Location

CCG-Center, Technologiepark Argelsrieder Feld 11,
D-82234 Wessling-Oberpfaffenhofen

A list of nearby accommodations, a description of the location and hints for travel will be mailed to the participants upon registration. Please make your own hotel accommodation.

Fee

EUR 2.195,--
CCG is a non-profit organisation, exempt from value-added tax in Germany. For foreign seminar locations the local tax regulations are applicable.
Members of CCG receive a discount of 10 %. Where several employees from one company / office apply for the same course, each participant will receive a discount of 10 %. For students special rates are available on request. Discounts cannot be combined.

Please pay by non-cash means after receiving the invoice.

Registration

Please write or call (up to 3 weeks before the seminar) to
Carl-Cranz-Gesellschaft e.V.; Argelsrieder Feld 11, D-82234 Wessling
Tel. +49 (0) 8153 / 88 11 98 -12, Fax -19, E-Mail: anmelden@ccg-ev.de
Internet: www.ccg-ev.de

After receipt of registration, a confirmation letter will be sent.

Further Information

For more information about our organization please do not hesitate to contact the CCG at Oberpfaffenhofen at the phone number given above.
For more information on the content of the seminar please contact

Prof. Dr. Irena Hajnsek, DLR, German Aerospace Center
Oberpfaffenhofen, D-82234 Wessling
Phone: +49 (0) 8153 / 28-2363, E-Mail: irena.hajnsek@dlr.de

Substitutions and Cancellations

Substitutions may be made at any time. Cancellation of an accepted registration made up to 10 days prior to the start of the seminar is subject to a EUR 25,-- administrative fee. Participants canceling after that date are responsible for the entire seminar fee.
CCG reserves the right to cancel a course up to 10 days before the course's beginning in case of low number of participants or for other significant reasons. Furthermore, CCG reserves the right, against the announcement in the programme, to possibly replace at short notice a lecturer and also the lecturer's topic. Any claims for damages shall be excluded.

SAR Principles and Application

Focus

The course provides a thorough introduction to Synthetic Aperture Radar (SAR) and its applications, including basic SAR principles and practical design examples of both airborne and spaceborne SAR systems. The signal processing techniques and algorithms required to produce a radar image are fully described and various applications of SAR polarimetry, SAR interferometry, polarimetric SAR interferometry and differential SAR interferometry will be introduced. Tools and methods are presented for SAR data analysis and image interpretation. Further, new satellite concepts and DLR airborne SAR activities are presented.

Who Should Attend

Engineers and scientists from all branches of the aerospace and radar industry and geosciences research community interested in the theory, design and application of active imaging radar.

Material

Each attendant will be provided with detailed course material in English.

Language

English

Lecturers

Richard Bamler	Prof. Dr.	Remote Sensing Technology, DLR,Oberpfaffenhofen
Yves-Louis Desnos		ESA, ESRIN, Frascati (I)
Irena Hajnsek	Prof. Dr.	Microwaves and Radar Institute, DLR, Oberpfaffenhofen ETH Zürich (CH)
Sven Jacobsen	Dr.	Remote Sensing Technology Institute, DLR, Bremen
Helmut Rott	Prof. Dr.	University of Innsbruck (A)
Achim Roth		German Remote Sensing Data Center, DLR, Oberpfaffenhofen
Alessandro Ferretti Alessio Rucci		TRE ALTAMIRA Srl, Milano (I)
Stefan Baumgartner	Dr.	
Ronny Hänsch	Dr.	
Ralf Horn		Microwaves and Radar Institute, DLR, Oberpfaffenhofen
Gerhard Krieger	Prof. Dr.-Ing.	
Alberto Moreira	Prof. Dr.-Ing.	
Kostas Papathanassiou	Dr.	
Giuseppe Parrella	Dr.	
Pau Prats	Dr.	

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Sensorik / Erkundung

Seminar SE 2.06

SAR Principles and Application

October 25 – 29, 2021
Oberpfaffenhofen near Munich

Scientific Coordination

Prof. Dr. Irena Hajnsek
DLR, German Aerospace Center
Oberpfaffenhofen

Seminar Outline

Monday, October 25, 2021
10.15 – 17.45

10.15 – 10.30 Introduction

10.30 – 12.00 **SAR Basics**
A. Moreira, P. Prats
Basics of imaging radar incl. principle of SAR signal and image formation · Overview of applications and existing air- and spaceborne systems

13.00 – 14.30 **SAR Theory**
A. Moreira, P. Prats
Basic theory for SAR signal modeling and processing · Point and distributed targets, SAR signal and image properties · Overview of SAR systems and technologies

15.00 – 16.00 **SAR Theory** (cont.)
A. Moreira, P. Prats

16.15 – 17.45 **Advanced and Future SAR Systems**
A. Moreira, P. Prats
Overview of future SAR developments and applications

Tuesday, October 26, 2021
08.30 – 17.45

Techniques and Applications

08.30 – 10.00 **SAR Interferometry I**
R. Bamler
Different principles of SAR interferometry and the concept of coherence, DEM generation

10.30 – 12.00 **SAR Interferometry II**
R. Bamler
Achievable accuracy, error sources, fundamental limits, e.g. critical baseline, basics of D-InSAR, SAR tomography

13.00 – 14.15 **ESA SAR missions and their exploitation for science, applications and services**
Y.-L. Desnos
Historical missions heritage, sentinel - 1 constellation in operation, Biomass in development and next generation SAR systems

SAR Principles and Application

14.30 – 16.00 **SAR Polarimetry I**
I. Hajnsek, G. Parrella
Background of SAR polarimetry in terms of fundamentals of wave polarimetry, scattering polarimetry and decomposition theorems · Practical examples

16.15 – 17.45 **SAR Polarimetry II**
I. Hajnsek, G. Parrella
Examples of the potential of SAR polarimetry for quantitative bio/geo-physical parameter estimation

Wednesday, October 27, 2021
08.30 – 16.15

Techniques and Applications

08.30 – 10.00 **Polarimetric SAR Interferometry I**
K. Papathanassiou
Interferometric observables at different polarizations over natural scatters · Main principles and the basic techniques for the coherent combination

10.30 – 12.00 **Polarimetric SAR Interferometry II**
K. Papathanassiou
Application of Pol-InSAR for model based quantitative estimation of physical parameters of different natural scatters by means of various experimental data sets

13.00 – 14.30 **SAR Moving Target Techniques**
S. Baumgartner
Moving target signal properties, influence on SAR imagery, position and motion parameter estimation, single- and multi-channel SAR-GMTI techniques (ATI, DPCA, STAP,...)

15.00 – 16.15 **SAR-Geocoding**
A. Roth
SAR inherent geometric distortions, algorithms, techniques and how these distortions can be corrected • Basics on map projection and cartography as well as different applications

SAR Principles and Application

Thursday, October 28, 2021
08.30 – 16.30

Applications

08.30 – 10.00 **Differential SAR Interferometry**
A. Ferretti, A. Rucci
Impressive precision figures from spaceborne systems · D-InSAR data examples: seismic fault, landslide, volcano, subsidence, monitoring individual buildings and structures

10.30 – 12.00 **Glaciology**
H. Rott
Basics of radar backscattering of snow and ice · Single-pass and repeat-pass InSAR methods for retrieval of snow and glacier parameters · Applications of SAR for snow cover monitoring and studies of ice flow dynamics and glacier mass balance

13.00 – 14.30 **Oceanography**
S. Jacobsen
Theoretical aspects and practical applications · From classic approaches to new machine learning methods to derive maritime information on wind, waves, sea ice, ships, oil spills and underwater topography

15.00 – 16.30 **Land Cover Classification**
R. Hänsch
Machine learning tools for land cover classification · Examples on selected SAR data

Friday, October 29, 2021
08.30 – 12.00

Satellite Concepts and DLR Airborne SAR Activities

08.30 – 10.00 **Innovative SAR Missions and Sensor Concepts**
G. Krieger
Capabilities and limitations of present-day spaceborne SAR systems and missions · New concepts for high-resolution wide-swathSAR imaging · Bistatic and multistatic SAR · Tandem-L

10.30 – 12.00 **DLR Airborne SAR Activities**
R. Horn
System presentation, capabilities and results