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Agenda item:
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Endorsed by: China Mobile, China Unicom, China Telecom, Huawei, ZTE, RITT, Eastern communication, Shanghai Bell, Jinpeng, LinkAir, XOCECO, CATT
Title: Clarification of deployment scenarios to be considered by RAN regarding the two TDD options
Document for: Discussion & Decision

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1 Introduction

The 1.28 Mcps TDD option is an agreed work item for release 2000 of 3GPP. In order to provide good system performance for all modes and options within 3GPP it is important that the modes and options have commonalties to an extent, which ensures both good performance in their individual application areas and good inter-operability at the same time. On the one hand the system parameters have mainly to be tuned to the individual application area to support operation with high capacity in the application areas the system is designed for. On the other hand, to support inter-operability, the coexistence of the different radio interfaces with high capacity has to be ensured as well.
This paper investigates the different coexistence scenarios being addressed in [4, 5].

1. Operation of the two TDD options in adjacent bands
2. Operation of the two TDD options in the same band. This scenario is divided in the border region between countries and the license exempt case.

In the following, deployment and coexistence scenarios are highlighted and a proposal how to proceed the inter-operability studies is made.

2 Considerations about operation of the two TDD options in adjacent bands

Adjacent band investigations are in the scope of WG4 and an integer part of the work plan of WG4. Deployment and coexistence scenarios regarding the two TDD options are discussed in WG4. WG4 investigates inter-operability in adjacent bands with high priority in order to finalise the related work item [2].

Recently, coexistence studies for low chip rate TDD in adjacent band and in the same geographical area were presented to RAN4[6]. The assumptions underlying these investigations are the same as has been applied in the WG4 standardisation work for 3.84 Mcps TDD and FDD. The results show that for the investigated scenarios, the performance for 1.28 Mcps TDD is in the same order as for 3.84 Mcps TDD. A similar performance is expected for the other scenarios, especially given that the simulations in WG4 for 3.84 Mcps TDD assume neither synchronised frame timing nor co-ordinated switching points.
When operating at adjacent bands, no further improvement is expected by further alignment of system parameters of the two TDD options, due to unsynchronised frame timing and uncoordinated switching points. Consequently, the inter-operability between different TDD options is well ensured.

3 Considerations about operation of the two TDD options in the same band

a) Cross-border
For the licensed operation the situation of operation of two different TDD options in the same geographical area and in the same band can only occur at the border region of neighbouring countries. Here it is not in the interest of the operators to perform any alignment in terms of neither frame timing nor switching point. This issue is independent of the radio access technology. In this particular case the interference can be avoided by a handover and in case of systems with a TDMA component in addition by interference escape mechanisms in the time domain (DCA for instance). This operation requires special measures which are included in the scope of the present TDD proposals. Anyway, due to the fact that the nodeBs of the two networks are distant to each other the interference is low. Consequently, this scenario is well covered by the currently specified two TDD options.

b) License exempt

For the licence exempt situation it is also not in the interest of the operators to perform any alignment in terms of neither frame timing nor switching point. Thus, the interference situation will remain the same if 3.84 systems and/or 1.28 Mcps systems are operated in the same geographical area. Consequently there is no benefit expected by changing system parameters of the low chip rate TDD option since the interference is inherent to the licence exempt operation itself.

In conclusion, when operating at the same band, no further improvement is expected to be reached by further alignment of system parameters of the two TDD options, due to unsynchronised frame timing and uncoordinated switching points.

The different system parameters of the two TDD options are designed for operation in different application areas where each of the options has its own characteristic features. It is beneficial for the operators to be able to select one of the TDD options to optimise their application from the two TDD respective characteristics.

The conclusions drawn in sections 2 and 3 are also reflected by the SA discussion [1], stating that operation on the same band needs not to be considered. According to the SA discussion, inter-operability means the ability to operate two TDD systems in the same geographic area with different TDD bands using different TDD options and not the overlaying of narrowband and wideband TDD.

4 Proposal

It is suggested that WG4 continues to study and evaluate the possible coexistence scenarios and consequences for operation in adjacent bands with respect to spectrum co-existence. This work has already started [6] and first results indicate, that the inter-operability in this context is assured.

When operating at the same band, no further improvement is expected by further alignment of system parameters of the two TDD options, due to unsynchronised frame timing and uncoordinated switching points. Therefore, operation on the same band should be studied with a lower priority. This is in line with the SA and WG4 decision.

Unsynchronized operation on adjacent carrier is considered to be the most general case and the studies should continue with highest priority. Co-existence in this scenario has to be ensured by the standard. Further scenarios should be investigated but should not lead to a change of these system parameters which leads to an impact on the system performance in the usual application areas.

References:

[1] SP-000357, “Draft Report of TSG SA meeting #8”, version 0.0.4, TSG SA meeting#9

[2] RAN WG4, ”LS answer on low chip rate TDD interference/deployment scenarios,” Doc. TSGR1-00-0773, TSG-RAN Working Group 1 meeting No. 13

[3] RAN WG1, “LS on low chip rate TDD interference/deployment scenarios,” TSGR1#12(00)0614, TSG-RAN Working Group 1 Meeting #12

[4] RAN WG1, “Coexistence between the 3.84 Mcps TDD option and the 1.28 Mcps TDD option”, TSGR1#15(00)1131, TSG-RAN WG1 Meeting #15

[5] RAN WG4, “Coexistence between the 3.84 Mcps TDD option and the 1.28 Mcps TDD option”, TSGR4#13(00)0633, TSG-RAN WG4 Meeting #13

[6] RAN WG4, “Coexistence Investigations related to 1.28Mcps TDD: First Results”, TSGR4#13(00)0607, TSG-RAN WG4 Meeting #13