The International Beacon Satellite Symposium *BSS2010*
P. Doherty, M. Hernández-Pajares, J.M. Juan, J. Sanz and A. Aragon-Angel (Eds)
Campus Nord UPC, Barcelona, 2010

DRABIT PAYLOAD : A NOVEL CONCEPT FOR ONBOARD COHERENT BEACON TRANSMITTER

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Key words:

Abstract. This paper presents the design aspects of a novel and low cost coherent beacon transmitter, being developed as Radio Beacon for Ionospheric Tomography (RaBIT) payload. One of the attractive features of this payload is that the design uses Commercial Off The Shelf (COTS) industrial grade components.

In the conventional beacon transmitters, the coherent frequencies are generated from a single crystal oscillator using the multiplier technique. This technique generates harmonics and sub-harmonics which require sharp filters to remove them. In the present design, the technique of frequency synthesis is adopted for the coherent carrier generation that avoids the requirement of sharp band pass filters. The basic source is a coaxial resonator oscillator (CRO) at a higher source frequency of 1200 MHz, which is divided by 3 and 8 to give 400 MHz and 150 MHz respectively. Thus instead of two separate multiplier blocks, as in the former case, a single synthesizer IC takes care of the signal generation, thus simplifying the circuitry, along with the major advantage of avoiding custom-made band pass filters. By using partially matched, highly efficient power amplifiers that require minimum matching, good repeatability is ensured, in addition to ease of design and testing methods. The entire circuit works on 3.3V, which effectively reduces the current consumption and power dissipation of the transmitter.

The major specifications of the transmitter include
- Frequency : 150MHz & 400MHz
- Frequency Stability : ±0.05ppm
- Power Output : +30dBm typ.
- Output VSWR : 10:1

- Weight : 800gms

The outputs are then fed to a combiner so as to have a single feed point for the novel dual frequency deployable antenna. A single dipole antenna with TRAPS introduced at appropriate distance from the feed point on either side will enable the dual frequency operation, apart from reducing the real estate required onboard.