

Workshop

“Proposed Mechanisms for the Interaction of RF- Signals with Living Matter”

Demodulation in Biological Systems



Organized by



COST 281



FGF E.V.



UNIVERSITY OF ROSTOCK

Program



SCOPE

This workshop will have two main parts:

- Specific discussion on proposed mechanisms of demodulation of modulated RF (Radiofrequency) fields, and
- Summary and conclusions of the last eight workshops organized by FGF, MMF, and COST 281 regarding mechanisms.

DEMODULATION OF MODULATED RF-SIGNALS IN BIOLOGICAL SYSTEMS:

The use of the radio spectrum for telecommunication, Radar and other applications is based on modulated RF-fields – and their demodulation. Demodulation in electro-technics is usually done with special electronic devices: diodes or rectifiers. The search for similar non-linear mechanisms in biology has lasted for several decades – and has not found a clear evidence for such a mechanism. With some exceptions.

Often the cellular membrane came into consideration as a barrier between different fluids and with a limited current flow. Consequently, an electric demodulation at the membrane was found, although limited to a maximum carrier frequency of approx. 10 MHz. Experiments and theoretical considerations show that

at higher frequencies the membrane is bridged, and consequently the electric field is not able to impose a force separately on ions at both sides of the membrane anymore. Recent workshops on this topic proposed other demodulation mechanisms that may apply to the double-layer or molecular dipoles, despite expectations that they are likely to be very inefficient. An update on this topic will be given at this workshop.

Another attempt for demodulation is proposed via the general accepted thermal effect of RF-fields. Assuming a pulse-modulated field, heat inside the biological system is only generated during the pulse period. The well-known “microwave hearing” is based on this mechanism, however, it is valid only for high field strengths and short pulse durations occurring at special Radar and UWB signals, but not with signals used by telecommunication devices.

Nevertheless, several - mainly biological - studies reported modulation-specific effects. For example experiments in the 1970s and 1980s showed a window effect on the calcium ion flux from brain tissue. However, later studies with improved methodology couldn't verify these results, e.g. recently inside the British MTHR programme. All other studies that claim modulation-specific effects have not been replicated independently, but a lot of them also not disproved. An over-

view of all biological studies comparing modulated versus non-modulated field effects will be presented by FGF at this workshop.

A lot of studies dealing with modulation-specific effects are ongoing or were recently finished, e.g. inside the German Mobile Telecommunication Research Programme (DMF), and the British Mobile Telecommunications and Health Research (MTHR). To collect and review methods and results of these experiments will be in the focus of this workshop.

SUMMARY OF MECHANISMS WORKSHOPS:

Eight workshops or seminars were conducted in the last six years dealing with the topic 'How does RF-fields interact with biological matter?': Münstereifel (2000), Dresden (2001), Washington (2001), Rockville (2002), London (2002), Ft. Lauderdale (2004), Zurich (2005), and Stuttgart (2005). Two scientists present at almost all of these events are preparing a summary with the outcome: Kenneth R. Foster and Roland Glaser. Additionally, a monograph with the details of these workshops is currently prepared by FGF.

Both documents will be presented at this workshop in Rostock. To discuss the conclusions of these papers and try to find a consensus among the scientists working in this field is one main goal of the workshop.

The rapporteur of this workshop will report results and conclusions at the planned 3rd Course of the International School of Bioelectromagnetics "Alessandro Chiabrera" in Erice, November 20-26, 2006.



SCHEDULE

(may be subject to on-site changes)

Monday, September 11th

08:15 Registration

09:00 Welcome and Introduction

“Demodulation of Modulated RF-Signals in Biological Systems”

Chair: Quirino Balzano

Chair: Roland Glaser

09:15 **Modulation and Demodulation in Communications**
Tobias Weber

14:15 **Detection of RF Demodulation by living Cells: the spectral Signature Method**
Quirino Balzano

09:45 Discussion

14:45 Discussion

10:00 **Comparison of Biological Experiments with Modulated versus Non-Modulated Fields**
Margarita Simeonova

15:00 **Functional and Molecular Investigations after 1.8 GHz Radiofrequency Electromagnetic Fields Exposure in different immune relevant Cells**
Myrtil Simkó

10:30 Discussion

10:45 Coffee Break

15:30 Discussion

11:15 **Mechanisms of Interaction of Rf-Fields with Biological Systems as related to Modulation**
Kenneth Foster

15:45 Coffee Break

11:45 Discussion

12:00 **Work in the UK relating to Signal Modulation in Biological Systems**
Lawrie Challis

16:15 **High Frequency Electromagnetic Fields (GSM Signals) affect Gene Expression Levels in Tumor Suppressor p53-deficient Embryonic Stem (ES) Cells and ES-derived Neural Progenitor Cells**
Teodora Nikolova

12:30 Discussion

16:45 Discussion

12:45 Lunch

17:30 Harbour Tour

19:30 Workshop Dinner



Tuesday, September 12th

Chair: Lawrie Challis

09:00 Comparison of the Effects of TETRA, GSM, UMTS and Unmodulated Fields on Brain Function in mice

John Tattersall

09:30 Discussion

09:45 Discussion on Demodulation

10:30 Coffee Break

“General Mechanisms of Interaction of RF Fields with Biological Systems”

11:00 Overview on recent Mechanism Workshops

Lutz Haberland

Jan Gimsa

15:15 Discussion

15:30 Coffee Break

11:30 Discussion

11:45 Theoretical Physics and Biology: Nonlinear Molecular Dynamics and Signal Amplification - Relevant for EMF Interactions with Biological Systems?

Friedemann Kaiser

16:00 Studies on the Issue, whether Macroscopic Dielectric Properties of tissues have unlimited Validity in both, Cellular and Subcellular Dimensions

Rudolf Gulich

16:10 Discussion

12:15 Discussion

12:30 Lunch

Chair: *Kenneth R. Foster*

16:20 Radiofrequency Energy Absorption by Planar Lipid Bilayers and Membranes doped with Ion-Channel Oligopeptides

Günter Wrobel

16:50 Discussion

14:00 Integration of Interaction Models in Bioelectromagnetism: from Molecular Dynamics to Cellular Networks

Guglielmo d'Inzeo

17:05 Measurements, Modelling and Mechanisms

Peter Excell

14:30 Discussion

14:45 The Influence of the Dielectric Properties Membranes on the Subcellular RF-Field-Distribution and Absorption

17:35 Discussion

18:00 Visit of the University Church



Wednesday, September 13th

<i>Chair: Jürgen Kiefer</i>	10:30 Coffee Break
09:00 “Non-Thermal” Effects of RF-Fields as a possible Reaction of Molecular Thermoreceptors <i>Roland Glaser</i>	11:00 Discussion on Mechanisms
09:30 Discussion	12:30 Lunch
09:45 Future Directions in Human RF Studies <i>Sheila Johnston</i>	14:00 Visit to Laboratory Facilities at University of Rostock (Working Group Gimsa and Working Group Weiß/Simkó/Mattsson)
10:15 Discussion	16:00 Adjourn

In case of need please contact the following persons:

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Organizing Committee

Gerd Friedrich - FGF

Jan Gimsa - University of Rostock

Roland Glaser - Humboldt University

Frank Gollnick - FGF

Lutz Haberland - University of Rostock

Anette Kellendonk - FGF

**Venue:**

- The workshop will take place in the lecture hall at Universitätsplatz 3, 18055 Rostock ("Großer Physik-Hörsaal"), situated in the backyard of the green building, 2nd floor.
- That's about five minutes walk from the hotel "Am Hopfenmarkt".

Hotel address:

Hotel garni "Am Hopfenmarkt", Buchbinderstraße 10, 18055 Rostock, Phone and fax:
+49 381 - 458 34 43

HOW TO FIND HOTEL AND VENUE:**Local transport:**

- Because the western part of Rostock City is a big building site until October some details in the following information may change till September:

From main station:

- You can reach the hotel "Am Hopfenmarkt" coming from main station by tram no. 5 (direction: *Hafenallee*) or no. 6 (direction: *HP Dierkow*) until station "Steintor". Then you can change to bus for one more station ("Neuer Markt", walking distance to hotel: 200m) or walk directly to the hotel (about 500m).
- You can also walk, it's about 1.2 km: from main station following 200m Rosa-Luxemburg Str., turn to your left and follow 800m Hermannstr. You will reach Wallstr. at its left end coming from the south (please see map).

From airport Rostock-Laage:

- There is a bus shuttle available going to south of the main station (central bus terminal: ZOB). If you arrive with Dau-Air (from Munich, Cologne, Dortmund or Zurich) you will find a timetable at: http://www.rostock-airport.de/site/managed/html/en_shuttle_service.html
- If you arrive with a charter flight you have to book a shuttle bus three days in advance (++49(0)381/40 560-18 or-19) or inform Lutz Haberland by email.
- Taxi fares are about 36€

By car:

- From autobahn A20 choose exit Rostock-Südstadt (15), L132 direction Südstadt. After ca. 7 km in the Südstadt turn right on Südring. After ca. 2km *Am Vögenteich* turn right on August-Bebel-Str. Follow the direction signs "Universität" or parking garage Stadtmitte.
- From autobahn A19 choose exit Rostock-Süd (7), B103 (Tessiner Str.) towards Rostock-Zentrum. In Rostock straight away on Mühlendamm, afterwards Ernst-Barlach-Str. and August-Bebel-Str. Follow the direction signs "Universität" or parking garage Stadtmitte.

