

# International Conference on Cell Tower Siting

Linking Science & Public Health  
Salzburg, Austria, June 7 – 8, 2000

## Proceedings

Federal State of Salzburg,  
Public Health Department, Environmental Health  
&  
University of Vienna, Institute of Environmental Health

**Imprint**

Publisher & Editor: Dr. Gerd Oberfeld, Federal State of Salzburg, Public Health Department,  
Environmental Health, [www.land-sbg.gv.at/umweltmedizin](http://www.land-sbg.gv.at/umweltmedizin).

Layout: Graphics Office Federal State of Salzburg.

Printed by: Printing Office Federal State of Salzburg.

All: P.O. Box 527, A-5010 Salzburg, Austria.

Published: August 2000.

# Content

- 9 Speakers and Chairmen
- 11 Preface and Acknowledgments
- 13 Summary

## Opening

- 21 Welcome Address Christoph König (A)
- 24 Opening of Conference Othmar Raus (A)
- 25 Cell Tower Siting – A Public Health Issue Gerd Oberfeld (A)
- 32 Cell Tower Siting - An Issue for the  
Federal Government of Austria Johann-Klaus Hohenberg (A)
- 37 Environmental Health Issues of Radiofrequency  
and Microwave Exposure Michael Kundi (A)

## Siting & Exposure

- 47 Cell Towers Results of Measurements and  
Estimation of Safety Limits for the Public Yuri Grigoriev (Russia)
- 52 Microwave Exposure from Mobile Phones and  
Base Stations in Sweden Yngve Hamnerius (S)
- 63 Amplification of the Radiation from two collocated Cellular  
System Antennas by the Ground Wave of an AM Broadcast  
Station Bill P. Curry (USA)
- 70 Radiofrequency Radiation Information: What the Public  
Needs to Know for wise Decision-making in Cell Siting Cindy Sage (USA)

## Experimental Studies

- 75 Alterations in Calcium Ion Activity caused by ELF  
and RF Electromagnetic Fields Carl Blackman (USA)
- 81 Cell Membranes and Electromagnetic Fields Fiorenzo Marinelli (I)
- 86 Investigations on Ear and Hearing Sensations,  
Noise and Sleep Disturbances Wilhelm Mosgoeller (A)
- 90 An Overview of Radiofrequency/Microwave Radiation  
Studies Relevant to Wireless Communications and Data Cindy Sage (USA)

## Epidemiological Studies

- |     |                                                                                                                                                    |                                                            |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 109 | Probable Health Effects Associated with Base Stations in Communities: The Need for Health Surveys                                                  | Neil Cherry (NZ)                                           |
| 115 | Symptoms Associated with Mobile Phone Use: Results of the Swedish-Norwegian Survey                                                                 | Monica Sandström (S)                                       |
| 119 | Cardiovascular Symptoms in Subjects Occupationally Exposed to HF Electromagnetic Fields                                                            | Stanislaw Szmigielski (Pol),<br>Elzbieta Sobiczewska (Pol) |
| 125 | Ten-years Experience with Epidemiological Research in the Vicinity of the Short-Wave Broadcasting Area Schwarzenburg: What does the Story tell us? | Ekkehardt Altpeter (CH)                                    |

## Public Health - Precautionary Strategy I

- |     |                                                                                                                            |                         |
|-----|----------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 133 | Rationale for Setting EMF Exposure Standards                                                                               | Huai Chiang (China)     |
| 137 | Reasons for Disagreement between European Council and Italy Concerning Protection Against Health Impacts from EMF.         | Livio Giuliani (I)      |
| 141 | The Implementation of a Prudent Avoidance Policy for the Siting of Cellular Telephone Antennas – the Experience of Toronto | Ronald Macfarlane (Can) |
| 150 | The Precautionary Principle 1898-1998: Some Late Lessons from Early Warnings and their Relevance to the EMF Debate         | Malcolm MacGarvin (UK)  |

## Public Health - Precautionary Strategy II

- |     |                                                                                                                 |                    |
|-----|-----------------------------------------------------------------------------------------------------------------|--------------------|
| 161 | The Need for a Precautionary Approach with Regard to both Cellphones and their Base Stations                    | Helene Irvine (UK) |
| 168 | Public Policy Issues on Mobile Phone Base Stations in Scotland                                                  | Colin Ramsay (UK)  |
| 172 | Public Concerns over Microwave Radiation in the U.S.: Comparing the Perceived Health Risks of Phones and Towers | Louis Slesin (USA) |
| 176 | The Salzburg Model: A Precautionary Strategy for Siting of Base Stations                                        | Gerd Oberfeld (A)  |

## Appendix I

- |     |                                                                                                                                                                 |                         |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| 185 | Cell Phone Tower Siting: Project Evaluation and Radiometric Measurements.                                                                                       | Livio Giuliani (I)      |
| 191 | Probable Health Effects Associated with Base Stations in Communities: The Need for Health Surveys (Long Version)                                                | Neil Cherry (NZ)        |
| 233 | Mortality of chicken embryos continuously exposed under GSM cell phone and validation of the effectiveness of a protective device                               | B.J. Youbicier-Simo (F) |
| 234 | Interference from GSM cell phones with the production of stress hormones in healthy and Lewis lung carcinoma-bearing mice: Effectiveness of a protective device | B.J. Youbicier-Simo (F) |

## Appendix II

- |     |                                                                               |  |
|-----|-------------------------------------------------------------------------------|--|
| 239 | Salzburg Resolution on Mobile Telecommunication Base Stations                 |  |
| 241 | Conversion of Units & Values for the Assessment of Exposures from Cell Towers |  |
| 242 | Internet Addresses                                                            |  |
| 243 | Proceedings - Fax Order Form                                                  |  |

## Speakers & Chairmen

Dr. Ekkehardt Altpeter	Inst. for Social- and Preventive Medicine, University of Bern	Bern, Switzerland
Dr. Carl Blackman	US Environmental Protection Agency	Research Triangle Park, North Carolina, USA
Dr. Neil Cherry	Lincoln University Christchurch	Christchurch, New Zealand
Prof. Dr. Huai Chiang	Zhejiang University School of Medicine Microwave Lab	Hangzhou, China
Dr. Bill P. Curry	EMSciTek Consulting Co.	Glen Ellyn, Illinois, USA
Prof. Dr. Livio Giuliani	National Institute of Occupational Safety and Prevention (ISPESL)	Rome, Italy
Prof. Dr. Yuri Grigoriev	Centre of Electromagnetic Safety, Institute of Biophysics	Moscow, Russia
Prof. Dr. Yngve Hamnerius	Chalmers University of Technology, Dept. of Electromagnetics	Goteborg, Sweden
DI Johann-Klaus Hohenberg	Federal Ministry of Agriculture, Forestry, Environment and Water Management	Vienna, Austria
Dr. Helene Irvine	Greater Glasgow Health Board, Dept. of Public Health	Glasgow, Scotland, UK
Dr. Christoph König	Federal State of Salzburg, Public Health Dept., Environmental Health	Salzburg, Austria
Prof. Dr. Michael Kundi	University of Vienna, Inst. for Environmen- tal Health	Vienna, Austria
Ronald Macfarlane	Health Promotion and Environmental Pro- tection Office, Toronto Public Health	Toronto, Canada
Dr. Malcolm MacGarvin	modus vivendi, Consultant for the Europe- an Environment Agency	Glenlivet, Scotland, UK
Dr. Fiorenzo Marinelli	Ist. di Citomorfologia C.N.R.	Bologna, Italy
Prof. Dr. Wilhelm Mosgöller	University of Vienna, Inst. for Cancer Rese- arch	Vienna, Austria
Dr. Gerd Oberfeld	Federal State of Salzburg, Public Health Dept., Environmental Health	Salzburg, Austria
Dr. Colin Ramsay	Scottish Center for Infection and Environ- mental Health (SCIEH)	Glasgow, Scotland, UK
Cindy Sage	Sage Associates	Santa Barbara, California, USA
Dr. Monica Sandström	National Institute for Working Life	Umea, Sweden
Dr. Luis Slesin	Microwave News	New York ,USA
Dr Elzbieta Sobiczewska	Department of Microwave Safety, Military Institute of Hygiene and Epidemiology	Warsaw, Poland
Prof. Dr. Stanislaw Szmigielski	Department of Microwave Safety, Military Institute of Hygiene and Epidemiology	Warsaw, Poland

## Preface and Acknowledgements

The International Conference on Cell Tower Siting – Linking Science & Public Health is based on the initiative of the political head of the Department of Health of the Federal State of Salzburg, Vice Governor Gerhard Buchleitner and of the political head of the Department of Environment of the Federal State of Salzburg, Councilor Dr. Othmar Raus.

We would like to express our thanks to Vice Governor Gerhard Buchleitner and Councilor Dr. Othmar Raus, for the idea and the request to held an International Conference on this important environmental health issue.

The Conference was organized by the Federal State of Salzburg, Public Health Department, Environmental Health, Dr. Gerd Oberfeld and the University of Vienna, Institute of Environmental Health, Univ. Prof. Dr. Michael Kundi.

Although the time scale for the organization of an international event was very short, 293 participants from 23 nations followed the invitation to come to Salzburg, to the Great Assembly Hall of the Theological Faculty of the University of Salzburg. Attendants came from following nations: Argentina, Australia, Austria, Belgium, Canada, Finland, France, Germany, Italy, Japan, Luxembourg, Netherlands, New Zealand, Poland, Public Republic of China, Russia, Southafrica, Spain, Sweden, Switzerland, Turkey, United Kingdom, USA.

Acknowledgements to

Mag. Sabine Buchberger und Mrs. Uta Alles, Salzburg Congress; Mr. Wolfgang Tramposch, Graphics Office Federal State of Salzburg; Mr. Siegfried Perschl und Mr. Peter Steiner, Printing Office Federal State of Salzburg; Mrs. Gertrude Diezl, Postoffice Federal State of Salzburg; Mr. Johann Pinezits, Mr. Friedrich Pelikan und Mr. Reinhard Rattensberger, University of Salzburg; Mrs. Sabine Hübler und Mag. Alfons Schlofer, Conference Translaters - Language Promotion; Dr. Hans-Peter Hutter and Dr. Hans Moshammer, Institute of Environmental Health, University of Vienna for their help with the translations; Mrs. Jasmin Ehsani, ÖGUT; Ing. Josef Karl, VÖSI; Mrs. Brigitta Gramsl, Public Health Department Salzburg, Dr. Alois Grüner, Head of the Health Department Federal State of Salzburg; Dr. Ulf Postuvanschitz, Head of the Public Health Department Federal State of Salzburg; Dr. Christoph König, Head of Environmental Health Federal State of Salzburg;

and the many unnamed contributors who made the conference a great success.

The translations and the publication of the proceedings had produced a lot of work and we apologize for any inconvenience in case that some graphs had not been translated.

Further information on this topic will be published at [www.land-sbg.gv.at/celltower](http://www.land-sbg.gv.at/celltower).

We are pleased to provide this written documentation in order to distribute the findings to a greater audience. We hope, that the proceedings will serve the expectations and would be pleased if the feedback is as positive as for the conference.

Dr. Gerd Oberfeld

Salzburg, August 2000

Prof. Dr. Michael Kundi

Vienna, August 2000

# Summary

## Preface

The „International Conference on Celltower Siting - Linking Science & Public Health“, held on June 7-8, 2000 in Salzburg, Austria, can even now be seen as an information offensive with historical significance.

On an international level this conference brought together for the first time leading scientists and experts from technical sciences, bioscience and medicine, and especially from public health, aiming at the discussion of the present knowledge about the exposure to and the health effects of high frequency electromagnetic fields, especially with the focus on public health and the precautionary principle.

It is difficult to represent a two day's conference with 25 contributions in a short summary. An attempt is made with this proceedings. The summary will focus only on some general aspects and some selected topics of the individual presentations.

The rapid development in the mobile telecommunications area led and leads to an increasing burden of exposure due to electromagnetic fields in the immediate environment of the population. In order to guarantee, that these technologies, working in the high-frequency range with variable modulations, have no negative impacts on human health and well-being, it is essential to restrict the exposure.

The main question is from which basis the exposure limits for the protection of human health and well-being are derived.

In 1998 ICNIRP (International Commission on Non-Ionizing Radiation Protection) a NGG acknowledged by the World Health Organization (WHO), proposed reference values for the protection of human health from non-ionizing radiation. ICNIRP holds the position, that in the high frequency range relevant effects on human health only appear in the case of excessive warming of tissues of more than 1° Celsius which is related to a specific absorption rate (SAR) of 4 watts/kg tissue. In order to protect also sensitive persons from excessive heating an uncertainty factor of 50 was introduced resulting in an SAR of 0,08 W/kg. Because the SAR is only measurable on a phantom or by a computer model a so called reference level is derived for example as field strength [V/m or A/m] or as power flux density [W/m<sup>2</sup>]. The reference levels proposed by ICNIRP for the currently used mobile telecommunications frequencies, 900 MHz and 1800 MHz, are 4500 mW/m<sup>2</sup> (450 µW/cm<sup>2</sup>) and 9000 mW/m<sup>2</sup> (900 µW/cm<sup>2</sup>) respectively.

The International Conference on Cell Tower Siting made it clear, that the proposal of ICNIRP for the protection of human health from highfrequency electromagnetic fields, on which the current recommendations of WHO and EU-Council are based, are on the one hand scientifically untenable and on the other hand not able to protect human health.

The Salzburg Conference has to be seen as a turning point and as a chance in judgement of highfrequency electromagnetic fields. It is to hope, that the special authorities responsible for the protection of public health from highfrequency electromagnetic fields in the different countries, will be able to take the findings of the conference into account and to enable a policy of consequent and forceful implementation.

## Individual Presentations

Christoph König, Public Health Department, Federal State of Salzburg, Austria, warmly welcomed the speakers and participants to the Conference and expressed his opinion about WHO and ICNIRP:

„The WHO is relying – blind in one eye or deaf in one ear – on the statements of one committee of experts, namely the ICNIRP, which itself demands further research at every opportunity, utters restrictive statements, but sets apodictic limits. The WHO has had to correct itself quite often, whether on the subject of low-frequency electromagnetic fields, in setting limits for air pollutants or the toxicological limits for drinking water. Knowledge increases and thus revisions are necessary and good. From this viewpoint, a serious and open discussion on the non-thermal and low-intensity biological effects of highfrequency electromagnetic fields is long overdue. How those scientists who represent the ICNIRP opinions will justify their absence from this conference, even though they were politely invited in a friendly manner and under the same conditions to attend – namely as speakers – remains to be seen. This does not demonstrate their ability to accept criticism of their own discoveries and experience. If their absence was due to arrogance and disdain for those who think differently, we should not leave the public in the dark about it.“

Othmar Raus, Councillor of the Federal State of Salzburg warmly welcomed the speakers and participants of the conference and expressed his delight, that so many had accepted the invitation to Salzburg. He stressed the necessity of a standardized judgement of the electromagnetic fields at least in Austria and Europe and hoped that this conference would provide a basis for better decisions.

Gerd Oberfeld, Environmental Health, Federal State of Salzburg, Austria explained that the siting of mobile telecommunications base stations not only in a historical context is a classic task for public health services. Public health services should, beside other institutions, serve as a contact point for the public, politics and administration in all questions related to health and mobile telecommunications. He pointed out that the public health service is of great importance for the assessment of possible disturbances of well-being and health in the vicinity of mobile telecommunications base stations. Last mentioned problems should cause detailed epidemiological investigations which should also serve as a basis for the derivation of effect-related exposure standards.

Johann-Klaus Hohenberg, Federal Ministry of Agriculture, Forestry, Environment and Water Management, Vienna, Austria, described the current position of the Federal Austrian Ministry of Transport, Innovation and Technology (BMVIT), which is responsible for telecommunications as well, and which, regarding EMF, holds the same position as ICNIRP/WHO and the Proposal of the European Council. He presented also the opinion of the responsible Federal Minister DI Michael Schmid, from May 31, 2000: that according to the scientific investigations conducted so far there is no health hazard due to mobile telecommunication; that he takes the concerns of the public seriously and will by better information of the public provide for a reduction of fears; that he is planning to issue an ordinance (based on § 67 of the Telecommunication Law) which will include technical specifications for telecommunication equipment, and will also provide a limit value for radiation. [note: On July 27, 2000 BMVIT published a draft for the regulation of exposure standards for base stations and mobiles (10 MHz - 300 GHz) on the basis of ICNIRP reference levels).

Michael Kundi, University of Vienna, Institute for Environmental Health, Austria, pointed out that for protection of human health from radiofrequency fields and microwaves it is scientifically untenable only considering the principle of tissue heating. He referred to the methodological faults of this approach and pointed to the body of data showing biological and health effects under non-thermal exposure conditions. He proposed the derivation of preliminary exposure standards from the available studies considering certainty factors.

Yuri Grigoriev, Centre of Electromagnetic Safety, Institute of Biophysics, Moscow, Russia, reported that the relevant exposure standard in Russia for the general public in the high frequency range is 100 mW/m<sup>2</sup> (10 µW/cm<sup>2</sup>). Exposure measurements in the first line buildings opposite to the base stations (n=787) showed in the mean 2,3 mW/m<sup>2</sup> (0,23 µW/cm<sup>2</sup>) with a maximum value of 9,3

mW/m<sup>2</sup> (0,93 µW/cm<sup>2</sup>). He presented also investigations on the isolated frog heart showing significant effect differences depending on the modulation of the signal.

Yngve Hamnerius, Chalmers University of Technology, Dept. of Electromagnetics, Goteborg, Sweden, gave an overview on the electromagnetic spectrum and went into EMF-measurements done at sixteen different sites in Sweden. Measurements had been carried out outdoors in city areas e.g. at bus stops (n=8). The maximum value observed was 3 mW/m<sup>2</sup> (0,3 µW/cm<sup>2</sup>) and was dominated by GSM 900. A measurement in an office (indoors) revealed a value of 1,5 mW/m<sup>2</sup> (0,15 µW/cm<sup>2</sup>), 96 % of the power flux density coming from a GSM 900 antenna 100 meters away. Measurements in the vicinity of radio and TV transmitters (n=3) resulted in values up to 2,3 mW/m<sup>2</sup> (0,23 µW/cm<sup>2</sup>).

Bill Curry, EMSciTek Consulting Co., Illinois, USA, demonstrated by a practical example, that the radiation of two mobile telecommunications base stations, given as power flux density, had been amplified six to ten times by vector addition by the ground wave of an AM broadcast station 6 km away. [note: this finding is of great importance for the siting of mobile telecommunications base stations in order to avoid the vector addition, as well as for the eventual elucidation of spatial distribution patterns of symptoms and cases of illness in epidemiological studies].

Cindy Sage, Sage Associates, Santa Barbara, USA, emphasized the need for the possibility of information on the personal exposure concerning electromagnetic fields from base stations. This data should be calculated before installation of the site. Sage made clear, that the additional going on air with the internet, the EMF exposure will increase significantly and she demands an adequate information for the public.

Carl Blackman, US Environmental Protection Agency, North Carolina, USA showed that electromagnetic fields can influence calcium-ion activity in nervous tissues at non-thermal levels in a non-linear fashion. He described an EMF induced series of effects from changes in human behavior, alteration of brain electrical activity (EEG) and induced changes in calcium ion activity. He also explained a model to predict the EMF related non-linear changes in calcium ion activity.

Fiorenzo Marinelli, Ist. di Citomorfologia C.N.R., Bologna, Italy, described a reversible formation of clusters of inter membrane proteins (function: ion channels, enzymes, receptors for chemical signals) in fibroblast cells exposed to a pulsed magnetic field. He considered the model as a basis to derive hypothesis on the reversion of symptoms of people no longer exposed to a field.

Wilhelm Mosgöller, University of Vienna, Inst. for Cancer Research, Austria, reported of investigations on ear and hearing sensations, noise and sleep disturbances associated with base stations and infra sound. In an experiment under real world conditions (base stations several hundred meters away) with two identical boxes (with or without shielding by an aluminum foil) the test persons were able to distinguish between the different boxes based on a change of the hearing sensation. An other test (time series) showed a significant association between hearing sensations and distinct GSM single frequencies at low intensities.

Cindy Sage, Sage Associates, Santa Barbara, USA, provided an overview of radiofrequency / microwave radiation studies relevant to wireless communications. She presented the studies arranged by effects, as well as ordered by exposure in a table. She listed a multitude of studies showing significant biological and health effects below the threshold recommended by ICNIRP of 4 W/kg and 0,08 W/kg respectively.

Neil Cherry, Lincoln University Christchurch, New Zealand, verified with numerous studies, some of them with an exposure-response-relationship, that the assertion of ICNIRP and WHO keeping the basic limit of 0,08 W/kg will produce no health effects, is wrong. He concluded from the body of evidence that EMF from mobile phone base stations are probable risk factors for serious health effects for the exposed population like neurological disorders, cancer, cardiac diseases and reproductive disorders. He proposed a reduction target for the mean exposure of the population of 0,1 mW/m<sup>2</sup> (0,01 µW/cm<sup>2</sup>) this could be accomplished by setting the outside boundary exposure as 1 mW/m<sup>2</sup> (0,1 µW/cm<sup>2</sup>). He recommended to carry out health surveys in the vicinity of base stations.

Monica Sandström, National Institute for Working Life, Umea, Sweden, reported of a study of Swedish and Norwegian mobile phone users. The study hypothesis that GSM telephones would lead to more subjective symptoms compared to analogous mobile phones was not confirmed. But the study brought up an association between the frequency and the strengths of different symptoms during the call (e.g. headache, difficulties concentrating, fatigue, warmth behind/around or on the ear) and the frequency and duration of use. Users were able to reduce their symptoms successfully by various measures (e.g. reduction of calls and calling time, change to wired phones, mounting of an outside car antenna, use of a hands free kit). She cites also an Australian study, which saw in mobile phone users most frequently headaches, which were different from „normal“ headaches.

Elzbieta Sobiczewska, Department of Microwave Safety, Military Institute of Hygiene and Epidemiology, Warsaw, Poland, presented a study of people occupationally exposed to EMF at a broadcast station. She found associations between EMF exposure and heart rate variability, day/night amplitude of blood pressure, pulse frequency and parameters of diurnal rhythms of blood pressure and heart rate (acrophase and amplitude but not for the mean value). These findings would indicate a dysregulation of autonomic control of cardiac function with shift towards sympatheticotony.

Ekkehardt Altpeter, Inst. for Social- and Preventive Medicine, University of Bern, Switzerland, reported of investigations in the vicinity of the Swiss shortwave transmitter Schwarzenburg in 1992, 1993 and 1996. In cross sectional surveys it was repeatedly shown that in the exposed population sleep disorders were more frequent than in the not exposed group. This findings were confirmed by short time series as well.

Huai Chiang, Zhejiang University School of Medicine Microwave Lab, Hangzhou, FR China, reported that in China the exposure standard (300 MHz - 300 GHz) for the general population is 100 mW/m<sup>2</sup> (10 µW/cm<sup>2</sup>). She presented a study of people chronically exposed to high frequency electromagnetic fields. The exposure was associated with the following symptoms and disorders: headaches, fatigue, insomnia or somnolence and decrease in memory, changes in ECG (bradycardia <50/min and ST-T downward displacement), reduction of thrombocytes and leukocytes. Overall the findings showed that chronic exposure to highfrequency EMF is associated with a series of non-specific symptoms including increased neuroses, liability of autonomic nervous system, slight changes in peripheral blood, the lens of the eye and the non-specific immune function.

Livio Giuliani, National Institute of Occupational Safety and Prevention (ISPESL), Rome, Italy, described the reasons for the position of Italy refusing the proposed guideline values of ICNIRP and the European Council for the protection of human health from non-ionizing radiation. Italy prevented by its position the adoption of the ICNIRP guideline values as an EU-directive, therefore only a proposal of the European Council was adopted. Beside a general exposure standard of 100 mW/m<sup>2</sup> (10 µW/cm<sup>2</sup>) Italy has introduced a so called quality target of 1 mW/m<sup>2</sup> (0,1 µW/cm<sup>2</sup>) per facility.

Ronald Macfarlane, Health Promotion and Environmental Protection Office, Toronto Public Health, Canada, reported of the plans of the city of Toronto in order to introduce a strategy of a precautionary reduction of exposure from base stations. Because of the legal position the final decision has to be made by the federal government. He also spoke about the possible approach for the derivation of preliminary exposure values.

Malcom MacGarvin, modus vivendi, Consultant for the European Environment Agency, Glenlivet, Scotland, explained on the basis of certain examples like asbestos, BSE, lead in gasoline etc. which lessons should be learned from early warnings.

Helene Irvine, Greater Glasgow Health Board, Dept. of Public Health, Scotland, listed a multitude of considerations regarding the need for a precautionary approach with regard to both cellphones and their base stations. In her estimation the ubiquitous use of cellphone technology has all the hallmarks of a future public health problem. Any new technology is likely to have some effects even if they are very small. Society needs to know about these risks and make an informed judgement about whether it wants to accept them or accept the costs of minimizing any risk. The principle of minimizing preventable environmental exposure should be applied to EMF as much as it is to water, air, noise and light pollution.

Colin Ramsay, Scottish Center for Infection and Environmental Health (SCIEH), Glasgow, Scotland, described the situation regarding the siting of base stations in Scotland from the perspective of the public health service. He stressed the need for public health professionals to keep up to date with the rapidly changing technology in order to give appropriate advice. This would be not easy when the industry itself is reluctant to enter into a dialogue with interested public health practitioners. Pending such future technical developments, the key remaining issue at present, in the UK at least, is to persuade the general public, skeptical public health professionals, industry and the government that the most sensible course of action is to adopt a precautionary approach.

Louis Slesin, Editor Microwave News, New York, USA, gave an overview on the controversy on mobile phones and base stations in the USA. He pointed out that the greatest irony would come from the fact that if the public did not love their phones so much, there would be much fewer towers. The proliferation of towers would be a direct result of the demand for dial tones on mobile phones. There are legitimate concerns over the lack of long-term studies of chronic, low-level exposures, especially since towers entail round-the-clock exposures.

Gerd Oberfeld, Environmental Health, Federal State of Salzburg, Austria, presented the dynamic Salzburg model, that started in 1997 aiming at the precautionary protection of public health. It showed that including the public is necessary and possible. Optimized siting of base stations led to a reduction of EMF exposure up to the factor 100 to 1000. Main element is the calculation of the expected EMF exposures in the vicinity of a base station (per sector), based on the maximum power output. If necessary the power has to be reduced in order to guarantee the compliance with the exposure limits. Because no data on exposures from previously erected basestations were available, the limit value of  $1 \text{ mW/m}^2$  ( $0,1 \text{ } \mu\text{W/cm}^2$ ) has been split up for the four network providers to  $0,25 \text{ mW/m}^2$  ( $0,025 \text{ } \mu\text{W/cm}^2$ ) per site for pragmatic reasons.

In the final discussion the Salzburg resolution on mobile telecommunications base stations was presented. This resolution lists central points that should be considered when siting and operating this facilities. The Resolution in complete wording is part of in this proceedings.

## Annex II

Salzburg Resolution

Conversion of Units

Internet Adresses

Proceedings - Faxorderform

## Salzburg Resolution on Mobile Telecommunication Base Stations

International Conference on Cell Tower Siting  
Linking Science & Public Health  
Salzburg, Austria, June 7-8, 2000  
[www.land-sbg.gv.at/celltower](http://www.land-sbg.gv.at/celltower)

1. It is recommended that development rights for the erection and for operation of a base station should be subject to a permission procedure. The protocol should include the following aspects:
  - Information ahead and active involvement of the local public
  - Inspection of alternative locations for the siting
  - Protection of health and wellbeing
  - Considerations on conservation of land- and townscape
  - Computation and measurement of exposure
  - Considerations on existing sources of HF-EMF exposure
  - Inspection and monitoring after installation.
2. It is recommended that a national database be set up on a governmental level giving details of all base stations and their emissions.
3. It is recommended for existing and new base stations to exploit all technical possibilities to ensure exposure is as low as achievable (ALATA-principle) and that new base stations are planned to guarantee that the exposure at places where people spend longer periods of time is as low as possible, but within the strict public health guidelines.
4. Presently the assessment of biological effects of exposures from base stations in the low-dose range is difficult but indispensable for protection of public health. There is at present evidence of no threshold for adverse health effects.

Recommendations of specific exposure limits are prone to considerable uncertainties and should be considered preliminary. For the total of all highfrequency irradiation a limit value of 100 mW/m<sup>2</sup> (10 µW/cm<sup>2</sup>) is recommended.

For preventive public health protection a preliminary guideline level for the sum total of exposures from all ELF pulse modulated high-frequency facilities such as GSM base stations of 1 mW/m<sup>2</sup> (0.1 µW/cm<sup>2</sup>) is recommended.

## Salzburg Resolution on Mobile Telecommunication Base Stations

International Conference on Cell Tower Siting  
Linking Science & Public Health  
Salzburg, Austria, June 7-8, 2000  
[www.land-sbg.gv.at/celltower](http://www.land-sbg.gv.at/celltower)

Disclaimer: The Resolution represents the personal opinion of the undersigning scientist and public health specialist and not that of the organization they are affiliated to.

Dr. Ekkehardt Altpeter	Inst. for Social- and Preventive Medicine, University of Bern	Bern, Switzerland
Dr. Carl Blackman	US Environmental Protection Agency	Research Triangle Park, North Carolina, USA
Dr. Neil Cherry	Lincoln University Christchurch	Christchurch, New Zealand
Prof. Dr. Huai Chiang	Zhejiang University School of Medicine Microwave Lab	Hangzhou, China
Dr. Bill P. Curry	EMSciTek Consulting Co.	Glen Ellyn, Illinois, USA
Prof. Dr. Livio Giuliani <sup>1</sup>	National Institute of Occupational Safety and Prevention (ISPESL)	Rome, Italy
Prof. Dr. Yuri Grigoriev	Centre of Electromagnetic Safety, Insti- tute of Biophysics	Moscow, Russia
Dr. Helene Irvine	Greater Glasgow Health Board, Dept. of Public Health	Glasgow, Scotland, UK
Dr. Christoph König	Federal State of Salzburg, Public Health Dept., Environmental Health	Salzburg, Austria
Prof. Dr. Michael Kundi	University of Vienna, Inst. for Environ- mental Health	Vienna, Austria
Ronald Macfarlane	Health Promotion and Environmental Protection Office, Toronto Public Health	Toronto, Canada
Dr. Malcolm MacGarvin	modus vivendi, Consultant for the Euro- pean Environment Agency	Glenlivet, Scotland, UK
Dr. Fiorenzo Marinelli <sup>1</sup>	Ist. di Citomorfologia C.N.R.	Bologna, Italy
Prof. Dr. Wilhelm Mosgöller	University of Vienna, Inst. for Cancer Research	Vienna, Austria
Dr. Gerd Oberfeld	Federal State of Salzburg, Public Health Dept., Environmental Health	Salzburg, Austria
Dr. Colin Ramsay	Scottish Center for Infection and Envi- ronmental Health (SCIEH)	Glasgow, Scotland, UK
MA Cindy Sage	Sage Associates	Santa Barbara, California, USA
Dr. Luis Slesin	Microwave News	New York ,USA
Prof. Dr. Stanislaw Szmigielski <sup>1</sup>	Dept. of Microwave Safety, Military In- stitute of Hygiene and Epidemiology	Warsaw, Poland

1) This preliminary guideline level of 1 mW/m<sup>2</sup> (0.1 µW/cm<sup>2</sup>) is, by the participants marked with a (1), understood as an operational level for one facility (e.g. a cell tower).

## Conversion of Units & Values for the Assessment of Exposures from Cell Towers

W/m <sup>2</sup>	mW/m <sup>2</sup>	µW/cm <sup>2</sup>	V/m	
10	10.000	1.000	61.400	proposal ICNIRP/WHO/EU-Council recommendation; std Germany (>2000 MHz)
9	9.000	900	58.249	proposal ICNIRP/WHO/EU-Ratsempfehlung; std Germany (1800 MHz)
8	8.000	800	54.918	
7	7.000	700	51.371	
6	6.000	600	47.560	
5	5.000	500	43.417	proposal ICNIRP/WHO/EU-Ratsempfehlung; std. Germany (1000 MHz)
4	4.000	400	38.833	
3	3.000	300	33.630	
2	2.000	200	27.459	
1	1.000	100	19.416	
0.9	900	90	18.420	
0.8	800	80	17.367	
0.7	700	70	16.245	
0.6	600	60	15.040	
0.5	500	50	13.730	
0.4	400	40	12.280	
0.3	300	30	10.635	
0.2	200	20	8.683	
0.1	100	10	6.140	std Switzerland (6V/m<1800 MHz) <sup>1</sup> ; std Italy; proposal Toronto; proposal Scotland
0.09	90	9	5.825	
0.08	80	8	5.492	
0.07	70	7	5.137	std Switzerland (5V/m 900 + 1800 MHz) <sup>1</sup>
0.06	60	6	4.756	
0.05	50	5	4.342	
0.04	40	4	3.883	std Switzerland (4V/m 900 MHz) <sup>1</sup>
0.03	30	3	3.363	
0.02	20	2	2.746	
0.01	10	1	1.942	
0.009	9	0.9	1.842	
0.008	8	0.8	1.737	
0.007	7	0.7	1.624	
0.006	6	0.6	1.504	
0.005	5	0.5	1.373	
0.004	4	0.4	1.228	
0.003	3	0.3	1.063	
0.002	2	0.2	0.868	
0.001	1	0.1	0.614	proposal Salzburg; Quality Target Italy <sup>1</sup>
0.0009	0.9	0.09	0.582	
0.0008	0.8	0.08	0.549	
0.0007	0.7	0.07	0.514	
0.0006	0.6	0.06	0.476	
0.0005	0.5	0.05	0.434	
0.0004	0.4	0.04	0.388	
0.0003	0.3	0.03	0.336	proposal Salzburg (0.25 mW/m <sup>2</sup> ) <sup>2</sup>
0.0002	0.2	0.02	0.275	proposal Dr. Cherry, New Zealand for 2000
0.0001	0.1	0.01	0.194	proposal Dr. Cherry, New Zealand for 2010
0.00009	0.09	0.009	0.184	
0.00008	0.08	0.008	0.174	
0.00007	0.07	0.007	0.162	
0.00006	0.06	0.006	0.150	
0.00005	0.05	0.005	0.137	
0.00004	0.04	0.004	0.123	
0.00003	0.03	0.003	0.106	
0.00002	0.02	0.002	0.087	
0.00001	0.01	0.001	0.061	proposal Resolution BRD 1999 waking areas – sleeping areas 10-times lower

std= standard by law, <sup>1</sup> per site, <sup>2</sup> per operator and site

Fax Order Form

Fax No: ++43 / 662 / 8042 – 3056

**PROCEEDINGS**

International Conference on Cell Tower Siting  
 Science & Public Health, Salzburg, Austria, June 7 – 8 2000

www.land-sbg.gv.at/celltower

**Please send to**

Land Salzburg  
 Umweltmedizin  
 Postfach 527

A-5010 Salzburg

www.land-sbg.gv.at/celltower  
 Tel. ++43 / 662 / 8042 – 2969  
 Fax: ++43 / 662 / 8042 – 3056  
 E-mail: gerd.oberfeld@land-sbg.gv.at

(Please complete in block letters or type)

Surname		Firstname	
Company			
Postal Adress			
Postal Code / City		Country	
Telefon		Telefax	
E-mail			

I order on account

	Price per Unit	Units	Total
Proceedings German	ATS 390,- (EUR 28.34)		ATS
Proceedings English	ATS 390,- (EUR 28.34)		ATS
Sum Total			ATS

**Term of payment**

By bank transfer (net of charges for the beneficiary), to the account "Land Salzburg"  
 No 212 701 7 (Bank Code 55 000) at Salzburger Landeshypothekenbank,  
 Residenzplatz 1, A-5010 Salzburg.  
 (Please clearly state Name and Invoice Number on transfer slip.)

Date: ..... Signature: .....