**3GPP TSG- Meeting #-bis-e**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.305** | **CR** |  | **rev** |  | **Current version:** | **15.9.0** |  |
|  | | | | | | | | |
| *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 | **X** |

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| ***Title:*** | APC clarification for SSR positioning | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos-Core | | | | |  | ***Date:*** | | | 2023-04-1x |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | 15 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | **APC:** LPP inherited the same behaviour from CLAS such that the NW should attempt to minimise the APC error given the UE does not apply any PCO/PCV correction, i.e. the UE must not apply any PCO/PCV correction from an external source. Unfortunately the CLAS specification itself is not explicit about this behaviour but it should be clarified in LPP to avoid the possibility of interoperability issues.  The meaning of the satellite ARP with respect to the orbit corrections and satellite APC is also not defined in CLAS or LPP. Similar to recent work in RTCM, we think it’s helpful to clarify that the UE should make no assumptions about satellite ARP given satellite ARP is implicit to the orbit correction itself. | | | | | | | | |
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| ***Summary of change:*** | | **APC:** Describe how the satellite ARP and satellite APC are to be interpreted with respect to the Satellite Orbit Corrections.  Impacted functionality  SSR Orbit Corrections  Inter-operability:  This is to correct an ambiguity in the specification which could lead to different implementations which cannot inter-operate. | | | | | | | | |
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| ***Consequences if not approved:*** | | **APC:** If the UE and NW adopt different interpretations of how the APC has been handled it may result in significant positioning errors (up to several decimeters) given the UE may assume that some APC errors have been corrected by the NW when they have not, or the UE may apply an APC model locally despite the NW already correcting for APC. | | | | | | | | |
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| ***Clauses affected:*** | | 8.1.2.1.21 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

START OF CHANGE

**/\*\*Skip unmodified parts\*\*/**

##### 8.1.2.1.21 SSR Orbit Corrections

SSR Orbit Corrections provides the GNSS receiver with parameters for orbit corrections in radial, along-track and cross-track components. These orbit corrections are used to compute a satellite position correction, to be combined with satellite position ­calculated from broadcast ephemeris (see clause 8.1.2.1.7).

The orbit corrections define an offset between the broadcast ephemeris orbit and a satellite antenna reference point (ARP) to which the other corrections refer. The exact definition of the reference point along the satellite antenna is implementation-defined by the service provider and use of all corrections together shall yield a consistent solution.

The UE should not apply any additional corrections for the Satellite Antenna Phase Center (APC) such as Phase Center Offset (PCO) or Phase Center Variation (PCV) corrections. The service provider may form the SSR corrections to minimise the impact of Satellite APC effects on the UE.

For integrity purposes, SSR Orbit Corrections also provides the correlation time for orbit error and orbit error rate, and the mean and standard deviation that bounds the residual Orbit Error and its associated error rate. The SSR Orbit Corrections also includes the satellite and constellation residual risks. These residual risks are the aggregate residual risk for the satellite or constellation Signal in Space including Orbit, Clock, Bias and all other satellite or constellation feared events, but excluding atmospheric effects.

When applying the integrity bounds as per 8.1.1a, the mean and stdDev must be calculated by projecting the Orbit error mean and variance along the line-of-sight vector between the satellite and the user, according to the following formula:

*stdDevorbit =* (Equation 8.1.2.1.21-1)

*meanorbit =*

where: *I*: 3-D line of sight vector from the user to the satellite in the WGS-84 ECEF coordinate frame.

R: the rotation matrix from satellite along-track (AT), cross-track (CT) and radial (RA) coordinates into the WGS-84 ECEF coordinate frame. RT denotes the transposed matrix.

*v*: the 3-D Orbit error variance vector expressed in satellite along-track, cross-track and radial coordinates.

*μ*: the Mean Orbit Error vector expressed in satellite along-track, cross-track and radial coordinates.

The vector v is expressed in the SSR Orbit Corrections as the three elements in the Variance Orbit Residual Error Vector.

*END OF CHANGE*