S4/SMG11 Tdoc 0145/00

Source: **Alcatel**

Title: **Need of a new artificial ear for GSM terminals**

Document for: **discussion**

Agenda Item: **12.6**

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1. Historic

At the last meeting it was proposed to use Type 3.3 or 3.4 artificial ear for the UMTS terminals as regards the acoustic tests.

It seems also consistent to apply the same improvement to the GSM terminals.

2. References

[1] SMG11/S4 00059/99 : "Which artificial ear for UMTS ?" Alcatel, HEAD acoustics, France Telecom

[2] GSM 03.50 version 7.0.0 Release 1998

[3] GSM 11.10-1 version 7.0.0 Release 1998

3. Purpose of the document

This document is in line of the proposal in [1] but deals with the GSM terminals. Moreover, measurements of acoustic responses with different artificial ear have been performed and are presented.

4. Need of more suitable artificial ear

All the arguments which were raised for the use of the new artificial ear in [1] remain true for the GSM terminals.

It is also consistent to propose the use of the same artificial ear for the testing

5. Receiving sensitivity - frequency response with different artificial ears

According to the recommendation 11.10 and 03.50, the sensitivity – frequency response was measured. In addition to the allowed artificial ears the Type 3.4 ear was also used.

The measurements were performed on a specific Alcatel mobile phone :

- the speaker is not leak tolerant (this is common)
- the speaker is in handset mode
- no equalization is performed

The figure #1 shows the results :

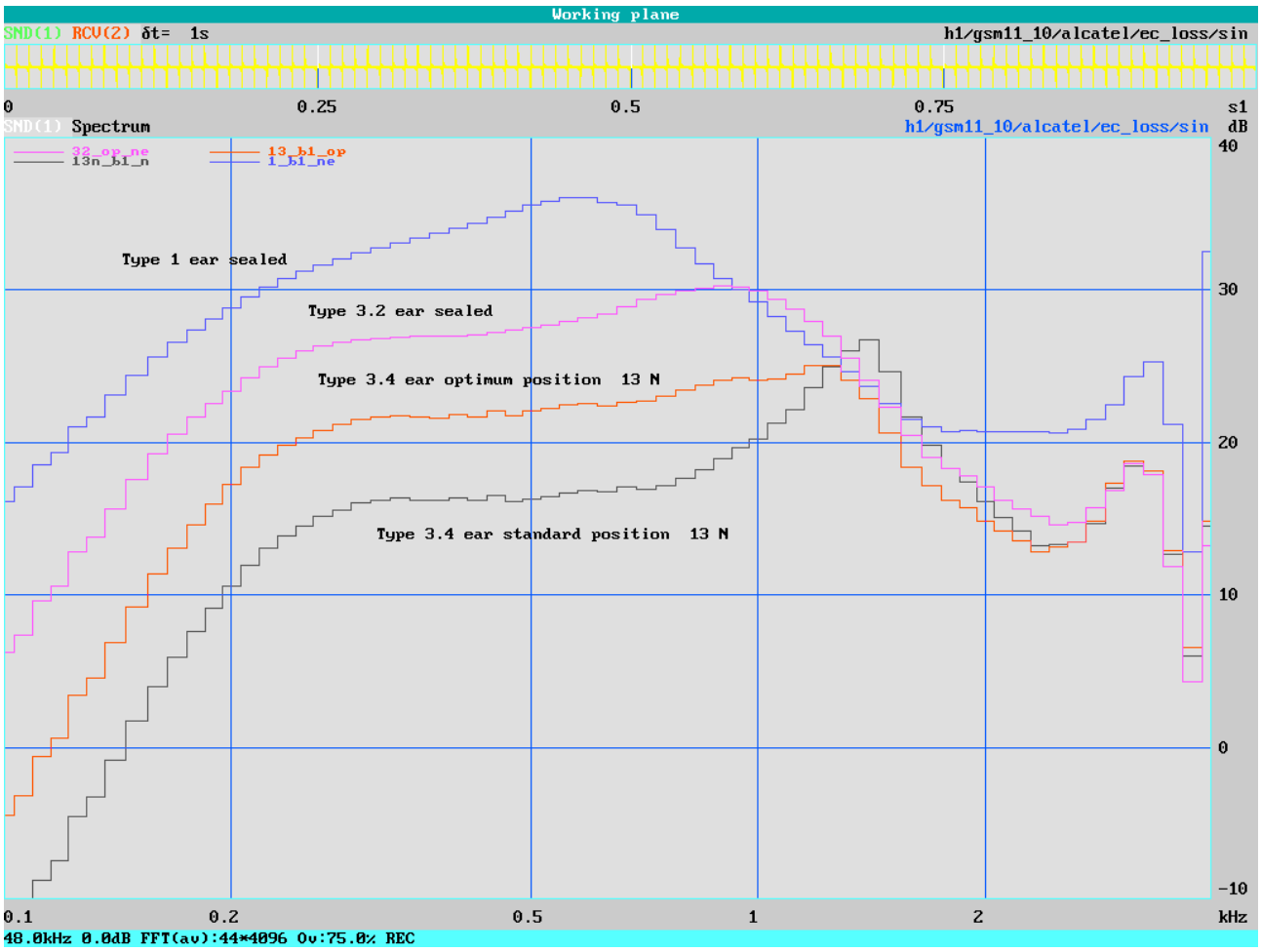

Figure #1 : sensitivity – frequency response with different artificial ears without equalization

It is to notice that up to 1000 Hz the difference between the two allowed artificial ear is about 5 dB whereas the difference between the Type 1 ear (no leakage is taken into account) and the Type 3.4 ear (which uses HATS and takes into account the leakage) is about 20 dB.

The positioning (standard position) is defined in P.64.

6. Conclusion

1. As well as for the UMTS terminals there is a need to have much more realistic acoustic measurements
2. The Type 3.4 artificial ear provides much more realistic conditions than the traditional LRGP setup using type 1 artificial ear. The measurements between the Type 1 or 3.2 and Type 3.4 artificial ear differ significantly.

In recommendation 03.50, it is allowed to use HATS if this one conforms to ITU-T Recommendation P.58. The HATS of Type 3.4 artificial ear do respect the P.58 and are thus suitable for the acoustic tests.

The manufacturers who want to put the emphasis on the speech quality and thus who want to be closer to the reality must be allowed to use artificial ears like Type 3.4.

It seems to be relevant to add to the list of allowed artificial ears in Recommendations 03.50 and 11.10 the Type 3.4 [and 3.3] artificial ear.

ANNEX : Tdoc S4/SMG11 00059/00

Joint TSG-S4#9 - SMG11#14 Meeting
January 24-28 2000, Puerto Vallarta, Mexico

S4/SMG11 Tdoc 0059/00

Source: **Alcatel, France Telecom, Head Acoustics**

Title: **Which artificial ear for UMTS ?**

Document for: **discussion**

Agenda Item: **8**

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7. Historic

The measurement methods in telephony were decided 30 years ago. These methods were based on terminals which were able to have very few leak between the audio speaker and the knight edge of the end user ear.

For the repeatability of the tests and to proceed easily it was decided to use Type 1 artificial ear. This artificial ear is used to obtain the receiving sensitivity frequency response as well as efficiency measurements.

In order to avoid leaks due to the design of the terminal, an hermetic joint can be used.

At that time a defect already existed in the measurement method, because of the lower leak existence. The measurements did not represent what the end user actually heard.

8. Today

From a design point of view the terminals have evolved. Due to this evolution, the leaks are today considerable concerning the mobile terminals. In opposition, the measurement method has not evolved.

Of course, the acoustic components have evolved. Today, it is common to find on the GSM terminals components with frequency responses which does not depend on the leaks (leak tolerant loudspeakers).The frequency response obtained in sealed measurements is almost flat as well as the response in leak measurements. However, the sealed measurement method is far away from the reality.

With non leak tolerant loudspeakers it is possible to obtain a good acoustic quality in practice, that means with a good reproduction of the low frequencies but with a frequency response which is not flat. Measurements of frequency responses using Type 1 artificial ear with a non flat response will lead to a test failure.

Tests conducted by Alcatel with end users show the above arguments.

9. Proposal

From our point of view, we must put the emphasis on the acoustic quality perceived by the end user. We propose therefore, to perform further work to define a new acoustic test method which will be closer to the reality - to what the end user actually perceives.

Characterization of acoustical components may be made using any type of artificial ears as defined in ITU-T Recommendation P.57. The acoustical tests on the terminals should be made on type 3.3 or 3.4 artificial ear according to ITU-T Recommendation P.57, the positioning is defined in ITU-T Recommendation P.64. The positioning is always done on a HATS according to P.58. This measurement setup provides much more realistic conditions than the traditional LRGP setup using type 1 artificial ear. When using a proper positioning device the repeatability of measurements is comparable to the repeatability of measurements conducted with type 1 artificial ears.

For informati

Standard deviations of 10 different telephone sets, measured in 10 different labs during the ITU-T Round Robin test for evaluating the repeatability of measurements on the new simplified pinna simulator, results derived at pressure forces of 2,4,6,8 and 13 N, comparison to type 1 and type 3.2 couplers.

Set	**P. 57 type 3.4**					**P. 57 type..**	
No.	**2N**	**4N**	**6N**	**8N**	**13N**	**1**	**3.2**
1	.31	.36	.39	.33	.20	.25	.12
2	.33	.36	.38	.41	.26	.18	.28
3	.34	.37	.38	.33	.22	.16	.31
4	.28	.31	.36	.37	.35	.22	.10
5	.28	.31	.27	.31	.31	.39	.27
6	.31	.38	.41	.41	.26	.25	.36
7	.33	.40	.46	.47	.58	.28	.42
8	.26	.26	.49	.69	.29	.22	.13
9	.35	.26	.24	.22	.17	.19	.16
Avg.	**0.31**	**0.33**	**0.38**	**0.39**	**0.29**	**0.24**	**0.24**

Results derived from:

A New Artificial Ear for Telephone Measurements

ITU-T SG 12 Q12, December 1993, Geneva, COM 12-26

Report on the Round Robin Experiment for Evaluating the Repeatibility of Measurements on the New Simplified Pinna Simulator.

ITU-T SG12 Q12, June 1995, COM 12-59-E