

**TSG-RAN Meeting #23
Phoenix, USA, 10-12 March 2004**

RP-040094

Title: CRs on 25.304 R'99 (and linked CRs from later releases)

Source: TSG-RAN WG2

Agenda item: 7.3.3

Spec	CR	Rev	Phase	Subject	Cat	Version-Current	Version-New	Doc-2nd-Level	Workitem
25.304	108	1	R99	H criteria & High mobility reselection	F	3.13.0	3.14.0	R2-040705	TEI
25.304	109	1	Rel-4	H criteria & High mobility reselection	A	4.7.0	4.8.0	R2-040706	TEI
25.304	110	1	Rel-5	H criteria & High mobility reselection	A	5.3.0	5.4.0	R2-040707	TEI
25.304	111	1	Rel-5	H criteria & High mobility reselection	A	6.0.0	6.1.0	R2-040708	TEI

3GPP TSG-RAN-WG2 Meeting #41
 Malaga, Spain, 16th-20st February 2004

Tdoc #R2-040705

CR-Form-v7	
CHANGE REQUEST	
# 25.304 CR 108 # rev 1 #	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 Radio Access Network Core Network

Title:	# H criteria & High mobility reselection		
Source:	# RAN WG2		
Work item code:	# TEI	Date:	# 18/02/2004
Category:	# F	Release:	# R99
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	# It is currently unclear whether a slow-moving UE in a network indicating support of HCS, shall reselect to a cell with higher priority when the H>=0 criteria is met for Treselection or when that cell has better quality than the serving cells. In the former, Treselection would be started as soon as a cell meets the H criteria, whilst in the latter Treselection would be started only when a cell has better quality than the serving cell.
Summary of change:	# Treselection shall be started when the H criteria is met.
Consequences if not approved:	# There may be interpretations that would only start Treselection when a cell is better ranked than the serving cell. This would mean that in co-located high-priority and low-priority cells, the UE may never reselect to a cell with higher priority. Impact analysis: If the UE starts Treselection only when a cell becomes better ranked than the serving cell, this may lead to the UE remaining permanently under lower priority cells, depending on the location of the UE in relation to the higher/lower priority cells. Such a UE would be required to change its implementation to start Treselection when the H criteria is met instead. This CR will not impact a UE that already starts Treselection when H>=0.

Clauses affected:	# 5.2.6.1.4								
Other specs affected:	#								
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 20px;">Y</td> <td style="text-align: center; width: 20px;">N</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">X</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">X</td> </tr> </table> Other core specifications # Test specifications # O&M Specifications #	Y	N	#	X	#	X	#	X
Y	N								
#	X								
#	X								
#	X								

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.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{meas,s} - Q_{hcs_s}$$

$$H_n = Q_{meas,n} - Q_{hcs_n} - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{meas,s} + Q_{hyst_s}$$

$$R_n = Q_{meas,n} - Q_{offset_{s,n}} - TO_n * (1 - L_n)$$

where:

$$TO_n = TEMP_OFFSET_n * W(PENALTY_TIME_n - T_n)$$

$$L_n = 0 \quad \text{if } HCS_PRIO_n = HCS_PRIO_s$$

$$L_n = 1 \quad \text{if } HCS_PRIO_n <> HCS_PRIO_s$$

$$W(x) = 0 \quad \text{for } x < 0$$

$$W(x) = 1 \quad \text{for } x \geq 0$$

$TEMP_OFFSET_n$ applies an offset to the H and R criteria for the duration of $PENALTY_TIME_n$ after a timer T_n has started for that neighbouring cell.

$TEMP_OFFSET_n$ and $PENALTY_TIME_n$ are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $HCS_PRIO_n <> HCS_PRIO_s$ and

$$Q_{meas,n} > Q_{hcs_n}$$

Or

- if $HCS_PRIO_n = HCS_PRIO_s$ and

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1_{s,n}}$$

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset2,s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1,s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S _n	Cell Selection value of the neighbouring cell, (dB)
Q _{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the <u>Cell_selection_and_reselection_quality_measure</u> information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection is fulfilled when:

for FDD cells:	Srxlev > 0 AND Squal > 0
for TDD cells:	Srxlev > 0
for GSM cells:	Srxlev > 0

Where :

Squal = Q _{qualmeas} – Q _{qualmin}
Srxlev = Q _{rxlevmeas} - Q _{rxlevmin} - P _{compensation}

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
Q _{qualmeas}	Measured cell quality value. The quality of the received signal expressed in CPICH E _c /N ₀ (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
Q _{rxlevmeas}	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Q _{qualmin}	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Q _{rxlevmin}	Minimum required RX level in the cell (dBm)
P _{compensation}	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_PRIO among those cells that fulfil the criterion $H \geq 0$. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).
- all cells, not considering HCS priority levels, if no cell fulfil the criterion $H \geq 0$. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Q_{offset1_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst1_s} is used for Q_{hyst_s} to calculate R_s .

If the usage of HCS is indicated in system information, $TEMP_OFFSET1_n$ is used for $TEMP_OFFSET_n$ to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Q_{offset2_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst2_s} is used for Q_{hyst_s} to calculate R_s . If the usage of HCS is indicated in system information, $TEMP_OFFSET2_n$ is used to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $T_{reselection}$. [For hierarchical cell structures when high mobility state has not been detected, if according to the HCS rules the serving cell is not ranked then all the ranked cells are considered to be better ranked than the serving cell.](#)
- more than 1 second has elapsed since the UE camped on the current serving cell.

3GPP TSG-RAN-WG2 Meeting #41
 Malaga, Spain, 16th-20st February 2004

Tdoc #R2-040706

CR-Form-v7	
CHANGE REQUEST	
# 25.304 CR 109 # rev 1 #	Current version: 4.7.0 #

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 Radio Access Network Core Network

Title:	# H criteria & High mobility reselection		
Source:	# RAN WG2		
Work item code:	# TEI	Date:	# 18/02/2004
Category:	# A	Release:	# Rel-4
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	# It is currently unclear whether a slow-moving UE in a network indicating support of HCS, shall reselect to a cell with higher priority when the H>=0 criteria is met for Treselection or when that cell has better quality than the serving cells. In the former, Treselection would be started as soon as a cell meets the H criteria, whilst in the latter Treselection would be started only when a cell has better quality than the serving cell.
Summary of change:	# Treselection shall be started when the H criteria is met.
Consequences if not approved:	# There may be interpretations that would only start Treselection when a cell is better ranked than the serving cell. This would mean that in co-located high-priority and low-priority cells, the UE may never reselect to a cell with higher priority. Impact analysis: If the UE starts Treselection only when a cell becomes better ranked than the serving cell, this may lead to the UE remaining permanently under lower priority cells, depending on the location of the UE in relation to the higher/lower priority cells. Such a UE would be required to change its implementation to start Treselection when the H criteria is met instead. This CR will not impact a UE that already starts Treselection when H>=0.

Clauses affected:	# 5.2.6.1.4								
Other specs affected:	#								
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 20px;">Y</td> <td style="text-align: center; width: 20px;">N</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> </table> Other core specifications # Test specifications # O&M Specifications #	Y	N	#	#	#	#	#	#
Y	N								
#	#								
#	#								
#	#								

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.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{\text{meas},s} - Q_{\text{hcs}_s}$$

$$H_n = Q_{\text{meas},n} - Q_{\text{hcs}_n} - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{\text{meas},s} + Q_{\text{hyst}_s}$$

$$R_n = Q_{\text{meas},n} - Q_{\text{offset}_{s,n}} - TO_n * (1 - L_n)$$

where:

$$TO_n = \text{TEMP_OFFSET}_n * W(\text{PENALTY_TIME}_n - T_n)$$

$$L_n = 0 \quad \text{if } \text{HCS_PRIO}_n = \text{HCS_PRIO}_s$$

$$L_n = 1 \quad \text{if } \text{HCS_PRIO}_n \triangleleft \text{HCS_PRIO}_s$$

$$W(x) = 0 \quad \text{for } x < 0$$

$$W(x) = 1 \quad \text{for } x \geq 0$$

TEMP_OFFSET_n applies an offset to the H and R criteria for the duration of PENALTY_TIME_n after a timer T_n has started for that neighbouring cell.

TEMP_OFFSET_n and PENALTY_TIME_n are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $\text{HCS_PRIO}_n \triangleleft \text{HCS_PRIO}_s$ and

$$Q_{\text{meas},n} > Q_{\text{hcs}_n}$$

Or

- if $\text{HCS_PRIO}_n = \text{HCS_PRIO}_s$ and
 - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{\text{meas},n} > Q_{\text{meas},s} + Q_{\text{offset}_{s,n}}$$

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset2,s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1,s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S _n	Cell Selection value of the neighbouring cell, (dB)
Q _{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the <u>Cell_selection_and_reselection_quality_measure</u> information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection is fulfilled when:

for FDD cells:	Srxlev > 0 AND Squal > 0
for TDD cells:	Srxlev > 0
for GSM cells:	Srxlev > 0

Where :

Squal = Q _{qualmeas} – Q _{qualmin}
Srxlev = Q _{rxlevmeas} - Q _{rxlevmin} - P _{compensation}

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
Q _{qualmeas}	Measured cell quality value. The quality of the received signal expressed in CPICH E _c /N ₀ (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
Q _{rxlevmeas}	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Q _{qualmin}	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Q _{rxlevmin}	Minimum required RX level in the cell (dBm)
P _{compensation}	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_Prio among those cells that fulfil the criterion $H \geq 0$. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).
- all cells, not considering HCS priority levels, if no cell fulfil the criterion $H \geq 0$. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Q_{offset1_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst1_s} is used for Q_{hyst_s} to calculate R_s .

If the usage of HCS is indicated in system information, $TEMP_OFFSET1_n$ is used for $TEMP_OFFSET_n$ to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Q_{offset2_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst2_s} is used for Q_{hyst_s} to calculate R_s . If the usage of HCS is indicated in system information, $TEMP_OFFSET2_n$ is used to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $T_{reselection}$. [For hierarchical cell structures when high mobility state has not been detected, if according to the HCS rules the serving cell is not ranked then all the ranked cells are considered to be better ranked than the serving cell.](#)
- more than 1 second has elapsed since the UE camped on the current serving cell.

3GPP TSG-RAN-WG2 Meeting #41
 Malaga, Spain, 16th-20st February 2004

Tdoc #R2-040707

CR-Form-v7	
CHANGE REQUEST	
# 25.304 CR 110 # rev 1 #	Current version: 5.3.0 #

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 Radio Access Network Core Network

Title:	# H criteria & High mobility reselection		
Source:	# RAN WG2		
Work item code:	# TEI	Date:	# 18/02/2004
Category:	# A	Release:	# Rel-5
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	# It is currently unclear whether a slow-moving UE in a network indicating support of HCS, shall reselect to a cell with higher priority when the H>=0 criteria is met for Treselection or when that cell has better quality than the serving cells. In the former, Treselection would be started as soon as a cell meets the H criteria, whilst in the latter Treselection would be started only when a cell has better quality than the serving cell.
Summary of change:	# Treselection shall be started when the H criteria is met.
Consequences if not approved:	# There may be interpretations that would only start Treselection when a cell is better ranked than the serving cell. This would mean that in co-located high-priority and low-priority cells, the UE may never reselect to a cell with higher priority. Impact analysis: If the UE starts Treselection only when a cell becomes better ranked than the serving cell, this may lead to the UE remaining permanently under lower priority cells, depending on the location of the UE in relation to the higher/lower priority cells. Such a UE would be required to change its implementation to start Treselection when the H criteria is met instead. This CR will not impact a UE that already starts Treselection when H>=0.

Clauses affected:	# 5.2.6.1.4								
Other specs affected:	#								
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center; width: 20px;">Y</td> <td style="text-align: center; width: 20px;">N</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> <tr> <td style="text-align: center;">#</td> <td style="text-align: center;">#</td> </tr> </table> Other core specifications # Test specifications # O&M Specifications #	Y	N	#	#	#	#	#	#
Y	N								
#	#								
#	#								
#	#								

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.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{\text{meas},s} - Q_{\text{hcs}_s}$$

$$H_n = Q_{\text{meas},n} - Q_{\text{hcs}_n} - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{\text{meas},s} + Q_{\text{hyst}_s}$$

$$R_n = Q_{\text{meas},n} - Q_{\text{offset}_{s,n}} - TO_n * (1 - L_n)$$

where:

$$TO_n = \text{TEMP_OFFSET}_n * W(\text{PENALTY_TIME}_n - T_n)$$

$$L_n = 0 \quad \text{if } \text{HCS_PRIO}_n = \text{HCS_PRIO}_s$$

$$L_n = 1 \quad \text{if } \text{HCS_PRIO}_n \triangleleft \text{HCS_PRIO}_s$$

$$W(x) = 0 \quad \text{for } x < 0$$

$$W(x) = 1 \quad \text{for } x \geq 0$$

TEMP_OFFSET_n applies an offset to the H and R criteria for the duration of PENALTY_TIME_n after a timer T_n has started for that neighbouring cell.

TEMP_OFFSET_n and PENALTY_TIME_n are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $\text{HCS_PRIO}_n \triangleleft \text{HCS_PRIO}_s$ and

$$Q_{\text{meas},n} > Q_{\text{hcs}_n}$$

Or

- if $\text{HCS_PRIO}_n = \text{HCS_PRIO}_s$ and
 - for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{\text{meas},n} > Q_{\text{meas},s} + Q_{\text{offset}_{s,n}}$$

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset2,s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1,s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S _n	Cell Selection value of the neighbouring cell, (dB)
Q _{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the <u>Cell_selection_and_reselection_quality_measure</u> information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection is fulfilled when:

for FDD cells:	Srxlev > 0 AND Squal > 0
for TDD cells:	Srxlev > 0
for GSM cells:	Srxlev > 0

Where :

Squal = Q _{qualmeas} – Q _{qualmin}
Srxlev = Q _{rxlevmeas} - Q _{rxlevmin} - P _{compensation}

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
Q _{qualmeas}	Measured cell quality value. The quality of the received signal expressed in CPICH E _c /N ₀ (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
Q _{rxlevmeas}	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Q _{qualmin}	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Q _{rxlevmin}	Minimum required RX level in the cell (dBm)
P _{compensation}	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_PRIO among those cells that fulfil the criterion $H \geq 0$. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).
- all cells, not considering HCS priority levels, if no cell fulfil the criterion $H \geq 0$. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Q_{offset1_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst1_s} is used for Q_{hyst_s} to calculate R_s .

If the usage of HCS is indicated in system information, $TEMP_OFFSET1_n$ is used for $TEMP_OFFSET_n$ to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Q_{offset2_{s,n}}$ is used for $Q_{offset_{s,n}}$ to calculate R_n , the hysteresis Q_{hyst2_s} is used for Q_{hyst_s} to calculate R_s . If the usage of HCS is indicated in system information, $TEMP_OFFSET2_n$ is used to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $T_{reselection}$. [For hierarchical cell structures when high mobility state has not been detected, if according to the HCS rules the serving cell is not ranked then all the ranked cells are considered to be better ranked than the serving cell.](#)
- more than 1 second has elapsed since the UE camped on the current serving cell.

3GPP TSG-RAN-WG2 Meeting #41
 Malaga, Spain, 16th-20st February 2004

Tdoc #R2-040708

CR-Form-v7	
CHANGE REQUEST	
# 25.304 CR 111 # rev 1 #	Current version: 6.0.0 #

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 Radio Access Network Core Network

Title:	# H criteria & High mobility reselection		
Source:	# RAN WG2		
Work item code:	# TEI	Date:	# 18/02/2004
Category:	# A	Release:	# Rel-6
	Use <u>one</u> of the following categories:		Use <u>one</u> of the following releases:
	F (correction)		2 (GSM Phase 2)
	A (corresponds to a correction in an earlier release)		R96 (Release 1996)
	B (addition of feature),		R97 (Release 1997)
	C (functional modification of feature)		R98 (Release 1998)
	D (editorial modification)		R99 (Release 1999)
	Detailed explanations of the above categories can be found in 3GPP TR 21.900 .		Rel-4 (Release 4)
			Rel-5 (Release 5)
			Rel-6 (Release 6)

Reason for change:	# It is currently unclear whether a slow-moving UE in a network indicating support of HCS, shall reselect to a cell with higher priority when the H>=0 criteria is met for Treselection or when that cell has better quality than the serving cells. In the former, Treselection would be started as soon as a cell meets the H criteria, whilst in the latter Treselection would be started only when a cell has better quality than the serving cell.
Summary of change:	# Treselection shall be started when the H criteria is met.
Consequences if not approved:	# There may be interpretations that would only start Treselection when a cell is better ranked than the serving cell. This would mean that in co-located high-priority and low-priority cells, the UE may never reselect to a cell with higher priority.
	Impact analysis: If the UE starts Treselection only when a cell becomes better ranked than the serving cell, this may lead to the UE remaining permanently under lower priority cells, depending on the location of the UE in relation to the higher/lower priority cells. Such a UE would be required to change its implementation to start Treselection when the H criteria is met instead. This CR will not impact a UE that already starts Treselection when H>=0.

Clauses affected:	# 5.2.6.1.4						
Other specs affected:	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;">Y</td> <td style="text-align: center;">N</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input checked="" type="checkbox"/></td> </tr> </table> Other core specifications	Y	N	<input type="checkbox"/>	<input checked="" type="checkbox"/>	#	
Y	N						
<input type="checkbox"/>	<input checked="" type="checkbox"/>						
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table> Test specifications	<input checked="" type="checkbox"/>	<input type="checkbox"/>	#			
<input checked="" type="checkbox"/>	<input type="checkbox"/>						
	<table border="1" style="display: inline-table; border-collapse: collapse;"> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table> O&M Specifications	<input checked="" type="checkbox"/>	<input type="checkbox"/>	#			
<input checked="" type="checkbox"/>	<input type="checkbox"/>						

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.

5.2.6.1.4 Cell Reselection Criteria

The following cell re-selection criteria are used for intra-frequency cells, inter-frequency cells and inter-RAT cells:

The quality level threshold criterion H for hierarchical cell structures is used to determine whether prioritised ranking according to hierarchical cell re-selection rules shall apply, and is defined by:

$$H_s = Q_{meas,s} - Q_{hcs_s}$$

$$H_n = Q_{meas,n} - Q_{hcs_n} - TO_n * L_n$$

If it is indicated in system information that HCS is not used, the quality level threshold criterion H is not applied.

The cell-ranking criterion R is defined by:

$$R_s = Q_{meas,s} + Q_{hyst_s}$$

$$R_n = Q_{meas,n} - Q_{offset_{s,n}} - TO_n * (1 - L_n)$$

where:

$$TO_n = TEMP_OFFSET_n * W(PENALTY_TIME_n - T_n)$$

$$L_n = 0 \quad \text{if } HCS_PRIO_n = HCS_PRIO_s$$

$$L_n = 1 \quad \text{if } HCS_PRIO_n <> HCS_PRIO_s$$

$$W(x) = 0 \quad \text{for } x < 0$$

$$W(x) = 1 \quad \text{for } x \geq 0$$

$TEMP_OFFSET_n$ applies an offset to the H and R criteria for the duration of $PENALTY_TIME_n$ after a timer T_n has started for that neighbouring cell.

$TEMP_OFFSET_n$ and $PENALTY_TIME_n$ are only applicable if the usage of HCS is indicated in system information.

The timer T_n is implemented for each neighbouring cell. T_n shall be started from zero when one of the following conditions becomes true:

- if $HCS_PRIO_n <> HCS_PRIO_s$ and

$$Q_{meas,n} > Q_{hcs_n}$$

Or

- if $HCS_PRIO_n = HCS_PRIO_s$ and

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH RSCP in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1_{s,n}}$$

- for serving FDD and neighbour FDD cells if the quality measure for cell selection and reselection is set to CPICH Ec/No in the serving cell, and:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset2,s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Q_{offset1,s,n}$$

T_n for the associated neighbour cell shall be stopped as soon as any of the above conditions are no longer fulfilled. Any value calculated for TO_n is valid only if the associated timer T_n is still running else TO_n shall be set to zero.

At cell-reselection, a timer T_n is stopped only if the corresponding cell is not a neighbour cell of the new serving cell, or if the criteria given above for starting timer T_n for the corresponding cell is no longer fulfilled with the parameters of the new serving cell. On cell re-selection, timer T_n shall be continued to be run for the corresponding cells but the criteria given above shall be evaluated with parameters broadcast in the new serving cell if the corresponding cells are neighbours of the new serving cell.

S _n	Cell Selection value of the neighbouring cell, (dB)
Q _{meas}	Quality value. The quality value of the received signal derived from the averaged CPICH Ec/No or CPICH RSCP for FDD cells, from the averaged P-CCPCH RSCP for TDD cells and from the averaged received signal level for GSM cells. The averaging of these measurement quantities are performed as specified in [10] and [11]. For FDD cells, the measurement that is used to derive the quality value is set by the <u>Cell_selection_and_reselection_quality_measure</u> information element.

Cell reselection parameters broadcast in system information are listed in subclause 5.2.6.1.5.

The cell selection criterion S used for cell reselection is fulfilled when:

for FDD cells:	Srxlev > 0 AND Squal > 0
for TDD cells:	Srxlev > 0
for GSM cells:	Srxlev > 0

Where :

Squal = Q _{qualmeas} – Q _{qualmin}
Srxlev = Q _{rxlevmeas} - Q _{rxlevmin} - P _{compensation}

Squal	Cell Selection quality value (dB) Applicable only for FDD cells.
Srxlev	Cell Selection RX level value (dB)
Q _{qualmeas}	Measured cell quality value. The quality of the received signal expressed in CPICH E _c /N ₀ (dB) for FDD cells. CPICH Ec/N0 shall be averaged as specified in [10]. Applicable only for FDD cells.
Q _{rxlevmeas}	Measured cell RX level value. This is received signal, CPICH RSCP for FDD cells (dBm), P-CCPCH RSCP for TDD cells (dBm) and the averaged received signal level as specified in [10] for GSM cells (dBm). CPICH RSCP, P-CCPCH RSCP and the received signal level for GSM cells shall be averaged as specified in [10] and [11].
Q _{qualmin}	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Q _{rxlevmin}	Minimum required RX level in the cell (dBm)
P _{compensation}	max(UE_TXPWR_MAX_RACH – P_MAX, 0) (dB)
UE_TXPWR_MAX_RACH	Maximum TX power level an UE may use when accessing the cell on RACH (read in system information) (dBm)
P_MAX	Maximum RF output power of the UE (dBm)

The UE shall perform ranking of all cells that fulfil the S criterion among

- all cells that have the highest HCS_Prio among those cells that fulfil the criterion $H \geq 0$. Note that this rule is not valid when UE high-mobility is detected (see subclause 5.2.6.1.2).
- all cells, not considering HCS priority levels, if no cell fulfil the criterion $H \geq 0$. This case is also valid when it is indicated in system information that HCS is not used, that is when serving cell does not belong to a hierarchical cell structure.

The cells shall be ranked according to the R criteria specified above, deriving $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values using CPICH RSCP, P-CCPCH RSCP and the averaged received signal level as specified in [10] and [11] for FDD, TDD and GSM cells, respectively.

The offset $Q_{offset1,s,n}$ is used for $Q_{offset,s,n}$ to calculate R_n , the hysteresis $Q_{hyst1,s}$ is used for $Q_{hyst,s}$ to calculate R_s .

If the usage of HCS is indicated in system information, $TEMP_OFFSET1_n$ is used for $TEMP_OFFSET_n$ to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . The best ranked cell is the cell with the highest R value.

If a TDD or GSM cell is ranked as the best cell, then the UE shall perform cell re-selection to that TDD or GSM cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH RSCP, the UE shall perform cell re-selection to that FDD cell.

If an FDD cell is ranked as the best cell and the quality measure for cell selection and re-selection is set to CPICH Ec/No, the UE shall perform a second ranking of the FDD cells according to the R criteria specified above, but using the measurement quantity CPICH Ec/No for deriving the $Q_{meas,n}$ and $Q_{meas,s}$ and calculating the R values of the FDD cells. The offset $Q_{offset2,s,n}$ is used for $Q_{offset,s,n}$ to calculate R_n , the hysteresis $Q_{hyst2,s}$ is used for $Q_{hyst,s}$ to calculate R_s . If the usage of HCS is indicated in system information, $TEMP_OFFSET2_n$ is used to calculate TO_n . If it is indicated in system information that HCS is not used, $TEMP_OFFSET_n$ is not applied when calculating R_n . Following this second ranking, the UE shall perform cell re-selection to the best ranked FDD cell.

In all cases, the UE shall reselect the new cell, only if the following conditions are met:

- the new cell is better ranked than the serving cell during a time interval $T_{reselection}$. [For hierarchical cell structures when high mobility state has not been detected, if according to the HCS rules the serving cell is not ranked then all the ranked cells are considered to be better ranked than the serving cell.](#)
- more than 1 second has elapsed since the UE camped on the current serving cell.