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Utilizing Off-the-Shelf Parts for the Next Generation of Space Exploration

Common components are evaluated for use in an orbiting Ku-band polarimetric scatterometer that will enable measurements of near-surface wind speeds for over 90% of the ice-free oceans. Designed as a successor to Seawinds, the new design requires two RF chains be closely matched to attain adequate performance. Off-the-shelf DBS (Direct Broadcast System) and telecom components have significant potential to reduce development and equipment costs. However, space flight systems have requirements that are qualitatively different from the commercial or consumer applications for which the majority of new RF products are developed. Furthermore, the 13.402GHz center frequency for scatterometers is somewhat higher than the commercial 12GHz DBS band. Consequently, Jet Propulsion Laboratory (JPL) has taken the next step to test and evaluate these parts, and at present, work reports on RF performance measurements of selected commercial Monolithic Microwave Integrated Circuit (MMIC) components are encouraging and appear suitable for space applications.

For evaluation, two MMIC LNAs (Filtronic, part #LMA246 and Triquint, part #TGA8399B) and one mixer (Remec, part #MM84MS-14) were selected. Test fixtures were constructed for the MMIC parts, which were then carefully examined in several test setups. Both dual and single chain configurations were necessary to completely define

each component, where tests such as noise figure and gain of the Ku-band amplifiers were completed. Of more importance to the polarimetric application, the stability of relative phase and gain tracking with respect to temperature was extensively characterized in a variety of candidate LNA/mixer configurations. While the initial RF evaluation looks promising, further evaluation of these parts (radiation tolerance, reliability, etc.) will be required for flight qualification.

Commercial, off-the-shelf (COTS) parts, in space applications are especially encouraging when the possibility of capitalizing on the extensive development for high-volume consumer applications is considered. Other applications for MMIC parts in space could possibly open new doors in the future.