

**Forschungsgemeinschaft  
Funk e.V. (FGF)**

**Research Association for Radio Applications**

**Annual Report 1999**

# Annual Report 1999

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## **Objectives and purposes of the Research Association for Radio Applications**

The Research Association for Radio Applications (FGF, Forschungsgemeinschaft Funk e.V.) looks back upon 1999, a busy and successful year. The objectives and purposes of the FGF, created in its foundation in 1992, were again realized in 1999.

The focal points of the research carried out on the initiative of the FGF are the determination of logical relationships between cause and effect, the formulation of new questions as a result of new scientific findings and scientific reproducibility as well as the direct reference of the acquired knowledge to recent scientific methods and know-how.

To each scientific report ordered and sponsored by the FGF, there is attached an exact set of tasks for the contractor. The corresponding standards were already defined at an early date by the working group for research activities and presented to the public in 1994 by the then President of the Supervisory Board of the FGF, Mr. Georg Langheld (see Annual Report 1992-1998). It must be strongly stressed that the Research Association for Radio Applications deliberately does not take part in speculations and hypothetical judgements, but only makes statements on the basis of scientific results.

With 1.47 million DM, the financial budget for sponsoring did not exactly reach the level of the highest recorded amount (in 1997).

As well as sponsoring scientific research projects, the FGF is also engaged in active public relations. It is the FGF's opinion that the information contained in scientific findings must be made available to the general public, comprehensible to everybody. The FGF meets these standards by a wide range of publications and activities.

An important event related to these standards was held in 1999 in the form of the "Citizens' Forum of Electromog" in Bonn. The FGF actively took part in this forum with a booth on the topic of "Scientific Research". It also published an information brochure, presenting the work and the opinion of the FGF on this important environmental topic.

Other methods of information communication in the FGF are the "Newsletter", the "Edition Wissenschaft", the "Hotline" and the website <http://www.fgf.de>. This variety of media enables experts, as well as the general public, to inform themselves about the activities of the FGF and the biological effects of electromagnetic fields. Free access to results and information is an important part of the FGF's public relations.

The seminars of the FGF were the main events of scientific character in 1999. Altogether, four of these scientific platforms for presentation and

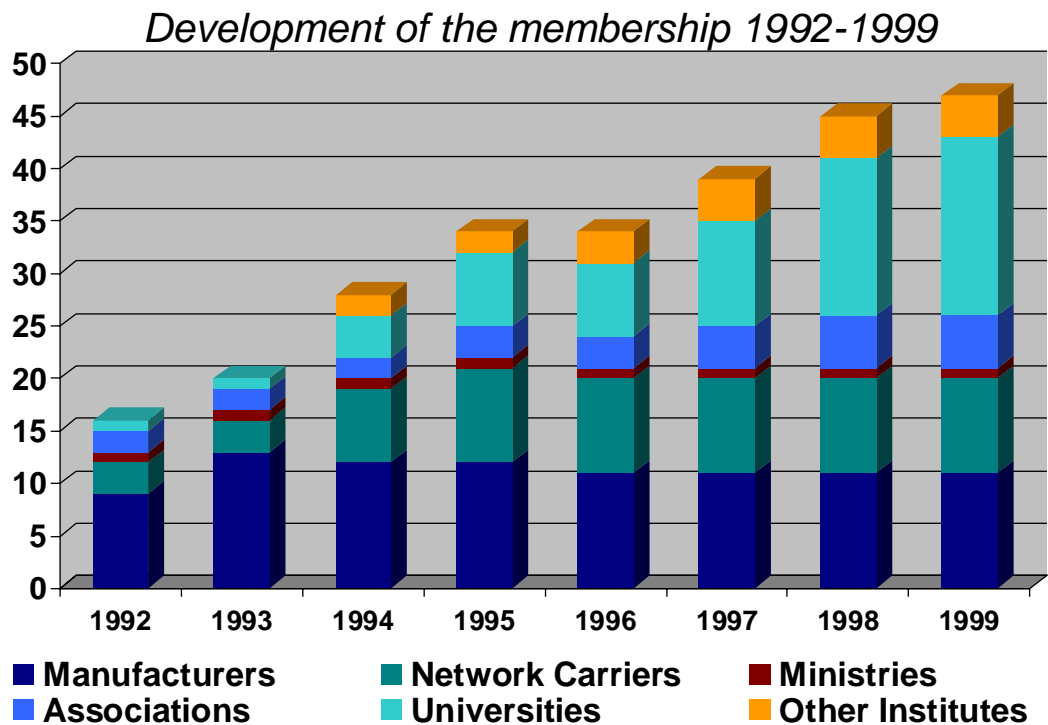
discussion took place. The professional and critical exchanges between the participants can always be considered as touchstones for the recent scientific activities and contribute to the transparency and to the understanding of research and science.

The results of the projects sponsored by the FGF are not exclusively published in the FGF media. The researchers are expected to publish their results in peer-review scientific magazines. Numerous studies of the FGF can be found in the databases of international projects such as the European research network COST244 or the worldwide "EMF project" of the World Health Organisation (WHO).

The Research Association for Radio Applications presents itself in the new millennium as a community of interests, with manifold interests that could only be realised by the commitment of all members and all people involved. The growing use of radio technology and the increasing importance of communication techniques show that the reflections, which led in 1992 to the foundation of the Research Association for Radio Applications, have not lost any amount of modernity.

## Development of the membership

The development of the membership was encouraging in 1999. The number of members of the FGF has risen from 3 to 48. The largest group are universities and scientific institutes with 21 members. The following chart shows the structure of the membership.



It is particularly pleasing that for the first time, a partner from an East-European country (the "Institute of Hygiene and Epidemiology" from Warsaw) and the Universidad Politecnica Madrid (a representative from Spain), joined the FGF. This means an important step fostering the international appreciation and orientation of the Research Association for Radio Applications. Aside from these institutes the University of Mainz can also be welcomed as another new member of the FGF.

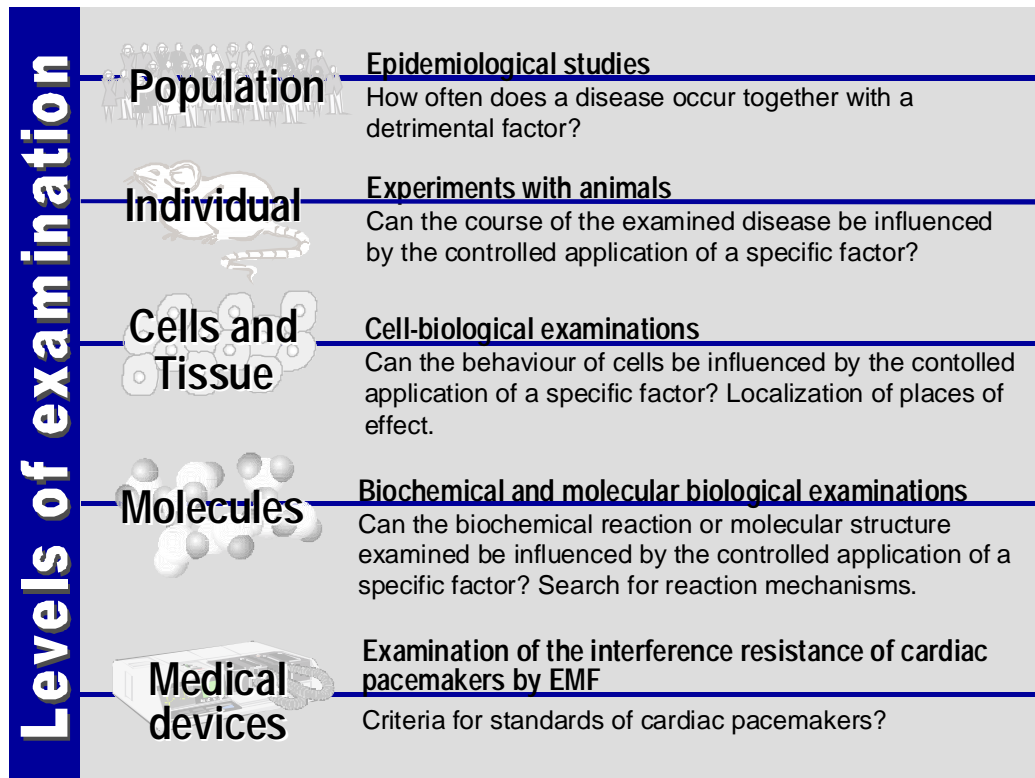
## **Members**

<b>Network carriers</b>	Deutsche Telekom AG Deutsche Telekom Mobilfunk GmbH (T-Mobil) E-Plus Mobilfunk GmbH Mannesmann Mobilfunk GmbH (MMO) Swisscom AG Viag Interkom GmbH & Co
<b>Service providers</b>	ARD/ZDF
<b>Manufacturers</b>	Alcatel SEL AG Daimler Benz Industrie AG Ericsson Mobilfunk GmbH Lucent Technologies Network Systems GmbH Motorola GmbH Nokia Mobile Phones GmbH Philips Consumer Communications GmbH Robert Bosch GmbH Rohde & Schwarz GmbH & Co. KG Siemens AG Kathrein-Werke
<b>Authority</b>	Bundesministerium für Wirtschaft (German Federal Ministry of Economics)
<b>Other</b>	Bund für Umwelt und Naturschutz Deutschland (BUND) Deutscher Arbeitskreis CB-Notfunk e.V. (DAKfCBNF) Deutscher Amateur-Radio-Club e.V. (DARC) Eidgenössische Technische Hochschule Zürich (ETH) Fachhochschule Köln Fernuniversität Hagen Forum Mobilkommunikation Wien Forschungsinstitut für Telekommunikation Dortmund GMT Bergische-Universität-GH-Wuppertal GWUP Gesellschaft zur wissenschaftlichen Untersuchung von Parawissenschaften e.V. Humboldt-Universität Berlin Institut für Arbeitsmarktforschung und berufliche Weiterbildung (IABW) Institut für Mobil- und Satellitenfunktechnik (IMST) Institute of Hygiene and Epidemiology, Warsaw/Poland Österreichisches Forschungszentrum Seibersdorf Polizei-Führungsakademie Münster Rheinisch-Westfälische Technische Hochschule Aachen, Forschungszentrum für Elektromagnetische Umweltverträglichkeit ( <i>femu</i> ) Technische Universität Braunschweig, Forschungsverbund: EMV biologischer Systeme Technische Hochschule Hannover Technische Universität Ilmenau Technische Hochschule Karlsruhe Technische Universität München Universidad Politecnica de Madrid Universität Dortmund Universität Graz Universität Mainz, Klinik für Psychiatrie und Psychotherapie Université Montpellier, Section de Nimes, Laboratoire de

Biophysique Médicale  
Universität Stuttgart

## Research activities

During the year 1999, the sponsoring of scientific research projects on the topic of electromagnetic compatibility was continued with the 5-layer-model as basis of the research strategy.



During last year the FGF published two calls for tenders for research orders. Furthermore, sixteen studies were sponsored and nine of these were finished:

- ◆ Rürger: "Einfluss von EMF auf DNA" (Influence of EMF on DNA)
- ◆ Fuhr: "Planare Mikroresonatoren zur direkten GHz Befeldung in *in-vitro* Zellkulturen"  
(Planar micro resonators for the direct GHz field exposure in *in-vitro* cell cultures)
- ◆ Landstorfer: "Entwicklung eines Kopplungsmodells zwischen Herzschrittmacher-Elektroden und dicht benachbarten Sendeantennen im Frequenzbereich 50 MHz bis 500 MHz"  
(Development of a coupling model between pacemaker electrodes and transmitting antennas in the near vicinity, in the frequency range between 50 and 500 MHz)  
Studies on the "Membrane complex" must also be added from:
- ◆ Boheim / Hansen: "EMF-Feldsensor in Zellmembranen"  
(EMF field sensor in cell membranes)

- ◆ Meyer / Detlefsen: "Wirkung hochfrequenter EMF auf elektrische Eigenschaften künstlicher Membranen mit und ohne eingelegte Carrier und Kanäle" (Effect of high-frequency EMF on electric qualities of artificial membranes with and without integrated carriers and channels")
- ◆ Enders / Spieker: "Dielectric properties of thin films in high DC electric fields and comparison with and interpretation of biological membrane experiments"

Studies completed:

- ◆ Buschmann / IMST: "Untersuchung zum Einfluss hochfrequenter EMF während der Trächtigkeit auf die Nachkommen" (Investigation of the effect of high-frequency EMF during gravidity of the offspring")  
"Aufbau einer Expositionseinrichtung zur Untersuchung der Auswirkungen gepulster hochfrequenter Felder auf ausgewählte physiologische Parameter von Ratten"  
(Construction of an exposure setup for the examination of effects of pulsed high-frequency fields on selected physiological parameters of rats")
- ◆ IMST: "Biologische Wirkung im cm/mm-Wellenbereich" (Biological effect in the cm/mm-wave range)  
Phase I: Literaturrecherche (Search for literature)  
Phase II/III: Bestimmung der Materialparameter und Analyse von Feldstärken im Gewebe  
(Definition of the material parameters and analysis of field strengths in tissue)
- ◆ Juutilainen / Pitkäaho / Puranen: "Effects of 900 MHz radiation on the development of cancer in mice" and "Modelling of SAR distribution in mice in a waveguide chamber"

Final reports of these studies are available.

The phase of experiments of three studies has been finished, the corresponding final reports are expected:

- ◆ Lerchl / Hansen: "Effects of pulsed EMF on body weight, testicular cell composition and melatonin levels in Djungarian hamsters"
- ◆ Lerchl / Hansen: "Design, implementation and computer simulation of an exposure setup for investigating the melatonin synthesis of male Djungarian hamsters"
- ◆ Hadeler / Landstorfer: Phase IV and V "Investigation of possible non-thermal effects of cm/mm waves on the autonomic nerve system"

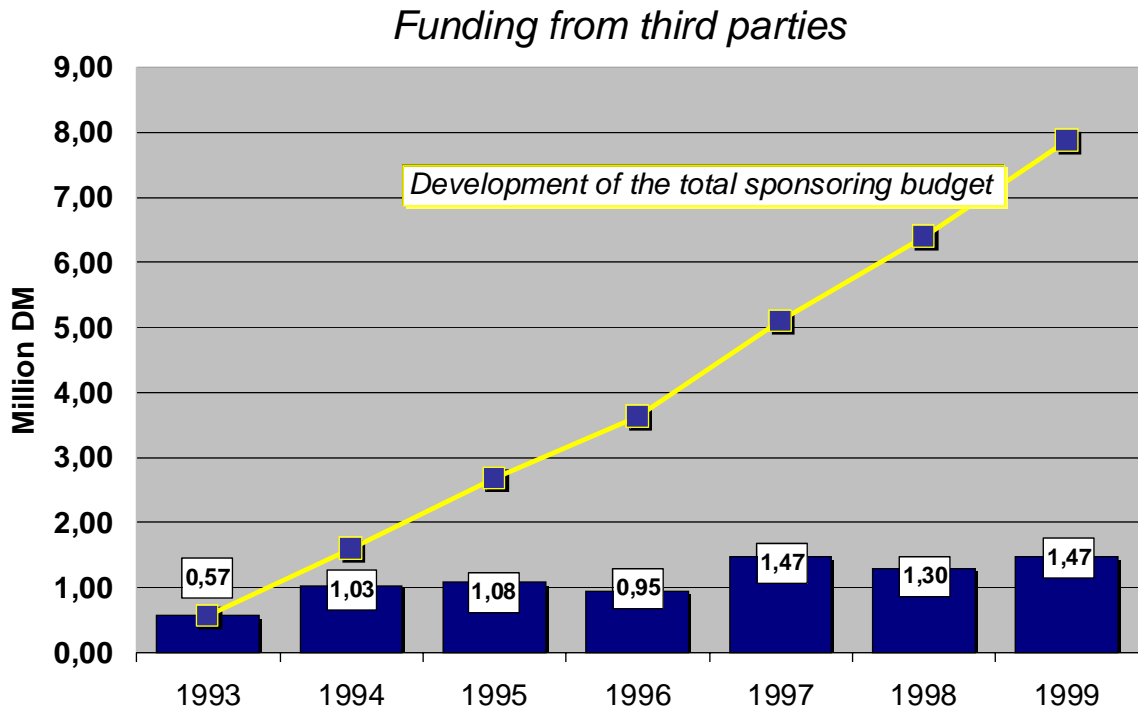
At present the following projects are still ongoing:

- ◆ Silny: "Aufbau, Weiterentwicklung und Pflege einer wissensbasierten Literaturdaten-Informationsbank"  
("Setup, further development and support of a knowledge-based literature data information bank")
- ◆ Buschmann / Hansen: "Auswirkungen gepulster hochfrequenter EMF auf ausgewählte physiologische Parameter von Ratten: Untersuchung der Auswirkung einer Exposition mit einer höheren Leistungsflussdichte während der Trächtigkeit auf die Nachkommen"  
("Effects of pulsed high-frequency EMF on selected physiological parameters of rats: investigation of the effect of an exposure with a higher flow density during gravidity on the offspring")
- ◆ Glaser: "Einfluss elektromagnetischer Felder auf das Ca-Signalsystem menschlicher Lymphozyten unter besonderer Beachtung der elektrischen Feldkomponente"  
("Effect of electromagnetic fields on the Ca-signal system of human lymphocytes with special consideration of the electrical field component")
- ◆ Aldenhoff / Hansen: "Kurz- und Langzeitauswirkungen von EMF auf die Qualität des menschlichen Schlafes und der hieraus resultierenden Tagesbefindlichkeit"  
("Short- and long-term effects of EMF on the quality of human sleep and the resulting physical state during the day")  
Creation of an outline and construction of an exposure setup for EEG experiments with 900 MHz.

The results of the studies are and will be published – as far as possible – in scientific journals and in congress reports. The preparatory structuring of the results for the integration in the databases of the WHO and COST244 as well as other databases have begun. The results of the studies will be transferred to standardizing committees, if possible.

The contractors present the results of their studies to experts in public seminars, organised by the FGF. (Further information on these FGF-colloquies, particularly reports, can be found on our website under "forum of topics").

1.47 million DM of funding from third parties were spent in 1999, which corresponds with accompanying measures of about two thirds of the total expenditure of the FGF. Suggestions for research to be sponsored in the future were gathered from members, applicants for projects and other organisations. The necessary decisions for these projects have not yet been made.



As far as the evaluation of scientific results is concerned, the Research Association for Radio Applications has kept its neutral position for the seventh year since its foundation, as before. Nevertheless, the FGF has to face reproach, indicating that its research orders are financed by manufacturers and so it is faced with a conflict of interests.

## Press information and public relations

According to the decision of the managing committee, press information and public relations were reviewed in 1999 and adjusted to the changing demand. As a result, some of the activities of the previous years were dropped, such as press seminars, press conferences, media training for members as well as the updating of the speaker handbook. The objective information of the public on the latest scientific results and knowledge moved to the centre of the public relations. For this purpose the Research Association for Radio Application makes use of its well established media

- ◆ Newsletter
- ◆ Edition Wissenschaft
- ◆ HOTLINE
- ◆ Website.

In the "Citizens' Forum of Electrosmog" on October 19 and 20 in Bonn, a brochure was issued giving information about the FGF, its purpose, work and activities. The participation in this citizens' forum opened a good opportunity to present itself to a large public.

In 1999, the Research Association for Radio Applications extended invitations to four scientific colloquies where the results of recent research projects were publicly presented and discussed. The tables of experts at these occasions were very informative and constructive with regard to the presented studies and regarding future research activities. They supported the endeavour of the FGF to make the scientific research and the results clearer and more accessible.

The Research Association for Radio Applications showed its presence on the international level as well. At the annual meeting of the Bioelectromagnetics Society (BEMS) in 1999 it presented 28 projects, carried out by FGF members or sponsored by the FGF.

## Newsletter

The Newsletter continued to be published in the same familiar design, insisting more and more on articles signed with an author's name. In 1999 three issues with 48 pages altogether were published. More details can be found in the following table.

<b>1993</b>	<b>7 issues with</b>	<b>28 long and 2 short articles</b>	<b>60 pages</b>
<b>1994</b>	<b>5 issues with</b>	<b>28 long articles</b>	<b>84 pages</b>
<b>1995</b>	<b>4 issues with</b>	<b>19 long articles</b>	<b>76 pages</b>
<b>1996</b>	<b>6 issues with</b>	<b>23 long articles</b>	<b>104 pages</b>
<b>1997</b>	<b>4 issues with</b>	<b>22 long and 11 short articles</b>	<b>60 pages</b>
<b>1998</b>	<b>3 issues with</b>	<b>13 long and 15 short articles</b>	<b>32 pages</b>
<b>1999</b>	<b>3 issues with</b>	<b>15 long and 19 short articles</b>	<b>48 pages</b>

## Edition Wissenschaft

Four issues of the "Edition Wissenschaft" were translated into English. For cost saving they were not published in printed form, but rather the texts have been made available on internet. In 1999 no new copies of "Edition Wissenschaft" were issued, because no studies were finished in time. The publication of the studies finished in 1999 will be realized at a later date.

## Hotline

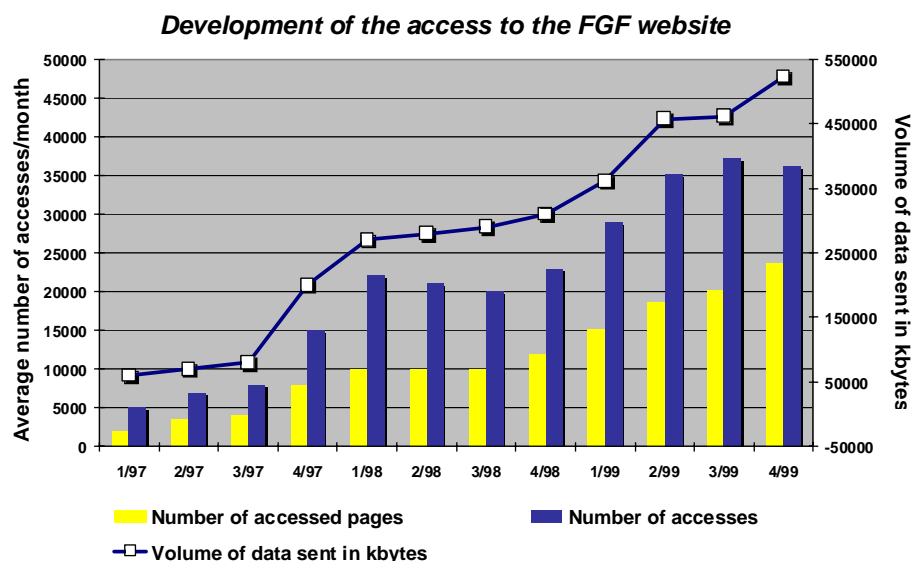
The "Hotline" was first introduced on February 28, 1994, and since then has been serving as an internal information means for FGF members. It answered its purpose again in 1999, by making available to the members information, news and facts worth knowing in the field of electromagnetic compatibility in the form of original sources. The spectrum of information is large, covering drafts of issued legal measures, curiosities, drafts for standardization, scientific reports and information about conferences and congresses. In 1999 41 "Hotlines" with 187 articles were published.

<i>Hotline statistics</i>	1994	1995	1996	1997	1998	1999
<b>HOTLINEs published</b>	64	45	55	53	42	41
<b>Articles in HOTLINE</b>	178	221	233	248	167	187
<b>HOT's offered</b>	36	201	307	458	501	355

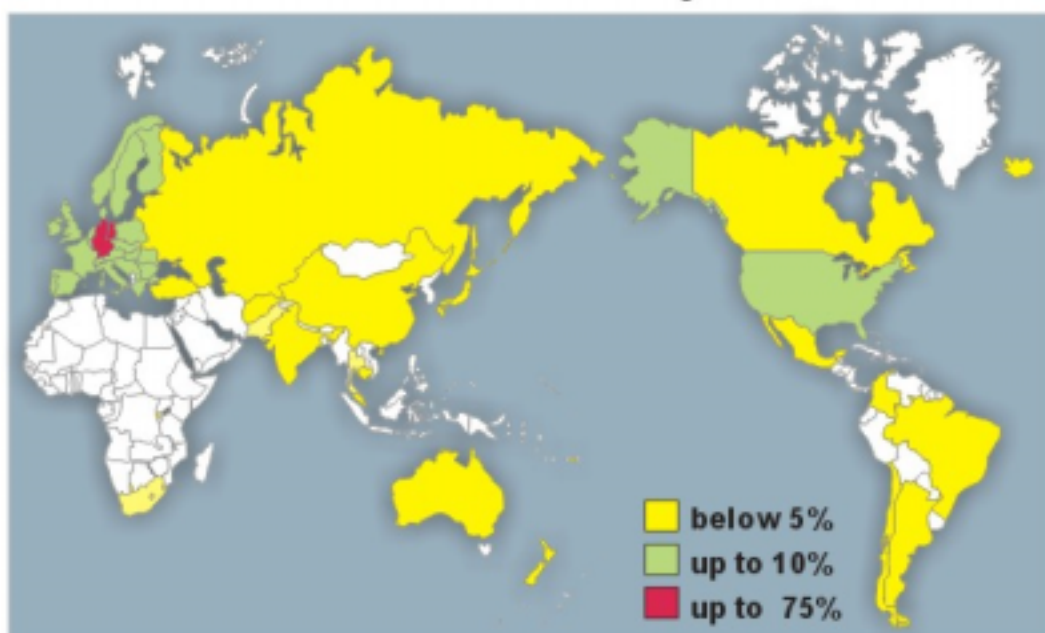
**Website:** <http://www.fgf.de>

In the year 1999 the number of accesses to the homepage of the Research Association for Radio Applications again showed an upward tendency. The sections mostly accessed were, as it had been the years before, "Newsletter" and "Edition Wissenschaft". The demand for the contents of the "Themenforum" has been developing positively too. During 1999 it went from 7% in January to 18% in October 1999.

An interesting trend can be seen regarding the origin of the accesses. At the beginning of 1999, 70% of the accesses came from Germany, whereas at the end of 1999, only 50% were national ones.



Accesses to the FGF website have their origin all over the world



	1997	1998	1999
. de (Germany)	65 %	69 %	55 %
.com (mostly USA)	7,8 %	8,2 %	10 %
.net	3,4 %	4,67 %	8,58 %
Europe	6,9 %	6,9 %	10 %
North- and South America	0,55 %	0,22 %	0,43 %
Middle East and Africa	0,02 %	0,02 %	0,11 %
Asia and Oceania	0,48 %	0,6 %	0,5 %

Development of the internet access according to sections (in %)

	1997	1998				1999			
		1 <sup>st</sup> q.	2 <sup>nd</sup> q.	3 <sup>rd</sup> q.	4 <sup>th</sup> q.	1 <sup>st</sup> q.	2 <sup>nd</sup> q.	3 <sup>rd</sup> q.	4 <sup>th</sup> q.
Newsletter	21,6	29,3	27,8	37	28,8	31,4	33,4	25,1	23,3
Edition Wissenschaft	21,6	20,5	25	23,4	25,9	24,7	22,3	21,7	23,1
News	4,5	3,5	4,1	4,5	5,5	6,1	5,2	5,5	5,7
Events (started March 98)	-		1,7	2,3	3,2	2,4	2,6	3,3	3,2
Forum of topics (started July 98)	-		-	3,5	7,4	8,1	11,6	17,3	19

## **Participation in the "Citizens' forum on Electromog", October 19 and 20, 1999, in Bonn**

On October 19 and 20, the German Federal Ministry for the Environment, Nature Protection and Reactor Safety extended invitations to the first "Citizens' Forum on Electromog" at the art exhibition hall in Bonn. It had been the aim of the forum to give the citizens, politicians, manufacturers' representatives, scientists and other groups of interest the opportunity to exchange their opinions and to gather information about the topic of "Electromog". The Research Association for Radio Applications – supported by some of its members and the Federal Office for Radiation Protection – participated actively in this forum with a common information booth. In the context of the Science Forum, FGF members presented examples of finished and ongoing research activities. The RWTH Aachen was represented by the working group "Knowledge-based literature database" of the "Forschungszentrum für elektromagnetische Verträglichkeit" (femu, Research center for electromagnetic compatibility) of Prof. Dr. Silny. The working group of Prof. Dr. Brinkmann, Technical University Braunschweig, presented "Experiment setups for the investigation of alternating electromagnetic fields"; the working group of Prof. Dr. Landstorfer of the Institute for High-frequency Engineering of Stuttgart University (IHF) presented research on the topic "Influence of electromagnetic fields on cardiac pacemakers".

An introduction to the topic "Electromog" was given in the lectures of the speakers Dr. W. Kreisel of the World Health Organisation (WHO), Prof. Leitgeb of the University of Graz as well as Dr. R. Meyer of the University of Bonn and Dr. L. von Klitzing of the University Luebeck on technical, scientific and health aspects.

The second day of the event provided sufficient possibilities for discussion. It became visible that a basic disapproval of the new technologies by the large public cannot be assumed. The citizens, however, want to take part actively in the discussions about the planned location of power lines or transmitting devices. A solid, comprehensible and unreserved information policy is needed. Only by information and explanation can the necessary acceptance of the modern technologies be achieved.

The "Citizens' Forum on Electromog" showed that only through dialogue between all people involved can communication problems and lack of information be avoided. The vast majority of participants was satisfied and pleased with the course of the citizens' forum, a reaction that leads us to expect further citizens' forums.

## Scientific colloquies

The scientific colloquies of the Research Association for Radio Applications aim towards a public exchange of ideas between experts on recent studies and research results. In these colloquies scientists and experts publicly and critically discuss the lectures and results. Furthermore, they debate other strategies and procedures in order to remove, for example, newly found knowledge gaps.

Seminars took place at the following dates in 1999:

14 April in Bonn  
28 April in Münster  
02 June in Stuttgart  
15 December in Munich.

## Report on the seminar

### **"Field effects in cell membranes" on April 14, 1999, at the Physiological Institute of the University in Bonn**

The following topics were presented at the FGF-seminar "Field effects in cell membranes" on April 14, 1999, at the Physiological Institute of the University of Bonn:

- ◆ "High resolving electromagnetic and theoretical analysis of an isolated membrane under the influence of HF-fields" (M. Alaydrus, working group of Prof. Hansen, University Wuppertal)
- ◆ "Investigations on the influence of HF-fields on endowed and non-endowed lipid membranes" (Prof. Dr. G.H. Boheim, University Bochum)
- ◆ "Effect of high frequency electromagnetic fields on the electrical qualities of artificial membranes, with and without integrated carriers and molecules" (Dipl.Ing. J. Helminger, Prof. Dr. J. Detlefsen, TU Munich, Munich part of the investigation)
- ◆ "Effect of HF-fields on the electrical qualities of artificial membranes" (Dr. K.W. Linz, working group Dr. R. Meyer, University Bonn)
- ◆ "Dielectric properties of thin films in high DC electric fields and comparison with the interpretation of biological membrane experiments" (Prof. Dr. A. Enders, TU Braunschweig).

The crucial point of the scientific investigations was the behaviour of artificial lipid membranes under the influence of a pulsed electromagnetic HF-field. The field parameters chosen were as follows:

frequency 900 MHz  
pulse frequency 217 Hz  
irradiated performance: 1-10 W

The artificial membranes were spread across a hole between two chambers filled with an electrolyte. The strength of the membranes was between 3 and 5 nm, which is corresponding to the membrane strengths in nature reaching between 4 and 10 nm.

The working group of Prof. Dr. Boheim, Bochum, could determine in non-endowed membranes, under the influence of HF-fields, the occurrence of so-called surplus currents over the membrane. In endowed membranes the researchers found an increase of the conductances and a decrease of the average life span of the ion channels.

The results from Bochum could be reproduced by the working group of Dr. Meyer, Bonn. Besides the changes in the conductivity of the membranes, this working group could also register a change of the membrane capacity under the influence of the created HF-field.

Similar effects, even if in a reduced form, were found by the working group of Prof. Dr. Enders in studies on polymer foil. These artificial foils also showed changes in conductivity and capacity under HF-influence. The differences in the quality of the effects determined are attributed to the so-called "torus" in the lipid membrane by Prof. Enders. The thickened roll at the contact surface between septum and membrane is described as the "torus". According to Prof. Enders high frequency fields can create a deformation of the torus and so influence the qualities of membranes.

The elaborated and presented scientific results indicate a possible influence of cell membranes by pulsed fields of 900 MHz. The causes of the effects determined, however, remain unexplained. The influence of the "torus" enormously complicates a transfer of the results into real nature as natural cell membranes do not have a "torus". (The minutes of this meeting are available at the website of the FGF.)

**Report on the seminar  
"Influence of electromagnetic fields on the melatonin  
synthesis"  
on April 28, 1999, in Münster**

On April 28, 1999, about 20 scientists and other interested parties met in Münster (Westphalia) to the 5<sup>th</sup> FGF-seminar, where latest research results of melatonin synthesis in living organisms, under the influence of high frequency electromagnetic fields was made the centre of the discussion. Studies on this topic were carried out by Dr. A. Lerchl, Institute for Reproductive Medicine of the University Münster, with Djungarian hamsters at an exposure of a 383 MHz field. This frequency is of great interest, because it will come into operation in future communication systems of authorities and organisations with safety tasks (e.g. for police radio).

The aim of the investigation was to determine if health risks were to be expected by the exposure to electromagnetic fields of 383 MHz. The Djungarian hamster (*Phodopus sungorus*) was used as a model system, because it already proved to be an appropriate model in earlier studies. The selected parameters were: the body weight, the cell composition in the testicles and the concentration of melatonin in the pineal organ as well as in the serum. For the specific absorption rate (SAR) 80 mW/kg was chosen in such a way that it was located near the upper limit of the allowed exposure for a 24 hour exposure. 120 animals were exposed for 24 hours and for 60 days.

Dr. Lerchl described in his lecture that within the exposed group of hamsters, no changes in the production of the hormone melatonin (mainly produced during the night) were detected, compared to the control group. The normal production of sperm, which was examined as well as a second parameter, remained unimpaired in the animals belonging to both groups. As a unique slight effect, but statistically significant, in the course of the examinations an increase in weight of 3% was discovered in the exposed hamsters, compared to the ones of the control group. This effect shall be examined in detail in further planned test series, for example with an exposure of 900 MHz and 1,8 GHz fields.

## **Report on the seminar**

### **"Influence of electromagnetic fields on cardiac pacemakers" on June 2<sup>nd</sup>, 1999, at the Institute for High Frequency Engineering of Stuttgart University**

On June 2<sup>nd</sup> 1999, a colloquy of the Research Association for Radio Applications took place at the Institute for High Frequency Engineering (IHF, Institut für Hochfrequenztechnik) of the University of Stuttgart. The lectures were focused on a worst-case study on the interference of cardiac pacemakers by electromagnetic waves in the frequency range between 50 MHz and 500 MHz carried out at the IHF. Statements on possible interference coupling of cardiac pacemaker electrodes should be made by means of mathematical models and their adjustment to the given problem. The lecturers Dr. Ulrich Jakobus and Dipl. Ing. Jan Waldmann of the Institute for High Frequency Engineering reported on computing and measurement procedures as well as on the proceeding of the development of a body model.

In a study by Dr. Meckelburg, Cetecom Essen, measurements of interference in cardiac pacemakers had already been made. These investigations, however, dealt with the compatibility model, making statements on the susceptibility of cardiac pacemaker electronics to electromagnetic waves. The working group of Prof. Landstorfer, IHF Stuttgart, was now to investigate the coupling model. The coupling model treats interference coupling at the cardiac pacemaker electrode, but does not allow statements on the later process in the cardiac pacemaker electronics.

For computation of the body models the working group proceeded from a combination of the multiple-multipolar method and the momentum method. These methods seemed to the working group to be the most appropriate ones, because they are able to produce expressive results without too much effort for the computation.

After having sufficiently modelled the geometric qualities of the body, the dielectric properties of the human body were imitated. In the course of the investigations it showed that skin and fat contribute little to the dielectric properties of the model. With a watery sugar-salt-solution, the conductivity and the dielectric properties of the internal body could be imitated. The surface of the ellipsoid body model was composed of a mixture of epoxic resin with intercalation of quartz.

By comparing measures made on a dummy and on an ellipsoid body model, it could be shown that the geometric form of the body is of minor importance and therefore the field distribution in different human bodies is comparable. The measured results of the ellipsoid body model then were compared to the results of the computational models and showed a lot of

congruences. Horizontal radiations over an area of 360° and vertical radiations over an area of 360° were modelled for the fields installed.

From the computations the following results could be concluded. In the far field there occurs a distinct resonance at about 100 MHz in all examined body models, which means that an increased coupling tension occurs at the cardiac pacemaker electrode in the range of this frequency. The geometry of the body is hereby of minor importance. It should be stressed again that the basis of these results is a worst-case scenario.

In the near field the following types of antennas were modelled:

- ◆ electric elementary dipole
- ◆ magnetic elementary dipole
- ◆ lamda/2-dipole
- ◆ handset (ideal transmitting device)

These did not show significant changes with regard to the interference coupling.

For relevance, the following statements can be made about this worst-case-study with respect to the new standard VDE 0848:

- ◆ below 150 MHz significant deviations from the results of other studies, higher interference coupling to be expected
- ◆ between 150 MHz and 500 MHz significant deviations, higher interference coupling to be expected.

It must be considered that existing studies were not outlined as worst-case-scenarios and their comparative values were produced at other models, planar models for example.

### **Report on the seminar**

#### **"Effects of the 900 MHz Radiation on the Development of Cancer in Mice" on December 15, 1999, in Munich**

This study was carried out by Prof. Dr. Juutilainen of the University of Kuopio. The purpose of the study was to find out if low energy pulsed high frequency electromagnetic fields (902 MHz) reinforce cancer in CBA/S-mice. The researchers particularly observed the feeding and drinking behaviour, the growth of the animals, the changes in blood composition and in histopathology as well as the weight of individual target organs. The course of the examinations and the results were presented by Prof. Juutilainen and Ms Heikkinen.

The dosimetric part was modelled and calculated by VTT (Information Technology) and STUK Radiation and Nuclear Safety Authority. This separate part was reported in detail by Mr Puranen and Mr Pitkäaho.

The results of the study showed that none of the parameters was influenced by the exposure.

(The minutes of all four seminars are available on internet in the "Forum of Topics".)

## **Cooperation with organisations and institutions**

In 1999 the different national and international cooperations between the Research Association for Radio Applications and other institutions in the field of science and research were continued, intensified and enlarged. Cooperations that have to be mentioned especially are those with the World Health Organisation (WHO), the international "Bioelectromagnetics Society" (BEMS), the European Research network "Cooperation in Science and Technology" (COST244), the "European Bioelectromagnetics Association" (EBEA) and the "Wireless Information Network" (WIN).

### **Bioelectromagnetics Society (BEMS)**

The "Bioelectromagnetics Society" has been established for more than 20 years now. During this time it has become the most important international association of scientists on the subject of effects of electromagnetic fields. 80 of its over 800 members come from Germany, among them the Research Association for Radio Applications, represented by its managing director.

At the Annual Meeting 1999 of BEMS in Long Beach, some of the studies sponsored by the FGF were presented to an international audience of experts. The FGF was represented by numerous members.

This Annual BEMS Meeting is considered to be one of the most important informational events on the topic of "electromagnetic fields" and provides information on the latest research results in finished studies and in intermediate reports of ongoing studies.

A special cooperation has been made with the "Bioelectromagnetics Society" (BEMS) for the year 2000. The Research Association for Radio Applications will be a co-organizer and sponsor of the 22<sup>nd</sup> BEMS congress in Munich.

Aside from the scientific planning, all the remaining organisation will be taken over by the FGF.

## World Health Organisation (WHO)

The active participation of the FGF in the international EMF-project of the World Health Organisation was continued in 1999. 41 studies sponsored by the FGF were integrated in the WHO database and so will attain a worldwide availability on a well reputed platform. By these means, the level of knowledge of the existence of the FGF raises considerably. The Research Association for Radio Applications provides important scientific and financial contributions to the international EMF-project.

*The International WHO*


*EMF Project*



- reviews the scientific literature on biological effects of EMF (0-300 GHz) exposure
- identifies gaps in knowledge requiring research that will improve health risks assessments
- encourages a focused agenda of high quality EMF research
- formally assesses health risk of EMF exposure after the required research is completed
- encourages internationally acceptable standards
- provides information on risk perception, risk communication, risk management

## Cooperation in Science and Technology (COST244bis)

*Cooperation in Science and Technology (COST 244)*



The programme is divided into three working groups:

- Epidemiology and human health effects
- Basic research
- System applications and engineering.

Complimentary to these three „horizontal“ working groups, a „vertical“ co-ordination group (mobile communications coordination committee, MCCC) has been set up to deal with all aspects of mobile communications research. The primary function is to coordinate the organisation of workshops on mobile communications and to ensure that an executive summary is prepared after each workshop and circulated widely.

MCCC also monitors the progress of all collaborative activities related to mobile communication research within COST 244. A second 4-year round has commenced in the Autumn of 1996.

The commitment of the FGF in the European network COST244bis can be seen as being very positive. Programmes and contents of COST244bis for the year 2000 could be defined together by an active participation. The scientific report "Possible health effects related to the use of mobile telephones" (continuation of the McKinley report of the EU from 1996) was continued under the responsibility of Prof. Bernard Veyret with active support of the FGF and is available in the updated version.

COST244bis has set itself new and ambitious goals for the year 2000. COST244bis will especially concentrate its activities on the evaluation of scientific knowledge and aim at the elimination of knowledge gaps. Studies of the FGF are integrated in the COST244bis database. Furthermore, the FGF will organise the COST244bis meeting in Munich in June 2000.

## European Bioelectromagnetics Association (EBEA)

The cooperation with the European sister organisation of BEMS, the "European Bioelectromagnetics Association" (EBEA) was continued. It is the purpose of the EBEA to provide a forum to researchers for an exchange of ideas. The FGF is a supporting member of the EBEA.

## **Wireless Information Network (WIN)**

The informal network WIN has existed for just two years, with members from 12 nations. It allows the possibility of a quick information exchange on particularly important and urgent research questions. The WIN institution has proved successful in everyday life and will be useful in the future for mutual quick information.

## **Further cooperation**

Aside from the above mentioned cooperations, there exist other informal contacts with other organisations. These organisations partly fulfill evaluation tasks for legislative and standardizing processes. They do not realize research projects themselves, but they assume the function of evaluating the results.

These are:

- ◆ German Federal Office for Radiation Protection (BfS, Bundesamt für Strahlenschutz)
- ◆ International Commission on non-ionizing Radiation Protection (ICNIRP)
- ◆ National Radiological Protection Board, U.K. (NRPB)

Further cooperations exist with manufacturer and network carrier organisations, being committed particularly to public relations. These are:

- ◆ Canadian Wireless Telecommunications Association (CWTA)
- ◆ Forum Mobile Communication (Vienna)
- ◆ Federation of the Electronic Industry, U.K. (FEI)