**3GPP TSG- WG4 Meeting #**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Method for determining ECRP for HaNTE-devices | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | |  |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change 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](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | UEs featuring non-traditional earpieces pose challenges for handset mode acoustic testing. For example, a UE may exclusively use a vibrating display to produce sound when operating in handset mode, offering no clearly identifiable centre of an earpiece to position the headset for testing. Additionally, such UE could have its acoustic response affected by the choice of handset positioner mechanism. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Update 3GPP TS 26.132 with reference to the appropriate version of ITU-T P.64 that addresses HaNTE devices.  Establish guidelines for mounting of HaNTE devices to ensure a repeatable and reproducible measurement method in 3GPP TS 26.132 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The ECRP of Handsets Featuring Non-Traditional Earpieces (HaNTE) cannot be properly defined. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.1, 3.2, 5.1.1, Annex H (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TS 26.131: "Terminal Acoustic Characteristics for Telephony; Requirements".

[…]

[18] ITU-T Recommendation P.64 (06/2019): "Determination of sensitivity/frequency characteristics of local telephone systems".

[…]

## 3.1 Definitions

[…]

For the purposes of the present document, the term *traditional earpiece* is defined as an acoustics outlet designed to be positioned at or near the ERP.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [47] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [47].

[…]

DTX Discontinuous Transmission

ECRP Ear Cap Reference Point

EEC Electrical Echo Control

[…]

LTE Long Term Evolution

MECRP Manufacturer Ear Cap Reference Point

MRP Mouth Reference Point

[…]

### 5.1.1 Setup for handset terminals

When using a handset UE, the handset is placed on HATS as described in ITU-T Recommendation P.64 Annex E [18].

The positioning for such handset UEs is defined in ITU-T Recommendation P.64 Annex D.5 and E.3 [18].

The criteria for determining the ECRP follows this order:

- At the manufacturer defined position (MECRP), if provided.

- If not, at the centre of the earpiece as defined in Annex E of ITU-T P.64, if the handset features a traditional earpiece.

- If not (handset provides a non-traditional earpiece, e.g., UE with vibrating display designed for sound radiation, with acoustic outlet at the top edge or non-visible outlet):

- A graphical user interface showing the location of optimal sound radiation, if provided.

- If not, through an objective determination procedure of ECRP as described in Annex H, if possible.

- If not, after a subjective determination by the test operator of the optimal holding position.

The position of the handset positioner fork positions and support pins shall also be documented by means of dz/dy coordinates according to the definitions in ITU-T Recommendation P.64 Annex D.5 and E.3 [18].

The artificial mouth shall conform to ITU-T Recommendation P.58 [15]. The artificial ear shall conform to ITU-T Recommendation P.57 [14]. Type 3.3 ear shall be used and positioned on HATS according to ITU-T Recommendation P.58 [15].

**Position and calibration of HATS**

The sending and receiving characteristics shall be tested with the HATS. It shall be indicated what application force was used. If not stated otherwise in TS 26.131, an application force of 8 ± 2 N shall be used.

The horizontal positioning of the HATS reference plane shall be guaranteed within ± 2º.

Annex H:  
Determination of ECRP for handset providing non-traditional earpiece

# H.1 Overview

The ECRP for handset UEs providing an acoustic outlet is defined according to Annex E.1 and E.2 of Recommendation ITU-T P.64 [18]. This positioning approach cannot be used for handsets without a traditional ear cap. Instead, Annex E.3 of [18] can be used, which specifies ECRP of a handset device in terms of distances from the upper edge (dy) and from a centre/symmetry line (dz). With these definitions, a manufacturer-defined ECRP (MECRP) can be specified for testing such devices.

However, in case MECRP is not available or not provided by the manufacturer, the method described in the following allows at least a suitable and reproducible positioning of a handset.

NOTE: Even though the method described in the following mimics user behaviour, i.e., multiple typical positions, the determination of a custom ECRP may not result in optimal performance. Whenever available, the use of MECRP is preferred.

# H.2 Grid Positions

Several shifts of 1 cm in Ze and Ye direction according to Table H.1 are evaluated around an initial and arbitrarily chosen ECRP at dz=0 mm and dy=20 mm (according to definitions of Annex E.3 of [18]).

Table H.1: Shifts around initial ECRP

|  |  |  |  |
| --- | --- | --- | --- |
| Shift | Offset Ze [mm] | Offset Ye [mm] | Type |
| S0 | 0 | 0 | Mandatory |
| S1 | 0 | -10 | Mandatory |
| S2 | +10 | 0 | Mandatory |
| S3 | 0 | +10 | Mandatory |
| S4 | -10 | 0 | Mandatory |
| S5 | +10 | -10 | Recommended |
| S6 | +10 | +10 | Recommended |
| S7 | -10 | +10 | Recommended |
| S8 | -10 | -10 | Recommended |

The shifts shall be reported. Figure H.1 illustrates the five mandatory (indicated in blue) and four optional (indicated in red) shifts relative to the centre point (indicated in green).

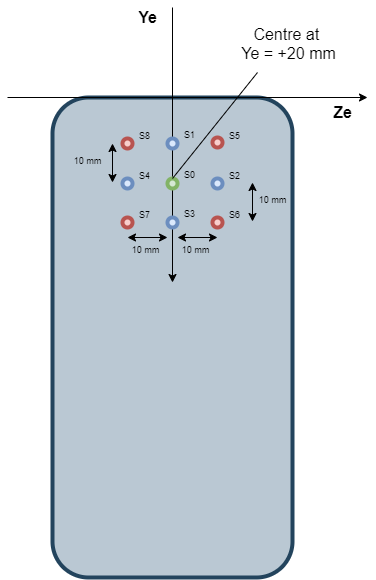


Figure H.1: Evaluation shifts for determination of ECRP

# H.3 Measurement procedure

## H.3.1 Overview

The iterative procedure to determine ECRP and nominal volume applies for all bandwidths and can be conducted in two different ways, as described in clause H.3.2 and H.3.3. Both methods shall be supported by the test equipment. The procedure in clause H.3.2 is recommended, the procedure in H.3.3 may be used as an alternative. The procedure used for testing shall be reported.

## H.3.2 Evaluation of all shifts per volume setting

1) The handset terminal is setup as described in clause 5 and the volume control is set to maximum. In case a manufacturer-defined nominal volume control setting is provided, this setting shall be used.

2) The test signal to be used for the measurements shall be the British-English single talk sequence described in ITU-T Recommendation P.501 [22]. The test signal level shall be -16 dBm0 measured at the digital reference point or the equivalent analogue point. Level calculation and bandwidth-specific pre-filtering shall be applied according to clause 5.4 on the test signal.

3) Receive loudness rating (RLR) and receive frequency response (RFR) are calculated from the same recording:

- RFR is calculated according to clause 7.4.2 for narrowband, clause 8.4.2 for wideband, clause 9.4.2 for super-wideband and 10.4.2 for fullband.

- RLR is calculated according to clause 7.2.2.2 for narrowband, clause 8.2.2.2 for wideband, clause 9.2.2.2 for super-wideband and 10.2.2.2 for fullband.

4) The measurement shall be carried out for the initial ECRP shift (S0) and for each mandatory shift according to Table H.1 (S1-S4). It is recommended to consider the optional shifts (S5-S8) as well.

5) For the current volume control setting…

a) The repeated RFR measures at each frequency band are linearily averaged across shifts, resulting in an average RFR spectrum.

b) The number of nominal RLR values (2 dB ± 3 dB) are counted.

6) If manufacturer-defined nominal volume control setting is provided:  
No further iterations are required.  
  
If no manufacturer-defined nominal volume control setting is provided:  
Steps 2) to 5) are repeated for volume control decreased by one step until all RLR values obtained more than 5 dB across all shifts.

7) The maximum number of valid RLR values is determined across all measured volume control settings. Each volume setting providing this amount of valid RLR values are considered for the next step of the analysis. If multiple volume control settings obtain the same amount of nominal RLR values, all of them are considered for the next analysis step.  
If nominal volume setting cannot be achieved at any shift and volume setting (i.e., all RLR values are either too high or too low), it is not possible to determine the ECRP with the present method.

8) For each single shift providing the determined nominal volume setting, the absolute difference (in dB) to the average RFR is calculated within the bandwidth-dependent frequency range according to clause 5.4. The shift providing nominal RLR and lowest difference to the average RFR (see step 4) is considered as the ECRP for testing.

## H.3.3 Evaluation of all volume settings per shift:

It is also possible to apply the method in a transposed way, i.e., for each shift, all volume steps are consecutively evaluated. The results obtained this way are equivalent to the ones of the default order. However, due to the non-applicable stop condition (see step 6), in some cases it might be necessary to conduct more measurements than for the default order to obtain the same ECRP result.

1) The handset terminal is setup as described in clause 5 and the volume control is set to maximum. In case a manufacturer-defined nominal volume control setting is provided, this setting shall be used. An arbitrary shift according to Table H.1 is applied. It is recommended to start at the initial ECRP shift S0.

2) The test signal to be used for the measurements shall be the British-English single talk sequence described in ITU-T Recommendation P.501 [22]. The test signal level shall be -16 dBm0 measured at the digital reference point or the equivalent analogue point. Level calculation and bandwidth-specific pre-filtering shall be applied according to clause 5.4 on the test signal.

3) Receive loudness rating (RLR) and receive frequency response (RFR) are calculated from the same recording:

- RFR is calculated according to clause 7.4.2 for narrowband, clause 8.4.2 for wideband, clause 9.4.2 for super-wideband and 10.4.2 for fullband.

- RLR is calculated according to clause 7.2.2.2 for narrowband, clause 8.2.2.2 for wideband, clause 9.2.2.2 for super-wideband and 10.2.2.2 for fullband.

4) If manufacturer-defined nominal volume control setting is provided:  
No further iterations are required.  
  
If no manufacturer-defined nominal volume control setting is provided:  
Steps 2) to 3) are repeated for volume control decreased by one step until minimum volume setting is reached.

5) Steps 2) to 4) are repeated for each mandatory shift according to Table H.1 (S0-S4). It is recommended to consider the optional shifts (S5-S8) as well.

6) After RFR and RLR measurements are completed, the following calculations are performed for each volume setting:

a) The repeated RFR measures at each frequency band are linearily averaged across shifts, resulting in an average RFR spectrum.

b) The number of nominal RLR values (2 dB ± 3 dB) are counted.

7) The maximum number of valid RLR values is determined across all volume control settings. Each volume setting providing this amount of valid RLR values are considered for the next step of the analysis. If multiple volume control settings obtain the same amount of nominal RLR values, all of them are considered for the next analysis step.  
If nominal volume setting cannot be achieved at any shift and volume setting (i.e., all RLR values are either too high or too low), it is not possible to determine the ECRP with the present method.

8) For each single shift providing the determined nominal volume setting, the absolute difference (in dB) to the average RFR is calculated within the bandwidth-dependent frequency range according to clause 5.4. The shift providing nominal RLR and lowest difference to the average RFR (see step 4) is considered as the ECRP for testing.