RP-040094

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

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	Α	4.7.0	4.8.0	R2-040706	TEI
25.304	110	1	Rel-5	H criteria & High mobility reselection	Α	5.3.0	5.4.0	R2-040707	TEI
25.304	111	1	Rel-5	H criteria & High mobility reselection	Α	6.0.0	6.1.0	R2-040708	TEI

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

Tdoc #R2-040705

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		C (functional modificat				•	(Release 1998)
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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.

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:

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

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

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:

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

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

where:

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

$$\begin{array}{ll} L_n = 0 & \text{if } HCS_PRIO_n = HCS_PRIO_s \\ L_n = 1 & \text{if } HCS_PRIO_n <> HCS_PRIO_s \end{array}$$

$$W(x) = 0$$
 for $x < 0$
 $W(x) = 1$ for $x > 0$

 $TEMP_OFFSET_n$ 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

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

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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

- 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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset2_{s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

 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
	Cell_selection_and_reselection_quality_measure 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:

 $Squal = Q_{qualmeas} - Qqualmin$

 $Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$

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 E_c/N_0 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].						
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.						
Qrxlevmin	Minimum required RX level in the cell (dBm)						
Pcompensation	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 $H \ge 0$. 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 >= 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 Qoffset $l_{s,n}$ is used for Qoffset $l_{s,n}$ to calculate $l_{s,n}$, the hysteresis Qhyst l_{s} is used for Qhyst l_{s} to calculate l_{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 $Q_{neas,n}$ is used for $Q_{neas,n}$ to calculate $Q_{neas,n}$ to calculate $Q_{neas,n}$ is used for $Q_{neas,n}$ to calculate $Q_{neas,n}$ is used for $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is indicated in system information, $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is indicated in system information that HCS is not used, $Q_{neas,n}$ is not applied when calculating $Q_{neas,n}$ 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 Treselection. 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

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

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

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

where:

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

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$$W(x) = 0 for x < 0$$

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 $TEMP_OFFSET_n$ 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.

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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 $HCS_PRIO_n \Leftrightarrow HCS_PRIO_s$ and

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

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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

- 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:

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	measurement that is used to derive the quality value is set by the
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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:

 $Squal = Q_{qualmeas} - Qqualmin \\$

 $Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$

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].
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Qrxlevmin	Minimum required RX level in the cell (dBm)
Pcompensation	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 $H \ge 0$. 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 >= 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.

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

Tdoc #R2-040707

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Other comments: ₩

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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:

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

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

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:

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

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

where:

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

$$\begin{array}{ll} L_n = 0 & \text{if } HCS_PRIO_n = HCS_PRIO_s \\ L_n = 1 & \text{if } HCS_PRIO_n <> HCS_PRIO_s \end{array}$$

$$W(x) = 0 for x < 0$$

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

$$W(x) = 1 \qquad \text{for } x >= 0$$

 $TEMP_OFFSET_n$ 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 $HCS_PRIO_n \Leftrightarrow HCS_PRIO_s$ and

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

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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

- 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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset2_{s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

 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
	Cell_selection_and_reselection_quality_measure 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:

 $Squal = Q_{qualmeas} - Qqualmin \\$

 $Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$

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].
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Qrxlevmin	Minimum required RX level in the cell (dBm)
Pcompensation	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 $H \ge 0$. 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 >= 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 Qoffset $l_{s,n}$ is used for Qoffset $l_{s,n}$ to calculate $l_{s,n}$, the hysteresis Qhyst l_{s} is used for Qhyst l_{s} to calculate l_{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 $Q_{neas,n}$ is used for $Q_{neas,n}$ to calculate $Q_{neas,n}$ to calculate $Q_{neas,n}$ is used for $Q_{neas,n}$ to calculate $Q_{neas,n}$ is used for $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is indicated in system information, $Q_{neas,n}$ is used to calculate $Q_{neas,n}$ is indicated in system information that HCS is not used, $Q_{neas,n}$ is not applied when calculating $Q_{neas,n}$ 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 Treselection. 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

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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 \(\mathcal{H} \) 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:

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

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

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:

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

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

where:

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

$$\begin{array}{ll} L_n = 0 & \text{if } HCS_PRIO_n = HCS_PRIO_s \\ L_n = 1 & \text{if } HCS_PRIO_n <> HCS_PRIO_s \end{array}$$

$$W(x) = 0 for x < 0$$

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

$$W(x) = 1 \qquad \text{for } x >= 0$$

 $TEMP_OFFSET_n$ 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 $HCS_PRIO_n \Leftrightarrow HCS_PRIO_s$ and

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

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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

- 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:

$$Q_{meas,n} > Q_{meas,s} + Qoffset2_{s,n}$$

- for all other serving and neighbour cells:

$$Q_{meas,n} > Q_{meas,s} + Qoffset1_{s,n}$$

 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
	Cell_selection_and_reselection_quality_measure 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:

 $Squal = Q_{qualmeas} - Qqualmin \\$

 $Srxlev = Q_{rxlevmeas} - Qrxlevmin - Pcompensation$

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].
Qqualmin	Minimum required quality level in the cell (dB). Applicable only for FDD cells.
Qrxlevmin	Minimum required RX level in the cell (dBm)
Pcompensation	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 $H \ge 0$. 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 >= 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 Qoffset $l_{s,n}$ is used for Qoffset $l_{s,n}$ to calculate $l_{s,n}$, the hysteresis Qhyst l_{s} is used for Qhyst l_{s} to calculate l_{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 $Q_{s,n}$ is used for $Q_{s,n}$ to calculate $Q_{s,n}$, the hysteresis $Q_{s,n}$ is used for $Q_{s,n}$ to calculate $Q_{s,n}$ is used for $Q_{s,n}$ to calculate $Q_{s,n}$ is used to calculate $Q_{s,n}$ is indicated in system information, $Q_{s,n}$ is not applied when calculating $Q_{s,n}$. 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 Treselection. 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.