Chapter 20
900MHz Spectrum Refarming Analysis for UMTS900 Deployment

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ABSTRACT

Refarming means re-arrangement of the traditionally allotted spectrum for a technology/application/service and carving out a part of the spectrum for technology/application/service with higher value. The refarming concept can be used for 3G network deployment in 2G bands or for 4G network deployment in 2G/3G bands. Relative to the UMTS core band (2100MHz), in the 900MHz band radio signal propagation loss is lower. Fewer base stations can be deployed in 900MHz band to achieve the same coverage. Especially in the rural areas, villages, etc., covering limited areas, the UMTS900 band coverage advantages are more obvious. The lower carrier frequency penetration capability becomes much stronger. It reduces the loss while penetrating the wall. This chapter aims to focus on the global UMTS900 refarming status, key advantages of UMTS900 refarming, major challenges of transitioning to UMTS900, technical feasibility of GSM/UMTS co-existence band, and UMTS900 frequency refarming case study in sandwich mode. ECC interference analysis and simulation results are provided for study on co-existence of GSM900 and UMTS900. In the later part of the chapter a detailed case study on 900MHz refarming on sandwich mode is provided with system simulation, frequency planning, capacity migration, and deployment strategy.

INTRODUCTION

900 MHz spectrum band has been historically used for providing second generation mobile services using GSM technology. Given the limitation of the 2100MHz spectrum band, the growing number of UMTS customers and the expiration of certain GSM licenses, the mobile telecommunications community is looking for potentially refarm the GSM900 MHz band for UMTS. UMTS900 satisfies the requirement for deep coverage in urban areas and address the problem of indoor coverage, weak coverage and blind area coverage. It is a highly cost effective solution for providing UMTS services in suburban and rural areas.

Deploying the UMTS network on the 900MHz band is widely used in many scenarios. Reduction of spectrum available to GSM mobiles should be carefully planned if capacity and quality is to be maintained. For network planning and optimization, the main challenges of 900 MHz refarming are frequency reallocation strategy, interference analysis and capacity migration. The reallocation stragety for existing 900MHz spectrum should be designed to reduce interference between GSM and UMTS. Interference between GSM and UMTS should be mitigated by use of separation requirements. Capacity migration strategy for GSM900 users should be mainly aimed at migrating existing users smoothly through traffic balance and avoid worsening the user perception of the live network. Capacity, quality, coverage for GSM only mobiles need to be maintained by the remaining GSM900 and GSM1800 layers.

BACKGROUND

The International Telecommunications Union (ITU) has originally allocated 900MHz band for GSM and 2100MHz band for UMTS operations. GSM900 and EGSM operate on 880-915/925-960 MHz and a total of 2 * 35MHz. UMTS 2100 operates on 1920 - 1980 MHz / 2110 -2170 MHz,

and a total of 2 * 60MHz. Most operators have GSM900 network in this band cannot be further allocated or provide complete 5MHz spectrum to UMTS network. At the same time, the existing GSM900 network has already accumulated large number of the subscribers, which is an important source of profits for the operators.

The main interest for some European operators to deploy UMTS in the 900 MHz band is the better coverage compared to UMTS at 2100 MHz, especially to provide coverage for rural areas. UMTS900 offers a considerably more cost efficient solution for operators to offer UMTS services in rural areas with low population density. GSM/UMTS900 frequency refarming is one of the inevitable future solutions for low cost GSM/UMTS co-existence, ensure the overall capacity of the network and to balance and enhance the quality of the network.

Since 3G technologies have better capabilities and greater efficiency than GSM, refarming of GSM900 spectrum will generate more value for operators and consumers. For existing GSM900 network operators, refarming of 900M frequency band and introduction of UMTS network carries certain significance for its frequency refarming again for a smooth transition to LTE in the future.

Worldwide UMTS900 Spectrum Refarming Status

As of May 9, 2013, globally 68 countries and regions permits or considering UMTS900 system deployment. 69 UMTS900 networks have been commercially launched in 47 countries and more than 21 UMTS900 networks are planned, getting tested or getting deployed by May 9, 2013. List of countries where UMTS900 networks is already launched is shown below (Until May 9, 2013) in Table 1 and List of countries where UMTS900 is commercially launched, planned or under deployment (Until May 9, 2013, data resource from GSA report) is shown in Table 2, Table 3, and Table 4.

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