ZACH COWAN, City Attorney SBN 96372
ZCowan@ci.berkeley.ca.us
RACHEL CHATMAN, Deputy City Attorney SBN 206775
RChatman@ci.berkeley.ca.us
BERKELEY CITY ATTORNEY'S OFFICE
2180 Milvia Street, Fourth Floor
Berkeley, CA 94704
TEL.: (510) 981-6998
FAX.: (510) 981-6960

LESTER LAWRENCE LESSIG III (Appearance Pro Hac Vice)
Lessig@law.harvard.edu
1563 Massachusetts Avenue
Cambridge, MA 02138

ROBERT CHARLES POST SBN 111917
Robert.post@yale.edu
265 East Rock Road
New Haven, CT 06511

AMANDA SHANOR (Appearance Pro Hac Vice)
Amanda.shanor@gmail.com
127 Wall St
New Haven, CT 06511

Attorneys for Defendants
CITY OF BERKELEY and CHRISTINE DANIEL

UNITED STATES DISTRICT COURT

NORTHERN DISTRICT OF CALIFORNIA

CTIA – THE WIRELESS ASSOCIATION, Plaintiff, vs. CITY OF BERKELEY, CHRISTINE DANIEL, CITY MANAGER OF CITY OF BERKELEY, Defendants.	NO. C15-02529 EMC DECLARATION OF OM GANDHI IN OPPOSITION TO PLAINTIFF'S MOTION FOR PRELIMINARY INJUNCTION DATE: August 20, 2015 TIME: 1:30 p.m. CTRM: 5, 17th Flr, San Francisco

I, Om Gandhi, declare:

1. I am a Professor of Electrical and Computer Engineering at the University of Utah. I was Chairman of the department from July 1992-2000. I have been at the University of Utah since 1966, when I started as an associate professor.

2. I have conducted research in the area of Bioelectromagnetics -Safety and Medical Applications of Electromagnetic Fields since 1973.

3. I am the author or co-author of several book chapters and over 260 peer-reviewed journal articles on electromagnetic dosimetry (Induced Currents, Internal E fields, Specific Absorption Rates or SAR), microwave tubes, and solid-state devices, as well as authoring and editing several textbooks. I wrote a textbook on Microwave Engineering and Applications published by Pergamon Press in 1979.

4. I have been invited by three different professional societies of the IEEE (Institute of Electrical and Electronics Engineers, New York) to be the Guest Editor for Special Issues of their journals to review Biological Effects and Medical Applications of Electromagnetic Fields. I have used each of these opportunities to provide a balanced review of the field of bioelectromagnetics by including invited articles from scientists who were reporting biological effects of low level EM fields.

5. I was elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in 1979, "for contributions to the understanding of nonionizing radiation effects, to the development of electron devices, and to engineering education." The IEEE is the largest professional society in the world with an international membership larger than 400,000. According to the By-Laws of the IEEE, no more than 0.1% of the members can be elected Fellows of the Institute in any given year. I have been a Life Fellow of IEEE since 1999.

6. I served as co-chair of the IEEE SCC 28.IV Subcommittee on RF Safety Standards from 1988-1998. During my tenure, this expert committee was responsible for revising the previous ANSI C95.1-1982 safety standard approved by the American National Standards Institute (ANSI) leading to the two later editions of this standard, IEEE C95.1-1991 and IEEE C95.1-1999. In addition to this professional voluntary service, I served as Chairman of the IEEE Committee on Man and Radiation (COMAR) from 1980-1982.

7. For the past 20 years, I have been focusing research on the interaction between RF radiation and children.

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8. The current FCC standards for RF exposure are based on standards developed by the American National Standards Institute (ANSI) and Institute of Electrical and Electronic Engineers (IEEE).

9. Current standards measure RF exposure by estimating a "specific absorption rate (SAR), the amount of power absorbed per unit mass of tissue.

10. The ANSI standard was first developed in 1982.

11. When it was developed, as the standard described, "[i[t was recognized that the specific absorption rate (SAR), which provides the basis for limiting power densities, does not contain all of the factors that could be of importance in establishing safe limits of exposure." (ANSI, 1982, p. 14).

12. The intent of the ANSI standard was to protect "exposed human beings from harm by any mechanism, including those arising from excessive elevation of temperature." (ANSI, 1982, p. 12). As this language indicates, this means ANSI was focused on both thermal as well as non-thermal effects.

13. The ANSI standard was first revised by the IEEE in 1991. (IEEE, 1991). In describing the basis for its recommendations, the IEEE stated that "[n]on-thermal effects, such as efflux of calcium ions from brain tissues, are also mentioned as potential health hazards." (IEEE, 1991, p. 23).

14. The IEEE also noted " . . . spatial peak SARs may exceed the whole-body averaged values by a factor of more than 20 times." (IEEE, 1991, p. 25).

15. In 1992, ANSI adopted the IEEE standard. In 1996, the FCC adopted the ANSI/IEEE standard as the basis for regulating RF radiation exposure.

16. All exposure limit standards and/or guidelines rested on avoiding acute heating effects originally observed in food-deprived rats.

17. At the time the FCC adopted its standard, there were many studies showing important effects from chronic non-thermal RF exposure.

18. Cell phone certification processes use a Specific Anthropomorphic Mannequin (SAM). The SAM is a plastic head mannequin, based on the 90th percentile of 1989 United

States military recruits. That resulted in a standard based on a large adult male that weighed about 220 lb (100 kg) and was 6 foot 2 in (188 cm) being used for cell phone compliance testing.

19. Because any head size smaller than SAM receives a larger SAR, children receive the largest SAR relative to adults modeled with the SAM process.

20. According to my own calculations, for 5- and 10-year old children, using only head size differences compared to an adult, the children's SAR was 153% higher than adults.

21. The research of other academics has confirmed my own findings.

a. Wiart et al. (2008) employed MRI scans of children between 5 and 8 years of age and found approximately 2 times higher SAR in children compared to adults.

b. Kuster et al. (2009) reported that the peak SAR of children's CNS tissues is "significantly larger (, 2x) because the RF source is closer and skin and bone layers are thinner."

c. de Salles et al. (2006), using scans of a 10-year old boy's head with children's electrical tissue parameters found that differences in head size and other parameters increased the SAR by 60% compared to an adult.

d. Peyman et al. (2001) found the relative permittivity of an adult brain was around 40 while a young child's brain is from to 60–80, resulting in a child's SAR being 50–100% higher than an adult's independent of head size.

e. Han et al. (2010) provided additional analyses of the underestimation of spatial peak SAR with the SAM process.

22. Additionally, my most recent research, I found that the psSAR both for 1-g and 10-g tissues increases at a compounding rate of 10-15% for each millimeter closer placement of a radiating telephone for the flat phantom as well as the sphere phantom. Since children have thinner pinnae and skulls the placement of the cell phone radiating source is closer to the brain, they absorb more radiofrequency energy, increasing by 10-15% for every additional millimeter of reduced spacing. A paper based on this research is currently available online and will be published in an IEEE journal in the near future.

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23. Based on this research, I believe it is not controversial to state that whatever risk is presented by RF exposure in excess of the FCC standards, that risk is greater for children.

24. Based on my experience, I know of no research that would draw this conclusion into doubt, even if different studies might reckon the increased risk differently.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge. This declaration was executed on this ___ day of July, 2015, in _______________, _______________.

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Om Gandhi