March 14, 2014

**Ex Parte**

Marlene H. Dortch
Secretary, Federal Communications Commission
445 12th Street SW
Washington, DC 20554

*Re: Reassessment of Federal Communications Commission Radiofrequency Exposure Limits and Policies, ET Docket No. 13-84; Proposed Changes in the Commission's Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields, ET Docket No. 03-137*

Dear Ms. Dortch:

On March 12, 2014, James Tomaseski, Director of Safety & Health of the International Brotherhood of Electrical Workers, Roger Egan, Executive Chairman of Risk Strategies Co., Doug Williams, Chairman and CEO of RF CHECK, Inc. ("RF CHECK"), Drew Fountain, Co-Founder & Vice Chairman of RF CHECK, and Daniel Jaurigue, President, North America of RF CHECK spoke with Julius Knapp, Chief, Joe Monie, Engineering Advisor, Bruce Romano, Associate Chief , Robert Weller, Technical Analysis Branch Chief, Ed Mantiply, Physical Scientist, and Martin Doczkat, Electronics Engineer, all of the FCC's Office of Engineering and Technology, regarding the above-referenced proceedings. Specifically, we discussed the need for a comprehensive RF safety system that is appropriate to the new RF environment. Unlike when the FCC's rules were written, today there are hundreds of thousands of RF transmitters. These transmitters are substantially more accessible by workers such as painters, roofers, and emergency personnel who are not trained in RF safety, and these transmitters are often hidden or otherwise not easily identified as a hazard. The existing tactics of relying on signs and physical barriers are no longer adequate and the FCC should not accept these tactics as compliant with its rules, either in individual cases or as part of a blanket safe harbor. I have also attached a letter I provided to Mr. Knapp and three articles that I believe are relevant to the record.

Pursuant to the Commission's rules, this letter is being submitted for inclusion in the public record of the above-referenced proceeding.

Sincerely,

Doug Williams, CEO

cc: Meeting participants

March 12, 2014

Julius Knapp
Chief- Office of Engineering and Technology
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

**RE: Improving Safety and FCC Compliance at RF Transmission Sites: RF CHECK Briefing for the FCC**

The FCC's rules regarding RF safety at cell towers and other transmitters are critical to meeting the Commission's responsibility under the Communications Act to ensure public safety. As the FCC has made clear, it is the unambiguous responsibility of every FCC licensee to ensure the safety of workers and the general public near its RF transmitters.

RF CHECK is here to inform the FCC and the wireless industry that we have developed a patented and comprehensive solution to this issue which benefits all of the wireless stakeholders. Our solution not only protects workers from RF exposures but also protects all governmental and commercial licensees, site owners, insurance companies, contractors, utility companies, local governments and others while ensuring FCC RF exposure compliance. RF CHECK's patented solution serves as a "de facto safe harbor" for the protection of all FCC licensees.

RF CHECK's founders intimately appreciate the complexities involved with the FCC's RF safety standards and the FCC licensees' responsibility to adhere to them. As a former building developer and a former primary contractor of wireless facilities who built commercial structures and installed wireless antennas for the largest cellular providers, we witnessed the massive changes in the wireless industry first hand, and how current safety practices – largely signs and barriers – do not work.

Today there are hundreds of thousands of transmitters; they are sited on buildings, churches, lamp posts, and even hidden behind false facades in every populated community in the country. Daily, hundreds of workers are compelled to perform their tasks directly in front of RF transmitting antennas without any knowledge of RF hazards. As such, reliance on signs, barriers or exemptions from routine evaluation does not ensure that all workers at every wireless site, regardless of design are protected from RF exposures.

Several commercial FCC licensees (Commenters) have asked the FCC for a "Safe Harbor" including exemptions from RF human exposure compliance enforcement. However, these

requests will not fulfill the FCC's goal of providing accountability and enforcement of their rules and regulations and appear to be limited to only rooftop sites. Regardless of the site design, if any worker can get in close proximity to the RF emissions, they need to be protected. The RF CHECK system does provide RF safety for all workers at every wireless site in the United States regardless of configuration.

## The following is a comparison of the "Safe Harbor" proposals and the RF CHECK solution:

1. The Commenters on the Further Notice proposed, "*Providing appropriate information and training"* without mentioning details on what this would include.

   The RF CHECK solution includes "*Providing appropriate information and training"* with the following details:

   - Provides a process to train and certify all workers on RF safety prior to performing their tasks at every wireless site in the United States
   - Provides a process, prior to performing their tasks, for workers to access site specific RF safety information which includes "Maps of the Invisible" delineating areas to avoid and how to mitigate exposure, especially for stealth and hidden antennas, at every wireless site in the United States

2. The Commenters on the Further Notice proposed, "Contact Information" however provided no specifics with details on what this would include.

   The RF CHECK solution includes the following details:

   - A single toll-free national contact number
   - National call center operates 24/7 with live operators trained in RF safety
   - Call center staff can view on-screen, the caller's point of reference
   - Call center staff has the ability to initiate a power-down with the appropriate FCC licensee in case of an emergency (e.g. fire fighters at a cell site during a structure fire)

3. The Commenters on the Further Notice proposed, "Access Procedures" however provided no specifics with details on what this would include.

   The RF CHECK solution includes "*Access procedures"* with the following details:

   - Provides a verifiable process for site owners to assume the responsibility and liability of access to their property by only RF trained and certified individuals

- Permanent recordation of receipt of RF training, certification and site specific RF safety information accessed by workers to avoid potential future litigation.

4. The Commenters on the Further Notice proposed, "Signage" however provided no specifics with details on what this would include.

   The RF CHECK solution includes "*Signage"* with the following details:

   - A single sign that is universally recognizable to workers
   - A single sign that clearly instructs workers not to proceed with their tasks if they have not received site specific RF safety information from their contractor or site owner
   - A single sign that informs workers to immediately call the sign number absent site specific safety information
   - A single sign that informs the call center staff specifically where the worker is at the cell site

5. The Commenters on the Further Notice proposed, "Barriers" however provided no specifics with details on what this would include.

   The RF CHECK system employs a verifiable high-tech solution to a high-tech problem and renders barriers obsolete for the following reasons:

   - Fixed barriers will not accommodate changing site conditions
   - Fixed barriers will not be accepted by many building owners
   - Fixed barriers would be limited to rooftops only
   - Temporary barriers can be moved or stolen
   - No verifiable way to ensure barriers will facilitate compliance with the FCC's rules set forth in 1.1307(b).
   - Barriers present significant challenges to sites with multiple licensees

The RF CHECK solution provides compliance with existing and proposed FCC RF exposure regulations and is economical for all.

## **Partial List of Benefits of the RF CHECK System**

FCC

- Promotes compliance with Commission rules
- Allows continued growth of and investment in the wireless network by easing siting battles, reducing burden for FCC licensees and site owners

- Provides no-cost access to comprehensive database of all governmental and commercial FCC licensee transmitter locations
- Offers the ability to audit all site activities and ensure FCC compliance within 5 key strokes

Licensees

- Allows compliance with FCC rules in the new RF landscape
- Protection from RF exposure liability
- Allows easier siting because it reduces burdens on site owners and allows site owners to maintain insurance coverage
- Foster trust within local communities and therefore helps promote network growth
- Provides easy access to site-specific safety information for each authorized location via desktop, phone, or smart device
- Facilitates resolution of issues at multiple-licensee locations
- Documents licensees current compliance as well as any changes
- Provides compliance certainty

Government: Cities, Counties, States, etc.

- No cost protection from RF exposure liability
- Site specific safety information for each site under their jurisdiction or control
- Easy access to site specific safety information for each authorized location via desktop, phone, or smart device
- RF Safety training and certification
- Permanent record of access to site or site information
- Provides compliance certainty
- Can be used for compliance or siting purposes
- Provide accountability of their wireless assets
- Ensure local zoning compliance

Property Owners

- Lowers burdens of complying with safety responsibilities
- No cost protection from RF exposure liability
- Allows easier qualification for and maintenance of property insurance with RF insurance requirements
- Site specific safety information for each of their sites

- Easy access to site specific safety information for each authorized location via desktop, phone, or smart device
- RF Safety training and certification
- Permanent record of access to site or site information

Insurers

- No cost protection from potential legacy litigation as a result of RF exposure
- Mitigates liability form RF exposure risks
- Maintains coverage for properties that host antenna sites
- Removes current RF property exclusions

Employers and their workers

- No cost Protection from RF radiation exposure
- Easy access to site specific safety information for each authorized location via desktop, phone, or smart device
- RF Safety training and certification
- Permanent record of access to site or site information
- Provides compliance certainty

February 14, 2013

# Emerging Technologies Pose Significant Risks with Possible Long-Tail Losses

It is critical for insurers to maintain vigilant oversight of these new risks.

The insurance industry faces a constantly escalating level of exposure from rapidly developing technologies with risks that are not well understood. In many situations, the science associated with understanding these new risks is in the early stages of development.

A.M. Best believes that it is critical for insurers to maintain vigilant oversight of emerging technologies as a critical component of their enterprise risk management system. Effective enterprise risk management encompasses identifying, evaluating and addressing risks that could threaten the earnings or viability of an insurer. This includes a prospective look at the underwriting exposures so that changes to policy language or underwriting criteria can properly manage losses from these new risks. An exposure which may present only insignificant insured losses at present, may bring future unprecedented losses.

None of the current emerging technologies appears to be the next asbestos, the longest running and most expensive tort in U.S. history, according to the Rand Institute. Asbestos in many ways presented the "perfect storm" of loss characteristics: extreme toxicity; a very lengthy latency period before emergence of illness; a contagion capability through airborne transmission and physical contact; and lengthy exposure to a very large number of workers, their family members and asbestos product users.

A.M. Best recently estimated the U.S. property/casualty industry's ultimate asbestos losses at $85 billion. While losses from emerging technologies may pale in comparison, they still could be extremely significant to the industry. Insurers need to monitor the manner in which emerging technologies are, or are likely to be, deployed; the risks associated with their use; their residual or unintended impacts; and the manner in which the insurance policies may be called upon to cover losses.

## Emerging Technology-Based Risks

***RF (Radio Frequency) Radiation Risk*** – Today there are more than 600,000 cell sites in the United States and that number is expected to grow with the demand for faster, more reliable wireless devices. The risks associated with long term use of cell phones, although much studied over the past 10 years, remains unclear. Dangers to the estimated 250,000 workers per year who come in close contact with cell phone antennas, however, are now more clearly established. Thermal effects of the cellular antennas, which act at close range essentially as open microwave ovens can include eye damage, sterility and cognitive impairments. While workers of cellular companies are well trained on the potential dangers, other workers exposed to the antennas are often unaware of the health risks. The continued exponential growth of cellular towers will significantly increase exposure to these workers and others coming into close contact with high-energy cell phone antenna radiation.

***Cyber Risk*** – Significant data breaches have become common (e.g., Citigroup, the International Monetary Fund, JP Morgan Chase & Co., Sony Online Entertainment, Hilton Worldwide, Marriott International Inc., Verizon and Heartland Payment Systems). These can involve, for example, loss of sensitive financial information, personal data, and

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**Editorial Management**
Carole Ann King

proprietary secrets. Identity theft alone is estimated to cost consumers and companies roughly $5 billion and $50 billion, respectively, each year. A 2009 study found that lost data cost U.S. companies in excess of $200 per lost customer file. In a 2011 study conducted among large U.S. companies, more than 80% of information technology executives said that they had detected one or more recent attacks. Such exposures continue to evolve as companies are increasingly storing sensitive and confidential information with cloud vendors – a vendor that provides other companies with an infrastructure on which to store data or run applications – exposing data to new types of breaches.

***Fracking Risk*** – Over the past 10 years horizontal hydraulic fracturing ("fracking") has become a big business and a highly contentious issue. The process involves pumping a pressurized fluid into a rock layer, which causes fracturing of the rock and release of petroleum, natural gas or other substances for extraction. The potential benefits are enormous; however, there are significant risks, including potential release of radioactive substances, radon (a known carcinogen) in the natural gas going into homes and potential chemical contamination of drinking water. The U.S. Environmental Protection Agency has determined that fracking was the likely source of ground water contamination in at least 36 cases. There are a variety of other concerns including the potential for exposed workers to develop silicosis and that the process may lead to earthquakes.

***Nanotechnology Risk*** – A wide variety of consumer and industry products are increasingly constructed at the molecular level, using materials from 1 to 100 nanometers in length (a nanometer is one billionth of a meter). Nanotechnology is employed in an array of products, including medicines and medical devices, glass, coatings, construction products, fire protection materials, vehicles, foods, textiles, cosmetics, optics and sports equipment. Nano-sized particles, however, act differently than materials built at normal scale, and existing chemical risk assessments are not suited for exposures arising from nanoparticles. Considerable concern has arisen that some nanoparticles may be toxic. With the exception of airborne nanoparticles entering the lungs, understanding of the effects of nanoparticle on the human body, including accumulation, metabolism and organ-specific toxicity is extremely limited. Concerns involve both the potential of immediate harms as well as harmful effects appearing after long latency periods. Of the technology risks now emerging, nanotechnology product exposures may be the most similar to asbestos. While it remains unclear whether nanoparticles can lead to asbestos-like losses, insurers need to carefully monitor developments of this emerging technology.

## Conclusion

Insurers must evaluate constantly evolving technology exposures with the knowledge that existing scientific/technical understanding is often incomplete. A.M. Best will review companies' understanding of their exposure to emerging risk, and their approaches to mitigating the risks within the framework of their enterprise risk management programs.


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CLAIMS JOURNAL

# Hidden Insurance Risk Lurks in Property Leases

By Gloria Vogel, CFA | August 21, 2013

## The RF Radiation Risk Factor

In February 2013, AM Best classified RF (radio frequency) radiation from wireless antennas as an "Emerging Technology-Based Risk." This was based, in part, on an estimated 250,000 workers per year who may be over-exposed to RF radiation from the 600,000 governmental and commercial RF radiating antenna systems across the nation.

The FCC recognizes RF radiation from transmitting antennas as a human health hazard, as a single RF transmitting antenna can emit hundreds of times more RF radiation than a cell phone. RF radiation hazards from transmitting antennas can cause thermal and non-thermal or cognitive/psychological injuries. Non-thermal or cognitive/psychological injuries do not necessarily have a physical manifestation. Cognitive/psychological RF injuries include memory loss, mood disorders, sleep disorders, and impaired or diminished cognitive function.

RF radiation injuries should be of concern to insurers, especially since their exposure to the risk is hidden within the lease contracts between the commercial wireless service providers (CWSPs) and landlords who lease space to those CWSPs for antenna systems.

## The Property Leases:

Landlords who lease space to the CWSPs are completely unaware of the potential for injury from RF transmitting antennas and that they will be held liable for such injures. Typical site leases include a mutual indemnification clause, which would appear to protect the landlords from personal injuries that may be caused by the CWSPs' antennas. However to enforce the indemnity provision, the landlords must demonstrate that the primary cause of injury was the fault of the CWSPs.

CWSPs will take the position that it was the landlords who permitted access to the RF hazard area near the antennas, which was the proximate cause of the injury; or, that injury could have been prevented by the landlords controlling access to the RF hazard areas. So, in reality, the lease language indemnity

provision merely buys the landlords and their insurers a lawsuit against well-financed CWSPs with a litany of possible legal defenses.

## Who Has Liability for RF injuries?

The CWSPs employ hundreds of RF engineers and are the technical experts on anything involving RF radiation and its ability to cause injury to humans. Accordingly, prior to the lease being signed, the CWSPs have a "Duty to Warn" the unsuspecting landlords, and their insurers, of the RF radiation hazards associated with the lessee's equipment.

By not divulging pertinent RF hazard information in the leases, the CWSPs may be attempting to use the 1996 Telecom Act as a shield in not warning the landlords. The Act precludes any discussion of RF radiation at municipal siting hearings. However, there is nothing contained in the language that enjoins the CWSPs from not informing the landlords of the hazards associated with RF radiation in the lease agreements they unilaterally create. Their actions are based solely on a business decision that has been used by other industries in the past…never mention the physical harm to humans that the product produces.

A landlord with full knowledge of their financial exposure to the liability assumed with the lease would likely either demand a greater monthly fee, or would decline permission to site on their property. It stands to reason that no business person would trade hundreds of thousands or more in attorney and legal fees associated with an RF injury, for a few thousand dollars of rental income per month.

## Legal Recourse

Once a lease has been executed without proper disclosure, "Fraud in the Inducement" can be alleged by the landlord asserting that the CWSP concealed material facts associated with the hazards of their operations/equipment. The CWSP will have known at the time of negotiating the contract that by not disclosing those material facts, the landlord might be more inclined to sign the lease. Additionally, theories of "Intentional and Negligent Misrepresentation of Material Facts" may be brought against the CWSP.

Finally, there will be insistence that the CWSP has a "Non-Delegable Duty" to ensure full compliance with the FCC RF human exposure standard. Federal law, 47 CFR 1.130, establishes the FCC licensee's (CWSP) duty regarding RF safety, which cannot be transferred to the landlord.

## Lack of Claims Doesn't Mean Lack of Claimants

The insurers should not rely on the lack of RF injury claims to proclaim there isn't a significant RF injury problem with workers being exposed to RF radiation on a daily basis. The lack of claims is the result of injured parties being unaware that they were over-exposed to RF radiation. Just one plaintiff's attorney with an aggressive media campaign can quickly alter this lack of knowledge. As the population of workers becomes aware of the hidden RF hazards and their potential for exposure, claims will likely be filed by the thousands, and long term litigation will result, in similar manner to the way asbestos evolved.

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*Gloria Vogel is senior vice president at N.Y.-based Drexel Hamilton, a service disabled veteran broker-dealer. She also teaches finance and metrics to graduate students as an adjunct professor at NYU-SCPS. Previously, Vogel was a contributing author on www.seekingalpha.com. She worked at Swiss Re and was an All-Star equity research insurance analyst at several major investment banks, including Lehman Brothers and Bear Stearns.*

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# RM/Insight

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# Are Radio Waves Injuring Us?

BY THOMAS F. PEGG, CIC

Experts say mounting scientific evidence demonstrates a causal link between radio frequency (RF) exposure and physical cognitive injuries.

*Recognizing RF radiation as a health and safety hazard, the Federal Communications Commission has established RF radiation regulations and human exposure limits.*

### A MILLION-PLUS WIRELESS ANTENNA SITES

The proliferation of wireless networks to satisfy consumer demand for new and improved technologies, products and services has rendered current RF radiation safety strategies obsolete. When these strategies were developed decades ago, fewer than 25,000 wireless antenna sites dotted the U.S.—today, there are more than 600,000 commercial and governmental wireless antenna systems, projected to exceed one million soon (based on various wireless reports: Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update 2011-

*continued on page* **23**

**Are Radio Waves Injuring Us?**
*continued from page* ***1***

2016; CTIA's Semi-Annual Wireless Industry Survey, cell sites). In the past, antenna sites could be fenced off and isolated, with access restricted to RF-trained technicians and signage telling others to stay out. Today, wireless antennas are everywhere—on rooftops, the sides of buildings, utility poles, light standards and hidden entirely within the structures of buildings. Third-party workers are routinely compelled to work in close proximity to RF radiation-transmitting devices.

Recognizing RF radiation as a health and safety hazard, the Federal Communications Commission (FCC) has established RF radiation regulations and human exposure limits. The science behind the FCC regulations is long-standing and uncontroverted (FCC adopted RF standards established by IEEE/ANSI after protracted review, research, debate and public comment. However, painters, firefighters, utility and maintenance workers, insurance inspectors, HVAC employees, roofers and other construction workers face overexposure to RF radiation every day.

RF radiation exposure causes "behavioral disruption" in laboratory subjects. Behavioral disruption in lab animals refers to the inability to perform food-motivated learned behavior. The inability to perform learned tasks following RF radiation exposure proves the causal link between the exposure and behavioral, cognitive and/or psychological injuries. In humans, such injuries can cause depression, memory loss, mood disorders, sleep disorders and impaired or diminished cognitive function (Ziskin, 2005). The courts also recognize an established link between these psychological injuries and RF exposure that only slightly exceeds the FCC human exposure limit (AT&T Alascom v. Orchitt, Alaska Supreme Court No. S-1200058).

Under current conditions, it is probably impossible to protect all workers from RF overexposure. In addition to the danger faced by these individuals, property owners with antennas on their premises may face serious financial exposure. This article discusses these exposures, as well as the evolution of RF regulations and the important difference between mobile phone and RF antenna risks.

### Financial Exposure

Two typical avenues of protection—limiting RF exposure in the first place and contractual protection against liability—are often flawed.

One method of RF exposure protection involves use of personal monitors. Pocket protection monitors indicate when the wearer is being exposed to RF radiation fields that may exceed FCC's maximum permissible exposure (MPE) limits for a controlled RF environment. Workers that use monitors and RF protective

## *Examples of Typical Language in Antenna Site Leases Designed to Limit Liability*

### Lessee's Indemnity Obligation

Lessee shall protect, defend, indemnify and hold lessor, its officers, representatives, agents and employees harmless from and against any and all claims asserted or liability established, which arise out of or are in any manner directly or indirectly connected with this lease or lessee's occupancy, development, use, operation or maintenance of the premises and all costs and expenses of investigating and defending against same, including without limitation reasonable attorney fees and costs; provided, however, that lessee's duty to indemnify and hold harmless shall not include any claims or liability arising from the established active negligence, sole negligence or sole willful misconduct of lessor, its officers, representatives, agents and employees. Lessor may, at its election, conduct the defense or participate in the defense of any claim related in any way to this indemnification. If lessor chooses at its own election to conduct its own defense, participate in its own defense or obtain independent legal counsel in defense of any claim related to this indemnification, lessee shall pay all of the costs related thereto, including without limitation reasonable attorney fees and costs.

### Lessor's Indemnity Obligation

Lessor shall protect, defend, indemnify and hold lessee, its officers, representatives, agents and employees harmless from and against any and all claims asserted or liability established, which arise out of or are in any manner directly or indirectly connected with lessor's development, active use or maintenance of the sites, and all costs and expenses of investigating and defending against same, including without limitation reasonable attorney fees and costs; provided, however, that lessor's duty to indemnify and hold harmless shall not include any claims or liability arising from the established negligence or willful misconduct of lessee, its officers, representatives, agents and employees.

gear must be trained to work in RF environments. They must satisfy FCC's criteria for being fully aware of the existence of RF hazards and able to exercise control over their exposure. This is often not the case.

Signage is also largely insufficient in preventing RF overexposure. Few signs are in place, and many have inconsistent wording. Signs are usually located well away from the exposure zone—unsurprising, perhaps, considering the prevalence of stealth installations, where the antennas are hidden in structures for aesthetic reasons.

In regard to liability, some businesses may assume they are protected by hold-harmless and indemnification language contained in their leases. In practice, these reciprocal indemnification provisions (see sidebar) not only fail to resolve issues of responsibility or risk transfer, but seem to ensure litigation between landlord and tenant when a claim arises. The cell company will argue that a worker exposed to RF radiation at the site was brought to or allowed on the property by the landlord. The cell company will counter that they cannot be aware of all activities at antenna sites on a continuous 24/7 basis. Accordingly, they say, the lessor is potentially guilty of active negligence, vitiating the indemnification provision in favor of the lessor.

***Once excessive exposure to RF radiation was proven to be hazardous to humans, the Institute of Electrical and Electronics Engineers developed limits for human exposure.***

In turn, the lessor will argue that the cell company's operation of the RF transmission device was the legal and proximate cause of the injury a worker may have sustained. The lessor may assert other representations and warrants as well, including a standard representation relative to compliance with applicable laws and regulations, including those pertaining to RF emissions.

Complicating the legal landscape, insurers have started including electromagnetic field exclusions in liability policies. A guide is in development to help the plaintiffs' bar begin pursuing RF radiation exposure cases. We believe that RF radiation exposure has a high potential for creating mass tort litigation.

### Assessing the Risk

Proving overexposure to RF radiation is not hard (specific legal theories will not be addressed in this article other than to note that wireless service providers may be confronted with the theory of negligence per se and property owners that host antenna sites with premises liability, both of which are relatively straightforward.). Plaintiffs' counsel might easily show that a worker performed a specific task at an antenna site, noting the proximity to RF radiation-transmitting antennas and the length of time of exposure. A subpoena might likely reveal that under current and historical business practices, most FCC licensees do not power down RF-transmitting antennas to protect third-party workers. Proof of a violation of RF radiation regulations and human exposure limits is straightforward. Established science demonstrates that RF radiation overexposure causes specific cognitive and psychological injuries. Sympathetic juries could render substantial judgments.

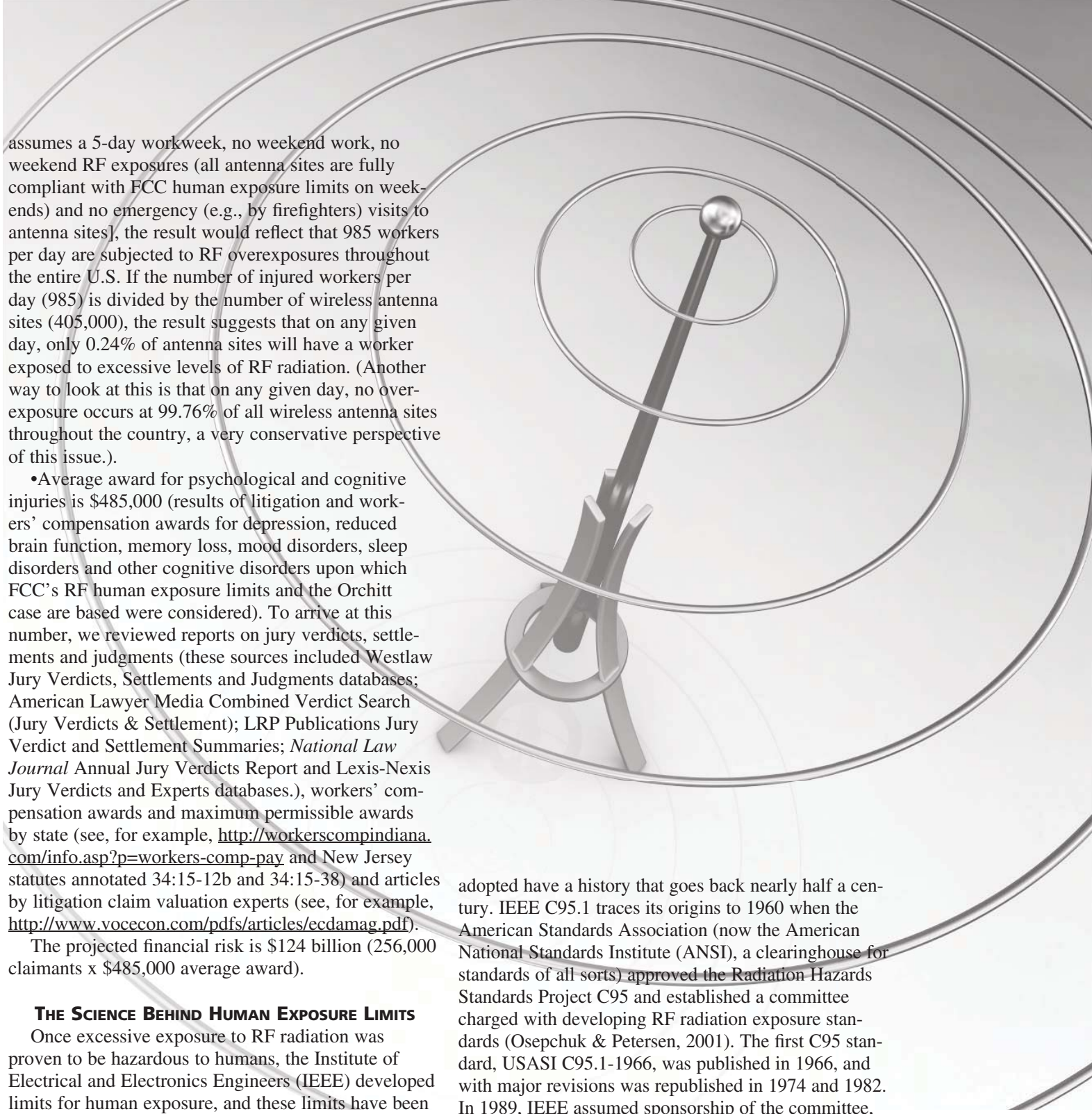
The financial risk resulting from potential litigation may be comparable to the risks created by asbestos and mold. Here we attempt to quantify this risk for the current-year workforce. The analysis does not consider future financial risks that could result if meaningful loss control and RF safety solutions are not implemented in light of the growing awareness of the RF exposure problem.

•The number of wireless RF transmission sites across the U.S. is 405,000. (Although the total number of sites is approximately 600,000, the number was reduced to account for co-located sites and sites that pose no significant risk to workers due to their location and characteristics, see http://www.rfcheck.com/RF-Radiation-Exposure.php).

•The total number of workers in trades that potentially bring workers to wireless antenna sites is 8 million. (Based on data drawn from the U.S. Bureau of Labor Statistics (BLS) and the U.S. Census Bureau on the total number of workers in trades that are likely to bring them to wireless antenna sites, (e.g., roofers, electricians, HVAC technicians, maintenance workers and others.) [Research was pursued to include only trades likely to encounter RF-transmitting antennas in their line of work. For example, trades engaged in new construction, residential (as opposed to commercial properties), and others unlikely to work in proximity to wireless antennas were excluded from the current population of potentially affected workers.]

•Forty percent of the total number of workers working in close proximity to RF-transmitting antennas is identified as 3,200,000 at risk. [This figure is based on the recognition that not all workers in at-risk occupations will be compelled to work in close proximity to RF-transmitting antennas. Additional scrutiny of BLS and U.S. Census Bureau data identified subpopulations of workers (e.g., roofers) with an increased likelihood of working near wireless antennas.]

•Eight percent of at-risk workers, or 256,000, can be expected to become claimants. Although one could argue that RF radiation overexposure is the rule, not the exception, this is a conservative estimate of the number of workers exposed to excessive levels of RF radiation. (This estimate was based on consultations with RF engineers; telecommunications health and safety personnel; and insurance loss control, underwriting and industrial hygiene executives.) If the population of claimants (256,000) is divided by the number of work days per year [260 (260 workdays per year



assumes a 5-day workweek, no weekend work, no weekend RF exposures (all antenna sites are fully compliant with FCC human exposure limits on weekends) and no emergency (e.g., by firefighters) visits to antenna sites], the result would reflect that 985 workers per day are subjected to RF overexposures throughout the entire U.S. If the number of injured workers per day (985) is divided by the number of wireless antenna sites (405,000), the result suggests that on any given day, only 0.24% of antenna sites will have a worker exposed to excessive levels of RF radiation. (Another way to look at this is that on any given day, no overexposure occurs at 99.76% of all wireless antenna sites throughout the country, a very conservative perspective of this issue.).

•Average award for psychological and cognitive injuries is $485,000 (results of litigation and workers' compensation awards for depression, reduced brain function, memory loss, mood disorders, sleep disorders and other cognitive disorders upon which FCC's RF human exposure limits and the Orchitt case are based were considered). To arrive at this number, we reviewed reports on jury verdicts, settlements and judgments (these sources included Westlaw Jury Verdicts, Settlements and Judgments databases; American Lawyer Media Combined Verdict Search (Jury Verdicts & Settlement); LRP Publications Jury Verdict and Settlement Summaries; *National Law Journal* Annual Jury Verdicts Report and Lexis-Nexis Jury Verdicts and Experts databases.), workers' compensation awards and maximum permissible awards by state (see, for example, http://workerscompindiana.com/info.asp?p=workers-comp-pay and New Jersey statutes annotated 34:15-12b and 34:15-38) and articles by litigation claim valuation experts (see, for example, http://www.vocecon.com/pdfs/articles/ecdamag.pdf).

The projected financial risk is $124 billion (256,000 claimants x $485,000 average award).

### The Science Behind Human Exposure Limits

Once excessive exposure to RF radiation was proven to be hazardous to humans, the Institute of Electrical and Electronics Engineers (IEEE) developed limits for human exposure, and these limits have been widely adopted around the world (Ziskin, 2005).

The IEEE standard, IEEE C95.1, represents a consensus of scientific opinion about safe levels of exposure. It covers the frequency range 3 kHz to 300 GHz, which includes the RF part of the spectrum. Other major exposure limits, in particular the widely referenced guidelines of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), have a similar rationale but were developed using different processes (IEEE, 1999).

### Setting the Limits

Present IEEE exposure guidelines that FCC has adopted have a history that goes back nearly half a century. IEEE C95.1 traces its origins to 1960 when the American Standards Association (now the American National Standards Institute (ANSI), a clearinghouse for standards of all sorts) approved the Radiation Hazards Standards Project C95 and established a committee charged with developing RF radiation exposure standards (Osepchuk & Petersen, 2001). The first C95 standard, USASI C95.1-1966, was published in 1966, and with major revisions was republished in 1974 and 1982. In 1989, IEEE assumed sponsorship of the committee, which became IEEE Standards Coordinating Committee 28 (SCC-28). In 2001, SCC-28 adopted the name IEEE International Committee on Electromagnetic Safety.

Under both IEEE and ANSI bylaws, all standards must be periodically updated and revised. The latest RF standard, IEEE C95.1, was approved by the IEEE Standards Board in 1991 and by ANSI in 1992. This standard was reaffirmed in 1997 and a supplement published in 1999.

While the C95.1 standards are voluntary, they have had a major influence on government policy in the U.S. and in the development of exposure limits around the world.

## The Scientific Basis

In assessing RF radiation hazards, a distinction must be made between levels outside the body (the exposure) and absorbed energy within body tissues (the dose). The exposure is measured in terms of the electric or magnetic field strength or power density incident on the body. The dose depends on the exposure, as well as on the body geometry, size, its orientation with respect to the external field and other factors.

Between approximately 100 kHz and 10 GHz, the specific absorption rate (SAR) is the dosimetric quantity that correlates best with reported biological effects of RF energy. The whole-body-averaged SAR is the total power absorbed by the animal or human (in watts) divided by the body mass (kilograms) and is expressed in units of W/kg.

For localized exposures to parts of the body, for example, the head, a more useful measure is often the partial body exposure, which is the power absorbed per unit mass in a localized region of tissue, also expressed in W/kg.

At frequencies below about 100 kHz, a more useful measure of a dose is often the electric field strength in tissue, expressed in units of volts per meter.

The IEEE standard is based on a limit to the SAR (called a basic restriction) set on the basis of biological data. In addition, it defines limits to the exposure as measured by field strength outside the body, which will ensure that the absorbed power within the body meets the basic restriction. ICNIRP guidelines are similar, both in their use of a basic restriction and exposure limits and in the numerical values of the limits.

As is the case with exposure limits for other hazardous substances, the RF safety standards in the U.S. (and most countries) have two tiers, which vary in definition, but correspond approximately to limits for occupational groups and the general public.

In the IEEE standard, adopted by FCC, two tiers are defined as applying to exposures in controlled (occupational) and uncontrolled (general public) environments.

## Verifying a Hazard

The IEEE C95.1-1991 standard was based on a comprehensive review of the scientific literature covering all reliable studies that reported biological effects of RF/microwave energy. This task, and the development of a draft standard, was accomplished by a 125-member subcommittee (Subcommittee 4) of the IEEE Standards Coordinating Committee 28 (The composition of the subcommittee by affiliation was research (university: 29.6%, nonprofit: 6.4%, military: 12% and government: 24%), industry (9.6%), industry-consulting (3.2%), general public and independent consultants (11.2%). The composition by principal discipline was physical sciences (physics, biophysics, engineering, etc.: 32.8%), life sciences (biology, genetics, etc.: 43.2%), medicine (physicians: 9.6%), radiol-

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ogy/pharmacology/toxicology (3.2%) and others (law, medical history, safety, etc.: 11.2%).

Scientific literature related to biological effects of RF radiation is highly diverse, both in quality and in relevance to health and safety risks in humans. The IEEE review process examined only studies that met selection criteria that included adequate dosimetry and experimental design and independent confirmation of reported effects. Studies that were not published in peer-reviewed scientific publications and those that were inadequately described were excluded from consideration.

Based on its review, the subcommittee concluded that disruption of food-motivated learned behavior in laboratory animals was the most sensitive biological response that could be both well confirmed and predictive. This effect, known as "behavioral disruption," has been observed in laboratory animals ranging from rodents to monkeys exposed to RF fields at frequencies ranging from 225 MHz to 5.8 GHz (Chou & D'Andrea, 2003). Depending on the animal species and RF frequency, the exposure needed to produce behavioral disruption varied widely, from about 100 to 1,400 W/m².

The behavioral disruption suffered by the test subjects following their exposure to RF radiation established the causal link between the exposure and behavioral/cognitive/psychological injuries. These injuries include depression, mood disorders, sleep disorders, memory loss and impaired or diminished cognitive function.

### Setting the Basic Restriction & Exposure Limits

From its literature review, the subcommittee chose a value of 4 W/kg for the whole-body-averaged SAR as the threshold for behavioral disruption in animals. It reduced this SAR by a factor of 10 to establish the basic restriction for exposure in controlled environments and then added another factor of 5 for exposure in uncontrolled environments. The resulting basic restrictions on whole body SAR are 0.4 W/kg for controlled environments and 0.08 W/kg for uncontrolled environments. The basic restrictions are, as a result, a factor of 10 to 50 below whole-body exposure levels shown to produce behavioral disruption following exposures ranging from several minutes to several hours in duration.

Based on engineering analysis, the committee then established limits to the external field (exposure) that would ensure that basic restrictions are met. Because the absorption properties of the body depend on frequency, the resulting exposure limits do also. Other limits were developed for partial body exposure and for fields of unusual characteristics, such as very short pulses of high intensity.

Partial body exposure limits were based on observations that the maximum SAR in any part of the body is approximately 20 times higher than the whole-body average SAR under many exposure conditions. Consequently, the subcommittee established a limit of 8 W/kg for partial body exposure for controlled environments and 1.6 W/kg for uncontrolled environments. These exposures are to be averaged over small volumes (corresponding to 1 gram) of tissue.

### Approval of the Standard

The draft of the 1991 IEEE standard underwent a long and rigorous process before finally being approved by IEEE. The first stage was balloting at the subcommittee level. Voting was done in several stages. After each preliminary round of balloting, all negative votes and comments were circulated to the subcommittee, and members who had originally submitted were given the opportunity to comment, reaffirm or change their votes. Final approval required 75% affirmative votes of those submitting ballots.

After approval by the subcommittee, the draft standard was moved to the main committee for approval using the same balloting procedure and then to the IEEE Standards Board for final approval.

The final approved IEEE standard was then forwarded to ANSI, which required a period of public comment and response. In 1992, ANSI adopted the standard as an American National Standard.

The standard is reviewed periodically and subject to potential revision.

### Cell Phone vs. Antenna RF Exposure

The wireless industry has successfully defended several class-action lawsuits involving allegations that cell phone use causes brain cancer (see, for example, Newman v. Motorola Incorporated). One outcome of this litigation has been to undercut the appreciation of the health and safety risks caused by RF radiation from wireless antennas. These cases also created confusion about the health effects of RF radiation exposures and probably delayed the inevitable tidal wave of lawsuits that will be

brought on behalf of third-party workers compelled to work in proximity to RF-transmitting antennas.

The successful defense of the cell phone cases, however, does not diminish the inevitability and potential severity of the financial consequences of these suits for several reasons.

•The successful defense of the cell phone litigation was, in part, based on the fact that FCC's RF MPE limits for the devices were not violated. FCC's MPE limits for cell phones are based on the premise that a cell phone user is safe with a SAR of 1.6 watts per kg, averaged over one gram of tissue. Compliance with this limit must be demonstrated before FCC approval is granted for cell phones (FCC, Office of Engineering and Technology, Bulletin 56). In other words, the cell phones at issue in the litigation were, at all times, fully compliant with FCC RF MPE limits. In contrast, third-party workers' RF overexposure lawsuits from antennas will prove that FCC RF MPE limits are routinely violated.

•The cell phone litigation was based on the assertion that RF emissions from cell phones cause brain cancer. The district courts ruled, and the appellate courts affirmed, that science has not produced reliable and relevant evidence of the causal link between cell phones and brain cancer.

•Again in contrast, the third-party workers' cases could allege that RF radiation overexposure from antennas causes cognitive or psychological injuries, not cancer. The science that established the causal link between RF exposure and psychological injuries is longstanding (FCC adopted the RF standards established by IEEE/ANSI after protracted review, research, debate and public comment). This science is the basis for FCC's adoption of its RF radiation MPE limits (Ziskin, 2005).

•Also, the magnitude of RF radiation exposure a third-party worker incurs when working in proximity to a wireless antenna is hundreds of times greater than that from a cell phone.

•The defendants in the cell phone litigation (i.e., handset manufacturers, wireless service providers, CTIA, municipalities and other participants) were able to avail themselves of facts that do not and will not exist in litigation involving worker RF overexposure from wireless antennas.

When assessing this risk, one should not be misled by the results of cell phone litigation.

### How to Respond

The quicker we move to establish national safety protocols, the sooner we will stop adding potential claimants and will reduce the significant financial liability to stakeholders. We believe two key steps must be taken to ensure worker safety:

***Because RF radiation is an invisible threat with latent bodily injury potential, education is crucial. Everyone who is at risk for RF overexposure should be taught the characteristics, hazards and exposure regulations associated with RF emissions.***

1) Create a national accessible registry of cell antenna sites, identifying the location and exposure zones throughout North America. Work on this has been started by RF CHECK, Inc. The registry will be similar to the "Call 1-800-123-4567 before you dig" utility locator services. RF CHECK is also establishing a new RF safety protocol featuring a layered, patented RF safety system that supplies all workers with the necessary information to educate and protect themselves from RF radiation overexposure.

2) Because RF radiation is an invisible threat with latent bodily injury potential, education is crucial. Everyone who is at risk for RF overexposure should be taught the characteristics, hazards and exposure regulations associated with RF emissions. ✪

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