3GPP TSG SA WG3 Security — S3#37 **S3-050023**
21 - 25 February 2005
Sophia Antipolis, France

3GPP TSG GERAN #23 **Tdoc GP-050599**
Tampa, Florida, 24th – 28th January 2005

Title: **Ciphering of access bursts on VGCS channel**
Release: Rel-6

Source: GERAN2
To: SA3

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Attachments: Tdoc GP-050533

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1. Overall Description:

3GPP TSG GERAN WG2 would like to inform 3GPP TSG SA WG3 that a correction on the sending of access bursts (eg HANDOVER ACCESS, UPLINK ACCESS) on ciphered VGC channels has been discussed. The correction clarifies that the access bursts are not ciphered on a ciphered group channel (see attached Tdoc GP-050533).
It is unclear to 3GPP TSG GERAN WG2 if not ciphering the access bursts could be a potential and acceptable security threat to the system.

2. Action:

3GPP TSG GERAN WG2 kindly asks 3GPP TSG SA WG3 to review and endorse the attached CR. In order to solve the issue in Rel-6 timeframe, 3GPP TSG GERAN WG2 kindly asks SA3 to confirm whether the CR is acceptable before the TSG-GERAN WG2 Meeting #24. In case the proposed change is not acceptable TSG-GERAN WG2 kindly asks SA3 to provide an answer earlier.

3. Date of Next TSG-GERAN2 Meetings:

TSG-GERAN WG2 Meeting #23bis	07 – 11 March 2005	Helsinki, Finland
TSG-GERAN WG2 Meeting #24	05 – 07 April 2005	Dublin, Ireland

3GPP TSG-GERAN Meeting #23
Tampa, Florida (U.S.A.), 24-28 January 2005

Tdoc ⌘GP-050533

CR-Form-v7.1

CHANGE REQUEST

⌘ **44.018** **CR** **399** ⌘ **rev** **1** ⌘ Current version: **6.10.1** ⌘

*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:	⌘	Access bursts on VGCS channel
Source:	⌘	Siemens
Work item code:	⌘	TEI6
Date:	⌘	26/01/2005
Category:	⌘	**F**
Release:	⌘	*Rel-6*

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:

Ph2	*(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)*
Rel-7	*(Release 7)*

Reason for change:	⌘	It is not stated whether the access bursts that are sent on the group channel are ciphered.
Summary of change:	⌘	State that the access bursts are unciphered on the VGCS channel
Consequences if not approved:	⌘	Handover access failure and Uplink Access failure.

Clauses affected:	⌘	3.3.1.2.1.2, 3.4.4.2.3, 3.4.4.2.4, 3.4.15.1.3

	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.

3.3.1.2 Entering the group transmit mode: uplink access procedure

Only applicable for mobile stations supporting "VGCS transmit".

The purpose of the uplink control procedure is to establish an RR connection on a VGCS channel between a mobile station which is in group receive mode on that channel and the network.

The mobile station enters the group transmit mode when a successful establishment of the RR connection is indicated. The channel mode assumed by the mobile station is the one derived from the channel description.

3.3.1.2.1 Mobile station side

3.3.1.2.1.1 Uplink investigation procedure

The mobile station in group receive mode shall consider the uplink as free if the last message indicating the uplink as being free was received less than 480 ms ago and if no UPLINK BUSY message has been received since the last message indicating the uplink as free.

On receipt of a request from the upper layer to access the uplink and if the uplink is not free, the mobile station starts the timer T3128.

If the uplink is free or becomes free before expiry of timer T3128, then the uplink investigation procedure is terminated, the mobile station shall stop T3128, and start the uplink access procedure.

NOTE: The start of the uplink access procedure is not subject to the access class of the mobile station.

If the uplink is not indicated free before the timer expires, the mobile station shall remain in the group receive mode and indicate a reject of the uplink request to the upper layer.

3.3.1.2.1.2 Uplink access procedure

The mobile station shall send UPLINK ACCESS messages on the voice group call channel with the appropriate establishment cause. These messages shall be sent unciphered. The first UPLINK ACCESS message shall be transmitted by the mobile station with a random delay between 0 and 20 ms. The UPLINK ACCESS messages shall be repeated after a further period of 100ms plus a random delay between 0 and 20 ms.

The UPLINK ACCESS messages contain a random reference which is drawn randomly from a uniform probability distribution. The UPLINK ACCESS messages repetitions shall contain the same random reference as the one contained in the first message.

If an uplink identity code (UIC) of the current cell has been provided by the network in the UPLINK FREE message, the mobile station shall use this UIC IE for the coding of the UPLINK ACCESS messages (see 3GPP TS 45.003). If no UIC is provided, the mobile station shall use the BSIC received from the current cell, for instance from the initial synchronization.

Having sent the first UPLINK ACCESS message, the mobile station starts timer T3130. At expiry of timer T3130, the mobile station shall repeat the same procedure if the uplink is free. A maximum of three attempts is allowed and after that a rejection of the uplink request is indicated to the upper layers.

If no VGCS UPLINK GRANT or UPLINK BUSY message is received by the mobile station 480 ms after having sent the first UPLINK ACCESS message, the mobile station shall stop sending UPLINK ACCESS messages and wait in order to receive a VGCS UPLINK GRANT or UPLINK BUSY message.

On receipt of an VGCS UPLINK GRANT message corresponding to one of its UPLINK ACCESS messages, the mobile station stops T3130, stops sending UPLINK ACCESS messages, and establishes the main signalling link with an SABM containing the TALKER INDICATION message in the information field. The ciphering key sequence number shall be included in the TALKER INDICATION message. Early classmark sending shall be performed if applicable. If a UA is received containing the message sent, the mobile station enters the group transmit mode and indicates the successful seizure of the uplink to the upper layer. If a UA is received with a message different from the message sent, the mobile station shall remain in the group receive mode and indicate the rejection of the uplink request to the upper layers.

When receiving an UPLINK BUSY message or a VGCS UPLINK GRANT message aimed to another mobile station (i.e. not corresponding to one of its UPLINK ACCESS messages), the mobile station stops T3130 and stops sending UPLINK ACCESS messages. The mobile shall remain in the group receive mode and shall indicate a rejection of the uplink request to the upper layers.

3.3.1.2.2 Network side

On receipt of an UPLINK ACCESS message the network shall perform, if necessary, contention resolution and grant the uplink to one mobile station by sending a VGCS UPLINK GRANT message to the mobile station in unacknowledged mode on the main signalling link. Furthermore, the network shall provide UPLINK BUSY messages on the main signalling link in all cells of the group call area. After having sent the first message, the network starts T3115. If the timer expires before the reception of a correctly decoded frame from the MS, the network repeats the VGCS UPLINK GRANT message to the mobile station, reset and restarts timer T3115. If the VGCS UPLINK GRANT message has been repeated Ny2 times without a correctly decoded frame being received from the MS, the network shall stop sending VGCS UPLINK GRANT messages and provide an UPLINK FREE message on the main signalling channel and wait for a new UPLINK ACCESS message. The correct decoding of a frame means that the decoding algorithm and the error detection tests, if any, indicate no error.

After the data link layer is established, the RR entity of the network shall analyse the TALKER INDICATION message received from the mobile station, adapt the RR procedures to the new classmark if necessary and provide the mobile subscriber identity and ciphering key sequence number to the upper layer.

3.3.1.2.3 Abnormal cases

If a lower link failure has occurred or an indication of the release of the data link layer was provided by the lower layer and no RR release request was previously received from the upper layer, the network shall provide an UPLINK FREE message on the main signalling channel and wait for a new UPLINK ACCESS message.

3.4.4.2 Physical channel establishment

Four procedures are defined. The support of three of them is mandatory in the mobile station. The pseudo-synchronization case is optional in the mobile station. A pseudo-synchronized handover can be commanded only to a mobile station that can support it, as indicated in the classmark.

3.4.4.2.1 Finely synchronized cell case

If the mobile station knows that the timing advance with the new cell is not out of range, i.e. smaller than or equal to the maximum timing advance that can be coded as specified in 3GPP TS 44.004, or if the new cell does accept out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station proceeds as follows.

After having switched to the assigned channels, the mobile station sends four times the HANDOVER ACCESS message in four successive layer 1 frames on the main DCCH. This message is sent in an access burst. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. MS shall not send additional bursts on the SACCH.

It then activates the channels in sending and receiving mode and connects the channels if need be.

If applicable, ciphering is immediately started . The access bursts are not ciphered, including when sent on the group channel.

3.4.4.2.2 Non synchronized cell case

After having switched to the assigned channels, the mobile station starts repeating the HANDOVER ACCESS message in successive layer 1 frames on the main DCCH and optionally on the SACCH. This message is sent in an access burst.

Its content is reduced to the handover reference information element. The mobile station starts timer T3124 at the start point of the timeslot in which the HANDOVER ACCESS message is sent the first time on the main DCCH.

The mobile station then activates the channels in receiving mode and connects the channels if need be (only for reception).

If applicable, deciphering is then immediately started . The access bursts are not ciphered, including when sent on the group channel.

When the network has the RF characteristics that are necessary, it sends in unacknowledged mode a PHYSICAL INFORMATION message to the mobile station on the main DCCH. If applicable, ciphering and deciphering is immediately started (i.e., before even the reception of a correct access burst), and the message is sent enciphered.

The PHYSICAL INFORMATION message contains various physical layer related information, allowing a proper transmission by the mobile station.

When sending the PHYSICAL INFORMATION message, the network starts timer T3105. If this timer times out before the reception of a correctly decoded layer 2 frame in format A or B (see 3GPP TS 44.006), or a correctly decoded TCH frame from the mobile station, the network repeats the PHYSICAL INFORMATION message and restarts timer T3105. The maximum number of repetitions is Ny1.

The correct decoding of a frame means that the decoding algorithm and the error detection tests, if any, indicate no error.

When the mobile station receives a PHYSICAL INFORMATION message, it stops timer T3124, stops sending access bursts, activates the physical channels in sending and receiving mode and connects the channels if need be. If the allocated channel is an SDCCH (+ SACCH), performance of the mobile station must enable the mobile station to accept a correct PHYSICAL INFORMATION message sent by the network in any block while T3124 is running.

3.4.4.2.3 Pseudo-synchronized cell case

The details of the use of this procedure are described in 3GPP TS 45.010. The mobile station computes the timing advance to be used with the new cell from the real time difference value given in the HANDOVER COMMAND message. If the mobile station knows that the timing advance with the new cell is not out of range , i.e. smaller or equal to the maximum timing advance that can be coded as specified in 3GPP TS 44.004, or if the new cell accepts an out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station switches to the new channel and proceeds as follows.

After having switched to the assigned channels, the mobile station sends in four successive slots on the main DCCH a HANDOVER ACCESS message. This message is sent in random mode and thus does not follow the basic format. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. The MS shall not send additional bursts on the SACCH.

The mobile station then activates the channels in sending and receiving mode and connects the channels if need be. The mobile station may activate the channels in receiving mode and connect the channels while sending access bursts.

If applicable, ciphering is then immediately started. The access bursts are not ciphered, including when sent on the group channel.

3.4.4.2.4 Pre-synchronized cell case

The details of the use of this procedure are described in 3GPP TS 45.010. The mobile station switches to the new channel and proceeds as follows.

After having switched to the assigned channels, the mobile station sends in four successive slots on the main DCCH a HANDOVER ACCESS message. This message is sent in an access burst and thus does not follow the basic format. Its content is reduced to the handover reference information element. The transmission of these four messages is optional if so indicated by the network in the HANDOVER COMMAND message.

Before completion of the 4 access bursts on the DCCH, additional access bursts may also be sent on the SACCH.

In those cells that support extended TA values if TA value in new cell is greater than 63 and the HANDOVER COMMAND message indicates that the transmission of four HANDOVER ACCESS messages is optional the MS shall not transmit these four messages. MS shall not send additional bursts on the SACCH.

The mobile station then activates the channel in sending and receiving mode and connects the channels if need be. The timing advance value to be used with the new cell is:

- either the value contained in the HANDOVER COMMAND message if the timing advance information element is present; or
- the default value for pre-synchronized handover as defined in 3GPP TS 45.010, if the timing advance information element is not included in the HANDOVER COMMAND message. The MS may activate the channels in receiving mode and connect the channels while sending access bursts.

If applicable, ciphering is immediately started. The access bursts are not ciphered, including when sent on the group channel.

3.4.4.3 Handover completion

After lower layer connections are successfully established, the mobile station returns a HANDOVER COMPLETE message, specifying cause "normal event", to the network on the main DCCH.

The sending of this message on the mobile station side and its receipt on the network side allow the resumption of the transmission of signalling layer messages other than those for RR management.

When receiving the HANDOVER COMPLETE message, the network stops timer T3103 and releases the old channels.

If requested to do so in the HANDOVER COMMAND message, the mobile station includes the observed time difference it has measured when performing the handover, corrected by half the timing advance, in the HANDOVER COMPLETE message (detailed specifications are given in 3GPP TS 45.010).

If the new cell supports DTM and the mobile station was in DTM in the old cell or the network does not have enough information about the RR mode in the old cell, the network sends the DTM INFORMATION message on the main DCCH after the HANDOVER COMPLETE message has been received.

3.4.4.4 Abnormal cases

In the case of a synchronous or pseudo-synchronous handover, if the mobile station knows that the timing advance with the new cell is out of range, i.e. is bigger than the maximum timing advance that can be coded as specified in 3GPP TS 44.004, and if the new cell does not accept out of range timing advance as indicated in the HANDOVER COMMAND message, the mobile station sends a HANDOVER FAILURE message, cause "handover impossible, timing advance out of range", on the main signalling link and does not attempt that handover.

If the HANDOVER COMMAND message instructs the mobile station to use a Channel Description or Mode that it does not support, or if the Channel Mode to use is not defined for all channel sets, then the MS shall return a HANDOVER FAILURE message with cause "channel mode unacceptable", and the MS shall remain on the current channel(s) and uses the old Channel Description or Mode(s).

If the mobile station receives a HANDOVER COMMAND message containing an inconsistent MultiRateConfiguration IE, then the mobile station shall return a HANDOVER FAILURE message with cause "channel mode unacceptable", and the mobile station shall remain on the current channel(s) and uses the old Channel Description or Mode(s).

The MultiRate Configuration IE shall be considered as inconsistent by the MS if:

- the active set does not include any codec mode or the active set includes more than four codec modes; or
- one or more codec modes of the active codec set are not supported by the assigned channel; or
- the threshold and hysteresis values are not set according to requirements given in 3GPP TS 45.009.

If the HANDOVER COMMAND message instructs the mobile station to use a frequency that it is not capable of, then the mobile station shall return a HANDOVER FAILURE message with cause "frequency not implemented", and the mobile station shall remain on the current channel(s).

If the mobile station receives a HANDOVER COMMAND message with a Frequency List IE or Frequency Short List IE indicating frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send a HANDOVER FAILURE message with cause "frequency not implemented". If the mobile station receives a HANDOVER COMMAND message with a Mobile Allocation IE indexing frequencies that are not all in one band, then the mobile station shall stay on the current channel(s) and send a HANDOVER FAILURE message with cause "frequency not implemented".

NOTE: A HANDOVER COMMAND message sent to a multi band mobile station shall not be considered invalid because it indicates target channel frequencies that are all in a different frequency band to that of the ARFCN in the Cell Description IE.

On the mobile station side, if timer T3124 times out (only in the non- synchronized case) or if a lower layer failure happens on the new channel before the HANDOVER COMPLETE message has been sent, the mobile station deactivates the new channels, reactivates the old channels, reconnects the TCHs if any and triggers the establishment of the main signalling link. It then sends a HANDOVER FAILURE message on the main signalling link and resumes normal operation as if no handover attempt had occurred. The operational parameters (e.g. ciphering mode) when returning on the old channel are those applied before the HANDOVER COMMAND message was received.

When the HANDOVER FAILURE message has been received, the network releases the new channels if they were dedicated channels and stops timers T3105 and stops T3103 in the non-synchronized case. If the new channels were VGCS channels, they shall be maintained.

If a lower layer failure happens while attempting to connect back to the old channels, the standard rules are applied (cf. sub-clause 3.4.13.2 for dedicated mode and sub-clause 3.4.13.5 for group transmit mode).

On the network side, if timer T3103 elapses before either the HANDOVER COMPLETE message is received on the new channels, or a HANDOVER FAILURE message is received on the old channels, or the mobile station has re-established the call, the old channels are released if they were dedicated channels and all contexts related to the connections with that mobile station are cleared. If the old channel was a VGCS channel, it shall be maintained and the uplink shall be set free.

On the network side, if neither a correctly layer 2 frame in format A or B nor a correctly TCH frame have been received from the mobile station on the new channel, the newly allocated channels are released if they were dedicated channels. If the new channels were VGCS channels, they shall be maintained and the uplink shall be set free.

On the network side, lower layer failures occurring on the old channels after the sending of the HANDOVER COMMAND message are ignored. Lower layer failures occurring after the receipt of the SABM frame on the new main signalling link are treated following a general scheme (cf. sub-clause 3.4.13.2 for dedicated mode and sub-clause 3.4.13.5 for group transmit mode).

3.4.15.1.3 Uplink reply procedure

In Group Receive mode, on receipt of an UPLINK FREE message with an uplink access request indication from the network on the voice group call channel downlink, the mobile station shall send two UPLINK ACCESS messages on the voice group call channel with establishment cause "Reply on uplink access request" and then stop immediately transmitting on the uplink.

The first UPLINK ACCESS message shall be transmitted by the mobile station with a random delay between 0 and 20 ms. The second UPLINK ACCESS messages shall be repeated after a further period of 100 ms plus a random delay between 0 and 20 ms. The UPLINK ACCESS messages shall be sent unciphered.

If an uplink identity code (UIC) of the current cell has been provided by the network in the UPLINK FREE message, the mobile station shall use this UIC for the coding of the UPLINK ACCESS messages. If no UIC is provided, the mobile station shall use the BSIC received of the serving cell, for instance as received from the initial synchronization.