

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of)
)
Amendment of Parts 1, 21, 73, 74 and 101)
Of the Commission's Rules to Facilitate)
The Provision of Fixed and Mobile) WT Docket No. 03-66
Broadband Access, Educational and Other)
Advanced Services in the 2150 – 2162 and)
2500 – 2690 MHz Bands)

To: The Commission

COMMENTS OF ARRAYCOMM, INC.

Respectfully Submitted,

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EXECUTIVE SUMMARY

ArrayComm, Inc. (hereinafter ArrayComm) is pleased that Time Division Duplex (TDD) technology is an integral consideration of this Notice of Proposed Rule-Making. In addition to this regulatory recognition of TDD, the Wireless Coalition Association (WCA), which provided a major impetus in the reformation of the 2500-2690 MHz band and represents many of the band's licensees, has given clear signals that significant use of both TDD and Frequency Division Duplex (FDD) systems is anticipated in the band.

ArrayComm believes that the reconfigured band should provide for flexibility and for efficient utilization. In light of the current occupancy and usage of this band, achievement of both objectives will require significant creativity. Technological neutrality must be balanced by business realities and engineering practicalities. Allocations that earmark specific portions of the band to one technology and designate other spectrum for another technology may be ideal from a co-existence perspective, but can misjudge the market. The result can be low utilization in one part of the spectrum and overcrowding in another. A regime that makes no attempt to foster co-existence between adjacent licensees' operations, however, may produce co-existence problems that cannot be practically solved, that significantly increase network deployment time and costs, or that necessitate large internal guardbands. Spectrum employed as guardbands is not used to provide services to end users, the public. The question is whether this specific band can be made available in a manner that fosters flexibility AND promotes efficient spectrum utilization. However utopian, we offer such a proposal ---- infra.

It is clear that interference is apt to be more frequent and more severe when dissimilar technologies (e.g. ,TDD and FDD) seek to co-exist in the same geographic area on adjacent or nearly adjacent channels. Technological "fixes" can be employed to minimize the interference, but always with attendant costs of capital and spectrum efficiency.

Even between similar systems, adjacent band TDD systems or adjacent band FDD systems, for example, co-existence issues arise. Their impact can be lessened by an appropriate regulatory regime. OOB limits should be tightened. They should be as stringent as is economically and practically feasible. ArrayComm is convinced that the limits now set in the Commission's Rules are well below the capabilities and deployment practices of today's equipment. An improved OOB standard for many bands is long over-due. That alone will significantly improve spectrum utilization and simplify the introduction of new, more efficient radio technologies.

ARRAYCOMM'S INTEREST IN THIS PROCEEDING

ArrayComm is dedicated to the improvement in performance of wireless systems through the development and utilization of spectrally efficient technologies including TDD and adaptive antennas.

Over the past several years, ArrayComm has filed comments and replies in a number of proceedings involving the proposed allocation/reallocation, and subsequent auction of bands for mobile use¹. ArrayComm's position has been that TDD offers unique advantages in spectral efficiency, especially for high-speed data applications,

¹ See, for example, ArrayComm's Comments and Reply comments in ET Docket No. 00-221,15 FCC Rcd. 22657 (2000); WT Docket No. 02-08,67 FR , 7113 (2002),ET Docket No. 00-258,18 FCC Rcd 2223 (2003); see also, WT Docket No. 02-353 (2003)

and should, therefore, be accorded equal treatment in the Commission's service rules. For example, when the Commission proposes frequency band pairs to accommodate FDD systems without a counterbalancing proposal for unpaired frequency bands for TDD systems, a non-level playing field results. In auctions under those circumstances, would-be TDD parties are forced to bid on both of the frequencies that comprise a pair although they would use only one of them. To its credit, the Commission has of late recognized the unfairness of such an allocation and has, since then, as exemplified by this proceeding, not recently proposed paired channels.²

ArrayComm has also expressed concern about potential problems of co-existence, particularly between wide-area FDD and TDD systems. ArrayComm has urged, inter alia, that OOB rules can and should be made more stringent to reduce the impact of potential interference between these systems. While ArrayComm focused upon the challenges of FDD/TDD co-existence in adjacent spectrum bands, it has also cautioned that TDD to TDD and FDD to FDD interference can well arise when they attempt to co-exist on adjacent channels in the same geographic area or in the same channel in adjacent geographical areas. While ArrayComm agrees that many co-existence problems can be mitigated, good regulatory practice should include allocation and assignment rules that promote co-existence and efficient spectrum utilization.

The instant proceeding differs from many of its predecessors in one key respect: The Commission is treating TDD systems as an integral part of its allocation considerations from the outset, increasing the likelihood of a genuinely level playing field.

² Note, however, that in ET Docket No. 00-258 the Commission did propose, or strongly suggest, that some spectrum be paired for FDD operations. The rationale was evidently based on the present use of those bands, which encouraged their deployment by FDD systems.

ArrayComm still has concerns, notably how to achieve optimal use of the 2500-2690 MHz band. In pursuing the Commission's objective of flexibility (that all frequencies can be used by the licensee with any technology he/she so desires), the possibility of significant portions of the spectrum being "lost" to guardbands or being relegated to low-power operations becomes real.

Some parties with whom ArrayComm has discussed its proposal have acknowledged its merits but have argued that it is impractical because of the chaotic nature of the 2500-2690 assignments that now exist. ArrayComm believes, however, that an allocation/assignment proposal that is flexible, technology neutral, and spectrally efficient deserves consideration.

A BAND PLAN PROPOSAL: FLEXIBILITY WITH ORDER

ArrayComm believes that an acceptable band plan should be a win/win for all affected parties. No party would necessarily have all its wishes granted, but each would emerge with adequate spectrum to meet reasonably foreseeable needs effectively and efficiently.

The plan should be technically sound: potential incidents of interference should be minimized.

The plan should utilize spectrum with maximum efficiency: It must be configured to allow various types of systems to operate efficiently AND minimize the amount of spectrum required for guardbands.

The plan should encourage compatibility with non-US allocations, particularly with Europe, to enable US operators and manufacturers to realize the benefits of scale

that result from harmonization: It should have sufficient band commonality to enable and encourage Europe to adopt an allocation plan that is structurally similar.

The plan must meet key FCC objectives: It must provide flexibility so that prospective licensees can choose whatever technology they believe will best serve the market, while being fair and making efficient use of a national resource.

These elements can be identified and summarized as follows:

- 1) Meets common US and European needs
 - a) paired spectrum for FDD systems with appropriate duplex spacing
 - b) common band gap
 - c) common duplex spacing
- 2) Provides spectrum for both FDD and TDD systems
- 3) Facilitates co-existence by minimizing the need for guard bands.
- 4) Maximizes spectrum utilization
- 5) Provides flexibility so that choice of technology is market-driven.

The band plans that ArrayComm has examined, including that of the WCA, all provide for spectrum for FDD and TDD with a block in the middle for high-powered systems. ArrayComm's plan has a similar accommodation.

ArrayComm, however, has emphasized the need to address the problem of co-existence. There have been a number of studies that focus on cases in which different technologies in the same area endeavor to operate on adjacent channels or in adjacent geographic areas on the same channel. Some have concluded, as WCA seems to have done, that these situations are readily solvable, and that the instances in which

drastic action is required are relatively few. ArrayComm believes that these assessments are unduly optimistic. Can most cases be cured? Even if "can" means "is possible to", we think that more critical co-existence problems than are anticipated will emerge. More importantly, when the more realistic criterion of flexibility is employed, the number of co-existence cases that defy a practical resolution will be substantial.

One relatively simple way to avoid these problems would be to establish separate allocations for FDD and TDD. Technically, this is the simplest and least problematic solution. While this approach would be effective, it requires a predetermination of how much spectrum should be allocated to each technology.

ArrayComm would satisfy both objectives of promoting spectral efficiency and providing for market-driven technology selection by establishing a simple process that would govern the assignment of licenses in each market:

Paired licenses would be assigned ("Assignment" in this context includes the reassignment of currently held licenses in conformance to the technical rules established through this proceeding.) from the lowest frequency up (or from the highest frequency down).

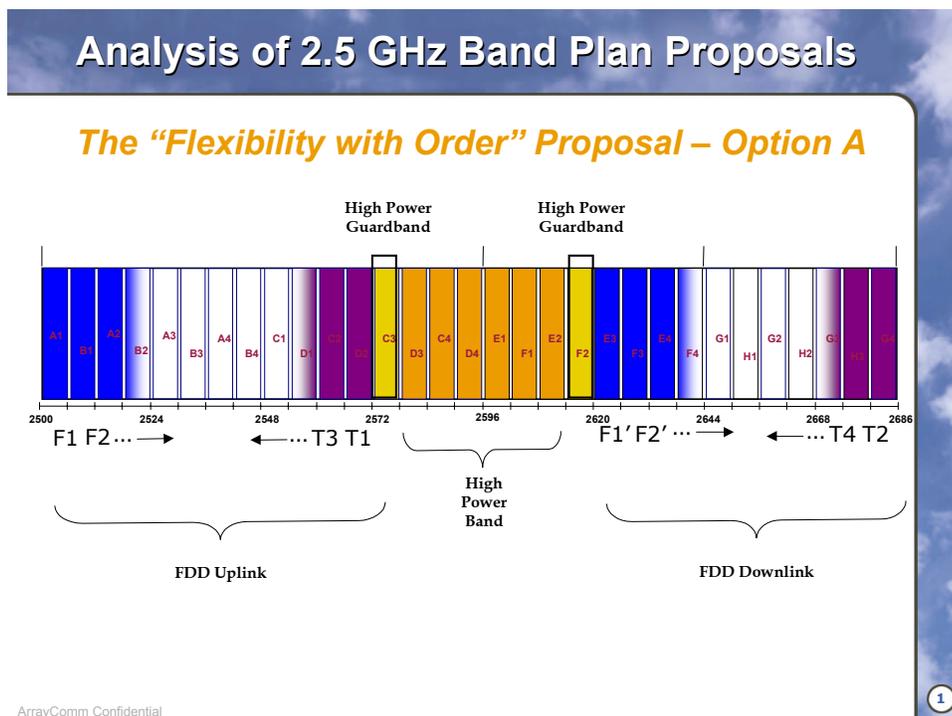
Unpaired licenses would be assigned from the highest frequency down (or from the lowest frequency up).

While the intent of this scheme is that licensees would operate TDD systems in unpaired licenses and FDD systems in paired licenses, we do not propose to prohibit licensees from operating FDD systems using two unpaired licenses or from operating TDD systems in one or both halves of a paired license.

Under this plan, assignments are on a technologically neutral basis. Note that we have made no judgment as to whether location at the bottom of the band or at the top conveys any technological advantage. Instead, we have presented both scenarios. If a majority chooses FDD, the assignments upward (downward) will be greater than those moving downward (upward) and the amount of spectrum for each will reflect a market preference for FDD. If TDD were to be the more favored choice, the assignments downward (upward) would be greater.

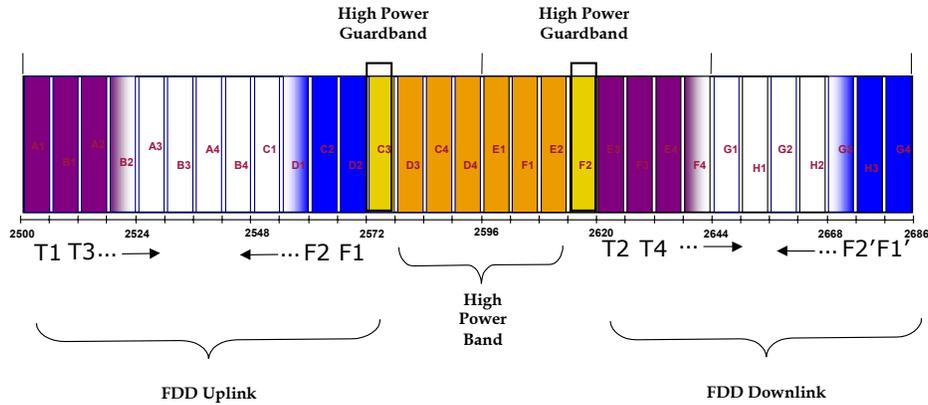
Note, as well, there would be no need to establish guardbands to separate FDD and TDD in advance. There would be de facto guard bands: unassigned spectrum. Only after the entire spectrum were assigned, would there be a need for licensees to deploy internal guardbands and then only at the point where the TDD and FDD assignments meet.

Here is how the 2500-2690 MHz band would look:



Analysis of 2.5 GHz Band Plan Proposals

The "Flexibility with Order" Proposal – Option B



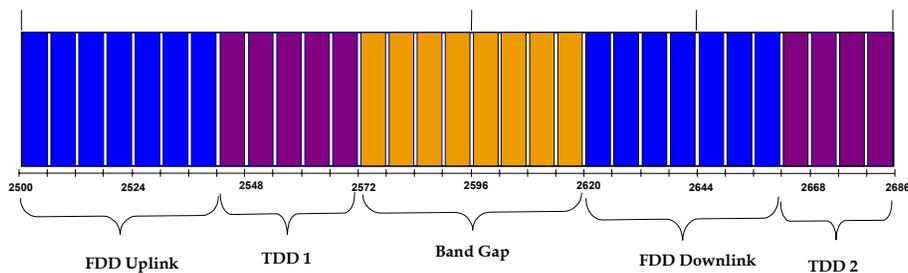
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Given Europe's tendency to favor specific services on specific frequencies, CEPT and EU Member States are unlikely to follow the Commission's flexibility approach. Europe may, however, be willing to follow the US lead in arranging the band. It could look like this:

Analysis of 2.5 GHz Band Plan Proposals

European version of "Flexibility with Order" Proposal – Option A

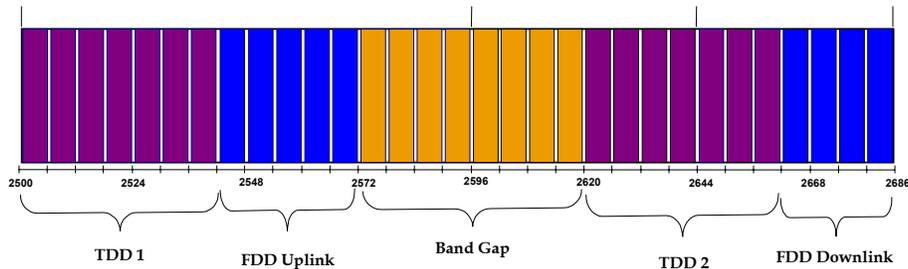


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Analysis of 2.5 GHz Band Plan Proposals

European version of "Flexibility with Order" Proposal – Option B



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Thus, the wireless industry would have a unique opportunity to "seize the day" with a proposal that would harmonize US and European markets in the 2500-2690 MHz band.

CONCLUSION

ArrayComm has endeavored to "lay down a marker", to establish criteria for an appropriate band plan. Given the present state of usage and licensing in this band, our proposal for meeting those criteria may seem beyond reach. Our belief is that any allocation scheme adopted by the Commission must meet those criteria. We ask that our proposal be seriously considered and we will examine with interest the proposals of others.