Pulse Compression for weather radars, practical implementation and case studies

Martin Malkomes, Matthias Toussaint, Dietmar Veerkamp

GAMICmbH, Aachen, Germany

Abstract

Over almost 20 years the pulse compression concept has been discussed, analyzed and tested in a number of cases. Pro- and con’s have been discussed, but operational use is still rare. This technology, which is widely in use in ATC (air traffic control) radars, dealing with point targets, can be used in the weather radar application too, provided a few design criteria are carefully dealt with:

1. Careful design of the pulse modulation functions – this to push down range-time side lobe artifacts
2. Use of a combination of a dual pulse scheme combining a leading short pulse and a modulated long pulse – this short pulse to cover the blind zone of the long pulse near the radar. The long pulse, to provide enough energy to cover the range requirements

With these processing requirements fulfilled, GAMIC has successfully supported a number of operational weather radar installations: C-band radars using solid state transmitter (SST), X-band transportable radars using TWT transmitters and S-band ATC radar weather extractors for SST and Klystron radars.

With this experience, it can be stated that the Pulse-Compression concept is well suited to provide a good low cost alternative to Magnetron and Klystron radars for short or medium ranges.

The paper will present the processing concept and case studies.