



FIXED SATELLITE SERVICE AND WIMAX COEXISTANCE IN 3400-4200 MHZ BANDS

By

Pakistan

Introduction

In recent times, WIMAX has emerged as one of the most promising broadband wireless access (BWA) technologies. Primarily WIMAX enabled infrastructure and devices are destined to operate in 3400-3600 MHz and 5725–5850MHz bands. While 3400-4200 MHz bands are extensively used by the Fixed-Satellite Service (FSS) throughout Asia. The band 3400 – 3700 MHz is often called the “extended C-band” while the band 3700 – 4200 MHz is known as the “standard C-band” for satellite services.

Issue

As mentioned in preamble, the 3600 to 4200 MHz bands are extensively used by the Fixed-Satellite Service (FSS) through ITU recommendations while at the same time BWA operators are using /intending to use these bands to provide WIMAX services. The same frequency usage by FSS and WIMAX can cause significant interference related issues for both Satellite and WIMAX service providers.

Through studies, three possible types of interference problems have been identified. These are (i) co-frequency emissions from BWA which can cause in-band interference with FSS services, (ii) The out of band emissions or spurious emission in one part of 3400 to 3800 MHz band of BWA can create interference in non-overlapping parts of the 3400 to 4200 MHz bands used by FSS services and (iii) BWA signals in vicinity of FSS systems can cause their receivers to saturate and operate non linearly.

IMT-2000 and IMT-Advanced include broadband wireless access technologies (BWA). Any inclusion of these bands in IMT 2000 and IMT-Advanced systems could cause interferences for FSS-based satellite applications in C-band. When FSS earth stations are deployed in a region then there is no mechanism to ensure minimum separation for spectrum sharing. Collocation of Wimax systems with FSS earth stations in way that both are utilizing separate portion of the band is not feasible as well because the widespread deployment of both services may lead to earth station earth station receiver amplifier saturation/ compression problems. This will again

end up as interference problems for FSS satellite systems because of their inherent low powered signals as compared to WIMAX signals.

In addition to these, the frequency band 3.4 - 4.2 GHz is important for the FSS because atmospheric absorption is lower in this band. Even in severe rain-fade conditions this band provides increased reliability and coverage area to these systems. Another popular band for satellite services is KU band. This band is split into multiple segments broken down into geographical regions, as determined by the ITU (International Telecommunication Union).The Ku band is a portion of the electromagnetic spectrum in the microwave range of frequencies ranging from 11.7 to 12.7GHz. (downlink frequencies) and 14 to 14.5GHz (uplink frequencies).

Although used extensively for satellite services it cannot provide the same communications capabilities if utilized in place of C-band for torrential rain areas. Many developing countries including Pakistan rely heavily on satellite links in this band to provide connectivity for national and international information transfers and linkages. Over 160 satellites are using these bands for communications worldwide and inclusion of these bands in IMT 2000 and IMT- Advanced can cause severe problems for such existing systems around the globe.

The Following table shows Pakistan’s frequency allocations in 3400 to 4200 bands.

Allocation to Services		
Frequency	ITU – Region 3	Pakistan’s Allocations
3400 – 3500	FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile Radiolocation	FIXED FIXED-SATELLITE (space-to-Earth) Amateur Mobile Radiolocation MOBILE-except aeronautical mobile PAK29
3500 – 3700	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile Radiolocation PAK29
3700 – 4200	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile	FIXED FIXED-SATELLITE (space-to-Earth) MOBILE except aeronautical mobile

5725-5850MHz band is also recommended for WIMAX by WIMAX forum. The utilization of this band in Pakistan is as follows.

Allocation to Services		
Frequency	ITU – Region 3	Pakistan’s Allocations
5725 – 5830	RADIOLOCATION Amateur	RADIOLOCATION FIXED MOBILE Amateur PAK32
5830 – 5850	RADIOLOCATION Amateur Amateur-satellite (space-to-Earth)	RADIOLOCATION FIXED MOBILE Amateur Amateur-satellite (space-to-Earth) PAK32

Recommendation

As mentioned earlier, IMT-2000 and IMT-Advanced include broadband wireless access technologies (BWA). Based on earlier discussion and viewing current frequency allocations it is clear that inclusion of 3400-4200MHz in the list of candidate bands for identification for IMT-2000 and IMT-Advanced systems can cause severe problems to existing FSS earth stations.

It is recommended that

- region wide studies be intensified, in continuation of the earlier work carried out both at APT and ITU, to explore the possibilities and methodologies of spectrum sharing between BWA systems and various FSS services.
- Practical recommendations for APT administrations should result from the study on ways to implement the interference mitigation and sharing schemes developed thus far.
- Elaborate coordination mechanisms be proposed for cross border interference between terrestrial BWA systems operating in one country and the FSS services operating in the other with specific application of interference prediction procedure approved by APT in last management committee meeting.