Technical Brief:

Optimizing the Interoperation of 3G and 2G Networks at 900 MHz by UMTS Uplink Adaptation

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1 Executive Summary

Because of superior RF propagation characteristics at 900 MHz relative to 2100 MHz, deployment of UMTS service in the 900 MHz band offers operators clear advantages for the delivery of ubiquitous 3G coverage. However, the existence of interference between the 3G air interface and the incumbent 2G/2.5G GSM networks has forced operators to implement stringent planning guidelines to limit capacity loss due to mutual interference between the two systems.

Existing planning guidelines assume network planners have two tools at their disposal to limit interference between GSM and UMTS when they are deployed in the same band:

? Frequency planning, in which a UMTS carrier is sandwiched between existing GSM carriers, with sufficient guard bands between the carriers to limit capacity loss due to adjacent channel interference to an acceptable level. 4.4-5.6 MHz (22-28 GSM channels) is typically required for each UMTS carrier.

? Spatial transition zones, in which a portion of the spectrum of the core GSM900 coverage area is excised in order to limit cochannel interference into the new UMTS 900 coverage areas. Depending on network design rules and the propagation characteristics of the region in question, a 10-15 km wide transition zone in which no GSM or UMTS traffic is carried in the band allocated to UMTS is typically required around the perimeter of the UMTS 900 service area.

The standard rules for guard bands are based on nominal assumptions about the adjacent channel selectivity of the receivers and the adjacent channel leakage of the transmitters in question, while the rules for the transition zones typically rely on the attenuation due to propagation loss alone. While simulations have shown that UMTS and GSM can be successfully deployed using these techniques, the cost in terms of spectral efficiency is quite high.

It has however been shown that interference from the GSM uplink onto the UMTS uplink is the dominant cause of capacity loss in codeployment scenarios. In this case, the use of intelligent, adaptive filters on the UMTS Node B transceivers, with the ability to selectively reject interfering GSM uplink signals, can substantially reduce the size of guard bands and transition zones required to hit target performance levels.

Using the same assumptions as those used by the standards bodies in determining the guidelines for deploying GSM and UMTS in the same band, we show that

- guard bands can be reduced by 400 kHz or more, and
- transition zone widths can be decreased by 50%

by use of intelligent filters, thus allowing efficient introduction of next generation wireless data services while protecting vital 2G voice/data assets.