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

In the Matter of Petition for Rulemaking of Lockheed Martin Corporation: Amendment of Part 15 to Enable More Flexible RFID Use in the 433 MHz Band	RM - 11651

REPLY COMMENTS OF LOCKHEED MARTIN CORPORATION

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I. Introduction and Summary.

Lockheed Martin Corporation ("Lockheed Martin") hereby files reply comments in support of its proposal to enable more flexible operations for radio frequency identification ("RFID") systems in the 433 MHz band.[1] As Lockheed Martin explained in its Petition for Rulemaking, the Federal Communications Commission ("Commission" or "FCC") can enable more intensive and efficient use of scarce spectrum resources, promote the growth of the U.S. RFID industry, and enable new, more advanced RFID applications by amending its rules to enable manufacturers and users to take advantage of modern, robust communications protocols.

Importantly, IEEE 802.18, the technical advisory group for the IEEE Local and Metropolitan Area Networks Standards Committee, has endorsed Lockheed Martin's proposed rule changes.[2] However, ARRL, the National Association for Amateur Radio ("ARRL") has opposed Lockheed Martin's request.[3] ARRL also objected to past FCC efforts to enable RFID systems at 433 MHz. In fact, much of ARRL's opposition takes issue with the FCC's 2004 Order approving certain RFID operations at 433 MHz under Section 15.240 rather than Lockheed Martin's proposal, arguing that the FCC's action was unsupported by the record.[4] It is surprising, therefore, that ARRL now argues against allowing a proceeding through which the FCC can establish a record on which to evaluate the proposed rule changes. Instead of allowing a thorough

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1 Petition for Rulemaking of Lockheed Martin Corporation, RM-11651 (filed Oct. 11, 2011) ("Petition").

2 *See generally* Comments of IEEE 802.18, RM-11651 (filed Jan. 25, 2012) ("IEEE Comments"). Lockheed Martin's proposal is similarly supported by Guard RFID Solutions Inc., an RFID manufacturer that has been actively involved in standards development in the 433 MHz band. *See generally* Guard RFID Solutions Inc. Response to ARRL Comments on Lockheed Martin Corporation Petition for Rulemaking: Amendment of Part 15, RM-11651 (filed Jan. 23, 2011).

3 Comments of ARRL, The National Association for Amateur Radio, On Petition for Rulemaking, RM-11651 (filed Jan. 10, 2012) ("ARRL Comments").

4 *Id*. at 7.

examination of what would serve the public interest, ARRL asks the FCC to deny the Petition outright.[5] ARRL's objections are unfounded, and the Commission should issue a notice of proposed rulemaking to enable full consideration of Lockheed Martin's proposal, where it can properly consider any substantive concerns ARRL may raise.

II. Updating the 433 MHz RFID Rules In the Near Future Will Yield Important Benefits.

ARRL opposes even considering updates to the Commission's RFID rules because the FCC last amended its rules governing RFID operations at 433 MHz "only seven years ago."[6] As the Commission is aware, however, spectrum needs, technologies, and markets can change substantially in seven years. This certainly has been the case both for the demand for spectrum resources in the U.S. in general and for the development of RFID in specific.

The Commission has argued that advances in technology and new consumer demand over the past several years have led to a "spectrum crunch."[7] In response, the Commission has recognized the need to adapt its policies to reflect new technological capabilities and demands.[8] As Americans increase their reliance on spectrum-dependent technologies and applications (indeed, in 2010 the FCC approved nearly 12,000 separate wireless transmitters, almost four times the number of devices the Commission authorized when it began its last proceeding to amend the RFID rules), the U.S. Government has worked hard to continue to adopt regulations that allow

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5 *See id*. at 17-18.

6 *Id.* at 2.

7 *See, e.g.*, Innovation in the Broadcast Television Bands: Allocations, Channel Sharing and Improvements to VHF, *Notice of Proposed Rulemaking*, ET Docket No. 10-235, 25 FCC Rcd. 16498, 16535 (2010) (Statement of Chairman Genachowski) ("Innovation in the Broadcast Television Bands").

8 *See* Connecting America: The National Broadband Plan, Chapter 5 at 75 (2010) ("National Broadband Plan").

more intensive and efficient operations, taking into account the spectrum environment. The changes in the spectrum environment and FCC policy over the past seven years would alone support initiating a proceeding to consider Lockheed Martin's proposal to allow more efficient and intensive use of spectrum resources.

In addition, and more specifically, RFID technologies and markets have changed substantially in the past seven years. Over this period, government and private sector use of RFID-enabled wireless applications has skyrocketed. RFID technologies now constitute a multi-billion dollar market, and this market is growing rapidly.[9] For example, consistent with Lockheed Martin's petition, the FCC highlighted in the National Broadband Plan the "emergence and adoption of new technologies such as radiofrequency identification" as an important technological development.[10]

Because of the substantial technological and market changes seen in the past several years, and given the National Broadband Plan's recommendations, the FCC already has commenced several other proceedings designed to promote flexible spectrum use in the near term.[11] Lockheed Martin's proposal complements these efforts, and the Commission should act swiftly on the

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9 *See* Ex Parte Letter of Craig Mundie, Chief Research & Strategy Officer, Microsoft Corp., to Julius Genachowski, Chairman, FCC, GN Docket No. 09-51 (filed Sept. 21, 2009); *see attached* Richard Thanki, *The Economic Value Generated by Current and Future Allocations of Unlicensed Spectrum* at 7, 34 (2009).

10 National Broadband Plan at 18.

11 *See, e.g.*, Fostering Innovation And Investment In The Wireless Communications Market, *Notice of Inquiry*, GN Docket No. 09-157, 24 FCC Rcd. 11322 (2009); Innovation in the Broadcast Television Bands, 25 FCC Rcd. 16498 (2010); Promoting Expanded Opportunities for Radio Experimentation and Market Trials under Part 5 of the Commission's Rules and Streamlining Other Related Rules, *Notice of Proposed Rulemaking*, ET Docket No. 10-236, 25 FCC Rcd. 16544 (2010); Promoting More Efficient Use of Spectrum Through Dynamic Spectrum Use Technologies, *Notice of Inquiry*, ET Docket No. 10-237, 25 FCC Rcd. 16632 (2010).

Petition to ensure that users of commercial RFID technologies in the 433 MHz band can enjoy the benefits of more flexible spectrum use with no adverse impact on other users.

Notwithstanding the Commission's stated policy goals, however, ARRL maintains that the Petition identifies only "vaguely-stated advances in RFID technology" that are insufficient to support a new rulemaking request.[12] This is not so. As Lockheed Martin explained in its Petition, the proposed rule changes will enable RFID applications in the 433 MHz band that have several distinct advantages over existing systems, including support for encryption, authentication and other communications protocols that keep systems secure and reliable.[13] Security and reliability clearly are important features for commercial uses, and are especially critical for many applications envisioned by the U.S. Government. In addition, the rule changes will enable more efficient spectrum use, larger data transfers that support functions such as detailed container tag manifest lists, and implementation of RFID technology within industrial automation and control systems.[14] Customers of Lockheed Martin's subsidiary Savi Technology ("Savi") have requested these new features, and adopting these improvements will allow Savi to deploy innovative commercial asset tracking applications both for the government and in a number of commercial industries.[15]

Indeed, as IEEE 802.18 has explained in this proceeding, the 802.15 working group already has developed an amendment to the standard applicable to low-rate wireless personal area networks ("LR-WPANs") that specifically contemplates RFID operations in the 433 MHz band.[16]

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12 ARRL Comments at 17.

13 Petition at 6.

14 *Id.* at 5-6.

15 *See id.* at 4-5.

16 IEEE Comments at 1.

IEEE is also currently considering a separate amendment to this standard that is "targeted at Low Energy Critical Infrastructure Monitoring in the 433 MHz band."[17] As IEEE 802.18 observes, applications that seek to use these standards will benefit from the rule changes proposed by Lockheed Martin.[18] And ARRL itself concedes that "there is no doubt but that…additional applications for RFID systems at 433 MHz would be possible" if the Commission adopts the proposed rules.[19]

ARRL also suggests that Lockheed Martin should look to other Part 15 spectrum to meet demand for new RFID applications.[20] But as the Commission explained in 2004, "there are advantages to allowing operation in the 433 MHz band" relative to other frequencies potentially available for RFID use under Part 15.[21] These advantages include superior propagation.[22] Moreover, as the Commission has recognized, rules enabling 433 MHz RFID devices "potentially allow[] the development of RFID systems that are capable of operating in multiple countries," including operations in Europe.[23]

Nevertheless, ARRL maintains that the Commission should not even consider the potential economic benefits of increased compatibility with European operations because the "allocation status of the 420-450 MHz band is substantially different."[24] ARRL even contends that the FCC was "well aware of the extent of the RFID band in Europe" when it promulgated Section 15.240,

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17 *Id*. at 1-2.

18 *Id*. at 4.

19 ARRL comments at 13.

20 *Id.* at 12 n.16, *id*. at 17.

21 Review of Part 15 and Other Parts of the Commission's Rules, *Third Report and Order*, ET Docket No. 01-278, 19 FCC Rcd. 7484, 7494 (2004) ("Part 15 Report and Order").

22 *Id*.; IEEE Comments at 3.

23 Part 15 Report and Order, 19 FCC Rcd. at 7494.

24 ARRL Comments at 14.

and that this supports dismissal of Lockheed Martin's Petition.[25] But the FCC's 2004 rules do not preclude the Commission from considering improvements seven years later that would not interfere with incumbent operations, especially in light of additional standards development and the substantial changes in the wireless marketplace that have emerged at home and abroad since the Commission last considered the issue. Increased compatibility with European operations are in the public interest because the resulting economies of scale will enable a wide range of innovative technologies on a cost-effective basis—a particularly important consideration given increasingly limited budgets. Achieving increased compatibility therefore strongly supports initiating a proceeding to consider Lockheed Martin's proposal.

III. The Proposed Rules Will Continue to Sufficiently Protect Amateur Operations.

Lockheed Martin understands the need to accommodate incumbent users—including U.S. Government operations and amateur stations—and designed the draft rules to accomplish such protection. As a result, ARRL's claims that the proposed rule changes will not protect amateur radio are incorrect.[26] In fact, the new rules offer several improvements over existing rules for mitigating interference. Initiating a rulemaking proceeding will provide the appropriate forum for the Commission to thoroughly consider the issues raised by ARRL as well as any other potential interference questions.

ARRL maintains that Lockheed Martin's proposal amounts to a request to operate a "constant-on device" using field strength limitations similar to those permitted under Section 15.231(a) even though that rule has an "exceptionally short duty cycle."[27] This is not so. As a threshold matter, ARRL's suggestion that Section 15.231, which has been used to authorize

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[25] *Id*. at 15.

[26] *Id.* at 17.

[27] *Id.* at 4, 12.

unlicensed operations in the 433 MHz band since 1989, limits all transmissions to "one or two seconds *per hour*," is incorrect.[28] Rather, this limitation applies only to "polling or supervision transmissions…to determine system integrity of transmitters used in security or safety applications."[29] Control signals for existing systems under Section 15.231(a) do not need to conform to this limitation as long as they are not transmitted at "regular predetermined intervals."[30]

The proposed rules would, in fact, *reduce* the maximum transmission duration already permitted under Section 15.240, which allows transmissions for up to 60 seconds with a silent period of 10 seconds,[31] to a maximum duration of 10 seconds, with a 1 second silent period.[32] Importantly, the asset tag communications enabled by the proposed rules will be intermittent and aperiodic when observed over time frames of minutes to hours.[33] Indeed, the polling cycles for these applications need not occur more than a few times an hour even in active freight yard settings. If, after reviewing the record in a rulemaking proceeding, the Commission determines that it would be beneficial for the rules to reflect the intermittent nature of these operations more specifically, Lockheed Martin would be willing to examine proposals to do so; for example, by restricting the percentage of time a device may transmit averaged over a one-hour interval.

ARRL is also incorrect in asserting that operations under the proposed rules would otherwise have greater interference potential than applications that the Commission already

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28 *Id.* at 12 (emphasis in original).

29 47 C.F.R. § 15.231(a)(3).

30 *Id.*

31 47 C.F.R. § 15.240(b).

32 Petition, Appendix A at 1.

33 For example, tags typically transmit their identification numbers and other data in short packets on the order of 25 to 30 milliseconds and remain off until interrogated by a reader.

permits under Section 15.231(a). Indeed, as set forth in the Petition, Lockheed Martin's proposal offers several improvements over Section 15.231(a) for interference control, including (1) limiting field strength to the levels of Section 15.209 at the band edges compared with the spurious level of 1100 µV/m under Section 15.231—which is 14 dB higher; (2) reducing the allowed peak power approximately 6 dB below that permitted under Section 15.231, which permits peaks of 110,000 µV/m as compared to Lockheed Martin's proposed peak of 57,500 µV/m; and (3) eliminating duty cycle averaging under Section 15.35 that would have allowed higher peaks.[34] ARRL speculates that the absence of an average field strength limit in Lockheed Martin's proposal could "raise the permitted emission level by as much as 14 dB."[35] But the proposed rule explicitly disallows use of Section 15.35 to prevent any power increase beyond the stated peak of 57,500 µV/m.[36] As ARRL concedes, "[t]he new peak limit proposed by Lockheed will not result in a change of peak field strength from the present maximum specified in Section 15.240."[37] The rule changes proposed by Lockheed Martin are designed not as an attempt to circumvent previously established field strength limits, but to make it possible to implement true bi-directional communications protocols.

ARRL also opposes Lockheed Martin's request to extend permissible operations to the 433.05–434.79 MHz band rather than the existing operations permitted between 433.5-434.5 MHz under Section 15.240.[38] Specifically, ARRL maintains that such operations would result in interference to the amateur radio weak-signal sub-band at 423-433 MHz and to the Amateur Satellite Service at 435-438 MHz because the existing 500 kHz buffer between these applications

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[34] *See* Petition, Appendix A.

[35] ARRL Comments at 16-17.

[36] Petition, Appendix A.

[37] ARRL Comments at 16.

[38] *Id.* at 15-16.

and RFID operations would be reduced.[39] This objection is similarly unfounded. Although Lockheed Martin's proposal would permit operations that are closer in the band to terrestrial weak-signal operations, devices authorized under the proposed rules would also be required to comply with the field strength restrictions in the band edges set forth in Section 15.209 rather than the more liberal out-of-band limits permitted under Section 15.231.[40] As ARRL has observed, Section 15.209 prescribes the limits that apply to continuous duty devices in this frequency range.[41] Thus, there is no change from the existing rules governing out of band emission limits that currently protect the amateur bands cited by ARRL.

Finally, ARRL maintains that the proposed rule would result in "unlimited geographic area deployment and unlimited use" of RFID applications under the new rules.[42] This assertion ignores the fact that the proposed rules will continue to limit operations only to applications that "identify, locate, monitor and track commercial assets."[43] In other words, while the proposed rules would enable the development of new RFID solutions in environments that do not involve shipping containers, these applications would still be used in commercial and industrial settings. The restriction on commercial asset tracking in the proposed rule will continue to ensure that devices are never marketed to consumers as a retail product and that devices will not proliferate in residential areas where many amateur radios are operated. Moreover, although applications that are not fixed at industrial locations could pass through residential areas (e.g. if a mobile reader were used to interrogate tags on freight pallets, vehicles, or other non-fixed assets), these

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39 *Id.*

40 Petition, Appendix A.

41 ARRL Comments at 4.

42 *Id.* at 12.

43 Petition, Appendix A at 1.

operations would be transient in both time and location, resulting in an extremely low probability of interference to similarly intermittent amateur operations. Indeed, Section 15.231(a) already permits unlicensed operations at higher peak power levels in residential environments, and has done so without modern contention management such as the listen-before-talk ("LBT") protocol proposed by Lockheed Martin that would reduce the potential for interference between RFID devices and other in-band transmitters.[44] Applications authorized under that section, including automotive keyless entry systems and tire pressure monitoring systems, have been deployed in abundance for years without any apparent effect on amateur operations.

[44] ARRL suggests that Lockheed Martin's proposal relies on the premise that LBT alone is "suitable to avoid interference in lieu of virtually all of the interference mitigation provisions" that the FCC adopted in 2004. ARRL Comments at 13. As explained above, this is not the case. Moreoever, many licensed amateur radios transmit at levels much higher than 1W (or the equivalent of 126 dBμV/m at 3 meters), which means that devices using LBT would often be able to sense the presence of the incumbent at distances up to 1,000 meters. While the proposed LBT requirement would not cover every potential incumbent use case, it improves upon existing rules covering RFID operations at 433 MHz, which contain no requirement to sense the radio environment before starting transmission.

IV. Conclusion.

The rule changes proposed by Lockheed Martin will allow RFID innovators to invest in and deliver more robust and reliable technologies and services, as well as new, advanced systems using modern communications protocols, while maintaining sufficient safeguards for incumbent operations. These changes also will allow U.S. manufacturers to produce systems that are more compatible with international standards, thus enhancing U.S. manufacturers' ability to compete in the international marketplace. For the reasons stated above, Lockheed Martin respectfully requests that the Commission issue a Notice of Proposed Rulemaking to amend Part 15 of its rules to permit greater flexibility for RFID systems.

Respectfully submitted,

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Certificate of Service

The undersigned hereby certifies that on January 25, 2012, a true and correct copy of the foregoing Reply Comments of Lockheed Martin Corporation was sent by U.S. Mail, postage prepaid to:

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