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December 14, 2011

VIA ELECTRONIC DELIVERY

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Room TWA325
Washington, DC 20554

Re: Notice of *Ex Parte* Presentations
WT Docket No. 11-18; RM-11592

Dear Ms. Dortch:

On December 12, Vulcan Wireless LLC ("Vulcan") representatives Michele Farquhar and Dave Saylor spoke by telephone with Louis Peraertz, Legal Advisor to Commissioner Clyburn, to discuss the critical need for a condition on the AT&T-Qualcomm acquisition that would help restore a consolidated Lower 700 MHz band class.

During the call, the Vulcan representatives discussed the nexus between the transaction and the proposed condition, as described in the attached antitrust and competitive harm analysis provided to Mr. Peraertz yesterday. They also indicated that Vulcan would be responding to several new technical claims made recently by AT&T in this proceeding.

Ms. Farquhar also spoke by telephone with Rick Kaplan, Chief of the Wireless Telecommunications Bureau, on December 12. The parties reviewed the technical and timing issues associated with a condition to reconsolidate the Lower 700 MHz band classes, as discussed in Vulcan's prior *ex parte* filings in this proceeding.[1]

Pursuant to Section 1.1206(b) of the Commission's rules, I am filing this notice electronically in the above-referenced docket. Please contact me directly with any questions.

Respectfully submitted,

/s/ Michele C. Farquhar

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cc: Rick Kaplan
Louis Peraertz

[1] *See Ex Parte* Filing by Vulcan Wireless LLC, WT Docket No. 11-18, RM-11592 (filed Dec. 6, 2011).

Overview of the Nexus between the AT&T-Qualcomm Transaction and the Competitive Harm Requiring a Remedy
Vulcan Wireless LLC
WT Docket No. 11-18

As explained below, there is a compelling factual and legal nexus to justify conditioning any Commission approval of this transaction upon a requirement that all AT&T 700 MHz devices work on all Lower 700 MHz paired blocks, including the A block. AT&T's prior 700 MHz spectrum purchases (which were large relative to other wireless operators) accorded AT&T a significant level of market power as a buyer of 700 MHz equipment. Through predatory market leverage, AT&T has used that market power to elicit private standards body (3GPP) decisions on 700 MHz-specific interference and interoperability issues that, in turn, have raised barriers to market entry by others (namely A block licensees).

AT&T's acquisition of additional 700 MHz spectrum from Qualcomm will broaden and further entrench AT&T's power to perpetuate its influence over 700 MHz equipment manufacturers and the 700 MHz standards-setting and interference-resolving processes, thereby blockading or delaying entry and raising prospective rivals' costs. Indeed, in anticipation of owning the Qualcomm 700 MHz D and E block spectrum, AT&T has already begun trying to manipulate the 3GPP standards body on interference issues relating to those blocks and to the specific detriment of its potential A block competitors. 1/

To justify comprehensive Commission remedial intervention now, there is no requirement in logic or Commission precedent that the instant transaction cause the entirety of the competitive problem, as opposed to measurably deepening and worsening the existing problem. Nor is this the classic case for industry wide rulemaking, namely where numerous industry participants are engaging in common widespread practices long considered proper and legal and suddenly the Commission wants to prohibit or limit those practices prospectively. **The focus here is on one company (*i.e.*, AT&T) which has been accumulating market power with respect to the Lower 700 MHz Band and engaging in coercive and potentially deceptive practices in the industry's standards body (3GPP) for several years.**

In a December 9, 2011 *ex parte* filing, AT&T brazenly threatened to terminate the Qualcomm transaction (despite the potential positive attributes of the transaction) rather than consider a modest condition that would limit AT&T's future ability to dominate the 700 MHz market sector and misuse the associated standards-setting and interference-resolving processes. 2/ This unvarnished threat speaks loudly about the need for Commission intervention now – rather than awaiting some future general inquiry – to rein in AT&T's hubris.

An antitrust court would always consider the full marketplace context and past market-shaping behavior of the proposed acquiring firm when deciding if a challenged transaction is

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1/ *See, e.g.*, *Ex Parte* Filing by Vulcan Wireless LLC, WT Docket No. 11-18, RM-11592 (filed Dec. 6, 2011) (attached hereto as **Attachment A**); *Ex Parte* Filing by Vulcan Wireless LLC, WT Docket No. 11-18, RM-11592 (filed Nov. 30, 2011).

2/ *Ex Parte* filing by AT&T Services, Inc., WT Docket No. 11-18 (filed Dec. 9, 2011).

unlawful and, if so, whether it can be made lawful by imposing certain remedial conditions. 3/ So the Commission, in exercising its public interest responsibilities to protect competition and consumers, must evaluate the proposed transaction in light of the 700 MHz market structure and history and AT&T's past behavior in that market sector.

By virtue of its actions to date, AT&T already possesses the incentive and the ability to coerce the 700 MHz equipment manufacturers and the private industry standards body to defeat or delay competition from A block licensees. The instant transaction, by providing AT&T an even larger 700 MHz platform, moreover, enhances that AT&T purchasing power in the eyes of 700 MHz manufacturers and expands AT&T's incentive and ability to cause further mischief through the 3GPP industry standards processes and to prevent reform of those processes. Arresting the anticompetitive consequences of ever-increasing monopsony power to which a pending acquisition would contribute is precisely what Commission approval conditions should address.

Notably, the Commission staff recently found that enhancing AT&T's already significant equipment purchasing power through the proposed T-Mobile acquisition may be contrary to the public interest when the exercise of that purchasing power may have the effect of hindering or preventing the design and manufacture of interoperable equipment to the detriment of consumers and rivals. 4/ A Commission majority was poised to place that AT&T-specific purchasing power/interoperability issue into hearing until AT&T withdrew its T-Mobile application.

AT&T's Conduct

For the Commission to conclude that AT&T's enhancement of its 700 MHz monopsony power through the Qualcomm acquisition cannot be approved absent a reasonable condition ensuring Lower 700 MHz band paired spectrum interoperability going forward, it is not necessary to find that AT&T's past exercise of that power has violated Commission rules or the antitrust laws.

3/ For example, in *United States v. Grinnell Corp*., 384 U.S. 563 (1966), the Supreme Court affirmed a fully litigated antitrust decision that the defendant had illegally gained monopoly power through a string of acquisitions and various other behavior. In affirming the antitrust liability finding but requiring further relief, the Court accepted the notion that the defendant could keep some of its accumulated businesses while divesting others. *Id.* at 577-78. Importantly for present purposes, the Court also held that the government was correct in insisting upon a decree that would prohibit particular commercial practices that had contributed to the monopoly power and would otherwise continue to act as "substantial barriers to competition" going forward. *Id.* at 576, 578.

Although unusual, the antitrust enforcement agencies have sometimes concluded after litigation that a merger or acquisition found illegal need not be prohibited or unwound but rather should be subject to behavioral conditions so as to preserve the beneficial aspects of the transaction. *See, e.g., Evanston Northwest Healthcare Corp.*, Dkt. No. 9315, slip op. (FTC April 28, 2008) (opinion on remedy) *available at* http://www.ftc.gov/os/adjpro/d9315/080428commopinionon remedy.pdf. The Justice Department considers "conduct remedies" "a valuable tool for the [Antitrust] Division" because "[t]hey can preserve a merger's efficiencies and, at the same time, remedy the competitive harm." U.S. Department of Justice, *Antitrust Division Policy Guide to Merger Remedies* at 6 (June 2011) *available at* http://www.justice.gov/atr/public/guidelines/272350.pdf. Indeed, conduct relief can apply to practices that may not themselves be unlawful and were regularly engaged in prior to the transaction being challenged. *See, e.g.,* Competitive Impact Statement, *United States et al. v. Comcast Corp. et al.*, http://www.justice.gov/atr/cases/f266100/266158.pdf (consent decree allowing the acquisition but, inter alia, prohibiting exclusivity practices otherwise common in the industry and lawful).

4/ *Applications of AT&T and Deutsche Telekom*, WT Dkt. No. 11-65, page 59 at paras. 120-122.

Nonetheless, the fact that AT&T's 3GPP conduct does raise antitrust concerns is an additional public interest reason to require such a condition in lieu of a time-consuming investigation and hearing.

Applicable Antitrust Law and Precedents

The 3GPP body of which AT&T is a very active member is a private standards-setting body. As the Supreme Court observed, "Private standard-setting associations have traditionally been objects of antitrust scrutiny." *Allied Tube & Conduit Corp. v. Indian Head, Inc.*, 486 U.S. 492, 500 (1988) (*Allied Tube)*. This is because "a private standard-setting organization can be rife with opportunities for anticompetitive activity." *American Soc'y of Mech. Eng'rs v. Hydrolevel Corp.*, 456 U.S. 556, 571 (1982). "Collaborative standard-setting is inconsistent with the antitrust laws, for example, if the standard-setting process is biased by members with economic interests in stifling . . . competition." *Allied Tube*, 486 U.S. at 501.

Anticompetitive misuse of the standards-setting process can constitute, depending on the circumstances, a violation of Section 1 of the Sherman Act (concerted conduct in unreasonable restraint of trade), Section 2 of the Sherman Act (illegal acquisition or maintenance of a monopoly; conspiracy or attempt to monopolize), and Section 5 of the Federal Trade Commission Act (unfair or deceptive act or practice, unfair method of competition). *See, e.g., Coalition for ICANN Transparency v. VeriSign, Inc.*, 611 F.3d 495, 506-08 (9th Cir. 2010)(*ICANN*); *Broadcom Corp. v. Qualcomm Inc.*, 501 F.3d 297, 308-20 (3d Cir. 2007); *Rambus, Inc. v. Infineon Technologies AG*, 330 F. Supp. 679, 694-99 (E.D. Va. 2004)(*Rambus v. Infineon*); *In the Matter of Dell Computer Corp.*, 121 F.T.C. 616, 618 (1996).

"[T]he subversion of a [standards setting organization] by a single industry player . . . can result in anticompetitive outcomes. Thus, antitrust law historically has been concerned with the risk of one or a small number of participants . . . turning the [organization] into a source of exclusionary power." *Rambus v. Infineon*, 330 F. Supp. at 696. Coercing a private standards body through threats of legal or economic consequences, unethical and deceptive practices, or more subtle predatory means such as working behind the scenes through ostensibly independent but actually economically rewarded standards body participants, may violate the antitrust laws. *Allied Tube*, 486 U.S. at 495-97; *ICANN*, 611 F.3d at 505-08.

An important line of FTC precedents makes clear that misrepresentation and/or the failure to disclose critical information in the standards-setting process, as well as the failure to abide by commitments to be open and fully forthcoming with the standards body on critical competition issues, can be an illegal abuse or misuse of market power and improper under the antitrust laws. *See, e.g., Dell Computer Corp. supra;* Complaint and Analysis of Proposed Consent Order, *Negotiated Data Solutions LLC,* Dkt. No. C-4234 (FTC 2008) available at http://www.ftc.gov/os/caselist/0510094/080122complaint.pdf and http://www.ftc.gov/os/caselist/0510094/080122analysis.pdf; *see also Rambus Inc. v. FTC*, 522 F.3d 456 (D.C. Cir. 2008) (overturning FTC on facts and holdings of particular case but not rejecting the notion that deceptive failure to disclose critical facts to a private standards body may constitute an antitrust violation in certain circumstances).

One reason why the antitrust laws permit certain collaborative standards-setting practices is to respond in certain industries (like telecommunications) to a genuine "need for interoperability," *i.e.*, "the ability of one manufacturer's product to interface with another manufacturer's product. *Rambus*

v. Infineon, 330 F. Supp. 2d at 696 and n. 26. However, if at the instigation of a dominant competitor the result of the standards-setting process is to diminish or eliminate interoperability and thereby raise insuperable barriers to effective competition, that dominant competitor's conduct in the standards-setting venue may well be subject to antitrust liability and a comprehensive remedy that reinstates interoperability.

AT&T's Conduct in the 3GPP Process to Foreclose Interoperability

As the Commission knows, the preparation for the 700 MHz auction (Auction 73) proceeded throughout 2007, with finalization of the spectrum blocks to be auctioned and the completion of technical rules. Auction 73 began January 24, 2008 and concluded March 18, 2008. Actual license grants occurred later that year, but use of the licenses was delayed due to a postponement of the deadline for the digital TV transition out of that spectrum until June 2009. Certainly AT&T knew in mid-2008 that it had won considerable spectrum in the B and C blocks and that numerous small, new competitors were being licensed in the A block. Prior to the bidding, the industry standards process had left every indication that the Lower A, B, and C blocks would be grouped in Band 12 and that winners of the A block licenses would be in an economically and technically viable ecosystem in which devices (at that point using 3G UMTS technology) would work on all three spectrum blocks.

By early 2008 technology was advancing and carriers as well as manufacturers began to focus on standards for using the 700 MHz spectrum to provide 4G LTE service. In February 2008, Ericsson proposed and the 3GPP body agreed to consider defining the base station specifications for LTE as Band 12, i.e., encompassing the A, B, and C blocks in a single band. (Meanwhile Band 12 was formally approved for UMTS the following month.) Then Auction 73 was concluded and it was clear AT&T had a strong position in Blocks B and C and was going to face competition from A Block licensees.

Conveniently for AT&T in May 2008, one of AT&T's major equipment suppliers, Motorola, asserted to the standards body that the A block might experience interference from sources outside Band 12 and that therefore it would be desirable to create a smaller sub-band (originally called Band 15 but later Band 17) consisting of blocks B and C. 5/ If adopted, this meant that equipment suppliers could design and manufacture equipment for their major customer AT&T that would not interoperate with the A block.

In June 2008, Ericsson refuted Motorola's interference concerns making clear that the stated concerns were very manageable. Ericsson argued that Band 15 (later 17) was not only unnecessary to protect B and C block operators but that creating the new band would fragment the market. 6/ AT&T in its June and August 2008 submissions to the standards body made several technically incorrect or exaggerated assertions about the interference issues and possible technical

5/ 3GPP TSG RAN WG4 (Radio) Meeting #47, Kansas, USA (April 5-9, 2008), R4-081108 (attached hereto as **Attachment B**).

6/ TSG-RAN Working Group 4 (Radio) Meeting #47bis, Munich, Germany (June 16-20, 2008), R4-081356 (attached hereto as **Attachment C**).

remedies. 7/ Moreover, AT&T made clear that it only planned operations on blocks B and C and wanted its own band (Band 17) for those two blocks. 8/

As AT&T well knew, the comparatively small and new entrants into the wireless industry who had acquired A block licenses were not yet involved in 3GPP and were not present in the standards discussions. They were not invited to explain their business plans or how a failure to fully examine the supposed interference issues and to rush to judgment on the creation of a basically AT&T-only Band 17 would erect a major economic barrier to their being able to build a business out of A Block licenses. AT&T used its long-standing economic power as an equipment purchaser to push the manufacturers who were significant 3GPP participants to quickly approve the creation of Band 17. 9/

The reports of the June and August 2008 3GPP meetings which indicate who spoke on the Band 17 subject make clear that the effect of creating Band 17 on A block licensees in the United States was effectively hidden by AT&T and its loyal supporters. 10/ Most of the 3GPP attendees from other parts of the world were not familiar with the particular 700 MHz licensing situation in the U.S. and were not really in a position to care about the effect of Band 17 on the U.S. A block licensees. Although there are a few references to Ericsson's concern about market fragmentation, there was no explanation or acknowledgement that the creation of Band 17 would have a major detrimental impact on Lower 700 MHz interoperability between the A block and the B and C blocks.

AT&T (as paraphrased in the 3GPP minutes) affirmatively played down Ericsson's concern over market fragmentation by saying "one subband more may not make a big difference in the market fragmentation" and the creation of this "subband" (Band 17) was "the simplest and the quickest way to solve the [supposed interference] problem." 11/ Conveniently, Qualcomm (licensee of the D and some E blocks) was there to vocally support AT&T, as did Motorola. 12/ Plainly, the 3GPP as a body was misled into thinking that the creation of Band 17 as a "subset" would ameliorate technical interference concerns rather than eliminate as a practical matter any chance of interoperability with the B and C blocks for the A block licensees and thus seriously handicap A block licensees from ever using their spectrum.

Conclusion

It is plain that AT&T used its market power as the major U.S. customer for 700 MHz equipment suppliers and potentially deceptive argumentation rife with critical omissions to coerce and mislead the 3GPP body into adopting a very economically significant Band change without any acknowledgment or analysis of the major economic consequences of that change. AT&T could not

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7/ 3GPP TSG RAN WG4 (Radio) Meeting #47bis, Munich, Germany (June 16-21, 2008), R4-081324 (attached hereto as **Attachment D**); Change Request, 3GPP TSG RAN WG4 Meeting #48, Jeju, Korea (August 18-22, 2008), R4-082179 (attached hereto as **Attachment E**).

8/ *Id.*

9/ *Id.*

10/ Report of the 3GPP TSG RAN WG4 meeting #47bis, Munich, Germany (June 16-20, 2008) (excerpts attached hereto as **Attachment F**); Report of the 3GPP TSG RAN WG4 meeting #47bis, Jeju, Korea (August 18-23, 2008) (excerpts attached hereto as **Attachment G**).

11/ *See* Attachment F.

12/ *See* Attachment F at p. 29.

have accomplished that anticompetitive result without the overwhelming equipment purchasing power it maintains for the 700 MHz spectrum. AT&T's actions had the purpose and effect of maintaining and expanding that market power. AT&T's strategy of enhancing its own market power and erecting a major barrier to the entry of A block rivals raises serious questions under the antitrust laws and precedents discussed above and under Commission public interest principles that incorporate antitrust concerns.

Moreover, the actions of AT&T's vendors last month reinforce concerns about AT&T's ability to harm other Lower 700 MHz spectrum holders if the FCC approves the AT&T-Qualcomm transaction. AT&T's proposed acquisition of Qualcomm's 700 MHz spectrum will further enhance AT&T's purchasing power and its consequent ability to use that power in the 3GPP processes to preserve and perpetuate its unfair advantage – an advantage that may have been deceptively obtained.

The Qualcomm deal will further exacerbate the situation in a seriously anticompetitive way unless the Commission insists upon mandatory Lower 700 MHz band interoperability across all three blocks (A as well as B and C) as a condition for approving the Qualcomm transaction. Such a remedy will address a serious competitive and public interest harm enhanced and exacerbated by the Qualcomm transaction. The proposed remedy is more than adequately "specific" to that transaction so as to satisfy the Commission's understandable desire to adopt only those approval conditions that are "specific" to cognizable transaction-based harms.

Attachment A

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December 6, 2011

VIA ELECTRONIC DELIVERY

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Room TWA325
Washington, DC 20554

Re: Notice of *Ex Parte* Presentation
WT Docket No. 11-18; RM-11592

Dear Ms. Dortch:

On December 2, 2011, Vulcan Wireless LLC ("Vulcan") representatives Scott Wills, Paul Nagle, Paul Kolodzy, and Michele Farquhar met with Commissioner McDowell and Angela Giancarlo, his Chief of Staff and Senior Legal Advisor, to discuss the critical need for a condition on the AT&T-Qualcomm acquisition that would help restore a consolidated Lower 700 MHz band class.

During the meeting, the Vulcan representatives discussed the concerns that are dramatically impeding A Block broadband deployment (as described in the attached presentation distributed at the meeting). They discussed a key condition that the Commission must impose before allowing the transfer of Qualcomm's 700 MHz spectrum to AT&T, or the transaction will further subvert FCC policy, decrease market competitiveness, and further delay the deployment of 4G networks.

They also discussed the following points:

- The Commission should only impose a single condition that restores the original Lower 700 MHz band plan, which would reconsolidate and unify the paired spectrum in the Lower 700 MHz band (*i.e.*, the A, B, and C Blocks);

- The Commission should promptly grant the transfer with this condition, as a reunified band will speed network deployment. Conversely, failure to address the fragmentation of the Lower 700 MHz band now will cause additional delay in network deployments and discourage participation by smaller operators in future spectrum auctions, thereby reducing the value of spectrum, discouraging competition, and subsequently driving up costs to consumers; and

- The Commission should provide AT&T with a sufficient amount time to comply with the condition by affording AT&T up to two years to fully comply with any such condition and ensure that all of its 700 MHz mobile handsets operate on the unified Lower 700 MHz band plan.

The representatives also discussed the results of a "real world" study, funded by a consortium of several Lower 700 MHz A Block licensees,[1] intended to prove or disprove the unsubstantiated claims previously submitted to the FCC and 3GPP by AT&T and Qualcomm, among others, regarding the need for establishing two separate band classes to govern only three spectrum blocks. As described in more detail in the attached presentation and in Vulcan's November 25 *ex parte* in this proceeding, the findings of the study were as follows:

- The underlying assumptions and claims put forth in 3GPP proceedings rationalizing a separate Band Class 17 were incorrect or overstated;
- Different operators' systems in the Lower 700 MHz B and C Blocks actually pose a threat of interference to each other that is greater than any threat that would be introduced from a unified Lower 700 MHz band class that includes the A Block;
- Neither the high power E Block transmissions nor Channel 51 transmissions present an interference threat to AT&T's LTE devices, which currently receive and manage signal level disparities from within the B and C Blocks that are greater than those which would need to be accounted for by restoring the original Lower 700 MHz band plan;
- Concerns about reverse intermodulation distortion interference are unfounded, as commercially deployed AT&T devices did not experience any such interference; and
- The vague and exaggerated concerns regarding the potential increase in cost and/or size of devices necessary to operate on a reunified Lower 700 MHz band plan are without merit, as the cost of devices with such a condition will be virtually unchanged.

Finally, Vulcan explained how the proposed transaction has already negatively impacted other Lower 700 MHz spectrum. Within the last two weeks, a leading AT&T 4G network vendor submitted a proposal to the 3GPP (seemingly endorsed by AT&T) to have other non-AT&T 700 MHz spectrum holders reduce the amount of their usable bandwidth to compensate for AT&T's anticipated use of the D Block. This proposal was not revealed to the FCC in any filings by AT&T, Qualcomm, or any vendors supporting this proposed transaction. Designed solely to accommodate AT&T's use of the D Block spectrum, this proposal would force non-AT&T spectrum holders to forfeit their valuable spectrum rather than require AT&T to bear the full responsibility of setting aside its own guard band to accommodate its operations on the D Block.

[1] The consortium members include: Vulcan Wireless, King Street Wireless, Cavalier Wireless, Continuum 700, Cox Wireless, C Spire and MetroPCS.

Pursuant to Section 1.1206(b) of the Commission's rules, I am filing this notice electronically in the above-referenced docket. Please contact me directly with any questions.

Respectfully submitted,

/s/ Michele C. Farquhar

Michele C. Farquhar
Counsel to Vulcan Wireless LLC

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cc: Commissioner McDowell
Angela Giancarlo

Attachment B

3GPP TSG RAN WG4 (Radio) Meeting #47
Kansas, USA
5th April to 9th April 2008

R4-081108

Source:	**Motorola**
Title:	**TS36.101: Lower 700 MHz Band 15**
Agenda Item:	**6.1.2**
Document for:	**Discussion**

1 Introduction

This document is presented as a discussion paper to evaluate the need for a new operating band to support block B and block C in the lower 700MHz band. This new operating band would be in addition to that in [1], for UTRA Band XII which supports Block A, Block B and Block C. The rationale for this new band is to address possible co-existence issues with High power TV broadcast transmission in Channel 51 and other broadcast transmission in channel 55 (Block D) and channel 56 (Block E).

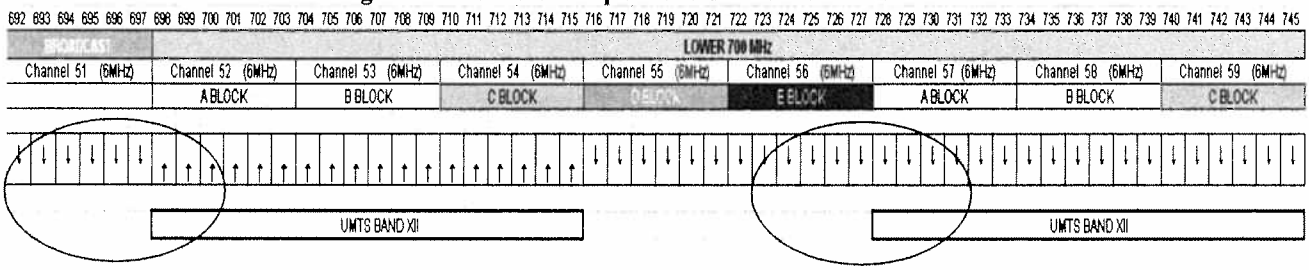
This document provides some of the rationale for this new band and a draft TP for discussion. These discussions should also encompass the future role of Band 12 in terms of either; following the same approach as UTRA in supporting Bands A, B and C, or be limited to Block A and B, in order to complement the proposed new band. In this case, inputs from the relevant spectrum stake holders, would be useful before a final decision can be made

A draft TP is provided for TS36.101 for this new band 15. This is in order to show how this could be implemented in the specification

2 Background

The FCC channel plan and 3GPP UTRA plan [1] is provided below;

Figure 2-1 FCC channel plan and UMTS Band X11



Band XII includes both A block (2x6MHz), B block (2x6MHz) and C block (2x6MHz). Using the FCC channel plan as a base line we note;

a) Per FCC, ERP for channel 51 can be between 500 KW (87 dBm) and 5MW (97 dBm). According to the FCC site (using the stringent mask) emissions must be attenuated 47 dB at the channel edge and no less than 76dB at a 3MHz offset.

   - As A block (Channel 52) is adjacent to Digital TV (channel 51) this would result in a high level of out of band emission into channel 51 (A block) and would place stringent requirements on the adjacent Rx and ACLR performance for a eNodeB operating in the same geographical area. In this case deployment of channel 52 (A block) site would need to be conditioned on the site location of a high power channel 51 transmitter.

b) For a UE operating in a Band 12 configuration (A+ B+ C), this would result in a significant in-band power when roaming near a channel 51 broadcast transmitter since limited RF filtering would be available for the adjacent Channel 51 if A block is part of the operating bandwidth. This large in band power would intermod with an existing UE transmission in block A, B and C to generate spurious emission ($2F_1$-F_2) in other parts of

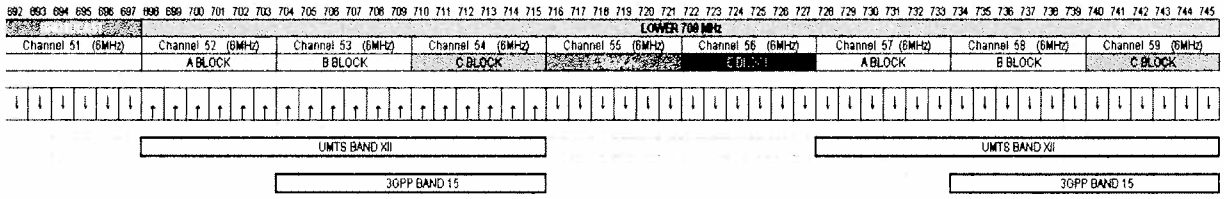
the 700 MHz spectrum. The key issue for Tx IM is the level of the DTV Channel 51 wideband signal that would be present at the UE antenna port based on a reasonable deployment scenario

c) As shown in figure 2-1, there may be some impact performance from high broadcast transmission for channel 55/56 for UE supporting Band 12 (A+ B+ C)as since limited RF filtering would be available to provide adequate UE Rx out of band blocking rejection if A block part of the operating band. Again, the magnitude of this problem is a function of the operator's deployment scenario.

3 Proposal for discussion

In order to address the co-existence issues highlighted in section 2 an additional EUTRA band [15] could be created as shown in figure 2.1-1 below

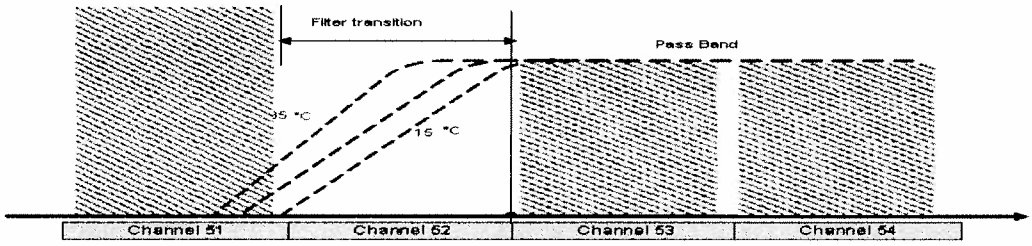
Figure 3-1 Band 15 proposal for Lower 700 MHz



3.1 Impact on Tx IMD and Rx blocking

Based on the operating band in Figure 2.1-1 additional front end RF filtering would be provided by the duplex filter in lieu of block A as shown above in figure 3.1-1 below for both TX IMD and Rx out of band blocker performance

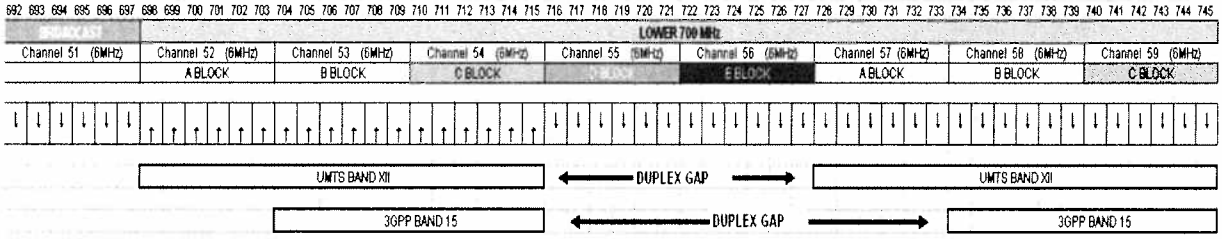
Figure 3.1-1 Channel 52 and 57 used as filter transition



3.2 Impact of duplex performance

The duplex distance for both band 12 (A+ B+ C) and Band 15 (B+C) is shown below in figure 3.2-1. In this case the duplex gap would increase from 12MHz for Band 12 to 18MHz and Band 15 would start to resemble Band V in terms of duplex gap, so we would expect an improvement in terms of Rx sensitivity and Tx output power for Band 15.

Figure 3.2-1 impact on channel plan on duplex gap



3.3 Impact of channel bandwidth / self interference

Self interference is a function of, Tx – Rx spacing, duplex filter performance, Tx power and transmitted RB(s). For a fixed duplex gap the self interference increases with channel bandwidth, transmit power and RB allocation. However, as the same TX-RX spacing is maintained, we would not expect a significant difference in desense performance for either band 12 or band [15].

3.4 Implementation aspects of adding a new operating band

All though there appears to be merit in terms of co-existence performance for the addition of a new operating, the number of operating bands a UE terminal would need to support would increase and some practical limitations may be necessary to reduce implementation complexity. In this scenario roaming between band 12, 13, 14 and 15 could be impacted depending on the number of E-UTRA support bands a UE could support.

4 Proposal / Conclusions

This document provides some of the rationale for this new band 15], and how this could be formulated in the specification for the Lower 700 MHz. A TP draft proposal for E-UTRA operating band is provided

As part of the discussions for band 15 we would welcome further discussion on E-UTRA band 12. In this case it is not clear if Band 12 should be aligned with UTRA Band XII to include Blocks A, B and C or just be limited to Block A and B.. Therefore, we propose to maintain the TBD status until this aspect is clarified.

-------- Start of draft TP for TS36.101 ----------

5.1 General

The channel arrangements presented in this clause are based on the frequency bands and channel bandwidths defined in the present release of specifications.

NOTE: Other frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	Uplink (UL) eNode B receive UE transmit	Downlink (DL) eNode B transmit UE receive	UL-DL Band separation	Duplex Mode
	F_{UL_low} – F_{UL_high}	F_{DL_low} – F_{DL_high}	F_{DL_low} - F_{UL_high}	
1	1920 MHz – 1980 MHz	2110 MHz – 2170 MHz	130 MHz	FDD
2	1850 MHz – 1910 MHz	1930 MHz – 1990 MHz	20 MHz	FDD
3	1710 MHz – 1785 MHz	1805 MHz – 1880 MHz	20 MHz	FDD
4	1710 MHz – 1755 MHz	2110 MHz – 2155 MHz	355 MHz	FDD
5	824 MHz – 849 MHz	869 MHz – 894MHz	20 MHz	FDD
6	830 MHz – 840 MHz	875 MHz – 885 MHz	35 MHz	FDD
7	2500 MHz – 2570 MHz	2620 MHz – 2690 MHz	50 MHz	FDD
8	880 MHz – 915 MHz	925 MHz – 960 MHz	10 MHz	FDD
9	1749.9 MHz – 1784.9 MHz	1844.9 MHz – 1879.9 MHz	60 MHz	FDD
10	1710 MHz – 1770 MHz	2110 MHz – 2170 MHz	340 MHz	FDD
11	1427.9 MHz – 1452.9 MHz	1475.9 MHz – 1500.9 MHz	23 MHz	FDD
12	[TBD] – [TBD]	[TBD] – [TBD]	[TBD]	FDD
13	777 – 787	746 – 756	21	FDD
14	788 – 798	758 – 768	20	FDD
[15]	[704] - [716]	[734] - [746]	[18]	[FDD]
...				
33	1900 MHz – 1920 MHz	1900 MHz – 1920 MHz	N/A	TDD
34	2010 MHz – 2025 MHz	2010 MHz – 2025 MHz	N/A	TDD
35	1850 MHz – 1910 MHz	1850 MHz – 1910 MHz	N/A	TDD
36	1930 MHz – 1990 MHz	1930 MHz – 1990 MHz	N/A	TDD
37	1910 MHz – 1930 MHz	1910 MHz – 1930 MHz	N/A	TDD
38	2570 MHz – 2620 MHz	2570 MHz – 2620 MHz	N/A	TDD

5.3 TX–RX frequency separation

5 References

[1] 3GPP TR25.822 v1.0.0 UMTS 700 MHz Work Item Technical Report

Attachment C

TSG-RAN Working Group 4 (Radio) meeting #47bis **R4-081356**
Munich, Germany, 16 – 20 June, 2008

Source: Ericsson

Title: On the introduction of Band 15

Agenda item: 6.1.2.2

Document for: Discussion

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1 Background

It has been proposed to introduce Band 15 as a subset of the current Band 12 to resolve certain co-existence issues [1]. The current Band 12 covers Blocks A+B+C in the lower 700 MHz band in Region 2, Band 15 would cover B+C (see Figure 1).

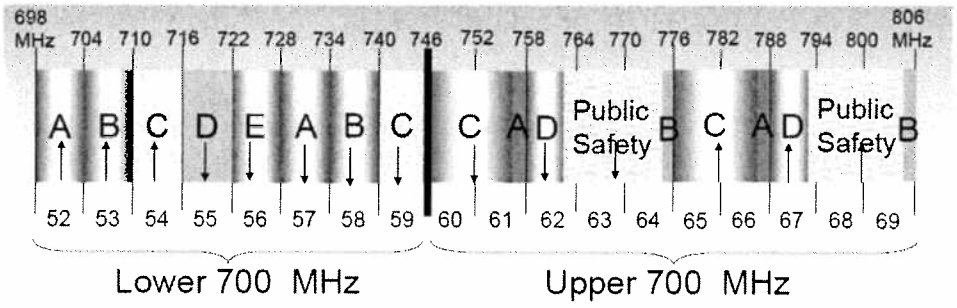

Figure 1 Band plan for Region2.

There are indeed some technical benefits of introducing Band 15, but there are also drawbacks. There would be two duplexers covering part of the lower 700 MHz (it has also been proposed to limit Band 12 to A+B), which goes against economies of scales and may lead to market fragmentation.

In this contribution, some of the co-existence issues are addressed to assess the merits of Band 15.

2 Discussion

2.1 Digital TV in Channel 51 and MediaFLO into eNB

DTV interference into eNB RX is the most difficult of the interference scenarios considered.

For DTV in Ch51 (and MediaFLO in Ch55, Block D/E) there are two interfering mechanisms

- Out-of-band emission (OOBE) from the TV transmitter falling into the LTE RX passband
- eNB RX blocking by an adjacent TV signal. Blocks A and C then the most prone

see Figure 2. The OOBE cannot be mitigated by filtering at the eNB, it must be done at the TV transmitter. Duplex- and additional filter can mitigate the RX blocking.

OOBE is thus not relevant for the Band 15 issue, we only note that for DTV (5 MW eirp) Block A will be significantly degraded in the neighbourhood of the TV transmitter unless 25 dB extra attenuation of a power reduction is supplied at the DTV transmitter, Blocks B and C are not impacted by Ch51.

When analysing the blocking we consider a DTV transmitter with 5 MW eirp (largest transmitters typically mounted in high TV masts) and a MediaFLO at 50 kW eirp. Clearly, a Band 15 duplexer would reduce the DTV blocker level but leave the MediaFLO unaffected.

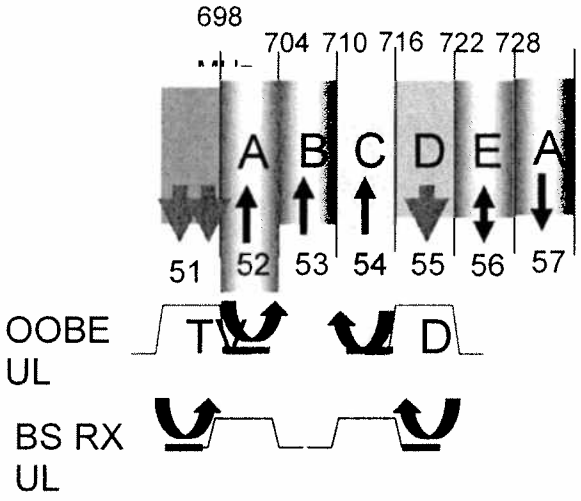

Figure 2 Interference from DTV in Ch51 and MediaFLO in Ch55.

The coupling between the broadcast transmitter and the eNB RX is highly dependent on the relative difference in height (see Figure 3) and the inter-site distance. Examples provided here represent worst case scenarios, in real deployments analysis must by made on a case-by-case basis. Clearly, additional filtering or different duplex arrangements in the eNB is only needed in the vicinity of the broadcast transmitter.

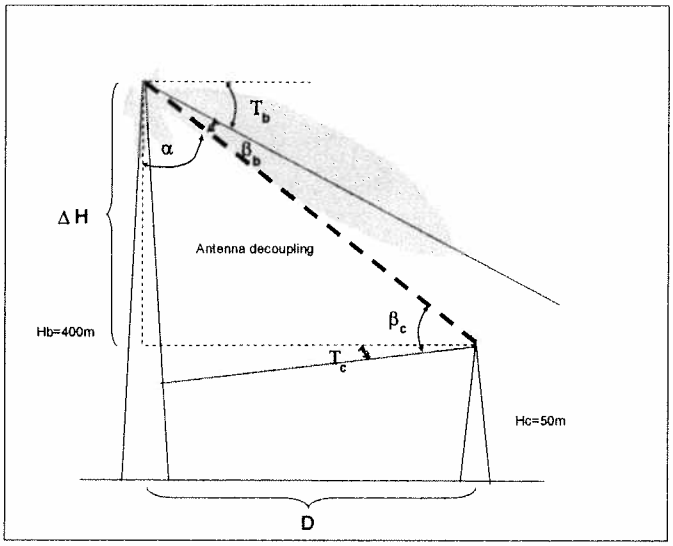

Figure 3

Considering a DTV 6 MHz interference in Ch51 the A block at 6 MHz offset from the broadcast signal will be the most impacted, an additional 35 dB of eNB filtering is needed at 698 MHz, which can be implemented at moderate loss in the RX passband. Block B will be less impacted and it suffices with a 15-20 dB additional attenuation is needed at 698 MHz. However, this can easily be achieved with an external filter for LTE sites close to the broadcast tower and is not a major reason for introducing a Band 15 duplexer.

For MediaFLO at 50 kW eirp the C block will be most impacted, but with some 20 dB extra eternal attenuation at 716 MHz the blocking can be mitigated with less than 1% degradation. Band 15 instead of Band 12 would have a very limited effect here.

To sum up: the interference from DTV at Ch51 does not in itself motivate the introduction of Band 15, for block B+C licence holders additional attenuation can be provided at the eNBs located in the vicinity of the broadcast tower.

2.2 MediaFLO into UE

The next scenario is interference from broadcast transmitting on Ch 55 (Block E) into LTE downlink Blocks A, B and C, see Figure 1. A Band 15 duplexer would then provide extra attenuation for Blocks B and C, but A is the most critical. The broadcast transmitter power is 50 kW eirp. Blocking is the worst case interference here as compared to that of OOBE.

The assumptions for the coexistence simulation are

- one broadcast system at 50 kW from a 138 m mast with a 12 dBi antenna
- a cellular system with a cell grid of 1000 m

The UE will be subject to a performance degradation close to the broadcast site. Figure 4 shows the degradation as a function of distance from the broadcast site for a 5 MHz channel in Blocks A, B and C at 6, 12 and 18 MHz separation, respectively. Block A is the most sensitive with a 1.3% performance degradation in the downlink. Block B is at 0.2%, a Band 15 duplexer would have reduced this further.

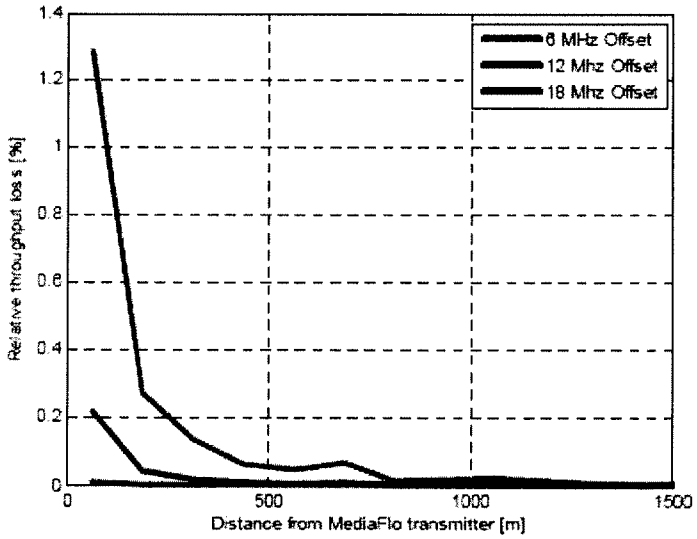

Figure 4 Interference from MediaFLO into downlink Blocks A, B and C.

A 500 m high broadcast tower would also have given a 0.2% degradation for Block B. Summarizing: it is questionable if a Band 15 duplexer should be introduced based on the coexistence results considered above.

2.3 TX IM due to DTV

The last issue considered is UE TX intermodulation of a lower 700 MHz LTE signal with a powerful DTV signal. The latter is a 6 MHz DVB-T signal in Ch 51 centred at 695 MHz transmitted at 5 MW eirp. The intermodulation occurs in the UE TX chain and may produce products falling in the UE transmit and receive bands. For UTRA, TX IM is specified as IM with a CW interferer, which will produce IM products of up to 10 MHz bandwidth. Now we have IM between two wideband signals which will produce a IM product that will interfere over a larger bandwidth but a lower PSD.

We assume that the DTV signal is centered at f_1 with the LTE transmitted signal at $f_0 = f_1 + \Delta f$ (centered at Blocks A, B and C or combinations). The IM product is produced from the sum of the DTV and LTE signals

$$u = A\cos 2\pi f_1 t + B\cos 2\pi f_0 t$$

where A and B are bandpass signals of bandwidths equal to the DTV and LTE signals, respectively. The TX nonlinearity is modelled as

$$g(x) = \sum_{j=1} k_j x^j$$

Now, the 3rd order intermodulation product will appear at the following frequencies with amplitudes

f_i $\quad k_1 A + \frac{3}{4} k_3 \left(A^3 + 2AB^2\right)$

f_0 $\quad k_1 B + \frac{3}{4} k_3 \left(2A^2 B + B^3\right)$

$2f_0 - f_i = f_0 + \Delta f$ $\quad \frac{3}{4} k_3 AB^2 .$

The IM product at $2f_i - f_0$ falls into the broadcast band. The product at $f_0 + \Delta f$ may fall into the receive band, considering its amplitude and using the supports of convolution in the spectral domain, it follows that it's located at

$$f_0 + \Delta f \pm \frac{1}{2}\left(BW_A + 2BW_B\right)$$

with regard to the LTE transmitted signal. Table 1 shows the frequency of this IM3 product in relation to the UE receive bands for various scenarios and LTE bandwidths

Table 1. IM3 in relation to the LTE receive band for a 6 MHz DTV interferer in Ch 51.

LTE Block	Interferer separation Δf MHz	IM3 frequency MHz	LTE receive band MHz
A (5 MHz)	6	699-715	728-734
B (5 MHz)	12	711-727	734-740
C (5 MHz)	18	723-739	740-746
A+B (10 MHz)	9	700-726	728-740
B+C (10 MHz)	15	712-738	734-746

For the 5 MHz LTE cases the IM3 will not overlap with the receive bands and the TX duplexer will provide more than 40 dB of attenuation outside the transmit band, so these products will likely not be blocking the UE receiver. The level depends on the linearity of the TX, the intermodulation requirements and required linearity is still TBD in TS 36.101.

There may be a problem for 10 MHz channels in B+C where part of the IM product will fall into the receive band (a problem even if the duplexer provides attenuation). The TX filter of a Band 15 duplexer could then decrease the DTV signal, but the reduction as compared to a Band 12 duplexer is still TBD as there are few 700 MHz filters available at present (ongoing work).

Looking at the frequencies of the IM3 products it appears that the only scenario that motivates a Band 15 duplexer is the 10 MHz LTE allocation in B+C for terminals used in the vicinity of broadcast transmitters. TX IM problems would of course also be alleviated for Block B channels.

3 Proposal

Collecting the results

- starting with the most difficult case, DTV and MediaFLO interference into eNB, we note that this requires additional filtering in the eNB in the vicinity of the broadcast tower for duplexers involving Block A (i.e also for the current Band 12), for Block B the filter requirements are less stringent
- MediaFLO interference into the LTE downlink will be most severe for Block E broadcast into Block A downlink, but it appears that the degradation does not translate into more than a percent of performance loss for LTE

- TX IM could be a problem for B+C licence holders when 10 MHz channels are deployed near big 5 MW eirp DTV transmitters

The first item above can be solved by external filters at the eNB close to the broadcast site and does not motivate a Band 15 duplexer in all eNB since the requirements on the external filter for Block B+C would not be difficult (Block A provides a guard). MediaFLO interference into Blocks B and C is a smaller problem than A assuming a Band 12 duplexer.

The TX IM in the vicinity of high-power broadcast transmitter will be alleviated for Block B, but the extra attenuation of the TX dupler is still uncertain. The isolation has to provided on the "wrong" side of the TX duplexer filter that needs to provide high attenuation in the RX band on the other side of the passband.

Unless there is a severe problem with TX IM and difficult MediaFLO into LTE UE interference scenarios into can be identified, Band 15 should not be introduced considering the risk of market fragmentation. However, the interference issues will remain for Block A holders regardless of Band 15 and still needs to be resolved. Nevertheless, the risk of interference will always be higher for Block A holders.

References

[1] R4-081108, "TS36.101: Lower 700 MHz Band 15", Motorola

Attachment D

3GPP TSG RAN WG4 (Radio) Meeting #47bis R4-081324
Munich, Germany
June 16-21, 2008

Source:	**AT&T**
Title:	**Performance and coexistence issues in the Lower 700 MHz band.**
Agenda Item:	**6.1.2.1**
Document for:	**Discussion**
Contact:	**David Shively, david.shively@att.com, Marc Grant marc.grant@att.com**

1. Introduction

This document is provided as discussion related to prior contributions on the 700 MHz bands to be used in the US and also the proposal for a new band (Band 15) to include only a portion of the Lower 700 MHz band [1].

2. Background

The band plan for the Lower 700 MHz band and the allowed power limits (ERP) are shown in Figure 1 below. Currently, AT&T has acquired spectrum licenses in only the B and C Blocks as indicated in the shaded blocks in the figure. The digital TV (DTV) broadcast stations on channels 51 and below are permitted to transmit up to 1 MW ERP. The unpaired D and E Blocks are permitted to transmit up to 50 kW and some of these stations are already in service on D Block with MediaFLO broadcast service for mobile devices. It is expected that similar transmitters and power levels will be used in E Block. The transmit power limits for the paired blocks (A, B, and C) are given in terms of power spectral density as 1 kW/MHz and this is approximated as 6 kW although the expected power levels for 2-way services are expected to be much lower than the maximum limit (expected to be 500 to 1000 W ERP, similar to cellular service at 850 MHz). The paired C Block is also allowed to transmit up to 50 kW for broadcast services but it is assumed that the C Block will be used for 2-way services in combination with B Block and will be limited by the 1 kW/MHz level. Note that the limit for the Upper 700 MHz blocks is also 1 kW/MHz and this means the 11 MHz block is allowed up to 11 kW. However, it is assumed that that block will also be used for 2-way services and will have power levels similar to B and C Blocks in the Lower 700 band.

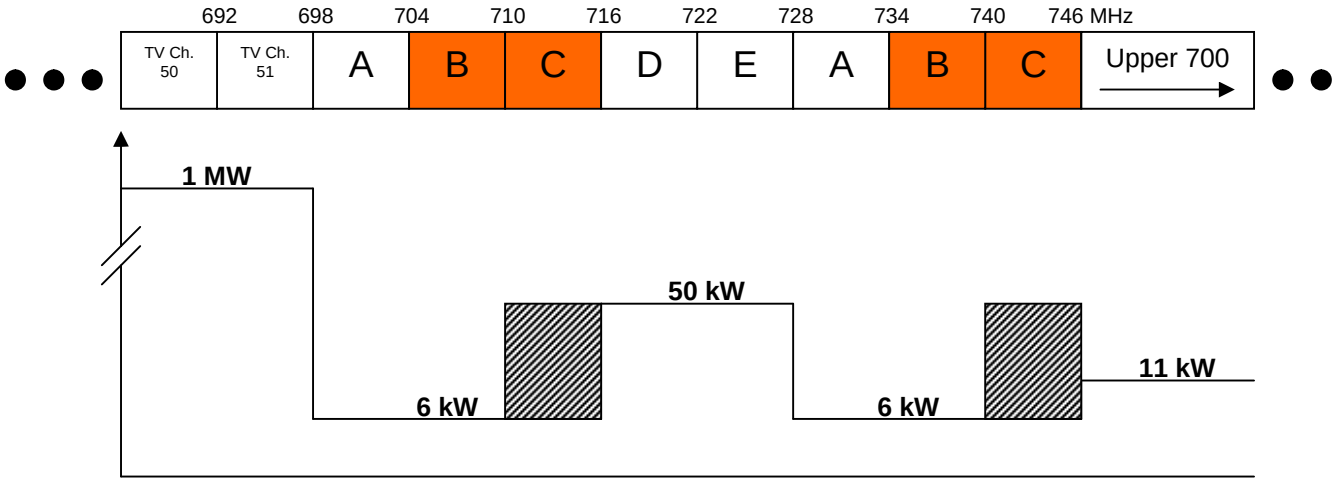

Figure 1. Band plan and power (ERP) limits for the Lower 700 MHz band.

As mentioned above, it is expected that the E Block will be used for broadcast type services such as MediaFLO, DVB-H, etc., and will transmit at 50 kW ERP. As shown in Figure 2 below, during the recent 700 MHz auction MediaFLO (Qualcomm) won licenses in California, New York, etc., shown in white with the remaining licenses won by Frontier (Echostar) shown in red. While it is not completely clear what technology will be deployed by Frontier it is likely that many large metropolitan markets will have broadcast services on E Block at high power (i.e. 50 kW ERP).

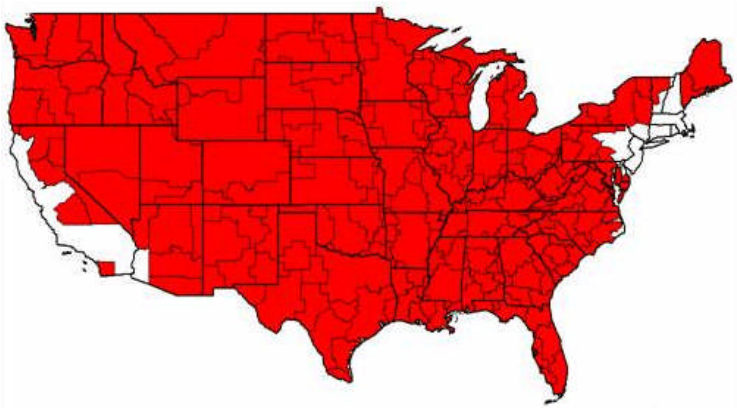

Figure 2. E Block licenses (6 MHz channel, unpaired).
(MediaFLO white, Frontier red)

The 700 MHz band plan and the allowed power limits introduce scenarios that have never occurred up to now and have not been addressed in the past in the 3GPP specifications. In particular, the band plan includes a narrow duplex gap (12 MHz), a relatively small duplex distance (Rx-Tx = 30 MHz), and the presence of strong interfering signals that fall directly into the duplex gap needed for two-way services. These issues, and in particular the strong interferers, will require some issues to be resolved in the specifications.

3. Technical Issues

UE Receiver Performance

In the present analysis the following points are assumed:

- For two-way services on A, B, and C Blocks the UE must be able to operate at a level close to the reference sensitivity with strong signals present on the D and E Blocks. As explained above, AT&T is primarily concerned with two-way operation on the B and C Blocks only.

- Typical duplex filters must account for tolerances due to temp. variations (approx. 2 MHz), manufacturing process (approx. 1.5 MHz, etc. It also takes a few MHz of spectrum to achieve a significant level of attenuation in the filter. Thus, it is unlikely that a typical filter can reject signals in the first 5-6 MHz outside of the intended receive pass band (i.e. very little rejection in the first adjacent channel block)

- Several values are used from the UE specifications (TS 25.101) and it is assumed that the values for LTE will be similar.

As noted above, high power broadcast services have already been deployed on the D Block and are also expected to be deployed on the E Block. These systems are allowed to operate at 50 kW ERP with some additional limits on their emissions. From Part 27.55, the power flux density at ground level is limited to 3000 μW/m2 within 1 km of the transmitter location. Assuming an isotropic receive antenna this is equivalent to a received power of -13.8 dBm. However, since these transmitters are generally located on high towers (200m-500m) with little antenna downtilt, the actual signal power at ground level may be somewhat lower due to the reduced antenna gain in the direction toward the ground (e.g. Rx power of -25 to -30 dBm w/ 0 dBi UE receive antenna). A sample link budget is shown in the table below.

		Units	**Notes**
E Block Tx Power (ERP) =	50	kW ERP	725 MHz, E Block
Tx power (EIRP) =	79.13	dBm EIRP	Convert to EIRP
Tx tower height =	200	m	
Distance to Victim UE =	500	m	Distance from base of tower
Antenna gain reduction =	-10	dB	Due to Tx ant. pattern in direction of UE
Path loss =	-84.27	dB	< 1 km so free space loss is assumed
Other losses =	-10	dB	Blockage, body loss, etc.
UE antenna gain =	0	dBi	Assumed isotropic Rx antenna
UE Rx power =	-25.14	dBm	Blocking signal level in E Block

Table 1. Sample link budget for E Block signal into UE receiver.

As noted in the table, the broadcast transmitter antenna height is assumed to be 200 meters and the UE is at 500 m distance from the base of the tower. In this case, free space loss is assumed since the Hata model is valid only for distances > 1 km. Note that the peak ERP is reduced by 10 dB due to the elevation pattern of the transmit antenna and an additional loss of 10 dB is also included to account for blockages in the signal path, body loss, etc. In this case, the azimuth pattern of the antenna is assumed isotropic and so there would little variation in azimuth. For reference, antenna pattern data for typical broadcast antennas can be found at [2]. While the UE may have an antenna gain somewhat below 0 dBi this can be easily included and would reduce the received power by a few dB. With the same assumptions as above but with a 1 km spacing, the Rx power at the mobile is estimated as -30.7 dBm. Note that this is also similar to the value predicted at 1 km by the urban Hata model (Rx power = -33.4 dBm, pathloss = 112.57+29.13log(d)) and the suburban Hata model (Rx power = -24.0 dBm, pathloss = 103.17+29.13log(d)). From these estimates it is assumed that the UE will be subjected to strong signals (approx. -25 to -30 dBm) within 1 km of D and E Block transmitters.

Assuming that the UE is operating on A Block, it must have sufficient selectivity to reject the interfering signal in E Block. In the current UMTS specifications the ACS is given for two cases. In Case 1 the desired signal is at REFSENS+14 dB and the interferer is at -52 dBm leading to an ACS value of 33 dB. In Case 2 the desired signal is at REFSENS+41 dB and the interferer is at -25 dBm, also leading to an ACS value of 33 dB. However, neither of these two cases addresses the

case of a UE operating at a point close to the reference sensitivity while in the presence of a strong signal due to MediaFLO or other high power transmitters which is a scenario that may occur depending on the location of the E Block transmitters and cell towers. In this case, the desired signal would be similar to Case 1 REFSENS+14 dB (or even lower) and the adjacent channel interference could be as high as -25 to -30 dBm . If the duplex filter could provide attenuation for the interfering signal it would help to mitigate this problem. However, as mentioned above, little or no attenuation is provided by the duplex filter in the block adjacent to the desired pass band. In this case, operation on A Block may be problematic.

A similar situation exists for a UE operating on B Block with a strong interfering signal on E (or D) Block. In this case, the in-band blocking specifications are used and for a UE operating on B Block at REFSENS+3 dB, a signal on E Block can be as high as -56 dBm (assumed at 10 MHz offset although in the case of the 700 MHz band this offset would be approx. 12 MHz). In this case, with an interfering signal at -30 dBm, an additional attenuation of 26 dB is needed. This could be accomplished with the duplex filter provided that a Band 15 approach is used so that the duplexer passband includes only the B and C Blocks. In this case, the desired filter attenuation can be achieved at 6 MHz outside the edge of the intended passband. **Without this attenuation provided by the duplexer the UE would be impacted at a distance of 8.7 km from the E Block transmitter** (assuming suburban Hata model w/ 10 dB additional loss for blockage, body loss, etc.). In addition, in some markets it is probable that both E Block and D Block will be on the air with high transmit power. AT&T currently believes that the Band 15 approach will provide performance for the UE that is consistent with the performance on other bands that do not have the more extreme operating conditions.

In addition, as noted in [1], the broadcast signals on Channel 51 and the D and E Blocks may mix with the UE's own transmit signal to produce intermodulation (IM) products that may fall into the UE receive band (and could affect the UE's own receiver or another nearby UE if the IM signal is re-radiated). The table below shows the possible IM components and the resulting signals (center frequency). Of particular concern are the products that fall into the B and C Block UE receiver. In addition, the bandwidth of IM products will be wider than the signals themselves and would affect multiple blocks. Furthermore, AT&T has the option to use a 10 MHz LTE carrier that spans both the B and C Blocks and these signals could mix with an E Block signal and fall into the 10 MHz receive band.

Broadcast Signal (F1)	**UE Transmit Signal (F2)**	**IM Center Freq. (2xF2-F1)**
Channel 51	B Block	719 MHz (D Block)
Channel 51	C Block	731 MHz (A Block)
D Block	B Block	731 MHz (A Block)
D Block	C Block	725 MHz (E Block)
E Block	B Block	**743 MHz (C Block)**
E Block	C Block	**737 MHz (B Block)**

Table 2. IM Products due to Broadcast signals and UE transmitter.

In terms of the specification, the IM response is evaluated at REFSENS+3 dB and the receiver must meet the performance target with interfering signals at -46 dBm at offsets of 10 MHz and 20 MHz.

In this case, the duplex filter must attenuate an external signal by at least 16 dB to meet the current specification. In the case of a Band 12 duplexer this would not be possible if the external signal is in the E Block but this would be mitigated in the case of Band 15. **Without this attenuation the UE would be affect by IM at a distance of 6 km from the E Block transmitter.**

Previous contributions on the 700 MHz band have also identified the possibility of interference to a UE receiver due to the out of band emissions from the MediaFLO, or other, transmitters operating on D and E Blocks. In this case, the interference cannot be reduced through filtering in the UE. However, it is generally expected that the out of band emissions from these types of UHF transmitters will be significantly lower than the general FCC limit (although this cannot be guaranteed through regulatory rules). For example, for transmitters operating in the Lower 700 MHz band the out of band emission limit is -13dBm / 100 kHz. However, as can be seen in a regulatory compliance report by Harris Broadcast Corp. [3], the actual level of the OOBE measured after the transmit filter is approx. -47 dBm / 100 kHz. Using this transmit power for the OOBE, a link budget is shown in Table 3 below to estimate the impact on the UE receiver. In this case, at a distance of 500 m the OOBE is well below the noise floor of the victim UE. **Thus, it can be assumed that the other interference aspect analyzed above will be the main sources of interference in the Lower 700 MHz band.**

		Units	**Notes**
Tx power =	-47	dBm/100kHz	D or E Block OOBE emission level
Tx power =	-30.5	dBm/4.5 MHz	Convert to 4.5 MHz
Tx line loss =	2	dB	
Tx antenna gain =	14.1	dBi	= 12 dBd
Tx tower height =	200	m	
Distance to Victim UE =	500	m	Distance from base of tower
Antenna gain reduction =	-10	dB	Due to ant. pattern in direction of UE
Path loss =	-84.27	dB	< 1 km so free space loss is assumed
Other losses =	-10	dB	Blockage, body loss, etc.
UE antenna gain =	0	dBi	Assumed isotropic Rx antenna
UE Rx power =	-122.67	dBm/4.5 MHz	OOBE level in UE receive block

Table 3. Sample link budget for OOBE from D or E Block transmitter to UE receiver.

UE Transmitter Performance

Earlier contributions have examined the self-desense issues related to LTE transmissions when the signal bandwidth is 5 MHz, or greater. Since the total amount of isolation that can be achieved in a Band 15 duplexer is approximately the same as in a Band 12 device the self-desense issue may not be improved. However, there are other advantages to using a Band 15 approach for the UE transmitter. Since the filter passband is smaller, the insertion loss may be slightly less than a Band 12 duplexer. Also, to avoid interference to mobile devices receiving signals on the D and E Blocks the out of band emissions from the UE should be reduced as much as possible. With a smaller passband, a Band 15 UE may exhibit lower out of band emissions. Similarly, a mobile device transmitting on the A, B, or C Blocks could cause interference to a DTV receiver operating on

Channel 51. Since AT&T plans operations on only the B and C Blocks, the Band 15 approach offers the possibility that emissions into Channel 51 could be reduced through the duplex filter.

eNode-B Performance

As for the UE receiver, the eNode-B receiver must work in the presence of in-band noise due to OOBE from D and E Blocks and also the presence of strong signals on the adjacent blocks including 1 MW transmitters on Channel 51. In general, much better filtering can be applied at the Node-B and some amount of additional isolation can be achieved through site engineering during deployment. AT&T recommends no specific changes to the eNode-B/Node-B specifications at this time.

4. Conclusions

Due to the disparity of wireless services that are deployed and envisioned for the Lower 700 MHz band in the US there will be additional requirements on the UE and the eNode-B to ensure acceptable performance for two-way voice and data services in the band. As proposed in previous RAN4 meetings some of these issues can be addressed through the introduction of an additional band in the specifications (Band 15) that includes only the B and C Blocks which are currently planned for service by AT&T. In addition, as has been presented in this contribution, the expected signal levels due to high-powered systems in neighboring blocks may be mitigated to some degree by front-end filtering and this alleviate some of the blocking and intermodulation problems in the UE receiver. This approach may be the preferred solution rather than impose more stringent requirements on the baseband components within the UE. Currently, AT&T believes that this offers the best way forward and that Band 15 should be adopted in the specifications.

References

[1] R4-081108, TS 36.101: Lower 700 MHz Band 15, Motorola, RAN WG4 #47, Kansas City, MO, April 5-9, 2008.

[2] See, for example, Model TLP-12A at www.dielectric.com

[3] Harris Broadcast Corp., Certification of Compliance for Digital TV Transmitter, March 2007, available at www.fcc.gov

Attachment E

3GPP TSG- RAN WG4 Meeting #48 ⌘*R4-082179*
Jeju, Korea, August 18 – 22, 2008

CR-Form-v9.4
CHANGE REQUEST

⌘	**36.101**	**CR**	**48**	⌘	**3**	⌘	Current version:	**8.2.0**	⌘
				rev					

*For **HELP** on using this form look at the pop-up text over the ⌘ symbols. Comprehensive instructions on how to use this form can be found at http://www.3gpp.org/specs/CR.htm.*

Proposed affects: ⌘	***change*** UICC apps⌘	☐ ME	☒ Radio Network	Access ☐	Core Network ☐

Title: ⌘ Addition of Band 17

Source to WG: AT&T
⌘

Source to TSG: R4
⌘

Work item code: LTE-RF ***Date:*** ⌘ 18/08/2008
⌘

Category: ⌘ **B** ***Release:*** ⌘ Rel-8

Use one of the following categories:	*Use one of the following releases:*	
F *(correction)*		
A *(corresponds to a correction in an earlier release)*	*R99*	*(Release 1999)*
	Rel-4	*(Release 4)*
B *(addition of feature),*	*Rel-5*	*(Release 5)*
C *(functional modification of feature)*	*Rel-6*	*(Release 6)*
D *(editorial modification)*	*Rel-7*	*(Release 7)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.	*Rel-8*	*(Release 8)*
	Rel-9	*(Release 9)*

Reason for change: ⌘ Due to the disparity of wireless services that are deployed and envisioned for the Lower 700 MHz band in the US there will be additional requirements on the UE and the eNode-B to ensure acceptable performance for two-way voice and data services in the band. As proposed in previous RAN4 meetings some of these issues can be addressed through the introduction of an additional band in the specifications (Band 17) that includes only the B and C Blocks. The expected signal levels due to high-powered systems in neighboring blocks may be mitigated to some degree by front-end filtering and this alleviate some of the blocking and intermodulation problems in the UE receiver.

Summary of change: ⌘ Added Band 17 (704-716/734-746 MHz) to table 5.2-1

Consequences not approved:	***if*** There is a potential for more stringent requirements to be imposed on the UE ⌘

Clauses affected:		5.2 ⌘	
Other specs affected:	⌘	**Y** / **N**	
			Other core specifications ⌘
		Y	Test specifications
			O&M Specifications
Other comments:		⌘	

5.1 General

The channel arrangements presented in this clause are based on the frequency bands and channel bandwidths defined in the present release of specifications.

NOTE: Other frequency bands and channel bandwidths may be considered in future releases.

5.2 Frequency bands

E-UTRA is designed to operate in the frequency bands defined in Table 5.2-1.

Table 5.2-1 E-UTRA frequency bands

E-UTRA Band	**Uplink (UL) eNode B receive UE transmit**			**Downlink (DL) eNode B transmit UE receive**				**Duplex Mode**
	F_{UL_low} – F_{UL_high}			F_{DL_low} – F_{DL_high}				
1	1920 MHz	–	1980 MHz	2110 MHz	–	2170 MHz		FDD
2	1850 MHz	–	1910 MHz	1930 MHz	–	1990 MHz		FDD
3	1710 MHz	–	1785 MHz	1805 MHz	–	1880 MHz		FDD
4	1710 MHz	–	1755 MHz	2110 MHz	–	2155 MHz		FDD
5	824 MHz	–	849 MHz	869 MHz	–	894MHz		FDD
6	830 MHz	–	840 MHz	875 MHz	–	885 MHz		FDD
7	2500 MHz	–	2570 MHz	2620 MHz	–	2690 MHz		FDD
8	880 MHz	–	915 MHz	925 MHz	–	960 MHz		FDD
9	1749.9 MHz	–	1784.9 MHz	1844.9 MHz	–	1879.9 MHz		FDD
10	1710 MHz	–	1770 MHz	2110 MHz	–	2170 MHz		FDD
11	1427.9 MHz	–	1452.9 MHz	1475.9 MHz	–	1500.9 MHz		FDD
12	[TBD]	–	[TBD]	[TBD]	–	[TBD]		FDD
13	777 MHz	–	787 MHz	746 MHz	–	756 MHz		FDD
14	788 MHz	–	798 MHz	758 MHz	–	768 MHz		FDD
...								
17	704 MHz	–	716 MHz	734 MHz	–	746 MHz		FDD
...								
33	1900 MHz	–	1920 MHz	1900 MHz	–	1920 MHz		TDD
34	2010 MHz	–	2025 MHz	2010 MHz	–	2025 MHz		TDD
35	1850 MHz	–	1910 MHz	1850 MHz	–	1910 MHz		TDD
36	1930 MHz	–	1990 MHz	1930 MHz	–	1990 MHz		TDD
37	1910 MHz	–	1930 MHz	1910 MHz	–	1930 MHz		TDD
38	2570 MHz	–	2620 MHz	2570 MHz	–	2620 MHz		TDD
39	1880 MHz	-	1920 MHz	1880 MHz	-	1920 MHz		TDD
40	2300 MHz	-	2400 MHz	2300 MHz	-	2400 MHz		TDD

5.3 TX–RX frequency separation

Attachment F

Title: Report of the 3GPP TSG RAN WG4 meeting # 47bis
Munich, Germany , 16-20 June 2008

Status: Proposed

Source: Stefania Sesia, MCC

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Executive Summary

- **Letters to other groups:** Need further discussions on Physical Cell Identities, Measurement gaps, Radio problem detection
- **Maintenance:** Treated: Inner loop power control, UE power classes, EDCH phase issues, CQI tests and New cell identification time
- **E-UTRA/E-UTRAN:**
  - Use nominal/additional bandwidth?
  - **UE Requirements:** Band 15 introduced as a subset of band 12. Public Safety relatd to band 13 has been discussed.
  - **UE Transmitter:** Min output power, Transmit OFF power, EVM windowing is reduced for 1.4 and 3MHz, Power control (conf call), ACLR (not removed requirements for 1.4 ad 3MHz), Tx Modulation (spectrum flatness need more discussion)
  - **UE Receiver:** Agreed refsens for 1.4 and 3MHz, UE ACS Test time alignement, FRC definition, In-band Blocking Requirement correction for band 13
  - **UE Performance Requirement:** High speed train need more results, Testing points accepted, PBCH scenarios agreed, Extra margin discussion (treat it case by case). Mimo correlation matrices defined.
  - **BS Requirements:** mask for the transmitter time dynamic behavior is added and clarification on the time duration during which the requirement applies. Otuput power, Output power dynamics Transmit on off power (applicable to TDD), TX signal quality, Unwanted emissions, Transmitter intermodulation for the transmitter and Receiver spurious emission for the receiver are affected. Unwanted emission requirements for multi-carrier BS agreed
  - **BS Performance Requirements:** remove the intra and inter frequency hopping currently in the simulation assumptions. Call for results for PUCCH format 2 (with impairments) and PRACH format 4 (ideal). Uplink timing adjustment (modifications according to ran 1), MU pucch simulation assumption agreed.
  - **BS Conformance Testing:** Good progress for 36.141
  - **RRM: Discussions on**
    - IDLE state mobility requirements
    - Handover
    - Monitoring Layers of multiple IF/RATs
    - Uplink timing issues
    - Intra-LTE RRC Re-establishment Requirements
    - Intra-frequency cell Search requirement
    - Inter-frequency Monitoring using measurement gaps
    - Inter rat monitoring unsing measurement gaps
    - Measurement accuracy requirements
    - Mobility UTRA->E-UTRA
  - Dual-cell HSDPA **operation on adjacent carriers: New reference measurement channel defined.**
  - **LTE FDD Repeaters:**Agreed requirements for definitions, Frequency stability, Operating band unwanted emissions, ACRR, spurious emissions, Input Intermodulation co-exitence and co-location
  - **FDD Home NodeB RF Requirement:** Frequency error 0.25ppm, ACLR -45dB is agreed
  - **64QAM for 1.28 Mcps TDD HSDPA:** Simulation assumptions endorsed in 1273.
  - **UE Antenna Performance Evaluation Method and Requirements:** accepted the proposal of test tolerances and measurement undertainties.

Extended Summary

- **Letter to other Groups:**
  - Ran 1 asks feasibility of introducing without impact to the Rel-8 timeline, a set of new Physical Cell Identities (PCIs) to be used for CSG cells. More discussions in meeting 48.
  - LS from Ran 1: Measurement gaps duration (6ms, 10ms periodicity), UE behaviour for transmissions overlapping with the measurement gap (no tx on PUSCH in a subframe containing measurement, UE shall drop UL transmissions overlapping with the measurement gap).
  - LS from RAN 1: Radio problem detection→ RAN 4 to define the tests→need more discussions: Propose that cell specific or the so-called common reference symbols (CRS) SIR is solely used as a criteria to determine radio link problem since received quality of reference symbol is fundamental to the decoding of control (e.g. PDCCH, PHICH) and shared channel (PDSCH). This will also simplify UE implementation compared to earlier discussions in which combination of channels for radio problem detection has been proposed. Nokia suggests the use of PC-FICH as a mapping function but this would mandate the Ue to use PC-FICH, that is not necessary to decode PDCCH. PC-FICH may be used in case it is received. Questions arise on to mesure the PC-FICH error rate.

- **Maintenance**
  - Inner loop power control: insufficient testing of ILPC accuracy (can affect system tput). Meeting 48, more discussions and more simulation results
  - UE power classes: 23dBm power class is supported also for WCDMA, no impact in other part of the spec (3bis, same PA.)
  - EDCH phase issues: (link level run with a particular specific power vs. phase shift profiles. Performance loss is related to the number of transitions passing the PA switch points-> need more analysis to define the worst case, best case and maybe a typical case implementation.
  - CQI: 3 cathegories: CQI-bias testing in static conditions, Fading CQI test cases, Varying Ior/Ioc CQI test cases (some tests will be agreed in next meeting).
  - New cell identification time (intra-frequency) when UE DRX is enabled: <800 ms when UE DRX cycle < 10 subframes and 1.5s when the UE DRX cycle ≥ 10 subframes. (this is because in DRX the T_identify_intra can be up to 6s).

- **E-UTRA/E-UTRAN**
  - Discussion on the use of nominal and additional bandwidth. It can be misleading to have these two tables. What are the differenceces between the applicability of the relaxations to these 2 tables? More discussion in the next meeting.
  - RF Scenarios: Seamcat presentation. Discuss how to proceed with that.
  - **UE Requirements:**
    - Band 15 as a subset of band 12 which includes only the B and C Blocks of the lowe 700MHz band (currently planned for service by AT&T)
    - In Region 2 there is a Public Safety (PS) downlink band in the duplex gap of Band 13 --> backoff power or network signal value to protect?
    - Band 13 REFSENS specified.
  - **UE Transmitter:**
    - Specify the min output power =-40dBm
    - Transmit OFF power is specified as -50 dBm in the associated channel bandwidth
    - EVM windowing is reduced for 1.4 and 3MHz otherwise the emission mask would be difficult to meet
    - Power control: discussion on power tolerance, position and amount of the transient period, scenarios, crietria for open loop. Conf call before meeting 48.
    - ACLR:

Agilent:formalizing a move towards subframe measurements (instead of slot based).

Motorola: most of the work has been done on subframe measurement, only a R&S contribution was based on a slot basis.

Freescale: extreme conditions added in table.

Motorola: it can be added when a proposal will be presented..

Agilent: we would need to give RAN 1 information about the flatness of the signal.

Motorola: let s finish the work on power control before sending the information to ran 1.

Status: Agreed

6.1.2.1 General [For section 1 to 5 in TS36.101]

R4-081575 Discussion TS36.101: Normal and additional channel bandwidth Motorola

Status: Withdrawn

Introduction of Band 15 as a subset of the current Band 12 to resolve certain co-existence issues

R4-081324 Decision Performance and coexistence issues in the Lower 700 MHz band AT&T

Comments:

As proposed in previous RAN4 meetings some of these issues can be addressed through the introduction of an additional band in the specifications (Band 15) that includes only the B and C Blocks which are currently planned for service by AT&T. In addition, as has been presented in this contribution, the expected signal levels due to high-powered systems in neighboring blocks may be mitigated to some degree by front-end filtering and this alleviate some of the blocking and intermodulation problems in the UE receiver.

Nortel: for the eNodeB filtering can be improved.

Qualcomm: analyze the interference situation and they come to conclusions similar to AT&T for the UE, they understand that for the BS the problem can be solved without introducing the 15 band.

AT&T: propose the band 15 as opposed to the best we can do with what it is available so far. Band 15 should be adopted.

Status: Noted

R4-081356 Discussion On the introduction of Band 15 Ericsson

There is a benefit in using Band 15 but there is a risk of market fregmentation.

AT&T: 1000m is it inter site distance?

Ericsson: yes.

Qualcomm: fig 4, tput loss, are these averaged across all the users.

Ericsson: averaged in a circle around the BS.

Qualcomm: 2.2, are the UE randomly distributed and the Mediaflo is trasnmitted at the center of the cell? It does not raise the blocking issue as in At&T doc.

Ericsson: they do address the blocking as well. If all the users are very close to the site, as in AT&T the degradation could be much higher. The difference between the assumptions, AT&T is close to the worst case scenario, why here it is more typical scenario that is used for average system analysis.

Ericsson: analysis in 2.2, 35dB of attenuation is at the BS. Intermodulation issue: this is not specified yet, looking at different attenuation there are different number circulating there.

AT&T: fragmenting the market, in 36.101, 13 and 14 FDD and TDD band, one subband more may not make a big difference in the market fragmentation. They belive that the simplest and the quickest way to solve the problem

Motorola: we have band 12 for A+B+C that is not applicable for US, now there is the proposal to have band 15 which consider only the combination B+C. The other possibe combinations need to be considered.

Status: Noted

R4-081357 Discussion Band 13 and spurious emission in Public Safety

In Region 2 there is a Public Safety (PS) downlink band in the duplex gap of Band 13. It consists of a broadband part in 763-768 MHz and a narrowband in 769-775 MHz (Figure 1). The latter is the most critical in terms of Band 13 emission and must be sufficiently protected. There is a regulatory limit that for a 23 dBm UE implies a spurious emission limit of -35 dBm/6.25 kHz, and this has been introduced into the spec. In this contribution we look at the emission levels produced by a LTE 10 MHz signal. It has been proposed to standardize scheduling restrictions in terms of RB allocations and power to resolve the problems. However, it turns out that this would not guarantee that the FCC limit is satisfied in all cases if 23 dBm output power is used. Moreover, scheduling behaviour is normally not standardized. proposed to allow some back-off for Power Class 3 in order to provide some margin to the FCC requirements whilst still allowing allocation of wide LTE uplink transmissions. We sum up by noting that a deterministic interference analysis based on worst case would imply spurious limits > 25 dB below the required regulatory limit. This would imply severe restrictions on the LTE UE uplink in Block C

They are not proposing to standardize any scheduling, they would like to propose a reduciton in the output power that can be standardized.

Motorola: they are proposing a 2dB backoff. In ue to ue coexistance, protection for wireless is -67/100KHz

Ericsson: we are using the actual FCC spurious emission . By backing off 2dB, in table 1.

Qualcomm: would it be possible to use a network signalled value? Using 2dB overall, in many cases it may not be necessary.

Ericsson: that's could be a feasable option.

Conclusion: Not to specify the backoff but using a network signalled value, we can achieve the same protection for PS system. The proposal is agreed in principle, the CR will be presented.

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Attachment G

Title: **Report of the 3GPP TSG RAN WG4 meeting # 47bis**
Jeju Island, South Korea , 18-23 August 2008

Status: **Draft**

Source: **Stefania Sesia, MCC**

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Summary: The concepts of nominal and additional bandwidths are removed. Tables 5.4.2.1-1 and 5.4.2.2-1 are merged onto one single table. Footnotes are used to indicate that a particular bandwidth in an operating band does have an an allowed receiver relaxation, e.g. reference sensitivity. Transmitter relaxations like MPR and A-MPR are not addressed since these are allowed for all bandwidths. For additional bamds (a part from band 1), there is note for which bandwidth for which a relaxation of the specified UE receiver sensitivity requirement (Clause 7.3) is allowed.

Band 1 there are spurious emissions. Possible that later we will have to add an other footnote to cover the spurious emissions

Frrescale: a footnote with [ ] what does it mean?

Ericsson: It is FFS.

Status: Agreed.

R4-081823 CRTXRX frequency separation Fujitsu

Summary: TX–RX frequency separations for each E-UTRA band are defined based on the separations in UTRA FDD. For E-UTRA TDD bands, the separation is inherently inapplicable and defined as N/A (Not Applicable) accordingly.

Ericsson: Not sure if the text below the table on the fixec duplex or variable duplex is appropriate. Need more discussion.

Motorola: Should be stated in the proposal how to define the separation.

Status: Noted

R4-082001 Discussion Improved Reference Power Amplifier Model for UE Transmitter Simulations Freescale

Summary: This contribution presents a modifiable model for a Power Amplifier (PA) that can be used as a baseline for contributions examining issues such as de-sense, coexistence and ACLR and out of band performance.

The model is used in order to show that there are effects due to imbalance that is particular important for coexistance. The document provide a script to change the test mdetodology. They provide how to derive the model.

Chairman: All the companies may have different implementation of the PA.

Status: Noted

R4-082068 Addition of Band 15 (CR 48 to 36.101) (AT&T)

T-Mobile: Band should be 'Band 17' to avoid problem spreading the specifications (overlapping)

Ericsson: ask to discuss this CR in the next meting together with the band 12.

Expect a revised CR in this meeting or in the next meeting. (Come back to checl the status).

Status: Revised in 2133

R4-082133 Addition of Band 15 (CR 48r1 to 36.101) (AT&T)

The band is called 17.

Status: Revised in 2168

R4-082168 Addition of Band 17 (CR 48r2 to 36.101) (AT&T)

Status: Revised in 2179

R4-082179 Addition of Band 17 (CR 48r3 to 36.101) (AT&T)

Status: Agreed

R4-082164 Frequency range for Band 12 (CR 52 to 36.101) (Ericsson)

Status: Revised in 2196

R4-082196 Frequency range for Band 12 (CR 52r1 to 36.101) (Ericsson)

Status: Agreed

R4-082169 Update of symbol and definitions (CR 53 to 36.101 Rel-8) (Ericsson, Alcatel-Lucent)

Comments: E_{RS} and ¥hat{E}_s is modified. I_{o} is defined with the 2 alternatives (with power averages), I_{or}, ¥hat{I}_{or} and I_{ot} + some definitions.

Status: Agreed

6.1.2.2 Transmitter requirement [For section 6 in TS36.101]

R4-081777 Discussion Discussion of RF and baseband frequency alignment Qualcomm Europe

Comments:

R&S: in wcdma they depend on each other and we have only one requirement. We can say that in the test environment the timing should not be changed. Or we can avoid having this as a requirement and we can state in the test procedure in ran 5 that the test assume that the 2 are coupled.

Status: Noted

POWER CONTROL

R4-081930 Information Summary of Telco on LTE UL Power Control (2008-08-07)Ericsson

6.1.4 BS requirements

6.1.4.1 General [For section 1 to 5 in TS36.104]

R4-081951 CR LTE Abbreviations update Ericsson 36.104 16 F

Status: Revised in 2083

R4-082083 LTE Abbreviations update (CR 16r1 to 36.104 Rel-8) (Ericsson)

Collect the abbreviations that are widely used in the LTE area and propose a CR for the document that it is gernally used for abbreviations.

Status: Agreed

R4-082193 Additional band 17 (CR 23 to 36.104 Rel-8) (AT&T)

Status: Agreed

6.1.4.2 Transmitter requirement [For section 6 in TS36.104]

R4-081870 CR LTE BS ON-OFF Mask Alcatel Lucent, Ericsson 36.104 7r22 B

Comments by last meeting: Make further modification in the next meeting. AL made further correction of the CR agreed in the 1637 in the last meeting.

CATT: in sec 3 there is a error in the applicatio

Status: Agreed

R4-081927 CR Unwanted emission requirements for multi-carrier BS NTT DOCOMO, Ericsson, Nokia Siemens Networks 36.104 14 B

Status: revised 2069

R4-082069 Unwanted emission requirements for multi-carrier BS (CR 14r1 to 36.104 Rel-8) (NTT DOCOMO, Ericsson, Nokia Siemens Networks, T-mobile)

The multi carrier area this area should be discussed in a separate Work Item.. But some conclusions can be done withput WI.Changes are based on the agreed R4-081638 for TR36.942.

Status: Agreed

R4-081950 CR Clarification of emission requirements for co-existence Ericsson 36.104 15 B

Changes:

- Regional requirements can be mandatory.

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