National Radio Astronomy Observatory

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Very Large Array Program

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Moon and Tcal, Tsys

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Recent interest in Tsys & Tcal measurement using the moon have prompted me to collate and look at data back to Jan 1990.

The data are derived by adjusting the assumed noise temperature of the moon to make the average of all the Tcals for each band equal to the average of the lab-measured Tcals for that band. Thus it is a "transfer" measurement. I make no other allowance for elevation or phase of the moon.

I have put this data into a 123 spreadsheet which can be used as a database. I can plot Tcal & Tsys for each band, for each antenna, vs. time.

In order to get an idea of the repeatability of the measurements, I have plotted the rms variation of the Tcals for each antennas (figs. 1-5). The interesting point us that (above L-band) this variation is roughly at the 3% level for about half the antennas.

I have edited out obvious bad points (e.g., temperatures that are huge or zero or negative), but have not tried to reconstruct cases where equipment has been changed, antennas were shadowed, front ends not cool, etc. The fact that about half the L-band front-ends were replaced in this period accounts for a lot of the variation at that band.

I have plotted the moon-derived Tcals for antennas 10, 11, 14, and 24 vs. time (figs. 6-9). Note that the first two points of #10 and #24 cause their rms in fig. 5 to be high, though the data is pretty constant at all other points.

Conclusion: Moon-derived Tcal measurements can be usefully consistent and repeatable (with careful editing) and accurate (when referenced to careful on-antenna measurements).

Mehtods of deriving an a priori value for Tmoon, independent of our Tcal measurements, are being examined.
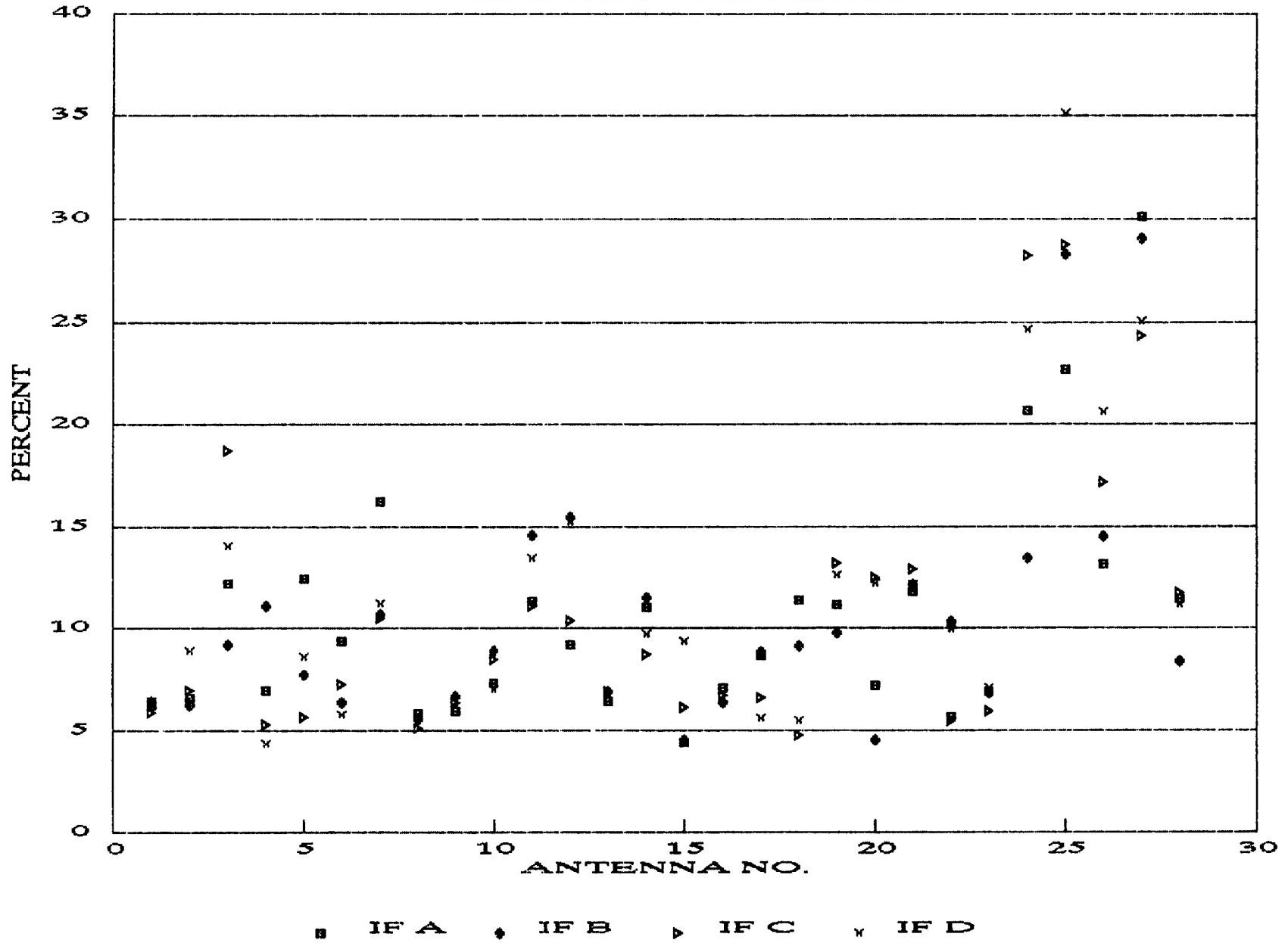
L—BAND DELTA_Tcal/Tcal
via LUNAR TRANSFER

Figure 1
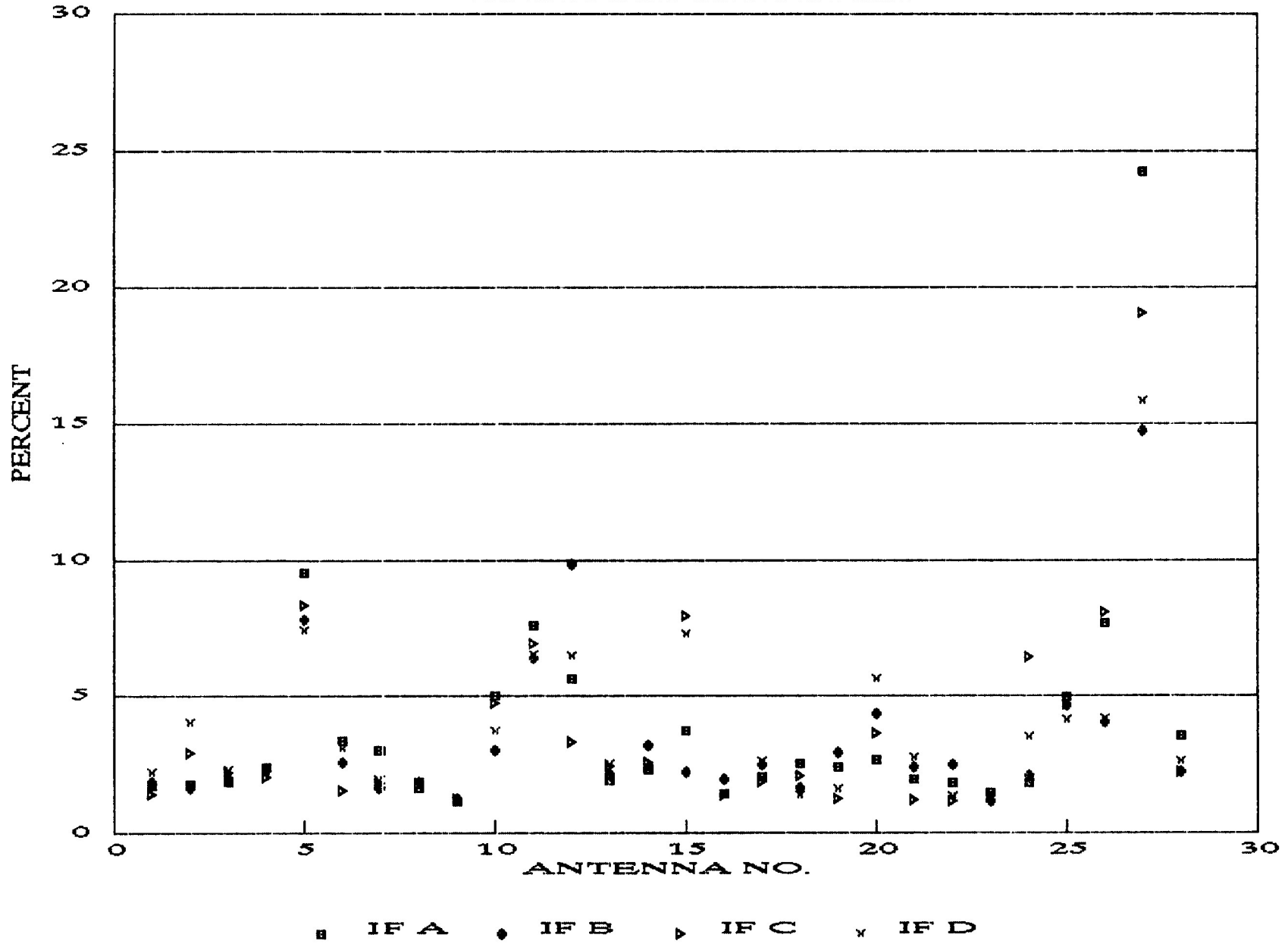
C—BAND DELTA_Tcal/Tcal
via LUNAR TRANSFER

Figure 2

■ IF A   ◆ IF B   ▷ IF C   ✕ IF D

X—BAND DELTA_Tcal/Tcal
via LUNAR TRANSFER

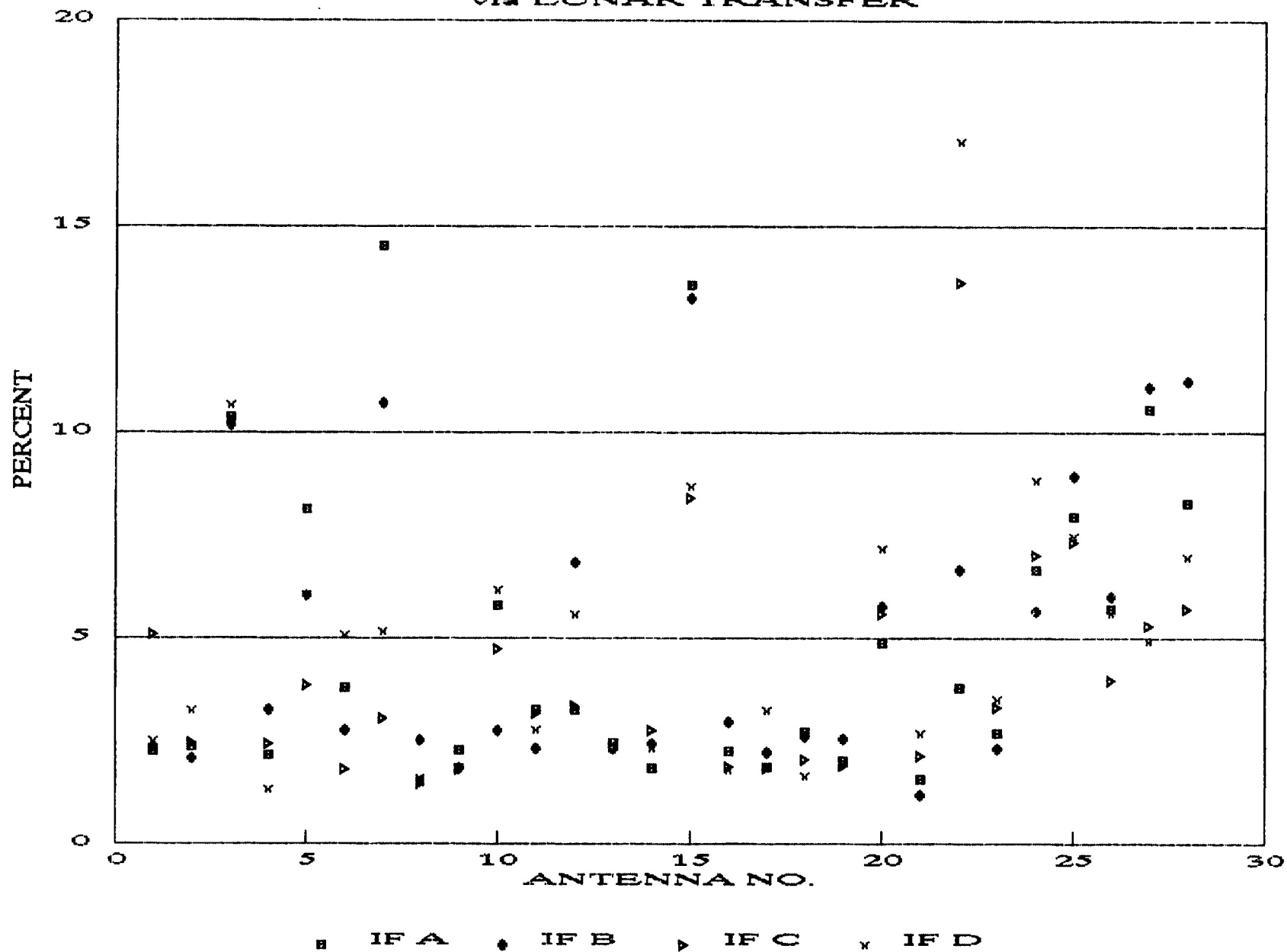IFA   IFB   IFC   IFD

Figure 3

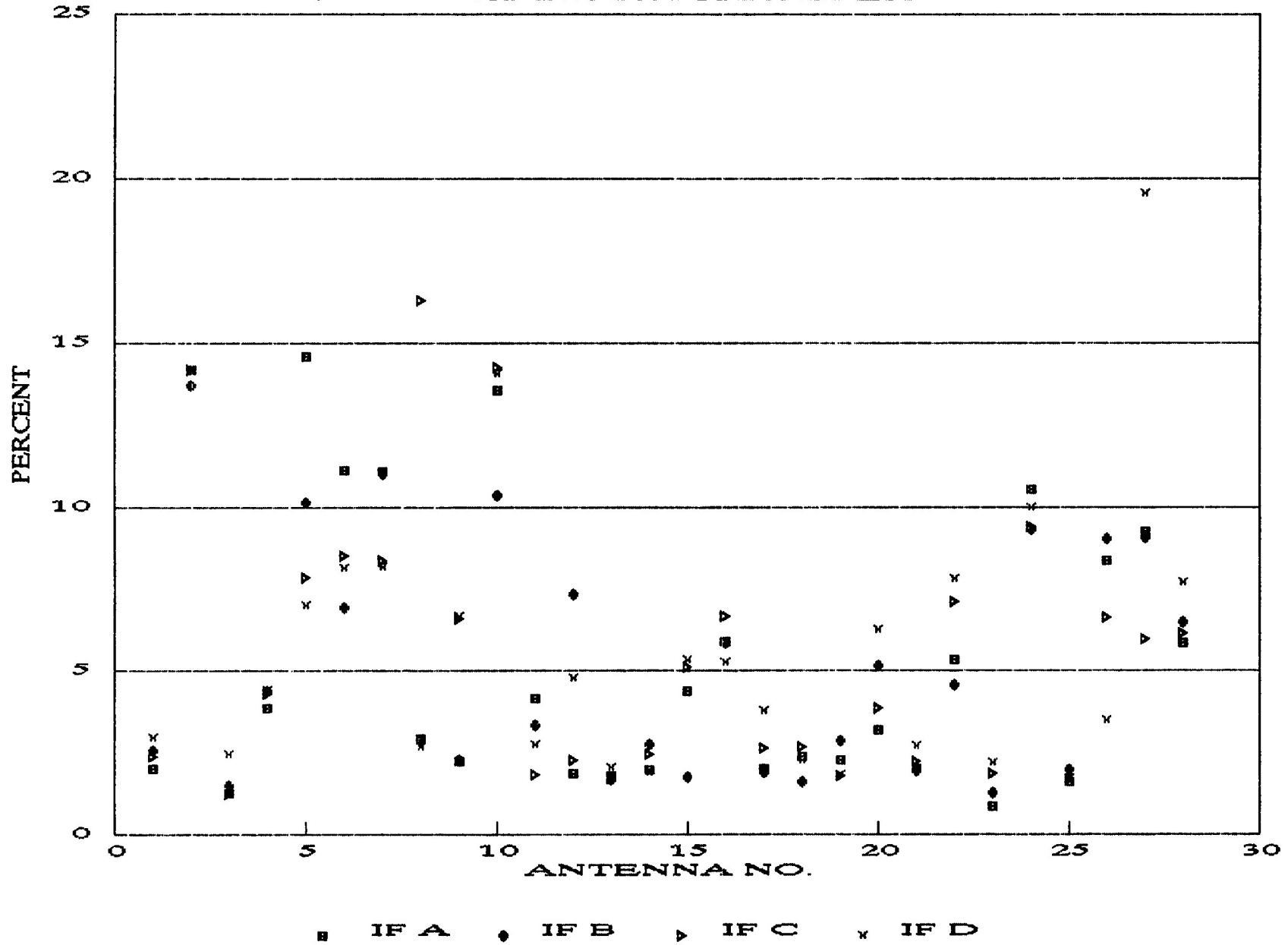**U—BAND DELTA_Tcal/Tcal**
via LUNAR TRANSFER

Figure 4

K—BAND DELTA_Tcal/Tcal
via LUNAR TRANSFER
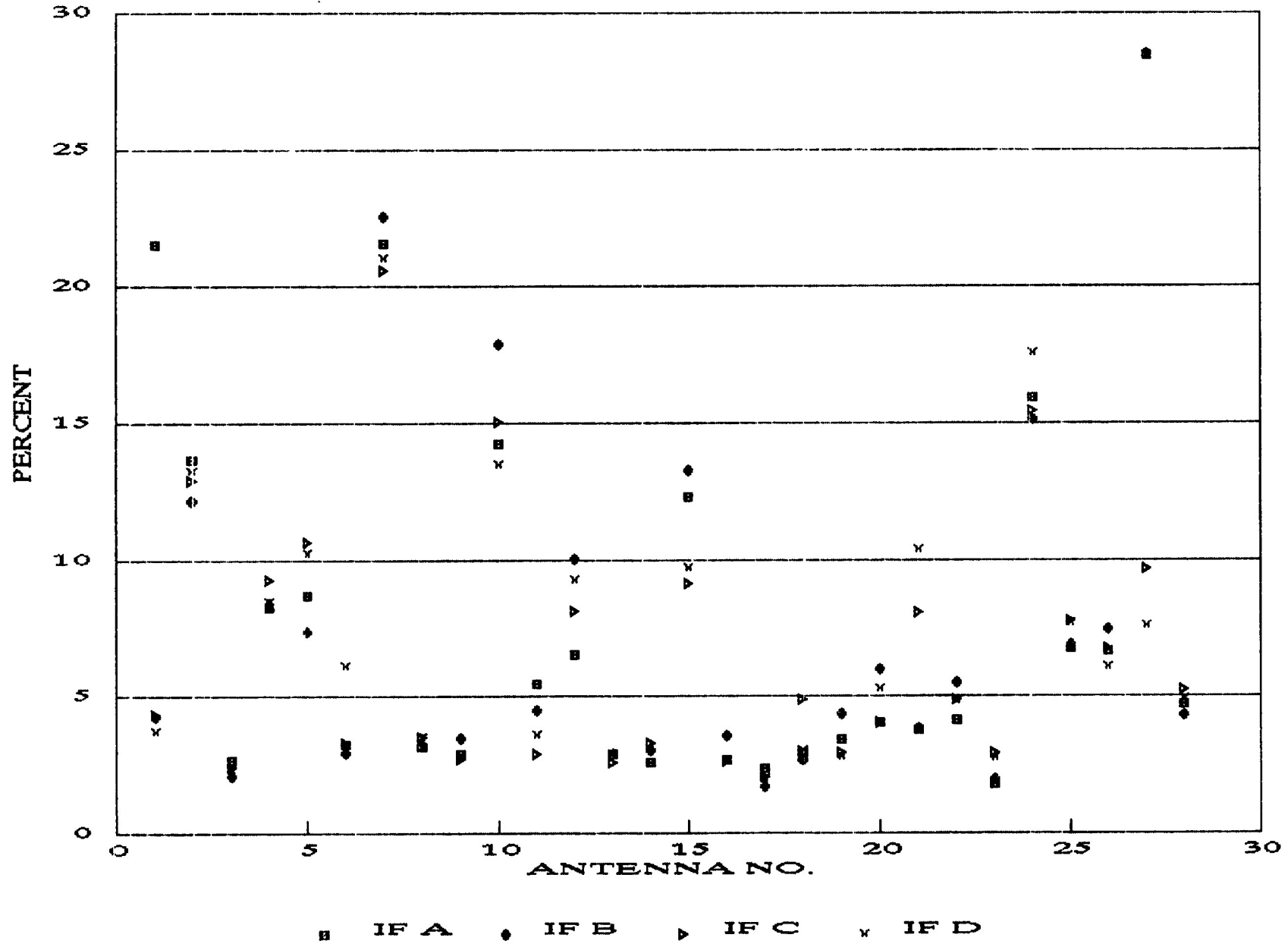
Figure 5

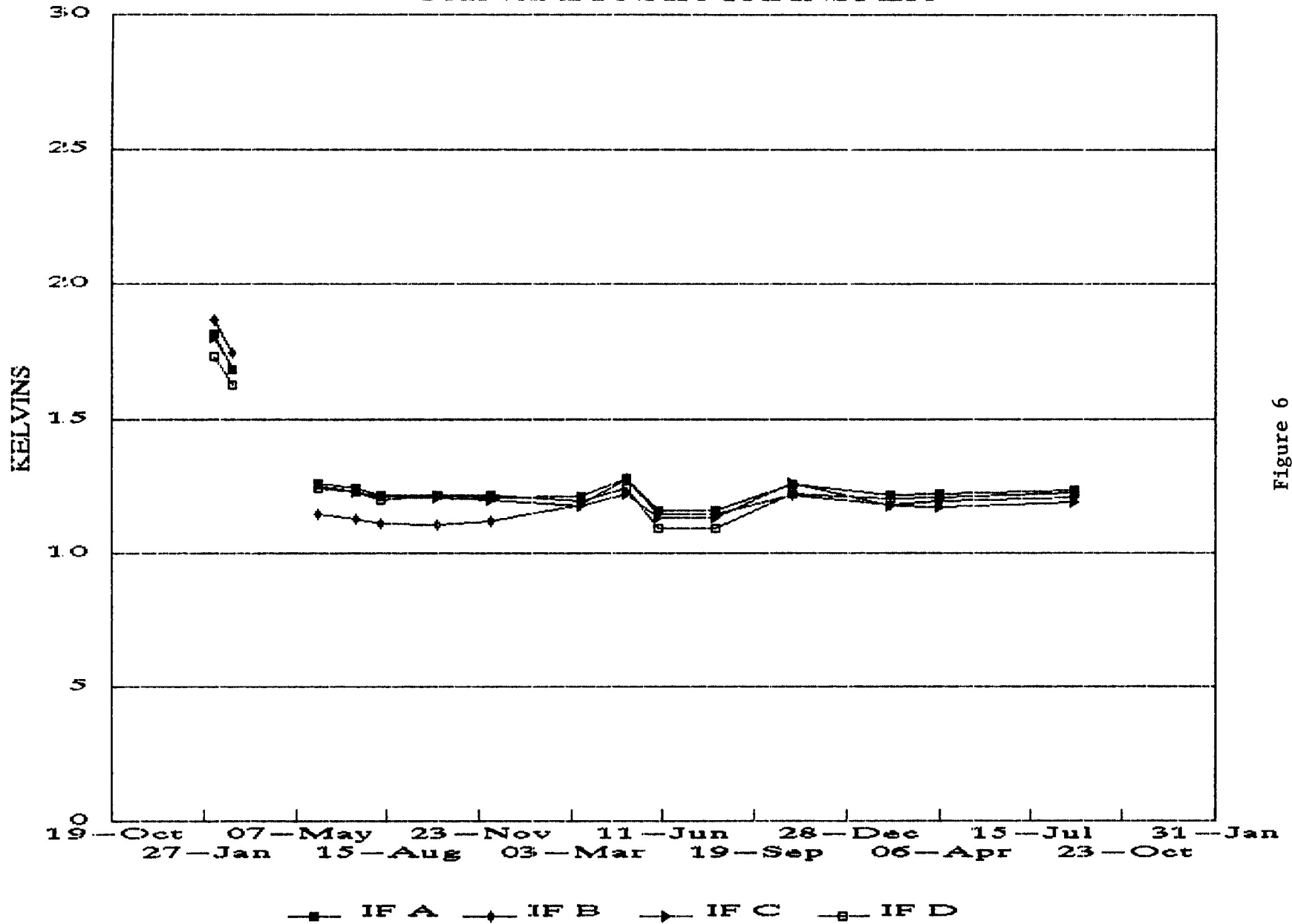# K—BAND ANTENNA 10
Tcal via LUNAR TRANSFER

Figure 6

K—BAND ANTENNA 11
Teal via LUNAR TRANSFER

Figure 7

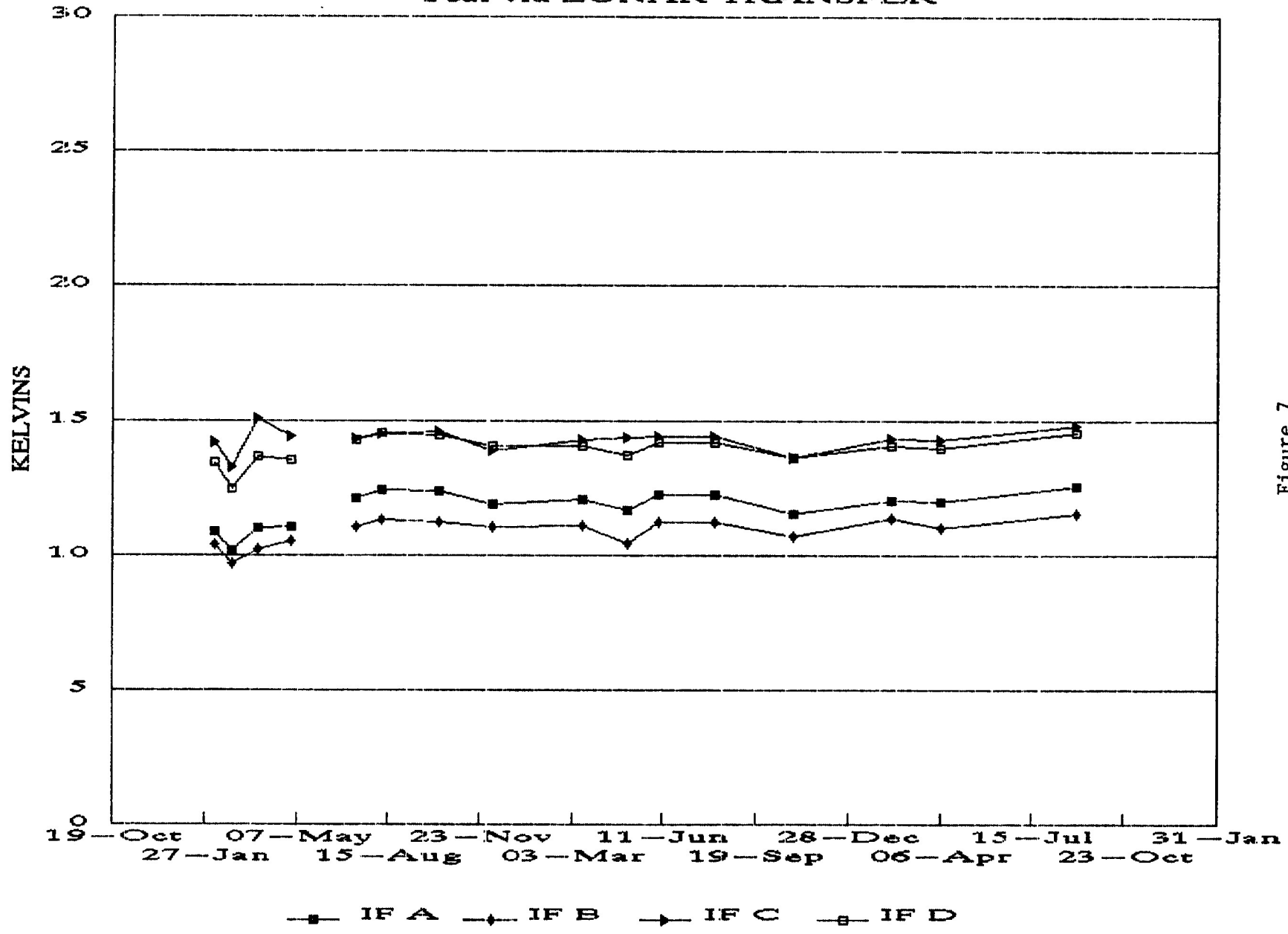IF A   IF B   IF C   IF D
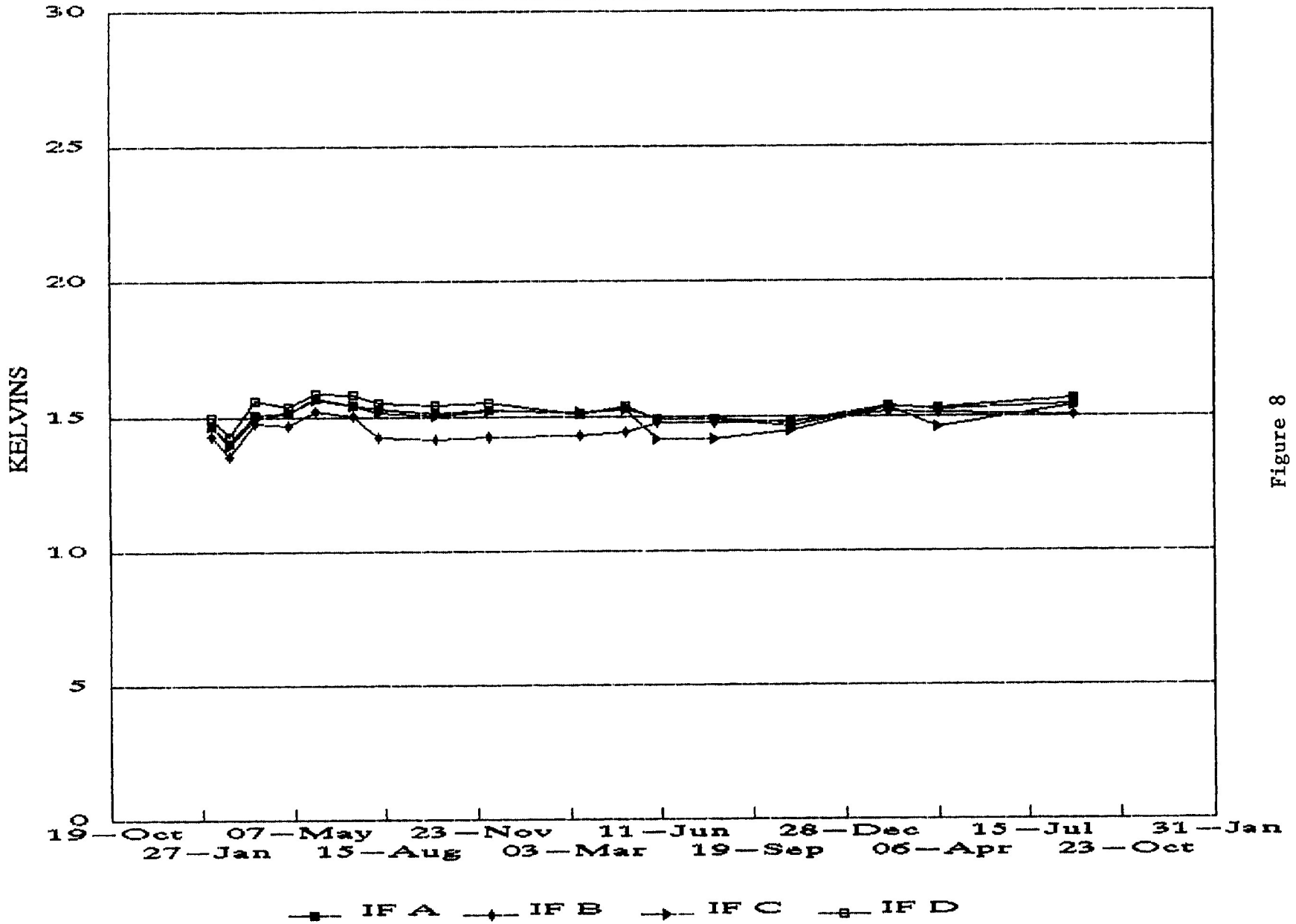
K—BAND ANTENNA 14
Teal via LUNAR TRANSFER

Figure 8

K—BAND ANTENNA 24
Tcal via LUNAR TRANSFER

Figure 9

KELVINS

IF A   IF B   IF C   IF D