**3GPP TSG-RAN WG4 Meeting # 112 *R4-241***

**Maastricht, NL, 19 August - 23 August, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.133** | **CR** | **Draft CR** | **rev** | **1** | **Current version:** | **18.6.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Draft CR on core requirements for CPP | | | | | | | | | |
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| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Core | | | | |  | ***Date:*** | | | 2024-07-12 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change 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](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 1. Some core requirements for CPP in agreed core big CR (R4-2410150) are missing in TS 38.133, V18.6.0. This CR resubmits the missing parts. | | | | | | | | |
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| ***Summary of change:*** | | 1. Resubmit the missing contents in agreed core big CR (R4-2410150). | | | | | | | | |
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| ***Consequences if not approved:*** | | The core requirements for CPP is not complete. | | | | | | | | |
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| ***Clauses affected:*** | | Clauses: 4.5.5.5, 5.6.7.5, 5.6.8.5. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | | NA | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R4-2411333. | | | | | | | | |

<Start of Change 1>

#### 4.5.5.5 Measurements Period Requirements

After receiving both *NR-DL-TDOA-ProvideAssistanceData* message and *NR-DL-TDOA-RequestLocationInformation* message from the LMF via LPP [34] with *nr-DL-PRS-RSCPD-Request*, the UE shall be able to measure multiple (up to the UE capability specified in Clause 4.5.5.3) DL RSTD and DL RSCPD measurements, defined in TS 38.215 [4].

When LMF does not configure measurement time window(s):

- When a single PFL is configured, requirements in clause 4.5.2.5 apply to both DL RSTD and DL RSCPD.

- When multiple PFLs are configured, the UE performs DL RSCPD measurement on a single PFL that is common between the reference TRP and the target TRP, and requirements in clause 4.5.2.5 apply to both DL RSTD and DL RSCPD.

When LMF configures measurement time window(s), but UE does not support *supportOfRSCPD-MeasurementInTimeWindow*:

- The UE performs DL RSCPD measurement on the indicated PFL by the network. The requirements in clause 4.5.2.5 apply to both DL RSTD and DL RSCPD measurements.

When LMF configures measurement time window(s), and UE supports *supportOfRSCPD-MeasurementInTimeWindow* but does not support *supportOfLegacyMeasurementInTimeWindow*:

- The requirements in the Clause 4.5.2.5 apply to DL RSTD measurement.

- The requirements in Clause 4.5.5.5 apply to DL RSCPD measurement for the PRS resource(s) that have occasions only within the measurement time window.

When LMF configures measurement time window(s), and UE supports *supportOfRSCPD-MeasurementInTimeWindow* and *supportOfLegacyMeasurementInTimeWindow*:

- The requirements in Clause 4.5.5.5 apply to DL RSTD measurement and DL RSCPD measurement.

If a periodic time window is configured, the UE shall be able to measure multiple (up to the UE capability specified in Clause 4.5.5.3) DL RSTD and DL RSCPD measurements, defined in TS 38.215 [4], based on the indicated PRS resource sets occurring inside the time window during the measurement period defined as:

Where:

- is the index of positioning frequency layer,

- is total number of positioning frequency layers, and

- is the periodicity of the PRS RSTD measurement in positioning frequency layer i

is the measurement period for PRS RSTD measurement in positioning frequency layer *i* as specified below:

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Where:

- is the UE Rx beam sweeping factor:

- = 1 if positioning frequency layer *i* is in FR1, and if positioning frequency layer *i* is in FR2

- equals to the value as UE reported in *supportedLowerRxBeamSweepingFactor-FR2* if the capability is reported by the UE for the band containing positioning frequency layer i, and LMF indicates *lowerRxBeamSweepingFactor-FR2* in *NR-DL-TDOA-RequestLocationInformation*.

- equals to 8, otherwise.

- is a scaling factor for PRS-based NR positioning measurements in RRC\_IDLE. If the UE supports *parallelPRS-MeasRRC-Inactive-r17*, Kcarrier\_PRS = 1; otherwise,

- If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, , where is defined in clause 4.2.2.4

- If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, , where is defined in clause 4.2.2.7.

- is the Rx TEG specific scaling factor:

- =1 if the UE is not configured by the LMF to measure a PRS resource with multiple Rx TEGs via *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* [34].

- is defined as follows if the UE is configured by the LMF with *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* [34] to perform measurement on same DL PRS resource of a TRP using different Rx TEGs in *NR-DL-TDOA-RequestLocationInformation* [34]:

- , if the UE is not capable of receiving same DL PRS resource simultaneously from multiple Rx TEGs, where P is the number of UE Rx TEGs that the UE is requested by LMF to measure the same DL-PRS Resource of a TRP indicated by *measureSameDL-PRS-ResourceWithDifferentRxTEGs-r17* in [34], and in case ‘n0’ is indicated, P is the maximum number of Rx TEGs with which UE can support to measure the same PRS resource as reported in *NR-UE-TEG-Capability*.

- , if the UE is capable of receiving the same DL PRS resource simultaneously from multiple Rx TEGs, where is the number of UE Rx TEGs for measuring the same DL-PRS Resource simultaneously indicated by *measureSameDL-PRS-ResourceWithDifferentRxTEGsSimul-r17* in [34].

- is the maximum number of DL PRS resources in positioning frequency layer *i* configured in a slot.

- is the time duration of available PRS in positioning frequency layer *i* to be measured , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of , only the unmuted PRS resources in the indicated resources sets that are not fully overlapped with other higher-priority DL signals/channels and overlapped the time window(s) are considered if PFL *i* is associated with the time window are considered, otherwise only the unmuted PRS resources that are not fully overlapped with other higher-priority DL signals/channels are considered.

- is the number of PRS RSTD samples, where

- = 1 if the UE supports *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34], and the LMF requests the UE to perform positioning measurements with reduced number of samples, and meets the following conditions:

- PRS bandwidth is within the initial BWP and

- Magnitude of difference between the serving cell’s SS-RSRP and the neighbor cell’s PRS-RSRP is within 6 dB.

- = 2 if the UE supports *supportedDL-PRS-ProcessingSamples-RRC-Inactive* [34], and the LMF requests the UE to perform positioning measurements with reduced number of samples, and does not meet the following conditions:

- PRS bandwidth is within the initial BWP and

- Magnitude of difference between the serving cell’s SS-RSRP and the neighbor cell’s PRS-RSRP is within 6 dB.

- = 4 otherwise.

- is the measurement duration for the last PRS RSTD sample in positioning frequency layer *i*, including the sampling time and processing time, = + ,

- is the periodicity of the PRS RSTD measurement in positioning frequency layer i defined as:

=

Where:

- corresponds to *durationOfPRS-ProcessingSymbolsInEveryTms-r17* in TS 37.355 [34],

- , the least common multiple between the time window periodicity , and the DRX cycle length , defined in TS 38.304 [1], clause 7.1, if PFL *i* is associated with the time window, otherwise ,

- is the periodicity of DL PRS resource with muting on positioning frequency layer *i,* and when calculating , only the PRS resources in the indicated resources sets and overlapped with the indicated time window(s) are considered if PFL *i* is associated with the time window,

- is the maximum periodicity of the indicated time window(s).

If more than one PRS periodicities are configured in positioning frequency layer *i*, the least common multiple of PRS periodicities among all DL PRS resource sets in the positioning frequency layer is used to derive , where,

- , is the PRS periodicity with muting per PRS resource,

- is the periodicity of PRS resource sets given by the higher-layer parameter *DL-PRS-Periodicity*.

- is the scaling factor considering PRS resource muting. , where

- is the muting repetition factor given by the higher-layer parameter *DL-PRS-MutingBitRepetitionFactor*, and is the size of the bitmap .

- is the UE capability combination per band for RRC\_IDLE state where N is a duration of DL PRS symbols in ms corresponding to *durationOfPRS-ProcessingSymbols-r17* in TS 37.355 [34], T (ms) corresponds to *durationOfPRS-ProcessingSymbolsInEveryTms-r17* in TS 37.355 [34], [ and T-N (>0) is the time required to process duration N of DL PRS symbols already buffered in memory], for a given maximum bandwidth supported by UE corresponding to *supportedBandwidthPRS* in TS 37.355 [34],

- is UE capability for number of DL PRS resources that it can process in a slot in RRC\_IDLE state as indicated by *maxNumOfDL-PRS-ResProcessedPerSlot-RRC-Inactive-r17* specified in TS 37.355 [34].

If the following conditions are met, the time starts from the first DL PRS resource(s) instances inside a PTW after both the *NR-DL-TDOA-ProvideAssistanceData* message and *NR-DL-TDOA-RequestLocationInformation* message are delivered from LMF to the UE via LPP [34].

- UE is configured with CN eDRX > 10.24s, and

- periodic PRS measurement reporting is configured, and

- CN eDRX cycle is smaller or equal to the PRS measurement reporting periodicity configured via higher layer parameter *reportingInterval* in TS 37.355 [34], and

- there is one or more PRS resources occurring in PTW.

Otherwise, the timestarts from the first DL PRS resource(s) after both the *NR-DL-TDOA-ProvideAssistanceData* message and *NR-DL-TDOA-RequestLocationInformation* message are delivered from LMF to the UE via LPP [34].

Note: No per-positioning frequency layer requirement is applied in scenarios when multiple positioning frequency layers are configured.

If the DRX cycle is reconfigured during the RSTD measurement period, then the measurement period can be longer.

When PRS-RSRP is configured for DL-TDOA, RSTD and PRS-RSRP are performed over the same measurement period.

The measurement requirements do not apply to any PRS resource that always collides with other higher-priority DL signals/channels, as specified in clause 5.6.1.

Longer RSTD measurement period is expected when there are collisions between PRS resources and other higher-priority DL signals/channels.

If changes for any PFL during the measurement period, the measurement period could be longer.

The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of N within duration .

The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.

The requirements in clause 4.5.5 do not apply if the PRS configuration given by higher layer paramters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-DL-TDOA-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities*.*

If cell re-selection occurs while RSTD and DL RSCPD measurements are being performed, then the UE shall continue and complete the on-going RSTD and DL RSCPD measurements after the cell selection is completed. The RSTD and DL RSCPD measurement period can be longer.

If the RRC state transition occurs from RRC\_IDLE to RRC\_CONNECTED state during the measurement period then the UE shall continue the RSTD and DL RSCPD measurement in the RRC\_CONNECTED state. The RSTD and DL RSCPD measurement period can be longer.

The UE shall meet the RSTD measurement accuracy requirements in clause 10.1.23.2.

The UE shall meet the DL-RSCPD measurement accuracy requirements in clause 10.x.x.x.

#### 5.6.7.5 Measurements Period Requirements

After receiving both *NR-DL-TDOA-ProvideAssistanceData* message and *NR-DL-TDOA-RequestLocationInformation* message with *nr-DL-PRS-RSCPD-Request* from the LMF via LPP [34]*,* when LMF configures measurement time window(s) for a PFL, the UE shall be able to measure multiple (up to the UE capability specified in Clause 5.6.7.3) DL RSTD and RSCPD measurements, defined in TS 38.215 [4], during the time window configured to UE via *nr-DL-PRS-MeasurementTimeWindowsConfig* during the measurement period defined as:

Where:

- is the index of positioning frequency layer,

- is total number of positioning frequency layers, and

- is the periodicity of the PRS RSTD measurement in positioning frequency layer i

is the measurement period for PRS RSTD with RSCPD measurement in positioning frequency layer *i* as specified below:

,

where:

- , , , , , , , and are defined in clause 5.6.2.5

- is the time duration of available PRS in the positioning frequency layer to be measured during , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of , only unmuted PRS resources that are not fully overlapped with other higher-priority DL signals/channels are considered.

- When periodic time window(s) are configured by the LMF, , the least common multiple between , the DRX cycle length and Twindow being the maximum periodicity of the indicated time window(s). is defined in clause 5.6.2.5.

- When periodic time window(s) are not configured by the LMF, , the least common multiple between and the DRX cycle length . is defined in clause 5.6.2.5.

- and are calculated by only considering the PRS resources in the indicated resources sets overlapping with the indicated time window(s).

The time *s*tarts from the first time window (TDL RSCPD) configured by LMF within DRX cycle containing the DL PRS resource(s) in the assistance data after both the *NR-DL-TDOA-ProvideAssistanceData* message and *NR-DL-TDOA-RequestLocationInformation* message are delivered from LMF to the UE via LPP [34].

When LMF does not configure measurement time window(s):

- When a single PFL is configured, requirements in Clause 5.6.2.5 apply to both RSCPD and RSTD measurements.

- When multiple PFLs are configured for legacy measurements, the UE performs RSCPD measurement on a single PFL that is common between the reference TRP and the target TRP. The requirement in Clause 5.6.2.5 apply to both RSTD and RSCPD measurements.

When LMF configures measurement time window(s), but UE does not support *supportOfRSCPD-MeasurementInTimeWindow*:

* The UE performs RSCPD measurement on the indicated PFL by the network. The requirements in Clause 5.6.2.5 apply to both RSTD and RSCPD measurements.

When LMF configures measurement time window(s), but UE does not support *supportOfLegacyMeasurementInTimeWindow* but supports *supportOfRSCPD-MeasurementInTimeWindow*:

* The requirements in the Clause 5.6.2.5 apply to RSTD measurements.
* The requirements in Clause 5.6.7.5 apply to RSCPD measurement for the PRS resource(s) that have occasions only within the measurement time window.

If the DRX cycle is reconfigured during the measurement period, then the measurement period can be longer.

When PRS-RSRP is configured for DL-TDOA, RSTD and PRS-RSRP are performed over the same measurement period.

The measurement requirements do not apply to any PRS resource that always collides with other higher-priority DL signals/channels, as specified in clause 5.6.1.

Longer measurement period is expected when there are collisions between PRS resources and other higher-priority DL signals/channels.

If changes for the PFL during the measurement period, the measurement period can be longer.

The measurement requirements do not apply for a PRS resource, if the PRS resource is across two sampling duration of N within duration .

The measurement requirements do not apply for a PRS resource, if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.

The requirements in clause 5.6.7 do not apply if the PRS configuration given by higher layer paramters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-DL-TDOA-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities*.*

If cell re-selection occurs while RSCPD together with RSTD measurements are being performed, then the UE shall continue and complete the on-going RSCPD and RSTD measurements after the cell re-selection is completed. The measurement period can be longer.

If the RRC state transition occurs from RRC\_INACTIVE to RRC\_CONNECTED state during the measurement period then the UE shall continue the RSCPD and RSTD measurements in the RRC\_CONNECTED state. The measurement period can be longer.

#### 5.6.8.5 Measurement Period Requirements

When the physical layer receives the last of *NR-Multi-RTT-ProvideAssistanceData* message and *NR-Multi-RTT-RequestLocationInformation* message from LMF via LPP [34] with *nr-UE-RSCP-Request* and configuring a measurement time window via *nr-DL-PRS-MeasurementTimeWindowsConfig*, subject to UE capabilities *supportOfRSCP-MeasurementInTimeWindow* and *supportOfLegacyMeasurementInTimeWindow*, the UE shall be able to measure multiple (up to the UE capability specified in clause 5.6.8.3) UE Rx-Tx and DL RSCP measurements, defined in TS 38.215 [4], during the time window only.

When LMF does not configure measurement time window(s):

- When a single PFL is configured, requirements in Clause 5.6.4.5 apply to both RSCP and UE Rx-Tx measurements.

- When multiple PFLs are configured for legacy measurements, the UE performs RSCP measurement on a single PFL that is common between the reference TRP and the target TRP. The requirement in Clause 5.6.4.5 apply to both RSCP and UE Rx-Tx measurements.

When LMF configures measurement time window(s), but UE does not support *supportOfRSCP-MeasurementInTimeWindow*:

* The UE performs RSCP measurement on the indicated PFL by the network. The requirement in Clause 5.6.4.5 apply to both UE Rx-Tx and RSCP measurements.

When LMF configures measurement time window(s), but UE does not support *supportOfLegacyMeasurementInTimeWindow* but supports *supportOfRSCP-MeasurementInTimeWindow*:

* The requirements in the Clause 5.6.4.5 apply to UE Rx-Tx measurement.
* The requirements in Clause 5.6.8.5 apply to RSCP measurement for the PRS resource(s) that have occasions only within the measurement time window.

If a periodic time window is configured, the UE shall be able to measure multiple (up to the UE capability specified in Clause 5.6.8.3) UE Rx-Tx and DL RSCP measurements, defined in TS 38.215 [4], during the measurement period defined as:

Where:

- is the index of positioning frequency layer,

- is total number of positioning frequency layers, and

- is the periodicity of the PRS RSTD measurement in positioning frequency layer i

is the measurement period for DL RSCP with UE Rx-Tx measurement in positioning frequency layer *i* as specified below:

,

where:

* , , , , , , , and are defined in clause 5.6.4.5.
* DL RSCP performed during is a single sample measurement where DL RSCP and UE Rx-Tx measurements are performed on the same PFL.

- is the time duration of available PRS resources in the positioning frequency layer, to be measured during , and is calculated in the same way as PRS duration K defined in clause 5.1.6.5 of TS 38.214 [26]. For calculation of , only unmuted PRS resources that are not fully overlapped with other higher-priority DL signals/channels are considered.

- When periodic time window(s) are configured by the LMF, , the least common multiple between , and Twindow being the maximum periodicity of the indicated time window(s).

- When periodic time window(s) are not configured by the LMF, , the least common multiple between and the DRX cycle length .

- and are calculated by only considering the PRS resources in the indicated resources sets overlapping with the indicated time window(s).

The time starts from the first time window (TDL RSCP) configured by LMF within DRX cycle containing the DL PRS resources in the assistance data after both the *NR-Multi-RTT-RequestLocationInformation* message and *NR-Multi-RTT-ProvideAssistanceData* message from LMF via LPP [34] are delivered to the physical layer of UE.

If the RRC state transition occurs from RRC\_INACTIVE to RRC\_CONNECTED state during the measurement period then the UE shall continue the DL RSCP measurement and shall restart the UE Rx-Tx time difference measurement after it obtains SRS configuration and Timing Advance command from the serving cell.

If cell reselection occurs during the measurement period then the UE shall restart the DL RSCP and UE Rx-Tx time difference measurements after it obtains SRS configuration and Timing Advance command from the new serving cell.

The measurement requirements do not apply for a PRS resource:

- if the PRS resource is across two sampling duration of N within duration or

- if time span of the PRS resource instance (including at least the minimum number of repetitions specified in the accuracy requirements) is greater than UE reported capability N.

If the DRX cycle is reconfigured during the measurement period then the measurement period can be longer.

If during the measurement period, PRS resources overlap with other DL signals/channels then the measurement period can be longer.

When PRS-RSRP is configured for multi-RTT, the UE Rx-Tx time difference measurements and PRS-RSRP measurements are performed over the same measurement period.

The requirements in clause 5.6.8 do not apply if the PRS configuration given by higher layer parameters *NR-DL-PRS-AssistanceData* exceeds any of the UE measurement capabilities given by *NR-DL-PRS-ResourcesCapability* in *NR-Multi-RTT-ProvideCapabilities*, and it is up to UE implementation which PRS resources are measured, subject to UE measurement capabilities*.*

If UE uplink transmission timing changes due to the network-configured Timing Advance command during the DL RSCP with UE Rx-Tx measurement period, then the DL RSCP with UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the DL RSCP and UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the change in the NTA\_offset defined in Table 7.1.2-2 during the DL RSCP with UE Rx-Tx measurement period, then the DL RSCP with UE Rx-Tx time difference measurement period is restarted after uplink transmission timing changes, and the DL RSCP and UE Rx-Tx time difference measurement period requirements in this clause shall not apply.

If UE uplink transmission timing changes due to the UE autonomous timing adjustment defined in clause 7.1.2 during the measurement period, then:

- DL RSCP and UE Rx-Tx measurement period requirements in this clause shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission.

- DL RSCP and UE Rx-Tx measurement period requirements in this clause shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission. The DL RSCP with UE Rx-Tx time difference measurement period may be restarted in such case.

<End of Change 1>