

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

In the Matter of)
)
Lockheed Martin Corporation Petition for) **RM- 11651**
Rulemaking; Amendment of Part15 to Enable)
More Flexible Use of Radio Frequency)
Identification Systems in the 433 MHz Band)

To: The Chief, Office of Engineering and Technology
Via: Office of the Secretary

**COMMENTS OF ARRL, THE NATIONAL ASSOCIATION
FOR AMATEUR RADIO, ON PETITION FOR RULEMAKING**

ARRL, the National Association for Amateur Radio, also known as the American Radio Relay League, Incorporated (ARRL), by counsel and pursuant to Section 1.415 of the Commission’s Rules (47 C.F.R. § 1.415) and the *Public Notice*, Report Number 2942, released December 14, 2011, hereby respectfully submits its comments with respect to the above-captioned Petition for Rulemaking filed October 11, 2011 by Lockheed Martin Corporation (Lockheed). Lockheed proposes to substantially eliminate the interference-prevention and mitigation provisions of Section 15.240 of the Commission’s rules governing unlicensed, high-power Radio Frequency Identification (RFID) systems in the 433 MHz range. The rules proposed for elimination were imposed recently -- in 2004 -- in order to permit high-power, virtually continuous-duty RFID systems for commercial package tracking and inventory, while providing some small modicum of interference protection for incumbent radio services operating in the 420-450 MHz band. These incumbent services include government radiolocation systems and Amateur Radio stations. The band is also used by true periodic radiators such as garage door openers,

operating pursuant to Section 15.231 of the Commission's Rules, which are widely deployed. In the interests of the Amateur Radio Service in conducting effective emergency and public service communications without harmful interference in the 420-450 MHz band, ARRL states as follows:

I. Introduction and Background.

1. Lockheed proposes substantial, yet unjustified modifications to Section 15.240 of the Commission's Rules regulating unlicensed RFID systems. The systems regulated under Section 15.240 do not meet the normal requirements for periodic radiators set forth in Section 15.231 of the Commission's Rules. Lockheed proposes in effect to eliminate all rules enacted only seven years ago, which were specifically intended to avoid interference and/or (in the case of Government radar facilities) to offer a means to identify and eliminate interference. Geographic area limitations¹ and use restrictions for RFID systems in Section 15.240 are the only protections against substantial RFID interference to the Amateur Radio Service, and to other part 15 devices operating around 433 MHz in accordance with the Part 15 rules, such as garage door openers. Lockheed's petition seeks to eliminate those geographic area and use regulations without the slightest effort to justify the proposal as a technical matter. Lockheed asks the Commission to permit a vast expansion of the deployment of RFID devices geographically, notwithstanding the fact that specific geographic and use restrictions on Section 15.240 RFID systems were the principal justification offered by the Commission in 2004 for effectively abandoning the regulatory paradigm for periodic radiators. Lockheed's petition does not justify the proposed elimination of the interference avoidance

¹ ARRL uses the term "geographic area limitations" herein to refer to the provision in Section 15.240 of the Commission's Rules limiting the use of RFID devices operating under that Section to commercial and industrial areas.

regulations in Section 15.240 which were adopted in 2004 in a *Third Report and Order* in Docket 01-278 (See, FCC 04-98, released April 23, 2004). In lieu thereof, however, Lockheed suggests the use of contention-based protocols which, as proposed, would be completely useless to protect ongoing Amateur Radio communications from interference. Finally, Lockheed suggests a significant, but again completely unjustified expansion of the frequency range for these high-power, almost continuous-duty RFID devices (solely to emulate the frequency range permitted in Europe for these devices), and a power increase over the 2004 levels.

2. The proponent in ET Docket 01-278 of very liberal operating parameters for RFID systems was Savi Technology, Inc., which at the time was a stand-alone company. Savi is now owned by Lockheed. At Savi's request, the Commission adopted the Section 15.240 rules, which are substantially more liberal than the Section 15.231 rules governing normal unlicensed periodic radiators. The Commission did this based on Savi's representations that its RFID products were useful for homeland security purposes. The devices, claimed Savi, permitted identification of the contents of shipping containers, the ability to detect tampering of shipping containers in transit and improved inventory control at commercial facilities. All of these purposes were conducted in commercial or industrial areas and pertained to commercial shipping containers. Savi initially, in a petition for rule making filed in November of 2000 (See, RM-10051), sought the addition of a new rule section for RFID devices operating in the 425-435 MHz band with higher field strength limits and a 120-second transmission duration with only a ten second silent period between transmissions. This proposal stood the concept of periodic radiators on its ear; the proposal was in effect to permit a "constant-on" unlicensed device at power

levels in excess of those permitted by the periodic radiator rules, Section 15.231. The Section 15.231 rules permit devices which send control signals at 433 MHz up to two seconds *per hour*. For devices which do not send control signals, the radiated power level is lower, and the periodic limit for transmissions is no more than one second, with a silent period between transmissions of at least 30 times the duration of the transmission, but in no case less than 10 seconds. Devices operating at 433 MHz which do not send a control signal are permitted to utilize maximum average field strengths of 4,383 $\mu\text{V}/\text{m}$ and maximum peak field strengths of 43,833 $\mu\text{V}/\text{m}$, measured at a distance of 3 meters. Devices that send a control signal to interrogate RFID tags under Section 15.231 may operate at a frequency of 433 MHz at higher field strength levels: average field strengths of 11,000 $\mu\text{V}/\text{m}$ and peak field strengths of 110,000 $\mu\text{V}/\text{m}$ at 3 meters. By comparison, continuous duty devices in this frequency range are, pursuant to Section 15.209 of the Commission's rules, limited to radiated field strengths of only 200 $\mu\text{V}/\text{m}$. The theory of the periodic radiator rules, and the entire justification of the *radically* higher power levels permitted them relative to continuous duty devices is that devices using those high radiated power levels will not interfere with licensed communication services because, and *only because*, of the exceptionally short duty cycle. The best example of the concept is garage door openers, the signals of which are very occasional and the transmissions are very short (but high-power) relative to long off-times. What Savi proposed in Docket 01-278 was in effect to permit RFID tags to operate at the very high power levels permitted for true periodic radiators, but without the interference-limiting short duty cycles. Savi proposed in essence constant-on devices – two minutes on, and ten seconds off. For the most part, ultimately, the Commission capitulated.

3. The Commission released a *Notice of Proposed Rule Making and Order* in Docket 01-278 in October of 2001 which proposed a number of changes to Part 15 and other parts of the rules. Among these was the creation of a new rule section, per Savi's request, to allow operation of RFID devices at 425-435 MHz with a maximum average field strength of 11,000 $\mu\text{V}/\text{m}$ measured at 3 meters and a peak field strength of 110,000 $\mu\text{V}/\text{m}$. Duty cycles would be as proposed by Savi. This proposal created an outpouring of opposing comments, 132 of which were filed by Amateur Radio operators or organizations. ARRL showed that the 420-450 MHz band is among the most popular Amateur allocations, and that the segment 425-435 MHz accommodated extensive television, packet data communications, weak-signal Earth-moon-Earth (EME) communications, and weak-signal CW and mixed modes (principally SSB communications over long paths using very low received signal levels). The segment 432-433 MHz is especially heavily used, almost exclusively for terrestrial, weak-signal operation using very sensitive receivers and preamplifiers. There is wide availability of equipment for this frequency range and the band has very high occupancy levels. ARRL submitted an extensive engineering study which established that interference distances from an RFID transmission of well in excess of 1000 meters are to be expected.

4. Savi claimed at the time that its devices "typically" operate in commercial areas but offered no technical interference analysis to rebut that submitted by ARRL. Neither did Savi at the time offer any justification for its proposed average field strength of 11,000 $\mu\text{V}/\text{m}$ (the level permitted for control signals limited to two seconds per hour). The sole justification offered for this power level was that the maximum field strength limit under Section 15.231(e) was not "sufficient to ensure reliable transmissions in all

circumstances.” It was surprising that the Commission proposed in the *Notice of Proposed Rule Making and Order* in Docket 01-278 exactly what Savi had asked for, with no explanation of its tentative conclusion that there would not be extensive interference resulting from the proposal.² The Commission stated that its proposal was intended to allow greater range for 433 MHz RFID systems and to allow data to be transferred from an RFID tag more quickly.

5. Other than radio Amateurs, certain part 15 manufacturers opposed the Savi proposal due to interference potential to already-deployed devices such as garage door openers which would be rendered inoperative by the Savi devices due to brute-force overload. The National Telecommunications and Information Administration (NTIA) opposed the *Notice* proposal because 425-435 MHz is allocated to the Federal Government on a primary basis, and is used for ground-based, shipborne and airborne radars. RFID devices operating as proposed would cause interference to federal radar operations in the 425-435 MHz band.³ Savi responded to this by proposing several restrictions on RFID operation in this frequency range, as follows:⁴

- 1) Narrow the frequency range from 425-435 MHz to 433-435 MHz
- 2) Lower the peak field strength limit from 110,000 $\mu\text{V}/\text{m}$ to 55,000 $\mu\text{V}/\text{m}$ at 3 meters.
- 3) Reduce the maximum transmission duration from 120 seconds to 60 seconds.
- 4) Adopt a narrow definition of RFID systems and prohibit voice transmissions.

² It was surprising in 2004 that the Commission, in enacting the Section 15.240 rules, claimed at Paragraph 23 of the *Third Report and Order* in Docket 01-278 that: [w]e find the arguments that 433 MHz RFID systems would cause interference unpersuasive in any event because the signal levels proposed in the *Notice* are no greater than the rules permit for garage door controls.” The obvious unstated distinction, however, is that garage door controls operate for a very brief period, unpredictably, while RFID systems are on for up to 60 seconds continuously, with only 10 second off-times. Lockheed now proposes to make that situation worse, proposing 10 second duty cycles and only one second off. For interference purposes, that is a constant-on device.

³ See letter from NTIA to the Chief, Office of Engineering and Technology dated October 15, 2002 at 4 in ET Docket 01-278.

⁴ See Savi *ex-parte* filings dated October 28, 2002 and October 15, 2003 in ET Docket 01-278.

- 5) Restrict operation at 433 MHz to commercial or industrial areas.

NTIA withdrew its opposition to the Savi proposal if the changes Savi proposed were included in the rules and if the following additional conditions were met, as follows:⁵

- 1) The permissible frequency band of operation would be 433.5-434.5 MHz.
- 2) Operation within 40 kilometers of five Federal Government radar sites was prohibited.
- 3) The locations where 433 MHz RFID systems operate would be noted in a manufacturer-maintained database, furnished to NTIA.

6. The record notwithstanding, the Commission issued its *Third Report and Order* in Docket 01-278 in April of 2004. That Order adopted the present Section 15.240, which incorporated Savi's proposed limitations and NTIA's additional conditions for withdrawing its opposition to the proposal. The RFID systems that are now thereby authorized to operate at 433.5 to 434.5 MHz are limited to use for identifying and managing the contents of commercial shipping containers in commercial and industrial areas. They are permitted to operate at field strengths well in excess of those permitted for constant-on radiators: 11,000 $\mu\text{V/m}$ average and 55,000 $\mu\text{V/m}$ peak. The "periodic" operation of these RFID systems is really not that at all: transmissions are limited to 60 seconds on, and ten seconds off.⁶ There is a manufacturer-maintained registration requirement for users of these high-power RFID devices as suggested by NTIA in order to allow location of the offending RFID systems in case of interference. There is a 40-mile quiet zone for RFID systems surrounding each of five military radar sites, including all Pave Paws radar sites.

⁵ See letters from NTIA to the Chief, Office of Engineering and Technology dated March 18, 2004 and March 24, 2004 in Docket 01-278.

⁶ The ten-second off time is an illusion, actually, because the Commission permits re-transmission of data in case of transmission error without the need for a ten second silent period. Constant-on devices are therefore permitted.

7. Of the geographic area and use limitation, the Commission stated in the *Third Report and Order* in Docket 01-278 at ¶ 16 that:

We recognize that the interference concerns raised with respect to 433 MHz RFID systems can be largely ameliorated by restricting the locations where they operate and the types of uses permitted. Such restrictions will limit the use of 433 MHz RFID systems to locations where they will not operate in close proximity to other users on the same frequency. Accordingly, we are restricting operation under the new RFID rule to the identification of the contents of commercial shipping containers. Voice communications will not be permitted. Further, we will require that operations be limited to commercial and industrial areas such as ports, rail terminals and warehouses. These requirements are essentially consistent with the conditions that Savi proposed and with which NTIA agreed...

This is in effect the only mechanism that was implemented in the Docket 01-278 proceeding in 2004 that could possibly limit the substantial interference potential to Amateur Radio from these RFID systems. The RFID systems operate at tremendously high power levels not permitted for any other constant-on Part 15 device.⁷ The Commission noted at paragraphs 23 and 24 of the *Third Report and Order* that it had reduced the RFID segment from the Savi-requested 10 MHz to 1 MHz, and had thereby created a 500 kHz buffer between the Amateur weak-signal segment at 432-433 MHz.⁸ The manufacturer registration requirement, which was exclusively for the benefit of government radiolocation facilities, to enable interference resolution after the fact, was justified by the Commission⁹ as follows:

NTIA also requests that the operating locations of 433 MHz RFID systems be registered to assist in locating the source of any interference to Federal Government operations that may arise... [r]egistration will allow the

⁷ At paragraph 25 of the *Third Report and Order*, the Commission stated with respect to RFID interference to Amateur stations: “Additionally, the rules we are adopting limit operation to commercial and industrial area such as ports and rail yards, so operation will not be permitted in residential areas and on delivery trucks as many parties expressed concern.”

⁸ Savi/Lockheed is now attempting to reduce that 500 kHz buffer to only 50 kHz. This is insufficient to segregate the RFID signals from Amateur weak-signal communications in the 432-433 MHz segment.

⁹ See, the *Third Report and Order*, at ¶¶ 19, 20.

Commission and NTIA to monitor the deployment of 433 MHz RFID systems and help pinpoint the source of interference to government operations in case such interference occurs.

The deployment location information would not be made available to radio Amateurs in any case, however, so there was no mechanism offered to radio Amateurs for *post hoc* interference resolution whatsoever.¹⁰

II. The Lockheed Petition

8. The changes to Section 15.240 that Lockheed now requests are summarized as follows:

(A) It seeks to expand the permitted frequency range of RFID tags from the present range of 433.5 - 434.5 MHz to 433.05 – 434.79 MHz. The latter is and has been the frequency range utilized by RFID systems in Europe. The stated reason for this is that multiple channels will permit more robust links for RFID systems.

(B) It proposes to implement listen-before-transmit or other contention-based protocols that would detect the presence of authorized service transmissions prior to transmitting RFID data. However, the proposed LBT threshold is extremely high: for 100 kHz receiver bandwidths, -80 dBm, and for 500 kHz receiver bandwidths, -73 dBm.¹¹

(C) It proposes to eliminate the current requirement that all RFID systems be registered with FCC by the manufacturer. Lockheed says that there have been in the intervening 7 years since this provision was adopted no complaints of RFID system interference to incumbent licensed users. Lockheed also says, however, that the registration requirement for users of RFID devices in this band, and which Lockheed now wants to delete, *has never been used*.

(D) The Petition would do away with the rule which now limits deployment of RFID systems in this band to *commercial or industrial areas* and which limits the use of the RFID devices to control of *commercial shipping containers*.

¹⁰ Nor did the Commission ever explain why, on the one hand, it found that interference from high-power RFID systems to Amateur Radio stations would be unlikely, but on the other hand created a 40-kilometer exclusion zone near certain government radar installations. Any radiator that must be excluded for a distance of 40 km from some licensed users clearly has a significant interference potential to other services at closer distance separations.

¹¹ These levels are much higher than the LBT thresholds set for other devices, such as Wi-Fi devices in the 5 GHz region, for example.

(E) The Petition proposes to replace the permitted duty cycle for RFID systems at 433 MHz (60 seconds on and 10 seconds off) to 10 seconds on and 1 second off. That would, with respect to interference potential, authorize the use of essentially constant-on devices to an even greater extent than do the existing rules.

(F) Finally, the present Section 15.240 calls for radiated emission limits of 11,000 $\mu\text{V}/\text{m}$ average and 55,000 $\mu\text{V}/\text{m}$ peak, measured at 3 meters from the device. The Lockheed petition proposes to change this to 1 mW EIRP, and a maximum 3 mW peak across the band, with a peak field strength of 57,700 $\mu\text{V}/\text{m}$ at 3 meters (with a resolution bandwidth of 100 kHz).

There is nothing offered by Lockheed to justify these rule changes in terms of interference avoidance or compatibility with incumbent radio services other than a vaguely proposed and inadequate contention-based protocol requirement. Nor is there anything offered by Lockheed to justify the departure from the interference mitigation provisions called for by NTIA. Especially objectionable -- and unacceptable to the Amateur Radio Service -- is the proposed elimination of the geographic area and use restrictions of Section 15.240.

9. Lockheed claims that RFID technology has advanced since 2004 when Section 15.240 was enacted. Without any detail or factual support at all, it claims that new applications will outpace current Commission Rules. We are left to wonder what those applications are that have developed since April of 2004 and which are compelling enough to necessitate a radical evisceration of the few interference protection and mitigation rules now incorporated in Section 15.240. Lockheed claims “explosive growth” in RFID technology¹² and asserts that as the result of the 2004 rules, “RFID solutions have developed in the 433 MHz band that create improvements in logistics and

¹² Lockheed Petition, at 3.

supply chain efficiency.”¹³ *However, it is unclear that any RFID systems have been actually deployed in this band since 2004.* At page 3 of its Petition, Lockheed touts RFID technology generally and claims *without any support at all* that 433 MHz is “a critical home for these devices.” However, at page 8 of the Petition, where Lockheed proposes to delete the end user registration requirement for 433 MHz RFID devices required in 2004 by NTIA as an interference detection provision. Lockheed states that: “*Indeed, no entity has even submitted a registration to the Commission since this rule was passed.*” If this is true, one of two circumstances must appertain: Either manufacturers are not complying with the registration rule (which is most certainly not a comforting circumstance and not a fact that should justify any relaxation of the interference mitigation rules); or (more likely) there are no 433 MHz RFID systems deployed in the band.¹⁴ If there are in fact no 433 MHz RFID systems deployed now, Lockheed’s plea for relaxed rules rings hollow.¹⁵ There is not the experience with 433 MHz products that would be sufficient to justify any of the interference mitigation rule deletions that Lockheed seeks.

10. Lockheed claims that its subsidiary, Savi, has certified a range of RFID “solutions” under the Commission’s existing rules (apparently *none* has been deployed, however, in the 433 MHz band). However, it asserts that Section 15.240 is not suitable for its purposes since uses under that rule are limited to commercial shipping containers,

¹³ *Id.*, at 4.

¹⁴ This fact would explain Lockheed’s claim that there have been no interference cases reported in this band since 2004. Since the end-user registration requirement in the rules was intended in part, as the Commission noted at Paragraph 20 of the Docket 01-278 *Third Report and Order*, to “allow the Commission and NTIA to monitor the deployment of 433 MHz RFID systems,” it can only be concluded that there has been inadequate experience with 433 MHz RFID systems to justify the rule changes proposed by Lockheed since 2004. Accordingly, the Lockheed Petition should be dismissed.

¹⁵ Lockheed’s claim that there have been no interference cases reported is not a justification for eliminating any interference mitigation mechanisms, because the end-user registration list, even if it had any entries on it to date, is not provided to ARRL or to any Amateur Radio operators. There is no indication that RFID interference to Amateur Radio could be identified as such by the victim Amateur Radio operators, and no indication therefore that there that such interference has not occurred.

and the Section 15.231 rules are likewise unsuitable because they preclude two-way communications. So, Savi/Lockheed has not been able to use the 433 MHz band for medical equipment monitoring, public transportation route mapping, and vehicle security and fleet management.¹⁶ Lockheed claims that its proposed rule changes to Section 15.240 would permit these additional applications and more. What Lockheed completely misses, however, is that it doesn't get to have its cake and eat it too: it cannot justify unlimited geographic area deployment and unlimited use of an unlicensed, constant-on device that operates at or above the field strength limitations applicable only to (and suitable for) devices which transmit for one or two seconds *per hour*. Lockheed offers not the slightest recognition of the fact that it is obligated to protect Amateur radio operations which are ubiquitous and which will inevitably, absent the geographic area and use limitations in Section 15.240, receive harmful interference at ranges in excess of 1000 meters.¹⁷ It is likely, should RFID systems operating pursuant to Section 15.240 in its present form proliferate, that interference will become prevalent anyway, given the substantial predicted interference contour of RFID systems, and the fact that often, commercial or industrial areas abut residential areas where Amateur Radio stations are typically found.¹⁸ The point, however, is that there cannot be found anything in the four corners of Lockheed's petition that would justify the elimination of the geographic area or use limitations now in Section 15.240. ARRL objects in the strongest terms to any change in the geographic area and use limitations in this rule section. Those were an

¹⁶ There are many, many examples of Part 15 devices being deployed for these applications under existing Part 15 rules. The broad scope of the Part 15 rules is sufficient without the modifications sought by Lockheed now to accommodate these applications without impediment.

¹⁷ It is unclear that Lockheed recognizes any obligation to avoid interference to the Amateur Service. The Amateur Service is not mentioned anywhere in the Petition.

¹⁸ As well, Amateur auxiliary link facilities (in support of repeater stations) in the 433-434 MHz band are often located on commercial towers sited in commercial or industrial areas.

essential component for the adoption of the rule in the first place and the only means of limiting the interference potential of these devices.

11. There is no doubt but that, should the interference protection rules adopted only seven years ago be scrapped as Lockheed proposes, additional applications for RFID systems at 433 MHz would be possible. That argument is the entire thrust of Lockheed's Petition.¹⁹ However, accommodation of new applications is not the extent of the necessary inquiry with respect to 433 MHz. Lockheed claims (again vaguely, without any technical showing at all) that its proposal for Listen-Before-Transmit (LBT) or other contention management protocols will be suitable to avoid interference in lieu of virtually all of the interference mitigation provisions established in 2004 in Docket 01-278. In fact, LBT as proposed by Lockheed would be completely insufficient to address interference from geographically proximate RFID systems to Amateur Radio stations. As mentioned above, the proposed LBT threshold for 100 kHz bandwidth receivers is -80 dBm, and for 500 kHz receiver bandwidths, -73 dBm. Therefore, the triggering of the LBT circuitry would necessitate an overwhelmingly strong signal from an Amateur Radio station. Only the strongest signals would trigger the LBT, so as proposed, there would be no utility of such a requirement. As an interference avoidance mechanism, it would be virtually useless.²⁰ The LBT protocol proposed by Lockheed is clearly intended to allow RFID devices to avoid interfering with each other. It is not configured for protection of the other services that have allocations in the 433 MHz band. The LBT thresholds are arbitrarily high; much higher than the LBT thresholds for some other types of devices.

¹⁹ There is no showing by Lockheed why it cannot make use of 13 MHz or 900 MHz for new RFID applications other than with respect to commercial shipping containers in commercial or industrial areas.

²⁰ It is unclear as well, given the typically high degree of directionality of Amateur auxiliary link facilities, that receive antennas would be protected from RFID transmissions incorporating LBT circuitry.

The LBT thresholds are configured for wide-bandwidth signals, ignoring the fact that Amateur Radio operators in this spectrum utilize occupied bandwidths that are much narrower. Furthermore, the time period over which the device will go silent after detecting band occupancy is clearly optimized to facilitate the coordination between multiple RFID transmitters and receivers. It could work for that purpose, but the requirement to reinitiate a transmission within one second of having detected occupancy is not compatible with typical voice transmissions, where the alternating between transmissions and reception is typically in a time frame of minutes rather than seconds.²¹ Lockheed submits nothing other than rank speculation that LBT *in any form* would supplant the geographic area and use limitations that are in the existing rules. Extensive experience with Commission enforcement processes with respect to Part 15 devices makes it quite plain that no relief from interference after the fact can be expected by radio Amateurs from the Commission.

12. Lockheed's claim at page 5 of its Petition that the rules in Europe dealing with 433 MHz RFID systems are more accommodating than those in the United States is easily explained by the fact that the allocation status of the 420-450 MHz band is substantially different in Europe than it is in the United States. As the result, there are interference avoidance issues in the United States that necessarily differ from those in Europe. Lockheed's petition is rife with arguments about the economic benefits of RFID

²¹ The point is that, under Lockheed's proposal, if the LBT protocol detected a nearby Amateur transmitter, it would give that station only one second to listen to the much weaker response from a distant station before the protocol decided that the channel was now "unoccupied" and thus free for use. For LBT to function to protect other services, it must have the ability to detect the same level of signals that are used by the other service and it must avoid the use of an unoccupied communications channel for a period of time that is compatible with the typical operation of the victim service's users. Protection of Amateur Radio given these conditions is not possible using LBT technology as proposed by Lockheed.

technology generally,²² but it never addresses the issues that the Commission addressed in 2004 in Docket 01-278. There is no showing by Lockheed that the interference avoidance issues in Europe are comparable to those in the United States. It is well-understood that Lockheed would like a worldwide market for its products. It has not, however, made a sufficient showing to justify relaxation of the as-yet untested interference avoidance rules. Its petition is not supported by the experience necessary to justify the radical abandonment of interference prevention mechanisms here.

13. The proposed expansion of the frequencies near 433 MHz as proposed by Lockheed was dealt with in 2004. The frequency range sought by Lockheed now, and proposed by Savi in Docket 01-278 after NTIA objected to the proposed use of 425-435 MHz, was 433.05-434.79 MHz. At paragraph 25 of the *Third Report and Order* in that Docket, the Commission established that it was well aware of the extent of the RFID band in Europe: “Further, although the 433 MHz band may not be available for use by unlicensed devices worldwide with the same technical parameters we are adopting for RFID systems, operation in the 433.05-434.79 MHz band is permitted in Europe.” The narrower frequency band, 433.5-434.5 MHz, was NTIA’s proposal to limit interference to government facilities. It also was relied on by the Commission as a means of preventing interference from RFID systems to the Amateur Radio weak-signal subband at 432-433 MHz (and to the Amateur Satellite Service operating at 435-438 MHz). By creating a 500 kHz buffer between the RFID signals and Amateur weak-signal receivers, interference might be avoided. Now, without any compatibility showing, Lockheed seeks

²² See, e.g. Lockheed’s statement at page 6 of its Petition to the effect that its proposed rule changes would “allow U.S. manufacturers to develop RFID operations under rules similar to those currently in place in Europe, enabling the U.S. RFID industry to compete more effectively in the global marketplace and ensuring that U.S. RFID users enjoy the benefits of a wider range of innovative RFID technologies on a more cost effective basis as soon as they are developed.”

to reduce that 500 kHz buffer to only 50 kHz. That would subject sensitive Amateur Radio receivers to significant interference.²³ Furthermore, the upward expansion of the high power RFID segment proposed by Lockheed, from 434.5 MHz to 434.79 MHz puts the upper end of the RFID segment perilously close to the lower edge of the 435-438 MHz Amateur-Satellite service subband. The sensitive receivers used for Amateur satellite communications above 435 MHz necessitate keeping the high power RFID systems at or below 434.5 MHz. Therefore, ARRL objects to the proposed frequency expansion, as that issue was adjudicated in 2004 and no substantial changes have occurred which justify the creation of additional interference potential to the Amateur Radio Service.²⁴ Economies of scale sought by Lockheed by emulating European RFID standards at 433 MHz are not possible in the United States, which has different allocations than exist in Europe in the 420-450 MHz band.

14. Finally, with respect to the proposal of Lockheed to modify the permitted field strengths and to convert to an EIRP power level without an average power limit, there is again insufficient experience with the interference potential of RFID devices to justify any changes at present to the field strength limitations liberally established in 2004. Lockheed offers no compatibility analysis or any indication of the effect of its proposed changes on incumbent licensed services, and its Petition offers an inadequate basis for revisiting this issue. The 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. However,

²³ At paragraph 24 of the *Third Report and Order*, the Commission stated: “However, the rules we are adopting limit 433 MHz RFID systems to the 433.5-434.5 MHz band. This band is separated by 500 kHz from the nearest weak signal band listed in ARRL’s band plan, thus addressing ARRL’s concern about RFID operation in weak signal bands.”

²⁴ No contention-based protocols would address adjacent-band interference, and most certainly would not avoid interference to sensitive Amateur Radio receivers deployed extensively in the 432-433 MHz band.

the elimination of the average field strength limit would, for some emission types, raise the permitted emission level by as much as 14 dB, which is an overwhelmingly large increase in the interference potential of the devices over that permitted by the present Section 15.240, which is already very substantial.

III. Conclusions.

15. Lockheed's petition seeks to undo virtually all of the few interference protections adopted in 2004 in Docket 01-278. Lockheed asks to have these restrictions lifted solely on the basis of vaguely-stated advances in RFID technology. There is no showing why these alleged advances cannot be accommodated in RFID bands other than at 433 MHz. The Commission in 2004 virtually abandoned the concept for Part 15 periodic radiators in order to accommodate what Lockheed's subsidiary touted as a specific use in commercial areas for homeland security purposes. Apparently, since then, to date, no devices have been deployed at 433 MHz pursuant to the Section 15.240 rule. Notwithstanding this, Lockheed wishes to eviscerate even the inadequate interference avoidance provisions of that rule, offering to substitute a completely inadequate and unjustified LBT provision that would not protect the Amateur Service from harmful interference at great distance separations caused by RFID systems operating in unspecified locations. The petition fails to provide an adequate basis to revisit the 2004 rules. Particularly inappropriate is the proposal to rescind the geographic area and use regulation in Section 15.240. That is the only provision that has any potential to limit RFID interference to Amateur Radio stations operating in the 433.5-434.5 MHz band.

Therefore, the foregoing considered, ARRL, the National Association for

Amateur Radio, respectfully requests, for the reasons set forth herein, that the Commission dismiss or deny the Lockheed Petition without further consideration.

Respectfully submitted,

ARRL, the national association for Amateur Radio

225 Main Street
Newington, CT 06111-1494

By: Christopher D. Imlay
Christopher D. Imlay
Its General Counsel

BOOTH, FRERET, IMLAY & TEPPER, P.C.
14356 Cape May Road
Silver Spring, MD 20904-6011
(301) 384-5525

January 10, 2012