Supplementary data

This document contains information on supplementary data. Files **3_well_full_data.xlsx** and **4_well_full_data.xlsx** contain simulation data in high detail.

The data in **3_well_full_data.xlsx** is organized in six Microsoft Excell worksheets corresponding to simulations in which Al molar fraction was set to 0.15, 0.16, 0.17, 0.23, 0.24, 0.25. Each sheet contains 52 columns of data where each entry is described in the worksheet heading. This data contains information on peak material gain, current density, electrical bias, heat factor, quality factor, frequency, and frequency offset (from lasing energy) when number of states per period was limited to 5,6 and 7. Energy differences between first four states are included as well. This file contains full simulation summary and it naturally contains a lot of redudant information for data analysis (i.e negative material gain or frequency of low interest). For instance, the frequency range in the simulation was set between 2.5 and 5 THz, however in the paper, we focused only on results around 3.5 THz where we are expecting the minimal loss.

The data in **4_well_full_data.xlsx** is similarly organized in 11 Excell worksheets corresponding to simulations in which Al molar fraction was set to 0.15 - 0.25. We performed more simulations with four well design as it was displaying lower resonant bias and current density and therefore lower electrical heating. The data is also organized in 52 columns, and the only difference from three well data file is that model output is presented when number of states per period was limited to 6,7 and 8.

In the paper we presented tables with 18 columns that best reflect our simulation results and the discussion. We have only presented three best candidates (in our opinion) per each simulation set. Files **Three_well_reduced_data.xlsx** and **Four_well_reduced_data.xlsx** contain reduced simulation data that we filterred from **3_well_full_data.xlsx** and **4_well_full_data.xlsx** data sets. These two files have 18 columns exactly as data in paper and we selected 250 best candidates per each Al molar fraction varied in Three and Four well structures. Note that heat sink temperature was set to 250 K in all our simulations.

As we discussed in the paper, our arguments on frequency, defintion of quality factor and number of states included in simulation can be argued. Therefore we provide this supplliementary information that can be used for further analysis. In the remainder of this document we also provide extended summary of promising structures which may be useful to growth teams.

I. THE BEST THREE WELL DESIGNS

In the paper we presented three best candidates per each Al molar fraction around 3.5 THz (if possible). Here we present ten best candidates (that can also be found in **Three_well_reduced_data.xlsx**) sorted by quality factor (material gain divided by product of current density and electric bias) where first five are designs with the highest quality factor at any arbitrary frequncy, while the other five are best designs around 3.5 THz. This is important because the design favours lower frequencies at lower Al molar fractions and structures, optimal both by frequency and quality factor appear with structures with taller barriers.

x	#	g_6 $[\mathrm{cm}^{-1}]$	g_7 $[\mathrm{cm}^{-1}]$	J_7 $\left[\frac{\mathrm{kA}}{\mathrm{cm}^2}\right]$	K_6 $\left[\frac{\mathrm{kV}}{\mathrm{cm}}\right]$	Q_7 $\left[\frac{\mathrm{cm}^2}{\mathrm{MW}}\right]$	f_6 [THz]	f_7 [THz]	δf_7 [GHz]	g_{n_6} $[\mathrm{cm}^{-1}]$	g_{n_7} $[\mathrm{cm}^{-1}]$	J_{n_7} $\left[\frac{\mathrm{kA}}{\mathrm{cm}^2}\right]$	K_{n_7} $\left[\frac{\mathrm{kV}}{\mathrm{cm}}\right]$	Q_{n_7} $\left[\frac{\mathrm{cm}^2}{\mathrm{MW}}\right]$	f_{n_6} [THz]	f_{n_7} [THz]	δf_{n_7} [GHz]
0.15	81779	13.64	12.82	2.05	12.50	0.500	2.74	2.74	-130.9	13.64	12.82	2.05	12.50	0.500	2.67	2.74	-130.9
0.15	81790	13.84	13.12	2.08	12.75	0.496	2.60	2.65	-213.1	13.84	13.08	2.12	12.50	0.494	2.52	2.60	-227.6
0.15	81778	13.95	13.30	2.11	12.75	0.494	2.79	2.77	-130.8	13.84	13.30	2.11	12.75	0.494	2.65	2.77	-130.8
0.15	81767	13.39	12.62	2.04	12.75	0.486	2.96	2.91	-16.6	13.33	12.62	2.04	12.75	0.486	2.82	2.91	-16.6
0.15	81910	13.45	12.76	2.07	12.50	0.494	2.69	2.69	-103.6	13.45	12.76	2.07	12.50	0.494	2.62	2.69	-103.6
0.15	82796	16.25	14.15	2.16	14.50	0.453	3.37	3.40	-20.8	15.99	14.05	2.16	14.75	0.441	3.59	3.49	-59.0
0.15	82533	14.94	13.44	2.08	14.75	0.439	3.42	3.35	0.0	14.94	13.30	2.08	15.00	0.427	3.49	3.45	-32.9
0.15	82664	15.62	13.91	2.18	14.75	0.433	3.45	3.40	-30.2	15.62	13.85	2.18	15.00	0.424	3.52	3.47	-43.6
0.15	71589	14.18	13.12	2.09	15.00	0.419	3.45	3.47	-47.8	14.08	13.12	2.09	15.00	0.419	3.59	3.47	-47.8
0.15	82532	15.14	13.77	2.20	15.25	0.409	3.49	3.45	-12.6	15.13	13.62	2.21	15.00	0.411	3.52	3.40	-23.2
0.16	81634	14.05	13.34	1.88	13.50	0.524	3.01	2.98	-109.6	13.83	13.29	1.90	13.75	0.509	2.89	3.06	-118.5
0.16	81765	14.21	13.48	1.95	13.50	0.511	2.91	2.91	-139.5	14.01	13.16	1.97	13.25	0.504	2.79	2.84	-122.6
0.16	81621	14.50	13.48	1.95	14.00	0.495	3.20	3.18	-33.2	14.44	13.38	1.96	13.75	0.496	3.11	3.13	-39.2
0.16	72129	14.13	13.53	1.95	14.00	0.497	3.13	3.08	-24.2	14.13	13.18	1.95	13.75	0.490	3.03	3.03	-36.6
0.16	82939	16.37	14.15	1.95	14.75	0.493	3.11	3.08	-105.7	16.26	14.00	1.96	14.50	0.492	3.01	3.01	-92.4
0.16	82664	17.34	14.69	1.86	15.00	0.525	3.42	3.40	-10.8	16.54	14.30	1.87	15.50	0.492	3.66	3.54	-28.9
0.16	81213	16.21	13.64	1.89	14.75	0.488	3.49	3.45	67.0	15.66	13.64	1.89	14.75	0.488	3.64	3.45	67.0
0.16	81082	15.93	13.31	1.80	14.75	0.502	3.49	3.47	27.5	14.62	13.16	1.80	15.00	0.487	3.74	3.54	16.8
0.16	81344	16.50	14.00	1.98	15.00	0.472	3.42	3.47	-15.6	16.38	13.92	1.99	14.75	0.474	3.49	3.40	6.5
0.16	80830	16.19	14.18	1.73	15.00	0.545	3.49	3.40	-34.3	15.55	13.26	1.75	15.75	0.480	3.66	3.62	-49.9

0.17	81080	18.14	15.49	1.90	16.00	0.510	3.66	3.64	8.7	17.34	15.49	1.90	16.00	0.510	3.81	3.64	8.7
0.17	82663	17.87	15.19	1.89	16.00	0.502	3.54	3.54	-41.3	17.24	15.15	1.89	15.75	0.508	3.69	3.47	-32.2
0.17	81488	16.28	15.05	1.95	15.00	0.514	3.23	3.20	-106.4	16.13	14.26	1.97	14.50	0.498	3.13	3.08	-110.0
0.17	79366	17.70	14.99	1.83	15.75	0.519	3.71	3.64	73.6	17.34	14.94	1.84	16.00	0.509	3.86	3.71	61.6
0.17	81211	18.62	16.08	2.01	16.00	0.499	3.57	3.54	-41.3	18.62	15.93	2.02	15.75	0.501	3.54	3.47	-24.7
0.17	81476	16.78	14.92	2.00	15.25	0.489	3.42	3.45	-14.2	16.78	14.85	2.01	15.00	0.492	3.40	3.40	-20.2
0.17	79365	17.94	15.11	1.89	16.75	0.477	3.83	3.78	-43.3	17.03	14.54	1.92	15.75	0.481	3.78	3.52	-3.6
0.17	82531	18.79	16.00	1.89	16.25	0.521	3.57	3.54	-57.0	16.85	14.50	1.91	16.00	0.476	3.52	3.49	-72.5
0.17	80816	18.25	15.78	1.97	16.50	0.484	3.66	3.57	-69.5	17.73	15.66	1.98	16.75	0.472	3.81	3.64	-82.2
0.17	71838	18.39	15.98	2.14	16.25	0.459	3.64	3.62	-10.5	18.28	15.98	2.14	16.25	0.459	3.69	3.62	-10.5
0.23	81474	16.62	16.49	1.72	17.25	0.555	3.62	3.54	-158.4	16.02	16.49	1.72	17.25	0.555	3.42	3.54	-158.4
0.23	81342	17.18	16.68	1.74	17.75	0.540	3.66	3.64	-204.8	16.71	16.68	1.74	17.75	0.540	3.52	3.64	-204.8
0.23	79627	17.01	16.78	1.76	18.25	0.523	3.98	3.91	-138.7	17.01	16.72	1.76	18.00	0.528	3.98	3.83	-133.2
0.23	79759	16.98	17.22	1.84	17.75	0.526	3.76	3.66	-171.2	16.77	17.16	1.85	17.50	0.530	3.59	3.59	-158.3
0.23	70267	16.52	16.11	1.73	18.00	0.516	3.86	3.76	-181.6	16.52	16.11	1.73	18.00	0.516	3.83	3.76	-181.6
0.23	81341	17.54	16.65	1.78	18.50	0.507	3.69	3.71	-189.7	17.18	16.62	1.79	18.25	0.508	3.57	3.66	-210.1
0.23	79758	17.98	17.47	1.92	18.25	0.499	3.81	3.74	-196.5	17.64	17.38	1.92	18.00	0.502	3.64	3.66	-185.0
0.23	81473	17.74	16.95	1.88	17.75	0.508	3.47	3.45	-202.6	16.83	16.80	1.89	17.50	0.508	3.28	3.40	-214.9
0.23	81593	16.44	16.24	1.85	17.50	0.502	3.66	3.64	-71.5	15.85	16.24	1.85	17.50	0.502	3.54	3.64	-71.5
0.23	70266	17.80	17.00	1.90	18.50	0.485	3.74	3.69	-281.9	17.62	16.87	1.90	18.25	0.486	3.57	3.59	-250.4
0.24	81341	16.43	16.12	1.55	18.25	0.568	3.74	3.62	-185.3	16.08	16.11	1.55	18.50	0.560	3.57	3.69	-186.9
0.24	81209	16.70	15.97	1.55	19.00	0.541	3.81	3.74	-192.6	16.37	15.94	1.56	18.75	0.546	3.64	3.66	-191.9
0.24	79626	17.06	17.05	1.68	18.75	0.540	3.83	3.76	-176.0	16.94	17.05	1.68	18.75	0.540	3.74	3.76	-176.0
0.24	81066	16.79	16.52	1.60	18.75	0.550	4.08	3.83	-110.7	16.78	16.47	1.61	19.00	0.539	3.98	3.91	-116.0
0.24	71573	16.80	16.01	1.57	19.75	0.517	4.00	3.98	-227.0	16.66	16.01	1.57	19.75	0.517	3.93	3.98	-227.0
0.24	70266	16.62	16.29	1.68	18.75	0.517	3.69	3.66	-197.9	16.48	15.90	1.69	18.25	0.517	3.59	3.49	-164.6
0.24	82780	17.22	16.00	1.63	19.25	0.511	3.71	3.66	-207.7	15.92	15.98	1.63	19.00	0.516	3.42	3.59	-204.3
0.24	79889	17.19	17.33	1.83	18.25	0.519	3.57	3.52	-201.1	16.20	17.25	1.83	18.00	0.523	3.32	3.45	-184.3
0.24	81460	17.06	16.54	1.73	18.50	0.516	3.76	3.69	-133.5	15.51	16.54	1.73	18.50	0.516	3.52	3.69	-133.5
0.24	70398	16.50	16.10	1.71	18.50	0.509	3.57	3.59	-175.6	16.01	15.94	1.73	18.00	0.513	3.40	3.45	-162.8
0.25	71837	15.33	15.72	1.43	19.00	0.578	4.12	3.86	-38.0	15.23	15.62	1.44	19.25	0.564	3.95	3.93	-38.4
0.25	79626	15.95	15.73	1.50	19.00	0.554	3.88	3.71	-77.1	15.66	15.68	1.50	18.75	0.557	3.69	3.64	-72.1
0.25	71836	16.97	16.39	1.60	19.75	0.518	3.78	3.74	-201.3	16.72	16.38	1.61	19.50	0.523	3.64	3.66	-198.0
0.25	71704	17.13	16.24	1.58	20.25	0.506	3.88	3.81	-221.3	16.54	16.02	1.59	19.75	0.512	3.64	3.66	-216.7
0.25	69858	16.58	16.22	1.56	20.00	0.521	4.32	4.05	-83.0	16.50	16.14	1.56	20.25	0.510	4.22	4.15	-113.1
0.25	70253	17.10	17.11	1.73	19.50	0.506	3.81	3.69	-169.1	16.76	16.95	1.74	19.25	0.507	3.62	3.62	-157.6
0.25	79757	16.57	16.21	1.65	19.00	0.518	3.66	3.54	-153.0	16.32	16.14	1.66	18.75	0.519	3.49	3.47	-141.9
0.25	71835	18.05	17.18	1.77	20.00	0.484	3.74	3.71	-217.5	17.14	17.02	1.78	19.75	0.484	3.54	3.64	-208.9
0.25	71967	17.41	16.71	1.74	19.50	0.494	3.76	3.62	-143.0	16.37	16.52	1.74	19.25	0.493	3.45	3.57	-156.4
0.25	70384	16.97	17.12	1.84	19.25	0.484	3.71	3.64	-165.3	16.51	16.93	1.84	19.00	0.484	3.54	3.57	-145.0

TABLE I: Simulation results for three well design, columns display material gain for six and seven states included in the simulation, along with the information on gain at NDR, peak current density, resonant bias, quality factor, frequency and frequency offset from lasing energy difference.

II. THE BEST FOUR WELL DESIGNS

In the paper we presented three best candidates per each Al molar fraction around 3.5 THz (if possible). Here we present ten best candidates (that can also be found in **Four_well_reduced_data.xlsx**) sorted by quality factor (material gain divided by product of current density and electric bias) where first five are designs with the highest quality factor at any arbitrary frequncy, while the other five are best designs around 3.5 THz. This is important because the design favours lower frequencies at lower Al molar fractions and structures, optimal both by frequency and quality factor appear with structures with taller barriers.

x	#	g_7 $[\mathrm{cm}^{-1}]$	g_8 $[\mathrm{cm}^{-1}]$	J_8 $\left[\frac{\mathrm{kA}}{\mathrm{cm}^2}\right]$	K_8 $\left[\frac{\mathrm{kV}}{\mathrm{cm}}\right]$	Q_8 $\left[\frac{\mathrm{MW}}{\mathrm{cm}^3}\right]$	f_7 [THz]	f_8 [THz]	δf_8 [GHz]	g_{n_7} $[\mathrm{cm}^{-1}]$	g_{n_8} $[\mathrm{cm}^{-1}]$	J_{n_8} $\left[\frac{\mathrm{kA}}{\mathrm{cm}^2}\right]$	K_{n_8} $\left[\frac{\mathrm{kV}}{\mathrm{cm}}\right]$	Q_{n_8} $\left[\frac{\mathrm{MW}}{\mathrm{cm}^3}\right]$	f_{n_7} [THz]	f_{n_8} [THz]	δf_{n_8} [GHz]
0.15	103067	13.05	12.97	1.40	12.00	0.774	2.82	2.82	274.3	13.05	12.97	1.40	12.00	0.774	2.82	2.82	274.3
0.15	103030	13.23	13.24	1.43	12.25	0.756	2.77	2.79	183.8	13.23	13.24	1.43	12.25	0.756	2.77	2.79	183.8
0.15	146051	14.05	14.15	1.54	12.25	0.750	2.84	2.86	16.5	13.65	13.78	1.55	12.00	0.741	2.77	2.79	22.9
0.15	103061	13.01	12.93	1.43	12.25	0.738	2.82	2.82	231.9	13.01	12.93	1.43	12.25	0.738	2.82	2.82	231.9
0.15	94390	15.83	15.82	1.64	12.50	0.773	2.67	2.67	109.9	14.79	14.77	1.67	12.00	0.736	2.52	2.52	130.0
0.15	95222	19.25	16.35	1.70	17.75	0.543	3.76	3.42	785.4	18.63	16.31	1.70	18.25	0.526	3.47	3.52	828.3
0.15	60661	21.35	15.67	2.03	18.00	0.428	3.76	3.32	704.5	18.03	15.46	2.04	17.75	0.427	3.25	3.28	685.6
0.15	26463	20.56	15.83	1.76	17.50	0.513	4.00	3.45	343.8	20.09	14.34	1.77	16.75	0.483	3.64	3.25	355.5
0.15	60667	21.72	15.99	1.85	19.25	0.450	3.69	3.47	1030.7	18.58	14.60	1.99	17.50	0.420	3.32	3.25	791.0
0.15	26462	21.59	14.57	1.79	17.50	0.465	4.08	3.28	384.1	17.94	12.92	1.80	16.75	0.429	3.42	3.23	234.2
0.16	120161	14.77	14.66	1.51	12.50	0.777	2.84	2.84	145.2	13.87	13.92	1.52	12.00	0.761	2.67	2.69	142.3
0.16	120124	14.96	14.89	1.57	12.75	0.746	2.84	2.84	78.7	14.43	14.42	1.57	12.50	0.733	2.77	2.77	85.8
0.16	146050	14.04	14.22	1.52	12.50	0.746	2.77	2.79	-106.5	13.56	13.75	1.54	12.25	0.730	2.72	2.72	-99.3
0.16	120166	14.30	14.22	1.52	12.75	0.733	2.89	2.91	46.8	13.78	13.81	1.53	12.50	0.723	2.82	2.82	58.2
0.16	145865	14.04	13.96	1.57	12.50	0.711	2.96	2.96	120.8	14.04	13.96	1.57	12.50	0.711	2.96	2.96	120.8
0.16	137194	14.78	14.73	1.67	13.25	0.666	3.13	3.13	108.4	14.57	14.63	1.69	13.00	0.666	3.03	3.03	153.9
0.16	119950	13.84	13.84	1.61	13.00	0.663	3.11	3.13	239.3	13.84	13.84	1.61	13.00	0.663	3.11	3.13	239.3
0.16	137188	14.87	14.75	1.70	13.25	0.656	3.08	3.08	91.5	14.30	14.27	1.70	13.00	0.644	2.98	3.01	111.6
0.16	144753	14.04	14.11	1.64	13.50	0.636	3.08	3.11	150.0	13.87	13.89	1.65	13.25	0.634	3.03	3.03	155.8
0.16	119938	13.89	13.81	1.65	13.25	0.631	3.06	3.08	180.8	13.89	13.81	1.65	13.25	0.631	3.06	3.08	180.8
0.17	94240	15.12	14.96	1.53	13.25	0.737	3.01	3.01	182.7	13.90	14.64	1.54	13.00	0.732	2.84	2.94	176.4
0.17	137410	15.25	15.46	1.62	12.75	0.750	2.74	2.77	-216.7	14.35	14.55	1.64	12.50	0.711	2.65	2.67	-176.1
0.17	68283	15.87	15.75	1.63	13.75	0.705	3.06	3.06	220.6	15.47	15.36	1.63	13.50	0.697	2.96	2.98	224.6
0.17	94209	16.03	16.06	1.61	13.50	0.739	2.96	2.98	11.0	15.63	14.76	1.63	13.00	0.696	2.89	2.82	39.7
0.17	94203	16.06	15.98	1.63	13.75	0.715	2.96	2.98	-10.9	15.23	15.24	1.66	13.25	0.694	2.82	2.84	-0.2
0.17	119938	14.94	14.88	1.65	13.50	0.668	3.08	3.11	80.7	14.94	14.88	1.65	13.50	0.668	3.08	3.11	80.7
0.17	118869	15.11	15.06	1.67	14.00	0.643	3.20	3.23	125.6	15.01	14.95	1.69	13.75	0.644	3.13	3.13	148.6
0.17	94029	15.09	15.02	1.68	14.00	0.639	3.28	3.30	148.6	14.71	14.72	1.68	13.75	0.637	3.18	3.20	171.2
0.17	111261	16.15	16.06	1.79	14.25	0.628	3.18	3.20	-0.5	14.85	15.80	1.81	14.00	0.623	3.01	3.11	44.6
0.17	111273	15.57	15.54	1.73	14.00	0.640	3.18	3.20	18.9	14.91	14.93	1.75	13.75	0.622	3.11	3.11	58.9
0.18	138647	17.86	17.29	1.26	16.00	0.856	3.25	3.32	46.9	15.52	15.67	1.43	14.75	0.742	2.98	3.01	40.5
0.18	138641	18.06	17.50	1.39	16.00	0.787	3.28	3.28	15.3	16.35	15.66	1.52	14.75	0.697	2.98	2.96	-2.1
0.18	79421	17.16	16.46	1.23	17.00	0.785	3.93	3.83	-274.3	15.36	14.59	1.40	15.25	0.684	3.32	3.23	-124.7
0.18	112721	17.42	16.71	1.21	17.25	0.798	3.88	3.86	80.4	15.20	14.42	1.39	15.25	0.678	3.37	3.32	73.6
0.18	68282	14.98	14.90	1.52	14.50	0.675	3.20	3.20	108.4	14.58	14.56	1.52	14.25	0.670	3.13	3.13	104.9
0.18	79241	18.38	17.61	1.33	17.25	0.766	3.93	3.88	-168.8	15.74	15.43	1.48	15.75	0.661	3.40	3.40	-55.3
0.18	103901	18.62	17.79	1.43	17.50	0.710	4.05	4.00	-203.8	15.12	14.97	1.55	16.25	0.593	3.62	3.59	-83.8
0.18	53284	19.16	18.30	1.45	17.75	0.711	4.05	3.98	-294.0	15.95	14.40	1.54	16.50	0.566	3.71	3.57	-158.3
0.18	28480	20.01	19.01	1.43	18.00	0.741	3.98	3.95	-42.5	15.56	14.52	1.61	16.25	0.556	3.59	3.45	44.0
0.18	42151	14.74	14.77	1.72	15.50	0.552	3.52	3.52	281.1	14.46	14.77	1.72	15.50	0.552	3.42	3.52	281.1
0.19	33971	16.55	16.30	1.70	13.75	0.698	3.06	3.03	39.1	10.98	16.00	1.70	13.50	0.698	2.91	2.94	73.3
0.19	94048	15.95	16.04	1.68	14.00	0.681	3.18	3.20	147.5	15.65	15.78	1.69	13.75	0.680	3.11	3.13	149.7
0.19	111489	17.25	17.46	1.74	13.50	0.743	2.84	2.86	-189.8	15.51	15.74	1.80	13.00	0.672	2.65	2.67	-108.8
0.19	111310	17.08	17.23	1.74	13.75	0.721	3.08	3.11	97.6	15.78	16.00	1.84	13.25	0.657	2.89	2.91	186.2
0.19	137187	15.53	15.93	1.74	14.00	0.656	3.25	3.20	-154.0	15.50	15.93	1.74	14.00	0.656	3.18	3.20	-154.0
0.19	79061	21.26	20.42	1.62	17.25	0.729	3.76	3.71	-116.8	19.06	17.73	1.78	16.00	0.622	3.45	3.37	-42.2
0.19	103901	19.91	19.44	1.61	17.25	0.699	3.78	3.76	-334.8	17.83	17.55	1.74	16.25	0.621	3.42	3.40	-186.1
0.19	42145	17.00	16.82	1.83	15.50	0.593	3.49	3.49	217.6	16.49	16.43	1.83	15.25	0.587	3.40	3.42	229.2
0.19	68065	15.84	15.81	1.78	15.25	0.582	3.49	3.45	43.8	15.79	15.81	1.78	15.25	0.582	3.42	3.45	43.8
0.19	42187	16.38	16.35	1.81	15.75	0.573	3.64	3.64	207.4	15.52	16.19	1.82	15.50	0.574	3.42	3.52	252.5

0.20	33971	17.19	17.84	1.74	14.25	0.721	3.06	3.03	28.7	10.49	16.81	1.76	13.75	0.694	2.96	2.89	50.1
0.20	58805	16.87	17.38	1.75	14.50	0.687	3.06	3.03	33.7	7.86	16.81	1.79	14.00	0.672	2.96	2.86	70.9
0.20	33965	17.06	17.93	1.80	14.50	0.688	3.08	3.06	4.8	10.91	17.04	1.85	14.00	0.659	2.96	2.91	22.8
0.20	85397	17.93	18.08	1.96	14.25	0.648	2.98	2.98	161.4	16.72	18.02	1.96	14.00	0.656	2.84	2.91	178.4
0.20	32854	18.06	17.34	1.86	14.50	0.642	3.01	2.98	15.5	9.13	17.34	1.86	14.50	0.642	3.06	2.98	15.5
0.20	129641	21.78	20.72	1.67	17.50	0.708	3.74	3.69	-136.5	18.57	18.19	1.82	16.50	0.606	3.40	3.42	-66.2
0.20	104801	20.81	19.59	1.61	17.50	0.696	3.76	3.74	215.7	17.93	16.92	1.76	16.25	0.593	3.49	3.47	213.3
0.20	42170	17.32	17.04	1.87	15.50	0.587	3.52	3.42	254.5	17.22	17.04	1.87	15.50	0.587	3.42	3.42	254.5
0.20	42139	17.09	16.87	1.91	16.25	0.544	3.69	3.69	214.3	16.96	16.84	1.91	16.00	0.551	3.59	3.62	223.8
0.20	16224	17.82	17.57	1.94	16.75	0.540	3.71	3.71	231.2	17.58	17.42	1.95	16.50	0.542	3.62	3.62	265.4
0.21	8014	16.83	16.80	1.71	14.75	0.666	3.06	2.98	47.6	9.32	16.80	1.71	14.75	0.666	3.06	2.98	47.6
0.21	32848	17.08	16.59	1.72	15.00	0.644	3.01	3.01	24.4	3.92	16.59	1.72	15.00	0.644	3.13	3.01	24.4
0.21	33909	16.07	16.62	1.74	14.75	0.647	3.32	3.20	187.8	14.17	16.36	1.75	14.50	0.644	3.06	3.11	225.3
0.21	33785	16.07	16.62	1.74	14.75	0.647	3.32	3.20	187.8	14.17	16.36	1.75	14.50	0.644	3.06	3.11	225.3
0.21	58583	16.46	16.20	1.77	14.25	0.643	2.96	2.82	195.6	3.36	16.20	1.77	14.25	0.643	2.96	2.82	195.6
0.21	42175	16.41	16.35	1.71	16.25	0.587	3.64	3.64	145.4	16.16	16.15	1.72	16.00	0.588	3.54	3.57	146.5
0.21	16429	16.44	16.34	1.73	16.50	0.573	3.52	3.52	198.1	15.87	16.25	1.73	16.25	0.578	3.32	3.42	221.5
0.21	59467	16.87	17.10	1.78	16.25	0.591	3.62	3.64	-18.1	16.06	16.28	1.82	15.75	0.568	3.40	3.42	47.1
0.21	16218	16.98	16.81	1.81	17.00	0.546	3.71	3.74	157.4	16.23	16.69	1.82	16.75	0.548	3.52	3.64	194.2
0.21	16428	16.33	16.21	1.75	17.00	0.543	3.52	3.52	98.6	15.73	16.05	1.76	16.75	0.544	3.35	3.45	93.1
0.22	103900	17.34	16.75	1.18	18.50	0.766	4.12	4.03	-50.3	15.22	15.41	1.27	17.50	0.695	3.81	3.83	-111.5
0.22	129677	17.10	16.94	1.24	18.00	0.762	4.03	3.95	252.7	14.67	15.34	1.30	17.00	0.693	3.78	3.78	164.9
0.22	3640	17.66	16.99	1.19	18.75	0.761	4.15	4.12	99.1	14.58	15.22	1.32	17.25	0.668	3.88	3.91	-29.9
0.22	58576	15.02	15.64	1.59	15.00	0.654	3.03	2.98	239.3	4.33	15.64	1.59	15.00	0.654	2.55	2.98	239.3
0.22	8008	15.52	15.45	1.53	15.00	0.673	3.03	2.96	51.1	7.66	15.22	1.53	15.25	0.651	2.98	3.03	30.8
0.22	129641	18.09	17.70	1.37	17.75	0.730	3.78	3.76	-240.4	16.28	15.65	1.44	16.75	0.650	3.52	3.47	-152.0
0.22	16429	15.75	15.70	1.57	16.50	0.608	3.52	3.52	227.7	15.46	15.70	1.57	16.50	0.608	3.42	3.52	227.7
0.22	16424	15.35	15.39	1.56	16.25	0.607	3.49	3.45	281.7	15.35	15.39	1.56	16.25	0.607	3.49	3.45	281.7
0.22	42175	15.15	15.24	1.55	16.25	0.604	3.66	3.66	135.8	14.34	15.04	1.56	16.00	0.604	3.47	3.57	163.5
0.22	59467	16.22	16.44	1.69	16.00	0.608	3.49	3.52	27.9	15.63	15.87	1.71	15.75	0.590	3.40	3.40	73.3
0.23	103899	16.96	16.55	1.13	19.25	0.760	3.93	3.91	222.0	13.54	14.68	1.27	17.50	0.662	3.59	3.62	46.7
0.23	16465	14.18	14.27	1.32	16.75	0.644	3.66	3.64	240.4	13.27	13.94	1.33	16.25	0.646	3.37	3.45	283.9
0.23	129676	17.31	17.20	1.31	18.25	0.722	3.69	3.59	367.3	14.10	15.16	1.43	16.75	0.635	3.45	3.28	296.1
0.23	16423	14.94	15.15	1.44	16.50	0.639	3.54	3.45	183.5	4.09	15.11	1.44	16.75	0.627	2.50	3.54	151.5
0.23	16429	14.57	14.69	1.40	16.75	0.625	3.62	3.62	231.1	14.44	14.69	1.40	16.75	0.625	3.52	3.62	231.1
0.23	59467	15.12	15.34	1.56	16.00	0.616	3.49	3.49	47.9	14.77	15.05	1.58	15.75	0.606	3.37	3.37	98.3
0.23	41268	14.19	14.22	1.41	17.00	0.593	3.74	3.66	68.2	14.16	14.01	1.41	16.75	0.593	3.66	3.57	85.6
0.23	53103	17.75	17.07	1.38	19.00	0.651	3.88	3.86	86.9	14.87	15.51	1.46	18.00	0.590	3.62	3.64	89.7
0.23	15348	14.31	14.28	1.40	17.50	0.584	3.76	3.74	231.2	13.59	14.25	1.40	17.25	0.589	3.47	3.64	253.9
0.23	16434	14.69	14.75	1.43	17.25	0.599	3.76	3.76	135.0	14.02	14.09	1.44	16.75	0.586	3.57	3.54	191.7
0.24	103899	15.09	14.83	1.00	19.25	0.774	3.93	3.91	242.3	13.03	13.60	1.08	18.00	0.701	3.71	3.66	151.0
0.24	16428	13.90	14.00	1.31	17.25	0.619	3.69	3.66	111.9	13.66	13.84	1.31	17.00	0.621	3.59	3.57	136.5
0.24	85406	13.71	13.62	1.37	15.75	0.633	3.28	3.28	-59.3	12.97	12.91	1.39	15.25	0.611	3.08	3.08	-30.9
0.24	41268	12.89	12.96	1.26	17.25	0.598	3.78	3.76	88.7	12.79	12.89	1.26	17.00	0.601	3.69	3.69	85.9
0.24	6921	12.94	12.82	1.32	16.25	0.598	3.32	3.32	13.1	12.75	12.67	1.33	16.00	0.597	3.25	3.25	20.5
0.24	42348	12.92	12.97	1.29	17.00	0.593	3.54	3.54	-23.2	12.44	12.86	1.29	16.75	0.595	3.40	3.45	-2.1
0.24	16422	14.03	14.09	1.36	17.50	0.594	3.66	3.64	73.9	13.86	14.09	1.36	17.50	0.594	3.57	3.64	73.9
0.24	42342	13.12	13.11	1.32	17.25	0.576	3.49	3.47	-12.4	12.96	12.97	1.32	17.00	0.577	3.42	3.40	-15.8
0.24	41256	13.27	13.28	1.35	17.75	0.554	3.66	3.66	47.9	13.16	13.28	1.35	17.75	0.554	3.74	3.66	47.9
0.24	16416	14.04	14.04	1.40	17.75	0.565	3.62	3.59	42.1	14.04	13.87	1.40	18.00	0.550	3.62	3.66	41.7
0.25	59683	13.49	13.39	1.29	15.50	0.670	3.01	3.01	-102.3	12.40	12.32	1.33	15.00	0.616	2.82	2.82	-79.2
0.25	16422	12.71	12.64	1.21	17.75	0.591	3.69	3.76	58.3	12.71	12.64	1.21	17.50	0.597	3.69	3.66	84.5
0.25	33772	12.10	11.82	1.26	16.00	0.586	3.47	3.35	137.3	11.47	11.61	1.28	15.50	0.585	3.06	3.11	240.8
0.25	59678	13.79	13.65	1.28	15.00	0.711	2.84	2.84	9.2	11.37	11.24	1.35	14.25	0.585	2.52	2.52	88.4
0.25	59455	13.38	13.32	1.38	16.00	0.602	3.08	3.08	-86.6	12.07	12.87	1.42	15.50	0.584	2.82	2.91	-41.3
0.25	16416	12.87	12.73	1.25	17.75	0.573	3.64	3.62	55.6	12.87	12.73	1.25	17.75	0.573	3.64	3.62	55.6
0.25	29562	12.70	12.62	1.29	19.00	0.515	3.81	3.74	141.2	9.24	12.15	1.31	18.25	0.506	3.23	3.47	196.0
0.25	4717	12.12	12.52	1.38	18.25	0.496	3.64	3.54	160.0	10.87	12.48	1.39	18.00	0.499	3.47	3.49	143.0
0.25	29557	11.79	12.14	1.35	18.25	0.492	3.62	3.52	164.0	10.70	12.01	1.36	18.00	0.492	3.42	3.47	144.5
0.25	6735	11.95	11.83	1.40	17.25	0.491	3.59	3.64	88.3	11.86	11.51	1.43	16.75	0.480	3.54	3.59	11.5

TABLE II: Simulation results for four well design, columns display material gain for seven and eigth states included in the simulation, along with the information on gain at NDR, peak current density, resonant bias, quality factor, frequency and frequency offset from lasing energy difference.