3GPP TSG RAN WG4 **R4-070116**
St. Louis, MO, 12th – 16th February 2007

Title: **Overview of 700 MHz band in the US.**

Source: Cingular Wireless

Agenda Item: 9

Document for: Discussion on Work Item Description for 700 MHz bands.

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1. Introduction

The 700 MHz band in the US is currently occupied by television broadcast systems. These systems will be moved to a lower portion of the VHF/UHF spectrum and will also be converter to digital technology. For commercial services, the 700 MHz band is split into two parts commonly referred to as the Lower 700 MHz band and the Upper 700 MHz band. At this time, a portion of the Lower 700 MHz band has already been auctioned and will be put into commercial service in the near future. It is anticipated that the commercial license blocks in the Upper 700 MHz band and the remaining license blocks in the Lower 700 MHz band will be auctioned in 4Q 2007.

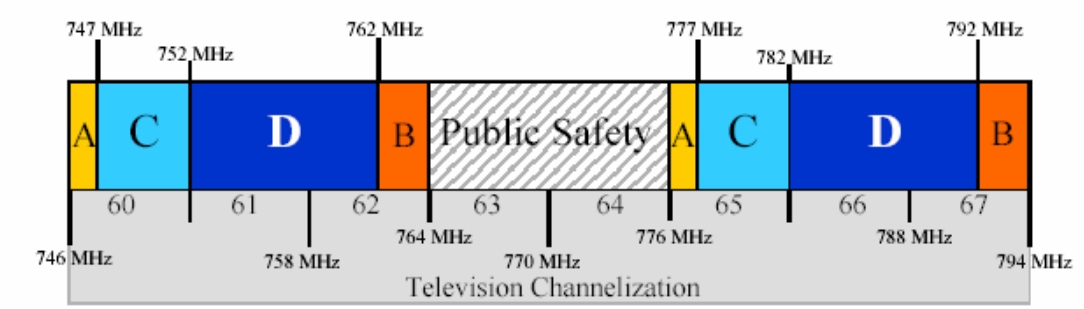
In the US the regulations allow for a variety of commercial technologies to be deployed in this spectrum. In an effort to further the applicability and availability of UMTS/HSPA technology for those who may purchase this spectrum, the companion WI proposal is being presented to RAN WG4 #42 for information, and if agreed, will be put forward for approval into RAN Plenary #35.

Naturally, there are interference and operational issues that should be considered. It is suggested that the changes made previously to include UMTS in the 850 MHz band could be used as the basis for this work which would reduce the effort required within 3GPP. In addition, it is noted that both the Lower 700 MHz band and the Upper 700 MHz band have already been added to the GSM specifications in TS 45.005 and are referred to as the GSM 710 band and the GSM 750 band.

2. Upper 700 MHz Band

The band plan for the Upper 700 MHz band is shown in Fig. 1 below. It is anticipated that UMTS/HSPA could be deployed in license blocks C and D which are paired blocks of 5 MHz and 10 MHz, respectively. As can be seen in the figure, the A and B blocks are not large enough for a UMTS carrier to be deployed and are subject to additional regulatory constraints that may preclude a cellular-type architecture. It should also be noted that the spectrum assigned to Public Safety systems, 764-776 MHz, is paired with

another 12 MHz block at 794-806 MHz. Recently, there have been proposals submitted to the FCC as well as related rulemaking proceedings regarding the current band plan, geographic license areas, etc. However at this time it is anticipated that if any changes to the band plan are made that they will be minor and will not preclude the deployment of UMTS/HSPA in the C and D blocks as shown below.



Block	Frequencies (MHz)	Bandwidth	Pairing	Geographic Area Type	No. of Licenses
A (Guard Band)	746-747, 776-777	2 MHz	2 x 1 MHz	Major Economic Areas	52
B (Guard Band)	762-764, 792-794	4 MHz	2 x 2 MHz	Major Economic Areas	52
C	747-752, 777-782	10 MHz	2 x 5 MHz	700 MHz EAG	6
D	752-762, 782-792	20 MHz	2 x 10 MHz	700 MHz EAG	6

Fig. 1. Upper 700 MHz Band Plan.

From the regulations in Part 27 (US Code of Federal Regulations Title 47 Part 27.50) for this band, base stations are limited to 1000 W ERP and portable (hand-held) devices are limited to 3 W ERP (note that mobile devices are allowed up to 30 W ERP). While the rules do not specify which blocks are to be used for mobile or base transmission, it is recommended to use the upper block for mobile transmission and the lower block for base transmission although this is reversed from the typical duplex directions used for UMTS at higher frequencies. The convention of using the upper block for mobile transmission is also used in the 700 MHz public safety spectrum and this scheme has been followed for GSM/EDGE in TS 45.005. It should also be noted that the rules for commercial service in the Upper 700 MHz band include more stringent limits on out of band emissions that fall into the public safety spectrum. These limits are as follows (from Part 27.53):

General limit outside of 747-762 MHz and 777-792 MHz: -13 dBm / 100 kHz
(slightly relaxed within 100 kHz of block edge)

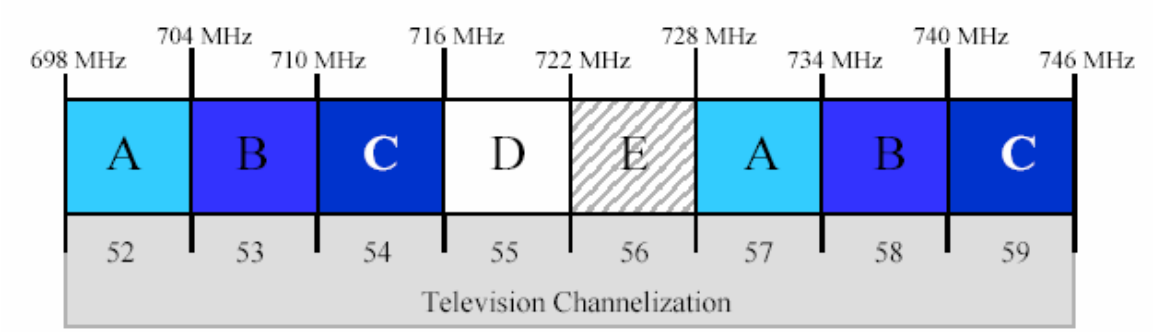
Base station emissions within 764-776 MHz and 794-806 MHz: -46dBm / 6.25 kHz
(approx. -34 dBm / 100 kHz)

Mobile station emissions within 764-776 MHz and 794-806 MHz: -35dBm / 6.25 kHz
(approx. -23 dBm / 100 kHz)

Reduced limits also apply to emissions falling into the 1559-1610 MHz band (-40 dBm / 1 MHz and -50 dBm for narrowband emissions less than 700 Hz bandwidth).

3. Lower 700 MHz Band

The band plan for the Lower 700 MHz band is shown in Fig. 2 below. The spectrum has been defined in 6 MHz blocks similar to what is used in the television channelization. Note that blocks A, B, and C are paired 6 MHz blocks while blocks D and E are unpaired. It is anticipated that UMTS/HSPA FDD could be accommodated in blocks A, B, and C. At this point, blocks C and D have already been auctioned and the D block will be put into commercial service in the near future through the launch of MediaFLO, an audio/video broadcast for mobile devices. As mentioned above, an auction of the remaining license blocks (A, B, and E) will likely occur during 4Q 2007.



Block	Frequencies (MHz)	Bandwidth	Pairing	Geographic Area Type	No. of Licenses
A	698-704, 728-734	12 MHz	2 x 6 MHz	700 MHz EAG	6
B	704-710, 734-740	12 MHz	2 x 6 MHz	700 MHz EAG	6
C	710-716, 740-746	12 MHz	2 x 6 MHz	MSA/RSA	734
D	716-722	6 MHz	unpaired	700 MHz EAG	6
E	722-728	6 MHz	unpaired	700 MHz EAG	6

The technical regulations for the Lower 700 MHz band are similar to those given above for the Upper 700 MHz band with one important difference. While cellular-type systems in the Lower 700 MHz band can operate at conventional power levels up to 1 kW ERP the rules also allow for transmit power levels up to 50 kW ERP to accommodate wide-area broadcast services such as MediaFLO. In this case, a power flux density limit is also specified as 3000 $\mu W/m^2$ within 1 km of the transmitter site (Part 27.55(b)). It may be necessary to examine these issues more closely in terms of the possible impacts on UMTS adjacent channel selectivity, receiver blocking, etc.