

Radar subsystem upgrades simplified with DPCSS retrofit

Challenge

Air Navigation Services Providers (ANSP) worldwide face difficult technical and budgetary decisions: whether to upgrade or replace their radar systems with analog or digital technology.

The decision involves their existing fleet of aged analog Air Traffic Control (ATC) radar systems. Based on 1980s Surface Acoustic Wave (SAW) technology, the lifecycle of these radars is nearing an end and they are on the brink of obsolescence.

Entirely replacing the existing ATC radar systems with new Airport Surveillance Radar (ASR) equipment is prohibitively expensive. Replacing only the key subsystems with another analog system makes little sense because modern digital platforms deliver significant increases in radar detection and performance.

What the ANSPs need is a modern, reliable and cost-effective retrofit subsystem that guarantees comparable (or better) radar detection and performance – without relying on obsolete SAW technology.



Solution

The team at Rakon recognized the challenge and developed the Digital Pulse Compression Sub-System (DPCSS). The solution is purpose designed for retrofitting or upgrading existing SAW based pulse compression radars. The DPCSS delivers a remarkable improvement in overall system performance and extends the life of the ATC radar systems.

Since the DPCSS is form, fit and function compatible with the old analog sub-system, existing radars are able to be upgraded very quickly.

Due to a powerful and scalable Field Programmable Gate Array (FPGA) based digital technology, the radar performance achieved was close to the theoretical limits, enabling improved aircraft detection. The DPCSS's performance improvements include the following: a higher instantaneous dynamic range (5dB improvement in side lobes), higher accuracy angular measurements (main lobe without base widening), higher flexibility (programmable parameters enabling customization in waveforms and software upgrades) and repeatable performance from one device to the other – as well as across the full operating temperature range.

Result

Rakon's DPCSS has become the leading solution to fulfil the growing demand for radar maintenance and life extension in almost all countries requiring a retrofit solution. The DPCSS delivers increased performance, simplified maintenance and extends the life of analog ATC radars.

As a key technology partner with lengthy radar retrofit experience, Rakon is also able to provide additional embedded functions, including the following: signal generation in the CoHo/RFLO/STALO, IF amplification, pulse compression and detection at the receiver.

Digital Pulse Compression Sub-System (DPCSS)

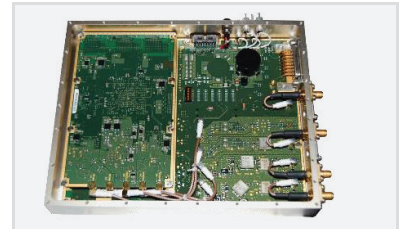
The CIF0x series may be used as a replacement for existing SAW based pulse expander and/or compressors to overcome device obsolescence or enhance radar performance. The series has compressor behavior and performance which is reproducible from one unit to the other. No matching is needed. The CIF0x series of products can also be customized to match linear or nonlinear chirps to generate compressed pulse. A pulse compression filter is customized according to the characteristics requested by the customer (chirp duration, bandwidth, compressed pulse width, chirp slope etc.). The expander and compressor modules are provided with FPGA firmware loaded, including waveforms and pulse compression filters.

Features

- Single or dual channel: expander or compressor for each channel
- Single or dual IF analog inputs / outputs
- High precision clock
- BITE function
- High bandwidth and time dispersion gain

Applications

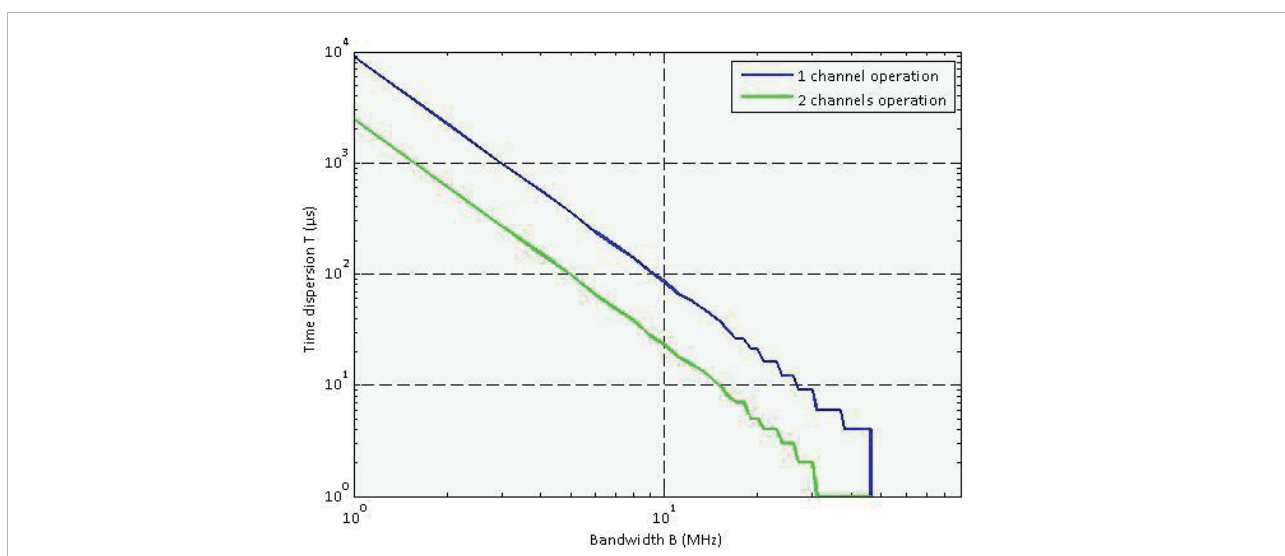
- SAW Based Pulse Compression Radar Upgrade



DPCSS Range Selection

Model	High B x T Compression Gain	Differentiation
CI F06	<ul style="list-style-type: none"> ▪ T up to 950 μs (B < 3 MHz, single channel) ▪ T up to 170 μs (B < 7 MHz, single channel) ▪ T up to 17 μs (B < 20 MHz, single channel) 	185 x 152 x 27.1 mm A digital expander and a digital compressor with IF analog I/O in a single unit
CI F05 CI F04	<ul style="list-style-type: none"> ▪ T up to 950 μs (B < 3 MHz, single channel) ▪ T up to 170 μs (B < 7 MHz, single channel) ▪ T up to 17 μs (B < 20 MHz, single channel) 	185 x 152 x 27.1 mm CI F05: A digital dual channel compressor with IF analog I/O, and performance matched filtering of a radar return signal CI F04: A stand-alone digital single channel compressor with IF analog I/O, and performance matched filtering of a radar return signal
CI E03	<ul style="list-style-type: none"> ▪ T up to 950 μs (B < 3 MHz, single channel) ▪ T up to 170 μs (B < 7 MHz, single channel) ▪ T up to 17 μs (B < 20 MHz, single channel) 	120 x 75 x 10 mm A digital dual pulse compression module, well suited for radar performance enhancement

Maximum Bandwidth and Time (B x T) Compression Parameters



Customized Solutions

Rakon can develop customized solutions for your unique requirements.