TSG-RAN Meeting #19 ***RP-030187***
Birmingham, UK, 11 - 14 March 2003

Title: **CRs (R'99 and Rel-4/Rel-5 Category A) on GPS navigation model update mechanism.**

Source: **Nokia**

Agenda item: **8.2.3**

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Workitem
25.331	1904	1	R99	Correction on GPS navigation model update mechanism	F	3.13.0	3.14.0	TEI
25.331	1905	1	Rel-4	Correction on GPS navigation model update mechanism	A	4.8.0	4.9.0	TEI
25.331	1906	1	Rel-5	Correction on GPS navigation model update mechanism	A	5.3.0	5.4.0	TEI

3GPP TSG-RAN Meeting #19
Birmingham, UK, 11-14 March 2003

Tdoc ⌘RP-030187

CR-Form-v7

CHANGE REQUEST

⌘ **25.331** **CR** **1907** ⌘ **rev** **-** ⌘ Current version: **3.13.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	GPS navigation model update mechanism
Source:	⌘	Nokia
Work item code:	⌘	TEI
Date:	⌘	13/03/2003
Category:	⌘	**F**
Release:	⌘	R99

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction 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.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*

Reason for change: ⌘

In GERAN#10, GP-022107 was agreed. That CR removed certain GPS assistance data parameters from GSM R98 (delta PRC2, delta PRC3, delta RRC2, and delta RRC3). The motivation in that CR applies equally well to UTRAN:

The GPS constellation does not guarantee broadcast satellite ephemeris udpates at regular predictable intervals. The present method inserted in the standard for delivery of PRC/RRC (current ephemeris issue) and the delta PRC2/RRC2 (two issues of ephemeris in the past) and the delta PRC3/RRC3 (three issues of ephemeris in the past) will only work if the GPS system updates the ephemeris on periodic even intervals (example, every two hour period) because the present method does not identify the IODEs of the ephemeris associated with delta PRC2/RRC2 and delta PRC3/RRC3. The UE can only identify a time-based rule to application of delta PRC2/RRC2 and delta PRC3/RRC3 based on time – toe calculation, which of course only works if the updates are regular periodic. Recent data observations from the GPS constellation prove that the broadcast satellite ephemeris does not update at predictable periodic intervals. To illustrate the problem, the following sequence of ephemeris updates was observed on Feb 22, 2002 for SVID 1. Other similar sequences were observed throughout a 3 day period. The TOW refers to the time in which the GPS receiver obtained a new ephemeris set. The IODE and TOE elements are the new ephemeris IODE and TOE values for the new ephemeris elements. ΔTOW and ΔTOE refer to the change in the parameter since the last update.

IODE	TOW	TOE	ΔTOW	ΔTOE
80	28800	35984		
81	36000	43200	7200 sec	7216 sec
82	43200	50400	7200 sec	7200 sec

104	47520	50384	4320 sec	-16 sec
105	50400	57584	2880 sec	7200 sec

During a 3 day period of observation approximately 10% of the ephemeris update cases showed this a-periodic behaviour of TOW and/or TOE. The toe parameter on each subsequent update does not always march forward on every IODE change. Likewise, the time in which the ephemeris is updated does not occur at even 2 hour intervals.

The present specification describes populating the delta PRC2/RRC2 and delta PRC3/RRC3 fields based on ephemeris 2 issues and 3 issues ago respectively and does not transmit the IODEs associated with the delta PRC2/RRC2 and delta PRC3/RRC3 parameters.

Summary of change:	⌘	Delta PRC2, delta PRC3, delta RRC2, and delta RRC3 are “removed”. **Impact Analysis** ASN.1 modifications are backwards compatible. The change has isolated impact to GPS navigation model update mechanism.
Consequences if not approved:	⌘	The navigation model update mechanism does not work. The UE cannot use the Delta PRC2/RRC2 and Delta PRC3/RRC3 values for updating the navigation model of a satellite as the present method does not identify the IODEs associated with Delta PRC2/RRC2 and Delta PRC3/RRC3. The UE can only identify a time-based rule to application of Delta PRC2/RRC2 and Delta PRC3/RRC3 based on time – toe calculation, which only works if the updates are regular periodic.

Clauses affected:	⌘	8.1.1.6.15.1, 10.3.7.91, 11.3				
		Y	**N**			
Other specs affected:	⌘		X	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

8.1.1.6.15.1 System Information Block type 15.1

The UE should store all the relevant IEs included in this system information block in variable UE_POSITIONING_GPS_DATA. The UE shall:

1> act on "DGPS information" in the IE "DGPS Corrections" in a similar manner as specified in [13] except that the scale factors for PRC and RRC are different~~. In addition, the IE group DGPS information also includes Delta PRC2 and Delta RRC2. Delta PRC2 is the difference in the pseudorange correction between the satellite's ephemeris identified by IODE and the previous ephemeris two issues ago IODE. 2. Delta RRC2 is the difference in the pseudorange rate-of-change correction between the satellite's ephemeris identified by IODE and IODE 2. These two additional IEs can extend the life of the raw ephemeris data up to 6 hours. If the IEs "Delta PRC3" and "Delta RRC3" are included, UE may use them as appropriate e.g. to extend the life of the raw ephemeris data up to 8 hours~~;

1> act upon the received IE " UE Positioning GPS DGPS corrections" as specified in subclause 8.6.7.19.3.3.

In this version of the specification, the UE shall:

1> ignore the following IEs: "Delta PRC2", "Delta RRC2", "Delta PRC3" and "Delta RRC3".

10.3.7.91 UE positioning GPS DGPS corrections

This IE contains DGPS corrections to be used by the UE.

Information Element/Group name	Need	Multi	Type and Reference	Semantics description
GPS TOW sec	MP		Integer(0..604799)	seconds GPS time-of-week when the DGPS corrections were calculated
Status/Health	MP		Enumerated(UDRE scale 1.0, UDRE scale 0.75, UDRE scale 0.5, UDRE scale 0.3, UDRE scale 0.2, UDRE scale 0.1, no data, invalid data)	
DGPS information	CV-*Status/Health*	1 to <maxSat>		If the Cipher information is included these fields are ciphered.
>SatID	MP		Enumerated (0…63)	
>IODE	MP		Integer(0..255)	
>UDRE	MP		Enumerated(UDRE ≤ 1.0 m, 1.0m < UDRE ≤ 4.0m, 4.0m < UDRE ≤ 8.0m, 8.0m < UDRE)	The value in this field shall be multiplied by the UDRE Scale Factor in the IE Status/Health to determine the final UDRE estimate for the particular satellite.
>PRC	MP		Real(-655.04..655.04 by step of 0.32)	meters (different from [13])
>RRC	MP		Real(-4.064..4.064 by step of 0.032)	meters/sec (different from [13])
>Delta PRC2	MP		Integer(-127..127)	~~Meters~~In this version of the protocol this IE should be set to zero and the UE shall ignore it.
>Delta RRC2	MP		Real(-0.224..0.224 by step of 0.032)	In this version of the protocol this IE should be set to zero and the UE shall ignore it.~~meters/sec~~
>Delta PRC3	~~CV-DCCH~~OP		Integer(-127..127)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters~~
>Delta RRC3	~~CV-DCCH~~OP		Real(-0.224..0.224 by step of 0.032)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters/sec~~

Condition	Explanation
Status/Health	This IE is mandatory present if "status" is not equal to "no data" or "invalid data", otherwise the IE is not needed.
~~*DCCH*~~	~~This IE is mandatory present if the IE " UE positioning GPS DGPS corrections" it is included in the point-to-point message. It is optional if the IE "UE positioning GPS DGPS corrections" is included in the broadcast message. Otherwise it is not needed.~~

11.3 Information element definitions

```
-- ************************************************
--
--     MEASUREMENT INFORMATION ELEMENTS (10.3.7)
--
-- ************************************************

DeltaPRC ::=                        INTEGER (-127..127)

-- Actual value DeltaRRC = IE value * 0.032
DeltaRRC ::=                        INTEGER (-7..7)

DGPS-CorrectionSatInfo ::=          SEQUENCE {
    satID                               SatID,
    iode                                IODE,
    udre                                UDRE,
    prc                                 PRC,
    rrc                                 RRC,
    -- dummy1 and dummy2 are not used in this version of the specification and should be ignored.
    dummy1deltaPRC2                         DeltaPRC,
    dummy2deltaRRC2                         DeltaRRC,
    -- dummy3 and dummy4 are not used in this version of the specification. They should not
    -- be sent and if received they should be ignored.
    dummy3deltaPRC3                         DeltaPRC            OPTIONAL,
    dummy4deltaRRC3                         DeltaRRC            OPTIONAL
}

DGPS-CorrectionSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        DGPS-CorrectionSatInfo
```

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CHANGE REQUEST

⌘ **25.331** **CR** **1908** ⌘**rev** **-** ⌘ Current version: **4.8.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

Title:	⌘	GPS navigation model update mechanism
Source:	⌘	Nokia
Work item code:	⌘	TEI
Date:	⌘	13/03/2003
Category:	⌘	**A**
Release:	⌘	Rel-4

Use one of the following categories:
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Use one of the following releases:

2	*(GSM Phase 2)*
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R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change: ⌘ In GERAN#10, GP-022107 was agreed. That CR removed certain GPS assistance data parameters from GSM R98 (delta PRC2, delta PRC3, delta RRC2, and delta RRC3). The motivation in that CR applies equally well to UTRAN:

The GPS constellation does not guarantee broadcast satellite ephemeris udpates at regular predictable intervals. The present method inserted in the standard for delivery of PRC/RRC (current ephemeris issue) and the delta PRC2/RRC2 (two issues of ephemeris in the past) and the delta PRC3/RRC3 (three issues of ephemeris in the past) will only work if the GPS system updates the ephemeris on periodic even intervals (example, every two hour period) because the present method does not identify the IODEs of the ephemeris associated with delta PRC2/RRC2 and delta PRC3/RRC3. The UE can only identify a time-based rule to application of delta PRC2/RRC2 and delta PRC3/RRC3 based on time – toe calculation, which of course only works if the updates are regular periodic. Recent data observations from the GPS constellation prove that the broadcast satellite ephemeris does not update at predictable periodic intervals. To illustrate the problem, the following sequence of ephemeris updates was observed on Feb 22, 2002 for SVID 1. Other similar sequences were observed throughout a 3 day period. The TOW refers to the time in which the GPS receiver obtained a new ephemeris set. The IODE and TOE elements are the new ephemeris IODE and TOE values for the new ephemeris elements. ΔTOW and ΔTOE refer to the change in the parameter since the last update.

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Clauses affected:	⌘	8.1.1.6.15.1, 10.3.7.91, 11.3			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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1> act upon the received IE " UE Positioning GPS DGPS corrections" as specified in subclause 8.6.7.19.3.3.

In this version of the specification, the UE shall:

1> ignore the following IEs: "Delta PRC2", "Delta RRC2", "Delta PRC3" and "Delta RRC3".

10.3.7.91 UE positioning GPS DGPS corrections

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Information Element/Group name	Need	Multi	Type and Reference	Semantics description
GPS TOW sec	MP		Integer(0..604799)	seconds GPS time-of-week when the DGPS corrections were calculated
Status/Health	MP		Enumerated(UDRE scale 1.0, UDRE scale 0.75, UDRE scale 0.5, UDRE scale 0.3, UDRE scale 0.2, UDRE scale 0.1, no data, invalid data)	
DGPS information	CV-*Status/Health*	1 to <maxSat>		If the Cipher information is included these fields are ciphered.
>SatID	MP		Enumerated (0…63)	
>IODE	MP		Integer(0..255)	
>UDRE	MP		Enumerated(UDRE ≤ 1.0 m, 1.0m < UDRE ≤ 4.0m, 4.0m < UDRE ≤ 8.0m, 8.0m < UDRE)	The value in this field shall be multiplied by the UDRE Scale Factor in the IE Status/Health to determine the final UDRE estimate for the particular satellite.
>PRC	MP		Real(-655.04..655.04 by step of 0.32)	meters (different from [13])
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>Delta PRC2	MP		Integer(-127..127)	~~Meters~~In this version of the protocol this IE should be set to zero and the UE shall ignore it.
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>Delta PRC3	~~CV-DCCH~~OP		Integer(-127..127)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters~~
>Delta RRC3	~~CV-DCCH~~OP		Real(-0.224..0.224 by step of 0.032)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters/sec~~

Condition	Explanation
Status/Health	This IE is mandatory present if "status" is not equal to "no data" or "invalid data", otherwise the IE is not needed.
~~*DCCH*~~	~~This IE is mandatory present if the IE " UE positioning GPS DGPS corrections" it is included in the point-to-point message. It is optional if the IE "UE positioning GPS DGPS corrections" is included in the broadcast message. Otherwise it is not needed.~~

11.3 Information element definitions

```
-- **************************************************
--
--     MEASUREMENT INFORMATION ELEMENTS (10.3.7)
--
-- **************************************************

DeltaPRC ::=                        INTEGER (-127..127)

-- Actual value DeltaRRC = IE value * 0.032
DeltaRRC ::=                        INTEGER (-7..7)

DGPS-CorrectionSatInfo ::=          SEQUENCE {
    satID                               SatID,
    iode                                IODE,
    udre                                UDRE,
    prc                                 PRC,
    rrc                                 RRC,
    -- dummy1 and dummy2 are not used in this version of the specification and should be ignored.
    dummy1deltaPRC2                         DeltaPRC,
    dummy2deltaRRC2                         DeltaRRC,
    -- dummy3 and dummy4 are not used in this version of the specification. They should not
    -- be sent and if received they should be ignored.
    dummy3deltaPRC3                         DeltaPRC            OPTIONAL,
    dummy4deltaRRC3                         DeltaRRC            OPTIONAL
}

DGPS-CorrectionSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        DGPS-CorrectionSatInfo
```

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CHANGE REQUEST

⌘ **25.331** **CR** **1909** ⌘**rev** **-** ⌘ Current version: **5.3.0** ⌘

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Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [ ]

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Source:	⌘	Nokia		
Work item code:	⌘	TEI	***Date:*** ⌘	13/03/2003
Category:	⌘	**A**	***Release:*** ⌘	Rel-5

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Reason for change: ⌘

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Clauses affected:	⌘	8.1.1.6.15.1, 10.3.7.91, 11.3			
		Y	**N**		
Other specs affected:	⌘		**X**	Other core specifications	⌘
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			X	O&M Specifications	
Other comments:	⌘				

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1> act upon the received IE " UE Positioning GPS DGPS corrections" as specified in subclause 8.6.7.19.3.3.

In this version of the specification, the UE shall:

1> ignore the following IEs: "Delta PRC2", "Delta RRC2", "Delta PRC3" and "Delta RRC3".

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This IE contains DGPS corrections to be used by the UE.

Information Element/Group name	Need	Multi	Type and Reference	Semantics description
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DGPS information	CV-*Status/Health*	1 to <maxSat>		If the Cipher information is included these fields are ciphered.
>SatID	MP		Enumerated (0…63)	
>IODE	MP		Integer(0..255)	
>UDRE	MP		Enumerated(UDRE ≤ 1.0 m, 1.0m < UDRE ≤ 4.0m, 4.0m < UDRE ≤ 8.0m, 8.0m < UDRE)	The value in this field shall be multiplied by the UDRE Scale Factor in the IE Status/Health to determine the final UDRE estimate for the particular satellite.
>PRC	MP		Real(-655.04..655.04 by step of 0.32)	meters (different from [13])
>RRC	MP		Real(-4.064..4.064 by step of 0.032)	meters/sec (different from [13])
>Delta PRC2	MP		Integer(-127..127)	~~Meters~~In this version of the protocol this IE should be set to zero and the UE shall ignore it.
>Delta RRC2	MP		Real(-0.224..0.224 by step of 0.032)	In this version of the protocol this IE should be set to zero and the UE shall ignore it.~~meters/sec~~
>Delta PRC3	~~CV-DCCH~~OP		Integer(-127..127)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters~~
>Delta RRC3	~~CV-DCCH~~OP		Real(-0.224..0.224 by step of 0.032)	This IE should not be included in this version of the protocol and if received the UE shall ignore it.~~meters/sec~~

Condition	Explanation
Status/Health	This IE is mandatory present if "status" is not equal to "no data" or "invalid data", otherwise the IE is not needed.
~~*DCCH*~~	~~This IE is mandatory present if the IE " UE positioning GPS DGPS corrections" it is included in the point-to-point message. It is optional if the IE "UE positioning GPS DGPS corrections" is included in the broadcast message. Otherwise it is not needed.~~

11.3 Information element definitions

```
-- **************************************************
--
--     MEASUREMENT INFORMATION ELEMENTS (10.3.7)
--
-- **************************************************

DeltaPRC ::=                        INTEGER (-127..127)

-- Actual value DeltaRRC = IE value * 0.032
DeltaRRC ::=                        INTEGER (-7..7)

DGPS-CorrectionSatInfo ::=          SEQUENCE {
    satID                               SatID,
    iode                                IODE,
    udre                                UDRE,
    prc                                 PRC,
    rrc                                 RRC,
-- dummy1 and dummy2 are not used in this version of the specification and should be ignored.
    dummy1deltaPRC2                             DeltaPRC,
    dummy2deltaRRC2                             DeltaRRC,
-- dummy3 and dummy4 are not used in this version of the specification. They should not
-- be sent and if received they should be ignored.
    dummy3deltaPRC3                             DeltaPRC            OPTIONAL,
    dummy4deltaRRC3                             DeltaRRC            OPTIONAL
}

DGPS-CorrectionSatInfoList ::=      SEQUENCE (SIZE (1..maxSat)) OF
                                        DGPS-CorrectionSatInfo
```