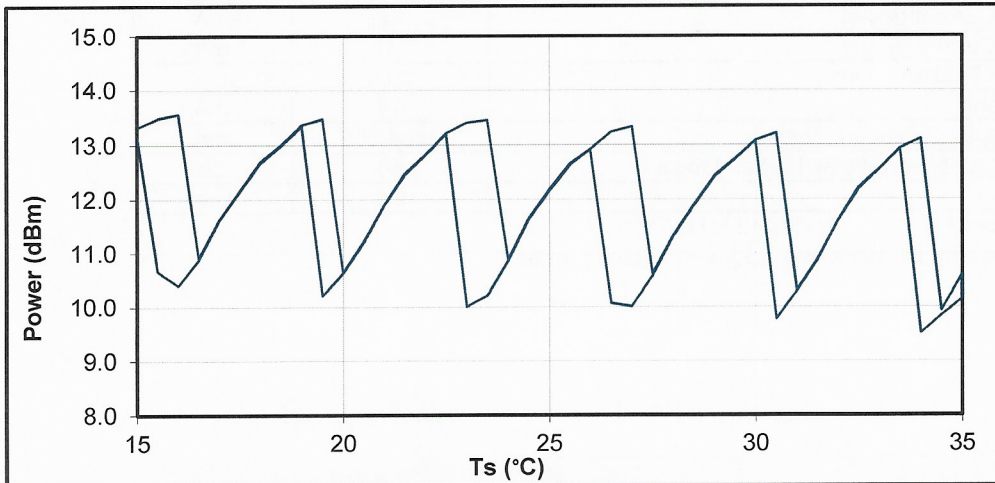


Fig.3: Power vs. Tset at I_{bias}

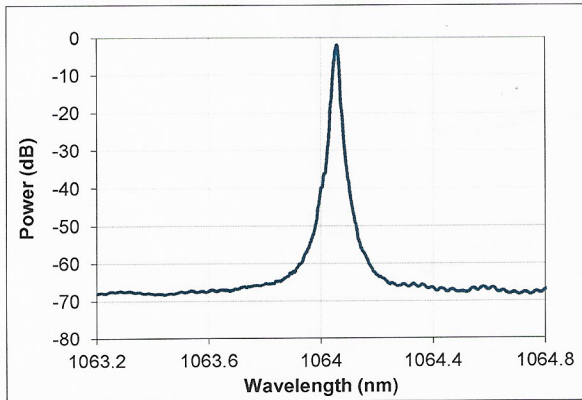


Fig.4: Spectrum (CW, Rset, I_{bias})

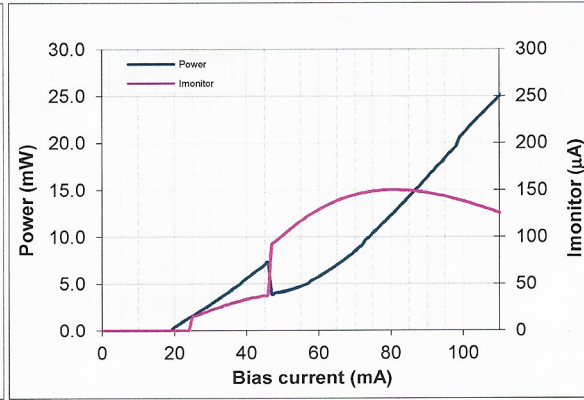


Fig.5: Laser Output Power and Imonitor vs. Bias Current at Tset

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110752



Test Report

RIO PLANEX™ Laser

Serial Number	110847
Part Number	RIO0195-5-08-3
Test Date	11/7/2018
Operator	PB
QA	GM

Parameter	Value	Units
Operating Temperature (Tset)*	18.5	°C
Operating Bias Current (Ibias)	107	mA
Maximum Bias Current (Imax)	120	mA
Output Power at Tset and Ibias	20.8	mW
Threshold Current	17	mA
Center Wavelength at Tset and Ibias	1064.883	nm
Side Mode Suppression Ratio at Tset and Ibias	58	dB
Linewidth**	2.2	kHz

* Thermistor resistance: 13.405 kΩ at Tset

** Linewidth obtained by measuring and integrating frequency noise

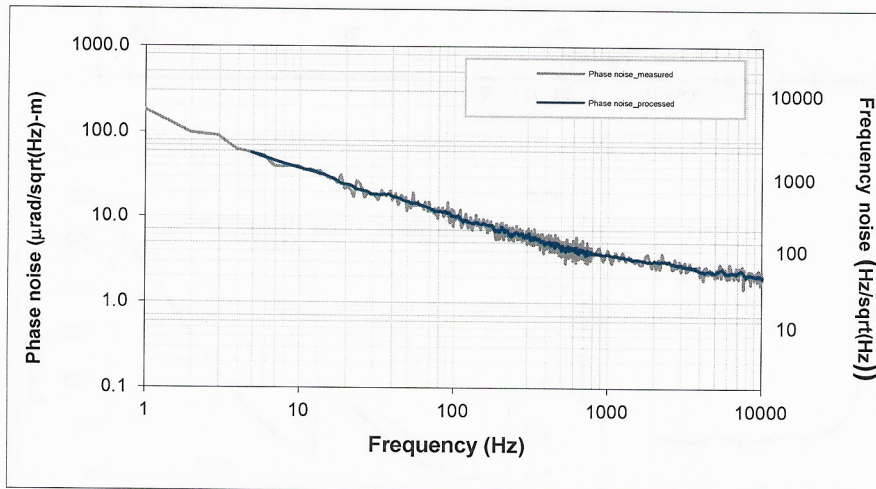


Fig.1: Phase Noise at Rset, Ibias, normalized to 1m path difference

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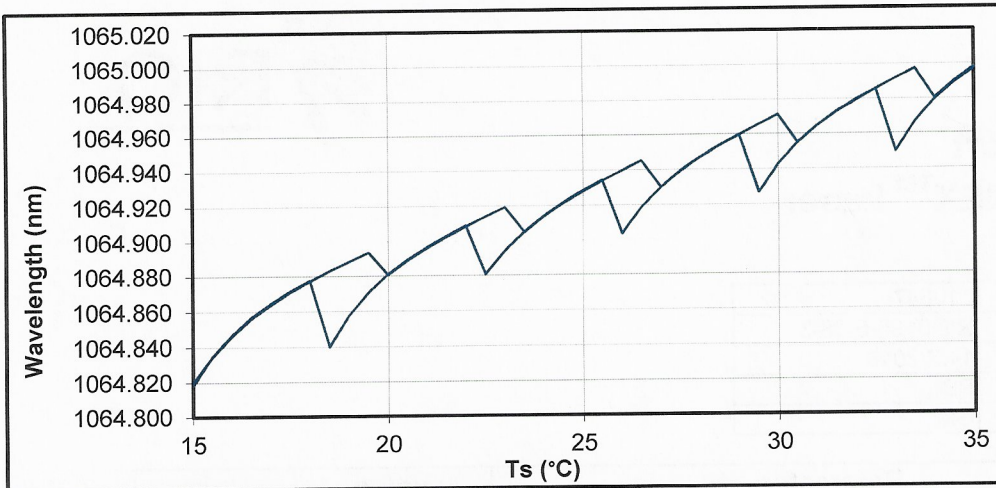


Fig.2: Wavelength vs. Tset at Ibias

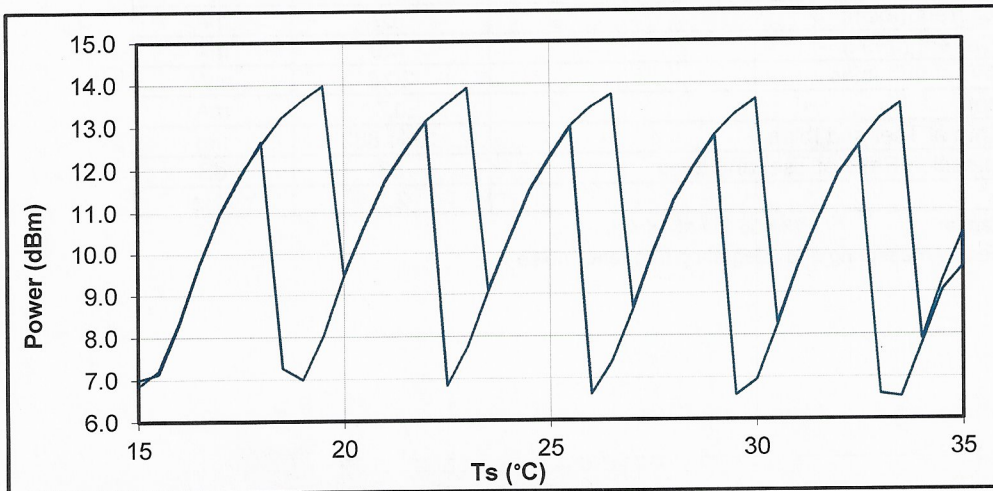


Fig.3: Power vs. Tset at Ibias

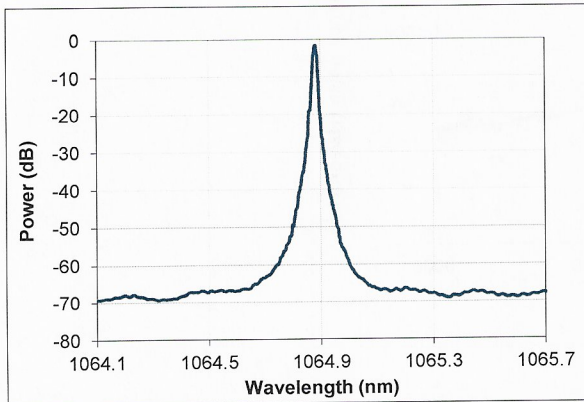


Fig.4: Spectrum (CW, Rset, Ibias)

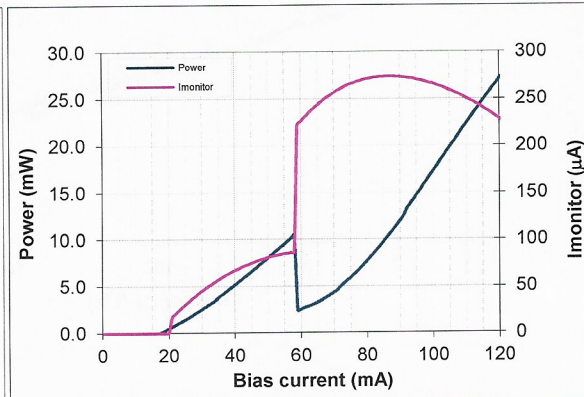


Fig.5: Laser Output Power and Imonitor vs. Bias Current at Tset

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