

**Datasheet for #sbcw13583 DN**

Recommendations:

Please read the User Manual and have a look at the FAQ at <http://www.alpeslasers.ch/?a=142>

**WARNING:** Operating the laser with higher current or voltage than specified in this document may cause damage and will result in loss of warranty, unless Alpes Lasers has permitted to do so!

**WARNING:** Beware of the polarity of the laser. This laser has to be powered with negative current on the laser contact (= bonding pad, corresponding to the label "laser" on the LLH) and the positive current on the base contact (= submount, corresponding to the label "base" on the LLH). To use with a power-supply ILX Lightwave LDX-3232 or equivalent.

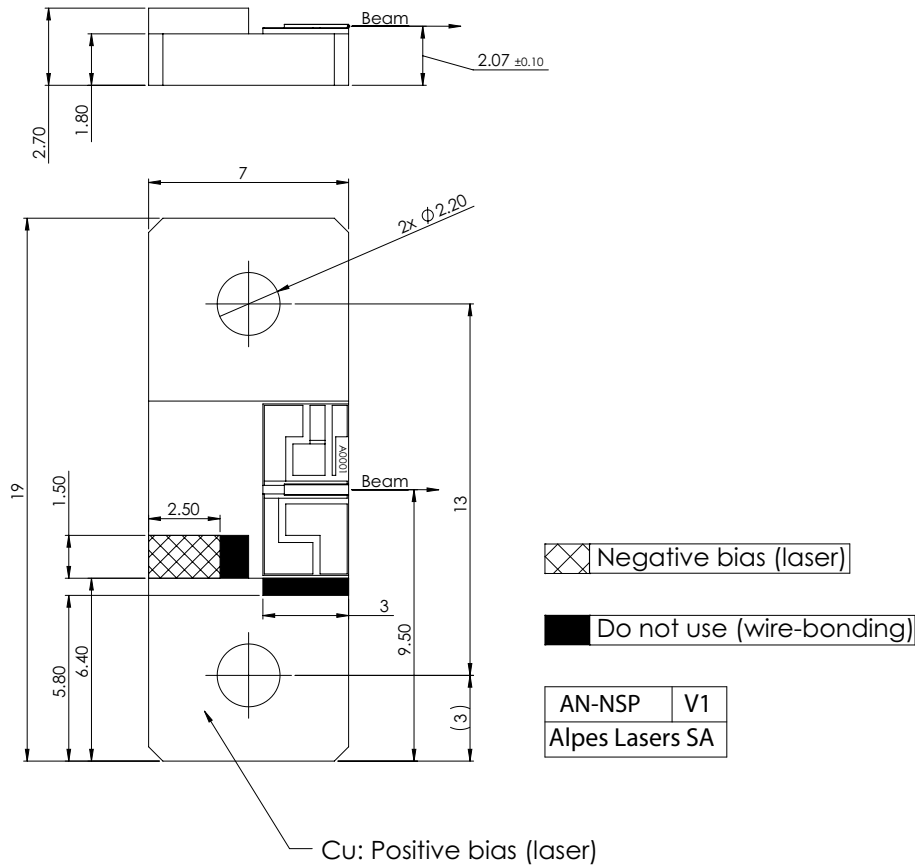


Figure 1: Mechanical and electrical interface for #sbcw13583 DN

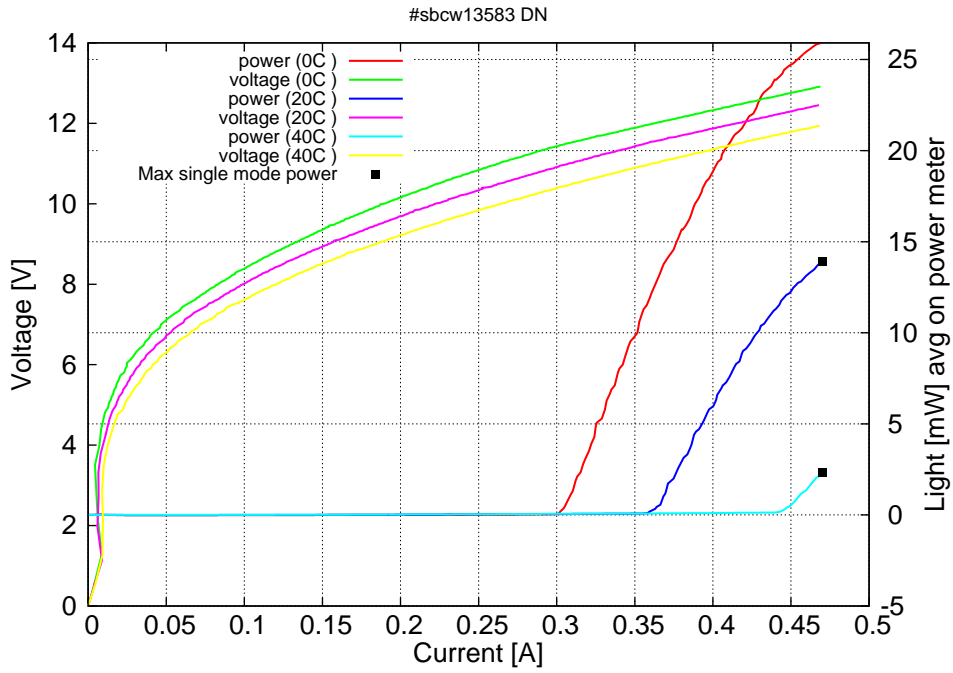


Figure 2: voltage and avg power vs current in continuous-wave operation (the solid squares indicate the maximum singlemode emitted power)

Note: at 0C:  $I_{th}=0.30A$  /  $V_{th}=11.4V$  (2-wires measurements). Maximum operation current: 0.47A for all temperatures.

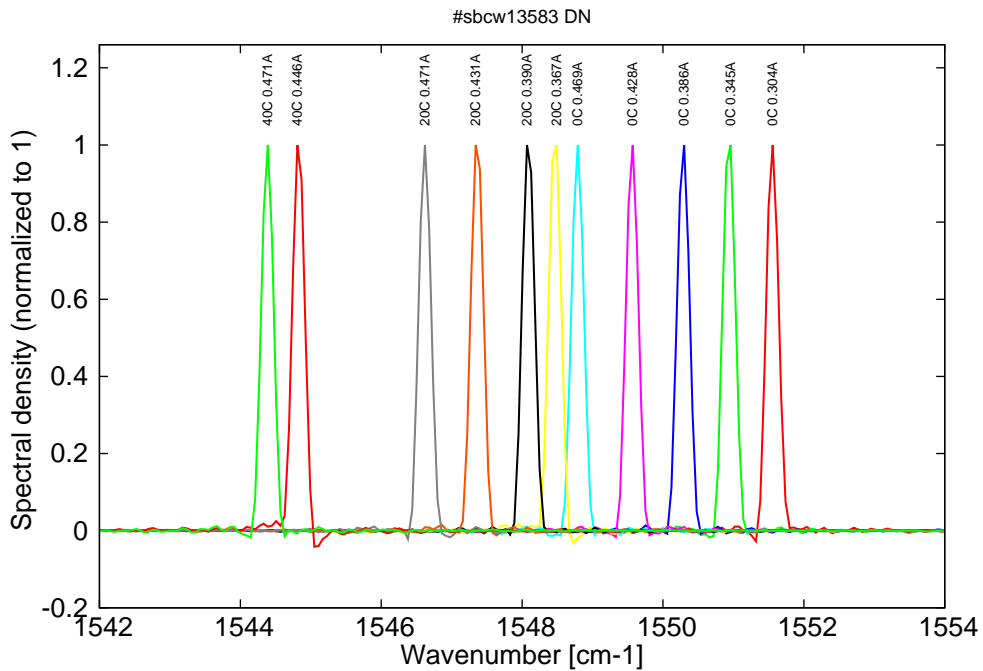


Figure 3: spectra at 0C, 20C and 40C in continuous-wave operation (front resistor current  $I_F = 0A$  and back resistor current  $I_B = 0A$ )

# Vernier characterization

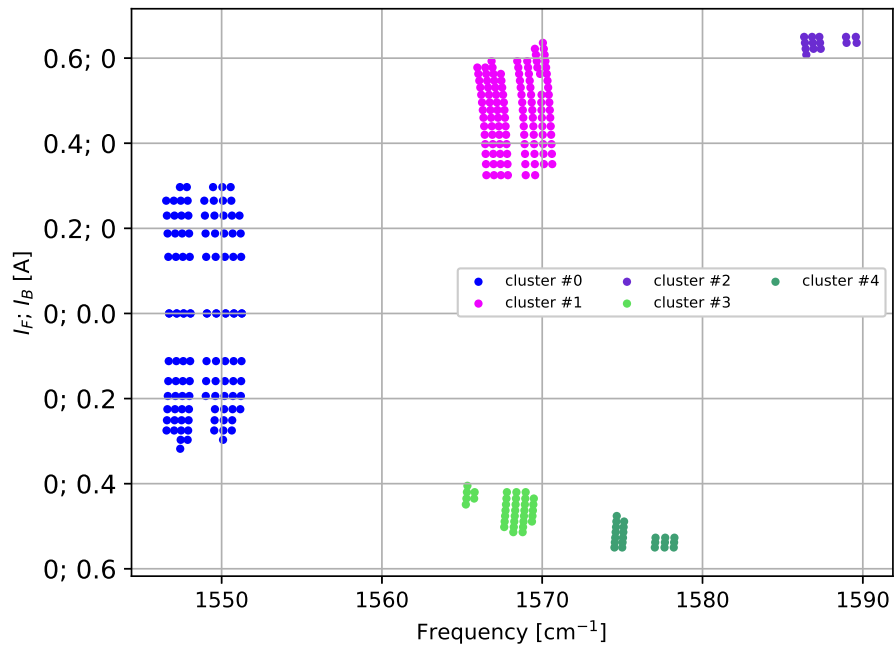


Figure 4: Emission frequency as a function of electrical current on the front resistor  $I_F$  or back resistor  $I_B$ . Either the back or the front resistors are heated, while no electrical current is flowing through the other resistor.

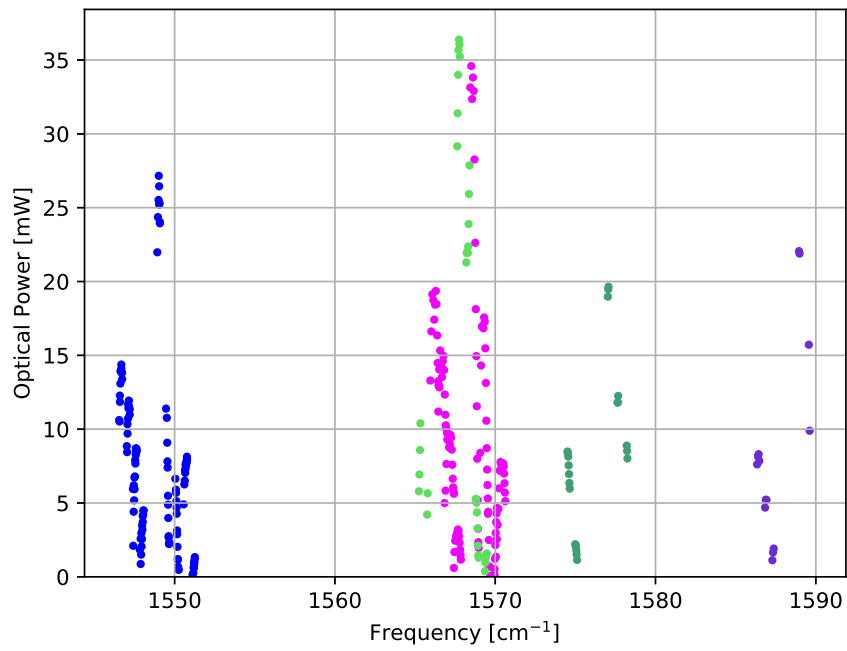


Figure 5: Optical power as a function of emission frequency.

Cluster	$I_B$ [A]	$V_B$ [V]	$I_F$ [A]	$V_F$ [V]	$I_L$ [A]	$V_L$ [V]	Freq [ $\text{cm}^{-1}$ ]	T [C]	$P_{\text{opt}}$ [mW]
#0-Back	0.00 - 0.32	0.0 - 1.4	0	0	0.32 - 0.47	11.5 - 12.9	1546.6 - 1551.3	0 - 20	27
#0-Front	0	0	0.00 - 0.30	0.0 - 1.2	0.32 - 0.47	11.5 - 12.9	1546.5 - 1551.3	0 - 20	26
#1-Front	0	0	0.33 - 0.64	1.3 - 2.5	0.35 - 0.47	11.5 - 12.7	1566.0 - 1570.6	0 - 20	35
#2-Front	0	0	0.61 - 0.65	2.5 - 2.8	0.42 - 0.47	11.6 - 12.4	1586.3 - 1589.6	0 - 20	22
#3-Back	0.41 - 0.51	1.8 - 2.1	0	0	0.35 - 0.47	11.7 - 12.7	1565.2 - 1569.5	0 - 20	36
#4-Back	0.48 - 0.55	2.1 - 2.4	0	0	0.38 - 0.47	11.9 - 12.6	1574.5 - 1578.2	0 - 20	20

Table 1: Overview of the clusters.

Details of cluster #0-Back

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.0	0.0	0.194	0.786	0.15	0.452	12.83	5.80	5.95	27	0	1549.01
0.0	0.0	0.159	0.631	0.10	0.452	12.85	5.81	5.91	26	0	1549.03
0.0	0.0	0.112	0.422	0.05	0.452	12.88	5.82	5.87	25	0	1549.06
0.0	0.0	0.0	0.0	0.00	0.452	12.95	5.85	5.85	24	0	1549.08
0.0	0.0	0.0	0.0	0.00	0.452	12.94	5.85	5.85	24	0	1549.08
0.0	0.0	0.275	1.138	0.31	0.418	12.47	5.21	5.53	9	0	1549.54
0.0	0.0	0.251	1.034	0.26	0.418	12.49	5.22	5.48	7	0	1549.56
0.0	0.0	0.225	0.921	0.21	0.418	12.50	5.23	5.43	5	0	1549.58
0.0	0.0	0.194	0.786	0.15	0.418	12.52	5.23	5.39	4	0	1549.61
0.0	0.0	0.159	0.631	0.10	0.418	12.55	5.24	5.34	3	0	1549.63
0.0	0.0	0.112	0.422	0.05	0.418	12.58	5.26	5.30	2	0	1549.65
0.0	0.0	0.0	0.0	0.00	0.418	12.64	5.28	5.28	2	0	1549.67
0.0	0.0	0.0	0.0	0.00	0.418	12.64	5.28	5.28	2	0	1549.67
0.0	0.0	0.297	1.234	0.37	0.383	12.14	4.65	5.02	6	0	1550.09
0.0	0.0	0.275	1.138	0.31	0.383	12.15	4.66	4.97	5	0	1550.11
0.0	0.0	0.251	1.034	0.26	0.383	12.17	4.66	4.92	4	0	1550.13
0.0	0.0	0.225	0.921	0.21	0.383	12.18	4.67	4.87	3	0	1550.15
0.0	0.0	0.194	0.786	0.15	0.383	12.21	4.67	4.83	2	0	1550.18
0.0	0.0	0.159	0.631	0.10	0.383	12.23	4.68	4.78	1	0	1550.20
0.0	0.0	0.112	0.422	0.05	0.383	12.26	4.69	4.74	1	0	1550.22
0.0	0.0	0.0	0.0	0.00	0.383	12.32	4.72	4.72	0	0	1550.25
0.0	0.0	0.0	0.0	0.00	0.383	12.32	4.72	4.72	0	0	1550.25
0.0	0.0	0.275	1.138	0.31	0.349	11.84	4.13	4.44	7	0	1550.64
0.0	0.0	0.251	1.034	0.26	0.349	11.85	4.14	4.40	7	0	1550.66
0.0	0.0	0.225	0.921	0.21	0.349	11.87	4.14	4.35	7	0	1550.68
0.0	0.0	0.194	0.786	0.15	0.349	11.89	4.15	4.30	8	0	1550.71
0.0	0.0	0.159	0.631	0.10	0.349	11.91	4.16	4.26	8	0	1550.73
0.0	0.0	0.112	0.422	0.05	0.349	11.94	4.17	4.22	8	0	1550.75
0.0	0.0	0.0	0.0	0.00	0.349	12.00	4.19	4.19	8	0	1550.77
0.0	0.0	0.0	0.0	0.00	0.349	12.00	4.19	4.19	8	0	1550.77
0.0	0.0	0.225	0.921	0.21	0.315	11.54	3.64	3.84	0	0	1551.17
0.0	0.0	0.194	0.786	0.15	0.315	11.56	3.64	3.79	1	0	1551.20
0.0	0.0	0.159	0.631	0.10	0.315	11.59	3.65	3.75	1	0	1551.22
0.0	0.0	0.112	0.422	0.05	0.315	11.62	3.66	3.71	1	0	1551.24
0.0	0.0	0.0	0.0	0.00	0.315	11.68	3.68	3.68	1	0	1551.26
0.0	0.0	0.0	0.0	0.00	0.315	11.68	3.68	3.68	1	0	1551.26
0.0	0.0	0.275	1.22	0.34	0.468	12.43	5.82	6.15	11	20	1546.56
0.0	0.0	0.251	1.085	0.27	0.468	12.44	5.82	6.10	12	20	1546.59
0.0	0.0	0.225	0.96	0.22	0.468	12.46	5.83	6.05	13	20	1546.62
0.0	0.0	0.194	0.812	0.16	0.468	12.48	5.84	6.00	14	20	1546.64
0.0	0.0	0.159	0.644	0.10	0.468	12.51	5.85	5.96	14	20	1546.67
0.0	0.0	0.112	0.415	0.05	0.468	12.54	5.87	5.91	14	20	1546.70
0.0	0.0	0.0	0.0	0.00	0.468	12.57	5.88	5.88	14	20	1546.72
0.0	0.0	0.0	0.0	0.00	0.468	12.59	5.89	5.89	13	20	1546.73
0.0	0.0	0.275	1.22	0.34	0.442	12.19	5.39	5.73	8	20	1547.04
0.0	0.0	0.251	1.085	0.27	0.442	12.21	5.40	5.67	10	20	1547.06

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$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[ $cm^{-1}$ ]
0.0	0.0	0.225	0.96	0.22	0.442	12.23	5.41	5.62	11	20	1547.09
0.0	0.0	0.194	0.812	0.16	0.442	12.25	5.41	5.57	11	20	1547.12
0.0	0.0	0.159	0.644	0.10	0.442	12.27	5.43	5.53	12	20	1547.15
0.0	0.0	0.112	0.415	0.05	0.442	12.31	5.44	5.49	11	20	1547.17
0.0	0.0	0.0	0.0	0.00	0.442	12.34	5.45	5.45	11	20	1547.19
0.0	0.0	0.0	0.0	0.00	0.442	12.35	5.46	5.46	11	20	1547.20
0.0	0.0	0.318	1.428	0.45	0.417	11.94	4.98	5.43	2	20	1547.42
0.0	0.0	0.297	1.328	0.39	0.417	11.96	4.99	5.38	4	20	1547.45
0.0	0.0	0.275	1.22	0.34	0.417	11.97	4.99	5.33	5	20	1547.47
0.0	0.0	0.251	1.085	0.27	0.417	11.99	5.00	5.27	6	20	1547.50
0.0	0.0	0.225	0.96	0.22	0.417	12.01	5.01	5.22	7	20	1547.53
0.0	0.0	0.194	0.812	0.16	0.417	12.03	5.02	5.17	8	20	1547.55
0.0	0.0	0.159	0.644	0.10	0.417	12.05	5.03	5.13	8	20	1547.58
0.0	0.0	0.112	0.415	0.05	0.417	12.08	5.04	5.08	8	20	1547.61
0.0	0.0	0.0	0.0	0.00	0.417	12.12	5.05	5.05	9	20	1547.62
0.0	0.0	0.0	0.0	0.00	0.417	12.12	5.06	5.06	9	20	1547.63
0.0	0.0	0.297	1.328	0.39	0.391	11.72	4.58	4.98	1	20	1547.88
0.0	0.0	0.275	1.22	0.34	0.391	11.74	4.59	4.92	2	20	1547.91
0.0	0.0	0.251	1.085	0.27	0.391	11.75	4.60	4.87	2	20	1547.94
0.0	0.0	0.225	0.96	0.22	0.391	11.77	4.60	4.82	3	20	1547.96
0.0	0.0	0.194	0.812	0.16	0.391	11.79	4.61	4.77	3	20	1547.99
0.0	0.0	0.159	0.644	0.10	0.391	11.82	4.62	4.72	4	20	1548.01
0.0	0.0	0.112	0.415	0.05	0.391	11.85	4.63	4.68	4	20	1548.04
0.0	0.0	0.0	0.0	0.00	0.391	11.89	4.65	4.65	4	20	1548.05
0.0	0.0	0.0	0.0	0.00	0.391	11.89	4.65	4.65	4	20	1548.06

Table 2:

Details of cluster #0-Front

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.265	1.03	0.0	0.0	0.27	0.452	12.78	5.77	6.05	22	0	1548.92
0.23	0.887	0.0	0.0	0.20	0.452	12.80	5.79	5.99	24	0	1548.96
0.188	0.714	0.0	0.0	0.13	0.452	12.83	5.80	5.93	26	0	1549.00
0.133	0.482	0.0	0.0	0.06	0.452	12.87	5.82	5.88	25	0	1549.04
0.0	0.0	0.0	0.0	0.00	0.452	12.95	5.85	5.85	24	0	1549.08
0.0	0.0	0.0	0.0	0.00	0.452	12.94	5.85	5.85	24	0	1549.08
0.297	1.159	0.0	0.0	0.34	0.418	12.45	5.20	5.55	11	0	1549.47
0.265	1.03	0.0	0.0	0.27	0.418	12.47	5.21	5.49	11	0	1549.51
0.23	0.887	0.0	0.0	0.20	0.418	12.49	5.22	5.43	8	0	1549.55
0.188	0.714	0.0	0.0	0.13	0.418	12.53	5.24	5.37	5	0	1549.59
0.133	0.482	0.0	0.0	0.06	0.418	12.57	5.25	5.32	3	0	1549.63
0.0	0.0	0.0	0.0	0.00	0.418	12.64	5.28	5.28	2	0	1549.67
0.0	0.0	0.0	0.0	0.00	0.418	12.64	5.28	5.28	2	0	1549.67
0.297	1.159	0.0	0.0	0.34	0.383	12.13	4.65	4.99	7	0	1550.05
0.265	1.03	0.0	0.0	0.27	0.383	12.15	4.65	4.93	6	0	1550.08
0.23	0.887	0.0	0.0	0.20	0.383	12.18	4.66	4.87	5	0	1550.12
0.188	0.714	0.0	0.0	0.13	0.383	12.21	4.68	4.81	3	0	1550.16
0.133	0.482	0.0	0.0	0.06	0.383	12.25	4.69	4.76	1	0	1550.20
0.0	0.0	0.0	0.0	0.00	0.383	12.32	4.72	4.72	0	0	1550.25
0.0	0.0	0.0	0.0	0.00	0.383	12.32	4.72	4.72	0	0	1550.25
0.297	1.159	0.0	0.0	0.34	0.349	11.82	4.12	4.47	5	0	1550.56
0.265	1.03	0.0	0.0	0.27	0.349	11.84	4.13	4.40	6	0	1550.61
0.23	0.887	0.0	0.0	0.20	0.349	11.86	4.14	4.34	7	0	1550.65
0.188	0.714	0.0	0.0	0.13	0.349	11.89	4.15	4.28	8	0	1550.69
0.133	0.482	0.0	0.0	0.06	0.349	11.93	4.16	4.23	8	0	1550.73
0.0	0.0	0.0	0.0	0.00	0.349	12.00	4.19	4.19	8	0	1550.77
0.0	0.0	0.0	0.0	0.00	0.349	12.00	4.19	4.19	8	0	1550.77
0.23	0.887	0.0	0.0	0.20	0.315	11.54	3.63	3.84	0	0	1551.12
0.188	0.714	0.0	0.0	0.13	0.315	11.57	3.64	3.78	1	0	1551.19
0.133	0.482	0.0	0.0	0.06	0.315	11.60	3.65	3.72	1	0	1551.22
0.0	0.0	0.0	0.0	0.00	0.315	11.68	3.68	3.68	1	0	1551.26
0.0	0.0	0.0	0.0	0.00	0.315	11.68	3.68	3.68	1	0	1551.26
0.265	1.062	0.0	0.0	0.28	0.468	12.40	5.81	6.09	11	20	1546.54
0.23	0.91	0.0	0.0	0.21	0.468	12.43	5.82	6.03	12	20	1546.59
0.188	0.729	0.0	0.0	0.14	0.468	12.46	5.83	5.97	14	20	1546.63
0.133	0.489	0.0	0.0	0.07	0.468	12.50	5.85	5.91	14	20	1546.67
0.0	0.0	0.0	0.0	0.00	0.468	12.57	5.88	5.88	14	20	1546.72
0.0	0.0	0.0	0.0	0.00	0.468	12.59	5.89	5.89	13	20	1546.73
0.265	1.062	0.0	0.0	0.28	0.442	12.18	5.38	5.66	9	20	1547.02
0.23	0.91	0.0	0.0	0.21	0.442	12.20	5.39	5.60	10	20	1547.06
0.188	0.729	0.0	0.0	0.14	0.442	12.23	5.41	5.54	12	20	1547.10
0.133	0.489	0.0	0.0	0.07	0.442	12.27	5.42	5.49	12	20	1547.15
0.0	0.0	0.0	0.0	0.00	0.442	12.34	5.45	5.45	11	20	1547.19
0.0	0.0	0.0	0.0	0.00	0.442	12.35	5.46	5.46	11	20	1547.20
0.297	1.2	0.0	0.0	0.36	0.417	11.94	4.98	5.33	6	20	1547.40
0.265	1.062	0.0	0.0	0.28	0.417	11.96	4.99	5.27	6	20	1547.45

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$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.23	0.91	0.0	0.0	0.21	0.417	11.98	5.00	5.20	7	20	1547.49
0.188	0.729	0.0	0.0	0.14	0.417	12.01	5.01	5.15	8	20	1547.54
0.133	0.489	0.0	0.0	0.07	0.417	12.04	5.02	5.09	9	20	1547.58
0.0	0.0	0.0	0.0	0.00	0.417	12.12	5.05	5.05	9	20	1547.62
0.0	0.0	0.0	0.0	0.00	0.417	12.12	5.06	5.06	9	20	1547.63
0.297	1.2	0.0	0.0	0.36	0.391	11.71	4.58	4.93	2	20	1547.83
0.265	1.062	0.0	0.0	0.28	0.391	11.72	4.58	4.87	3	20	1547.88
0.23	0.91	0.0	0.0	0.21	0.391	11.75	4.59	4.80	3	20	1547.93
0.188	0.729	0.0	0.0	0.14	0.391	11.78	4.61	4.74	3	20	1547.97
0.133	0.489	0.0	0.0	0.07	0.391	11.82	4.62	4.69	4	20	1548.01
0.0	0.0	0.0	0.0	0.00	0.391	11.89	4.65	4.65	4	20	1548.05
0.0	0.0	0.0	0.0	0.00	0.391	11.89	4.65	4.65	4	20	1548.06

Table 3:



Details of cluster #1-Front

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.593	2.363	0.0	0.0	1.40	0.452	12.47	5.64	7.04	33	0	1568.44
0.578	2.329	0.0	0.0	1.35	0.452	12.48	5.64	6.99	35	0	1568.51
0.563	2.267	0.0	0.0	1.28	0.452	12.48	5.64	6.92	32	0	1568.56
0.547	2.202	0.0	0.0	1.20	0.452	12.50	5.65	6.86	34	0	1568.61
0.531	2.141	0.0	0.0	1.14	0.452	12.51	5.65	6.79	33	0	1568.66
0.514	2.068	0.0	0.0	1.06	0.452	12.52	5.66	6.72	28	0	1568.71
0.496	2.008	0.0	0.0	1.00	0.452	12.54	5.67	6.66	23	0	1568.75
0.478	1.907	0.0	0.0	0.91	0.452	12.55	5.67	6.58	18	0	1568.79
0.46	1.818	0.0	0.0	0.84	0.452	12.56	5.68	6.52	15	0	1568.82
0.44	1.735	0.0	0.0	0.76	0.452	12.59	5.69	6.45	12	0	1568.85
0.42	1.654	0.0	0.0	0.69	0.452	12.61	5.70	6.39	8	0	1568.88
0.398	1.565	0.0	0.0	0.62	0.452	12.63	5.71	6.33	5	0	1568.90
0.375	1.472	0.0	0.0	0.55	0.452	12.65	5.72	6.27	3	0	1568.93
0.351	1.377	0.0	0.0	0.48	0.452	12.68	5.73	6.21	2	0	1568.95
0.325	1.272	0.0	0.0	0.41	0.452	12.71	5.74	6.16	2	0	1568.97
0.593	2.363	0.0	0.0	1.40	0.418	12.17	5.09	6.49	8	0	1569.07
0.578	2.329	0.0	0.0	1.35	0.418	12.18	5.09	6.44	14	0	1569.12
0.563	2.267	0.0	0.0	1.28	0.418	12.18	5.09	6.37	17	0	1569.17
0.547	2.202	0.0	0.0	1.20	0.418	12.20	5.10	6.31	17	0	1569.22
0.531	2.141	0.0	0.0	1.14	0.418	12.21	5.10	6.24	17	0	1569.26
0.514	2.068	0.0	0.0	1.06	0.418	12.22	5.11	6.17	18	0	1569.30
0.496	2.008	0.0	0.0	1.00	0.418	12.24	5.11	6.11	17	0	1569.35
0.478	1.907	0.0	0.0	0.91	0.418	12.25	5.12	6.03	15	0	1569.38
0.46	1.818	0.0	0.0	0.84	0.418	12.27	5.13	5.96	13	0	1569.42
0.44	1.735	0.0	0.0	0.76	0.418	12.29	5.14	5.90	11	0	1569.45
0.42	1.654	0.0	0.0	0.69	0.418	12.31	5.14	5.84	9	0	1569.47
0.398	1.565	0.0	0.0	0.62	0.418	12.33	5.15	5.78	7	0	1569.50
0.375	1.472	0.0	0.0	0.55	0.418	12.36	5.17	5.72	6	0	1569.52
0.351	1.377	0.0	0.0	0.48	0.418	12.38	5.18	5.66	5	0	1569.54
0.622	2.485	0.0	0.0	1.55	0.383	11.81	4.52	6.07	4	0	1569.54
0.325	1.272	0.0	0.0	0.41	0.418	12.41	5.19	5.60	4	0	1569.56
0.608	2.421	0.0	0.0	1.47	0.383	11.85	4.54	6.01	2	0	1569.61
0.593	2.363	0.0	0.0	1.40	0.383	11.85	4.54	5.94	1	0	1569.66
0.578	2.329	0.0	0.0	1.35	0.383	11.86	4.54	5.89	0	0	1569.70
0.563	2.267	0.0	0.0	1.28	0.383	11.87	4.55	5.82	0	0	1569.87
0.496	2.008	0.0	0.0	1.00	0.383	11.93	4.57	5.56	0	0	1569.94
0.478	1.907	0.0	0.0	0.91	0.383	11.94	4.57	5.48	1	0	1569.96
0.514	2.068	0.0	0.0	1.06	0.383	11.91	4.56	5.62	0	0	1569.96
0.46	1.818	0.0	0.0	0.84	0.383	11.96	4.58	5.42	1	0	1569.98
0.44	1.735	0.0	0.0	0.76	0.383	11.98	4.59	5.35	2	0	1570.01
0.42	1.654	0.0	0.0	0.69	0.383	12.00	4.60	5.29	3	0	1570.03
0.636	2.541	0.0	0.0	1.62	0.349	11.48	4.01	5.62	1	0	1570.04
0.398	1.565	0.0	0.0	0.62	0.383	12.02	4.61	5.23	4	0	1570.06
0.375	1.472	0.0	0.0	0.55	0.383	12.05	4.62	5.17	4	0	1570.08
0.622	2.485	0.0	0.0	1.55	0.349	11.50	4.01	5.56	3	0	1570.10
0.351	1.377	0.0	0.0	0.48	0.383	12.07	4.62	5.11	5	0	1570.11

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$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.608	2.421	0.0	0.0	1.47	0.349	11.54	4.03	5.50	4	0	1570.15
0.593	2.363	0.0	0.0	1.40	0.349	11.54	4.03	5.43	5	0	1570.20
0.578	2.329	0.0	0.0	1.35	0.349	11.55	4.03	5.38	6	0	1570.24
0.563	2.267	0.0	0.0	1.28	0.349	11.56	4.03	5.31	7	0	1570.28
0.547	2.202	0.0	0.0	1.20	0.349	11.58	4.04	5.25	8	0	1570.33
0.531	2.141	0.0	0.0	1.14	0.349	11.59	4.05	5.18	8	0	1570.37
0.514	2.068	0.0	0.0	1.06	0.349	11.61	4.05	5.11	7	0	1570.41
0.496	2.008	0.0	0.0	1.00	0.349	11.62	4.06	5.05	7	0	1570.44
0.478	1.907	0.0	0.0	0.91	0.349	11.64	4.06	4.97	8	0	1570.47
0.46	1.818	0.0	0.0	0.84	0.349	11.66	4.07	4.90	8	0	1570.50
0.44	1.735	0.0	0.0	0.76	0.349	11.67	4.07	4.84	7	0	1570.53
0.42	1.654	0.0	0.0	0.69	0.349	11.70	4.08	4.78	7	0	1570.56
0.398	1.565	0.0	0.0	0.62	0.349	11.72	4.09	4.71	6	0	1570.58
0.375	1.472	0.0	0.0	0.55	0.349	11.74	4.10	4.65	6	0	1570.60
0.351	1.377	0.0	0.0	0.48	0.349	11.77	4.11	4.59	5	0	1570.63
0.578	2.401	0.0	0.0	1.39	0.468	12.12	5.67	7.06	13	20	1565.95
0.563	2.338	0.0	0.0	1.32	0.468	12.13	5.68	6.99	17	20	1566.01
0.547	2.26	0.0	0.0	1.24	0.468	12.14	5.68	6.92	19	20	1566.08
0.531	2.192	0.0	0.0	1.16	0.468	12.15	5.69	6.85	19	20	1566.14
0.514	2.131	0.0	0.0	1.10	0.468	12.16	5.69	6.79	17	20	1566.20
0.496	2.048	0.0	0.0	1.02	0.468	12.19	5.70	6.72	18	20	1566.25
0.478	1.973	0.0	0.0	0.94	0.468	12.20	5.71	6.65	19	20	1566.29
0.46	1.902	0.0	0.0	0.87	0.468	12.22	5.72	6.59	18	20	1566.34
0.44	1.817	0.0	0.0	0.80	0.468	12.24	5.73	6.53	16	20	1566.38
0.42	1.727	0.0	0.0	0.73	0.468	12.25	5.73	6.46	14	20	1566.41
0.398	1.635	0.0	0.0	0.65	0.468	12.27	5.74	6.39	13	20	1566.44
0.578	2.401	0.0	0.0	1.39	0.442	11.89	5.26	6.64	11	20	1566.45
0.375	1.536	0.0	0.0	0.58	0.468	12.30	5.76	6.33	13	20	1566.47
0.351	1.433	0.0	0.0	0.50	0.468	12.32	5.77	6.27	13	20	1566.49
0.563	2.338	0.0	0.0	1.32	0.442	11.90	5.26	6.58	14	20	1566.51
0.325	1.32	0.0	0.0	0.43	0.468	12.35	5.78	6.21	13	20	1566.52
0.547	2.26	0.0	0.0	1.24	0.442	11.92	5.27	6.50	15	20	1566.57
0.531	2.192	0.0	0.0	1.16	0.442	11.93	5.27	6.44	14	20	1566.63
0.514	2.131	0.0	0.0	1.10	0.442	11.94	5.28	6.37	14	20	1566.68
0.496	2.048	0.0	0.0	1.02	0.442	11.96	5.29	6.30	15	20	1566.73
0.478	1.973	0.0	0.0	0.94	0.442	11.97	5.29	6.24	15	20	1566.77
0.46	1.902	0.0	0.0	0.87	0.442	11.99	5.30	6.18	14	20	1566.81
0.593	2.494	0.0	0.0	1.48	0.417	11.66	4.86	6.34	5	20	1566.84
0.44	1.817	0.0	0.0	0.80	0.442	12.01	5.31	6.11	12	20	1566.85
0.42	1.727	0.0	0.0	0.73	0.442	12.03	5.32	6.04	11	20	1566.89
0.578	2.401	0.0	0.0	1.39	0.417	11.68	4.87	6.26	6	20	1566.90
0.398	1.635	0.0	0.0	0.65	0.442	12.05	5.33	5.98	10	20	1566.92
0.375	1.536	0.0	0.0	0.58	0.442	12.07	5.34	5.91	10	20	1566.94
0.563	2.338	0.0	0.0	1.32	0.417	11.69	4.87	6.19	8	20	1566.96
0.351	1.433	0.0	0.0	0.50	0.442	12.10	5.35	5.85	10	20	1566.97
0.325	1.32	0.0	0.0	0.43	0.442	12.13	5.36	5.79	10	20	1566.99
0.547	2.26	0.0	0.0	1.24	0.417	11.70	4.88	6.12	9	20	1567.01
0.531	2.192	0.0	0.0	1.16	0.417	11.71	4.88	6.05	9	20	1567.07

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$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.514	2.131	0.0	0.0	1.10	0.417	11.72	4.89	5.98	9	20	1567.12
0.496	2.048	0.0	0.0	1.02	0.417	11.74	4.90	5.91	9	20	1567.17
0.478	1.973	0.0	0.0	0.94	0.417	11.76	4.90	5.85	10	20	1567.21
0.46	1.902	0.0	0.0	0.87	0.417	11.78	4.91	5.79	9	20	1567.25
0.44	1.817	0.0	0.0	0.80	0.417	11.80	4.92	5.72	9	20	1567.29
0.42	1.727	0.0	0.0	0.73	0.417	11.82	4.93	5.65	8	20	1567.32
0.398	1.635	0.0	0.0	0.65	0.417	11.84	4.94	5.59	7	20	1567.35
0.375	1.536	0.0	0.0	0.58	0.417	11.86	4.95	5.52	6	20	1567.38
0.351	1.433	0.0	0.0	0.50	0.417	11.88	4.96	5.46	6	20	1567.40
0.563	2.338	0.0	0.0	1.32	0.391	11.46	4.48	5.80	1	20	1567.42
0.325	1.32	0.0	0.0	0.43	0.417	11.91	4.97	5.40	6	20	1567.42
0.547	2.26	0.0	0.0	1.24	0.391	11.48	4.49	5.72	2	20	1567.45
0.531	2.192	0.0	0.0	1.16	0.391	11.48	4.49	5.65	2	20	1567.50
0.514	2.131	0.0	0.0	1.10	0.391	11.50	4.50	5.59	3	20	1567.56
0.496	2.048	0.0	0.0	1.02	0.391	11.52	4.51	5.52	3	20	1567.61
0.478	1.973	0.0	0.0	0.94	0.391	11.53	4.51	5.45	3	20	1567.64
0.46	1.902	0.0	0.0	0.87	0.391	11.55	4.52	5.39	3	20	1567.68
0.44	1.817	0.0	0.0	0.80	0.391	11.57	4.52	5.32	3	20	1567.72
0.42	1.727	0.0	0.0	0.73	0.391	11.59	4.53	5.26	3	20	1567.75
0.398	1.635	0.0	0.0	0.65	0.391	11.61	4.54	5.19	2	20	1567.78
0.375	1.536	0.0	0.0	0.58	0.391	11.64	4.55	5.13	2	20	1567.81
0.351	1.433	0.0	0.0	0.50	0.391	11.66	4.56	5.06	1	20	1567.83
0.325	1.32	0.0	0.0	0.43	0.391	11.69	4.57	5.00	1	20	1567.86

Table 4:

Details of cluster #2-Front

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.65	2.594	0.0	0.0	1.69	0.452	12.38	5.59	7.28	22	0	1588.95
0.636	2.541	0.0	0.0	1.62	0.452	12.39	5.60	7.22	22	0	1588.99
0.65	2.594	0.0	0.0	1.69	0.418	12.08	5.05	6.74	16	0	1589.56
0.636	2.541	0.0	0.0	1.62	0.418	12.10	5.06	6.67	10	0	1589.62
0.65	2.755	0.0	0.0	1.79	0.468	12.04	5.63	7.42	8	20	1586.34
0.636	2.687	0.0	0.0	1.71	0.468	12.05	5.64	7.35	8	20	1586.39
0.622	2.624	0.0	0.0	1.63	0.468	12.07	5.65	7.28	8	20	1586.44
0.608	2.546	0.0	0.0	1.55	0.468	12.09	5.66	7.21	8	20	1586.48
0.65	2.755	0.0	0.0	1.79	0.442	11.81	5.22	7.01	5	20	1586.84
0.636	2.687	0.0	0.0	1.71	0.442	11.83	5.23	6.94	5	20	1586.88
0.622	2.624	0.0	0.0	1.63	0.442	11.85	5.24	6.87	5	20	1586.93
0.65	2.755	0.0	0.0	1.79	0.417	11.60	4.84	6.63	1	20	1587.29
0.636	2.687	0.0	0.0	1.71	0.417	11.61	4.84	6.55	2	20	1587.33
0.622	2.624	0.0	0.0	1.63	0.417	11.63	4.85	6.48	2	20	1587.38

Table 5:

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[ $\text{cm}^{-1}$ ]
0.0	0.0	0.502	2.08	1.04	0.452	12.61	5.70	6.74	29	0	1567.63
0.0	0.0	0.489	2.036	1.00	0.452	12.61	5.70	6.70	31	0	1567.66
0.0	0.0	0.476	1.983	0.94	0.452	12.62	5.71	6.65	34	0	1567.68
0.0	0.0	0.463	1.997	0.92	0.452	12.63	5.71	6.63	36	0	1567.71
0.0	0.0	0.449	1.9	0.85	0.452	12.64	5.72	6.57	36	0	1567.74
0.0	0.0	0.435	1.858	0.81	0.452	12.65	5.72	6.53	36	0	1567.77
0.0	0.0	0.42	1.761	0.74	0.452	12.66	5.72	6.46	35	0	1567.80
0.0	0.0	0.514	2.123	1.09	0.418	12.29	5.14	6.23	21	0	1568.20
0.0	0.0	0.502	2.08	1.04	0.418	12.31	5.14	6.19	22	0	1568.23
0.0	0.0	0.489	2.036	1.00	0.418	12.31	5.15	6.14	22	0	1568.26
0.0	0.0	0.476	1.983	0.94	0.418	12.32	5.15	6.09	22	0	1568.29
0.0	0.0	0.463	1.997	0.92	0.418	12.33	5.15	6.08	22	0	1568.31
0.0	0.0	0.449	1.9	0.85	0.418	12.34	5.16	6.01	24	0	1568.34
0.0	0.0	0.435	1.858	0.81	0.418	12.35	5.16	5.97	26	0	1568.36
0.0	0.0	0.42	1.761	0.74	0.418	12.36	5.17	5.91	28	0	1568.39
0.0	0.0	0.514	2.123	1.09	0.383	11.98	4.59	5.68	5	0	1568.78
0.0	0.0	0.502	2.08	1.04	0.383	11.99	4.59	5.64	5	0	1568.80
0.0	0.0	0.489	2.036	1.00	0.383	11.99	4.59	5.59	5	0	1568.83
0.0	0.0	0.476	1.983	0.94	0.383	12.00	4.60	5.54	4	0	1568.86
0.0	0.0	0.463	1.997	0.92	0.383	12.01	4.60	5.53	3	0	1568.89
0.0	0.0	0.449	1.9	0.85	0.383	12.02	4.61	5.46	2	0	1568.92
0.0	0.0	0.435	1.858	0.81	0.383	12.04	4.61	5.42	1	0	1568.94
0.0	0.0	0.42	1.761	0.74	0.383	12.04	4.61	5.35	1	0	1568.97
0.0	0.0	0.489	2.036	1.00	0.349	11.68	4.08	5.07	0	0	1569.36
0.0	0.0	0.476	1.983	0.94	0.349	11.69	4.08	5.02	1	0	1569.39
0.0	0.0	0.463	1.997	0.92	0.349	11.70	4.08	5.01	1	0	1569.42
0.0	0.0	0.449	1.9	0.85	0.349	11.71	4.09	4.94	2	0	1569.45
0.0	0.0	0.435	1.858	0.81	0.349	11.72	4.09	4.90	2	0	1569.48
0.0	0.0	0.449	1.962	0.88	0.468	12.29	5.75	6.63	6	20	1565.24
0.0	0.0	0.435	1.911	0.83	0.468	12.30	5.76	6.59	7	20	1565.27
0.0	0.0	0.42	1.837	0.77	0.468	12.32	5.76	6.54	9	20	1565.30
0.0	0.0	0.405	1.785	0.72	0.468	12.33	5.77	6.49	10	20	1565.33
0.0	0.0	0.435	1.911	0.83	0.442	12.07	5.34	6.17	4	20	1565.75
0.0	0.0	0.42	1.837	0.77	0.442	12.09	5.34	6.11	6	20	1565.78

Table 6:

Details of cluster #4-Back

$I_F$	$V_F$	$I_B$	$V_B$	$P_{elR}$	$I_L$	$V_L$	$P_L$	$P_{tot}$	$P_{opt}$	T	freq
[A]	[V]	[A]	[V]	[W]	[A]	[V]	[W]	[W]	[mW]	[C]	[cm <sup>-1</sup> ]
0.0	0.0	0.55	2.291	1.26	0.452	12.56	5.68	6.94	19	0	1577.03
0.0	0.0	0.538	2.237	1.20	0.452	12.56	5.68	6.88	19	0	1577.05
0.0	0.0	0.527	2.189	1.15	0.452	12.57	5.68	6.84	20	0	1577.07
0.0	0.0	0.55	2.291	1.26	0.418	12.25	5.12	6.38	12	0	1577.63
0.0	0.0	0.538	2.237	1.20	0.418	12.26	5.13	6.33	12	0	1577.65
0.0	0.0	0.527	2.189	1.15	0.418	12.27	5.13	6.28	12	0	1577.67
0.0	0.0	0.55	2.291	1.26	0.383	11.95	4.57	5.83	9	0	1578.21
0.0	0.0	0.538	2.237	1.20	0.383	11.95	4.58	5.78	9	0	1578.23
0.0	0.0	0.527	2.189	1.15	0.383	11.96	4.58	5.74	8	0	1578.25
0.0	0.0	0.55	2.358	1.30	0.468	12.16	5.69	6.99	8	20	1574.51
0.0	0.0	0.538	2.304	1.24	0.468	12.17	5.70	6.94	8	20	1574.53
0.0	0.0	0.527	2.264	1.19	0.468	12.19	5.70	6.90	8	20	1574.55
0.0	0.0	0.514	2.258	1.16	0.468	12.25	5.73	6.90	8	20	1574.58
0.0	0.0	0.502	2.192	1.10	0.468	12.23	5.73	6.83	7	20	1574.61
0.0	0.0	0.489	2.103	1.03	0.468	12.25	5.73	6.76	6	20	1574.63
0.0	0.0	0.476	2.077	0.99	0.468	12.26	5.74	6.73	6	20	1574.65
0.0	0.0	0.55	2.358	1.30	0.442	11.93	5.27	6.57	2	20	1574.99
0.0	0.0	0.538	2.304	1.24	0.442	11.95	5.28	6.52	2	20	1575.01
0.0	0.0	0.527	2.264	1.19	0.442	11.96	5.29	6.48	2	20	1575.04
0.0	0.0	0.514	2.258	1.16	0.442	12.03	5.32	6.48	2	20	1575.06
0.0	0.0	0.502	2.192	1.10	0.442	12.01	5.31	6.41	2	20	1575.08
0.0	0.0	0.489	2.103	1.03	0.442	12.03	5.32	6.34	1	20	1575.11

Table 7: