

Revised Estimate of Expected Defelction at 30to1 switch:

Jayaprakash R Kamble

The deflection test is used to check the health or performance of the GMRT antenna which finds out whether the antenna gives the desired amount of deflection against a strong source. The test should be done at IF level on the strong source like CASA, VIRGOA, CYGA & CRAB.

This test is extensively used in PMQC(Post-Maint Quality Check), which is done after weekly maintenance before releasing the antennas for GTAC observation (Generally on Thursday morning around 0700 Hrs to 1100 Hrs).

Procedure :-

1. Focus the feed for the particular frequency.
2. Set default frequency settings(RF, LO, IF and BB).
3. Start pointing on calibrator source (e.g. 3c147 or 3c48 or 3c286 or any good point source) and load the latest offsets of all antennas.
4. Switch off the ALC and keep high attenuation (30dB) and low gain(0) at IF in both channels.
5. Track the telescope on a strong source(CASA, CYGA, CRAB and VIRGOA).
6. Equalise the IF power around 50dB by using 30to1 switch.
7. Record 3 dumps on onsource in a file (eg: casa_150_ON.spd).
8. Track the telescope on offsource and record 3 dumps (eg: casa_150_OFF.spd).
9. Analyse the data by using "getdefl.tst" programe.
10. Check the final result of the programe.

*30to1 power equalization programme.

Usage: ./ofmpeq.pl [options]

Options:

--	End of options
-h, --help	Show this help message.
--offset=NUMBER	Number of data fields to skip.
--band-width=NUMBER	Bandwidth in MHz (6/16/32 MHz).
--bw=NUMBER	Bandwidth in MHz (6/16/32 MHz).
--rf-freq=NUMBER	RF frequency (150/235/325/610 etc).
--source=SOURCE	Source name (3C48/3C147/3C286 etc).
--online=HOSTNAME	Hostname running ONLINE.
--side-band=STRING	Side-band to use for equalisation (USB/LSB/BOTH).
--use-ants=STRING	Antennas to use.
	Antenna names separated by a comma (C*,W01,E03 etc).

```

--flag-ants=STRING      Antennas not to use.
                        Antenna names separated by a comma (C*,W01,E03 etc).
--run-file=FILENAME     Runfile name (OUTPUT).
--attn-file=FILENAME     IF attenuation file (INPUT).

```

```

*For data recording usage: csparecord -h -d < num > -f < filename > -m < spa >
    -h help
    -d number of dumps.
    -f out put file name.
    -m <spa/SPA> <vvm/VVM>

```

*Analysis

Usage : /home/elab/bin/getdefl.tst [options] onsrcfile offsrcfile

* Options :-

```

-b <IF bandwidth in MHz>
  (default is 6 MHz.)
-e <expected deflection>

```

Antenna Temperature: T_a : The Antenna temperature T_a is by $P = k * T_a$, as the equivalent noise temperature that gives the same amount of power density (P) as the received signal from the sky.

System temperature : T_{sys} : The receiver contribute noise due to thermal noise in the receiver components, shot noise in the tubes or transistors etc. In addition, losses in the transmission line between the antenna and receiver will add noise. Thus, the total or system noise is called system temperature.

$$T_{sys} = T_a + T_{receiver}$$

T_a : antenna temperature (K)

$T_{receiver}$: Receiver noise temperature (K)

The PMQC team has recalculated the expected deflection for CASA, CYGA, CRAB and VIRGO. There are two reason behind the recalculation of deflection.

1. In earlier calculation the 14dB solar attenuation was not consider it is default setting in front end (FE) for 150 and 235MHz.

2. The CRAB is very near to galactic plane so while tracking on CRAB the antennas were adding extra temperature at 150MHz(around 300K) and 235MHz(around 90K). These extra temperature also was not consider in the old calculation.

The new deflection table is given below.

	Source and Deflection (dB)			
RF FREQ.	VIRGO	CYGA	CASA	CRAB
150	2.1	8.3	8.2	3.4
235	3.3	10.4	10.6	4.8
325	4.5	12.4	12.7	6.6
610	3.4	10.7	11.1	6.5
1060	2.5	8.7	9.5	6.1
1170	2.3	8.3	9.2	6.0
1280	2.2	7.9	8.9	5.9
1390	1.9	7.3	8.3	5.5

The sample out put of 30to1 analysis is given below.

=====
 * Total Number of antennas : 30.

* Expected Deflection : 12.40 dB

* Data files :-

On source file : cyga_325_on.spd ## Date : Thu Feb 18 08:44:16 2010

Off source file : cyga_325_of.spd ## Date : Thu Feb 18 08:44:16 2010

Antenna	ON SOURCE	OFF SOURCE	DEFL in dB	DEFL less by	COMMENT
C00-130	-54.0	-66.2	12.2	0.2	GOOD
C00-175	-53.6	-65.9	12.3	0.1	GOOD
C01-130	-54.6	-67.7	13.1	-0.7	GOOD
C01-175	-53.7	-67.2	13.4	-1.0	GOOD
C02-130	-54.0	-67.1	13.1	-0.7	GOOD
C02-175	-54.3	-67.5	13.2	-0.8	GOOD
C03-130	-54.4	-66.6	12.2	0.2	GOOD
C03-175	-51.1	-63.6	12.5	-0.1	GOOD
C04-130	-49.9	-61.1	11.2	1.2	BAD
C04-175	-48.5	-60.4	11.9	0.5	GOOD
C05-130	-54.3	-66.7	12.3	0.1	GOOD
C05-175	-51.0	-63.8	12.9	-0.5	GOOD
C06-130	-60.7	-72.8	12.1	0.3	GOOD
C06-175	-58.2	-71.1	13.0	-0.6	GOOD
C08-130	-54.7	-67.1	12.4	0.0	GOOD
C08-175	-54.7	-66.9	12.2	0.2	GOOD
C09-130	-54.4	-67.2	12.7	-0.3	GOOD
C09-175	-53.9	-66.6	12.7	-0.3	GOOD
C10-130	-54.2	-67.8	13.6	-1.2	GOOD
C10-175	-55.0	-68.3	13.3	-0.9	GOOD
C11-130	-54.8	-66.0	11.2	1.2	BAD
C11-175	-54.2	-65.5	11.3	1.1	BAD
C12-130	-54.2	-66.1	12.0	0.4	GOOD

C12-175	-54.1	-66.5	12.4	-0.0	GOOD
C13-130	-54.5	-67.1	12.6	-0.2	GOOD
C13-175	-54.7	-67.3	12.5	-0.1	GOOD
C14-130	-54.8	-66.8	12.0	0.4	GOOD
C14-175	-54.7	-66.8	12.1	0.3	GOOD
E02-130	-55.1	-65.6	10.5	1.9	BAD
E02-175	-54.4	-65.8	11.5	0.9	GOOD
E03-130	-54.3	-65.5	11.2	1.2	BAD
E03-175	-54.6	-65.7	11.1	1.3	BAD
E04-130	-60.9	-64.8	4.0	8.4	UGLY
E04-175	-60.4	-64.0	3.7	8.7	UGLY
E05-130	-54.5	-66.6	12.1	0.3	GOOD
E05-175	-54.2	-66.8	12.6	-0.2	GOOD
E06-130	-56.5	-67.9	11.3	1.1	BAD
E06-175	-53.6	-65.9	12.4	0.0	GOOD
S01-130	-55.2	-67.3	12.1	0.3	GOOD
S01-175	-54.3	-66.8	12.5	-0.1	GOOD
S02-130	-54.2	-67.0	12.8	-0.4	GOOD
S02-175	-54.3	-67.2	12.9	-0.5	GOOD
S03-130	-55.1	-66.6	11.5	0.9	GOOD
S03-175	-54.6	-66.4	11.9	0.5	GOOD
S04-130	-54.2	-66.9	12.8	-0.4	GOOD
S04-175	-54.6	-67.9	13.2	-0.8	GOOD
S06-130	-54.0	-66.8	12.7	-0.3	GOOD
S06-175	-54.6	-67.6	13.0	-0.6	GOOD
W01-130	-54.5	-67.2	12.7	-0.3	GOOD
W01-175	-54.0	-67.0	12.9	-0.5	GOOD
W02-130	-54.6	-67.2	12.6	-0.2	GOOD
W02-175	-54.6	-67.3	12.7	-0.3	GOOD
W03-130	-54.6	-67.4	12.9	-0.5	GOOD
W03-175	-54.5	-67.1	12.6	-0.2	GOOD

W04-130	-54.2	-65.4	11.1	1.3	BAD	
W04-175	-54.0	-65.6	11.6	0.8	GOOD	
W05-130	-55.5	-67.7	12.2	0.2	GOOD	
W05-175	-54.1	-66.7	12.6	-0.2	GOOD	
W06-130	-55.5	-67.9	12.3	0.1	GOOD	
W06-175	-53.8	-66.4	12.6	-0.2	GOOD	

+=====+

- * GOOD : The deflection less by is below 1dB.
- * BAD : The deflection less by is between 1.1 to 2.9dB.
- * UGLY : The deflection less by is above 3.0dB.
