

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, D.C. 20554**

In the Matter of

Amendment of Part 15 of the Commission's Rules for Unlicensed Operations in the Television Bands, Repurposed 600 MHz Band, 600 MHz Guard Bands and Duplex Gap, and Channel 37, and

ET Docket No. 14-165

Amendment of Part 74 of the Commission's Rules for Low Power Auxiliary Stations in the Repurposed 600 MHz Band and 600 MHz Duplex Gap

Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions

GN Docket No. 12-268

**REPLY COMMENTS OF QUALCOMM INCORPORATED**

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**REPLY COMMENTS OF QUALCOMM INCORPORATED**

QUALCOMM Incorporated ("Qualcomm") hereby submits these reply comments on the *NPRM* in the above proceedings<sup>1</sup> to highlight the serious concerns raised in the opening comments with the proposed rules permitting duplex gap and guard band operations. As explained below, the proposed operation of unlicensed white space devices and wireless microphones in the 600 MHz duplex gap and guard bands will cause harmful interference to licensed mobile operations, and if these proposals are enacted, they would violate the Spectrum Act, the Communications Act, and the FCC's own Part 15 rules, all of which prohibit such harmful interference to licensed mobile services.

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<sup>1</sup> See Amendment of Part 15 of the FCC's Rules for Unlicensed Operations in the TV Bands, Repurposed 600 MHz Band, Guard Bands and Duplex Gap, and Channel 37, ET Docket No. 14-165, *Notice of Proposed Rulemaking* FCC 14-144 (rel. Sept. 30, 2014) ("*NPRM*").

## INTRODUCTION & SUMMARY

Under the Spectrum Act, the Commission may only permit unlicensed operations within the duplex gap and guard bands if such operations do not cause “harmful interference to licensed services.”<sup>2</sup> More broadly, the agency’s longstanding Part 15 rules also permit unlicensed operations but only to the extent that “no harmful interference is caused” to licensed services.<sup>3</sup> In the *NPRM*, the FCC proposes unlicensed operations in the 600 MHz mobile band plan duplex gap and guard bands that the Consumer Electronics Association (“CEA”), CTIA, and Qualcomm all have shown will cause harmful interference to licensed mobile operations 100% of the time when they are operating within the same room. These analyses were confirmed via live testing by V-COMM and Qualcomm showing that, in order to avoid causing harmful interference, the proposed unlicensed white space device and wireless microphone transmit power levels and out-of-band emissions (“OOBE”) limits need to be reduced to levels substantially below the levels proposed, which the unlicensed advocates have said are necessary to provide a viable service.

V-COMM found that OOBE from white space or wireless microphone operations at the levels proposed in the *NPRM* present “a significant level of interference that significantly degrades LTE service, and impairs coverage and performance for all LTE devices within the area.” CEA similarly found that interference from the unlicensed white space device to licensed mobile LTE device would prevent the licensed device from receiving incoming signals and possibly cause it to shut down. For these reasons, the FCC must not allow unlicensed white space or wireless microphone operations in the 600 MHz duplex gap or guard bands.

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<sup>2</sup> *NPRM* at ¶ 79 (citing Spectrum Act § 6407).

<sup>3</sup> 47 C.F.R. § 15.5.

As many commenting parties have noted,<sup>4</sup> the *NPRM*'s analysis to support the insertion of unlicensed devices incorporates signal losses that do not exist when unlicensed devices and licensed mobile devices are operated side-by-side as the proposed rules would allow and speculates that the performance of all licensed mobile devices will exceed industry standards by an order of magnitude based upon one unlicensed vendor's measurement of a handful of LTE devices. In addition, the *NPRM* claims that unlicensed devices will use transmit power control to operate with the least amount of power necessary to ensure successful transmissions, but the unlicensed supporters have said that the proposed 40 mW (*i.e.*, 16 dBm) transmit power level for unlicensed devices already is the lowest level that can support a viable service.

Recognizing that white space devices in the duplex gap and guard bands will cause harmful interference to licensed mobile operations in the 600 MHz band, the *NPRM* claims that the affected mobile licensees can just move to other spectrum bands. This assertion, however, is contrary to the Communications Act, the Spectrum Act, and the FCC's own Part 15 rules, which expressly prohibit unlicensed devices from causing harmful interference to licensed operations, let alone force a 600 MHz mobile licensee to move out of its authorized band of operation.<sup>5</sup> It also severely disadvantages new entrants and smaller entities who may not hold licenses to other bands. Moreover, the *NPRM*'s assertion is sheer speculation even for carriers with licenses to other bands because the FCC cannot possibly know whether there is capacity available in those

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<sup>4</sup> See, *e.g.*, CTIA Comments; TIA Comments (both filed Feb. 4, 2014). “[T]he Commission’s concession that ‘there may be concerns’ about its proposal is a significant understatement — accepting seven meters of interference would severely degrade or destroy the availability of 600 MHz LTE service within a home or office ... .” TIA Comments at 6.

<sup>5</sup> “[T]here is simply no basis to convert the obligation of Part 15 devices not to cause harmful interference to licensed services — here, a very specific statutory obligation — into a shared-responsibility requirement.” TIA Comments at 7.

other bands at any given location to add users who have to vacate 600 MHz to avoid such interference. To be clear, the FCC's position, by its terms, will force bidders to devalue 600 MHz licensed spectrum.<sup>6</sup>

Accordingly, the FCC cannot speculate around its own finding that confirms the analyses and testing in the record from CEA, CTIA, and Qualcomm showing that there will be unresolvable harmful interference when white space devices are in the same room as licensed devices. The proposed rules allowing such unlicensed operations in the duplex gap or guard band are not defensible on technical or legal grounds.

Similarly, the FCC's decision in the *600 MHz Report & Order* to permit licensed wireless microphone operations in the duplex gap along with unlicensed white space devices<sup>7</sup> under technical parameters later proposed in the instant *NPRM* will cause interference to licensed mobile operations in violation of the Spectrum Act, as Qualcomm's and V-COMM's testing demonstrates. In fact, the *NPRM* provides no support or analysis showing that licensed wireless microphones can operate without causing harmful interference to mobile broadband operations. In addition, the placement of licensed operations inside the duplex gap violates the Spectrum Act because that law only permits *unlicensed* operations in the duplex gap.

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<sup>6</sup> "Even to the extent Commission staff disagrees with this industry assessment, the bidders' perceptions are the only thing that matter in the auction, and it is clear that bidders will discount their bids in the forward clock auction to account for the possibility that they may end up with spectrum they believe may be degraded by unlicensed users in the duplex gap." AT&T Comments on 600 MHz Auction Procedures PN (Feb. 20, 2015) at 15.

<sup>7</sup> See *600 MHz Report & Order* at ¶ 314. The FCC proposed to partition the duplex gap so that 6 MHz is used for unlicensed white space devices operating at 40 mW, and 4 MHz is used for licensed wireless microphones. See *id.*

The proposed technical rules, which are based upon unreasonable assumptions that defy the record evidence, run contrary to well-established legal precedent.<sup>8</sup> The *NPRM* fails to grapple with the significant problems identified by Qualcomm and completely overlooks CEA’s detailed technical study in violation of the law.<sup>9</sup> Also, the *NPRM* does not even consider the interference that such duplex gap and guard band operations will suffer from licensed mobile operations and that threaten the viability of such operations.

The FCC should not permit unlicensed operations or licensed wireless microphones in the duplex gap and guard bands because the proposed technical rules — which the unlicensed advocates have deemed necessary to support viable unlicensed operations — will cause harmful interference to licensed mobile devices and thus undermine the value of the licensed spectrum blocks.<sup>10</sup> The *NPRM*’s proposed rules, like the *Report & Order*’s initial decision to allow such operations, are not legally sustainable or factually valid or in the public interest.

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<sup>8</sup> See *Sorenson Commc’ns Inc. v. FCC*, 755 F.3d 702, 707 (D.C. Cir. 2014) (quoting *Motor Vehicles Mfrs. Ass’n of the U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)) (agency acts arbitrarily and capriciously if it “entirely fail[s] to consider an important aspect of the problem, offer[s] an explanation for its decision that runs counter to the evidence before the agency, or [if it] is so implausible that it could not be ascribed to a difference in view or the product of agency expertise”).

<sup>9</sup> *Covad Commc’ns Co. v. FCC*, 450 F.3d 528, 550 (D.C. Cir. 2006) (agency “must respond in a reasoned manner to [comments] that raise significant problems”).

<sup>10</sup> See Coleman Bazelon, *et al.*, “Unlicensed Operations in the 600 MHz Band: Fatally Flawed Twice Over” (filed Feb. 25, 2015 in ET Docket No. 14-165 and GN Docket No. 12-268). See also n.6, *supra*.

## DISCUSSION

### **I. The Proposed 600 MHz Duplex Gap And Guard Band Operations Will Cause Harmful Interference To Licensed Mobile Services In Violation Of The Spectrum Act, The Communications Act, and the FCC's Own Part 15 Rules**

#### **A. The NPRM Relies Improperly Upon Multiple Unreasonable Assumptions**

The *NPRM's* proposed technical rules authorizing unlicensed white space devices and both unlicensed and licensed wireless microphones in the 600 MHz duplex gap and guard bands will cause harmful interference to licensed mobile operations. In fact, the FCC found that unlicensed device operation in the 600 MHz guard band will cause harmful interference at a 7 meter separation distance even when one includes multiple unreasonable assumptions.<sup>11</sup>

To get to the 7 meter separation distance, the *NPRM* assumes that all licensed mobile devices will provide 10 dB better performance than 3GPP specifications require based on one unlicensed vendor's measurement of a few LTE devices.<sup>12</sup> There are hundreds of LTE devices on the market today designed to meet 3GPP specifications. Assuming all LTE devices will provide a full order of magnitude better adjacent channel selectivity performance based upon the limited measurement of a few devices is entirely unreasonable. It also fails to account for the variability that exists due to production variations as well as operational variability associated with power supply voltage and operating temperature — each of which needs to be accounted for in any technically sound interference analysis. The *NPRM* also assumes all white space devices will be mounted at a three meter height, and assumes body losses that do not exist when the

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<sup>11</sup> See *NPRM* at ¶¶ 82-84.

<sup>12</sup> See *id.* at ¶ 84 n.127 (citing Broadcom March 4, 2014 *ex parte* filing in GN Docket No. 12-268, attachment at 2) *but see* Qualcomm May 8, 2014 Letter and Presentation (filed May 8, 2014) (explaining that Broadcom's assertion was based on measurement of a few devices, although there are hundreds of LTE device models worldwide designed to 3GPP specs, and the FCC should not rely upon such unsupported assumptions).

unlicensed device and licensed device are operated side-by-side as the FCC's proposed rules would allow.<sup>13</sup>

Thus, in setting operating parameters that will apply across the board, the *NPRM* relies improperly upon the performance characteristics and limited measurements of a handful of devices as well as signal losses that do not exist in many common use cases.<sup>14</sup> Relying on one of these technically-flawed assumptions would call into question the resulting analysis, but relying on all of them across the board completely undermines the *NPRM* and reflects improper "results oriented" decision-making, which cannot withstand judicial review.

Recognizing the impropriety of a 7 meter separation distance, the *NPRM* falls back on still other questionable factors without basis. The *NPRM* asserts that the 7 meter interference radius will be reduced because unlicensed devices use transmit power control to operate with the least amount of power to ensure successful communications; however, unlicensed vendors have claimed that the proposed 40 mW transmit power level already is the lowest level that can

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<sup>13</sup> See *NPRM* at ¶ 84. The unlicensed advocates also continue to overestimate loss conditions and engage in improper double counting. Broadcom's calculations include 3 dB of loss for antenna polarization mismatch, but this is already accounted for in using -6 dBi antenna gain for the LTE device. Broadcom also uses 3 dB of shadowing loss and 3 dB of body loss, see Broadcom Comments at 5, 26, but there are no such losses for a portable white space device that can be located less than a meter away from the LTE device. In this regard, Broadcom's use of a 2 meter separation distance also ignores the reality that unlicensed and licensed devices will be much closer than that in typical use cases.

Additionally, Broadcom pretends that the mobile LTE UE receive filter reduces the level of the interfering white space device, see Broadcom Comments at 12, but this is not how interference calculations are properly carried out. The receive level at the LTE UE is the transmit level less the signal propagation loss. The filter loss characteristic is used to determine blocking performance. Using filter loss to also lower the receive level is another example of improper double counting. Microsoft and Google rely on Broadcom's analysis and overlook all of these errors.

<sup>14</sup> See, e.g., Broadcom Comments at 13.

support successful communications. The test results provided in Section I.B of Qualcomm's opening comments demonstrate that unlicensed power levels need to be much lower than this to avoid harmful interference, which is why we have maintained that unlicensed operations should not be inserted in the duplex gap or guard bands.

The *NPRM* claims next that licensed operations that suffer interference can move to other spectrum bands, but this not only disadvantages new entrants and smaller entities who lack license rights in other spectrum bands, but it also is total speculation even for those who do have other bands because the FCC has no way of knowing whether there is sufficient capacity in those other bands for a particular user. More importantly, the FCC's reasoning not only acknowledges that harmful interference will occur, but it grants unlicensed users priority access rights over licensed users in violation of the Communications Act, the Spectrum Act, and FCC rules. Indeed, "there is simply no basis to convert the obligation of Part 15 devices not to cause harmful interference to licensed services — here, a very specific statutory obligation — into a shared-responsibility requirement."<sup>15</sup>

Accordingly, the *NPRM's* analysis is technically unsound and legally infirm.

**B. Detailed Technical Analyses And Testing Show That Unlicensed White Space And Wireless Microphone Operations In The 600 MHz Band Duplex Gap And Guard Bands Will Cause Harmful Interference To Licensed Services**

*Qualcomm Analysis.* Qualcomm has filed multiple detailed interference analyses in this proceeding demonstrating that unlicensed device operations within the 600 MHz duplex gap or guard bands at levels proposed in the *NPRM* will result in harmful interference to licensed mobile LTE services.<sup>16</sup> These analyses reflect the industry accepted practice that good

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<sup>15</sup> TIA Comments at 7.

<sup>16</sup> See Qualcomm Reply Comments (Mar 12, 2013, refiled with corrected page numbers on Apr. 3, 2013, "Qualcomm Reply Comments") at iv, 4-17. Qualcomm also submitted multiple

electromagnetic compatibility requires a one meter separation distance between unlicensed devices and licensed mobile user equipment. Indeed, it is an understatement to say that 4G LTE licensed operations and unlicensed Wi-Fi operations often occur in very close proximity.

Qualcomm showed that a 600 MHz unlicensed device transmitting at 40 mW EIRP and providing 55 dBc of adjacent channel attenuation (*i.e.*, the levels proposed in the *NPRM*) will cause harmful interference to a 600 MHz licensed mobile receiver located up to 19 meters or 62 feet away.<sup>17</sup> This means that mobile phones cannot use the 600 MHz licensed spectrum adjacent to the duplex gap and guard bands if the mobile user is in the same room as an unlicensed device operating in the 600 MHz duplex gap or guard bands (or in an adjacent room) because the licensed mobile device operations will be blocked by the unlicensed device operation.

***CEA Analysis.*** To date, the FCC has completely overlooked a lengthy technical study from the Consumer Electronics Association that examines the potential inter-service interference scenarios in the 600 MHz band among TV broadcast operations, TV receivers, licensed mobile base stations and LTE User Equipment (“UEs”), unlicensed TV white space devices, wireless microphones, and radio astronomy, among others.<sup>18</sup> CEA’s comprehensive study found

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technical papers responding to an unlicensed vendor’s claims that unlicensed operations in the duplex gap and guard bands would not impact the adjacent licensed spectrum blocks. Qualcomm showed that the vendor was, *inter alia*, using inapplicable signal propagation models, incorrectly calculating filter losses, and assuming nonexistent signal losses. *See* Qualcomm Letter and Presentation (filed Feb. 19, 2014); Qualcomm Letter and Presentation (filed Apr. 3, 2014); Qualcomm Letter and Presentation (filed May 8, 2014); Qualcomm Letter and Presentation (filed Aug. 5, 2014).

<sup>17</sup> *See* Qualcomm Reply Comments at 8-10.

<sup>18</sup> *See* CEA Technical Paper, “Protection Bands and Potential Interference at 600 MHz” (filed Dec. 16, 2013) linked [here](#).

unlicensed white space device operations in the duplex gap and guard band to present a significant and unresolvable interference risk to licensed mobile operations.<sup>19</sup>

Indeed, CEA found the unlicensed white space device to licensed mobile UE interference scenario to be the “most significant problem identified” that “will prevent the LTE UE receiver from receiving incoming signals”<sup>20</sup> and “could cause shut down of [the] LTE UE in proximity to TVWS UE.”<sup>21</sup> The CEA study found that “unlicensed devices generally cannot operate in the guard bands above unacceptably low transmission power thresholds without the potential for harmful overload or OOB interference to adjacent-channel end-user broadband equipment, unless the ‘victim’ equipment is designed to exceed accepted performance levels by a wide margin.”<sup>22</sup> The *NPRM*, like the *600 MHz Report & Order* that authorized such duplex gap and guard band operations, completely misses these critical and material findings.

***Qualcomm Testing.*** Qualcomm performed interference testing with commercially-available LTE devices and unlicensed white space and wireless microphone operations in the 600 MHz duplex gap and guard bands as requested in the *NPRM*.<sup>23</sup> Qualcomm’s tests, which followed the technical rules proposed in the *NPRM*, confirm Qualcomm’s earlier technical analyses and conclusions.<sup>24</sup>

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<sup>19</sup> CEA notes also that “the *NPRM* provides no support, evidence, or analysis showing that [licensed wireless microphone] operations could safely operate without causing harmful interference to mobile broadband operations.” CEA Comments at 6-7.

<sup>20</sup> *Id.* at 35.

<sup>21</sup> *Id.* at 55.

<sup>22</sup> *Id.* at 6.

<sup>23</sup> *See NPRM* at ¶ 82.

<sup>24</sup> *See Qualcomm Comments* (filed Feb. 4, 2015) at 8-12.

Qualcomm used FCC- and IEEE-compliant white space device waveforms to model the impact on the proposed duplex gap and guard band operations on a 10 MHz LTE channel. Qualcomm ran four discrete sets of tests modeled after the FCC's proposals with each of six different LTE handsets that support 3GPP Band 20. In our view, Band 20 is the most analogous band to the new 600 MHz band because both bands have an 11 MHz duplex gap and are reverse duplex bands.

The testing showed that: (i) the proposed white space operations in the duplex gap will cause harmful interference to licensed mobile handsets up to 18 meters or 59 feet away; (ii) the proposed licensed wireless microphone operations in the duplex gap will cause harmful interference to licensed mobile handsets located up to 69 meters or 226 feet away;<sup>25</sup> (iii) the proposed white space operations in the guard band below the mobile downlink spectrum will cause harmful interference to licensed mobile handsets located up to 29 meters or 95 feet away; and (iv) when a white space device and a wireless microphone are simultaneously operating inside the duplex as the proposed rules allow, the harmful interference range increases. It also is important to note that if multiple unlicensed white space devices and wireless microphones are operating near a licensed mobile device — which can happen as the *NPRM* proposes no means of restricting such operation — the harmful interference range increases.

This testing also demonstrates that the FCC's proposed -55 dBc OOB level is woefully insufficient to achieve good electromagnetic compatibility and prevent harmful interference. While much greater attenuation of OOB is necessary, the technical viability of a handheld white space device even meeting a -55dBc OOB limit is dubious because the required tolerance

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<sup>25</sup> The greater interference impact of the wireless microphone operations is due in large part to the decreased frequency separation to the licensed mobile downlink spectrum.

on the band center and bandwidth are at or beyond the limits of available technology, and the required narrow bandwidth results in high insertion loss that has a detrimental impact on device battery life and sensitivity.

***V-COMM Testing.*** V-COMM performed testing with commercially-available LTE devices operating in the 3GPP Band 12 (699-716 MHz and 729-746 MHz). V-COMM determined Band 12 to be representative of the 600 MHz mobile band plan because it is the closest in operating frequency range and has a similar duplex gap (13 MHz as compared to 11 MHz). V-COMM tested a total of 10 Band 12 LTE devices: eight smartphones and two tablets from four different device manufacturers.<sup>26</sup>

When testing for LTE receiver blocking at 1 dB desense interference threshold, V-COMM found that white space device and wireless microphone operations in the duplex gap at the power levels proposed in the *NPRM* would cause interference to licensed mobile LTE devices located up to 21 meters or 69 feet away.<sup>27</sup> V-COMM also found that white space device and wireless microphone operations in the guard band require larger buffers and much lower radiated power than what the *NPRM* proposes in order to avoid causing harmful interference to the mobile LTE device.<sup>28</sup>

V-COMM also tested for the intermodulation interference and found that LTE devices operating on channels that are non-adjacent to the duplex gap or guard bands suffer harmful

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<sup>26</sup> See CTIA Comments at 8, V-COMM Test Results at 3-4.

<sup>27</sup> See V-COMM Test Results at 76.

<sup>28</sup> See *id.* at 78.

interference at levels similar to the receiver blocking interference.<sup>29</sup> Thus, the proposed white space and wireless microphone operations will affect multiple mobile downlink spectrum blocks.

V-COMM also measured the impact of the OOB from white space and wireless microphone in the duplex gap and guard bands and found that the NPRM's proposed OOB limits for white space and wireless microphone operations are 32 dB less stringent than what is necessary to protect LTE devices to a 1 dB desense interference threshold.<sup>30</sup> V-COMM found that the FCC's proposed OOB limit would cause 26 dB of desensitization to LTE devices located 1 meter away, which is "a significant level of interference that significantly degrades LTE service, and impairs coverage and performance for all LTE devices within the area."<sup>31</sup>

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As the preceding analyses and test results convincingly demonstrate, the *NPRM's* proposals to allow white space and wireless microphone operations in the duplex gap and guard bands should not be enacted because they will cause harmful interference to licensed mobile operations.

**C. Unlicensed White Space Operations And Wireless Microphones Will Suffer Interference From Licensed 600 MHz Mobile Operations**

The *NPRM* completely ignores the fact that licensed mobile operations will interfere with unlicensed white space devices and wireless microphone operations in the duplex gap and guard bands at even greater distances. Although unlicensed operations must accept any and all interference from licensed services, one has to question the utility of authorizing white space

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<sup>29</sup> See *id.* at 80.

<sup>30</sup> See *id.* at 82.

<sup>31</sup> See *id.* V-COMM also tested the impact of multiple interfering devices upon an LTE device and found that the licensed devices are 1-2 dB more sensitive on average with two interferers. See *id.* at 88.

device and wireless microphone operations in the duplex gap and guard bands that also will suffer harmful interference when a 600 MHz mobile device is operating anywhere within 140 meters, or 1.5 times the length of a football field.

This problem, which is not even acknowledged in the *NPRM*, is implicitly acknowledged by the unlicensed advocates in their opening comments who propose a revised structure that provides a 1 MHz buffer between the licensed mobile uplink spectrum and the unlicensed white space device operations in a 6 MHz band and then a 4 MHz band for licensed wireless microphones directly adjacent to the licensed mobile downlink spectrum.<sup>32</sup> The revised duplex gap structure, which moves white space operations and wireless microphones closer to the licensed mobile downlink spectrum, will cause greater harmful interference to licensed mobile services than the *NPRM*'s proposal, and, like the *NPRM*'s proposal, must be rejected.

**D. Inserting Unlicensed Operations In The 600 MHz Mobile Band Violates The Law And It Undermines The Core Goals Of Incentive Auction Proceeding**

The placement of unlicensed white space operations within the duplex gap and guard bands has a detrimental impact on all five policy goals that the FCC identified to support the framework for adopting a wireless band plan: utility, certainty, interchangeability (*i.e.*, fungibility), quantity, and interoperability.<sup>33</sup> Although the Commission recognizes that guard bands are needed to “protect[] against harmful interference” and thus “ensure that the 600 MHz

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<sup>32</sup> See, *e.g.*, Broadcom Comments at 2-3, 19. As Google concedes in proposing the revised structure, “LTE uplink signals originate from handsets themselves and, therefore, pose the greatest interference risk indoors, where white space devices are likely to also operate.” Google Comments at 17. The unlicensed advocates’ proposed 1 MHz buffer between the licensed mobile uplink and white space operations, while exacerbating the harmful interference caused to licensed services, will not protect the white space devices from interference.

<sup>33</sup> See *600 MHz Report & Order* at ¶ 41; see also *600 MHz NPRM* at ¶ 125.

spectrum blocks [offered] in the forward auction are as interchangeable as possible,”<sup>34</sup> it approved the placement of unlicensed white space device operations within the guard bands and duplex gap that — under the technical rules proposed in the *NPRM* — destroys such interchangeability. Unlicensed devices operating under the parameters set out in the *NPRM* will impair the adjacent licensed mobile spectrum blocks and thus impact the utility of the 600 MHz band for mobile broadband use, introduce additional uncertainty into the auction process and success of the band, impact interchangeability, lower the quantity of unimpaired spectrum, and may well introduce interoperability challenges. The Commission should not permit unlicensed devices in the duplex gap and guard bands in light of the serious harm it wreaks upon the core goals of this proceeding.

Moreover, the *NPRM*'s proposals violate the Spectrum Act, the Communications Act, the FCC's Part 15 Rules<sup>35</sup> as well as the Administrative Procedure Act (“APA”).<sup>36</sup> Like the *600 MHz Report & Order*, the *NPRM* recognizes that the Spectrum Act “conditions unlicensed use of guard band spectrum on not causing harmful interference to licensed services,”<sup>37</sup> yet it proposes to authorize the operation of unlicensed devices in the 600 MHz band overlooking detailed interference studies and without serious review of multiple parties' detailed showings in the docket that such interference will occur. Detailed test data provided in the opening comments by CTIA and Qualcomm based upon measured results with commercially-available LTE products

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<sup>34</sup> *600 MHz Report & Order* at ¶ 89.

<sup>35</sup> *See* 47 C.F.R. § 15.5.

<sup>36</sup> The APA, 5 U.S.C. § 551 *et seq.*, provides that a court reviewing agency action shall consider the whole administrative record that was before the agency when it made its decision.

<sup>37</sup> *600 MHz Report & Order* at ¶ 268 n.805 (citing § 6407(e) of the Spectrum Act). *See also NPRM* at ¶¶ 79, 86, 99, & 162.

buttress the technical showings in the docket that the *NPRM's* proposed duplex gap and guard band operations will result in harmful interference to licensed services. These are real-world analyses using representative use cases. “Ignoring important arguments and evidence,” such as these analyses and test data, would be arbitrary and capricious in violation of the APA.<sup>38</sup> Courts have consistently required agencies to consider all relevant factors when engaging in notice-and-comment rulemaking pursuant to section 553 of the APA.<sup>39</sup> That has not yet been done here.

**E. Authorizing Licensed Wireless Microphones In The Duplex Gap Violates The Spectrum Act And Lacks Record Support**

The decision in the *600 MHz Report & Order* to permit *licensed* wireless microphone operations in the duplex gap along with unlicensed white space devices<sup>40</sup> was made without any record support and in violation of the Spectrum Act, which only permits *unlicensed* operations in those bands if they do not cause harmful interference to licensed mobile services. That decision also should be withdrawn because, as shown above, the proposed licensed wireless microphone usage in the duplex gap will cause harmful interference to licensed mobile operations.

In fact, no party advocated in favor of allowing the two disparate types of operations (*i.e.*, licensed wireless microphones and unlicensed white space operations) simultaneously in separate portions of the duplex gap.<sup>41</sup> Even supporters of allowing white space devices in the duplex gap and guard bands advocated against also inserting wireless microphone operations in those

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<sup>38</sup> See *David Ortiz Radio Corp. v. FCC*, 941 F.2d 1253, 1260 (D.C. Cir. 1991).

<sup>39</sup> See *Motor Vehicles Mfrs. Ass'n of the U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (agency decision is arbitrary and capricious if it fails “to consider an important aspect of the problem”).

<sup>40</sup> See *600 MHz Report & Order* at ¶ 314.

<sup>41</sup> See *id.* at ¶ 314 n. 953.

bands.<sup>42</sup> This is because these disparate types of operations will unquestionably interfere with each other (as well as licensed mobile services as discussed above).

In sum, this decision must be withdrawn because it violates the Spectrum Act, which does not permit the FCC to insert a *licensed service* inside the duplex gap or guard bands. Under the law, only unlicensed operations may be permitted and only to the extent that they do not cause harmful interference to licensed mobile operations.

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<sup>42</sup> See Broadcom May 2, 2014 Letter, item 4, in GN Docket No. 12-268.

## CONCLUSION

For the foregoing reasons, the FCC should not authorize unlicensed white space devices and wireless microphones in the duplex gap or guard bands. The record demonstrates that the operations proposed in the *NPRM* cannot be inserted into the 600 MHz duplex gap and guard bands without causing harmful interference to the licensed mobile services in violation of the Spectrum Act and the FCC's longstanding Part 15 rules. Moreover, the proposed duplex gap and guard band operations will suffer interference from licensed mobile services. Thus, the proposals in the *NPRM* are not technically feasible, legally sustainable, or in the public interest.

Respectfully submitted,

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