TELESCOPE TESTS OF HYBRID SPECTROMETER

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Tests of the prototype, one-eighth-of-final, hybrid spectrometer (HYSPEC) were conducted on the NRAO 12-meter telescope using a 115 GHz SIS front-end during several-hour sessions on June 18 and June 26, 1986. HYSPEC was operated in parallel with the 1 MHz and 250 KHz filter banks; exact correlation of outputs is not obtained because of partial non-overlap of integration periods (aggravated by variable weather) and somewhat different frequency characteristics as follows:

Back-End	Total BW MHz	Point Spacing MHz	Half-Power Hanning Weight MHz	Resolution Uniform Weight MHz
HYSPEC 8	300	1.56	3.16	1.94
FB 1000	256	1	1	1
HYSPEC 1	37.5	.19	.39	.24
FB 250	64	.25	.25	.25

(HYSPEC 8 mean hybrid spectrometer in 8 filter mode. Hanning weight was used for all tests.)

Measurements of system temperature and a cold-sky, 50-minute integration are shown in Figure 1. The system temperatures measured with a 300K absorber are nearly identical for the two back-ends. The system temperature measured by HYSPEC with a noise tube calibration shows a large ripple which is apparently caused by reflections in the noise tube source. The cold sky integration gives close to theoretical RMS for both back-ends considering the difference in resolution.

Observations of Orion, shown in Figure 2, were as expected other than the effects of 100 MHz RFI in the HYSPEC one-filter mode. The signal was identified with an HP spectrum analyzer as being the 5th harmonic of the correlator clock. Tight shielding of the digital components in the final system should eliminate this problem.

Observations of IRC10216 are shown in Figure 3. In some of the observations the LO was shifted to place the CO line at the cross-over point between two filters; reasonable results were obtained. A "pedestal" step in baseline, one filter wide, was seen in the June 18 data and in artificial line data (not shown) with the pedestal height ~ 1% of the line. The June 18 data had no system temperature calibration, but this should not cause the pedestal. The effect needs further investigation.

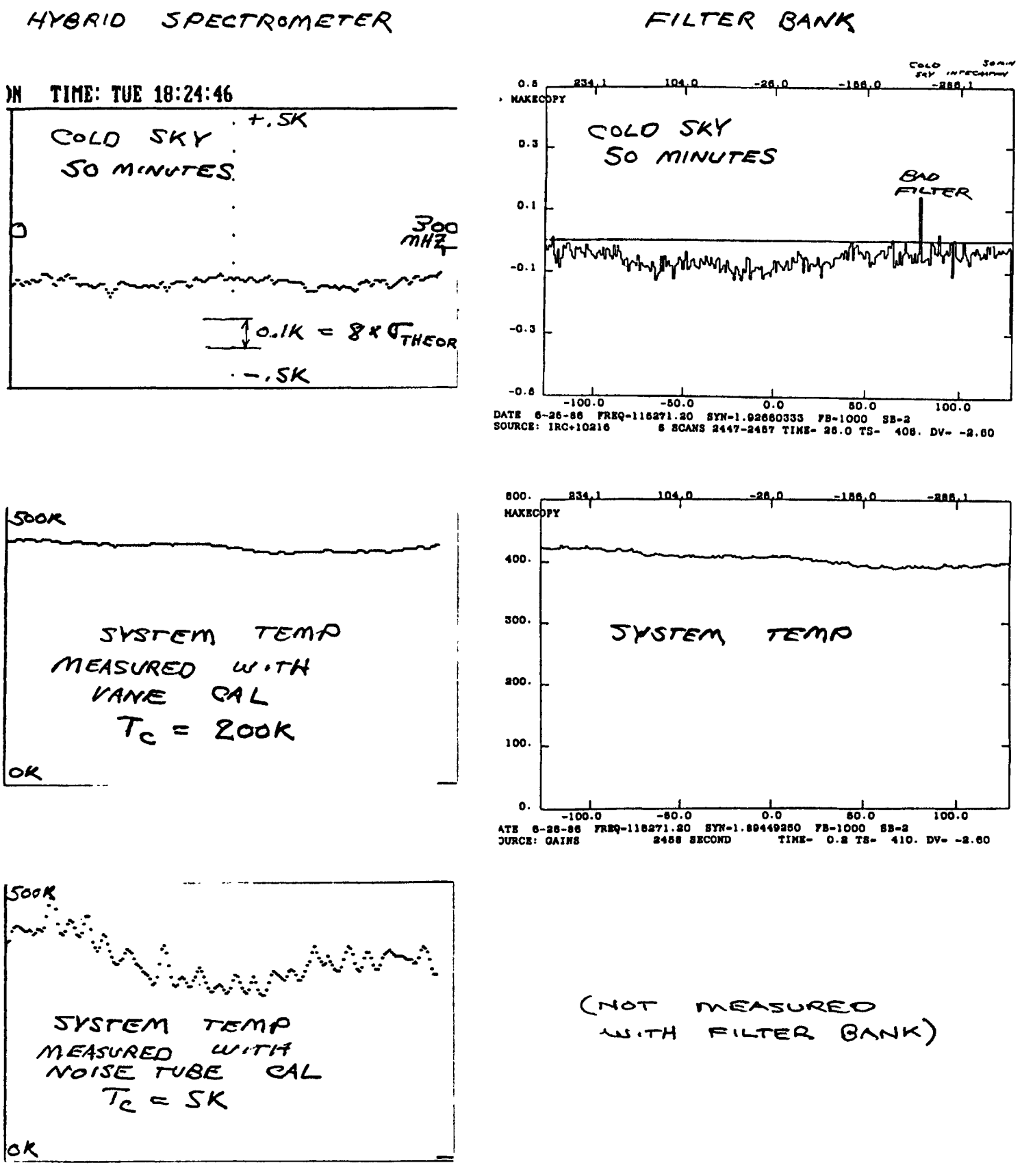


Fig. 1. Comparison of 300 MHz x 192 point bandwidth hybrid-spectrometer data (left) with 256 MHz x 256 point filter-bank data (right) for cold sky (top), system temperature calibration with 300K vane absorber, and system temperature calibrated by noise tube transmitted from vertex.

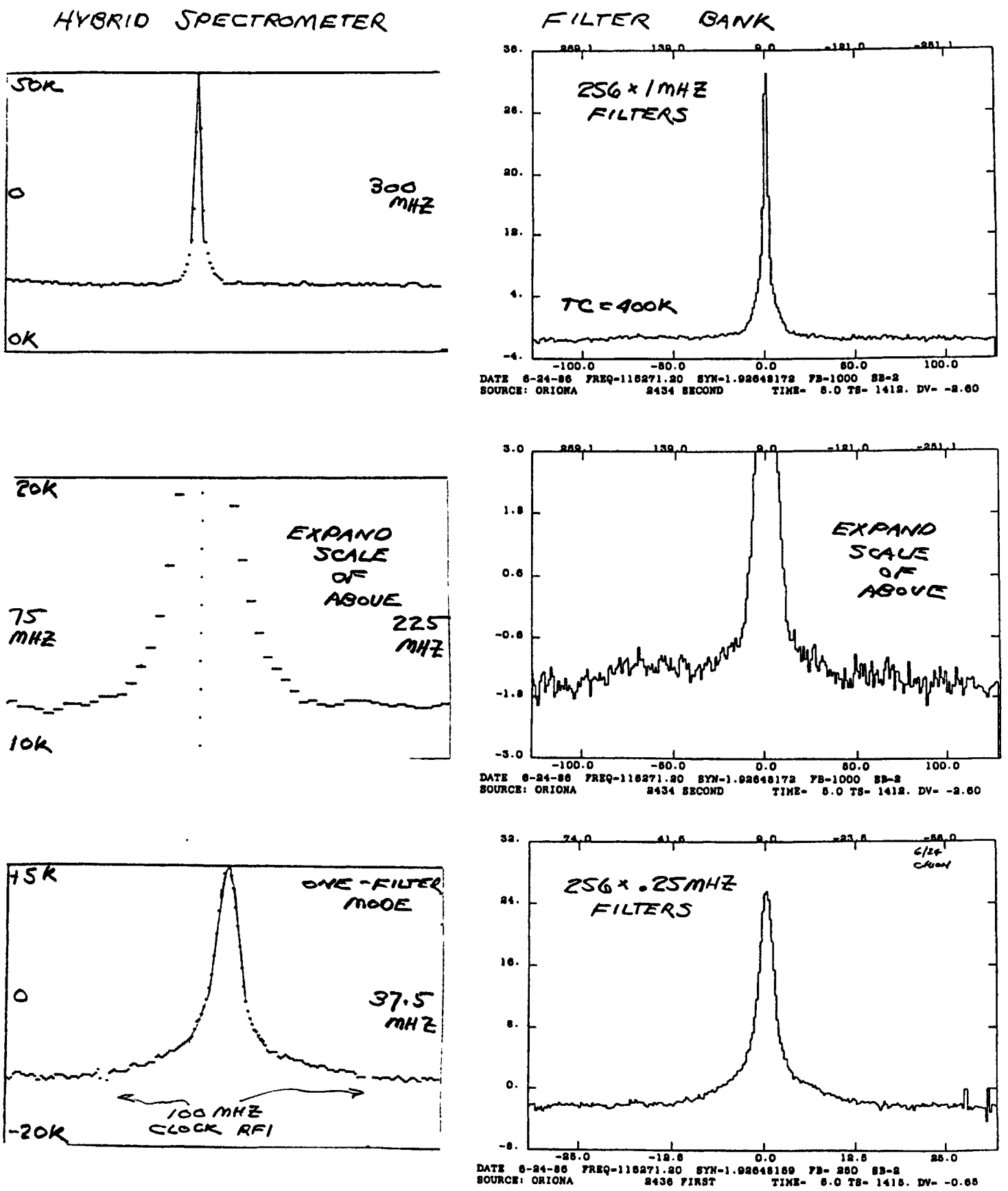
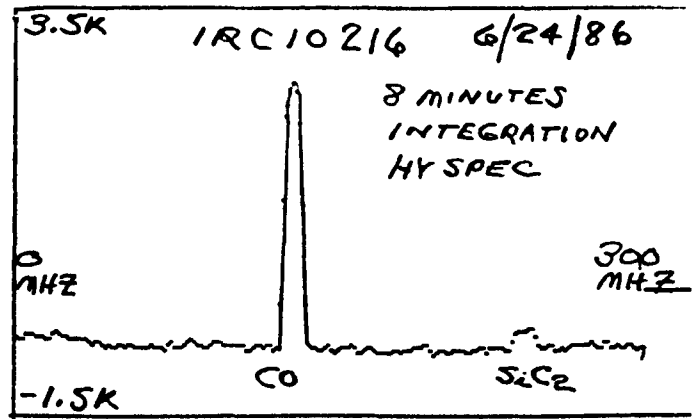
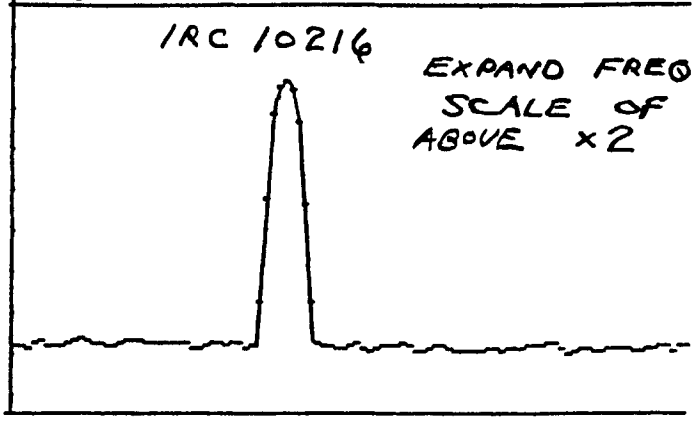
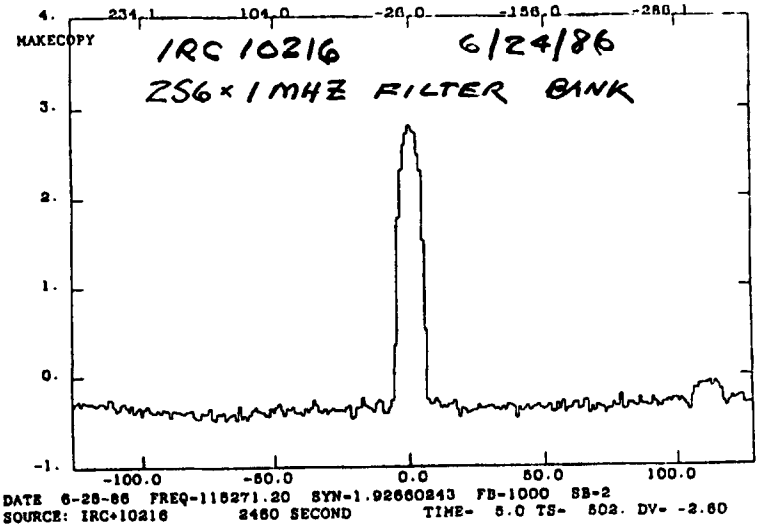
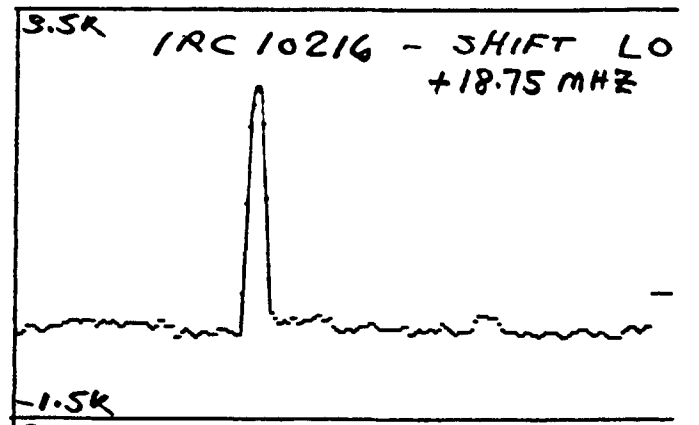


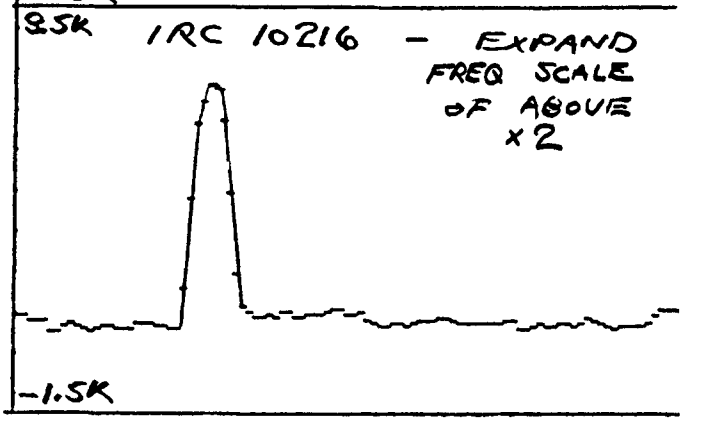
Fig. 2. Observations of CO in Orion performed with hybrid spectrometer (left) and two different filter banks (right). At the time of the observations, Orion was low in the sky and storm clouds were in the antenna beam.











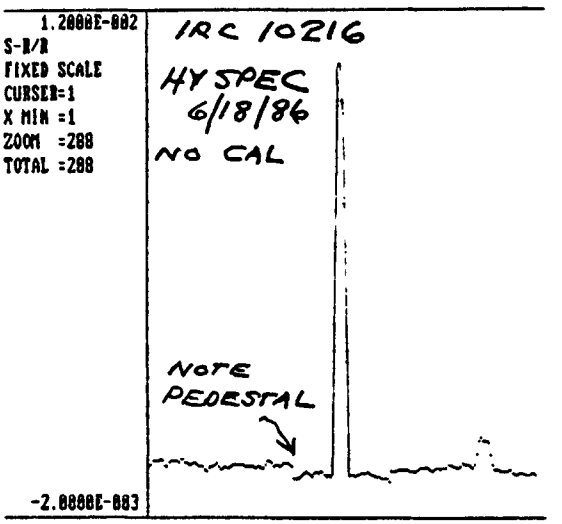


Fig. 3. Observations of IRC10216. The spectra at lower left were taken with LO shifted one-half a filter width so one-half the line is measured through one filter and one-half through another; the resulting line is symmetrical but there is some asymmetry in the baseline. On data taken the previous week, a one-filter wide pedestal exists in the baseline as shown in the lower right spectrum. This pedestal has been seen in artificial line data, but for an unknown reason is not present in the data taken on 6/24/86.