Multimode VCSEL Simulation with Microcavity model

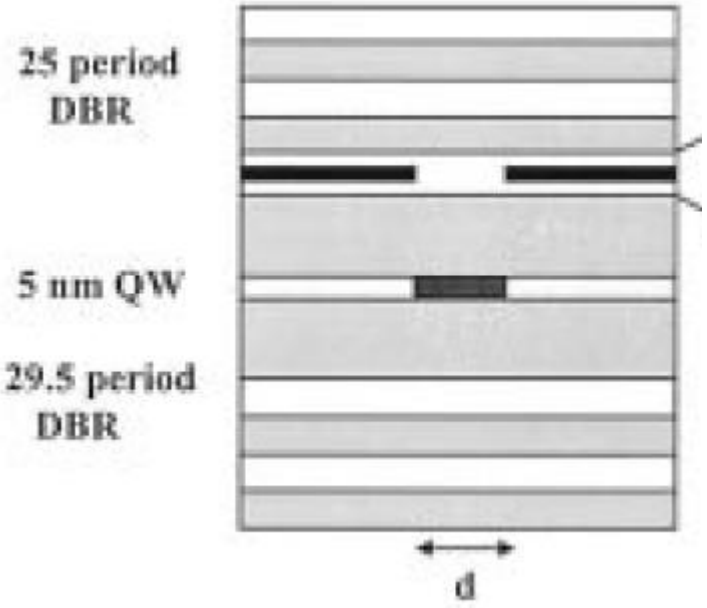
Introduction

- Oxide confined multimode VCSELs
- 3 QWs, lasing at 980 nm
- FDFD based Microcavity model
- 15 vectorial modes

Device structure

TABLE I
LAYER THICKNESSES AND REFRACTIVE INDICES OF BENCHMARK STRUCTURE

	thickness	material	Index	
air		air	1	
24 pair DBR	69.49	GaAs	3.53	
	79.63	AlGaAs	3.08	
oxide window	69.49	GaAs	3.53	
	63.71-*x*	AlGaAs	3.08	
	15.93	AlAs	2.95	r < d/2
		AlOx	1.60	r > d/2
	x	AlGaAs	3.08	
lambda cavity	136.49	GaAs	3.53	
	5.00	QW	3.53 + j n_i	r < d/2
			3.53 - j 0.01	r > d/2
	136.49	GaAs	3.53	
29.5 pair DBR	79.63	AlGaAs	3.08	
	69.49	GaAs	3.53	
substrate		GaAs	3.53	



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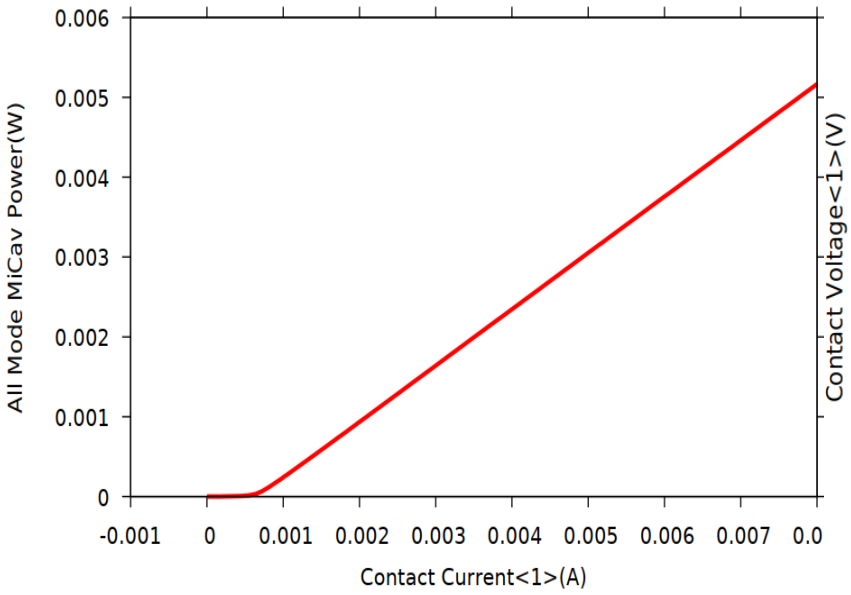
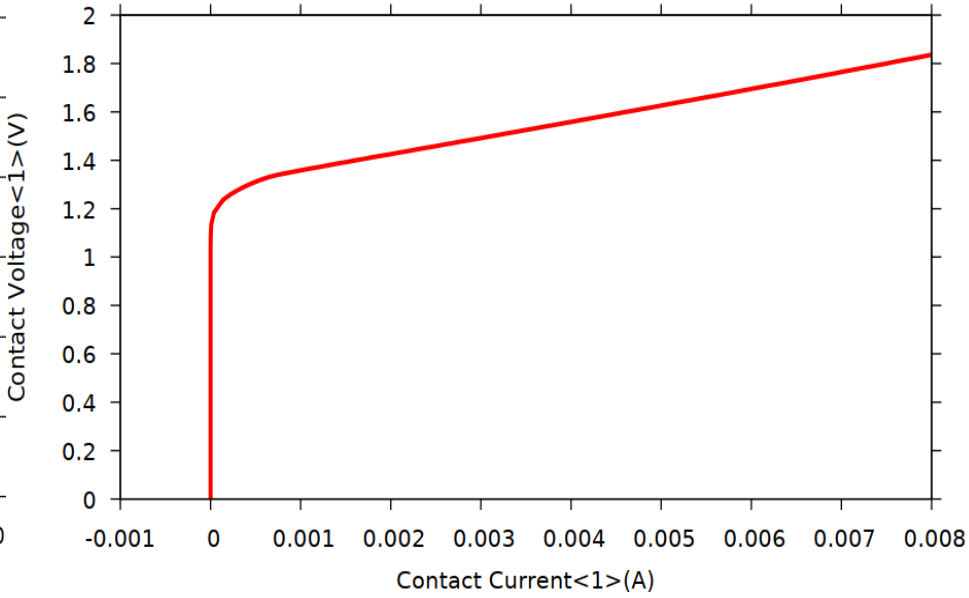
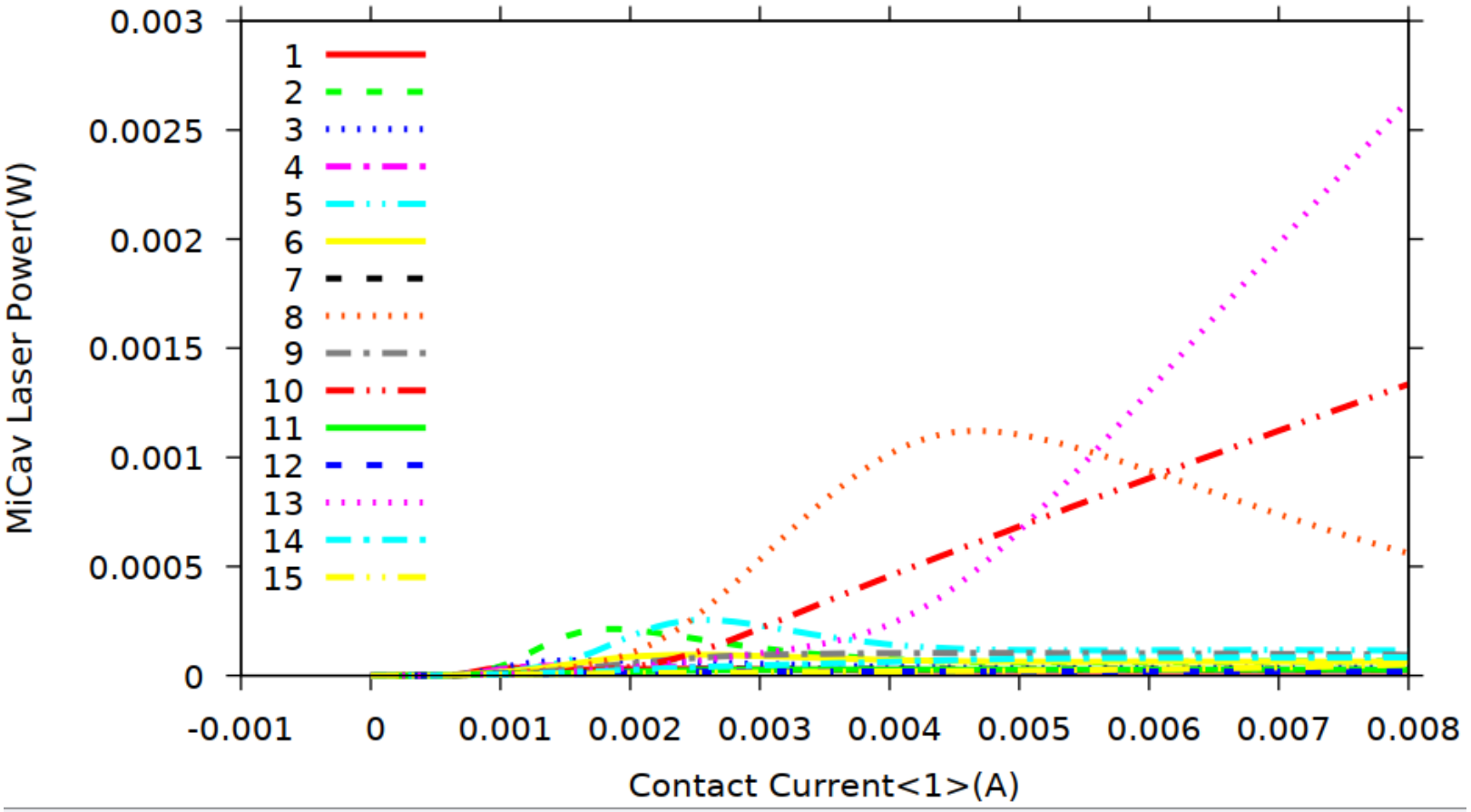
LI and LV

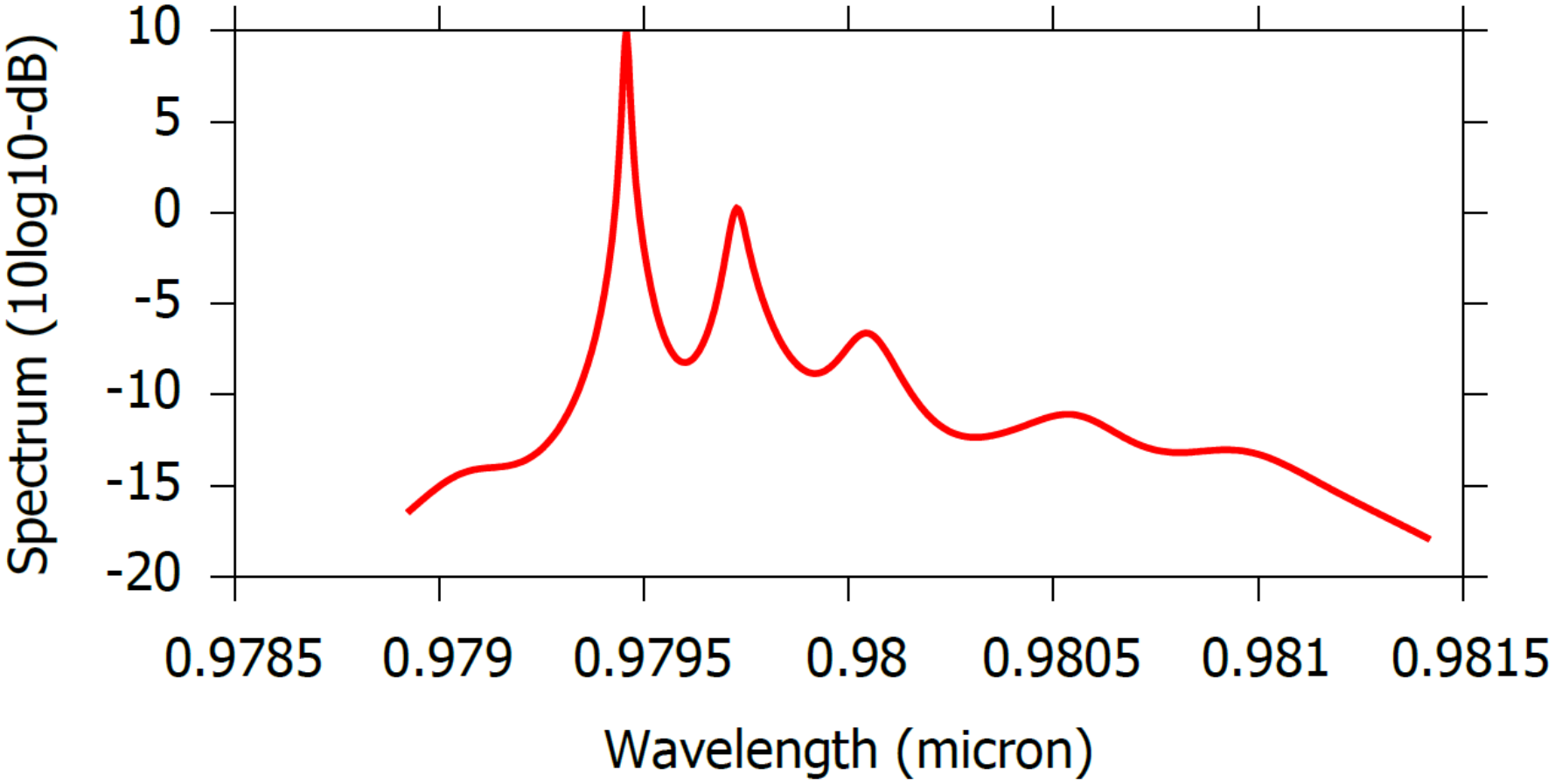

All Mode MiCav Power(W)
0.006
0.005
0.004
0.003
0.002
0.001
0
-0.001
0
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.0
Contact Current<1>(A)


Contact Voltage<1>(V)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.001
0
0.001
0.002
0.003
0.004
0.005
0.006
0.007
0.008
Contact Current<1>(A)

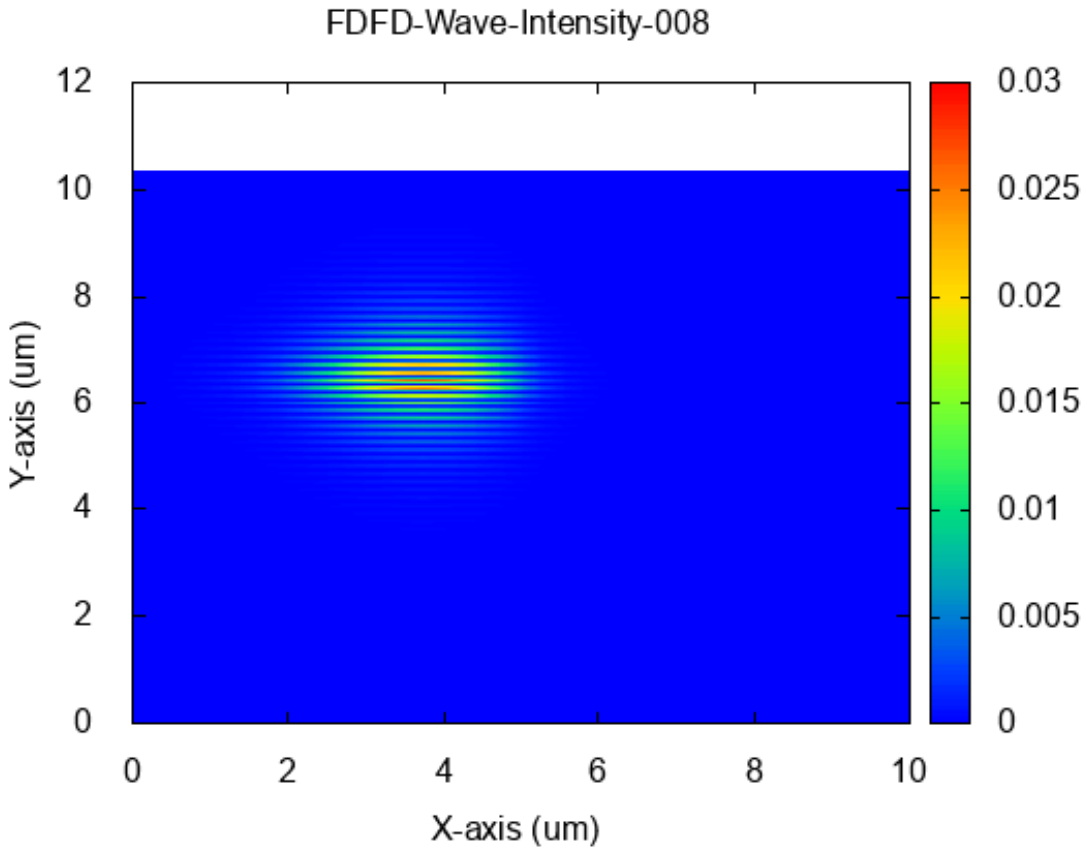
Multimode evolution



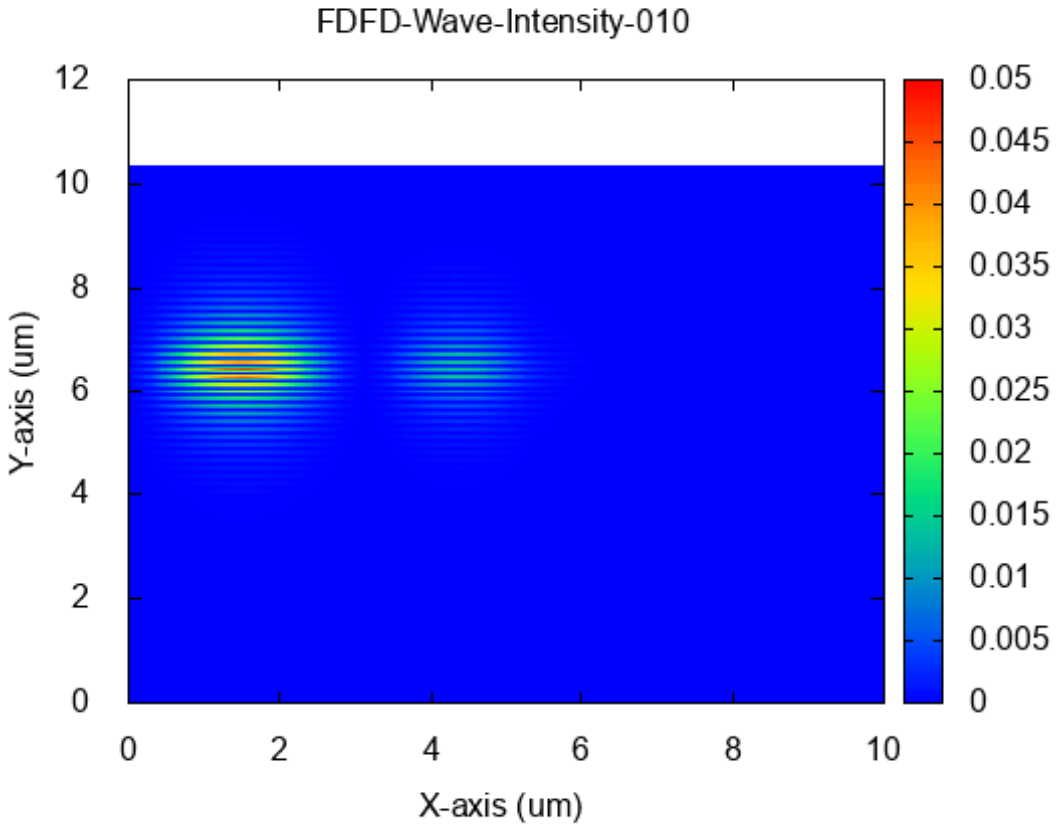
Mode spectrum at 8mA



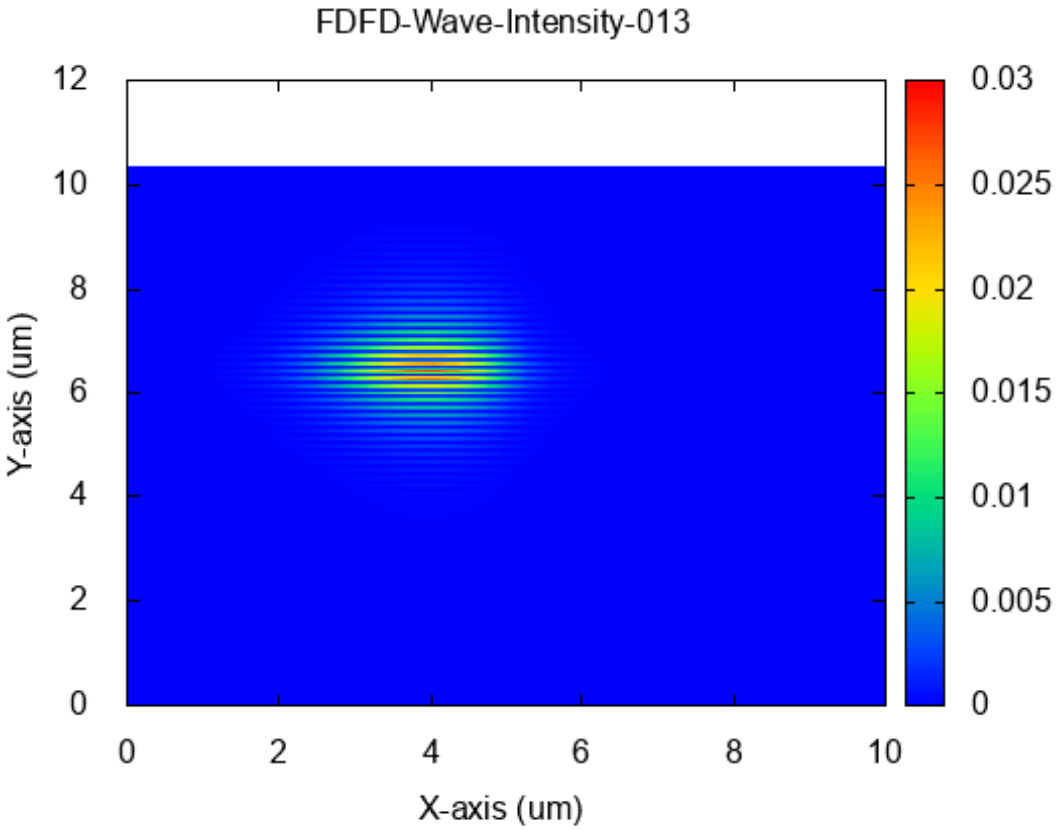
Near field pattern of lasing mode #8



Near field pattern of lasing mode #10



Near field pattern of lasing mode #13



Far field pattern of all modes