Before the
Federal Communications Commission
Washington DC 20554

In the Matter of	)	
	)	
Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012)(WRC-12), Other Allocation Issues, and Related Rule Updates	)	ET Docket No. 15-99

COMMENTS OF THE
FIXED WIRELESS COMMUNICATIONS COALITION

The Fixed Wireless Communications Coalition, Inc. (FWCC)[1] files these comments in response to the April 23, 2015, *Report and Order, Order and Notice of Proposed Rulemaking* in the above-referenced docket.[2] The FWCC opposes the NPRM's proposal to permit aeronautical mobile telemetry (AMT) operations in the 6 GHz bands by allocating the 5925-6700 MHz band to the aeronautical mobile service (AMS) on a primary basis for Federal use and the 5925-6425 MHz and 6525-6700 MHz bands to the AMS on a primary basis for non-Federal use. The FWCC believes such sharing appears to be infeasible.

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[1] The FWCC is a coalition of companies, associations, and individuals actively involved in the fixed services—*i.e.*, terrestrial fixed microwave communications. Our membership includes manufacturers of microwave equipment, fixed microwave engineering firms, licensees of terrestrial fixed microwave systems and their associations, and communications service providers and their associations. The membership also includes railroads, public utilities, petroleum and pipeline entities, public safety agencies, cable TV providers, backhaul providers, and/or their respective associations, communications carriers, and telecommunications attorneys and engineers. Our members build, install, and use both licensed and unlicensed point-to-point, point-to-multipoint, and other fixed wireless systems, in frequency bands from 900 MHz to 95 GHz. For more information, see www.fwcc.us.

[2] Amendment of Parts 2, 15, 80, 90, 97, and 101 of the Commission's Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012)(WRC-12), Other Allocation Issues, and Related Rule Updates, ET Docket No. 15-99, *Report and Order, Order and Notice of Proposed Rulemaking*, 30 FCC Rcd 4183, FCC 15-50 (rel. April 27, 2015) (NPRM).

The high likelihood of interference to Part 101 fixed service (FS) facilities from AMT operations appears to make sharing infeasible. The 6 GHz bands are very heavily utilized by FS across the entire country. Operations in these bands support a wide variety of critical services such as public safety communications (including police and fire vehicle dispatch), coordinating the movement of trains, controlling natural gas and oil pipelines, regulating the electric grid, and backhauling wireless traffic (which the Commission has recognized "is vital for the deployment of competitive wireless broadband services").[3] All of these operations have extreme need of high reliability and protection from harmful interference. It is difficult to envision how the proposed AMT operations will adequately guarantee that these needs are met.

The FWCC disagrees with the NPRM's view that "the underlying assumptions made in Report ITU-R M.2119…concluded that sharing [of the 6 GHz bands between FS and AMT] is feasible" in the U.S.[4] Rather, the ITU-R Report's conclusions illustrate that successful sharing in the U.S. appears to be highly improbable (if not impossible) because:

> there would be almost 57,000 receivers [in the U.S. as of 2007] in the band 5925-6700 MHz…between the upper and lower 6 GHz bands. It remains to be seen…how many of the existing AMT test ranges could be coordinated for use in the 6 GHz bands, where the usage is so intense.[5]

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[3] NPRM at ¶ 212.

[4] NPRM at ¶ 216. *See* Report ITU-R M.2119 (2007), titled "Sharing between aeronautical mobile telemetry systems for flight testing and other systems operating in the 4,400-4,940 and 5,925-6,700 MHz bands" (ITU-R Report). *See also*, ITU Radio Regulations, Volume III, Resolution 416 (WRC-07), titled "Use of the bands 4400-4940 MHz and 5925-6700 MHz by an aeronautical mobile telemetry application in the mobile service" (Resolution 416). The FWCC notes that the proposed footnote language requiring that 6 GHz AMT usage "shall be in accordance with Resolution 416" is not sufficiently clear. Resolution 416 and all associated ITU documents are concerned with coordination between administrations. Additional language is needed to ensure and require that all listed sharing conditions that apply between administrations in the ITU documents shall also be considered to apply among US licensees and users.

[5] ITU-R Report at 38, Annex 5, Section 2.5; *see also, Id.* at 4, Section 7.

Moreover, where there is intensive usage:

> the combined effects of all the local frequency sharing situations with FS/MS stations, radioastronomy observatories, and FSS earth stations may severely limit availability of spectrum resources for introduction and operation of AMT systems in the… 5925-6700 MHz bands.[6]

The number of affected receivers in the U.S. has increased significantly since the time the ITU-R Report was prepared. According to Table 4 of the NPRM, there are now over 98,000 FS links and earth stations authorized to operate in the 5925-6700 bands. The number of affected receivers is certain to increase significantly as "[t]he number of FS systems is generally growing throughout the world, e.g. by as much as 25% per year at 6 GHz…."[7] As more transmitters and receivers are added each year in the 6 GHz bands, "[t]he burden of dealing with [coordination for] such a large number of stations would weigh heavily on both [AMT and FS]."[8]

The conclusion that sharing in the U.S. appears infeasible is also drawn from the ITU-R Report's finding that "AMT systems for flight testing as currently described can cause harmful interference to fixed service receivers located at distances as great as 450 km for the worst-case geometries,"[9] In order to prevent the possibility of harmful interference:

> there would need to be an area associated with a fixed service receiver within which AMT operations would be excluded… [and] the largest necessary exclusion area would extend along the main beam axis of the FS receiving antenna for 450 km with a width of 24 km.[10]

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6 *Id.* at 5.

7 ITU-R Report at 4, Section 7.

8 ITU-R Report at 38, Annex 5, Section 2.5.

9 *Id.* at 37, Annex 5, Section 2.5.

10 *Id.* at 38, Annex 5, Section 2.5.

450 km is roughly the distance from Dallas to San Antonio. In other words, the exclusion zone for a single FS receiver would cover a nearly five-hour drive across a significant portion of the state of Texas. Taking into account just the current number of FS receivers in 5925-6425 MHz (i.e., not even taking into account the upper 6 GHz band) in the U.S., the entire nation (and then some), as well as virtually all of the AMT test areas, would be blanketed with 450 km by 24 km rectangular exclusion zones ("receiver rectangles"). Figures 1 and 2 below illustrate the intersection of FS receiver rectangles with AMT test areas using only two sample frequency ranges representing a typical lower 6 GHz channel centered at 6152.75 and 6256.54 MHz.[11] Figure 3 illustrates the intersection of all lower 6 GHz FS receiver rectangles with AMT test areas.[12] As Figures 1 – 3 clearly illustrate, there are no geographic areas in the continental U.S. where AMT test areas would fall outside of the exclusion zones created by lower 6 GHz FS receiver rectangles.[13] Consequently, according to the ITU-R Report's findings, nowhere in the U.S. would FS receivers be immune to potentially harmful interference from AMT operations in the 6 GHz bands.

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[11] According to data provided by Comsearch, for receiver rectangles in the 6137.925-6167.575 MHz range, 870 out of 2578 intersect AMT test areas; for receiver rectangles in the 6241.715-6271.365 MHz range, 1351 out of 4022 intersect AMT test areas. Figures 1 – 3 provided courtesy of Comsearch. For purposes of illustration, AMT test areas on Figures 1 – 3 were traced from the map included in the ITU-R Report. The FWCC also notes that footnote US111 with the coordinates for the flight testing locations would not be sufficient for AMT coordination with existing services in the 5925-6700 MHz band. The flight test areas would need to be better defined to, for example, analyze the potential proximity of FS receive antenna beams to AMT transmitters aboard test aircraft.

[12] According to data provided by Comsearch, for all lower 6 GHz receiver rectangles, 13,286 out of 41,854 intersect AMT test areas.

[13] The only portions of AMT test areas not covered by the exclusion zones appear to be offshore.

FIGURE 1

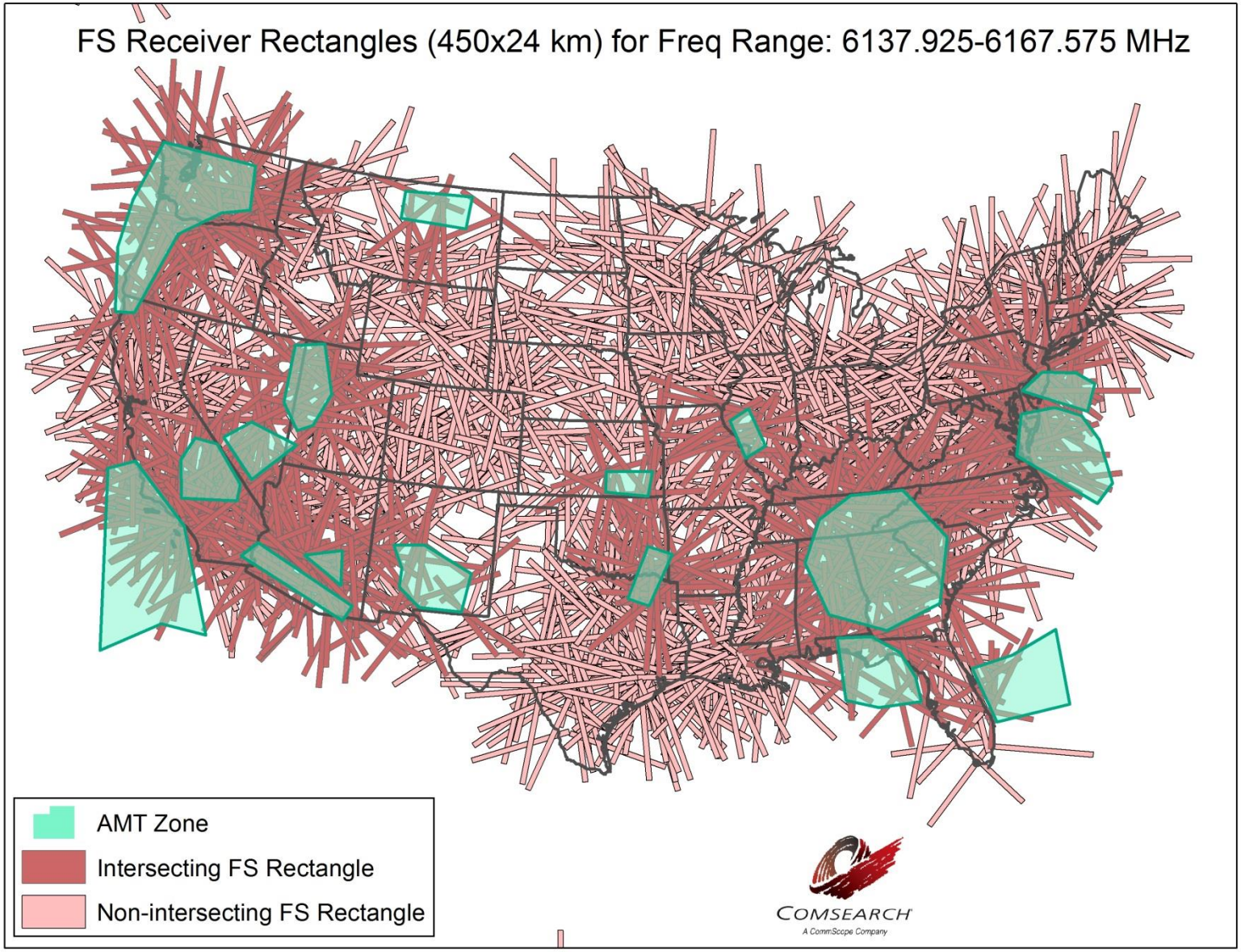

FS Receiver Rectangles (450x24 km) for Freq Range: 6137.925-6167.575 MHz
AMT Zone
Intersecting FS Rectangle
Non-intersecting FS Rectangle
COMSEARCH
A CommScope Company

FIGURE 2

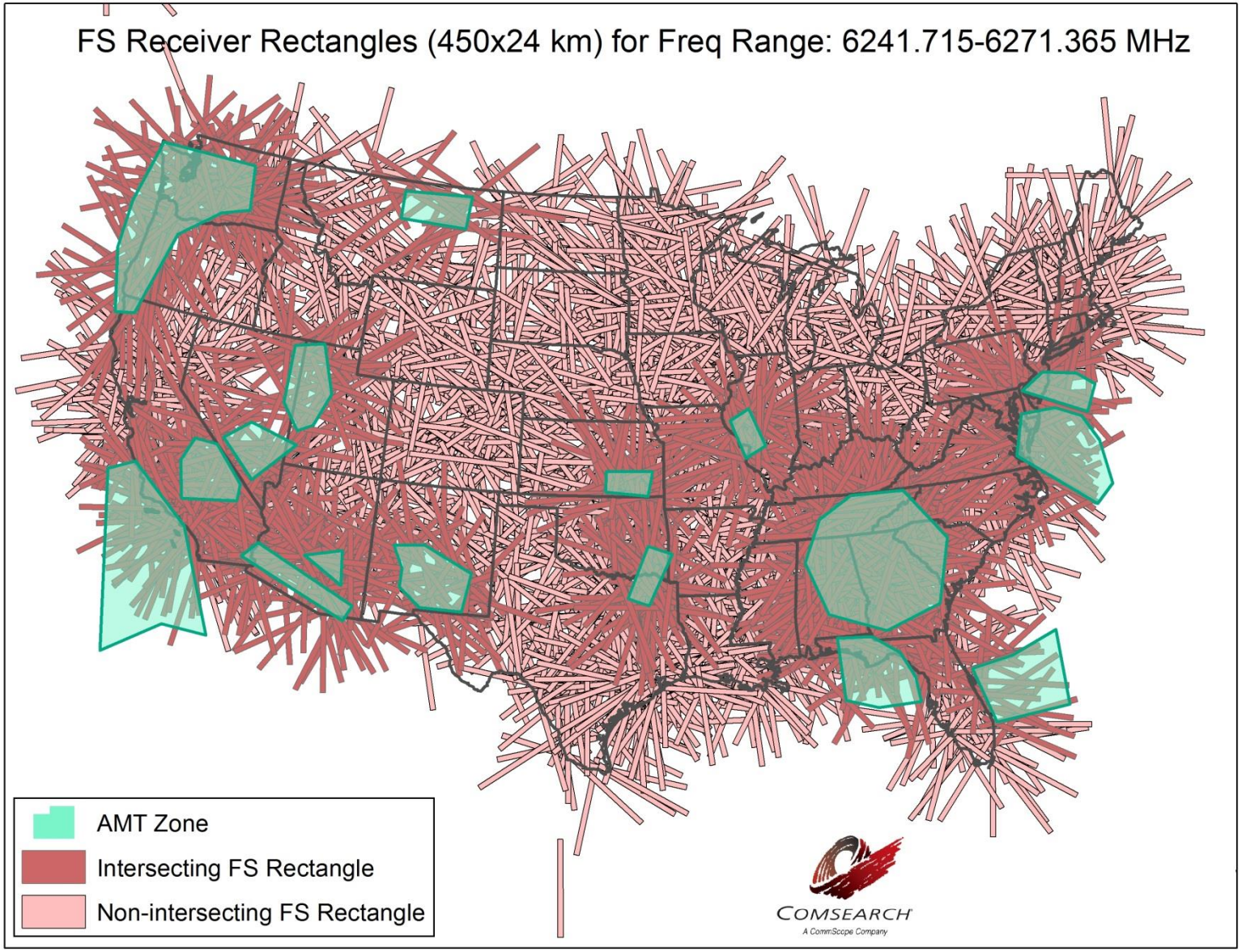
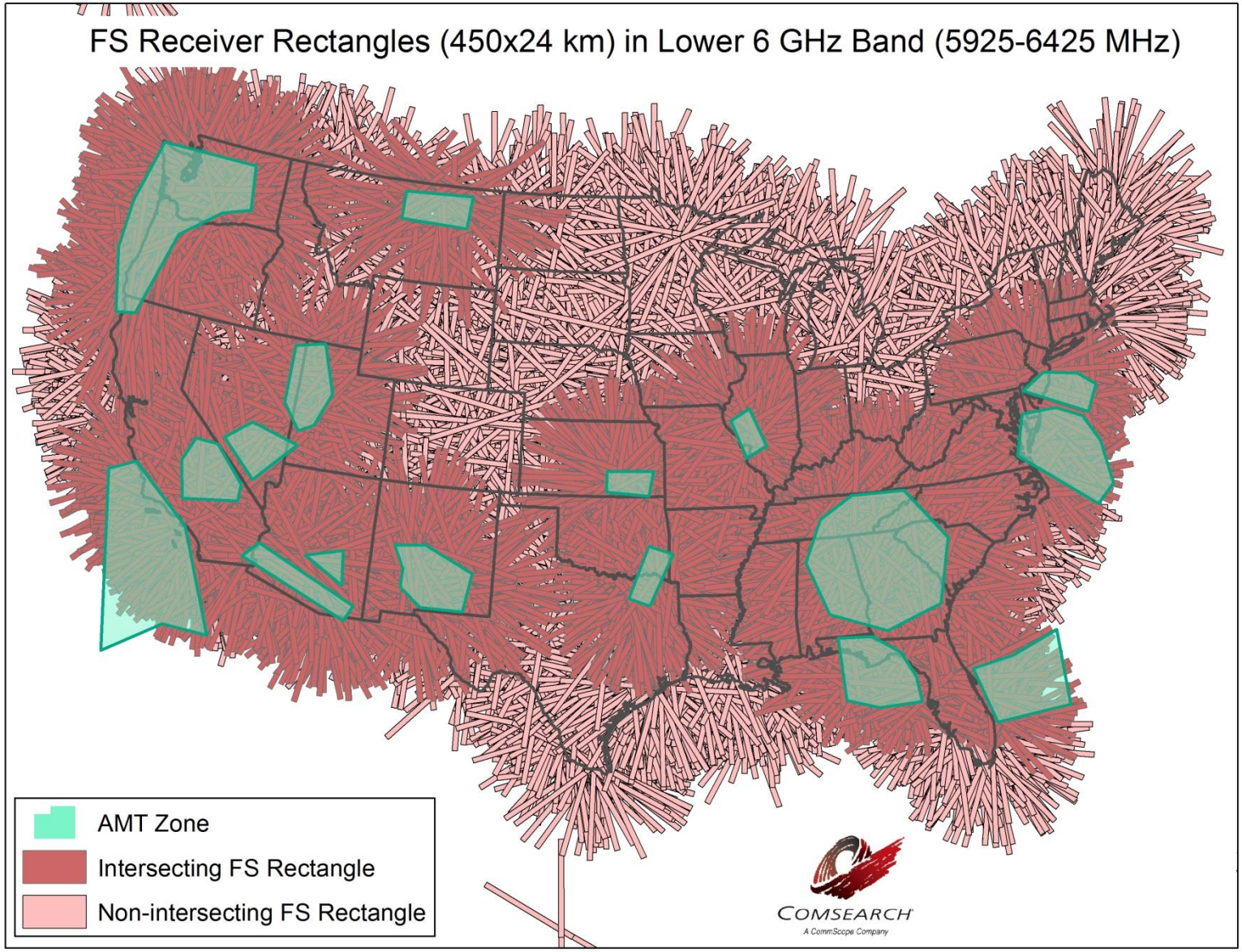

FS Receiver Rectangles (450x24 km) for Freq Range: 6241.715-6271.365 MHz
AMT Zone
Intersecting FS Rectangle
Non-intersecting FS Rectangle
COMSEARCH
A CommScope Company

FIGURE 3


FS Receiver Rectangles (450x24 km) in Lower 6 GHz Band (5925-6425 MHz)
AMT Zone
Intersecting FS Rectangle
Non-intersecting FS Rectangle
COMSEARCH
A CommScope Company

Even assuming, *arguendo*, that "it *might* be possible to operate AMT systems closer to a FS receiver through the implementation of frequency coordination, such close operation with existing FS receivers *might* only be achievable by implementing restrictions on the AMT system."[14] However, as the ITU-R Report recognizes, "[d]ifficulties in finding such a solution could result from the need to accommodate more than one existing FS receiver because of the intensive use of the 6 GHz bands by the FS."[15] These difficulties are further exacerbated by the ways in which AMT operations would occur:

> Major AMT test ranges are capable of supporting at least 2-6 simultaneous tests… [and] major test flight[s] can involve as many as ten separate aircraft… that require nearly the entire available spectrum… [and] it is not unusual for manned aircraft to traverse thousands of kilometers in test flights lasting 10-12 hours.[16]

Thus, hundreds, if not thousands, of FS receivers could be affected by a single test flight. According to the ITU-R Report, for a very fast moving aircraft (900 km/hr):

> a single pass through one of the [Severely Errored Seconds] SES regions in Fig. 9 would take from 6 to 12 s. The short term interference criterion for SESs in Table 13 is 1.2 × 10–5%, or 0.3 s per month. Thus, in a single pass across the main-beam axis of the FS antenna within 300 km of that antenna, the AMT transmitter would exceed the allocation for SES events by a large factor.[17]

Significantly, the ITU-R Report warns that "consecutive SES events of this duration would cause a FS link to become unavailable, or could crash a network, such as a cellular back-haul network,

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[14] ITU-R Report at 38, Annex 5, Section 2.5 (emphasis added). Moreover, according to the NPRM, "NTIA recognizes that the burden of avoiding interference to the existing FS stations would primarily be on the AMT users" (NPRM at n. 444), and that the only current means to achieve compatible operations between AMT and FS may be through "co-channel avoidance and spatial isolation techniques." NPRM at n. 447. Given the dense usage in the U.S., as illustrated in Figure 3, above, these techniques are likely unworkable.

[15] ITU-R Report at 38, Annex 5, Section 2.5.

[16] NPRM at n. 435.

[17] ITU-R Report at 29, Annex 5, Section 2.3. Slower aircraft would take even longer to pass through an FS receiver's main-beam axis, creating even greater concerns. *Id.*

containing it."[18] The coordination burden involved for just one test flight would be monumental, at best. In all likelihood, it appears impossible to adequately protect FS receivers from harmful interference caused by AMT. The temporal and fast moving nature of potential AMT interference to FS receivers adds an additional burden: it will be nearly impossible for the affected FS licensee to determine the cause and who is responsible. Dozens of test flights, traveling over thousands of kilometers for hours on end, could wreak havoc on FS receivers, and potentially crash critical networks across the country.[19]

The potential difficulties do not stop there. The ITU-R Report may only reveal the tip of the iceberg. The ITU-R Report's distance-determined criteria for interference impact does not take into account all of the variations of 6 GHz systems deployed and in use over many years. A wide range of types of antennas, radios, and site configurations (e.g. mountain-top sites) exist that make it difficult to come up with one universal distance-of-impact number. Moreover, the ITU-R Report's analysis does not account for: (1) the since-authorized smaller antennas in the 6 GHz bands that have a wider beamwidth for the off-main beam axis situation that may affect the 24 km width of an exclusion zone; (2) larger antennas with a larger main beam gain that may affect the exclusion zone distance of 450 km; or (3) wider bandwidths now allowed in the 6 GHz band.[20] Taking these differences into account can only make a nearly impossible situation (protecting 6 GHz FS operations from the proposed AMT operations) worse.[21]

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18 *Id.*

19 For cell site backhaul links (which comprise a significant number of licensed FS links in the band at issue), even short outages produce much longer service interruptions as the cell site to cell phone transceivers must reacquire synchronization and recover. In addition, it is not uncommon for multiple service providers on a cell tower to share the same microwave backhaul facility, thereby multiplying the negative impact of any backhaul outage and potentially denying all cell service to a coverage area.

20 The Commission has acknowledged that "the studies undertaken [for the ITU-R Report]

For the foregoing reasons, the FWCC believes that sharing between AMT and FS operations does not appear to be feasible. Accordingly, the FWCC respectfully opposes the NPRM's proposal to permit AMT operations in the 6 GHz bands.[22]

Respectfully submitted,

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regarding AMT operations may show different results if they are performed using these new parameters as inputs." NPRM at n. 455.

[21] Additionally, the proposed AMT operations would have a detrimental impact on FS utilization of the upper 6 GHz band (6525-6825 MHz), which pairs "channels in the 6525-6700 MHz band (175 megahertz of spectrum)… with channels in the 6700-6825 MHz band (175 megahertz)." NPRM at n. 461. As the Commission recognizes, "the requested AMT allocation… would impact future fixed stations in 350 megahertz of spectrum, not just the requested 175 megahertz." *Id*.

[22] Many of the FWCC's concerns regarding sharing in the 6 GHz bands would also apply to the NPRM's proposal for AMT operations in the 4400-4940 MHz band. As the ITU-R Report notes, "results [for the 4400-4940 MHz band] would not be expected to differ significantly" and "such small differences [in antenna gains and short-term interference criteria] would not significantly alter the size of the resultant exclusion areas." ITU-R Report at 38, Annex 5, Section 2.5. While the 4400-4940 MHz band is not as widely used by the FS, due consideration should be given to ensure FS usage can be protected from proposed AMT operations, and to ensure future FS usage of the band is not further precluded.