



3GPP TSG RAN #83

Shenzhen, China, 18 - 21 Mar 2019

Agenda Item: 9.2.1

DISCUSSION ON FR2 GAP-LESS MEASUREMENT IN LTE SA

Intel Corporation

UNDERSTANDING ON THE PROPOSAL

It has been proposed to introduce an optional capability for FR2 Gapless measurement in LTE SA

Observations:

- It is applied to case 2/3/4/5 but not applicable to other cases.
- This capability is not applied to LTE +NR(FR1).
 - The existing per-UE gap is applied.
- Once EN-DC is configured (when FR1 or FR2 serving cell is configured), this capability is not applied.
 - The existing per-UE gap is applied.

Case	Serving cell(s)	Measurement objects	Need for gap		
			per-UE gap	gap-less FR2 (new)	per-FR gap
1	LTE (FR1)	NR FR1	Yes	Yes	Yes
2	LTE (FR1)	NR FR2	Yes	No	No
3	LTE (FR1)	NR FR1, NR FR2	Yes	Yes	Yes
4	LTE (FR1)	LTE , NR FR2	Yes	Yes	Yes
5	LTE (FR1)	LTE, NR FR1,NR FR2	Yes	Yes	Yes
6	LTE (FR1) + NR FR1	NR FR1	Yes	Yes	Yes
7	LTE (FR1) + NR FR1	NR FR2	Yes	Yes	No
8	LTE (FR1) + NR FR1	NR FR1, NR FR2	Yes	Yes	Yes
9	LTE (FR1) + NR FR2	NR FR1	Yes	Yes	Yes
10	LTE (FR1) + NR FR2	NR FR2	Yes	Yes	Yes
11	LTE (FR1) + NR FR2	NR FR1, NR FR2	Yes	Yes	Yes
12	LTE (FR1) + NR FR1 + NR FR2	NR FR1	Yes	Yes	Yes
13	LTE (FR1) + NR FR1 + NR FR2	NR FR2	Yes	Yes	Yes
14	LTE (FR1) + NR FR1 + NR FR2	NR FR1, NR FR2	Yes	Yes	Yes
15	NR FR1	NR FR1	Yes	Yes	Yes
16	NR FR1	NR FR2	Yes	Yes	No
17	NR FR1	NR FR1, NR FR2	Yes	Yes	Yes
18	NR FR2	NR FR1	Yes	Yes	No
19	NR FR2	NR FR2	Yes	Yes	Yes
20	NR FR2	NR FR1, NR FR2	Yes	Yes	Yes
21	NR FR1 + NR FR2	NR FR1	Yes	Yes	Yes
22	NR FR1 + NR FR2	NR FR2	Yes	Yes	Yes
23	NR FR1 + NR FR2	NR FR1, NR FR2	Yes	Yes	Yes

REQUIRED SPEC CHANGE

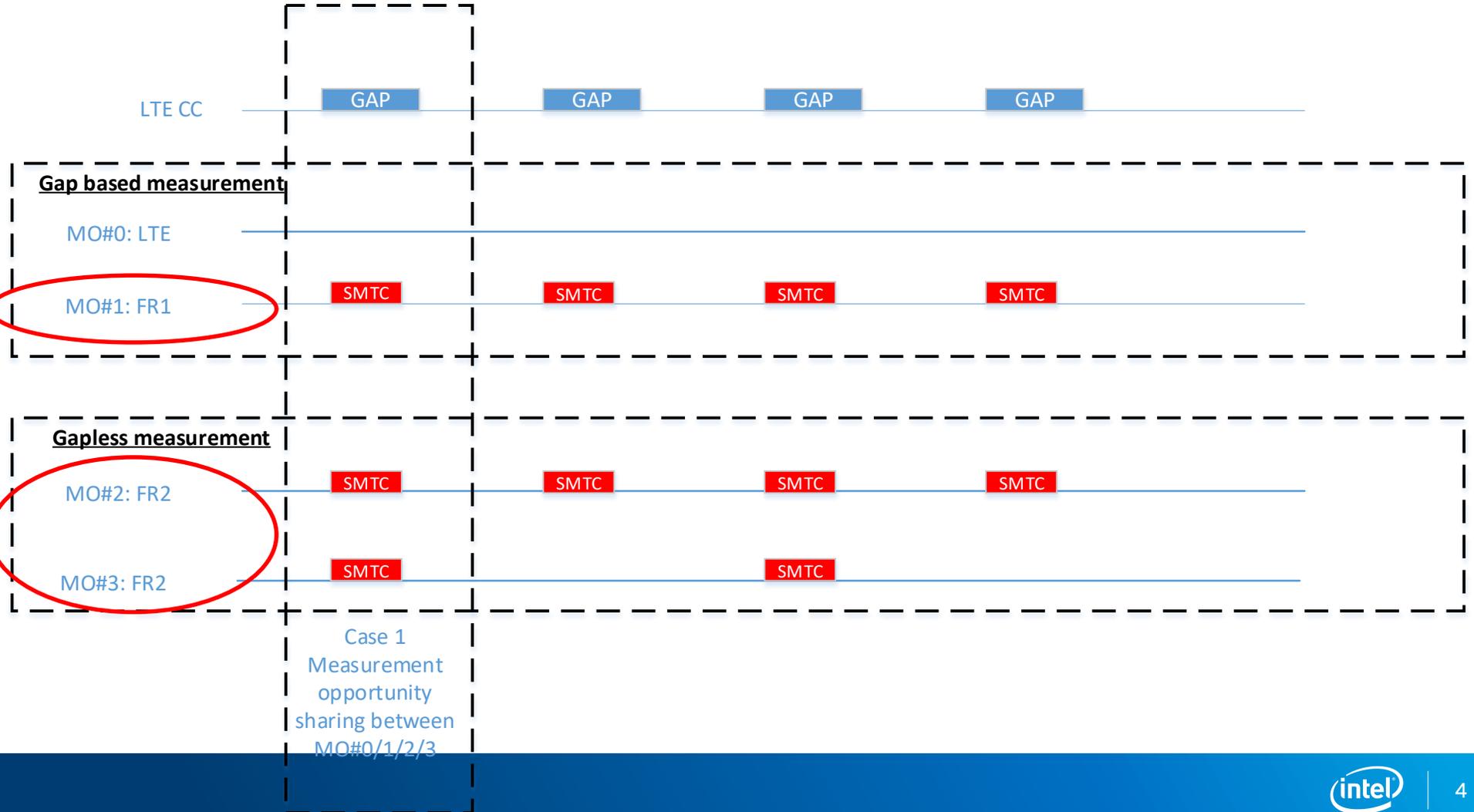
Required spec changes:

- RAN2 (TS36.331 & 306)
 - New UE capability signaling: per UE or Per NR band or per Band/BC?
 - Granularity need to be discussed in RAN4.
 - Per UE may not be future-proof because UE may not support gap-less for all FR2 MOs if a certain FR2 has crosstalk issue with FR1 carriers.
- RAN4 (TS36.133)
 - Need a new performance requirement for FR2 gap-less measurement for the following cases
 - Existing performance requirement for per-FR gap cannot be applied directly. (details based on case 5 are in the next slides) .

Case	Serving cell(s)	Measurement Objects (MOs)
3	LTE (FR1)	NR FR1, NR FR2
5	LTE (FR1)	LTE, NR FR1, NR FR2

DIFFERENCE BETWEEN FR2 GAP-LESS AND INDEPENDENT GAP

Case 5: in LTE SA (LTE serving cells), LTE (inter-frequency) + FR1 +FR2 MOs are configured.



UE can measure MO#1 and MO#2/3 simultaneously?

- FR2 gap-less: **No**
- Per-FR gap: **Yes**

DETAILS ON NEW PERFORMANCE REQUIREMENT (1/2)

Case 5: in LTE SA (LTE serving cells), LTE + FR1 + FR2 MOs are configured.

- UE capability to handle parallel measurement
 - LTE and FR2 MO can be measured in parallel
 - FR1 and LTE MO cannot be measured in parallel
 - FR1 and FR2 MO cannot be measured in parallel
- When SMTC of FR2 MO collides with gap, UE can take the following options
 - Measure LTE and FR2 in parallel
 - Measure FR1 only
- **New RAN4 requirements** should be introduced with at least the following aspects to be considered
 - Different requirement should be defined for gapless FR2 measurement. Existing requirement cannot be reused
 - In LTE, measurement without gap reuses the same requirement as gap based one, which is the function of MGRP and total number of carriers.
 - For gapless FR2 measurement in LTE SA, the related performance does not depend on MGRP and total number of carriers anymore. Gap based measurement cannot be reused.

DETAILS ON NEW PERFORMANCE REQUIREMENT (2/2)

- **New RAN4 requirements** should be introduced with at least the following aspects to be considered (Cont.)
 - Gap sharing between LTE and FR1 MO
 - Option 1: LTE MO and FR1 MO have the equal gap sharing
 - Option 2: LTE MO should have higher priority than FR1 MO since it can take advantage of parallel measurement with FR2
 - Option 3: LTE MO should have lower priority than FR1 since FR1 MO may have less measurement opportunity due to FR2 MO
 - Measurement opportunity sharing between FR1 and FR2 MO
 - Option 1: Without considering LTE MO, new measurement opportunity sharing table between FR1 and FR2 should be introduced with or without taking the SMTC configuration into consideration.
 - it is hard to reuse the existing gap sharing requirement since the existing one is defined between intra-frequency with gap and inter-frequency measurement.
 - Option 2: With considering LTE MO, different measurement opportunity sharing table can be introduced with the following issues to be considered
 - Whether LTE MO should be prioritized since LTE is the coverage layer
 - # of MO in LTE, FR1 and FR2
 - SMTC configuration of different #MO
 - Non, partial or full overlap between SMTC of FR2 MO and gap

COMPARISON BETWEEN EXISTING AND PROPOSED MEASUREMENT

		Existing feature <u>Per UE measurement Gap</u>	New feature <u>FR2 Gap-less measurement for LTE SA</u>	Existing feature <u>Per FR measurement Gap</u>
Measurement capability		<ul style="list-style-type: none"> All measurement objects shares the same gap configuration LTE-liked solution. Simple and robust 	Parallel measurement between <ul style="list-style-type: none"> FR1 and FR2 LTE and FR2 New feature yet to be introduced	Parallel measurement between <ul style="list-style-type: none"> FR1 and FR2 LTE and FR2 Newly introduced Rel-15 feature
Performance requirements		Already defined in Rel-15	New RAN4 requirement is needed.	Already defined in Rel-15
Application scenarios		LTE SA, NR SA, EN-DC, NE-DC, NR-DC	LTE SA	LTE SA, NR SA, EN-DC, NE-DC, NR-DC
Gap configuration and related LTE Tput degradation in LTE SA	MO: LTE, FR1 and FR2	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded
	MO: LTE and FR2	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded
	MO: FR1 and FR2	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded	Gap is needed. LTE throughput is degraded
	MO: FR2 only	Gap is needed. LTE throughput is degraded	Gap is not needed.	Gap is not needed.