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

Re: ET Docket No. 03-104
ET Docket No. 04-37
Broadband over Power Line Systems
Ex Parte Communication

Dear Ms. Dortch:

On behalf of CURRENT Group, LLC, pursuant to Section 1.1206(b)(1) of the Commission's Rules, I am electronically filing this written *ex parte* communication in the above-referenced dockets.[1]

CURRENT is filing solely to respond to new matter that ARRL raised in its Reply to Oppositions of the Homeplug Power Alliance and Current Group, LLC to Petition for Reconsideration (filed July 27, 2012).

CURRENT's recent Opposition to ARRL's Petition for Reconsideration defended the 40 dB/decade extrapolation factor in part as follows:

> ARRL continues to insist that BPL signals radiate from a considerable length of the power line. . . . [S]uppose, for the sake of discussion, that ARRL were correct. As a consequence, the prescribed 30 meter measurement distance would come

[1] CURRENT participated in earlier phases of this proceeding in the name of its subsidiary, CURRENT Technologies, LLC.

> within the near field of the radiator. Emissions drop off much more rapidly with distance in the near field than they do farther away. Accordingly, even if 20 dB/decade were the correct parameter in the far field . . . measurements in the near field would show a much steeper attenuation, of at least 40 dB/decade.[2]

ARRL now counters that fields decay rapidly only in the *reactive* near field.[3] Within that reactive near field, however, ARRL concedes that the appropriate extrapolation is at least 40 dB/decade.[4]

But ARRL incorrectly calculates the extent of the reactive near field, which it says is bounded by:

$$R = \frac{\lambda}{2\pi} \qquad (1)$$

where R is the extent of the reactive near field and λ is the wavelength. At a frequency of 30 MHz, λ is 10 meters; R is approximately 1.6 meters.

ARRL provides a link to an Industry Canada website as authority for this equation.[5] But the same website also says, just above equation (1):

> ***For an antenna with a maximum overall dimension that is small compared to the wavelength***, the near field region is mostly reactive . . . The reactive near field region extends from the antenna up to a distance "R".[6]

Equation (1) comes next. The context thus makes clear that equation (1) only applies to "electrically small antennas," *i.e.* those whose largest dimension is much less than the wavelength.

We agree with Industry Canada that equation (1) governs the reactive near field for small antennas. But this entire discussion is predicated on hypothetically accepting ARRL's view that the power line radiates over a considerable length. In that event the power line emphatically fails to qualify as an electrically small antenna, so equation (1) does not apply.

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2 Opposition of CURRENT Group, LLC to Petition for Reconsideration of Second Report and Order of ARRL, the National Association of Amateur Radio at 6 (filed July 17, 2012) (footnotes omitted).

3 ARRL Reply at 5.

4 *Id*. at 5 n.8, 6.

5 Industry Canada, GL-01 — Guidelines for the Measurement of Radio Frequency Fields at Frequencies from 3 KHz to 300 GHz at § 2.2.2, *available at* http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08511.html#gl-2.2.2

6 *Id*. (emphasis added).

According to ARRL's reasoning, a radiating power line would qualify as an "electrically large antenna"—one whose largest dimension is much greater than the wavelength. At 30 MHz, where the wavelength is 10 meters, a power line that radiates over a few tens of meters or more would be "electrically large."

The Industry Canada author goes on:

> For antennas large in terms of wavelength, the near field region consists of the reactive field extending to the distance given by [equation (1)] followed by a radiating region.[7]

We think this is wrong. We found no other authority giving equation (1) as describing the reactive near field of an electrically large antenna. Rather, most sources agree that the reactive near field for an electrically large antenna is bounded by:[8]

$$R = 0.62\sqrt{\frac{D^3}{\lambda}} \qquad (2)$$

where D is the maximum dimension of the antenna. If we set λ = 10 meters (for 30 MHz), and R = 30 meters (the outer limit for measurement), and solve for D, the result is D = 28.6 meters. In other words: if a power line were to radiate over 28.6 meters or more, then all measurement distances at 30 meters or less will lie within the reactive near field. ARRL agrees that the extrapolation factor within the reactive near field is 40 dB/decade or more.[9]

CURRENT has maintained throughout that the Commission adequately justified 40 dB/decade as an appropriate extrapolation factor. ARRL has argued that, because the power line radiates over a considerable length, the factor must instead be 20 dB/decade. The foregoing shows that, even if we hypothetically accept ARRL's position favoring a long radiating element, then all practical measurement distances fall within the reactive near field, and, so the correct extrapolation factor remains at 40 dB/decade as a minimum.

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7 *Id.*

8 For details and a derivation of equation (2), see CONSTANTINE A. BALANIS, ANTENNA THEORY: ANALYSIS AND DESIGN 116-17 (John Wiley & Sons 1982). *See also* CONSTANTINE A. BALANIS, ED., MODERN ANTENNA HANDBOOK at § 1.2.3 (John Wiley & Sons 2011); MICHAEL T. CHRYSSOMALLIS AND CHRISTOS G. CHRISTODOULOU, ANTENNA RADIATION PATTERNS at § 2.4 & Figure 7, available at http://data.eefocus.com/myspace/0/942/bbs/1174163529/29c6d0e7.pdf.
An online search brings up many more such sources.

9 ARRL Reply at 5 n.8 ("Within the reactive near-field region, fields generally decay at 40 dB/decade to 60 dB/decade.")

Please do not hesitate to contact me with any questions.

Respectfully submitted,

Mitchell Lazarus
Counsel for CURRENT Group, LLC

cc: Chairman Julius Genachowski
Commissioner Robert McDowell
Commissioner Mignon Clyburn
Commissioner Jessica Rosenworcel
Commissioner Ajit V. Pai
Julius P. Knapp, Chief, Office of Engineering and Technology
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