3GPP TSG-RAN WG4 meeting #61 **R4-115759**
San Francisco, California, USA, 14-18 November, 2011

Source: Ericsson, ST-Ericsson

Title: Co-existence/co-location between LTE Downlink FDD 716-728 MHz and Band 17, 12

Agenda item: 8.3.1

Document for: Approval

1 Introduction

LTE downlink FDD 716-728 MHz was approved in [1]. LTE downlink FDD 716-728 MHz is allocated at 0 MHz distance from Band 12/17 UL. Co-existence/co-location between these bands needs to be considered.

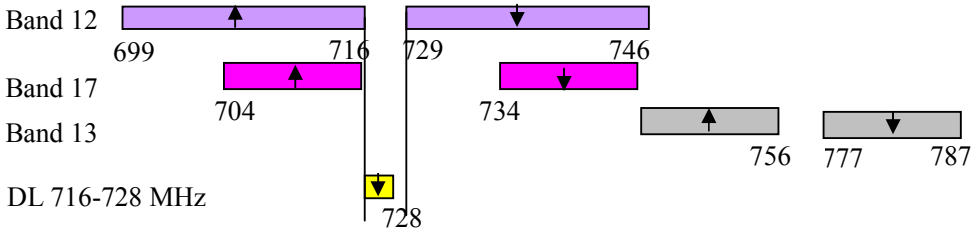

Figure 1. 3GPP spectrum allocation in together with DL 716-728 MHz

2 Discussion

2.1. BS co-existence/co-location

The same operator is expected to deploy in both LTE DL FDD 716-728 MHz and Band 12/17. Therefore BS co-location (instead of co-existence) can be considered the most realistic scenario.

To be able to protect Band 12/17 UL against a LTE DL 716-728 MHz BS with 46 dBm transmit power, an attenuation of about 80 dB is needed in case of co-located BSs, considering that ACS is the applicable requirement for Band 12/17 at 716 MHz, which defines a blocker of -52dBm for 6dB degradation. Here, we assume 1 dB degradation at the receiver band of Band 12/17. Such rejection level will require certain frequency separation between the bands or performance degradation at Band 12/17 UL highest edge. Band 12/17 is 17/12 MHz wide, which means that the largest LTE carrier which can be fit is 15/10 MHz. Assuming that this carrier is allocated in the middle of Band 12/17, degradation could be allowed at Band 12/17 UL highest edge.

LTE DL FDD 716-728 MHz needs to protect Band 12/17 UL according to the co-location spurious emission requirements stated in TS 36.104, -96 dBm/100kHz at 716 MHz, if co-location is declared. The filter needs to attenuate the signal by 80 dB considering ACLR=45dB at the adjacent channel. LTE DL FDD is composed by two blocks, Block D (716-722 MHz) and E (722-728 MHz), which are 6 MHz wide each. It is then possible to allocate 2x5 MHz LTE carriers as well as 1x10 MHz carriers. In those regions on which just Block D has been allocated for mobile communications, the carrier could be put at the highest edge, i.e. 717-722 MHz. In case of regions, where both block D+E are allocated, the carrier could occupy 718-728 MHz, increasing the frequency separation towards Band 12/17 UL.

Figure 2 shows simulations for LTE DL FDD 716-728 MHz assuming co-location with Band 12 and allowing less protection at the highest edge of Band 12 UL. 20 dB rejection is also considered at 10 MHz from the highest operating band edge of LTE DL FDD to be able to decrease emissions on the spurious emissions domain according to TS 36.104. LTE DL FDD arrangement is defined as 716-728 MHz, while real deployment scenarios allow an increase of the guard between Band 12 UL and LTE DL FDD by at least 1 MHz. Thus, filter simulations are shown with a 716-728 MHz and 717-728 MHz passband. Simulations are not optimized since they intend to show the effect of the frequency separation between Band 12 UL and LTE DL FDD 716-728 MHz. We can observe that the number of poles needed for LTE DL FDD 716-728 MHz with 716-728 MHz passband is 12 and 10 for a 716-728 MHz and 717-728 MHz

passband, respectively. The Q value is in case of 716-728 MHz passband (Q=17000) is about 2.4 times the one for 717-728 MHz passband (Q=7000)

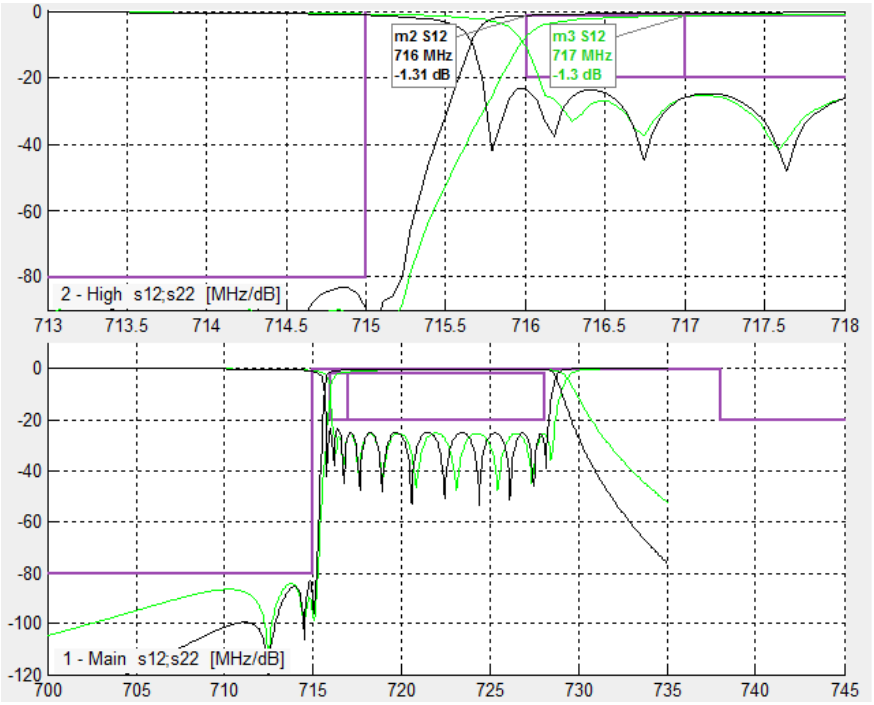

Figure 2. LTE DL FDD 716-728 MHz

Band 12 is 17 MHz wide while LTE DL FDD 716-728 MHz is 12 MHz. Due to the larger passband, the filter will be more challenging for a co-location scenario which requires 80 dB attenuation at 716 MHz or alternatively 717 MHz, if a real deployment case is considered. Certain IL degradation can also be allowed at the highest edge of band 12 UL, i.e. 699-715 MHz passband, taking into account the current deployment scenario.

2.1. UE co-existence

The coexistence between LTE Downlink FDD 716-728 MHz and Band 12 DL has been considered earlier but in a different context with a MediaFLO broadcast interferer in Block D and possibly also Block E. To facilitate UE coexistence, a 1 MHz guard and an additional in-band blocking requirements were introduced to protect Band 12 DL against broadcast interferers.

For the LTE Downlink FDD 716-728 MHz, coexistence with Band 12 is an UL-DL and the 1 MHz guard has only marginal effect on protected adjacent band. However, the DL-only band is used for carrier aggregation and supporting a Secondary CC. The Primary CC with the associated uplink is assigned in an operating band well separated from Band 12 in frequency, e.g. Band 2 or Band 4. Hence, if the Secondary CC is harmfully interfered by a close-by Band 12 UE, the Primary CC will still supply throughput. The CQI reported on the Primary CC will then show low values for the interfered Secondary CC and data (or higher-layer retransmissions) can be scheduled on the primary CC.

3 Conclusion

BS-BS co-location between LTE DL FDD 716-728 MHz and Band 12 requires challenging filters. However, this can be facilitated by considering a real deployment scenario on which carriers in Band 12 UL are allocated below 715 MHz and above 717 MHz in LTE DL FDD 716-728 MHz. In this way, guard band between UL and DL is increased.

3 Proposal

It is proposed to study the possibility of considering LTE Downlink FDD 76-728 MHz frequency arrangement as 717-728 MHz to improve BS-BS co-location/co-existence while not impacting real deployment scenarios. It is also proposed to add the following TP into the TR for LTE Downlink FDD 716-728 MHz [2]

References

[1] RP-110710, “Revised WID for New Band LTE Downlink FDD 716-728 MHz”, AT&T

[2] R4-113902, “New TR new Band 716-728MHz v0.0.1”, AT&T

TEXT PROPOSAL:

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6 List of band specific issues for <Work item name>

- General issues

  - Co-existence/co-location between LTE DL 716-728 MHz and Band 12/17

- <UTRA issues>

  - <Issue 2>

  - ...

- <E-UTRA issues>

  - <Issue 3>

  - ...

-<MSR issues>

  - <Issue 4>

  - ...

List of general issues, UTRA, E-UTRA and/or MSR issues (if there is not any issue for a specific requirement, the same requirement as for the existing bands in the current 3GPP specifications will apply to the new band). The list serves as a summary of issues and should not contain any discussion of the solution to the issues. Further details, analysis, solutions and resulting requirements should be documented in the respective clause (7, 8, 9 and/or 10).

This chapter should consider for example co-existence studies with other 3GPP bands and other adjacent services, UE REFSENS and A-MPR.

This chapter should be filled in first place in order to have a clear picture of all issues which need further study and should be updated when new issues are found

7 General issues

This chapter is needed if is there is any general issue to solve (e.g. co-existence). Otherwise, it can be omitted. BS and UE issues should be treated separately.

General issues refer to common issues between E-UTRA, UTRA and/or MSR.

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7.1 Co-existence/co-location between LTE DL 716-728 MHz and Band 12/17

7.1.1. BS-BS co-existence/co-location

The same operator is expected to deploy in both LTE DL FDD 716-728 MHz and Band 12/17. Therefore BS co-location (instead of co-existence) can be considered the most realistic scenario.

To be able to protect Band 12/17 UL against a LTE DL 716-728 MHz when the BS are co-located requires an attenuation of about 80 dB, assuming a BS with 46 dBm transmit power. Band 12/17 is 17/12 MHz wide, which means that the largest LTE carrier which can be fit is 15/10 MHz. Assuming that this carrier is allocated in the middle of Band 12/17, degradation could be allowed at Band 12/17 UL highest edge.

LTE DL FDD 716-728 MHz needs to protect Band 12/17 UL according to the co-location spurious emission requirement in TS 36.104, for which 80 dB attenuation is needed at the RF filter, assuming ACLR=45dB at the adjacent channel. LTE DL FDD is composed by two blocks, Block D (716-721 MHz) and E (722-728 MHz), which are 6 MHz wide each. It is then possible to allocate 2x5 MHz LTE carriers as well as 1x10 MHz carriers. In those regions on which just Block D has been allocated for mobile communications, the carrier could be put at the highest edge, i.e. 717-722 MHz. In case of regions, where both block D+E are allocated, the carrier could occupy 718-728 MHz, increasing the frequency separation towards Band 12/17 UL.

Figure 7.1-1 shows simulations for LTE DL FDD 716-728 MHz assuming co-location with Band 12 and allowing less protection at the highest edge of Band 12 UL. 20 dB rejection is also considered at 10 MHz from the highest operating band edge of LTE DL FDD to be able to decrease emissions in the spurious emissions domain according to TS 36.104. The filter simulations are shown with a 716-728 MHz and 717-728 MHz passband based on the LTE DL FDD 716-728 MHz arrangement and real deployment scenario, respectively. Simulations are not optimized since they intend to show the effect of the frequency. We can observe that the number of poles needed for LTE DL FDD 716-728 MHz with 716-728 MHz passband is 12and 10 for a 716-728 MHz and 717-728 MHz passband, respectively. The Q value is in case of 716-728 MHz passband (Q=17000) is about 2.4 times the one for 717-728 MHz passband (Q=7000)

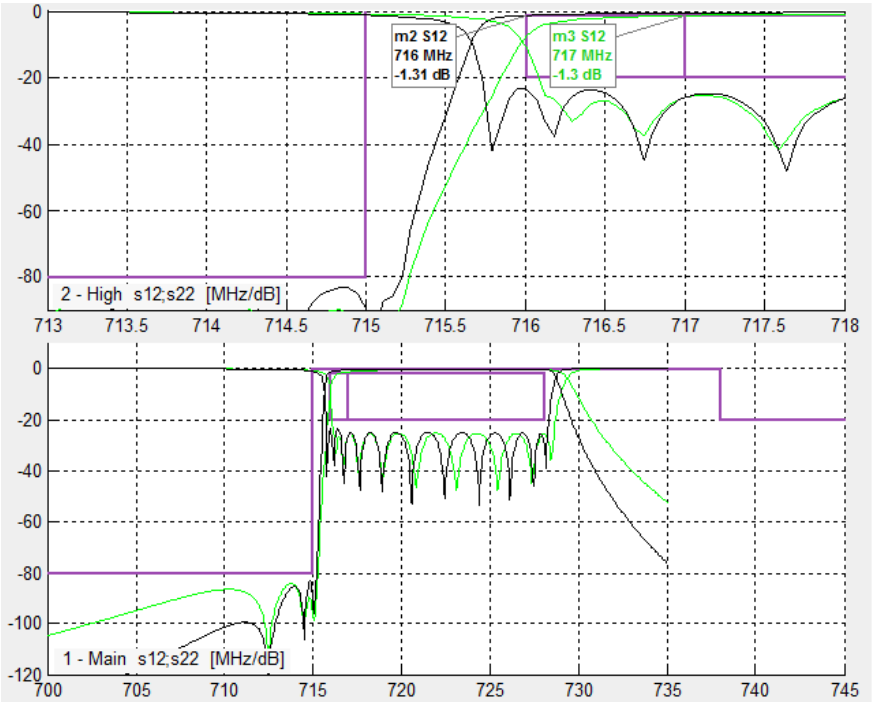

Figure 7.1-1. LTE DL FDD 716-728 MHz

Band 12 has a wider passband than LTE DL FDD 716-728 MHz, thus the filter will be more challenging for this co-location scenario which requires 80 dB attenuation at 716 MHz or alternatively 717 MHz, if a real deployment case is considered. Certain IL degradation can also be allowed at the highest edge of band 12 UL, i.e. 699-715 MHz passband, taking into account the current deployment scenario.

7.1.2. UE-UE co-existence

UE co-existence between LTE FDD DL 716-728 MHz and Band 12 is an UL-DL and the 1 MHz guard has only marginal effect on protected adjacent band. However, the DL-only band is used for carrier aggregation and supporting a Secondary CC. The Primary CC with the associated uplink is assigned in an operating band well separated from Band 12 in frequency, e.g. Band 2 or Band 4. Hence, if the Secondary CC is harmfully interfered by a close-by Band 12 UE, the Primary CC will still supply throughput. The CQI reported on the Primary CC will then show low values for the interfered Secondary CC and data (or higher-layer retransmissions) can be scheduled on the primary CC.

7.1.3. Conclusion

Conclusion: study the possibility of LTE Downlink FDD 716-728 MHz frequency arrangement as 717-728 MHz to improve BS-BS co-location/co-existence while not impacting real deployment scenarios.

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