TSG RAN Meeting #14 **RP-010785**

Kyoto, Japan, 11 - 14 December 2001

Title: **CRs (R'99 and Rel-4 Category A) to TR 25.942**

Source: **TSG RAN WG4**

Agenda Item: **8.4.3**

RAN4 Tdoc	Spec	CR	Title	Cat	Phase	Curr Ver	New Ver
R4-011572	25.942	2	Co-location UTRA-FDD with UTRA-TDD Site engineering solutions	F	Rel99	3.1.0	3.2.0
R4-011622	25.942	3	Co-location UTRA-FDD with UTRA-TDD Site engineering solutions	A	Rel-4	4.0.0	4.1.0

3GPP TSG RAN WG4 Meeting #20 **R4-011572**

East Brunswick, NJ, USA 12th - 16th November 2001

CR-Form-v4

CHANGE REQUEST

⌘	**25.942**	**CR**	2	⌘	ev	**-**	⌘	Current version: **3.1.0** ⌘

For ***HELP*** *on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘	(U)SIM ☐	ME/UE ☐	Radio Access Network ☐	Core Network ☐

Title: ⌘	Site engineering solutions for co-location of UTRA-TDD with UTRA-FDD		
Source: ⌘	RAN WG4		
Work item code: ⌘		***Date:*** ⌘	2001-11-14
Category: ⌘	**F**	***Release:*** ⌘	Rel99
	Use one of the following categories: ***F*** *(correction)* ***A*** *(corresponds to a correction in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* Detailed explanations of the above categories can be found in 3GPP TR 21.900.		*Use one of the following releases:* *2 (GSM Phase 2)* *R96 (Release 1996)* *R97 (Release 1997)* *R98 (Release 1998)* *R99 (Release 1999)* *REL-4 (Release 4)* *REL-5 (Release 5)*

Reason for change: ⌘	The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA-FDD with UTRA-TDD on adjacent frequencies for the same 30 dB BS-BS minimum coupling loss used to calculate the UTRA-FDD BS ACS and blocking requirements. Site engineering solutions can be used to enable the co-location of UTRA-FDD with UTRA-TDD
Summary of change: ⌘	Addition of site engineering solutions for co-location of UTRA-FDD with UTRA-TDD
Consequences if not approved: ⌘	Situation when co-location UTRA-TDD with UTRA-FDD is not stated clearly.

Clauses affected: ⌘	8.4	
Other specs affected: ⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘
Other comments: ⌘		

8.4 Site engineering solutions for co-location of UTRA-FDD with UTRA-TDD

8.4.1 General

The minimum blocking requirements and minimum ACLR requirements as defined in [3] and [4] are not sufficient to enable the co-location of UTRA-FDD and UTRA-TDD base stations at a minimum coupling loss of 30 dB. A single generic solution cannot cover all combinations of TDD and FDD band allocation.

Instead site engineering solutions are required for this deployment scenario. Such site engineering solutions will be addressed in more detail in this section.

8.4.2 Interference Mechanism

For UTRA-FDD base station co-located with UTRA-TDD base stations, two interference mechanisms have to be considered.

8.4.2.1 Unwanted UTRA-TDD emissions

The unwanted emissions of the UTRA-TDD BS transmitter in the UTRA FDD uplink bands have to be sufficiently low not to desensitise the UTRA-FDD BS receiver. The following equation has to hold

$$I_{acc} \geq P_{unwant,TDD} - CL$$

where

I_{acc} maximum acceptable interference level at the UTRA-FDD BS receiver

$P_{unwant,\ TDD}$ unwanted emission at the UTRA-TDD BS transmitter measured in the victim receive band

CL coupling loss between UTRA-TDD BS transmitter and UTRA-FDD BS receiver

The maximum acceptable interference level I_{acc} depends on the cell size. For macro cells the allowed interference level is typically below the noise floor of the receiver.

The unwanted emission $P_{unwant,\ TDD}$ of the UTRA-TDD base station in the UTRA FDD uplink bands can be extracted from the spurious emission and ACLR requirements specified in [4]. The spurious emission level $P_{unwant,\ TDD}$ is explicit in [4]. For the minimum ACLR requirement the unwanted emission $P_{unwant,\ TDD}$ can be calculated by

$$P_{unwant,\ TDD} = P_{Tx,TDD} - ACLR$$

where $P_{Tx,TDD}$ is the transmit power of the UTRA-TDD base station.

For a UTRA TDD BS that already fulfils the TS 25.105 [4] unwanted emissions requirements for co-location with UTRA FDD, the ACLR and spurious emission levels $P_{unwant,\ TDD}$ are such that I_{acc} is below –110 dBm for MCL = 30 dB. Additional site engineering solutions at the aggressing UTRA TDD BS will then not be necessary for co-location.

8.4.2.2 Blocking of UTRA-FDD BS receiver

To avoid blocking of the UTRA-FDD BS receiver, the following equation has to hold

$$I_{block} \geq P_{TDD} - CL$$

where

I_{block} maximum acceptable level of an unwanted interferer in the interferer transmit band

P_{TDD} transmit power of the UTRA-TDD BS

CL coupling loss between UTRA-TDD transmitter and UTRA-FDD BS receiver

The maximum acceptable level of an unwanted interferer I_{block} for the UTRA-FDD base station can be extracted from the Adjacent Channel Selectivity and blocking characteristics specified in [3].

8.4.3 Site engineering solutions

To enable the co-location of UTRA-FDD and UTRA-TDD base stations site engineering has to limit the interference level at the UTRA-FDD BS receiver as well as the maximum acceptable level of an unwanted interferer in the interferer transmit band (blocking).

Different site engineering solutions are given in this section. These site engineering solutions may be used alone or in combination to meet the co-location requirements. The solutions apply either to the aggressor (UTRA TDD BS) or the victim (UTRA FDD BS) as summarised in Table X.

Table X. Parameters for co-siting and corresponding possible [SITE ENGINEERING SOLUTION]UTRA TDD/FDD co-location.

UTRA TDD BS (Aggressor)	**UTRA FDD BS (Victim)**
$P_{Tx, TDD}$	I_{acc}, I_{block}
ACLR, Spurious emissions **[UTRA TDD BS Tx filter]**	ACS, Blocking req. **[UTRA FDD BS Rx filter]**
MCL **[Antenna isolation]**	

The operator of the victim BS are in control of the parameters on the right side in Table X, while the parameters on the left are controlled by the operator of the aggressing BS. The only site engineering solution that the operator of the victim BS is in full control of is additional UTRA FDD BS Receiver Filtering. The Scenario Examples in Subclause 8.4.4 therefore apply FDD BS Rx filtering as site engineering solution.

Depending on the deployment scenario for UTRA TDD BS, it is possible to reduce the output power of the UTRA-TDD base station. In the same way, in certain deployment scenarios the UTRA FDD BS may allow higher interference and blocker levels. Changing those parameters are not however generally applicable site engineering solutions.

8.4.3.1 Antenna installation

The coupling loss is determined by the installation of the UTRA-TDD BS transmit and UTRA-FDD BS receive antenna. As seen from [28], different antenna configurations give raise to a large variation in coupling loss values.

8.4.3.2 RF filters

8.4.3.2.1 UTRA-TDD base station transmitter filter

The unwanted emission of the UTRA-TDD base station transmitter in the victim receive band $P_{unwant, TDD}$ may be reduced by additional RF filters incorporated into the transmitter chain of the UTRA-TDD base station. To obtain an effective suppression of the unwanted emissions and a negligible suppression of the wanted signal, band-pass filters with high Q ceramic resonators can be used.

8.4.3.2.2 UTRA-FDD base station receiver filter

The level of unwanted interference in the interferer transmit band I_{block} may be decreased by additional RF filters incorporated into the receiver chain of the UTRA-FDD base station. To obtain an effective suppression of the unwanted interferer and only a small suppression of the wanted receive signal, band-pass or band-stop filters with high Q ceramic resonators can be used.

8.4.4 Scenario Examples

8.4.4.1 General

The site-engineering solutions shown in this chapter are describing co-location scenarios of a Wide Area BS UTRA-FDD with a Wide Area BS UTRA-TDD that fulfils the applicable co-location requirements in [4]. Co-location of other BS classes (Micro, Local Area) needs to be studied when the BS classification investigations are finalized and the Micro and Local Area base station requirements are included in the core specifications.

Scenario 1, 2a and 2b together, as described below, are allowing the use of the whole FDD spectrum.

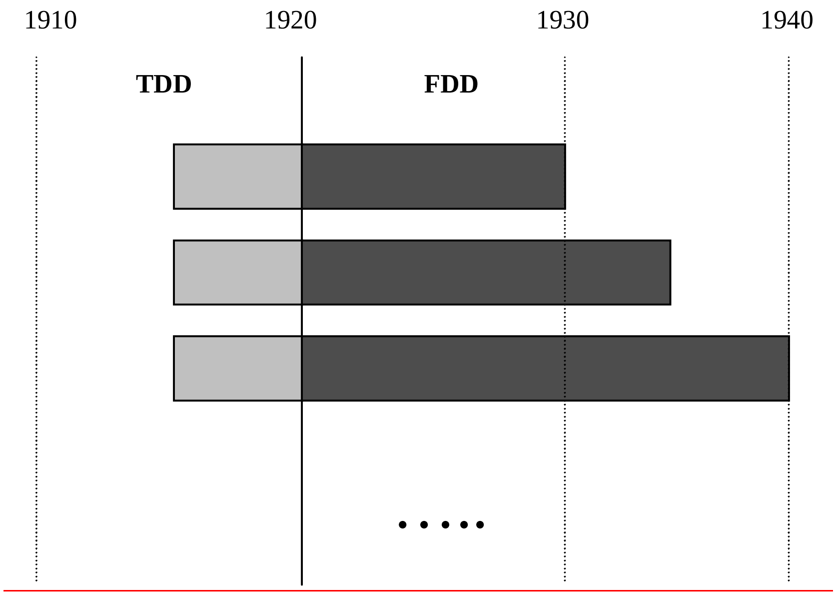
Scenario 1 in chapter 8.4.4.2 is describing the situation when UTRA-FDD and UTRA-TDD are using adjacent frequencies at 1920 MHz. For those adjacent FDD and TDD frequency bands co-location with 30dB is not possible. However, those adjacent FDD and TDD frequencies can still be used in the network given the stated minimum BS-BS coupling loss is ensured.

Co-location site solutions for the non-adjacent FDD and TDD frequency bands are described in Scenario 2a and Scenario 2b.

The filter attenuation that is proposed in the following chapters 8.4.4.3 and 8.4.4.4 are examples based on the requirements of TS 25.104 regarding blocking and accepted performance degradation.

8.4.4.2 Scenario 1: Both TDD and FDD adjacent to 1920 MHz

- TDD range: … – 1920 MHz; TDD BS output power: +43dBm
- FDD range: 1920 –… MHz



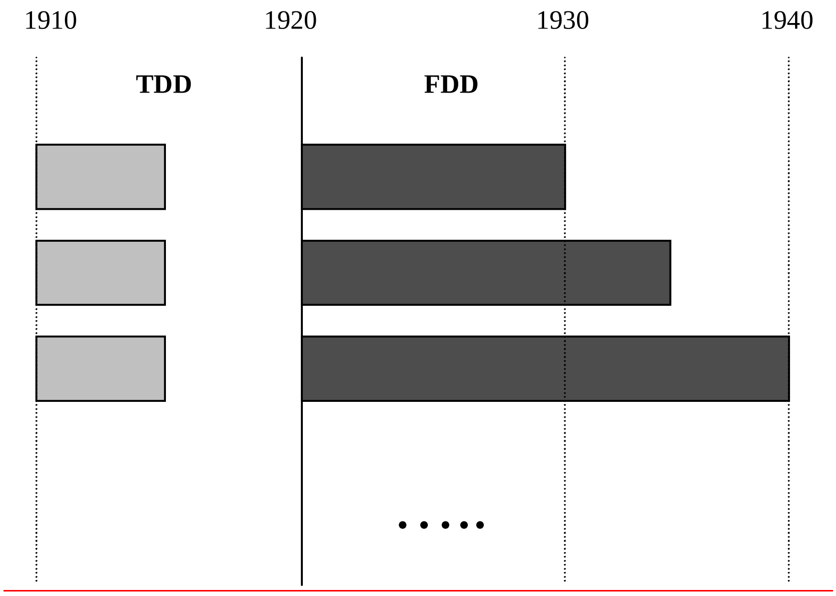
Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is even with cryogenic technology not possible due to the adjacent FDD and TDD channels without sufficient guardbands.

- If only the site engineering solution "antenna installation" is used, the required BS – BS minimum coupling loss for this scenario is at least:

    +43dBm – (-52dBm [FDD ACS]) = 95dB

8.4.3 Scenario 2a: TDD 1900-1915 MHz and FDD 1920-1940 MHz

- TDD range: 1900 – 1915 MHz; TDD BS output power: +43dBm
- FDD range: 1920 – 1940 MHz



Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is possible by adding an external filter in the UTRA-FDD UL chains.

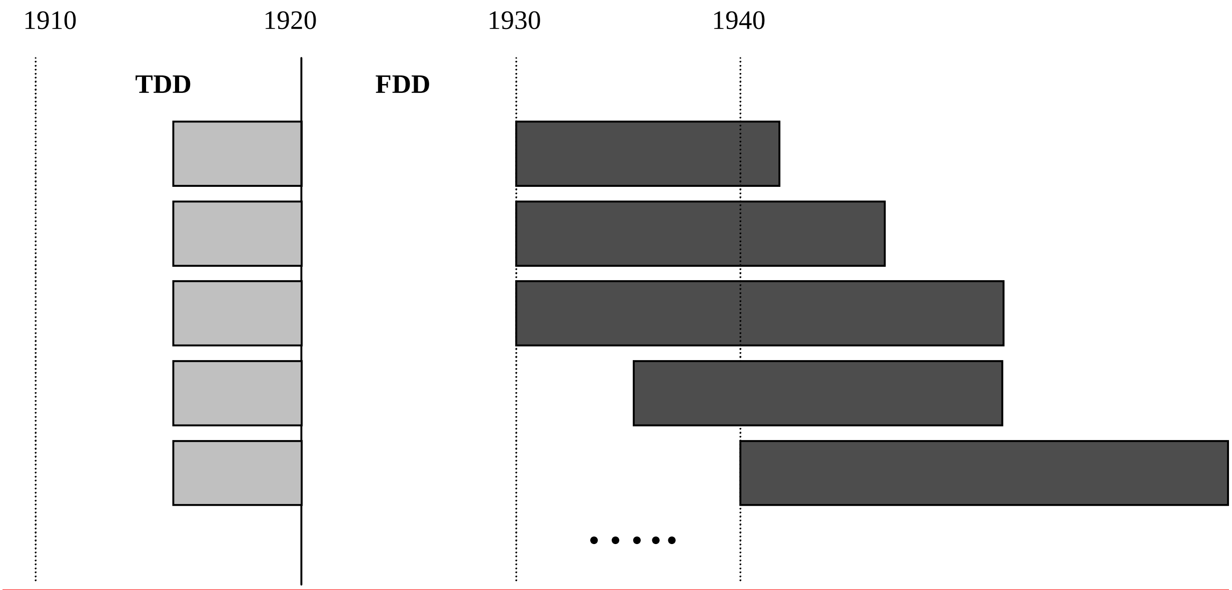
- Filter parameters:

Filter attenuation requirement in the range 1900 – 1915 MHz should be at least:
+43dBm + 3dB [Multicarrier margin] – 30dB [BS-BS coupling loss] – (-40dBm [FDD inband blocking]) = 56dB

Inband losses of the filter in the range 1920 – 1940Mhz: < 1dB

8.4.4 Scenario 2b: TDD 1900-1920 MHz and FDD 1930-1980 MHz

- TDD range: 1900 – 1920 MHz; TDD BS output power: +43dBm
- FDD range: 1930 – 1980 MHz



Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is possible by adding an external filter in the UTRA-FDD UL chains.

- Filter parameters:

Filter attenuation requirement in the range 1900 – 1920 MHz should be at least:
+43dBm + 3dB [Multicarrier margin] – 30dB [BS-BS coupling loss] – (-40dBm [FDD inband blocking]) = 56dB

Inband losses of the filter in the range 1930 – 1980 MHz: < 1dB

3GPP TSG RAN WG4 Meeting #20 **R4-011622**

East Brunswick, NJ, USA 12th - 16th November 2001

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CHANGE REQUEST

⌘ 25.942	CR 3	⌘ ev -	⌘ Current version: 4.0.0 ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Site engineering solutions for co-location of 3.84 MCPS UTRA-TDD with UTRA-FDD
Source:	⌘	RAN WG4
Work item code:	⌘	
Date:	⌘	2001-11-15
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The current state-of-the-art technology does not allow a single generic solution for co-location of UTRA-FDD with 3.84 MCPS UTRA-TDD on adjacent frequencies for the same 30 dB BS-BS minimum coupling loss used to calculate the UTRA-FDD BS ACS and blocking requirements. Site engineering solutions can be used to enable the co-location of UTRA-FDD with 3.84 MCPS UTRA-TDD
Summary of change:	⌘	Addition of site engineering solutions for co-location of UTRA-FDD with 3.84 MCPS UTRA-TDD
Consequences if not approved:	⌘	Situation when co-location 3.84 MCPS UTRA-TDD with UTRA-FDD is not stated clearly.

Clauses affected:	⌘	8.4
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

8.4 Site engineering solutions for co-location of UTRA-FDD with 3,84 Mcps UTRA-TDD Option

8.4.1 General

The minimum blocking requirements and minimum ACLR requirements as defined in [3] and [4] are not sufficient to enable the co-location of UTRA-FDD and UTRA-TDD base stations at a minimum coupling loss of 30 dB. A single generic solution cannot cover all combinations of TDD and FDD band allocation.

Instead site engineering solutions are required for this deployment scenario. Such site engineering solutions, for UTRA-FDD base station co-located with 3.84 Mcps UTRA-TDD base stations, will be addressed in more detail in this section.

8.4.2 Interference Mechanism

For UTRA-FDD base station co-located with UTRA-TDD base stations, two interference mechanisms have to be considered.

8.4.2.1 Unwanted UTRA-TDD emissions

The unwanted emissions of the UTRA-TDD BS transmitter in the UTRA FDD uplink bands have to be sufficiently low not to desensitise the UTRA-FDD BS receiver. The following equation has to hold

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where

I_{acc} maximum acceptable interference level at the UTRA-FDD BS receiver

$P_{unwant,\,TDD}$ unwanted emission at the UTRA-TDD BS transmitter measured in the victim receive band

CL coupling loss between UTRA-TDD BS transmitter and UTRA-FDD BS receiver

The maximum acceptable interference level I_{acc} depends on the cell size. For macro cells the allowed interference level is typically below the noise floor of the receiver.

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8.4.2.2 Blocking of UTRA-FDD BS receiver

To avoid blocking of the UTRA-FDD BS receiver, the following equation has to hold

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where

I_{block} maximum acceptable level of an unwanted interferer in the interferer transmit band

P_{TDD} transmit power of the UTRA-TDD BS

CL coupling loss between UTRA-TDD transmitter and UTRA-FDD BS receiver

The maximum acceptable level of an unwanted interferer I_{block} for the UTRA-FDD base station can be extracted from the Adjacent Channel Selectivity and blocking characteristics specified in [3].

8.4.3 Site engineering solutions

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MCL **[Antenna isolation]**	

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8.4.3.2 RF filters

8.4.3.2.1 UTRA-TDD base station transmitter filter

The unwanted emission of the UTRA-TDD base station transmitter in the victim receive band $P_{unwant, TDD}$ may be reduced by additional RF filters incorporated into the transmitter chain of the UTRA-TDD base station. To obtain an effective suppression of the unwanted emissions and a negligible suppression of the wanted signal, band-pass filters with high Q ceramic resonators can be used.

8.4.3.2.2 UTRA-FDD base station receiver filter

The level of unwanted interference in the interferer transmit band I_{block} may be decreased by additional RF filters incorporated into the receiver chain of the UTRA-FDD base station. To obtain an effective suppression of the unwanted interferer and only a small suppression of the wanted receive signal, band-pass or band-stop filters with high Q ceramic resonators can be used.

8.4.4 Scenario Examples

8.4.4.1 General

The site-engineering solutions shown in this chapter are describing co-location scenarios of a Wide Area BS UTRA-FDD with a Wide Area BS UTRA-TDD that fulfils the applicable co-location requirements in [4]. Co-location of other BS classes (Micro, Local Area) needs to be studied when the BS classification investigations are finalized and the Micro and Local Area base station requirements are included in the core specifications.

Scenario 1, 2a and 2b together, as described below, are allowing the use of the whole FDD spectrum.

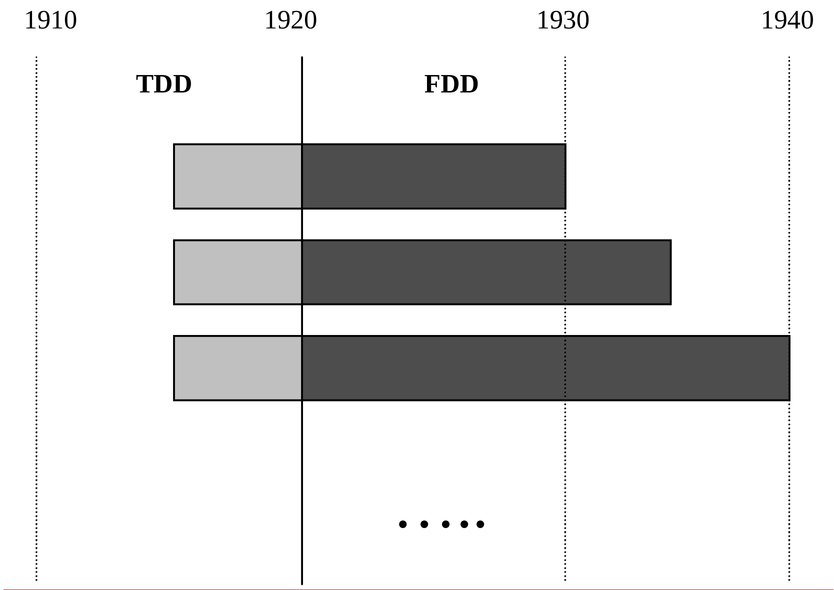
Scenario 1 in chapter 8.4.4.2 is describing the situation when UTRA-FDD and UTRA-TDD are using adjacent frequencies at 1920 MHz. For those adjacent FDD and TDD frequency bands co-location with 30dB is not possible. However, those adjacent FDD and TDD frequencies can still be used in the network given the stated minimum BS-BS coupling loss is ensured.

Co-location site solutions for the non-adjacent FDD and TDD frequency bands are described in Scenario 2a and Scenario 2b.

The filter attenuation that is proposed in the following chapters 8.4.4.3 and 8.4.4.4 are examples based on the requirements of TS 25.104 regarding blocking and accepted performance degradation.

8.4.4.2 Scenario 1: Both TDD and FDD adjacent to 1920 MHz

- TDD range: … – 1920 MHz; TDD BS output power: +43dBm
- FDD range: 1920 –… MHz



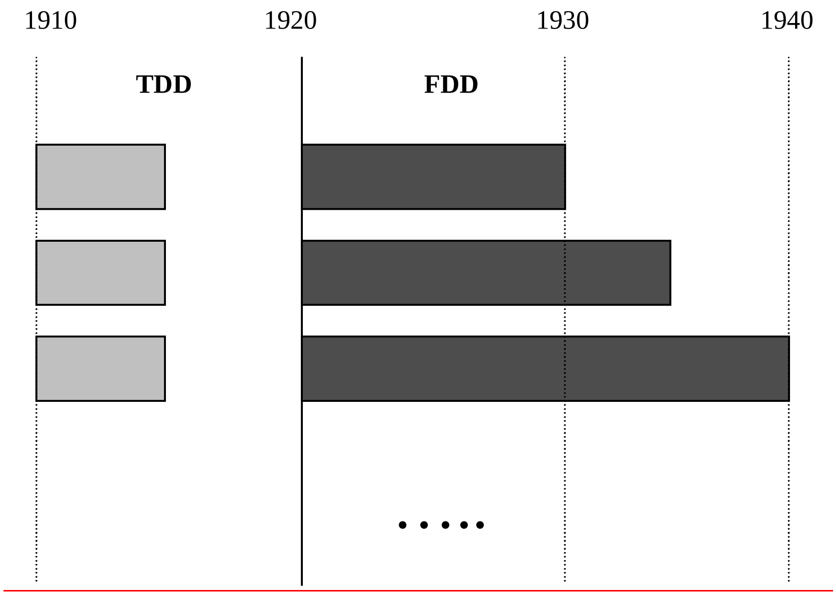
Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is even with cryogenic technology not possible due to the adjacent FDD and TDD channels without sufficient guardbands.

- If only the site engineering solution "antenna installation" is used, the required BS – BS minimum coupling loss for this scenario is at least:

+43dBm – (-52dBm [FDD ACS]) = 95dB

8.4.3 Scenario 2a: TDD 1900-1915 MHz and FDD 1920-1940 MHz

- TDD range: 1900 – 1915 MHz; TDD BS output power: +43dBm
- FDD range: 1920 – 1940 MHz



Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is possible by adding an external filter in the UTRA-FDD UL chains.

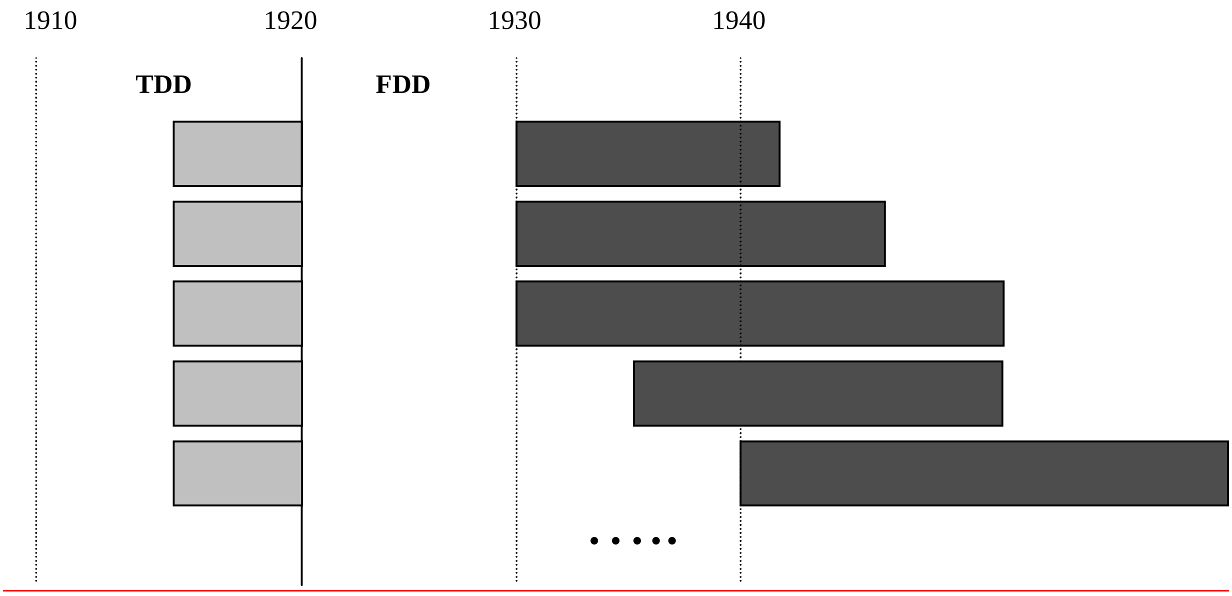
- Filter parameters:

  Filter attenuation requirement in the range 1900 – 1915 MHz should be at least:
  +43dBm + 3dB [Multicarrier margin] – 30dB [BS-BS coupling loss] – (-40dBm [FDD inband blocking]) = 56dB

  Inband losses of the filter in the range 1920 – 1940Mhz: < 1dB

8.4.4 Scenario 2b: TDD 1900-1920 MHz and FDD 1930-1980 MHz

- TDD range: 1900 – 1920 MHz; TDD BS output power: +43dBm
- FDD range: 1930 – 1980 MHz



Co-location of UTRA-FDD and UTRA-TDD with 30dB BS-BS coupling loss is possible by adding an external filter in the UTRA-FDD UL chains.

- Filter parameters:

  Filter attenuation requirement in the range 1900 – 1920 MHz should be at least:
  +43dBm + 3dB [Multicarrier margin] – 30dB [BS-BS coupling loss] – (-40dBm [FDD inband blocking]) = 56dB

Inband losses of the filter in the range 1930 – 1980 MHz: < 1dB