

Source: Mitsubishi Electric, NEC, E-Plus, KPN Mobile

Title: Inter-FDD Cell identification in Compressed Mode
TS 25.133 section 8

Agenda item: 7.4.2

Document for: Discussion and decision

1. Problem

During identification of target cell, if there is too much time difference between compressed mode transmission gaps, the UE will suffer from incoherence between signals sampled during these gaps. This inconsistency may be caused by:

- ppm drift between reference oscillators of Node Bs
- fading conditions (the channel may vary between gaps)
- Doppler shifts which may be different from the dedicated node to the measured Node B.

As detection needs integration time during several gaps to have sufficient SNR, it is not possible to detect the cell within the identification time with P=0.9 probability as specified in the core requirements for all possible combinations of patterns.

In order to allow the UE to fulfil the general requirements for inter-frequency cell identification , **it is proposed to limit the range of the possible compressed mode combinations by limiting the time space between the gaps and to keep on with the current requirements.**

2. Background

- In RAN4 #20 (USA), Mitsubishi introduced the concept of minimum compressed mode ratio. The idea was to set a lower bound of the ratio of the time in transmission gaps over the total time.

- In RAN4 #23 (Korea), Siemens re-introduced this idea by tdoc R4-020739 showing that inter-FDD cell identification is difficult for all combinations of compressed mode patterns. The concept is renamed "gap density"

- In Ran4 #24 (Finland), Mitsubishi and NEC addressed this issue by presenting similar results. RAN4 decided to liase to RAN 2 CC RAN1 informing them that the signalling would be reduced accordingly in **release 99**. :

**** from LS R4-021346 (begin) ****

In this context, it has concluded that

*RAN4 will continue to study the impact of the use of compressed mode for the purpose of FDD inter-frequency cell identification on performance requirements for cell identification. It was agreed that the concept of "minimum gap density" (see **R4-021100** and R4-021107) would be used to define a domain of compressed mode pattern sequences possibly compatible with the existing cell identification performance requirements. **It was agreed that the target for the inclusion of this minimum gap density (i.e. the restriction of gap patterns for which the current requirements are applicable) is R99 specification.***

Further details on the discussion on FDD inter-frequency cell identification requirements are recorded in R4-021347. RAN4 will inform RAN1 and RAN2 when further conclusions in this context are drawn. In particular, RAN4 will notify RAN1 and RAN2 when the minimum gap density value is agreed for R99.

**** from LS R4-021346 (end) ****

The decision was to:

- **set a minimum gap density in the core requirements for Release 99,**
- **introduce new inter-FDD test cases in fading radio conditions for release 5**

In RAN4 #25 (USA): CR R4-021409 to set low bound to 7 % in Release 99 was presented and rejected as some companies wanted more time for simulations.

An evening session reviewed documents R4-021408, R4-021409 R4-021579 R4-021580 R4-021461 and **concluded in R4-021641:**

1. **To agree on simulation assumptions as well as methodology**
2. **To agree on a way forward for the introduction on transmission gap pattern limitation (e.g. the proposal in Tdoc R4-021409)**

After discussion on additional documents R4-021485 and R4-021664, **Chairman concluded: as Release 99 may be impacted by this topic, issue should be brought to RAN Plenary.**

3. Way forward

RAN is requested to mandate RAN4 to:

- **finalise at the next RAN4 #26 :**
 - o **Agreement on simulations assumptions**
 - o **New simulation results from all interested companies**
 - o **Agreement on minimum gap density in core requirements of R99**
 - o **Agreement on release 5 radio fading condition test cases for 50 kmph**
 - o **Draft of release 5 radio fading condition test case for 3 kmph and 120 kmph (if possible)**
- **finalise at RAN4 #27 :**
 - o **release 5 radio fading condition test cases for 3 kmph and 120 kmph**

4. Risks

This issue has been discussed for a long time and is sensitive from terminal design perspective. If no progress is done soon, the terminals will not be able to meet the requirements of cell identification in all realistic propagation channel conditions. This will lead to interoperability problems and radio network planning difficulties.

5. References

- [1] R4-011466 : Minimum compressed mode ratio for inter-frequency FDD measurements. – Mitsubishi Electric Telecom Europe
- [2] R4-020739 : Discussion on cell Identification Requirements – SIEMENS AG
- [3] R4-021100 : Cell identification requirements : comments on R4-020739 – Mitsubishi Electric Telecom Europe
- [4] R4-021107 : Discussion on cell Identification Requirements – NEC
- [5] R4-021258 : Discussion on Cell Identification Requirements – SIEMENS AG
- [6] R4-021408:Requirements on CM patterns for successful inter-frequency cell identification – NEC
- [7] R4-021579:On cell identification in compressed mode – SIEMENS AG
- [8] R4-021580:On cell identification in multipath fading conditions – SIEMENS AG
- [9] 3GPP TS25.101: UE Radio Transmission and Reception (FDD)
- [10]3GPP TS25.133: Requirements for Support of Radio Resource Management (FDD)
- [11]3GPP TS 25.212: Multiplexing and channel coding (FDD)