

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

In the Matter of

Promoting Expanded Opportunities for Radio
Experimentation and Market Trials under Part 5 of
the Commission's Rules and Streamlining Other
Related Rules

ET Docket No. 10-236

2006 Biennial Review of Telecommunications
Regulations – Part 2 Administered by the
Office Of Engineering and Technology (OET)

ET Docket No. 06-105

To: The Commission

**COMMENTS OF
THE BOEING COMPANY**

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SUMMARY

As a world leader in developing innovative technologies, Boeing applauds the Commission for seeking to encourage and foster technological growth and innovation through the expansion of its experimental licensing program. Boeing submits that the Commission can further accelerate groundbreaking innovation by amending its rules to not only ease testing restrictions on research organizations and universities, but to relax experimental licensing requirements for *all* entities developing new services and devices that utilize spectrum. Allowing the greatest number of innovators to test and introduce new and cutting-edge technologies without burdensome impediments will help ensure that the U.S. remains a global leader in spectrum policy and innovation in the 21st century.

As a heavy user of the Commission's experimental licensing process, Boeing supports the Commission's proposal to create two new classes of experimental licenses – program experimental and innovation zone licenses. Access to these new classes of experimental licenses, however, should not be limited to the academic community or otherwise designated for use by specific entities. In addition, the Commission should permit program experimental and innovation zone operations in the restricted spectrum bands subject to appropriate operating conditions, and should only impose coordination and reporting requirements on such experimental licensees, as well as traditional experimental licensees, when absolutely necessary to avoid harmful interference.

Finally, the Commission should codify its policy of permitting entities to conduct experiments within RF enclosures, such as anechoic chambers or Faraday cages, without an experimental license. Such testing, if done correctly, involves essentially no potential for interference to authorized radio communications. Testing in RF enclosures should be permitted

in any spectrum band. Further, the Commission should impose frequency-specific maximum emissions limits as measured at a specific distance outside the facility, but entities should be permitted to self-certify their facilities.

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The Boeing Company (“Boeing”), by its attorneys and pursuant to Section 1.415 of the Commission’s Rules, 47 C.F.R. § 1.415, hereby submits the following comments in response to the Commission’s Notice of Proposed Rulemaking (“NPRM”) proposing to amend the Commission’s experimental licensing rules.¹

Boeing supports the Commission’s overarching goal of promoting innovation and efficient spectrum use by increasing opportunities for experimentation. As Chairman Julius Genachowski recently observed, the goal of the NPRM is “to accelerate innovation,” and “[e]ncouraging research and development is vital to our objective of making the U.S. the

¹ See *In the Matter of 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, FCC 10-197 (Nov. 30, 2010) (“NPRM”).

spawning ground for the great technological advances of tomorrow.”² Boeing urges the Commission to recognize that large manufacturers such as Boeing, which have proven to be highly innovative users of spectrum and developers of advanced technologies, are the key to enabling the Commission to achieve its goals. The Commission should therefore avoid amending its experimental licensing rules in such a manner that would hinder the ability of established innovative enterprises from testing and introducing new advanced services and technologies.

I. INTRODUCTION

Boeing is the global leader in the design and manufacture of commercial and military aircraft and is a leader in the manufacture and launch of commercial and government satellites.³ Potentially all of Boeing’s products require ready access to spectrum, either to support internal or external communications and data transfer systems, or to facilitate testing of those products to ensure such factors as structural integrity and resistance to electromagnetic interference. To further this effort, Boeing develops and utilizes numerous wireless devices and technologies in the design, manufacture and testing of aircraft, space systems, and communications equipment, including avionics, ground, maritime and aerospace systems. Much of this work necessitates prompt access to experimental licenses.

On average, Boeing submits ninety applications a year to the Office of Engineering and Technology (“OET”) seeking authority to conduct experimental operations using wireless

² *Id.* at Statement of Chairman Julius Genachowski.

³ Boeing employs more than 158,000 people in the United States, and is currently planning to hire additional staff to support increased aircraft production. In 2009, Boeing, as one of the leading U.S. exporters, accounted for 35% of total U.S. exports of aerospace products and generated \$68.3 billion in revenues.

technologies. Boeing currently holds more than one hundred OET experimental licenses and possibly submits more experimental applications than any other company or entity in the United States.

Boeing employs experimental licenses in part to test and certify wireless communications systems installed in the commercial and governmental aircraft and satellites it manufactures at sites throughout the United States. During the aircraft manufacturing and assembly process, Boeing installs and tests numerous communication and navigation systems in each aircraft in order to ensure compliance with FCC and Federal Aviation Administration (“FAA”) regulations, as well as those of international and foreign aeronautical regulatory agencies. For example, an important part of aircraft design, manufacturing and certification is the testing and certification of the Traffic Collision Avoidance System (“TCAS”) and Automatic Dependent Surveillance-Broadcast (“ADS-B”) on each aircraft. TCAS and ADS-B are used to monitor the space around aircraft and to warn pilots of any collision threats.

The FAA requires Boeing to perform High Intensity Radiated Field testing on commercial aircraft to ensure that aircraft flight systems are not disrupted by spurious emissions of electromagnetic energy in the 30 MHz to 18 GHz spectrum range. The Department of Defense also often mandates the completion of these same tests for government aircraft. Boeing and its predecessor companies have no records of complaints regarding harmful interference resulting from its experimental testing.

Boeing also conducts a substantial number of its experiments in RF enclosures without an experimental license and without causing interference to its nearby highly sensitive communications equipment. Boeing’s RF enclosed testing is conducted pursuant to a strict self-certification regimen.

II. THE COMMISSION SHOULD EXTEND THE AVAILABILITY OF PROGRAM EXPERIMENTAL LICENSES AND INNOVATION ZONES TO ALL ELIGIBLE ENTITIES WITHOUT BURDENSOME CONDITIONS OR REQUIREMENTS

Boeing supports the Commission's proposal to adopt two new classes of experimental licenses – program experimental licenses and innovation zone licenses. Boeing, however, urges the Commission to permit all entities with the requisite technical expertise to participate in its proposed program experimental licensing and innovation zone programs. The FCC's experimental licensing program is intended to foster innovation and the best way to foster innovation is to allow the most advanced institutions to test and develop new and cutting-edge technologies. Restricting the number of entities that can utilize the Commission's proposed experimental authorizations will serve only to restrict the anticipated benefits of the programs. Provided that the Commission's technical requirements are met, all applicants should be eligible to receive program experimental and innovation zone licenses. Moreover, subject to appropriate operating conditions, the Commission should permit such experimental licensees to operate using spectrum in the restricted bands without burdensome coordination requirements. By expanding its experimental authorizations to as many entities as possible with a minimal amount of limitations, the Commission can ensure that the United States will achieve its goal of remaining a world leader in radio technology research and development.⁴

A. The Commission Should Extend Program Experimental Licenses To Entities That Have The Resources And Technical Expertise To Drive Innovation

Boeing supports the establishment of a program experimental license for broad use by colleges, universities, and non-profit research organizations to conduct experiments on a non-

⁴ See *NPRM*, ¶ 15.

interference basis.⁵ Boeing requests that the Commission extend the availability of such experimental authority to any proven testing entity that can demonstrate to OET that it is sophisticated in the design and operation of wireless systems, and in the use of various forms of attenuation to minimize the possibility of harmful interference.

Most innovation and experimentation in the wireless arena takes place outside the academic field. A review of OET's experimental licensing database demonstrates that the overwhelming majority of applicants for new experimental licenses are commercial entities.⁶ Contrary to what the NPRM suggests, these commercial entities, not research organizations or universities, are the driving force behind major advances in communications.⁷ Boeing, for instance, has used its experimental authority to test numerous advanced technologies such as a software synthesized base station for CMRS protocols and a wireless health-monitoring system for its 787 "Dreamliner," a highly innovative aircraft with unmatched fuel efficiency and the capacity to travel at speeds similar to today's fastest wide-body aircraft.⁸

The record of the Commission's *Wireless Innovation NOI*⁹ suggests that most commercial manufacturers and developers invest heavily in the research and development of

⁵ See NPRM, ¶ 19.

⁶ Based on ULS records, Boeing currently holds 105 experimental authorizations, the most of all commercial users, followed by Lockheed Martin Corp. and Raytheon Co.

⁷ See NPRM, ¶¶ 14-15.

⁸ See Boeing 787 Dreamliner Will Provide New Solutions for Airlines, Passengers, *available at* <http://www.boeing.com/commercial/787family/background.html> (last visited Feb. 18, 2011).

⁹ See *In the Matter of Fostering Innovation and Investment in the Wireless Communications Market, A National Broadband Plan For Our Future*, Notice of Inquiry, FCC 09-66, ¶ 66 (Aug. 27, 2009) ("NOI").

innovative technologies.¹⁰ At least one commenter specifically requested that the Commission expand the availability of program experimental licenses to manufacturers and developers of new services and devices due to the significant amount of fundamental research it conducts to advance technology.¹¹ As the Commission correctly recognizes, research and development are the “engine of innovation and investment.”¹² The Commission should therefore seek to encourage as many institutions as possible to engage in research and development efforts by extending program experimental licenses to such entities.

B. The Commission Should Not Prohibit Single Entities From Utilizing Their Exclusive-Use Facilities As Innovation Zones

Boeing also supports the establishment of innovation zones to give innovators greater flexibility to conduct and modify the terms of their experiments.¹³ Similar to the program experimental license, Boeing urges the Commission not to limit the pool of applicants, but to permit all eligible entities to receive such experimental authority. Given the potentially unlimited number of innovation zone experimental licenses that could be issued, such authorizations should be permitted within the confines of exclusive-use facilities such as manufacturing plants.

¹⁰ See, e.g., *Comments of AT&T, Inc.*, GN Docket No. 09-157 and GN Docket No. 09-51, at 82 (filed Sept. 30, 2009); *Comments of Ericsson, Inc.*, GN Docket No. 09-157 and GN Docket No. 09-51, at 3 (filed Sept. 30, 2009); *Reply Comments of Microsoft Corp.*, GN Docket No. 09-157 and GN Docket No. 09-51, at 7 (filed Nov. 5, 2009).

¹¹ See *Comments of Motorola, Inc.*, GN Docket No. 09-157 and GN Docket No. 09-51 at 27 (filed Sept. 30, 2009); see also *Comments of Nikolaus E. Leggett*, GN Docket No. 09-157 and GN Docket No. 09-51 (filed Sept. 4, 2009).

¹² *NPRM*, ¶ 14.

¹³ See *id.* ¶ 41.

In its *NPRM*, the Commission states that applicants for innovation zones “must hold appropriate technical credentials,” but emphasizes that applicants “will not necessarily have to be associated with a college, university, or non-profit research organization.”¹⁴ The Commission explained that its decision to limit program experimental licenses to research institutions was based on harmful interference concerns.¹⁵ Limiting the pool of eligible entities for innovation zones to address these concerns, however, is unnecessary because the innovation zone proposal would establish a restricted set of locations, which would isolate experimental operations and protect spectrum users from harmful interference.¹⁶ The Commission nonetheless continues by stating that innovation zones “would not be appropriate for use by a single entity at its exclusive-use facility (such as within a large manufacturer’s plant grounds).”¹⁷

The Commission has offered no explanation why it is proposing to extend innovation zones to all entities except for such single entities. Boeing notes that the Commission has never before arbitrarily placed limits on licenses or operations such as the one it is proposing to place on innovation zones without sufficient justification. Previous Commission action to restrict licenses to a certain class of entities has been only in response to public interest concerns such as harmful interference, which the Commission concedes will be addressed by the location limitation in the proposed innovation zone program.¹⁸ Given the choice, the Commission has

¹⁴ *Id.*

¹⁵ *See id.* ¶ 38.

¹⁶ *See id.*

¹⁷ *Id.* ¶ 41.

¹⁸ *See id.* ¶ 38.

shown that it prefers to limit user operations to address interference concerns rather than limiting the availability of licenses and devices for innovative uses.

For example, in its decision regarding ultra-wideband (“UWB”) transmission systems, the Commission specifically declined to impose a strict licensing requirement for operations of UWB devices or limit the distribution of the devices to public safety officials.¹⁹ The Commission instead restricted uses of UWB devices and the locations where they may be operated, explaining that “by limiting the applications of UWB [devices] we will minimize the risk of interference by controlling [their] proliferation.”²⁰ In balancing the potential of harmful interference to licensed services with the benefits that UWB devices provide to public safety, businesses and consumers, the Commission ruled in favor of encouraging and fostering technological growth.²¹

In contrast, the Commission designated the 4.9 GHz band in 2002 for exclusive use by public safety entities.²² The Commission made this determination because the 4.9 GHz band “has propagation characteristics that are ideal for [public safety] communications.”²³ In addition, only a few commenters expressed interest in commercial use of the spectrum.²⁴ Because of the

¹⁹ See *In the Matter of Revision of Part 15 of the Commission’s Rules Regarding Ultra-Wideband Transmission Systems*, First Report and Order, FCC 02-48, ¶ 16 (April 22, 2002).

²⁰ *Id.* ¶ 189.

²¹ See *id.* ¶¶ 1, 13 (noting the demand for the wide array of products that could be developed using UWB techniques).

²² See *In the Matter of The 4.9 GHz Band Transferred from Federal Government Use*, Second Report and Order and Further Notice of Proposed Rulemaking, FCC 02-47 (Feb. 27, 2002).

²³ *Id.* ¶¶ 23, 26.

²⁴ See *id.* ¶ 25.

limited commercial use and the ideal features of the 4.9 GHz band for public safety services, the Commission concluded that it was appropriate to limit the entities eligible for 4.9 GHz band licenses.

Similar to the UWB devices, the proposed innovation zone licenses have the potential to result in numerous innovative services and products. Entities with exclusive-use facilities such as Boeing often require a great range of frequencies to test advanced proprietary technologies. Moreover, unlike the 4.9 GHz proceeding, there is a large demand to use these innovation zones for commercial purposes.²⁵ Allowing these commercial entities the flexibility to conduct and modify the terms of their experiments under innovation zone licenses without having to secure additional traditional experimental authorizations would greatly encourage and promote experimentation.

Further, Boeing and other non-governmental entities regularly require secure facilities to conduct confidential testing of certain defense-related services and products in accordance with International Traffic in Arms Regulations (“ITAR”).²⁶ The ITAR is designed to safeguard U.S. national security and to further foreign policy goals. The regulations impose strict confidentiality requirements on entities testing defense and military related technologies. Thus, not only would permitting entities to secure innovation zone licenses covering exclusive-use

²⁵ Several entities commenting on the Commission’s Spectrum Sharing Innovation Test-Bed proceeding, which the innovation zone program is designed to complement, requested that the Commission authorize multiple candidates to utilize the test-bed for commercial and proprietary purposes. *See e.g., Comments of Motorola, Inc.*, ET Docket No. 06-89 and NTIA Docket No. 060602142-6142-01 (filed July 10, 2006); *Comments of The Software Defined Radio Forum*, ET Docket No. 06-89 and NTIA Docket No. 060602142-6142-01 (filed July 10, 2006).

²⁶ *See* 22 C.F.R. pts. 120-30.

facilities foster experimentation, it would also help further U.S. policy objectives more efficiently without jeopardizing national security.

Finally, as the Commission acknowledges, the location restrictions inherent in the innovation zones provide enough safeguards against harmful interference such that restricting the pool of eligible licensees is unnecessary.²⁷ Accordingly, without further justification, the Commission should not limit innovation zones so as to exclude single entities with exclusive-use facilities.

C. Subject to Appropriate Conditions, Program Experimental and Innovation Zone Licensees Should Be Permitted To Use Restricted Band Spectrum

Provided that they demonstrate that sufficient precautions have been taken to prevent harmful interference, program experimental and innovation zone licensees should be permitted to use any spectrum, including frequencies listed in Section 15.205(a) of the FCC rules and footnote US246 of the Table of Frequency Allocations. In authorizing the experimental use of spectrum in the restricted bands or other highly sensitive spectrum, the Commission should include operating conditions in program experimental and innovation zone licenses that specify the specific restricted bands that are available for operation, the permissible power levels of those operations and any other appropriate conditions. The process for securing Commission approval for operations in restricted or other highly sensitive spectrum bands by program experimental and innovation zone licensees should be largely identical to the process that currently exists for licensees seeking to secure new or modified experimental licenses.

The Commission notes that it is important to protect sensitive bands above 38.6 GHz because “[m]any federal agencies use spectrum above 38.6 GHz for satellite communication and

²⁷ See *NPRM*, ¶ 38.

scientific research which use extremely low received signal levels.”²⁸ Most experimental operations, however, are conducted at such low power levels and in such remote locations that they could not interfere with other networks. In fact, Boeing often conducts its government-mandated testing in remote locations, generally at relatively low power levels and only for brief periods of time.

To the extent the Commission is concerned that certain experimental operations will interfere with operations in the restricted bands, OET should determine whether to impose notification or consent requirements on such experimental activities on a case-by-case basis. The coordination requirement set forth in Section 5.85(e) of the Commission’s rules is permissive, not mandatory.²⁹ Thus, OET should exercise its discretion to determine when notice and coordination requirements are absolutely necessary. For example, if the nature of the proposed testing generally ensures that other spectrum users will not experience harmful interference or if the potentially affected licensees have not constructed their networks, OET should not impose coordination and consent requirement on an experimental licensee.

Moreover, OET should not impose notification or coordination requirements where experimental licensees demonstrate that they will operate within the emissions limits set forth in Section 15.109 or Section 15.209 of the Commissions rules.³⁰ Part 15 of the Commission’s rules sets forth specific emission limits and technical standards for intentional, unintentional and incidental radiators operating at low power levels in certain frequency bands. Provided that the emissions limits in Part 15 are met, operation of the radiators is permitted on an unlicensed basis.

²⁸ *NPRM*, ¶ 21.

²⁹ *See* 47 C.F.R. § 5.85(e).

³⁰ *See id.* §§ 15.109, 15.209.

The Commission's rules reflect its determination that the risk of harmful interference to other users of the radio spectrum by devices operating at such low power levels is so minimal that they should be permitted without a license, experimental or otherwise.³¹ Boeing urges the Commission to similarly recognize that experimental activities meeting the emissions limits and technical requirements in Part 15 are also unlikely to cause harmful interference to incumbent licensees, and should therefore be permitted without notice or consent requirements.

D. Unless Absolutely Necessary, Operations Pursuant to Program Experimental And Innovation Zone Licenses Should Not Be Subject to Coordination

The rules governing program experimental licenses and innovation zones should be as flexible as possible, while adequately protecting incumbent spectrum users. The Commission should not impose coordination conditions requiring licensees to secure prior consent from commercial operators using the same spectrum as program experimental or innovation zone licenses, or indeed any experimental authorization, unless the conditions are absolutely necessary. Such requirements unnecessarily hinder experimental operations and incentives to invest, thereby limiting technological advances and growth.

The Commission astutely observes that program experimental licenses and innovation zones will be most effective if they provide eligible entities the flexibility to operate experimental stations without coordination requirements.³² As explained in Boeing's comments and reply comments in the Commission's *Wireless Innovation NOI* proceeding, coordination and

³¹ See *Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems*, Notice of Proposed Rule Making, 15 FCC Rcd 12086, ¶ 2 (2000) (explaining that the "technical standards contained in Part 15 are designed to ensure that there is a low probability that these unlicensed devices will cause harmful interference to other users of the radio spectrum.").

³² See *NPRM*, ¶¶ 19, 41.

consent requirements often overburden holders of experimental licenses, thereby hindering innovation.³³ Incumbent licensees have no incentive to furnish their consent to experimental testing and, in Boeing's experience, have frequently refused consent to coordination requests.³⁴ Licensees seem willing to reject coordination for any reason, or no reason at all,³⁵ and some have refused consent even though they have not constructed their networks. Others have refused even though their networks would not suffer harmful interference. In effect, Boeing and other manufacturers have been prevented from conducting necessary experimental testing despite the lack of anticipated effect on any commercial wireless receivers, resulting in certification and delivery delays of their products as well significant costs.³⁶

Boeing notes that there are already several procedures and policies in place that can be, and have been, applied to experimental testing activities to protect incumbents from harmful interference. The primary rule governing experimental authorizations is that testing must be performed on a non-interference basis.³⁷ If experimental operations result in harmful interference to any other authorized spectrum use, the experimental operation must shut down

³³ See *Comments of the Boeing Company*, GN Docket No. 09-157 and GN Docket No. 09-51, at 9-10 (filed Sept. 30, 2009) ("*Boeing Wireless NOI Comments*"); *Reply Comments of the Boeing Company*, GN Docket No. 09-157 and GN Docket No. 09-51, at 2-3 (filed Nov. 5, 2009) ("*Boeing Wireless NOI Reply Comments*").

³⁴ See *Boeing Wireless NOI Comments*, at 10-12 (describing Boeing's difficulty in coordinating consent with wireless service licensees to enable High Intensity Radiated Field testing of new aircraft).

³⁵ See *Boeing Wireless NOI Reply Comments*, at 3; *Lockheed Comments*, GN Docket No. 09-157 and GN Docket No. 09-51, at 3-4 (Sept. 30, 2009) (stating that recent experience has shown that incumbent users have been allowed to reject coordination "*even when no objectively verifiable interference concern exists*").

³⁶ See, e.g., *Boeing Wireless NOI Comments*, at 12.

³⁷ See 47 C.F.R. § 5.85(c).

immediately. Accordingly, experimental licensees often agree to provide contact information, such as a toll free telephone number, which is staffed throughout the testing process by employees that have the authority to implement emergency “cease buzzer” procedures to ensure that any complaints of harmful interference are immediately addressed by the cessation of testing. These extensive precautions ensure that other licensees in the region will be unable to detect the presence of the experimental signals, much less suffer harmful interference, and negate the need in most cases for any coordination requirements.

E. Reporting Requirements Are Unnecessary, But, If Imposed, Should Allow for Confidential Submissions

The NPRM requests comment on whether the proposed program experimental and innovation zone authorizations should be coupled with a reporting requirement.³⁸ It appears that the purpose behind the proposed reporting requirement is to identify potential interference concerns as well as to “build a public record of active innovation in the field of radio communications.”³⁹ It also appears that the Commission’s reporting proposal is duplicative of Section 5.73 of the FCC rules, which gives OET authority to impose regular reporting obligations on experimental licensees when appropriate. Boeing observes that OET appears to only occasionally impose such reporting requirements on experimental licensees to mitigate harmful interference likely because of the many safeguards that have already been put into place by experimental licensees. Thus, Boeing submits that the redundant, not-often invoked reporting requirements are unnecessary and should not be included in the Commission’s experimental licensing proposals.

³⁸ See NPRM, ¶¶ 34, 44.

³⁹ *Id.* ¶ 34.

If the Commission does adopt such a requirement, however, the Commission should afford experimental licensees an opportunity to withhold confidential information from their reports and seek confidential treatment for the information that is provided. As explained above, Boeing often conducts experimental testing on proprietary technologies, some of which must be handled with the utmost secrecy in order to protect national security. Although Boeing appreciates the Commission's desire for transparency and to encourage further innovation through the establishment of a public record, Boeing urges the Commission to recognize the public interest harms that would occur if experimental licensees are required to share certain confidential information. Any reporting requirement imposed on experimental licensees should therefore be, as the Commission recognizes, narrowly tailored and as minimally burdensome as possible.⁴⁰

III. THE COMMISSION SHOULD EXPAND THE AVAILABILITY OF MARKET TRIALS AND STUDIES

The Commission correctly recognizes that market studies and real-world trials are crucial to the development of new technologies.⁴¹ Boeing agrees that the FCC should relax its rules regarding market studies in order to encourage innovators and investment, and to expedite the transformation of prototypes to fully functional new technologies. In addition to being a manufacturer, Boeing is a wireless communications service provider, providing in-flight broadband connectivity to critical U.S. Government aircraft.⁴²

⁴⁰ *See id.*

⁴¹ *See id.* ¶ 57.

⁴² Boeing provides its aeronautical broadband service, previously known as Connexion by Boeing and now called the Boeing Broadband SatCom Network, under contract to the federal government pursuant to an experimental license issued by OET (Call Sign WC2XVE).

Many innovators offer or wish to offer similar services, especially in-flight broadband connectivity, to consumers on a commercial basis. Expanding experimental testing to include market trials during initial service introduction, and prior to production, is important for such entities because it helps them research actual user demand and determine whether their products and services can be offered in the commercial market. The faster new products and services are introduced into the marketplace, the more innovative technologies will follow, as technology developed for one purpose is almost always used for other purposes. Thus, the Commission should modify its rules to make it easier for, and encourage experimental licensees to conduct, market trials and studies.

IV. THE COMMISSION SHOULD CODIFY ITS POLICY OF PERMITTING ENTITIES TO CONDUCT EXPERIMENTS WITHIN RF ENCLOSURES WITHOUT OBTAINING AN EXPERIMENTAL LICENSE

Boeing supports the Commission's proposal to codify its policy of permitting experimental operations in RF enclosures, such as anechoic chambers or Faraday cages, without requiring that the testing entity obtain an experimental license.⁴³ Because there is essentially no potential to cause interference, such experiments and testing should be permitted across all spectrum bands. Further, the Commission should impose frequency-specific maximum emissions limits for the facilities as measured outside the facilities, however, entities should be permitted to self-certify compliance with the limits.

⁴³ See *NPRM*, ¶ 82.

A. Experimental Licenses Are Unnecessary For Testing Conducted in RF Enclosures

Boeing has extensive experience with the construction, maintenance and use of RF enclosures in many locations across the United States to test equipment at various power levels and frequencies. Based on Boeing's experience, it is clear that a substantial amount of testing can be conducted in RF enclosures with essentially no risk of interference to other radio services. In fact, Boeing has for many years operated RF enclosures in close proximity to equipment at its facilities that is highly sensitive to interference (*e.g.*, aircraft and associated communications equipment) without any incidents of interference. The Commission's policy of not requiring experimental licenses for operations in RF enclosures has reduced the administrative and licensing workload of the Commission staff, as well as that of entities, such as Boeing, that conduct constant RF testing. The Commission should codify its longstanding policy of permitting operations in RF enclosures without the need for an experimental license.

B. Experiments Conducted in RF Enclosures Should Not Be Restricted By Spectrum Band

Unlicensed experimental operations in RF enclosures should be permitted in all spectrum bands, including frequencies listed in Section 15.205(a) of the FCC rules and footnote US246 of the Table of Frequency Allocations. If done correctly, as the Commission states, the potential for interference from operations in RF enclosures to other radio services is "practically nonexistent."⁴⁴ Therefore, it is not necessary to restrict the bands in which such experiments can be conducted. The Commission's Part 15 rules already permit unlicensed unintentional radiators

⁴⁴ *Id.*

to create emissions in all spectrum bands.⁴⁵ As discussed in further detail below, one option to ensure that no harmful interference results is to limit emissions from RF enclosures to the same levels that are permitted from unlicensed unintentional radiators.

C. The Commission Should Impose Maximum Emissions Limits on RF Enclosures

In order to protect adequately authorized radios from interference, the Commission should impose maximum emissions limits as measured outside of RF enclosures. The limits measured outside the RF enclosure should vary based on the frequency bands utilized in the testing process. Boeing does not propose at this time what specific emissions limits the Commission should impose. Because of some important parallels described below, however, the limits should in no event be stricter than the limits that currently exist for class A digital device unintentional radiators under the Commission's Part 15 rules.⁴⁶

The Commission's Part 15 rules contain different radiated emissions limits applicable to class A digital devices and class B digital devices based on differences between the primary intended uses of the devices.⁴⁷ The Commission's class A digital device emissions limits are designed for computing devices that are marketed solely for use in commercial, industrial or business environments.⁴⁸ Contrarily, class B digital devices are marketed primarily for use in

⁴⁵ *See Amendment of Part 15 to Redefine and Clarify the Rules Governing Restricted Radiation Devices and Low Power Communication Devices*, First Report and Order, 79 F.C.C.2d 28, ¶¶ 64-69 (1979) (“*Part 15 Order*”).

⁴⁶ *See* 47 C.F.R. § 15.109(b).

⁴⁷ *See id.*

⁴⁸ *See id.* § 15.3(h).

residential environments.⁴⁹ Class B digital devices generally lack the technical sophistication of commercial equipment and do not receive the same preventive maintenance.

RF enclosures, like class A digital devices, are predominantly located in commercial or industrial environments and receive regular preventive maintenance. Therefore, the Commission should impose emission limits on experiments conducted in RF enclosures that are no stricter than those imposed on class A digital device unintentional radiators. The Section 15.105(b) emissions limits vary depending on the frequency of emission and so should the Commission's emissions limits for RF enclosures.⁵⁰ RF enclosures should be specifically designed for the frequencies at which the subject equipment will be tested and the emissions limits should vary accordingly.

The Commission may find that more relaxed emissions limits are appropriate for experiments conducted inside RF enclosures. This would arguably be appropriate given the fact that, unlike class A digital devices, RF enclosures are stationary and potentially subject to significant management and control by the operator of the facility. In contrast, class A digital devices are often portable and presumably can be used in a variety of potentially sensitive locations, such as airport hangars and tarmacs. For these reasons, the Commission may choose to adopt emissions limits for RF enclosures that are less stringent than those imposed by Section 15.105(b) of the Commission's Rules for class A digital devices. Boeing does not have an

⁴⁹ *See id.* § 15.3(i). Class B digital devices are subject to more stringent emissions limits because such equipment is generally located in closer proximity to radio and television receivers, which are highly susceptible to interference. *See Part 15 Order*, ¶ 29.

⁵⁰ The maximum emissions limit from class A digital devices is 300 microvolts/meter when measured at a distance of 10 meters for frequencies above 960 MHz. *See* 47 C.F.R. § 15.109(b).

objection to the adoption of less restrictive limits. Boeing believes, however, that no justification would exist for adopting limits that are stricter than those included in Section 15.105(b).

In addition, the Commission should not impose a specific minimum attenuation standard for shielding effectiveness because of the diversity of experiments that are conducted in RF enclosures.⁵¹ A certain type or amount of shielding may or may not be necessary for certain experiments depending on the output power or frequencies involved in the experiments. Measured emissions limits outside the RF enclosure will take into account the necessary shielding effectiveness for the output power and frequency of a particular experiment and will be adequate to protect authorized radio communications from interference.

D. Entities Should Be Permitted to Self-Certify Compliance With RF-Shielding Requirements

There is currently no requirement that experiments conducted in RF enclosures be conducted pursuant to an experimental license or other certification from the Commission.⁵² Entities should be able to continue to employ self-certification procedures to ensure that their test operations will not cause interference to authorized radio communications. Boeing conducts experiments in RF enclosures pursuant to standards and test certification procedures that it has developed and verified. Boeing conducts an initial self-certification of each RF enclosure and periodically conducts follow up tests to verify continued compliance with its non-interference standards.

Boeing conducts the initial self-certification for each RF enclosure at the time of construction. The certification is specific to the frequencies at which experiments will be

⁵¹ See *NPRM*, ¶ 82.

⁵² See *id.*

conducted. Further, Boeing conducts periodic follow up tests on the RF-shielding of each facility. Follow up compliance tests of shielded doors are undertaken annually. Follow up compliance tests of shielding in modular type facilities is conducted every three years. Finally, follow up tests of shielding in welded type facilities is conducted every five years.

Boeing retains records of its testing and certifications, which contain such data as: 1) a description of the facility, 2) the minimum attenuation provided by the facility, 3) frequencies permitted to be radiated within the facility, 4) a list of test equipment utilized during the certification process and 5) test equipment calibration data traceable to the National Institute of Standards and Technology. As discussed above, Boeing conducts a substantial number of experiments in RF enclosures throughout the United States. The procedures described herein represent a certification regimen that Boeing has found to be effective.

Experimental operations in properly RF enclosed facilities involve essentially no risk of interference to authorized radio communications. Therefore, the Commission should codify its policy of permitting such experiments without the need for an experimental license. Such operations should be permitted in all frequency bands, but should be subject to maximum emissions limits as measured outside the facilities. Further, entities should be permitted to self-certify compliance with the emissions limits.

V. CONCLUSION

As a substantial holder of experimental licenses, Boeing fully supports and commends the Commission for seeking to improve its experimental licensing program. Boeing believes that expanding the Commission's experimental licensing program to encourage all entities to test and develop new products will allow the Commission to meet its stated goals of accelerating innovative spectrum use and delivering the highest value of spectrum use to the American people.

Boeing, however, strongly urges the Commission to implement its proposed experimental programs, and to continue to apply its existing experimental licensing policies and rules, in a manner that facilitates innovation, while protecting the needs of incumbent spectrum licensees.

Boeing looks forward to continuing to be an active participant in these deliberations as the Commission moves forward.

Respectfully submitted,

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