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Fractus S.A.

DECLARATION OF DR. DONALD G. BODNAR

I, Dr. Donald G. Bodnar, declare that:

1. I am over 18 years of age. I have personal knowledge of the facts stated in this Declaration and could testify competently to them if asked to do so.

Personal Background

2. I have over 40 years of experience in antenna design and development and I am currently employed as President of Biltmore Enterprises, which engages in technical consulting. Prior to that, I was Vice President for New Business Development at MI Technologies and their technical lead for new antenna and RCS products. My previous job experience covers decades of work related to antenna research, design, and development.

3. I have taught graduate and undergraduate courses at the Georgia Institute of Technology in antennas, electromagnetic theory, materials, and computer programming. I also obtained my Ph.D. in Electrical Engineering from the Georgia Institute of Technology

4. I am a member and have been president of various professional organizations related to antennas, including the IEEE Antennas and Propagation Society and the Antenna Measurement Techniques Association (AMTA). I have been honored by the IEEE as a Life Fellow for my contributions.

5. My background has provided me with involvement in the design and analysis of antennas for portable devices, including antennas for cellular phones and lap tops computers.

6. My full curriculum vitae is attached as Exhibit A.

Scope of this Declaration

7. I have been retained by Samsung Electronics Co. Ltd ("Samsung") to provide technical analysis of prior art references at my standard rate of $350 an hour. This analysis includes using my antenna analysis and other relevant experience to produce computer models of antenna described in the prior art so that the performance of certain operational characteristics of the antennas can be computed.

8. The prior art references I have reviewed, modeled, and provided computational operational performance for in this declarations are:

a. U.S. Patent No. 5,995,064 to Yanagisawa et al., issued on November 30, 1999 ("Yanagisawa '064");

b. U.S. Patent No. 6,239,765 to Johnson *et al.*, issued on May 29, 2001 ("Johnson");

c. Misra, et al., "Experimental Investigations on the Impedance and Radiation Properties of a Three-Element Concentric Microstrip Antenna," Microwave and Optical Technology Letters, Vol. 11, No. 2, February 5, 1996 ("Misra");

d. Misra and Chowdhury, "Study of Impedance and Radiation Properties of a Concentric Microstrip Triangular-Ring Antenna and Its Modeling Techniques Using FDTD Method, " IEEE Transactions on Antennas and Propagation, Vol. 46, No. 4, April 1998 ("Misra-Chowdhury"); and

e. Guo, et al., Double U-Slot rectangular patch antenna, Electronic Letters Vol. 34, No. 19 published September 17, 1998 ("Guo").

9. On or about January 15, 2011, I prepared an expert report on invalidity on US Patents 7,015,868; 7,123,208; 7,394,432; 7,397,431; 7,528,782; 7,411,556; 7,148,850; 7,202,822 and 7,312,762 (collectively "the Fractus patents") for the defendant Kyocera

Communications Inc. in the litigation styled *Fractus, S.A. v. Samsung Electronics Co., Ltd. et al.*, No. 6:09-cv-00203 (E.D. Tex).

10. I reviewed the Fractus patents when preparing my January 15, 2011 invalidity report, but I did not review or consider the Fractus patents when preparing this declaration. Furthermore, while I may have reviewed other documents related to the ligation at the time I prepared my invalidity report, I did not re-review or consider any such documents for this expert report. All statements in this declaration are based solely on the disclosure of the prior art references cited herein and what they would teach to one of ordinary skill in the art.

11. I was directed to analyze the specific prior art references in this declaration based on instructions from Samsung's counsel and thus the references may be different than the prior art I relied on in my January 15, 2011 expert report for Kyocera. I do not know the reasons why Samsung's counsel directed me to model and calculate the performance of the references cited herein rather than other references.

12. I have been also instructed by Samsung's counsel that for the purposes of this declaration, I should consider one of ordinary skill in the art at the relevant time period to have a M.S. degree in Electrical Engineering with a major in electromagnetics and antennas, and at least 5 years of experience with antenna design and multi-scale objects; or alternatively, have a Ph.D. in Electrical Engineering with an emphasis in electromagnetics, a knowledge of fractals, and at least 2 years of experience with antenna design and multi-scale objects.

General Operational Characteristics of Antennas

13. Antennas are physical structures that can receive or transmit electromagnetic signals. However, the structure of an antenna is such that electromagnetic waves having certain frequencies produce a stronger signal. These frequencies are known to those of ordinary skill in the art as the resonant frequencies of the antenna.

14. The resonant frequency of an antenna is generally inversely proportional to the length of the antenna portion that radiates. This means that antennas that resonant at

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higher frequencies are generally shorter than antennas that resonant at lower frequencies. In addition, if all the physical dimensions of an antenna are changed by the same proportion, then the resonant frequency will also change by the inverse of that proportion. For example, if all the dimensions of an antenna were halved, then the resonant frequency would double. However, so long as all the dimension are changed by the same proportion, the current magnitude, current direction, VSWR, and radiation patterns would remain substantially the same at the respective resonant frequencies. Thus, one of ordinary skill in the art understands that an antenna design can be reduced in size while maintaining the same basic operational characteristics, except that the resonant frequencies would increase proportionately to the size reduction. For a practical example of this effect using the prior art cited herein, see paragraph 89 below.

15. The conductive material that makes up an antenna can be a solid monolithic structure or it can be made up of separate conductive elements that are electromagnetically coupled together (such as being coupled via capacitance). When electromagnetic coupling between separate conductive elements is used, some of the resonant frequencies of the antenna as whole would be different than the resonant frequencies for each of the separate conductive elements. In other words, if there was no electromagnetic coupling (e.g., if the separate conductive elements were physically separated by a large enough distance) then each separate conductive element could act as its own antenna with each having its own separate resonant frequencies.

16. It is common for antennas to be connected to other circuits to refine the operation of the antenna. One example of these circuits is an impedance matching network designed to minimize power loss due to reflection by loading the antenna so that impedance of the antenna approximately matches that of the transceiver circuitry it is connected to. A common usage for a matching network is to set the antenna impedance to 50 ohms at the desired frequencies, but the matching network may establish other impedance values for the antenna. 50 ohms has become a de-facto industry standard for impedance in the field of antennas and most of-the-shelf RF antenna components are designed to work at 50 ohm impedances. Other common circuits that can be connected to an antenna are various types of frequency filters that can reduce noise and enhance the

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