Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
Creation of Interstitial 12.5 kHz	)	WP Docket 15-32
Channels in the 800 MHz Band Between	)	RM-11572
809-817/854-862 MHz	)	

Reply Comments of RadioSoft, Inc.

I. INTRODUCTION

1. RadioSoft is a provider of Frequency Coordination, Contour calculation, Service and Interference calculation and TIA/EIA TSB-88 compliance to the Commission, Frequency Advisory Committees ("FACs"), the Federal Government and the general radio user community for both Land Mobile and Broadcast users. It is also, by contract, the retail frequency coordinator for both Public Safety (for AASHTO) and Business-Industrial (for AAA and MRFAC) applicants. It is an active participant in spectrum policy debates, and has commented on the record various Dockets. The undersigned was one of the two original authors of the language proposed by the Land Mobile Communications Council ("LMCC") to revise CFR47 §90.187 and was likewise a part of the LMCC and NPSTC discussions in the above-captioned matter. However, to achieve consensus, and in the interest of expedience, not all of what is submitted by the LMCC reflects RadioSoft's intent or the undersigned's opinion.

II. SUMMARY

2. The wide variety of uses of the Mid-Band 800 MHz channels presupposes (for spectrum efficiency) a complexity of allocation principles which few of the commenters have apparently entirely grasped. RadioSoft agrees with much of what is proposed by the Commenters, and seeks to clarify certain points and suggest several alternatives to protection under §90.621 which will achieve a better balance between necessary incumbent protection and spectrum efficiency by resolving certain differences between Commenters. Among these are:

a) Retire the distance-based protections in favor of contours;

b) Use the F(50,50) method for calculation of interfering contours;

c) Allow 25 kHz bandwidth uses on all interstitial channels;

d) Allow, for cases of contour overlap, the admission of standardized studies based on TSB-88 protocols; and lastly

e) Indicate that should the Commission agree with the principle of consensus among the certified Frequency Advisory Committees, adjacent channel protections will be carefully monitored and quickly adjusted as necessary by the LMCC.

III. DISTANCE AND DHAAT HAVE OUTLIVED THEIR USEFULNESS

3. The current allocation scheme, which is proposed by the LMCC to be retained for co-channel allocation both for existing and interstitial channels, calls for distance-based analysis (113 kilometers), with a short-spacing table, the so-called "DHAAT" table in §90.621(b)(4) allowing operation between 88 and 113 kilometers. There is also a provision for very elevated locations, primarily among California

Mountains, which involves both Heights Above Average Terrain (HAAT) exceeding 458 meters and a table of site-to-site co-channel prohibitions, which were needed as one distance cannot adequately and efficiently protect very different service areas. The Comments on record largely ignore current allocation policy, though the question was raised in the NPRM. Some have privately remarked that changing distance/DHAAT to contours is "too big an ask". We find little opposing opinion on the record, and thus propose contour protection for co-channel and adjacent existing and interstitial allocation.

IV. PROTECTION FROM INTERFERENCE WILL BE IMPROVED USING F(50,50)

4. Several commenters address the proposal to use F(50,50) contour calculation methods for interference contour determination rather than the F(50,10) often used in other bands, typically asserting that "Proponents have failed to provide a technical justification for a lower standard for interference protection."[1] This is a misunderstanding of the effect of proposed change. Using the 14 dB correction factor between F(50,50) and F(50,10) at 800 MHz, what is proposed for protecting service contours from interference at co-channel would be a contour value of 8 dBμ. To be clear, the LMCC proposal does not suggest an 8 dBμ interfering contour, as it proposes to retain the existing distance/DHAAT method for co-channel protection for all channels. However, it is the F(50,50) interfering contour value that represents the basis for determination of the tables of various adjacent channel modulation type protections. Examination will reveal that using a F(50,50) 8 dBμ contour provides considerably *better* protection than a 22 dBμ F(50,10) contour in all cases.

5. F(50,10) contours are certainly inappropriate for very small interference areas, such as those found with two adjacent 12.5 kHz modulation types. Thus F(50,50) contours should be exclusively used for calculation of caused and received adjacent channel interference.

6. F(50,50) interfering contours have been almost ubiquitous in the NPSPAC portion of the 800 MHz band, now 806-809/851-854 MHz. Though that band does not exactly mirror the Mid-Band uses, it does provide a good record on 12.5 kHz channel spacing. Their use here would conform practice across both the NPSPAC and Mid-Bands.

7. This method will have the desirable effect, if employed for co-channel protection, of dramatically simplifying those calculations, as no DHAAT table, no "California High Site" table and no "Above 458 meters HAAT" exception need be retained. In our experience, the 113 kilometer distance protection standard (with the DHAAT table) fails, as would be expected, with very low terrain roughness coupled with tall towers and high Effective Radiated Power. In such cases, the commonly used "40/22 F(50,10)" contour method also fails permissively, but the proposed 40/8 method does not. Thus using 40/8 would not only simplify, but improve protection regardless the terrain roughness. We thus suggest a Further Notice to propose revision of §90.621 for co-channel use on all channels both existing and interstitial.

8. We agree with the Comments of the American Electric Power Service Corp. that there is a danger of "an ever-tightening vice where no location or modification of facilities will be possible…"[2] We thus suggest a proposal for such "wiggle room" for all incumbent users on existing channels that their ERP used to calculate the above-proposed 40 dBμ protected service contour should be increased by 3 dB up to a limit of 500 Watts, above which it would remain as licensed. We believe this to be an effective compromise between the current "We can always upgrade to 1000 Watts" presumption currently reflected in the DHAAT table, and the need to provide for site relocations and limited expansion of systems.

[1] UTC comments at II, P. 3

[2] AEPSC Comments at III, P. 5

V. ALLOW 25 KHZ MODULATION ON INTERSTITIAL CHANNELS

9. In the United Telecom Council (UTC) comments to the original Rulemaking, UTC proposed allowing wideband operation on interstitial channels.[3] In its current Comments, UTC states, "…the introduction of these additional narrowband channels will make it more difficult for utilities to use wideband technologies to increase capacity on existing systems. This runs contrary to Commission policy to promote broadband or wideband channelization…"[4] This appears to modify its original position on the question raised in §19 of the NPRM suggesting that wideband uses be allowed on interstitial channels. There is no clear consensus on that issue, probably because many simply went along with the original EWA suggestion for narrowband uses.

10. While we see both pros and cons for the use of TETRA (one example of wideband technology) on interstitial channels, there appears to us to be little downside to allowing wideband generally, and thus propose that. Spectrum-efficient coordination can accommodate the addition of those technologies, and any future developments. We have observed a compelling interest by manufacturers in "channel splitting" under §90.221, i.e., placing multiple smaller carriers within one emission mask. Proposals exist for both DMR (12.5 kHz TDMA technology) and NXDN (6.25 kHz FDMA technology), and will be demonstrably more spectrum efficient. Some may already have been type-accepted. We do not wish to constrain such advances to only the existing channels.

11. We do not see much possibility for aggregation of channels below 860 MHz, either for incumbents or for interstitials, due to the patterns of licensing: we are aware of no instance of the use of §90.645(g). The only spectrum which could therefore benefit from such aggregation lies mostly above 861 MHz (the "Guard Band"), in which it might be useful. Thus we see no reason to modify §90.645, assuming the Commission agrees to the adjacent channel consensus principle, which would allow for such technology to be correctly coordinated without further Rule changes.

VI. ALLOW BUT NOT REQUIRE TSB-88 WHERE CONTOURS OVERLAP

12. We argued for the use of TSB-88 in the original Rulemaking Comments, and subsequent developments have made it even more advisable, though there is little argument for or against it specifically.[5] Thus the failure to develop a complete record on the subject may be fairly addressed in Reply.

13. The arguments against this protocol list its complexity (it can only be performed using computerized algorithms) and its lack of repeatability. There is also a more general argument against modeling, such as the repeated assertion in the Peak Relay comments, "…the calculations are only theoretical, they require field testing to validate them".[6] The Peak Relay comments also go on to raise a geography-specific argument about tropospheric ducting and other atmospheric phenomena in Southern California where it operates: "… these effects are dependent upon the local topography, and both can be modeled to an extent by the use of an accurate geo-database and modern propagation analysis programs. The ray reflection problem … cannot be so handled, because of the dependence of is strength and its

[3] UTC Comments on RM-11572 at 4.

[4] UTC Comments at 2.

[5] The NPSTC Comments state "…engineering studies could use a tile-based matrix study with TSB-88 methods…" and recommends standardization between coordinators, at P. 6

[6] Peak Relay Comments, at 8.

effects solely open both temporally- and spatially-varying atmospheric conditions."[7] We are abundantly familiar with ducting in SoCal, but those occasional interfering signal variations of 20 dB or more cannot be used as a defining factor for allocation policy *in toto* or even for SoCal, as it would limit the vast majority of spectrum uses unreasonably. Peak then goes on to assert, "…theoretical standardized propagation analysis programs … used as the sole basis for channel assignment policy would not seem to constitute a reliable method for establishing such policy. … But it is one of our central tenants (sic) … that proposed channel assignment standards must be investigated and confirmed by field measurements…"[8] We disagree. If a licensee is located in an area well known to exhibit frequent atmospheric phenomena, it cannot demand a general policy to protect it, and in any case it applies no differently to existing channels than to the interstitials.

14. Until the present, all terrain-sensitive propagation methods have been non-standardized to the extent that the terrain database and the precise methods for extracting data from it remain unspecified. This has led to justifiable concerns about the repeatability of TSB-88 calculations as a method for pass-fail analysis. The undersigned was chair of the TIA workgroup charged with that standardization; that group's work was largely ignored, and is now dated in any case. However, the requirements for contour accuracy imposed on TV White Space database providers led to the creation of a new standardized document of which sections 2 and 3 would allow any TSB-88 users to produce practically identical results. It may be downloaded at http://apps.fcc.gov/ecfs/comment/view?id=6018306003. We believe adoption of this as a standard here (and in other bands) would result in at least a 6 dB increase in spectrum efficiency, as well as permitting new technologies to be quickly implemented upon submission to the TIA for inclusion of its transmission and receiver characteristics. The various White Space database administrators have cooperatively implemented this standard with excellent results.

15. Another benefit to allowing such analysis is to permit the use of deliberately conservative contour values, especially in protection of analog service against digital interference, without excessive spectrum inefficiency. In preparation of the suggested (and soon to be refined) LMCC contour tables, this was exactly the process—the suggested interfering contour values are larger in area than the Adjacent Channel Power Ratios for the modulation types in question would dictate. This contour/TSB-88 dual process preserves simplicity (the contours methods are well established) yet allows for otherwise fallow spectrum in often congested areas to be used without unreasonable risk of interference.

16. Channel splitting under §90.221 makes defining protection by contours both more complex and less accurate. This argues as above for showings to allow allocations otherwise prohibited by small contour overlaps where no actual interference would be caused or received.

17. Using standardized TSB-88 software, one could also allow for different protection requirements for Public Safety versus Businesses, for example 1% Area Reliability Degradation versus 5% as is currently the practice for T-Band adjacent proponents. Due to the large number of Public Safety users on non-Public Safety channels, and to the different channel eligibility on many adjacent channel pairs, there is no reason to define proposed contour values differently for Public Safety.

VII. COORDINATORS ARE RESPONSIVE

18. Though APCO and EWA, the two coordinators designated by the FCC to resolve interference cases in Public Safety and Business spectrum respectively have done an admirable if thankless job, we can guarantee that no coordinator wants to assign 800 MHz spectrum resulting in interference to

[7] *Id.* at 34

[8] *Id.* at 35

incumbents or proponents. As many of the Commenters have pointed out, 800 MHz systems involve substantial investments by Government, First Responders and Businesses alike: that value must not be degraded. The LMCC is and will remain eager to address such issues and opportunities as may arise to improve its allocation policy and avoid any interference.

VIII. CONCLUSION

19. The newly diversifying implementation of digital narrowband, wideband and frequency-shifted systems does not permit the existing §90.621 Rule to optimize spectrum efficiency. Since protection requirements are now well-established in TSB-88 for such cases, and since that document is evolving to meet new technologies, it should be allowed for allocation of all new proposals in the Mid-Band. Contour models, while imperfect, have served well and are thoroughly understood by the industry, and should be universally implemented for both co-channel and interstitial protections, in both directions. They should be deliberately conservative, with the option of *standardized* TSB-88 showings for small overlap cases.

Respectfully submitted this 26th of May, 2015 by

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