MARS EXPRESS

PLANETARY FOURIER SPECTROMETER

INSTRUMENT CALIBRATION REPORT

VOLUME I

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IFSI-2002-3

TABLE OF CONTENT:

1. The Series of Measurements Performed

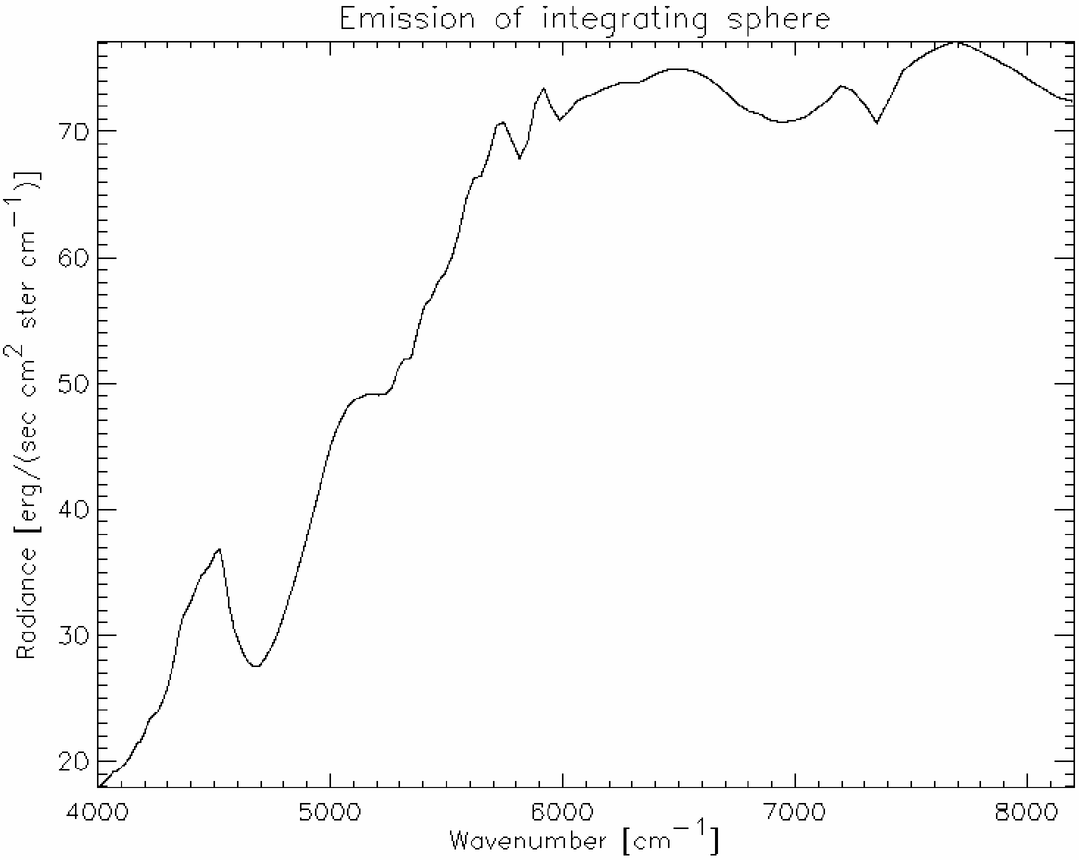
Data collected have been ordered by time : we started measurements with the lw channel and the black bodies.
Reference sources used are:

1. "IFSI" black body (MIKRON M345X4 UDC): it has a certified emission of 0.97±0.005 in the range [8; 15] μm and [3; 5] μm
2. Integrating sphere (Optronic Lab., inc., OL 455 12 2): it provides the radiance spectrum of fig. 1 when the current is set to 5440 mA, to which 5403 fL correspond. The spectrum can be scaled proportionally to luminance when acting on internal slit.

Other non-certified sources are:

1. IKI black bodies: a value of emissivity of 1. ± 0.1 has been estimated in Lecce laboratories
2. Ceramic element: stable source, able to provide intense signal in the whole PFS spectral range, but decreasing very much in the range 5000 – 8000 cm-1.
3. Mercury lamp: (Oriel 6035) very stable against temperature variations, presents lines at 9862.13 8859.44 7369.09 7313.42 6537.74 5923.64 5910.10 5902.49 5857.27 5844.57 5770.54 5515.60 and 5076.09 cm^{-1}. The line at 6537.74 is the strongest and the only actually reliable for our purposes. The width of these lines are declared as "negligible" by the manufacturer but no precise figure in this sense is provided.

Moreover, the PFS scanner hosts a calibration lamp and internal black bodies. The characterization of these sources is one of the most important tasks for the whole calibration program. A first order evaluation of black body paint emissivity and bare lamp intensity are provided by the manufacturer.

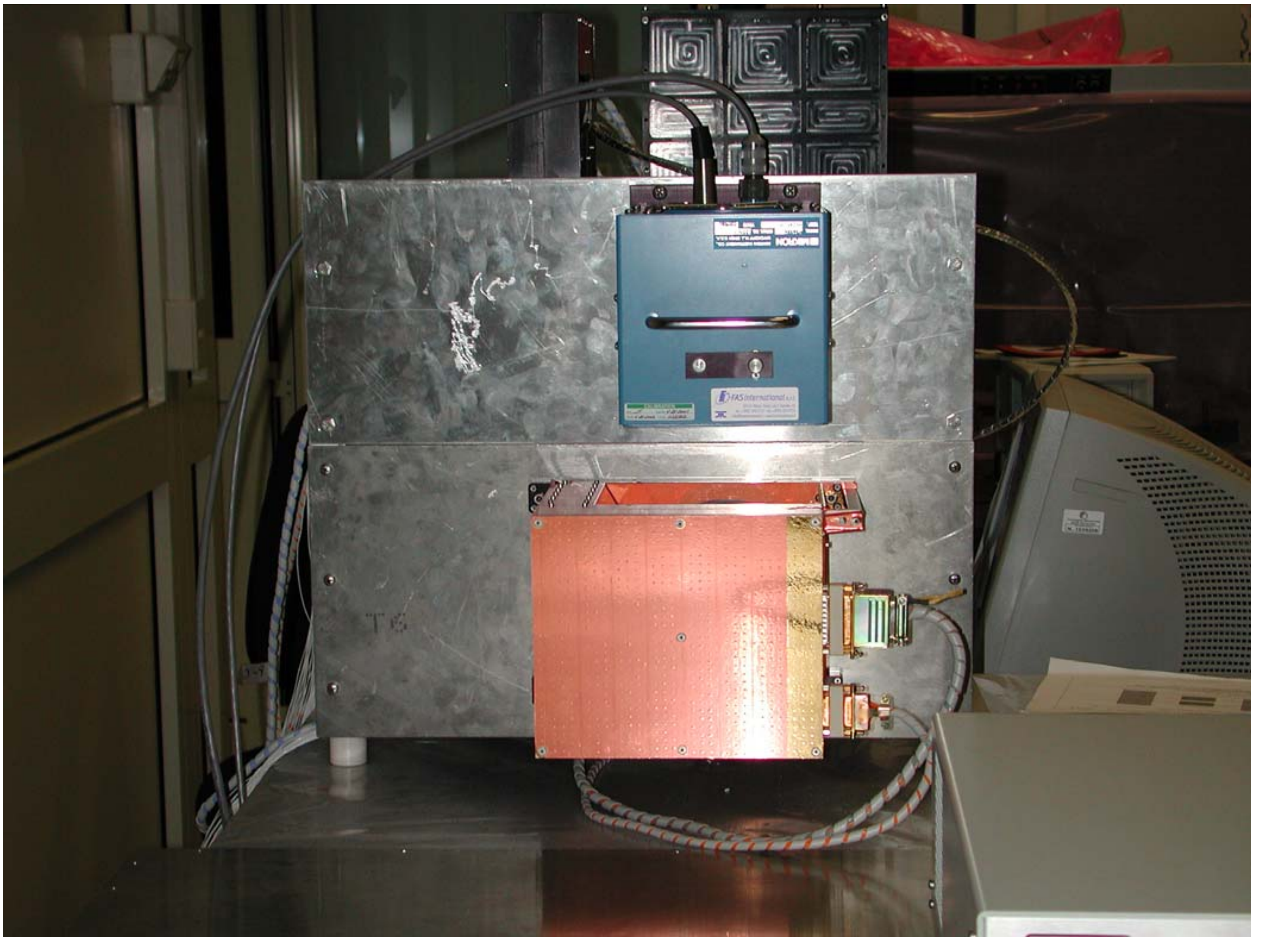


Spectral intensity of the integrating sphere when the current is 5540 mA.

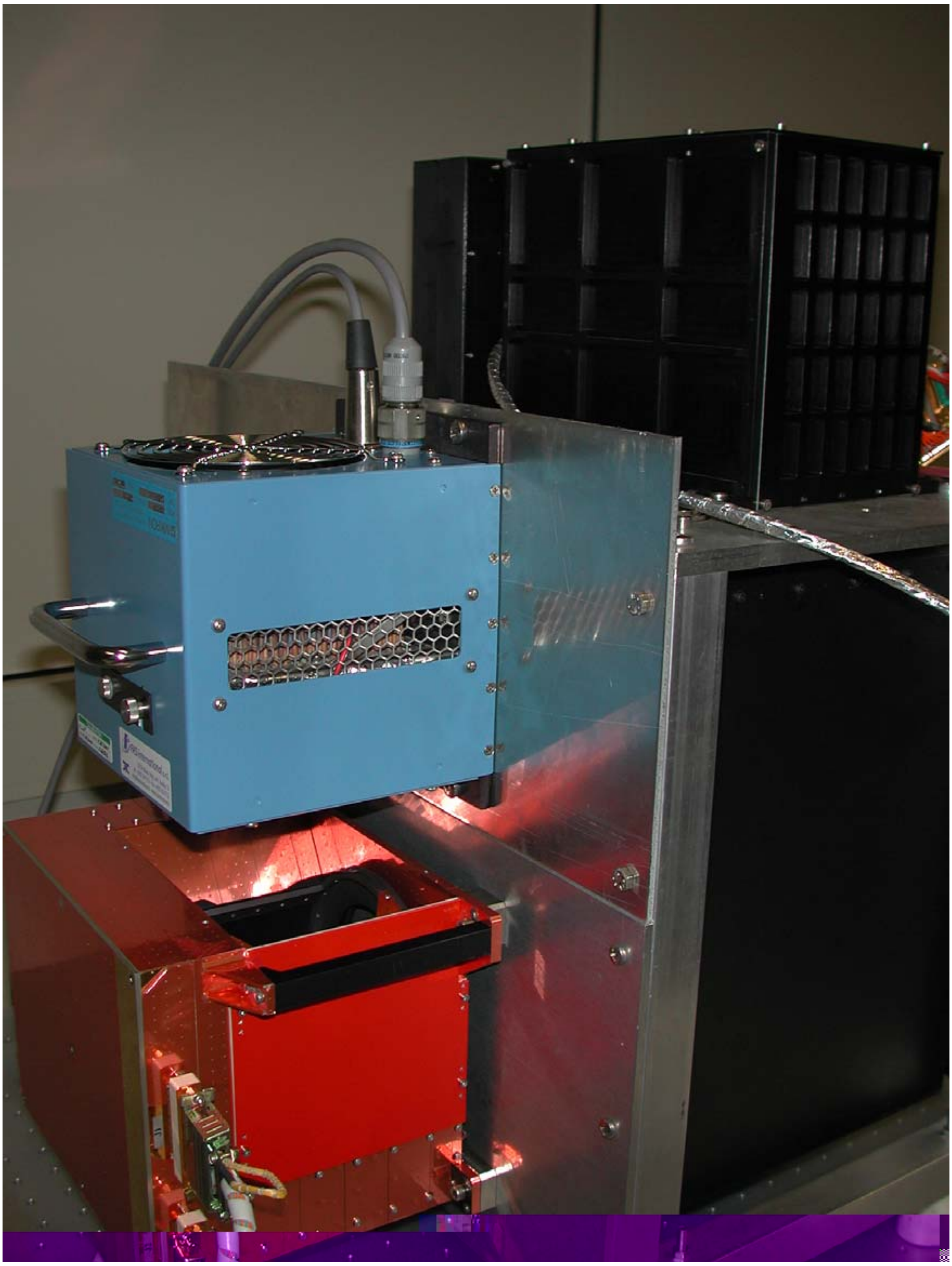
1.1 27 DEC 2001

All the acquisitions have been done into the laboratory at room temperature, using the Black Body calibration source (M345).

See pictures:



PICTURE 1
PFS and IFSI BB assembly: frontal view.



PICTURE 2
PFS and IFSI BB : lateral view.

PICTURE 3
IFSI BB frontal panel.

File Description:

BB30_011227_100440.ifg

Measurements: 200. Scanner Position: NADIR. Black Body Temperature: 30 °C. Motor: Secondary

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BB40_011227_105014.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 40 °C. Motor: Secondary

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BB50_011227_113148.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 50 °C. Motor: Secondary

----

BBINT_011227_120917.ifg

Measurements: 50.Scanner Position: INTERNAL BLACK BODY. Motor: Secondary

----

BB50A_011227_124602.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 50.5 °C. Motor: Secondary

----

BB50B_011227_125653.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 50.8 °C. Motor: Secondary

----

BB51_011227_131522.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 51 °C. Motor: Secondary

----

BB51B_011227_133557.ifg

Measurements: 10.Scanner Position: NADIR. Black Body Temperature: 51 °C. Motor: Primary

----

BB50P_011227_134426.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 50 °C. Motor: Primary

----

BB100_011227_142714.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 100 °C. Motor: Primary

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BB149_011227_153737.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 148.9 °C.
Motor: Primary. SW & LW Gain sensors: 0

BB149B_011227_161518.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 148.9 °C. Motor: Primary.
SW & LW Gain sensors: 1

BBINTB_011227_162926.ifg

Measurements: 50.Scanner Position: INTERNAL BLACK BODY. Motor: primary.
SW & LW Gain sensors: 1

BB30B_011227_164222.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 30 °C. Motor: Primary.
SW & LW Gain sensors: 1

1.2 28 DEC 2001

All the acquisitions have been done into the laboratory, using the Black Body calibration source (M345) and the russian black body.
PFS is in the russian green house.

See picture:

PICTURE 4
PFS and two BB: the IFSI and the Russian BB assembled inside the "greenhouse" in the laboratory.

File Description:

BBITA150_011228_112317.ifg

Measurements: 200.Scanner Position: NADIR. Black Body Temperature: 150.6 °C.
Motor: Primary. SW & LW Gain sensors: 0

BBRUSS-30_011228_120021.ifg

Measurements: 200.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: -30 °C. Motor: Primary. SW & LW Gain sensors: 0

BBINT_011228_123630.ifg

Measurements: 100.Scanner Position: INTERNAL BLACK BODY
Motor: Primary. SW & LW Gain sensors: 0

BBRUSS-60_011228_125342.ifg

Measurements: 200.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: -60 °C. Motor: Primary. SW & LW Gain sensors: 0

BBITA150_011228_133306.ifg

Measurements: 109.Scanner Position: NADIR .Black Body Temperature: 150.6 °C.
Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-A_011228_135457.ifg

Measurements: 200.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -53 °C to -18 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-B_011228_142906.ifg

Measurements: 200.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -18 °C to 0 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-C_011228_151035.ifg

Measurements: 11.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from 0 °C to -15 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-D_011228_151926.ifg

Measurements: 199.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -18 °C to -100 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSS-100_011228_155257.ifg

Measurements: 201.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: -100 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-E_011228_162757.ifg

Measurements: 32.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -100 °C to -85 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-F_011228_163729.ifg

Measurements: 59.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -80 °C to -55 °C. Motor: Primary. SW & LW Gain sensors: 0

BBRUSSRAMP-G_011228_165402.ifg

Measurements: 200.Scanner Position: DEEP SPACE (RUSSIAN BB).
Black Body Temperature: from -80 °C to -55 °C. Motor: Primary. SW & LW Gain sensors: 0

BBINT_011228_174851.ifg

Measurements: 200.Scanner Position: INTERNAL BLACK BODY. Motor: Primary.
SW & LW Gain sensors: 0.

1.3 19 JAN 2002

It should be noted that in the above activity the IFSI BB was destroyed because the temperature was set to 150.6 deg C. which a priory should not have been accepted. In January, when trying again the IFSI BB, we discovered that indeed the BB was not usable any more, see the following files:

19 JAN 2002 : All the acquisitions have been done into the laboratory, at room temperature.
File Description:

BBEXT51_020119_204408.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 51 °C.SW & LW Gain sensors: 0

BBEXT50-80_020119_202836.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 50.8 °C.SW & LW Gain sensors: 0

BBEXT50-50_020119_200849.ifg

Measurements: 50.Scanner Position: NADIR. Black Body Temperature: 50.5 °C.SW & LW Gain sensors: 0

BBEXT50_020119_193915.ifg

Measurements: 50. Scanner Position: NADIR. Black Body Temperature: 50 °C. SW & LW Gain sensors: 0

BBEXT33_020119_185818.ifg

Measurements: 50. Scanner Position: NADIR. Black Body Temperature: 33 °C. SW & LW Gain sensors: 0

BBEXT28_020119_183041.ifg

Measurements: 50. Scanner Position: NADIR. Black Body Temperature: 33 °C. SW & LW Gain sensors: 0

BBEXT1_020119_1726004.ifg

Measurements: 100. Scanner Position: NADIR. Black Body Temperature: 28 °C. SW & LW Gain sensors: 0

BBINT_020119_170733.ifg

Measurements: 100. Scanner Position: Internal Black Body. SW & LW Gain sensors: 0

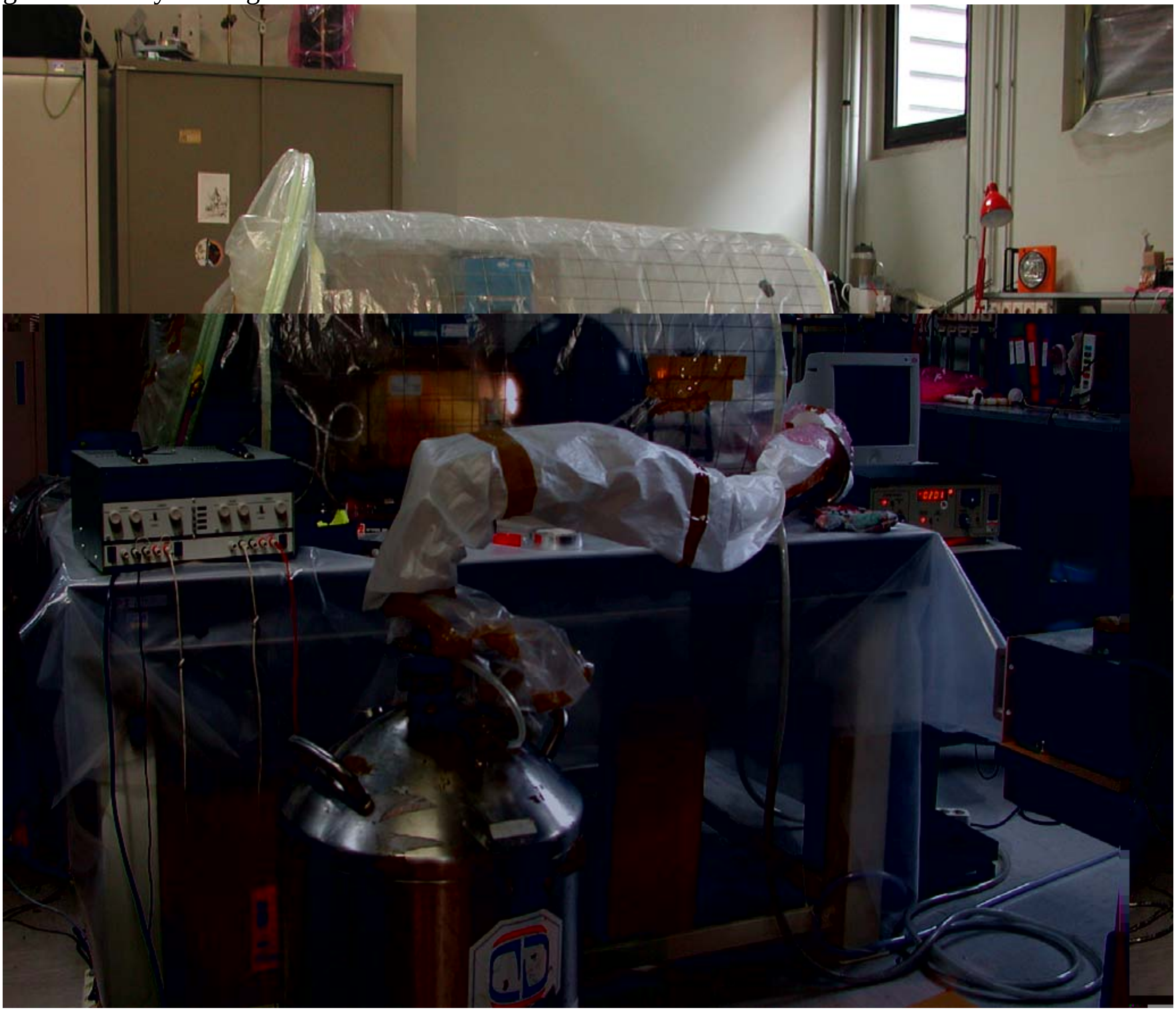
BBINT_020119_175647.ifg

Measurements: 100. Scanner Position: Internal Black Body. SW & LW Gain sensors: 0

BBINT_TEST5_020119_184219.ifg

Measurements: 64. Test 5: n=4. Scanner Position: Internal Black Body. SW & LW Gain sensors: 0

After the work on the LW channel on the 27 and 28 DEC. we tried to work on the SW channel in the greenhouse by cooling the detector.



PICTURE 5
Integrating sphere with the cooled detector in the greenhouse.

1.4 29 DEC 2001

All acquisitions have been done into the russian laboratory at room temperature, using the Integrating Sphere, with a constant current set to 5.540 A, while the luminance has been changed about every 100 acquisitions.

File descriptions:

SPHERE500_011229_124020.ifg

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50 Acquisitions. Scanner Position: Cold Space. Luminance: 500 footlamberts. SW Gain Sensor: 6. LW Gain Sensor: 0. Motor: Secondary

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SPHERE500_011229_125006.ifg

----

13 Acquisitions. Scanner Position: Cold Space. Luminance: 500 footlamberts. SW Gain Sensor: 6. LW Gain Sensor: 0. Motor: Secondary

---

SPHERE500_011229_125356.ifg

----

100 Acquisitions. Scanner Position: Cold Space. Luminance: 500 footlamberts.SW Gain Sensor: 5.LW Gain Sensor: 0. Motor: Secondary

----

SPHERE500_011229_131202.ifg

----

26 Acquisitions. Scanner Position: Cold Space. Luminance: 500 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

----

SPHERE400_011229_132537.ifg

----

100 Acquisitions. Scanner Position: Cold Space. Luminance: 400 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

----

SPHERE300_011229_134318.ifg

----

100 Acquisitions. Scanner Position: Cold Space. Luminance: 300 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

----

SPHERE200_011229_140323.ifg

----

100 Acquisitions. Scanner Position: Cold Space. Luminance: 200 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

----

SPHERE100_011229_142042.ifg

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66 Acquisitions. Scanner Position: Cold Space. Luminance: 100 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

In this activity we had several problems and the motion was not good many times. We decided to take the experiment out.

NOTE ALL THE MEASUREMENTS ON THE INTERNAL BB ARE STILL GOOD

At this point in the calibration activity we had several problems with the double pendulum motion : the motion was not OK in one direction, and often not ok also in the opposite direction. The temporary solution to the problem was to put PFS upside down : not pending from the dampers, but lying on the dampers. This solved the motion problem, which was, indeed, caused by the current being now too low for the motor. Previously had been added 2 coils to module O in order to decrease the inrush current at switch on, as measured in module P, because was too large.

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29 Dec 2001
All acquisitions have been done into the russian laboratory at room temperature.
cooling the coldfinger with nitrogen.
See picture: image01.JPG
File descriptions:

CLAMP_011229_160653.ifg
----
58 Acquisitions. Scanner Position: CALIBRATION LAMP.SW Gain Sensor: 0.LW Gain Sensor:0

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30 Dec 2001
All acquisitions have been done into the laboratory at room temperature.File descriptions:

CLAMP_PFS_ALIVE_011230_180411.ifg
----
50 Acquisitions. Scanner Position: CALIBRATION LAMP.SW Gain Sensor: 0.LW Gain Sensor:0. "PFS UPSIDEDOWN"

CLAMP_011229_160653.ifg
----
58 Acquisitions. Scanner Position: CALIBRATION LAMP. SW Gain Sensor: 0.LW Gain Sensor:0

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02 Jan 2002
All acquisitions have been done into the laboratory at room temperature. The ADC Serial Clock is set to 4 MHz, instead of 2 MHz.
File descriptions:

CLAMP_020102_160326.ifg
----
20 Acquisitions. Scanner Position: CALIBRATION LAMP. SW Gain Sensor: 0. LW Gain Sensor:0

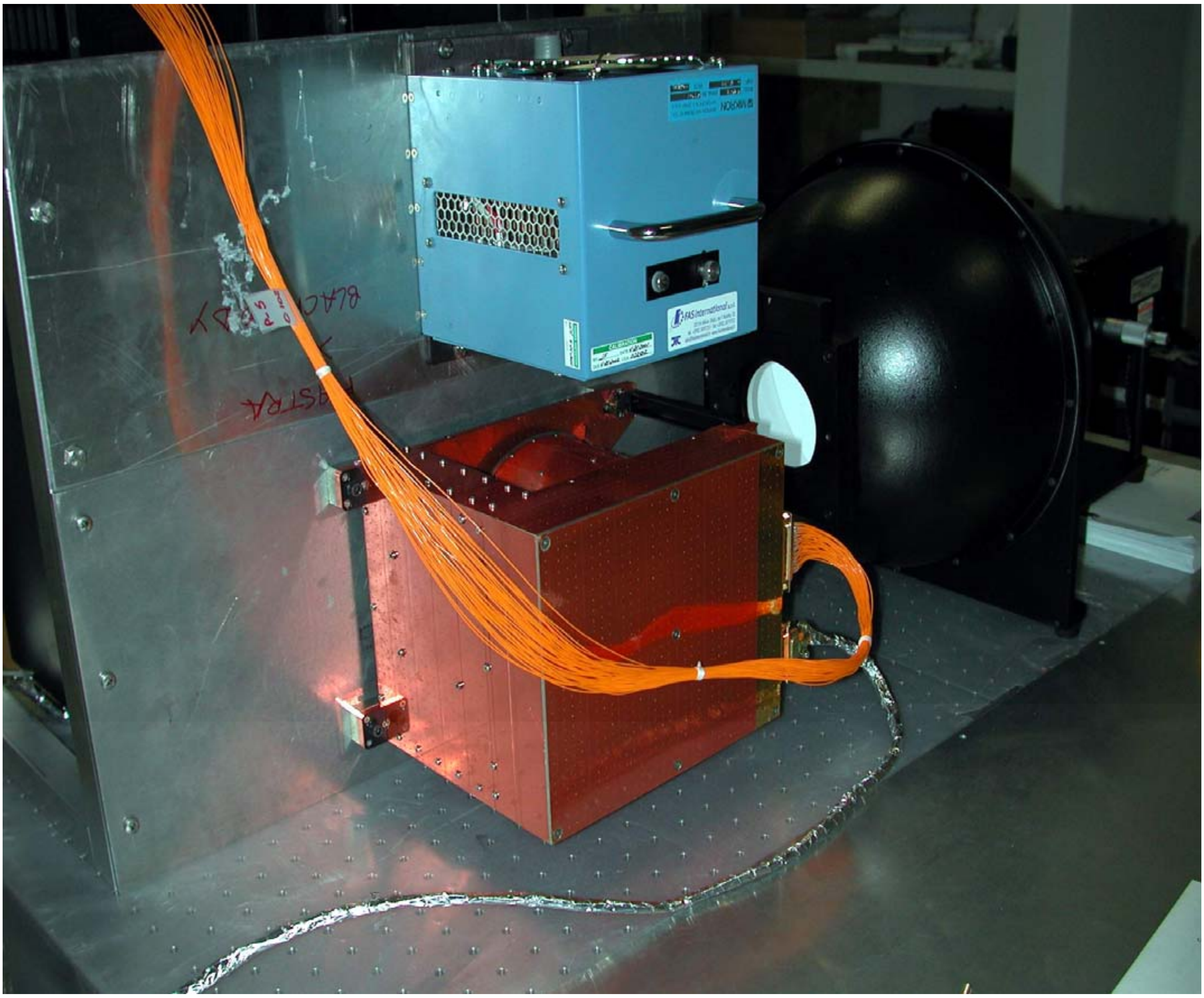
CLAMP_020102_161532.ifg
----
50 Acquisitions. Scanner Position: CALIBRATION LAMP. SW Gain Sensor: 1. LW Gain Sensor:0

05 Jan 2002

All acquisitions have been done into the laboratory at room temperature, without the scanner. The distance between the Lamp and the Module O is 95 cm.
See picture: image01.jpg
File descriptions:

CERAMIC_020105_122310.ifg
----
100 Acquisitions. SW Gain Sensor: 3. LW Gain Sensor: 0. Lamp Current: 7 Amps

PICTURE 6
PFS in the lab with the Oriel lamp without the scanner.



PICTURE 7
PFS in the lab with the scanner and the integrating sphere.

1.5 02 JAN 2002

All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Integrating Sphere, with a constant current set to 5.540 A. The ADC Serial Clock is set to 4 MHz, instead of 2 MHz.

File descriptions:

SPHERE100_020102_121928.ifg

----

50 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

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SPHERE200_020102_125326.ifg

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50 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary.

SPHERE300_020102_131251.ifg

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50 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE400_020102_133345.ifg

----

50 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

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SPHERE500_020102_135121.ifg

----

200 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE1000_020102_143628.ifg

----

50 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE2000_020102_144813.ifg

----

50 Acquisitions. Luminance: 2000 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE3000_020102_150212.ifg

----

50 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE4000_020102_151345.ifg

----

50 Acquisitions. Luminance: 4000 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

----

SPHERE5000_020102_152758.ifg

----

50 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 0. LW Gain Sensor: 0. Motor: Primary

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SPHERE100_020102_154015.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

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SPHERE300_020102_154015.ifg

----

20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

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SPHERE500_020102_155210.ifg

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20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 5. LW Gain Sensor: 0. Motor: Primary

1.6 03 JAN 2002

All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Integrating Sphere, with a constant current set to 5.540 A.
File descriptions:
SPHERE10A_020103_095638.ifg

----

50 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 0. Motor: Primary

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SPHERE10B_020103_100737.ifg

----

50 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 1. Motor: Primary

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SPHERE10C_020103_102135.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 2. Motor: Primary

----

SPHERE10D_020103_102848.ifg

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20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 3. Motor: Primary

----

SPHERE10E_020103_103643.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 4. Motor: Primary

----

SPHERE10F_020103_104104.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 5. Motor: Primary

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SPHERE10G_020103_104539.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 6. Motor: Primary

----

SPHERE10H_020103_105016.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 7. Motor: Primary

----

SPHERE30A_020103_105540.ifg

----

20 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 2. Motor: Primary

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SPHERE30B_020103_110205.ifg

----

20 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 3. Motor: Primary

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SPHERE30C_020103_110641.ifg

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20 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 5. Motor: Primary

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SPHERE30D_020103_111113.ifg

----

20 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 7. Motor: Primary

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SPHERE50A_020103_111528.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 0. Motor: Primary

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SPHERE50B_020103_112102.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 1. Motor: Primary

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SPHERE50C_020103_112628.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 4. Motor: Primary

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SPHERE50D_020103_113101.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 5. Motor: Primary

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SPHERE50E_020103_113533.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 6. Motor: Primary

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SPHERE50F_020103_114211.ifg

----

50 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 7. Motor: Primary

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SPHERE70A_020103_121126.ifg

----

20 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 2. Motor: Primary

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SPHERE70B_020103_121527.ifg

----

20 Acquisitions. Luminance: 70 footlamberts.SW Gain Sensor: 3. Motor: Primary

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SPHERE70C_020103_122238.ifg

----

50 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 5. Motor: Primary

----

SPHERE70D_020103_123455.ifg

----

20 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 7. Motor: Primary

----

SPHERE100A_020103_124248.ifg

----

50 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. Motor: Primary

----

SPHERE100B_020103_125430.ifg

----

50 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 1. Motor: Primary

----

SPHERE100C_020103_130500.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 2. Motor: Primary

----

SPHERE100D_020103_131128.ifg

----

50 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 4. Motor: Primary

----

SPHERE100E_020103_132354.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 5. Motor: Primary

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SPHERE100F_020103_133059.ifg

----

50 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 6. Motor: Primary

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SPHERE100G_020103_134126.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 7. Motor: Primary

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SPHERE200A_020103_134910.ifg

----
20 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 0. Motor: Primary
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SPHERE200B_020103_135829.ifg
----
50 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 3. Motor: Primary
----
SPHERE200C_020103_142646.ifg
----
20 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 5. Motor: Primary
----
SPHERE200D_020103_143816.ifg
----
20 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 7. Motor: Primary
----
SPHERE300A_020103_144426.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPHERE300B_020103_144841.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 1. Motor: Primary

1.7 04 JAN 2002

All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Integrating Sphere, with a constant current set to 5.540 A.
File descriptions:

SPEHERE300C_020104_174823.ifg
----
50 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 2. Motor: Primary
----
SPEHERE300D_020104_181108.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 5. Motor: Primary
----
SPEHERE300E_020104_182507.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 4. Motor: Primary
----
SPEHERE300F_020104_183526.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 6. Motor: Primary
----
SPEHERE300G_020104_184150.ifg
----
20 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 7. Motor: Primary

----
SPEHERE400A_020104_184150.ifg
----
20 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPEHERE400B_020104_185355.ifg
----
20 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 3. Motor: Primary
----
SPEHERE400C_020104_190014.ifg
----
20 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 5. Motor: Primary
----
SPEHERE400D_020104_190816.ifg
----
20 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 7. Motor: Primary
----
SPEHERE500A_020104_191341.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. Motor: Primary
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SPEHERE500B_020104_192136.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 1. Motor: Primary
----
SPEHERE500C_020104_192945.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 2. Motor: Primary

1.8 05 JAN 2002

All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Integrating Sphere, with a constant current set to 5.540 A.
File descriptions:

SPEHERE500D_020105_085459.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 4. Motor: Primary.

SPEHERE500E_020105_090300.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 5. Motor: Primary
----
SPEHERE500F_020105_090912.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 6. Motor: Primary
----
SPEHERE500G_020105_091353.ifg

----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 7. Motor: Primary
----
SPEHERE1000A_020105_092450.ifg
----
20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPEHERE1000B_020105_092923.ifg
----
20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 3. Motor: Primary
----
SPEHERE1000C_020105_093453.ifg
----
20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 4. Motor: Primary
----
SPEHERE2000A_020105_094206.ifg
----
20 Acquisitions. Luminance: 2000 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPEHERE2000B_020105_094848.ifg
----
20 Acquisitions. Luminance: 2000 footlamberts. SW Gain Sensor: 1. Motor: Primary
----
SPEHERE2000C_020105_095331.ifg
----
20 Acquisitions. Luminance: 2000 footlamberts. SW Gain Sensor: 2. Motor: Primary
----
SPEHERE2000D_020105_095809.ifg
----
20 Acquisitions. Luminance: 2000 footlamberts. SW Gain Sensor: 5. Motor: Primary
----
SPEHERE3000A_020105_100303.ifg
----
20 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPEHERE3000B_020105_100919.ifg
----
20 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 3. Motor: Primary
----
SPEHERE3000C_020105_101344.ifg
----
20 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 4. Motor: Primary
----
SPEHERE4000A_020105_101838.ifg
----
20 Acquisitions. Luminance: 4000 footlamberts. SW Gain Sensor: 0. Motor: Primary
----
SPEHERE4000B_020105_102713.ifg
----

20 Acquisitions. Luminance: 4000 footlamberts. SW Gain Sensor: 1. Motor: Primary

----

SPEHERE4000C_020105_103444.ifg

----

20 Acquisitions. Luminance: 4000 footlamberts. SW Gain Sensor: 2. Motor: Primary

----

SPEHERE5000A_020105_103913.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 0. Motor: Primary

----

SPEHERE5000B_020105_104626.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 1. Motor: Primary

----

SPEHERE5000C_020105_105101.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 2. Motor: Primary

----

SPEHERE5000D_020105_105742.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 3. Motor: Primary

This set completes the SW channel calibration at room temperature. It also contains the non linearity studies with the gain and source intensities.

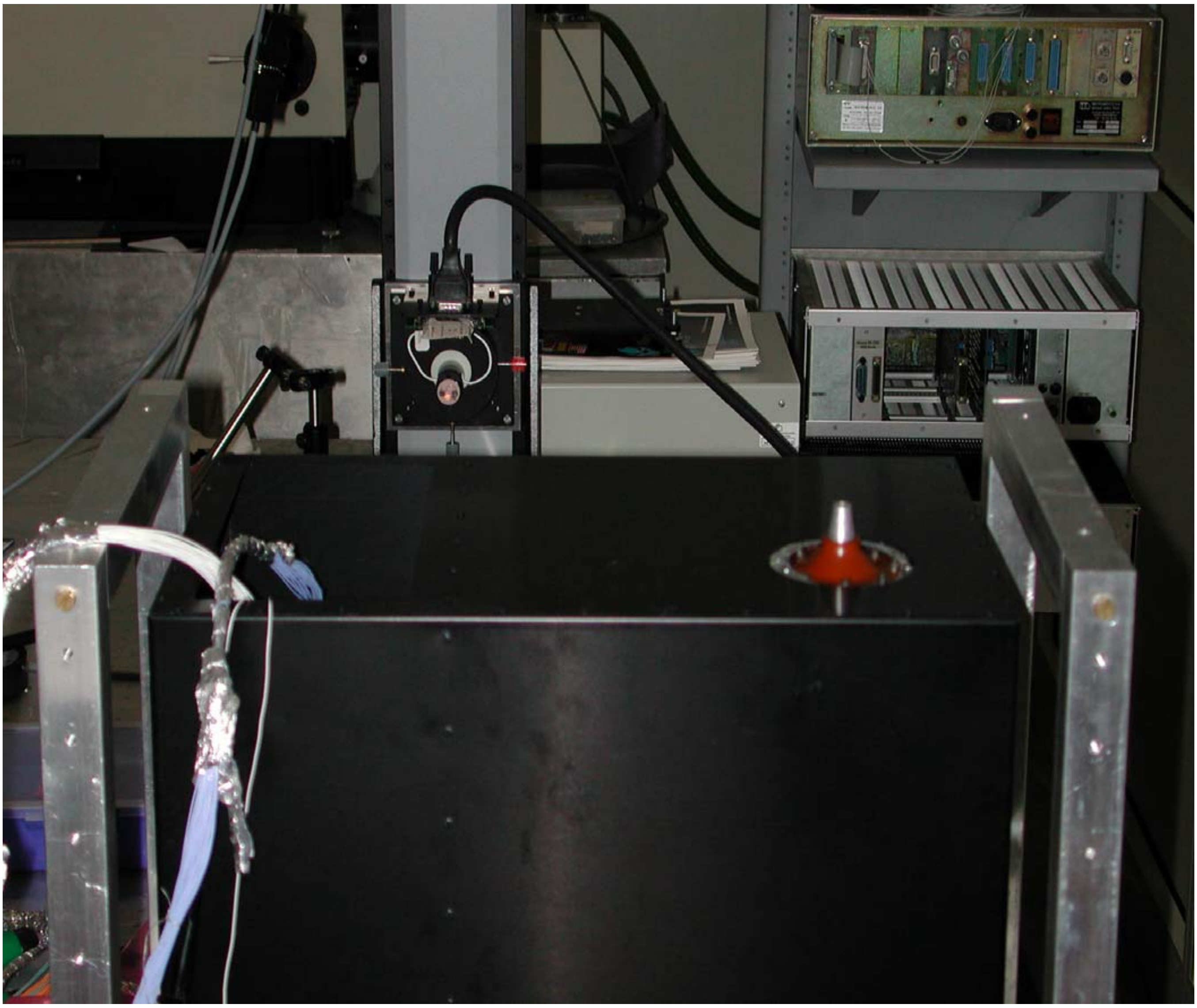
1.9 FOV MEASUREMENTS

05 Jan 2002
All acquisitions have been done into the laboratory at room temperature, without the scanner. The distance between the Ceramic Element and the Module O is 93 cm, 6 Acquisitions for each step.
File descriptions:

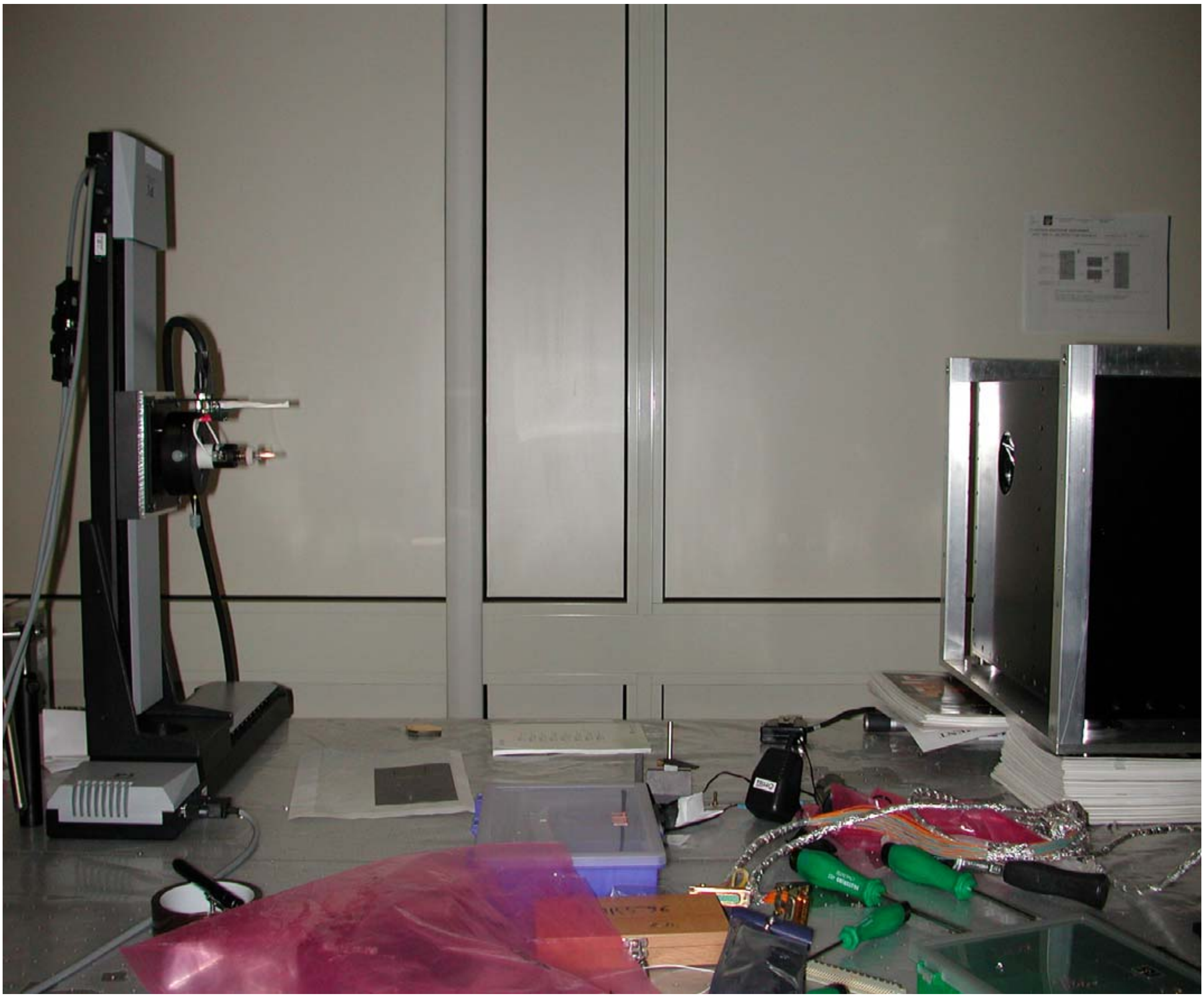
SW Gain Sensor: 3. LW Gain Sensor: 3. Lamp Current: 7.5 Amps

1-FOV001_020105_135001.ifg - 48 Acquisitions
2-FOV002_020105_140141.ifg - 42 Acquisitions
3-FOV003_020105_141228.ifg - 90 Acquisitions
4-FOV004_020105_143245.ifg - 46 Acquisitions (miss last 2)
5-FOV005_020105_144640.ifg - 48 Acquisitions
6-FOV006_020105_154103.ifg - 66 Acquisitions
7-FOV007_020105_155620.ifg - 66 Acquisitions
8-FOV008_020105_161135.ifg - 66 Acquisitions
9-FOV009_020105_162953.ifg - 66 Acquisitions
10-FOV010_020105_164812.ifg - 78 Acquisitions
11-FOV011_020105_183811.ifg - 12 Acquisitions
12-FOV012_020105_184200.ifg - 60 Acquisitions
13-FOV013_020105_185639.ifg - 90 Acquisitions

14-FOV014_020105_191701.ifg - 90 Acquisitions (1 more)
15-FOV015_020105_192738.ifg - 24 Acquisitions
16-FOV016_020105_193627.ifg - 114 Acquisitions
17-FOV018_020105_201200.ifg - 6 Acquisitions
18-FOV019_020105_201353.ifg - 84 Acquisitions
19-FOV020_020106_145039.ifg - 66 Acquisitions
20-FOV021_020106_150618.ifg - 66 Acquisitions
21-FOV022_020106_152151.ifg - 66 Acquisitions
22-FOV023_020106_153818.ifg - 66 Acquisitions
23-FOV024_020106_155309.ifg - 48 Acquisitions
24-FOV025_020106_160420.ifg - 24 Acquisitions
25-FOV026_020106_161111.ifg - 36 Acquisitions



PICTURE 8
FOV MEASUREMENTS
FRONT VIEW OF THE ASSEMBLY



PICTURE 9

FOV MEASUREMENTS
SIDE VIEW OF THE ASSEMBLY

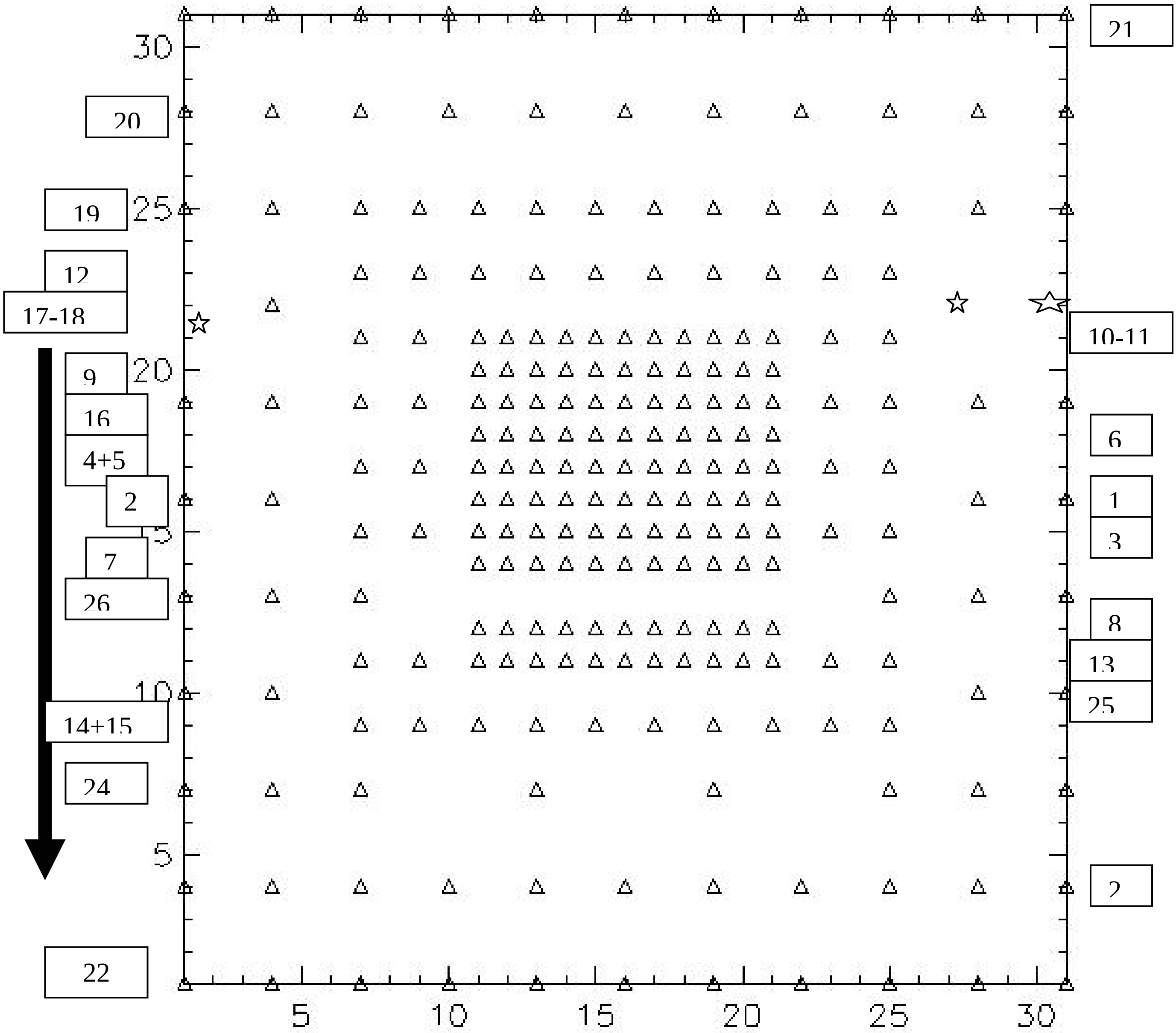


FIGURE 1

LOCATION IN THE X-Y PLANE WHERE THE 6 MEASUREMENTS WERE TAKEN. LOCATION IS IN CM. NOTE UP IS NOW DOWN (SEE ARROW).

Note the number is the file number. Its position gives the direction in which the source was moved along the line to which the number refers. When 2 numbers are present 2 files were needed to complete the line. Only 6 measurements per position were usually taken.

The test was made by putting the Module O on the optical bench, lying on the dampers, as it is shown in the image. The measurement of the FOV and optical axis direction was made in two steps: first we measured the transfer function of the scanner, then we measured the FOV of Module O without the scanner. For the FOV, in each position indicated in the figure, we took10 measurements. The figure identifies a plane at 93 cm from the Module O outer face. Dimensions are in cm. The source (ceramic element) was moved in a plane parallel to the Module O face. The origin (center in the figure) was not in front of the O module optical aperture, but displaced. The normal to O located in the center of the entrance hole, was in the location of the rectangular shape at (3,2) cm away from the center. Here is where we expect the optical axis, and therefore the maximum of the detected signal. The FWHM of the signal detected is shown in the next figure. PFS Field of view

Curves represent surface curves of PFS signal at a level half of the maximum. Scale is 1 cm in the focal actuator plane.

As we can see the optical axis of the two channels are not coincident and are not normal to the Module O “normal” direction. Note that the SW FOV is 38 mm diameter and the LW is 60 mm diameter. To transform these measurements in angle we have to take into account the internal path of module O plus the 930 mm external : for the SW we have a distance of 930 +489.9 = 1419 This correspond to 1.57 degrees FOV. For the LW we have 930+345,3 = 1275 this corresponds to a FOV of 2,77 degrees. This are FWHM FOV measurements.

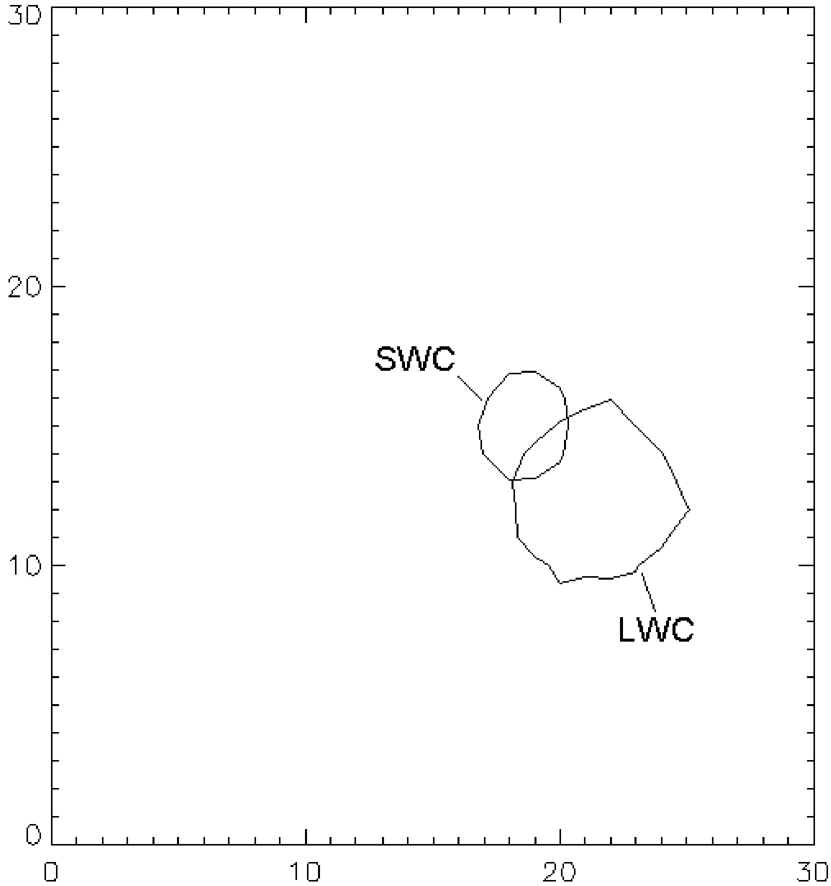


FIGURE 2
FOV of the 2 channels

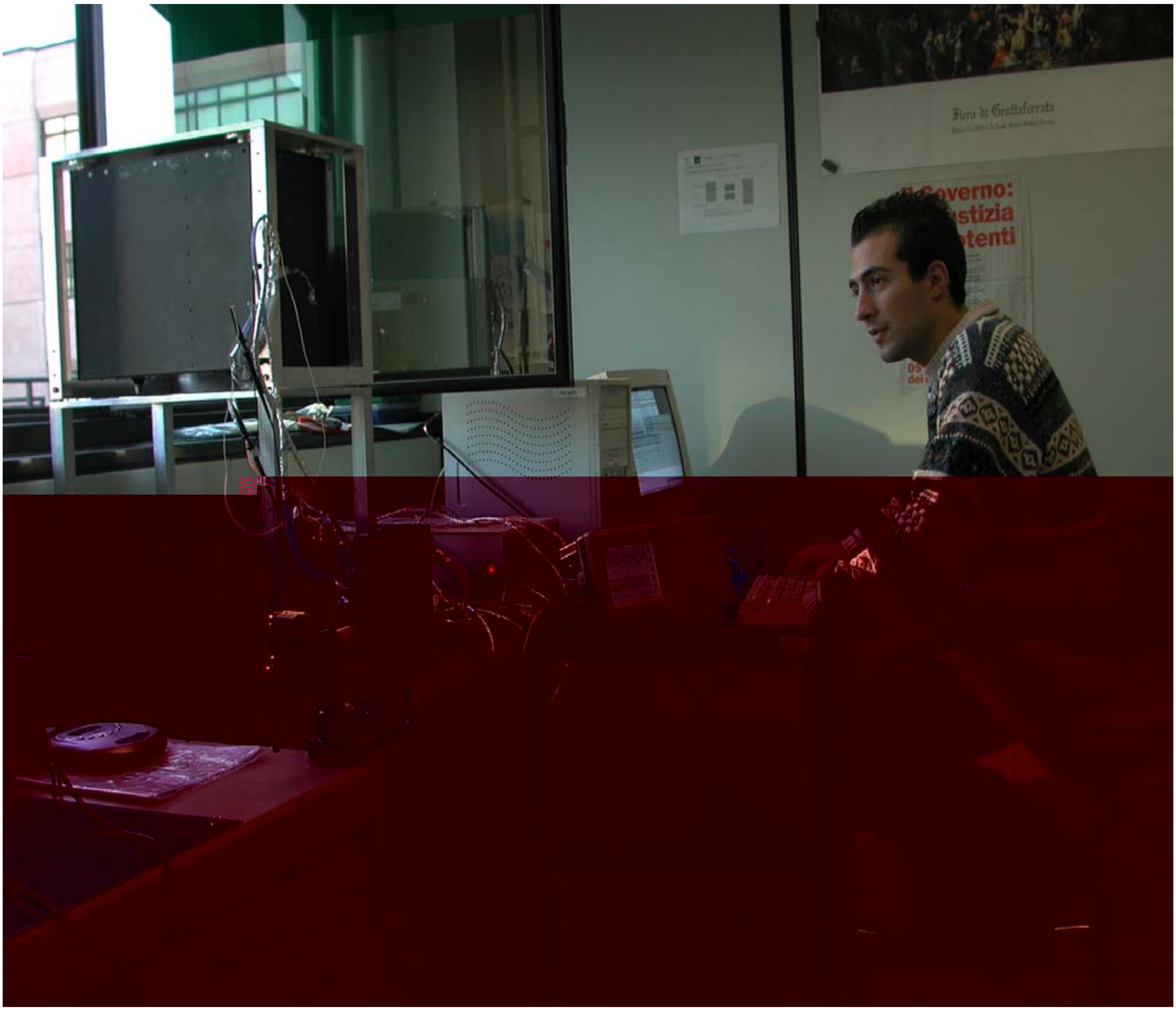
PICTURE 10
scanner transfer function measurement arrangement.

1.10 SCANNER TRANSFER FUNCTION

First we put the laser beam perpendicular to the 4 feet of the scanner.
We measure the distance from the x-y to the 4 feet : 860 mm.
We measure the distance between the output of the scanner and the plate on which we project the laser “image”: it is 1290 mm.
We measure then the height of the laser beam in input : 260 mm at the laser, 261 mm at the scanner: we consider to be OK (parallel to the optical bench).
We measure height of the laser beam at the exit of the scanner 261 mm, and at the plate : 259 mm. It went down only 2 mm.
On the following picture we can see 5 circles-spot, location of the laser in the center and at different location on the scanner mirror. With respect to the continuous line, where the red spot should be, we see a displacement of 12 mm. From this point we move 20 mm up or down the input laser, and the spot moves of the same amount. If we move horizontally by 40 mm, the spot moves by 32, if we move by 20 in the opposite direction the spot moves by almost 20. In conclusion, in one direction is OK, in the horizontal direction the scanner mirror reduces the image (ovalization of the footprint). The deviation is in the Y direction (motion direction) of the spacecraft by 12/1290 mm = 0.55 degrees.

PICTURE 11
Motion of the laser spots for the scanner transfer function measurements.

OTHER MEASUREMENTS HAVE BEEN MADE :
CUBE MIRROR ON SCANNER AND LASER LIGHT REFLECTED BY SILICON WINDOW.



PICTURE 12

Measurements out of the window: Earth’s atmosphere study.

PICTURE 13
Measurements toward Rome.

1.11 OUT OF THE WINDOW MEASUREMENTS.

10 Jan 2002
File descriptions:

FUORI_G00_020110_151119.ifg

Looking at the other building. 3 Acquisitions. SW Gain Sensor: 0. LW Gain Sensor: 0

FUORI_G33_020110_152447.ifg

Looking at the other building. 3 Acquisitions. SW Gain Sensor: 3. LW Gain Sensor: 3

FUORI_G53_020110_152730.ifg

Looking at the other building. 3 Acquisitions. SW Gain Sensor: 5. LW Gain Sensor: 3

FUORI_G53_020110_153127.ifg

Looking at the other building. 100 Acquisitions. SW Gain Sensor: 5. LW Gain Sensor: 3

FUORI_G53_020110_154952.ifg

Looking at the atmosphere. 3 Acquisitions. SW Gain Sensor: 5. LW Gain Sensor: 3

FUORI_G53_020110_155221.ifg

Looking at the atmosphere. 10 Acquisitions. SW Gain Sensor: 5. LW Gain Sensor: 3

FUORI_G53_020110_155630.ifg

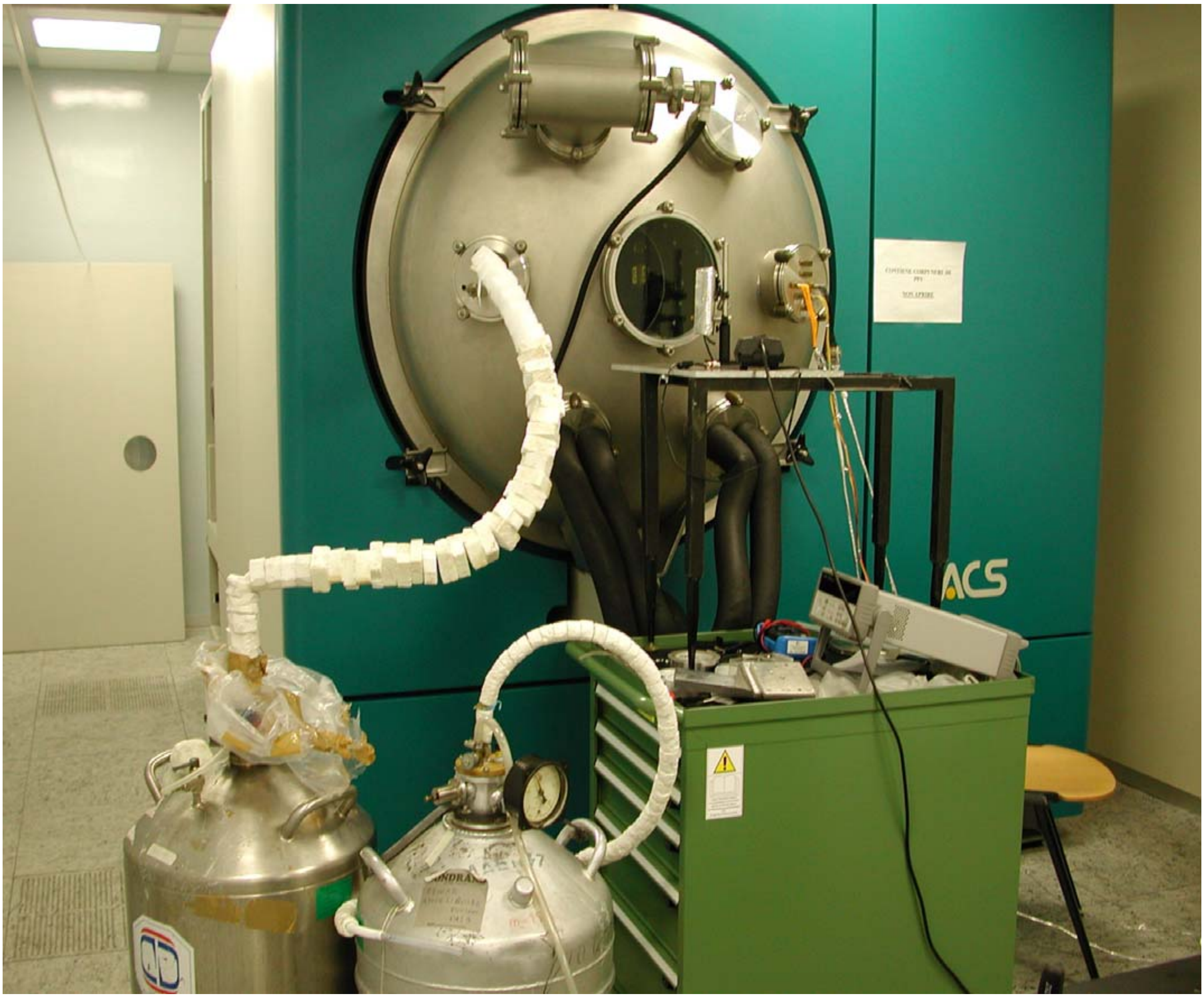
Looking at the atmosphere. 10 Acquisitions. SW Gain Sensor: 5. LW Gain Sensor: 3

FUORI_G53_020110_155920.ifg

Not looking at the atmosphere (the ceiling). 3 Acquisitions. SW Gain Sensor:5. LW Gain Sensor:3

The measurements were taken first looking straight to IAS building, then looking toward IFA, and far away, finally we tried to look upward toward the sky, but perhaps we see the roof.

WE PASS NOW TO THE MEASUREMENTS MADE IN THERMOVACUUM CHAMBER.



PICTURE 14
Measurements in the Thermovac. Mercury lamp in the picture.

1.12 THERMOVACUUM, 08 JAN 2002

All the acquisitions have been done into the thermovacuum chamber. All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Integrating Sphere, the Mercury Lamp, or the Internal Lamp. For the Integrating Sphere the current is set to 5.540 A.

See picture: PICTURE 14

File descriptions:

SPHERE10_020108_113622.ifg
----

10 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----
SPHERE10A_020108_113833.ifg
----
10 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE10B_020108_154216.ifg
----
10 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE10C_020108_154416.ifg
----
10 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE10D_020108_163102.ifg
----
10 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary
----
SPHERE20A_020108_114231.ifg
----
10 Acquisitions. Luminance: 20 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE30_020108_113404.ifg
----
10 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE30A_020108_114442.ifg
----
10 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE30B_020108_154015.ifg
----
10 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE30C_020108_154634.ifg
----
10 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary
----

SPHERE30D_020108_163331.ifg

----

10 Acquisitions. Luminance: 30 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary

----

SPHERE50_020108_113200.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE50A_020108_114653.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE50B_020108_153815.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE50C_020108_154836.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE50D_020108_163542.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary

----

SPHERE50D_020108_163542.ifg

----

10 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary

----

SPHERE70_020108_112942.ifg

----

10 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE70A_020108_114914.ifg

----

10 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE70B_020108_153601.ifg

----

10 Acquisitions.   Luminance: 70 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE70C_020108_155039.ifg

----

10 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE70D_020108_163805.ifg

----

100 Acquisitions. Luminance: 70 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary

----

SPHERE100_020108_112721.ifg

----

10 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE100A_020108_115137.ifg

----

10 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE100B_020108_153240.ifg

----

10 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE100C_020108_155249.ifg

----

10 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE100D_020108_164945.ifg

----

10 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 236 °K. Motor: Primary

----

SPHERE200_020108_112431.ifg

----

10 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

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SPHERE200A_020108_115406.ifg

----

10 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE200B_020108_153031.ifg

----
10 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 2.SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE200C_020108_155457.ifg
----
10 Acquisitions. Luminance: 200 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE300_020108_112145.ifg
----
10 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE300A_020108_115613.ifg
----
10 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE300B_020108_152826.ifg
----
10 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE300C_020108_160400.ifg
----
10 Acquisitions. Luminance: 300 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE400_020108_111901.ifg
----
10 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE400A_020108_115824.ifg
----
10 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K. Motor: Primary
----
SPHERE400B_020108_152622.ifg
----
10 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary
----
SPHERE400C_020108_160621.ifg
----
10 Acquisitions. Luminance: 400 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary
----

SPHERE500_020108_111555.ifg

----

10 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE500A_020108_120033.ifg

----

10 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 286 °K.Motor: Primary

----

SPHERE500B_020108_152329.ifg

----

10 Acquisitions . Luminance: 500 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE500C_020108_160847.ifg

----

10 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE1000_020108_111323.ifg

----

10 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE1000C_020108_161106.ifg

----

10 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE3000_020108_111019.ifg

----

10 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

SPHERE3000C_020108_161307.ifg

----

10 Acquisitions. Luminance: 3000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 240 °K. Motor: Primary

----

SPHERE5000_020108_110554.ifg

----

10 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 286 °K. Motor: Primary

----

MERCURY_020108_094128.ifg

----

3 Acquisitions. Motor: Primary

MERCURY_020108_103149.ifg

----

5 Acquisitions. Motor: Primary

MERCURY_TEST6_020108_094425.ifg

----

210 Acquisitions - TEST 6. Motor: Primary

1.13 10 JAN 2002

All the acquisitions have been done into the thermovacuum chamber. All acquisitions have been done into the laboratory at room temperature, without the scanner, using the Mercury Lamp, or the Internal Lamp.

See picture: PICTURE 14

File descriptions:

CLAMP_020110_094859.ifg

----

38 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 295 °K. Motor: Primary

----

CLAMP_020110_100310.ifg

----

60 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 295 °K. Motor: Primary

----

CLAMP_SWDETRAMP_020110_101627.ifg

----

200 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: RAMP TO 250 °K. Motor: Primary

----

CLAMP_SWDETRAMP_020110_105332.ifg

----

92 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: RAMP TO 250 °K. Motor: Primary

----

CLAMP_SWDETRAMP_020110_112402.ifg

----

100 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: RAMP TO 250 °K. Motor: Primary

----

CLAMP_SWDET-23_020110_120131.ifg

----

100 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 250 °K. Motor: Primary

----

CLAMP_TEST5_020110_114348.ifg

----

96 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 250 °K. Motor: Primary

----

MERCURY_020110_122007.ifg

----

3 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 250 °K. Motor: Primary

----

MERCURY_020110_122336.ifg

----

3 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 250 °K. Motor: Primary

----

MERCURY_TEST6_020110_122521.ifg

----

84 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 250 °K. Motor: Primary

1.14 21 JAN 2002

All the acquisitions have been done into the thermovacuum chamber, using the Integrating Sphere with the current set to 5.540 A.

File descriptions:

FONDO_020121_113645.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280°K. Motor: Primary

----

FONDO_020121_122532.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K. Motor: Secondary

----

FONDO_020121_121919.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_123331.ifg

----

17 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 0. SW Detector Temp.:280°K. Motor: Secondary

----

SPHERE_020121_123621.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_124014.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_124403.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_124758.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_125145.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_125549.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_125957.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K. Motor: Secondary

----

SPHERE_020121_130345.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_130734.ifg

----

20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_131155.ifg

----

20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_131548.ifg

----

20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_131935.ifg

----

20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_132352.ifg

----

20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_132743.ifg

----

20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_133139.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_133546.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 280 °K Motor: Secondary

----

SPHERE_020121_133936.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 280 °K Motor: Secondary

----

BBINT_020121_134322.ifg

----

20 Acquisitions. SW Gain Sensor: 4. SW Detector Temp.: 280 °K. Motor: Secondary

----

BBINT_020121_134840.ifg

----

20 Acquisitions. SW Gain Sensor: 2. SW Detector Temp.: 280 °K. Motor: Secondary

----

BBINT_020121_135233.ifg

----

20 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 280 °K. Motor: Secondary

----

CLAMP_020121_135622.ifg

----

20 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 280 °K. Motor: Secondary

----

BBINT-RAMP_020121_140147.ifg

----

300 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: from 280 °K to ? °K. Motor: Secondary

----

BBINT-RAMP_020121_152718.ifg

----

100 Acquisitions . SW Gain Sensor: 0. SW Detector Temp.: from ? °K to ? °K. Motor: Secondary

----

BBINT-RAMP_020121_154539.ifg

----

20 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: from ? °K to ? °K. Motor: Secondary

----

BBINT-RAMP_020121_155057.ifg

----

20 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: from ? °K to ? °K. Motor: Secondary

----

FONDO_020121_183028.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_160224.ifg

----

20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 0 SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_160559.ifg

----

20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_161004.ifg

----

20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_161417.ifg

----

20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_161852.ifg

----

20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_162247.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 0. SW Detector Temp.: 260 °K Motor: Secondary

----

SPHERE_020121_162707.ifg

----
20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 264.3 °K
Motor: Secondary

SPHERE_020121_163146.ifg
----
20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 264.3 °K
Motor: Secondary

SPHERE_020121_163538.ifg
----
20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 265.3 °K
Motor: Secondary

CLAMP_020121_163938.ifg
----
20 Acquisitions. SW Gain Sensor: 0. SW Detector Temp.: 265.3 °K. Motor: Secondary
----
SPHERE_020121_173737.ifg
----
22 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_174130.ifg
----
20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_174521.ifg
----
20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_174919.ifg
----
20 Acquisitions. Luminance: 10 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_175324.ifg
----
20 Acquisitions. Luminance: 50 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_175720.ifg
----
20 Acquisitions. Luminance: 100 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K
Motor: Secondary

SPHERE_020121_180110.ifg

----

20 Acquisitions. Luminance: 500 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K Motor: Secondary

----

SPHERE_020121_180453.ifg

----

20 Acquisitions. Luminance: 1000 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K Motor: Secondary

----

SPHERE_020121_180840.ifg

----

20 Acquisitions. Luminance: 5000 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K Motor: Secondary

----

FONDO_020121_182153.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 4. SW Detector Temp.: 266 °K Motor: Secondary

----

FONDO_020121_182631.ifg

----

20 Acquisitions. Luminance: 0 footlamberts. SW Gain Sensor: 2. SW Detector Temp.: 266 °K Motor: Secondary

Parent Directory	10-Jan-2002	12:11	-
TVBalance_011215_165..>	03-Jan-2002	16:03	161k
TVBalance_011215_182..>	03-Jan-2002	16:03	926k
TVBalance_011215_190..>	03-Jan-2002	16:03	2.9M
TVBalance_011215_202..>	03-Jan-2002	16:03	362k
TVBalance_011215_202..>	03-Jan-2002	16:03	1.8M

Parent Directory	10-Jan-2002	12:11	-
TVBalance_011216_151..>	03-Jan-2002	16:03	2.3M
TVBalance_011216_160..>	03-Jan-2002	16:03	2.3M
TVBalance_011216_171..>	03-Jan-2002	16:03	1.2M
TVBalance_011216_185..>	03-Jan-2002	16:03	886k

1.15 ORIEL LAMP

05 Jan 2002

All acquisitions have been done into the laboratory at room temperature,
without the scanner. The distance between the Lamp and the Module O is 103 cm.

File descriptions:

ORIEL_020105_114934.ifg
----
100 Acquisitions. SW Gain Sensor: 3. LW Gain Sensor: 0. Lamp Current: 5 Amps

1.16 - MINERALS

Parent Directory	20-Jan-2002	19:17	-
ALBITE.ifg	17-Jan-2002	16:14	81k
GESSO.ifg	17-Jan-2002	16:14	81k
KBR.ifg	17-Jan-2002	16:14	309k

18 Jan 2002

All the acquisitions have been done into the laboratory, at room temperature.

See picture: minerals.jpg

File Description:

ALBITE_020118_142603.ifg

Measurements: 50. ALBITE (Ontario) very fine grain, 0.50 mg dispersi in 253.1 mg of KBr.

KBr1_020118_145325.ifg

Measurements: 50. KBr n°1 from 252.8 mg

HEMATITE1_020118_150316.ifg

Measurements: 50. Hematite South Dakota (raw). 0.67 mg in 263.3 mg of KBr
----
DOL1_020118_153351.ifg

Measurements: 50. Dolomite Bayern (raw). 0.69 mg in 251.2 mg of KBr
----
KBr2_020118_162223.ifg

Measurements: 50. KBr n°2 from 255.7 mg

QUARZO1_020118_163533.ifg

Measurements: 50. quartz dust Dr. Krantz. 0.67 mg in 248.8 mg of KBr
----
KAOLINITE1_020118_170007.ifg

Measurements: 50. Kaolinite New Mexico. Size of grain 20-50 um 0.66 mg in 248.8 mg of KBr
----
KBr1A_020118_171538.ifg

Measurements: 50. KBr n°1 from 252.8 mg

GYPSUM_020118_174539.ifg

Measurements: 50. GYPSUM 1 Colorado. Size of grain 20-50 um 0.75 mg in 251.8 mg of KBr

****
****
****** Warning: the disposition of lamp is changed!!!**
****
****

OLIVINA2_020118_182438.ifg

Measurements: 50. OLIVINA 2 Eifel. Size of grain < 20 um, 0.72 mg in 249.5 mg of KBr
----
KBr2A_020118_184009.ifg

Measurements: 50. KBr n°2 from 255.7 mg

CALCITE_020118_190011.ifg

Measurements: 50. CALCITE 1 Lecce (raw). 0.64 mg in 265.5 mg of KBr
----
HEMATITE2_020118_191521.ifg

Measurements: 50. Hematite 2 Michigan (raw).0.72 mg in 254.2 mg of KBr
----
KBr1B_020118_193042.ifg

Measurements: 50. KBr n°1 from 252.8 mg

OLIVINA1_020118_194549.ifg

Measurements: 50. OLIVINA 1 Eifel. Size of grain 100-200 um, 0.68 mg in 249.9 mg of KBr

19 JAN 2002

All the acquisitions have been done into the laboratory, at room temperature.

File Description:

FONDO_020119_110418.ifg
----
50 Acquisitions. SW Gain Sensor: 2.LW Gain Sensor: 2. Lamp OFF

LAMP_020119_115249.ifg
----
50 Acquisitions. SW Gain Sensor: 1. LW Gain Sensor: 3. Lamp ON

GYPSUM1_020119_122454.ifg

Measurements: 50. gYPSUM 1 Colorado. Size of grain 20-50 um 0.75 mg in 251.8 mg of KBr
----
KBr2_020119_123635.ifg

Measurements: 50. KBr n°2 from 255.7 mg

CALCITE1_020119_125027.ifg

Measurements: 50. CALCITE 1 Lecce (raw). 0.64 mg in 265.5 mg of KBr
----
KBr1_020119_130303.ifg

Measurements: 50. KBr n°1 from 252.8 mg

FONDOL2_020119_131639.ifg

Measurements: 50. Buio lampada 2 (ceramic element)

LAMP2_020119_135825.ifg

Measurements: 50. Lamp ON (ceramic element)

ALBITE_020119_211450.ifg

Measurements: 50. ALBITE (Ontario) very fine grain,. 0.50 mg dispersi in 253.1 mg of KBr.

KBr1_020119_213045.ifg

Measurements: 50. KBr n°1 from 252.8 mg

Parent Directory	20-Jan-2002	19:17	-
ALBITE_BB_020120_113..>	20-Jan-2002	15:19	2.0M
DOLOMITE_BB_020120_1..>	20-Jan-2002	15:19	2.0M
EMPTY-CSI1_LAMP_0201..>	20-Jan-2002	15:59	2.0M
EMPTY-CSI2_LAMP_0201..>	20-Jan-2002	15:59	2.0M
EMPTY-CSI_BB_020120_..>	20-Jan-2002	15:19	2.0M
GYPSUM_BB_020120_115..>	20-Jan-2002	15:19	2.0M
OLIVINE_LAMP_020120_..>	20-Jan-2002	15:59	2.0M
ORPIMENT_LAMP_020120..>	20-Jan-2002	15:59	2.0M
ORPI_BB_020120_12332..>	20-Jan-2002	15:19	2.0M
SPODUMENE_LAMP_02012..>	20-Jan-2002	15:59	1.9M
TITANITE_LAMP_020120..>	20-Jan-2002	15:59	2.0M
pasticche.jpg	20-Jan-2002	19:15	852k

16 JAN 2002: IFSI Clean Room
18 JAN 2002: IFSI Laboratory - Ceramic Element
19 JAN 2002: IFSI Laboratory - Oriel Lamp

1.17 DATA TAKEN IN ALENIA IN TURIN

Stand Alone Procedure

The procedure done for the stand alone test before the integration to the spacecraft is the follow:

1. Test 1 as GONOGO Test
2. Unblock the Double Pendulum
3. Test 5 with the scanner pointing a source (a mercury lamp)
4. Test 6 with the scanner pointing a source (a mercury lamp)
5. Block the Double Pendulum
6. Run automatically the FPT test sequence (in nominal and in the redundand power)

Test 1 as GONOGO Test
During the test we checked the current and the voltage values and are in the right range value. Also the Housekeeping was regular.
GONOGO TEST IS OK

UNBLOCK DOUBLE PENDULUM
Unblocking the pendulum the current values are correct and after about 12 min. the pendulum was correctly unblocked. We received the event packet meaning that the double pendulum was unblocked, and also the remarks in the housekeeping meant that the pendulum was really unblocked.

Test 5 and Test 6

Done with the MERCURY LAMP : DATA ARE IN THE FILE S:
MERCURY_020205_12213..> 25-Feb-2002 19:32 163k
MERCURY_020205_12285..> 25-Feb-2002 19:32 163k
MERCURY_020205_12341..> 25-Feb-2002 19:32 33k
MERCURY_020205_12370..> 25-Feb-2002 19:32 49k
MERCURY_020205_12402..> 25-Feb-2002 19:32 163k
Stand-Alone-Report.doc 25-Feb-2002 18:01 103k
TEST5_020205_115841.ifg 25-Feb-2002 19:35 1.3M
TEST6_020205_121131.ifg 25-Feb-2002 19:32 1.7M

Both tests are OK

BLOCK DOUBLE PENDULUM

The block is OK
Full Performance Test
Finally we performed the FPT test sequence.
FPT Input File: ***/Mex/CmdFiles/PFS_FPT.txt***
Test Result for Nominal Power
Telecommands sent file name: ***/Mex/Archive/TELECOMMAND/C020205_133159.cmd***
Log file name: ***/Mex/Archive/TELECOMMAND/L020205_133243.log***
For Redundant Power the test result is ok (similar to the nominal).
CONCLUSION
The Stand Alone Test is OK

The file with the stand alone interferograms is : no file : science telemetry was not on.

Second we performed the Full performance test after integration on the spacecraft : the file with the data is :

- FPT_020212_052243.ifg 25-Feb-2002 18:18 443k

2 TYPICAL RAW SPECTRA OBTAINED.

2.1 THERMAL LW CHANNEL.

We shall now present some raw data obtained with PFS. The raw data are interesting to note instrumental effects, when present, To have an idea of the intensity of the signal measured, to observe unexpected features and so on. In general raw data are useful to become familiar with the data themselves.
In the following figures we present data from the LW channel obtained with the IFSI BB. The measurements were taken in air, therefore atmospheric features (water and CO2 lines) are present. The side panels give the PFS measurement conditions. See plot 1,2,3,4,5.
We note that the spectrum covers 2.5 decades, the spectral range is between 250 and 1750 cm-1. The spectra show the typical modulation induced by the optical element. As the IFSI BB was hold at temperatures larger than ambient temperature, but decreasing from 150 to 30, we could see that the signal itself was decreasing: 10 DN at max, and 0.5 at 30 deg.
Note that a spurious peak at 1300 cm-1 appears due to bad motion in the measurements taken at low radiation intensity on December 27 and 28. Later the current of the motors was increased and the peak disappeared. This peak was present with the secondary motor (lowest current). The current was too low after the addition of two big inductance to decrease the inrush current l, as requested by module P. After January 2 the current was increased and the effect disappeared for ever. Plot 6 and 7 summarize and compare the measurements.
When comparing the raw data spectra, we should not expect the curves to be linearly ordered : planckians are not linear with T.
When we compare the IFSI BB at 30 C with internal BB (green and red in the second color figure) we see that, with respect to the detector we have + 7 deg and – 5 deg : the 2 curves almost coincide, meaning that the instrument temperature is also important and it has been neglected in this simple comparison.
The last color figure (plot 8) of the LW channel spectra shows 3 measurements of a 50 C source. The 3 are in relatively agreement, the differences being due to the fact that we had not waited 15 minutes for the measurement, as required by the stability of the source.
It is interesting to note, finally, the behaviour of the atmospheric features in the spectra : CO2 almost completely absent (only the Q branch visible : on the short path of 10-20 cm there is not enough CO2 to be measured, or the temperature is uniform). The water lines are more evident in the spectra of the hot source. (The termal difference increase the contrast).

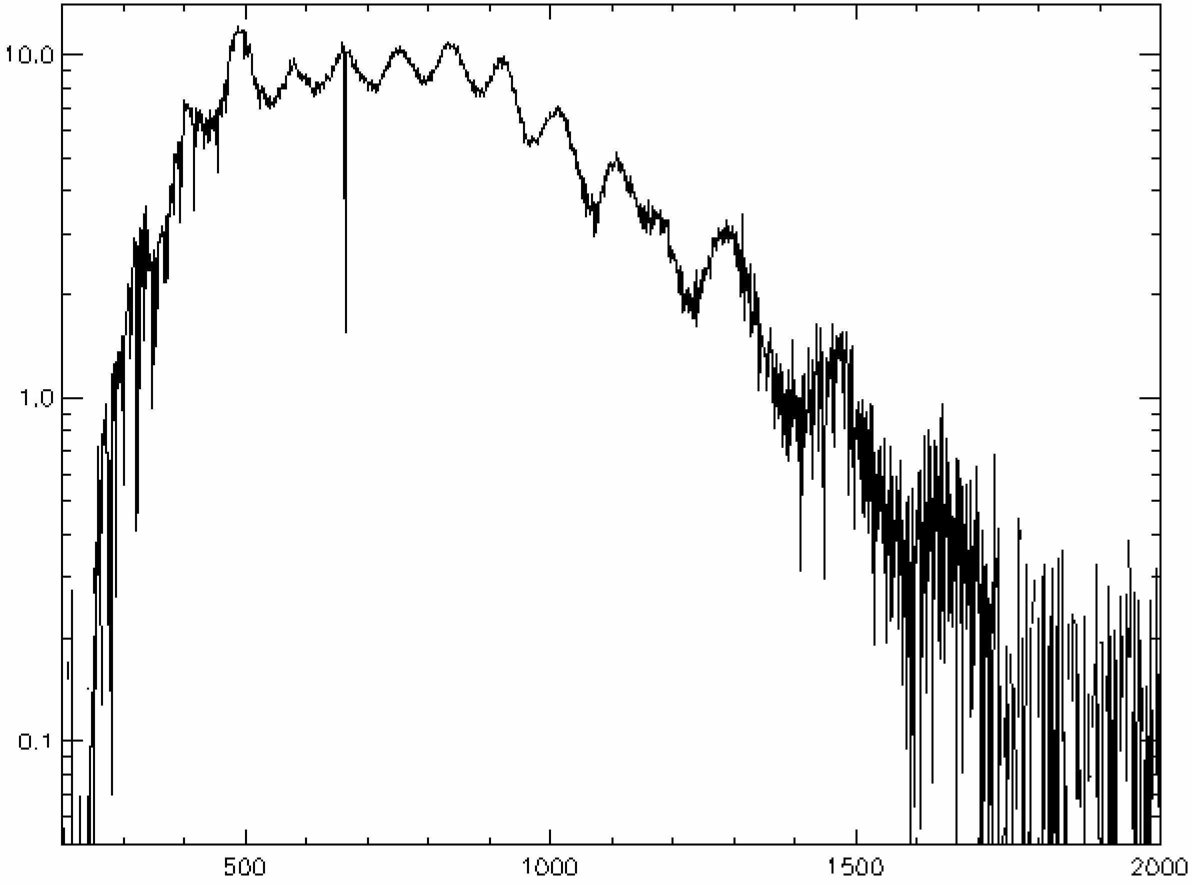
2.2 THERMAL SW CHANNEL.

In the next set of figures (plot 9,10,11,12,13) we plot the contribution in the SW channel of the same measurements presented above. We see that we have now a 2 orders of magnitude spectra, ranging from 2000 to 4000 cm-1. The CO2 main band is clearly visible now, and we shall come back to comment it. We see that the SW channel is not able to see thermal differences less than 10 degrees (in a single spectrum). The important point is that we can use the same procedure for SW and LW to calibrate the LW channel and this portion of the SW channel. (see plot 14, 15, 16).
The blow up of the CO2 band shows several things : first PFS is able to resolve rotovibrational features (see plot 17). Second we discover that the central peak of the CO2 band is in some cases shifted by 5 cm-1. Details of this effect can be seen in the next 3 figures. See plot 18, 19, 20. xWe start with some water lines in the LW channel : it is clear that the water line does not move, but the laser diode reference wavelength is changing. The second figure shows similarly the CO2 Q branch: apparently tends to move and its depth is reduced : this is due to changing of the laser diode

wavelength and to the response of the instrument to monochromatic sources. We shall come back later to this point, when studying the mercury lamp measurements.

In the cases of figures the temperature of the laser diodes was changing by only 0.5 – 0.6 degrees, but this was enough to change the wavelength DISCONTINUOUSLY. It is clear that if we mix all the measurements, with different motion (forward-reverse) and different laser diode wavelength, we will get wrong responsivity and NER.

It is obvious, therefore that before averaging data and computing whatever quantity, the data must be screened one by one and corrected for the laser diode wavelength. Also, the behaviour of the laser diode must be well studied, and the response of PFS to monochromatic features must be well understood.

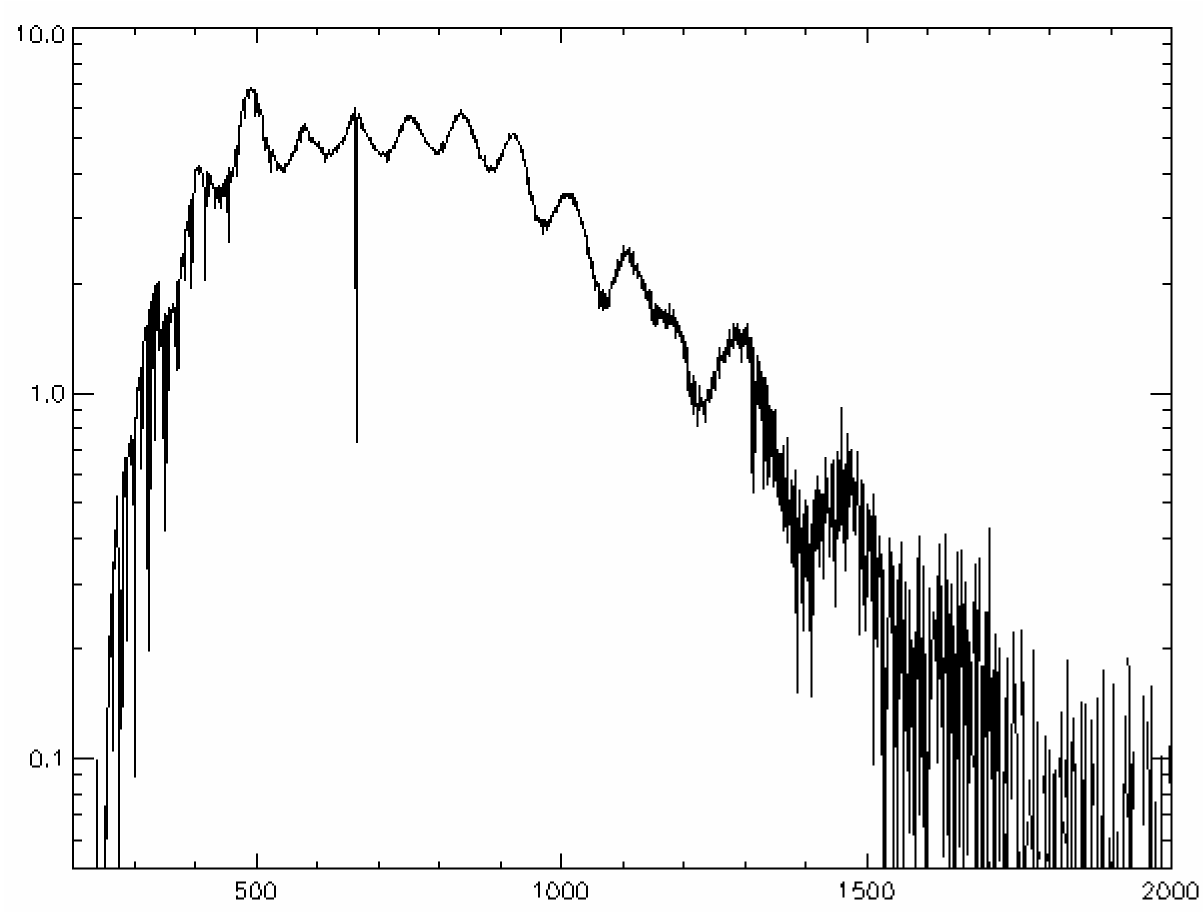


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	303.316
LW Det. Temp. (±5V):	302.819
LW Det. Temp. (±10V):	302.795
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	303.800
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	302.930
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	297.995
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	298.106

Acquisition #:	35		
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	301.520	T2:	302.254
T3:	302.067	T4:	301.723
T5:	301.020	T6:	302.817
T7:	301.957	T8:	301.223

IFSI Black Body @ 148,9 °C
LWC FFT spectrum

Plot - 1

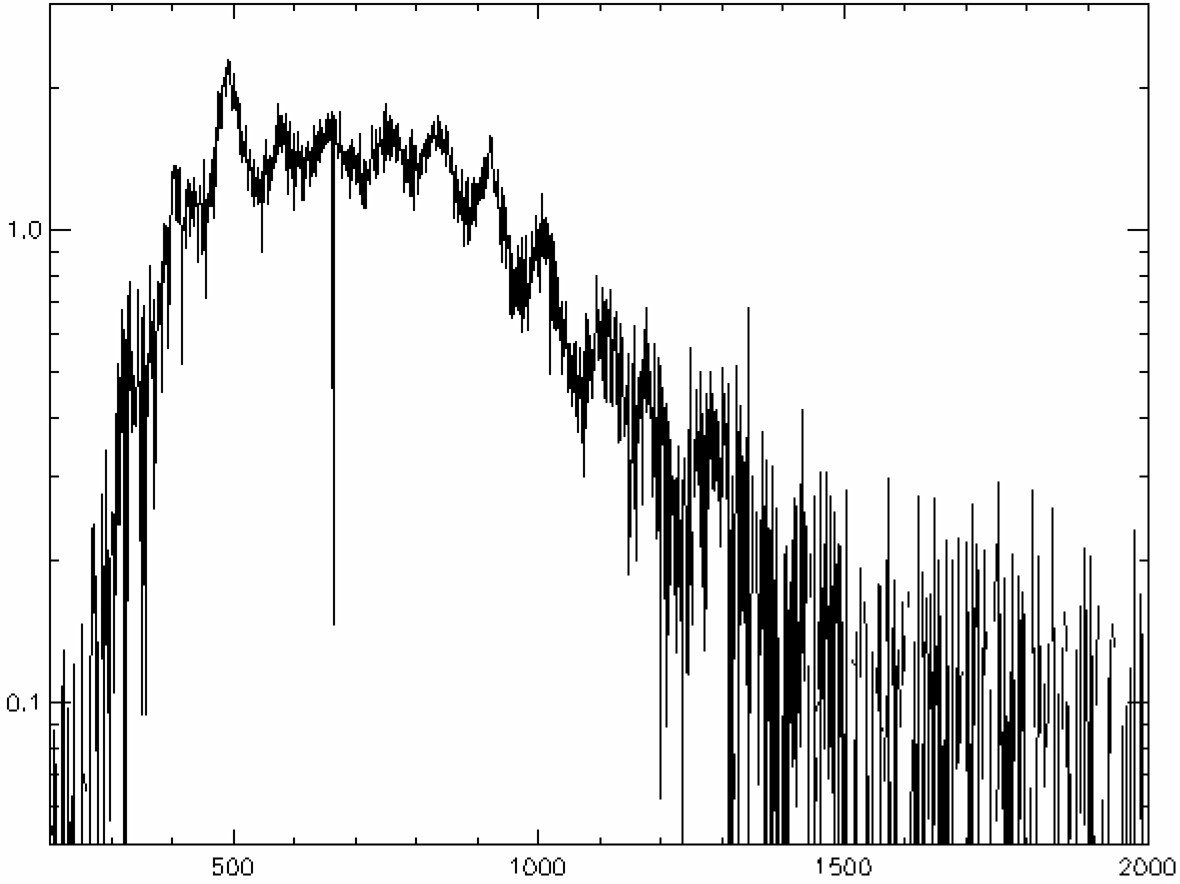


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	302.593
LW Det. Temp. (±5V):	302.018
LW Det. Temp. (±10V):	302.013
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	303.018
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	302.139
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	297.097
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	297.248

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	300.723	T2:	301.457
T3:	301.238	T4:	300.910
T5:	300.191	T6:	302.051
T7:	301.160	T8:	300.426

IFSI Black Body @ 100 °C
LWC FFT spectrum

Plot – 2

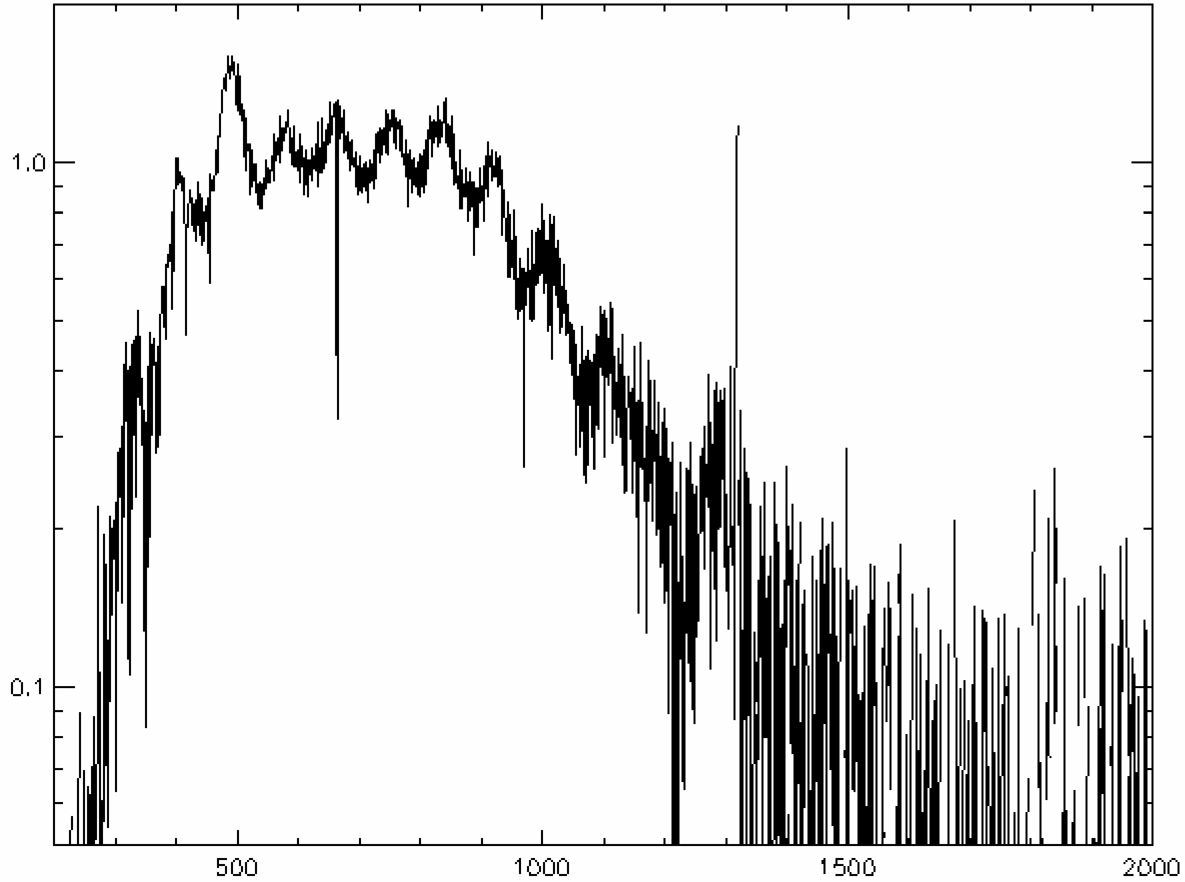


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	301.714
LW Det. Temp. (±5V):	301.149
LW Det. Temp. (±10V):	301.134
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	302.178
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	301.250
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	296.863
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	296.897

Acquisition #:	1		
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	300.082	T2:	300.738
T3:	300.535	T4:	300.285
T5:	299.472	T6:	301.301
T7:	300.441	T8:	299.691

IFSI Black Body @ 50 °C
LWC FFT spectrum

Plot – 3

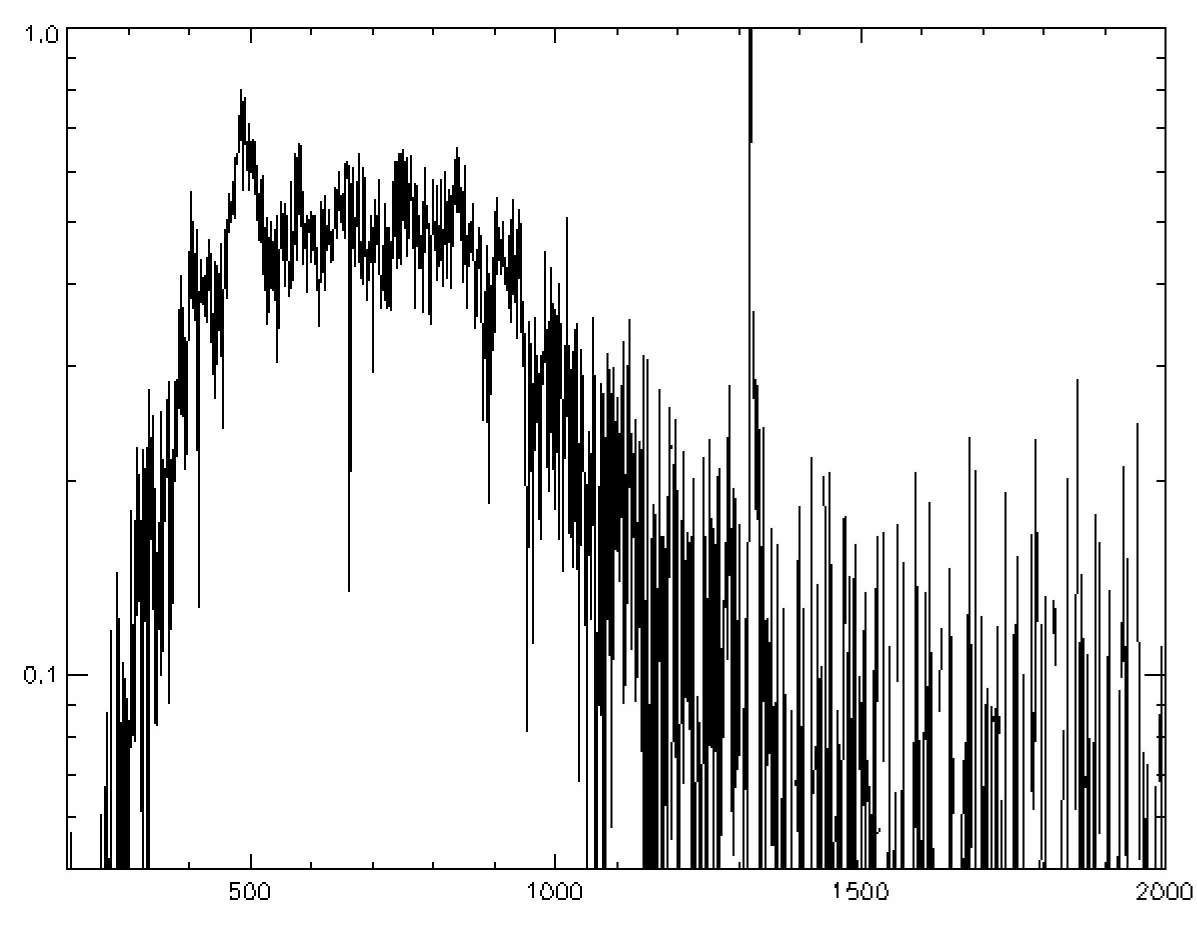


SW Det. Temp. (±5V):	298.242
SW Det. Temp. (±10V):	298.217
LW Det. Temp. (±5V):	297.486
LW Det. Temp. (±10V):	297.481
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	298.408
LW Laser Temp. (±5V):	297.717
LW Laser Temp. (±10V):	297.705
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	295.262
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	295.338

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	296.378	T2:	296.972
T3:	296.769	T4:	296.753
T5:	295.690	T6:	297.581
T7:	296.690	T8:	295.940

IFSI Black Body @ 40 °C
LWC FFT spectrum

NOTE: Secondary motor was used.
Plot – 4

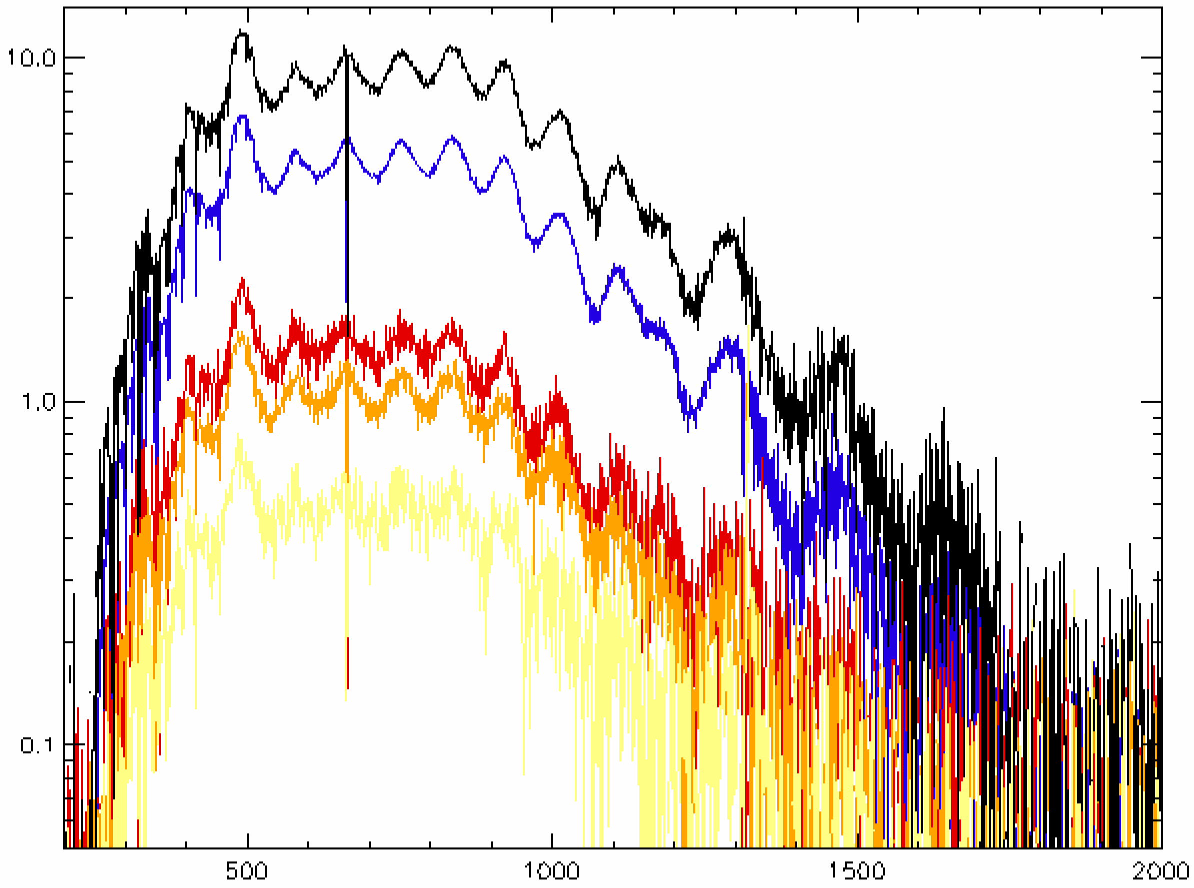


SW Det. Temp. (±5V):	297.314
SW Det. Temp. (±10V):	297.280
LW Det. Temp. (±5V):	296.626
LW Det. Temp. (±10V):	296.641
SW Laser Temp. (±5V):	297.604
SW Laser Temp. (±10V):	297.568
LW Laser Temp. (±5V):	296.857
LW Laser Temp. (±10V):	296.845
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	294.832
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	294.910

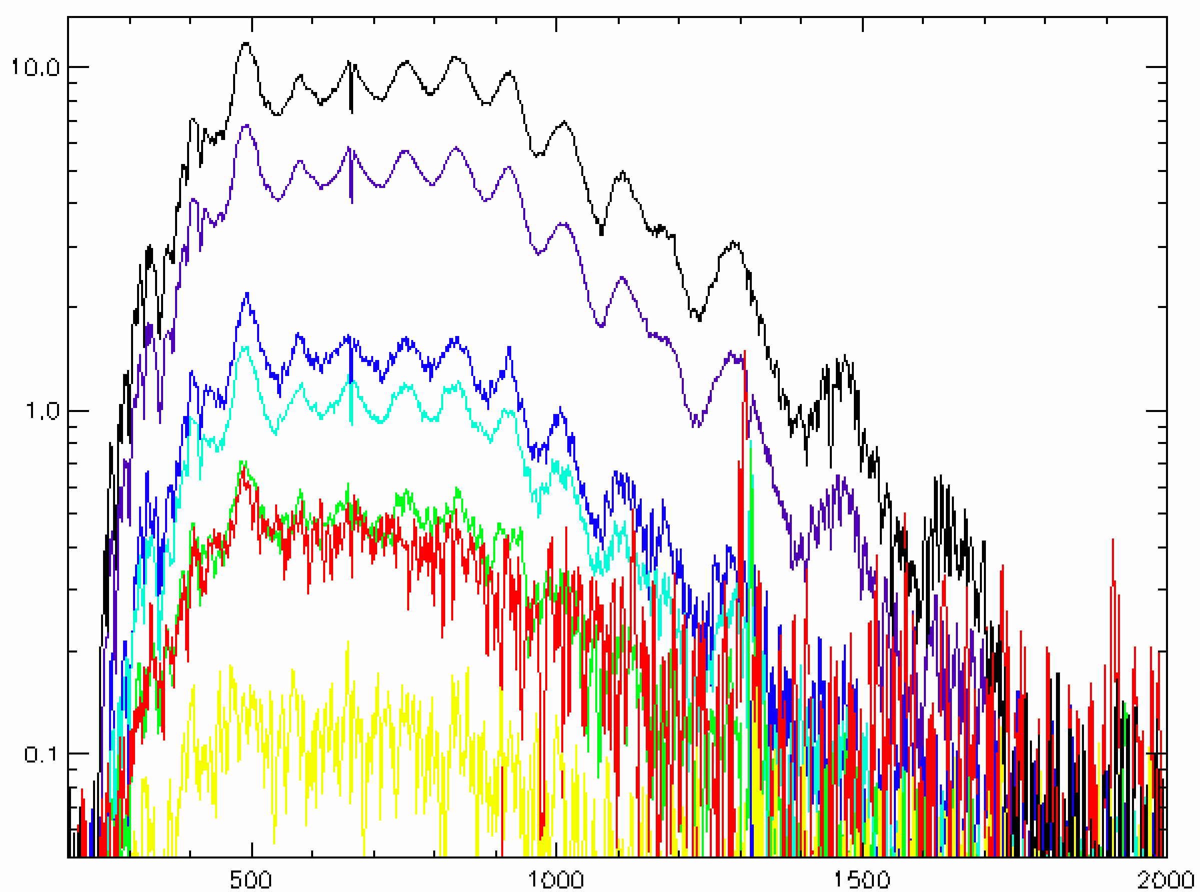
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	295.534	T2:	296.221
T3:	295.956	T4:	296.018
T5:	294.940	T6:	296.722
T7:	295.878	T8:	295.159

IFSI Black Body @ 30 °C
LWC FFT spectrum

NOTE: Secondary motor was used.
Plot – 5



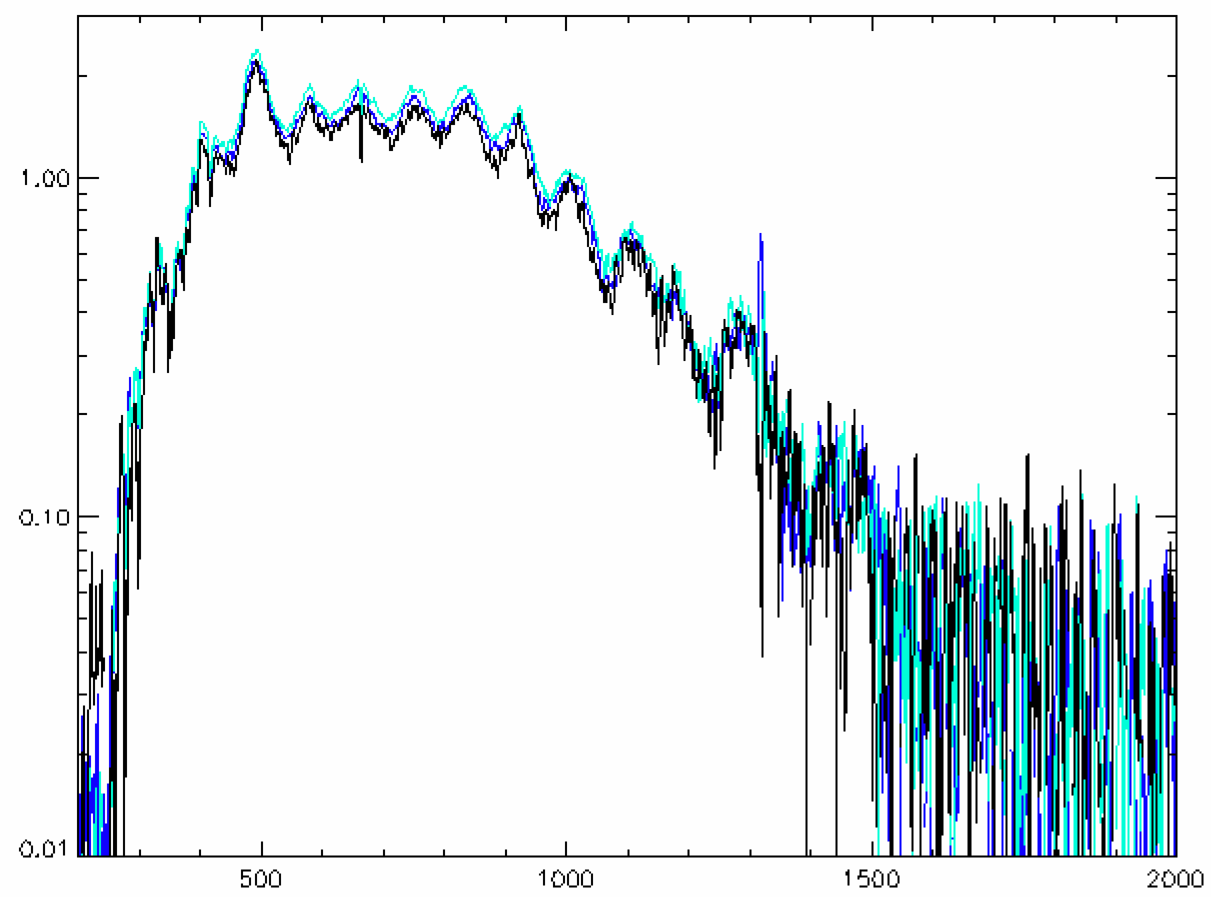
Black: IFSI Black Body @ 148,9 °C
Blue: IFSI Black Body @ 100 °C
Red: IFSI Black Body @ 50 °C
Orange: IFSI Black Body @ 40 °C
Yellow: IFSI Black Body @ 30 °C.LWC FFT spectra
Plot – 6



Plot – 7 SMOOTHING ON 5 PTS
Black: IFSI Black Body @ 148,9 °C
Violet: IFSI Black Body @ 100 °C
Blue: IFSI Black Body @ 50 °C
Cyan: IFSI Black Body @ 40 °C
Green: IFSI Black Body @ 30 °C
Red: Internal Black Body (**Primary Motor** – acquired just after IFSIBB @ 149°C)
Yellow: Internal Black Body (**Secondary Motor** - acquired just after IFSIBB @ 50°C)

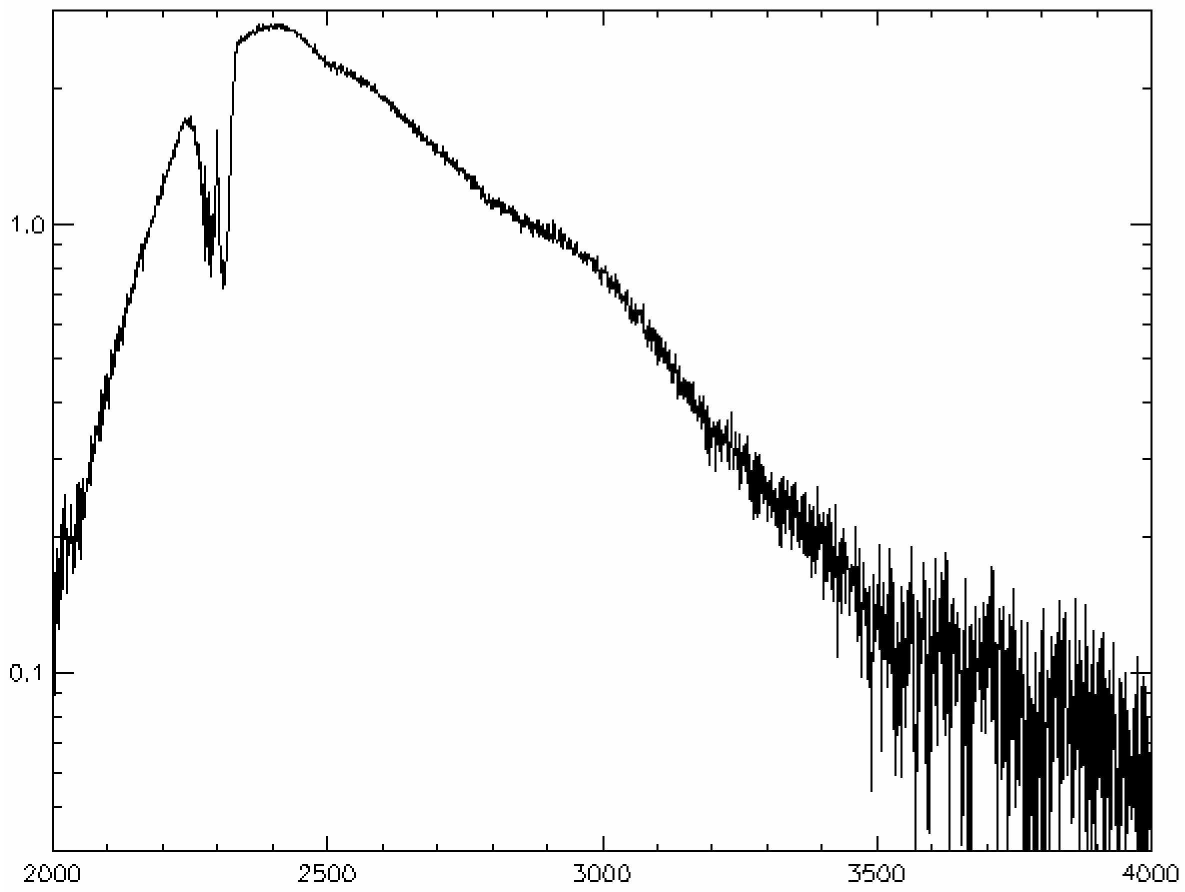
Int.BB after IFSIBB @ 148,9°C	
SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	303.941
LW Det. Temp. (±5V):	303.386
LW Det. Temp. (±10V):	303.381
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	304.425
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	303.546
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	298.932
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	298.963

Int.BB after IFSIBB @ 50°C	
SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	299.995
LW Det. Temp. (±5V):	299.352
LW Det. Temp. (±10V):	299.337
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	300.381
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	299.541
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	296.199
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	296.352



Cyan: IFSI Black Body @ 50°C (secondary motor)
Blue: IFSI Black Body @ 50,5°C
Black: IFSI Black Body @ 50°C

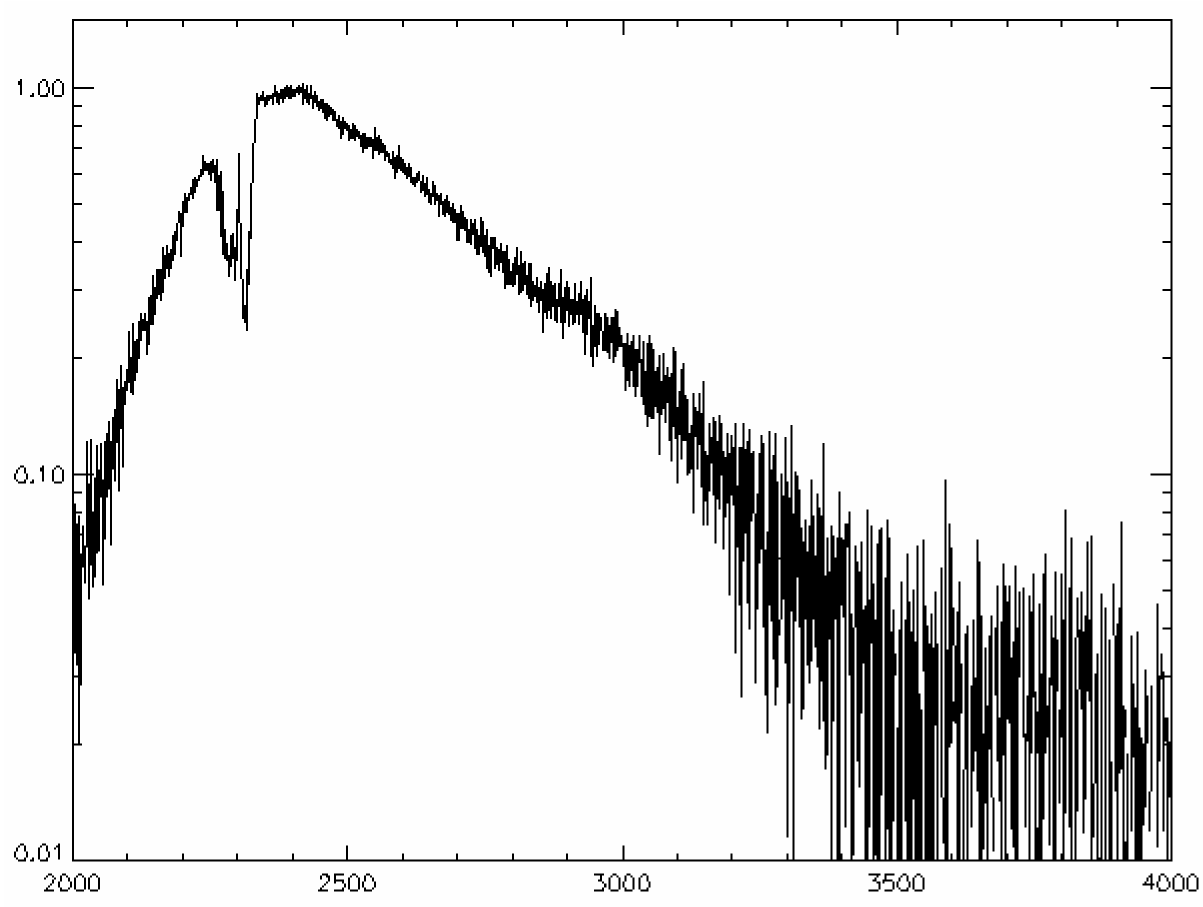
Plot – 8



SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	303.199
LW Det. Temp. (±5V):	302.722
LW Det. Temp. (±10V):	302.717
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	303.692
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	302.794
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	297.917
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	297.989

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	301.473	T2:	302.223
T3:	302.035	T4:	301.676
T5:	300.973	T6:	302.786
T7:	301.926	T8:	301.176

IFSI Black Body @ 148,9 °C
SWC FFT spectrum
Plot – 9

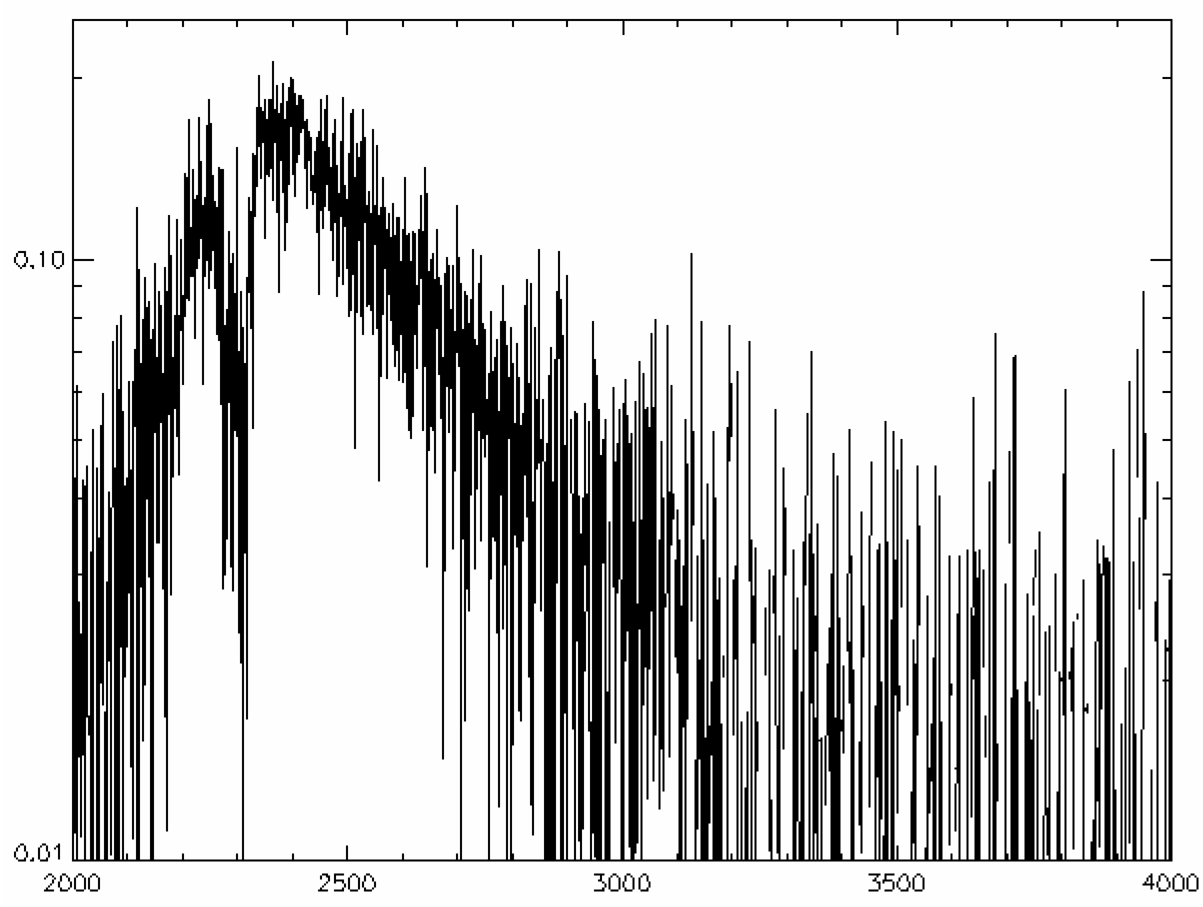


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	302.574
LW Det. Temp. (±5V):	301.989
LW Det. Temp. (±10V):	301.974
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	302.999
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	302.120
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	297.058
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	297.170

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	300.707	T2:	301.426
T3:	301.207	T4:	300.895
T5:	300.160	T6:	302.020
T7:	301.129	T8:	300.394

IFSI Black Body @ 100 °C
SWC FFT spectrum

Plot - 10

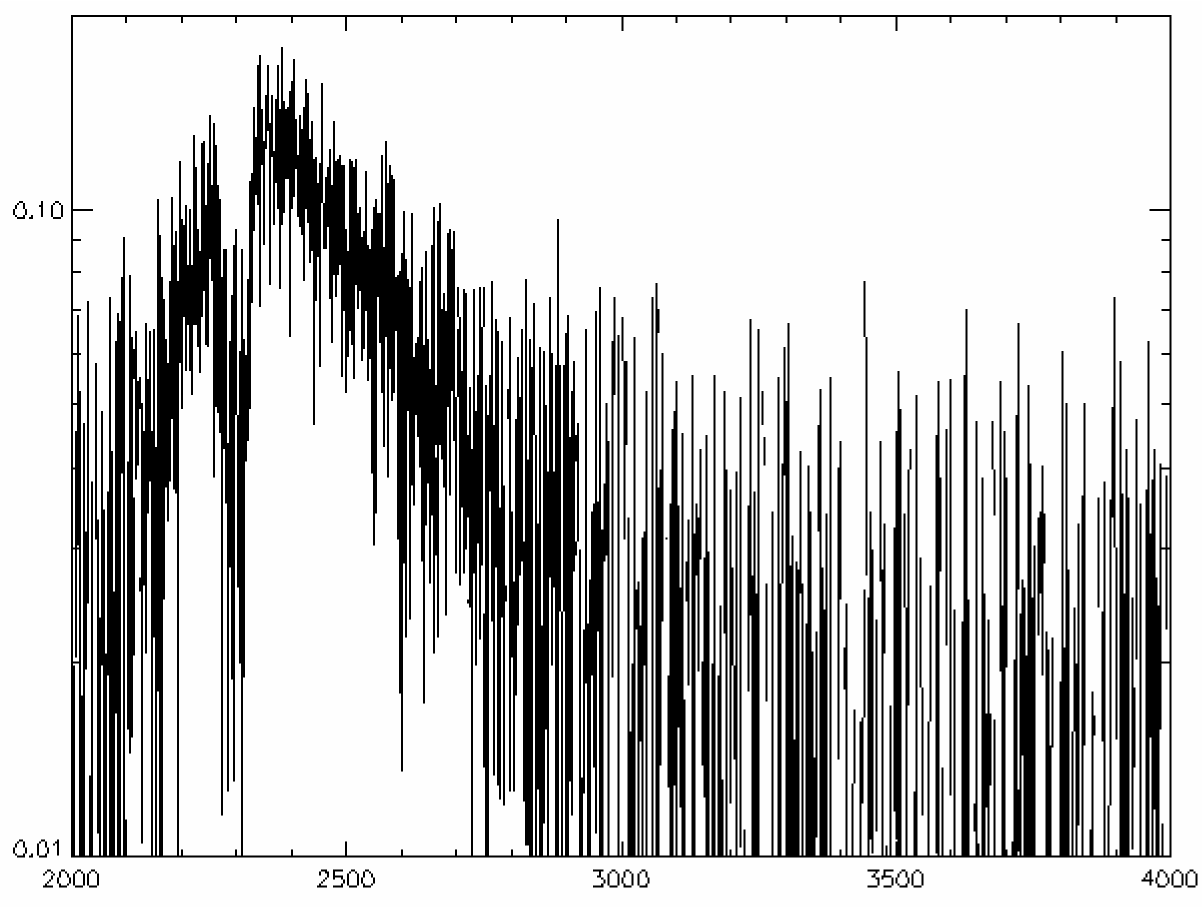


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	301.714
LW Det. Temp. (±5V):	301.149
LW Det. Temp. (±10V):	301.134
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	302.178
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	301.250
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	296.863
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	296.897

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	300.082	T2:	300.738
T3:	300.535	T4:	300.285
T5:	299.472	T6:	301.301
T7:	300.441	T8:	299.691

IFSI Black Body @ 50 °C
SWC FFT spectrum

Plot - 11

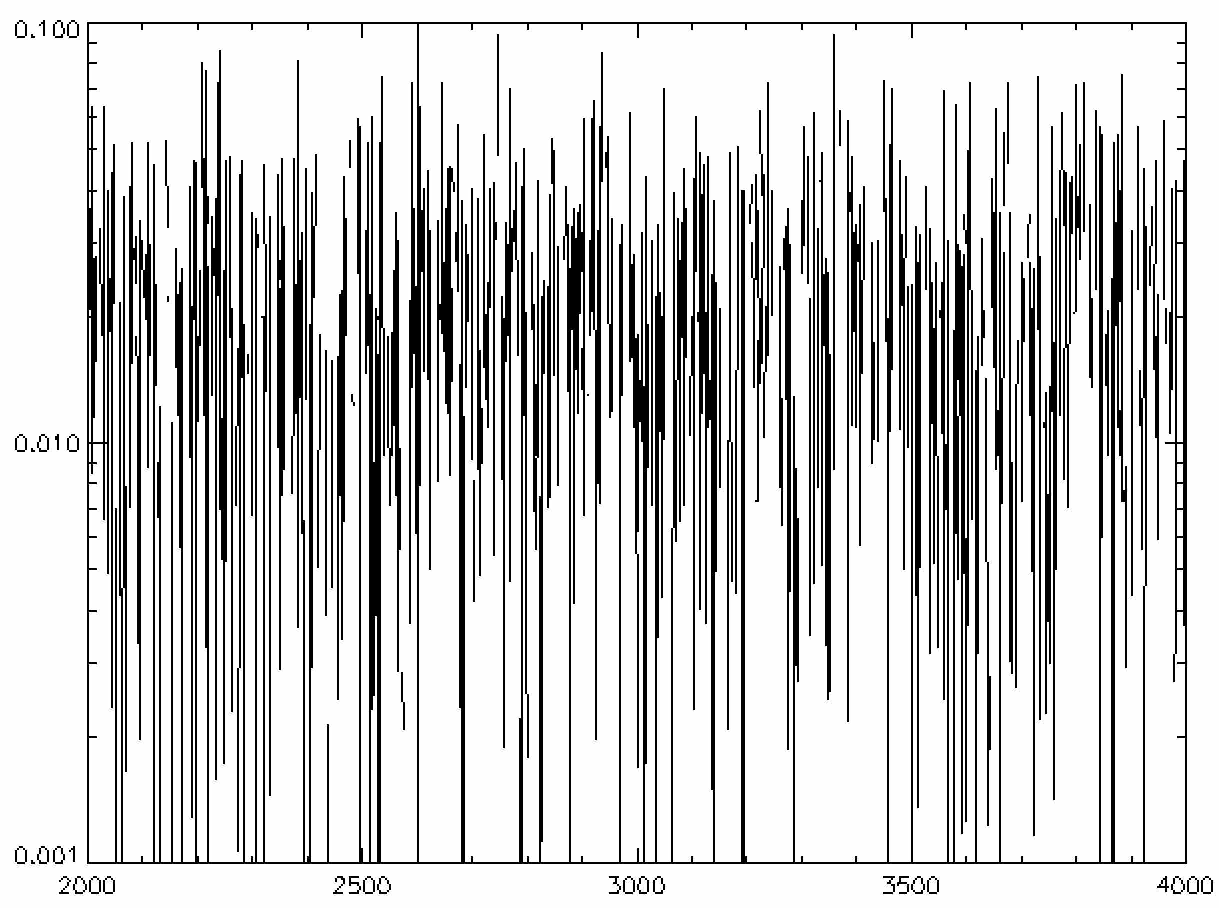


SW Det. Temp. (±5V):	298.212
SW Det. Temp. (±10V):	298.178
LW Det. Temp. (±5V):	297.466
LW Det. Temp. (±10V):	297.481
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	298.388
LW Laser Temp. (±5V):	297.697
LW Laser Temp. (±10V):	297.675
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	295.262
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	295.338

Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	296.347	T2:	296.956
T3:	296.737	T4:	296.722
T5:	295.674	T6:	297.550
T7:	296.659	T8:	295.909

IFSI Black Body @ 40 °C
SWC FFT spectrum

NOTE: Secondary motor was used.
Plot – 12

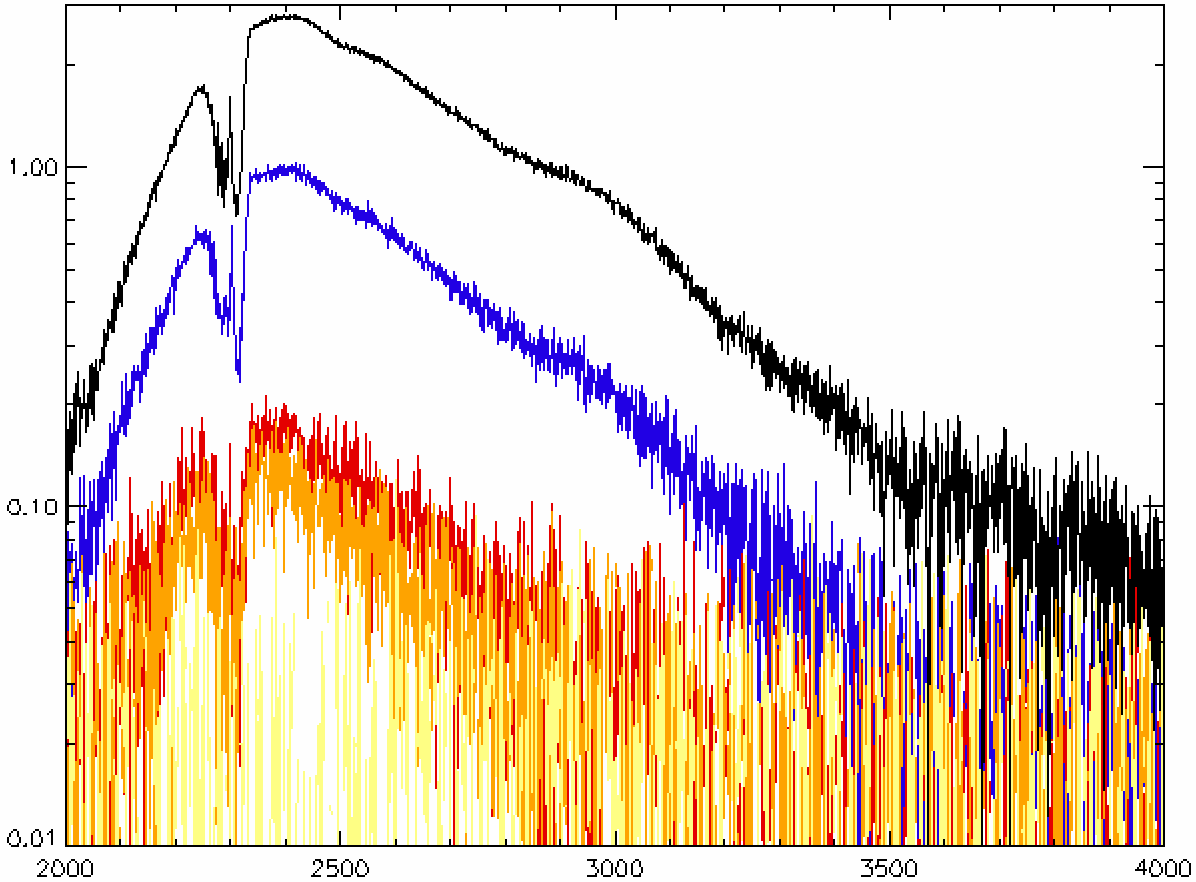


SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	304.059
LW Det. Temp. (±5V):	303.474
LW Det. Temp. (±10V):	303.498
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	304.542
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	303.614
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	298.698
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	298.807

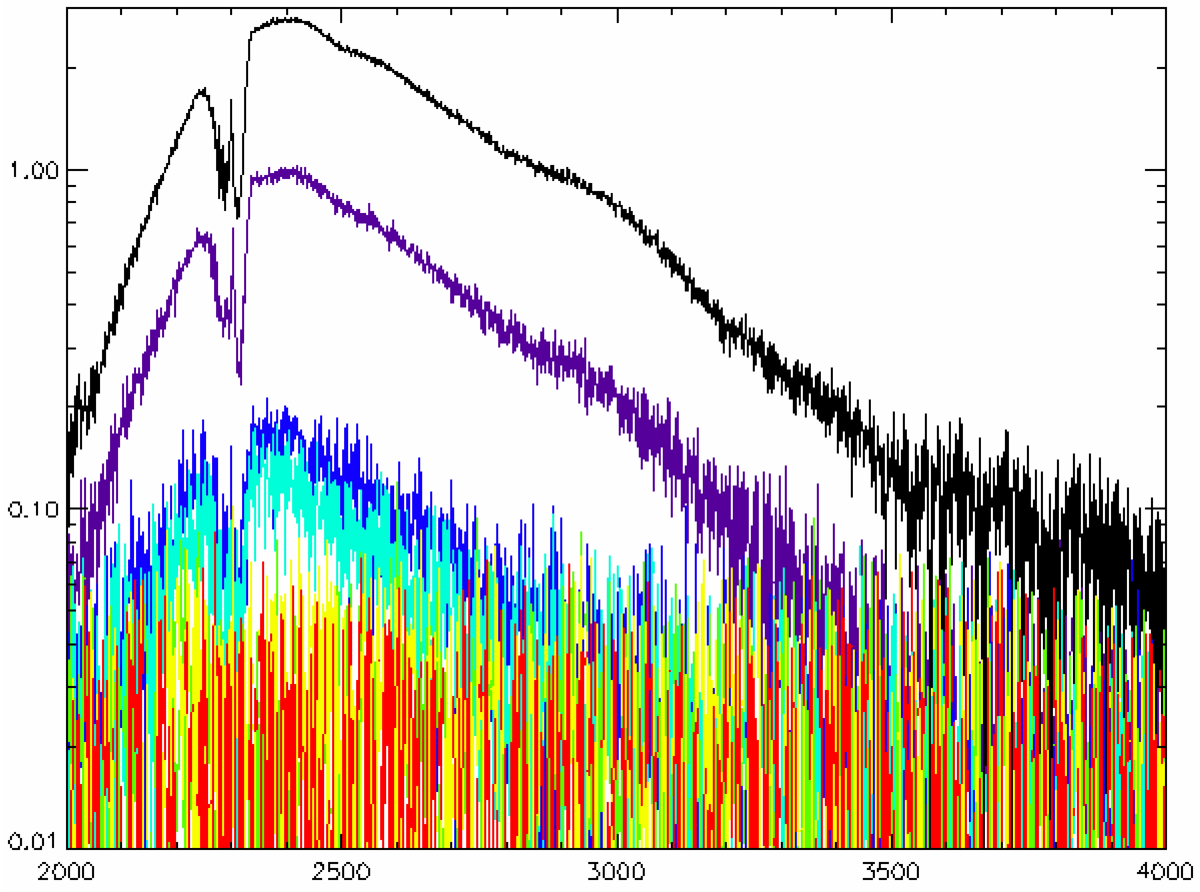
Actual DTM:	17		
SW Gain Set:	1		
LW Gain Set:	1		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Forward	
Pendulum Status:		Unblock	
T1:	302.160	T2:	302.942
T3:	302.723	T4:	302.285
T5:	301.660	T6:	303.536
T7:	302.629	T8:	301.879

IFSI Black Body @ 30 °C
SWC FFT spectrum

Plot – 13

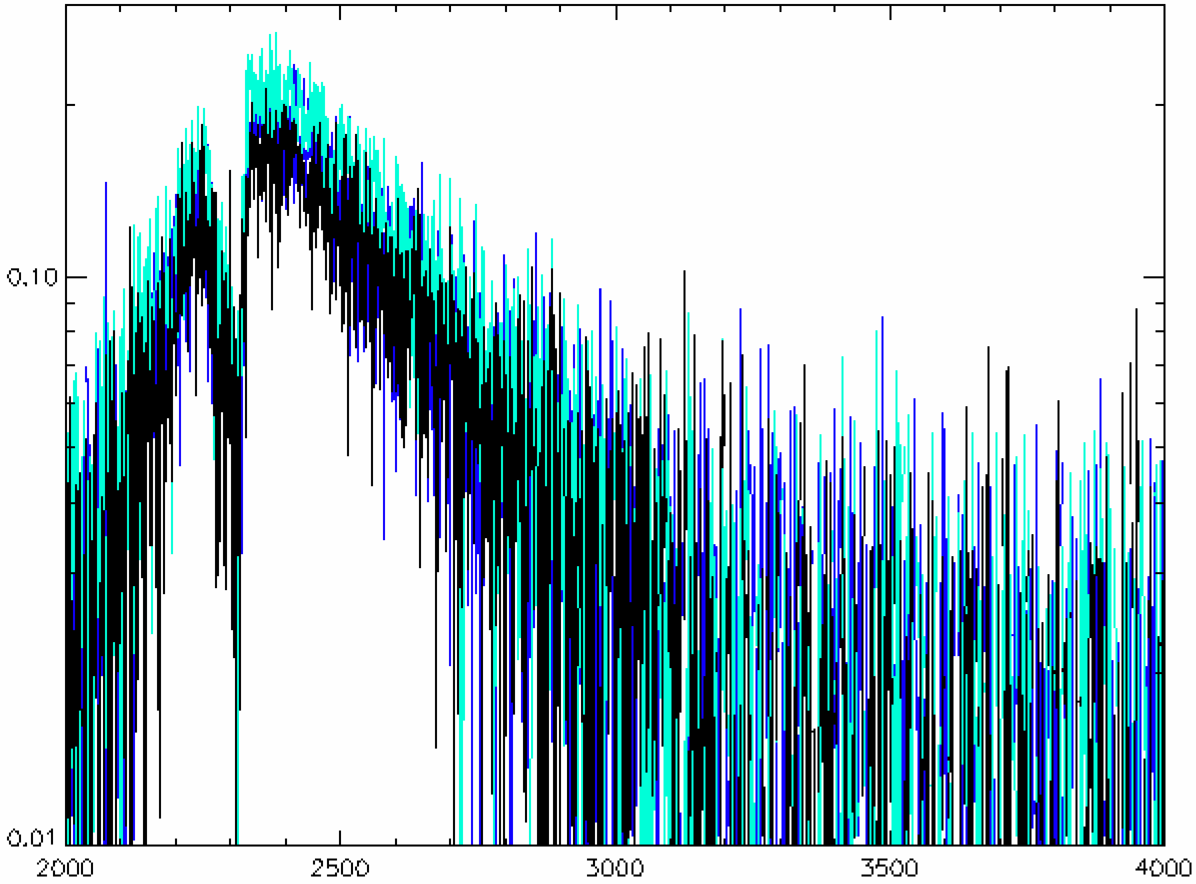


Black: IFSI Black Body @ 148,9 °C
Blue: IFSI Black Body @ 100 °C
Red: IFSI Black Body @ 50 °C
Orange: IFSI Black Body @ 40 °C
Yellow: IFSI Black Body @ 30 °C
SC FFT spectra
Plot – 14



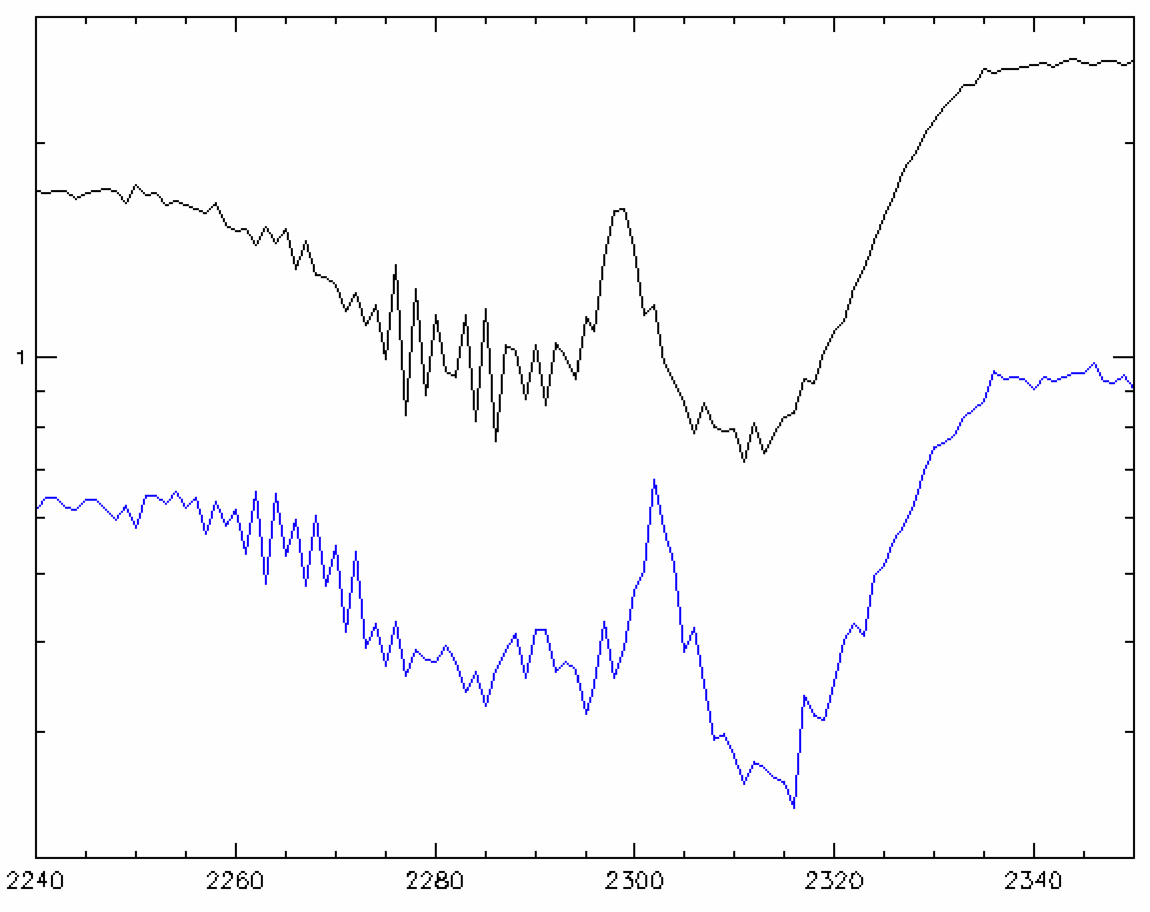
Plot – 15
Black: IFSI Black Body @ 148,9 °C
Violet: IFSI Black Body @ 100 °C
Blue: IFSI Black Body @ 50 °C
Cyan: IFSI Black Body @ 40 °C
Green: IFSI Black Body @ 30 °C
Red: Internal Black Body (**Primary Motor** – acquired just after IFSIBB @ 50 °C)

Yellow: Internal Black Body (**Secondary Motor** - acquired just after IFSIBB @ 148,9 °C)



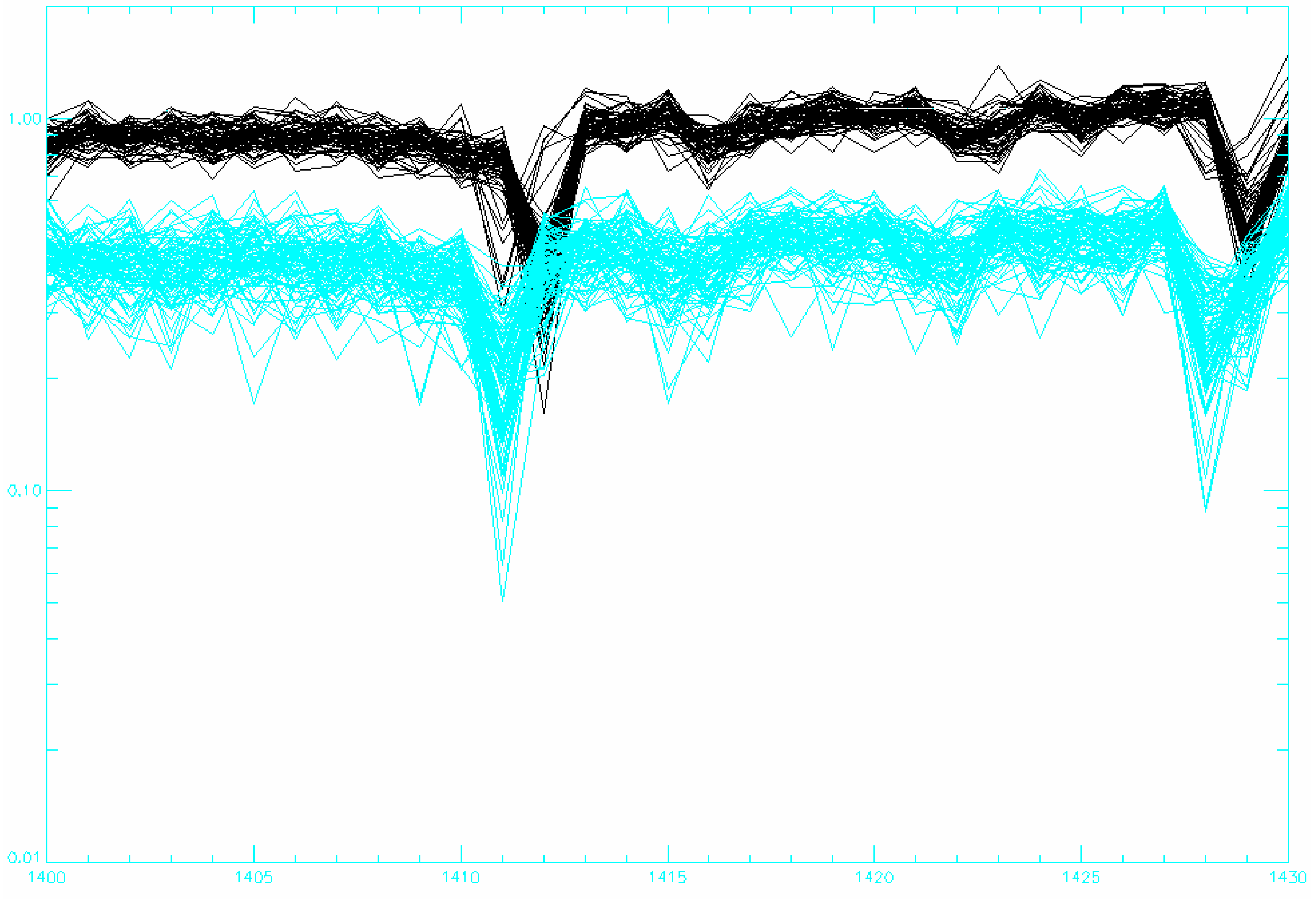
Plot - 16

Cyan: IFSI Black Body @ 50°C (secondary motor)
Blue: IFSI Black Body @ 50,5°C
Black: IFSI Black Body @ 50°C

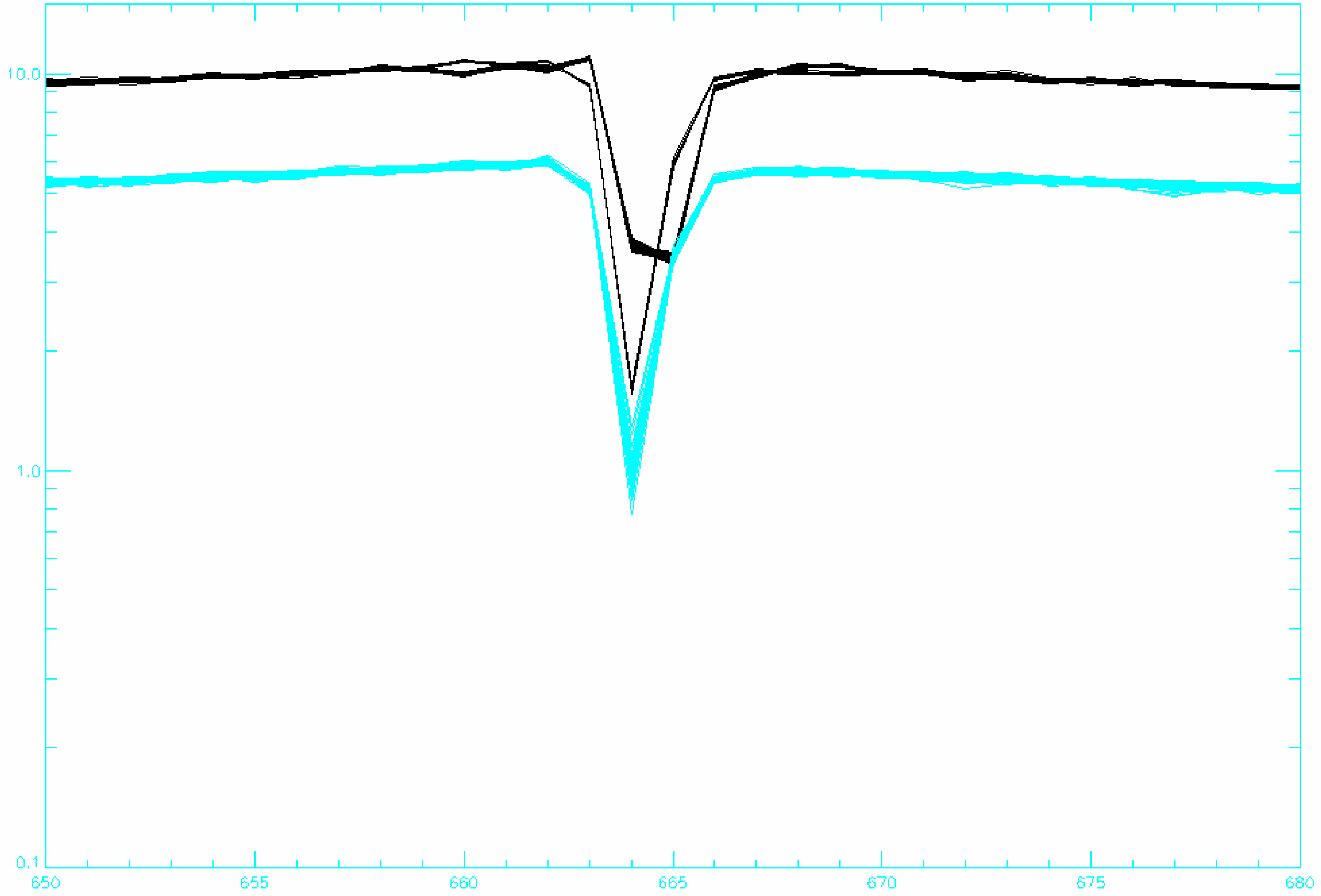


2240 ÷ 2350 cm^{-1} Short Wavelength Channel Blow-up

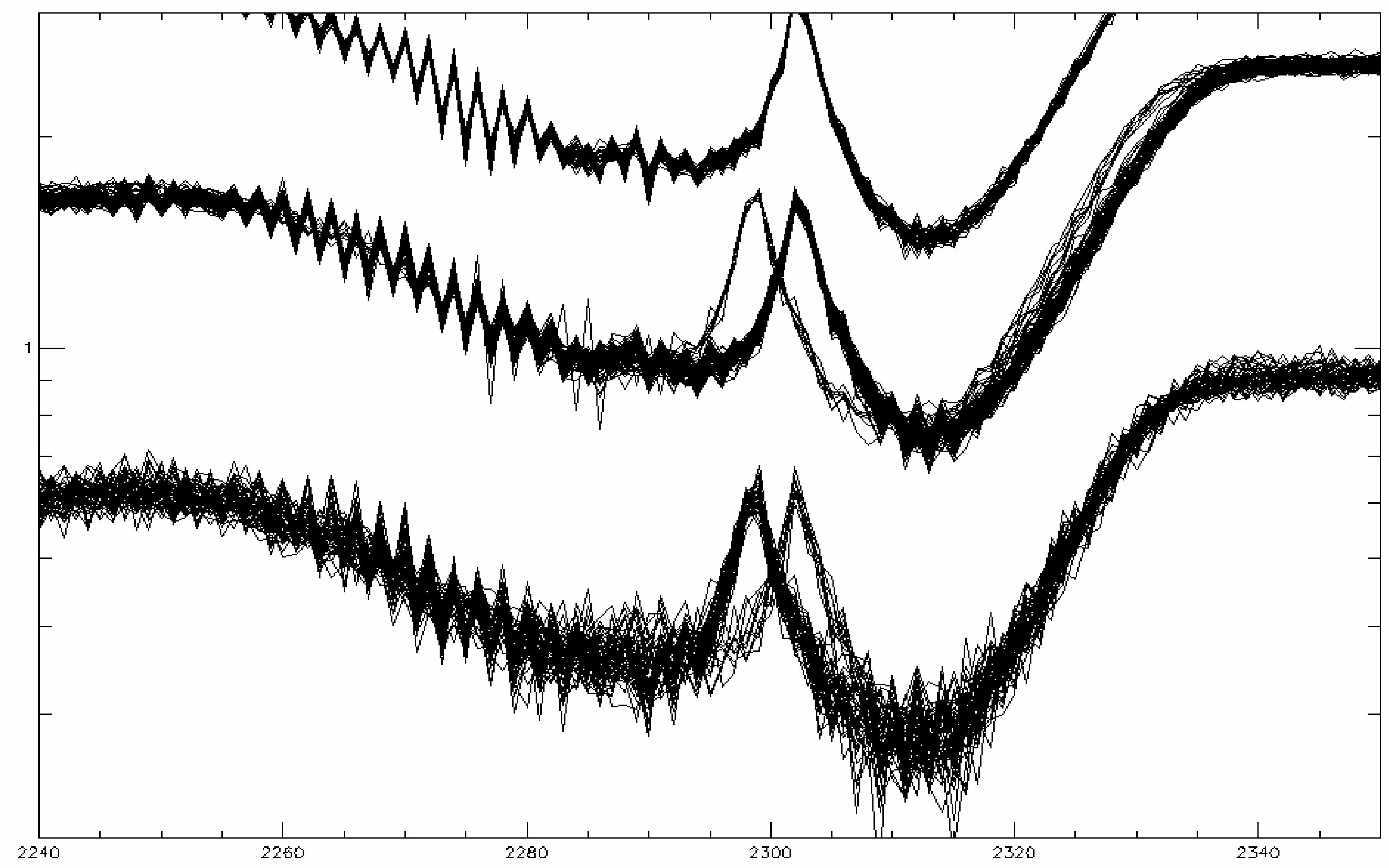
Black: IFSI Black Body @ 148,9 °C
Blue: IFSI Black Body @ 100 °C
Plot – 17



Plot – 18



Plot – 19



Plot – 20

2.3 RUSSIAN BLACK BODY

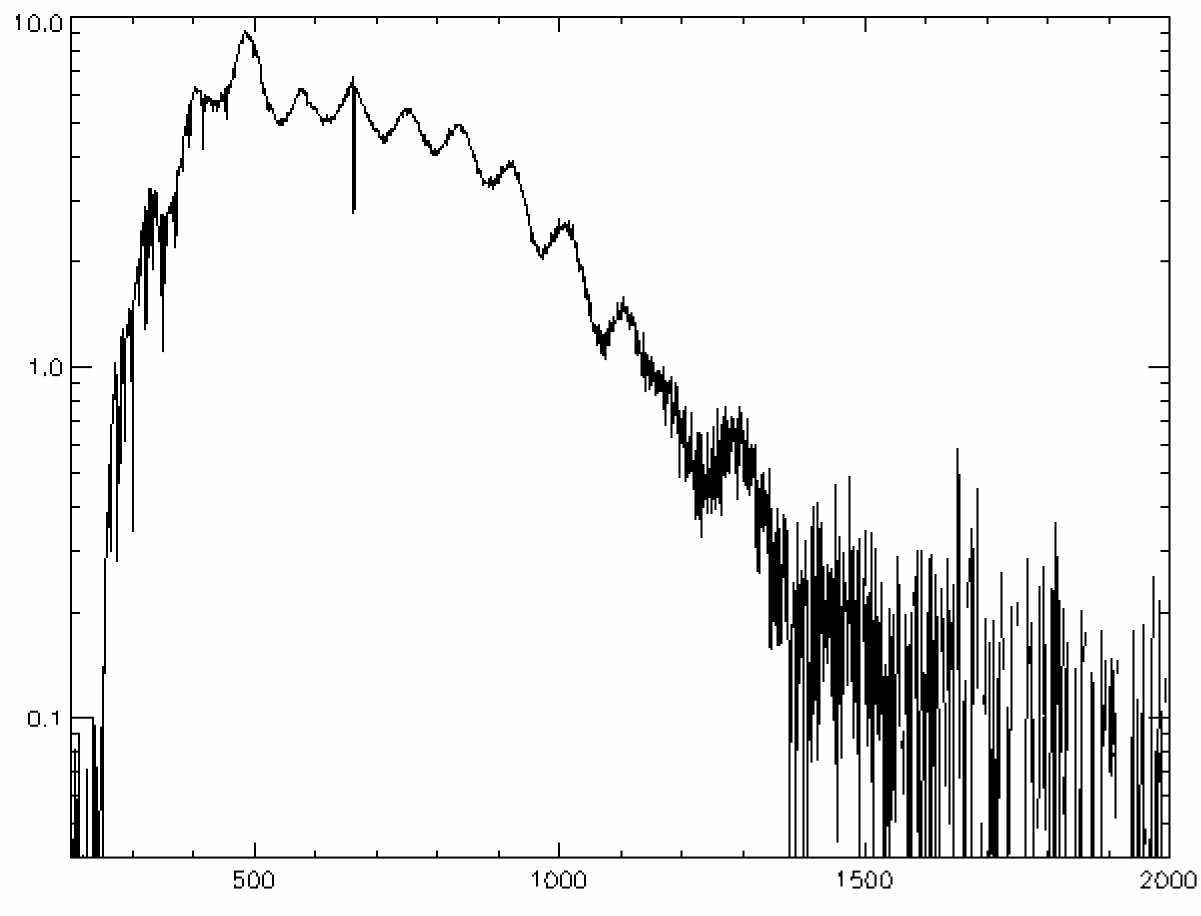
We now turn to some raw spectra of Russian BB. Temperatures of –100, -60, -30 deg were measured. Note that the spectra with –30 deg (240 Kelvin) should be similar to what we shall see at Mars in terms of radiance and DT. The spectra do not show any important difference with the similar spectra taken with the IFSI BB. See plots 21,22,23, 24, 25, 26, 27.

2.4 GOSTS FEATURES

As it can be seen in the next figure,(see plot 28,29,30,31, 32, 33, 34, 35) when we look at a 149 deg IFSI BB, the spectrum does not stop at 4000 cm –1, but goes up to 6000 with the shape of a strange square wave. This radiation depends on the source intensity, as it disappears when the IFSI BB temperature goes to 50 celsius. The next figure shows that there are some spectral features which are strange and need to be understood. The two following figures show that the first half of the platueau-ghost can be explained with a 4 % ghost – repetition of the main spectrum at x2 resolution and x2 wavenumber. As in the case of IRIS Mariner 9 studied in the past we think that his ghost is due to internal reflections: we have tilted the entrance silicon window, but we have not considered that the detector itself has a saffire window which can reflect. The present ghost, however, is not similar to the one of IRIS, and the rest of the plateau is not explained. It has been suggested that the introduction of a third spectrum with opposite wavenumber scale can explain the observations. We note that the absorption band that could be another ghost of the CO2 band, and that is observed before 6000 cm-1, does not have the central peak, therefore it is still to be demonstrated and understood the cause of the plateau observed in the SW channel when the IFSI BB was observed at 150 celsius. A very important point is to keep in mind that the shape of the CO2 ghost band is not identical to the main one, as a peak appears at 2330 cm-1 where the second minimum of the band should be. The summation of the absorption due to the CO2 ghost with some other spectrum should not give a peak, unless there is emission : at the moment, therefore the entire SW spectrum between 4000 and 8000 cm-1 is not understood. Finally it is worth noting that the absorption band seen at the second edge of the plateau, does not look like a CO2 absorption band, so is not related to the ghost. We have made the exercise to subtract the ghost, computed assuming 3% of the original spectrum, at 2x resolution and 2x wavenumber. The result, shown in the figure, illustrates that other bands may be present, but for the moment it is not clear that what is left can be considered another spectrum with reversed wavenumber scale.

Note also that the curve subtracted and computed as 3 % of the spectrum, because decreases the noise level at 6300 cm-1, should be considered an upper limit to the ghost intensity, a value 2 or 2.5 being a better estimate.

We have searched for the ghost in other measurements, to be sure it is present and it is of the intensity (4%) shown above.

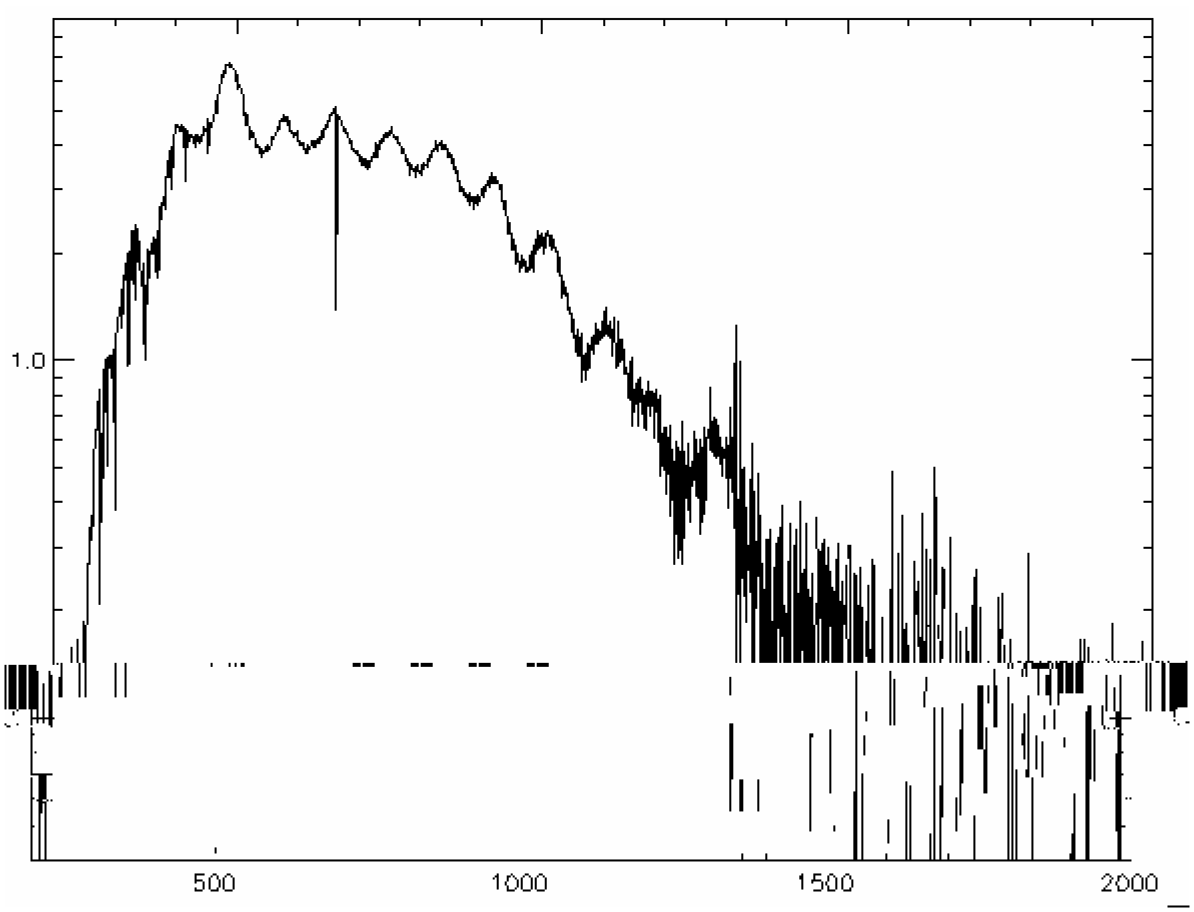


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:	Forward		
Pendulum Status:	Unblock		
T1:	295.143	T2:	295.487
T3:	295.596	T4:	294.096
T5:	294.377	T6:	296.190
T7:	295.503	T8:	294.377

SW Det. Temp. (±5V):	294.247
SW Det. Temp. (±10V):	294.212
LW Det. Temp. (±5V):	295.943
LW Det. Temp. (±10V):	295.938
SW Laser Temp. (±5V):	297.307
SW Laser Temp. (±10V):	297.275
LW Laser Temp. (±5V):	295.900
LW Laser Temp. (±10V):	295.888
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	286.749
Int. BB Temp A2. (±5V):	326.402
[illegible]	[illegible]

Russian Black Body @ -100 °C

Plot - 21

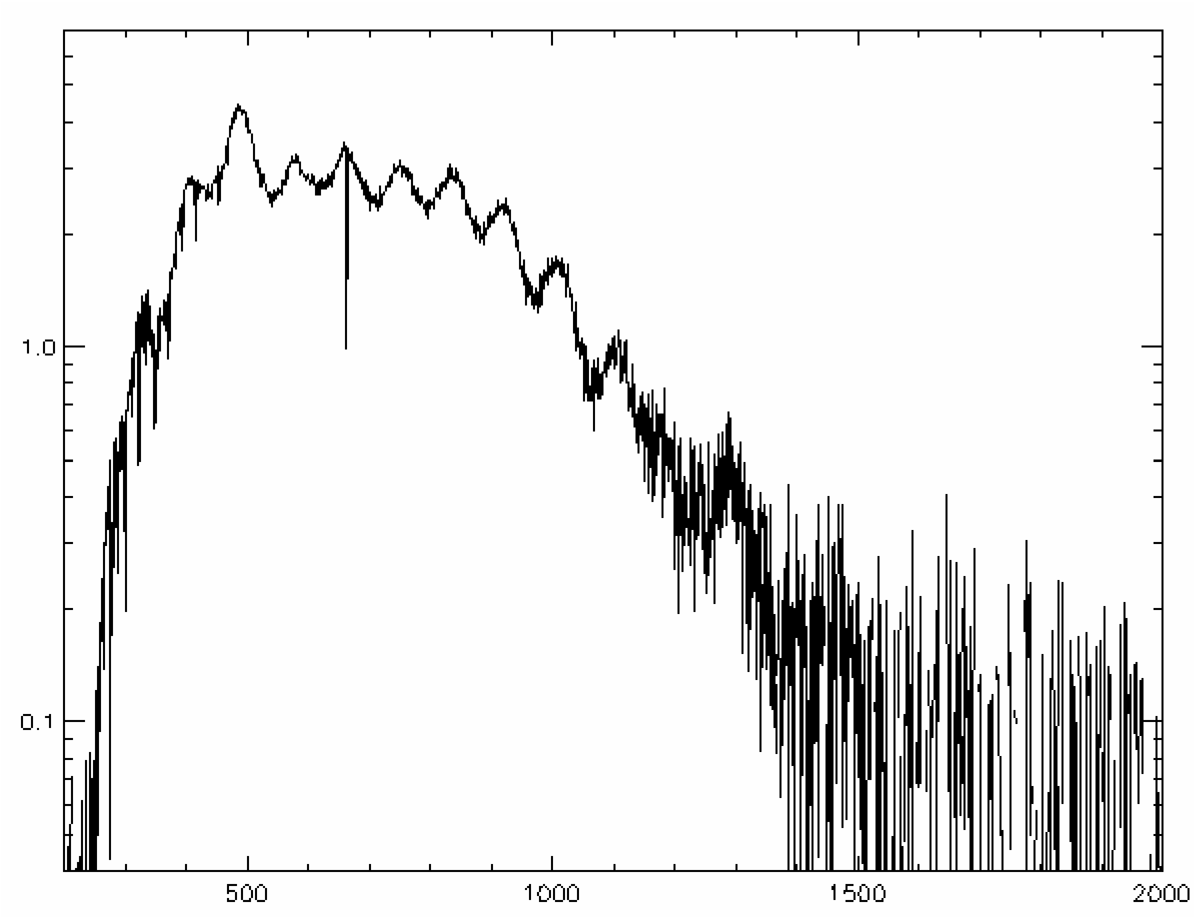


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:	Reverse		
Pendulum Status:	Unblock		
T1:	293.205	T2:	293.955
T3:	293.924	T4:	292.564
T5:	292.830	T6:	294.612
T7:	293.846	T8:	292.877

SW Det. Temp. (±5V):	292.713
SW Det. Temp. (±10V):	292.689
LW Det. Temp. (±5V):	294.526
LW Det. Temp. (±10V):	294.512
SW Laser Temp. (±5V):	295.724
SW Laser Temp. (±10V):	295.702
LW Laser Temp. (±5V):	294.337
LW Laser Temp. (±10V):	294.325
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	287.686
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	287.738

Russian Black Body @ -60 °C

Plot – 22

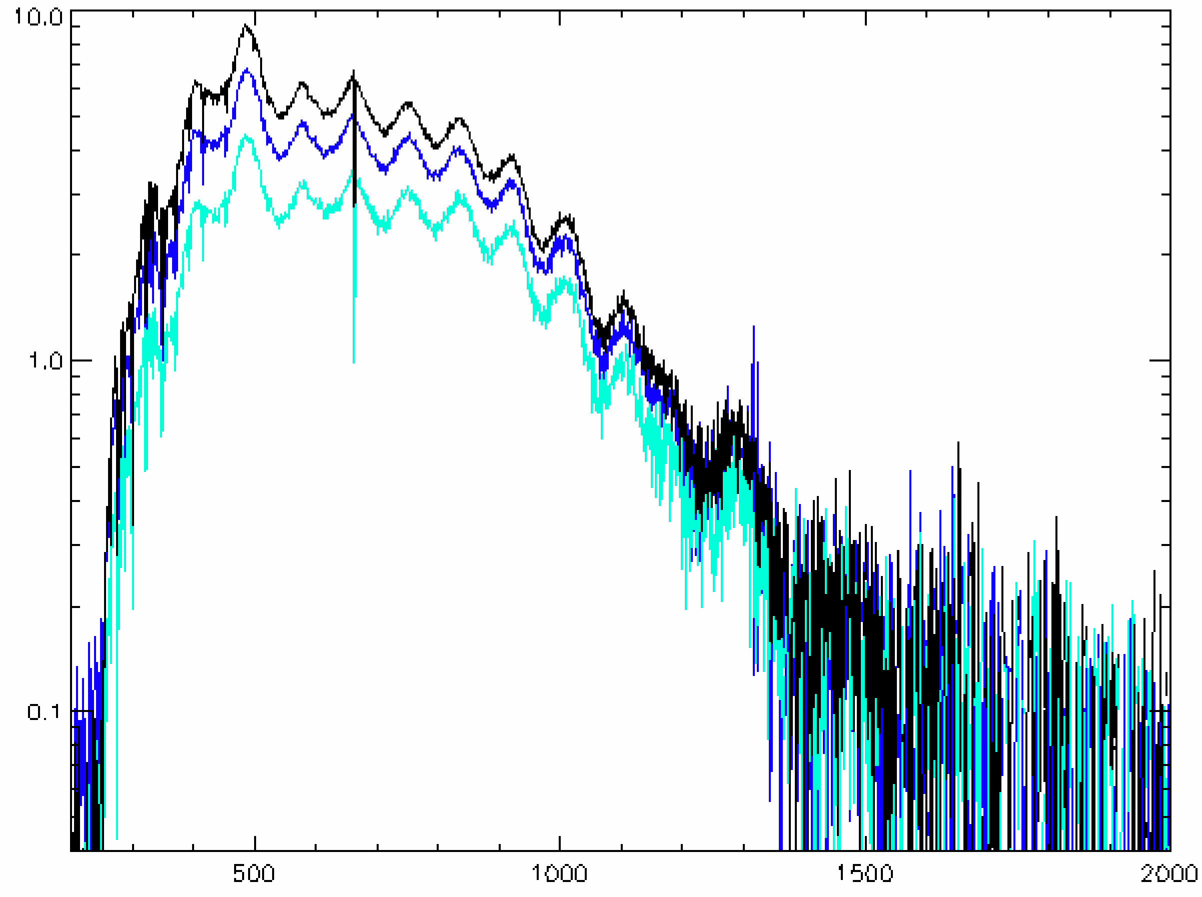


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	293.018	T2:	293.611
T3:	293.424	T4:	293.158
T5:	292.361	T6:	294.237
T7:	293.361	T8:	292.564

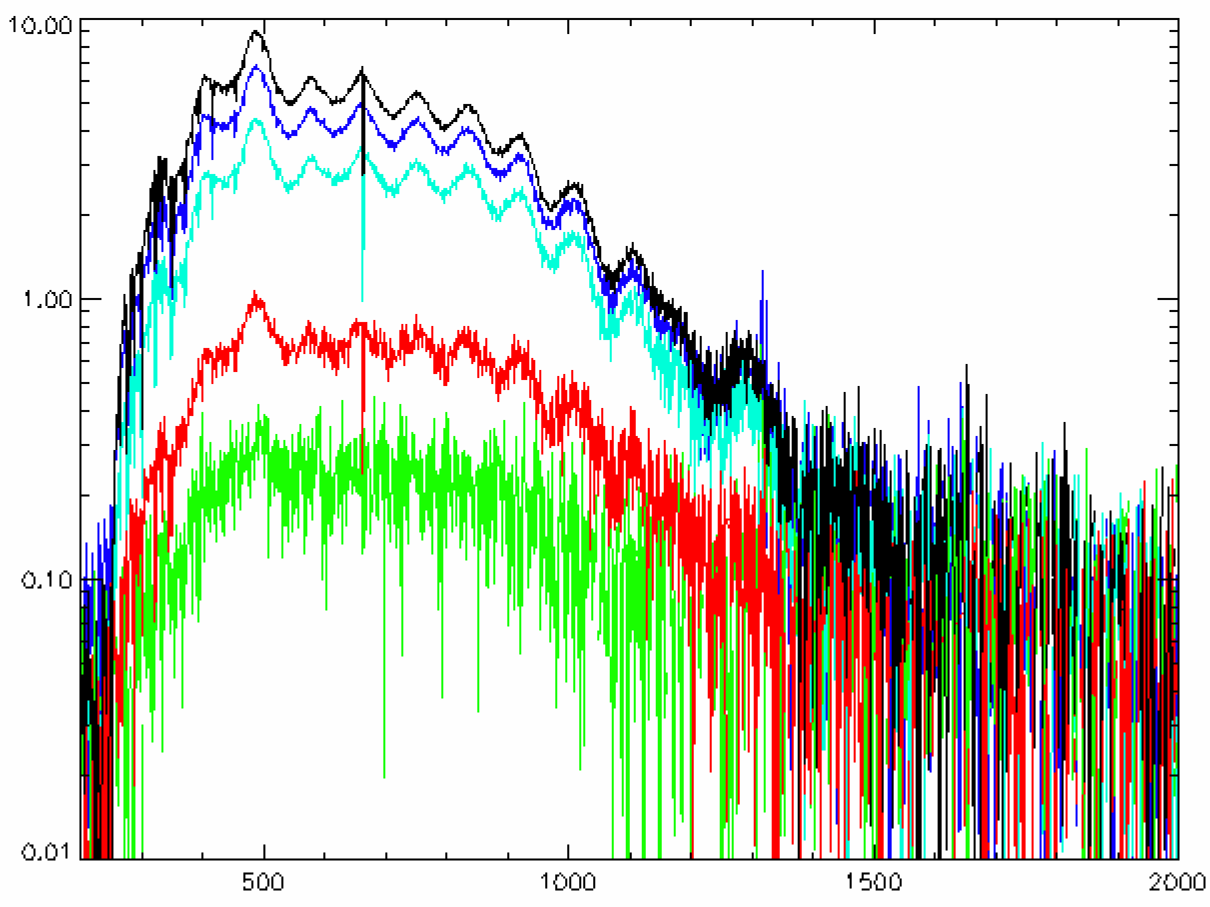
SW Det. Temp. (±5V):	293.846
SW Det. Temp. (±10V):	293.802
LW Det. Temp. (±5V):	294.292
LW Det. Temp. (±10V):	294.297
SW Laser Temp. (±5V):	295.187
SW Laser Temp. (±10V):	295.165
LW Laser Temp. (±5V):	294.508
LW Laser Temp. (±10V):	294.491
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	291.942
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	292.026

Russian Black Body @ -30 °C

Plot – 23

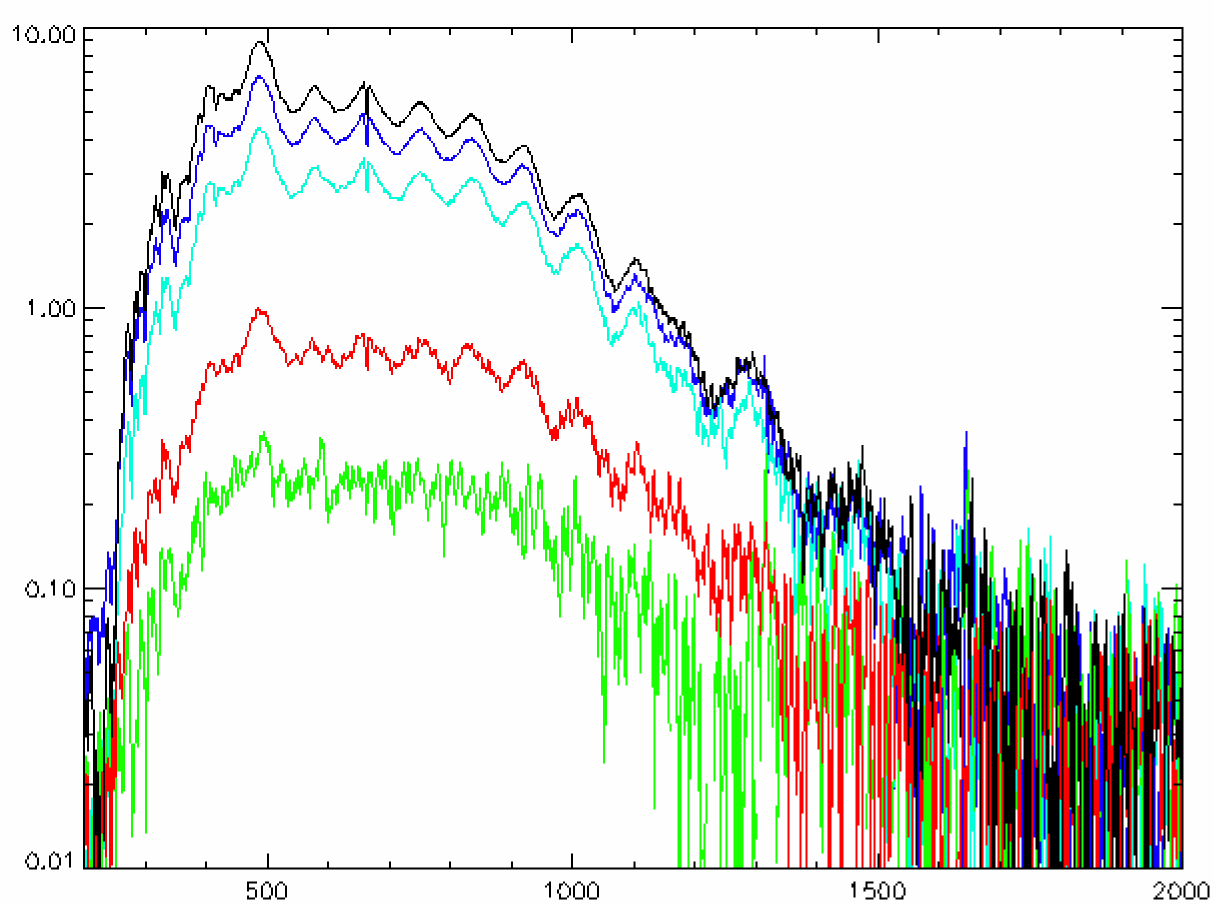


Black: Russian Black Body @ -100°C
Blue: Russian Black Body @ -60°C
Cyan: Russian Black Body @ -30°C
Plot – 24



Plot – 25

Black: Russian Black Body @ -100°C
Blue: Russian Black Body @ -60°C
Cyan: Russian Black Body @ -30°C
Red: Russian Black Body (acquired just after Russian BB RAMP from -80 °C to –55 °C)
Green: Russian Black Body (acquired just after Russian BB @ -30 °C)

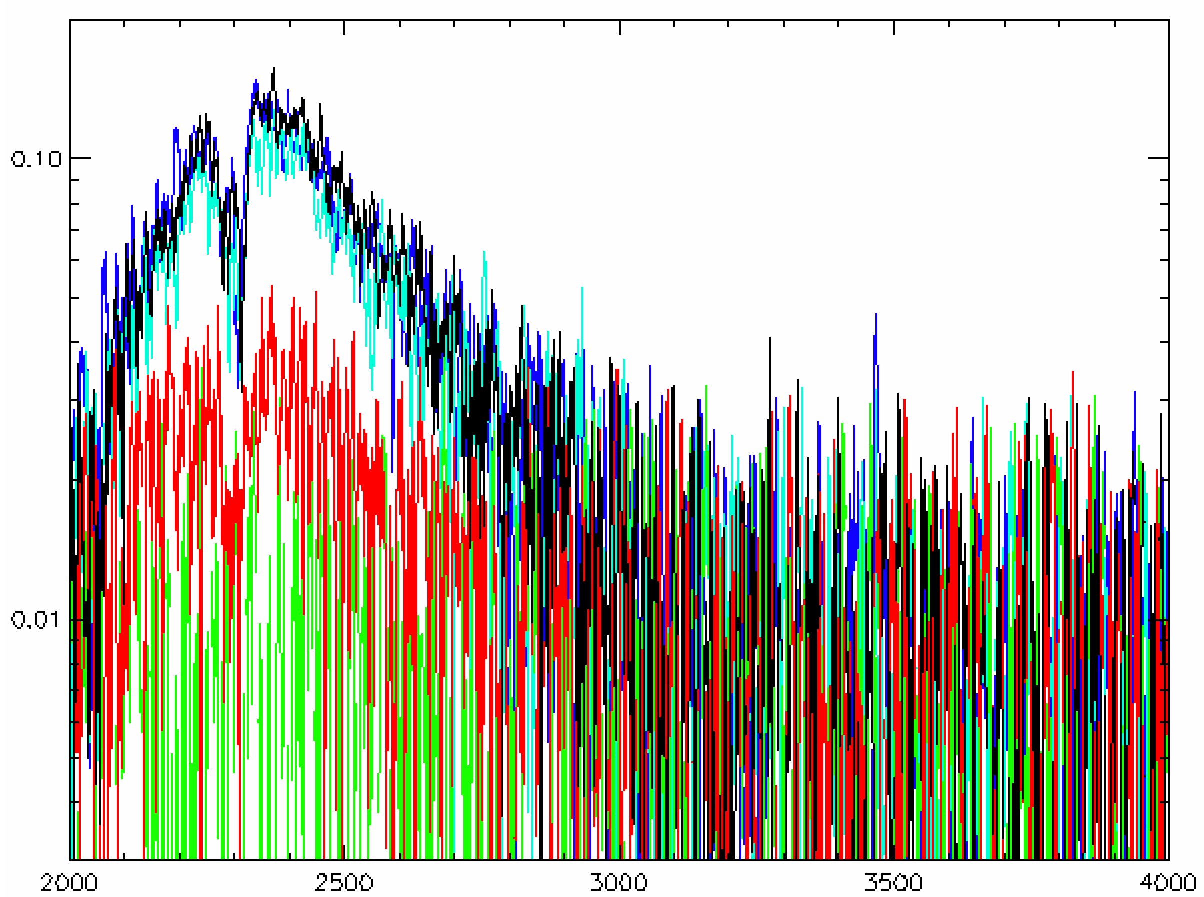


Plot – 26
smoothed on 5 points

Black:	Russian Black Body @ -100°C
Blue:	Russian Black Body @ -60°C
Cyan:	Russian Black Body @ -30°C
Red:	Internal Black Body (acquired just after Russian BB RAMP from -80 °C to –55 °C)
Green:	Internal Black Body (acquired just after Russian BB @ -30 °C)

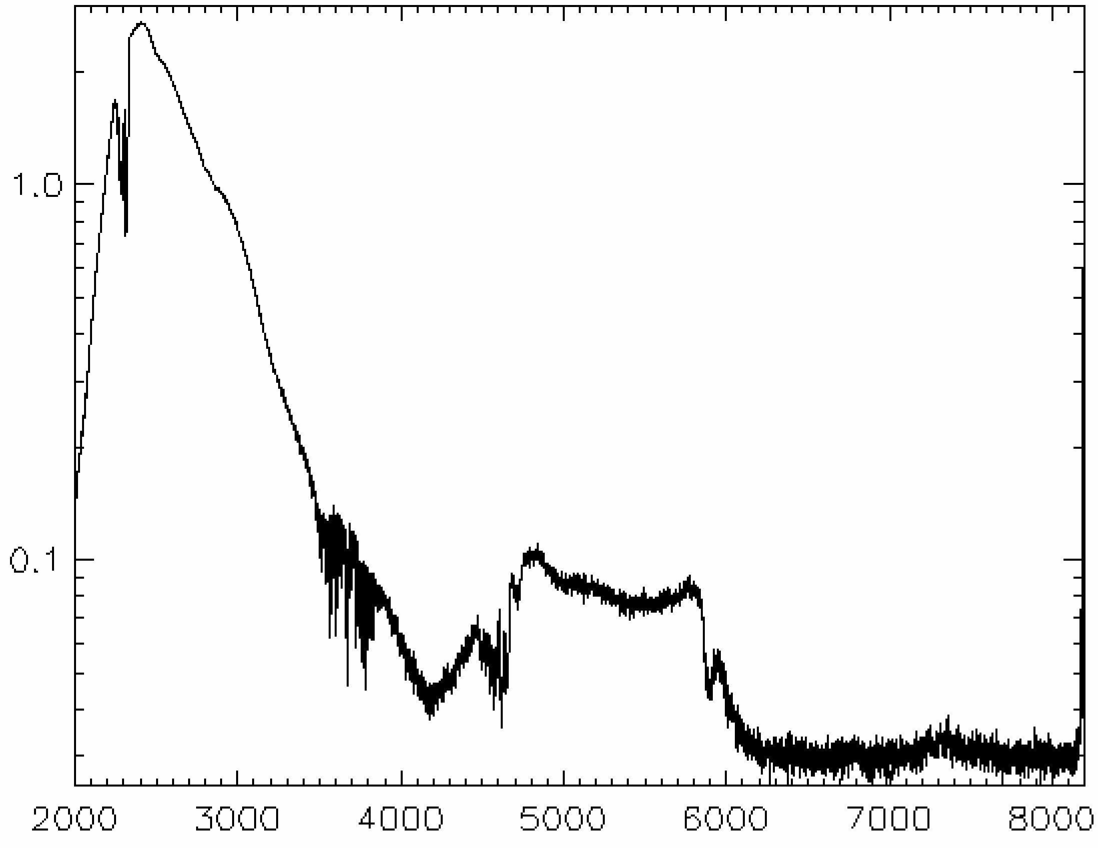
Int. BB after Ramp	
SW Det. Temp. (±5V):	291.219
SW Det. Temp. (±10V):	291.184
LW Det. Temp. (±5V):	292.563
LW Det. Temp. (±10V):	292.538
SW Laser Temp. (±5V):	293.575
SW Laser Temp. (±10V):	293.553
LW Laser Temp. (±5V):	292.286
LW Laser Temp. (±10V):	292.283
Int. BB Temp A1. (±5V):	316.075
Int. BB Temp A1. (±10V):	281.282
Int. BB Temp A2. (±5V):	316.151
Int. BB Temp A2. (±10V):	281.346

Int. BB after –30 °C	
SW Det. Temp. (±5V):	293.368
SW Det. Temp. (±10V):	293.333
LW Det. Temp. (±5V):	294.468
LW Det. Temp. (±10V):	294.453
SW Laser Temp. (±5V):	295.607
SW Laser Temp. (±10V):	295.575
LW Laser Temp. (±5V):	294.425
LW Laser Temp. (±10V):	294.413
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	289.951
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	289.999

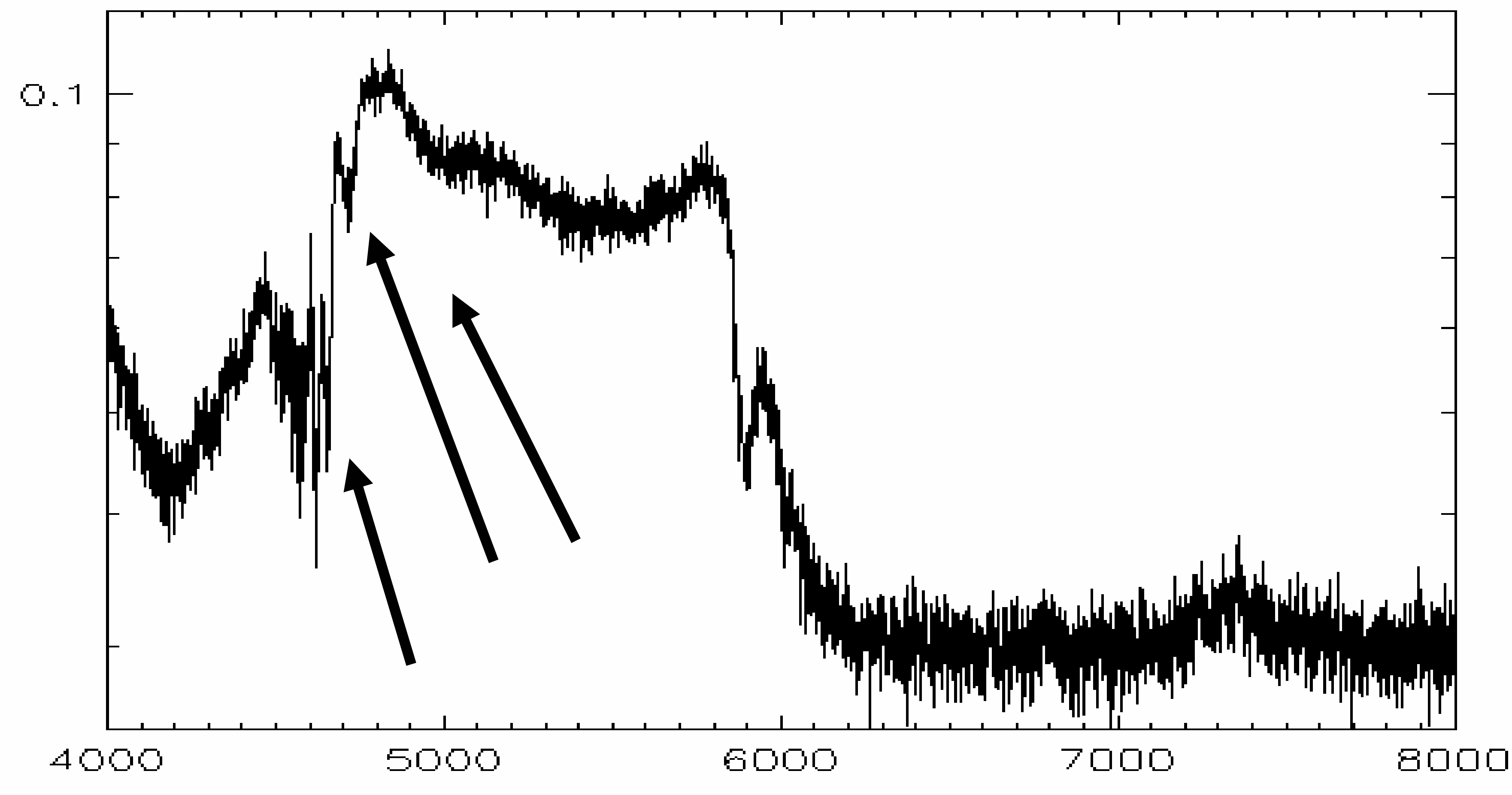


Plot – 27. SMOOTHED ON 5 POINTS

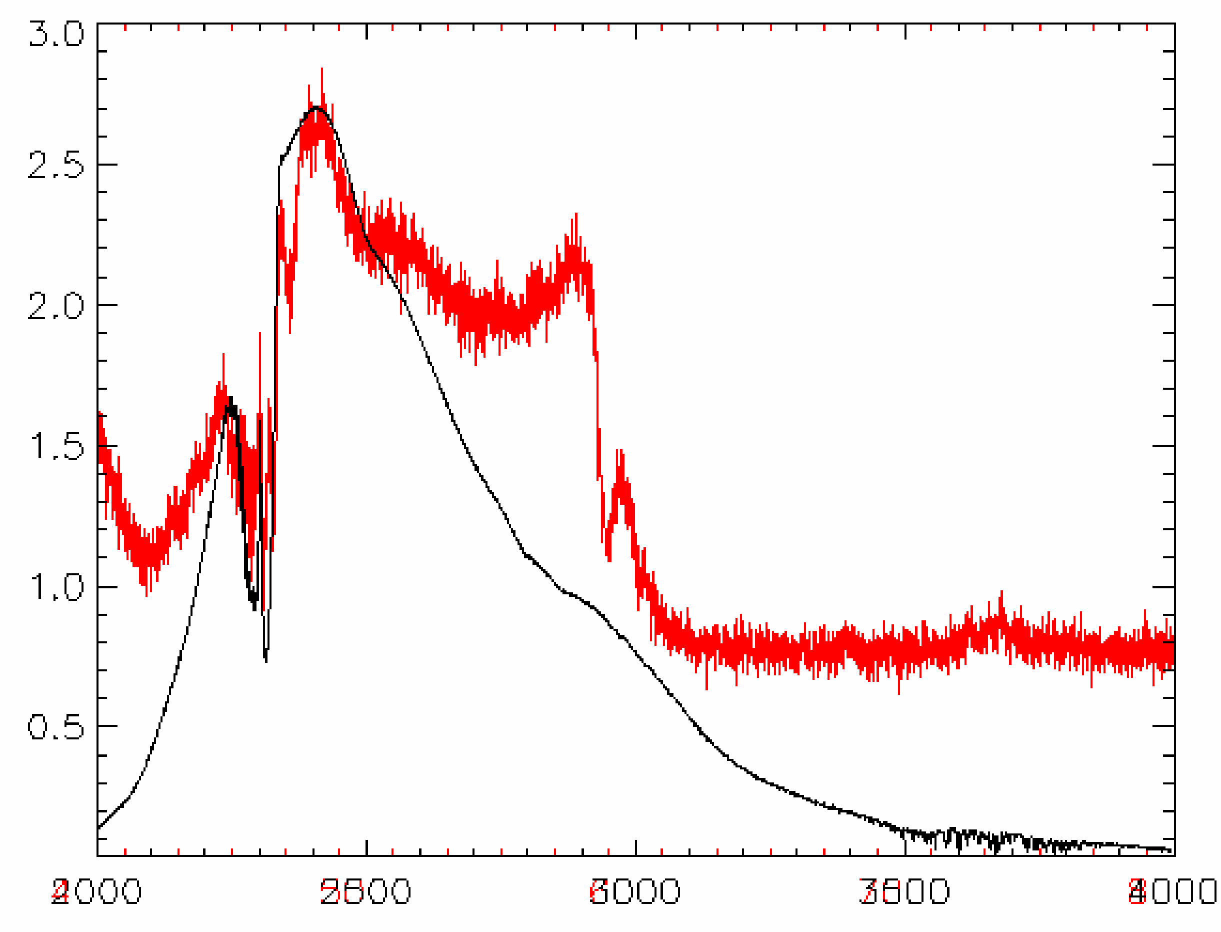
Black:	Russian Black Body @ -100 °C
Blue:	Russian Black Body @ -60 °C
Cyan:	Russian Black Body @ -30 °C
Red:	Internal Black Body (acquired just after Russian BB RAMP from -80 °C to –55 °C)
Green:	Internal Black Body (acquired just after Russian BB @ -30 °C)



IFSI BB @ 148.9 °C - Average on 95 spectra
SW spectrum in the entire wavenumber range : some extra radiation is present.
Plot – 28

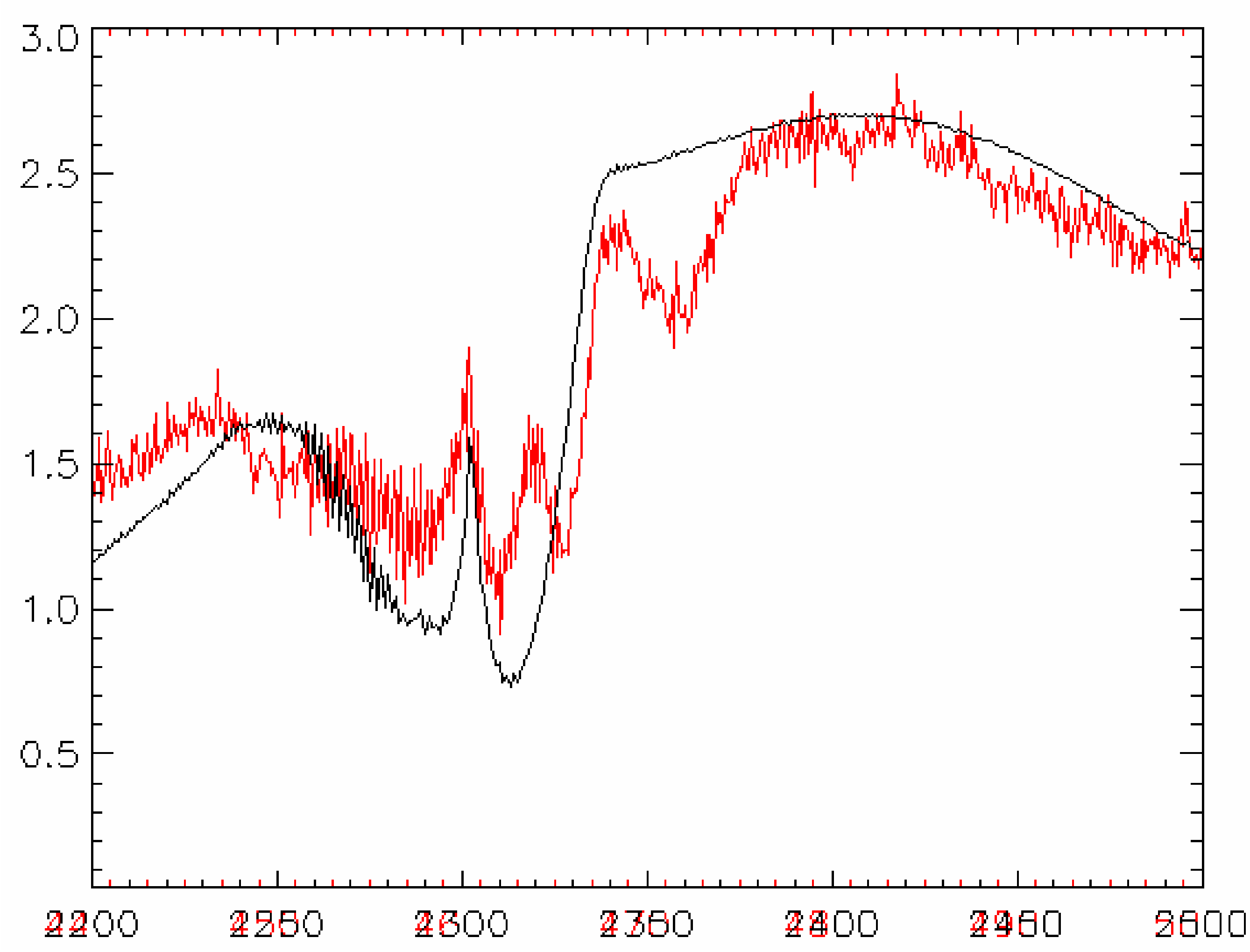


Plot – 29
IFSI BB @ 148.9 °C - Average on 95 spectra
Blow-up within 4000÷8000 cm^{-1}
Some real radiation enable to see not only the ghost of the CO2 4.3 micron band, but also the 3 two micron bands indicated by arrows.

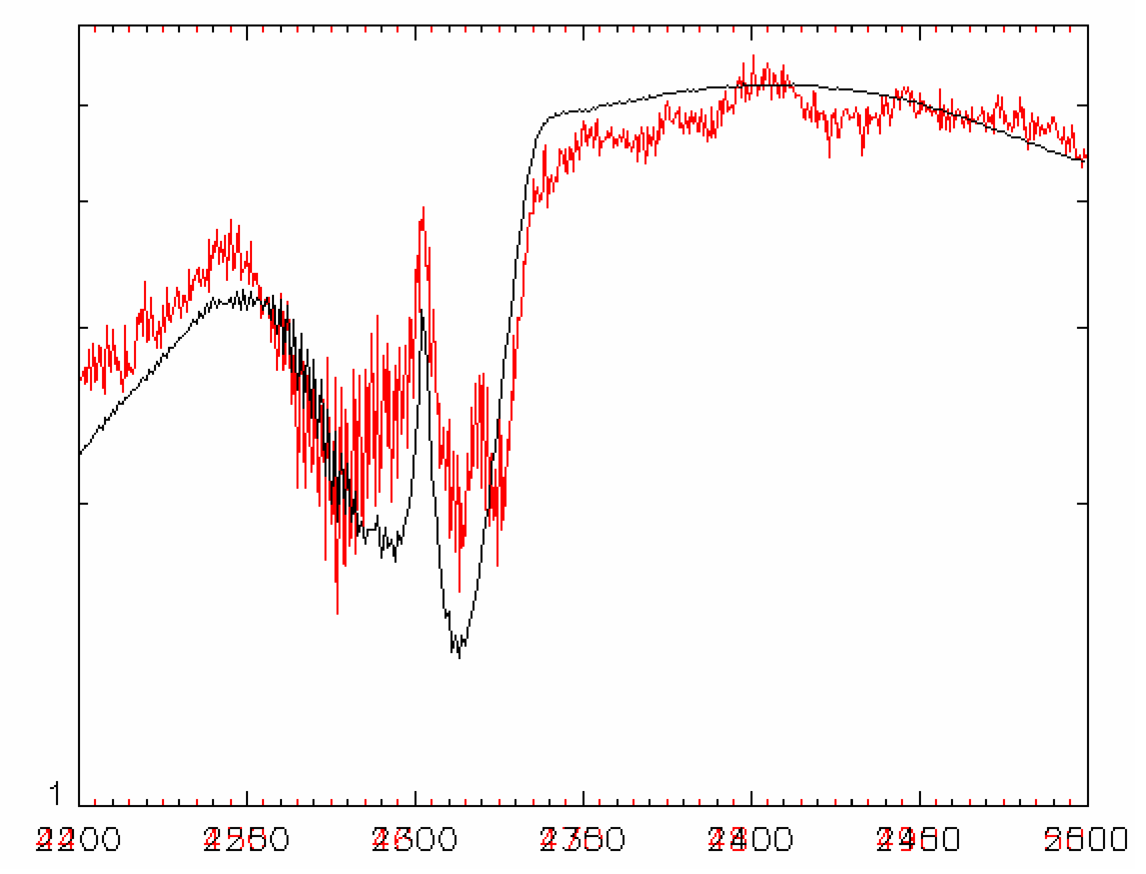


Plot – 30
Black: IFSI BB @ 148.9 °C within the range 2000÷4000 cm^{-1}
Red: IFSI BB @ 148.9 °C within the range 4000÷8000 cm^{-1}

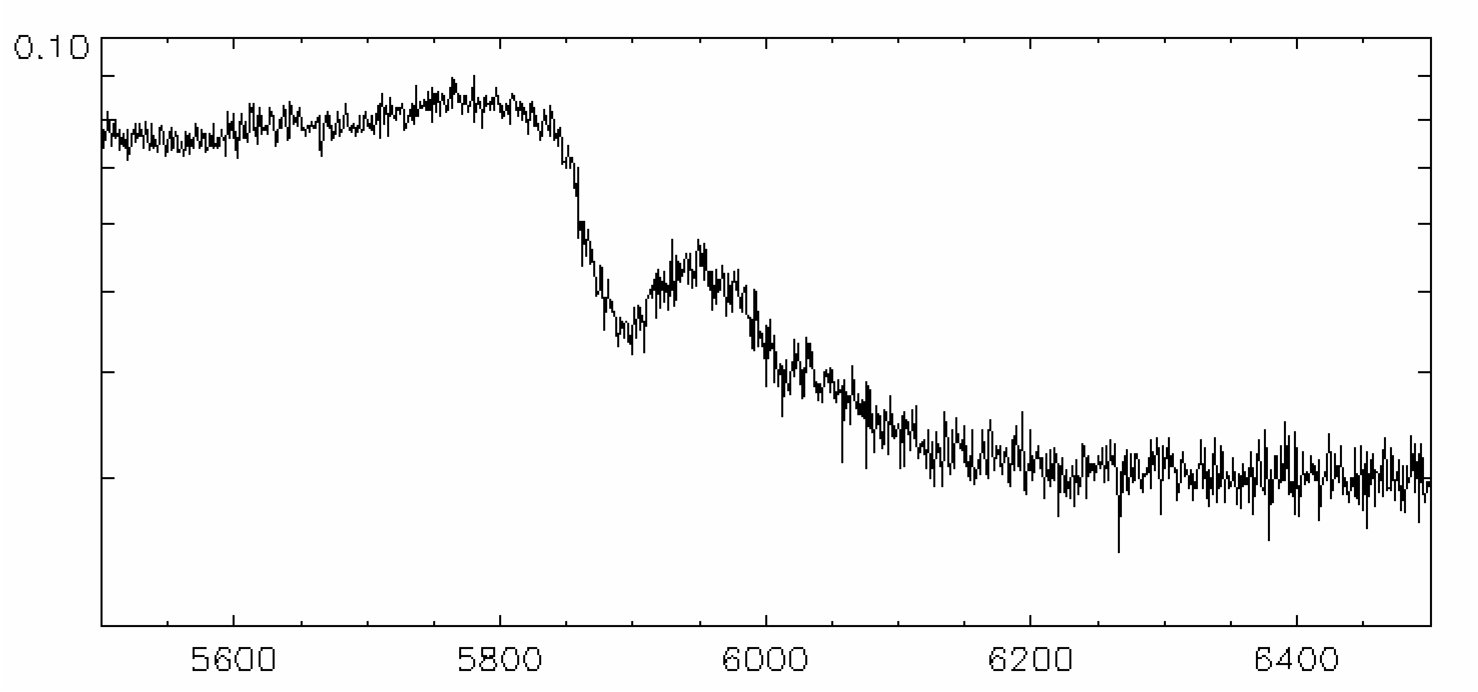
The red line was multiplied by 25.7277 (see previous page for details).



Same as fig. 6; Blow-up within the range 2200÷2500 cm^{-1} (black curve) and 2000÷4000 cm^{-1} (red curve).
The intensity of the ghost is then about the 3.9% of the intensity of the main spectrum.
Plot – 31



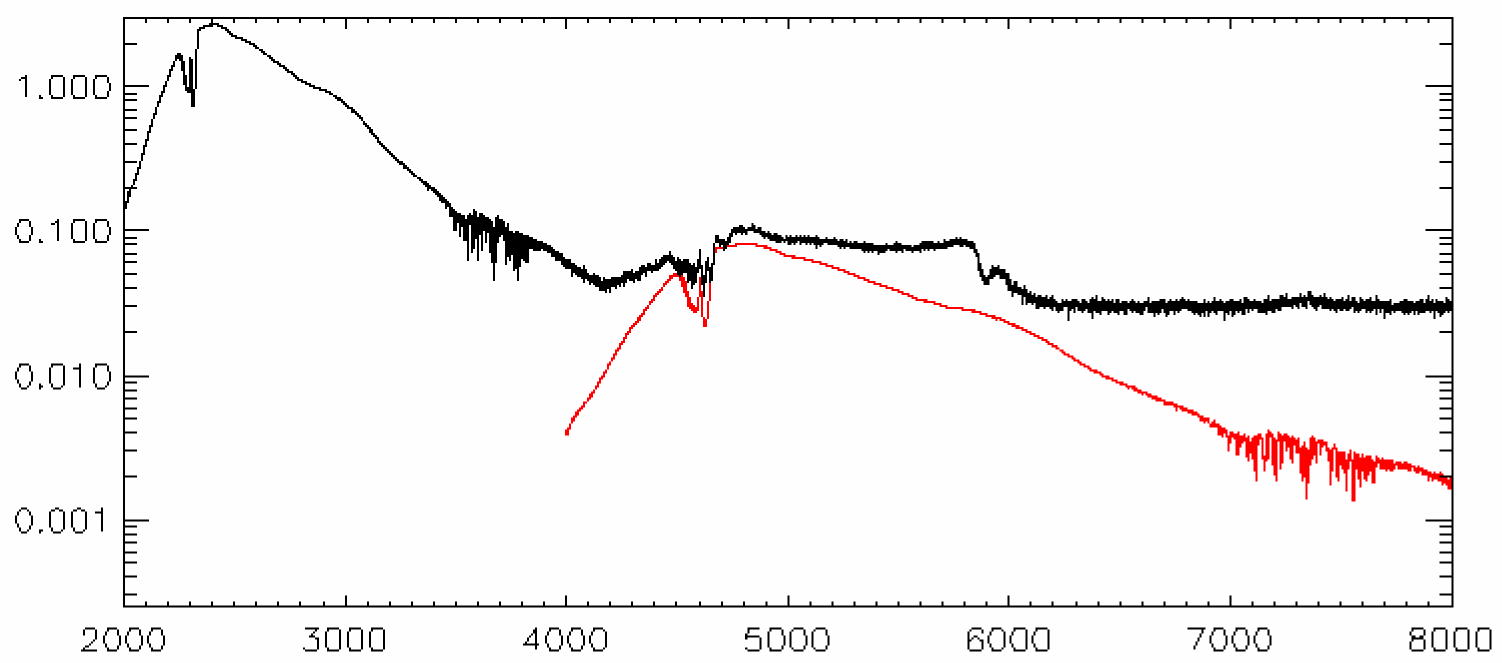
Same as fig. 6, but for the IFSI BB @ 148.9 °C – Gain 1
The red line was multiplied by 27.1418
Plot – 32



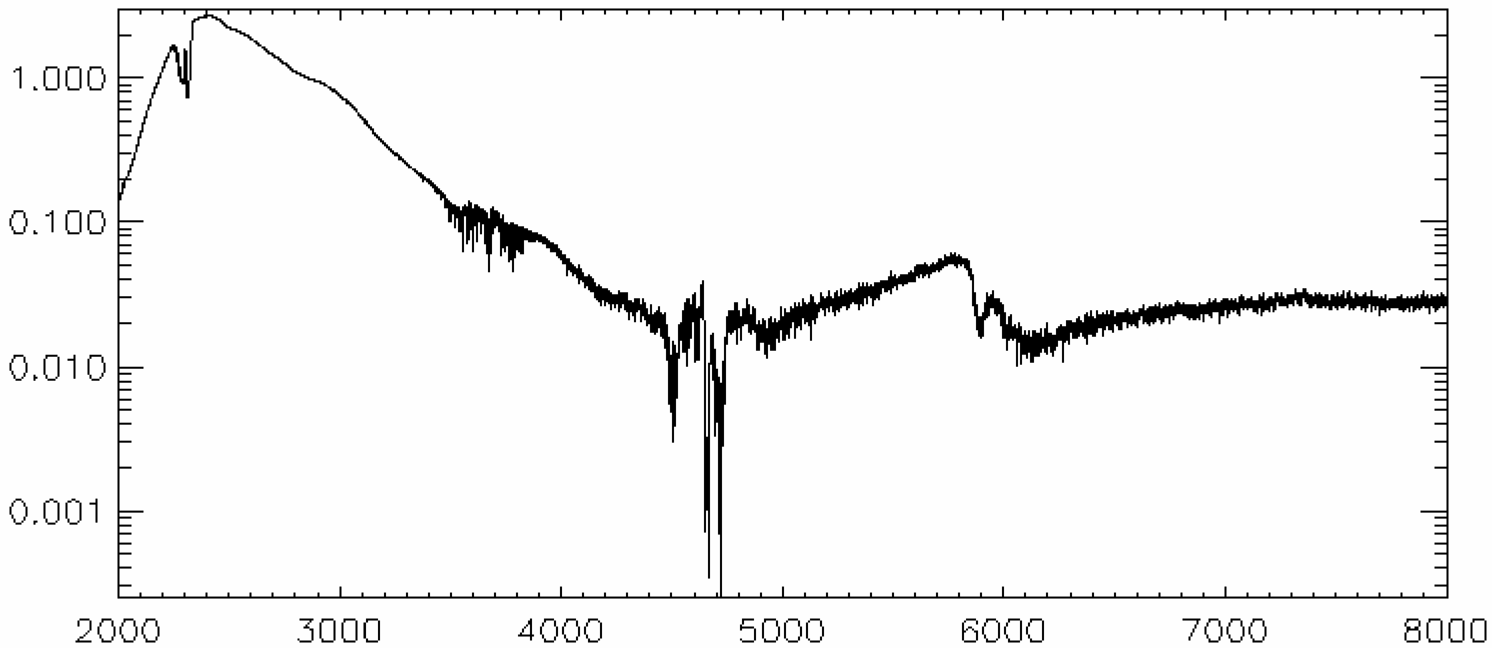
Zoom of the “reversed” ghost

The central line is absent.

Plot – 33



Plot - 34



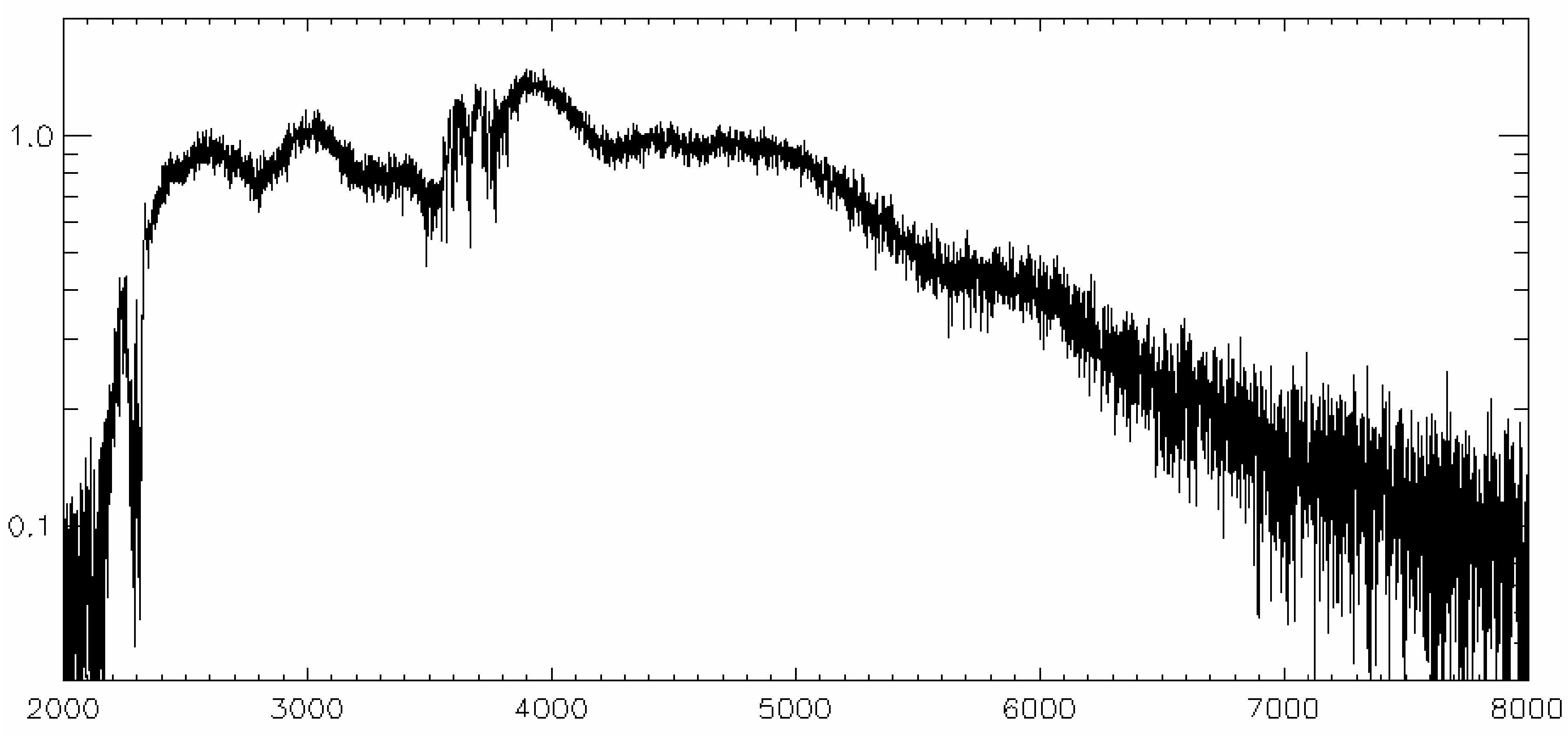
Plot - 35

2.5 ORIEL AND CERAMIC ELEMENT LAMP.

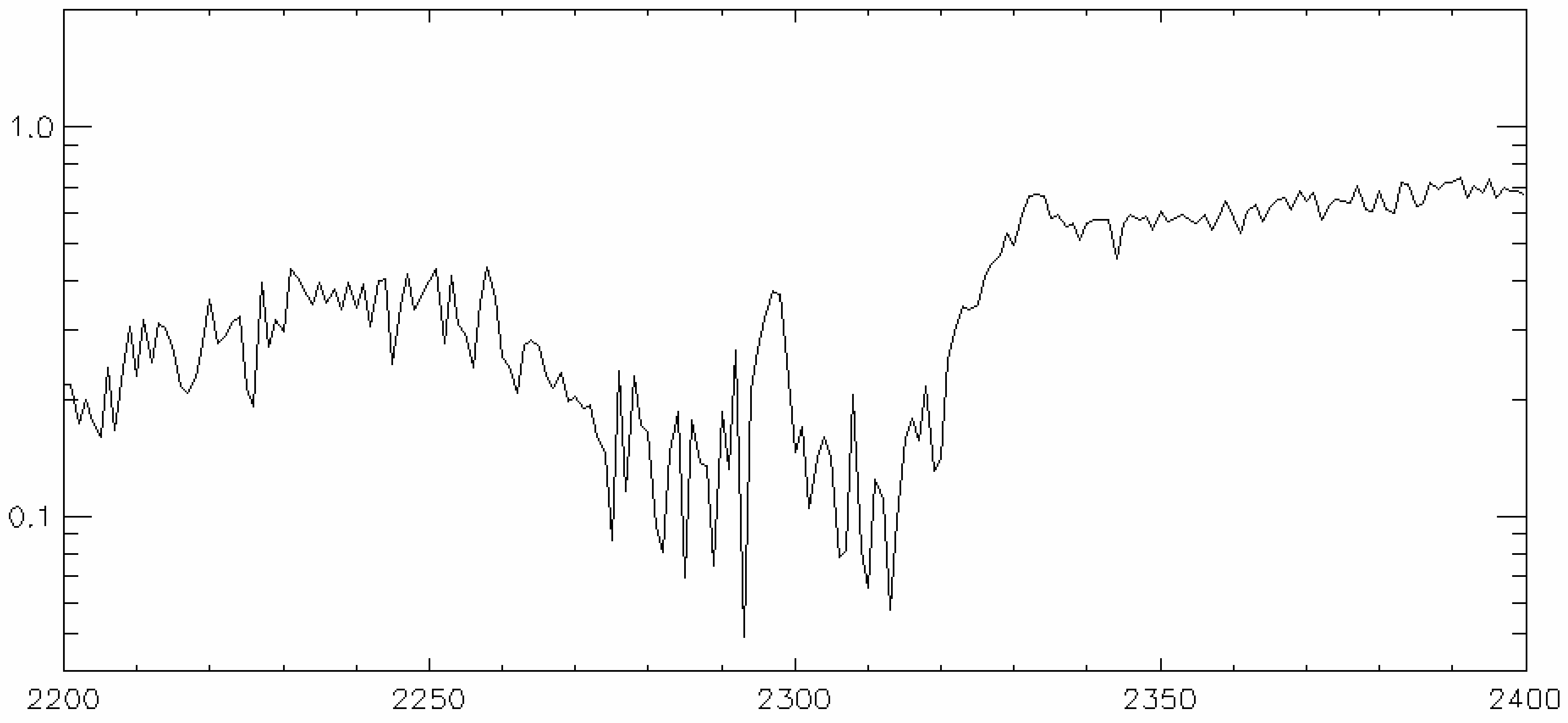
We report now on SW spectra taken with the ceramic element lamp and with the Oriel lamp(See Plot 36, 37 ,38, 39, 40, 41, 42. The last one should have a spectrum more intense in the short wavelenght range. We start first showing single spectrum, and its blow up around the CO2 absorption band, than we make averages. On the average over 25 spectra we see that the CO2 band may have a ghost 2x, therefore we again blow up and overplot the ghost to see how it matchs the main band. The ghost is not very clear, being noisy, but it is certainly there.
When looking at the Oriel lamp we discover a new effect : the interferogram is NOT SATURATED, but we see a very strong signal below 2000 cm-1. This effect has been interpreted occasionally as saturation of the detector without saturation of the interferogram. Alternatively can be interpreted as strong non linearity of the detector. We shall study in more details later this effect.

2.6 FORWARD AND REVERSE MOTION.

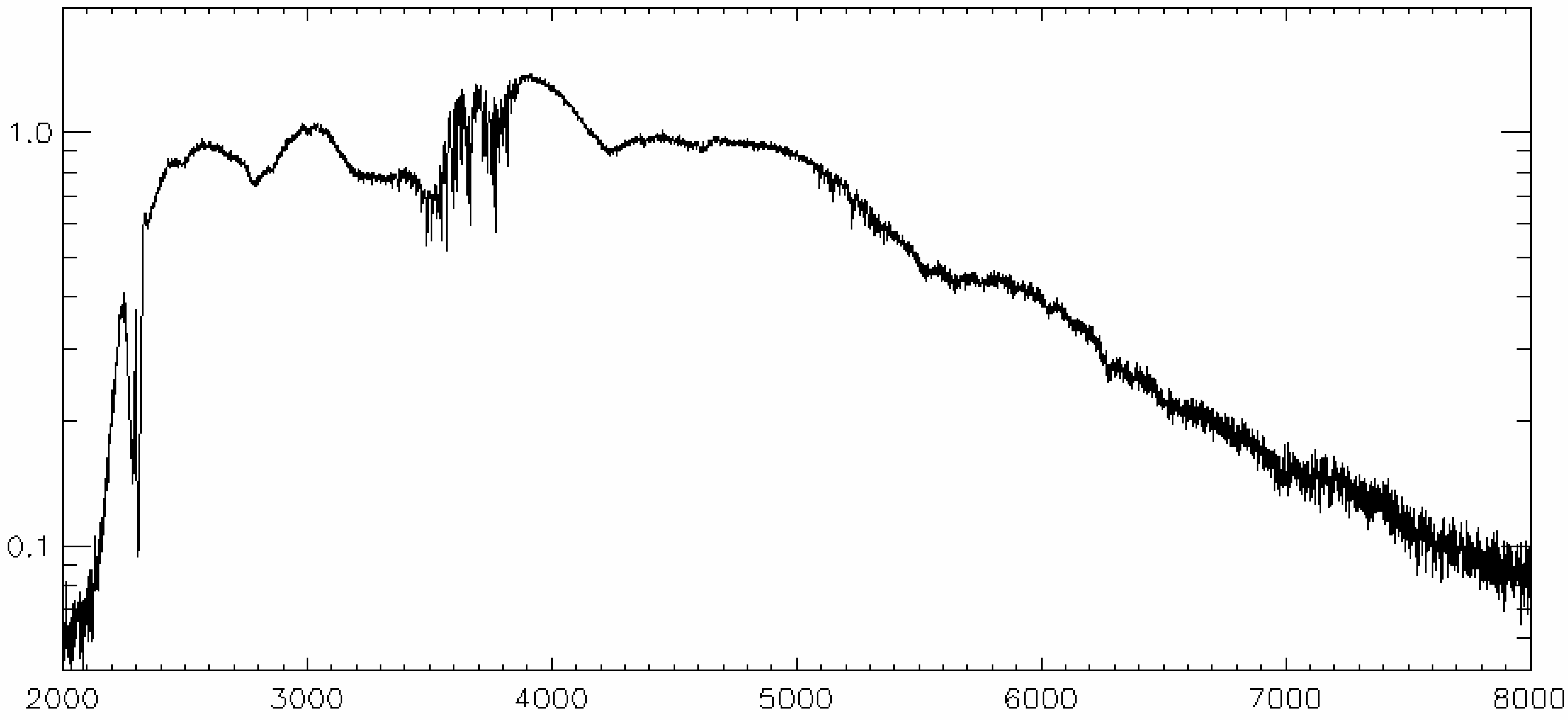
Plot 43, 44, 45, 46, 47 are shown to compare the raw data from forward and reverse motion. In the cases considered here seems to be essentially identical spectrum for the measurements taken from forward and for reverse motion. This indeed should be the case, but we have seen occasionally important differences, specially when the movement was not OK. All the average spectra shown for both SW and LW channel demonstrated that the direction of motion is not important for the measurement of the spectrum, however we know that the interferogram shows that the central part is displaced on one side or another depending on the motion direction.
As the SW spectra shown are from BB observations, it is important to look at some other source to confirm that the forward-reverse motion gives the same spectrum. We have considered the integrating sphere data. The following figures show the SW spectra for different source intensity. We see that the reverse motion shows a spectrum that does not change much the intensity close to 8000 cm –1, while the forward spectrum shows an intensity change proportional to the integrating sphere input (up to 5). The conclusion is that the reverse motion may have a different speed, therefore the electronic filter acts more strongly to decrease the signal. We have essentially two different instruments, one forward, one reverse motion : responsivity and ner should be computed separately for the 2. The effect in theory should be visible also in the LW channel, but there the signal in the range 1800-2000 cm-1 is absent, and the filter shape may also be different : a fact is that we are not able to see a substantial difference in the LW forward or reverse motion direction, while in the SW channel a strong effect appears in the range 7500- 8200 cm-1. On the cause of this effect we should say the following :
The double pendulum has a motor (with an identical spare for redundancy) which is used, no to the full possible power, but to the almost minimum power. On January 2, 2002 the power (current) was increased because motion was not OK after the inclusion of two large inductances in Module O. Also with the new current level the motion in all the laboratory measurements can be and it is affected by the presence of the gravity. As the Module O is never perfectly horizonthal, the motion forward (or reverse) can be against gravity, while the opposite is with gravity in favour. The motion with gravity in favour has obviously higher speed and therefore will show the effect of the electronic filter cutting the signal. The opposite motion will not show the effect. As in the Lab we have worked occasionally with PFS upside down (specially in early January – 2/5 jan) we may have data with reverse motion showing the filter cutting, other data may have the forward motion with the filter cutting, if PFS was upside down. It is important to note that in space this difference forward reverse should not exists.



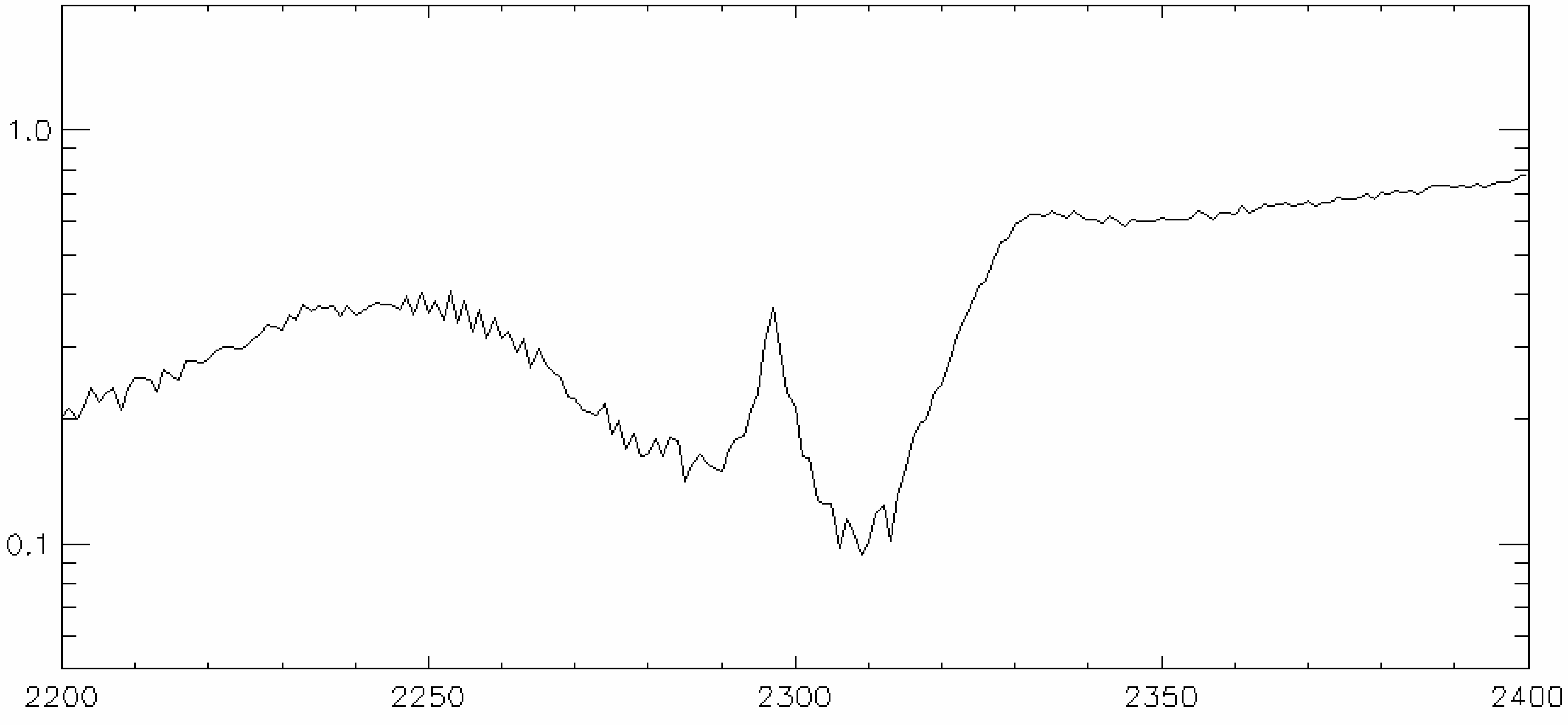
Ceramic Element – Single FFT Spectra – SWC
Plot – 36



Ceramic Element – Single FFT Spectra – SWC – Blow-Up of the CO_2 Absorption Bands
Plot – 37

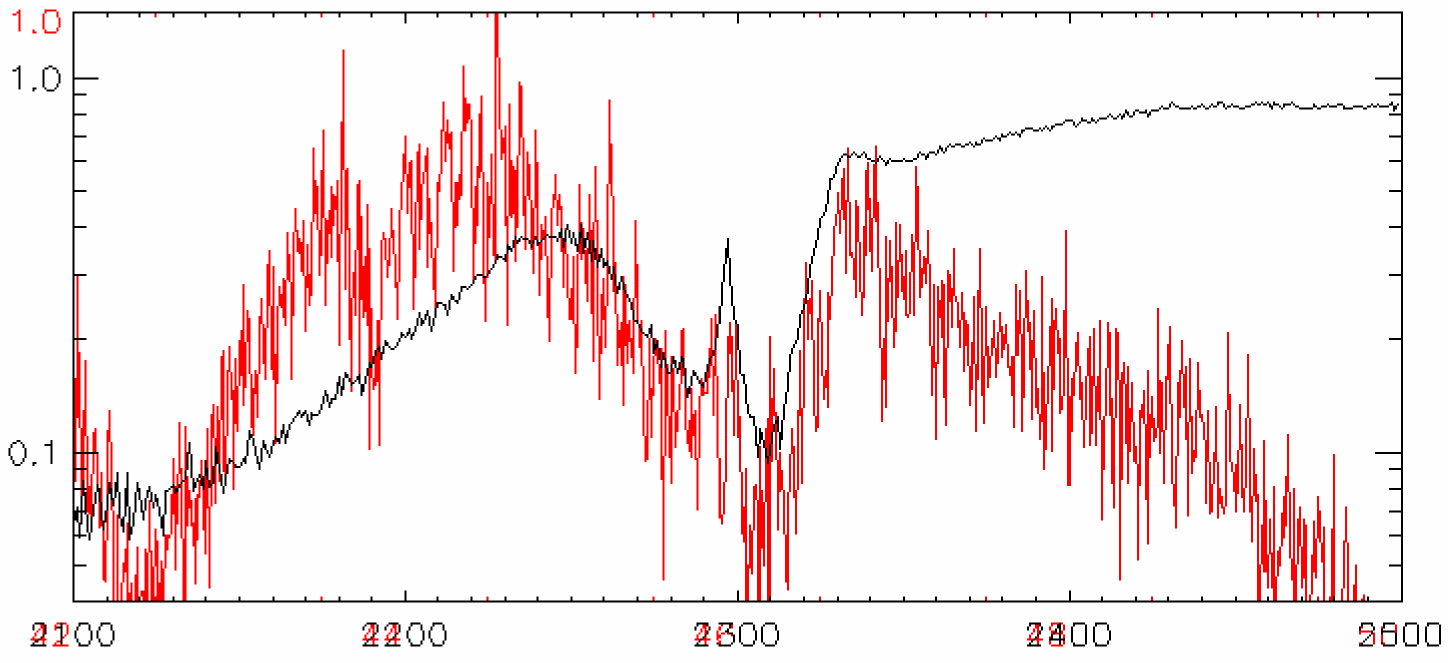


Plot – 38
Ceramic Element – Average on 25 FFT Spectra – SWC



Ceramic Element – Average on 25 FFT Spectra – SWC - Blow-Up of the CO_2 Absorption Bands

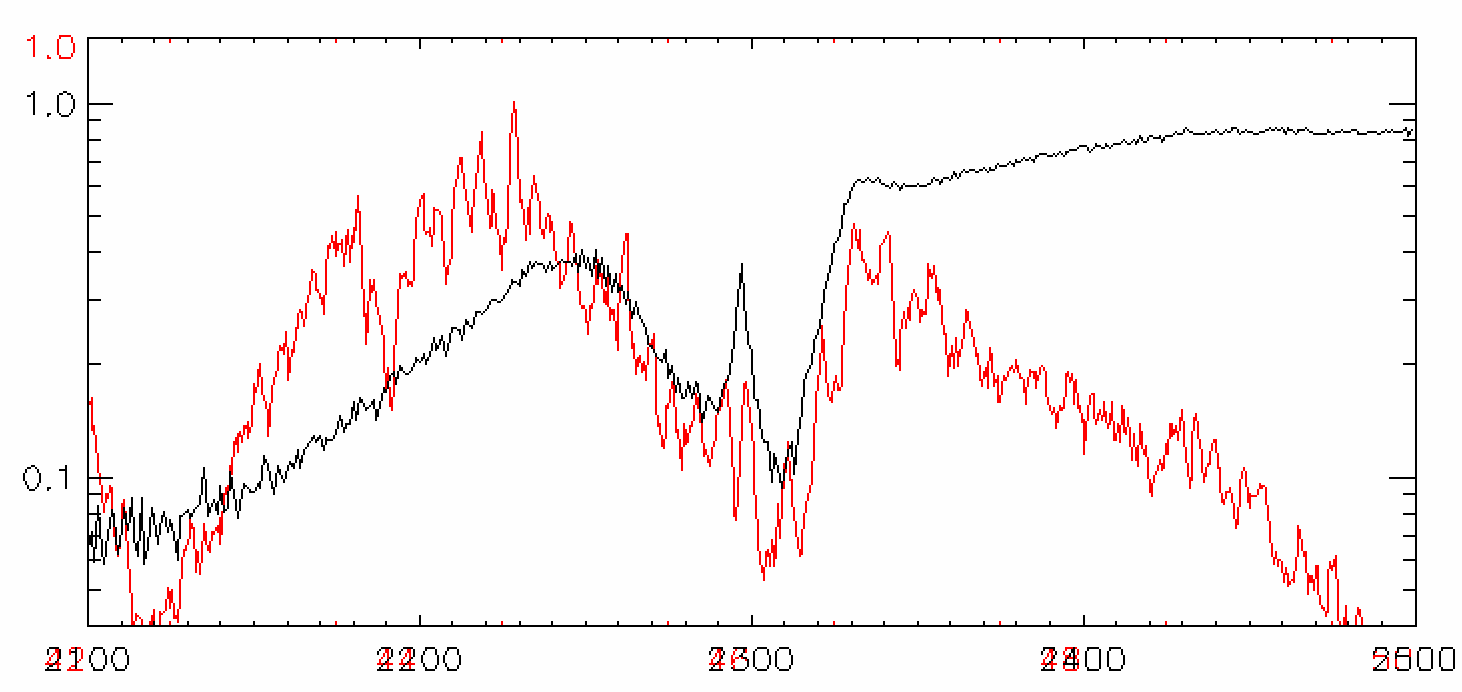
Plot – 39



Black: Primary spectrum
$2100 \div 2500\ cm^{-1}$

Red: Ghost(?)
$4200 \div 5000\ cm^{-1}$

Plot - 40

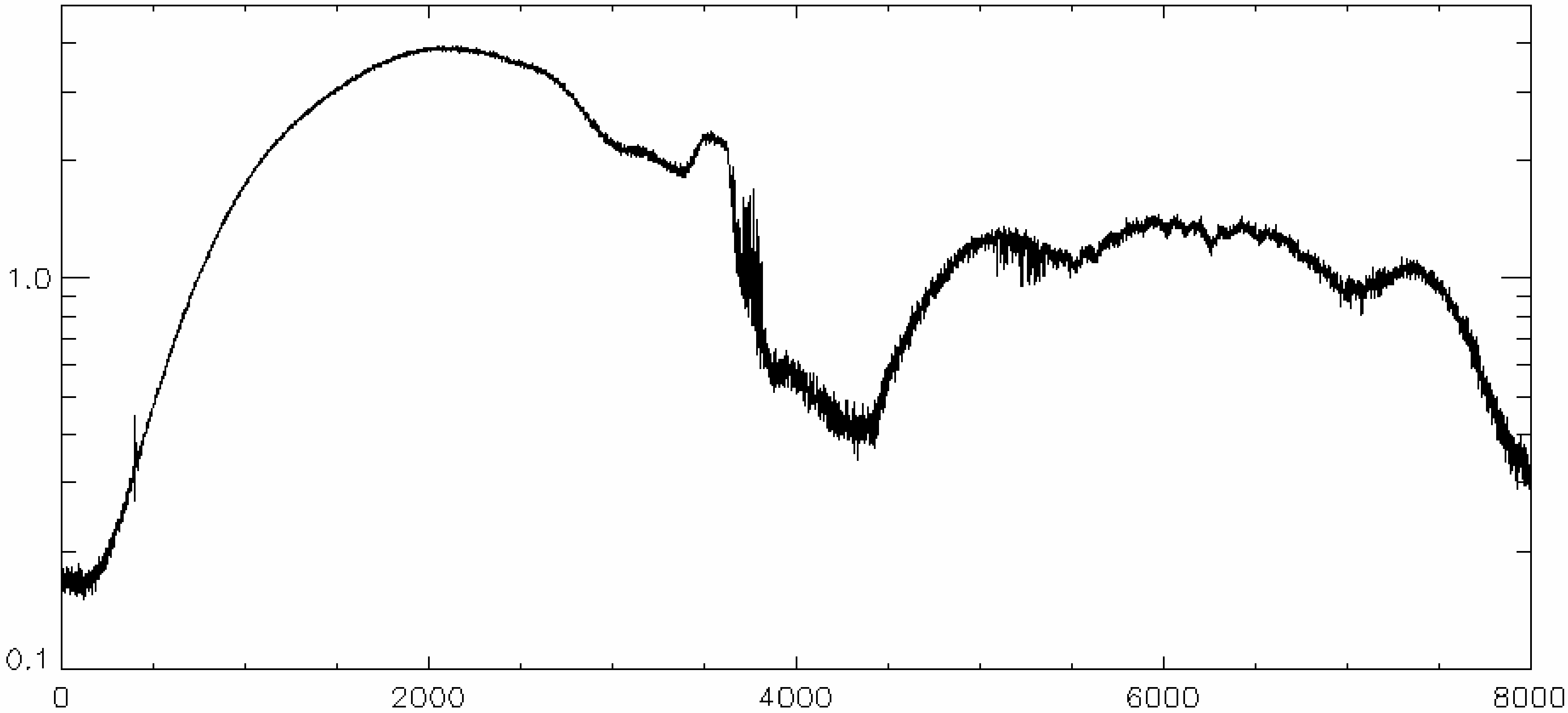


Black: Primary spectrum 2100÷2500 cm^{-1}

Red: Ghost(?) 4200÷5000 cm^{-1}

SMOOTH ON 5 PTS

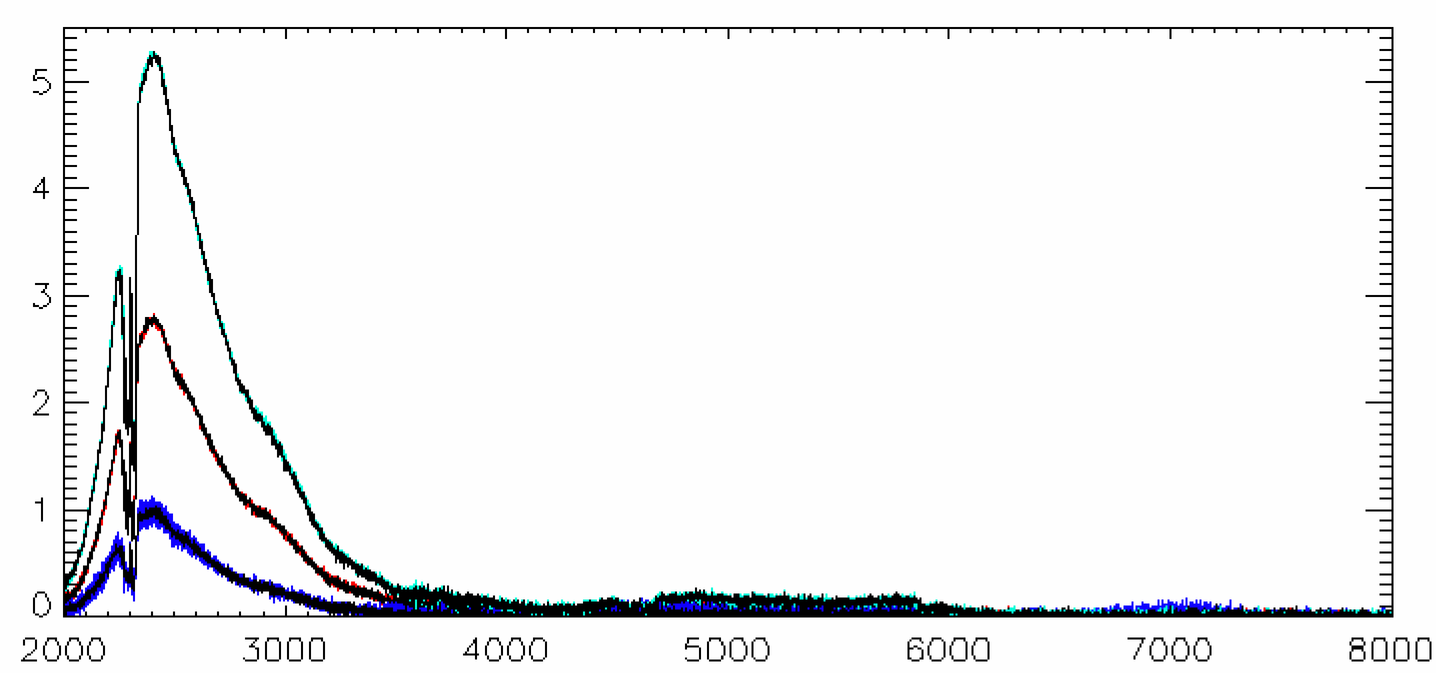
Plot – 41



Plot – 42

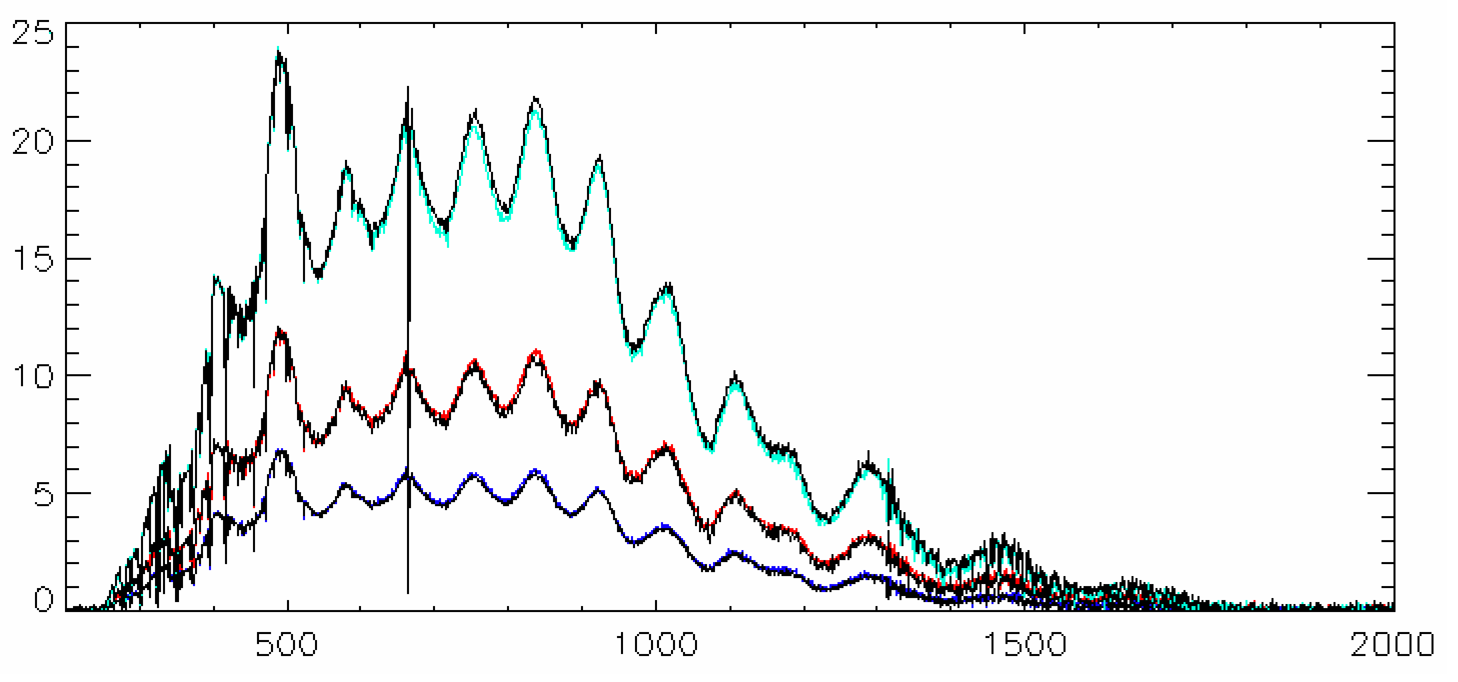
Oriel Lamp – Average on 25 FFT spectra – SWC

NOTE: Something went obviously wrong! We have high signals even under 1000cm^{-1}



Black: Reverse directions
Blue: Forward direction IFSI BB @ 100 °C
Red: Forward direction IFSI BB @ 148.9 °C
Cyan: Forward direction IFSI BB @ 148.9 °C – Gain 1

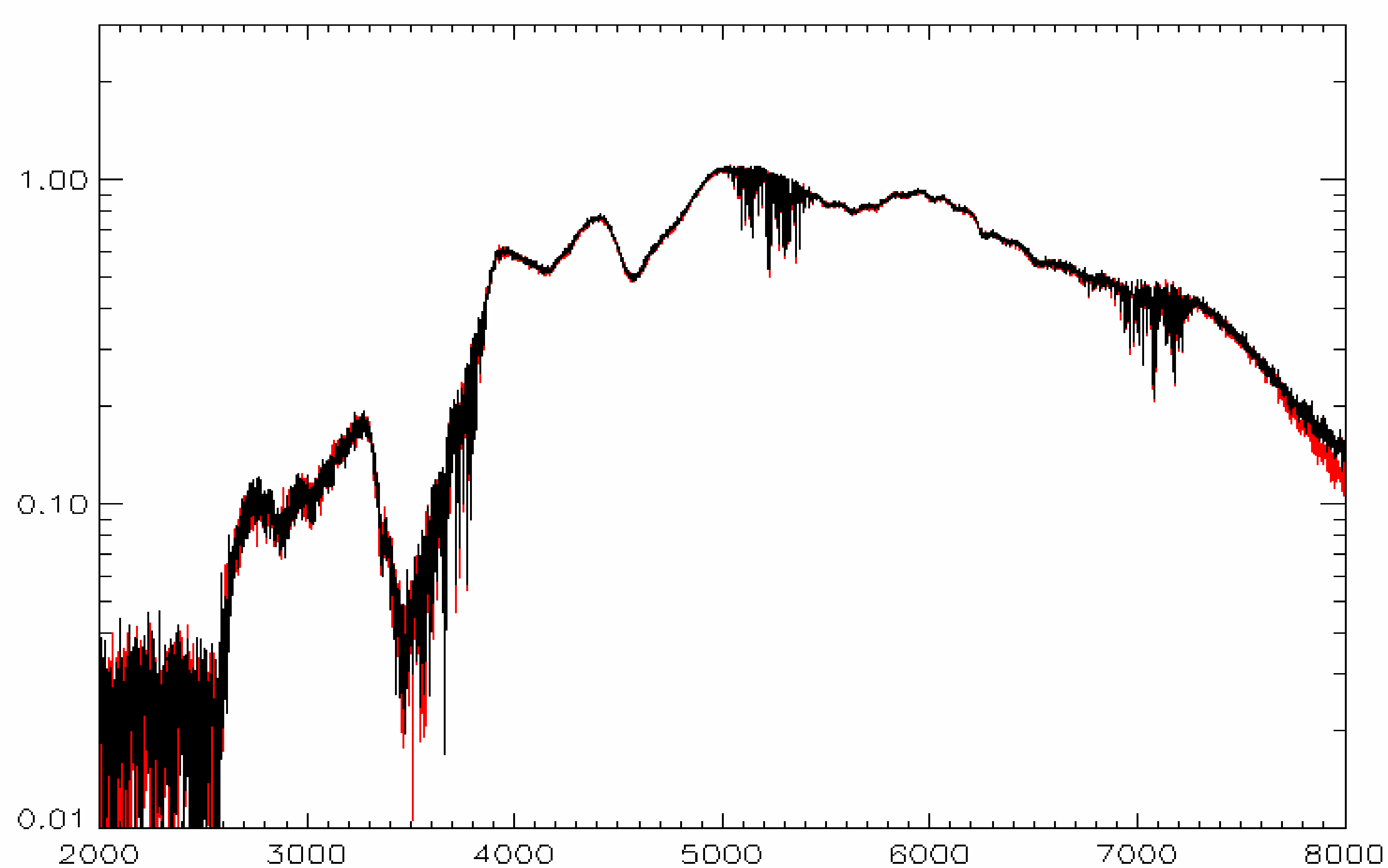
SWC
Plot- 43



Black: Reverse directions
Blue: Forward direction IFSI BB @ 100 °C
Red: Forward direction IFSI BB @ 148.9 °C
Cyan: Forward direction IFSI BB @ 148.9 °C – Gain 1

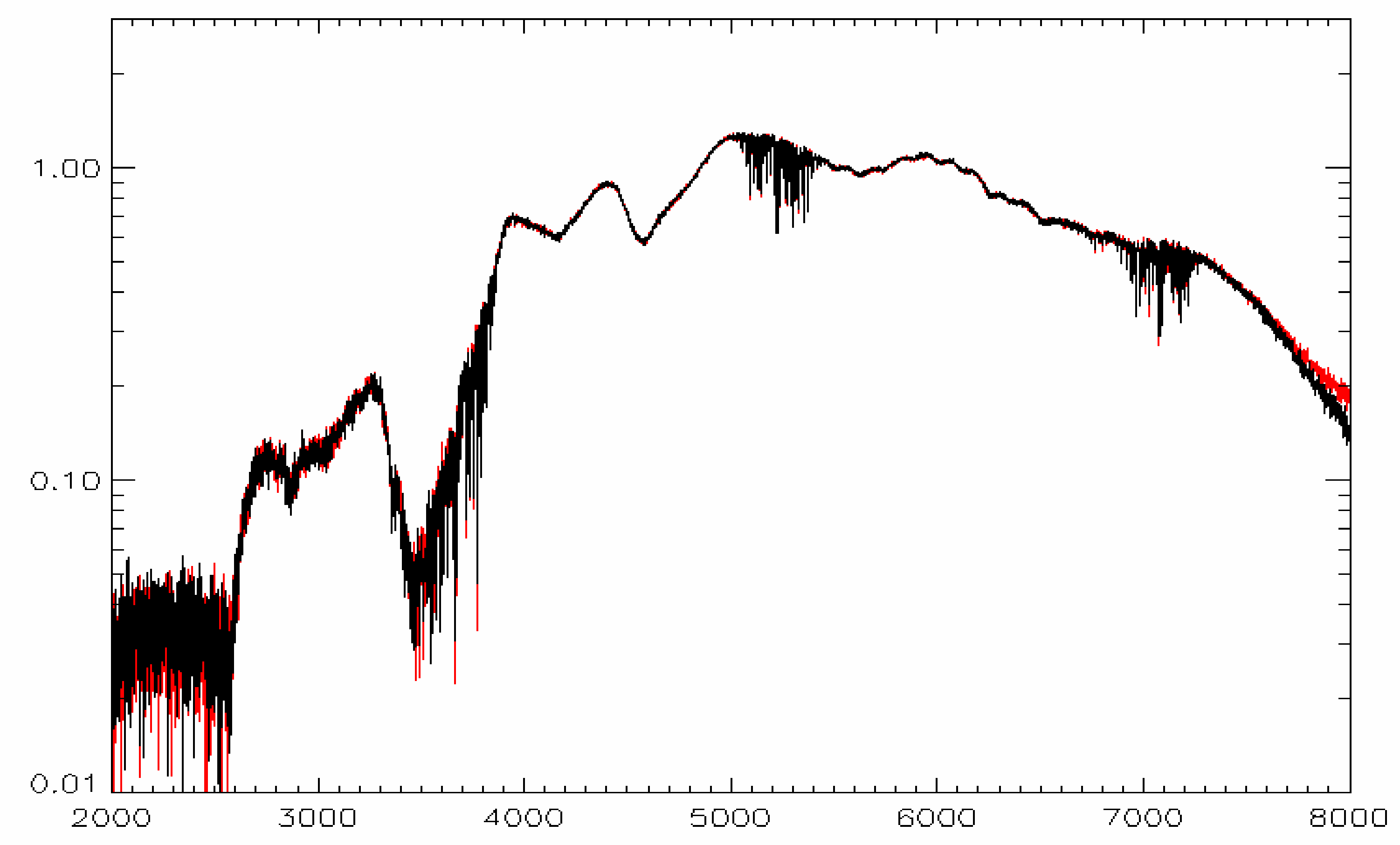
LWC

Plot - 44



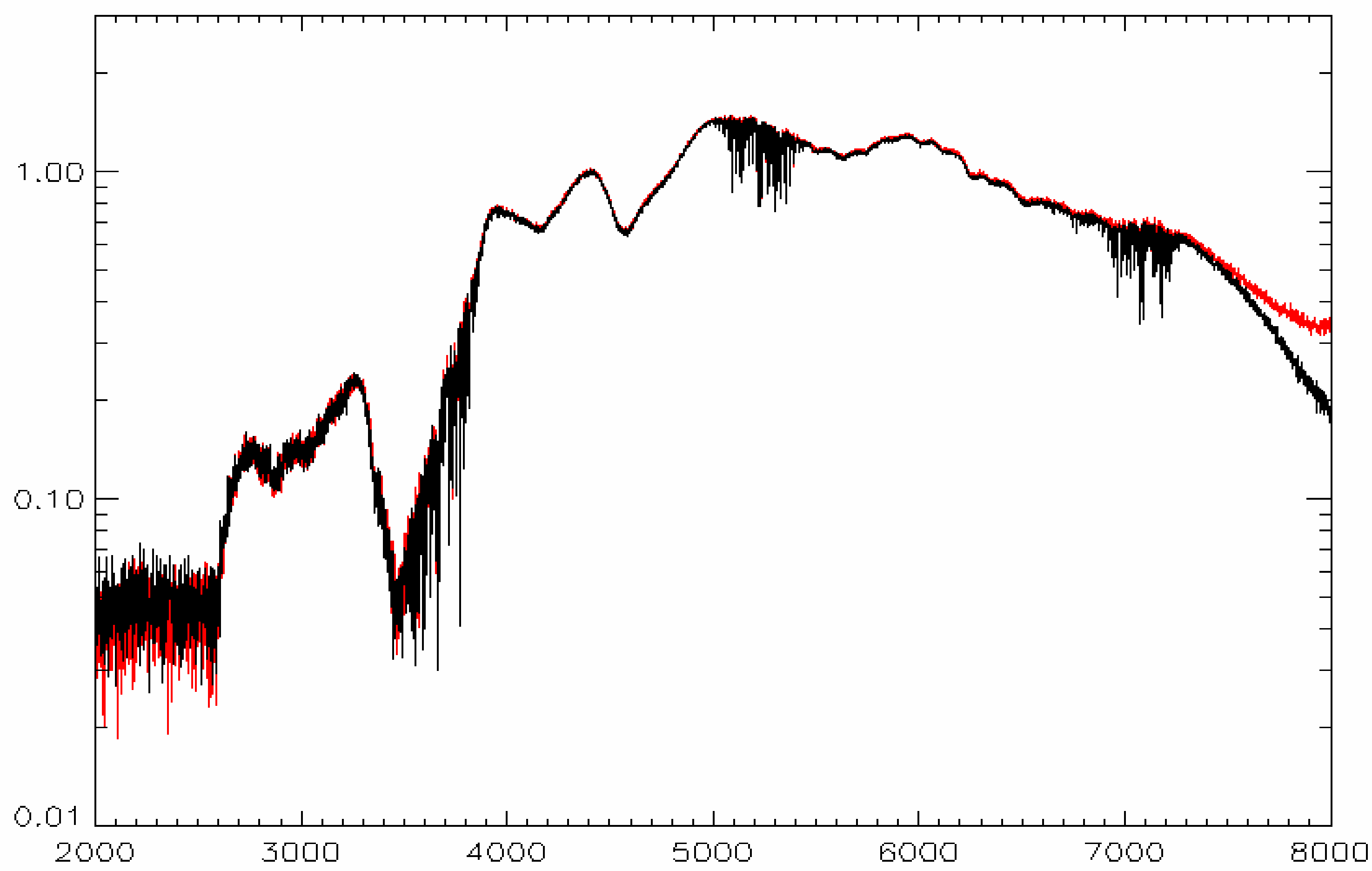
Integrating Sphere – 3000fL – SWC – Average on 10spectra – Gain 0 – Room temperature

Black: Reverse pendulum direction
Red: Forward pendulum direction
Plot – 45



Integrating Sphere – 4000fL – SWC – Average on 10spectra – Gain 0 – Room temperature

Black: Reverse pendulum direction
Red: Forward pendulum direction
Plot – 46



Integrating Sphere – 5000fL – SWC – Average on 10spectra – Gain 0 – Room temperature

Black: Reverse pendulum direction
Red: Forward pendulum direction
Plot – 47

2.7 INTEGRATING SPHERE

In the following we show measured spectra taken using the integrating sphere (See plot 48, 49, 50, 51). We show 2 figures in each case : spectra average over 10 measurements (all reverse motion) for different gain factors first. The same figure is then shown with the spectra smoothed. The luminosity was fixed at 100 fotlam. Note that in the last measurements (gain 7) probably we have saturation, or we are very close to saturation, and the spectrum is deformed. The integrating sphere should not give signal below 4000 cm-1. We do see something but we do not understand the cause of that signal. The spectra show that indeed there is a factor 2 increase in gain going from gain 0 to 1,2,3,4,5,6,7 (each step a factor 2). It is interesting to note that 100 Fl are equivalent to 1-2 ergs/s sr.s cm-1, like at Mars. At Mars, therefore we may have to use gain 4 to get good signal to noise ratio without saturation.

After that we show the gain 0 measurements for different luminosity, from 10 to 5000ftl. We note here that in the region 7500 – 8000 cm-1 the spectral shape may depend on the fact that the motion of the double pendulum was against gravity or not.

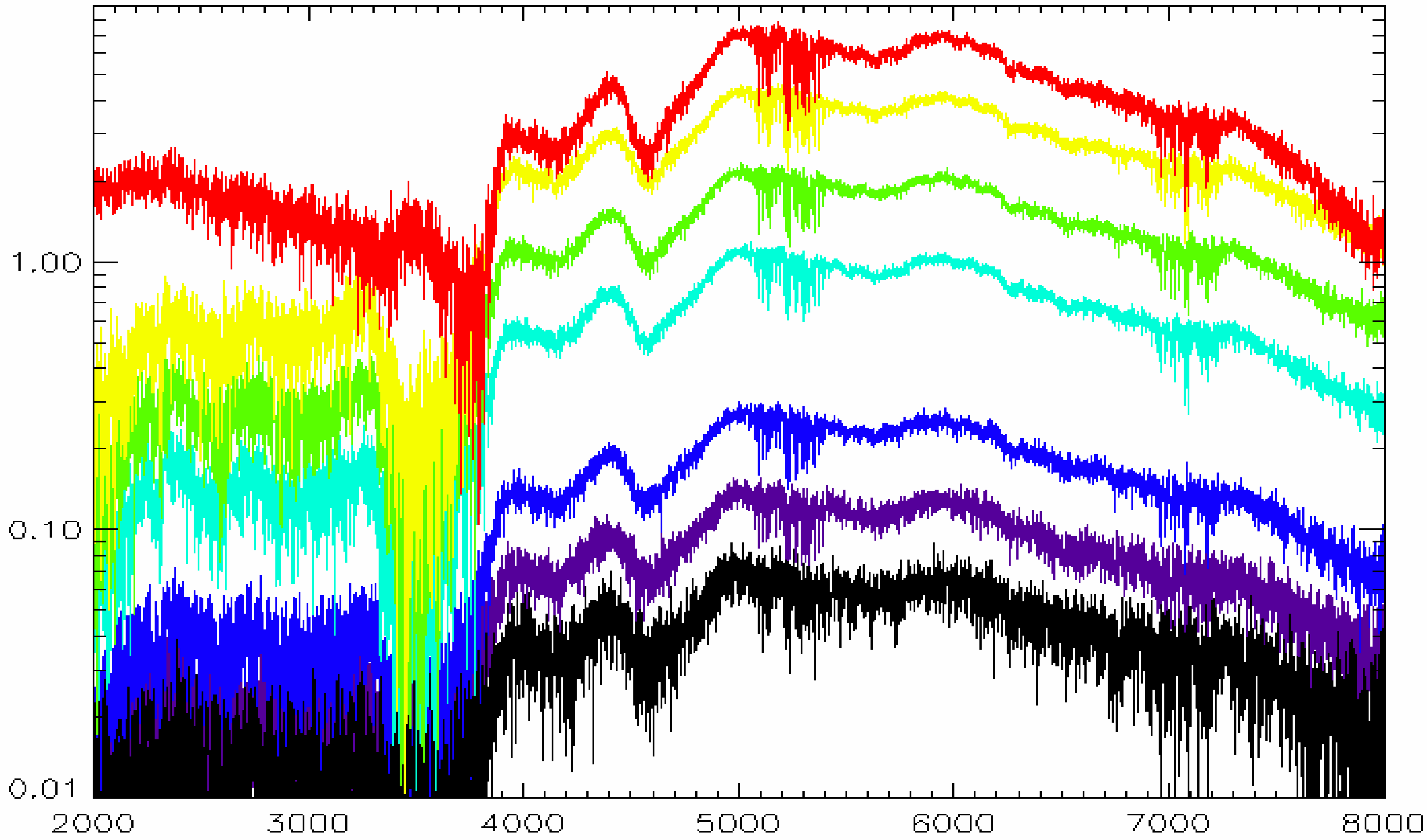
In both cases we not that the spectra can span over 2-3 decades.

We show now some strange spectra which indicate the presence of other instrumental effects. See plot 52, 53, 54, 55, 56, 57, 58. The next figure shows a spectrum average over 5, and smoothed over 10 points. The spectrum was taken in the Thermovac, with the Sw detector cooled at –37 celsius. PFS was looking at the integrating sphere out of the window. The signal from the sphere was very small and the radiance from the window was dominating. Gain 4 was used and the interferogram was not saturated, being 23700 at max intensity. A strong signal between 1000 and 2000 is observed. A priory no signal is detectable between 0 and 2000 cm-1. There is only one way to generate a false signal below 2000 cm-1, and this is by means of strong distortion of the central part of the interferogram, which is the part that controls the low frequencies of the spectrum. This effect can be explained as a non linearity of the detector for large signals. That this is the case is demonstrated also by the following figure : we are now looking at the internal calibration lamp at gain zero and with the detector at decreasing temperatures. We see that the spectral intensity increases as the responsivity increases, as expected. What is not expected is the increase of the signal below 2000 cm-1, which becomes non negligible at –46 Celsius.

We shall in the following study the linearity of the detector and the increase of the responsivity at decreasing detector temperature. Here we simply conclude that the detector may be non linear for intense signals, and this effect may deform the shape of the spectrum.

2.8 INTERNAL LAMP

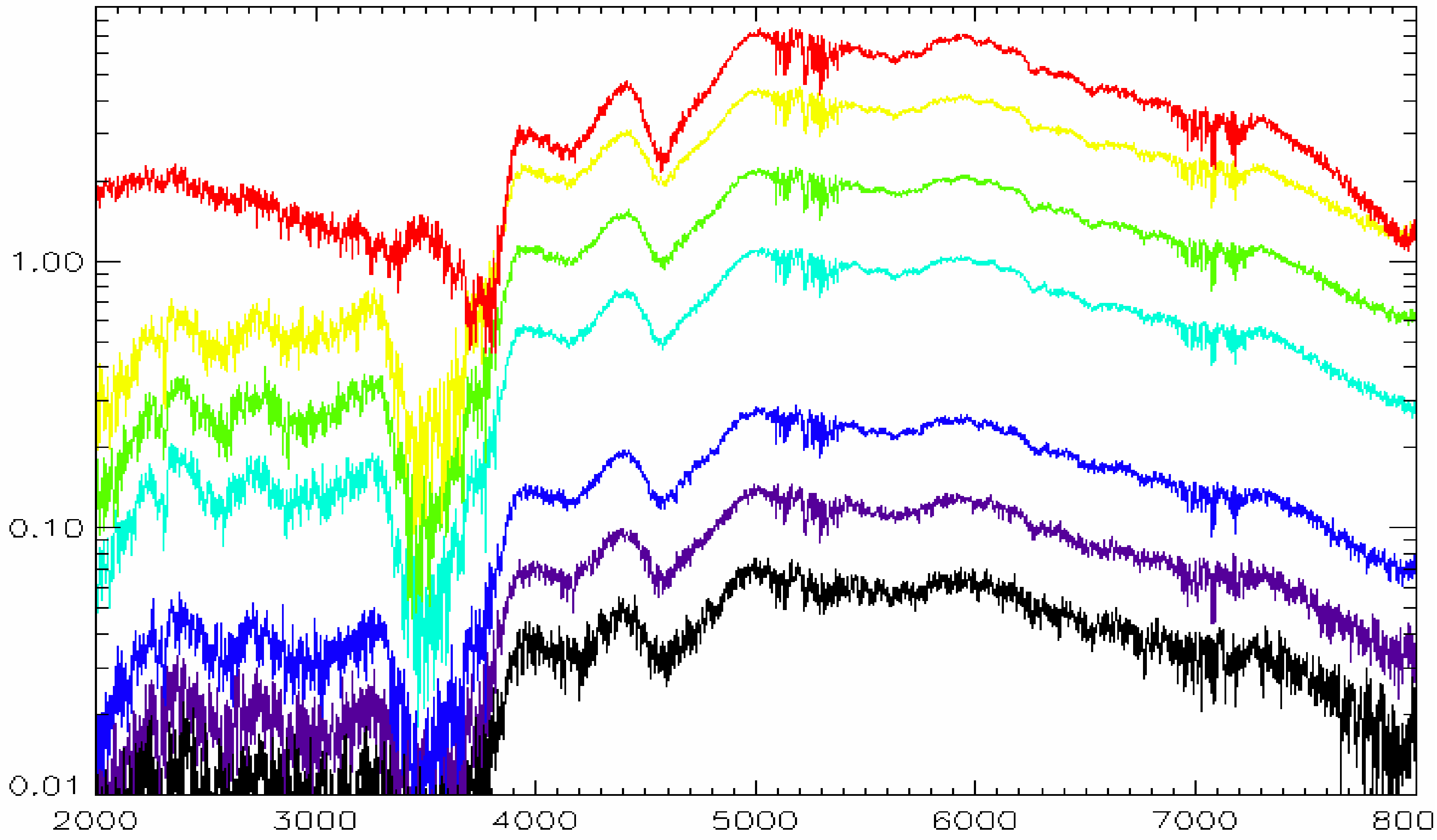
In the following figures (see plot 59, 60, 61, 62, 63) we show other spectra of the internal lamp. The main point to be stressed here is that the internal lamp can be observed at room temperature only with gain 0 and 1. at all the other gains the interferogram is saturated in spite of the current reduction from 16 to 10 ma. It is obvious that when we go to cooled SW detector, the responsivity increases and the interferogram for the internal calibration lamp can be saturated for all the gain factors available. This probably means that in space we will not have any calibration source for the SW channel.



Integrating Sphere – 100fL – SWC – Averages on 10 spectra – Room temperature

Black:	Gain 0	Cyan:	Gain 4	Red:	Gain 7
Violet:	Gain 1	Green:	Gain 5		
Blue:	Gain 2	Yellow:	Gain 6		

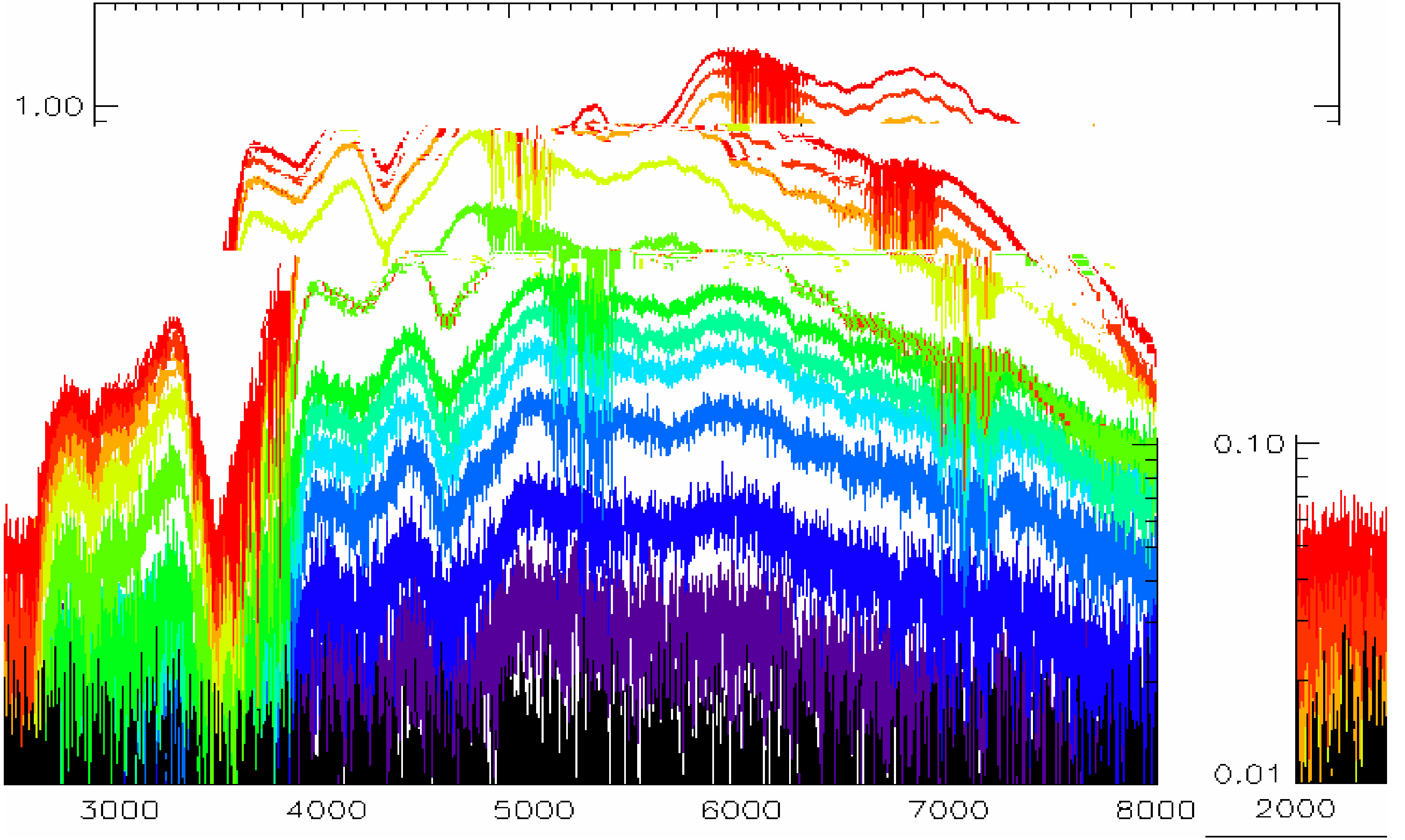
Plot - 48



Integrating Sphere – 100fL – SWC – Averages on 10spectra – Room temperature – **SMOOTHED ON 5 PIONTS**

Black:	Gain 0	Cyan:	Gain 4	Red:	Gain 7
Violet:	Gain 1	Green:	Gain 5		
Blue:	Gain 2	Yellow:	Gain 6		

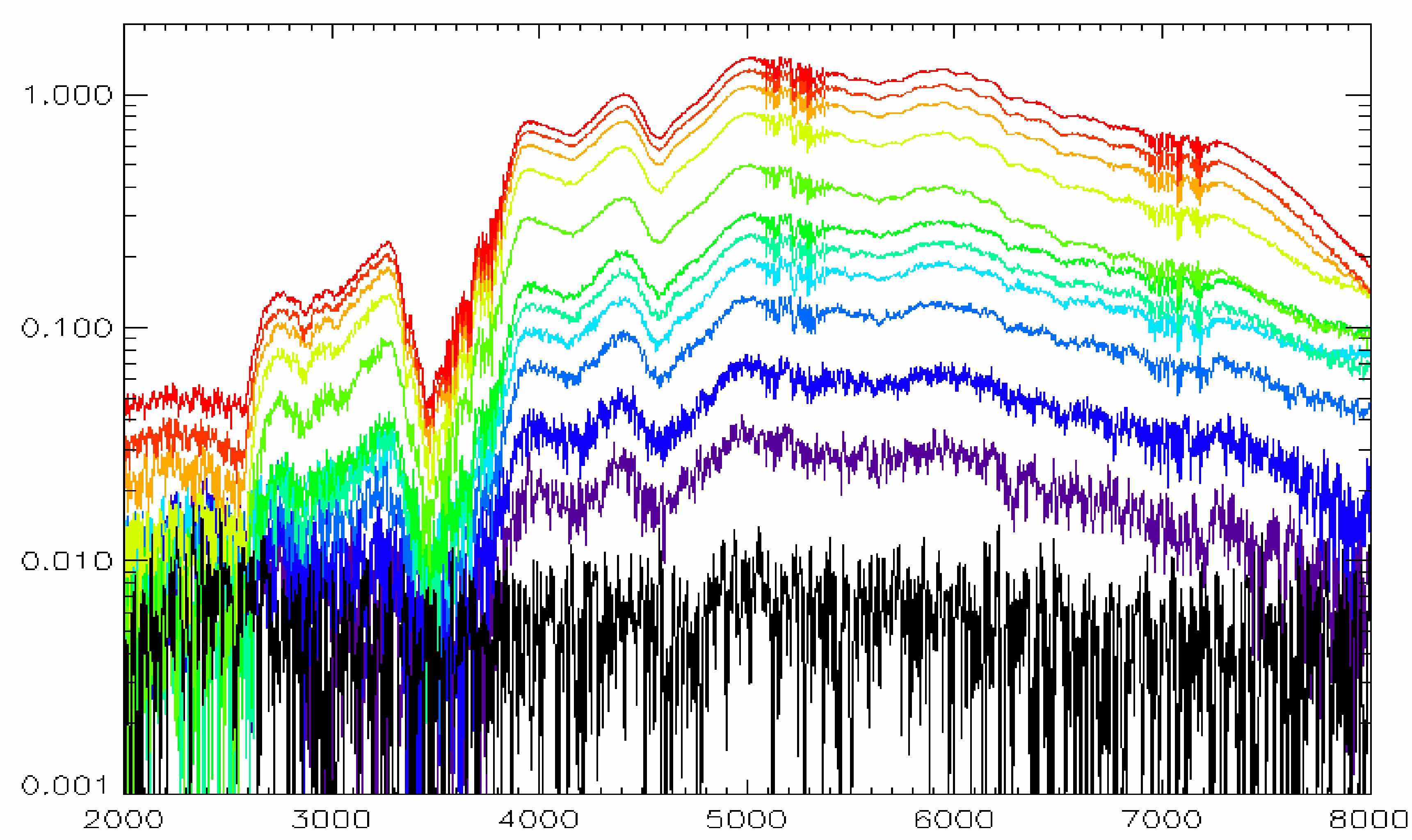
Plot - 49



Plot - 50

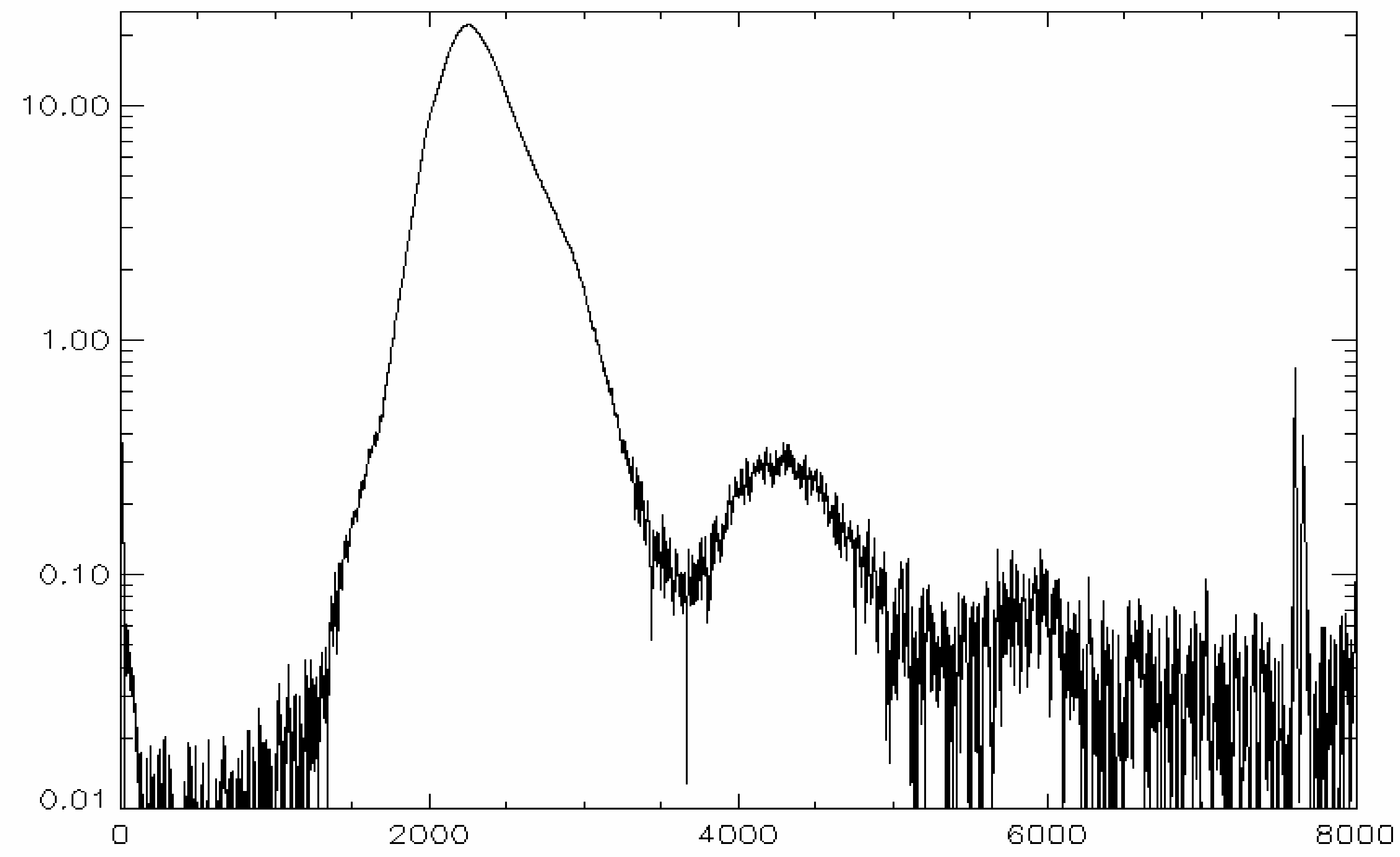
Integrating Sphere – SWC – Averages on 10spectra – Room temperature

From bottom to top: 10fL, 50fL, 100fL, 200fL, 300fL, 400fL, 500fL, 1000fL, 2000fL, 3000fL, 4000fL, 5000f

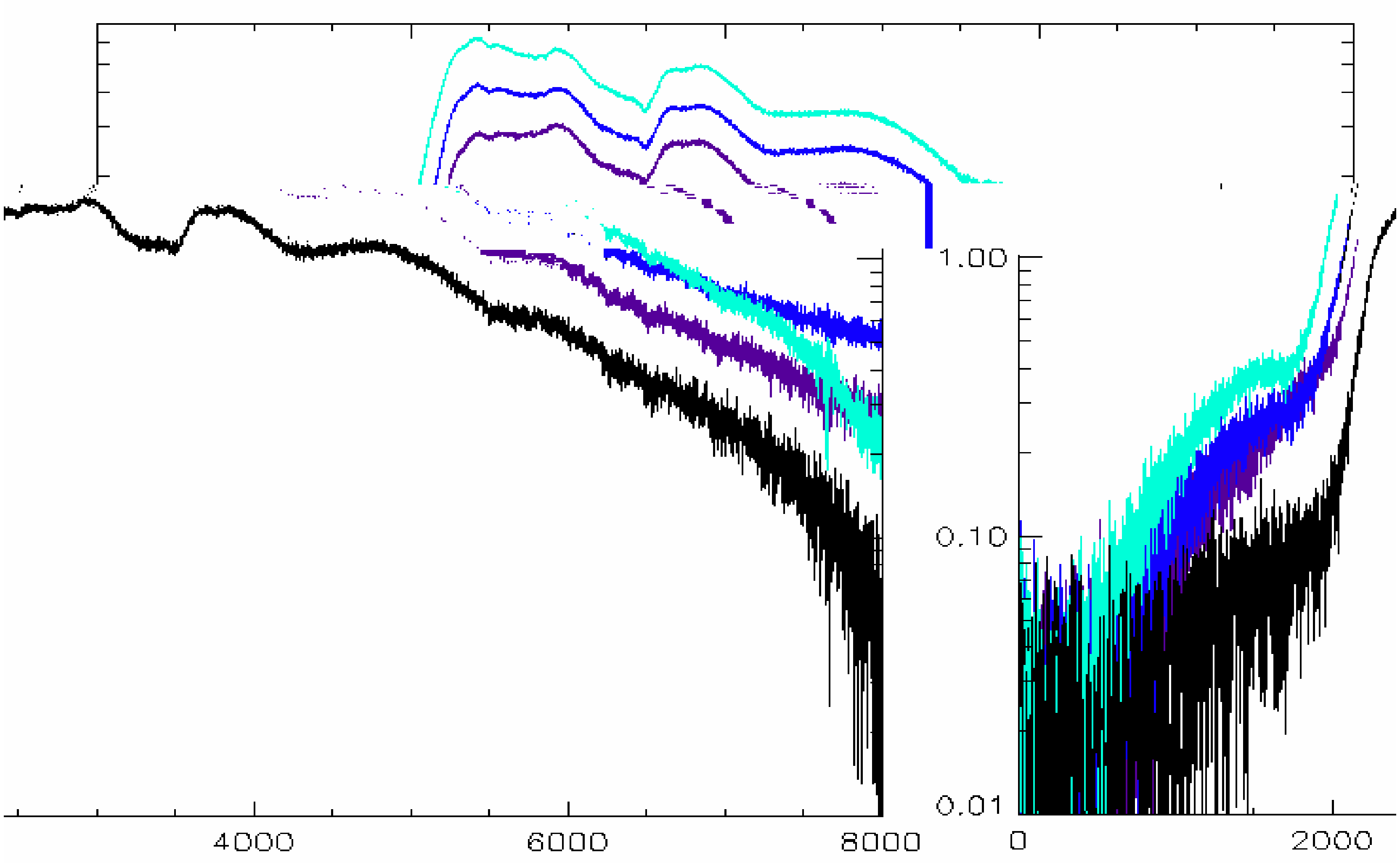


Plot – 51
Integrating Sphere – SWC – Averages on 10spectra – Room temperature – **SMOOTHED ON 5 POINTS**

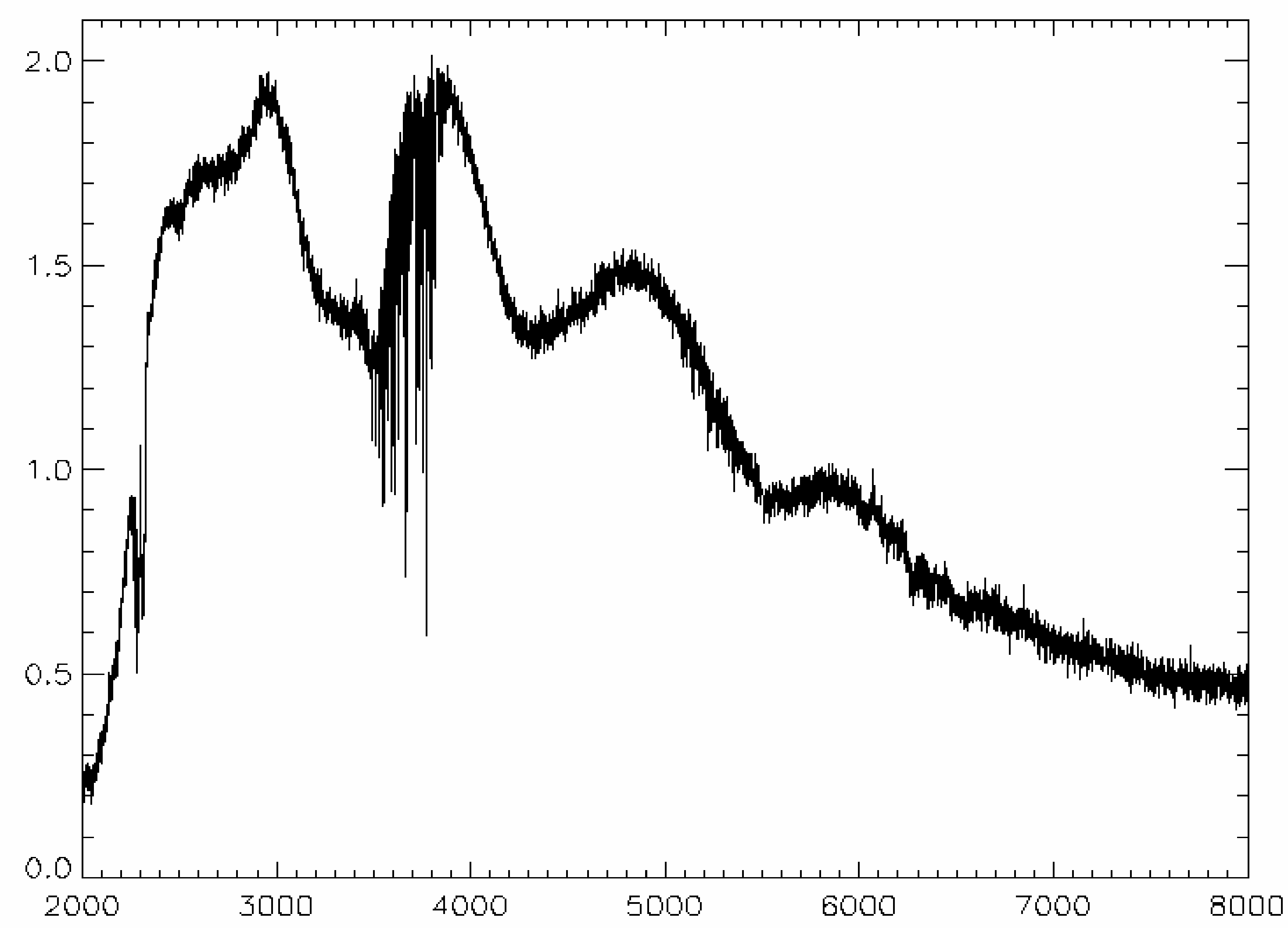
From bottom to top: 10fL, 50fL, 100fL, 200fL, 300fL, 400fL, 500fL, 1000fL, 2000fL, 3000fL, 4000fL, 5000fL



Integrating Sphere – 100fL – SWC – Gain 4 – AVERAGE OVER 5 SPECTRA – Smoothed on 10 points. Very low signal from the sphere. Thermal signal from chamber window. Detector SW cooled to –40 celsius.
Plot – 52



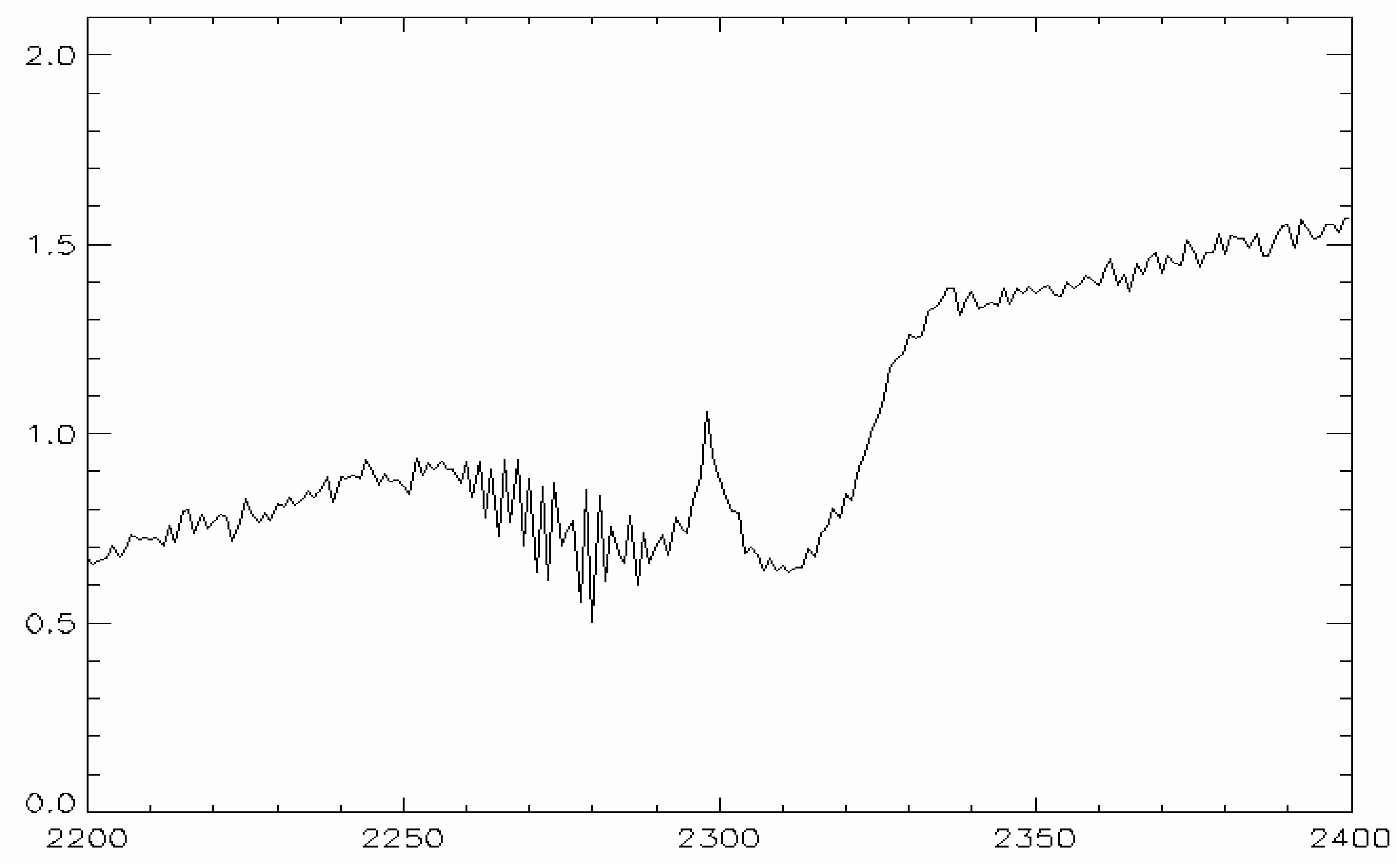
Black:	SW detector @ 7 °C	Plot 53	INTERNAL CALIBRATION LAMP
Violet:	SW-detector @ 0 °C		
Blue:	SW-detector @ -25 °C		
Cyan:	SW-detector @ -46 °C		



Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	291.955	T2:	293.768
T3:	293.721	T4:	289.861
T5:	292.783	T6:	294.409
T7:	293.643	T8:	292.580

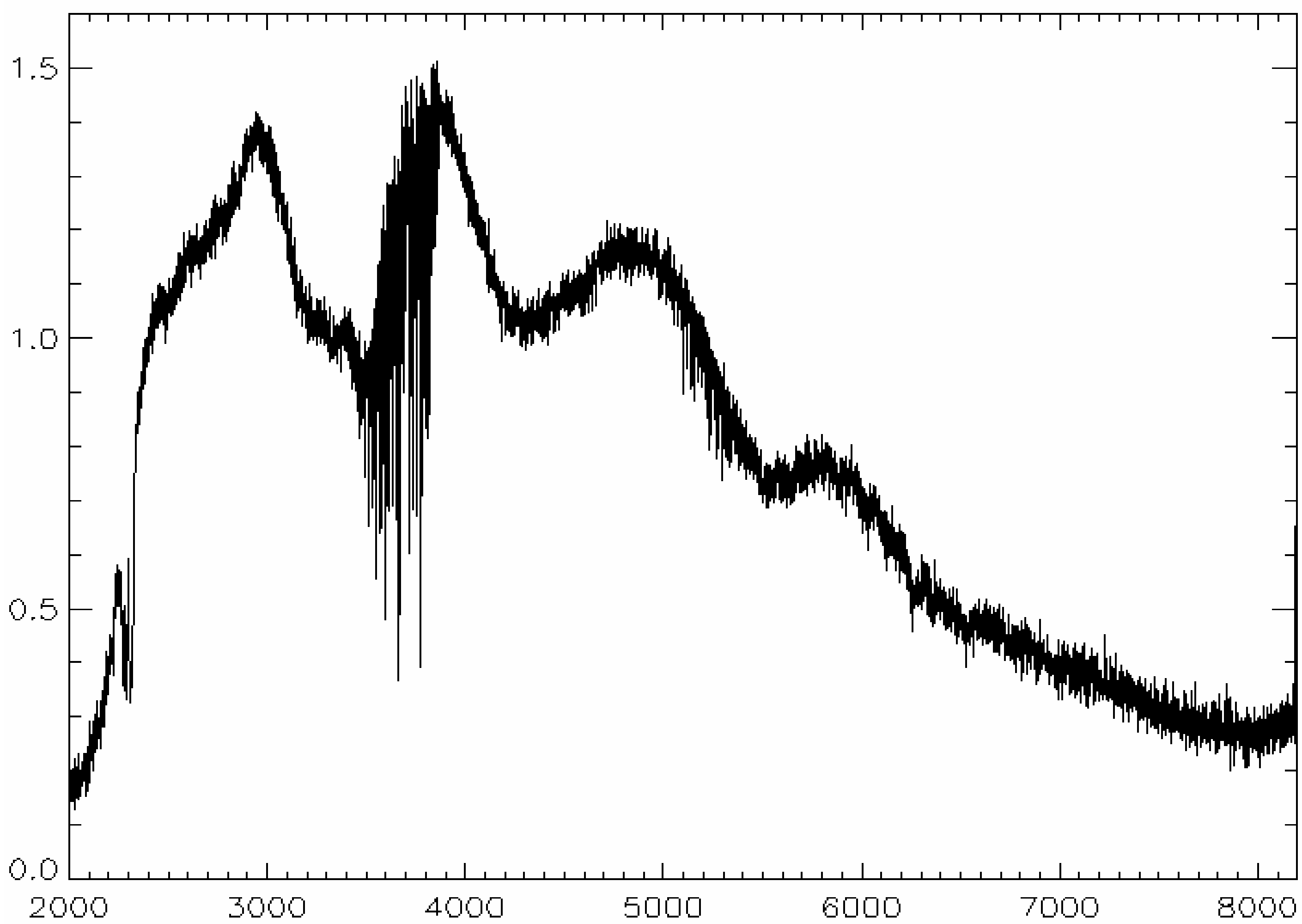
SW Det. Temp. (±5V):	284.400
SW Det. Temp. (±10V):	284.347
LW Det. Temp. (±5V):	294.448
LW Det. Temp. (±10V):	294.414
SW Laser Temp. (±5V):	299.188
SW Laser Temp. (±10V):	299.190
LW Laser Temp. (±5V):	296.653
LW Laser Temp. (±10V):	296.661
Int. BB Temp A1. (±5V):	307.718
Int. BB Temp A1. (±10V):	277.181
Int. BB Temp A2. (±5V):	307.733
Int. BB Temp A2. (±10V):	277.137

Plot – 54 Internal Lamp – Single spectrum – 29-12-2001 - SWC



Plot - 55

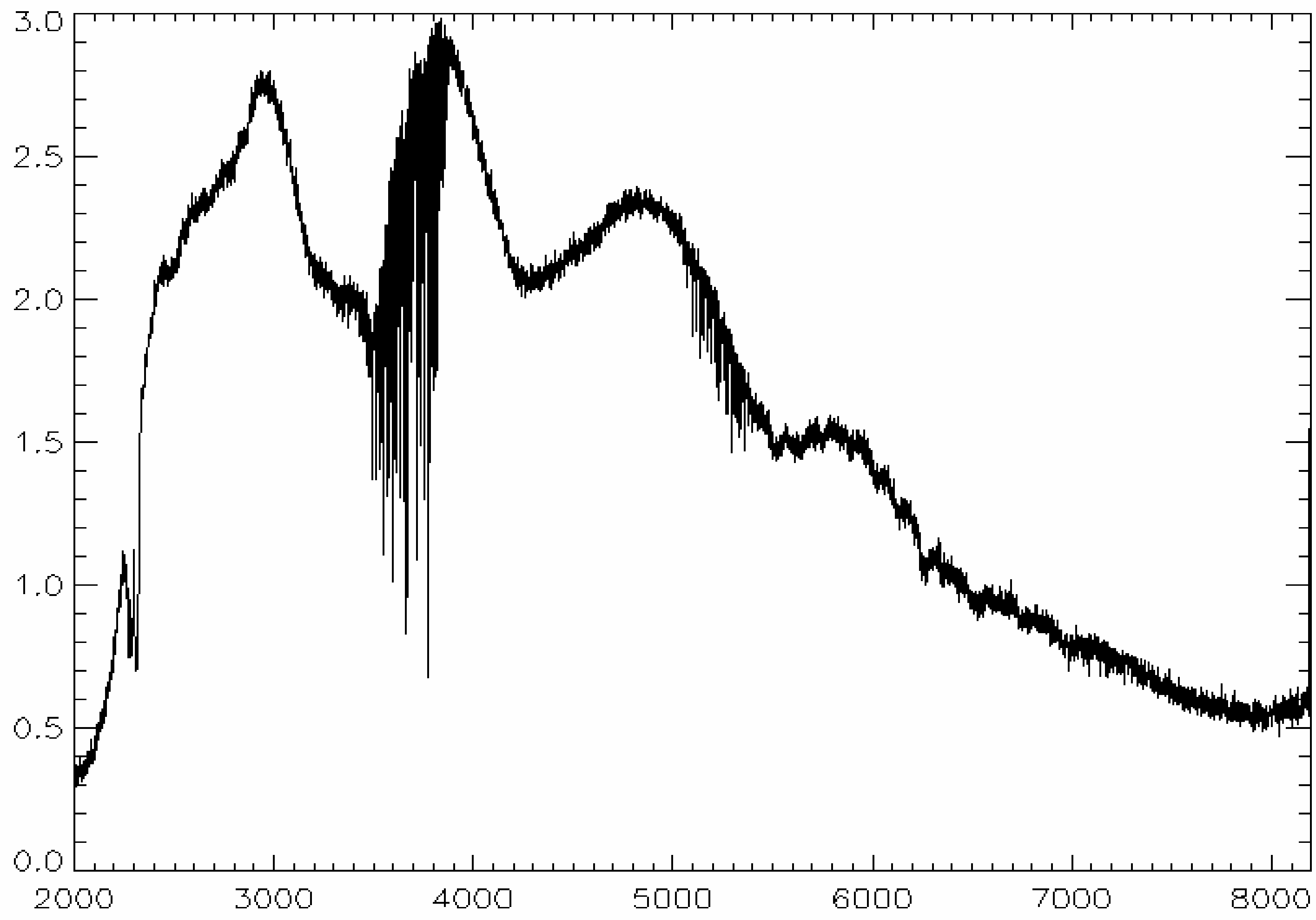
Internal Lamp – Single spectrum – 29-12-2001 – SWC – CO_2 band
No line-shifting is present



Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	300.144	T2:	300.926
T3:	300.613	T4:	300.504
T5:	299.597	T6:	301.457
T7:	300.519	T8:	299.894

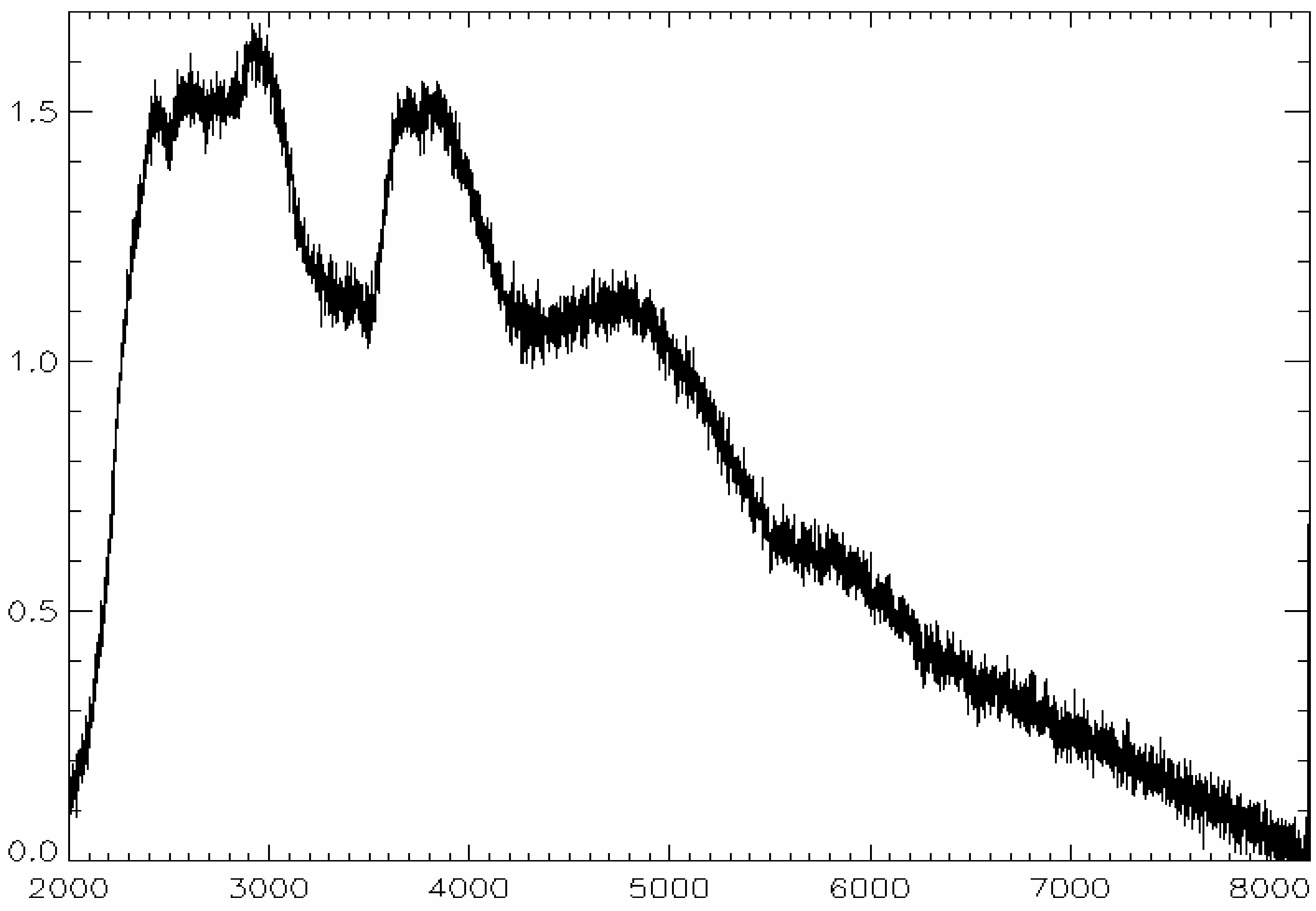
SW Det. Temp. (±5V):	300.000
SW Det. Temp. (±10V):	301.890
LW Det. Temp. (±5V):	301.344
LW Det. Temp. (±10V):	301.330
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	302.276
LW Laser Temp. (±5V):	298.020
LW Laser Temp. (±10V):	301.592
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	293.348
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	293.312

Plot - 56
Internal Lamp – Single spectrum – 02-01-2002 – SWC
No line-shifting is present.



Plot – 57
Internal Lamp – Single spectrum – 02-01-2002 – SWC – **Gain 1**

No line-shifting is present.

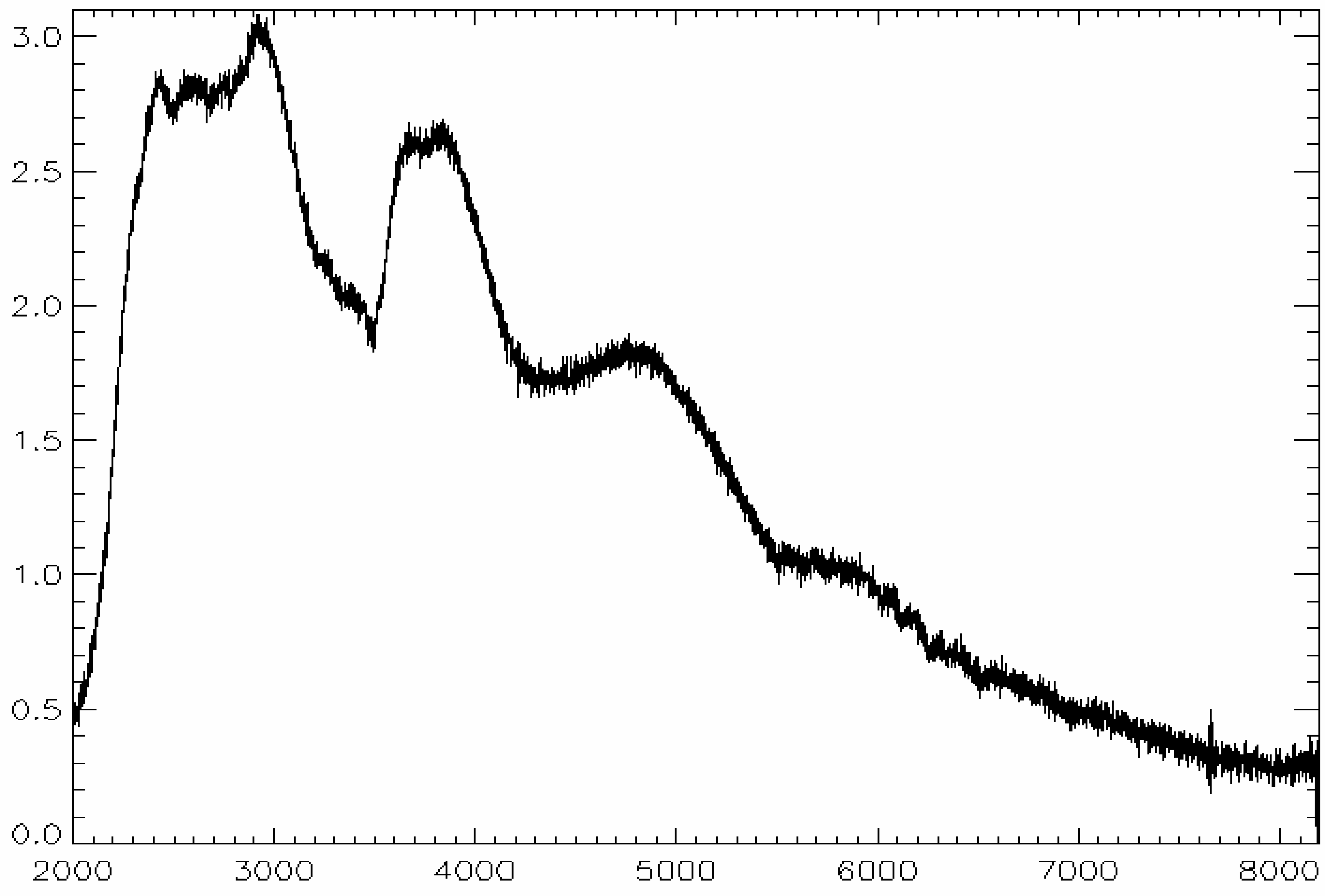


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	280.749	T2:	281.906
T3:	281.421	T4:	281.280
T5:	280.483	T6:	282.390
T7:	281.546	T8:	280.827

SW Det. Temp. (±5V):	280.083
SW Det. Temp. (±10V):	280.068
LW Det. Temp. (±5V):	286.995
LW Det. Temp. (±10V):	286.990
SW Laser Temp. (±5V):	289.880
SW Laser Temp. (±10V):	289.878
LW Laser Temp. (±5V):	289.870
LW Laser Temp. (±10V):	289.868
Int. BB Temp A1. (±5V):	301.900
Int. BB Temp A1. (±10V):	274.253
Int. BB Temp A2. (±5V):	302.081
Int. BB Temp A2. (±10V):	274.331

Internal Lamp – Single spectrum – 08-01-2002 – SWC – In the thermo-vacuum Chamber

SW-detector @ room temperature
Plot - 58

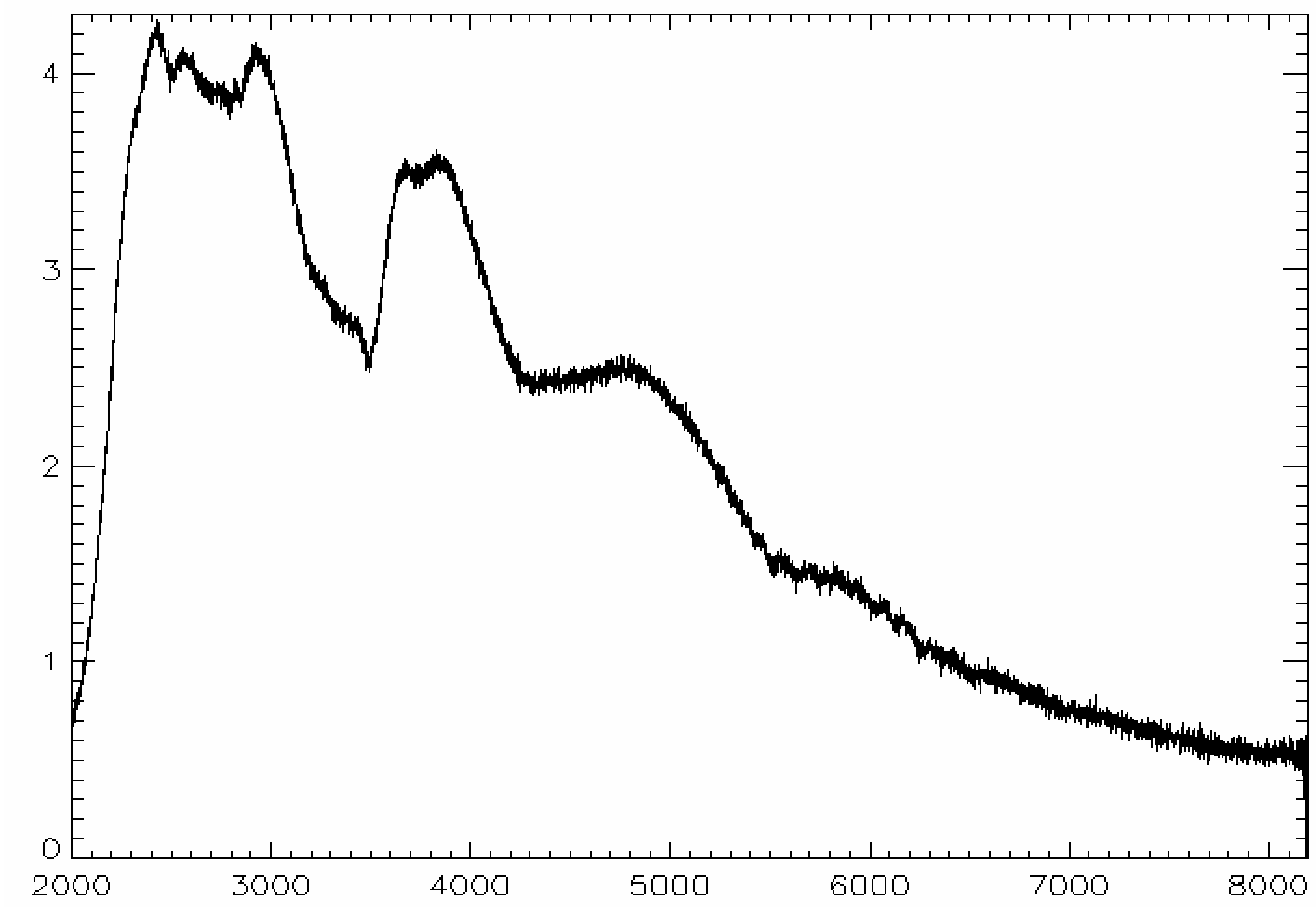


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	287.923	T2:	288.532
T3:	288.329	T4:	288.266
T5:	287.235	T6:	289.095
T7:	288.266	T8:	287.469

SW Det. Temp. (±5V):	267.121
SW Det. Temp. (±10V):	267.136
LW Det. Temp. (±5V):	288.968
LW Det. Temp. (±10V):	288.944
SW Laser Temp. (±5V):	290.153
SW Laser Temp. (±10V):	290.151
LW Laser Temp. (±5V):	289.895
LW Laser Temp. (±10V):	289.897
Int. BB Temp A1. (±5V):	319.160
Int. BB Temp A1. (±10V):	282.883
Int. BB Temp A2. (±5V):	319.386
Int. BB Temp A2. (±10V):	282.944

Plot - 59
Internal Lamp – Single spectrum – 08-01-2002 – SWC – In the thermo-vacuum Chamber

SW-detector @ 0 °C



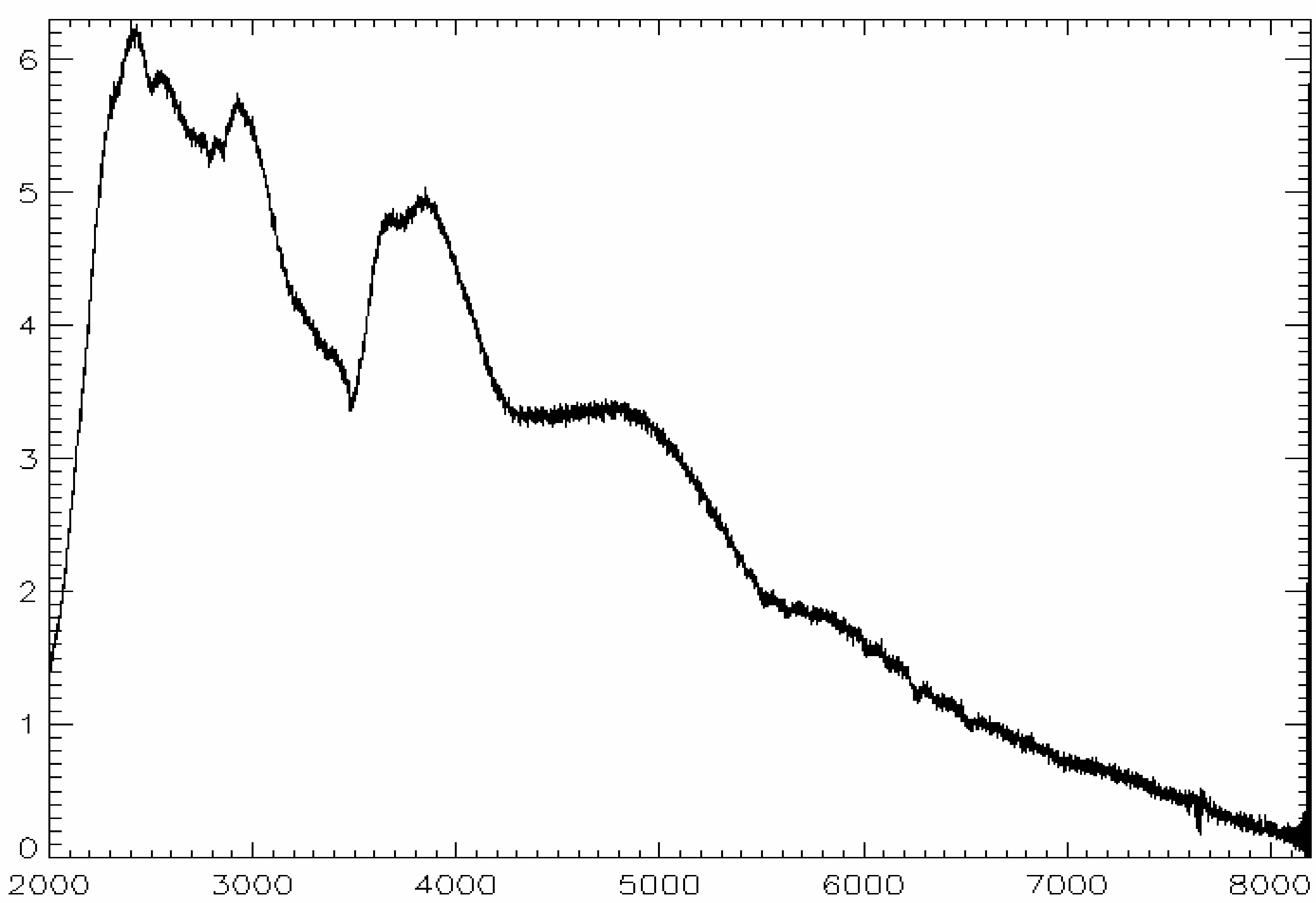
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	288.391	T2:	288.985
T3:	288.782	T4:	288.688
T5:	287.688	T6:	289.532
T7:	288.704	T8:	287.907

SW Det. Temp. (±5V):	260.000
SW Det. Temp. (±10V):	249.123
LW Det. Temp. (±5V):	289.378
LW Det. Temp. (±10V):	289.315
SW Laser Temp. (±5V):	290.554
SW Laser Temp. (±10V):	290.542
LW Laser Temp. (±5V):	289.992
LW Laser Temp. (±10V):	289.995
Int. BB Temp A1. (±5V):	320.449
Int. BB Temp A1. (±10V):	283.546
Int. BB Temp A2. (±5V):	320.672
Int. BB Temp A2. (±10V):	283.568

Plot – 60

Internal Lamp – Single spectrum – 08-01-2002 – SWC – In the thermo-vacuum Chamber

SW-detector @ -25 °C

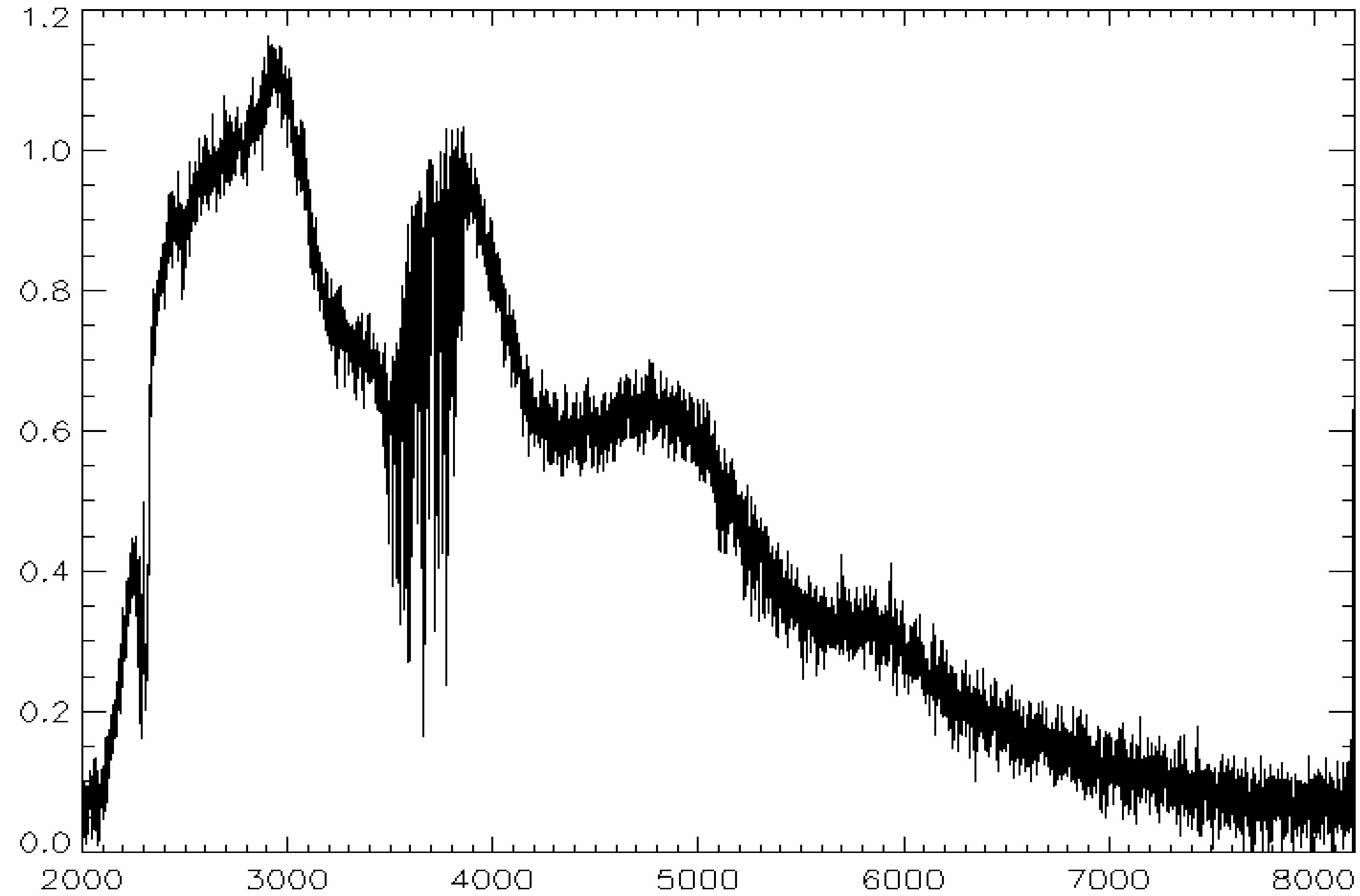


Acquisition #:	91		
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	290.611	T2:	291.236
T3:	291.001	T4:	290.876
T5:	289.907	T6:	291.705
T7:	290.923	T8:	290.158

SW Det. Temp. (±5V):	228.087
SW Det. Temp. (±10V):	228.112
LW Det. Temp. (±5V):	291.615
LW Det. Temp. (±10V):	291.581
SW Laser Temp. (±5V):	292.901
SW Laser Temp. (±10V):	292.889
LW Laser Temp. (±5V):	292.173
LW Laser Temp. (±10V):	292.166
Int. BB Temp A1. (±5V):	325.291
Int. BB Temp A1. (±10V):	285.929
Int. BB Temp A2. (±5V):	325.583
Int. BB Temp A2. (±10V):	286.023

Plot - 61
Internal Lamp – Single spectrum – 08-01-2002 – SWC – In the thermo-vacuum Chamber

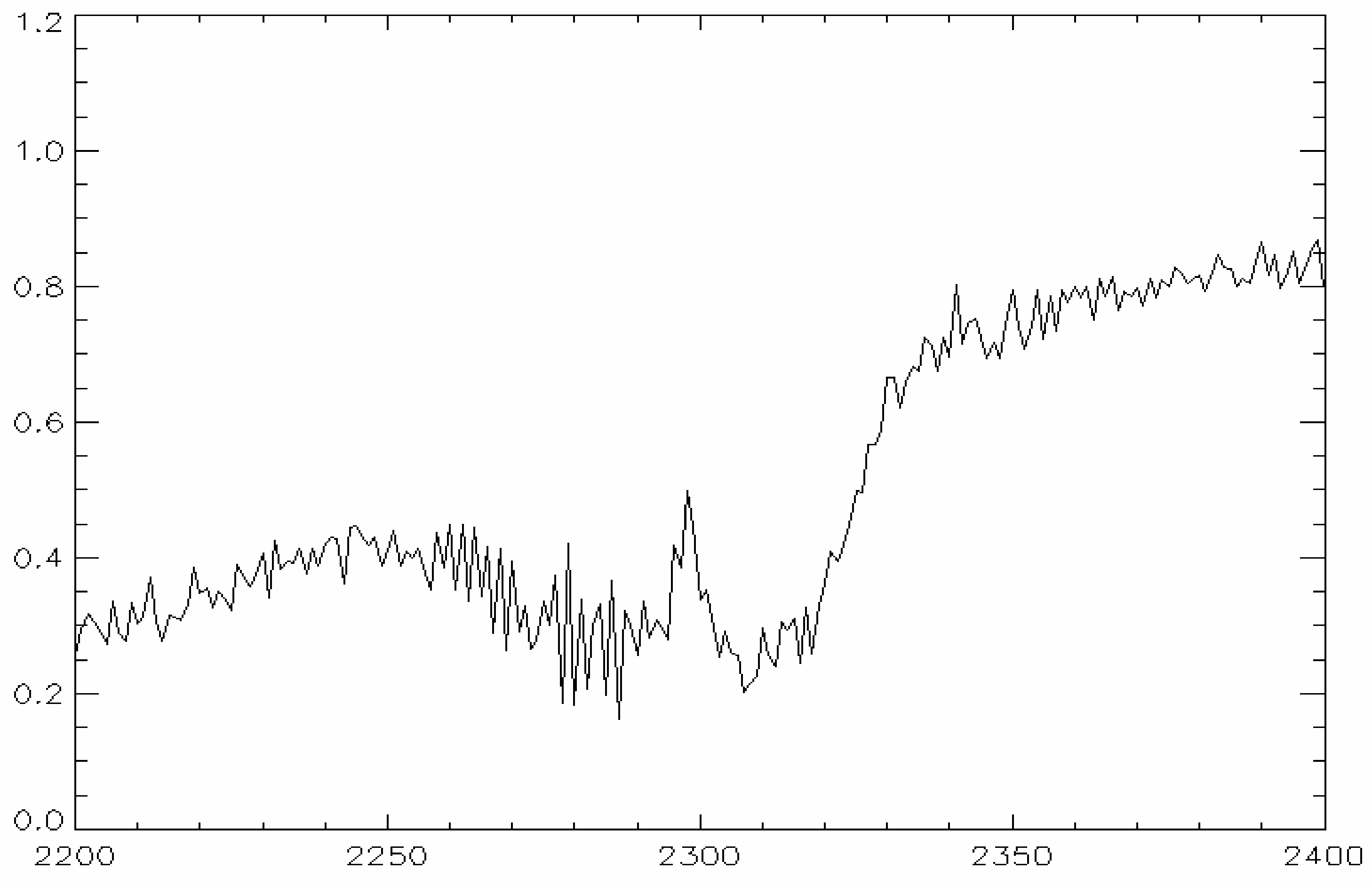
SW-detector @ -46 °C



Plot – 62
Internal Lamp – Single spectrum
Alenia Spazio Torino 11-12/02/2002

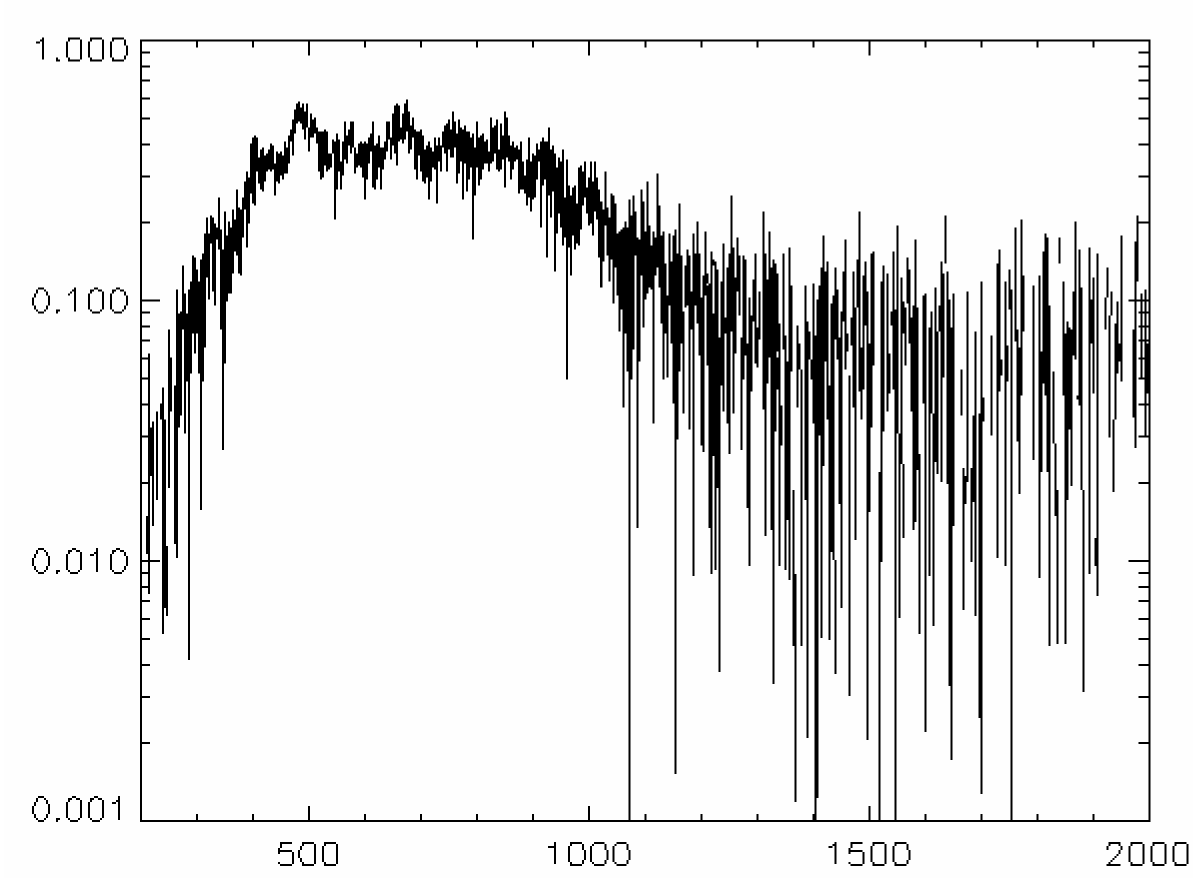
Acquisition #:	3		
Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	295.909	T2:	296.706
T3:	296.409	T4:	296.284
T5:	295.518	T6:	297.128
T7:	296.315	T8:	295.596

SW Det. Temp. (±5V):	240.078
SW Det. Temp. (±10V):	260.078
LW Det. Temp. (±5V):	297.017
LW Det. Temp. (±10V):	297.051
SW Laser Temp. (±5V):	298.020
SW Laser Temp. (±10V):	298.105
LW Laser Temp. (±5V):	297.194
LW Laser Temp. (±10V):	297.177
Int. BB Temp A1. (±5V):	326.736
Int. BB Temp A1. (±10V):	294.676
Int. BB Temp A2. (±5V):	326.402
Int. BB Temp A2. (±10V):	294.793



Plot – 63
Internal Lamp – Single spectrum
Alenia Spazio Torino 11-12/02/2002

2.9 INTERNAL BLACK BODY

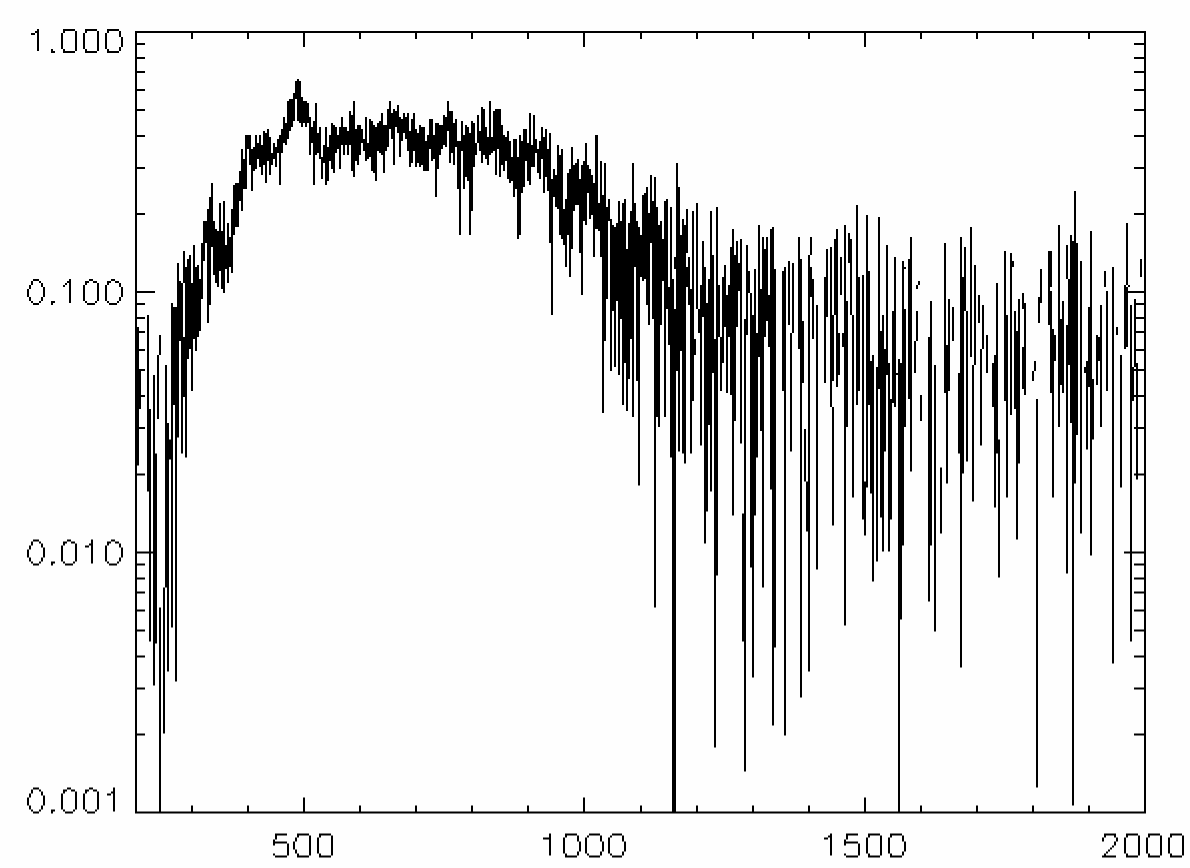


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	289.376	T2:	290.236
T3:	289.939	T4:	289.814
T5:	288.907	T6:	290.798
T7:	289.876	T8:	289.157

SW Det. Temp. (±5V):	289.011
SW Det. Temp. (±10V):	288.977
LW Det. Temp. (±5V):	290.756
LW Det. Temp. (±10V):	290.741
SW Laser Temp. (±5V):	291.698
SW Laser Temp. (±10V):	291.700
LW Laser Temp. (±5V):	291.468
LW Laser Temp. (±10V):	291.466
Int. BB Temp A1. (±5V):	322.011
Int. BB Temp A1. (±10V):	284.327
Int. BB Temp A2. (±5V):	322.309
Int. BB Temp A2. (±10V):	284.386

Internal Black Body – Gain 0

Plot - 64

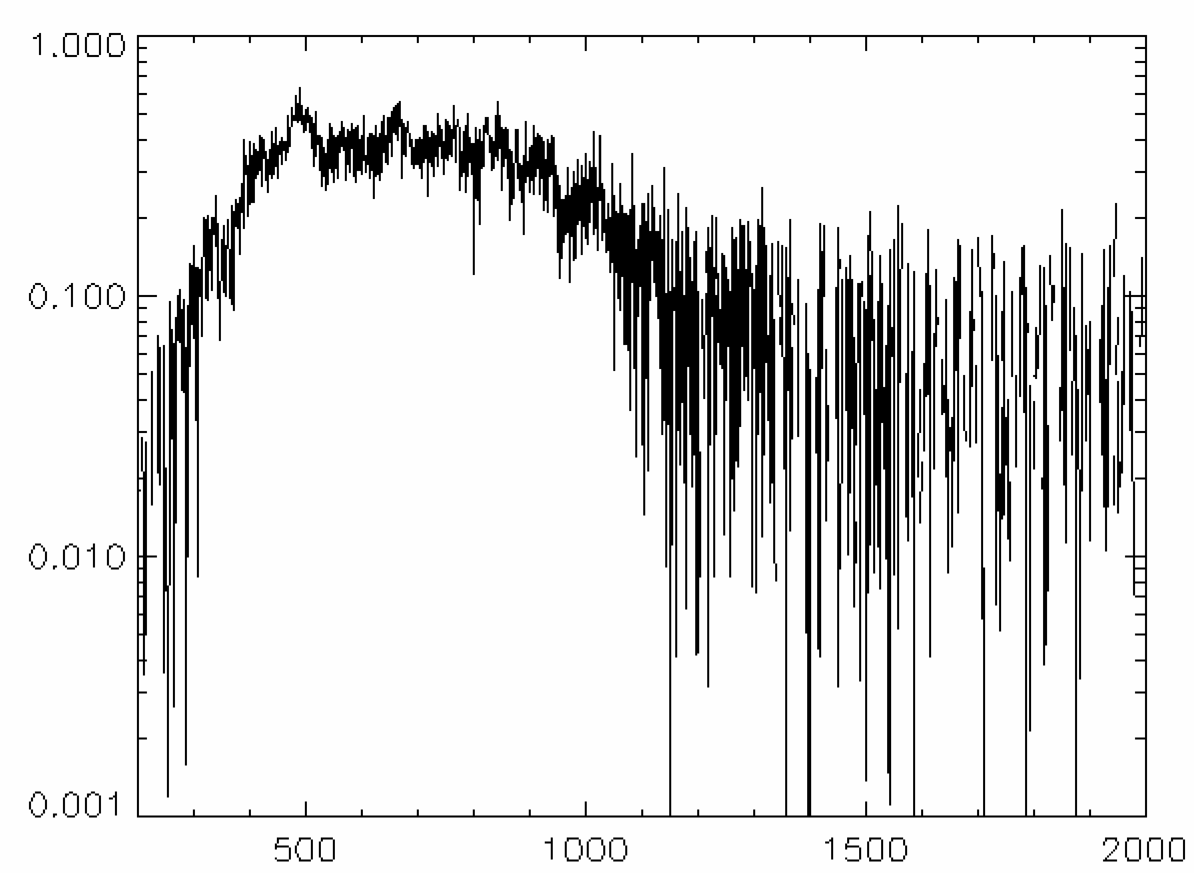


Actual DTM:	17		
SW Gain Set:	2		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	289.298	T2:	290.158
T3:	289.861	T4:	289.736
T5:	288.829	T6:	290.720
T7:	289.798	T8:	289.095

SW Det. Temp. (±5V):	288.943
SW Det. Temp. (±10V):	288.899
LW Det. Temp. (±5V):	290.678
LW Det. Temp. (±10V):	290.682
SW Laser Temp. (±5V):	291.644
SW Laser Temp. (±10V):	291.651
LW Laser Temp. (±5V):	291.463
LW Laser Temp. (±10V):	291.456
Int. BB Temp A1. (±5V):	321.855
Int. BB Temp A1. (±10V):	284.210
Int. BB Temp A2. (±5V):	322.114
Int. BB Temp A2. (±10V):	284.308

Internal Black Body – Gain 2

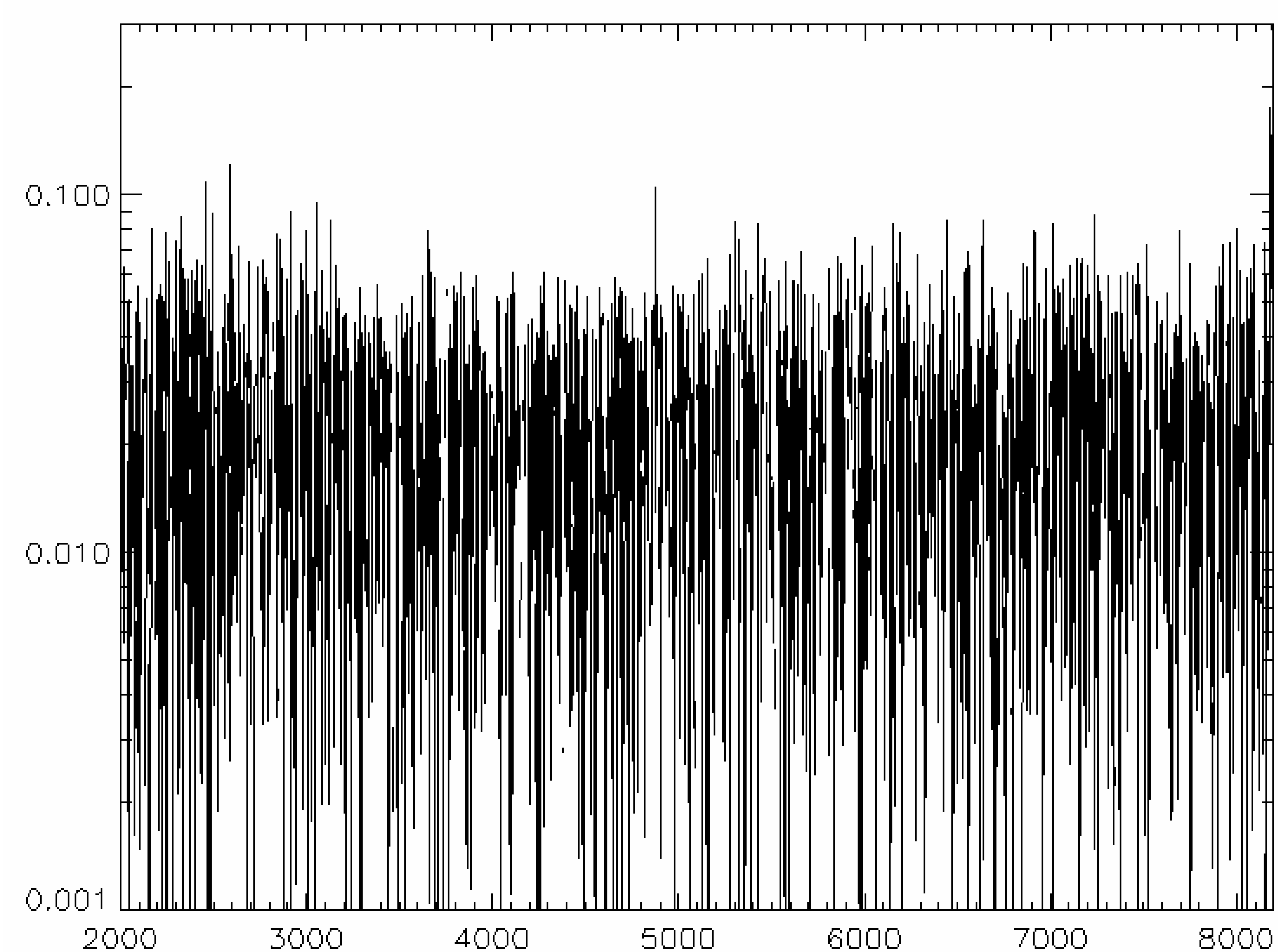
Plot - 65



Actual DTM:	17		
SW Gain Set:	4		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:			Reverse
Pendulum Status:			Unblock
T1:	289.220	T2:	290.095
T3:	289.782	T4:	289.657
T5:	288.751	T6:	290.642
T7:	289.720	T8:	289.017

SW Det. Temp. (±5V):	288.884
SW Det. Temp. (±10V):	288.860
LW Det. Temp. (±5V):	290.609
LW Det. Temp. (±10V):	290.604
SW Laser Temp. (±5V):	291.600
SW Laser Temp. (±10V):	291.593
LW Laser Temp. (±5V):	291.488
LW Laser Temp. (±10V):	291.475
Int. BB Temp A1. (±5V):	321.620
Int. BB Temp A1. (±10V):	284.093
Int. BB Temp A2. (±5V):	321.881
Int. BB Temp A2. (±10V):	284.192

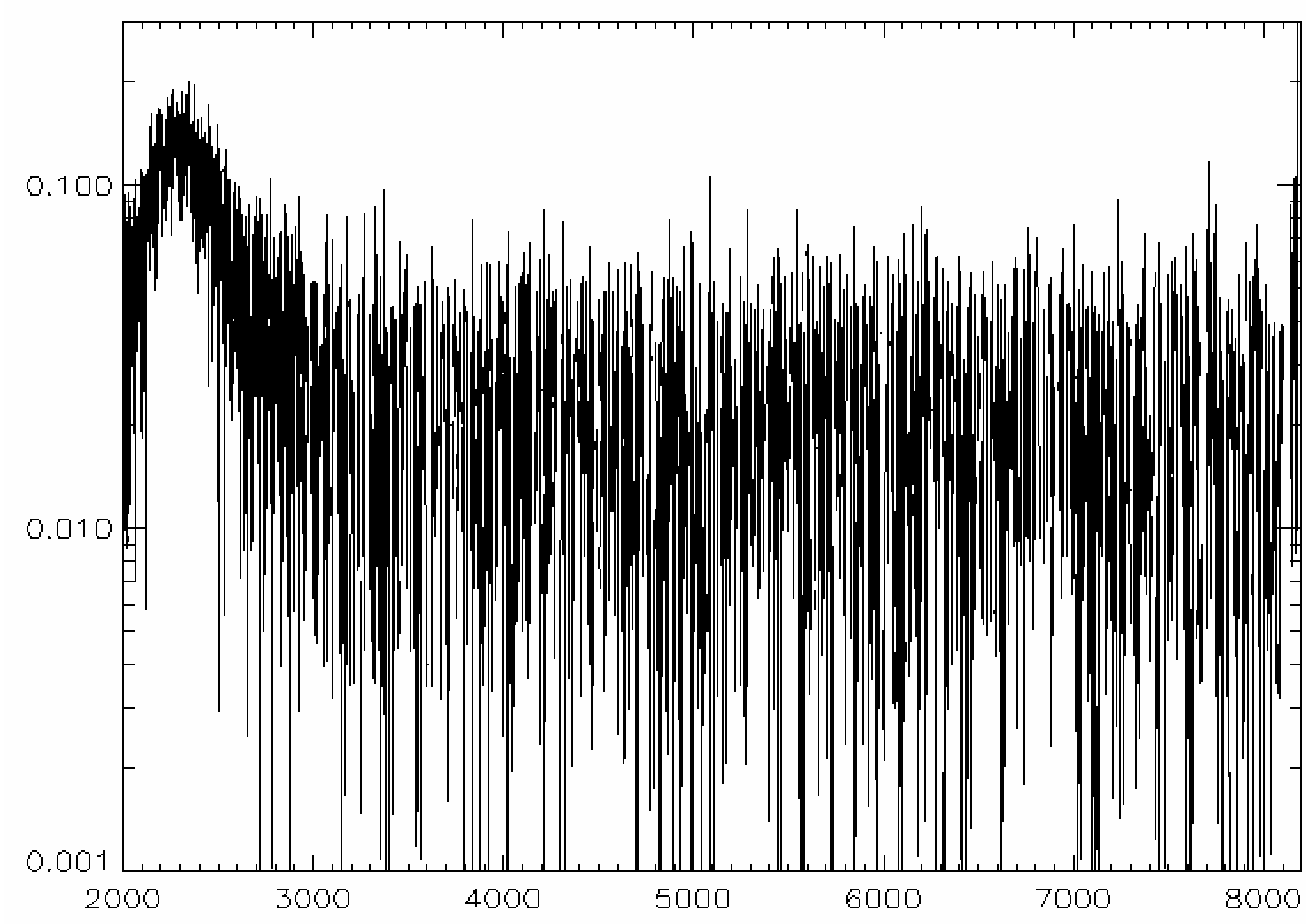
Internal Black Body – Gain 4
Plot - 66



Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Reverse	
Pendulum Status:		Unblock	
T1:	289.376	T2:	290.236
T3:	289.939	T4:	289.814
T5:	288.907	T6:	290.798
T7:	289.876	T8:	289.157

SW Det. Temp. (±5V):	289.011
SW Det. Temp. (±10V):	288.977
LW Det. Temp. (±5V):	290.756
LW Det. Temp. (±10V):	290.741
SW Laser Temp. (±5V):	291.698
SW Laser Temp. (±10V):	291.700
LW Laser Temp. (±5V):	291.468
LW Laser Temp. (±10V):	291.466
Int. BB Temp A1. (±5V):	322.011
Int. BB Temp A1. (±10V):	284.327
Int. BB Temp A2. (±5V):	322.309
Int. BB Temp A2. (±10V):	284.386

Plot – 67

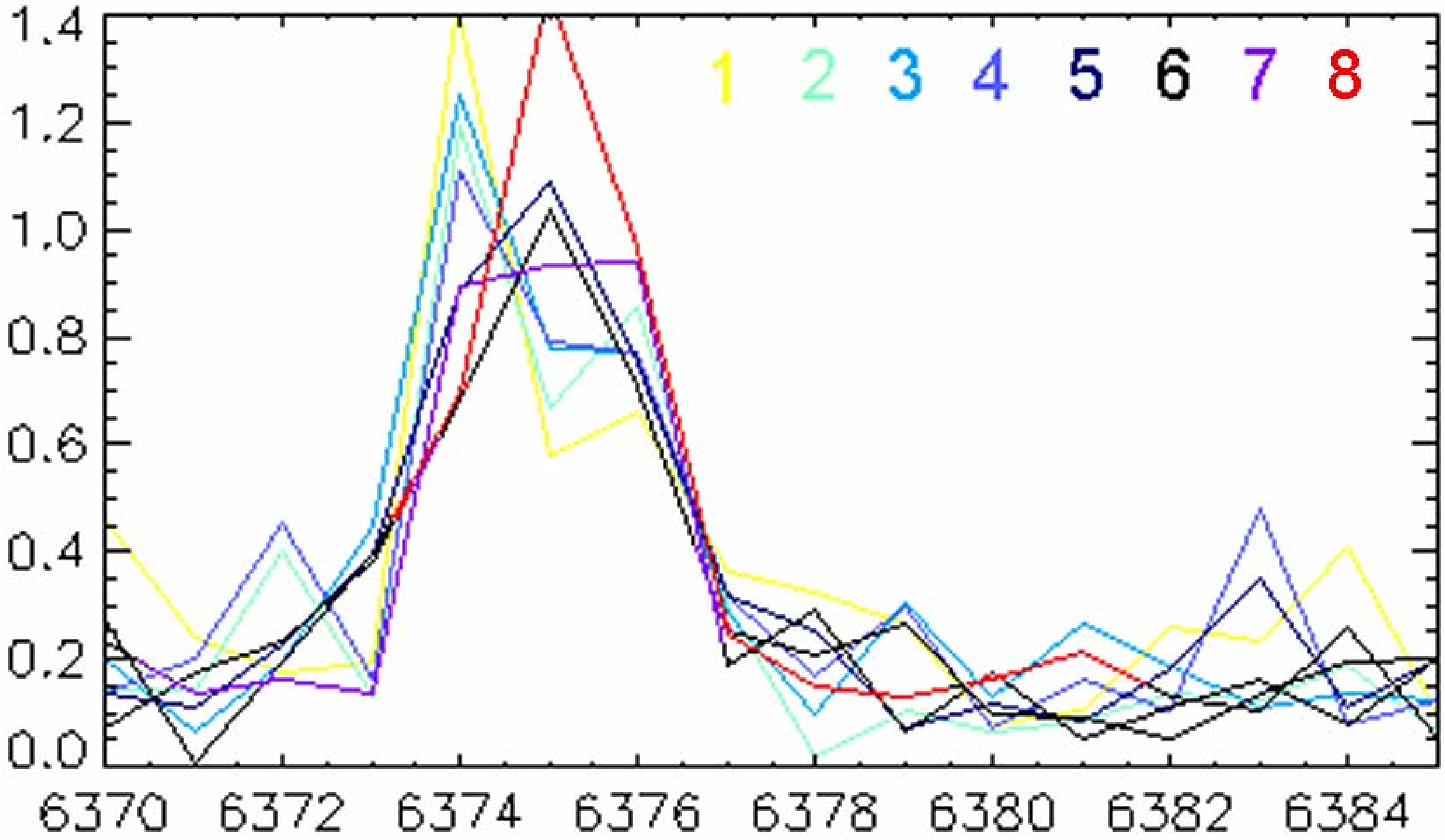


Actual DTM:	17		
SW Gain Set:	0		
LW Gain Set:	0		
LWLASER:	On		
SW Laser:	On		
Pendulum Direction:		Forward	
Pendulum Status:		Unblock	
T1:	290.923	T2:	291.845
T3:	291.533	T4:	291.189
T5:	290.517	T6:	292.299
T7:	291.455	T8:	290.751

SW Det. Temp. (±5V):	262.813
SW Det. Temp. (±10V):	262.857
LW Det. Temp. (±5V):	292.270
LW Det. Temp. (±10V):	292.226
SW Laser Temp. (±5V):	293.373
SW Laser Temp. (±10V):	293.361
LW Laser Temp. (±5V):	292.606
LW Laser Temp. (±10V):	292.599
Int. BB Temp A1. (±5V):	314.201
Int. BB Temp A1. (±10V):	280.422
Int. BB Temp A2. (±5V):	314.397
Int. BB Temp A2. (±10V):	280.450

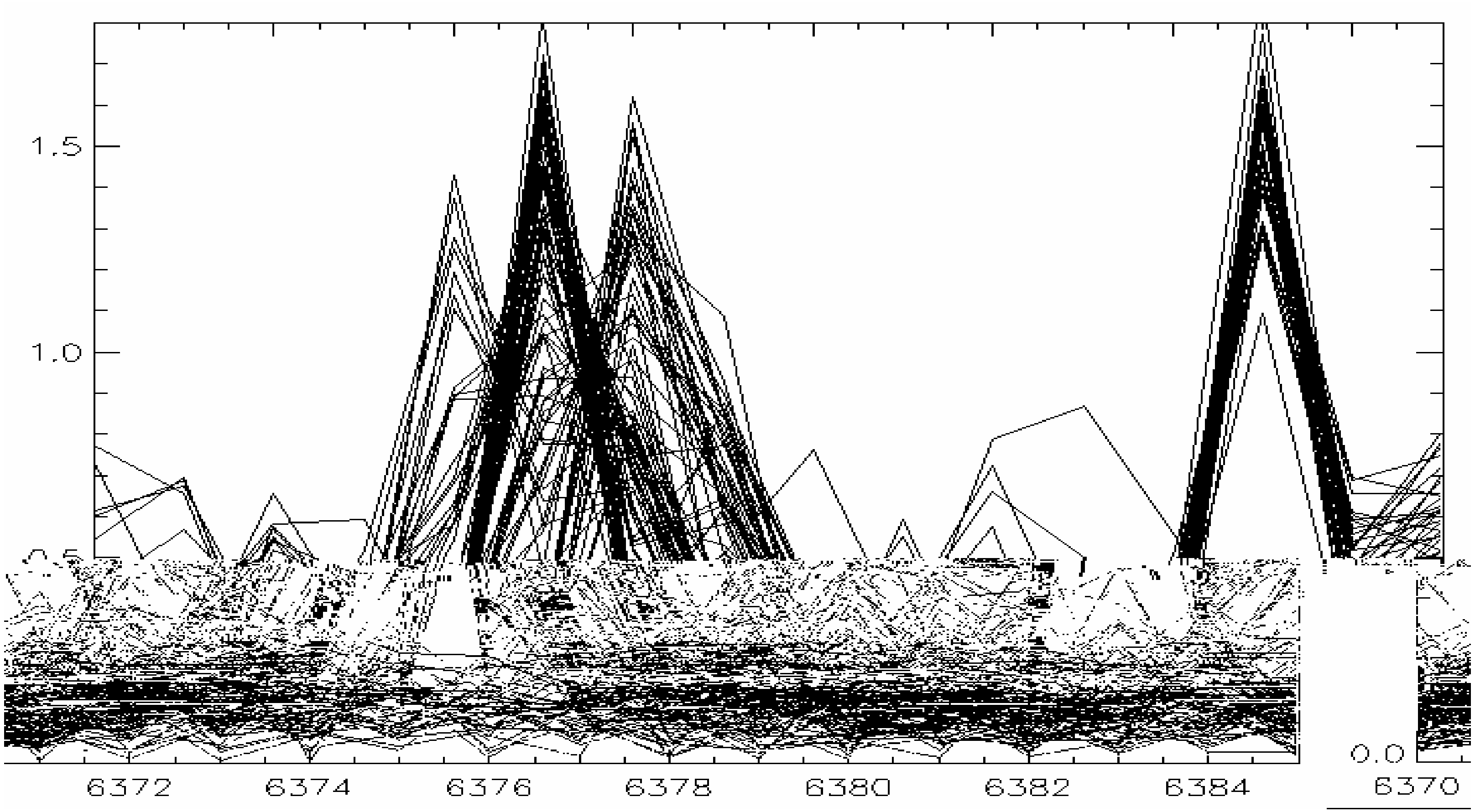
Plot – 68

2.10 MERCURY LAMP.



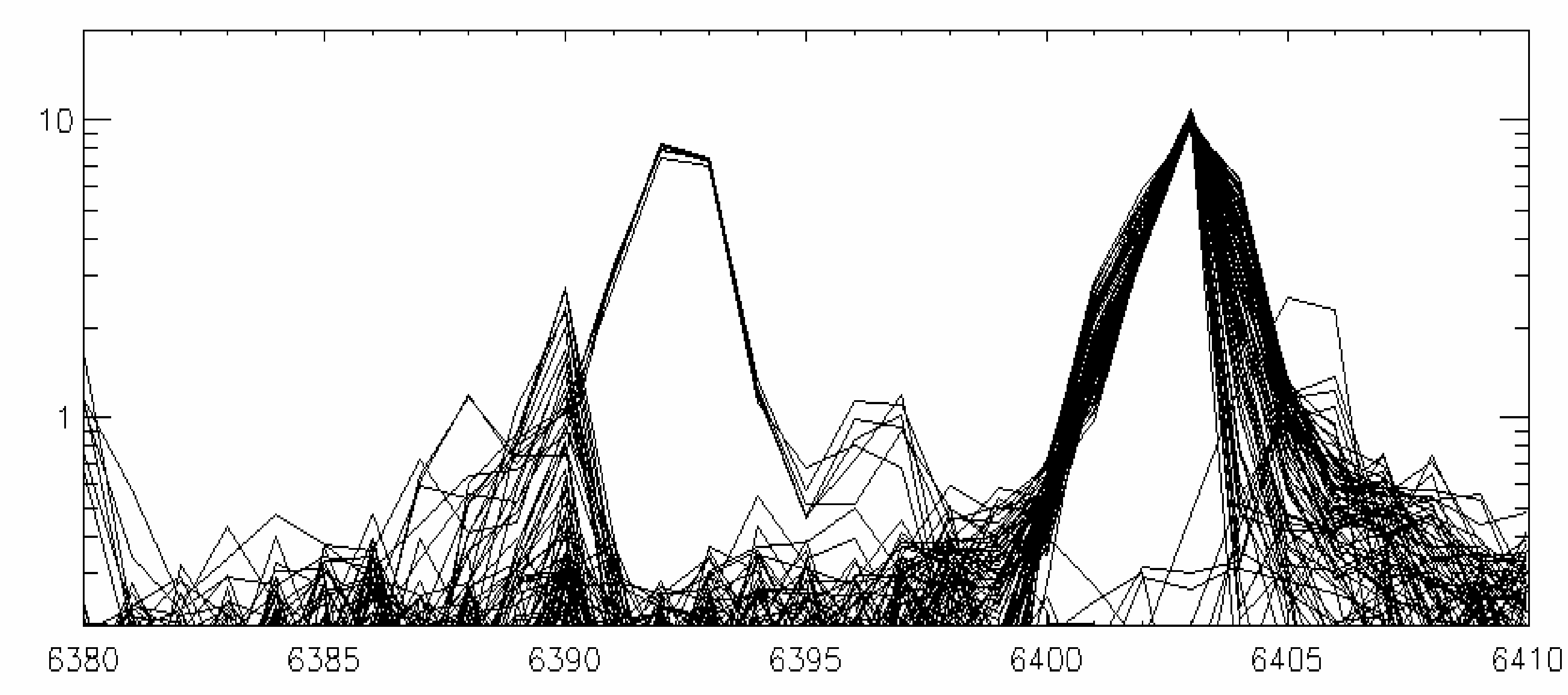
Mercury Lamp single channel line shifting – Gain 4 – SW Detector @ 280K

Plot – 69

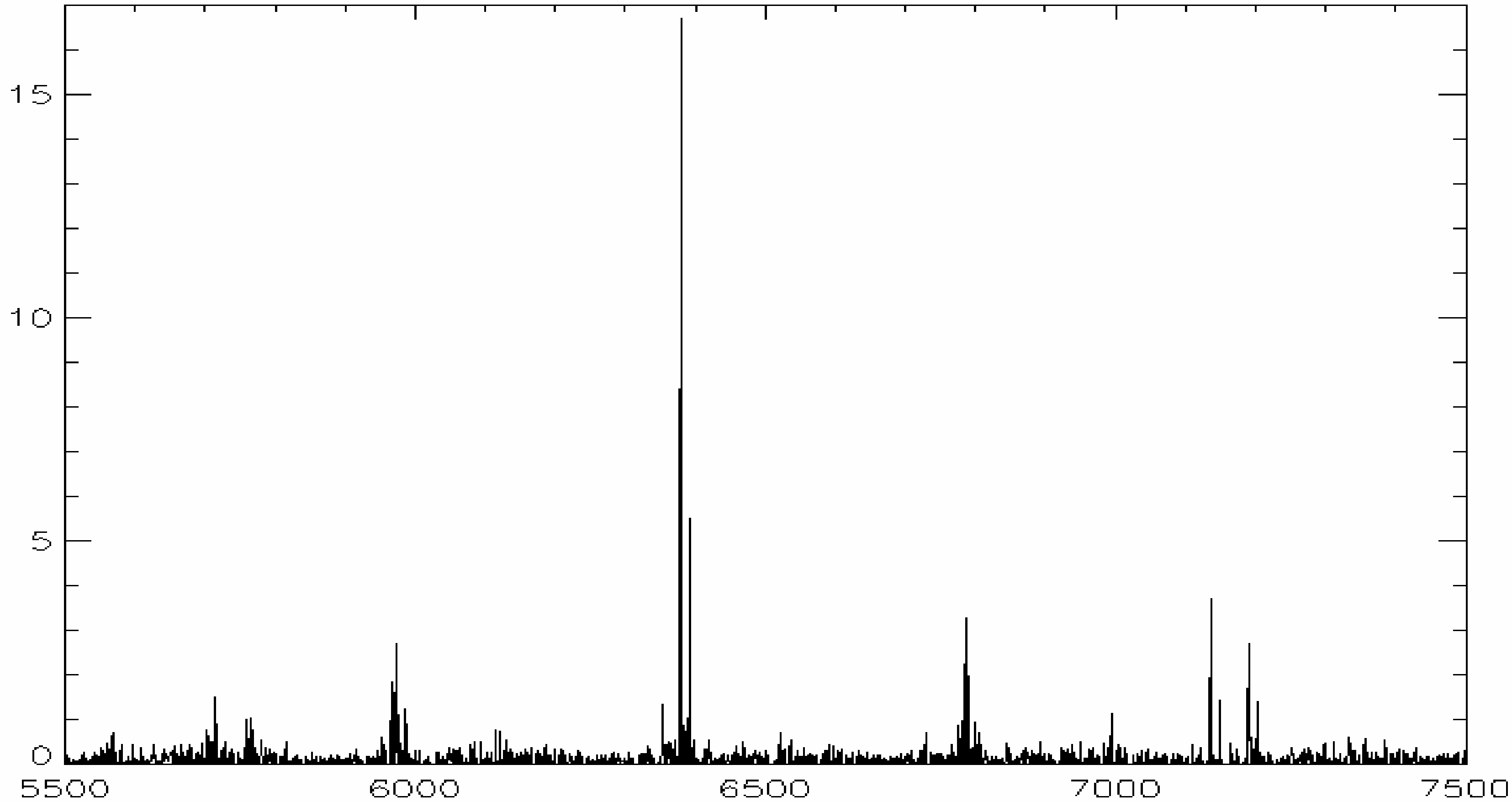


Mercury Lamp line shifting from “MERCURY_TEST6_020108_094425-210.ifg” – Gain 4 – SW Detector @ 280K

Plot – 70



Mercury Lamp line shifting from "MERCURY_TEST6_020110_122521-84.ifg" – Gain 3 – SW Detector @ 248K
Plot - 71



Mercury Lamp lines position – Gain 3 – SW Detector @ 248K

Plot – 73

2.9 INTERNAL BLACK BODY

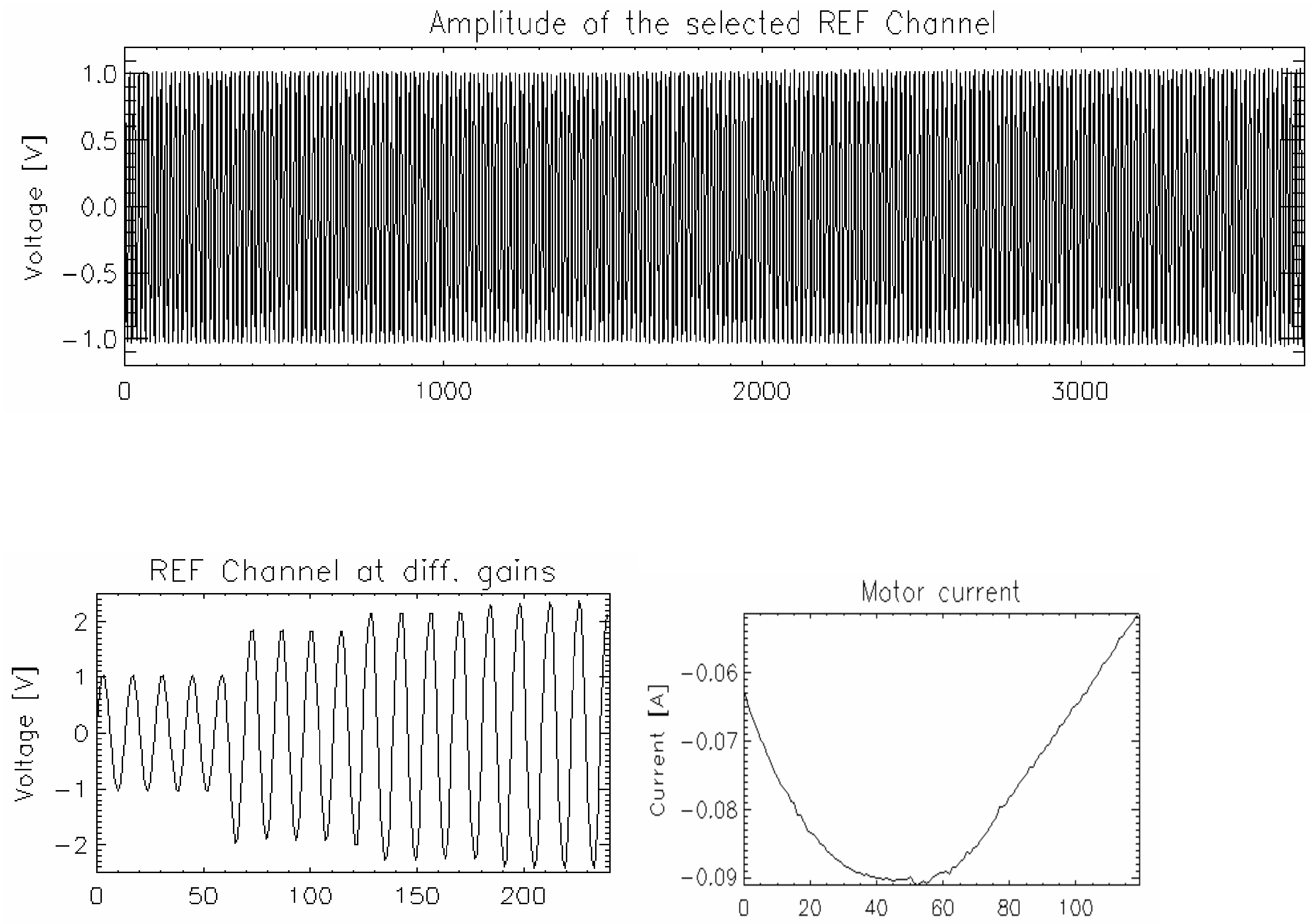
All the calibration activity is aiming to get knowledge of the calibration sources that we carry in the experiment. It is natural, therefore that we look also at the Internal Black body to see how it appears in the data.(See plot 64, 65, 66 ,67, 68). The internal BB, being almost at the same temperature of the instrument gives a very small signal in the LW channel. In the SW channel, on the contrary, the signal depends strongly on the SW detector temperature and this may be very important in space, where theSW detector is going to be cooled at 200 K. The SW channel may complement very well to determine the BB temperature.

2.10 MERCURY LAMP

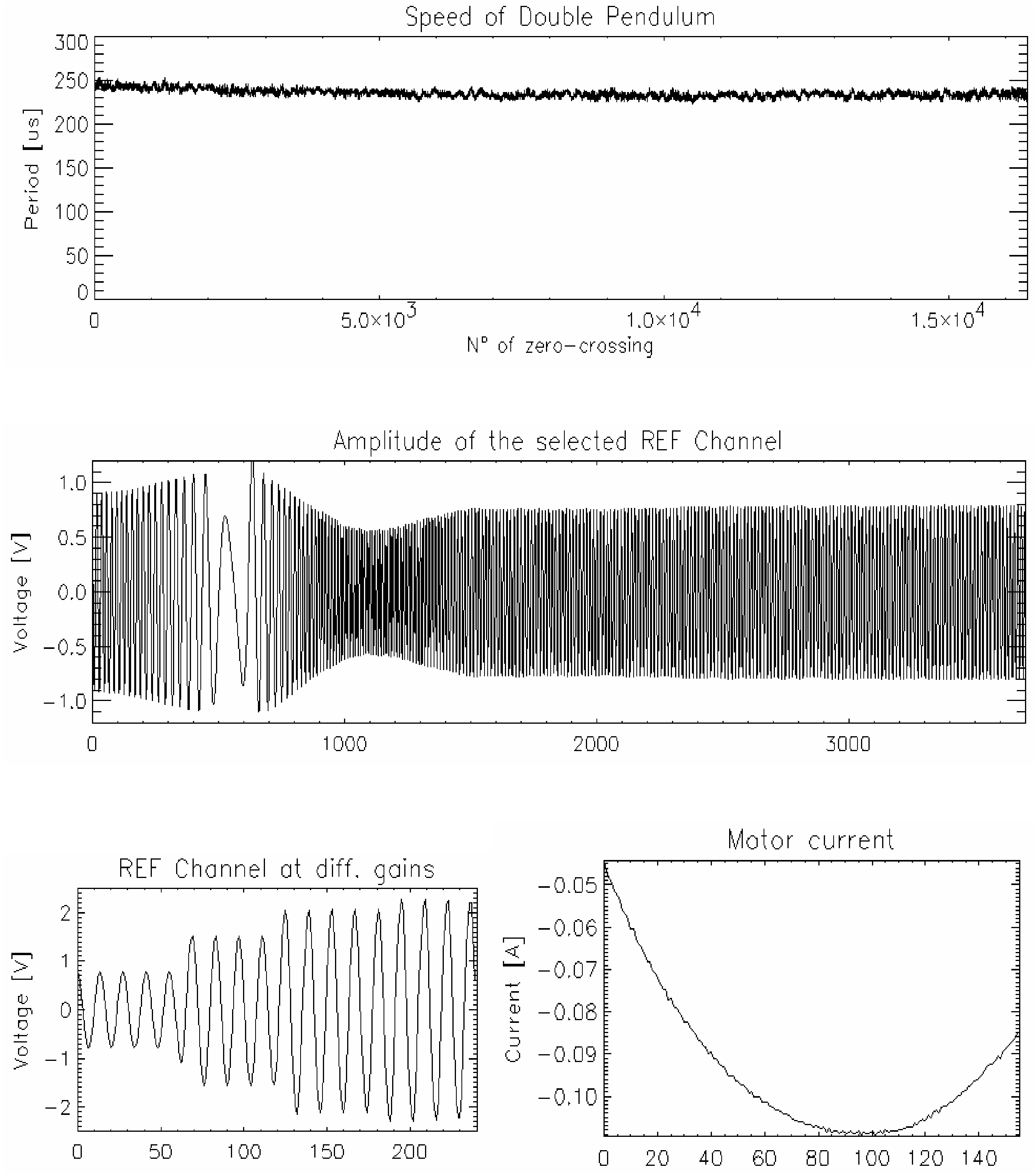
We have taken several measurements in Test 6 with a mercury lamp.See plot 69 ,70, 71, 72, 73. Test 6 is supposed to heat the laser diode by 10 degrees in steps of 0.5 deg, and at each step take a number of measurements. We have not been able to really get the 10 deg temperature increase, because either not enough time was given to the laser for temperature adjustement, or the laser was not really controlled because ambient temperature was larger than the set temperature. In any case this test was very important because by changing the laser wavelength we have also the instrument response to monochromatic features. In the color figure, as well as in the test made in Alenia, the shift of the line of the mercury lamp is by only 1 cm-1. We see that before the peak moves to the next wavenumber channel it decreases to half intensity (energy conservation ?). We see also that the laser diode wavelength does not move continuously, but jumps discontinuously. This is a very important fact that we must further investigate in the future.

2.11 AUTOTEST DATA

PFS has an automatic test called autotest in which instrumental information is sampled and transmitted. We show here two autotest performed one in the IFSI lab(see plot 74, 75), and one when integrated on the spacecraft. From the autotest, performed in 2 complete motions of the double pendulum, we get 4 measurements. The first is the speed of the double pendulum (first panel). The second is the shape and stability of the sine wave, laser diode interferogram. The third is the current used for the motion, the last is the sine wave at different amplification factors. In the following figures we see that the motion on the spacecraft was not perfect (we cannot put the spacecraft exactly perpendicular, to minimise gravity effects), although the data taken were all ok. The fact is that out of 18000 sine periods, we are sampling the first 1000 only, while the interferogram is sampled when the motion is stabilised.



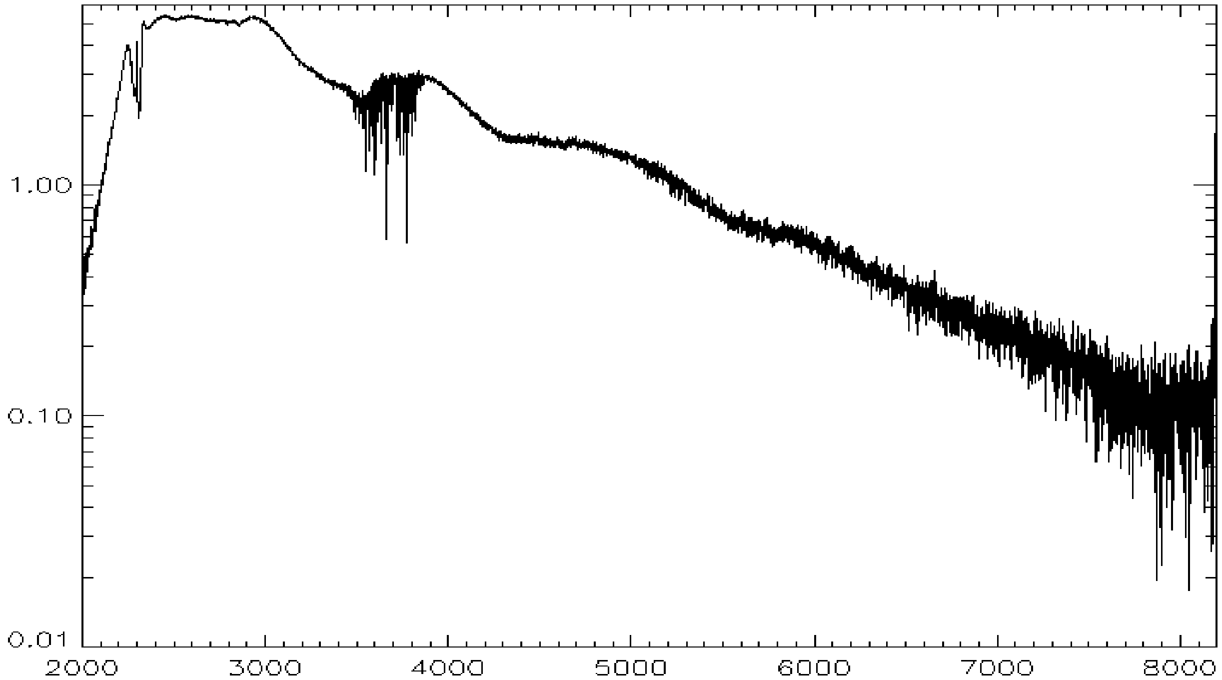
Plot – 74 AUTOTEST IN THE LAB IFSI



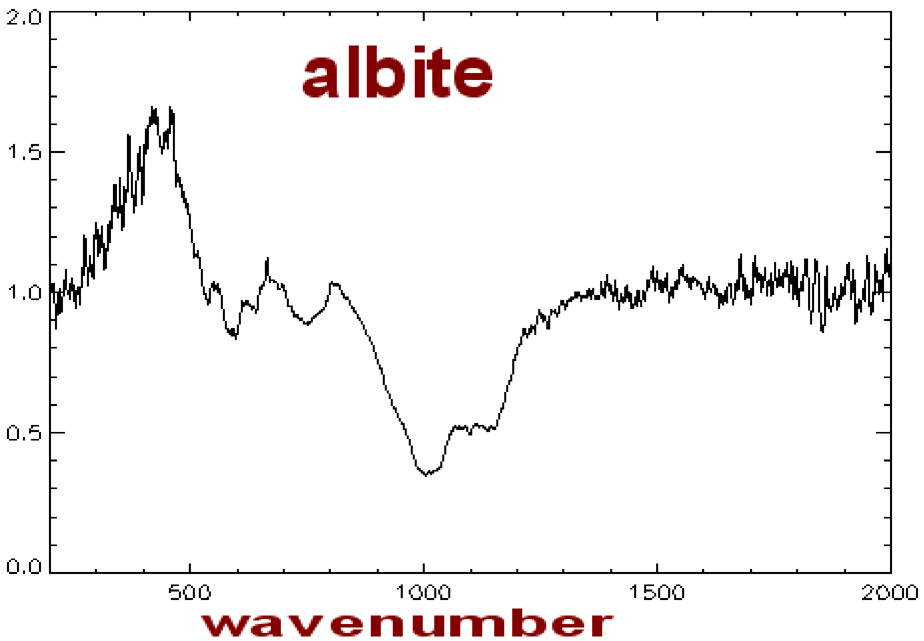
Plot – 75 AUTOTEST AFTER INTEGRATION ON THE SPACECRAFT.

2.12 MINERALS

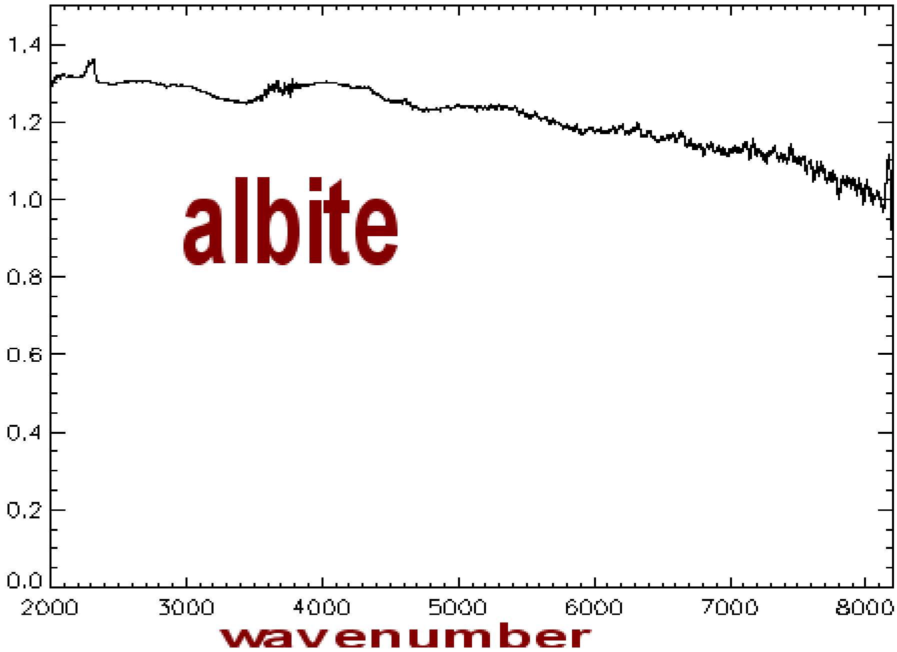
A number of trasmissivity spectra for minerals were taken(see plot 76, 77, 78). The minerals were either prepared as dust elements included in KBR diskette or as dust element distributed over a CaF2 disk. Here we present only some spectra taken as diskette. A full report will be prepared for publication.



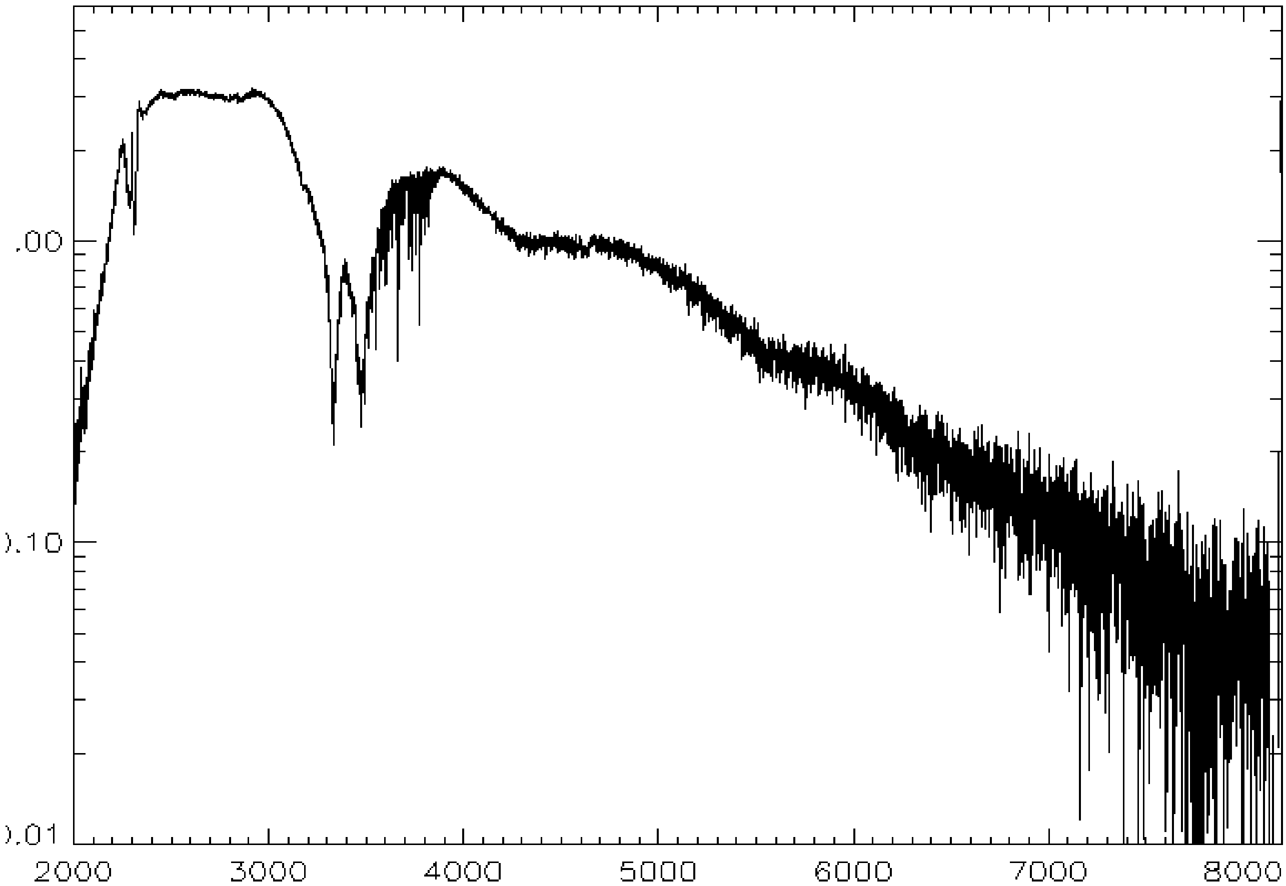
Plot- 76 Albite
Illuminated by a ceramic element.



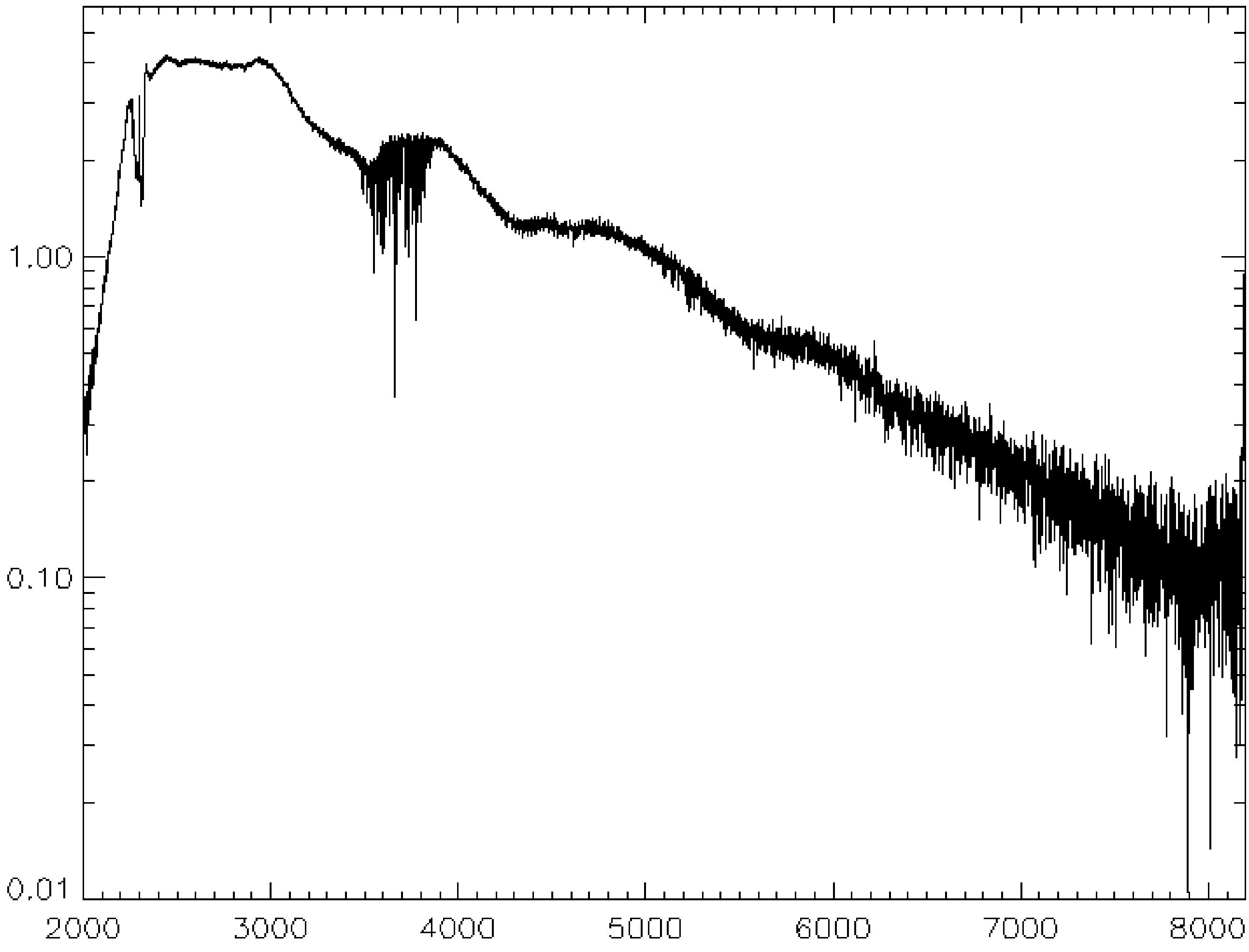
Plot 77



Plot 78



Plot – 79
Gypsum illuminated by a ceramic elemen



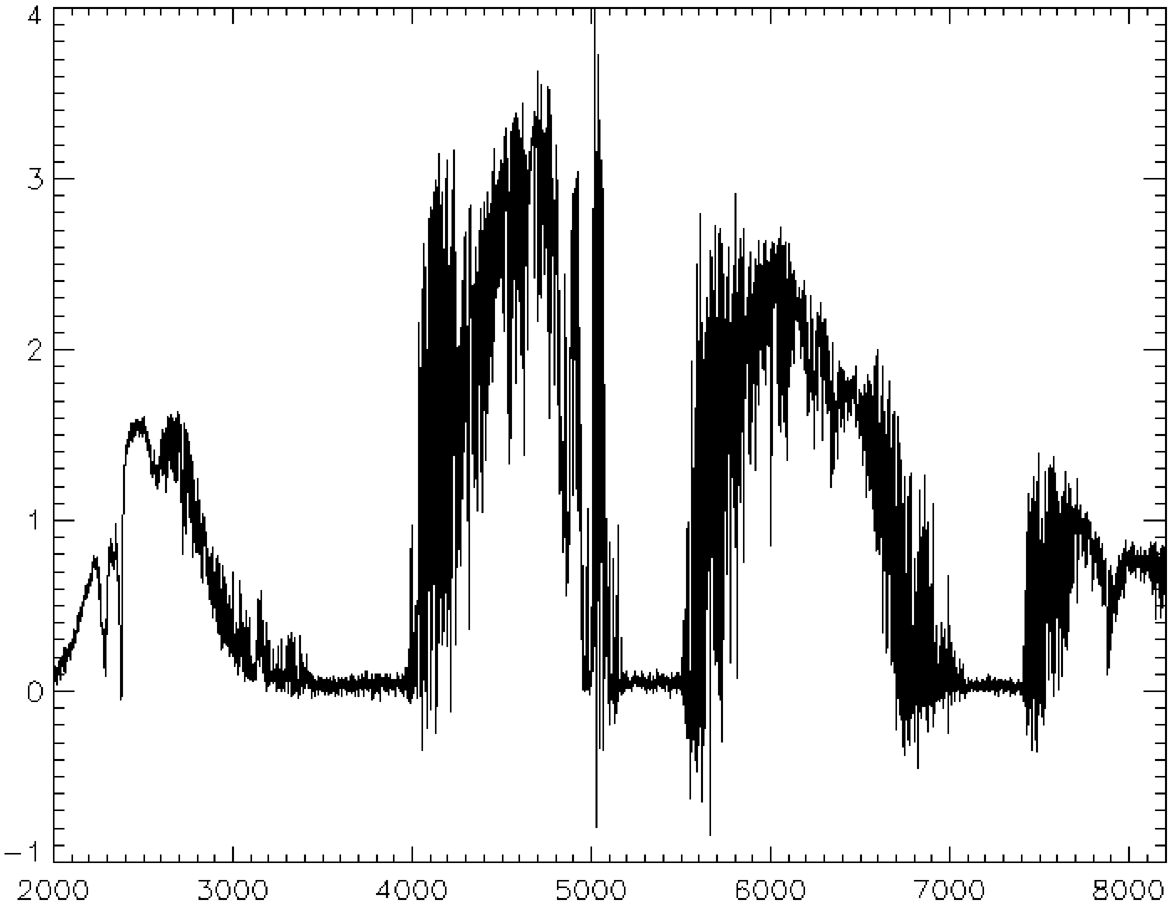
Plot – 80

KBR illuminated by a ceramic element.

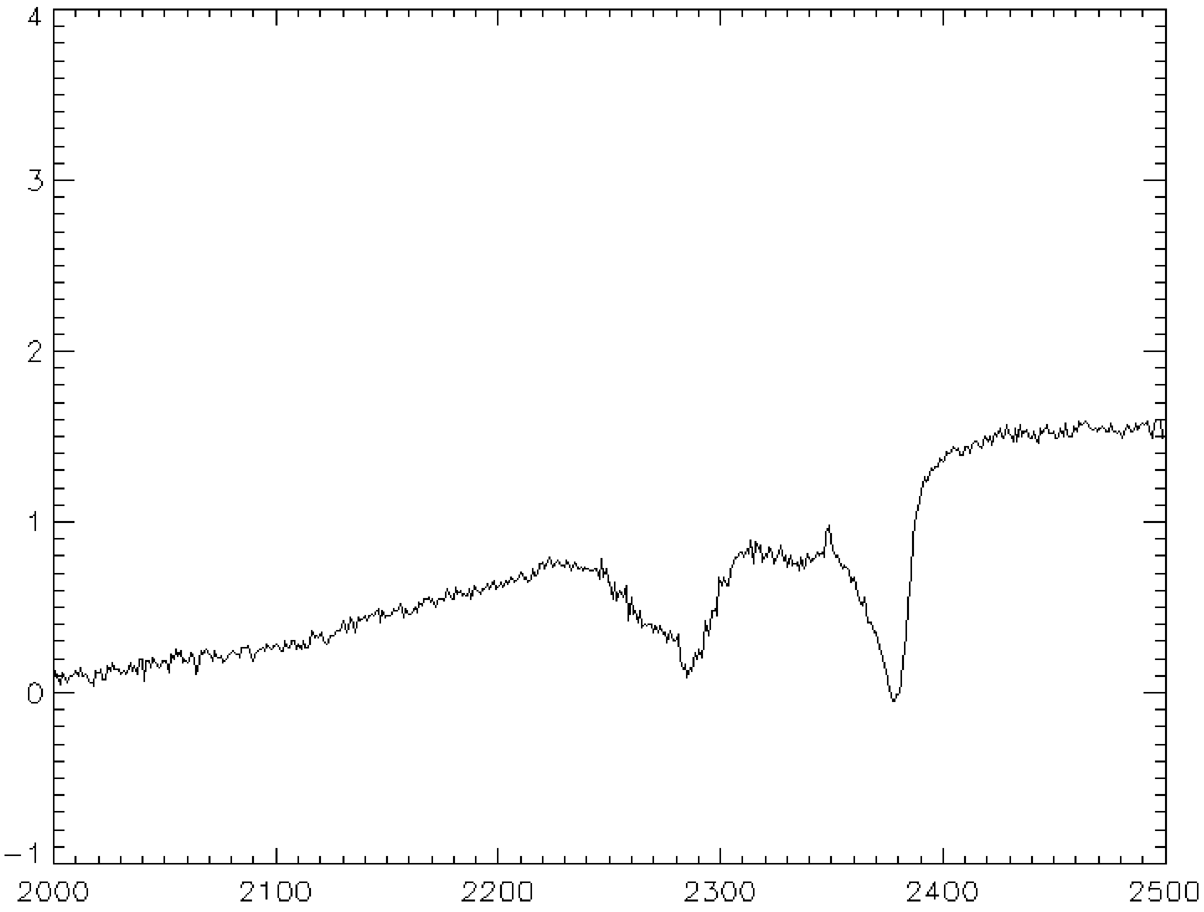
Plot 76 ,79, 80 show the obtained spectrum, while plot 78,79 show the ratio with Kbe spectrum, and therefore gives the trasmissivity of albite mineral.

2.13 EARTH'S ATMOSPHERE

We have used PFS to study the Earth's atmosphere by looking out of the window in daytime. The average over 50 spectra in the SW channel is shown below. The 3 saturated water band are evident, however there are, in the 4 trasmitting windows of the atmosphere many important bands to study : CO2, H2O, HDO, O2, CH4 etc.

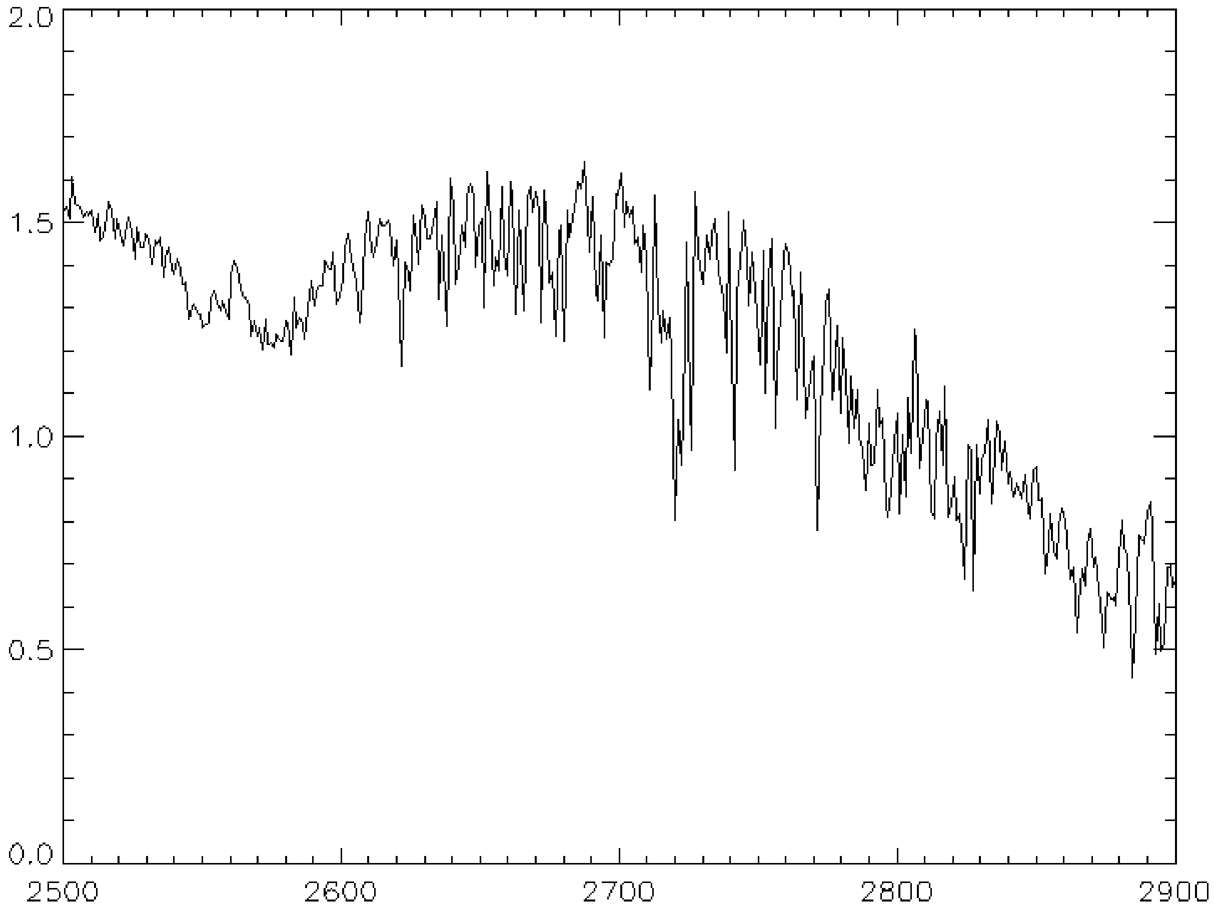


SW channel spectrum, average over 50 measurements. Gain 5.
Plot-81 - 81

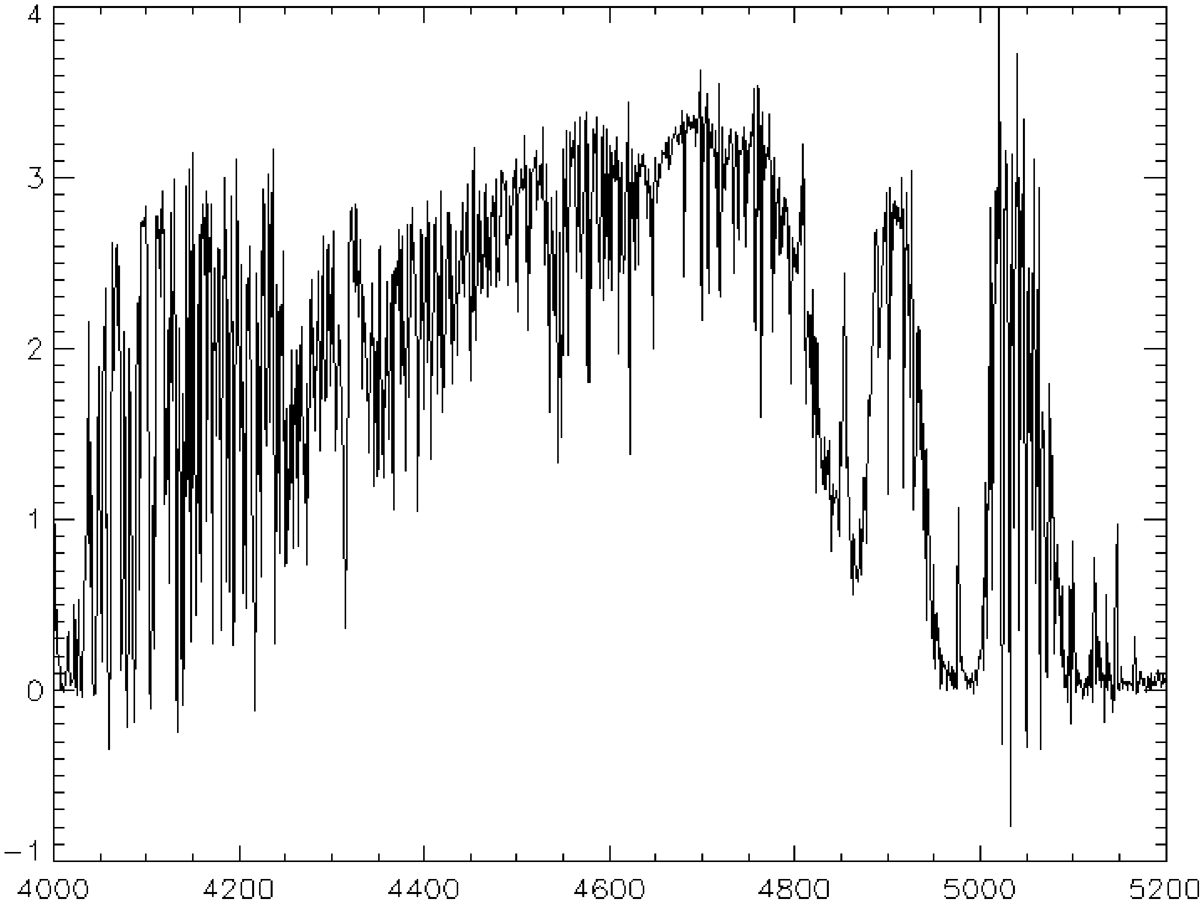


SW channel spectrum, average over 50 measurements. Gain 5. Blow up around the CO_2 absorption band. Note that the band is almost completely masked by apparent emission : Between the source and the detector the thermal situation is very complex : Note the absence of the usual thermal emission rising toward the 2000 cm-1.

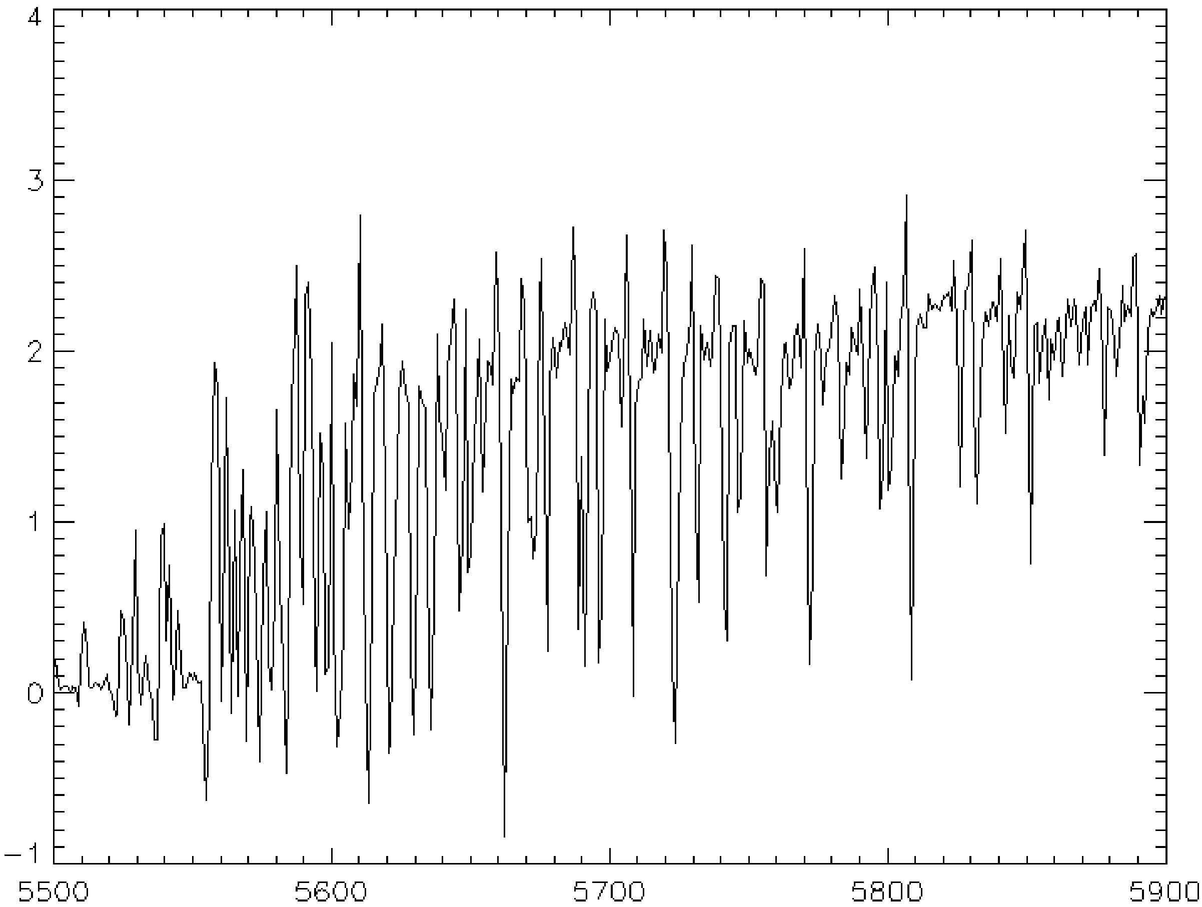
Plot - 82



Blow up of the average spectrum in the 2500 – 2900 cm^{-1} region. 2 major features should be noted here: the NO_2 band at 2540-2590 cm^{-1} (another similar band at 3500 cm^{-1} disappears in the H_2O band), and the deuterium band at 2720 cm^{-1}. Other water bands are also evident.
Plot - 83

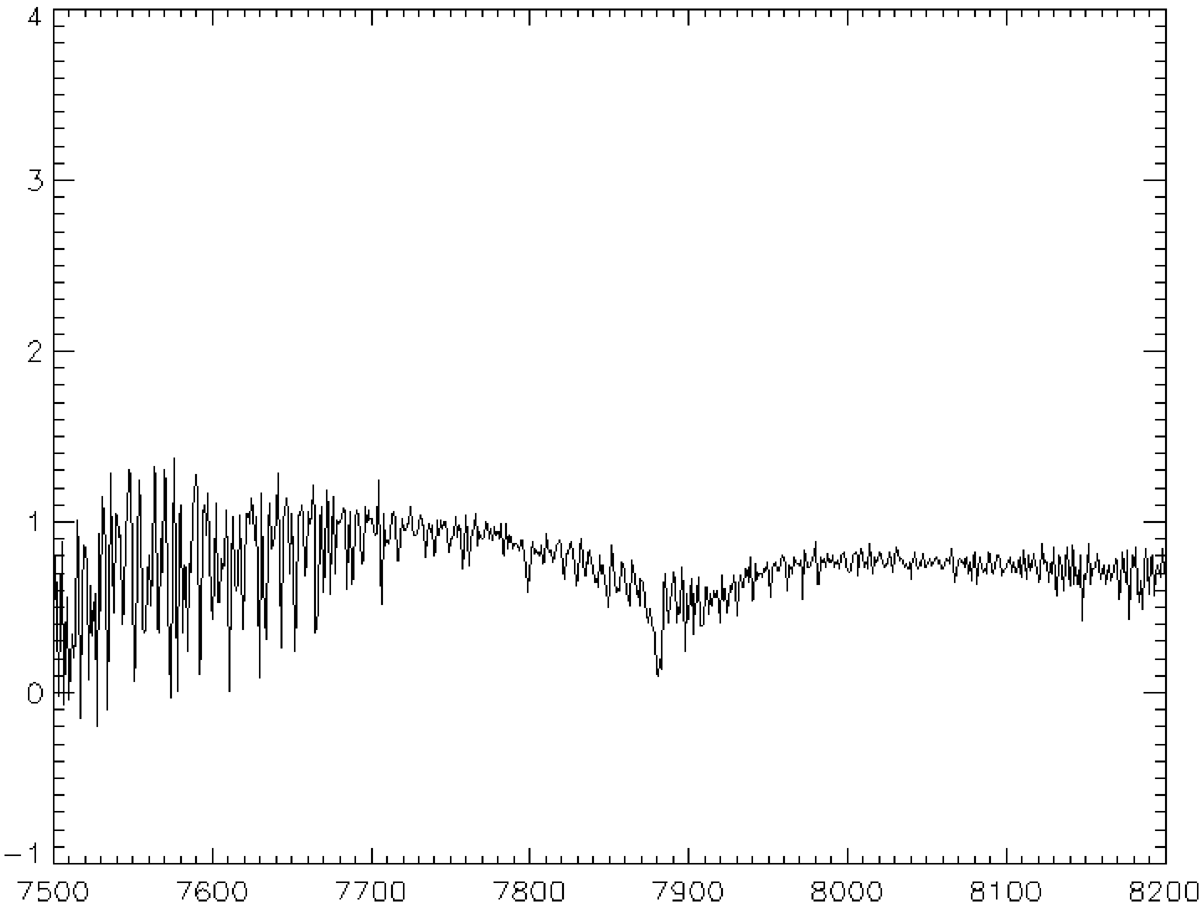


Blow up of the atmospheric spectrum in the 4000-5200 cm^{-1} region : In the region 4300- 4500 cm^{-1} water has no major features : the bands observed are due to methane. In the region 4800- 5200 cm^{-1} are the 3 major CO_2 bands, the third one being absorbed in the big water band absorption.
Plot - 84



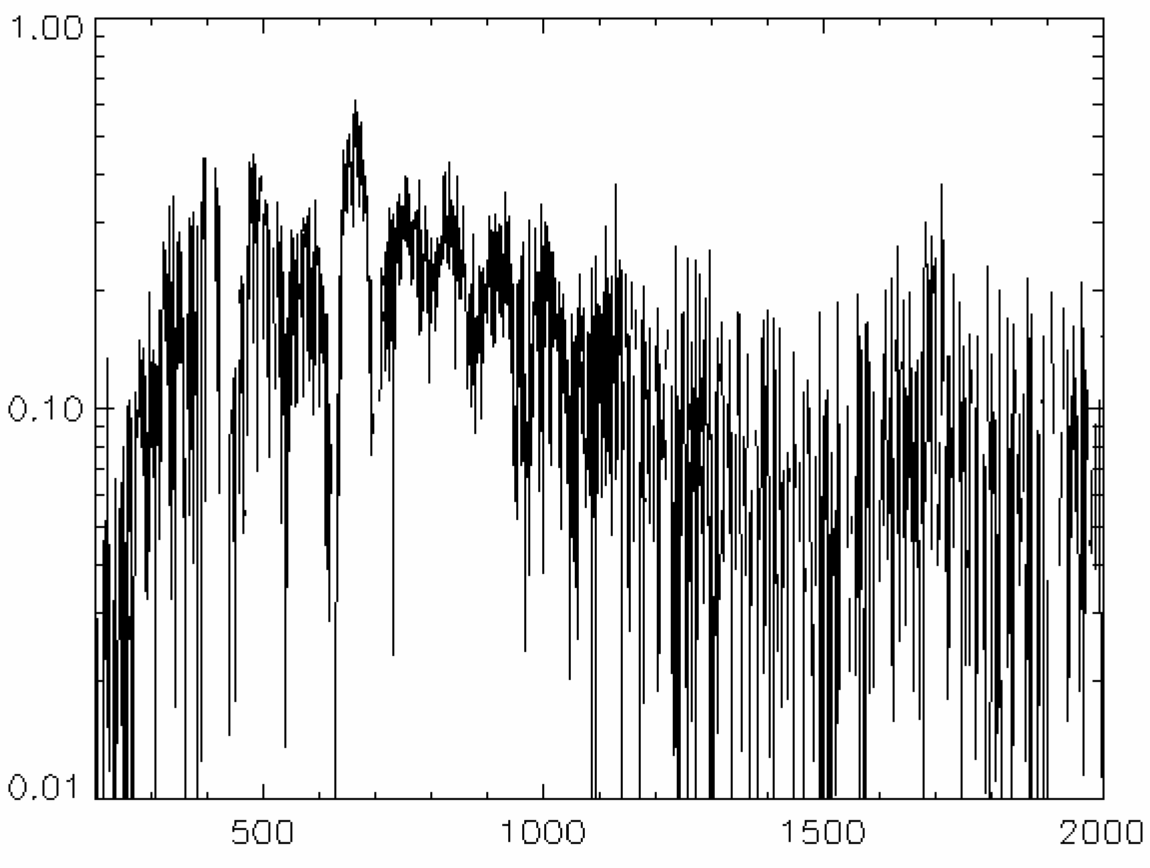
Blow up in the 5500- 5900 cm-1 zone. Many water lines are clearly visible.

Plot - 85



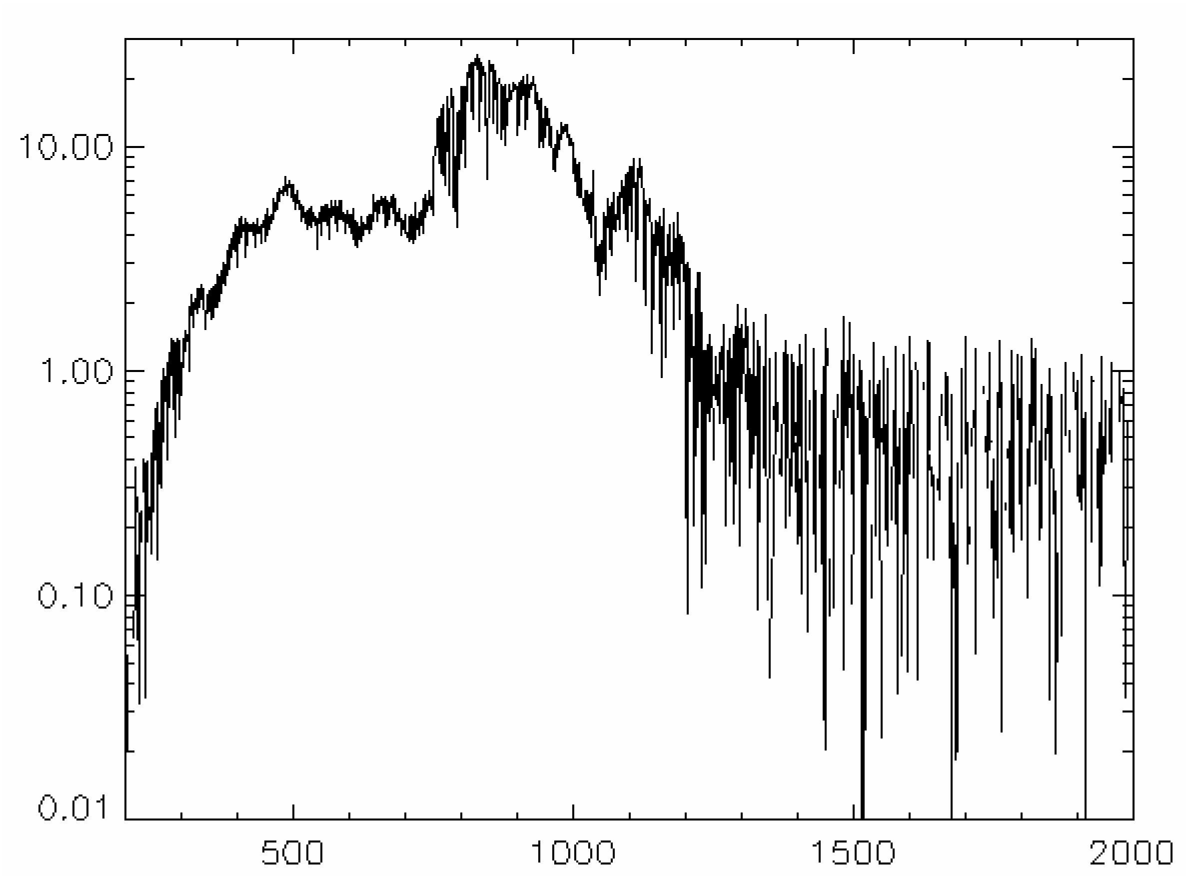
Plot - 86

Blowup of the spectrum in the wavenumber region 7500- 8200 cm-1. Note the O2 line and band clearly visible at 7880 cm-1. This is the FM at gain 5 SW channel.



Plot 87

The LW channel looking out of the window in the direction of IAS. Note the CO2 band in emission ,as in the case of the SW channel.

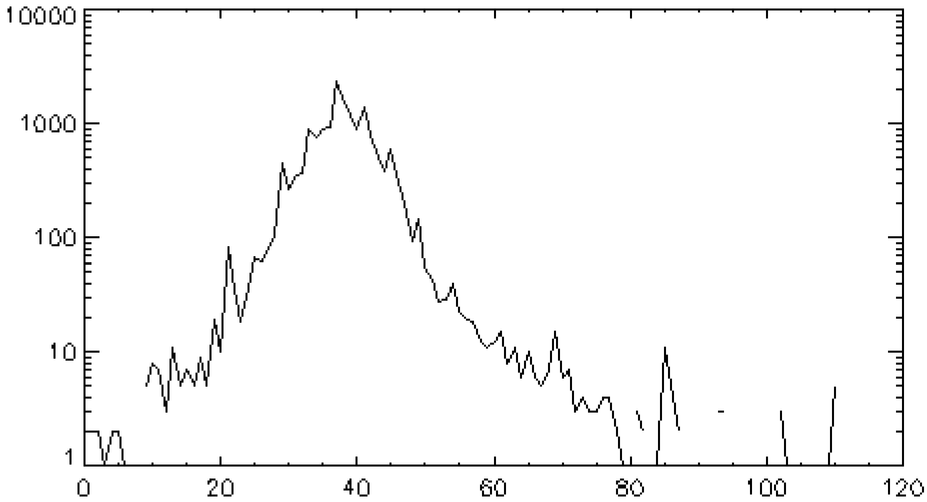


Plot 88

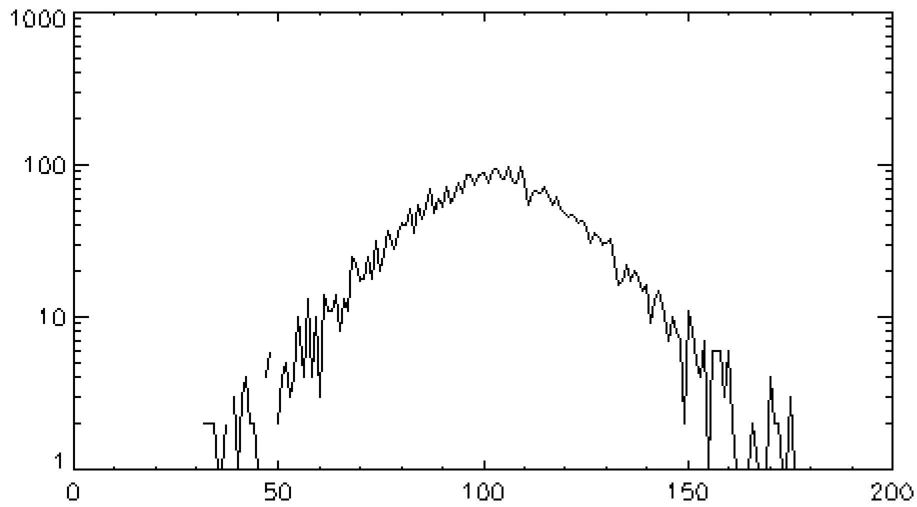
The LW channel when looking in the direction of Rome. The soil is out of the field of view. Over Rome there was a thermal inversion stratification: aerosols emission at higher temperature is evident.

2.14 INTERFEROGRAMS STATISTICS

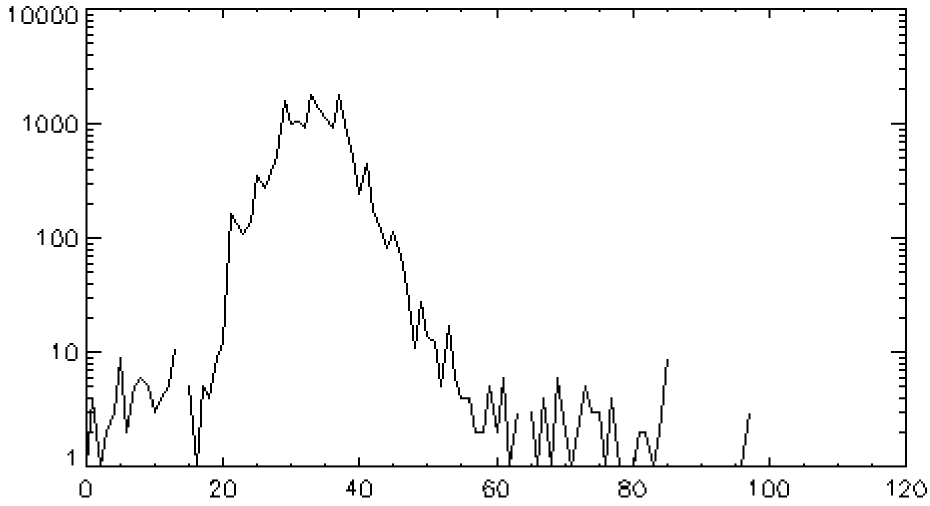
In order to study the behaviour of the ADC, we have performed statistical study of the values obtained by the interferograms, specially the values of the long wings. From our study it is evident that there is no bias and that the ADC are working correctly.



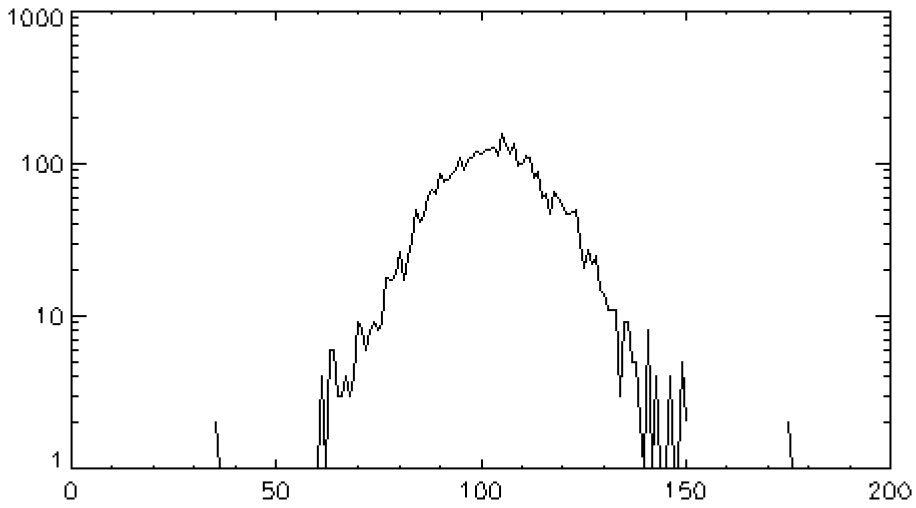
Plot 89
statistics of the SW channel when observing IFSI BB.



Plot 90
Statistic of the LW channel when observing the IFSI BB. Both histograms 89 and 90 are bin 1 and centred roughly around the zeros of the interferograms.



Plot 91
As for plot 89 but for another case : note that the “peaks” are now in different positions.

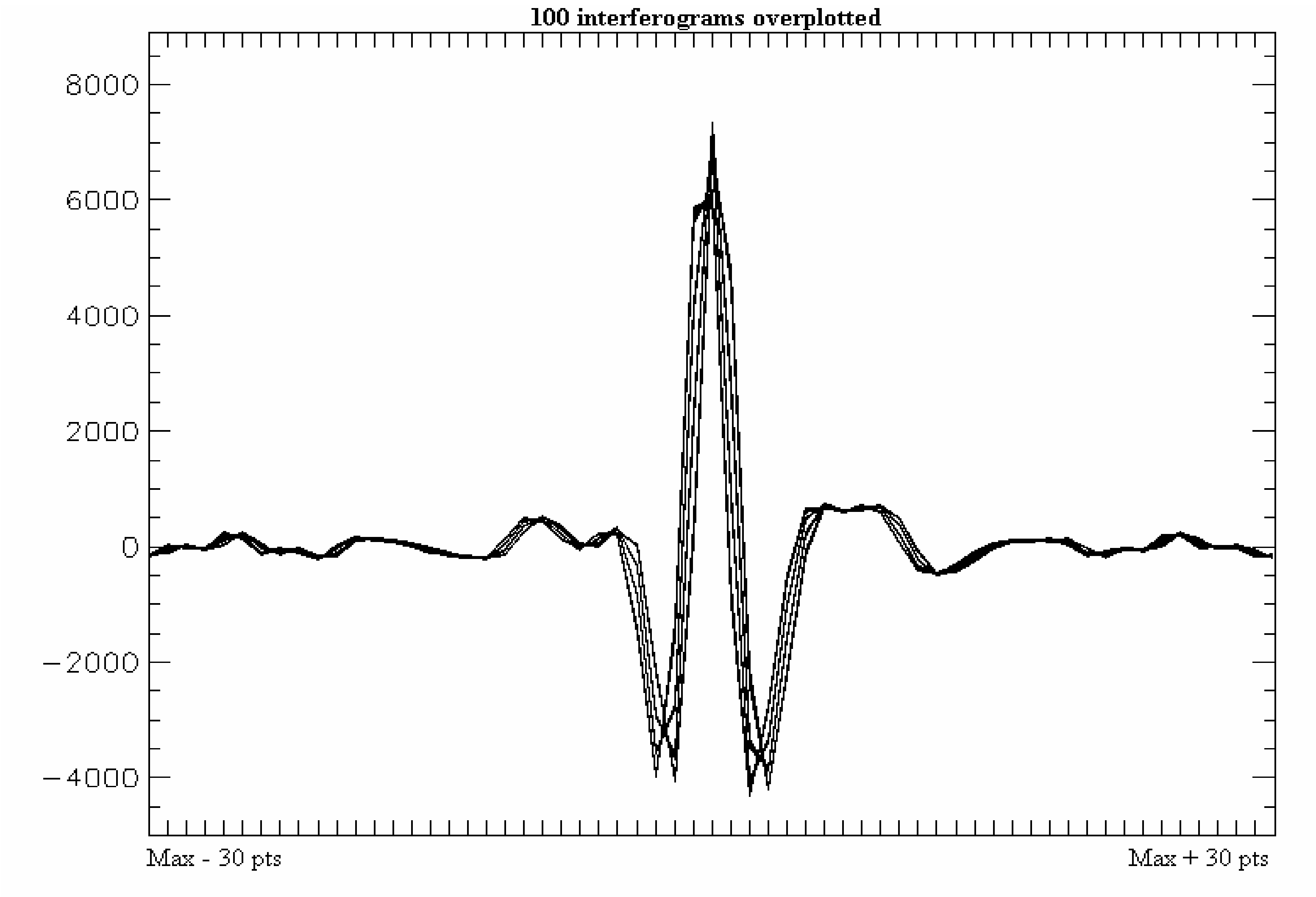


Plot 92
As for Plot 90 LW but for another case. Note the Gaussian distribution.

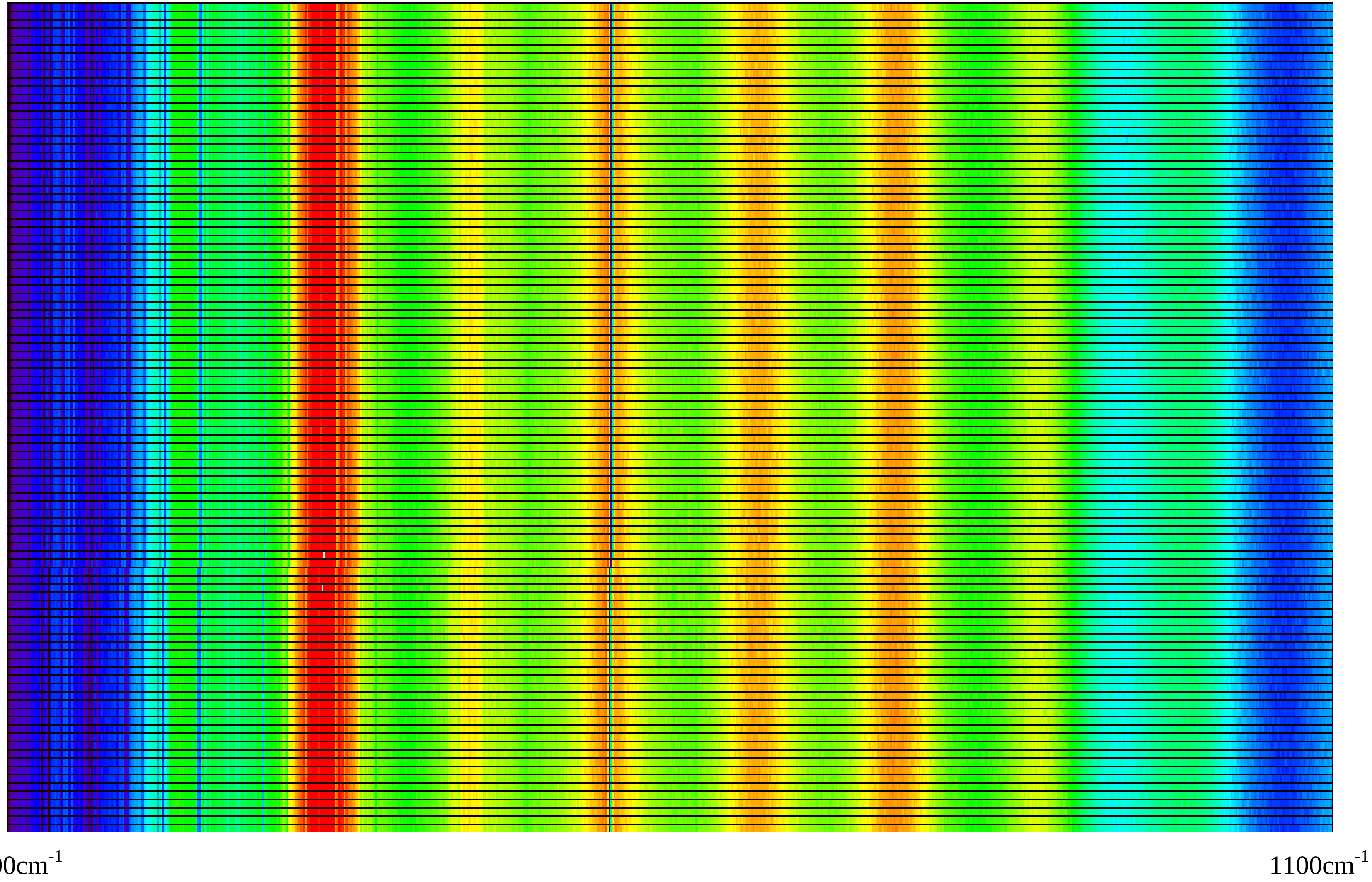
2.15 STABILITY OF THE EXPERIMENT

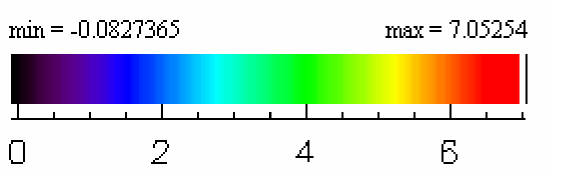
LW Channel Stability
In order to study the stability of the experiment during one set of measurements, we over plot the center part of the interferograms of that session, selecting forward or reverse motion, and check that the interferograms are stable.

Plot 93 : 100 LW interferograms overplotted. +- 100 points are shown around the zero optical path difference.



Plot 94 – The same data as plot 93 but a blow up around the ZOPD : Note theshift caused by the laser diode change.

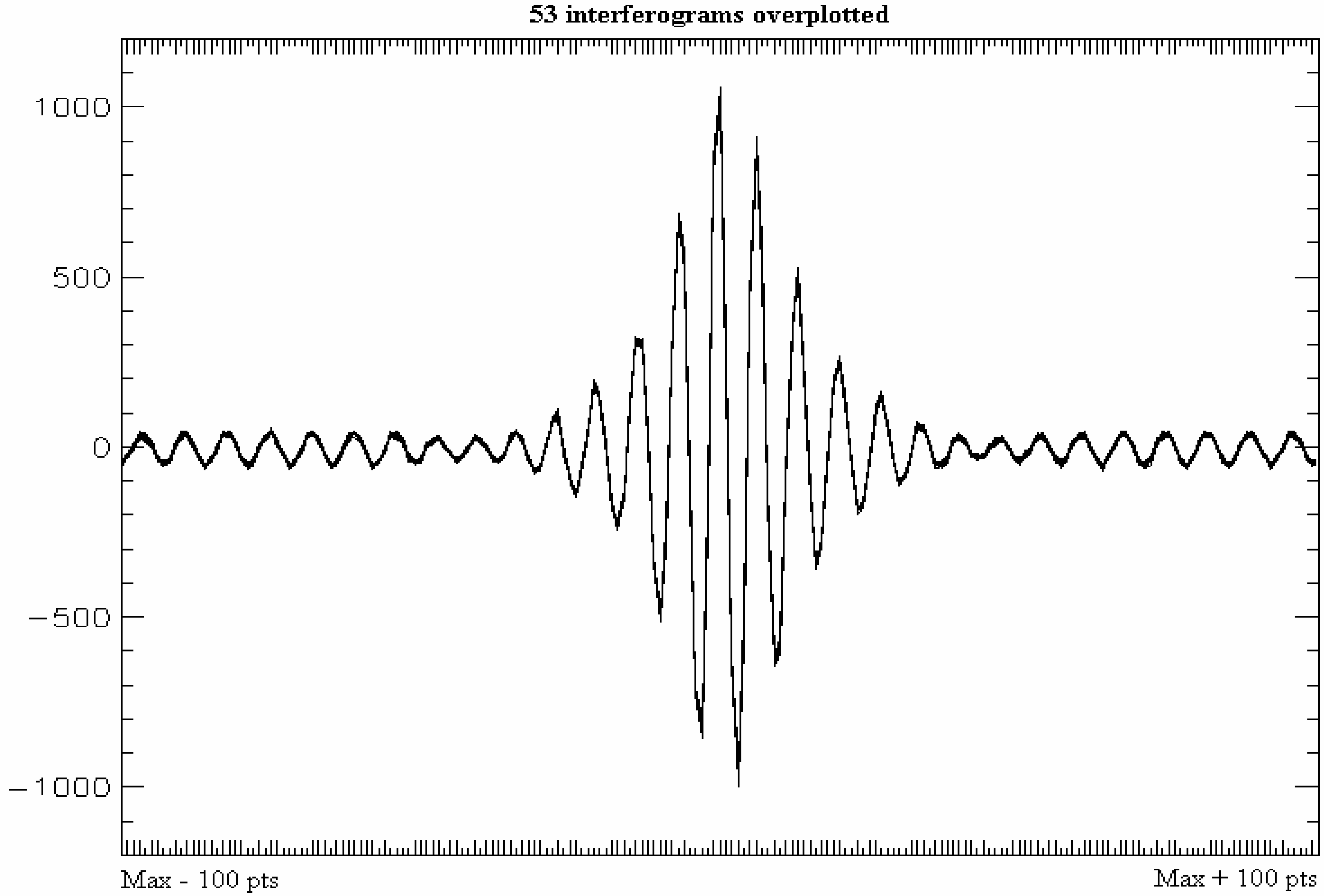

300cm-1
1100cm-1



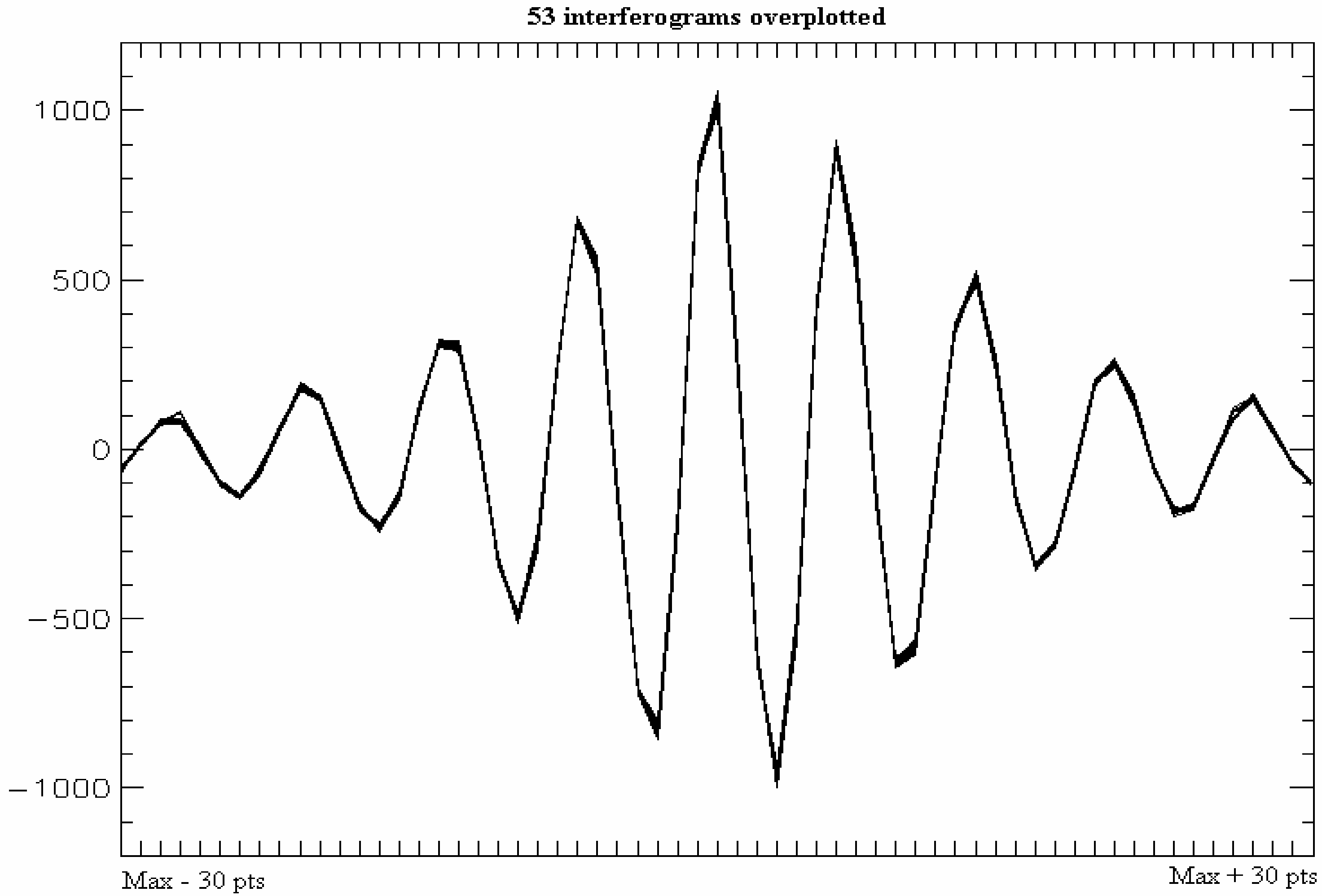
Plot 95.
Spectral shape stability over 100 measurements : Each line in the color figure above is one spectrum. The color code is given above. Note the wavy features of the spectra in the range of wavenumbers shown. The CO2 Qbranch is evident as thin vertical line.

The conclusion is that the LW channel is very stable and therefore very reliable instrument.

SW Channel Stability

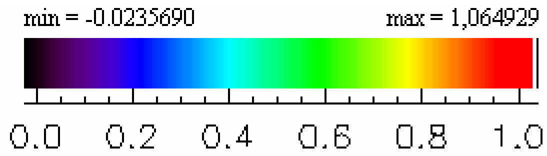


Plot 96 : 53 interferograms SW overplotted.



Plot 97 : The same interferograms of plot 96: blow up of the central part.

2000cm^{-1} 2800cm^{-1}



Plot 98 :
Color plotting of the 53 spectra (only the thermal part, as the source was the IFSI BB). Note the presence of the CO2 band.

It is clear that the conclusion is that also the SW channel is very stable.

-LASER WAVELENGTH JUMPING

we have shown a few spectra in which the laser diode was jumping from one wavelength to another. this effects can be identified because the natural wavenumber of co2 or h2o features are fixed and do not move. we have built in pfs a test called test 6 in which the temperature of the laser diodes is increased by 10 degrees in step of 0.5 degrees. this test has not always worked well because depends on the ambient temperature and on the temperature set for the laser diodes at the beginning. we should, however have enough data to study the laser diode wavelength as function of the temperature. it is obvious that no averaging of the data should be performed a priori, but only after selection of measurements with the laser in the same conditions. the result could be, otherwise, an increase of the apparent noise.

-SATURATION OF THE INTERNAL CALIBRATION LAMP

This is a different instrumental effect, in the sense that it is not observed always on ground but it is expected to be so in space also for gain 0, simply because the SW detector responsivity shall increase by a large factor. Note that with respect to the original 16 mA current we have tested several values (16, 8, 12, 10 mA) 8 mA was not acceptable because the lamp was notable to switch on, and acted as a thermal source only. We shall report on measurements at 10 and 12 mA. But is a fact that when the SW detector was cooled gain 1 was always saturated, and the temperatures reached were far from the temperatures in space. Further cooling for the detector is expected to give a better signal to noise ratio for the observations of Mars.

-STABILITY OF THE EXPERIMENT

The experiment is very stable when a sequence of measurements in the same conditions are made.