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

In the Matter of	**)**	
	)	
Spectrum Horizons	**)**	**GN Docket No. 18-21**

To: The Commission

COMMENTS OF THE AMERICAN RADIO RELAY LEAGUE, INCORPORATED

ARRL, the national association for Amateur Radio, formally 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), hereby respectfully submits its comments in response to the *Notice of Proposed Rule Making and Order*, FCC 18-17, 83 Fed. Reg. 13888, released February 28, 2018 (the Notice).[1] The Notice proposes to amend, among other regulations, the Commission's Part 15 rules with respect to the bands above 95 GHz, in order to accommodate the development of, and to enable new innovative services and technologies. Specifically, the *Notice* requests comment on proposed rules permitting licensed, fixed point-to-point operations in large portions of that spectrum between 95 GHz and 275 GHz; making portions of that spectrum available for unlicensed use; and creating a new type of minimally regulated experimental license, for the development of new services and technologies between 95 GHz and 3 THz, without limits on geography or technology. For its comments in response to the *Notice* proposals and in the interests of the Amateur Radio Service in fostering a favorable environment for technical self-training, experimentation and furtherance of the science and art of radio by licensed radio Amateurs in the millimeter-wave bands, ARRL states as follows:

[1] Because the *Notice* in this proceeding was published in the Federal Register on April 2, 2018 with a specified comment date thirty days thereafter, these comments are timely filed.

1. ARRL generally does not oppose the proposals contained in the *Notice* in this proceeding. Regulatory flexibility is justified in the millimeter-wave bands above 95 GHz due to the extensive frequency re-use possibilities[2] resulting from the high level of attenuation of signals at that frequency range.[3] Other factors are the relatively short range of communications paths; the many opportunities for use of these bands for experimentation; and the inherently low interference potential to many types of applications, even anticipating increased band occupancy. However, it must be acknowledged that for the same reason that there should be a higher level of regulatory flexibility in these "spectrum horizons" bands than now exists, the currently favorable noise environment in the few, and relatively small Amateur Radio allocations (including most especially the two bands at 134-136 GHz and 248-250 GHz in which Amateur Radio has primary allocation status) makes these bands especially useful for propagation research, and for development and refinement of equipment and systems for both wideband and narrowband Amateur applications. The Amateur allocations require protection against increases in the noise floor due to aggregate radio frequency (RF) devices. The bands are used ubiquitously and unpredictably, typically but not always at high elevations for research and development purposes and propagation studies, for terrestrial point-to-point, satellite and Earth-moon-Earth communications experimentation.

[2] The Commission notes at Paragraph 22 of the *Notice* as follows:

> The propagation of millimeter wave radio signals is limited when compared to that associated with lower-frequency radio signals. Signals in millimeter wave bands are significantly affected by the presence of oxygen and water vapor within the atmosphere, although the amount of signal attenuation due to oxygen and water vapor varies with frequency and other factors. Attenuation caused by oxygen is significant throughout the millimeter wave spectrum, but increases dramatically around 60 GHz, 120 GHz, and 183 GHz.

[3] See, for example, CEPT Electronic Communications Committee (ECC) Document ECC Report 90 entitled *Compatibility between Short-Range Devices (SRD) and EESS (passive) in the 122 to 122.25 GHz band* (approved May 2013).

2. There are several, relatively small Amateur Radio Service domestic[4] allocations in the millimeter-wave bands above 95 GHz. The Commission notes correctly at Footnote 2 of the *Notice* that:

> All of these bands are allocated on a primary basis to the same radio services for federal/non-federal shared use, with two exceptions; and certain of these bands are also allocated to secondary services (e.g., the radio astronomy service (RAS) in the 123-130, 134-136, and 248-250 GHz bands). The two exceptions are the 134-136 GHz and 248-250 GHz bands, which are allocated to the amateur service (ARS) and the amateur-satellite service (ARSS) on a primary basis for non-federal use and to the RAS on a secondary basis for federal/non-federal shared use.

However, the following statement at paragraph 5 of the Notice is *incorrect by omission*:

> 5. The Commission has not adopted service rules to license radio services on a primary basis in the 95 GHz to 275 GHz range. However, our rules permit operation on a secondary basis by amateur radio licensees in the 122.25-123 GHz, 134-141 GHz, and 241-250 GHz bands. In addition, industrial, scientific, and medical (ISM) uses may occur in the 122-123 GHz and 244-246 GHz bands, subject to the provisions of footnote 5.138. (footnotes omitted)

The first sentence above is incorrect with respect to the Amateur Service,[5] and the remainder of the quoted portion infers incorrectly that all of the Amateur allocations above 95 GHz are secondary. An accurate recitation of the domestic allocation status of the Amateur Service in this spectrum region, which is clearly set forth in Section 2.106 of the Commission's Rules, the Table of Allocations, is as follows:

> 1. 122.5-123 GHz: The Amateur Service is secondary to the fixed and mobile services, and to Industrial, Scientific and Medical (ISM) devices.
> 2. 134-136 GHz: this band is primary for the Amateur Service and the Amateur-Satellite Service (shared with the Radioastronomy Service, which is secondary).

[4] Internationally, in all three ITU Regions, there is a secondary Amateur allocation at 122.5-123 GHz; a primary Amateur and Amateur-Satellite allocation at 134-136 GHz; a secondary Amateur and Amateur-Satellite allocation at 134-136 GHz; a secondary Amateur and Amateur-Satellite allocation at 241-248 GHz; and a primary Amateur and Amateur-Satellite allocation at 248-250 GHz. These worldwide allocations closely track the domestic table of allocations.

[5] Section 97.301(a) of the Part 97 Service Rules for the Amateur Service provides for the use of the bands enumerated herein by licensees holding a Technician license class or above. Section 97.303 notes regulatory conditions on the use of, *inter alia*, the millimeter-wave bands.

3. 136-141 GHz: this band is secondary for the Amateur Service and the Amateur-Satellite Service.
4. 241-248 GHz this band is secondary for the Amateur Service and the Amateur-Satellite Service and is used by ISM devices.
5. 248-250 GHz this band is primary for the Amateur Service and the Amateur-Satellite Service (shared with the Radioastronomy Service, which is secondary).

3. It is standard spectrum management practice to permit Amateur operation on a secondary basis in ISM microwave bands due to the absence of interference protection for ISM devices, and the flexibility of radio Amateurs in making adaptable use of spectrum (for certain types of Amateur applications) with relatively high noise environments. That philosophy should continue to be applied in the millimeter-wave bands, and there is nothing in the Notice that would suggest any change in the Table of Allocations, nor any reason to discontinue Amateur experimentation in the ISM bands at 122.5-123 GHz and 241-248 GHz.[6] However, ARRL would *oppose* any proposal to permit unlicensed devices or largely unregulated experimental operations in the two primary Amateur allocations in this range, 134-136 GHz and 248-250 GHz. It is critical to preserve for Amateur Radio experimentation the current, relatively quiet noise floor and the positive RF environment that now exists in those two, relatively small band segments. As both bands are shared with the Radioastronomy Service (which is secondary in both bands and which also requires a quiet RF environment), there is an additional basis for ensuring that unlicensed devices or largely unregulated experimental operations be excluded from these bands. Such policy would preserve the ability of radio Amateurs to continue experimentation and technical self-training in these allocations in particular, and for RAS to conduct its operations in relatively quiet bands on a cooperative, coordinated basis with the

[6] The secondary Amateur Radio allocation in those two bands permits itinerant, unregulated operation in all parts of each allocation, using unspecified emission types and no specific power limitation relative to other bands. There are no operational restrictions except a non-interference obligation with respect to the fixed, inter-satellite and mobile services per Section 97.303(p).

Amateur Service without disruption going forward. In the secondary Amateur allocations, due to greater available bandwidths and the higher ambient noise levels due to ISM applications, Amateur high speed multimedia and high-speed, wide bandwidth data applications (which are more robust than are Amateur propagation experiments, receiver development and testing, and other research-type Amateur operations) can be and are being utilized, developed and refined by Amateur Radio experimenters.

4. ARRL takes no position on the *Notice* proposal to make 15.2 gigahertz of spectrum above 95 GHz available for unlicensed use in four frequency bands, including the 122.5-123 GHz and the 244-246 GHz bands. These are already designated ISM bands and not subject to emissions limits, and because of that, the removal of these two bands from the list of restricted bands in Section 15.205 of FCC rules is unlikely to have a marked impact on the noise environment. However, ARRL strongly urges that Part 15 devices not be permitted in the bands 134-136 GHz and 248-250 GHz under any circumstances. The Commission has no data concerning increases in the noise floor from potentially large numbers of Part 15 devices, either individually or in the aggregate, in either of these bands. There is no compelling need to include these two bands among those which might be made available for unlicensed devices and systems in this proceeding; and the Amateur Service, the Amateur-Satellite Service and the Radioastronomy Service require allocations with low ambient noise levels.

5. For the same reasons, ARRL would oppose the authorization of Spectrum Horizons experimental authorizations in the bands 134-136 GHz and 248-250 GHz. The *Notice*, at Paragraph 70, notes that the Commission proposes to permit such expanded experimental authorizations on any frequency from 95 GHz to 3 THz. It proposes to add to the current structure of Part 5 a new subpart I that would provide specific requirements for

"Spectrum Horizons Experimental Radio Licenses" in that entire range. At Paragraph 76 of the *Notice,* it is proposed that a qualified applicant for such be required to include a narrative statement that explains the proposed new technology or potential new service and incorporates an interference analysis that explains why the proposed experiment would not cause harmful interference to any other spectrum user. This statement would include technical details, the requested frequency band(s), maximum power, emission designators, area(s) of operation, type(s) of device(s) to be used, and the maximum number of each type of device to be used. The *Notice* asks what other requirements a Spectrum Horizons experimental authorization applicant should have to address in its application.

6. It would be difficult for such an applicant to make an accurate showing of non-interference in the bands 134-136 GHz and 248-250 GHz, due to the variety and itinerant nature of fixed, temporary fixed and mobile type applications used by radio Amateurs in these bands which involve low received signal levels, and the need for low noise levels for Radioastronomy in these bands. At Paragraph 77 of the Notice, the Commission states as follows:

> Because all ERS licenses are authorized on a non-interfering basis, and such applications must be coordinated with federal users via NTIA, we propose that subpart I specify that Spectrum Horizons licenses be permitted on any frequency in the range of 95 GHz-3 THz, provided there are no objections raised in the coordination process. Applicants would be expected to address any allocation footnotes and any known use(s) of the requested frequency or frequencies in the spectrum analysis that they would be required to provide in their narrative statements discussed above. Additionally, applicants must ensure that the significant number of passive services that use spectrum above 95 GHz are protected from harmful interference and, if proposing to use spectrum that is exclusive (sic) allocated for passive use(s), they must explain why nearby bands that have non-passive allocations are not adequate for the experiment. (footnotes omitted).

None of this explanation is sufficient to justify the use of Amateur Radio primary spectrum, which is shared with radioastronomy by Spectrum Horizons experimental authorization holders.

NTIA does not consider interference to the Amateur Service in IRAC[7] reviews of Experimental or Special Temporary Authorizations (STAs), and the non-interference requirement of Section 15.5 of the Commission's Rules is not sufficient to evaluate compatibility *ex ante* between Amateur Radio and Amateur-Satellite experimentation (and/or radioastronomy) on the one hand and the proposed course of Spectrum Horizons experimentation on the other. The two primary Amateur allocations noted above should not, therefore, be subject to Spectrum Horizons experimental authorizations.

7. Should the Commission nevertheless decide to permit Spectrum Horizons experimental authorization applicants to apply for the bands 134-136 GHz and 248-250 GHz, there should be two specific obligations that each Spectrum Horizons experimental applicant should have to satisfy: (1) it should demonstrate convincingly that there are no other allocations that would be suitable for the specific experiment in lieu of the bands 134-136 GHz and/or 248-250 GHz; and (2) it should coordinate its operation with ARRL *at the time of filing the application*, to ensure that there is no conflict with ongoing or planned Amateur Radio or Amateur-Satellite operation. There is nothing new about this second requirement. The Commission now includes in many, if not most experimental license grants and STA grants a prior coordination requirement for various radio services. Amateur Radio experimentation in these frequency ranges is not inexpensive. This is especially true for Amateur-Satellite experimentation. Nor is interference easily resolved once it arises, even if there is a "stop-buzzer" contact provided in the application. Prior coordination is a requirement in the fixed microwave service in Part 101 and it has equally compelling justification for Part 5 experimentation in the Spectrum Horizons bands relative to Amateur Radio primary allocations.

[7] Interdepartment Radio Advisory Committee

8. With respect to experimental operation in the secondary Amateur Radio millimeter-wave allocations, it is suggested that either a notification requirement should be established whereby an applicant would notify ARRL of the intent to commence operations in the 122.5-123 GHz, the 136-141 GHz or the 241-248 GHz bands, or alternatively that the Commission maintain a public database of outstanding Spectrum Horizons experimental authorizations, the frequency ranges, operating locations and file numbers, so that interference sources can be located at least somewhat readily.[8] It is urgent that Amateur Radio operators be aware of experimental proposals that would or could have a preclusive effect on Amateur experimentation in these secondary bands. It is likely that the Spectrum Horizons experimental authorizations granted in that band will be for wide bandwidth systems that will raise the noise floor in the secondary Amateur allocations. It is difficult under such circumstances to locate the source of signals that raise the noise floor or to differentiate such signals from ISM devices. A prior notification requirement for millimeter-wave experimental operation in Amateur secondary allocations is therefore necessary in order to allow ready identification of the source of interference when it arises.

9. Overall, the Commission is on the right track in this proceeding. Opening the millimeter wave bands to expanded unlicensed operation is not unreasonable. Some, but not all of the bands above 95 GHz (including the 122.5-123 GHz, the 136-141 GHz and the 241-248 GHz bands) can be removed from the Part 15 restricted band list in Section 15.205(a) of the

[8] The Commission has been diligent about calling on users of spectrum pursuant to Special Temporary Authority and in some cases Part 5 experimental authorizations to coordinate with incumbent licensees in some cases in order to allow the incumbents to know the potential source of interference, should it be created by the experimental operation or STA. This concept should be extended, and, prior to a grant of authorization for a Spectrum Horizons user, there should be both public announcements, either by the Commission or by the Spectrum Horizons experimental authorization holder, and there should be a coordination requirement with local incumbents prior to the commencement of operation. The Commission has not the enforcement resources to police interference in such cases and therefore, the interference avoidance mechanisms should be put in place in advance and the onus placed on the experimental license holder to do necessary advance coordination.

Commission's rules without significant concern. However, the Amateur Radio primary allocations at 134-136 GHz and 248-250 GHz which are shared with radioastronomy should be unavailable for either Part 15 operation or for other commercial development. There should be two specific obligations that each Spectrum Horizons experimental applicant should have to satisfy: (1) it should demonstrate convincingly that there are no other allocations that would be suitable for the specific experiment in lieu of the bands 134-136 GHz and/or 248-250 GHz; and (2) it should coordinate its operation with ARRL *at the time of filing the application*, to ensure that there is no conflict with ongoing or planned Amateur Radio or Amateur-Satellite operation. All non-Amateur operation in the secondary Amateur Radio allocations should be subject to a prior coordination requirement.

Therefore, the foregoing considered, ARRL, the national association for Amateur Radio respectfully requests that the Commission resolve this proceeding in accordance with the recommendations contained in these comments.

Respectfully submitted,

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