3GPP TSG-RAN WG2 #118-e R2-22xxxxx

Online Meeting, May 9th – May 20th, 2022

Agenda Item: 6.21.2

Source: Ericsson

Title: [Post118-e][601][TEI17] NMEA GGA sentence info (Ericsson)

Document for: Discussion, Decision

# Introduction

This email discussion will discuss the details of the draft CR that was the converging during the at meeting email discussion 628 about adding NMEA GGA sentence info to HA-GNSS reporting:

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| [R2-2206395](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Inbox/R2-2206395.zip) | [AT118-e][628][POS] NMEA GGA string for HA-GNSS reporting | Ericsson |
| [R2-2206444](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Inbox/R2-2206444.zip) | NMEA GGA sentence info in high accuracy GNSS location estimates [HA-GNSS-NMEA] | ESA, Ericsson, Deutsche Telekom, T-Mobile USA, Swift Navigation, Hexagon, MediaTek Inc., u-blox |

based on the following original contribution

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| [R2-2206329](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Inbox/R2-2206329.zip) (revision of R2-2205845) | Remaining details for high-precision GNSS reporting | ESA, Ericsson, Deutsche Telecom, T-Mobile USA, Swift Navigation, Hexagon, MediaTek Inc., u-blox |

* [Post118-e][601][TEI17] NMEA GGA sentence info (Ericsson)

Scope: Review the CR in R2-2206444 and determine what parts are agreeable.

Intended outcome: Agreed CR

With a short deadline, please comments in consideration the deadline ***Thursday 2022-05-26 1800 UTC.***

#  Contact Information

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# Discussion

The draft CR [R2-2206444](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Inbox/R2-2206444.zip) is also provided separately as “R2-22xxxxx\_37.355\_CRnnnn\_(Rel-17)” in the drafts folder.

* A new version R2-22xxxxx\_37.355\_CRnnnn\_(Rel-17)\_v2 has been uploaded to reflect the comments made in v01-v03.
* A new version R2-22xxxxx\_37.355\_CRnnnn\_(Rel-17)\_v3 has been uploaded to reflect the comments made in v04-v07
* A draft R2-2206841 CR has been uploaded for final review.

To structure the comments, consider the following questions:

*Question 1. In the email discussion 628 at the meeting, the following companies ESA, Ericsson, Deutsche Telekom, T-Mobile USA, Swift Navigation, Hexagon, MediaTek Inc., u-blox,,Intel, Huawei, HiSilicon, Apple, CATT and vivo expressed support for adding the remaining NMEA GGA information to location information reports. In addition to those companies, do you support the CR*?

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| Company | Comments |
| Swift Navigation | We agree with the motivation but highlight that NMEA GGA is a legacy protocol meaning it only addresses a subset of the GNSS positioning methods in LPP. Therefore, we believe there is merit in expanding the CR to provide for extensibility as new positioning modes and metrics are identified. We are OK to start with a smaller subset of functionality that can be built upon over time.In particular we would suggest leaving the LocationSource as is, and putting any more granular information about the fix type into HA-GNSS-Metrics (see Q5). It will become cumbersome to continue to extend LocationSource if we need to introduce different or more granular fix types. |
| MediaTek | Support as a cosigner. We are OK with the general approach of taking information from the NMEA GGA string into other existing fields where possible, as discussed in RAN2#118-e. |
| Qualcomm | As already commented in 628, no, we do not support the CR. The benefit has not been demonstrated. It seems the motivation is related to improved Operation & Maintenance, crowdsourcing, etc. which is not the purpose of LPP (and should not be introduced as a TEI feature).Specifically, from the Reason for Change:"Support for high accuracy GNSS was introduced in Rel 15 and has been enhanced in Rel 16 and 17. It was leveraged by NTRIP/RTCM distribution and representation, where NMEA GGA sentences are used to report high accuracy GNSS performance."HA-GNSS in Rel-15 was based on RTCM Standard 10403.3; in REL-16 based on QZSS CLAS standard. No NTRIP/NMEA specifics were ever in scope, and do not need to be in scope since LPP has its own Request/Provide Location Information mechanism. In any case, the NMEA GGA is legacy DGPS, unrelated to HA-GNSS in 3GPP."The parts representing the location estimate and its uncertainty have already been represented in 3GPP LPP, but some parts are not yet represented – number of satellites used, dilution of precision, GNSS positioning fix quality indicator and age of used assistance data for HA GNSS – all attributes that are relevant for high accuracy GNSS devices to report to assess performance."It is unclear why these "attributes" are relevant for high accuracy GNSS devices to assess performance (e.g., without knowing a ground truth). It is also unclear why an LMF must "assess performance" for HA-GNSS, but not for e.g., legacy A-GNSS or UL-TDOA, etc."In cases when it is legitimate for LMF to obtain position estimates based on high accuracy GNSS from the device, it is typically as part of an offered service in a use case. With these additional fields from the de facto standard NMEA GGA, the LMF is more precise in analyzing the provided positioning service. DOP provides information about the geometry of the positioning problem in terms of how the used satellites are lined up, and it is highly relevant to analyze the provided positioning performance accordingly. If the position estimates that are self-assessed as less accurate by the device also are provided with a poor DOP, then the underlying reason for poor performance is better understood. Same thing if the number of used satellites is low. It is also possible for the operator to analyze the overall situation in a region based on crowd sourced data to identify parts of a service area where high accuracy GNSS is not alone providing sufficient performance, and thereby indicate a part of the service area where outdoor 5G positioning build-out could be considered."The underlying reason for potential poor performance can be diverse. GDOP, no. SVs, etc. may be one factor, but other factors affecting signal acquisition are likely more dominating. Even in the same area, performance can be varying (e.g., hand-held device vs. device in a pocket, etc.). It is not clear how e.g., DOP, no. SVs can be used to "assess performance"."The ability to maintain an integer or floating-point ambiguity solution to the carrier measurements is also seen as an important quality and performance assessment that is an important and de factor standard performance metric."Unclear why all this is needed for quality and performance assessment. It is also unclear where this requirement for "quality and performance assessment" is coming from. This seems a separate/different requirement (e.g., O&M).According to Stage 2, a device reports a location estimate (taking the requested QoS and other information into account), together with uncertainty. None of the additional attributes proposed would enable an LMF to determine a reason for "good/poor" performance, or determine whether 5G positioning would result in better performance, etc. It is also unclear what a server would do with such a "reason". Either the location result was successful (according to the requested QoS) or not. Nothing will change with these additional UE reporting. In any case, nothing (except for the RTK variants (which are not precisely defined anyway)) is specific to HA-GNSS. |
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*Question 2. Comments to the* nrOfUsedSatellites *field of HA-GNSS-Metrics* IE?

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*Question 3. Comments to the* *dilution of precision fields* hdopi *and* pdopi *of HA-GNSS-Metrics* IE?

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| Company | Comments |
| Swift Navigation | Representation as an unsigned 8-bit integer with a multiplier of 0.1 (i.e. 0.0 – 25.5) would allow for easier encoding and decoding compared to the discrete values in the proposal, with minimal additional number of bits. |
| Ericsson | Agree, this can be a better solution hdopi-r17 INTEGER (1..256) OPTIONAL, pdopi-r17 INTEGER (1..256) OPTIONAL,with field descriptions***hdopi***This field specifies the horizontal dilution of precision for the location estimate, scale factor 0.1***pdopi***This field specifies the 3D position dilution of precision, scale factor 0.1. |
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*Question 4. Comments to the* age *field of HA-GNSS-Metrics* IE?

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| Company | Comments |
| Ericsson | It seems some GNSS devices in the industry is reporting age in relation to the most recent used high accuracy and some do not provide age information, possibly by considering this only related to DGNSS messages. Therefore, we suggest that this field should be OPTIONAL and the field description changed to***age***This field, if supported by the device, specifies the age of the most recent used assistance data for high accuracy GNSS, scale factor 0.1 second. |
| Swift Navigation | Agree it should be an optional field if included |
| MediaTek | Agree it should be optional. |
| Nokia | A quick internet search for NMEA 0183 standard and GGS sentences shows this age parameter as the age of corrections used. However, in LPP we are defining it generically as assistance data. If we are referencing NMEA 0183 v4.11 in the LPP specification, then this age parameter should be exactly the way as it is defined in that standard. We would like to see additional description as to what specific assistance data this is and how is the age measured. |
| Ericsson | Agree, good point. NMEA also defines talker ID prefixes such as GP for only GPS and GN for multi-GNSS constellations. We made the below addition aligned with how the references to RTCM and CompactSSR specs has been made in LPP:– HA-GNSS-MetricsThe IE *HA-GNSS-Metrics* is included by the target device when high accuracy GNSS positioning metrics associated to a location estimate is provided to the location server. The parameters provided in IE HA-GNSS-Metrics are used as specified for sentence type GGA in [xx] and apply to all GNSSs and types of high accuracy GNSS assistance data. |

*Question 5. Comments to the two new location source alternatives* ha-gnss-float *and* ha-gnss-fix *of field LocationSource-r13 in CommonIEsProvideLocationInformation* IE?

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| Company | Comments |
| Ericsson | At this stage, it seems relevant to start by adding the fix and float alternatives that are in use in the GNSS industry today and discuss later if refinements by adding more alternatives would be recommended.  |
| Swift Navigation | We prefer to introduce a ‘fix type’ field into HA-GNSS-Metrics and leave the LocationSource as ha-gnss-v1510 as this will allow for more extensibility. We see the fix type as a separate concept from the LocationSource.We would suggest starting with the following, modified from those previously identified by Ericsson (R2-2206395):* Autonomous
* DGNSS
* Carrier-phase Float
* Carrier-phase Fixed

Additional modes can be added over time. |
| Ericsson | Sounds good. That makes it more clean and the fix type becomes subclasses under the master class of ha-gnss-v1510. That would go back to the HA-GNSS-Metrics IE as the complete container for the information:Some comments to the suggested elements:* *autonomous* – that would not be represented as ha-gnss location source but a-gnss so could be omitted from this list?
* *dgnss* – The NMEA GGA alternative combines DGNSS and SBAS which is a bit strange. We could leave this alternative out for the time being until we have clarified its meaning as a fix type under ha-gnss location source?

If we start from the other two fields, we start from what we had in the draft CR from the at meeting email discussion:-- ASN1STARTHA-GNSS-Metrics-r17 ::= SEQUENCE { nrOfUsedSatellites-r17 INTEGER (0..64), hdopi-r17 INTEGER (1..256) OPTIONAL, pdopi-r17 INTEGER (1..256) OPTIONAL, age-r17 INTEGER (0..99) OPTIONAL, fixType-r17 ENUMERATED (carrier-phase-float, carrier-phase-fix, ...}, ...}-- ASN1STOPWith a suggested field description:***fixType***This field specifies the positioning fix type, based on the positioning fix quality indicators of [xx]. Specifically* *carrier-phase-float* - converged carrier phase integer ambiguity resolution
* *carrier-phase-fix* - converging carrier phase floating point ambiguity resolution

Thereby, the fix type can be extended with more options later.  |
| MediaTek | OK with the suggestion above from Swift/Ericsson. |
| Nokia | Generally, if the fix type that is proposed is not an exact adoption as defined in NMEA 0183, we have to make it clear in the specification. Currently, there is a statement in the CR viz. “The parameters provided in IE HA-GNSS-Metrics are used as specified for sentence type GGA in [xx]”. Either this should be removed, or the parameters/fields added should be compliant to the quoted standard. |
| Ericsson | For the fix/float, these are the same as in the fix quality indicators of NMEA but only those two represented***fixType***This field specifies the positioning fix type, based on the positioning fix quality indicators RTK float and RTK fix of [xx]. Specifically* *carrier-phase-float* - converged carrier phase integer ambiguity resolution
* *carrier-phase-fix* - converging carrier phase floating point ambiguity resolution
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*Question 6. Any other comments*?

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| Company | Comments |
| MediaTek | In relation to the discussions of the principle of the CR from RAN2#118-e, we understand that “officially” the NMEA GGA sentence was not conceived as related to HA-GNSS, but also that it is used that way in practice. The rationale for using specific information for performance assessment/optimisation is necessarily dependent on deployments and implementations, but the support for the CR from a combination of operators, infra vendors, UE vendors, and GNSS experts argues that there actually is a practical end-to-end use for this information. |
| Nokia | In general, if we reference NMEA 0183 standard and quote “The parameters provided in IE HA-GNSS-Metrics are used as specified for sentence type GGA in [xx]”, we should be compliant to that standard. I don’t see GGA sentence being specific to HA-GNSS. GGA is specific to GPS, while other sentences are defined for other GNSS. |
| Ericsson | GGA is generic – it is the talked ID prefix that indicates which GNSS that is concerned, where GP is GPS, GB is Beidou etc and GN is multi-GNSS. As discussed above, we made the same generalization as for the RTCM and Compact SSR references. |
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At the time of the short deadline, in total 16 companies have been active and only one company not supportive. All the technical argument were sorted out already in the at meeting email discussion 628, reported in R2-2206444. The email discussion has converged to the CR in R2-2206841 for RAN#96.

# Conclusion

The post meeting email discussion 601 has at the short deadline converged to the CR in R2-2206841 for RAN#96.

# References

[1] [R2-2206329](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Inbox/R2-2206329.zip) Remaining details for high-precision GNSS reporting, ESA, Ericsson, Deutsche Telecom, T-Mobile USA, Swift Navigation, Hexagon, MediaTek Inc., u-blox

[2] Draft R2-2206444 CR#0349 NMEA GGA sentence info in high accuracy GNSS location estimates [HR-GNSS-NMEA]

[3] Draft R2-2206444 v2 CR#0349 NMEA GGA sentence info in high accuracy GNSS location estimates [HR-GNSS-NMEA]

[4] R2-2206444 CR#0349 NMEA GGA sentence info in high accuracy GNSS location estimates [HA-GNSS-NMEA]