

A Note on the DCPR Downlink Frequency Offset from GOES-13/14

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Discussion

The DCPR downlinks on the GOES N/O/P series satellites were designed to be approximately 2.6 kHz lower in frequency than the nominal Domestic band center frequency of 1694.500 MHz. (This was done to improve the performance of the frequency translation in the DCPR transponder.) Measurements of this downlink frequency on GOES-13 and GOES-14 during Post Launch Testing (PLT) have shown the actual downlink frequency at the time of those measurements was slightly lower by a few tens of Hertz. It is expected that the GOES-P spacecraft will be similar.

A question was raised concerning this frequency difference because of DCS plans to reduce the intended DCPR channel width to be only 750 Hz wide. A shift of about 2.6 kHz in the DCPR downlink frequency would therefore cause all channels in this downlink to be more than three full channels removed from the frequencies at which they were expected.

An examination of the full DCPR receive process has shown that this frequency offset is automatically corrected at all DCPR receive systems. All channels will be adjusted to appear at their expected frequencies; except for the amount that each of the DCPR uplink transmitters is off of its allocated frequency.

The receive path at all DCPR receive stations includes a frequency adjustable downconversion in which the DCPR pilot is automatically located, locked to, and adjusted to an exact, known, frequency, e.g. 5,000,000 Hz. This process is necessary to compensate for Doppler shift, and the satellite aging and temperature effects, which would otherwise limit the range of the frequency drift by the DCP transmitters that can be tolerated by the system.

The ability of a receive system to find and lock to the pilot and the length of time needed to accomplish it can be affected by the downlink frequency offset and therefore could be improved by a more accurate knowledge of the actual frequency of that downlink.

Recommendation

It is recommended that NOAA publish the information that the DCPR downlink channel center frequency for GOES-13 and GOES-14 is approximately 2.60 kHz lower than its formal listing at 1694.4474 MHz.

It is suggested NOAA consider placing this information on the DCS web site and by making it an agenda item at the next DCS Manufacturers Meeting