A Correlator Chip for Spaceborne Radiometry

Constantin Timoc
Spaceborne Inc.

Summary

The S2000S128C is a digital correlation spectrometer comprising a digitizer and an auto-correlator on a single chip. The digitizer is used in conversion of noise-like signals to 2-bit/4-level digital signal. The S2000CS128 is provided with 4 frequency counters which contain information necessary for auto-calibration of the digitizer. The digitizer includes 16-bit DACs used to set the threshold voltages for comparators during auto-calibration by a computer software. The computer is connected to the digitizer through a serial interface. The auto-correlator calculates 128 points of the correlation function of two digitized signals. The spectrometer employs a 4-level quantization scheme with weighting factors of (-3,-1,+1,+3) and a modified 2x2 bit multiplication table to achieve a sensitivity of 87%. The S2000S128C uses parallel processing with a time multiplexing factor of 2 to achieve an effective signal bandwidth of 2 GHz at a clock frequency of only 2 GHz. Each lag comprises a 2x2 bit multiplier, a 4-bit accumulator, a 32-bit counter, and a 32-bit buffer shift register. Several chips can be cascaded to construct spectrometers with more than 128 lags. The chip is powered from a 1.8 V supply and dissipates 4.5 W at a sampling frequency of 2 GHz