

**Workshop on Advanced Weather Radar Signal Processing
& Dual Polarization**

Holiday Inn Hotel, Düsseldorf - Neuss

13th to 15th September 2005

Course Objectives

“If the radar is the body, then the signal processor is the brain”

This or similar striking remarks are often-used to explain the role of signal processing for weather radar application in a short and expressive manner to those who are not yet familiar with the business. Although such sentences provide a little simplified view, they clearly underline the importance of the signal processing, or more generally processing as a part of an integrated system.

Weather radar signal processing is not only a fascinating world in itself but also one of the most challenging and fastest growing fields of radar meteorology. Signal processors follow the rapid growth of the computer technology. New DSP generations are breaking all benchmark records year-by-year whereas the development times are getting shorter and shorter. Meanwhile, even high-complex algorithms like for instance high-resolution DFT-based data calculations are performed in realtime on commercial-off-the-shelf platforms. The new generations of weather radar signal processors are at the door. Processor Upgrade initiatives are executed all-over the world, the RDA development project, which is currently implemented by the US National Weather Services, is just one example.

This intensive short course opens with an overview of basic weather radar signal processing principles and its application for weather observation as well as quantitative measurements. The goal is to develop a profound understanding of the fundamental signal processing operations. This provides the basis for in-depth study of advanced signal processing techniques.

The workshop will then focus on the sophisticated, state-of-the-art signal processor designs and algorithms, including e.g. FFT, DFT, multi-trip recovery, and adaptive clutter filtering. Each topic should reflect on the concept, the application and the pros & cons. The latest status of polarimetric signal processing technology is presented as well.

The course closes by tying the concepts together through descriptions of a variety of applications and sample data.

Who should attend?

Meteorologists, engineers, scientists, managers, technicians and other professionals who are interested in the operation, development and evaluation of modern radar signal processors should attend. The course will be especially beneficial to those who have a basic understanding of radar system principles and wish to dig deeper into the concepts, algorithms, performance, and limitations of the signal processing portion of the overall weather radar system.

The workshop reports on the latest news, trends and developments in weather radar signal processing. Thus, it would especially be valuable for those who plan to invest into new weather radar systems and/or signal processing technologies in the near future. Opportunities will be given to evaluate the corresponding AMS – Gematronik products in-depth.

Although there is no specific prerequisite for the workshop, participants should have a basic understanding of elementary radar theory and signal processing principles

What will be discussed?**Radar and Signal Processing Basics**

- Basic radar concept
- Detection theory and radar equation
- Doppler processing
- Basic architecture of digital receivers and signal processors
- Coherent detection implementation
- Signal sampling and quantization
- IF signal processing

IF Signal Processing

- IF frequency levels, IF bandwidth & dynamic range, IF sampling
- Matched filtering
- Automatic frequency control (Magnetron), Transmitter Reference (Klystron)

Video Processing

- Calculation of parameters: reflectivity, radial velocity, spectrum width
- Pulse-Pair Processing, FFT, DFT
- Signal detection, target and clutter characteristics, signal-to-noise ratio
- Clutter correction: thresholding, filtering (IIR, DFT, statistical, adaptive, decision-tree/fuzzy-logic)
- Reflectivity Calibration, Receiver Response Curve
- Data output to the remote post-processing units

Mitigation of range/velocity ambiguities

- PRF/PRT staggering, velocity unfolding
- Multi-trip recovery

Advanced radar concepts & processing

- Phase/Frequency agility
- Pulse Compression

Polarimetric Processing

- Basic design of polarimetric radars, implementation requirements
- Co-polar and cross-polar variables
- Improved attenuation correction
- Estimation of Rain Drop Size Distribution
- Improvements of precipitation measurements
- Hail identification
- Hydrometeor Classification

Common User Requirements & Benchmarks

- General signal processor features
- Hardware & Software requirements
- Open architecture & interfaces, Networking capabilities
- Separation between real-time signal processing and data post-processing

Processing example

Step by step processing of one typical data set and discussion of results and possible errors

Workshop Registration Form
September 13th – 15th 2005**1. Who will be attending:****Attendee 1**

First Name:
Name:
Email:
Phone:
Fax:

Attendee 2

First Name:
Name:
Email:
Phone:
Fax:

3. Hotel Accomodation

Holiday Inn Hotel
Anton – Kux – Str. 1
41490 Neuss
Germany
Tel.: +49 (0) 2131 – 184 0
Fax.: +49 (0) 2131 – 184 184
Email: neuss@holiday-inn-hotel.de
www.holiday-inn-hotel.de

A limited number of rooms incl. breakfast is available at a special Gematronik rate of 95 Euro/person & night (until August 2005).

Please contact the Holiday Inn Hotel directly for your reservations.

Attendee 3

First Name:
Name:
Email:
Phone:
Fax:

2. Your Organization:

Name:
Address:

Zip Code:
City:
Country:

4. Method of payment:

September 13th – 15th 2005, 3 Days

Workshop incl. Lecture Material, Lunch and Refreshments: 500 EURO (ea.)

Total amount Due: EURO

- 1) Enclosed is check # payable to AMS - Gematronik GmbH.
- 2) Money transfer to
Commerzbank AG Düsseldorf
BLZ: 300 400 00
Acc. No.: 44 00 420
- 3) Send Invoice to:
Organization:
Attn.:
Address:

Zip Code:
City:
Country:

Details on the Workshop are available at www.gematronik.com.

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