



## **Nordic HF Conference**

Fårö Kursgård, Fårö

### **Programme**



THE NATIONAL COMMITTEE  
FOR RADIO SCIENCE  
THE ROYAL SWEDISH ACADEMY OF SCIENCES



It is a great pleasure to again welcome all participants to HF 25, the 14th Nordic Conference on HF Communications. With this conference, we celebrate the 14th consecutive event.

In retrospective, both the conferences and the technology reflected in the papers, presentations and exhibitions have changed markedly during the three decades that have passed since 1986.

With a bit more than 25 years in the HF-business I have had the pleasure to experience a vast change in HF systems technology during these years, from morse code operation and binary FSK to wideband HF and IP integration. Although the commercial use of HF has declined over this time the usage in my field of work, the military usage, has prevailed and even increased. The need for secure communications in a contested electromagnetic environment has become very apparent and HF-communications is an important capability in this aspect.

The unique features of HF: the robustness, the resilience and the ability to work without the dependency on other infrastructure have shown its value in crisis situations. These features together with the continuous strive to make HF a communication asset seamlessly integrated into our information systems make a bright future for HF. The 90s gave us the serial tone modem, the standardized ARQ protocols, the years from 2000 we saw the IP integration picking up speed, in the past 5-10 years we have experienced the move towards wideband HF. It is certainly interesting what will be behind the next corner for HF. Nordic HF is one of the forums where we have a chance to look around the next corner.

Like previous conferences HF 25 promises to be a success with many interesting presentations of new developments and equipment. The aim of the conference is also to provide a meeting-place for discussions among colleagues on the interesting and stimulating field of HF communications. HF 25 is planned to provide ample time for contacts and informal meetings among the participants. We strongly encourage all to take advantage of these opportunities to meet old as well as new colleagues and friends - informal networks of personal relations are indeed important factors in the advancement of HF technology!

As before, the conference takes place at the Training Camp on Fårö north of Gotland in the Baltic Sea. We trust that the unique surroundings, pleasant climate and the company of old and new friends at the conference will, once again, help to create a friendly atmosphere and a memorable week for the participants and their families.

As usual, the topics of the papers submitted to the current conference show a great diversity, ranging from theoretical analysis to "hands-on" practical experiences. The current conference has a very varied composition covering a lot of the HF aspects. I am very pleased to see that we manage to maintain diversity in the origins of the papers. There are authors from industry, government agencies, university and the user community. This is an important factor for the valuable information exchange at the conference. HF 25 is, as usual, an international conference with English as the official language. The programme offers a substantial number of papers divided into a total of eight sessions, covering most aspects of HF.

The Committees wish to express their sincere thanks to:

Union Radio-Scientifique Internationale (URSI), Swedish National Committee of URSI (SNRV), Nordic Radio Society foundation (NRS), Swedish Defence Materiel Administration (FMV), Combitech AB and others that have provided valuable assistance in the HF 25 organisation.

Finally, we are also deeply indebted to all authors and presenters who have provided the core substance of the conference.

Rickard Berg  
Editor  
Chairman of the HF 25 Programme Committee

## **SNRV - Swedish National Committee of URSI**

SNRV was founded in 1931 as the Swedish National Committee of the International Union of Radio Science (URSI). There are corresponding committees in the other Nordic countries.

SNRV has 20 full members and in addition 2 honorary and about 120 co-opted members. The objective of SNRV is to encourage and promote education, research and development in the radio field. The SNRV is organised in sections in the same way as the URSI Commissions:

- A Electromagnetic Metrology
- F Wave Propagation and Remote Sensing
- B Fields and Waves
- G Ionospheric Radio and Propagation
- C Radiocommunication Systems and Signal processing
- H Waves in Plasmas
- D Electronics and Photonics
- J Radio Astronomy
- E Electromagnetic Environment and Interference
- K Electromagnetics in Biology and Medicine

SNRV and URSI are also in charge of arranging national and international conferences to spread scientific results and to make the radio scientific field a subject of debate.

## **NRS - Nordic Radio Society**

The Nordic Radio Society is a foundation co-operating with SNRV to contribute to the development and increase of the radio technical competence by arranging or initiating various activities within the radio field. Its short form NRS was taken when arranging and sponsoring the Nordic Radio Symposium in 1986 in Saltsjöbaden, Sweden. Six other Nordic Radio Symposia followed: 1989 (Saltsjöbaden), 1992 (Aalborg, Denmark), 1995 (Saltsjöbaden), 1998 (Saltsjöbaden), 2001 (Nynäshamn), and 2004 (Oulu, Finland).

NRS has been active in the arrangement of the Nordic HF conferences at Fårö every 3rd year since 1992.

NRS has also held a number of Seminars on special radio themes for a limited number of participants. Moreover, also Evening Meetings with invited guest on radio topics.

NRS is thus a forum for contacts and exchange of information between experts, scientists, technicians and people engaged in development. The Nordic Radio Society works for the exchange of knowledge between different technical disciplines and between universities and the radio industry.

The members of NRS represent SNRV, radio industry, consultants, defence and universities see: [www.nrs.se](http://www.nrs.se).

Mats Nilson  
Chairman NRS





**SUNDAY**

17:00 – 22:00 Bavarian buffet, sponsored by Rohde & Schwarz.

19:00 – 24:00 The pub is open.

**MONDAY**

07:45 Please gather on the parade grounds for the flag ceremony and official conference opening.

08:00 The flag is raised.

09:00 Instructor-led yoga session. Gather at the flag pole!

15:30 – 17:00 Sightseeing tour on Fårö; buses leave from the garage yard-

19:00 HF 25 concert in Fårö Church (short walk from the camp). Gotland bagpipe and traditional instruments by Lars Kruthoff and Julia Westerberg.

20:00 Exhibitors' party in the exhibition area

19:00 – 24:00 The pub is open.

**TUESDAY**

09:00 Instructor-led yoga session. Gather at the flag pole!

15:30 – 18:00 Foxhunt (Amateur Radio Direction Finding); please assemble in the auditorium.

18:00 “Dricka” (Gotland drinks) served just outside the restaurant and pub area.

19:00 Conference dinner. In a convenient break we will have the prize award for the foxhunt.

19:00 – 24:00 The pub is open.

N.B. Swedish alcohol rules state that the “Dricka” must not enter the restaurant and pub area including the terraces. And wines etc must not exit that area.

**WEDNESDAY**

09:00 Instructor-led yoga session. Gather at the flag pole!

13:45 Bus shuttle leaves for Visby airport (ETA 15:00) and ferry terminal (ETA 15:30). Other transportation can be arranged on your own initiatives – plenty of private cars will leave after lunch.

**EXHIBITORS** (at printing deadline)

Promarine Ltd, Finland	GOMspace, Sweden
Rohde & Schwarz, Sweden	TrellisWare, USA
KNL, Finland	Comrod, Norway
Amtele, Sweden	Grimeton World Heritage Centre, Sweden
W5 Solutions, Sweden	



## SESSION PROGRAMME AND CONTENTS

### Monday, 11 August

<b>COMMERCIAL HF &amp; BROADCASTING (Karl-Arne Markström)</b>		<b>Page</b>
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<b>08:00 – 10:00</b>		
Harald Wickenhäuser	The sad end of radio DARC's HF broadcasts from Vienna by end of 2024 and their happy new start in 2025 from Woofferton (UK)	1.1
Stefan Boesch	Algorithm based arbitrage trading over radio frequencies: RF use cases from a banker's perspective	1.2
Alex Pilosov	Low-latency HF systems: Challenges, system design, technology advancements, spectrum management	1.3
 <b>MODULATION &amp; CODING (Jens Zander)</b>		 <b>Page</b>
<hr/>		
<b>10:30 – 12:00</b>		
Harri Viittala, Matti Raustia and Hannu Tuomivaara	A study of HF communications using a constant envelope modulation	2.1
Mark Jorgenson	Understanding the potential for communication signals exploitation at HF	2.2
Brandon T Hunt, Brian Nelson, Brandon Starks, Hussein Moradi and Behrouz Farhang- Boroujeny	Noncontiguous Spread-Spectrum Communications for Robust High Frequency Links	2.3
 <b>FIELD TRIALS (William Batts)</b>		 <b>Page</b>
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<b>13:30 – 15:00</b>		
Bertrand Ravera and Jean-Yves Bernier	HF-XL sea transmissions experimentation between frigates	3.1
Axel Meiton	Challenges with radio communication in the polar regions: Experience from working on a scientific icebreaker in the Arctic and Antarctica	3.2
Aatu Koivisto and Kalle Kantola	Field trial results of CNHF1 radios using IP networking over HF	3.3

## SESSION PROGRAMME AND CONTENTS

### Tuesday, 12 August

<b>ROBUST WAVEFORMS (Jürgen Escher)</b>		<b>Page</b>
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<b>08:00 – 09:00</b>		
Stephan Isebeck and Alex Berger	Extensions to the MIL-STD-188-110D / STANAG 5069 to cater for contested spectrum scenarios in a GPS denied environment	4.1
Ian Venter and Stephan Isebeck	Extensions to MIL-STD-188-141D WALE waveforms	4.2
<b>EMC &amp; MEASUREMENTS (Henrik Olsson)</b>		<b>Page</b>
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<b>09:00 – 10:00</b>		
Karl-Arne Markström	Field measurements of emissions in the HF range from consumer-grade solar-power installations	5.1
Petter Gärdin	The rising electromagnetic threat to military operations caused by civilian infrastructure	5.2
<b>ANTENNAS (Rolf Gustavsson)</b>		<b>Page</b>
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<b>10:30 – 12:00</b>		
Jens Zander	Simple HF antenna efficiency comparisons using the WSPR system	6.1
Jens Zander	Simple HF antenna pattern measurement using low-cost UAVs	6.2
Harald Wickenhäuser	Common mode currents (“Sheath Waves”) – Baluns – Radiation patterns	6.3
<b>SPECTRUM MANAGEMENT &amp; INTERFERENCE (Olov Carlsson)</b>		<b>Page</b>
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<b>13:30 – 15:00</b>		
Klaus Eichel and Andreas Lock	ENAMS – A high-resolution radio noise field strength monitoring system: 5 years of operation – Results & outlook	7.1
Sara Linder and Kia Wiklundh	Noise and interference in the HF band	7.2
Rickard Berg and Jonas Mentzer	Spectrum sharing in four dimensions	7.3

## SESSION PROGRAMME AND CONTENTS

### Wednesday, 13 August

<b>SYSTEM &amp; TECHNIQUES (Susan Trinder)</b>		<b>Page</b>
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<b>08:00 – 10:00</b>		
Steve Kille	Transparent switching between HF and fast IP	8.1
Jaco Boshoff, Stephan Isebeck, Alex Berger and Ian Venter	IP Data over WBHF packet waveform	8.2
Alfons Sailer, Tobias Blersch, Albert Haug and Jürgen Escher	Real life experiences with direct sampling HF radio systems	8.3
Jonas Mentzer	HF broadcast communications using wideband and staring receiver techniques	8.4
<b>PROPAGATION &amp; MODELLING (Harald Wickenhäuser )</b>		<b>Page</b>
<b>10:30 – 11:30</b>		
<hr/>		
Maria Elenius, Eric Corrigan and Gunnar Eriksson	HF propagation modelling with parabolic equation techniques	9.1
Paul Hirschausen, Brian Ng and Jack Sudarev	A node-centric analysis of channel congestion in HF ALE networks	9.2
<b>CLOSING OF CONFERENCE</b>		
<b>11:30 – 12:00</b>		
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Best Paper award and thanks to all contributors (authors/presenters, organisers and sponsors)

### LIST OF AUTHORS

<b>Author</b>	<b>Organisation</b>	<b>Page</b>
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**SPONSORS (at printing deadline)**

The HF 25 organisers are very grateful for the valuable sponsorships provided by the following organisations (note – there may be more, but due to printing deadline they may not have made it in time for this list):



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Welcome dinner,

**COMBITECH**

[www.combitech.se](http://www.combitech.se)

Musical entertainment during welcome dinner  
Sunday evening



amtele communication

[www.amtelecommunication.se](http://www.amtelecommunication.se)

Umbrellas



**COMROD**  
*Reaching further*

[www.comrod.com](http://www.comrod.com)

Guided bus tour around the island of Fårö

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Conference bag, food at Conference Banquet,  
Ballpoint pens

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● ● ● ● ●

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Concert in the Church of Fårö

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Printing of Conference Proceedings



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Gift of appreciation by Karin Walde and Best  
Paper Award

**TUTUS**

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Drinks at the conference banquet

**ORGANISING COMMITTEE**

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Erika Larsson	Combitech AB	

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