

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

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| In the Matter of |) | |
| |) | |
| LightSquared Subsidiary LLC |) | IB Docket No. 11-109 |
| |) | |
| Request for Modification of its |) | |
| Authority for an Ancillary Terrestrial |) | SAT-MOD-20101118-00239 |
| Component |) | |
| |) | |

COMMENTS OF DEERE & COMPANY

Deere & Company (“Deere”), by its undersigned attorneys, and pursuant to the February 15, 2012 *Public Notice* in the above-captioned docket,¹ hereby submits comments on the issues and tentative conclusions reached by the Federal Communications Commission (“FCC” or “Commission”) in response to recommendations made by the National Telecommunications and Information Administration (“NTIA”) in a letter² concerning the *Conditional Waiver Order* granted by the Commission on January 26, 2011.³

**I. DEERE SUPPORTS THE DECISION TO VACATE LIGHTSQUARED’S
CONDITIONAL WAIVER ORDER GRANTED JANUARY 26, 2011**

Deere concurs with the Commission's conclusion that the Interference Resolution Process (“IRP”) provided for in the *Conditional Waiver Order* has not been successfully completed and LightSquared has not resolved interference concerns regarding the harmful impact of its

¹ See FCC Public Notice, “International Bureau Invited Comment on NTIA Letter Regarding LightSquared Conditional Waiver,” DA 12-214, IB Docket No. 11-109, released February 15, 2012 (setting Comment deadline of March 1, 2012) (“*Public Notice*”).

² See Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information, U.S. Dept. of Commerce, to Julius Genachowski, Chairman, FCC (dated Feb. 14, 2012) (“*NTIA Letter*”).

³ See *LightSquared Subsidiary LLC*, 26 FCC Rcd 566 (IB 2011) (“*Conditional Waiver Order*”).

proposed terrestrial network on Global Positioning System (“GPS”) receivers. Therefore, LightSquared has not satisfied the express prerequisite established by the FCC in the *Conditional Waiver Order* for the commercial operation of terrestrial network facilities in L-band mobile satellite service (“MSS”) spectrum. Accordingly, the Commission’s decision to vacate the conditional authority granted under the waiver order is both appropriate and necessary to protect the integrity of the United States GPS system and the hundreds of millions of government and commercial and individual civilian users that rely on GPS.

The *Conditional Waiver Order* states that the Interference Resolution Process “will be complete once the Commission, after consultation with NTIA, concludes that the harmful interference concerns [raised by GPS interests] have been resolved.”⁴ After a comprehensive testing and technical evaluation process most recently undertaken by the government, open and transparent to LightSquared, including LightSquared’s direct participation, and confirmed by peer review, the interference concerns regarding LightSquared’s proposed network have been scientifically and empirically validated, and LightSquared’s proposed mitigation solutions have been discredited or proven ineffective. Extensive laboratory and field testing undertaken by the National Space-Based Positioning, Navigation and Timing Systems Engineering Forum (“NPEF”) and radiofrequency modeling conducted by the Federal Aviation Administration (“FAA”) to evaluate the impact of LightSquared’s proposed terrestrial network on GPS receivers and GPS-based devices found that LightSquared’s revised “Low 10 MHz” network causes inmitigable significant interference to Personal/General Navigation and Aviation receivers. Specifically:

- During testing undertaken during the latter half of 2011, the NPEF found that 69 of 92 personal/general navigation receivers (or approximately 75%) under test

⁴ *Conditional Waiver Order* at ¶43.

experienced harmful interference in the presence of LightSquared's "Low 10 MHz" signal.⁵

- The FAA determined during its modeling of LightSquared's proposed "Low 10 MHz" proposed signal that critical flight-safety systems that rely on GPS navigation, including Terrain Awareness and Warning Systems ("TAWS"), would experience harmful interference.⁶

In keeping with sound engineering principles, the NPEF tests were subject to rigorous review by the Idaho National Laboratories and Massachusetts Institute of Technology Lincoln Laboratory, both of which determined that the test methods and findings were appropriate, and that the NPEF conclusion that a "Low 10 MHz" signal results in harmful interference to GPS receivers was scientifically sound.⁷ Further, the NPEF results are consistent with the conclusions of the Technical Working Group ("TWG"), a collaboration of more than 100 participants, co-chaired by LightSquared, that tested the impact of LightSquared's original proposal on seven (7) classes of GPS receivers over four (4) months in 2011.⁸ The June 2011 TWG report also found that the LightSquared signal caused significant interference to GPS receivers used in Personal/General Navigation applications.⁹

Given that the implementation of the revised "Low 10 MHz" signal, LightSquared's principal and only potentially viable real-world mitigation technique proposed to date,¹⁰ proved ineffective during tests involving Personal/General Navigation and Aviation receivers, the NPEF

⁵ See NPEF Study, Follow-on Assessment of LightSquared Ancillary Terrestrial Component Effects on GPS Receivers, § 5.1.1.2, at 32 (Public Version, released January 18, 2012) ("*NPEF January 2012 Study*").

⁶ U.S. Department of Transportation, FAA, "Status Report: Assessment of Compatibility of Planned LightSquared Ancillary Terrestrial Component Transmissions in the 1526-1536 MHz Band with Certified Aviation GPS Receivers," Exec. Summary, at ii ("*FAA Report*").

⁷ *NPEF January 2012 Study*, § 1.3, at 3.

⁸ See Working Group Final Report, SAT-MOD-20101118-00239 (dated June 30, 2011) ("*TWG Final Report*").

⁹ See, e.g., *Id.* at 142.

¹⁰ LightSquared's proposal to limit the power-on-the-ground of its base station network to -30 dBm was deemed infeasible by government agencies involved in interference mitigation testing.

recommended that NTIA undertake no further testing on highly sensitive classes of receivers more prone to harm from high power signals in the 1525-1559 MHz band, including High Precision receivers. Summing up its conclusions, NTIA stated that the “use of [L-band MSS spectrum] for terrestrial services is not viable due to significant systems engineering and integration challenges.”¹¹ The FAA separately concluded that LightSquared’s “proposed [terrestrial] network is not compatible with FAA requirements for operations dependent on GPS receivers at low altitudes in the vicinity of [terrestrial] transmitters.” Based on the data and analysis provided by the NPEF and FAA in January 2012, the NTIA appropriately “conclude[d] that LightSquared’s proposed mobile broadband network will impact GPS services and that there is no practical way to mitigate the potential interference at this time.”¹²

The NPEF conclusion that the LightSquared proposed network is fundamentally incompatible with even Personal/General Navigation GPS receivers does not reflect other interference issues that also remain unresolved. Even if a viable mitigation solution had been identified during government testing for Personal/General Navigation and Aviation receivers, which is not the case, LightSquared has not demonstrated that it has addressed the potential for severe interference to more sensitive high-precision GPS receivers used in important government and civilian applications. “All parties, including LightSquared, have agreed that LightSquared’s operations in the lower 10 MHz signal will cause unacceptable interference to the high-precision receivers tested by the TWG.”¹³ Further, LightSquared handsets operating in the 1626.6-1660.5

¹¹ NPEF January 2012 Study, § 5.1.1.2, at 30-31.

¹² NTIA Letter at 1.

¹³ See Letter from Lawrence E. Strickling, Assistant Secretary for Communications and Information, U.S. Dept. of Commerce, to William Lynn, Deputy Secretary, U.S. Department of Defense and John Porcari, Deputy Secretary, U.S. Department of Transportation (dated Sep. 13. 2011).

MHz band created significant OOB interference for GPS receivers during testing.¹⁴ In addition, LightSquared has also not addressed the co-channel interference with Part 25 L-band satellite receivers that will occur under both LightSquared's initial and revised plans.¹⁵ Finally, the FCC has also yet to fully evaluate what protections are necessary to ensure the integrity of wideband signals used by future GNSS systems, including Galileo and Compass.

Given the lack of near-term and readily implementable mitigation techniques capable of making LightSquared's proposed network compatible with the classes of GPS device the government has already tested, and the many unknowns regarding other interference issues, Deere supports the Commission's proposed decision to accept NTIA's recommendation and vacate the *Conditional Waiver Order*.

II. DEERE AGREES WITH THE DECISION TO SUSPEND LIGHTSQUARED'S ANCILLARY TERRESTRIAL COMPONENT AUTHORITY

The Commission has always recognized the need for terrestrial stations operating in the MSS L-band to protect against interference to GPS systems.¹⁶ In the decisions developing the ATC concept, while the FCC elected not to micromanage construction of ATC systems and thus gave MSS licensees flexibility to decide precisely how to implement their networks, the FCC did not alter its directive that terrestrial MSS emissions would need to be "carefully controlled in order to avoid interfering with GPS receivers."¹⁷ Given that ATC base station emissions as contemplated by LightSquared in the 1525-1559 MHz band and even in a "Low 10 MHz"

¹⁴ See *NPEF January 2012 Study* § 5.1.1.3, at 31.

¹⁵ Assumptions of self-interference protection would not apply if the terrestrial service is no longer integrated with the MSS service.

¹⁶ See *Flexibility for Delivery of Communications by Mobile Satellite Service Providers*, 18 FCC Rcd 1962, at ¶ 124 (2003) ("*MSS Flexibility Order*").

¹⁷ *Id.*

configuration, have proven in comprehensive testing to be incompatible with GPS and GNSS receivers, Deere supports the indefinite suspension of L-band ATC authority. Testing over the past year leads to the inescapable conclusion that operation of a high power terrestrial network in the L-Band that is capable of such widespread interference to U.S. infrastructure is not viable.

Deere is committed to working with the Commission and other spectrum stakeholders on spectrum issues relevant to GPS, and continues to support Commission efforts to improve spectrum efficiency, provided that such initiatives do not degrade the performance of GPS and future GNSS receivers and constellation signals. To that end, Deere participated in the Commission's recent workshop examining complex and challenging issues of receiver performance and efficiency conducted during March 12 and 13. Deere looks forward to further contributing to the Commission's analysis and consideration of relevant spectrum-related matters in the future.

III. THE COMMISSION'S DECISION IS BASED ON A ROBUST TECHNICAL RECORD AND AMPLE PUBLIC NOTICE AND COMMENT

The record in IB Docket No. 11-109 and ET Docket No. 10-42 is replete with extensive technical data and analysis to support the Commission's tentative decision to vacate the authority granted in the *Conditional Waiver Order* and to indefinitely suspend LightSquared's ATC authority.

The expansive technical record includes irrefutable evidence of severe potential interference to GPS developed under LightSquared's co-leadership of and direct participation in the FCC-mandated TWG, which involved testing on a huge scale at state-of-the-art anechoic chambers and test sites throughout the country, and ultimately generated a 600+ page report supported by extensive complementary technical exhibits. TWG testing, which included a wide cross-section of hardware manufacturers, wireless companies, U.S. military personnel,

government agencies (federal, state and local), satellite companies and technical consultants, including LightSquared's network partner Sprint-Nextel, demonstrated that all classes of GPS receiver experienced devastating harmful interference when exposed to LightSquared's various proposed ATC network configurations.¹⁸ Specifically:

- The Aviation Sub-team concluded that LightSquared's proposed deployment plan was "incompatible with aviation GPS" and "would result in a complete loss of GPS operations... over a large radius" near LightSquared base stations.¹⁹
- The Cellular Sub-team found that LightSquared signals "caused GPS failure for a significant number of the tested devices."²⁰
- The Personal/General Navigation Sub-team concluded that "all phases of the LightSquared deployment plan will result in widespread interference to GPS signals and service and that mitigation is not possible."²¹
- The High Precision, Timing and Networks Sub-team, co-chaired with Deere technical experts, found widespread harmful interference "over long ranges," determined that no mitigation technique is available for protecting the installed base of diverse receivers from LightSquared interference, and concluded that "no currently available receiver, filter, antenna or other mitigation technology would enable the construction of *future* wideband High-Precision, Timing or Network GPS receivers and augmentation systems that are compatible" with LightSquared's proposed network deployment plan.²²
- The Spaced Based Sub-team determined that interference from LightSquared to its receivers "would be severely disruptive to NASA's science mission based on the test and analysis conducted in the TWG."²³

¹⁸ LightSquared originally proposed a phased implementation of its terrestrial broadband network. Phase 0 involved the operation of a single 5 MHz LTE signal centered at 1552.7 MHz, Phase 1 involved operation of a pair of 5 MHz LTE signals centered at 1552.7 MHz and 1528.8 MHz, and Phase 2 involved a operation of a pair of 10 MHz LTE signals centered at 1550.2 MHz and 1531.0 MHz.

¹⁹ *TWG Final Report*, at 27.

²⁰ *TWG Final Report*, at 55.

²¹ *TWG Final Report*, at 122. (LightSquared dissented with regard to the conclusions reached by the General Location / Navigation Sub-team, disagreeing with the broader team's definition of harmful interference, and arguing that incorporating new filters into GPS devices may help alleviate interference. LightSquared did not provide actual filter designs.)

²² *TWG Final Report*, at 181. (LightSquared dissented with regard to mitigation techniques for future high precision receivers, arguing that certain mitigation strategies or a combination of strategies *might* be feasible. LightSquared provided no scientific data to support its recommendations.)

²³ *TWG Final Report*, at 300.

The harmful interference revealed during the LightSquared-led TWG test effort did not occur at trivial distances. The receivers under test experienced harmful interference at dramatic ranges that would occur routinely during real-world operations. For example, high precision receivers, the class of GPS receivers that are used throughout and are integral to today's agricultural sector, were disrupted at distances of up to 22 kilometers.²⁴ Space-Based GPS receivers were affected at distances of several hundred kilometers.²⁵

The Commission procedures following the release of the *Conditional Waiver Order* on January 26, 2011, included ample public notice of proposed Commission actions or conclusions and public input. Examples include monthly on-the-record progress reports from the TWG proceedings, publication of the voluminous TWG report and LightSquared's simultaneously released Supplemental Recommendations both of which were the subject of full public comment, and publication of the NTIA/NPEF plan for supplemental testing. The record reflects extensive *ex parte* written submissions and oral presentations many of which were commented on in further *ex parte* filings. Indeed, Commission records indicate that 3,819 public filings were made in Docket 11-109, alone, between January 26, 2011 and February 15, 2012.

The technical record includes test data developed during government-led NPEF testing further undertaken during the latter half of 2011 at Space and Naval Warfare Systems Command laboratories in San Diego, California and the Army Electromagnetic Vulnerability Assessment Facility at the White Sands Missile Range in New Mexico. LightSquared was also involved in the NPEF test effort (with the exception of discrete tests involving classified government receivers) which generated damaging interference test data and findings discussed above in

²⁴ See *TWG Final Report*, at 251.

²⁵ See *TWG Final Report*, at 300.

Section I, including the conclusion by the NPEF that approximately 75% of all Personal/General Navigation receivers still experience harmful interference in the presence of LightSquared’s revised “Low 10 MHz” signal.²⁶ The FAA contributed its extensive analysis to the FCC record as well regarding LightSquared’s proposed impact on Aviation receivers, finding that the proposed “Low 10 MHz” signal would create harmful interference for critical flight-safety systems such as TAWS.²⁷

The technical record is not only extensive, it is also balanced and impartial. LightSquared itself led the TWG test effort, and can therefore not credibly assert that TWG test methodologies or processes were somehow biased or otherwise compromised. LightSquared also was present for and contributed to the government testing.²⁸ The government testing withstood rigorous peer review by the Idaho National Laboratories and Massachusetts Institute of Technology (“MIT”), ensuring that the testing would be beyond reproach. The Idaho National Laboratories observed the NPEF tests and independently reviewed and validated the NPEF test methodology, test implementation and the data yielded from the tests.²⁹ The MIT Lincoln Laboratory conducted an independent peer-review and engineering assessment of the NPEF test effort, determining that the NPEF’s “[f]indings support [the] conclusion that Lower 10 MHz LightSquared signal results in harmful interference to [the] majority of GPS devices tested.”³⁰

While further testing would give the Commission more granular insight into the range, scope and specific levels at which LightSquared’s base station signal creates harmful

²⁶ See *NPEF January 2012 Study*, § 5.1.1.2, at 30-31

²⁷ See *FAA Report*, Exec. Summary, at ii.

²⁸ See, e.g., *NPEF January 2012 Study*, § 3.2.2.1, at 7 (Multiple engineers from LightSquared participated in the NPEF tests and the company supplied equipment for the test effort, including filters and antennas used to simulate its Low 10 MHz signal).

²⁹ See *NPEF January 2012 Study*, § 1.3, at 3.

³⁰ See *Id.*

interference for other more sensitive classes of receivers (*e.g.*, NPEF tests did not involve augmented high-precision receivers), the current record demonstrates conclusively that all variants of LightSquared’s proposed plan to operate a high power terrestrial network in the 1525-1559 MHz band, including its “Low 10 MHz” signal, pose an unacceptable and widespread interference threat to millions of GPS receivers and GPS-enabled devices.

CONCLUSION

For the reasons set forth above, Deere supports the Commission’s proposed vacatur of the Conditional Waiver and indefinite suspension of LightSquared’s ATC authority.

Respectfully submitted,

/s/

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March 16, 2012

CERTIFICATE OF SERVICE

I, Tim Bransford, hereby certify that on March 16, 2012, I have caused a copy of Deere & Company's Comments to be served via U.S. Mail on the following:

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