3GPP TSG-RAN WG2 #110e Tdoc R2-20xxxxx

Online, June 01 – 12, 2020

Agenda Item: x.x.x.x

Source: Ericsson

Title: Email discussion summary: [Post109bis-e][946][POS] Reference for additional path reporting

Document for: Discussion, Decision

# 1 Introduction

This document summarizes the following email discussion:

* [Post109bis-e][946][POS] Reference for additional path reporting (Ericsson)

      Scope: Discuss the options for a time reference convention for additional path reporting and conclude a way forward, starting from the text proposal in Annex 1 of R2-2003997.

      Intended outcome: Summary for next meeting

      Deadline:  Long

To allow a discussion of the summary as well, companies are asked to provide comments no later than Tuesday May 19th, 10.00 UTC.

Section 2 provides a short summary of the email discussion about additional path reporting [1], and a suggested agreeable text proposal in Annex.

# 2 Email discussion summary

The following different path timing possibilities (for different resources of two exemplary TRPs):

The black line illustrates the "main RSTD", *nr-RSTD* measurement.

Reference Path

Reference TRP

Path#1

Neighbouring TRP

Path#2

Path#2

Path#1

Path#1

Path#2

Path#2

Path#1

Path#1

Path#2

Path#2

Resource#0

Resource#1

Resource#2

Resource#0

Resource#1

Resource#2

RSTD

The blue line illustrates the *nr-RSTD-ResultDiff* (provided in IE *NR-DL-TDOA-AdditionalMeasurementElement*).

The red line illustrates the *nr-AdditionalPathList* for the "main RSTD" (outside the *NR-DL-TDOA-AdditionalMeasurementElement*).

The green, orange and purple dashed curves are the candidates for the *nr-AdditionalPathList*for *NR-DL-TDOA-AdditionalMeasurementElement*

The additional path time reference options:

**Option 1.** The additional path time reference is the first path of the resource (the reference path) illustrated in “orange” in the figure

**Option 2.** The additional path time reference is the first path of the resource used to determine RSTD illustrated in “green” in the figure.

**Option 3.** The additional measurements (blue – reference TRP and dashed blue – neighbour TRP) and additional path (dashed purple) time reference is the detected reference TRP path used to determine the RSTD value

A few things shall be noted:

* The time reference ***is only about reporting – the actual path timing measurements are the same for all options and it is possible in post-processing to go between the representations***. For the reference cell with path timings tr00 and tr01 of resource 0 and tr10 and tr11 of resource 1, where resource 0 path timing tr00 is used to determine RSTD,
	+ option 1 reports additional measurements (tr10-tr00) and additional paths (tr01-tr00) and (tr11-tr10)
	+ option 2 reports additional measurements (tr10-tr00) and additional paths (tr01-tr00) and (tr11-tr00) – note that the same information as in option 1 is retrieved in post-processing by (tr11-tr00) - (tr10-tr00) = (tr11-tr10)
	+ option 3 is the same as option 2 for the reference cell
* The resources are typically configured with beam sweeping and therefore corresponds to different DL-PRS transmission times. Therefore, definitions need to acknowledge this difference in transmission time.
* If there eventually will be RAN4 requirements for these relative RSTD and addional path timing reports, this can have an impact on how these are defined, if requirements are believed to be defined in relation to what has been reported, not measured.

|  |
| --- |
| **Summary of company comments:** Five out of six companies are in favour of Option 2, which also is considered to imply very limited changes to ASN.1. However, the field *nr-RSTD-ResultDiff* needs a field description. |

Based on the summary, we have the following proposal:

1. Additional path reporting is based on a path timing reference as in Option 2, which means the path timing used to determine the nr-RSTD, and nr-UE-RxTxTimeDiff values
2. RAN2 to agree to the text proposal in Annex.

# Conclusion

Based on the email discussion summary in the previous sections we propose the following:

[Proposal 1 Additional path reporting is based on a path timing reference as in Option 2 , which means the path timing used to determine the nr-RSTD, nr-RSTD-ResultDiff, nr-UE-RxTxTimeDiff and nr-UE-RxTxTimeDiffAdditional values](#_Toc40874387)

[Proposal 2 RAN2 to agree to the text proposal in Annex.](#_Toc40874388)

# References

1. R2-20xxxxx, Email discussion report: [Post109bis-e][946][POS] Reference for additional path reporting (Ericsson).

# Annex 1, Text proposal to 3GPP TS 37.355 for Additional path representation

#### 6.5.10.4 NR-DL-TDOA Location Information Elements

– *NR-DL-TDOA-SignalMeasurementInformation*

The IE *NR-DL-TDOA-SignalMeasurementInformation* is used by the target device to provide NR-DL TDOA measurements to the location server. The measurements are provided as a list of TRPs, where the first TRP in the list is used as reference TRP in case RSTD measurements are reported. The first TRP in the list may or may not be the reference TRP indicated in the *NR-DL-PRS-AssistanceData*. Furthermore, the target device selects a reference resource per TRP, and compiles the measurements per TRP based on the selected reference resource.

-- ASN1START

NR-DL-TDOA-SignalMeasurementInformation-r16 ::= SEQUENCE {

 dl-PRS-ReferenceInfo-r16 DL-PRS-IdInfo-r16,

 nr-DL-TDOA-MeasList-r16 NR-DL-TDOA-MeasList-r16,

 ...

}

NR-DL-TDOA-MeasList-r16 ::= SEQUENCE (SIZE(1.. nrMaxTRPs)) OF NR-DL-TDOA-MeasElement-r16

NR-DL-TDOA-MeasElement-r16 ::= SEQUENCE {

 trp-ID-r16 TRP-ID-r16 OPTIONAL,

 nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceId-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-r16 INTEGER (0..ffs), -- FFS on the value range

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16,

 nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

 nr-DL-TDOA-AdditionalMeasurements-r16 NR-DL-TDOA-AdditionalMeasurements-r16,

 ...

}

NR-DL-TDOA-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF NR-DL-TDOA-AdditionalMeasurementElement-r16

NR-AdditionalPathList-r16 ::= SEQUENCE (SIZE(1..2)) OF NR-AdditionalPath-r16

NR-DL-TDOA-AdditionalMeasurementElement-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceId-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-RSTD-ResultDiff-r16 INTEGER (0..ffs), -- FFS on the value range to be decided in RAN4

 dl-PRS-RSRP-ResultDiff-r16 INTEGER (FFS) OPTIONAL, -- FFS on the value range to be decided in RAN4

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

...

}

nrMaxTRPs INTEGER ::= 256 -- Max TRPs per UE

-- ASN1STOP

| ***NR-DL-TDOA-SignalMeasurementInformation* field descriptions** |
| --- |
| ***nr-PRS-RSRP-Result***This field specifies the reference signal received power (RSRP) measurement, as defined in TS 38.331 [35]. |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-RSTD* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |
| ***nr-RSTD***This field specifies the relative timing difference between this neighbour TRP and the PRS reference TRP, as defined in FFS. Mapping of the measured quantity is defined as in FSS. |
| ***nr-TimingMeasQuality***This field specifies the target device′s best estimate of the quality of the measurement. |
| ***nr-RSTD-ResultDiff***This field specifies the relative time difference between the detected path timing of this DL-PRS resource relative to the path timing used for determining the *nr-RSTD* value, compensated for the difference in DL-PRS transmission timing.  |

*[…]*

6.5.12.4 NR-Multi-RTT Location Information Elements

– *NR-Multi-RTT-SignalMeasurementInformation*

The IE *NR-Multi-RTT-SignalMeasurementInformation* is used by the target device to provide NR Multi-RTT measurements to the location server. The measurements are provided as a list of TRPs, where the first TRP in the list is used as reference TRP.

-- ASN1START

NR-Multi-RTT-SignalMeasurementInformation-r16 ::= SEQUENCE {

 nr-Multi-RTT-MeasList-r16 NR-Multi-RTT-MeasList-r16,

 ...

}

NR-Multi-RTT-MeasList-r16 ::= SEQUENCE (SIZE(1.. nrMaxTRPs)) OF NR-Multi-RTT-MeasElement-r16

NR-Multi-RTT-MeasElement-r16 ::= SEQUENCE {

 trp-ID-r16 TRP-ID-r16 OPTIONAL,

 nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceId-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL,

 nr-UE-RxTxTimeDiff-r16 INTEGER (0..ffs) OPTIONAL, -- FFS on the value range to be decided in RAN4

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 nr-TimingMeasQuality-r16 NR-TimingMeasQuality-r16,

 nr-PRS-RSRP-Result-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

 nr-Multi-RTT-AdditionalMeasurements-r16 NR-Multi-RTT-AdditionalMeasurements-r16,

 ...

}

NR-AdditionalPathList-r16 ::= SEQUENCE (SIZE(1..2)) OF NR-AdditionalPath-r16

NR-Multi-RTT-AdditionalMeasurements-r16 ::= SEQUENCE (SIZE (1..3)) OF NR-Multi-RTT-AdditionalMeasurementElement-r16

NR-Multi-RTT-AdditionalMeasurementElement-r16 ::= SEQUENCE {

 nr-DL-PRS-ResourceId-r16 NR-DL-PRS-ResourceId-r16 OPTIONAL,

 nr-DL-PRS-ResourceSetId-r16 NR-DL-PRS-ResourceSetId-r16 OPTIONAL,

 nr-PRS-RSRP-ResultDiff-r16 INTEGER (FFS) OPTIONAL, -- FFS, value range to be decided in RAN4.

 nr-UE-RxTxTimeDiffAdditional-r16 INTEGER (0..ffs) OPTIONAL, -- FFS on the value range

 nr-AdditionalPathList-r16 NR-AdditionalPathList-r16 OPTIONAL,

 nr-TimeStamp-r16 NR-TimeStamp-r16,

 ...

}

nrMaxTRPs INTEGER ::= 256 -- Max TRPs

-- ASN1STOP

| ***NR-Multi-RTT-SignalMeasurementInformation* field descriptions** |
| --- |
| ***nr-PRS-RSRP-Result***This field specifies the reference signal received power (RSRP) measurement, as defined in TS 38.331 [35]. |
| ***nr-UE-RxTxTimeDiff***This field specifies the UE Rx–Tx time difference measurement, as defined in FFS.  |
| ***nr-AdditionalPathList***This field specifies one or more additional detected path timing values for the TRP or resource, relative to the path timing used for determining the *nr-UE-RxTxTimeDiff* value. If this field was requested but is not included, it means the UE did not detect any additional path timing values. |

*[…]*

*– NR-AdditionalPath*

The IE *NR-AdditionalPath* is used by the target device to provide information about additional paths associated with the path timing measurements for NR positioning in the form of a relative time difference and a quality value. The additional path *nr-relativeTimeDifference* is the detected path timing relative to the detected path timing used for determining the corresponding timing measurements, and each additional path can be associated with a quality value *nr-path-Quality.*

-- ASN1START

NR-AdditionalPath-r16 ::= SEQUENCE {

 nr-relativeTimeDifference-r16 INTEGER (FFS),--FFS to be decided in RAN4

 nr-path-Quality-r16 NR-TOAMeasQuality-r16 OPTIONAL,

 ...

}

-- ASN1STOP

| ***NR-AdditionalPath* field descriptions** |
| --- |
| ***nr-relativeTimeDifference***This field specifies the additional detected path timing relative to the detected path timing of the corresponding timing measurement. If the additional detected path timings and the detected path timing are associated with different DL-PRS transmission timings, the device subtracts the transmission timing difference from the value. A positive value indicates that the particular path is later in time than the detected path timing; a negative value indicates that the particular path is earlier in time than the detected path timing. |
| ***nr-path-Quality***This field specifies the target device′s best estimate of the quality of the detected timing of the additional path. |