

A Double-Conversion Receiver Sub-system for Satellite Based Navigation

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ABSTRACT

Satellite based navigation is fast emerging as a major satellite application. The International Civil Aviation Organization (ICAO) member states have endorsed the Global Satellite Navigation System (GNSS) as the major future system for aviation. Airport Authority of India and ISRO will implement this system for Indian airspace through an indigenous satellite and ground enhancement. The said Receiver, whose input frequency is in the C-Band and output frequency is in the VHF band, will be used in this satellite as part of the system for introduction of satellite based communication, navigation, surveillance and Air Traffic Management. In augmentation of the existing GPS, the system would achieve a positional accuracy of 5 meters for precision landing of the aircrafts. This paper discusses the design and achieved test results of this Receiver which is proposed to be shortly flown in space.

Being a part of the navigation payload, the Receiver has been designed as a satellite sub-system to meet the G/T requirements of the transponder. The design has been optimized for space application keeping minimum weight and footprint occupancy. Individual sub-circuits have shown good agreement with the simulated results and the integrated performance of the Receiver presents a Noise Figure of 1.8 dB with a full-band flatness of 0.1 dB.

There was some criticality in the spurious rejection which was predicted during simulation and solved subsequently, meeting all the targeted specifications comfortably. The final assembly weighs 1.7 kg with a power consumption of less than 5 Watts. The double-conversion Receiver with its high gain, excellent linearity, low power consumption and large dynamic range is adaptable for any onboard application for navigation and communication payloads. The subsystem has met all the EMI/EMC performance requirements and is capable of being flown on any type of space platform or launch vehicle.

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