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MEMORANDUM

To: Tucson Internal Report Series

From: P. R. Jewell and D. T. Emerson

Subject: 12 m System Tests, 1987 July 15 - 17

We had two primary objectives in these system tests performed at the beginning of the 1987 Summer Shutdown: (1) to test several new observing procedures that we want to release after Shutdown, and (2) to perform general system checkouts before the major changes (computer moves, recabling) scheduled for the summer.

I. Continuum Tests

We tested the following new continuum observing procedures (most of these procedures had existed for the analog backend but not the digital backend):

a) SON (+BEAM sequence)
b) SOFF (-BEAM sequence)
c) SON-OFF (ON-OFF-ON-OFF-... sequence)

All these procedures performed perfectly. We displayed them in CONDAR using the M procedure (normally used for displaying mapping rows). We should probably develop a procedure or verb that calculates source temperatures and standard errors for SON-OFF scans.

d) DRF (continuum drift scan)

This procedure also performed well. There appears to be about 200 ms of dead time between the samples in a drift scan, i.e., 1 sec samples take about 1.2 sec of elapsed time. This has the effect of shifting the source from the middle of the scan, if it was positioned to be in the center based on elapsed time. It also has the effect of narrowing the beam. (N.B. even after multiplying the measured beam width by 1.2, the beam was still a few percent narrower than measured with a five point or azimuth scan. We did not resolve this discrepancy, although it may just be the noise of the measurement.)

II. Spectral Line Tests

We tested the following new spectral line observing procedures:

a) RMAP (total power grid mapping)

This procedure worked very well. We observed several grid maps and all were successful. The cosine(declination) effect appears to be properly taken into account. We have two suggestions for enhancements that would make the procedure easier to use.

i) The commands that set the frequency of OFFS and CALS should be in terms of ONS per OFFS and OFFS per CALS.

For example, let N/F ≡ ONS per OFFS and
F/C ≡ OFFS per CALS.

The existing words S/O and S/C are functions of N/F and F/C as follows:

S/O = N/F + 1
S/C = (N/F + 1) * F/C

ii) The status monitor should display the total number of ONS in the map and the number left to observe (or some other equivalent indicator of which map point is being observed).

iii) The 0 FFS ! option that keeps the telescope from moving momentarily to the OFF position before every ON should be built in as an automatic feature of RMAP, if possible.

b) ATP mode (automatic total power, position switched observing)

This procedure also worked perfectly. Comments i) and iii) of RMAP also apply to ATP.

c) TPON and TPOF (total power ons and offs)

TPOF appeared to work fine but TPON failed because of a conflict of source names with TPON.

In addition to the new observing procedures, we also checked out several of the old observing techniques.

d) APS (absolute position switching)

This worked fine except for one problem: when in either the manual or automatic observing modes, the calibrate before the first scan of a set is taken in the ON position instead of the OFF position.

e) Frequency Switching (FS)

This executed fine. We observed a source with a 4 MHz shift. The standing waves were horrendous, but were stable enough that by taking a frequency switched scan in an OFF position and subtracting it from the ON, we could flatten out the baselines quite nicely. The standing wave had a half-period of just over 7 m, which is probably the telescope (feed to subreflector) standing wave. A corner cube (path length modulator) also cleans up the standing wave nicely.

III. Filter Bank Bad Channel Checks

We cataloged the bad channels in the filter banks. Those banks routed through the Switcher were observed in the F1 and F2 portions of the Multiplexer to isolate filter bank and Switcher bad channels.

The checks were done in SERIES mode and the channel numbering is from 1.

	Bad Channels	
Filters	F1	F2
30's	---	88,112,119 (may be stable)
100's	none	none
250's	240, 256	240, 256
500's	147, 148, 187	147, 148, 187
Old 1 MHz	none	none
Red 1 MHz	---	none
2 MHz	244	---
Red 2 MHz	---	none

Conclusions: There are no bad Switcher or Multiplexer channels. The bad channels listed above are in the filter banks. The 250's and 500's should probably receive some attention this summer.

IV. Observations with the 30 kHz filter bank and the Spectrum Expander.

We observed S140 in the J=1-0 HCN line at 88.6 GHz using the 30 kHz filters, the Spectrum expander in the x4 (25 kHz) mode, and the 100 kHz filters, for comparison. There was good agreement between all of the banks, including the peak intensity and the profile shapes.

V. Spectral Line Beam Switching Phasing Problem

We investigated the problem of the 512 ch. Multiplexer performing its integrations of spectral line beam switched observations with a slight phase error relative to the subreflector position. It appears that the 512 MUX can be synchronized to an external wave form. After discussions with J. Payne, we decided that the best solution is to construct a phase delay box that causes the 512 MUX to delay the start of its integration relative to the input waveform driving the subreflector. The delay should be adjustable by thumbwheels. The box should also allow the subreflector phasing to be such that the dump time of the MUX occurs during subreflector motion (thereby reducing observing inefficiency relative to position switching even further).

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