

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

July 2007

The RF Safety Committee 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.

1 RF Safety Committee Activities

- 1.1 The committee reviewed a paper that had been submitted to QST to determine if there were any unaddressed RF safety implications. The paper discussed a loop antenna that was designed for portable use, placing it in close proximity to the operator and to others. Dr. Siwiak performed a near-field modeling analysis of the antenna and suggested that the article be edited to emphasize the potential RF safety issues. In particular, the author provided photographs of himself wearing the antenna on his back while operating, clearly placing him in a condition of overexposure. Otherwise, for QRP operation the antenna could be used safely as long as a distance from the antenna of at least 1.6 meters was maintained for the operator and 2.1 meters for spectators.
- 1.2 The committee reviewed a proposed “Doctor is In” article for QST regarding the performance of RF environmental evaluations. Mr. Hare pointed out some inconsistencies in the text but otherwise it was determined to be very good.
- 1.3 A ham sent the committee a question about the safety of sitting in a lawn chair underneath his 20’ high G5RV antenna. Dr. Siwiak provided an electromagnetic analysis of the field around the antenna, concluding that with a 100-watts transmitted to the antenna the person sitting below it would be exposed to less than the MPE at all frequencies the antenna is capable of radiating. Dr. Lapin added a discussion of the further reductions in exposure levels due to modulation duty cycle and transmit/listen times over a 6-minute period.
- 1.4 The committee was contacted by a ham who is concerned that his station will interfere with his daughter’s recently implanted pacemaker. He was advised to contact his daughter’s cardiologist and the pacemaker manufacturer. When this question was raised earlier, Dr. Lapin obtained information from Medtronic, the largest pacemaker manufacturer, and the committee was impressed with the thoroughness of their EMC data. The committee also discussed the advisability of recommending some sort of field strength monitor to help hams determine if there are appreciable EM fields in their shacks, perhaps due to problems with feedlines or grounding. Although affordable devices cannot be used for accurate assessment of EM field levels, they may be sufficient to determine the potential for problems.
- 1.5 Drs. Siwiak and Guy have been working on the EM analysis of small loop antennas as this type of antenna is gaining in popularity.

2 Monitoring Scientific Studies

- 2.1 The committee reviewed an article in a British newspaper that announced yet another proposed study of cell phone use and disease. This study was proposed by British scientist Professor Lawrie Challis, who claims that there is a hint of a long-term effect among long-term users of cell phones. Professor Challis plans to study 200,000 cell phone users who have been exposed for 10 year or more. He is negotiating with the British Health Ministry and cell phone companies for \$2 million to perform this study. Of interest in this article is a recap of the major studies in the past 5 years and how the scientific community views them. These are:
 - 2.1.1 In 2006 a Danish study of 420,000 long- and short-term cell phone users of up to 21 years ruled out any large effect on any cancer. There was a suggestion of a slightly raised risk of acoustic neuroma, a rare, benign tumor of the inner ear among users of more than ten years. However, the increased risk of the tumor on the same side of the head that the user claimed to hold the phone was balanced by a decreased risk on the opposite side of the head, which suggested a recall bias, meaning that no conclusion could be drawn.
 - 2.1.2 In 2006 a US study suggested lower sperm counts among heavy phone users. This study was widely discounted because of a small sample size and poor study design that did not control other factors that are known to affect sperm count.
 - 2.1.3 In 2005 an international study found no effect on acoustic neuroma after ten years of cell phone use. Insufficient data was available to rule of the effect for longer-term use.
 - 2.1.4 In 2004 one study suggested that rural users of cell phones have an increased risk of brain cancer. Their explanation for this was that the cell phone power is increased when there are few base stations.
 - 2.1.5 In 2003 a Swedish study suggested a higher risk of acoustic neuroma among heavy users of analog cell phones. The methodology of this study was widely criticized.
 - 2.1.6 In 2002 a Finnish study suggested that cell phone signals could cause abnormalities in blood vessel cells in the laboratory. Scientists were unable to find a link to actual blood vessels in vivo.
- 2.2 The committee discussed a study from Finland that claimed a significantly increased incidence of a brain glioma for cell phone users. The article about this study, which has not yet been published in the scientific press, presents conflicting results that there was no link between mobile phone use and glioma incidence, and the statistics showed an overall decrease in glioma incidence for the total group of cell phone users that was studied. However, the study claimed to find a 39% increase in the likelihood of developing a glioma on the same side of the head that the phone is held for those who had used the cell phone for more than ten years. As in previous retrospective studies that include the side of the head as a variable, recall bias is a strong probability that would taint the results. In this particular study, the discrepancies between the data before and after it was massaged added to the committee's doubts about its impact.
- 2.3 The Mayo Clinic published a study indicating that cell phones do not interfere with the operation of medical devices in hospitals and concluded that the bans on cell phone use in many hospitals is unwarranted.

- 2.4 Doctors from the University of Tennessee reported cases of interference to pacemakers and implantable cardiac defibrillators by anti-theft RFID (Electronic Article Surveillance, or EAS) devices in stores.
- 2.5 The Committee discussed recent news articles that blamed the proliferation of cellular telephone technology for disruption in honeybee populations. The problem is being seen in Europe and the USA where bees leave the hive and never return. One German investigator placed a cellular telephone in a beehive and when the bees did not return to that hive he concluded that the electromagnetic energy was disrupting their navigational capabilities and they were getting lost. Even though this was a far cry from a scientific study, the Independent in England picked up the story and turned it into an international phenomenon, with many reputable news agencies retransmitting their story. The committee noted that in addition to lack of a scientific basis for this conclusion, there have been reports of problems with honeybees for many years, even before cell phones were in existence. In the past other explanations for this problem have been the death of bees due to pesticides and the invasion of species of aggressive bees that displace the more passive honeybee. Also, the committee noted that the original source of this news was a paper in England that is akin to the National Enquirer in the United States.
- 2.6 A report from another newspaper in England claimed to have obtained access to a “secret” report that again claims that exposure to high tension power lines is a source of several cancers, including childhood leukemia, adult leukemia, brain tumors, miscarriages and one type of motor neuron disease. This is a topic that has been going back and forth for many years, with the most recent conclusion of the World Health Agency being that there is a weak carcinogenic effect of power line EMF with relation to childhood leukemia. The story about this latest report from England did not specify any new scientific findings and this is something that the committee will be watching.
- 2.7 The committee reviewed a flurry of articles about a high school student’s science project showing that an iPod placed directly over a pacemaker could cause the heart rhythm to falter. The project was submitted by a cardiologist at the Cleveland Clinic to the American Heart Association for presentation at their next meeting. Dr. Lapin, along with some members of IEEE COMAR, received a preprint copy of the presentation and concluded that there was little basis for concern. It was the participation of a high school student at the AHA that grabbed the fancy of the press. However, the study was not performed in a scientific fashion and left open many holes. It did not measure radiation from the iPod with a calibrated antenna and spectrum analyzer and it was not performed in conjunction with the pacemaker manufacturer, who has already performed many such studies and also has the diagnostic tools to determine how the pacemakers are reacting. We theorized that since the iPod must meet the standards of FCC Part 15 Unintentional Radiators it could not be emitting enough energy to adversely affect a pacemaker, which are tested in the presence of intentional radiators. From the data that we observed, we came up with the following explanation of what was seen: The effect occurred when the iPod was switched on-and-off at a rate similar to a heart rate. The switching transients, which are not considered to be normal radiation and are not tested as Part 15 interference, were picked up in the pacing leads (the relatively long wires from run from the heart to the pacemaker in the abdomen) and were determined to be what they were, periodic noise. The pacemaker has an algorithm that recognizes this type of noise and produces a default-pacing rate. This is what the study considered to be failure of the pacemaker, even though it is what the pacemaker is designed to do. Since it is unlikely that anyone will hold an iPod directly

- over his or her pacemaker site and switch it on-and-off repeatedly at a rate from 50 to 150 times per minute, the findings of this study are meaningless.
- 2.8 The committee commented on a news story about an retired engineer who was trying to cure cancer by embedding gold in the tumor cells and then heating and killing those cells with RF energy. Drs. Siwiak and Guy commented that RF heating to kill tumor cells is a decades-old technique and Dr. Small added that targeting cancer cells with cancer-specific antibodies is also widely used. The committee agreed that a paradox exists in our society with the public both vilifying RF energy and also looking to it for miracle cures.
 - 2.9 The committee commented on a story from another British newspaper claiming that WiFi networks radiated three times the energy of a cellular telephone tower. This is an example of yet another scare story by the British press and there is no veracity to its claims. Dr. Lapin also noted that most cell towers produce exposures on the ground that are 1000 times below the current MPEs and even if it were true that WiFi produced three times the exposure, it would still be hundreds of times below MPE.
 - 2.10 A guest editorial in MRT magazine pointed to the problems with bees (discussed earlier), purported links between EM and Autism, and other fears about EM and concluded that the government should commit money to studying these things before we further increase the amount of energy in the air. The author was clearly unaware of the state of scientific study in this field and the committee felt that this type of editorial was unworthy of a publication with the quality and stature of MRT.
- 3 Participation in the Scientific RF Safety Community.
 - 3.1 Dr. Lapin continues to serve on the IEEE Committee on Man and Radiation (COMAR).
 - 3.2 Mr. Hare continues to serve on the IEEE Standards Coordinating Committee 28 on Non-Ionizing Radiation, which develops the standards for human exposure to RF energy. Mr. Hare maintains a list server for communications among members of this committee, and occasionally cross-pollinates pertinent issues between the RFSC and SCC-28 list servers.
 - 3.3 Dr. Lapin has testified about the health implications of RF energy at several local cell tower siting hearings.
 - 3.4 Dr. Siwiak submitted an article to QST about an attic-mounted inverted L antenna and its safety implications to people in the home.
 - 3.5 Dr. Kaune made an RF Safety presentation to the Jefferson Country Amateur Radio Club.
 - 4 Administrative Issues
 - 4.1 The committee continues to look for a new member with an expertise that fills our need of responding to hams with pacemakers regarding the safety of their operating.

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