Before the
FEDERAL COMMUNICATIONS COMMISSION
WASHINGTON, D.C. 20554

In the Matter of:	)	
	)	
Amendment of Part 2 of the Commission's Rules	)	
to Allocate Spectrum Below 3 GHz for Mobile	)	
and Fixed Services to Support the Introduction	)	ET Docket No. 00-258
of New Advanced Wireless Services, including	)	
Third Generation Wireless Systems	)	

To: The Commission

COMMENTS

CelPlan Technologies, Inc. ("CelPlan") submits the following comments in response to the Commission's Notice of Proposed Rulemaking ("Notice") in the above-captioned proceeding initiated to examine the possible use of several spectrum bands below 3 GHz for anticipated third-generation (3G) mobile wireless services. These comments will address the difficult technical issues raised by one option set forth in the Notice proposing use of the present ITFS/MDS bands for 3G mobile services.

CelPlan, as the Commission is aware, has had substantial experience with ITFS/MDS band engineering issues in connection with its development of one of the software programs now in common use for conducting complex interference studies required by Appendix D of the Commission's Two-Way Order authorizing the development of advanced fixed wireless broadband services in the ITFS/MDS bands. In addition, CelPlan provides RF engineering and support services to ITFS and MDS licensees engaged in the development of advanced fixed broadband services. As set forth in the attached technical paper prepared by CelPlan's Senior Project Manager, Gustavo Nader, overwhelming technical obstacles exist to the development of a realistic band sharing or band

segmentation plan which would permit new 3G mobile use of the band in addition to existing advanced fixed wireless use. Given the significant differences in spectrum use patterns from one geographic area to another and heavy licensing of the bands, an extremely complex interference environment already exists in the bands. This environment, in CelPlan's judgment, does not permit the additional use of the band on a shared basis for 3G mobile services or the segmentation of the band so as to provide an adequate contiguous block of spectrum nationwide that would realistically meet 3G mobile service needs. Rather, the current usage patterns of government users in the 1710-1850 MHz band makes that band far more suitable for 3G use.

Respectfully submitted,

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Considerations on Spectrum Sharing/Segmentation between ITFS/MDS and 3G Systems

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Summary

This paper analyzes the impact of spectrum sharing between ITFS/MDS systems and the proposed 3G systems. It estimates the required spatial separation between ITFS/MDS stations and future 3G radio base stations sharing the same spectrum band, as to allow both services to operate without harm. It concludes that substantial separation is required in order for 3G systems to operate in the ITFS/MDS band without interference, requiring the services to maintain mutually exclusive service areas, making this alternative impossible given present ITFS/MDS licensed use of the band. It shows, in addition, that the segmentation of the ITFS/MDS spectrum is not a viable option, for it would severely compromise the services currently allocated to that band.

Feasibility of spectrum sharing between ITFS/MDS and 3G

Per FCC regulations, the maximum allowable aggregate power flux density from a station, or group of stations, sharing the same channel as an ITFS/MDS station, cannot exceed –73 dBW/m^2 (within the 6 MHz bandwidth) in any point inside the ITFS/MDS Protected Service Area (PSA) [1]. In addition, any co-channel interferer must be at least 45 dB below the signal of the protected ITFS/MDS station, whereas adjacent channels must be at least 0dB below.

The typical maximum EIRP level for 3G base stations can be assumed to be 1250 W (31dBW), based on a 25W transmitter and a 17dBi antenna gain, in a 5MHz bandwidth. This power level may vary over a wide range, depending upon the propagation conditions of the service area, traffic density, cell size and system design. For the purposes of this analysis we will consider the maximum level, as to obtain a worst-case scenario. As per the 3rd Generation Partnership Project's Technical Specifications [2], the maximum output power defined for a 3G mobile terminal is +33 dBm (3dBW) in a 5 MHz bandwidth.

3G systems, as an evolution of current cellular mobile systems, are characterized by the mobility of the users within the defined service area. This mobility being random over time and geographical area may often result in mobile subscribers to be located at the edge of the service area of 3G cells. The pronounced distance from the 3G base stations

[1] Title 47, Code of Federal Regulations, Part 21, Subpart K
[2] 3rd Generation Partnership Project; Technical Specification Group Radio Access Networks; UE Radio Transmission and Reception (3G Technical Specification 25.101), Clause 6.2.1

may require the mobile terminal to operate at its highest power level in order to maintain the link with the serving cell.

The current power flux density protection threshold of –73 dBW/m^2 (-140 dBW/Hz/m^2) was defined to preserve the quality of the ITFS/MDS services. Assuming an imaginary mobile terminal at the fringe of a 3G network service area, transmitting at the power level of +3dBW, and assuming line-of-sight propagation conditions, the border of the 3G network would have to be 2 Km away from the border of the protected service area of any ITFS/MDS station in order to preserve the required power flux density threshold. This means that no overlap of service areas would be possible.

The same rationale applies to 3G base stations. Cellular mobile networks are based on the concept of multiple stations scattered throughout the intended service area according to a certain pattern. Unless coordination is enforced, 3G deployments are likely to position sites too close to ITFS/MDS stations, resulting in interference levels incompatible with the current regulation. A 3G base station transmitting at maximum power, as defined above, in line-of-sight conditions, would have to be spaced 49 Km from the border of the protected service area of any ITFS/MDS station if the defined power flux density threshold is to be respected.

If ITFS/MDS systems were to share the spectrum with 3G networks the mobility associated with the latter would have to be severely restricted, in order to preserve the interference protection threshold currently in place. The required geographical separation between any 3G base station and an ITFS/MDS station would make the deployment of 3G networks unattractive and unless strict coordination is enforced, the interference on ITFS/MDS systems by 3G base stations would clearly exceed the thresholds that allow these systems to operate.

Segmentation of the ITFS/MDS Spectrum for use by 3G Systems

The ITFS/MDS band is comprised of a total of 190 MHz of spectrum (2500-2690 MHz), divided in thirty-one 6 MHz channels and one 4MHz channel. This allocation has historically been made available for ITFS/MDS usage through community licensing and more recently in all 487 Basic Trading Areas (BTA's) through the FCC's auction of MDS spectrum. FCC records show over 14,000 filings for licenses in the band.

Wideband CDMA stands out as the strongest candidate for future 3G deployments and current specifications call for bandwidths of as much as 20 MHz per carrier, with options of 1.25, 5, 10 and 20 MHz [3]. If such systems were to occupy spectrum currently allocated to ITFS/MDS, the existing services would be severely disrupted by the amount of contiguous spectrum needed for 3G system operation in an incompatible band, which is fragmented into smaller usage blocks that are not uniform is use from area to area, making segmentation nearly impossible.

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[3] Ojanperä et al; Wideband CDMA for Third Generation Mobile Communications, Artech House, 1998

For example, if a 5MHz bandwidth is assumed for a 3G service, 10 MHz of spectrum must be allocated [4] (since different bands are used for uplink and downlink), occupying nearly two ITFS/MDS channels. In addition, guard bands must be defined to prevent mutual interference between the systems. Considering that more than one license per market will be granted for 3G services, the required bandwidth would at least double.

A more feasible solution would be the 1710-1850 MHz band currently occupied by the Department of Defense (DoD) for Fixed and Tactical Radio Relay. Geographic sharing of this band appears to be possible, since DoD's heaviest demand occurs in rural areas, whereas 3G systems would be concentrated primarily in urban areas. Alternatively, relocation can also be considered, with emphasis to the 3-7GHz range, which has been determined to be suitable for relocation of these types of systems operating at 2 GHz [5]. Other options in this case would be:

1. Relocation to alternative media: such as fiber optic cable and satellites, which are reliable alternatives to terrestrial microwave links
2. Relocation to Federal Government Bands: with the advantage of having maximum flexibility in accommodating the affected systems without the need of coordination with the private sector. Two bands identified for consideration are 4400-4990 MHz and 7250-8400 MHz
3. Relocation to Non-Federal Government Bands: in this case, it would be necessary to review regulatory issues associated with the use of non-federal spectrum by federal agencies. The following bands have been identified for consideration:
   - 3700-4200 MHz
   - 5925-6425 MHz
   - 6525-6875 MHz
   - 6875-7075 MHz
   - 7075-7125 MHz
   - 10.55-10.68 GHz
   - 10.70-11.70 GHz
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Conclusions

Sharing of the ITFS/MDS spectrum with 3G services would require non-overlapping service areas, with a significant separation between the borders of both systems, in order to preserve the required interference thresholds defined by the FCC. If such geographical separation were not followed, the mobility associated with 3G users, as well as the reach of the service, would be severely impaired.

Segmenting the ITFS/MDS spectrum to allow for 3G services does not appear to be an attractive solution. The spectrum demand of 3G is such that it would occupy a significant portion of the bandwidth currently allocated to ITFS/MDS, severely compromising the

[4] Assuming FDD is used. If TDD were used, the required bandwidth would be 5 MHz.
[5] "Creating New Technology Bands for Emerging Telecommunications Technologies", OET/TS 91-1

services currently in place. The necessity of guard bands between 3G and ITFS/MDS would further aggravate the issue, diminishing the feasibility of any such alternative.

A possible solution would be the allocation of 3G services to the 1710-1850 MHz bands, currently used by the DoD. This would require the relocation of the DoD functions to another band or to alternative media. Both options seem to be possible and should be considered as strong candidates in the process of selecting the band(s) for 3G.