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ELEC413 – Project 2 – Bragg + SOA – Or Bahari

Our Objective in this project is to design a laser model using INTERCONNECT which is similar in properties to the SAF 1126. That said, to design a laser with resonance wavelength 1550nm and Threshold Current Ith~60mA, as well with a good wall plug efficiency.

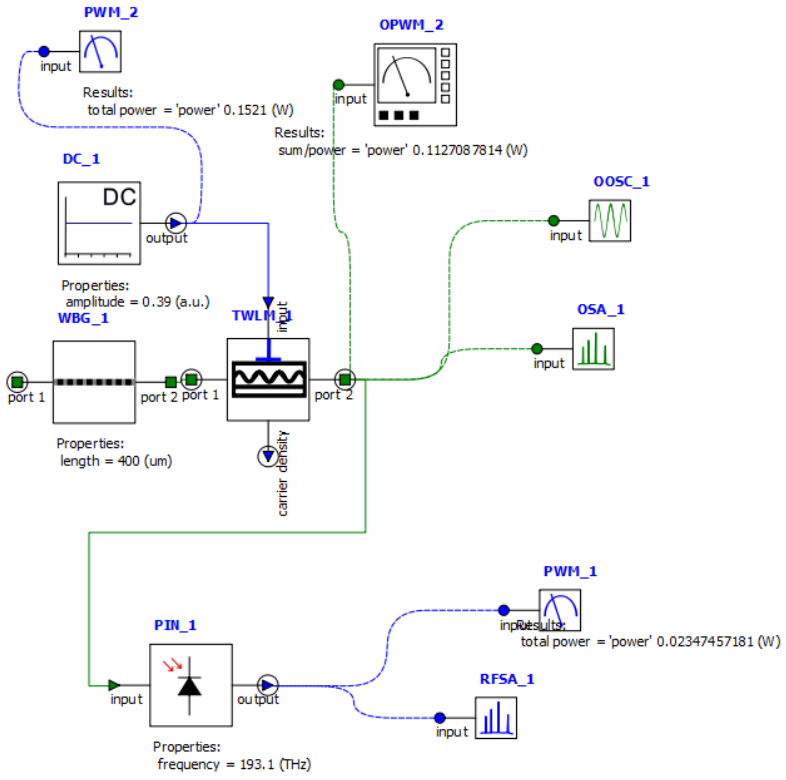
Parameters used:

TWLM: facet reflectivity=0, R2=0.1, length=200microns, width 1.6microns, thickness 1.8microns. neff=3.5, ng=3.5065, Spontaneous emission factor=0.002.

Bragg:

Name	Value	Unit	Expression	Annotate
Standard				
configuration	bidirectio...			☐
length	400	um		☑
input parameter	Bragg fre...			☐
period	5.3e-07	m		☐
frequency	1550	nm		☐
coupling parameter	effective i...			☐
effective index change ac	0.0004			☐
effective index change dc	0			☐
grating coupling coeffici...	800	1/m		☐
phase shift	0	rad		☐
Waveguide				

My design from INTERCONNECT:



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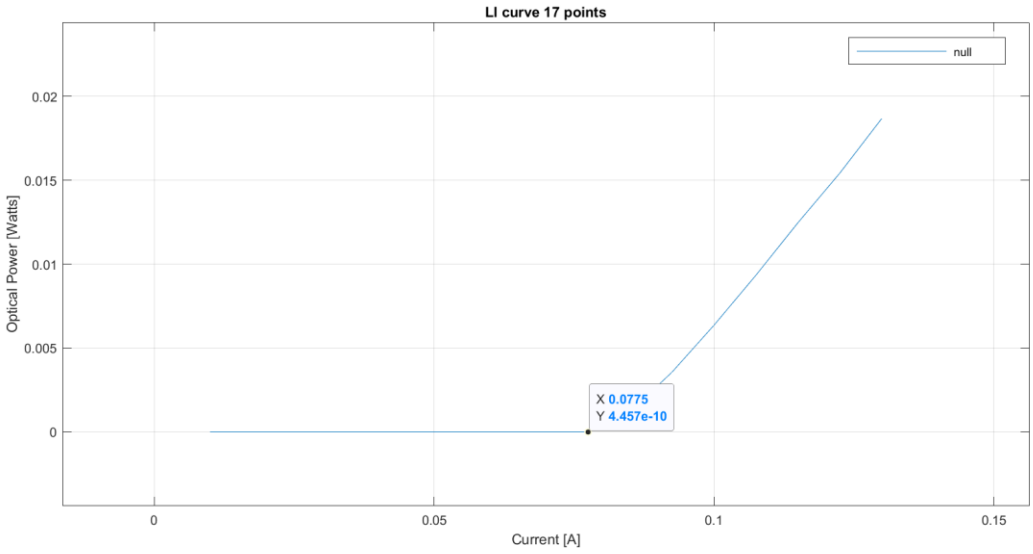
Current Sweep for **LI curve**: 17 Currents in the between 10mA to 130mA and the Optical Power was measured (**OPWM_1**).

To Retrieve the plot, I used this script:

```
?power=getsweepdata('LI','power');

?current=getsweepdata('LI','current');

plot(current, power);
```



We can see that the threshold is about 77.5mA, for convenience we will take the value 78mA from now on. Note: According to note from Piazza Ith does not have to be necessarily 60mA.

Wall Plug Efficiency was calculated as: $\boldsymbol{WPE = 100 * \left(\frac{OPWM_2\ [Watts]}{PWM_2\ [Watts]}\right)}\ [\%]$

$$WPE_{1.2Ith} = 100 * \left(\frac{0.0040}{0.00876}\right) = 47.7\%$$

$$WPE_{2Ith} = 100 * \left(\frac{0.02433}{0.0278}\right) = 87.50\%$$

$$WPE_{5th} = 100 * \left(\frac{0.1127}{0.1521}\right) = 73.64\%$$

The WPE is not in the range of 10-50% as recommended, therefore I could not achieve a sufficient WPE for higher currents.

Optical Spectra, from OSA_1

Optical Spectrum Analyser at 1.2XIth, 2XIth, 5XIth:

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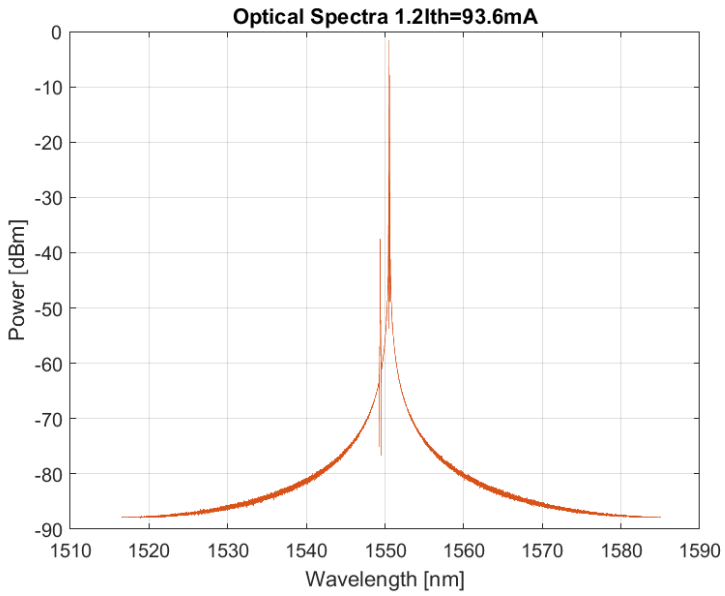
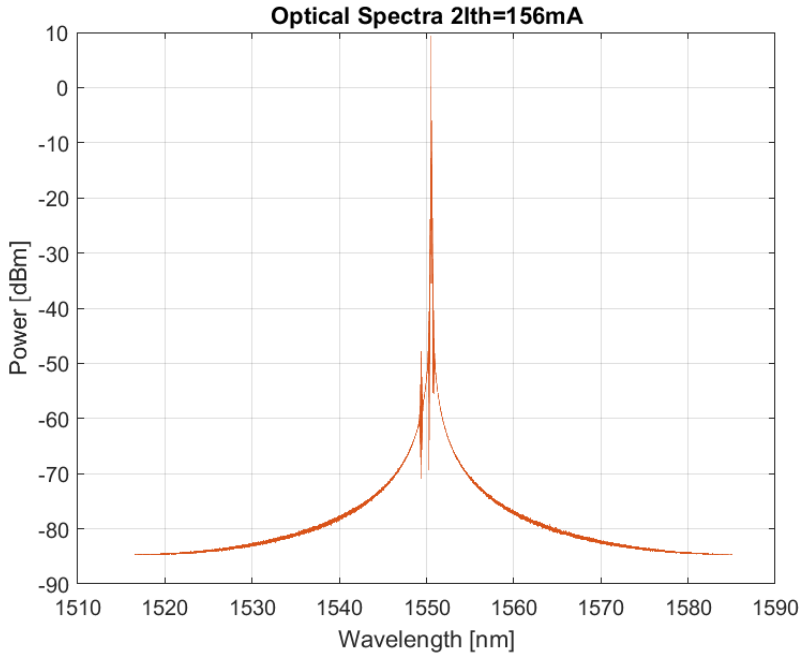
1.2Ith=93.6mA:



Central Frequency 1550.5nm.

2Ith=156mA:



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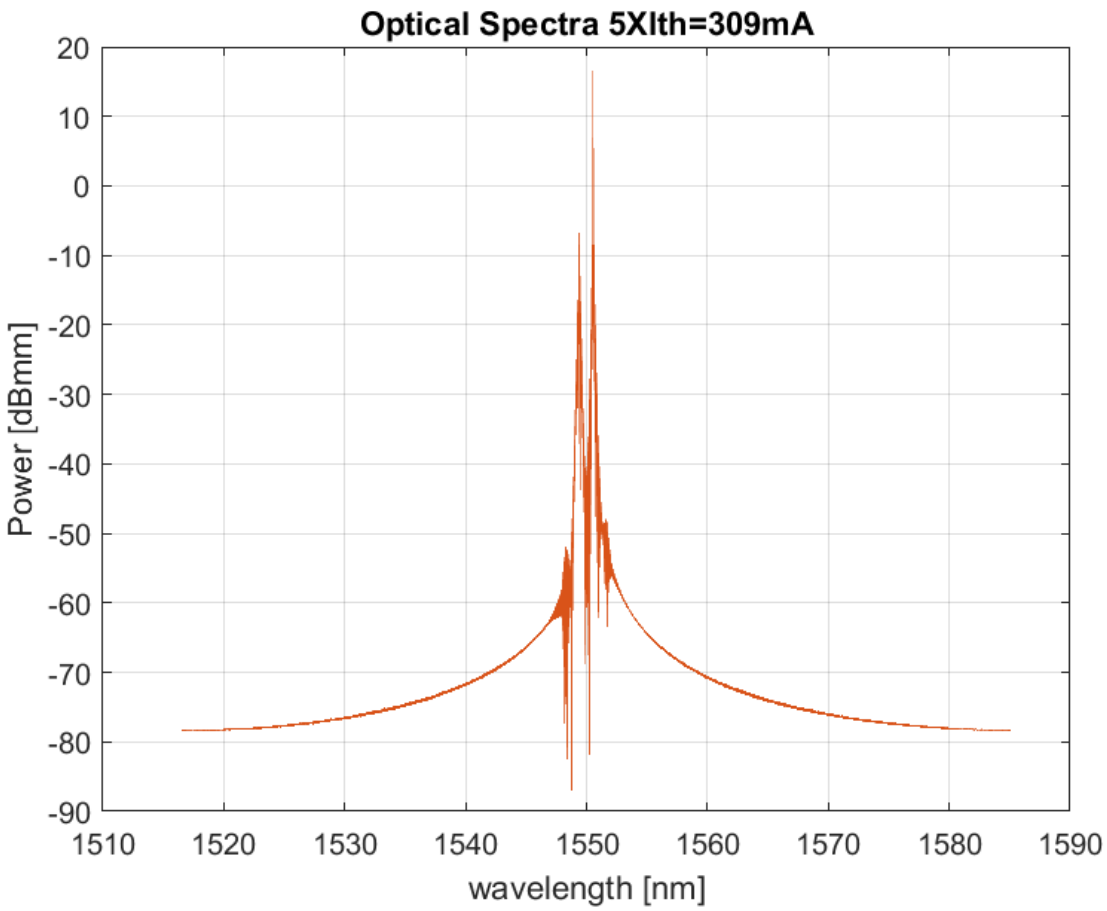
Central Frequency 1550.6nm.

5Ith=390mA:



Resonance frequency at 1550.5mn.

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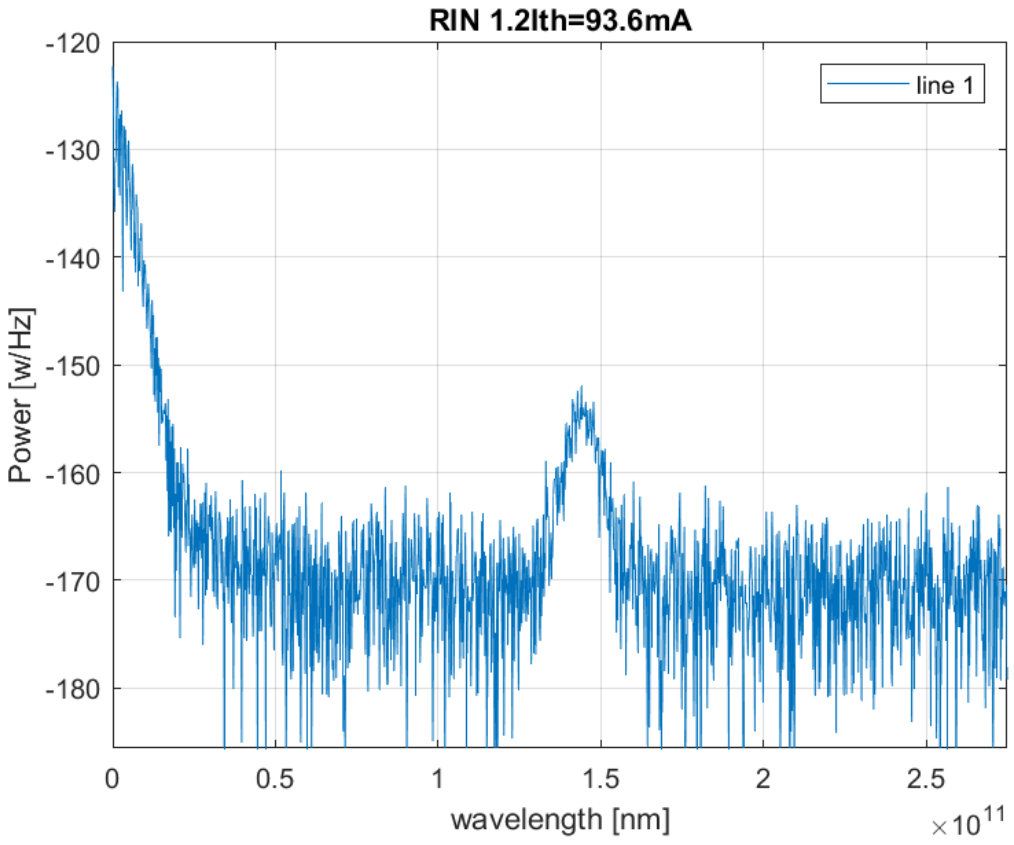
RIN was measures using this code:

```
# Measure the DC electrical power
dc_pwr = 0.0936; #enter your Current here!
# Measure the AC spectrum
RFSA=getresult('RFSA_1','signal');
spectrum = RFSA.getattribute("power (W/Hz)");
RIN = 10*log10(spectrum/dc_pwr);
plot (RFSA.frequency, RIN);
# Average RIN:
select('::Root Element');
?BW = 0.5*get('sample rate');
ac_pwr = getresult('PWM_1','ac power');
?RIN_av = 10*log10(ac_pwr/dc_pwr/BW);
```

1.2XIth=93.6mA:



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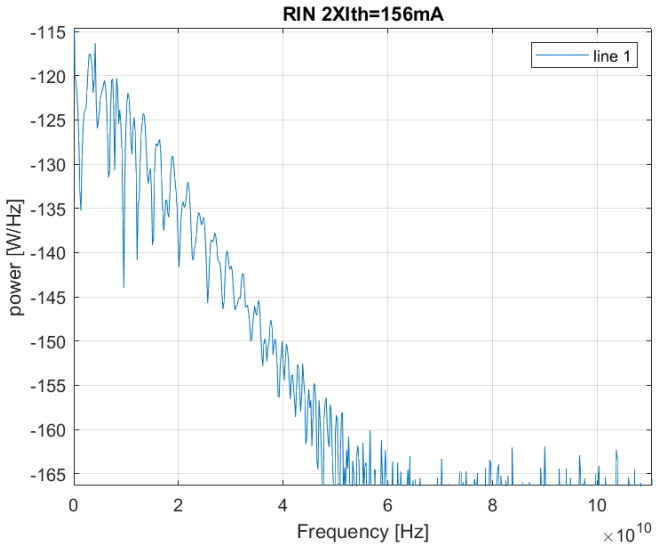
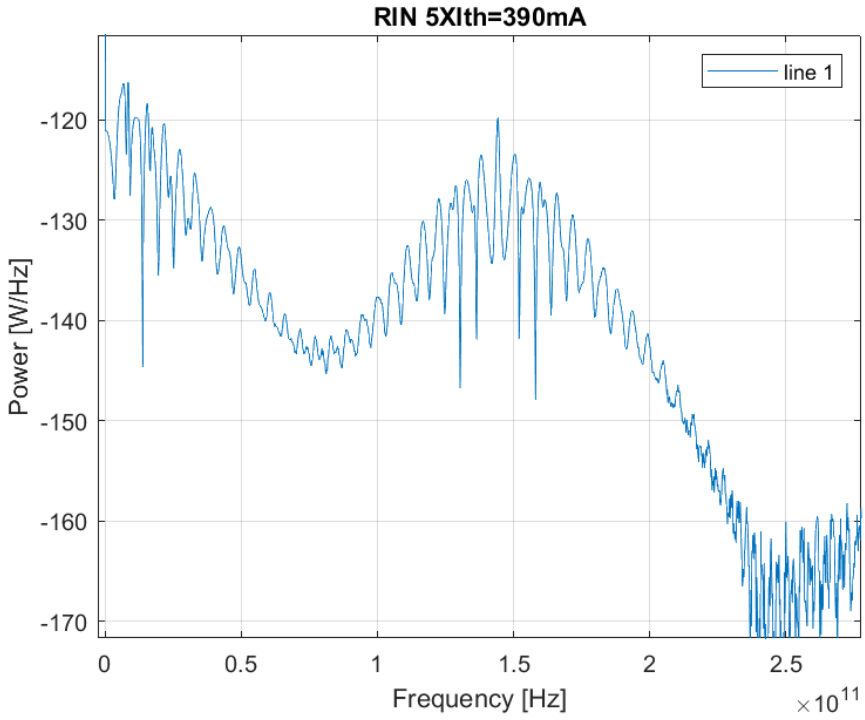
2Xith=156mA:



5Ith=390mA:



Note: All the figures are attached to the project as Matlab ".fig" flies so you can look at the plots with different "zoom-ins". Attached the scripts as well.