

“Mobile Phone Base S

4. Workshop within the framework of the COST 281 Pro

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New radio masts for mobile radio network base stations are causing inhabitants to complain more often about health problems, which are mostly unspecific in nature (headaches, sleep disturbances or general discomfort). Although in all of the cases the valid value limits were complied with and were mostly considerably below the prescribed limits, the electromagnetic radiation of the base stations was held responsible for these health problems. Some of the general public is concerned that the electromagnetic emissions from mobile radio masts, even when valid value limits are complied with could at least in the long run pose a health risk.

Dublin Castle

tations and Health’

programme of the European Union held on 15 and 16 May 2003 in Dublin, Ireland

Circa 100 scientists and experts from all over the world meet in Dublin Castle to deal with this problem in the following five subject areas.

- *Epidemiological studies*: Which of the studies that have been done to date are relevant in this context? How must this type of study be conducted and what particular problems make this kind of study difficult to conduct?

- *Measurement methods*: Can the levels of exposure in the areas around radio masts be reliably determined? Can in particular long-term exposure be estimated?

- *Dosimetry*: A simple dosimeter would be desirable that measures exposure over a long period of time. What should such a “mobile radio dosimeter look like”? Can it be designed so that it is easy to use and can be worn at all times? Is a feasibility study worth doing?

- *Psychological Aspects*: Do the reported non-specific health problems occurring in the vicinity of phone masts reflect objective effects or are they subjectively felt disorders which have no physical cause. How should a study be conducted to ensure that a clear distinction is made between psychological and physical causes?

- *Risk communication*: How can the dialogue be carried out between the those concerned and affected and the authorities and science and how should the scientific findings of a study on these com-

plex issues be conveyed to the public? What are the possibilities, the risks and the pitfalls of risk communications?

If you haven’t noticed by now that the subject “radio masts and health” has been getting a lot of public attention recently, then you will finally be made aware of it by the fact that Ireland’s Minister for Communications, Marine and Natural Resources, John Browne, officially opened the workshop in Dublin. Minister Browne pointed out in his opening address that he has recently spent more time discussing radio masts than any other environmental concern.

I. Epidemiological Studies

The topic “epidemiological studies”, began with a keynote speech held by Joachim Schüz from the Institute of Medical Bio-Statistics, Epidemiology and Informatics of the University of Mainz. He gave an overview of the basic problems involved in epidemiological studies. A very important point regarding this is to have a clearly defined metric, where an explicit difference can be made between those who are exposed and those who are not exposed. This is, however, with regard to health risks posed by mobile radio masts extremely difficult, since the effect that is being sought, if it exists at all, can only be very weak and on the other hand, the exposure values in the vicinity of base stations from



Minister John Browne, Department of Communications, Marine & Natural Resources



From left to right Gunnhild Oftedal, Mirjana Moser, Norbert Leitgeb, Joachim Schüz

a time and spatial point of view (even less than a meter) can fluctuate by several orders of magnitude.

In this context, Schüz made a further point that studies that attempt to prove very weak effects must be conducted so that they have the highest possible specificity, i.e., a person who is not exposed will be classified with a high probability as not being exposed. Or in other words: the number of persons falsely classified as “exposed” must be kept as low as possible. This condition will be very difficult to realize when conducting epidemiological studies on possible health risks posed by mobile radio masts. Schütz presented a number of studies which investigated the risk of cancer in the vicinity of radio and television transmitters. The findings seem to indicate that there is an increased risk of leukaemia. However, no definite conclusions can be drawn because of a lack of methodology.

Gunnhild Oftedal from Sør-Tondelag University College in Trondheim, Norway expounded on the question in her report if it makes any sense to use epidemiological studies while seeking health risks posed by radio masts. She investigated this based on examples from several concrete investigations, which had already been carried

out for this purpose. These studies (all of them cross-sectional surveys) have investigated subjectively reported unspecific symptoms such as head aches, sleep disturbances and cognitive factors.

In Ms Oftedal’s opinion the following factors must be especially observed in future investigations: statistical significance, bias, confounding and exact determination of exposure. It is not sufficient simply to use the distance to the base station as an exposure metric because the fluctuations would be too great. Avoiding bias is also very important. Therefore when possible double blinds should be conducted. Confounding could arise, for example from people who are especially concerned and have a tendency to overrate their symptoms.

Mirjana Moser from the Swiss Federal Office for Health in Bern presented a pilot study which was conducted in Switzerland with people who complained about health problems linked to electromagnetic fields. 394 people were questioned and 74% of them responded that “with certainty” their problems were linked to mobile radio base stations. The most frequent complaint was sleep disturbances (60%) and headaches (40%). Ms Moser proposed that a laboratory study or an “experimental field” study should be conducted in order to investigate the causal connection between the symptoms reported on and electromagnetic fields.

Norbert Leitgeb from the Institute of Biomedical Technology at the Technical University in Graz, Austria stated in his report that he doubted, in principle, the use of epidemiological studies to investigate possible health risks in the vicinity of mobile radio stations. If mobile communication systems pose a health risk at all, than this would have to be demonstrated first with the use of mobile telephones since in this case the exposure is substantially higher than what is experienced in the vicinity of a mobile radio base station.



According to Leitgeb, due to a high degree of uncertainty (e.g. when determining exposure over longer periods of time) epidemiological studies on health risks stemming from base stations can neither prove that a possible minor risk exists nor definitely demonstrate the non-existence of a risk. Therefore, concerning risk communication it would even be counterproductive.

During the final discussion it was revealed that the majority of the experts who were present at the workshop found epidemiological studies in connection with mobile radio base stations more problematic than not. The main reason for this assessment is the fact that the exposure ratio can only be determined with a great deal of effort and uncertainty, especially when the investigation is to be carried out over a longer period of time.

Concerning an investigation on acute effects, laboratory experiments are definitely preferred because the exposure ratio in this case can be reliably controlled. With regard to investigations on short-term effects (e.g. sleeping disturbances) in every case researchers should strive to do double blind experiments. This is, however, only possible in cooperation with network providers. The main problem involved with long-term effects (e.g. the occurrence of cancer) is that currently there is no reliable way to make a distinction between people who are exposed and those who are not exposed or only slightly exposed in the vicinity of mobile radio base stations. Epidemiological studies would make more sense if they were conducted near strong transmitters (radio and TV), since in this case it is easier to divide the inhabitants into different exposure classes.

In any case, it is necessary to develop better methods for determining an exposure metric. Moreover, numerous measurement campaigns should continue to be carried out in the vicinity of mobile radio masts, in order to make extensive material

available for actual exposure situations. Finally in this context it was seen as important that further studies be conducted on the effects of weak electromagnetic fields on biological systems.

2. Measurement methods

In the first reports on the subject "measurement methods" Georg Neubauer from the Austrian Research Centres GmbH in Seibersdorf, Austria, mainly focused on the question: How exact and reliable, if at all, can the exposure from electromagnetic fields in the vicinity of base stations be determined. The exposure values depend on a number of physical phenomena (e.g. scattering, diffraction, multipath-propagation) which cause the base station fields to show strong spatial fluctuations. Recent measurements carried out by ARC Seibersdorf showed that even within the smallest space (ca. 1m³) the power density level of one BCCH channel of a neighbouring GSM base station can vary by a factor of 100. The variations in time are typically of the same order of magnitude as the variations in space. This indicates that it will be extremely difficult to determine the actual amount of radiation inhabitants are exposed to in the vicinity of base stations. The selection of a suitable expo-

sure assessment protocol is, therefore, especially important.

Under a mandate by the European Union the Technical Committee TC 106x of CENELEC (European Committee for Electrotechnical Standardization) is currently dealing with the development of standards (including the required measurement procedures), which will serve to assess the exposure in the vicinity of base stations according to a uniform procedure. First preliminary results indicate that the type of field distribution depends strongly on the exposure scenario. In heated debates experts are also controversially discussing if, with these prerequisites, epidemiological studies investigating the possible harmful effects of electromagnetic fields from base stations can be conducted at all.

Christof Olivier from the Department of Information Technology at the University of Ghent in Belgium compared in his report the different methods which are used when measuring electromagnetic fields of base stations, depending on whether the measurement is used for checking value limit compliance or if the actual exposure of individual persons is to be determined. To date, measurements in the vicinity of base stations are almost exclusively taken to check for the compliance of valid value



from left to right: Antonio Martínez-González, Carla Oliveira, Christian Bornkessel, Wolfgang Hotz, Georg Neubauer, Christof Olivier

limits. They always start from the assumption of the worst case situation. This approach is however, not suitable for determining the actual degree of emissions that individual persons are exposed to. The measurement and calculation methods that have been used to date have to be correspondingly adjusted.

A first intermediate step could be to ascertain the mean values at certain sites or to proceed from the assumption that the investigated person possess certain behavioural patterns. It is generally assumed to be important that the whole body SAR has to be determined. However, to estimate the whole body SAR, it is simply not enough to measure only the electric field. One must also determine the angle of incidence and polarization. Substantially more complex field measurements are required here than when simply measuring for the compliance of value limits. According to Olivier, predictions concerning long-term exposure in the vicinity of mobile phone base stations are almost impossible to make because they are dependent on many uncontrollable variables. The same holds true for the estimation of historical exposure values.

Carla Oliveria from the Institute for Telecommunications of the University of Lisbon, Portugal presented in her report the results of a measurement campaign, where the exposure values of mobile radio base stations were measured in Lisbon. The goal of the measurement campaign was to check whether or not the protection values for people were being complied with. Even in the most unfavourable cases values were measured which were 13.58 dB below the value limits (in accordance with the recommendations of the EU Council of Ministers). The measured values were generally 22.4 dB below the value limit. The highest values were measured on roofs at antenna heights.

Wolfgang Hotz from the German Regulation Authority of Telecommunications

and Postal Services (RegTP) in Mainz presented the results of a German measurement campaign where at 3600 sites measurements were taken. The goal here was also to check the compliance of value limits. Not one single case was found where the measurements were above the protective value limits for people. It was established that the level of the field strength at a particular site is not particularly representative. The values are time-dependent as well as strongly dependent on the respective local conditions. Therefore, it does not seem very useful to present field strength measurements cartographically, as it was originally planned by the RegTP. Concerning a detailed measurement campaign in Taucha (Saxony), which Mr Hotz presented as an example, it was established that mobile radio's share to overall exposure (radio, television, etc.), is very low. This tendency was also the case at the majority of the other measurement sites.

Antonio Martínez-González from the Institute of Theoretical Communications Engineering at the Technical University in Carthagene, Spain presented the results of a measurement campaign in a medium-sized city in south-east Spain. As in the previous report these measurements were done to check compliance limits. Again, in all of the cases the values measured were considerable below the value limits.

The last report in this field was given by Christian Bornkessel from the IMST GmbH in Kamp-Lintfort, Germany on a measurement programme conducted in the vicinity of 24 base stations (mostly indoors). Other than the previously described campaigns, these measurements were not taken to check for compliancy but rather with the goal to determine the actual level of exposure within the building. At each location the maximum field strength was determined by the to-and-fro motion of the antenna. Although all measurement places were in direct vicinity of the base

stations the results show, that all measured fields are well below the ICNIRP limits.

It was not possible to classify the base stations according to specific parameters, since the exposure ratios, even with similar external conditions, were too different. Bornkessel's group also found out in laboratory experiments that the field strength even with regard to the smallest space (ca. 10 cm) could fluctuate by a factor 100. Another remarkable result was the fact that the so called "umbrella or lighthouse-effect" (the field strength is supposed to be especially low directly below the transmitting antenna) could not be confirmed.

In summation, one could say that regarding this subject area it has been demonstrated that it might be extremely difficult to categorise the inhabitants near mobile radio base stations concerning their exposure to electromagnetic fields in order for it to be used as a basis for meaningful epidemiological studies. For this the spatial and temporal fluctuations are too great, and the effects of other high frequency-sources (radio and television transmitters, mobile telephones, cordless telephones etc.) are often much stronger than what people are interested in, namely, the fields of base stations. Moreover, it must be stressed that in all of the measurement campaigns the exposure values were well below the ICNIRP value limits.

3. Dosimetry

Owing to the difficulties, which were described above, that are entailed in assessing just how much exposure people are getting from electromagnetic fields, it would be desirable if a simple, small device were available for participants in an epidemiological study to wear at all times and for a longer period of time. This device could immediately record radiation that a person is being exposed to independently of where that person happens to be.



In the first report on this subject area Joe Wiart from the Research and Development Centre of France Telecom went into detail about the basic requirements and the feasibility of such a “personal dosimeter”. In his opinion such a dosimeter should not be bigger than 15x10x4 cm³. It has to be frequency selective in order to report only the fields of mobile communication systems. Moreover, the device should ideally measure isotropic (uniform in all directions), whereby, the fact that the device must be worn on the body, presents a great problem. Finally, the dosimeter must be sensitive enough to be able to measure the expected weak fields, which could lead to problems with linearity.

Could a dosimeter be built fulfilling the above mentioned requirements, so that field effects over an area of circa 20 dB (factor 100) could be measured and afterwards the participants of an epidemiological study could be placed in different exposure classes? According to Joe Wiart this is difficult but feasible.

Jürgen Kausche from the company Rohde and Schwarz presented in his report a design study for a personal dosimeter. The essential element of the proposed device consists of a series of mini antennas incorporated at various points around a belt which is to be worn by the test person. On

one side of the belt there is a little box which will periodically at timed intervals evaluate the different antenna signals.

Two types are being considered: one is a narrow-band spectrum analyser in which for every single antenna the spectrum will be scanned in succession. The total recording time for this type is supposed to be three hours. The second type is a wide band system which works with six frequency selective filters and switches at a rhythm of less than a second through all six filters and then from one antenna to the other. This device should be able to record measurements for 24 hours.

Experts present at the presentation asked if such a system with mini antennas incorporated into a belt was practical. After all, the device would also have to be worn while sleeping.

Kausche suggested a simpler solution, such as an isotropic and frequency selective sensor which can determine radiation levels in a room where people normally spend several hours (the best room for this would be the bedroom). In this way it would be possible to differentiate between those who are exposed to a (relatively seen) high level of radiation in their sleeping quarters and those who are exposed to low levels (concerning the mobile radio frequencies of interest). This would, at least

for the length of time spent sleeping, facilitate a rough classification for an epidemiological study.

In the last report on this subject Carla Malacarne from ITC-irst (Centre for Scientific and Technological Research) in Trentin, Italy presented a numerical model which calculates how much energy from electromagnetic fields of a base station is absorbed on a particular part of the human body. The model used was a GSM base station with a field of 900 MHz. For the human body a model was developed where the body’s water distribution (and with this the permittivity) was recorded tomographically by means of a MRI (Magnetic Resonance Imaging).

4. Psychological Aspects

Johan Havenaar from the Albrecht Institute for Mental Health Care in Utrecht, the Netherlands gave the first report in the section “psychological aspects”. He concentrated on the so-called “Electric Hypersensitivity Syndrome” EHS and stressed that “psychological effects” are normally first referred to when concerning a health problem all conceivable biological causes can be ruled out with adequate certainty. However, concerning exposure posed by electromagnetic fields this is not unconditionally the case. He gave an example of a biological effect on the brain rTMS (repetitive Transcranial Magnetic Stimulation) triggered by electromagnetic fields. rTMS is used therapeutically, e.g. to treat schizophrenia.

On the other hand, symptoms for EHS are comparable to those of “multiple chemical sensitivity” or other so-called “medically unexplained physical symptoms” (MUPS) where it is suspected that these symptoms are entirely of a psychological nature. According to Havenaar there have been a number of studies where it has been proven that these unspecific symptoms also occur under mock-exposure. These studies also seem to confirm that



from left to right Elzbieta Sobiczewska, Ray Kamp, Paolo Vecchia, Tom Mc Maunus



the symptoms are triggered by a “nocebo” effect (in contrast to a placebo effect). In this context, it is important that other studies (studies not conducted on electromagnetic fields) could demonstrate that this nocebo effect can be reduced, for example by informing those affected about it.

Eric von Rongen from the Health Council of the Netherlands in Den Haag reported on an experiment which is in progress at the moment in the Netherlands. 36 people who claim that they are experiencing effects from electromagnetic fields stemming from a neighbouring base station and a control group of 36 people who are in this respect not electro hypersensitive are being investigated for general symptoms and cognitive functions while under the influence of fields from GSM and UMTS signals. The experiments are being conducted in an anechoic room and are double blinded, i.e. neither the test subject nor the person conducting the experiment know if the field is switched on or not. The field strengths used in the experiments correspond to what can be expected in the houses near the base station (well below the ICNIRP value limits). The first results of the study are expected to be released in mid-July 2003.

A further experiment which was carried out in Switzerland was presented by Martin Rööslü from the Department of Social and Preventative Medicine of the University of Bern, Switzerland. It dealt with a pilot study to test the feasibility of a large-scale study which will be planned at a later stage. The pilot study was conducted in the surrounding area of a newly erected base station, which was not in operation at the beginning of the study. Altogether 37 test persons, who all lived near the base station were asked to keep a sleep diary for six weeks, making entries every morning and evening. In addition every Wednesday morning urine samples were taken and cortisone levels were tested. One person

also wore an “actiwatch” device during the test which could record sleep activity. At the beginning and at the end of the test period each test person was visited at home and by means of an interview other effects from various environmental factors (e.g. noise) were established. Exposure measurements in the radio and microwave frequency range were also taken.

The base station was put into operation on the 16th day of the study, albeit the public and the test persons were not informed about it. In this way it could be determined without any psychological effects if the operation of the base station in any way influenced the sleep or the well-being of the test persons.

It showed that the design of the study (sleep diary, interviews, measurements, actiwatch, test persons also functioned simultaneously as a control group), is in principle suitable for conducting a meaningful large-scale study. It is doubtful if the cortisone level alone is of any significance. It is imperative that such a study be done in cooperation with the network operators. Only so the exposure from the base station can be switched on and off in a random way. However, an essential disadvantage of the design of the study is that only short-term effects can be investigated.

Even in the pilot study no significant alterations in the length of sleep and the well-being of the test persons were determined after the base station was switched on. However, it must be stressed that the total level of exposure from electromagnetic fields in the houses of the test persons barely changed after the base station was operating.

Herman Vetter from the HAAG in Schönbrunn, Germany reported on a research project that was conducted between 1971 and 1976 in Heidelberg. More than 6000 inhabitants of Heidelberg aged 33 to 46 were interviewed at the time with the goal to obtain a psychological personality

profile. An essential characteristic of this personality profile was if the interviewees tended to find the cause of personal problems within themselves or if they tended to blame outside factors, (pollution, social environment, etc.). These data can be now used to question the same people again if their well-being is affected by mobile radio communication systems in general or if it is especially affected by nearby base stations. First of all, the personality parameters previously established of those questioned could be used to classify the interviewees as “concerned” and “unconcerned” (with regard to environmental factors) and then it could be investigated if there is a correlation between complaints about health problems posed by base stations.

Monica Sandström from the National Institute of Working Life in Umeå, Sweden, reported on a pilot study where 18 people were asked which symptoms they thought were connected to a neighbouring base station. The interviewees did not represent a cross-section of the population. They were recruited after they responded to ads in 10 Swedish newspapers. They were asked to report on symptoms that were connected to mobile radio base stations. Only 18 people responded to the ads and 17 of them described themselves as electro hyper-sensitive. Many of the people who responded were members of the Swedish organization for electro-sensitive people.

The most frequent symptoms those interviewed complained of were Concentration difficulties, headaches, general discomfort, memory disturbance, dizziness, nausea, and tooth disorders. Ms Sandström concluded from her study that there are people who are concerned about the further extension of mobile radio networks and that many people do not see any need for a further extension of the networks. The decision to continue extending the networks does not seem to have enough

backing from the public. Therefore, she finds that a dialogue based on facts would be very important.

5. Risk communication

Without a doubt the public is greatly concerned about the possible health risks posed by mobile radio base stations, these concerns can very often be traced back to false estimations concerning these sensitive risks. An open and honest risk communication is therefore important to dispel unfounded fears or to make sure that fears do not take root in the first place.

In the first report on this subject Peter Wiedemann from the Programme Group Human, Environment and Technology of the Research Centre in Jülich, Germany focused on fundamental questions concerning the public’s risk perception in conjunction with electro smog. A basic problem is that laypersons perceive the “risk” of radio masts (and from mobile telephones) differently than how the risk is assessed by experts. In a number of studies it was revealed that the public is generally not very concerned about these risks, but that the subject is dealt with in the media with increasing frequency and the political discussion about it is highly controversial.

In the summer of 2002 in Tirol, Austria, Wiedemann’s group conducted a study with 151 people in order to investigate the individual differences concerning risk perception regarding radio masts and mobile telephones and to find out how the public evaluates the most important arguments used in connection with risk communication. It was also of interest how future events could influence risk perception.

The persons interviewed were placed into three groups according to their attitude towards the risk of mobile radio communication. The three groups were: “concerned”, “unconcerned” and those who had no clear opinion regarding the subject in question, “undecided”. The variables which

decided which group a person belonged to were primarily age and sex. Other variables (e.g. educational level) did not play a role. Wiedemann formulated it so: “unconcerned” were especially young men and “concerned” were mainly older women.

Once again it was demonstrated that risk perception is very dependent on an a one-time held opinion. Both the concerned group and the unconcerned group tended to prefer those arguments which confirmed their firmly held opinions, while contrary arguments and information was underestimated. Only the undecided were prepared to accept pro and contra arguments as equally important. This presents a challenge for risk communication since it is difficult to change a firmly held opinion, even if the arguments used are good ones. It seems plausible that it primarily depends on a timely information policy (in other words before a new radio mast is erected).

Wiedemann explained that according to the findings obtained to date, they have revealed that there is a strong asymmetry between information that warns and information that is reassuring. People are much more aware and give more attention to reports that warn than to those types of reports which are reassuring. This effect is much more characteristic of the concerned group. All of this indicates obviously that with regard to risk communication it is not enough to educate the public neutrally and factually. In Wiedemann’s opinion it is important to have a better understanding of the other variables, e.g. social norms and emotions which do effect one’s perception of things.

Ray Kemp from Galson Sciences in Oakham, Great Britain emphasized in his report that it is important to take the concerns of the public regarding possible health risks posed by radio masts seriously. Even when no biologically effects have been proven to be linked to radiation from base stations, the idea alone can trigger stress in those concerned and can lead to

considerable protest by the public against radio masts being erected. Recently a few initiatives that have been started by network operators in Great Britain and in a few other countries in order to intensify the dialog with the public (e.g. online base station registers) are indications that the attitude is changing regarding the concern of citizens living near base stations.

Ray Kemp proposed for this dialog a, as he calls it, "ladder of communication" in order to avoid risk communication from becoming counterproductive. The first stage would simply be general information communicated by means of press releases, or flyers, albeit the higher one climbs up this ladder the more intensive the dialogue becomes, whereas the different stages would involve different actors, (network operators, town meetings, research institutions, authorities, etc.). According to Kemp it is essential that the effectiveness of risk communication be researched further and improved.

In the opinion of Paolo Cecchia from the Physics Laboratory of the National Institute of Health in Rome, Italy risk communication is a decisive element regarding the management of the public's perception of "risks" stemming from mobile radio base stations. Obviously, there is a big gap between the assessment of risks posed by modern technology in the opinion of experts and the perception of the same risks by laypersons.

Scientific investigations on the mechanisms of risk perception revealed which factors play an essential role. One of the most important factors is a lack of familiarity with the complicated scientific, technological and medical mechanisms. The conveyance of scientific findings in a way that laypersons can understand it is therefore a central aspect of risk communication, however it can also lead to a number of problems.

In order to present scientific information in such a way that laypersons under-

stand it, simplifications are necessary. This procedure is always subjective and can lead to misunderstandings, especially when the information is distorted by the media. Moreover, laypersons tend to judge things in either "black or white" categories (dangerous, not dangerous, cancer causing, not cancer causing), whereas scientists evaluate a risk on a continual basis and essentially in much finer graduations.

It is also important how the information is conveyed. Lectures, newspaper articles and brochures are suitable instruments for a "direct" transmission of information. However, there are also many channels in which hidden or indirect messages can be transmitted, such as court rulings, "good advice" for risk prevention, exaggerated precautionary measures and unreasonable value limits. Often these hidden messages are also at the same time conveyed when direct information is given, and may even work against the latter. For example, sometimes only the announcement that an epidemiological study will be done may unintentionally signal to the public that "there must be something to" the concerns they raised issue with. In Vecchia's opinion this must be absolutely taken into consideration, if one is thinking about conducting a study on the possible health risks posed by radio masts.

The final report was given by Elzbieta Sobiczewska from the Department of Microwave Safety, of the Military Institute of Hygiene and Epidemiology in Warsaw, Poland. She presented a study which was conducted with 1000 people who lived near mobile radio base stations and who were engaged in citizens' campaigns against the erection of base stations. The participants in the study were asked about their perception and how much they knew about the possible risks posed by mobile radio masts and they were also asked about how much they knew about the biological effects of microwaves. It revealed that the majority of those asked knew very little

about the possible biological effects of microwaves. On the other hand, as a rule the lower the level of knowledge concerning the biological effects from electromagnetic waves was, the greater the level of fear was concerning possible health risks of radiation stemming from radio masts. It must be mentioned here that people were only aware of mobile radio base stations when they were erected in the distance as visible radio masts and not when they were on buildings.

A consequence of the findings of this study and other studies which were conducted in Poland during the last 5 years was a set of recommendations for mediating future conflicts concerning the erection of new base stations: firstly, the use of modern risk communication methods in the form of clear scientifically based information that can be understood by the general public. Secondly, meeting and negotiating with resident representatives with the participation of independent experts, and when possible these experts should be selected by the inhabitants and thirdly, the initiation and support of independent research on the effects of electromagnetic fields on humans and the environment.

Summary of the Workshop-Discussion

Firstly it must be stressed that the strength of electromagnetic fields from mobile radio-base stations, even in the immediate neighbourhood is always well-below the ICNIRP value limits. At such low exposure levels it is from a scientific point of view rather improbable that humans or the environment in any way could be harmed. Moreover, to date despite innumerable studies which have investigated the effects of weak electromagnetic fields on biological systems in general, and especially the effects on humans and animals, have brought no conclusive evidence to light of there being any health risks at such low exposure.



Due to this many experts at the workshop were of the opinion that one cannot reckon that an epidemiological study is able to prove that there are any harmful health risks posed by the electromagnetic fields of mobile radio-base stations or to prove if a statistical recognizable risk can be determined.

Owing to the spatial and temporal field strength fluctuations, it is only possible with considerable effort (when at all) to determine a useable exposition metric where the participants in such a study can be divided into different exposure classes. This is also made more difficult by the fact that people who do not live near a base station are exposed to countless other electromagnetic fields and these fields are usually much stronger than those emitted by mobile radio communication systems.

A personal dosimeter, worn directly on the body of the test person, with which the frequency selective exposure could be measured over a longer period of time, would make the task considerably easier to determine the different exposure classes. However, a personal dosimeter does not exist at the moment. Even if it could be built in the short-run, its suitability to be used would have to be proven in a pilot study. In addition, at best it would only allow for short-term effects to be investigated, which as a rule – according to most of the experts present – is better investigated under laboratory conditions.

It still remains to be clarified whether or not the psychological effects which were discussed at this workshop could be an explanation for the reported health problems residents near base stations com-

plained of. When someone is convinced that radio masts pose a health risk, then the mere fact that in the immediate neighbourhood a base station is being erected will trigger stress for that person and this may lead to all kinds of health and well-being problems. Those who gave reports in the section “psychological aspects” presented a number of indications that support this theory.

Therefore, it is all the more important to heed what some of the experts present at the workshop advocated, namely a carefully planned risk communication, so that people do not develop this kind of stress to begin.

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