3GPP TSG-RAN WG2 Meeting #126 R2-2405757

**Fukuoka, Japan, May 20th – 24th, 2024**

**Agenda item: 7.7.3**

**Source: Sequans Communications**

**Title: Report of Soft satellite switch SSB time offset and SMTC impact**

**Document for: Discussion and Decision**

# Introduction

This is the report for the following offline discussion:

* [AT126][301][NR NTN Enh] SMTC impacts for soft satellite switch (Sequans)

 Scope: discuss the impact on SMTC adjustment for soft satellite switch and possible impact on decision for H115

 Intended outcome: report of offline discussion

 Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited) 🡺 F2F planned Wed 16:30-17:00 BO3

 Deadline for rapporteur's summary (in R2-2405757): Thursday 2024-05-23 08:00

[R2-2405672](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2405672_%5BH010%5D%5BH115%5D%20and%20MIB%20acquisition.docx) [H010][H115] and skipping MIB acquisition Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core

Proposal 2: RAN2 to discuss if any fields require updating, and why (particularly SMTCs)

* Continue the discussion in [301]

[R2-2405680](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2405680_Soft%20switch%20SSB%20time%20offset%20and%20SMTC%20impact.docx) Soft satellite switch SSB time offset and SMTC impact Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: Consider soft switch where SSB-timeOffset is applied only between t-serviceStart and t-service

* Continue the discussion in [301]

# Discussion

## SMTC impacts of soft satellite switch

The soft satellite switch changes the SSB timing. Potential impacts on SMTCs have been investigated in ‎[1]. The SSB timing change might be realized at gNB either with or without changing the cell timing, so both options are considered.

We assume as an example a SSB periodicity of 20ms, and an SSB-offset of 10ms. We consider mobility with neighbor TN cells, and with other NTN cells “synched” with the NTN unchanged PCI cell (performing a similar change in a synchronized way).

Upon **each soft satellite switch**, potential impact on SMTCs would be as follows:

* NTN cell SMTC, in TN cell: off by 10ms => need to be updated
* TN cells SMTCs, in NTN cell
	+ With shifted cell timing: off by 10ms => need to be updated
	+ With shifted SSB location (no cell timing change): no impact
* NTN cells SMTCs, in NTN cell
	+ With shifted cell timing: no impact
	+ With shifted SSB location (no cell timing change): off by 10ms => need to be updated

“Need to be updated” above means:

* In IDLE/INACTIVE, SMTCs offsets update in SIB2/SIB4
* In CONNECTED, RRC reconfiguration of the SMTCs offsets (if configured)

**Q1: Do companies agree on the impacts on SMTC configuration as described above?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Google | In case of no cell timing change, there are no issues |
| Apple | For connected, current procedure will enable to update the SMTCs. |
| QC | SMTC update should be handled autonomously by UE |
| Huawei | If cell timing is shifted, no need to update the SMTCs |
| Ericsson | If shifted SSB location, SMTC needs to be reconfigured |

## SIB acquisition at satellite switch (related to [H115])

SIB acquisition at satellite switch could enable to mitigate the signaling load (avoid SI change notification for IDLE/INACTIVE UEs in green cases above).

**Q2: Companies views on SIB acquisition at satellite switch? (other SIBs than SIB19)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| CMCC | Not needed |
| Nokia | Needed, e.g for SMTCs |
| Vivo | Needed (no spec change) |
| QC | Not needed |
| HW | Not needed |
| China Telecom | Not needed |
| LG | Needed (no spec change) |
| Google | Not needed |
| Ericsson | Needed (SMTCs configuration may change) but ok with legacy SI change notification |

## Soft switch without SSB timing change

An alternative would be to consider that the SSB-timeOffset would be applicable **only** between t-serviceStart and t-service, so that the overall SSB timing is not changed by the soft switch procedure, hence avoiding SMTCs impact.



Figure - Soft switch without SSB timing change

The cell timing/SSB location would not change (as for the hard switch). The only difference of soft switch would be the additional SSBs sent during the soft switch duration, with SSB-timingOffset. The UE would just sync PSS/SSS to acquire timing (and freq) and can apply it at T-service by removing SSB-timingOffset.

**Q3: Companies views on Soft switch without SSB timing change?**

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

# Conclusion

The output of the F2F is as follows:

**Q1: Do companies agree on the impacts on SMTC configuration as described above?**

There seems to be different views on the impact on SMTCs configuration, with at least a few companies not seeing an impact (Qualcomm, Google).

 **Q2: Companies views on SIB acquisition at satellite switch? (other SIBs than SIB19)**

Not needed (5): CMCC, QC, HW, China Telecom, Google

Needed (4): Nokia, Vivo (?), LG, Ericsson (could also accept legacy SI change notification)

There is no consensus on this topic.

 **Q3: Companies views on Soft switch without SSB timing change?**

Not discussed.

# References

1. R2-2405680, “*Soft satellite switch SSB time offset and SMTC impact*”, Sequans Communications