Before the

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

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| In the Matter of | ) | |
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| Amendment of the Commission's Rules With Regard to the 3650-3700 MHz Government Transfer Band | ) | ET Docket No. 98-237 RM-9411 |
| | ) | |
| The 4.9 GHz Band Transferred from Federal Government Use | ) | WT Docket No. 00-32 |

To : The Commission

## COMMENTS OF TRANSCOMM INC.

TRANSCOMM Inc. ("Transcomm") hereby responds to issues raised in the above referenced First Report and Order and Second Notice of Proposed Rulemaking (FR&O & 2nd NPRM) for the 3650-3700 MHz frequency band. These comments are intended to :

- Update the record on some characteristics of high capacity / high efficiency TDD-based FWA technologies and the implications for block sizes and pairing.
- Enhance the Commission's proposals in relation to enabling more effective availability of this spectrum to improve telecommunications access for Tribal and Rural communities
- Ensure that the Commission's rules are suitably harmonized with International activities or interests in this band so as to maximize the opportunities for US service providers and exporters
- Respond to the Commission's questions about potential pairing with the 4.9GHz band plus the offshore distances for naval radiolocation operations in the 3650-3700 MHz band

## 1. INTRODUCTION

Transcomm is an economic and engineering consulting firm established in 1969. We have worked extensively with telecom investors, operators, customers, regulators, and policymakers in the United States and in numerous other countries. We assist in the planning, analysis and implementation of successful telecom programs and infrastructure projects, especially those focused on bringing affordable telecom services to rural areas previously without adequate access. Transcomm originally filed comments[1] in response to the Commission's First NPRM on the 3650-3700 MHz band and made an ex Parte[2] presentation under the same proceeding and the "Extending Wireless to Tribal Lands" proceeding.

## 2. FREQUENCY BLOCK SIZING AND PAIRING

The Commission[3] has asked for additional comments on the appropriate block sizes and pairing arrangements for these bands. Within this context it is important to take into account capacity, spectrum efficiency and other technical factors, as well as International harmonization.

### a) Capacity and Spectrum Utilization Efficiency

The previous commentors who supported single blocks of 50 MHz because of traditional capacity and sectorization considerations would not have been aware of subsequent technology developments. Traditional fixed wireless access (FWA) technologies have provided payload throughputs of 1-3 bits per second per Hertz per cell (bps/HZ/cell) for non-line of sight deployments, with frequency / sector re-use plans based on N= 3 to 9, necessitating very large spectrum allocations (e.g. the MDS bands) to serve viable numbers of users at competitive (and ever increasing) data rates. Newer technologies now coming to market are using adaptive modulation, adaptive antenna and adaptive multibeam techniques to achieve 10-20 bps/Hz in non-Line-of-Sight (NLOS) applications, with frequency / sector re-use factors of only one or two. This significantly reduces the bandwidth allocation needed to support any given payload, or conversely increases the ability to deliver much greater payloads for any given frequency allocation. This is especially important when addressing residential and small business locations where deployability, coverage and cost are critical to the service provider's business plans, or "narrow" frequency bands, such as 3650 - 3700 MHz which would otherwise have been regarded as non-viable for FWA deployments.

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1 Docket ET98-237 Comments of Transcomm Inc dated February 16th, 1999
2 Docket ET98-237 and WT99-266 Ex Parte Presentation on January 25th, 2000
3 FR&O & 2nd NPRM at 70 and 71

Transcomm gives an example[4] below of the typical capacity of one of these new technologies, currently being developed for the WCS and MDS bands that could also be made applicable to the 3650-3700 MHz band. *This example uses "stacked" TDD sub-blocks with flexible separation ( 0 - 200 MHz ) between the pair of sub-blocks.*

| **Band Allocation** *(Paired or Contiguous)* | **Downlink Payload per Cell** *(Base Station to Customer)* | **Uplink Payload per Cell** *(Customer to Base Station)* |
|---|---|---|
| 6.25 + 6.25 = 12.5 MHz | Supercell : 100 Mb/s<br>Multi-cell : 60 - 75 Mb/s | Supercell : 80 Mb/s<br>Multi-cell : 50 - 60 Mb/s |
| 12.5 + 12.5 = 25 MHz | Supercell : 200 Mb/s<br>Multi-cell : 125 - 145 Mb/s | Supercell : 160 Mb/s<br>Multi-cell : 100 - 120 Mb/s |
| 25 + 25 = 50 MHz | Supercell : 400 Mb/s<br>Multi-cell : 250 - 295 Mb/s | Supercell : 320 Mb/s<br>Multi-cell : 200 - 240 Mb/s |

Typically, a (100 + 80) Mb/s payload capacity can serve up to 12,500 residential data customers, 17,500 residential voice lines, 5000 small business data customers, 7,500 business voice lines or appropriate aggregations within these values.

Transcomm suggests that wide area (competitive) licenses targeted at higher density metropolitan and urban areas should encourage the development of such forward looking technologies with very high spectral efficiency whereas rural licenses can tolerate technologies which provide longer range but might be less spectrally efficient. In either case, this implies full flexibility in the allocation, operation and potential pairing of frequency blocks.

**Transcomm recommends that any auctioning or licensing of the 3650 - 3700 MHz band be on the basis of individual 12.5 MHz blocks, with each block treated as a separate entity. Bidders / applicants should be able to pair any two or more blocks in any manner, if they wish, to suit their business / service plans and technology preferences**.

[4] Example is based on BeamReach Networks Inc (www.beamreachnetworks.com)

**b) Pairing of Blocks <u>within</u> the 3650-3700 MHz Band**

Several commentors[5] suggested that most FDD technologies require a minimum of 50 MHz or 100 MHz duplex separation, making the 3650-3700 MHz band inappropriate for FDD operation, which also have restricted ability to flexibly assign downlink versus uplink capacity in asymmetric applications. TDD technologies are generally cheaper / simpler to implement and can typically operate using single, multiple or combined blocks with no minimum or specific block separation and can more easily adapt to meet different or varying asymmetry requirements without affecting the frequency block allocations or pairing.

**<u>Transcomm recommends that the Commission optimize its licensing procedures for the 3650-3700 MHz band for TDD technologies. This need not preclude FDD solutions if they can meet the appropriate out-of-block emission and coexistence criteria. Bidders / applicants should be able to pair any two or more blocks in any manner, if they wish, to suit their business / service plans and technology preferences</u>**.

**c) Pairing of Blocks <u>between</u> the 3650-3700 MHz and 4.9 GHz Bands**

The Commission[6] asks whether "coupling" the 3650-3700 MHz band with the 4.9 GHz band would address the FDD separation issue. Transcomm believes that FWA radio hardware design tends to economically limit the overall frequency range of FDD downlinks and uplinks to within 200 - 300 MHz at these frequencies. This would suggest that there is no technical merit in coupling the two bands for FDD purposes, and any such arrangement might limit the flexibility for TDD operations within each of the two bands, taking into account the additional potential interference paths in mixed TDD / FDD adjacent channel scenarios. Transcomm is aware of one such "Half FDD" system[7] which currently operates downlinks in the 2400 MHz ISM band and uplinks in the 5.7GHz ISM / UNII band. This approach could probably be adapted to the combination of 3.65 and 4.9 GHz frequencies, but Transcomm believes that such solutions would not be competitive or cost-effective for residential and small business FWA applications.

**<u>Transcomm recommends that the Commission does NOT impose or imply any technical pairing or coupling of the 3.6 and 4.9 GHz bands Bidders / applicants should be able to pair any two or more blocks in any band or manner, if they wish, to suit their business / service plans and technology preferences</u>.d) International Harmonization**

The 3400 - 3700 MHz bands in Canada and South America generally favor 25 MHz block sizes (single or paired), but 12.5 MHz would also be compatible. For the 3400 - 4200 MHz bands,

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[5] FR&O & 2nd NPRM at 44

[6] FR&O & 2nd NPRM at 15 and 44

[7] Wireless Inc 2458 System (www.wire-less-inc.com)

European specifications allow any multiple of 0.25 MHz but typically favor 7MHz, 14 MHz and 28 MHz blocks (single or paired).

Given the expectation of higher bandwidth fixed data and voice access, **Transcomm recommends a single block size of 12.5 MHz. Licensees would obtain single or multiple blocks in accordance with their own business / service plan requirements and technology preferences, within coexistence or out-of-block emission or susceptibility requirements which should be consistent with the existing International specifications and practice in these bands.**

A second International consideration is that Canada, Mexico and some other CITEL[8] countries have so far held back from licensing the 3600-3700 MHz portions of their 3400-3700 MHz FWA allocations until the US policy for the 3650-3700 MHz band is known. At such time these countries could implement their own licensing procedures in a compatible manner, but across the whole 3600-3700 MHz band. Equipment that is developed for the US market would then have a potential market outside the US, and US service providers / consumers might also benefit from equipment developed for the (wider) band in the International markets. Europe has also allocated the entire bands 3400 - 4200 MHz for FWA but there are no specific rules in place for the 3600 - 3700 MHz segment in most countries. An opportunity exists to align US and European licensing policy and practice in this regard for further mutual benefit.

Although NTIA[9] has ruled out the entire 3400 - 3650 MHz bands for non-government use or sharing, Transcomm understands that in earlier NTIA reports [10],[11] the 3600-3625 MHz and 3625-3650 MHz segments were identified to be retiring from their current military needs in 2002 and 2009 respectively - possibly earlier. This suggests that in the longer term, the US <u>might</u> be able to align its allocation of the entire 3600-3700 MHz band with Canadian, Mexican and potential CITEL plus European FWA usage.

**Transcomm recommends that the Commission should take these International harmonization aspects into account when finalizing its 3650-3700 licensing and coexistence rules so as to enable maximum economies of scope and scale for any equipment developed for these frequency bands in the domestic and International markets, with due regard to the adjoining 3600- 3650 MHz blocks.**

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[8] Telecommunications Committee of the Organisation of American States (OAS)
[9] Docket ET98-237 NTIA Letter and DoD Attachment dated June 30, 2000 to Dale Hatfield, Chief OET.
[10] NTIA Special Publication SP-94-27 "Preliminary Spectrum Reallocation Report"
[11] NTIA Special Publication SP-95-32 "Final Spectrum Reallocation Report"

## 2. GEOGRAPHIC AREAS FOR RURAL AND TRIBAL FIXED WIRELESS ACCESS

The Commission[12] states its intention / expectation that the proposed rules for making this frequency band available to non-Government users will particularly promote the (rapid) deployment of PSTN, broadband and other advanced telecommunications services to rural and tribal communities. The Commission[13] has tentatively concluded in favor of wide area licensing and seeks additional comments on how this should be achieved and whether different arrangements could be made for smaller areas outside of a more general wide-area strategy. Several commentors[14,15,16,17] expressed concerns, urging the Commission to adopt the smallest possible geographic areas for licensing in Rural or Tribal locations, and to distinguish them from the (competitive) licensing of larger / wider Metropolitan or Economic areas. Based on our previous experiences, and comments in other proceedings[18], Transcomm shares these concerns, and believes that some specific improvements should be made, such as :

- Allow Part 101 or BETRS-like licensing for rural and tribal applications, whereby applicants define their own license areas for specific communities, markets and applications, even where a wider area is defined for competitive licensing purposes.
- Obliging wider-area licensees to readily disaggregate, partition or sub-license their spectrum to rural and Tribal entities on a fair, reasonable and non-discriminatory (long-term) basis to serve specific communities, markets and applications.

Transcomm takes no position here with regard to the appropriate wide-area geographic licensing mechanism for non-rural and non-tribal areas.

**Transcomm recommends that whichever wide-area scheme is adopted, it should specifically EXCLUDE the Rural Statistical Areas (RSAs) originally used for Cellular licensing (in much the same way as the Commission will effectively exclude the protected Government and FSS zones).**

Within RSAs, licenses could be awarded by one or more of the following mechanisms :
i) Separate competitive bidding (e.g. by incumbent Cellular, Wireline, Internet Service Providers (ISPs), Rural or Tribal enterprises / Utilities) who can most benefit from existing infrastructure and

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12 FR&O & 2nd NPRM at 1, 10, 13 and elsewhere.
13 FR&O & 2nd NPRM at 64 - 68
14 Docket ET98-237 GTE Reply Comments dated March 1st,1999 and Ex Parte dated May 18th,1999
15 Docket ET98-237 Reply Comments of OPASTCO dated March 3rd, 1999
16 Docket ET98-237 Reply Comments of Blooston *et al* dated March 1st, 1999
17 Docket ET98-237 Reply Comments of Western Wireless Corp dated March 1st, 1999
18 Especially the Universal Service, Section 706 and Tribal Lands proceedings since 1996.

sharing to more rapidly deploy Fixed Wireless Access solutions to improve coverage in the rural and tribal areas concerned on an incremental cost basis.

ii) On application, by any bona fide service provider or utility / facility organization using Part 101 or BETRS-like procedures to address specific communities or niches within the RSA. This would occur where an RSA-wide license has not been taken up, or is not being effectively deployed to serve the particular niche in a timely manner.

iii) By appeal to the FCC if an agreement in (ii) above (or a request for partition or disaggregation etc) is unreasonably withheld, obstructed or seeks unfair / discriminatory payment terms.

Our reason for proposing RSAs for these purposes is that the (Cellular) tower, feeder and interconnect infrastructures already in place for these communities are probably best suited to rapidly offering or extending coverage for FWA purposes to the rural and Tribal communities concerned.

The main benefit of Transcomm's proposal is that it puts the licensing regime for rural and Tribal areas, plus the timing and priority of service deployment in the hands of those with the greatest interest in resolving telecommunication service and access issues in such areas, rather than at the mercy of a competitive bidding process optimized for the more (profitable) urban and metropolitan interests, where the 20% "safe harbor" provisions are easier to achieve. This proposal also provides safeguards against unreasonable "warehousing" of rural spectrum capability or universal service subsidies without deploying the much needed advanced services and infrastructure in a timely manner.

### 3. RADIOLOCATION SERVICES

The Commission[19] proposes to allow Government naval radiolocation services to operate in the 3650 - 3700 MHz band, subject to being more than 80km offshore, rather than using the smaller distance (approx. 50km) suggested by NTIA or the longer distance (approx. 100km) suggested by SR Telecomm. The joint Nortel / DoD / JSC analysis mentioned in the NTIA / DoD Letters[20] concluded that the required separation distances (over water) could be in excess of 100km within the 3650 -3700 MHz band.. This has been confirmed in the information submitted by the US Government to ITU-R JRG 8A-9B[21] which specifies separation distances up to 122 or 135km. The Commission proposes that future requests to *increase* the distance beyond 80km would be considered if the appropriate technical analysis were to be made available. Much of the information needed to perform such analysis is in the hands of the military (some of it classified) who would generally prefer shorter distances, for operational reasons.

**Based on the analysis provided by the US Government to ITU-R JRG8A-9B, Transcomm recommends an offshore distance limit of 135km (rather than the proposed 80km) with the burden on NTIA and the military for providing any technical analysis or justification for *reducing* the distance.**

According to Nortel[22] the JSC advised "...it is normal practice for (safety) helicopters to operate while naval vessels are entering and leaving harbor, during which time the vessel's air traffic control radar (e.g. AN/SPN-43) must be operating." This implies that additional coordination zones might be needed around naval harbor locations, such as Norfolk (VA), Charleston (NC), San Diego (CA) and others.

As mentioned above, the US Government has been discussing at ITU-R and with other Administrations the offshore separation distances needed to protect other countries' authorized FWA deployments in the 3400 - 3700 MHz bands from US and US-type naval radiolocation operations. The distances adopted for US rulemaking purposes should be consistent with whatever agreements are reached with ITU-R and other Administrations, and *vice versa*.

**Transcomm recommends that the Commission further reviews and clarifies these domestic and International radiolocation aspects before finalizing the 3650-3700 MHz licensing rules and proposed footnotes to the US Table of Allocations.**

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[19] FR&O & 2nd NPRM at 37,38 and 109

[20] Docket ET98-237 NTIA Letter and DoD Attachment June 30, 2000 to Dale Hatfield, Chief OET.

[21] ITU-R Doc 8A-9B/27-E 19 October 2000, Attachment 1, Annex 1 Table 7-4

[22] Docket ET98-237 Comments of Nortel at Page 13 "Paragraph 16 : Coordination ...etc"

## 4. CONCLUSIONS

Based on the information and reasoning presented in these comments, Transcomm recommends that the Commission :

i) Should license the 3650 - 3700 MHz band on the basis of individual 12.5 MHz blocks, optimized for TDD FWA technologies. Bidders / applicants should be able to pair any two or more blocks in any manner, if they wish, to suit their business / service plans and technology preferences.

ii) Could choose to license the 4.9GHz band at the same time, and with similar rules, but that there should be no specific or implied pairing with the 3650-3700 MHz band. Bidders / applicants should be able to pair any two or more blocks in either or both bands or manner, if they wish, to suit their business / service plans and technology preferences

iii) Should apply an offshore distance limit of 135km for naval radiolocation operations, with the burden on NTIA and the military for providing any technical analysis or justification for *reducing* the distance (rather than the Commission's current proposal of 80km with the burden effectively on the non-Government operators to justify any future *increase*).

iv) Should ensure harmonization of its 3650 - 3700 MHz rules with International standards and practice in this band, and the adjacent 3600 - 3700 MHz band, which might also become available for non-Government use in the US at a future date.

v) Should specifically EXCLUDE (or separately license) the Rural Statistical Areas (RSAs) originally used for Cellular licensing, regardless of whatever wide-area licensing scheme is used for competitive bidding in metropolitan and urban areas.

vi) Should allow a Part 101 or BETRS-type licensing scheme (and/or appropriate appeal process) for *bona fide* applicants wishing to serve rural and / or Indian communities, regardless of the wide-area or RSA-based licensing areas used for more competitive / commercial operations.

Transcomm stands prepared to discuss or present additional information, clarification or suggestions on any of these comments should the Commission or its staff believe that it would help their deliberations.