

**Agenda Item:** 10.4.1.6.4  
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## 1 Introduction

In NR system, the SI messages are divided into two groups, one is named as Minimum SI which is periodically broadcast and comprises of basic information required for initial access and information for the SI scheduling. The other one is named as Other SI which includes everything not broadcast in the Minimum SI and may either be broadcast or triggered upon network or the request from the UE [1].

However, in previous meeting, what's the behavior of network and UE has not been discussed when the SI is changed. Therefore, in this contribution, we discuss both Minimum SI modification and Other SI modification respectively, and subsequently provide our proposals.

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## 2 Discussion

### 2.1 Modification Period

In LTE, when the network changes (some of the) system information, it first notifies the UEs about this change, i.e. this may be done throughout a modification period. In the next modification period, the network transmits the updated system information as indicated in Figure 1. This general principle is applied to almost all SI message in LTE.

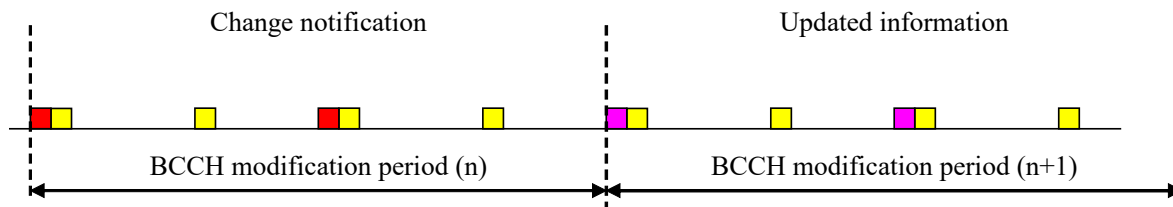


Figure 1. Change of System Information

In NR, the SI message including both Minimum SI and Other SI can still follow the same LTE principle, which is that the change notification will be sent through modification period n, while the new system information will be updated in modification period n+1, because both types of SI require the UE who are interested in the information getting the notification before the system information really changes.

**Proposal 1** NR can take the modification period concept in LTE as the baseline for NR SI Change.

### 2.2 Change Notification

In LTE, the *systemInfoModification* included in the Paging message is used to notify the UE in RRC\_IDLE and UEs in RRC\_CONNECTED about the system information change. When the UE gets the change notification i.e. *systemInfoModification* in Paging message, it will understand that there is some modification on the stored system information without knowing exactly which one is changed. In this case, the UE has to either update all the system information, or at least acquire the MIB information to determine whether to update the system information accordingly if the UE is eMTC or NB-IoT UE. Obviously, this is not efficient from UE power consumption perspective.

In NR, the Minimum SI will be defined as two parts, i.e. Minimum SI transmitted in PBCH (i.e. MSI defined in RAN1, and similar like MIB in LTE) as well as Minimum SI transmitted via PDSCH (i.e. RMSI defined in RAN1, and similar like SIB1 and SIB2 in LTE).

The Minimum SI contained in PBCH will be always transmitted with using specific resource defined by physical layer, and based on previous discussions and agreements about the contents of PBCH in RAN1 [2], the information contained in PBCH including the configuration of RMSI scheduling information may be quite static, therefore, there is no change notification needed for the Minimum SI contained in PBCH.

**Proposal 2 No need to add change notification in Paging message for Minimum SI contained in PBCH.**

The Minimum SI contained in PDSCH i.e. SIB1 (and SIB2 if defined) discussed in RAN2 will contain rest of the Minimum SI related to initial access and Other SI scheduling. The information here will change more frequent than that contained in PBCH. If UE could know exactly whether the Minimum SI contained in PDSCH is changed or not, the UE power as well as the SI acquisition time could be optimized, therefore,

**Proposal 3 The change notification for the Minimum SI contained in PDSCH i.e. SIB1 (and SIB2 if defined) should be added in Paging message.**

For Other SI message, since they are interested by specific UEs, it's better for the UE to understand well which Other SI is changed, in this case, those UEs who are not interested in the SI message could skip the SI update, therefore, the UE power consumption could be saved.

**Proposal 4 For Other SI, the SI specific/per-SIB change notification should be introduced in Paging message.**

## 2.3 Value Tag

In current LTE system, in addition to the change notification provided in Paging, a value tag i.e. *systemInfoValueTag* is also included in SIB1 to indicate if a change has occurred in the SI messages. UEs may use *systemInfoValueTag*, e.g. upon return from out of coverage, to verify if the previously stored SI messages are still valid. And in LTE enhancements for eMTC and NB-IoT, the value tag has been enhanced to identify specific SI changed. Moreover, in LTE, the SIBs other than MIB, SIB1, SIB10/11/12/14 share the same *SystemInfoValueTag*. We think this may not be suitable for NR because Other SIs may be independently broadcasted. If all the SIs in Other SI shares just one *SystemInfoValueTag*, then each SIB change will cause the UE to acquire all the SIBs. Considering all the above aspects, we propose that in stage-3 work, RAN2 could define *SystemInfoValueTag* per SIB, or per SI message or per SIB group. Here, SIB group means certain SIBs which may appear together which may be relevant for one function like cell selection reselection or one service like V2X, D2D etc.

**Proposal 5 For NR, RAN2 should discuss whether value tag can be per-SIB or per-SI message or per-SIB group.**

For per-SIB value tag, as the change notification discussed in Section 2.2, the per-SIB value tag for RMSI and Other SI should be supported.

**Proposal 6 The per-SIB value tag for RMSI (at least SIB2 is RAN2 agrees RMSI contains SIB1 and SIB2) and Other SI can be supported.**

In the last meeting discussion, it was agreed that no value tag/area related info will be included in MIB. Therefore, the value tag will be included in SIB1 which is aligned with LTE.

**Proposal 7 The value tag should be included in SIB1.**

## 2.4 Behavior of Network and UE when SI is changed

When the one SI is changed, including the Minimum SI contained in PDSCH and Other SI, the UE will receive the paging message with change notification for that SI. After the reception of the notification, the UE will understand which SI is changed. If the UE is interested in that SI, the UE will update the SI with the

scheduling information stored; while if the UE is not interested in that SI, the UE will just skip the change notification.

No matter the updated SI belongs to Minimum SI or Other SI, no request is supposed to be transmitted from UE. The network should transmitted the updated SI message after the modification boundary at least for a defined period.

**Proposal 8** When the SI is changed, no SI request needs to be sent from UE, and network will send the updated SI after the modification boundary at least for a period defined.

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### 3 Conclusions:

In this contribution, we discuss both Minimums SI modification and Other SI modification respectively, and subsequently provide our proposals as follows:

**Proposal 1** NR can take the modification period concept in LTE as the baseline for NR SI Change.

**Proposal 2** No need to add change notification in Paging message for Minimum SI contained in PBCH.

**Proposal 3** The change notification for the Minimum SI contained in PDSCH i.e. SIB1 (and SIB2 if defined) should be added in Paging message.

**Proposal 4** For Other SI, the SI specific change notification should be introduced in Paging message.

**Proposal 5** For NR, RAN2 should discuss whether SystemValueTag can be per-SIB or per-SI message or per-SIB group.

**Proposal 6** The per-SIB value tag for RMSI (at least SIB2 is RAN2 agrees RMSI contains SIB1 and SIB2) and Other SI can be supported.

**Proposal 7** The value tag should be included in SIB1.

**Proposal 8** When the SI is changed, no SI request needs to be sent from UE, and network will send the updated SI after the modification boundary at least for a period defined.

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### 4 References:

[1]. TS 38.300, NR and NG-RAN Overall Description, Stage 2;

[2]. R2-1706304, LS on NR-PBCH content (R1-1709789; contact: Ericsson), RAN1.