



Dispersion Calibration SOP for the Brewer Spectrometer

The Canadian Brewer Spectrometer Network
Réseau Canadien de spectrophotometric –
Brewer

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Version 2.1



Dispersion Calibration – Brewer Spectrometers

A dispersion calibration is performed to determine the relationship between the micrometer movement (steps) and the UV wavelengths passing through the exit slits of the slit mask. The UV spectrum of three different lamp sources, mercury, zinc and cadmium are scanned (PMT counts vs. wavelength) and the peak width and peak max are determined. With the use of dispersion specific software the coefficients for ozone and sulphur dioxide are calculated using this spectral data.

The following is a step by step SOP detailing the dispersion calibration procedure.

Note: Environment and Climate Change Canada (ECCC) uses DisPro to process dispersion data. DisPro is a software created by International Ozone Services (IOS) Inc. ECCC has access to DisPro via a license from IOS Inc.

Pre-Calibration

Prior to performing the dispersion calibration, the brewer must first be operationally stable and in good working order. A series of test are run and are compared to the historical data of this instrument to determine the brewer's current operational state.

As a minimum the following pre-calibration tests should be performed and deemed to have passed before the dispersion calibration can proceed.

- Status and Control (ST) for Iris and filter wheels,
- Zero zenith prism (ZE),
- Slit Mask Motor Timing Test (SH) ,
- Print out A/D monitor (AP),
- Slit Mask Run/Stop test (RS),
- Photomultiplier Dead Time test (DT),
- Grating Synchronization (HP, for MKIII Brewers only),
- Mercury Wavelength Calibration (HG),
- Standard lamp test (SL),
- Confirm gradient offset (GA, for MKIII Brewers only),
- High voltage test (HV).

Refer to Kipp & Zonen Instruction Manual for test descriptions and how to interpret results. Adjustment and changes to optimize the brewer should be performed at this point.

Dispersion Calibration Procedure

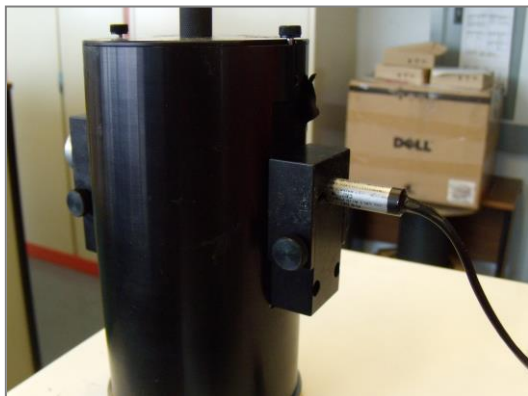
Equipment Required

- Mercury vapour lamp and power supply,



- Cadmium vapour lamp and power supply,
- Zinc vapour lamp and power supply,
- Lamp cradle housing,
- UV protective glasses and Kimwipes.

Equipment Setup

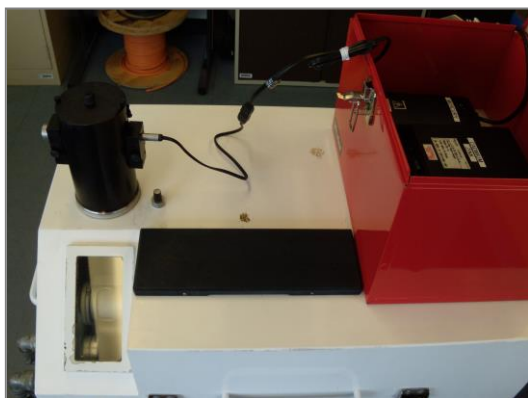


1. Place and center lamp housing over the top of the UV dome.
2. Remove the lamp appropriate storage plug from the lamp housing by loosening the two side screws and lifting the lamp holder (in the case of the mercury lamp, remove the smaller of the two plugs) and carefully slide in the lamp.

Do not touch the lamps with bare hands; use a Kimwipe or powder free gloves when handling the lamps.



3. Reinstall the lamp holder.
4. Plug the lamp into its specific power supply, plug the power supply into an outlet and turn on.
5. **While wearing UV safety glasses** loosen the top lid screws and slide open the lid of the lamp housing. Orientate the lamp so that the greatest light intensity is directed towards the UV dome and that the lamp is centered over the dome.
6. Secure the lamp in the housing by retightening the side screws while holding the lamp in place.
7. Slide the housing lid closed and retighten the screw.
8. Remove UV safety glasses.
9. Return to the computer of the Brewer being tested.
10. If the brewer is mounted on a tracker, turn the trackers azimuth function off via the IC command in the instruments DOSBOX window.



Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:49:05 3.78
menu -- RH = 5% I in: out: 60.97

mu= 2.039 Tracking Sun * za= 60.97
cm->

Enter a desired command or select a sub-menu from the following list:

command	main menu
dm	data management menu
om	observations menu
tm	test menu
hk	housekeeping menu
up	update menu
sm	summaries printout menu
sp	special operations menu
os	operational setup menu
em	extended menu

DS O3	0.0 /	0.0
ZS O3	0.0 /	0.0
DS SO2	0.0 /	0.0

DUV	at	0.0
SL R6	at 13:07:27	321
Last HG	at 14:12:15	26°C
Current temperature	26°C	

Running cf from menu

this SOP Brewer 191 is the instrument being calibrated.

Dispersion Initialization

11. Begin the dispersion calibration routine from the home brewer control screen. For the purposes of

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:03:45 3.78
menu -- RH = 5% I in: out: 67.44

mu= 2.559 Tracking Sun * za= 67.44
cm-> pd

Enter a desired command or select a sub-menu from the following list:

command	main menu
dm	data management menu
om	observations menu
tm	test menu
hk	housekeeping menu
up	update menu
sm	summaries printout menu
sp	special operations menu
os	operational setup menu
em	extended menu

DS O3	0.0 /	0.0
ZS O3	0.0 /	0.0
DS SO2	0.0 /	0.0

DUV	at	0.0
SL R6	at 13:07:27	321
Last HG	at 12:56:10	25°C
Current temperature	25°C	

Running b1 from menu

12. Start by pressing the *Ctrl-ScrLk* keys to interrupt the DosBox. Next press the *Ctrl-Home* keys to clear the screen. Then *type run* and press *enter* to restart the DosBox.

type *pd* (the *pd* command writes the data file into the Brewers D file) and then press enter.

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:04:28 3.78
menu -- RH = 5% I in: out: 67.44

mu= 2.559 Tracking Sun * za= 67.44
cm-> dsp

Enter a desired command or select a sub-menu from the following list:

command	main menu
dm	data management menu
om	observations menu
tm	test menu
hk	housekeeping menu
up	update menu
sm	summaries printout menu
sp	special operations menu
os	operational setup menu
em	extended menu

DS O3	0.0 /	0.0
ZS O3	0.0 /	0.0
DS SO2	0.0 /	0.0

DUV	at	0.0
SL R6	at 13:07:27	321
Last HG	at 12:56:10	25°C
Current temperature	25°C	

Running b1 from menu

14. Next type *dsp* and press enter.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO
in: out:

Choose lamp type:
1-Mercury lamp scan
  (Lines 1 to 3)
2-Cadmium lamp scan
  (Lines 4 to 9)
3-Zinc lamp scan
  (Lines 10 to 12)
4-Indium lamp scan
  (Lines 13 to 14)
0-Custom (manually entered) lamp scan

```

15. Press the number associated with the lamp being used.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:06:28 3.78
dsp -- RH = 5% I in: out: 67.44

Would you like to have a 10 minute lamp warm up? - Press r for previous menu:
y-Yes, schedule the warm up
n-No, don't wait, start the scans

```

16. Press *y* or *n* and then press *enter* (*n* is pressed only if the lamp has been on for a minimum of 10 minutes).

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:06:52 3.78
dsp -- RH = 5% I in: out: 67.44

Select light source - Press r for previous menu:
1-Quartz window
2-UVB dome
0-Internal Mercury lamp

```

17. Press 2 to select UV Dome and then *enter*.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:07:27 3.78
dsp -- RH = 5% I in: out: 67.44

User Selections
LN Start End Wavelength Neutral Density Lamp
1 0 1 2893.60 0 Ext:UVB
2 0 3 2967.28 1 Ext:UVB
3 0 5 3341.48 0 Ext:UVB

Enter A to accept these values, R to respecify

```

18. If the program determined wavelengths correspond with the table below, press A, if not press R to correct

Note: The wavelengths used to conduct dispersion calibrations for single brewers (S) and double brewers (D) are tabled below. The DSP calibration script automatically determines the wavelengths that will be used based on the brewer model being tested.

Lamp Type	Line (LN)	Starting Slit	Ending Slit	Wavelength AU	Brewer Model
Hg	1	0	1	2893.600	S, D
Hg	2	0	3	2967.280	S, D
Hg	3	0	5	3341.480	D
Cd	4	0	5	3080.820	S, D
Cd	5	0	5	3133.167	S, D
Cd	6	0	5	3261.055	S, D
Cd	7	0	5	3403.652	D
Cd	8	1	5	3499.950	D
Cd	9	5	5	3611.630	D
Zn	10	0	5	3018.360	S, D
Zn	11	0	5	3035.780	S, D
Zn	12	0	5	3282.330	S, D

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:08:08 3.78
dsp -- RH = 5% I in: out: 67.44

Please make sure the dispersion lamp is on
*****
Press return when ready

```

19. Press *enter* when ready.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:26:53 3.78
hg w0 RH = 11% I in: out: 84.66

Waiting until 13:28:00 for lamp warmup

DS o3 0.0 / 0.0
ZS o3 0.0 / 0.0
DS SO2 0.0 / 0.0

RH / Pr 11.2 / 1005.0
DUV at 0.0
SL R6 at 0.0
Last HG at 0°C
Current temperature 26°C

Doing dispersion test with Hg

```

20. An example of the brewer screen while waiting for a dsp test to start.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:26:53 3.78
aspl ng RH = 12% I in: * out: 84.03

Line Wavelength Lamp
1 2893.60 External Hg :UVB dome

Scanning slit 0

Step Photon count Step Photon count Step Photon count
1709 132 1779 879 1889 153
1719 132 1789 1402 1899 157
1729 146 1799 1814 1909 153
1739 139 1809 2076 1919 165
1749 183 1819 2118 1929 134
1759 185 1829 1956 1939 136
1769 409 1839 1520 1949 171
1849 946 1959 127
1859 503 1969 130
1869 228
1879 155

```

21. Typical screen display during a dsp test. Note: The highest counts should be near the middle of the scan, center portion of the center column.

```

Brewer 191
MAR 06/13 day= 065 o3 #191 * TORONTO C.U.T. E 14:03:45 3.78
menu -- RH = 5% I in: out: 67.44

mu= 2.559 Tracking Sun * za= 67.44
cm-> pd

Enter a desired command or select a sub-menu
from the following list:

command main menu
dm data management menu
om observations menu
tm test menu
hk housekeeping menu
up update menu
sm summaries printout menu
sp special operations menu
os operational setup menu
em extended menu

DS o3 0.0 / 0.0
ZS o3 0.0 / 0.0
DS SO2 0.0 / 0.0

DUV at 0.0
SL R6 at 13:07:27 321
Last HG at 12:56:10 25°C
Current temperature 25°C

Running b1 from menu

```

22. Once the dsp test has completed the brewer will return to menu mode. Type *pd* and then press enter to write the dsp results to the D file.

23. Using the most recent D file confirm that the Hg's have "passed" and that there is not a step difference greater than one from the offset to the target number of steps. If this is not the case, do not proceed with the remaining lamps until the cause in discrepancy has been corrected. The lamp that was tested will again have to be re-run. The D file is located in the instruments data directory.

```

**** HG Calibration ****
16:02:14 JAN 22/13 Brewer temp = 29C ( 3.33V) moisture = 01.79 g/m3 (06.6%)
16:04:18 JAN 22/13 Brewer temp = 29C ( 3.33V) moisture = 01.79 g/m3 (06.6%)
5      412
6      516
7      532
8      541
9      890
10     3389
11     9485
12     17153
13     24304
14     28384
15     28958
16     27356
17     22023
18     14898
19     7100
20     1895
21     612
22     586
23     534
24     518
16:05:30 ( 0.9986 ) corr est for step 923.48 target is step 923 28958 37.59
micro is moved by 0 steps
Last HG was OK
Doing dispersion test with Zn (uv port)
Using narrow slit0 on line 296.7 nm HG line ...

**** HG Calibration ****
16:11:12 JAN 22/13 Brewer temp = 29C ( 3.33V) (T2 = 29C T3= 29C) moisture = 01.89 g/m3 (06.6%)
16:13:16 JAN 22/13 Brewer temp = 29C ( 3.33V) (T2 = 29C T3= 29C) moisture = 01.89 g/m3 (06.6%)
5      434
6      504
7      522
8      556
9      1004
10     3747
11     9903
12     18286
13     25953
14     29962
15     30608
16     28837
17     23169
18     15559
19     7688
20     1987
21     627
22     614
23     602
24     546
16:14:28 ( 0.9986 ) corr est for step 923.38 target is step 923 30608 37.77
micro is moved by 0 steps
Using narrow slit0 on line 296.7 nm HG line ...

```

D File

Hg results before dsp test.

Hg results after dsp test.

24. If the before and after dispersion Hg are within one step, turn off the lamp that was tested, allow it to cool then remove and store it safely.
25. Repeat the above procedures for the remaining lamps.

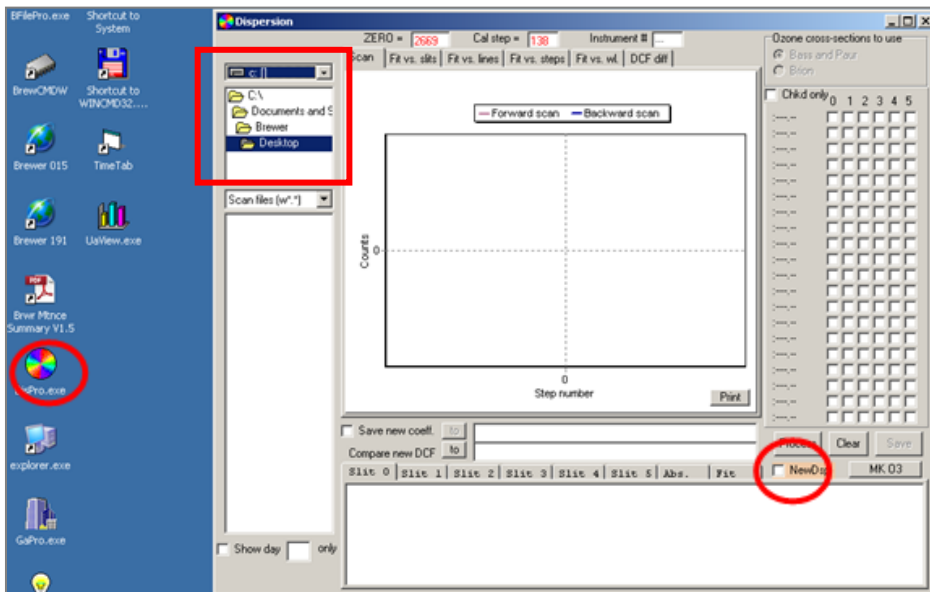
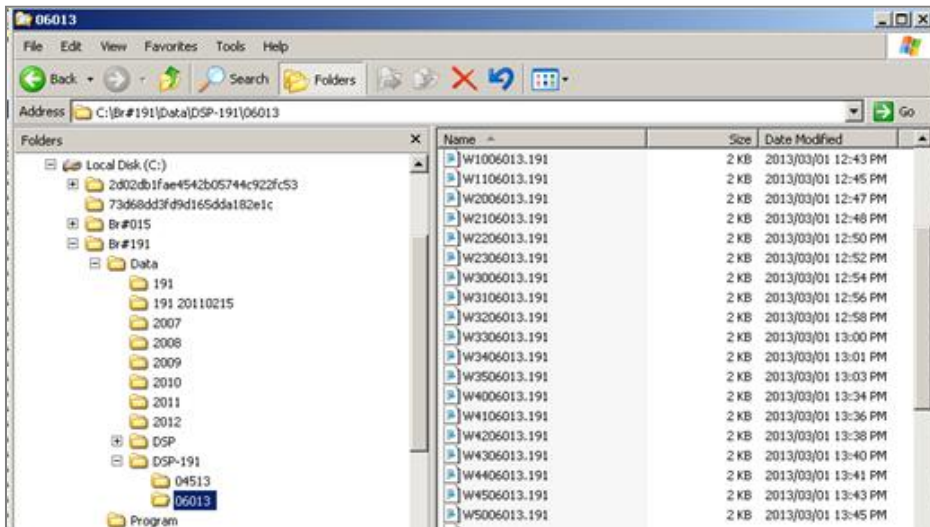
Take note that the cadmium and zinc lamps both have Max Output Ports; these ports are directed towards the UV dome.



26. Once completed, return the equipment to its storage case and close. Also, return the Brewer and tracker to its normal operation.

Dispersion Calibration Analysis

The dispersion files created are located in the instrument's data folder (e.g. using #191, C:\BR#191\Data\DSP-191\06013). The last folder is identified using the Julian day and year the dispersion test was run. The dispersion files are analysed using the DisPro.exe program.



27. Double click on the *DisPro.exe* icon to initialize the dispersion data processing program.

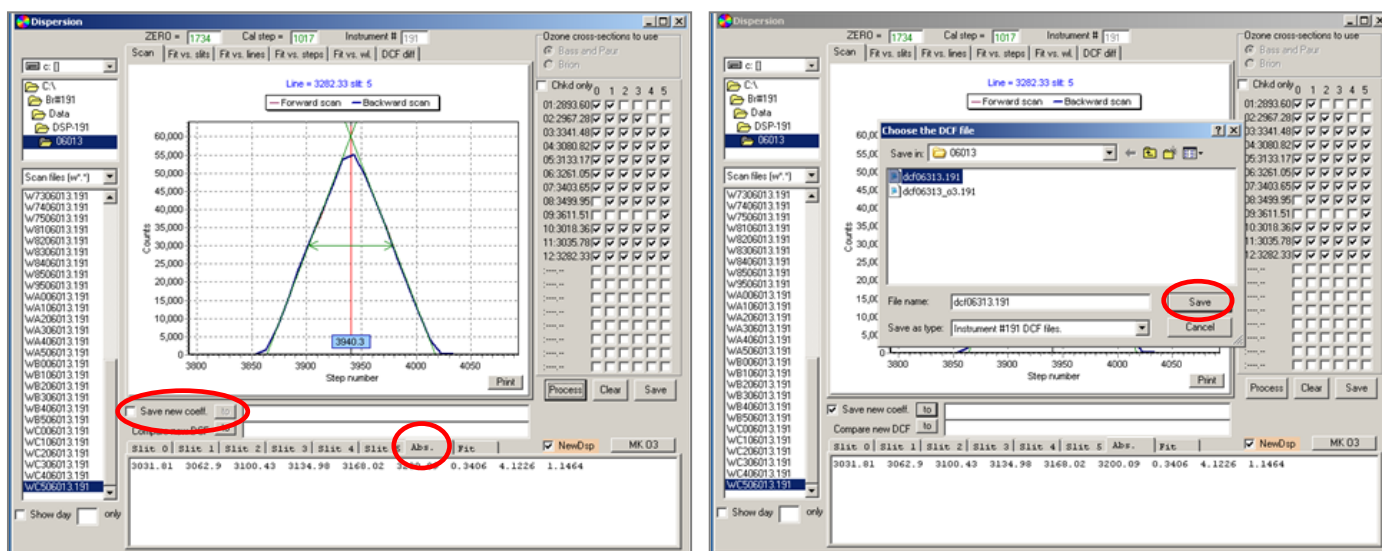
28. Next activate the *NewDisp* field by pressing the alt key and checking the newly created box. When checked, the program uses a

cubic function to create a best fit curve and when unchecked a quadratic equation is used.

29. Using the top left window of the *DisPro* program, navigate to the folder containing the dispersion calibration files just created. Click on the top *w*. ** file and use your computer's keyboard down arrow to add all the files to the analysis. Adding these scans will place a check mark into its corresponding slit and wavelength box located to the right of the graphing area.

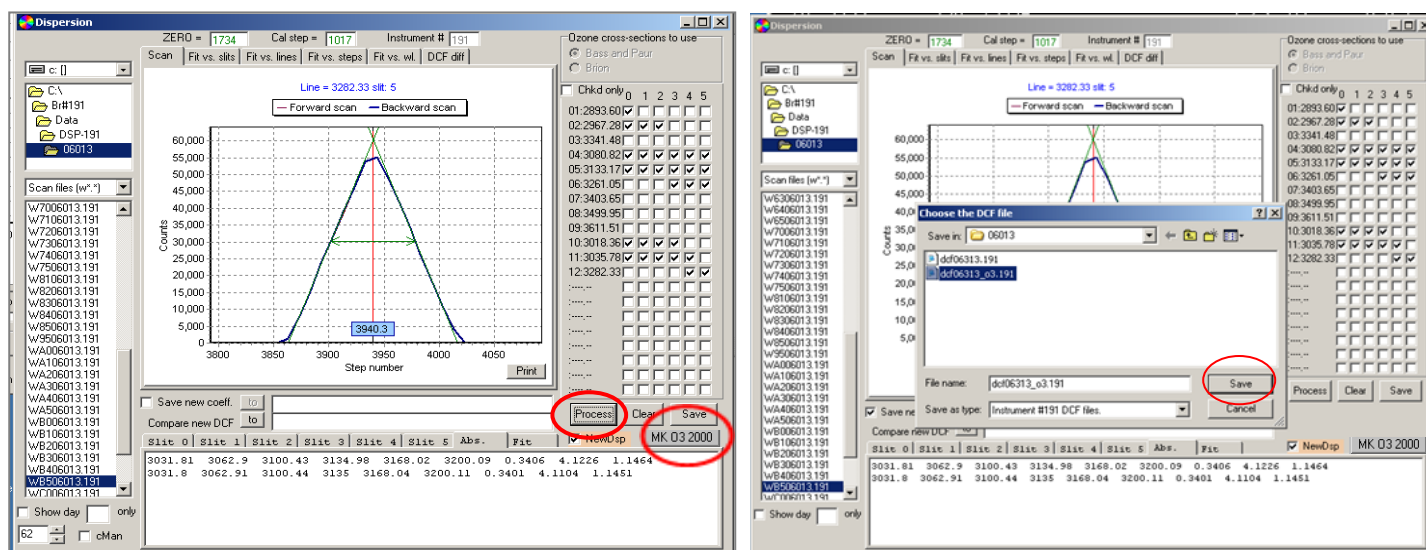
Note, if a check box is outlined in red without a check mark this would indicate that the scan was too poor to include in the data set.

30. Next click on the *Process* button. Note, this program has built in scan disqualifiers and these scans will have a red box around the checkmarks created. If there are disqualified scans following processing, simply uncheck the box corresponding to the poorest scan first (use the Fit vs slits and the Fit vs lines tabs to determine the poorest scan corresponding to one of the red boxes) and reprocess. By removing the poorest scan first and only one at a time the reprocessed data set may now include scans that were previously identified as being suspect. Continue this until there are no more red boxes.
31. Following the data processing the final wavelengths for this dispersion calibration are displayed in the bottom window/tabs. In particular the Abs. (absorption) tab displays the calculated wavelengths for each slit. An indicator of a good data set is the wavelength value for slit 5 (6th value from the left) which should be close to 3200, otherwise there may be issues with the brewer instrument (0.065 difference from 3200 indicates a 1 step difference from ideal).
32. At this point a calibration dcf file is created. To save this file check the *Save new coeff* box and click on the *to:* button next to it.

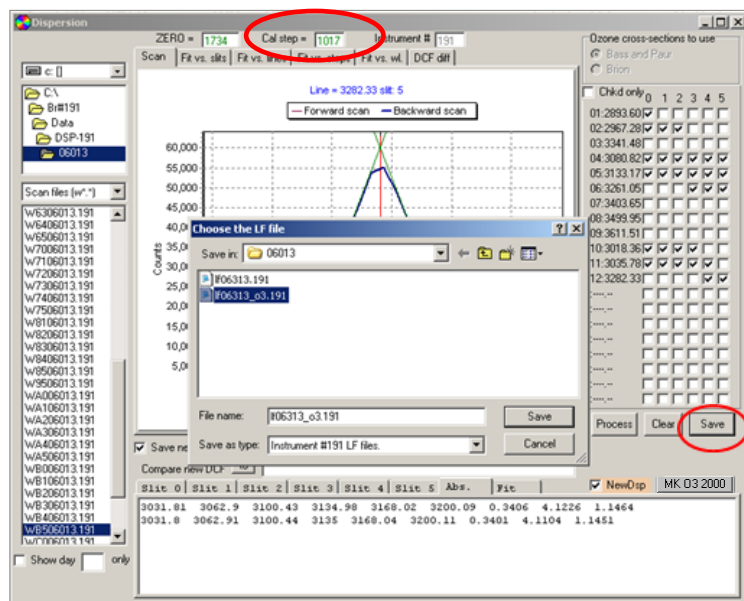


33. Name the dcf file with the julian day and year it was created (eg. dcf06313.191) and save in the same folder as above (eg. C:\BR#191\Data\DSP-191\06313) and click *Save* in the dcf file name window. Next click on the *Save* button below the checked slits to save the dcf file to the folder previously identified. Note a line fit (If) file is also produced during the creation of the dcf file. Files created include, dcf*.*, dcf*.*.cubic, dcf*.*.dwl, If*.*, If*.*.dat.
34. To calculate the ozone absorption coefficient, uncheck the *NewDisp* box and click on the *MK O3* button (which will change to read *MK 2000*) then recheck the *NewDisp* box. The

software will optimize the wavelengths to use in this calculation. Next press the *process* button and a new dcf ozone file will be created. Do not re click the MK O3 2000 button to reprocess if an error is discovered, click on MK O3 2000 until MK O3 is displayed and restart the dispersion analysis from the beginning.



35. Name the dcf o3 file with the julian day and year it was created (eg. dcf06313_o3.191) and save in the same folder as above (eg. C:\BR#191\Data\DSP-191\06313) and click save in the dcf file name window. Next click on the Save button below the checked slits to save the dcf o3 file to the folder previously identified. Note a line fit ozone(lf o3) file is also produced during the creation of the dcf o3 file. Files created include, dcf*_o3.*, dcf*_o3.*.cubic, dcf*_o3.*.dwl, lf*_o3.*, lf*_o3.*.dat.



Files Created

- dcf06313.191
- dcf06313.191.cubic
- dcf06313.191.dwl
- dcf06313_o3.191
- dcf06313_o3.191.cubic
- dcf06313_o3.191.dwl
- lf06313.191
- lf06313.191.dat
- lf06313_o3.191
- lf06313_o3.191.dat

36. Open the ozone line fit file just created (lf06313_o3.191) and scroll down to the cal step number used in the dispersion test (circled in red above, 1017). Note the O₃ and SO₂ absorption coefficient (circled in red below). Note: The correct cal step must be confirmed with sun scan tests and the O₃ and SO₂ absorption coefficients corresponding to the correct cal step must be used and entered into the cf brewer file.

lf06313_o3.191 - Notepad

O3 Abs (1/cm)	2.6311	1.7865	1.0060	0.6775	0.3748	0.2945	O3: 0.3434
SO2Abs (1/cm)	2.6931	6.4873	1.9672	1.8413	0.9867	0.5458	
Ozone weighting:	0.00	0.00	-1.00	0.05	3.06	-2.11	O3: 0.4467 0.6 -0.1
SO2 weighting:	0.00	-1.00	0.00	0.00	4.43	-3.43	SO2: 1.1363 -0.4 0.0
Rayleigh coeff.:	5329	5099	4837	4611	4408	4221	-3.1 / -5.8 (DU)
Rayleigh origin.:	0	4870	4620	4410	4220	4040	+0.3 / -2.5 (DU)
1015 Wavelength(A)	3031.66	3062.77	3100.30	3134.86	3167.90	3199.97	SO2: 1.1517
Resolution(A)	11.26	11.16	10.85	11.06	10.85	10.73	
O3 Abs (1/cm)	2.6283	1.7850	1.0057	0.6772	0.3748	0.2940	O3: 0.3424
SO2Abs (1/cm)	2.6691	6.5274	1.9772	1.8232	0.9898	0.5400	
Ozone weighting:	0.00	0.00	-1.00	0.02	3.12	-2.14	O3: 0.4520 0.6 -0.2
SO2 weighting:	0.00	-1.00	0.00	0.00	4.43	-3.43	SO2: 1.1331 -0.4 0.0
Rayleigh coeff.:	5329	5097	4837	4611	4407	4221	-3.1 / -5.9 (DU)
Rayleigh origin.:	0	4870	4620	4410	4220	4040	+0.3 / -2.5 (DU)
1016 Wavelength(A)	3031.73	3062.85	3100.38	3134.93	3167.97	3200.04	SO2: 1.1484
Resolution(A)	11.26	11.16	10.85	11.06	10.85	10.73	
O3 Abs (1/cm)	2.6258	1.7835	1.0054	0.6769	0.3749	0.2936	O3: 0.3412
SO2Abs (1/cm)	2.6455	6.5670	1.9873	1.8053	0.9929	0.5341	
Ozone weighting:	0.00	0.00	-1.00	-0.02	3.19	-2.17	O3: 0.4601 0.6 -0.3
SO2 weighting:	0.00	-1.00	0.00	0.00	4.43	-3.43	SO2: 1.1297 -0.4 0.0
Rayleigh coeff.:	5328	5097	4836	4610	4407	4221	-3.1 / -6.3 (DU)
Rayleigh origin.:	0	4870	4620	4410	4220	4040	+0.3 / -3.0 (DU)
1017 Wavelength(A)	3031.81	3062.92	3100.45	3135.00	3168.04	3200.11	SO2: 1.1451
Resolution(A)	11.26	11.16	10.85	11.06	10.85	10.73	
O3 Abs (1/cm)	2.6232	1.7821	1.0051	0.6766	0.3750	0.2933	O3: 0.3402
SO2Abs (1/cm)	2.6241	6.6031	1.9973	1.7874	0.9959	0.5282	
Ozone weighting:	0.00	0.00	-1.00	-0.06	3.28	-2.22	O3: 0.4665 0.5 -0.2
SO2 weighting:	0.00	-1.00	0.00	0.00	4.43	-3.43	SO2: 1.1263 -0.4 0.0
Rayleigh coeff.:	5327	5097	4836	4610	4407	4220	-3.1 / -6.0 (DU)
Rayleigh origin.:	0	4870	4620	4410	4220	4040	+0.3 / -2.6 (DU)
1018 Wavelength(A)	3031.88	3062.99	3100.52	3135.07	3168.11	3200.18	SO2: 1.1415
Resolution(A)	11.26	11.16	10.85	11.06	10.85	10.73	
O3 Abs (1/cm)	2.6207	1.7804	1.0049	0.6762	0.3750	0.2926	O3: 0.3390
SO2Abs (1/cm)	2.6027	6.6372	2.0085	1.7695	0.9988	0.5223	
Ozone weighting:	0.00	0.00	-1.00	-0.11	3.38	-2.27	O3: 0.4758 0.5 -0.2
SO2 weighting:	0.00	-1.00	0.00	0.00	4.43	-3.43	SO2: 1.1225 -0.4 0.0
Rayleigh coeff.:	5327	5096	4835	4610	4406	4220	-3.1 / -6.1 (DU)
Rayleigh origin.:	0	4870	4620	4410	4220	4040	+0.3 / -2.7 (DU)

37. From the menu screen, type the command *cf* to open the cf file used by the brewer being tested.

Brewer 191

MAR 05/13 day= 064 o3 #191 * TORONTO C.U.T. E 15:29:52 3.78

menu -- RH = 4% ↓ in: out: 87.09

mu= 10.518 Tracking Sun * za= 87.09

cm-> cf

Enter a desired command or select a sub-menu from the following list:

command	main menu
dm	data management menu
om	observations menu
tm	test menu
hk	housekeeping menu
up	update menu
sm	summaries printout menu
sp	special operations menu
os	operational setup menu
em	extended menu

DS O3	0.0 / 0.0
ZS O3	0.0 / 0.0
DS SO2	0.0 / 0.0
RH / Pr	4.2 / 989.0
DUV at 12:51:10	0.1
SL R6 at 11:56:34	1748
Last HG at 12:14:53	6 °C
Current temperature	5 °C

Running cf from menu

38. Arrow down to the *O3 on O3 Ratio* line and compare the 'just' calculated ozone absorption coefficient with the coefficient in the 'old/current' icf file. If the difference relative to the

original is greater than 1%, change this value to the newly calculated ozone absorption coefficient.

39. The *O3 on SO2* constant is also changed to the value calculated in the If file above.

Brewer 191

MAR 06/13 day= 065 o3 #191 * TORONTO

in: out:

File: icf06313.191

Instr. #191

Press Control-END to exit

name	value
o3 Temp coef 1	0.00000
o3 Temp coef 2	-0.07920
o3 Temp coef 3	-0.24870
o3 Temp coef 4	-0.31300
o3 Temp coef 5	-0.37700
Micrometer steps/deg	0
O3 on O3 Ratio	0.3402
SO2 on SO2 Ratio	2.35000
O3 on SO2 Ratio	1.1451
ETC on O3 Ratio	1594
ETC on SO2 Ratio	-10
Dead time (sec)	0.0000000300
WL cal step number	1017
Unused	14
Umkehr Offset	2439
ND filter 0	0
ND filter 1	4122

40. Exit out of this window by pressing control-end.

41. Save the new icf file with the julian day and year it was created (icf06313.191)

42. Exit out of the home screen window by typing *ex* and pressing enter. The control window should now be closed.

43. Open the *op_st* file (eg. *Op_st.191*) and change the *dcf* and *icf* file names to reflect the newly created files (eg. *dcf06313.191* and *icf06313.191*). Save changes to *op_st* file.

191

File Edit View Favorites Tools Help

Back Forward Search Folders

Address C:\Br#191\Data\191

Name	Size	Date Modified
OP_ST.191	1 KB	2013/03/05 11:56 AM
ICF06313.191	1 KB	2013/03/05 11:56 AM
ICF15212.191	1 KB	2013/03/01 12:34 PM
out1.dat	3 KB	2013/02/25 12:40 PM
uvr05113.191.log	3 KB	2013/02/25 12:40 PM
uvr05113.191	3 KB	2013/02/25 12:40 PM
BREW191.CFG	8 KB	2013/02/19 18:22 PM
BREW191 20130219.CFG	8 KB	2013/02/19 18:22 PM
BREW191 20130214.CFG	8 KB	2013/02/14 17:31 PM
BREW191 20120517.CFG	8 KB	2012/06/05 10:44 AM
uvr15612.191	3 KB	2012/06/04 16:50 PM
ICF13812.191	1 KB	2012/05/31 12:23 PM
ICF07312.191	1 KB	2012/03/13 14:08 PM
KZTEMP.191	1 KB	2012/02/14 17:17 PM
ICF15911.191	1 KB	2012/02/14 16:58 PM
icf04211.191	1 KB	2011/02/15 21:17 PM
dcf04211.191.dwl	1 KB	2011/02/14 17:09 PM
dcf04211.191	1 KB	2011/02/14 17:09 PM
BREW19120110201.CFG	8 KB	2011/02/01 18:17 PM
Brew191 20090707.cfg	8 KB	2009/07/07 06:41 AM
UMKSETUP.191	1 KB	2009/05/29 13:44 PM
uvr14809.191	4 KB	2009/05/28 13:28 PM
BREW191 Original.CFG	8 KB	2008/01/08 21:00 PM
Brew191 K&Z test.cfg	8 KB	2007/11/21 12:56 PM
zsf.191	1 KB	2000/10/17 11:24 AM

OP_ST.191 - Notepad

File Edit Format View Help

```

191
C:\br#191\data\
icf06313
zsf
dcf06313
uvr07213
25
03
13
TORONTO
43.781
79.468
990
2.214056
335
-24
14688
1
1
1
1
1
1
0
1
1
0
1
1
0
1
1
1
skc
o3
calo3sc
  
```