

**REPORT OF THE RF SAFETY COMMITTEE
TO THE
ARRL BOARD OF DIRECTORS
January 2002**

The RF Safety Committee has participated in the following areas over the past six months:

1. RF Safety Committee Activities.
2. Monitoring recent scientific studies regarding RF Safety.
3. Participation in the scientific RF Safety community.
4. Administrative issues.
5. Future Plans.

1 RF Safety Committee Activities

- 1.1 The committee received communication from a ham concerned about the safety of a friend who works on active TV and radio broadcast towers. He noted that his friend commented “that he can feel the RF, it heats up his body.” The initial reaction of the committee was that this represents an unsafe activity. However, this issue is covered specifically in FCC document OET65 Supplement A. The question was studied by the FCC and EPA and there is a lot of documentation related to it. They determined what would be safe limits for climbing active towers. The limits are usually below the full operating power, but they do allow a station to perform tower maintenance without going off the air completely. This information was forwarded to the concerned ham.
- 1.2 In late September the committee received communication from a non-ham who claimed to have been overexposed to RF in his work and wanted to know if the ill health that he was experiencing could be caused by this. The committee discussed this and thought that it was entirely possible, though it was not our place to comment directly to this individual. We communicated to this man that he should contact the FCC RF Safety Office and OSHA to deal with this situation.
- 1.3 In November the committee heard from a ham concerned about the exposure consequences of his EME station. We discussed potential differences that exist between an EME exposure analysis and that of a regular HF station, and concluded that though both are similar, the highly directional nature of the EME antenna should be taken into account and will generally help the evaluation to pass muster.
- 1.4 The committee, represented by Mr. Hare, was invited by IEEE SCC-28 to vote on the issue of classifying the external ear (pinna) as an extremity subject to the same SAR requirements as the other extremities, *e.g.*, hands and feet. This is a topic that we discussed in detail earlier this year. We gave Mr. Hare our proxy to cast our ballot in the affirmative. Thus, we are of the opinion that the skin of the outer ear is no more sensitive to RF absorption than the hands or the feet and should be subject to the higher safety limits that are defined for extremities.

2 Monitoring Scientific Studies

- 2.1 Germany's top radiation official said in an interview that people, especially children, should minimize their use of mobile phones as a health precaution. "In general, cell phone calls should be kept as short as possible," Wolfram Koenig, head of Germany's Radiation Protection Agency, told *Berliner Zeitung*. He continued, "Parents should keep their children away from this technology as much as possible." This appears to be an echo of the official position of the British government on cellular telephone use by children. The committee considers that the scientific reasons behind the British concerns about cellular telephone use by children are poorly founded. There are two basic motivations behind this thinking:
 - 2.1.1 Growing children have a much higher percentage of cells undergoing replication than adults do. Since cancer can be caused by mutation of a cell in the process of replication, the implication is that children are at a higher risk of developing cancer if exposed to anything that disrupts cellular replication. However, it has never been shown that exposure to RF energy at or below the currently accepted safety levels disrupts cellular replication.
 - 2.1.2 It has been suggested that the smaller size of children's heads results in higher RF absorption deep within the brain. This has not been shown to be the case in modeling studies, and is discussed in more detail below.
- 2.2 A study by Lennart Hardell, a cancer specialist at Orebro University in Sweden, saying that cellular telephone users have a higher cancer incidence appeared in the press in September. According to Hardell, people who used mobile phones for two hours a day in the 1980s and early 1990s have a "significantly raised" risk of developing a brain tumor. The study was referred to in the article as a "landmark piece of research in the debate over whether the microwave radiation put out by mobile phone handsets can cause cancer." It is due to be published in the scientific press later this year. Hardell's research compared 1,600 people who survived brain tumors with 1,600 healthy people. He found that those who had used mobile phones for more than five years were 26 per cent more likely, and those who used them for more than a decade were 77 per cent more likely, to develop a brain tumor than those who did not. The tumors were 2.5 times more likely to be on the same side of the head as the phone was usually held. The committee discussed this article and had doubts about the veracity of the claims. Hardell has a reputation for publishing results that are not based on the best data and his results are the opposite of those recently published by two very large and well performed studies by the National Cancer Institute and a Finnish group. Nevertheless, Hardell always seems to command headlines whenever he communicates his results to the press.
- 2.3 Also in September Dr. Alan Preece, head of Biophysics at Bristol Oncology Center in Great Britain, came out in the press claiming radiation from cell phones triggers chemical processes in the body that may be harmful. He stated that six separate studies indicate that response times speed up when people are exposed to radio frequency signals from mobile phones. "Perhaps we now have to accept there is an effect on the brain," Preece told a London conference on the health risks of mobile phones. "The response time has improved

because of stress proteins, which are switched on by a gene. This needs further research. The chronic exposure to radio frequency signals might well have a detrimental (health) effect.” The committee discussed this and concluded that it is not well founded. Preece is another scientist who has a reputation for questionable results.

- 2.4 In November an article in the press claimed new research from Dr. Om Gandhi at the University of Utah showed that young children absorb up to 50% more radiation than adults when using mobile phones. According to this research, “radiation from a phone penetrates half-way through the brain of a 5 year-old child, compared with 30% for a 10 year-old child. Penetration levels for adults, meanwhile, tend to be limited to a very small area around the ear.” The committee discussed this and Dr. Guy noted that Gandhi’s modeling methods did not use anatomical images from real children but were rather based on linear scaling down of adult images. This, of course, will decrease structures that are not proportionately smaller in children, such as the thickness of the skull, which would affect modeling of absorption of energy before reaching the brain tissue. Gandhi also played some tricks with measurement units, switching from cm to image voxels while changing the calibration of voxel size. Thus, his results have the appearance of greater depth of penetration when the actual distance of penetration remains about the same in adults and children.
- 2.5 In September a group of five senior Swedish epidemiologists published an editorial in Sweden’s Leading daily newspaper, *Svenska Dagbladet/Brännpunkt*. An English translation of this editorial appeared in the Bioelectromagnetics Society newsletter in November. The editorial directly challenged the methods and motivations of several Swedish scientists, whom they did not name directly but whose work was referred to. They presented a case for the public to distinguish between good and bad science. Much of what they discussed was similar to what has appeared in ARRL RF Safety articles, including the questionable practice of releasing “scientific results” to the popular press before it has been peer reviewed and accepted by the scientific community (a description that applies to most of the items listed above). Dr. Lapin obtained permission from the Swedish authors to quote excerpts of this editorial, which will be included in an RF Safety column to be published soon on the ARRL web site.

3 Participation in the Scientific RF Safety Community.

- 3.1 Dr. Lapin continues writing a column about RF Safety for the ARRL Web Page, though its frequency is decreasing. The titles for the second half of the year are: "More About Athermal Bioeffects--Does RF Affect Your Thinking?" and "Can We Trust Controlled Experiments?"
- 3.2 Dr. Lapin visited the National Cancer Institute in Bethesda, MD and spent a day with Dr. Cantor, who is performing the epidemiological study of hams. They went over the data that have been obtained to date and discussed ways to improve the accuracy of data collection. At Dr. Lapin’s suggestion, Dr. Cantor contacted Mr. Hare to request data that exist in ARRL records (mainly evidence that a ham was still alive after a certain data) that would improve the accuracy of his results. Dr. Lapin also met with Dr. Peter Inskip, the author of the large NCI cellular telephone study mentioned earlier, and Dr. Dalsu Baris, an

epidemiologist who specializes in electromagnetic effects and cancer rates. Among other things, they discussed the latest epidemiological news from Sweden.

- 3.3 Mr. Hare and Dr. Guy continue to serve on the IEEE Standards Coordinating Committee 28 on Non-Ionizing Radiation, which develops the standards for human exposure to RF energy.
- 3.4 Dr. Gold led a discussion on the RF safety problems related to cellular sites within the community at a meeting of the homeowners association. He also assisted two amateurs in determining their RF radiation patterns so they can comply with FCC regulations.
- 3.5 Mr. Hare prepared an RF safety evaluation for a ham who is dealing with a difficult zoning-board application in Kinderhook, NY.
- 3.6 Dr. Guy has been involved with FDTD analyses of various RF exposure scenarios to determine (1) EM field and SAR patterns induced in a human head exposed to fixed wireless 2.355 GHz multipatch antenna for AT&T Wireless Services, Redmond, WA, (2) EM field and SAR patterns induced in human head exposed to 6.0 GHz radiation from separated waveguide flanges for Workers' Compensation Division, State of Alaska, (3) SAR patterns of blood cells in Petri dishes exposed to 837 MHz in transverse electromagnetic (TEM) cells for Integrated Laboratory Services, Research Triangle Park, NC., and (4) SAR patterns and penetration depths in model heads of adult, 10-year old children and 5-year old children to help resolve reason for conflicting conclusions in published papers for Motorola Corporate Research Laboratory, Plantation, FL

4 Administrative Issues

- 4.1 Mr. Hare continues to administer the RF Safety committee email reflector, which handles correspondence between committee members. Other ARRL staff members and some former committee members monitor traffic over the reflector and we occasionally receive helpful comments from them. We have the capability to review things that were discussed in the past and search for keywords. In the second half of this year, approximately 150 messages were posted on the RFSC reflector.
- 4.2 The RFSC has included two potential new committee members in its discussions. Based on their participation in RF safety discussions, the committee voted to propose them for inclusion and submitted their names to the ARRL President for consideration.
- 4.3 Dr. Lapin was appointed to the FCC Technological Advisory Council, representing ARRL and its RFSC on that body. He attended meetings at the FCC Portals Building in Washington, DC on November 5 and December 5, 2001.

5 Future Plans

- 5.1 The committee continues to consider restructuring of the RF Safety text that appears in all ARRL publications.
- 5.2 The committee will continue to monitor the NCI epidemiological study of radio amateurs, and help the investigators maintain the highest level of accuracy.
- 5.3 The committee is looking into acquiring the tools to perform Finite Difference Time Domain analysis of RF interactions with humans. Many of the questions that are posed to the committee about the safety implications of various amateur radio activities can only be explored with this type of tool. Because of the specialized nature of this analysis technology and the small number of amateurs (in comparison to cellular telephone users) it is unlikely that such questions will be answered elsewhere.

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