Technical Specification Group Services and System Aspects ***TSGS#18(02)0771***

Meeting #18, New Orleans, U.S.A., 9-12 December 2002

Source: **TSG SA WG2**
Title: **CRs on 03.32 and 23.032**
Agenda Item: **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #18.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

Tdoc #	Title	Spec	CR #	cat	Version in	REL	WI	S2 meeting
S2-023343	Coding of Maximum Offset and Included angle	03.32	007rev2	F	7.1.0	98	LCS	S2-28
S2-023344	Coding of Maximum Offset and Included angle	23.032	002rev2	A	3.1.0	99	LCS	S2-28
S2-023345	Coding of Maximum Offset and Included angle	23.032	003rev2	A	4.0.0	4	LCS	S2-28

3GPP TSG-SA2 #28 ***S2-023343***
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘	**03.32**	**CR**	**7**	⌘ **rev**	**2**	⌘ Current version:	**7.1.0** ⌘

*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 [X]

Title:	⌘ Coding of Maximum Offset and Included angle.		
Source:	⌘ SIEMENS AG		
Work item code:	⌘ LCS	***Date:*** ⌘	06/11/2002
Category:	⌘ **F**	***Release:*** ⌘	R98
	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: ⌘	It is ambiguous how the ranges for offset and included angle should be coded.
Summary of change: ⌘	It has been described, that there are different ranges for offset and included angle. Some editorial errors are also corrected. The decimal point in the related tables has been replaced by comma following the rules defined in TS21.801.
Consequences if not approved: ⌘	The angles for offset and included could be wrongly coded.

Clauses affected: ⌘	Section 5.7, 6.2, 6.4, 6.6, 6.7				
	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:

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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.

**************** First Modified Section ********************

5.7 Ellipsoid Arc

An ellipsoid arc is a shape characterised by the co-ordinates of an ellipsoid point *o* (the origin), innerouter radius *r1*, uncertaintyinner radius *r2*, both radii being geodesic distances over the surface of the ellipsoid, the offset angle (θ) between the first defining radius of the ellipsoid arc and North, and the included angle (β) being the angle between the first and second defining radii.start angle *a1* and stop angle *a2*. Start and stop angle, (*a1* and *a2*) are defined as the angle clockwise from north. The offset start angle is within the range of 0° to 359,999…° while the included stop angle is within the range from 0,000…1° to 360°. This is to be able to describe a full circle, 0° to 360°.

This shape-definition can also be used to describe a sector (inner radius equal to zero),; a circle (included angle equal to 360°) and other circular shaped areas. The confidence level with which the position of a target entity is included within the shape is also included.

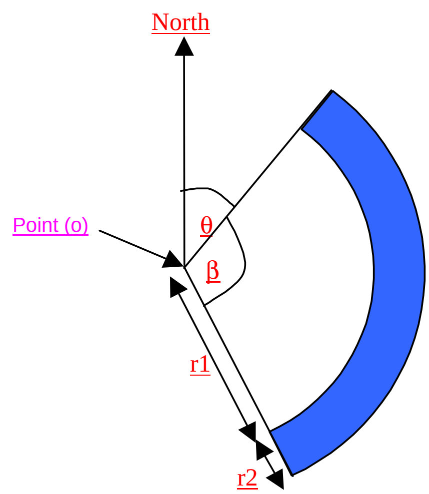

Figure 3c: Description of an Ellipsoid Arc

**************** Next Modified Section ********************

6 Coding

6.1 Point

The co-ordinates of an ellipsoid point are coded with an uncertainty of less than 3 metres

The latitude is coded with 24 bits: 1 bit of sign and a number between 0 and 2^{23}-1 coded in binary on 23 bits. The relation between the coded number N and the range of (absolute) latitudes X it encodes is the following (X in degrees):

$$N \le \frac{2^{23}}{90} X < N + 1$$

except for N=2^{23}-1, for which the range is extended to include N+1.

The longitude, expressed in the range -180°, +180°, is coded as a number between -2^{23} and 2^{23}-1, coded in 2's complement binary on 24 bits. The relation between the coded number N and the range of longitude X it encodes is the following (X in degrees):

$$N \le \frac{2^{24}}{360} X < N + 1$$

6.2 Uncertainty

A method of describing the uncertainty for latitude and longitude has been sought which is both flexible (can cover wide differences in range) and efficient. The proposed solution makes use of a variation on the Binomial expansion. The uncertainty *r*, expressed in metres, is mapped to a number K, with the following formula:

$$r = C\left((1 + x)^K - 1\right)$$

with C = 10 and x = 0,1. With 0 ≤ K ≤ 127, a suitably useful range between 0 and 1800 kilometres is achieved for the uncertainty, while still being able to code down to values as small as 1 metre. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 1: Example values for the uncertainty Function

Value of K	Value of uncertainty
0	0 m
1	1 m
2	2,.1 m
-	-
20	57,.3 m
-	-
40	443 m
-	-
60	3 km
-	-
80	20 km
-	-
100	138 km
-	-
120	927 km
-	-
127	1800 km

6.3 Altitude

Altidude is encoded in increments of 1 meter using a 15 bit binary coded number N. The relation between the number N and the range of altitudes *a* (in metres) it encodes is described by the following equation;

$$N \le a < N+1$$

except for N=2^{15}-1 for which the range is extended to include all greater values of *a.*

The direction of altitude is encoded by a single bit with bit value 0 representing height above the WGS84 ellipsoid surface and bit value 1 representing depth below the WGS84 ellipsoid surface.

6.4 Uncertainty Altitude

The uncertainty in altitude, h, expressed in metres is mapped from the binary number K, with the following formula:

$$h = C\left((1+x)^{K} - 1\right)$$

with C = 45 and x = 0.025. With 0 ≤ K ≤ 127, a suitably useful range between 0 and 990 meters is achieved for the uncertainty altitude,. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 2: Example values for the uncertainty altitude Function

Value of K	Value of uncertainty altitude
0	0 m
1	1.13 m
2	2.28 m
-	-
20	28.7 m
-	-
40	75.8 m
-	-
60	153.0 m
-	-
80	279.4 m
-	-
100	486.6 m
-	-
120	826.1 m
-	-
127	990.5 m

6.5 Confidence

The confidence by which the position of a target entity is known to be within the shape description, (expressed as a percentage) is directly mapped from the 7 bit binary number K, except for K=0 which is used to indicate 'no information', and 100 < K ≤128 which should not be used but may be interpreted as "no information" if received.

6.6 Radius

Inner Rradius is encoded in increments of 5 meters using a 16 bit binary coded number N. The relation between the number N and the range of radius *r* (in metres) it encodes is described by the following equation;

$$5N \le r < 5(N+1)$$

Except for N=2^{16}-1 for which the range is extended to include all greater values of *r*. This provides a true maximum radius of 327675 meters.

The uncertainty radius is encoded as for the uncertainty latitude and longitude.

6.7 Angle

Offset and Included Aangle areis encoded in increments of 21° using an 98 bit binary coded number N in the range 0 to 179. The relation between the number N and the range of offset (ao) and included (ai) angles a (in degrees) it encodes is described by the following equations;

Offset angle (ao)

2 N <= ao < 2 (N+1) Accepted values for ao are within the range from 0 to 359,9...9 degrees.

Included angle (ai)

2 N < ai <= 2 (N+1) Accepted values for ai are within the range from 0,0...1 to 360 degrees.

2 N ≤ a < 2 (N+1) $N \le a < N+1$

Accepted values foron *a* are within the range from 0 to 360 degrees.

3GPP TSG-SA2 #28 **_S2-023345_**
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘	**23.032**	**CR**	**3**	⌘ **rev**	**2**	⌘	Current version:	**4.0.0**	⌘

*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 [X]

Title:	⌘	Coding of Maximum Offset and Included angle.
Source:	⌘	SIEMENS AG
Work item code:	⌘	LCS
Date:	⌘	06/11/2002
Category:	⌘	**A**
Release:	⌘	Rel-4

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:	⌘	It is ambiguous how the ranges for offset and included angle should be coded.
Summary of change:	⌘	It has been described, that there are different ranges for offset and included angle. The decimal point in the related tables has been replaced by comma following the rules defined in TS21.801.
Consequences if not approved:	⌘	The angles for offset and included could be wrongly coded.

Clauses affected:	⌘	Section 5.7, 6.2, 6.4, 6.7

		Y	N		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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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.

**************** First Modified Section ********************

5.7 Ellipsoid Arc

An ellipsoid arc is a shape characterised by the co-ordinates of an ellipsoid point *o* (the origin), inner radius *r1*, uncertainty radius *r2*, both radii being geodesic distances over the surface of the ellipsoid, the offset angle (θ) between the first defining radius of the ellipsoid arc and North, and the included angle (β) being the angle between the first and second defining radii. The offset angle is within the range of 0° to 359,999…° while the included angle is within the range from 0,000…1° to 360°. This is to be able to describe a full circle, 0° to 360°.

This shape-definition can also be used to describe a sector (inner radius equal to zero), a circle (included angle equal to 360°) and other circular shaped areas. The confidence level with which the position of a target entity is included within the shape is also included.

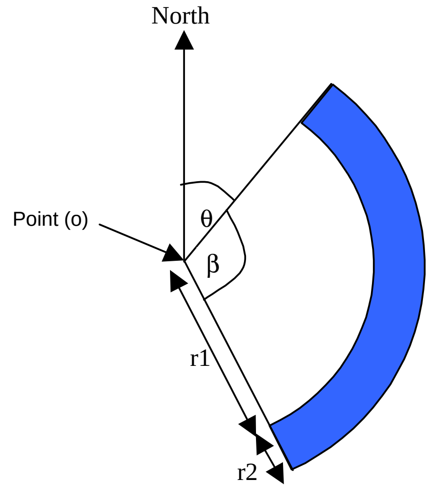

Figure 3c: Description of an Ellipsoid Arc

**************** Next Modified Section ********************

6 Coding

6.1 Point

The co-ordinates of an ellipsoid point are coded with an uncertainty of less than 3 metres.

The latitude is coded with 24 bits: 1 bit of sign and a number between 0 and 2^{23}-1 coded in binary on 23 bits. The relation between the coded number N and the range of (absolute) latitudes X it encodes is the following (X in degrees):

$$N \le \frac{2^{23}}{90} X < N+1$$

except for N=2^{23}-1, for which the range is extended to include N+1.

The longitude, expressed in the range -180°, +180°, is coded as a number between -2^{23} and $2^{23}-1$, coded in 2's complement binary on 24 bits. The relation between the coded number N and the range of longitude X it encodes is the following (X in degrees):

$$N \le \frac{2^{24}}{360} X < N + 1$$

6.2 Uncertainty

A method of describing the uncertainty for latitude and longitude has been sought which is both flexible (can cover wide differences in range) and efficient. The proposed solution makes use of a variation on the Binomial expansion. The uncertainty *r*, expressed in metres, is mapped to a number K, with the following formula:

$$r = C\left((1+x)^K - 1\right)$$

with C = 10 and x = 0,1. With $0 \le K \le 127$, a suitably useful range between 0 and 1800 kilometres is achieved for the uncertainty, while still being able to code down to values as small as 1 metre. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 1: Example values for the uncertainty Function

Value of K	Value of uncertainty
0	0 m
1	1 m
2	2,1 m
-	-
20	57,3 m
-	-
40	443 m
-	-
60	3 km
-	-
80	20 km
-	-
100	138 km
-	-
120	927 km
-	-
127	1800 km

6.3 Altitude

Altitude is encoded in increments of 1 meter using a 15 bit binary coded number N. The relation between the number N and the range of altitudes *a* (in metres) it encodes is described by the following equation:

$$N \le a < N + 1$$

except for $N=2^{15}-1$ for which the range is extended to include all greater values of *a*.

The direction of altitude is encoded by a single bit with bit value 0 representing height above the WGS84 ellipsoid surface and bit value 1 representing depth below the WGS84 ellipsoid surface.

6.4 Uncertainty Altitude

The uncertainty in altitude, h, expressed in metres is mapped from the binary number K, with the following formula:

$$\mathrm{h} = \mathrm{C}\left((1+\mathrm{x})^{\mathrm{K}} - 1\right)$$

with C = 45 and x = 0,~~.~~025. With 0 ≤ K ≤ 127, a suitably useful range between 0 and 990 meters is achieved for the uncertainty altitude. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 2: Example values for the uncertainty altitude Function

Value of K	Value of uncertainty altitude
0	0 m
1	1,~~.~~13 m
2	2,~~.~~28 m
-	-
20	28,~~.~~7 m
-	-
40	75,~~.~~8 m
-	-
60	153,~~.~~0 m
-	-
80	279,~~.~~4 m
-	-
100	486,~~.~~6 m
-	-
120	826,~~.~~1 m
-	-
127	990,~~.~~5 m

6.5 Confidence

The confidence by which the position of a target entity is known to be within the shape description, (expressed as a percentage) is directly mapped from the 7 bit binary number K, except for K=0 which is used to indicate 'no information', and 100 < K ≤128 which should not be used but may be interpreted as "no information" if received.

6.6 Radius

Inner radius is encoded in increments of 5 meters using a 16 bit binary coded number N. The relation between the number N and the range of radius r (in metres) it encodes is described by the following equation:

$$5N \le r < 5(N+1)$$

Except for $N=2^{16}-1$ for which the range is extended to include all greater values of r. This provides a true maximum radius of 327,675 meters.

The uncertainty radius is encoded as for the uncertainty latitude and longitude.

6.7 Angle

Offset and Included angle are encoded in increments of 2° using an 8 bit binary coded number N in the range 0 to 179. The relation between the number N and the range offset (ao) and included (ai) of angles ~~*a*~~ (in degrees) it encodes is described by the following equations:

Offset angle (ao)

2 N <= ao < 2 (N+1) Accepted values for ao are within the range from 0 to 359,9...9 degrees.

Included angle (ai)

2 N < ai <= 2 (N+1) Accepted values for ai are within the range from 0,0...1 to 360 degrees.

~~2 N ≤ a < 2 (N+1)~~

~~Accepted values for *a* are within the range from 0 to 360 degrees.~~

3GPP TSG-SA2 #28 **_S2-023344_**
Bangkok, Thailand, 11 – 15 November 2002

CR-Form-v7

CHANGE REQUEST

⌘	**23.032**	**CR**	**2**	⌘ **rev**	**2**	⌘ Current version:	**3.1.0** ⌘

*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 [X]

Title: ⌘	Coding of Maximum Offset and Included angle.		
Source: ⌘	SIEMENS AG		
Work item code: ⌘	LCS	***Date:*** ⌘	06/11/2002
Category: ⌘	**A**	***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: ⌘	It is ambiguous how the ranges for offset and included angle should be coded.
Summary of change: ⌘	It has been described, that there are different ranges for offset and included angle. The decimal point in the related tables has been replaced by comma following the rules defined in TS21.801
Consequences if not approved: ⌘	The angles for offset and included could be wrongly coded.

Clauses affected: ⌘	Section 5.7, 6.2, 6.4, 6.7			
	Y	**N**		
Other specs affected: ⌘		**X**	Other core specifications	⌘
		X	Test specifications	
		X	O&M Specifications	
Other comments: ⌘				

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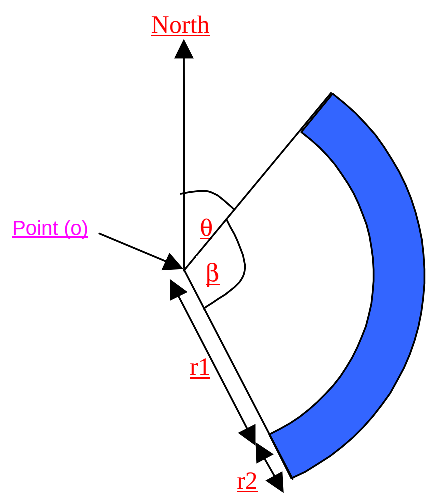

Figure 3c: Description of an Ellipsoid Arc

**************** Next Modified Section ********************

6 Coding

6.1 Point

The co-ordinates of an ellipsoid point are coded with an uncertainty of less than 3 metres.

The latitude is coded with 24 bits: 1 bit of sign and a number between 0 and 2^{23}-1 coded in binary on 23 bits. The relation between the coded number N and the range of (absolute) latitudes X it encodes is the following (X in degrees):

$$N \le \frac{2^{23}}{90} X < N + 1$$

except for N=2^{23}-1, for which the range is extended to include N+1.

The longitude, expressed in the range -180°, +180°, is coded as a number between -2^{23} and 2^{23}-1, coded in 2's complement binary on 24 bits. The relation between the coded number N and the range of longitude X it encodes is the following (X in degrees):

$$N \le \frac{2^{24}}{360} X < N + 1$$

6.2 Uncertainty

A method of describing the uncertainty for latitude and longitude has been sought which is both flexible (can cover wide differences in range) and efficient. The proposed solution makes use of a variation on the Binomial expansion. The uncertainty *r*, expressed in metres, is mapped to a number K, with the following formula:

$$r = C\left((1 + x)^K - 1\right)$$

with C = 10 and x = 0,1. With 0 ≤ K ≤ 127, a suitably useful range between 0 and 1800 kilometres is achieved for the uncertainty, while still being able to code down to values as small as 1 metre. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 1: Example values for the uncertainty Function

Value of K	Value of uncertainty
0	0 m
1	1 m
2	2.1 m
-	-
20	57.3 m
-	-
40	443 m
-	-
60	3 km
-	-
80	20 km
-	-
100	138 km
-	-
120	927 km
-	-
127	1800 km

6.3 Altitude

Altitude is encoded in increments of 1 meter using a 15 bit binary coded number N. The relation between the number N and the range of altitudes *a* (in metres) it encodes is described by the following equation:

$$N \leq a < N + 1$$

except for $N=2^{15}-1$ for which the range is extended to include all greater values of *a*.

The direction of altitude is encoded by a single bit with bit value 0 representing height above the WGS84 ellipsoid surface and bit value 1 representing depth below the WGS84 ellipsoid surface.

6.4 Uncertainty Altitude

The uncertainty in altitude, h, expressed in metres is mapped from the binary number K, with the following formula:

$$h = C\left((1+x)^{K} - 1\right)$$

with *C* = 45 and *x* = 0,.025. With 0 ≤ K ≤ 127, a suitably useful range between 0 and 990 meters is achieved for the uncertainty altitude. The uncertainty can then be coded on 7 bits, as the binary encoding of K.

Table 2: Example values for the uncertainty altitude Function

Value of K	Value of uncertainty altitude
0	0 m
1	1,.13 m
2	2,.28 m
-	-
20	28,.7 m
-	-
40	75,.8 m
-	-
60	153,.0 m
-	-
80	279,.4 m
-	-
100	486,.6 m
-	-
120	826,.1 m
-	-
127	990,.5 m

6.5 Confidence

The confidence by which the position of a target entity is known to be within the shape description, (expressed as a percentage) is directly mapped from the 7 bit binary number K, except for K=0 which is used to indicate 'no information', and 100 < K ≤128 which should not be used but may be interpreted as "no information" if received.

6.6 Radius

Inner radius is encoded in increments of 5 meters using a 16 bit binary coded number N. The relation between the number N and the range of radius *r* (in metres) it encodes is described by the following equation:

$$5N \leq r < 5(N + 1)$$

Except for $N=2^{16}-1$ for which the range is extended to include all greater values of *r*. This provides a true maximum radius of 327,675 meters.

The uncertainty radius is encoded as for the uncertainty latitude and longitude.

6.7 Angle

Offset and Included angle are encoded in increments of 2° using an 8 bit binary coded number N in the range 0 to 179. The relation between the number N and the range of offset (ao) and included (ai) angles *a* (in degrees) it encodes is described by the following equations:

Offset angle (ao)

2 N <= ao < 2 (N+1) Accepted values for ao are within the range from 0 to 359,9...9 degrees.

Included angle (ai)

2 N < ai <= 2 (N+1) Accepted values for ai are within the range from 0,0...1 to 360 degrees.

~~2 N ≤ a < 2 (N+1)~~

~~Accepted values for *a* are within the range from 0 to 360 degrees.~~