



May 31, 2012

The Honorable Julius Genachowski, Chairman  
The Honorable Mignon Clyburn, Commissioner  
The Honorable Robert McDowell, Commissioner  
The Honorable Jessica Rosenworcel  
The Honorable Ajit Pai  
Federal Communications Commission  
445 12<sup>th</sup> Street, S.W.  
Washington, D.C. 20054

**Re: WT Docket 11-186**

Dear Chairman Genachowski and Commissioners Clyburn, McDowell, Rosenworcel, and Pai:

The purpose of this letter is to: (a) provide an overview of Pong Research Corporation (“Pong”) to the Federal Communications Commission (the “Commission”); (b) elucidate how after-market form-fitting cases for wireless devices—that are neither tested nor assumed in the equipment authorization process, but that have become as integral to devices as original equipment manufacturer (“OEM”) phone and tablet shells—detrimentally impact consumers’ experiences of wireless network service quality and, potentially, their health and safety; and (c) in this regard, recommend steps the Commission could take to provide more information to consumers, improve service quality, and promote the public interest. A copy of this letter is filed in the Commission’s WT Docket No. 11-186.

**Introduction**

Pong, in short, makes the world’s most technologically advanced cases for smartphones, tablets, and other wireless devices. Pong cases remain the only products commercially available that have been proven in Commission-certified laboratories to reduce user exposure to potentially harmful cell phone radiation, as measured on the Specific Absorption Rate (“SAR”) scale<sup>1</sup>, while maintaining Total Radiated Power (“TRP”)<sup>2</sup> and optimizing the ability of devices to receive and transmit data on a network.

Each Pong case (itself made of specially-tested material) embeds a unique (to each device model) “Coupled Antenna System” (in the form of a proprietary flexible printed circuit board) that passively interacts with the electromagnetic fields generated by the cellular and Wi-Fi antennas within the mobile device. This architecture provides two essential benefits. First, a Pong case can materially enhance 3G/4G and Wi-Fi performance—particularly versus other cases that, unknown to consumers generally, can seriously impair data transmission and reception. (This letter explicates specific comparative results below.) This phenomenon directly impacts both consumers’ experiences, and carriers’ delivery, of

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<sup>1</sup> *In re Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation*, Release No. 96-326, 11 F.C.C.R. 15123, 15124 (1996). The Commission adopted the current radio frequency (“RF”) radiation exposure standards that establish a maximum SAR of 1.6 watts per kilogram (1.6 W/kg) for spatial peak SAR as averaged over any 1 gram of tissue. See 47 C.F.R. §2.1093(d)(2). All wireless devices marketed, distributed, or sold in the United States must comply with this limit.

<sup>2</sup> The value of the transmitted power is measured in decibels referenced to one milliwatt (dBm), and is defined in terms of Mean Effective Gain and TRP.

network services.

Second, a Pong case—by redirecting and redistributing near-field electromagnetic radiation (“cell phone radiation”)<sup>3</sup> away from the user’s head and body and toward the back of the device—provides the mobile health benefit of reducing exposure to potentially harmful cell phone and Wi-Fi radiation by up to 95% below Commission safety limits, as measured on the SAR scale. Pong cases simultaneously maintain or even enhance the antenna’s TRP. Pong tests its cases in third-party facilities (including CETECOM<sup>4</sup>) certified by the Commission, and calibrates its own extensive equipment to these industry standards. As in the case of data transmission and reception, other wireless device cases can both dramatically increase SAR and decrease TRP—again, with adverse resultant effects on consumers’ experiences and, potentially, their health and safety.

Pong’s solutions converge at two of the fastest-growing consumer product segments: mobile technology and mobile health. Pong was organized in January 2011, based upon years of academic research now embodied in Pong’s 4 international patents and 9 patents pending. Pong is headquartered in Leesburg, Virginia and employs 23 people (in addition to various consultants), including 4 who hold PhDs in Physics and Applied Physics, Nuclear Engineering, Health Sciences and Technology, and related fields, and others with MSEEs in Electrical Engineering and similar disciplines with specialties in Antenna Design. Pong’s experts received their advanced degrees from Princeton, the Massachusetts Institute of Technology, Harvard, the University of Manchester (UK), and other prominent institutions. In June 2011, just 6 months after its formation, Pong received a \$10 million series A investment from Catterton Partners—the leading consumer-focused private equity fund with over \$2.5 billion under management. Pong has already sold products to consumers in 55 countries.

The Commission’s Public Notice on the State of Competition in Mobile Wireless released on November 11, 2011 (the “Public Notice”)<sup>5</sup> inquired specifically into “. . . ‘downstream’ or ‘edge’ market segments—such as devices . . . [as well as] consumer behavior with respect to mobile wireless services . . .”<sup>6</sup> On the matter of performance, in particular, the Commission solicited comment on “network and service quality”<sup>7</sup> and with respect to “additional metrics that would enhance the Commission’s analysis of the mobile wireless marketplace”<sup>8</sup> vis-à-vis network and service quality. The Commission further noted the following with respect to service quality<sup>9</sup>:

*Indicators of service quality performance in the Fifteenth Report included the results of consumer surveys, such as those conducted by J.D. Power & Associates, Consumer Reports, and the Commission, as well as the results of network speed and reliability tests performed by PCWorld magazine, PCMag.com, and Root Metrics. The Bureau seeks comment on the usefulness of these sources in measuring service and network quality, and asks whether it should consider data from additional sources.*

*We invite comment on whether there are additional sources of information that we should include in*

<sup>3</sup> Cell phone radiation is a form of electromagnetic radiation that cell phone antennas emit when they send and receive data to and from cell towers. Cell phone antennas usually transmit RF waves in a 360-degree spherical pattern (a so-called “omni-directional” antenna) around the phone itself.

<sup>4</sup> See [www.cetecom.com](http://www.cetecom.com).

<sup>5</sup> WT Docket No. 11-186. The Public Notice solicits input and data on mobile wireless competition for the Commission’s 16<sup>th</sup> Annual Report on the State of Competition in Mobile Wireless.

<sup>6</sup> *Id.* at page 2.

<sup>7</sup> *Id.* at page 7.

<sup>8</sup> *Id.* at page 8.

<sup>9</sup> *Id.* at page 11.

*the Commission’s analysis of service quality, such as those that include quantifiable measures of network quality. What factors do such sources take into account when evaluating service quality?*

Pong commends the Commission for requesting further information on factors that could affect service quality, and is pleased to respond herein.

## **I. Background**

At the outset, brief background on the Commission’s equipment authorization process and recent trends in consumer behavior—particularly concerning the adoption of after-market, form-fitting device cases—is instructive.

### **A. Equipment Authorization Processes**

The Commission correctly identifies two inter-dependent aspects of the wireless telecommunications system: on the one hand, “upstream” or “input” market segments (such as spectrum, infrastructure, and backhaul) and, on the other hand, “downstream” or “edge” segments (including devices, operating systems, applications, and mobile commerce).<sup>10</sup> It is tautological that one aspect cannot work without the other. As an extreme example, a consumer using an outmoded analog “bag phone” to make a call on a 4G/LTE network could not rightly complain that a faulty network precluded connectivity.

As part of the Commission’s regulatory regime, the downstream/edge segment of devices is ensured through (among other things) an “equipment authorization process” overseen by the Commission’s Office of Engineering and Technology—the requirements of which appear in 47 C.F.R. Part 15.<sup>11</sup> Broadly speaking, these requirements encompass two components: (1) network service quality (in terms of a device’s performance on the wireless network) and (2) consumer health and safety (in terms of a device’s SAR rating). OEMs must strictly adhere to the rigorous standards of the equipment authorization process, and certify compliance to the Commission. The very system for introducing devices into the telecommunications system—the metaphorical “can” attached to the end of the “string” into which the network is “speaking”—rests upon the integrity of the equipment authorization process.

### **B. Consumer Adoption of Form-Fitting Cases for Devices**

In the United States and globally, cell phone usage has skyrocketed—particularly in the “smartphone” category. In the United States alone, for example, smartphone ownership has grown to: 67% among adults age 18-24, 71% for ages 25-34, 54% for ages 35-44, and 44% for ages 45-54, 31% for ages 55-64, and 13% for ages 65 and over. Adoption rates have increased by as much as 18% within these age groups just between May 2011 and February 2012.<sup>12</sup> The percentage of adults in the United States who own tablet computers—which likewise connect to cellular or Wi-Fi networks—nearly doubled from 10% to 19% from December 2011 to January 2012 and, during the same timeframe, the number of Americans owning at least one digital reading device jumped from 18% to 29%.

Smartphone owners (as well as tablet computer and digital reading device consumers) typically purchase form-fitting cases for their devices. These cases are available through various sources, with a plurality purchased together with devices at point of sale and others procured in the after-market at various retail

<sup>10</sup> *Id.* at page 1.

<sup>11</sup> See <http://transition.fcc.gov/oet/ea/eameasurements.html> (summarizing various measurement procedures that may be used when testing equipment to determine its compliance with Commission rules).

<sup>12</sup> Smith, A., Pew Internet & American Life Project, Pew Research Center, March 1, 2012, at <http://www.pewinternet.org/~media/Files/Reports/2012/Smartphone%20ownership%202012.pdf>.

vendors, online, and even in vending machines. Although so-called “attachment rates” for these products remain elusive, anecdotal information provided to Pong and published industry research indicates that consumers purchase cases at the rate of **at least 1.5 per device** over time. The excess of cases to devices themselves owes, in large measure, to the “fashion-oriented” marketing of these goods. Ironically, however, the composite elements, thick materials, and other variables that go into the overwhelming majority of these products may have a deleterious impact on TRP and SAR.

## II. Wireless Device Cases Can Negate the Entire Equipment Authorization Process

Although seemingly obvious upon reflection, few realize that **because after-market form-fitting cases contour to devices themselves, these products—that are neither tested nor assumed in the handset equipment authorization process—have become as integral to devices as OEM phone shells.** As such, a case can detrimentally impact consumers’ experiences of wireless network service quality and, potentially, their health and safety. *The resultant “radiation profile” of a given device (the same goes for both phones and tablets with cellular or Wi-Fi connectivity) with a case may bear little resemblance to that of the same device without a case, as tested in the equipment authorization process.* This altered profile, as well, might dramatically increase SAR and decrease TRP.<sup>13</sup>

The device performance changes attendant to TRP and SAR can impact other variables, as well, including battery life. For a “real life” referent, some of us might mistakenly have left our mobile phones stowed away but “on” (not in “airplane mode” with the cellular antenna disengaged) during a long airplane flight, only later to find the devices “dead” or with little battery power remaining. This phenomenon occurs because an operating cellular device constantly attempts to send and receive data. When it cannot efficiently “find” a cell tower (a likely result during a high-altitude flight), the device emits greater radiated power (resulting in a greater transient SAR). The greater power emissions, in turn, drain the battery.

For illustrative purposes only, the following charts and graphs show the impact the Pong case has on TRP, SAR, and battery life—versus other leading brands and even “bare” devices. Pong is pleased to share any raw test data with the Commission.

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<sup>13</sup> The increased SAR profile in actual use, moreover, might even exceed the “theoretical” assumptions that inform the Commission’s safety standard of 1.6 W/kg. This result could obtain because the efficiency of an antenna depends on the impedance of its surrounding medium. Cellular antennas are typically designed to operate surrounded mostly by air. Changing the material surrounding the antenna—for example, with a case—can alter the impedance match and affect the antenna’s efficiency. In some scenarios (dependent on frequency and dielectric properties) efficiency can be improved, so that the antenna radiates more power. The addition of a case to a device, however, could change antenna efficiency and increase radiated power, so that the safety limit is violated. In any event, the stated SAR rating of a device for purposes of its equipment authorization would differ from its actual SAR emission with the addition of a form-fitting case. The fact that consumers generally use their devices against their heads and bodies—again, contrary to the assumptions that underlie both the Commission’s safety standard and equipment authorization testing regulations—would exacerbate this state of affairs.

A. Test Data—TRP

Figure 1 shows the impacts of various cell phone cases on signal strength (in TRP) of an iPhone 4 on a sample GSM 850 MHz band tested in Pong’s laboratory.

Figure 1. Effects of Cases on iPhone 4 Signal Strength—Pong Lab Results

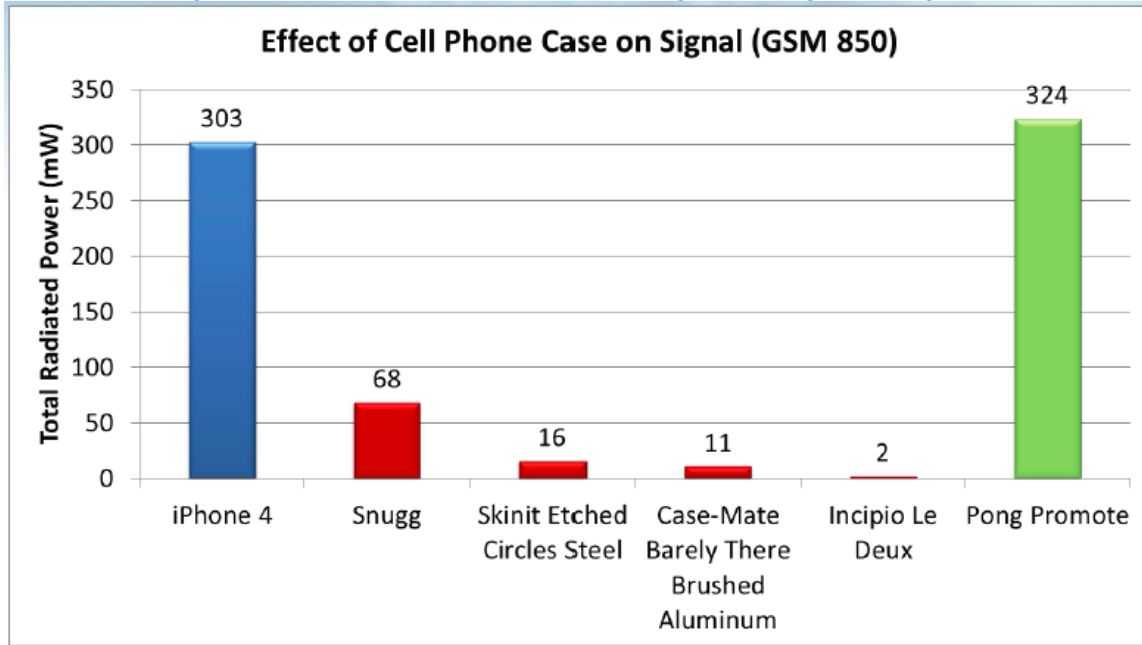


Figure 2 shows the impacts of a cell phone case on TRP of an iPhone 4 on the GSM cellular band, channel 128, tested next to a Specific Anthropomorphic Mannequin or “SAM” head and held with a SAM hand, in compliance with industry standards at CETECOM.

Figure 2. Effects of Cases on iPhone 4 Signal Strength—CETECOM Results

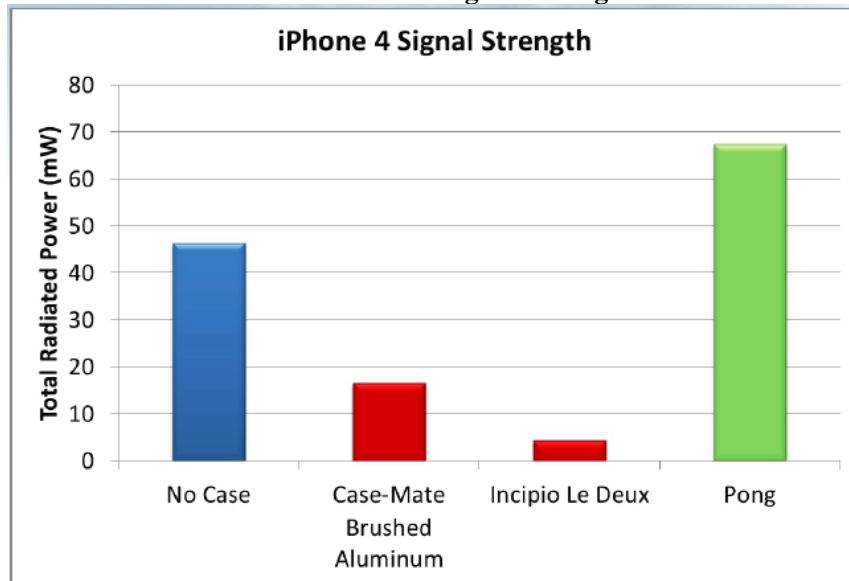
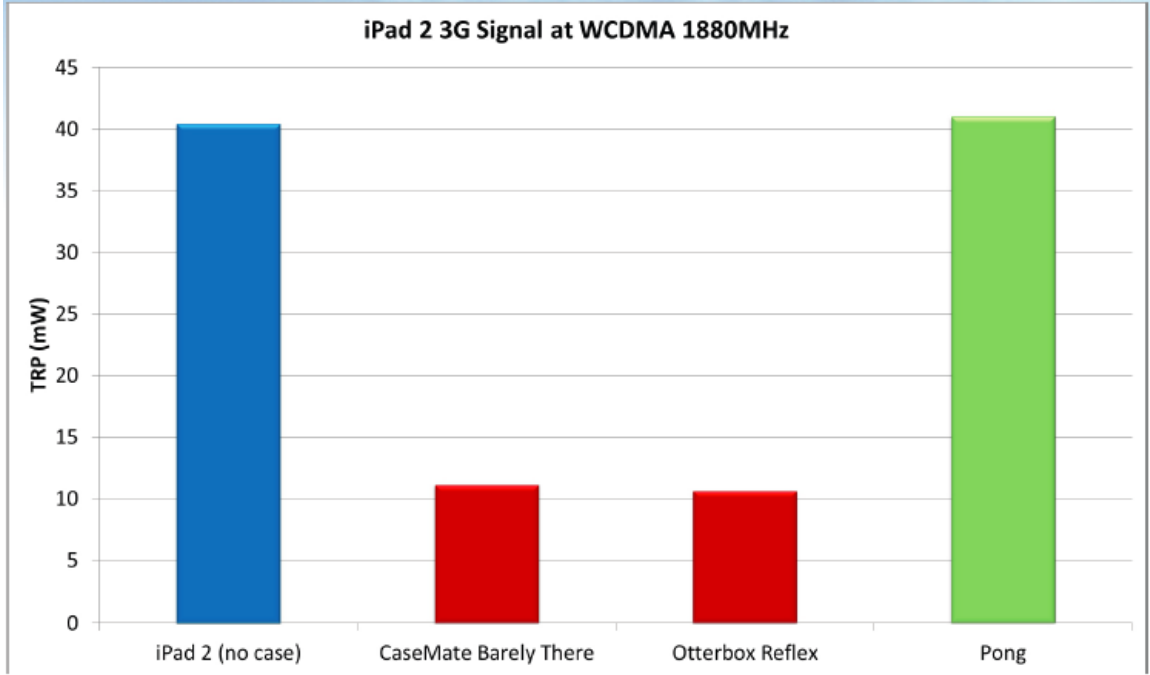


Figure 3 shows the impacts of various cases on signal strength of an iPad 2 on a sample WCDMA 1880 MHz band tested at CETECOM.

Figure 3. Effects of Cases on iPad 2 Signal Strength—CETECOM Results



B. Test Data—SAR

Figure 4 shows the impacts of various cell phone cases on SAR of an iPhone 4 on the GSM cellular 850 MHz band, channel 128, tested in Pong’s laboratory.

Figure 4. Effects of Cases on SAR of iPhone 4—Pong Lab Results

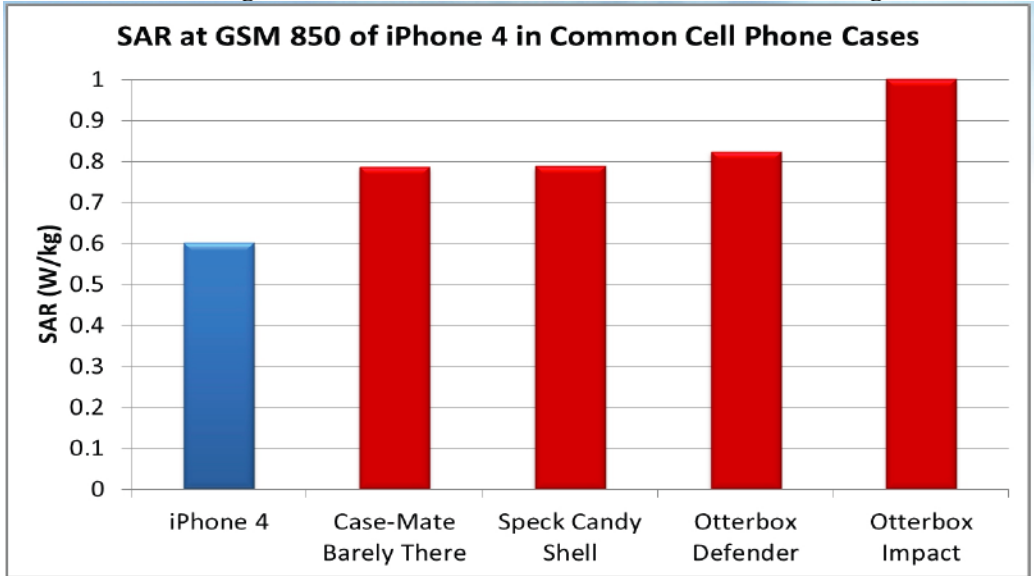


Figure 5 shows the impacts of various cell phone cases on SAR of an iPhone 4 versus a Pong case on a sample GSM 824 MHz band tested at CETECOM on March 29, 2012.

Figure 5. Effects of Cases on SAR of iPhone 4—CETECOM Results

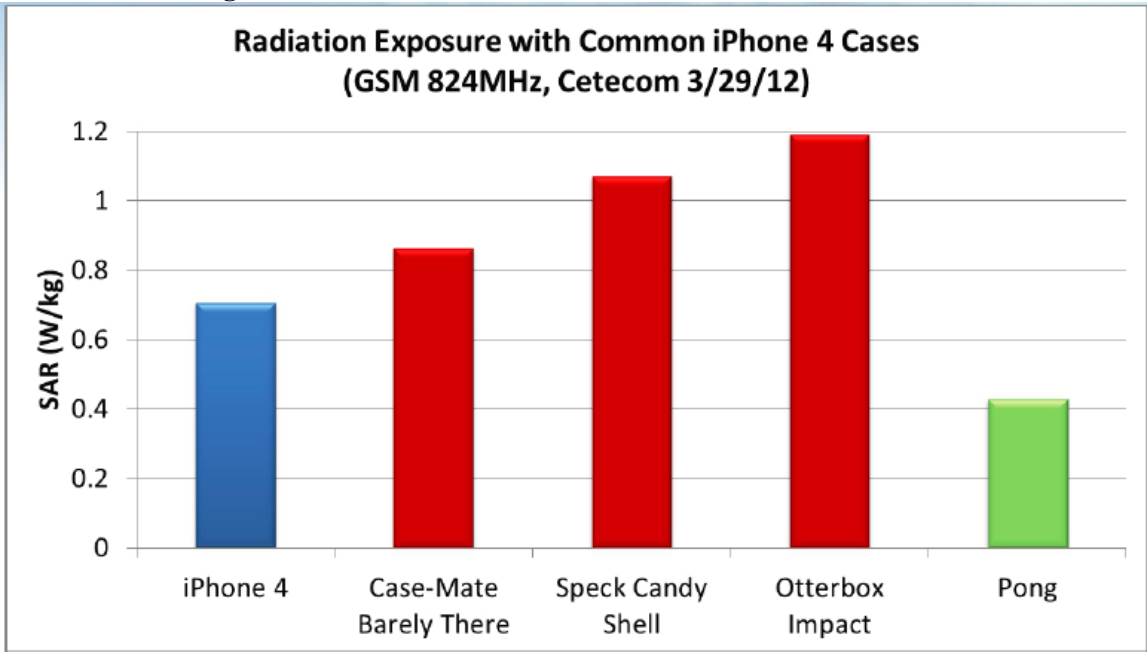
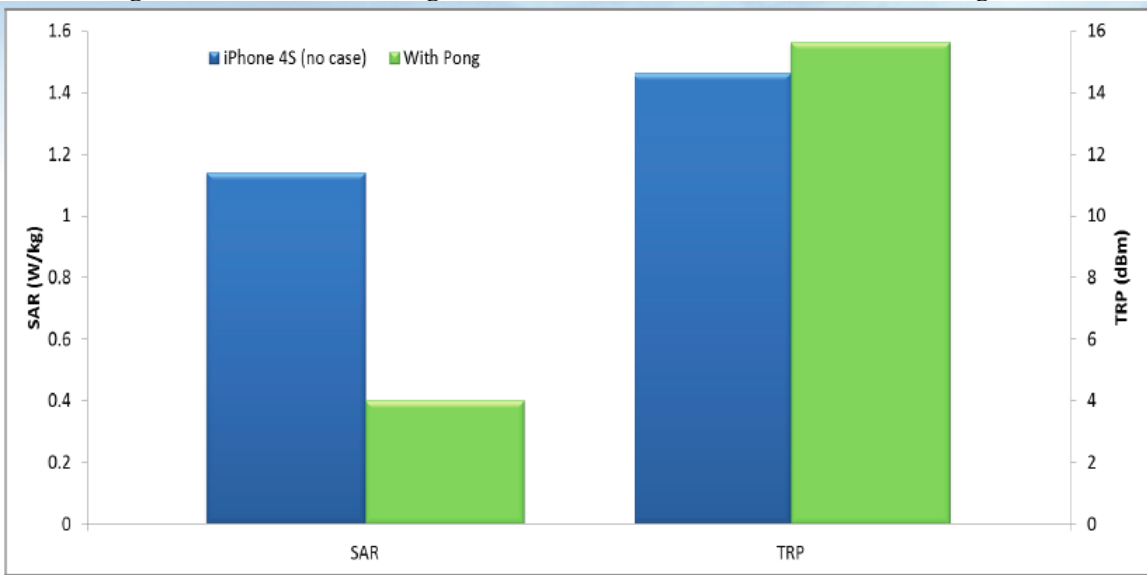


Figure 6 compares the TRP and SAR of an iPhone 4S with and without a Pong case (tested on a sample AT&T 3G 1880 MHz band).

Figure 6. Effects of a Pong Case on TRP and SAR of iPhone 4S—Pong Lab Results

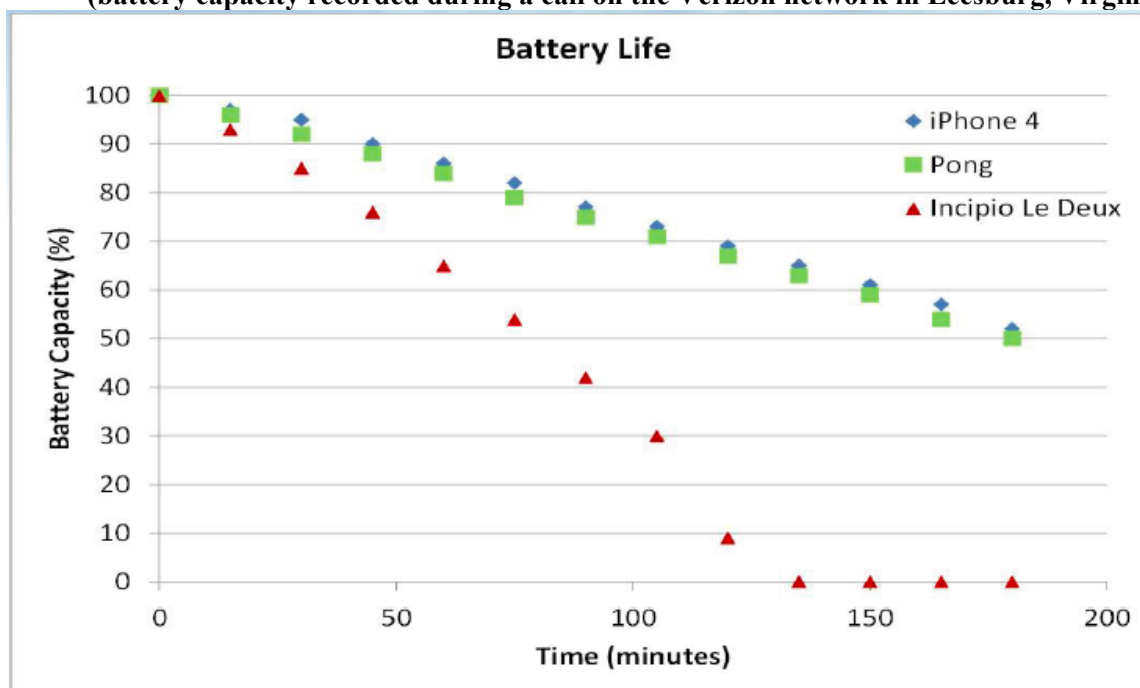


As indicated by the testing results shown above, Pong can beneficially impact both TRP and SAR relative not only to other commercial cases but also to a “bare” device.

### C. Test Data—Battery Life

**Figure 8** illustrates the effect on battery life that Pong has compared with another commercially available case. As noted above, an operating cellular device constantly attempts to send and receive data. When it cannot efficiently “find” a cell tower, the device emits greater radiated power (resulting in a greater transient SAR) and, in turn, accelerates battery drain. A case’s impact on battery life is another important factor affecting service quality and the customer experience and, as such, should be included in the record in WT Docket 11-186.

**Figure 8. Effects on Battery Life of iPhone 4 from Incipio LeDeux Case and Pong Case (battery capacity recorded during a call on the Verizon network in Leesburg, Virginia)**



### III. Consequences for Network Quality and other “Upstream” Market Segments

“Downstream” impacts on wireless devices, particularly from form-fitting cases, may have direct consequences upon network quality and other “upstream” market segments such as spectrum. Consumers’ experience of dropped calls, poor signal, slow downloads, and compromised performance on cellular networks may—at least in part—owe to the presence of a case. The comprehensive impact of customers’ “isolated” bad experiences, when measured across the entire consumer population of 350 million cell phone and tablet users in the United States, represents a significant potential benefit to service quality and network efficiency—as well as for providers’ resources and users’ productivity. The comparatively simple fix of optimizing the ability of devices (together with their cases) to receive and transmit data is a simple exercise that could improve bandwidth utilization and network efficiency.

Pong has sought to address both cellular and Wi-Fi signal factors, particularly with the proliferation of tablet computing devices like the iPad, within enterprise environments. Service providers ought especially to share Pong’s interest in optimizing Wi-Fi communication because, as 4G/LTE rollout remains at a relatively early stage, Wi-Fi represents the best way to handle the growing enterprise traffic without clogging up existing 3G networks. Test data for Pong’s iPad cases, in this context, show vastly faster Wi-Fi downloads and uploads, and better reception than other leading brands—as well as versus a



“bare” iPad or Apple’s “Smart Cover.”

## Conclusion

Wireless device cases have a substantial impact on wireless device reception, battery life, and user radiation absorption and, potentially, on overall network efficiency. The Commission has astutely asked for input on these factors, and Pong believes that further in-depth analysis is warranted with respect to the relationship of these factors to cases. Given the ubiquity of cellular and Wi-Fi device usage in the United States, and the extent to which Americans rely on their wireless devices, Pong believes that the Commission’s enhanced efforts to inform consumers would serve the public interest.

We respectfully suggest, therefore, that the Commission should include within its review of wireless service quality (including in its annual inquiry as to the status of competition in mobile wireless), or in a separate inquiry, an assessment of the impact that cases have on consumers’ experiences of wireless network service quality, as well as, potentially, their health and safety. With respect to wireless service quality, factors such as reception quality, battery life, and network efficiency should be examined. In the interim, the Commission could, via its web site, inform consumers that standard mobile device cases may reduce transmission and reception quality and increase RF radiation absorption, so that consumers should thoroughly research and compare products before selecting cases for their wireless devices.

Finally, a substantial percentage of all wireless device cases are purchased from a small number of vendors that also sell most of the wireless devices and services to consumers in the United States. The Commission has an interest in ensuring that consumers are afforded the greatest choice of, and the highest quality and safest, devices in the marketplace. The Commission should remain cognizant of the importance of these distribution pipelines to both competition and consumer welfare. Thank you for your consideration of these matters.

Sincerely,



**Kevin L. Passarelo**

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