

DEUTERIUM ARRAY MEMO #009

**MASSACHUSETTS INSTITUTE OF TECHNOLOGY**  
**HAYSTACK OBSERVATORY**  
*WESTFORD, MASSACHUSETTS 01886*

April 30, 2002

*Telephone: 978-692-4764*  
*Fax: 781-981-0590*

To: Deuterium Array Group

From: Alan E.E. Rogers

Subject: IP2 measurement on the bench and in the field.

1] Bench measurement

Using a single ended common source HEMT ATF-54143 amplifier with the following bias voltages

$$V_{DS} = 3v$$

$$I_{DS} = 30ma$$

$$V_{GS} \approx 0.5v$$

I injected a signal at 150 MHz through a narrow band filter to eliminate the 2<sup>nd</sup> harmonic from the signal source. I measured

$$\begin{array}{ll} 150 \text{ MHz output} & -41 \text{ dBm} \\ 300 \text{ MHz IM2 output} & -119 \text{ dBm} \end{array}$$

i.e.  $IP2_{out} = -82 + 119 = +37 \text{ dBm}$

I attempted the same measurements at 10 and 500 MHz

$$\begin{array}{ll} IP2_{out} \text{ at } 10 \text{ MHz} & +45 \text{ dBm} \\ IP2_{out} \text{ at } 500 \text{ MHz} & +29 \text{ dBm} \end{array}$$

Since these measurements are not easy to make I placed errors at about  $\pm 5$  dB.

2] Field measurement

The amplifier was connected to the 237 MHz standard gain antenna on the trailer and I measured

Freq. MHz	Source	Level at antenna output
175.26	Ch 7 tv	-65 dBm
152.6	Paging	-70 dBm
327.86	IM2	-143 dBm (referred to amp. Input.)

From which I calculate

$$IP2_{input} = +8 \text{ dBm}$$

$$IP2_{output} = +33 \text{ dBm (amp. gain 25 dB)}$$

Measurement accuracy and signal strength variations limit the accuracy to about  $\pm 5$  dB.

Comments:

There are other signals around 152 MHz which when mixed by IM2 result in frequencies close to 327.4 MHz. For example:

F1	F2	F1+F2	Strength*
152.6	175.26	327.86	0 dB
152.48	175.26	327.74	-6 dB
152.37	175.26	327.63	-15 dB

\* relative to 152.6 MHz

In addition there are many intermittent transmissions around 152 MHz.