Discussion of Radiofrequency Exposure from Proposed Small Cell Sites

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Tacoma City Council Study Session
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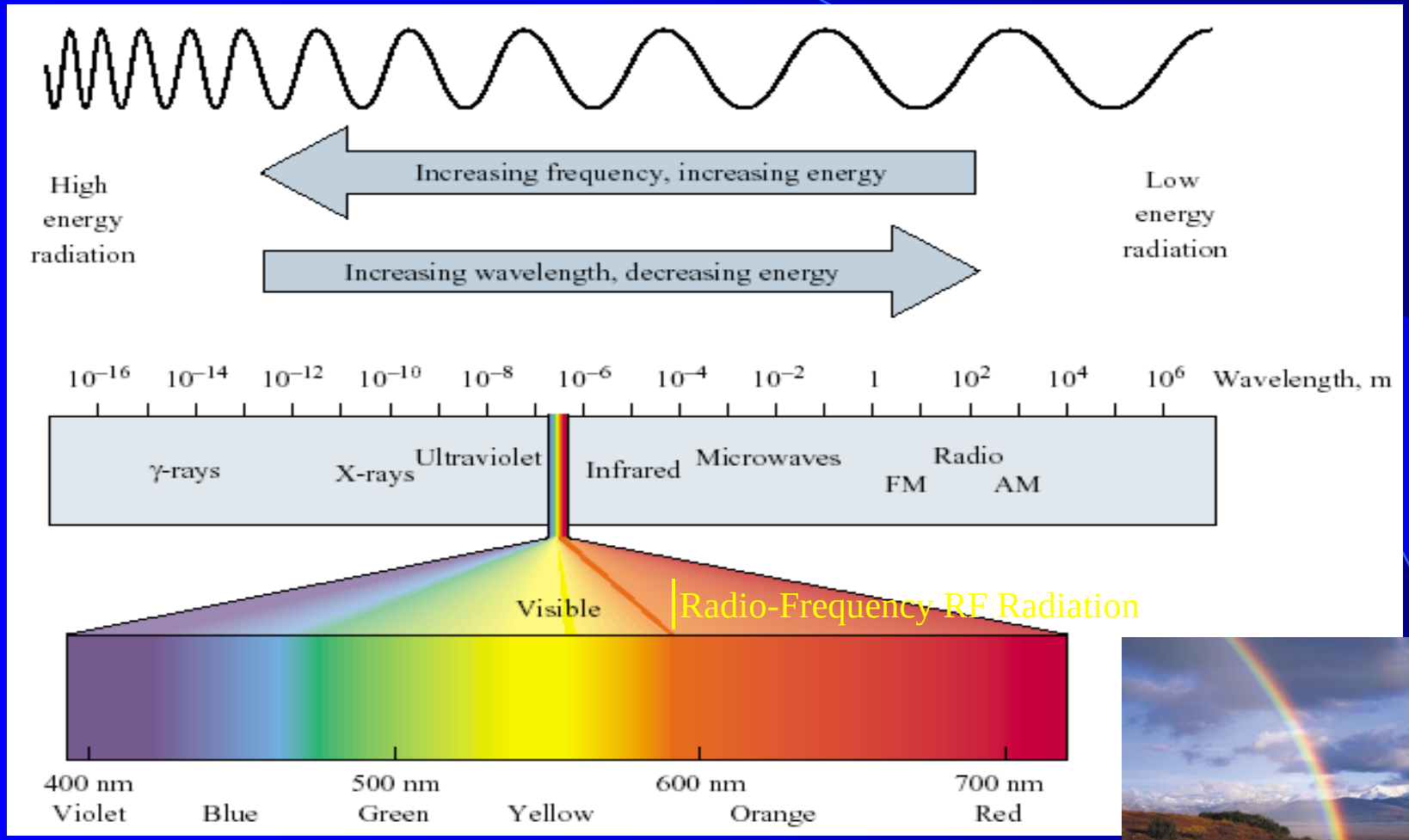
My Background

- Masters in Health Physics (Georgia Tech) (1997)
- Board Certified, American Board of Health Physics (1996 – 2020)
- Adjunct professor, Vanderbilt University, (2004-2014)
- Associate editor, Health Physics Journal (2013 -)
- Consultant of the ACGIH Threshold Limit Values for Physical Agents Committee (2014 -)
- Radiofrequency (non ionizing radiation) expert, State of Washington Department of Health (1991-2014)

Compliance?

- Tacoma requires applicant to comply with all applicable laws (including an FCC environmental assessment)
- Compliance can be determined by calculations or measurements
- There are no requirements to perform post installation verification of compliance

The Electromagnetic Spectrum

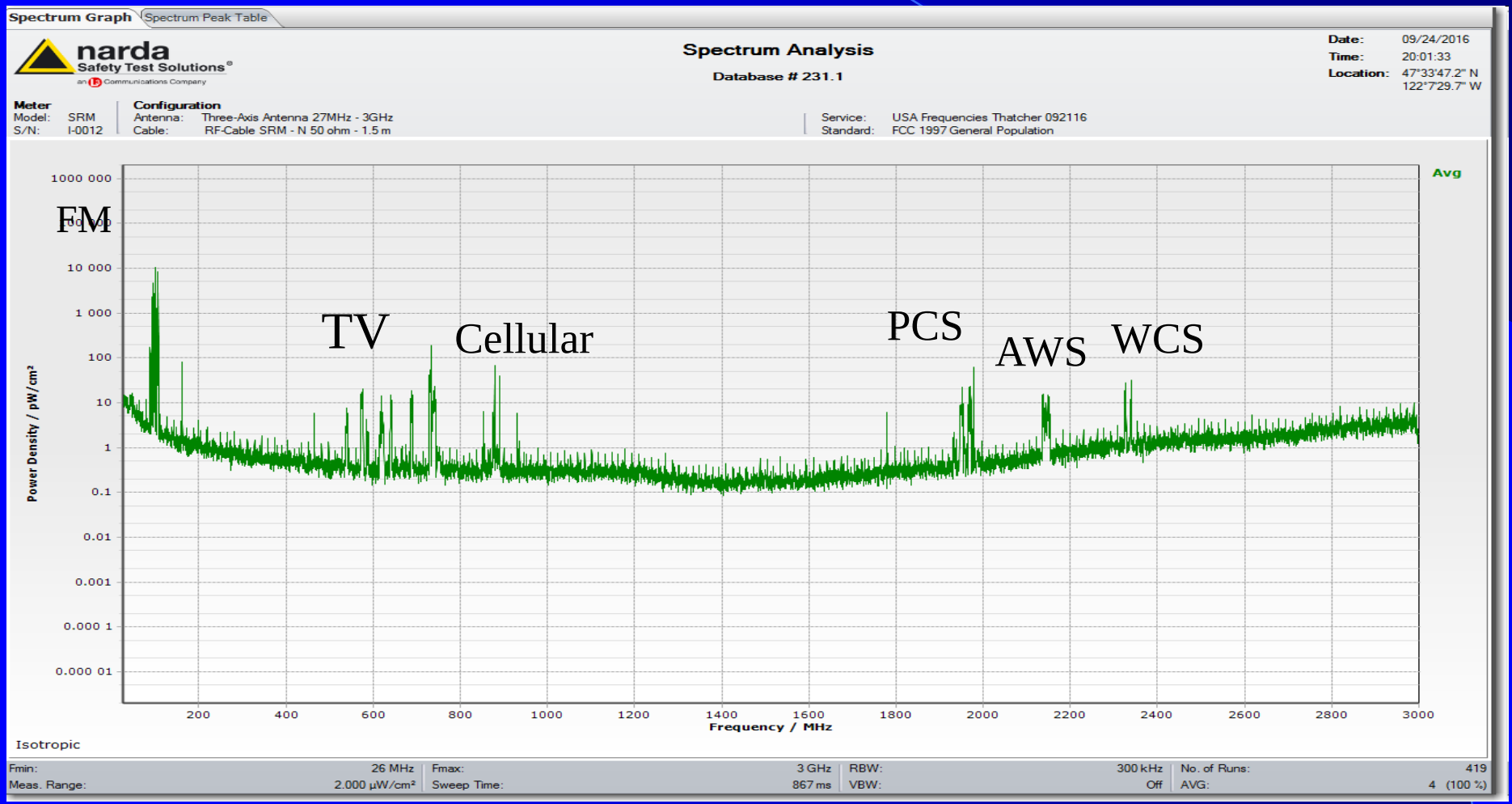


RF Energy is Non-Ionizing

- RF energy such as that used in cellular communication is at least 1 million times too low to directly break chemical bonds or disrupt macromolecules such as DNA.

- With few specialized exceptions, the only confirmed hazards of RF EMF are associated with excessive heating of tissue.

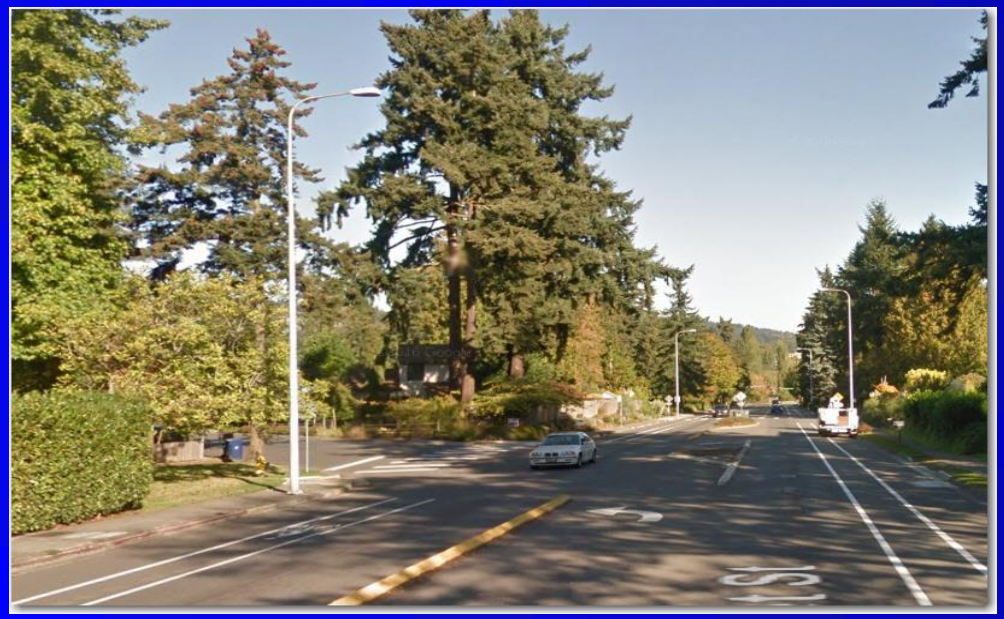
Radiofrequency Spectrum at 16118 SE 46th Way in Bellevue, WA



Small Cell Exposures – SE 46th Way Bellevue

- Maximum outdoor exposure from proposed antennas operating at 100% power 5 μW/cm² (@30')
- The likely outdoor exposure near the proposed antenna is <1 μW/cm²
- Max indoor exposure = 0.015 μW/cm²
- Maximum outdoor exposure is ~0.5% of the public limit while the maximum indoor exposure is ~67,700 times less than the allowable public limit

Ground Level Maximum Radiofrequency Exposures Current Verizon Proposal in Tacoma



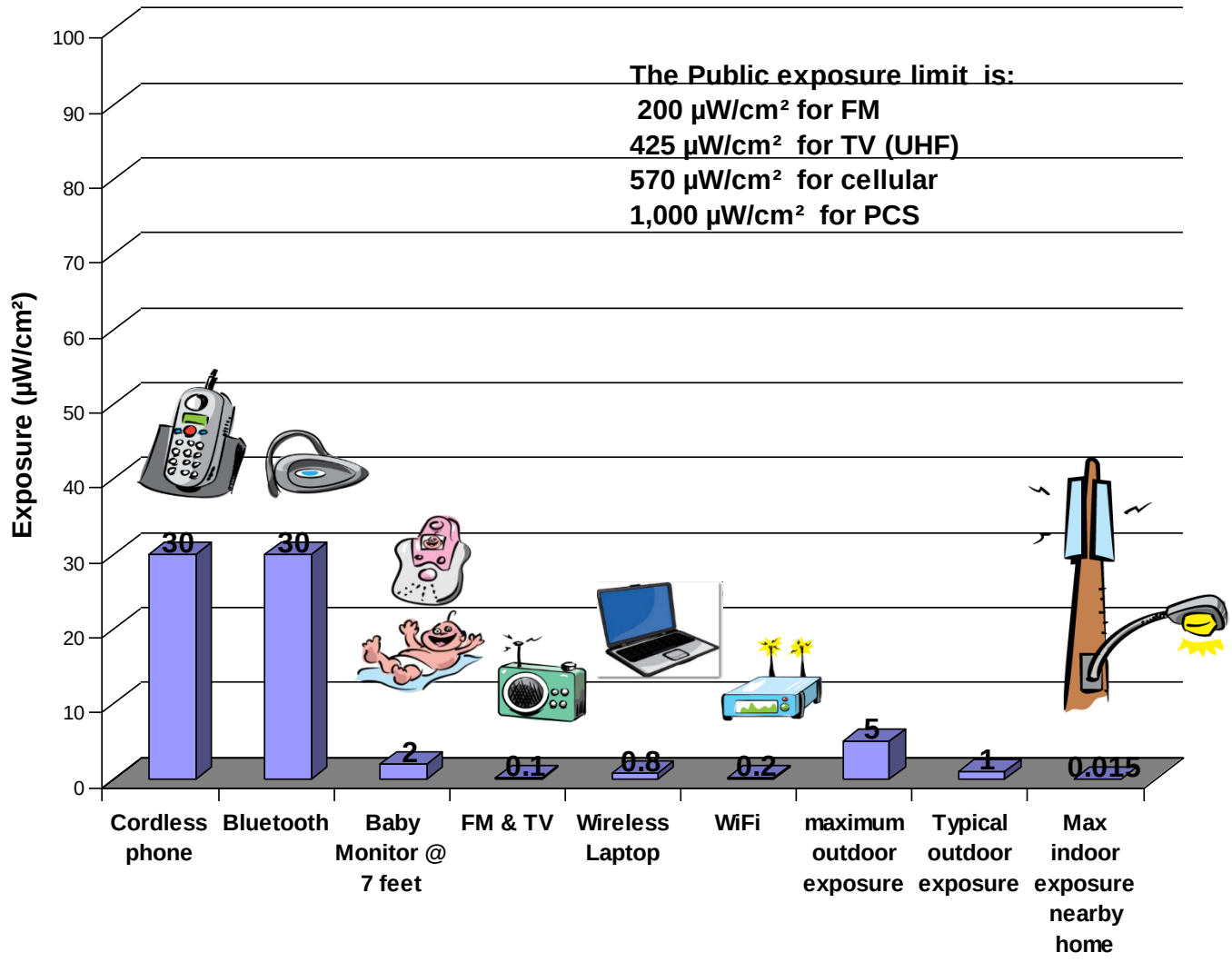
Maximum ground level exposure from any node is 0.021 mW/cm^2 or 2.1 % of the FCC general public exposure limit

Example of a Comprehensive Analysis of Exposure from Small Cell Sites

Predicted Ground Level Power Density as a Percent of the FCC General Public Exposure Limit					
	Antenna Height (feet above ground)				
Antenna(s) and power level (41 W combined)	10	15	20	25	30
Antenna 1	26	13.1%	5.4%	2.9%	1.8%
Antenna 2	> limit	8.9%	3.7%	2.0%	1.3%
Antenna 3	13.0%	1.8%	0.7%	0.4%	0.2%
Antenna 4	16.0%	6.4%	2.6%	1.4%	0.9%
Antenna 5	71.0%	13.5%	5.6%	3.0%	1.9%
Antenna 6	81.0%	9.3%	3.8%	2.1%	1.3%

High Power Antennas Predicted Ground Level Power Density as a Percent of the FCC General Public Exposure Limit					
	Antenna Height (feet above ground)				
Antenna(s) and power level (161 W combined)	10	15	20	25	30
Antenna 3	48.3%	6.0%	2.5%	1.3%	0.8%
Antenna 4	62.0%	32.2%	13.3%	7.2%	4.5%
Antenna 5	>limit	>limit	22.3%	12.1%	7.6%
Antenna 6	>limit	>limit	15.2%	8.3%	5.2%

Typical Radiofrequency Exposures in our Lives



Basis of Standards

- Current standards are designed to provide protection to all age groups, including infants and children, on a continuous basis (24 hours/day, 7 days/week)*

- Basis of standard is to prevent a thermoregulatory response which is at an absorption rate of 4 W/kg. A factor of 50 reduction from this rate serves as the basis for the general public.

- Numerous expert reviews have affirmed the basis of this standard and no other adverse health effects have been identified.

*Direct quote from Health Canada press release March 13, 2015
http://news.gc.ca/web/article-en.do?nid=949109

Standards Used in the World

International Commission of Non Ionizing Radiation Protection (ICNIRP) Guidelines (more than 60 countries)

Re-affirmed in 2009

Argentina, Australia, Austria, Brazil, Colombia, Croatia, Czech Republic, Denmark, Ecuador, France, Finland, Germany, Hong Kong, Japan, Hungary, Ireland, Malaysia, Morocco, Netherlands, New Zealand, Norway, Oman, Pakistan, Paraguay, Peru, Philippines, Portugal, Romania, Rwanda, Saudi Arabia, Singapore, Slovak, Slovenia, South Africa, South Korea, Spain, Sweden, Thailand, Taiwan, Tanzania, Turkey, Uganda, UK, Venezuela, etc.

FCC Standard: Bolivia, Canada, Estonia, Panama, USA

Below ICNIRP and IEEE

Belarus, Bulgaria, China, Lithuania, Poland, Russia

Belgium, Chile, Greece, India, Israel, Italy, Liechtenstein, Switzerland

IARC 2011

Radiofrequency Electromagnetic Fields
IARC Monographs, Vol 102

International Agency for Research on Cancer
Lyon, France

Kurt Straif, MD MPH PhD

Head, IARC Monographs Programme

The IARC Working Group concluded that there is

- limited evidence in humans for the carcinogenicity of RF-EMF, based on positive associations between glioma and acoustic neuroma and exposure to RF-EMF from wireless phones.
- limited evidence in experimental animals for the carcinogenicity of RF-EMF.
- weak mechanistic evidence relevant to RF-EMF-induced cancer in humans.

Overall, RF-EMF were classified as "possibly carcinogenic to humans" (Group 2B).

International Agency for Research on Cancer

World Health Organization

2012 HPA (UK) "Health Effects from Radiofrequency Electromagnetic Fields. Report of the Independent Advisory Group on Non-ionising Radiation"

"…In summary, although a substantial amount of research has been conducted in this area, **there is no convincing evidence that RF field exposure below guideline levels causes health effects in adults or children."**

Swedish Council: Ten Year Update (2012)

- We now know much more about measurements and absorption of RF fields and also about sources of exposure to the population and levels of exposure. A considerable number of provocation studies on RF exposure and symptoms have been unable to show any association. Overall, the data on brain tumor and mobile telephony do not support an effect of mobile phone use on tumor risk, in particular when taken together with national cancer trend statistics throughout the world.

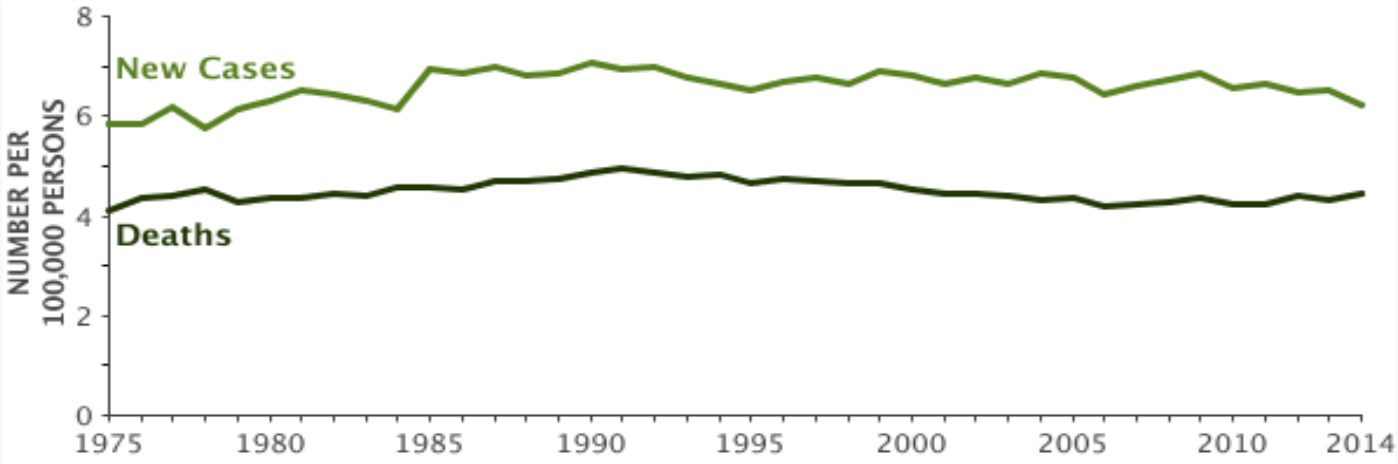
Changes Over Time

Keeping track of the number of new cases, deaths, and survival over time (trends) can help scientists understand whether progress is being made and where additional research is needed to address challenges, such as improving screening or finding better treatments.

Using statistical models for analysis, rates for new brain and other nervous system cancer cases have been falling on average 0.2% each year over the last 10 years. Death rates have been stable over 2005–2014. 5-year survival trends are shown below the figure.

New Cases, Deaths and 5-Year Relative Survival

View Data Table



Year	1975	1980	1985	1990	1995	2000	2005	2009
5-Year Relative Survival	22.8%	22.8%	24.7%	28.5%	33.3%	34.8%	34.8%	36.1%

SEER 9 Incidence & U.S. Mortality 1975–2014, All Races, Both Sexes. Rates are Age-Adjusted.

RFR Exposure and Health Effects Summary

- The proposed site is significantly less than the FCC public exposure limits and complies with all applicable regulations.
- Lack of a plausible Biological Mechanism for health effects
- Epidemiology provides little evidence,
- Animal and cellular study results provide no replicated indication of health effects
- Lack of a Dose/Response relationship
- The exposure from towers to public is too small to result in any effect. No replicated studies have identified any non-thermal effects at these levels nor is there any reason to believe that effects of any type would be observed at these levels

RF Summary

- Radiofrequency exposures have been studied since the early 1950s.
- Current analysis shows that exposures the relatively new technology is no different than exposures from older FM and TV exposures.
- This area of study is well established – over 25,000 published studies.
- Focus on the major organizational reviews for guidance on possible health effects.

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