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A Report on Non-Ionizing Radiation

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Standards Harmonization Meeting: Russia and West Far Apart

East met West in September at a Moscow conference on radiation safety—but neither side blinked.

Russian limits for radiofrequency and microwave (RF/MW) radiation exposures are up to 100 times stricter than those in the U.S. and Western Europe. Despite extensive discussions and vodka toasts at the Moscow conference, no compromise is in sight. It appears that the gulf that has separated the two sides for more than 30 years will remain for some time to come.

The latest effort to bridge the gap—or to “harmonize” RF/MW standards—took place at the *2nd International Conference on Problems of Electromagnetic Safety of the Human Being*, held in Moscow, September 20-24. The meeting was sponsored by the Russian National Committee on Non-Ionizing Radiation Protection (RNCNIRP) and a host of other Russian scientific groups, in cooperation with the World Health Organization (WHO), the International Commission on Non-Ionizing Radiation Protection (ICNIRP) and the U.S. Air Force (USAF). Scientists from 12 countries took part.

“So far we have entirely different approaches to harmonization,” Professor Yuri Grigoriev stated at the conference. Grigoriev chairs the recently formed RNCNIRP and is a senior research scientist at the Institute of Biophysics in Moscow.

Grigoriev’s point was underscored by the fact that the meeting did not result in adoption of any joint statement or action plan on harmonization.

Western standard-setting organizations have emphasized protection from

(continued on p.9)

Wireless Industry Seeks To Raise RF/MW Exposure Limit for the Ear

Wireless phone manufacturers want to relax the radiation exposure standard for the outer ear, and the Institute of Electrical and Electronics Engineers (IEEE) is expected to give its approval. The request came just weeks after a report that many mobile phones violate current limits by overexposing the ear.

“C.K. Chou [of Motorola] proposed that, for the general public, the outer ear should be considered an extremity, similar to the hands, feet, wrists and ankles,” said Ron Petersen, secretary of the IEEE’s Standards Coordinating Committee 28 (SCC-28). The IEEE’s RF/MW standard allows higher exposures for these extremities than for the rest of the body.

Chou introduced the subject in Atlanta at the October 17 meeting of SCC-28’s Subcommittee 4 (SC-4), which deals with standards from 3 kHz to 300 GHz. Dr. Veli Santomaa of Nokia then gave a presentation in support of the proposal. Although “the SAR in the ear is the highest in the body,” Santomaa

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Large Swedish Occupational Study Suggests EMFs May Affect Hormone-Related Cancers

A new study by Dr. Birgitta Floderus of the Karolinska Institute in Stockholm suggests that EMFs may increase the risk of cancer by interacting with estrogen and other hormones.

Floderus examined the incidence of all types of cancer and occupational EMF exposures among 2.4 million people. She found small but significant risks for a wide range of specific cancers, many of which are hormone-related. Floderus presented initial results in 1995 (see *MWN*, S/O95), and has now published the completed study in the October issue of *Cancer Causes and Control* (10, pp.323-332, 1999).

The research was not intended to test a particular theory. Rather, its aim was to generate hypotheses for future study, particularly to see if the data might "suggest possible biological pathways" for an EMF-cancer mechanism.

"The outcome suggests an interaction with the endocrine/immune system," Floderus and colleagues conclude. In particular, they write, reproductive hormones may be involved: "The results of the present study are coherent with a mechanism involving gonadal hormones, possibly estrogens." There are no commonly accepted theories about how such an EMF-estrogen mechanism might operate.

Among women, there was "a clear association" between working in EMF-exposed jobs and the risk of cancer of the uterine lining (endometrial cancer). EMF-exposed women also showed some increases in ovarian cancer and breast cancer. "The most notable finding for men," Floderus writes, "was an increased risk of testicular cancer in young workers."

Floderus also found that EMF exposure was linked to liver cancer, which is known to be hormone-related, and to malignant melanoma, thought by many to be associated with estrogens.

What do hormone-related cancers have in common? "*In vitro*, most hormone-related cancers respond to estrogens with increased cell proliferation, whether or not they were caused by estrogens in the first place," Dr. Michele Marcus, an epidemiologist at Emory University in Atlanta, said in an interview. Marcus noted that testicular, breast and prostate cancers are all hormone-sensitive and have increased in recent years, and that "some people have blamed pesticides and other compounds that might mimic naturally occurring hormones and act as environmental endocrine disrupters." But Marcus believes that hormone sensitivity is "a pretty tenuous link" among these different cancers. Any sort of theory about a common etiology, she said, "at this point is pure speculation."

Dr. Michael Gallo agreed: "The underpinning of hormonal carcinogenesis is that the tissues react to the hormones in terms of proliferation." Gallo, of the Environmental Occupational Health Sciences Institute in Piscataway, NJ, added, "But we don't know a lot about what causes abnormal or uncontrolled proliferation."

Interestingly, Floderus found that cancers which have shown the greatest increases in recent years had a particularly consistent link to EMF exposure. She did a joint analysis of cancers with the largest annual increases in Sweden from 1965 to 1984, and found that they were about 20% more likely to occur among

those with medium and high EMF exposures than among others. These included liver, lung and skin cancers and non-Hodgkin's lymphoma, as well as testicular and prostate cancers among men and breast cancer among women.

Does this mean that these cancers may have increased in part because of EMF exposures? "I do not want to speculate on that question," Floderus told *Microwave News*. "The results show statistical associations and nothing more." She added, however, that, "Some of these results need an explanation."

Until now, no large occupational study of EMFs had taken a systematic look at cancer at all sites. Past studies of workplace EMF exposure focused on leukemia and brain cancer, and tended to find associations with both. According to Floderus, two meta-analyses by EPRI show "that there is an overall statistical association for both leukemia and brain tumors, and that it is unlikely that this association, although weak, is caused by chance" (see *MWN*, J/F96 and N/D97; also S/O99).

Floderus based her all-site study on national census and cancer registry data. She found elevated risks for most of the specific cancers she examined—increases that were modest but often statistically significant. In addition to the hormone-related cancers cited above, there were significant increases in chronic lymphocytic leukemia among women, colon and brain cancers among men and lung cancer among both sexes. People with medium or high EMF exposures had a significant increase of about 10% in overall cancer risk.

"The overall increase in cancer incidence is probably not due to chance, because the statistical precision is very high," Floderus said. "But this does not necessarily mean that the association reflects causality." She stressed that unidentified confounders could also explain the results.

In support of a possible hormone connection, however, Floderus's paper cites a previous study in which she observed a rise in pituitary tumors among male train drivers and conductors (see *MWN*, M/J94). This finding "adds to the credibility [of the idea] that the endocrine glands/hormones are involved in the potential pathway between magnetic fields and cancer," she writes. For testicular cancer in particular, Floderus contends that her latest findings are unlikely to be the result of confounding, "considering the outcome for other hormone-dependent cancers and the large number of occupations contained in the exposure groups."

"The most consistent site-specific associations were seen for genital cancers and malignant melanoma," the paper notes.

Floderus suggests that future research focus on specific hormone-related cancers. "For example," she said, "a robust case-control study of endometrial cancer, with a careful assessment of magnetic field exposure and potential confounding factors, such as obesity and reproductive history," would be quite useful.

In an interview, Dr. Sam Milham of Olympia, WA, formerly with the Washington state Department of Social and Health Services, commented, "It's interesting that in Bill Guy's study of microwave-exposed rats, there were a lot of cancers that had an endocrine tie" (see *MWN*, J/A84).

Floderus's paper cautions that "all associations observed were weak," with few increases exceeding 20%-30%. But, she notes, "Large cohort studies based on registry data, involving millions of people and long follow-up times, seldom produce strong associations," partly because they assess exposure through "crude surrogate measures" such as job titles.

Imprecise estimates of EMF exposure in various jobs and variability of exposure within job titles lead to exposure misclassification. Because of this, Floderus explains, her risk estimates would probably understate any "true association between magnetic field exposure and disease."

Exposure assessment was based on a job exposure matrix encompassing the 100 most common jobs in Sweden, developed by Floderus for her landmark study of EMFs and cancer on the job (see *MWN*, S/O92). For Floderus's new study, ten other jobs were added to increase the number of highly exposed subjects. Exposure categories were relative, with male and female workers each divided into thirds. Risks were calculated relative to the

third of each group with the lowest exposure.

"No obvious exposure-response relationships were observed," Floderus writes, which may reflect a lack of any real causal connection. Alternatively, she writes, it might be that because of exposure misclassification, "there is, in fact, no meaningful difference between medium and high exposure" groups.

Cancer was more strongly associated with working in EMF-exposed jobs among men than among women. Floderus points out that women in the high-exposure group had lower average exposures than did their male counterparts. More generally, she notes, "The job exposure matrix was developed on male workers only and may not have the same validity for women."

It is possible, she writes, that women could be less exposed to industrial carcinogens that can initiate various types of cancer. There may also be "a sex-specific sensitivity to intermediate factors in the [EMF-cancer] pathway, for example estrogens." In the latter case, male workers could face a greater risk from a given level of EMF exposure.

Late-Breaking News from the U.K.

No Childhood Cancer Link at Low Magnetic Field Levels; Aerosol Pollutants Stronger in Power Line Environments

As we go to press in early December, two sets of studies have been published in the U.K. One casts doubt on the likelihood of an association between low-level 50 Hz magnetic fields and cancer, and the other points to the area near power lines as a breeding ground for cancer-causing particles.

The long-awaited U.K. childhood cancer epidemiological study appeared in the December 4 issue of *The Lancet*. "This major study provides firm evidence that exposure to the levels of magnetic fields found in the U.K. does not augment risk for childhood cancer," said Professor Richard Doll, who directed the study.

In an accompanying editorial, Drs. Michael Repacholi of the World Health Organization in Geneva and Anders Ahlbom of the Karolinska Institute in Stockholm countered that the new study "is not the 'definitive' study many scientists have been hoping for." They pointed to the small number of children exposed to more than 2 mG (0.2 μ T) and to the use of time-weighted average fields to assess exposures. They want to see exposures to transients included in future studies.

Professor Nick Day of the University of Cambridge, who led the EMF part of the U.K. study, measured the fields for more than 4,000 children under the age of 14—half of whom had cancer, including more than 1,000 with leukemia. Among the children with leukemia, only 21 had average exposures of 2 mG or more and only five had exposures of 4 mG or more.

"Our results are consistent with those of larger studies on childhood leukemia that use measured fields," Day concluded, adding that the study "contributes little evidence" on exposures above 4 mG.

Electric field exposures were also measured, but these results have not yet been released.

In addition to EMFs, the U.K. researchers are investigating the possible influence of the children's and their parents' exposures to ionizing radiation and toxic chemicals, as well as the

role of infectious agents. The cancer study, which is costing over £11 million (US\$17.5 million), was first announced more than seven years ago (see *MWN*, M/A92).

In the same issue of *The Lancet*, a group from the U.K. and New Zealand, led by Dr. John Dockerty of the University of Oxford, reported a similar lack of an association in a smaller study of childhood leukemia in New Zealand. Repacholi and Ahlbom noted that this effort has the "same inadequacies" as the U.K. study.

Just before the release of the U.K. Childhood Cancer Study, researchers at the U.K.'s University of Bristol announced that they have new experimental data showing that exposures to airborne pollutants are considerably higher in the vicinity of high-voltage power lines.

The Bristol team, led by Professor Denis Henshaw and Dr. Peter Fewes, concluded that people living near high-voltage power lines are exposed to higher levels of both ionizing radiation from naturally occurring radon byproducts and carcinogenic chemicals from traffic exhaust. The team based this finding on over 2,000 experimental observations.

In a second paper, Henshaw and colleagues showed that the aerosol pollutants in power line environments tend to be charged and are therefore more readily deposited in the lungs—where they can do the most damage—of those living within a few hundred meters of lines of 132 kV or higher.

"We suggest that these results may be relevant to the reported associations between high-voltage power lines and childhood and adult leukemia," Henshaw said.

The two papers are in the *International Journal of Radiation Biology*, 75, pp.1,505-1,521 and pp.1,523-1,531, December 1999.

Henshaw first proposed that electric fields could increase exposure to radiation emitters known as "radon daughters" more than three years ago (see *MWN*, M/A96).

Disagreements Stall Interagency RAPID Report

The final report of the Interagency Committee (IAC) on the EMF RAPID program has been delayed due to disagreements among the eight participating federal agencies. As of early December, the content and the release date of the IAC report were in doubt. No meetings are scheduled before the end of the year.

"Perhaps we should simply say we agree with the NIEHS report and forget about writing our own," said one exasperated committee member.

Another IAC member was more optimistic that the differences could be resolved. He said that a meeting may not even be needed because the committee could work via e-mail.

The National Institute of Environmental Health Sciences' (NIEHS) report on the RAPID program, submitted to the U.S. Congress last June, concluded that there was "weak" evidence that EMFs pose a health risk (see *MWN*, J/A99).

White House science officials appear to be ambivalent about the need for any IAC report at all. A knowledgeable source told *Microwave News* that when Dr. Imre Gyuk of the Department of Energy (DOE), the chair of the IAC, contacted the White House Office of Science and Technology Policy (OSTP), he was told that a final report was not really necessary. But the IAC report is required by Congress under the Energy Policy Act of 1992, which established the RAPID program.

Gyuk, who is now the manager of DOE's research program on energy storage in Washington, declined to confirm or deny OSTP's reaction.

One of the most contentious points has been how specific the IAC's recommendations should be. For instance, one draft of the report cited 10 mG as "a value that identifies the most highly exposed populations and which could be used as a cut-point to identify how and for whom to target hazard awareness information so that individuals may elect to alter their exposures." This 10 mG action level was later deleted when two IAC members objected.

Robert Curtis of the Occupational Safety and Health Administration's Technical Center in Salt Lake City is one IAC member who wants to see some definition of what a "high" exposure level is. "The NIEHS report recommends an awareness program and that unnecessarily high exposures be prevented," he said in an interview, "and I want both these concepts in the IAC report."

The report has also been delayed by Dr. Michael Marron's move from the Office of Naval Research to the National Institutes of Health (NIH). Marron was the lead author of the IAC report, but in mid-November he resigned to become the associate director for biomedical technology at the NIH's National Center for Research Resources in Bethesda, MD.

The IAC report is now in its fourth or fifth draft. An earlier draft obtained by *Microwave News* concluded that, "Exposure to power frequency EMFs may pose some level of health risk," based on epidemiological studies of children exposed at home and of workers exposed on the job. The draft also noted that the "scientific evidence is not strong" and that "causality remains

uncertain." It recommended that EMF health research continue, specifically pointing to breast cancer, heart disease and Alzheimer's disease as areas that would need more attention.

A more recent draft continued to endorse the NIEHS conclusions, and went on to argue that, "There is epidemiologic evidence for an exposure-response relationship with long-term average ELF magnetic field magnitudes."

When the IAC report is completed, it will mark the official end of the six-year EMF RAPID research and public information program.

IEEE Once Again Sets Out To Write an EMF Health Standard

The Institute of Electrical and Electronics Engineers (IEEE) has authorized its Standards Coordinating Committee 28 (SCC-28) to begin work on safety limits for extremely low frequency (ELF) EMFs. Kent Jaffa, who, as the chair of SCC-28's Subcommittee 3 (SC-3), is leading the effort, estimates that it will take a couple of years to complete the standard.

"I am trying to push this along in a timely manner," Jaffa, of PacifiCorp in Salt Lake City, told *Microwave News*. PacifiCorp is a utility headquartered in Portland, OR, that provides electricity in six western states as well as in Australia. The U.K.'s Scottish Power is in the process of buying PacifiCorp.

This is not the first time that SCC-28 has sought to write an EMF health standard. In 1991, after completing the revision of its RF/MW standard, the committee asked Dr. John Bergeron of GE and William Feero of Electric Research and Management to develop a set of limits for ELF frequencies (see *MWN*, N/D91), but they never completed the task. In 1993, SC-3 considered adopting the IRPA (now ICNIRP) guidelines to speed up the process, but its members were split. Some argued that the subcommittee itself should examine the underlying science (see *MWN*, N/D93). The effort languished when no agreement could be reached.

On September 16 of this year, the IEEE Standards Board started afresh and approved a new project to write safety limits for frequencies from 0 Hz to 3 kHz. They will be "based on the results of an evaluation of the relevant scientific literature and proven effects which are well established and for which thresholds of reaction are understood," according to a statement defining the scope of the project.

Jaffa has set up two working groups: Dr. Asher Sheppard, a consultant based in Redlands, CA, is establishing a process for reviewing the relevant EMF literature. And Patrick Reilly of Metatec Associates in Silver Spring, MD, is leading the group on mechanisms of EMF bioeffects.

Reilly's working group is writing the EMF exposure criteria. "Our goal is to develop a document for SCC-28 review within the next 12-18 months," he told *Microwave News*.

Sheppard is worried that the recent sharp cutback in EMF research funding could compromise the new effort. "I am concerned as to whether we have broad enough representation from the ELF research community to assure acceptance of our standard," he said in an interview.

« Wireless Notes »

Dr. **Lennart Hardell** of the Örebro Medical Center in Sweden and colleagues have published a case report of an **angiosarcoma** (a rare type of soft tissue cancer) on the scalp of a 57-year-old woman who used both **cordless** and mobile phones. "The tumor developed in the anatomical area with the highest exposure to microwaves," they report in the November issue of *Epidemiology*, pointing out that "the highest absorption rate will be in the skin" for both types of phone. The woman used her cordless phone "at least one hour per day" for over ten years, but its maximum power output was quite low—only 10 mW. While she began to use a **GSM** mobile phone in 1994, this was only for "a few minutes per week." One of Hardell's collaborators, Dr. **Kjell Hansson Mild** of the National Institute for Working Life in Umeå, conceded that 10 mW is a very low exposure. But if microwaves do prove to be linked to cancer, he told *Microwave News*, it is unclear what the threshold for the effect might be.

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Senator Seeks GAO Report On Cell Phone Safety Research

Sen. Joseph Lieberman (D-CT) has asked the General Accounting Office (GAO) to investigate the current status of mobile phone safety research.

"In the last five years, the number of Americans using cellular telephones has increased dramatically," Lieberman stated in a letter to the GAO on October 20. "Uncertainty in this area persists, fueling the fears of phone users and spurring calls for further research."

In a 1994 report requested by Rep. Edward Markey (D-MA), the GAO concluded there was no proof of harmful effects from mobile phones (see *MWN*, N/D94). It noted, however, that bioeffects at other frequencies had been reported. The 1994 report urged that the FDA, EPA and FCC take steps "to maximize the usefulness, independence and objectivity" of the industry's five-year research program, WTR.

Five years later, Lieberman has asked the GAO to review: (1) Current evidence on mobile phone health risks; (2) The need for federal regulation; (3) What actions federal agencies took to bolster the independence and usefulness of WTR-sponsored research, as per the GAO's 1994 recommendation; (4) The "structure, methodology and findings of the industry's research program"; and (5) What government or industry could do to study possible health effects, and whether "precautionary safety measures" are needed.

A new GAO study looks likely, a staffer in Lieberman's office told *Microwave News*, though its scope and timetable have yet to be defined.

In 1992, Lieberman convened a Senate hearing on cancer and police radar guns (see *MWN*, M/J92 and S/O92). After Dr. Ross Adey testified on cellular phones and other RF/MW sources, Lieberman said, "Wow! There's a lot to be worried about here." He later allowed that this might be a "non-senatorial" response, but did not downplay the issue.

FDA Asks for Animal Studies

Last year the FDA proposed that the National Toxicology Program (NTP) study the health effects of RF/MW radiation from mobile phones, *Microwave News* has learned. The FDA described this as a high priority, calling for large-scale animal studies on cancer and on ocular and neurological effects. It specifically called for replication of the Australian study that found a doubling of cancer among mice exposed to a digital mobile phone signal (see *MWN*, M/J97).

Apparently, no decision has yet been made on the FDA's request. The NTP receives many such proposals each year. Dr. Errol Zeiger of the NTP in Research Triangle Park, NC, did not respond to repeated requests for comment.

In a letter in the *Journal of the American Medical Association* (November 17), Dr. **Nancy Dreyer** and her team at **Epidemiology Resources Inc.** in Newton Lower Falls, MA, break down the data from their study of wireless phone use and mortality (see p.14 and *MWN*, M/J96). For deaths from brain cancer and leukemia, no link to phone use was found. Deaths from auto accidents, however, increased with time spent on the phone. Dreyer notes billing data used in the study do not show whether a call was made while in a car: "A more accurate measure of telephone use while driving would likely show an even stronger effect."

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A number of the media stars in the ongoing cell phone-health controversy will be speaking next February 4 at a **workshop** sponsored by the **Bioelectromagnetics Society** at Catholic University in Washington. Drs. Ross Adey, Niels Kuster, Henry Lai and Alan Preece will all present their latest results. In addition, Sweden's Dr. Maria Feychting will give an update on the IARC brain tumor study and Australia's Dr. Ken Joyner will review research and regulation from an Asian-Pacific perspective. "The workshop is open to everyone and it's free," said FDA's Dr. Ewa Czerska, who is organizing the meeting with NIH's Dr. Lee Rosen. For contact information, see the conference calendar, p.15.

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German activists have an offer for those who claim that RF/MW radiation is harmless as long as it is below **ICNIRP** exposure limits. Citizens Wave (Bürgerwelle) will pay **20,000 DM** (more than US\$10,000) to a volunteer who is willing to be exposed for ten days to mobile phone radiation at sublimit levels. Qualified subjects include wireless industry executives, government officials and standard setters such as Dr. **Jürgen Bernhardt**, the chair of ICNIRP, who also works in the Federal Radiation Protection Office in Oberschleißheim. "Now we will see how much [they] trust the limit values, which they have declared fit for the general public," said spokesperson Siegfried Zwerenz.

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A report on the mobile phone market from the Geneva-based

HIGHLIGHTS

International Telecommunication Union (ITU), released in October, has some provocative statistics. The number of users in all countries, 319 million at the end of 1998, is expected to grow to 491 million by the end of 2000, and to 1 billion by 2004. At that point, the ITU predicts, there will for the first time be more wireless than wired phones worldwide. That is already true in Cambodia, Finland and Italy.

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Toys “R” Us and wireless service provider **Optus Communications** have drawn fire in **Australia** for marketing mobile phones to children. In a new joint venture, the toy store chain will begin selling phones with prepaid service this holiday season. **Senator Lyn Allison** calls the deal “reprehensible, given long-term concerns over the effects of electromagnetic radiation from mobile phones on children.” The Consumers’ Telecommunications Network and the **Australian Family Association** have also spoken out against the campaign, with the association asking parents to “shop elsewhere for toys for their children.” Meanwhile,

in the U.S., **AT&T** is now marketing phones with pictures of Mickey Mouse and Donald Duck on the front.

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The **Furby**, a stuffed electronic doll, caused no **EMI** to medical devices in tests by Canada’s federal health agency. The tests were spurred by reports that the Royal Hospital for Sick Children in Glasgow, Scotland, had banned Furbys from its intensive care unit. Some airlines have also banned Furbys because of EMI concerns (see *MWN*, S/O99). **Health Canada’s** Medical Devices Bureau tested a Furby with devices used in hospitals, including an incubator, an infusion pump, a ventilator, a pacemaker and a kidney dialysis machine. “The Furby did not affect the performance of any of the 13 medical devices tested at any distance,” write Drs. Kok-Swang Tan and Irwin Hinberg in a letter in the October 19 issue of the *Canadian Medical Association Journal*. (The letter is on the Web at <www.cma.ca/cmaj>.) The Furby did generate broadband EMFs, but Tan and Hinberg report that these were far weaker than those from a digital mobile phone.

SAR Search

- Since August 1996, manufacturers have been required to file SAR data with the **FCC** before marketing new phones in the U.S. (see *MWN*, J/A96). After ABC’s *20/20* noted this fact in its October 20, 1999, broadcast on wireless phone safety (see p.7), some viewers asked the agency for the exposure information on their phones. The FCC could not help them, however. “Usually when people call, they ask about a certain model number,” explained the FCC’s **Kwok Chan**. “But, internally, we have no way to reference model numbers. We need the FCC ID number.” The FCC’s Dr. **Robert Cleveland** added that, “You have to dig through a lot of paperwork to get the number. We haven’t put this into a database yet, so it takes someone a lot of time to find it.” Chan told *Microwave News* that callers eventually will get answers.

- *20/20* also reported that four of the five phones that it had tested exceeded the FCC’s exposure limit of 1.6 W/Kg in at least one test configuration. The Institute for Mobile and Satellite Radio Technology (**IMST**) in Kamp-Lintfort, Germany, measured each phone in two positions and, where appropriate, with the antenna both extended and retracted. All five phones were tested in analog mode. **Nokia’s** 6160, which *20/20* called “one of the top-selling phones in the country,” had SARs of 1.84 to 2.16 W/Kg, while the Nokia 636, an older model, measured from 1.52 to 2.12 W/Kg. The SAR for **Ericsson’s** AH 618 was 1.34 W/Kg in one position, but 1.65 W/Kg in the other. One of two **Motorola** phones tested, the MicroTac Lite XL, ranged from 1.53 W/Kg with the antenna extended to as high as 3.15 W/Kg with it retracted. Only Motorola’s StarTac measured below the FCC limit in all test configurations. Its highest SAR was 0.43 W/Kg.

- In a September 21 letter, CTIA President **Thomas Wheeler** urged the IEEE’s **SCC-34** to “use all deliberate speed” to complete its protocol for measuring mobile phone SARs. FCC Chairman **William Kennard** made a similar plea earlier this year (see *MWN*, J/F99). **Howard Bassen** of the FDA told Wheeler on

October 18 that his Subcommittee 2 (SC-2) of SCC-34 planned to finish a draft “soon after” its meeting scheduled for early December. Once SC-2 reaches an agreement, the FCC has said that it will issue its own revised testing rules for phone makers (see p.1).

- The **FCC** has purchased a DASY3 system from **Schmid & Partner Engineering** of Zurich so it can do its own SAR measurements. Among the Swiss firm’s founders is Dr. **Niels Kuster** of the ETH in Zurich.

- In its September 22 issue, the Swiss consumer magazine **K-Tip** reported on tests in which the **Philips Genie 900** had an SAR of 2.67 W/Kg with the antenna retracted—the highest among the 25 mobile phones tested (see *MWN*, S/O99). An October 6 statement from Philips noted that the *K-Tip* SARs were averaged over 1 g of tissue (as required in the U.S.), not 10 g (as specified in Europe by CENELEC). For the larger averaging volume, the Dutch manufacturer stated, the Genie 900’s SAR values are “substantially better” than the 2.0 W/Kg European limit. Philips added that, according to the **IMST**, which did the testing for *K-Tip*, “The Philips Genie is also compliant to the U.S. FCC guidelines,” in which the maximum SAR is 1.6 W/Kg. Neither Philips nor the IMST responded to requests from *Microwave News* for clarification.

- Observers have long wondered how the handheld phones used in **Motorola’s Iridium** system can comply with SAR limits while communicating with satellites several hundred miles above the Earth. In June, appearing before the U.K. Parliamentary Select Committee on Science and Technology (see *MWN*, S/O99), Motorola’s Dr. **Q. Balzano** offered this explanation: “Cellular phones on the ground have to communicate around the area. With cellular phones and satellites, the energy goes straight up; otherwise, you do not make the link. The antenna is completely above the head of the user and the energy is propagating upwards, so the exposure is even lower than the levels you encounter in the terrestrial cellular phones.”

CTIA and FDA Unveil Narrow Research Pact as TV Report Airs

The Food and Drug Administration (FDA) announced on October 20 that it intends to form a partnership with the wireless industry to sponsor future safety research. The announcement came the same day that ABC's *20/20* broadcast a special report on mobile phone safety.

After months of informal discussions, the FDA and the Cellular Telecommunications Industry Association (CTIA) signed a formal letter of intent on October 18. It calls for follow-up research on two topics stemming from the CTIA-funded Wireless Technology Research (WTR) program: the finding of genetic damage in *in vitro* tests with the micronucleus assay (see *MWN*, M/A99) and results of WTR's epidemiology studies (see p.5 and *MWN*, M/J99). The letter provides a framework for negotiating a Cooperative Research and Development Agreement (CRADA).

Dr. Russell Owen of FDA's Center for Devices and Radiological Health in Rockville, MD, told *Microwave News* that he hopes that the CRADA will provide "a foundation for future collaboration" on additional research topics. In the past, the FDA has called for many other kinds of wireless health studies, citing animal studies as the top priority (see *MWN*, M/A97). Owen said, however, that the letter of intent does not reflect any narrowing of the FDA's views. "The CTIA has not expressed an interest in pursuing animal studies," Owen explained, adding, "We do not have a legal mechanism to force research."

The accord represents a shift from 1993, when the FDA rejected the limited role it was offered in the CTIA's research program on the grounds that it would not give the agency sufficient control (see *MWN*, J/A93; also J/F93 and S/O93).

When its funding of WTR came to an end in mid-1999, the CTIA made a general pledge to continue supporting research (see *MWN*, J/A99). Signing the letter of intent with the FDA is the first specific step it has taken in that direction. According to the letter, requests for proposals will be issued by the CTIA, which will "directly administer the funding of the research." The FDA "will make recommendations on proposal selection."

The CTIA and the FDA decided at the last minute to cancel a jointly sponsored conference on future research needs, which would have taken place one week before the ABC broadcast (see *MWN*, S/O99). Owen said the meeting will be rescheduled.

The report by *20/20* featured exposure measurements for several cellular phones, four of which exceeded the FCC's radiation limits under certain conditions (see p.6 and *MWN*, S/O99). All U.S. labs approached by ABC refused to conduct the tests if the phones' manufacturers were going to be named on TV, and the network ended up hiring a testing lab in Germany.

Those interviewed on the program included Drs. Ross Adey, George Carlo, Lennart Hardell, Martin Meltz and Louis Slesin, as well as Richard Branson, David Reynard and Tom Wheeler. The FDA refused to have any representatives appear on camera.

The next day the FCC promised to give "close scrutiny" to ABC's assertion that some phones violated exposure regulations. "Whether these phones are not in compliance with our limits remains to be determined, since variability in evaluation proce-

dures is often an issue," the FCC stated. "We renew our call for the standard-setting committees to develop specific uniform procedures." If this is not done soon, it added, the FCC "will mandate action on its own" (see also p.1).

There was some drama and maneuvering in the days before *20/20*'s report. CTIA lawyer Andrew Copenhaver wrote to ABC on October 11, urging that the show not be broadcast until it was changed to make it acceptable to the industry group. Copenhaver, of the Washington firm of Womble, Carlyle, Sandridge & Rice, had won a multimillion dollar judgment against ABC for the Food Lion grocery chain, after the network used hidden cameras in an attempt to document the sale of spoiled meat.

On October 7, WTR's Carlo wrote to each member of the CTIA board, stating that he is "extremely frustrated and concerned that appropriate steps have not been taken by the wireless industry to protect consumers." Carlo asked for their help in distributing a consumer information packet on wireless safety, which his Health Risk Management Group is selling for \$19.95.

On the day of the broadcast, the FDA posted a new consumer advisory on its Web site, at <www.fda.gov/cdrh/ocd/mobilphone.html>. It repeats advice the agency has given since 1993, stating that there is no definite proof that cellular phones are harmful or that they are safe. One new point is a call for the industry to "design mobile phones in a way that minimizes...RF exposure to the user."

Expert Panel To Consider Navy Radar's Environmental Impact

A panel of experts will examine a long-simmering dispute between the U.S. Navy and the California Coastal Commission over health and environmental effects of a radar test facility. On December 14, the panel will tour the Navy's Surface Warfare Engineering Facility (SWEF), located next to a public beach in Port Hueneme, CA.

"We're in this situation because the Navy did not abide by the law," local activist Lee Quaintance said in an interview. "It should have done a report on the environmental effects of this facility, and it never did." Quaintance is on the board of the Beacon Foundation in Oxnard, CA, a coastal-protection group.

Jean Schick, a public affairs officer with the Navy in Port Hueneme, told *Microwave News* that, "The panel is unbiased and qualified to review the information."

The panel members are: Dr. Ross Adey of the University of California, Riverside; Dr. Robert Beason of the State University of New York, Geneseo; Dr. John D'Andrea of the Naval Medical Research Institute at Brooks Air Force Base in San Antonio; Dr. Joseph Elder of the Environmental Protection Agency (EPA) in Research Triangle Park, NC; and Edwin Mantiply of the EPA in Montgomery, AL. The Coastal Commission appointed Quaintance as a citizen observer.

Completed in 1985, SWEF first came under public scrutiny in 1993 when the Navy sought permission for low-level jet flybys during radar testing. The Navy dropped the idea in the face of public opposition, but by then residents had become concerned about the radar facility itself. They had uncovered a 1978 Navy

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preconstruction report stating that SWEF would have “significant environmental impacts,” including “unavoidable” RF/MW emissions that would require “exclusion of the public from coastal recreation areas in violation of the California Coastal Act.”

The Navy claimed that this report was only a draft, and that a thorough study of SWEF’s environmental effects had found that there would be none. But when the Coastal Commission asked for the official environmental report in 1995, the Navy was unable to produce it. The Navy insisted that the study had in fact been filed, but finally admitted in 1997 that “no environmental documentation was found” during a yearlong search. The report “may have been done, it may not have been done—I don’t know,” Capt. J.W. Phillips told the commission in January 1999. “We looked for it and we just can’t find it.”

The Navy has continued to maintain that there are no environmental effects from SWEF, and in 1998 the Coastal Commission asked for informal mediation from the federal Office of Ocean and Coastal Resource Management, which then convened the expert panel. The Navy initially objected to Adey’s participation, contending that his expertise was mainly with low frequency radiation, but it later withdrew this objection.

Panel members will issue individual reports, and are expected to do so within a few weeks of their December 14 tour of SWEF.

New Canadian RF/MW Standard Includes Voluntary Eye Limits

The new revision of Safety Code 6, Canada’s RF/MW standard, establishes guidelines for exposure of the eyes of 0.2 W/Kg for the public and 0.4 W/Kg for workers.

“It is suggested” that specific absorption rates (SARs) be kept below these levels “whenever possible,” states Safety Code 6, which was released by Health Canada on October 12.

The new Safety Code 6 otherwise follows the ANSI/IEEE and ICNIRP standards: SARs of 0.08 W/Kg and 0.4 W/Kg for whole-body exposures of the public and of workers, respectively. These limits correspond to 200 μ W/cm² for the public and 1,000 μ W/cm² for workers in the strictest frequency band, from 30 to 300 MHz. For exposures of the head and neck, the maximum SARs are 1.6 W/Kg for the public and 8 W/Kg for workers, averaged over 1 g of tissue. Unlike the guidelines on eye exposures, these limits are mandatory.

A draft of the revised standard had included mandatory limits for eye exposures (see *MWN*, S/O98). In the wake of opposition from industry—including a warning from a Canadian manufacturers group that many walkie-talkies would not comply with the limits—a voluntary approach was chosen.

Last spring, an expert panel appointed by the Royal Society of Canada recommended an interim limit of 1.6 W/Kg for eye exposures on the job (see *MWN*, M/J99).

Health Canada’s Radiation Protection Bureau (RPB) had included eye exposure limits in its previous revision of Safety Code 6, in 1991. But transmitters operating below 7 W, including walkie-talkies and mobile phones, were exempt from this standard (see *MWN*, S/O87 and J/A91). In its new revision, Health Canada eliminated the exemption for many low-power devices.

The new Safety Code 6 states that the eye guidelines “shall remain valid until sufficient scientific information is available to accurately assess the health effects of RF exposure on the eye.”

The full text of Safety Code 6 is available as a PDF file on the RPB’s Web site at <www.hc-sc.gc.ca/rpb>.

Safety Code 6 applies directly only to Canada’s federal employees. But Industry Canada, which sets SAR limits for manufacturers of wireless devices, bases its rules on Safety Code 6, making it in effect a legally binding public exposure standard.

On September 25, Industry Canada issued revised rules for compliance testing of portable RF/MW devices. SAR testing is now required for portable devices that operate at frequencies below 1 GHz with an output power exceeding 200 mW, or between 1 and 2.2 GHz with an output power greater than 100 mW. Industry Canada has also instructed manufacturers to make the results of their SAR tests available on request.

Swiss Study Finds GSM Phone Radiation Affects Sleep

Changes in sleep patterns caused by GSM phone radiation indicate that “mobile phones can influence the brain,” according to a study at the Neuroscience Center Zurich (NCZ) in Switzerland. But the new results do not show that mobile phone use is dangerous, an NCZ statement stressed.

Mobile phone signals can “promote sleep” in some circumstances, conclude Drs. Alexander Borbély, Peter Achermann and colleagues in the November *Neuroscience Letters* (275, pp.207-210). Volunteers exposed to a GSM mobile phone signal spent less time awake after they first fell asleep, and also showed significant changes in their electroencephalograms (EEGs).

“We do not know the neurophysiological mechanisms leading to the effect,” Achermann told *Microwave News*. GSM exposure altered the subjects’ EEGs, with signals as much as 15% stronger in some frequencies. In size, Achermann noted, this is “comparable to the rise induced by...melatonin.” This increase was prominent in a frequency band related to “sleep spindles,” a type of EEG signal characteristic of one stage of deep sleep.

The paper points out that this effect was produced with specific absorption rates (SARs) “in the range of the exposure [experienced] during the use of mobile phones.”

“The Borbély group is well-known in the field for its very thorough analysis of sleep stages,” Dr. Boris Pasche of the Memorial Sloan-Kettering Cancer Center in New York City said in an interview. “Its results confirm that you can affect EEG activity with an RF field.” The effect appears to be mild, Pasche said.

In the Borbély study, 24 men in their early 20s were exposed while they slept to an intermittent GSM signal—switched on or off every 15 minutes—with a maximum SAR of 1 W/Kg. The double-blind study involved two nights of observation one week apart. Volunteers were exposed to the signal in one session and sham-exposed in the other, with the order determined at random.

After volunteers fell asleep, the time they spent awake over the course of the night was reduced, on average, from 18 to 12 minutes. Of 24 volunteers, 17 showed a decrease in time awake.

This effect is statistically significant, but was only observed

when volunteers were exposed to the GSM signal during the first of the two sessions. If the sham exposure came first, no difference in time awake was seen. Borbély and colleagues theorize that the unfamiliarity of the experimental setup “seems to have caused a mild sleep disturbance” in the first session, which the GSM signal helped to overcome. They refer to studies of low-energy emission therapy (LEET), a technique pioneered by Pasche that uses RF signals to treat chronic insomnia (see *MWN*, M/J96). “As in the present study, the presence of sleep disturbance seemed to be a prerequisite for the [LEET] effect,” the Swiss researchers write, citing their own unpublished research.

In contrast, EEG changes did not depend on the order of exposure. Signals were stronger among exposed volunteers, and significantly stronger for a wide range of frequencies. EEG changes did not fluctuate with the on-off cycle of the GSM signal, which “suggests that field exposure triggers a chain of events, rather than exerting a direct and immediate effect on sleep control,” the paper states. EEG changes diminished over the course

of the night, which “points to an adaptation mechanism.”

Borbély’s group saw no changes in the time needed to fall asleep (sleep latency), or in the length or sequence of the different stages of sleep. These findings are at odds with those of previous studies of sleep and GSM signals by Drs. Klaus Mann and Joachim Röschke of the University of Mainz in Germany (see *MWN*, M/J94 and M/J98). Also in contrast to Mann and Röschke, the Swiss researchers saw no EEG changes during REM sleep—the shorter, shallower part of the sleep cycle in which rapid eye movements and dreaming occur.

“It is difficult to say what accounts for the differences between the studies,” commented Achermann, though he noted that there were some differences in the field conditions.

Borbély’s study, which was funded by Swisscom and the Swiss National Science Foundation, is on the Web at <www.unizh.ch/phar/sleep/handy/>. The NCZ is affiliated with both the Federal Institute of Technology (ETH) and the University of Zurich, where Borbély and Achermann are based.

Russia and West Far Apart on RF/MW Standards (continued from p.1)

RF/MW thermal effects, Grigoriev said, while Russia’s more restrictive standard also reflects a concern over nonthermal effects and subjective symptoms.

Grigoriev emphasized the need to take into account possible cumulative effects from repeated exposure to relatively low levels of radiation as well as the potential bioeffects of specific modulation patterns. “If we bring our viewpoints together, we will have a shorter way to harmonize,” he said.

Dr. Michael Repacholi, director of WHO’s International EMF Project in Geneva, urged the participants to “work together toward a common standard,” arguing that, “We must have uniform standards because everyone should have the same high level of protection.”

Asked later by *Microwave News* whether he envisioned adjusting U.S. and ICNIRP standards toward the considerably more stringent Russian standard, Repacholi replied that, “The WHO does not set standards. However, the WHO does support harmonized health standards based on valid science.”

Repacholi did endorse the need for Western scientists to pay serious attention to the Russian standard. He explained that “the process of harmonization requires that everyone appreciate that there are many viewpoints on how standards should be set other than those now used in most Western countries.”

In that regard, the meeting made some headway. For instance, Dr. James Lin of the University of Illinois, Chicago, said that he had benefited from hearing firsthand how Russian scientists go about standard setting. Before, he said, “I had heard rumors and harbored suspicions as to how things might have been done.” Lin is chair of the National Council on Radiation Protection and Measurements (NCRP) committee that is revising the NCRP’s 1986 RF/MW safety standard (see *MWN*, S/O95).

Lin observed that in order to reach any level of harmonization, efforts will need to be made to bridge the differences in basic philosophies behind standard setting. “Given the variability and the uncertainties in science, the different philosophical

approaches make the situation very complicated,” he said.

“I did not see much in the way of motion,” cautioned Dr. Ben Greenebaum of the University of Wisconsin, Parkside, the editor of *Bioelectromagnetics*. “What is most discouraging is the fact that the Russians are still talking at us instead of with us.”

Nevertheless, Greenebaum has some hope that the two sides will come together. “What I found most significant was the sense on the part of the Russian group that this harmonization of standards is really necessary,” he commented.

The two sides will not reach common ground for some time. Dr. Jürgen Bernhardt, of Germany’s Federal Office of Radiation

Public RF/MW Limits: Russia vs. ICNIRP

<u>Frequency</u>	<u>Russia</u>	<u>ICNIRP</u>
30 kHz-300 kHz	25 V/m	87 V/m
300 kHz-1 MHz	15 V/m	87 V/m
1-3 MHz	15 V/m	87/√f* V/m
3-10 MHz	10 V/m	87/√f* V/m
10-30 MHz	10 V/m (27 μW/cm ²)	200 μW/cm ²
30-300 MHz	3 V/m (2.4 μW/cm ²)	200 μW/cm ²
300-400 MHz	10 μW/cm ² †	200 μW/cm ²
400-2,000 MHz	10 μW/cm ² †	f*/200 μW/cm ²
2-300 GHz	10 μW/cm ² †	1,000 μW/cm ²

† 100 μW/cm² for exposures from TV or radio transmitters operating in a circular transmission or scanning mode.
* Frequency in MHz.

The "Special Importance" of Mobile Phones

More than 30 years ago, Soviet physicians first described microwave sickness, a condition among civilian and military personnel exposed to RF/MW radiation on the job.

Today, some of those same symptoms—fatigue, irritability, headaches, short-term memory loss and loss of libido—are being linked to the use of wireless hand-held telephones. But, as Drs. Yuri Dumansky and V.I. Datsenko of the Ukrainian Scientific Hygiene Center in Kiev pointed out in the abstract of the paper they prepared for the September Moscow conference, the data are still too limited to draw any firm connections.

"Special importance should be attached to this problem," advised Professor Yuri Grigoriev, the meeting's chief Russian organizer, pointing to the approximately 700 million people who are expected to be using mobile phones around the world within the next two years (see p.5).

Grigoriev wants more research on the possible long-term effects of RF/MW radiation on the brain. He stressed that in the studies carried out to date, volunteers have been exposed only for short time periods. "What happens to the users of mobile phones after two or three years of exposure?" he asked.

In a presentation, coauthored with Dr. L.P. Gulchenko, a colleague at the Institute of Biophysics in Moscow, Grigoriev

cautioned that animal studies may be inappropriate for determining possible long-term health effects because they "do not correspond to real conditions of EMF exposure of the phone user."

Russian scientists, like those in other countries, are less worried about radiation from mobile phone base stations. A consensus statement, drafted by Grigoriev—with assistance from the WHO's Dr. Michael Repacholi and other attendees—and released at the conference, seeks to provide public reassurance about such towers. "EMF levels in public areas do not exceed existing maximum permissible levels contained in the Russian national standards," the statement reads. "Population safety is well protected by maximum permissible radiation levels. However, there is a lack of information provided to the public, causing fears for health and safety...."

Dr. A.V. Merkulov of the Russian Center of Electromagnetic Safety at the Institute of Biophysics told the Moscow participants that measurements conducted at a radius of 250 meters from 86 base stations found a maximum power level of $0.93 \mu\text{W}/\text{cm}^2$ —less than one-tenth of Russia's strict $10 \mu\text{W}/\text{cm}^2$ exposure limit (see table, p.9). He did not discuss power levels at closer distances.

Protection and the chair of ICNIRP, predicted that it will take "at least another three to four years to achieve harmonization of the standards." For now, he pointed to "the readiness of the responsible Russian scientists to participate in the harmonization process" as the most significant result of the Moscow meeting.

Repacholi, who chaired ICNIRP before Bernhardt, emphasized the need to educate the public about EMF safety issues and to counter health scare stories in the news media. "Public confidence will be reduced if they see experts arguing among themselves, going to meetings, debating, but then nothing is decided," he said.

Russia's official safety standard for general population exposure to RF/MW radiation—endorsed in May 1996 by a decree of the State Commission of Sanitary and Epidemiological Supervision—is $10 \mu\text{W}/\text{cm}^2$ between 300 MHz and 300 GHz. In contrast, the ICNIRP and ANSI/IEEE voluntary standards vary with frequency in this part of the spectrum and can go as high as $1,000 \mu\text{W}/\text{cm}^2$ (see table, p.9). Below 300 MHz, the Russian standard dips as low as $2.4 \mu\text{W}/\text{cm}^2$, while the Western limits never drop below $200 \mu\text{W}/\text{cm}^2$.

Dr. V.N. Nikitina of the Northwest Scientific Center of Hygiene and Public Health in St. Petersburg reviewed the history of Soviet and Russian electromagnetic radiation safety standards.

Editor's Note

In our last issue, we wrote that the Chinese RF/MW exposure standard for the general population is the strictest anywhere. In fact, while the Russian and Chinese limits are the same above 300 MHz, between 30 and 300 MHz, the Russian standard is more stringent—3 V/m, compared to 5 V/m in China.

She noted that maximum permissible exposures were set below assumed bioeffects threshold levels by a safety factor of five for frequencies up to 300 MHz and by a factor of ten above 300 MHz.

Nikitina pointed out that these standards were based on the belief that there is a threshold for health effects, but that clinical studies conducted since the 1980s undermine the validity of this assumption. "The threshold concept appears to require reconsideration," she said.

Other areas covered during the Moscow conference included experimental studies of mechanisms of EMF interaction, RF/MW effects on the blood-brain barrier (BBB), changes in the immune status of video display terminal (VDT) operators and cancer risks for workers exposed to power frequency fields, as well as clinical applications of EMF therapeutic devices.

The USAF sent five staffers to Moscow, led by Dr. Michael Murphy of Brooks Air Force Base in San Antonio. Other members of the USAF delegation included Dr. Eleanor Adair, who spoke on thermal physiological responses to RF/MW radiation, and James Merritt, who addressed leakage through the BBB.

Ukrainian scientist Dr. O.N. Chernysheva of the Research Institute of Labor Hygiene and Occupational Diseases in Kharkov presented findings from a comparative study of VDT operators and personnel occupationally exposed to RF/MW radiation. Elevated white blood cell counts were found in both groups, she said.

The part of the conference dealing with EMF devices used in medical treatment included eight papers, six of them by Russian scientists. This session was chaired by two Americans, Douglas Williams and Dr. Marko Markov, whose company, EMF Therapeutics Inc. of Chattanooga, TN, has undertaken a pilot study using a 120 Hz pulsating magnetic field to inhibit the blood supply to tumors.

said, the outer ear “is not a vital organ”: Its main function is simply “to capture sound for hearing.” Thus, it is not necessary to “protect the [outer ear] against RF exposure at the same level as the brain,” Santomaa told SCC-28/SC-4. If the limit for the ear is raised, Santomaa argued, “Maximum power of phones will not be limited unnecessarily.”

The members of SC-4 gave unanimous support to the proposed change, Chou and Petersen told *Microwave News*.

The IEEE’s RF/MW standard limits most of the body to exposures of 1.6 W/Kg, averaged over 1 g of tissue. Exposures of the extremities can be as high as 4 W/Kg, averaged over a much greater 10 g. The IEEE standard has been adopted by the American National Standards Institute (ANSI). The Federal Communications Commission’s (FCC) regulations are based on both the ANSI/IEEE guidelines and those of the National Council on Radiation Protection and Measurements.

It will be “at least six months” before the IEEE officially approves the higher exposure for the ear, Petersen said. But SC-4’s vote may have an immediate impact on the design of testing procedures for cellular phones.

“It’ll make it a lot easier to test for compliance if you don’t have to worry about the ear,” the FCC’s Dr. Robert Cleveland said in an interview. Soon after the Atlanta meeting, Cleveland issued a memo proposing that a realistic ear not be included in the head models used for compliance testing, “due to a recent advisory opinion from the IEEE SCC-28/SC-4.”

Reclassifying the ear as an extremity would eliminate a sticky problem for manufacturers: A recent study indicates that many phones now on the market do not comply with the FCC’s exposure limits because of high exposures in the ear.

Using both experimental measurements and computer modeling, Dr. Om Gandhi of the University of Utah, Salt Lake City, tested ten mobile phones—five analog and five PCS digital models. While all five PCS phones met current standards, four of the five analog units had specific absorption rates (SARs) in the ear that exceeded the FCC’s 1.6 W/Kg limit. Gandhi told the International Union of Radio Science’s (known as URSI) meeting in Toronto on August 17 that the SAR in the ear was at least twice as high as allowed by the FCC for three of the analog phones, with one phone’s SAR as high as 5.4 W/Kg, averaged over 1 g. Gandhi detailed his measurements in the August *IEEE Transactions on Electromagnetic Compatibility* (see *MWN*, S/O99).

All ten phones received FCC approval, Gandhi noted, because the agency allows testing with a plastic spacer instead of a realistic, radiation-absorbing model of the ear. “An earless model with a 4-6 mm thick plastic spacer underestimates the peak...SAR down to 40%-60% of the actual SAR,” Gandhi wrote. Gandhi did not respond to requests for comment.

The IEEE subcommittee that is developing mobile phone testing protocols, SCC-34/SC-2, met in September and established an ear issue task force. Its members include Santomaa and Cleveland, with Chou as its chair. In an October 14 e-mail, Chou underlined the importance of reclassifying the ear for decisions on compliance testing: “About the ear discussion for SCC-34,” he wrote, “since the outcome of SCC-28/SC-4 on October 17 will influence our decision, I prefer to wait until [that] meeting is over and then we will decide which way to go.”

At the SCC-28/SC-4 meeting in Atlanta, Chou then proposed reclassifying the ear. Santomaa stressed that “passing of this motion will help SCC-34” in developing a measurement protocol. Petersen and Robert Curtis, of the Occupational Safety and Health Administration (OSHA) in Salt Lake City, were both willing to support the change, but they cautioned that this was not a valid reason. “The purpose of SCC-28 is to set the limits, not help with how measurements are done,” Petersen told *Microwave News*. “Any change has to be based on the biological effects.”

“There were some people in the beginning who thought this could be done just as an interpretation of the existing standard,” Petersen added. “But the standard doesn’t mention anything about this, so it does require a formal vote to change it,” with mail ballots by both SC-4 and SCC-28 as a whole, and a vote by the IEEE standards board no earlier than June.

But SCC-34/SC-2 may decide not to wait. It is under pressure to act soon from both industry and the FCC, which have expressed concern that it is taking too long to agree on a standardized measurement procedure (see p.6 and *MWN*, J/F99). “We would like to make a decision on the ear issue at our meeting in Washington in December,” said SCC-34/SC-2 chair Howard Bassen, of the Food and Drug Administration in Rockville, MD. In an interview, Bassen said that a proposal from the ear issue task force will be considered at the December 6-7 meeting.

Chou told *Microwave News* that SCC-28/SC-4’s vote on the ear was a “decision [that] is important in resolving a controversial issue in SCC-34/SC-2.” But Petersen was more doubtful. “I’m not sure it’s going to help SCC-34,” he said. “It would be difficult to base a decision on something that hasn’t been approved yet, because there is always a risk that it won’t end up being approved.”

The FCC’s Cleveland seems inclined to move ahead. “We could make a tentative conclusion that we can ignore the ear and proceed on the assumption that this change is going to happen,” he said. “But having the data is a critical part of that.” Cleveland’s October 29 memo asks SC-4 members to document that absorption in the ear could never exceed the 4 W/Kg level allowed for the extremities as long as the SAR in the head meets the existing ANSI/IEEE standard. (It is not clear if the SAR that Gandhi measured at 5.4 W/Kg would fall below this limit when averaged over 10 g.)

As soon as SCC-34/SC-2 makes its key decisions, the FCC wants to use them as the basis for revising its own certification procedures. The FCC’s new procedures were supposed to be issued almost a year ago (see *MWN*, J/F99).

The ear can take the higher exposures without any risk, argue supporters of the change. Even a 4 W/Kg exposure would cause a temperature increase in the ear of less than 1°C, Chou told SC-4. Santomaa asserted that such RF heating would be far less than the heating of the ear from the phone’s circuitry, which warms up when it is in use.

“I’m not really worried about people having their ear exposed,” Cleveland told *Microwave News*, echoing remarks by the FCC’s Kwok Chan in September. “The ear can take a lot of abuse,” Chan told the trade paper *RCR* (see *MWN*, S/O99). For his part, Petersen observed that, “The ear has really good cooling, if heating is the concern.”

Hot New Papers

David Blask et al., "Melatonin Inhibition of Cancer Growth *in Vivo* Involves Suppression of Tumor Fatty Acid Metabolism via Melatonin Receptor-Mediated Signal Transduction Events," *Cancer Research*, 59, pp.4,693-4,701, September 15, 1999.

"Here, we describe a novel interface between two seemingly unrelated environmental factors that affect the regulation of tumor growth, namely, dietary fat, as represented by LA [linoleic acid], and information about the light/dark cycle, as conveyed by the melatonin signal. The discovery of this interaction forms the basis for a new understanding and integration of widely spread systemic, cellular and molecular metabolic pathways with the environmental influences of dietary fat, the photoperiod and the circadian system in the maintenance of the host-cancer balance. We believe these results provide a scientific rationale for the development of new dietary recommendations that consider LA intake, circadian-timed melatonin supplementation and/or photoperiodic alterations for the prevention and treatment of a variety of cancers."

Jiri Silny, "Electrical Hypersensitivity in Humans—Fact or Fiction?" *Zentralblatt für Hygiene und Umweltmedizin*, 202, pp.219-233, August 1999.

"The phenomenon of electrical hypersensitivity cannot be explained by the known mechanisms of [EMFs] in humans, as the thresholds of such effects are several decades higher than the field strengths in most of the living areas. Moreover, there is no evidence for significant effects in the weak fields, an adequate sensitization process is not known. If the phenomenon of electrical hypersensitivity should turn out real, then it would take intense research to investigate the acting behind it."

Martin Blank and Reba Goodman, "Electromagnetic Fields May Act Directly on DNA," *Journal of Cellular Biochemistry*, 75, pp.369-374, December 1999.

"Significant differences between the magnetic field-activated stress response and other forms of activation suggest that the conventional stress-activated signal transduction pathways may not necessarily be the only mechanisms for extracellular signaling to the nucleus.... [S]everal lines of evidence support a direct effect of magnetic fields on DNA through interaction with conducting electrons in the DNA. Since cells are minimally perturbed during magnetic field activation of the stress response, magnetic field stimulation could provide a unique experimental tool to study the steps involved in cellular activation mechanisms."

Lise Loberg, James Gauger, James Buthod, William Engdahl and David McCormick, "Gene Expression in Human Breast Epithelial Cells Exposed to 60 Hz Magnetic Fields," *Carcinogenesis*, 20, pp.1,633-1,636, August 1999.

"HBL-100 cells and normal (nontransformed) human mammary epithelial [HME] cells were exposed to [pure, linearly polarized 60 Hz] EMF flux densities of 0.1, 1.0 and 10.0 G for periods ranging from 20 min to 24 h....No patterns of statistically significant EMF effects on any gene were seen in either cell system....At 100 mG, a 32% increase in *c-fos* was seen in HME cells; no other effects were seen in HME cells, and the expression of all assayed genes in HBL-100 cells was comparable with sham control. The increase in *c-fos* expression in HME cells exposed to 100 mG EMFs is notable, since *c-fos* is a breast cancer-associated oncogene whose induction by EMFs has been reported in other *in vitro* systems. However, the small magnitude of this increase, when considered with the lack of induction of *c-fos* in cells exposed to EMFs at the higher flux density (10 G), appears to limit the biological significance of this finding. The results of the present studies demonstrate that exposure to EMFs has no statistically significant effects on the expression of *c-myc* and a battery of other cancer-related genes in two *in vitro* human breast epithelial cell model systems. These results supplement a growing body of evidence which suggests that

Childhood Leukemia: A Two-Step Process

J.L. Wiemels et al. (including M.F. Greaves), "Prenatal Origin of Acute Lymphoblastic Leukemia in Children," *Lancet*, 354, pp.1,499-1,503, October 30, 1999.

"Our findings showed that childhood acute lymphoblastic leukemia is frequently initiated by a chromosome translocation event *in utero*. Studies in identical twins show, however, that such an event is insufficient for clinical leukemia and that a postnatal promotional event is also required."

alterations in oncogene or tumor suppressor gene expression are unlikely to be involved in a mechanism of EMF-induced cancer."

C. Robinson, M. Petersen and S. Palu, "Mortality Patterns Among Electrical Workers Employed in the U.S. Construction Industry, 1982-1987," *American Journal of Industrial Medicine*, 36, pp.630-637, December 1999.

"Our study of construction site electrical workers found a striking excess of risk for electrocution at work; modest excesses for brain tumors, leukemia, melanoma skin cancer, prostate cancer and asbestos-related illnesses—lung cancer, mesothelioma and asbestosis; and unexpected moderate excesses of suicide, musculoskeletal disease, prostate cancer and disorders of the blood-forming organs. Many of the excesses suggest or are consistent with an occupational etiology."

Eraldo Occhetta et al., "Implantable Cardioverter Defibrillators and Cellular Telephones: Is There Any Interference?" *PACE*, 22, pp.983-989, July 1999.

"The aim of our study was to consider cellular telephone interference using different cellular telephones and implantable cardioverter defibrillator (ICD) models. Thirty (26 men, 4 women) patients with ICDs were considered....Present ICD models seem to be well protected from electromagnetic interference caused by European cellular telephones (TACS and GSM), without under/oversensing of ventricular arrhythmias. However, cellular telephones disturb telemetry when located near the programming head. ICD patients should not be advised against the use of cellular telephones, but it has to be avoided during ICD interrogation and programming." (See also p.17.)

J.-L. Chagnaud, J.-M. Moreau and B. Veyret, "No Effect of Short-Term Exposure to GSM-Modulated Low-Power Microwaves on Benzo(a)pyrene [B(a)P]-Induced Tumors in Rats," *International Journal of Radiation Biology*, 75, pp.1,251-1,256, October 1999.

"The results presented here indicate that under our conditions of low-level exposure, GSM-modulated MW do not effect the development of sarcomas in rats treated with B(a)P. The incident power levels used in this study are close to the reference levels that correspond to the basic restrictions which are almost universally accepted: 0.08 and 0.4 W/Kg for the public and workers, respectively. Comparison of our results with other studies is difficult because of the difference in animal cancer models used (strains of animals, carcinogen, type of tumor) and the conditions of exposure." (See *MWN*, J/A99.)

Charles Graham et al., "Human Exposure to 60 Hz Magnetic Fields: Neurophysiological Effects," *International Journal of Psychophysiology*, 33, pp.169-175, August 1999.

"The neurophysiological effects of exposure to power frequency magnetic fields at two occupationally relevant intensities [14.1 and 28.3 μ T]

were evaluated in a single-blind study with 18 male and 18 female volunteers....Men and women showed a similar lack of sensitivity to exposure. The present results do not support the mechanistic hypothesis that the transmission of sensory information to appropriate cortical centers is delayed or distorted by exposure to power frequency magnetic fields at occupational intensities."

Dave Lamble et al., "Cognitive Load and Detection Thresholds in Car-Following Situations: Safety Implications for Using Mobile (Cellular) Telephones While Driving," *Accident Analysis and Prevention*, 31, pp.617-623, November 1999.

"The conclusion of the current study is that neither a hands-free phone option nor a voice-controlled interface removes the problem of driver performance impairment when using a mobile phone in the car. What is needed, as a minimum improvement, is an increase in road user education to make drivers aware of the risks involved with using phones whilst driving even with a hands-free option. Given the current level of mobile phone usage in vehicles, it is apparent that drivers are able to use a mobile phone while driving, but its use is an attention-demanding factor which is likely to contribute to a crash in a critical situation. The

present and past experimental results, as compared to alcohol effects... and reported crashes where the responsible driver was distracted through the use of a mobile phone...imply that mobile phones in cars represent an unacceptable increase in the risk of having a crash." (See *MWN*, J/F 98.)

Xiao Ou Shu, Martha Linet et al. (including Leslie Robison), "Breast-Feeding and Risk of Childhood Acute Leukemia," *Journal of the National Cancer Institute*, 91, pp.1,765-1,772, October 20, 1999.

"Ever having breast-fed was found to be associated with a 21% reduction in risk of childhood acute leukemias (odds ratio (OR) for all types combined=0.79; 95% confidence interval (CI)=0.70-0.91). A reduction in risk was seen separately for AML [acute myeloid leukemia] (OR=0.77; 95% CI=0.57-1.03) and ALL [acute lymphoblastic leukemia] (OR=0.80; 95% CI=0.69-0.93). The inverse associations were stronger with longer duration of breast-feeding for total ALL and AML....Biologically plausible mechanisms that may underlie the relationship between breast-feeding and risk of childhood acute leukemia include anti-infective and/or immune-stimulatory and immune-modulating effects."

Across the Spectrum

Last words: Though there are no proven biological dangers of cell phones, when you have a choice, why not use a regular phone? You can also buy an inexpensive cell phone headset, so the phone can stay in your purse or pocket while you talk.

—"Cell Phones vs. Brain Cells?"
UC Berkeley Wellness Letter, p.3, October 1999

More than half were under the impression that living near electricity pylons increased cancer risk, when this has never been proven.

—Richard Hannaford on the results of a 1,000-person survey, in "Public Gripped by Cancer Myths,"
BBC Online Network, <news.bbc.co.uk>, October 11, 1999

Regulatory oversight of wireless technology in the U.S. is at best weak and ineffectual and at worst an illusion. The FCC is only now beginning to look at in-field testing of phones in use, a necessary policing step. The FDA seems unable to make a move unless there is absolute proof of harm to the public, and the bizarre notion of a collaborative financial relationship with the industry it is supposed to be regulating is beyond belief in its blatant conflict of interest....

—Dr. George Carlo, chair, WTR, Washington,
in a letter to the editor, *Wireless Week*, p.4, November 1, 1999

"No matter how remote the risk may be, we want to make customers aware that they are putting themselves at some risk if they are speaking on a cell phone or operating a pager or any other electronic device in the proximity of flammable liquids."

—Howard Miller, spokesperson, BP Amoco, quoted by Katie Hafner in
"Safety Fears Will Discourage Cell Phone Use at Gas Pumps,"
New York Times, p.G3, October 14, 1999

It all starts with this radar antenna, ten stories in the air. The steel behemoth, shaped like a jai alai cesta and painted red and white, rises from a concrete tower and lords over an abandoned, weed-choked military base at the easternmost tip of Long Island. From this radar dish [at the Montauk Air Force Station] came the deadly rays that altered thoughts, that ripped a hole in the time-space continuum, that fired the particle beam that shot down all the airplanes. Or so go the conspiracy theories. Over the last three years, a handful of airplanes have crashed into the

Atlantic not far from here: TWA 800, Swissair 111, John F. Kennedy Jr.'s Piper and now EgyptAir 990....The [Montauk] base closed in 1981 and has been empty since....

—Frank Ahrens, "Flight into the Space-Time Continuum: EgyptAir Crash Fuels Conspiracy Buffs' 'Montauk Project' Myth,"
Washington Post, p.C1, November 6, 1999

"Motorola was adamant that Adey never mention DNA damage and RF radiation in the same breath."

—Dr. Jerry Phillips, Colorado Springs, CO, formerly a member of
Dr. Ross Adey's lab at the VA Hospital, Loma Linda, CA,
quoted by Gordon Bass in "Radar: Is Your Cell Phone Killing You?"
PC Computing, p.63, December 1999

[T]here is no overwhelming wave of costly litigation in the EMF area today. One of the reasons is that despite many years of research on EMFs and their risks, there is no certain consistency in the results of the studies. Claimants do not have unanimous scientific agreement of a causal relationship between EMFs and injuries. What claimants do have, and what should cause concern to insureds and insurers, is the public perception that EMFs are harmful. Public fear that EMFs cause cancer and other ailments can affect the outcome of a lawsuit.

—David Thamann, "EMF Claims Could Still Overwhelm Insurers,"
National Underwriter, p.6, November 8, 1999

We will soon be bombarding the universe with more radio and infrared emissions than ever before.

—Peter Lewis, on the introduction of wireless networking of computers and other consumer electronics devices, in "Not Born To Be Wired,"
New York Times, Circuits, p.3, November 25, 1999

Brain Cancer Causes Cell Phones, a new comedy, is an examination of the creative process in a technology and media dominated society fast approaching a new millennium—blah, blah, blah—you get the point....

—Announcement for *Brain Cancer Causes Cell Phones*,
"an explosive new sketch-play" at the Gene Frankel Theater,
New York City, running December 3-19, 1999

International Workshop on Mobile Phones and Brain Cancer

The International Workshop on Mobile Phone Use and Adult Brain, Head and Neck Tumors, held at the German Cancer Research Center in Heidelberg, November 12-13, brought together researchers from around the world. Dr. Joachim Schüz of the University of Mainz's Institute for Medical Statistics and Documentation, who presented a paper at the meeting, filed this report for Microwave News.

Professors Maria Blettner of the University of Bielefeld, Jörg Michaelis of the University of Mainz and Jürgen Wahrendorf of the German Cancer Research Center organized the workshop to review the results of their feasibility study for a large-scale epidemiological study on the possible association between the use of mobile phones and cancer in Germany.

The German study group was seeking assistance in answering two central questions: (1) Are case-control and cohort studies feasible under conditions that are relevant to the German experience? and (2) Should exposure to RF/MW from mobile phone base stations be included in such studies? With the help of a group of invited international experts, a number of methodological issues that could impact risk estimates were covered, including sources of selection bias and the effects of exposure misclassification and confounding factors.

Sweden's Dr. Lennart Hardell and the U.S.'s Joshua Muscat described the results of their completed case-control studies, both of which indicate no overall increase in brain tumor risk associated with the use of mobile phones [see *MWN*, M/J99]. Their findings for subgroups are inconclusive due to the small numbers of subjects. In both studies, GSM, the digital mobile phone system commonly used in Germany, played only a minor role.

Further insights were drawn from talks by Dr. Elisabeth Cardis on the planned multicountry, case-control study coordinated by the International Agency for Research on Cancer (IARC) in Lyon, France [see *MWN*, J/F98 and S/O98], by Dr. Kenneth Rothman of Epidemiology Resources Inc. in Newton Lower Falls, MA, on a promising U.S. cohort study that came to an abrupt end [see p.5 and *MWN*, M/J96 and N/D97] and by Dr. Christoffer Johansen on the ongoing cohort study at the Danish Cancer Registry in Copenhagen [see *MWN*, M/J99]. In each case, there was extended debate on the controversial problem of

the relatively short latency period that has elapsed since the widespread introduction of mobile phones.

The German feasibility study indicates that Bielefeld, Heidelberg and Mainz—each city has a large neurosurgical clinic—would make up a reasonable study area and that a sufficiently high response rate could be expected. The use of mobile phones in Germany has been historically low, however. It has only increased over the last few years and, at present, includes 23% of the German population. This prompted the suggestion that the German part of the IARC study be expanded to achieve independent, meaningful results for the German population.

There was a further suggestion to undertake cohort studies to complement the planned case-control studies in order to include a greater number of possible outcomes. There was agreement that cohorts should be large enough to allow internal comparisons between heavy and infrequent users of mobile phones, as previous studies indicated a lower overall mortality among mobile phone users.

During the discussions it became clear that the health concerns among the general public in Germany over microwave exposures from mobile phone base stations are more pronounced than in many other countries. RF/MW measurements in randomly selected locations in the city of Mainz show that the distance to a base station cannot be used to discriminate reliably between different levels of individual exposures. The observation that distance is a poor indicator of radiation exposure was supported by surveys by the U.K. National Radiological Protection Board.

The main conclusions of the Heidelberg workshop were:

- The German part of the IARC case-control study should include a larger sample size to achieve meaningful results for Germany alone.
- Prospective cohort studies should complement case-control studies. Protocols and preliminary budgets will be worked out for two cohorts: one for subjects already participating in a survey of almost 30,000 mobile phone users and one based on data from health insurers.
- Ecological studies near base stations are not recommended at the present time due to uncertainties over exposure assessment. The feasibility study will try to determine whether field strengths predicted by computer models developed by mobile carriers can be used for such studies.

Further details will be published in a workshop report. The other speakers at the workshop were: Drs. Angus Cook (New Zealand), Maria Feychting (Sweden) and Simon Mann (U.K.), as well as Dr. Gabriele Berg, Klaus Schlaefler and Dr. Brigitte Schlehofer of the German study group.

"MICROWAVE NEWS" FLASHBACK

Years 15 Ago

- Dr. Abe Liboff of Oakland University and the U.S. Navy's Dr. John Thomas find that rats exposed to a combination of 60 Hz and static magnetic fields display impaired timing discrimination. The result was predicted by a cyclotron resonance model.
- The WHO and IRPA (now ICNIRP) recommend keeping long-term EMF exposures "as low as can be reasonably achieved" until more is known about the biological effects of EMFs.
- The Johns Hopkins University (JHU) Applied Physics Lab adopts a "flat" 100 $\mu\text{W}/\text{cm}^2$ limit for exposures to 30 MHz-100 GHz.

Years 10 Ago

- A JHU team finds some telephone linemen have high rates of leukemia and other cancers. A male breast cancer cluster is also reported, the first time this disease is linked to EMFs.

- The Colorado Public Utilities Commission adopts a policy of "prudent avoidance" of EMF exposures from new power lines.
- "In response to an emerging customer requirement," IBM introduces VDTs shielded to reduce emissions of VLF magnetic fields.

Years 5 Ago

- Drs. Henry Lai and N.P. Singh of the University of Washington, Seattle, show that low-level 2450 MHz radiation can cause DNA breaks in the brains of live rats.
- Canada's Hydro-Québec (HQ) denies McGill University further access to its data, after HQ workers exposed to high frequency transients are found to have an increased risk of lung cancer.
- Nine months after President Bill Clinton said he would address EMFs and childhood cancer, the White House has yet to issue a statement on EMF health risks.

2000 Conference Calendar (Part I)

Part II will appear in our next issue.

January 10-13: **RF Safety: Science, Compliance and Communications**, Marriott Riverwalk, San Antonio, TX. Contact: Michelle Gutberlet, Electromagnetic Energy Association, 1255 23rd St., NW, Suite 200, Washington, DC 20037, (202) 452-1070, Fax: (202) 833-3636, E-mail: <eea@elecenergy.com>, Web: <www.elecenergy.com>.

January 23-27: **Winter Meeting of the IEEE Power Engineering Society (PES)**, Singapore. Contact: IEEE PES, 445 Hoes Lane, PO Box 1331, Piscataway, NJ 08855, (732) 562-3883, Fax: (732) 562-3881, E-mail: <peswm2000@ieee.org>, Web: <www.ieee.org/power>.

February 4: **Radiofrequencies and Modulations Applied in Wireless Communication: Biological Effects and Safety Concerns**, Catholic University of America, Washington, DC. Contact: Dr. Ewa Czerska, (301) 594-1212, ext.119, E-mail: <emc@cdhr.fda.gov> (see p.5).

February 28-March 1: **Wireless 2000**, Ernest Morial Convention Center, New Orleans, LA. Contact: CTIA, (202) 785-2842, Web: <www.wow-com.com/convsem/wireless/2000>.

March 1-3: **10th Annual DistribuTECH Conference and Exhibition**, Miami Beach Convention Center, Miami Beach, FL. Contact: DistribuTECH 2000, 1421 S. Sheridan Rd., Tulsa, OK 74112, (918) 831-9160, Fax: (918) 831-9161, E-mail: <distributtech@pennwell.com>, Web: <www.distributtech.com>.

March 20-22: **39th Annual Meeting of the Society of Toxicology (SOT)**, Convention Center, Philadelphia, PA. Contact: SOT, 1767 Business Center Dr., Suite 302, Reston, VA 20190, (703) 438-3115, Fax: (703) 438-3113, E-mail: <clarissa@toxicology.org>, Web: <www.toxicology.org>.

April 1-7: **8th Scientific Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine (ISMRM)**, Convention Center, Denver, CO. Contact: ISMRM, 2118 Milvia St., Suite 201, Berkeley, CA 94704, (510) 841-1899, Fax: (510) 841-2340, E-mail: <info@ismrm.org>, Web: <www.ismrm.org>.

April 2-6: **2nd World Congress on Microwave and Radiofrequency Processing**, Renaissance Resort, Orlando, FL. Contact: David Clark, University of Florida, Dept. of Materials Science and Engineering, PO Box 116400, Gainesville, FL 32611, (352) 392-7660, Fax: (352) 846-2033, E-mail: <dclar@mse.ufl.edu>, Web: <www.acers.org/2WC>.

April 5-6: **36th Annual Meeting of the National Council on Radiation Protection and Measurements (NCRP)**, Crystal City Marriott, Arlington, VA. Contact: NCRP, 7910 Woodmont Ave., Suite 800, Bethesda, MD 20814, (301) 657-2652, Fax: (301) 907-8768, Web: <www.ncrp.com>.

April 8-13: **31st Annual Meeting of the Environmental Mutagen Society**, Hyatt Regency Superdome, New Orleans, LA. Contact: Jim Tucker, Lawrence Livermore National Lab, BBR Program L-452, PO Box 808, 7000 East Ave., Livermore, CA 94551, (925) 423-8154, Fax: (925) 422-2282, E-mail: <tucker5@llnl.gov>, Web: <www.ems-us.org/meetings.html>.

April 9-13: **2000 International Magnetics Conference (Intermag 2000)**, Royal York Hotel, Toronto, Canada. Contact: Courtesy Associates, 2000 L St., NW, Suite 710, Washington, DC 20036, (202) 973-8676, Fax: (202) 973-8722, E-mail: <intermag@courtesyassoc.com>, Web: <www.intermagconference.com>.

April 9-14: **Millennium Conference on Antennas and Propagation (AP 2000)**, Davos, Switzerland. Contact: AP 2000 Secretariat, ESTEC Conference Bureau, PO Box 299, 2200 AG Noordwijk, The Netherlands, (31+71) 565-5005, Fax: (31+71) 565-5658, E-mail: <confburo@estec.esa.nl>, Web: <www.estec.esa.nl/AP2000>.

April 10-12: **62nd Annual Meeting of the American Power Conference**, Marriott Downtown, Chicago, IL. Contact: American Power Conference, Illinois Institute of Technology, 3310 S. State St., Chicago, IL 60616, (312) 567-3196, Fax: (312) 567-3892, E-mail: <apc@iit.edu>, Web: <apc.iit.edu>.

April 10-13: **National Association of Broadcasters Annual Convention (NAB 2000)**, Las Vegas, NV. Contact: Kathy Muller, NAB, 1771 N St., NW, Washington, DC 20036, (202) 775-3527, Web: <www.nab.org/conventions>.

May 4-5: **Low Frequency EMF, Visible Light, Melatonin and Cancer**, Co-

logne, Germany. Contact: Thomas Erren, Institut und Poliklinik für Arbeits- und Sozialmedizin der Universität zu Köln, 50924 Köln, Germany, (49+221) 478-5819, Fax: (49+221) 478-5119, E-mail: <tim.erren@uni-koeln.de>.

May 7-12: **2000 IEEE Radar Conference**, Hilton Mark Center, Alexandria, VA. Contact: Jacquelyn Hunter, PO Box 220521, Chantilly, VA 20153, (703) 803-8701, Fax: (703) 222-3208, E-mail: <j.hunter@ieee.org>, Web: <www.ewh.ieee.org/soc/aess/radar2000>.

May 12-19: **American Occupational Health Conference (AOHC)**, Convention Center, Philadelphia, PA. Contact: Nancy Olson, AOHC, 114 N. Arlington Heights Rd., Arlington Heights, IL 60004, (847) 818-1800, Fax: (847) 818-9266, E-mail <nolson@acoem.org>.

May 14-17: **32nd Annual National Conference on Radiation Control**, Hyatt Regency, Tampa, FL. Contact: Lin Carigan, Conference of Radiation Control Program Directors, 205 Capital Ave., Frankfort, KY 40601, (502) 227-4543, Fax: (502) 227-7862, E-mail: <lcarigan@crpcd.org>, Web: <www.crpcd.org/meetings.html>.

May 14-19: **Conference on Precision Electromagnetic Measurements (CPEM 2000)**, Hilton Hotel, Sydney, Australia. Contact: CPEM 2000, GPO Box 128, Sydney, NSW 2001, Australia, (61+2) 9262-2277, Fax: (61+2) 9262-2323, E-mail: <cpepm2000@tourhosts.com.au>, Web: <www.tourhosts.com.au/cpem2000>.

May 14-19: **International Radiation Protection Association International Congress 2000 (IRPA-10)**, Hiroshima, Japan. Contact: IRPA-10 Secretariat, c/o Japan Convention Services Inc., Nippon Press Center, Building 4F 2-2-1, Uchisaiwai-cho, Chiyoda-ku, Tokyo 100, Japan, (81+3) 3508-1214, Fax: (81+3) 3508-0820, E-mail: <irpa@convention.co.jp>, Web: <www.convention.co.jp/irpa10>.

May 19-26: **American Industrial Hygiene Conference and Exposition**, Orange County Convention Center, Orlando, FL. Contact: American Industrial Hygiene Association, 2700 Prosperity Ave., Suite 250, Fairfax, VA 22031, (703) 849-8888, Fax: (703) 207-3561, E-mail: <cdavisjones@aiaa.org>, Web: <www.aiaa.org/conf.html>.

May 20-26: **IEEE International Conference on Phased Array Systems and Technology**, Marriott Laguna Cliffs Resort, Dana Point, CA. Contact: Dr. Michael Thorburn, Aerospace Corporation, PO Box 92957, M1/111, Los Angeles, CA 90009, (310) 336-2197, Fax: (310) 336-6225, E-mail: <m.a.thorburn@ieee.org>, Web: <www.ieeeaps.org/ISPAST00>.

May 22-26: **WHO/ICNIRP 4th International Non-Ionizing Radiation Workshop**, Kyoto, Japan. Contact: R. Matthes, Institut für Strahlenhygiene, Bundesamt für Strahlenschutz, Ingoelstädter Landstraße 1, D-85764 Oberschleißheim, Germany, (49+89) 31603-288, Fax: (49+89) 31603-289, E-mail: <r.matthes@icnirp.de>, Web: <www.icnirp.de>.

May 29-June 2: **25th Annual Conference of the Australasian Radiation Protection Society (ARPS 25)**, Millennium Hotel, Sydney, Australia. Contact: ARPS 25, Dr. Ron Cameron, Safety Division, ANSTO, Private Mail Bag 1, Menai, NSW 2234, Australia, Web: <www.arl.gov.au/arps>.

May 30-June 2: **2000 European Electromagnetics Conference (EUROEM 2000)**, Edinburgh, U.K. Contact: EUROEM 2000, Concorde Services Ltd., Suite 325, Pentagon Business Center, Washington St., Glasgow G3 8AZ, U.K., (44+141) 221-5411, Fax: (44+141) 221-2411, E-mail: <euroem@concorde-uk.com>, Web: <www.mcs.dundee.ac.uk:8080/~euroem>.

June 7-10: **8th European Magnetic Materials and Applications Conference (EMMA 2000)**, Kiev, Ukraine. Contact: EMMA 2000 Conference, Institute of Magnetism, 36-b, Acad. Vernadsky Blvd., 252142 Kiev, Ukraine, (380+44) 444-3420, Fax: (380+44) 444-1020, E-mail: <emma@imag.kiev.ua>, Web: <www.viaduk.net/freepage.nsf/page/emma2000>.

June 9-16: **22nd Annual Meeting of the Bioelectromagnetics Society (BEMS)**, Technical University, Munich, Germany. Contact: Dr. William Wisecup, 7519 Ridge Rd., Frederick, MD 21702, (301) 663-4252, Fax: (301) 371-8955, E-mail: <75230.1222@compuserve.com>, Web: <www.bioelectromagnetics.org>.

June 11-16: **IEEE Microwave Theory and Techniques Society (MTT-S) International Microwave Symposium**, Boston, MA. Contact: LRW Associates, 6701 Bay Meadow Dr., Glen Burnie, MD 21060, (704) 841-1915, Fax: (704) 845-3078, E-mail: <lrwassoc@sprintmail.com>, Web: <www.ims2000.org>.

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New Warning Issued on Capitol Hill...At a congressional hearing on October 7, Reagan-era national security planners beat the drums for more spending on defenses against electromagnetic pulse (EMP) weapons. Rep. Curt Weldon (R-PA), chair of the House Armed Services Committee's subcommittee on R&D, said that the hearing was needed "to help educate the public on this still not widely understood threat." In the 1980s, the U.S. spent billions to protect its military systems against EMP effects, and remarks at the hearing were reminiscent of past warnings about a Soviet EMP threat (see *MWN*, Jun81, May82 and Sept84). This time, though, the chief villains are Third World regimes such as Iraq and North Korea. "Pyongyang may consider an EMP attack...the best way to blackmail or deter the U.S. in the event of a crisis," Weldon suggested in his opening remarks. Dr. William Graham of National Security Research Inc., science adviser to Reagan and former chair of a Pentagon committee on the "Star Wars" antimissile system, argued that a small nation might launch an EMP attack on the U.S. "simply to demonstrate that the nation had both functional nuclear weapons" and a way to deliver them. While there is no evidence that the U.S. has ever been targeted in this way, Dr. Lowell Wood of the Lawrence Livermore National Lab in California testified that, "It is widely known that we Americans contemplated, briefly and in a nonpervasive fashion, a nuclear EMP laydown on Iraq" as an opening salvo in the Gulf War. In 1992, there were reports that the U.S. had actually used a nonnuclear EMP device against Iraq—a high-power microwave weapon mounted on a Tomahawk missile (see *MWN*, M/J92 and S/O92). Nonnuclear EMP weapons can operate "more surgically, from distances [of up to] several hundred miles," corrupting electronic data or even "fusing or melting sensitive internal components," Graham testified. Wood warned that modern electronics are more vulnerable to EMP than are older systems, due to their smaller and more sensitive circuits. In contrast, Wood claimed that an EMP attack "doesn't damage the human body," and that "no physiological damage of any kind takes place." He said that a nuclear EMP attack would be the opposite of the popular image of the effects of the neutron bomb: Instead of killing people and leaving physical objects intact, it would destroy electronics but leave people unharmed. (Wood did not discuss possible health effects experienced by those exposed during EMP testing, such as Boeing engineer Robert Strom. Strom contracted leukemia and sued Boeing, winning a settlement of over \$500,000; see *MWN*, S/O90, also S/O 88.) As for past efforts to protect military hardware against EMP, Wood—who currently holds a fellowship at the Hoover Institution in Stanford, CA—complained that their "average effectiveness was not exceedingly high." He blamed this on top officials who neither "really understood—or, in some cases, believed in the existence of—EMP and its effects." But he conceded that there had also been some technical problems: "In some notable EMP-hardening programs, sustained and strenuous efforts were made without securing desired results." Wood urged more spending on EMP-hardening efforts in the military, and, echoing the views of Dr. Edward Teller (see *MWN*, J/F83), also called for EMP-hardening of civilian communications and power facilities. Describing civilian infrastructure as "naked to our nuclear-

armed enemies," Wood asserted that, "Even a modest, single-explosion EMP attack on the U.S. might well devastate us as a modern, postindustrial nation." Dr. Michael Bernardin, who has worked on EMP and on offensive RF weapons at Los Alamos National Lab in New Mexico, spoke for the Clinton administration. He noted that in the most famous EMP incident, 30 strings of streetlights failed on the Hawaiian island of Oahu during a high-altitude nuclear test in 1962. While this was impressive, given that it occurred 800 miles from the blast site, it represented only 1% of all streetlights on the island. "Thus, the effects were not ubiquitous," said Bernardin. Careful computer modeling of EMP effects is needed, he added, "before predictions of catastrophic damage are to be believed."

MEDICAL DEVICE EMI

"Don't Lean, Don't Linger, Don't Worry"... A study of 169 people with implantable cardioverter defibrillators (ICDs) exposed to electronic antitheft systems found 19 instances of electromagnetic interference (EMI), according to a paper in the July 27 issue of *Circulation* (100, pp.387-392, 1999). A team led by Dr. Douglas Zipes of the Indiana University School of Medicine in Indianapolis reported that all the cases of EMI occurred during so-called "extreme exposure," in which ICD users stood for two minutes within six inches of one of the antitheft system's pillars (which are placed at store exits to detect removal of any merchandise with an antitheft tag still attached). "It does not appear that...systems pose a threat to patients with ICDs if exposure is kept to a 10- to 15-second...walk-through," Zipes concluded. "Don't lean, don't linger, don't worry!" was how Zipes summarized his advice for patients (see *MWN*, J/A99). In 12 of the 19 cases of EMI, Zipes judged that the interference was "not clinically relevant." But in the other seven instances, EMI might have caused the ICD to deliver an "inappropriate" electrical shock to the heart. (The shocking mechanism was turned off for this experiment.) These seven cases occurred with ICDs implanted in the abdomen—a procedure that is almost never used today. Thus, Zipes wrote, "The already minimal risk of [EMI] should diminish even more as older and abdominal ICDs are replaced with newer pectoral defibrillators." Zipes's paper called for signs to be posted when antitheft systems are hidden in walls or floors, an increasingly common situation. This idea was opposed last year by Dr. Warren Harthorne, a consultant for Sensormatic, a leading maker of antitheft devices based in Boca Raton, FL. "If you start placing signs in stores, you're going to have a rash of hysterical patients," Harthorne, of Massachusetts General Hospital in Boston, said at an FDA hearing (see *MWN*, S/O98). Sensormatic provided funding for Zipes's study, which examined only Sensormatic equipment. The three most serious cases of EMI in Zipes's study were caused by an acousto-magnetic system, a type made only by Sensormatic (see *MWN*, N/D98).

PEOPLE

Dr. **David Savitz** of the University of North Carolina, Chapel Hill, has been elected president of the Society for Epidemiologic Research. He takes the helm next June....**Janie Blanchard** has left Bechtel in San Francisco to join the Metropolitan Trans-

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portation Commission in Oakland, CA....Dr. **Alessandro Chia-brera** died on November 9. Chia-brera was at the University of Genoa in Italy and was an associate editor of *Bioelectromagnetics*....Dr. **John Goldsmith** of Ben-Gurion University of the Negev in Beer Sheva, Israel, died on October 21 after a long illness. He was formerly with the California Department of Health. In some of his last papers, Goldsmith argued in favor of a policy of prudent avoidance of RF exposures (see *MWN*, N/D97).

VIDEO DISPLAY TERMINALS

NIOSH Anthology...NIOSH has issued a new edition of its papers on VDTs and health. The volume features the controversial 1991 study, led by Dr. Teresa Schnorr, of VDT use and miscarriages among telephone operators (see *MWN*, M/A91). In the *New England Journal of Medicine*, Schnorr and coauthors concluded that, “[U]se of VDTs and exposure to the accompanying EMFs were not associated with an increased risk.” NIOSH does not include letters that later appeared in the *Journal* (September 12, 1991), pointing out that the exposed and control groups worked in power frequency magnetic fields of nearly identical strengths (see *MWN*, S/O91). The book contains excerpts of Richard Tell’s exposure assessment for the study. The 134-page collection also includes a 1997 paper on VDT use and low birth weight or preterm births. Many of the papers address office ergonomics. *NIOSH Publications on Video Display Terminals* (3rd edition) is available free of charge from: NIOSH Publications Dissemination (C-13), 4676 Columbia Parkway, Cincinnati, OH 45226, (800) 356-4674, Fax: (513) 533-8573, E-mail: <pubstaf@cdc.gov>, Web: <www.cdc.gov/niosh>.

Keeping Current: Follow-Up on the News

◆ The COST244bis workshop in Stockholm, December 12-13, was to address “Quality Assurance in EMF Epidemiology.” But, possibly because of a glut of other meetings, the plans have changed. Those who show up will instead discuss the future of COST244.

◆ The U.K.’s Independent Expert Group on Mobile Phones (see *MWN*, S/O99) has its own Web site: <www.iegmp.org.uk>.

◆ The EMR Network, an umbrella group of activists fighting cellular towers, is looking to expand its support (see *MWN*, N/D 98 and M/A99). On November 17, it ran a quarter-page ad in the “Giving” section of the *New York Times* arguing that, “The wireless buildout should not continue until basic questions about safety are answered.” The group reran the ad on the much more widely read Op-Ed page of the *Sunday Times* on November 28.

◆ There is “no definitive scientific evidence” of any public health hazard associated with radiation from the U.S. Air Force’s PAVE PAWS missile defense radar on Cape Cod, concluded a panel appointed by the Massachusetts Department of Public Health in a report released on November 26 (see *MWN*, M/J87, J/A98 and N/D98). The full text of the report is available on the Internet at: <www.state.ma.us/dph/beha>.

◆ In the October issue of *Bioelectromagnetics* (20, pp.440-445), James Hatfield, Dr. Sam Milham and Richard Tell published their findings on ELF magnetic fields generated by steel-belted radial tires. They first described the phenomenon in *Microwave News* (M/A98).

◆ Could using a jammer land you in the slammer? In countries such as Japan and Israel, devices that block mobile phone signals are reported to be quite popular. In the U.S., however, the FCC issued a statement on October 12 noting that federal law prohibits their “manufacture, importation, marketing [and] operation.”

◆ Dr. Gary Zeman of Lawrence Berkeley National Lab and, previously, of the U.S. Navy and Bell Labs, is now writing a regular column on non-ionizing radiation for the *Health Physics Society’s Newsletter*. He closed his December column with: “If there are any risks such as cancer associated with living near power lines, then it is clear that those risks are small.”

◆ Trendsetters take note: The disposable mobile phone will be here soon. The November 8 *New York Times* reported that Randice-Lisa Altschul, who has also invented an “interactive cereal,” has patented a way to make phones with no plastic housing, lowering their cost to as little as \$14 each.

VIEWS ON THE NEWS

Wireless Phones and Public Health: Industry Is in the Driver's Seat

Last summer Dr. Om Gandhi reported that many mobile phones violate exposure limits by causing high exposures in the ear. Industry representatives soon proposed a solution: Raise the limits (see p.1).

Surprised? You shouldn't be. Industry is firmly in control of decisions on wireless phones and public health, as it has been since the issue first emerged.

Standard-setting bodies do more or less as industry wants. Their members are often current, past or future employees of the very companies they are supposed to regulate. Meanwhile, government agencies have no appetite for confrontation. The result is that no one speaks for ordinary citizens, who are kept in the dark.

Here's an example: How much radiation is put out by your wireless phone? If you call the manufacturer, you won't find out. The official corporate position is that you don't need to know.

By law, this is public information, which each manufacturer of a new phone is required to file with the FCC. But just because it's public information doesn't mean you can get it.

After ABC's *20/20* reported on mobile phones in October, the FCC got calls from owners who wanted to know how much radiation they are getting from their particular phones. Callers were told that although the radiation numbers are somewhere in the FCC's files, they are buried so deep that no one had the time to find them (see p.6).

This is Orwellian: "Public information" that is not available to the public. Exposure numbers that must be filed but cannot be retrieved. There's a simple way to cut through all this. As we have long maintained, manufacturers should be forced to put the numbers right on the box.

Health research is another area where the public has been left out in the cold. For years the FDA has let industry set the agenda for safety research. Occasionally the agency might issue some criticism of the industry's research effort. But the FDA has never actively supervised industry-sponsored research.

Now industry funding of WTR has come to an end, with few results to show for it. The CTIA says it will fund more research, but so far only to follow up two of the WTR findings (see p.7). Certainly these deserve some attention, but there is other work on mobile phone bioeffects that is far more important.

The FDA's response to the industry plan was to ask, "Where do we sign?" There appears to have been no negotiation for a broader scope of study, or for a funding mechanism that would not allow industry to dictate what to study. In other words, the FDA is still letting the telecom industry define the research agenda.

When pressed on this point, an FDA staffer told *Microwave News* that recently the FDA had proposed federally sponsored animal studies on RF/MW health effects (see p.5). This is good news, but it prompts two questions: Why has the FDA kept this proposal secret? And why did it take so long? Certainly the need for such research was clear by 1993, if not earlier.

In any case, the FDA proposal is still just that—a proposal—

A Simple Wish for 2000

A hallmark of electromagnetic health controversies is that they are never resolved. When an effect is reported, it is quickly countered with an opposing result and the contradiction is left to fester.

It's time to resolve one important microwave health effect: whether low-level microwave radiation can cause leakage through the blood-brain barrier (BBB).

This fall, the European and Australian press warned that Swedish researchers are concerned that mobile phones could cause chemicals to pass through the BBB, possibly leading to Alzheimer's and other neurological diseases. This was hardly news. The same Swedish team had announced a BBB-microwave effect more than seven years ago (see *MWN*, J/A 92). And even then it was not news.

Dr. Allan Frey first reported the BBB effect 25 years ago, and U.S. Army researchers confirmed it in 1977.

The BBB work is as controversial today as it was then. James Merritt of the U.S. Air Force tried to debunk the BBB effect at the recent Moscow conference (see p.1)—just as he had tried to refute Frey's original work a generation earlier.

The impact of microwaves on membrane permeability has important implications for cell phones. The risk is not limited to the brain: The eye-blood barrier has also been shown to be vulnerable.

This is a clearly defined problem and could be settled without a major research program. It is about time.

and it doesn't seem to be on the fast track. No one we called would even send us a copy.

The last few months have seen more public attention paid to the cellular phone issue than at any time since 1993. The special report on *20/20* drew responses from the industry, the FDA, the FCC and Congress, and there has been prominent coverage on British, French, German and Irish TV.

But despite all the fuss, corporate interests are still firmly in control. Industry is writing its own standards, deciding what the public needs to know and telling the government what research should be done.

It will take more than a few news stories to change all that.

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