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July 25, 2011

Ms. Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Re: WT Docket No. 07-293; ID Docket No. 95-91;
GEN Docket No. 90-357; RM-8610 Ex Parte Notice

Dear Ms. Dortch:

The WCS Coalition ("WCS" or the "Coalition") has submitted ex parte filings contending that the proposed resolution of the Medical Body Area Network ("MBANs") proceeding, and a May 20 filing by the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") in this proceeding (the "May 20 Filing"), indicate that aeronautical mobile telemetry ("AMT") receivers do not require the protection level specified in ITU-R Recommendation M. 1459 (the "Recommendation" or "Rec. M. 1459").[1]

In particular, the Coalition argues that AFTRCC has accepted a coordination arrangement for MBANs which is inconsistent with, and more lenient than, the Recommendation which, according to the Coalition, AFTRCC intends to "slavishly" apply as against WCS. It further argues that the AFTRCC filing and the MBANs draft rules are 5-7 dB less restrictive than the Recommendation. From this the Coalition contends that the Commission should modify Section 27.73(a) of the Rules to delete the reference to WCS-AMT coordinations being conducted "consistent with [the Recommendation]." There is no merit to the WCS arguments.

The MBANs Settlement

First of all, rather than applying the hard limits in the Recommendation without further consideration, AFTRCC has done what it told the Commission it would do; namely, utilize the flexibility provided within the Recommendation in order to facilitate coordination. The end result of the MBANs resolution is a level of protection for AMT which takes explicit account of local conditions in a detailed and comprehensive way. For systems that do not meet the pfd levels in recommends (1) and (2), recommends (3) states that "the calculation methods and mitigation techniques given in Annexes 1 and 2 may be used, as applicable, for determining the

[1] Ex parte June 17, 2011; cf. ex parte July 21, 2011.

probability of interference to telemetry systems in the aeronautical service." For example, Annex 1 provides important descriptions of the AMT sharing problem so that coordination analyses can be carried out correctly and yield accurate results. As noted in the Engineering Statement, the Annex defines the geometry of the flight test airspace, describes propagation and fading characteristics that are unique to flight test, quantifies link budget requirements, and provides a validated methodology for conducting the complex, multi-variable coordination analyses for AMT systems. These considerations figured importantly in the MBANs settlement and development of the draft rules.

It should also be noted that the MBANs rules were arrived at in the give-and-take of negotiations conducted over the course of a year and a half, negotiations looking toward resolution of a difficult, intensely-litigated proceeding. The draft rules represent a creative blend of the Recommendation's guidelines and expected local conditions. Rather than demonstrating a material inconsistency, the WCS filing shows just the opposite -- AFTRCC's willingness, as promised, to exercise reasonable judgement in fulfilling its coordination responsibilities. The Coalition should not be heard to try leveraging a negotiated resolution to which it was not even a party -- not at least if the Commission hopes to encourage the negotiated resolution of increasingly frequent spectrum policy controversies. Beyond this, there is also no merit to the WCS technical argument.

There Is No Technical Inconsistency

WCS argues that the proposed MBANs rules produce a protection value of -149 dBm/MHz *versus* -156 dBm/MHz provided in Rec. M. 1459. As discussed in the Engineering Statement, the 149 dBm posited by WCS converts to a protection value of -174 dBw/m^2/4 kHz in Rec. M. 1459 terms, i.e. a seeming 6 dB difference.

However, the simplistic conversion proffered by WCS fails to account for the MBANs Rule's express inclusion of a factor built into that rule for aggregating interference from multiple MBANs sources in the calculation of path loss. Since the burden of the aggregation is borne by MBANs operators under the draft rule, the factor of 6 dB that accounts for aggregation in Rec. M. 1459 was removed. By contrast, there is nothing in the WCS rules dealing with aggregation of WCS interferers to AMT sites. Thus, as shown in the Engineering Statement, with MBANs aggregation properly accounted for, the value L = 149 dB in the draft rules gives a protection level of -180 dBW/m^2 in 4 kHz, consistent with the Recommendation.

Of course, MBANs devices are also significantly different from WCS base stations. Instead of one one-thousandth of a Watt, WCS base stations will operate up to 2,000 Watts average power. Instead of no peak-to-average issue, WCS devices are allowed peak levels which can exceed the average by a factor of 13 dB. Instead of concentrated locations in a relatively few locations, WCS entails widely-dispersed base stations numbering in the hundreds. Instead of desired transmission paths measured in feet inside buildings, WCS coverage is measured in miles even in metropolitan areas where flight test centers are often located. Therefore, while solutions applicable to MBANs cannot automatically be considered applicable to WCS, coordination for

WCS in any event can only be determined on a case-by-case basis in the light of specific WCS deployment proposals.

With respect to the May 20 Filing, AFTRCC responded to a staff request for the lowest receive signal level and the highest noise floor characteristic of AMT receivers. In its ex parte, WCS calculates that the values provided translate to a protection level of -151 dBm/MHz versus the value of -156 dBm that would be required by the Recommendation.

However, the Engineering Statement shows in mathematical terms that there is no more than a one dB difference between the pfd level derived from the May 20 Filing and the Recommendation. The Statement further notes that, in providing the requested information the May 20 Filing referenced an illustrative antenna gain value of 30 dBi which corresponds to the specified receive signal level tracking an aircraft at maximum range. As the Commission is aware, however, AMT antennas are available in a wide range of diameters/gains, some larger, some smaller. In contrast to the Filing, the Recommendation's pfd levels reflect a composite gain factor for a variety of antenna sizes up to 40 dBi, an . And, the Recommendation shows that this composite approach legitimately provides for a single pfd protection level that is appropriate across a wide range of antenna gain values.

The Continued Value of the Recommendation

The Recommendation's retention in the rule is important on several other counts as well. As referenced in the attachment, Rec. M. 1459 provides guidance on the analysis of link budgets that properly account for the complicated geometry of flight test airspace; on the impact on coordination of the six-degree-of-freedom dynamics of an aircraft in flight; on the unique fading environment encountered during flight test; on the range of adjustable system parameters in an AMT link budget; and on the handling of aggregation from multiple sources in different services.

Conclusion

The WCS filing has merit in one sense, but not in the way intended. The ex parte contradicts the premise for the Coalition's Petition for Reconsideration; namely, that AFTRCC intends to "slavishly" apply the Recommendation and stymie WCS deployment. On the contrary, AFTRCC's willingness to work with co-channel MBANs parties to resolve that difficult proceeding belies the notion that it intends to "slavishly" apply the Recommendation, or anything else for that matter.

If any change to the WCS rule were to be even considered, it should be no more than possible addition of the phrase "good engineering practices" -- the very same practices employed by AFTRCC and MBANS vendors when they stopped litigating, and decided to negotiate.

One final thought. It seems increasingly apparent that the Coalition seeks to second-guess the level of protection required for any given commercial, military, or NASA flight test center, and the operations conducted therefrom. Such a notion is contrary to the cooperation contemplated by the Commission, and is unacceptable. While the AMT community will take a

flexible approach to WCS coordination -- *as it already has in the case of MBANs* -- the safety of flight testing is not to be compromised.

A copy of this ex parte filing is submitted for the docket.

Sincerely,

William K. Keane

cc: Rick Kaplan
Julius Knapp
Ronald Repasi
John Kennedy
Tom Peters
Roger Noel
Linda Chang
Paul Moon
Moslem Sawez
David Strickland
Zhi Li

Engineering Statement

July 25, 2011

The WCS Coalition ("WCS" or the "Coalition") has submitted comments contending that the proposed resolution of the Medical Body Area Network ("MBANs") proceeding, and a May 20, 2011 filing by the Aerospace and Flight Test Radio Coordinating Council ("AFTRCC") (the "May 20 Filing") in WT Docket No. 07-293, are inconsistent with the protection level specified in ITU-R Recommendation M.1459 (the "Recommendation," or "Rec. M.1459").

In particular, WCS calculates that the Recommendation produces a protection level in dBm of -156 dBm/MHz, whereas the proposed MBANS rules produce a value of -149 dBm/MHz, and the AFTRCC filing of May 20, 2011 a value of -151 dBm/MHz WCS asserts that the Recommendation is 5 – 7 dB more protective, and that accordingly the reference in Rule 27.73(a) to WCS-AMT coordinations being conducted "consistent with [the Recommendation]" should be deleted.

As discussed below, there is no merit to these arguments.

I. There Is No Inconsistency with Recommendation ITU-R M.1459.

The computations performed by WCS are overly simplistic, and fail to account properly for the complexities of the AMT-WCS coordination relationship. In particular, WCS fails to account for aggregation effects of multiple WCS stations in simultaneous view of an AMT ground station antenna, or to consider the corresponding impact on the total interference-to-noise ratio experienced by the AMT ground station.[1]

A. The MBANS Rules

One of the proposed MBANs rules specifies that aggregate MBANS signals into an AMT ground station parabolic dish receive antenna must be attenuated by an amount greater than or equal to

$$L = 149 + 10 \log [(T \text{ mW/MHz})/(1 \text{ mW/MHz})] \text{ dB} \qquad (1)$$

where T represents the average power level of the aggregate number of MBANs devices in view of an AMT antenna when the antenna is pointing at an (in this example) MBANs equipped hospital. This value corresponds to -174 dBW/m^2 in 4 kHz.

[1] Two minor errors are noted in the WCS filing. First, the appropriate pfd level from Rec. M.1459 for use in its analysis is the S-band level, -180 dBW/m^2 in 4 kHz, not the L band level, -181 dBW/m^2 in 4 kHz. Next, the units used in the WCS filing, dBm/MHz, for the calculated protection levels should be dBW/MHz.

Of critical importance, L = 149 dB is defined for a single 1 mW MBANs emitter operating indoors. If T emitters are placed into operation within an assembly of healthcare buildings co-located within the mainbeam of the 30 dBi AMT receive antenna, the path loss must be increased by the factor T. Thus, no adjustment from a single-entry protection level need be performed to account for aggregation, and AMT operators never see an increase in interference due to an increase in MBANs devices placed in use within the field of view of the AMT antenna.

This accounts for the decrease in pfd protection level from -180 dBW/m^2 in 4 kHz, per Rec. M.1459, to -174 dBW/m^2 in 4 kHz cited above. In simple terms, since the burden of aggregation falls on the MBANs operator, the factor (in this case, 6 dB) that accounts for aggregation in the Rec. M.1459 pfd level can be removed. This is not the case for WCS, in which the Report and Order does not mention aggregation in the AMT context, places no limit on the number of WCS towers placed in use, and leaves open the question of how the gain of a WCS transmit antenna affects the out of band interference received at an AMT antenna. Instead, the R&O defers these questions to the WCS and AMT operators to resolve using good engineering practices in conjunction with Rec. M.1459. This is precisely the approach taken, with considerable success, in the development of the proposed MBANs rules.

Note that the protection level of -180 dBW/m^2 in 4 kHz in Rec. M.1459 applies to the use of AMT antennas that range in gain value from 28 dBi to 40 dBi. As the gain is increased, the beamwidth of the antenna, and hence the number of possible interferers, decreases. Over the range of 28 dBi to 40 dBi (and for all practical purposes, over the range of 30 dBi to 40 dBi of interest here), the beamwidth of the smaller antenna admits four times as much (6 dB) interference as the beamwidth of the 40 dBi antenna. This scaling effect is why, in Rec. M.1459, a single pfd value can apply across such a wide range of antenna gain/beamwidth combinations.[2]

As stated above, this difference is immaterial to an aggregation of MBANs devices, which by definition is treated as being a single, albeit large, point source. But for an aggregation of WCS towers, the interference seen by a single antenna increases as the number of base stations within the beamwidth of the antenna increases.[3]

Hence, to adjust the value of L for a WCS deployment requires increasing that value by at least 6 dB, raising the value of -174 given above to a protection level of -180 dBW/m^2 in 4 kHz. Scaled to Rec. M.1459 units of dBW/m^2 in 4 kHz, the corresponding required pfd protection value for interference from MBANs is -174 dBW/m^2 in 4 kHz,

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[2] Because the interference problem is essentially a two dimensional problem, interference scales with beamwidth, and beamwidth is proportional to the reciprocal of the square root of the gain of the antenna. Increasing the gain from 28 dBi to 40 dBi is 12 dB, or a factor of 16. As the gain increases by 16, the beamwidth decreases by 4, and vice versa.

[3] This is in contrast to the assumption in the D/U analysis in Appendix B of the WCS April 23, 2010 comments, in which advantage is taken of the fact that for a single point source interferer, C/I for an AMT link is independent of the beamwidth. That assumption is invalid for an aggregation of WCS base stations interfering with the signal from an AMT aircraft.

and the required pfd protection value for protection of AMT from WCS = -180 dBW/m^2 in 4 kHz. Both values are entirely consistent with Recommendation M.1459.

B. The May 20 Filing

The May 20 Filing was a response by AFTRCC to a Commission request for two values. The first was the worst-case (lowest) received signal power; the second was the highest receiver noise floor of an AMT ground station.

With respect to the former parameter, the May 20 Filing noted that the weakest AMT signal level is encountered when a low gain AMT receive antenna (e.g., 30 dBi) is used to track an aircraft operating at maximum range (200 miles) during a significant (15 – 20 dB or more) fade due to aircraft maneuvers and multipath. For the 30 dBi receive antenna referenced in the Filing, this yields a signal value of 6.4 x 10^{-13} Watts as measured at the LNA of the AMT ground station receive system.

For the AMT system noise floor, AFTRCC advised that for a system temperature of 250 Kelvin and a 10 MHz bandwidth, the value was 4 x 10^{-14} Watts.

The combination of these two numbers provides, in the absence of interference, a signal to noise ratio of 12 dB, which represents the bare minimum condition at which an AMT link can be closed while maintaining antenna tracking, bit synchronization, and an acceptable bit error rate.

The WCS ex parte observes at page 4 that a typical measure used to ensure that received signals are not degraded by OOBE (WCS being adjacent to AMT operations in 2360-2390 MHz), is that the interfering signal be 10 dB below the noise floor. Combining this value with the data supplied in the May 20 Filing, and converting to a power flux density at the aperture of the AMT ground station receive antenna, yields a power flux density value of -179 dBW/m^2 in 4 kHz assuming a 30 dBi AMT receive antenna, which is 1 dB different than the value of -180 dBW/m^2 in 4 kHz referenced in Rec. M.1459.

Without the Recommendation, a complex "wheel", including difficult definitions of flight test airspace and computations of convolution integrals, would need to be "reinvented" for each and every negotiation and site coordination. As shown below, use of Rec. M.1459 avoids this complex set of problems.

C. Comparison of MBANs and WCS Transmitters

The approach to the MBANS rule described above combines the protections of Rec. M.1459 with good engineering practices. However, there are critical distinctions between MBANS and WCS which also must be kept in mind.

First, unlike MBANS, the WCS goal is to maximize coverage. The proposed placement of multiple WCS antennas in proximity to AMT ground stations is a likely by-

product of WCS deployment, especially in metropolitan areas such as Wichita (Bombardier and Cessna), St. Louis (Boeing), Marietta (Lockheed), Phoenix (Bell Textron), and Seattle (Boeing), where aerospace manufacturing plants and AMT ground stations are located.

Second, the 43 + 10 log(P) requirement for WCS out of band emissions at the AMT band edge does not take into account the gain of WCS antennas (typically 8 dBi or higher)[4], or peak-to-average excursions (as high as 13 dB). Nor does the WCS rule address aggregation. Aggregation effects for MBANs are captured in the definition of the path loss L, and for MBANs devices, the peak-to-average ratio is equal to one.

Furthermore, unlike the MBANs case, there are no terms independent of distance that contribute to the computation of an equivalent value of L for WCS. For example, external wall attenuation from inside hospitals (MBANS being limited to indoor use in the AMT band) is irrelevant to WCS base stations.

II. Other Points

In its filing, WCS also challenges the relevance of Rec. M.1459 to WCS coordination on the grounds that the Recommendation deals with interference to AMT from satellites, not terrestrial sources, and sets forth generic characteristics as opposed to the characteristics of specific AMT sites which should be used in coordinations. (Ex Parte at note 6 referencing the April 23, 2010 WCS Filing.) There is no merit to these points either.

Since Rec. M.1459 is concerned with the pfd level due to interference as measured at the aperture of the AMT ground station antenna, it is irrelevant whether the interference originates from a satellite or from a terrestrial source. Interference is interference, regardless of its source or the path that interference takes to get to the victim receive antenna.

The only material difference between satellites and terrestrial interferers is that satellites can be present not only at low elevation angles with respect to the horizon, but at any angle with respect to the horizon.

Rec. M.1459 provides more than enough information to model accurately the interference from any terrestrial source. In particular, the derivation of protection levels at angles of arrival of 2 degrees or less with respect to the horizon covers most, and perhaps all, possible sources of terrestrial interference.

While on the point of elevation angles, it is useful to note that WCS, in its 23 April 2010 engineering statement, proposes to use a propagation exponent of 2.4 for

[4] Appendix B to the April 23, 2010 WCS Filing also assumes that WCS base station towers will use omni directional antennas. A fundamental tenet of wireless communication is to maximize capacity (and hence spectrum reuse) by a combination of cellularization and segmentation, the latter referring to the use of high gain antennas on base station towers in order to divide cells into 6 or more segments.

WCS signals, but stipulates that AMT operators should use the free space exponent value of 2 for AMT signals in the same calculation. This approach ignores the fact that AMT signals travel through the same clutter once they are at close range to the AMT ground station. Indeed, AMT signals will encounter more clutter, because earth curvature effects depress the elevation angle of the AMT ground station antenna, pointed at an aircraft 320 km away, below the elevation angle needed to view a WCS ground station tower located ~10 times closer to the AMT ground station.

Lastly, with respect to the argument that the Recommendation is too generic, the Coalition disregards the fact that the Recommendation provides a method for performing $C/(N + I)$ analyses given the numerous differing conditions applicable to AMT systems, e.g. the fact that C varies with antenna gain, I sometimes varies with AMT receive antenna gain, but N does not vary with AMT receive antenna gain.

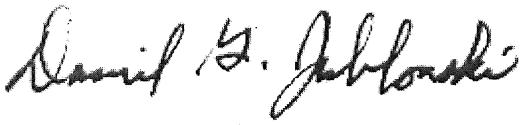
It is no exaggeration to state that the proposed MBANs rules could not have been developed successfully without having Rec. M.1459 to use as a starting point for all parties. For example, Rec. M.1459 provides guidance on:

- the analysis of link budgets that account properly for the complicated geometry of flight test airspace
- the impact on coordination of the six-degree-of-freedom dynamics of an aircraft in flight
- the unique fading environment encountered during flight test
- the range of adjustable system parameters in an AMT link budget,
- the convolution across the link budget trade-space of parameters that vary during flight
- the handling of aggregation from multiple sources from different services
- the practical use of local conditions to facilitate sharing

Above all, Rec. M.1459 provides a framework that combines technical information about AMT systems with a validated methodology for conducting analyses. Use of the Recommendation yields accurate results with a level of quality assurance that is conspicuously absent when AMT analyses are based on *ad hoc* models.

III. Conclusion

For all these reasons, there is no merit to the WCS contentions, and the rule's reference to Rec. M.1459 should be retained.



Dated: July 25, 2011