Abstracts

Ranging and Data Transmission Using Digital Encoded FM-"Chirp" Surface Acoustic Wave Filters

J. Burnsweig and J. Wooldridge. "Ranging and Data Transmission Using Digital Encoded FM-"Chirp" Surface Acoustic Wave Filters." 1973 Transactions on Microwave Theory and Techniques 21.4 (Apr. 1973 [T-MTT] (Special Issue on Microwave Acoustic Signal Processing)): 272-279.

A digital encoded multislope chirp modem/demodem unit has been implemented using two 3-port surface acoustic wave filters. Each filter operating at a 30-MHz center frequency provides either positive or negative slopes as digital 1's or 0's with a time-bandwidth product of 280, an unweighed bandwidth of 5.6 MHz, and a time dispersion of 50 µs.The modems were used to calibrate and compare the operational performance of the conventions multitone CW ranging system with a multislope chirp ranging system. Range measurements and range-rate observations were made to a synchronous satellite with both systems using a ground communication satellite terminal. Both ranging techniques provided accuracies well within the predictable satellite range of 20,000 nmi; the multitone system provided a theoretical range resolution of 1 m, and the chirp system 0.4 m. Data transmission was also accomplished, using 12-bit binary code at a 1.25-Mbit rate. The significant advantage to be noted with the chirp system is the ability to obtain continuous range data from the satellite repeater simultaneously while other modes of information are being transmitted, and to combine the ranging and data-link transmission on a time-order basis using digital encoded chirp sequences. The chirp system was found the more desirable technique, since it provides a more direct range measurement, with minimal calibration requirements, and provided greater processing gain with relative ease and reliability. The data transmission at low data rates provided little deterioration in theoretical compressive gain. However, at the higher data rate a greater loss was encountered due to power sharing of the overlapping chirp coded carriers in the limiting satellite.

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