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Title: ETSI/AMR NS Selection Experiment 1 - COMSAT Results

Source*: COMSAT Laboratories

Summary

This document presents a summary for ETSI Adaptive Multi Rate (AMR) Noise Selection (NS) Selection Phase Experiment 1 conducted by COMSAT in the Spanish language.

1. Introduction

COMSAT Laboratories in accordance with the AMR NS Selection Phase Experiment 1 performed a listening laboratory evaluation in Spanish. This experiment was designed to identify whether the noise suppression candidate algorithms for the AMR codec operating at 12.2 and 5.9 kbit/s would introduce any artifacts during the initial convergence time for noisy and quiet background. The test design is defined in Section 7 of the AMR NS Selection Subjective Test Plan [1], which used speech material processed under selected experimental conditions from Experiments 2, 4, and 5.

COMSAT performed Experiment 1 using a subset of the Spanish speech material available in the NTT Speech Database. Six subjects fluent in the Spanish language performed as “expert” subjects in the test. The raw data collected was used to derive gender-wise and combined-gender pair comparison scores and standard deviation statistics for each of the three questions posed to the experts.

2. Source Material

Six single-sentence stimuli were selected for two male and two female talkers from the NTT Speech Database. The source material was provided to COMSAT, the designated Host Laboratory, which was responsible for all pre- and post-processing according to the test plan in [2].

3. Experimental Design

The test design followed the specification in the AMR NS Selection Test Plan, as summarized in Tables 1 and 2.

4. Processed Material

The host laboratory provided a CDROM with 960 processed speech files, which corresponds to the processing of 5 files per talker through 96 reference conditions and 96 test conditions and. Speech processing details are given in [3]. Test and reference files were concatenated for each condition following the presentation order given in the test plan before presentation to the subjects.

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Table 1:
Factors and Conditions for Experiment 1: a subset of conditions in Experiments 2, 4, and 5

Main Codec Conditions	#	Notes
Noise Supresser Candidates	6	
Codec	1	AMR
Codec Modes (FR/HR)	HR	5.9 kbit/s rate
	FR	12.2 kbit/s rate
BER	0	Clear channel, no transmission errors
Input level	1	Nominal (-26dBov)
Acoustic Background Noise	0	<ul style="list-style-type: none"> • Experiment 2: None • Experiments 4A and 5A: Car (6 dB), street (9 dB), and babble (9 dB) • Experiments 4B and 5B: Car (12 dB), street (15 dB), and babble (15 dB)
Transcodings	2	Self tandem condition from Experiment 2
Input Characteristic	1	GSM Filtered
Codec references	#	Notes
Test vocoders	1	AMR with NS
Reference vocoder	2	AMR@12.2, AMR@5.9
Other references	#	Notes
None		
Common Conditions	#	Notes
GSM Channel	0	NO channel model
Number of talkers	4	2 male + 2 female
Number of speech samples	52	6/talker in split-plot mode
Sentences/sample	1	Single sentence stimuli with 2-second silence or noise preamble
Listening Level	1	-18dBPa (76dB SPL) at ERP, binaural
Listeners	6	Expert listeners
Listening instrument		AKG K240DF Studio Monitor Headphone
Randomizations	6	1 expert at a time
Rating Scale	1	Comparison of processed and reference stimuli according to special instructions (Section 7.7 of the test plan).

5. Listening Sessions

COMSAT performed Experiment 1 according to the Test Plan.

5.1 Presentation Sequence Material

COMSAT used the randomization sequences specified in the AMR NS Selection Test Plan for Experiment 1.

Table 2:
Experiment 1: Artifacts in initial convergence

Cond.No Exp. 1	Original Cond.No.	Noise	SNR (dB)	Reference	Processed	Tandems
01	4A/15	Car	6	AMR@5.9	AMR@5.9/NS1	1
02	4A/16	Car	6	AMR@5.9	AMR@5.9/NS2	1
03	4A/17	Car	6	AMR@5.9	AMR@5.9/NS3	1
04	4A/18	Car	6	AMR@5.9	AMR@5.9/NS4	1
05	4A/19	Car	6	AMR@5.9	AMR@5.9/NS5	1
06	4A/20	Car	6	AMR@5.9	AMR@5.9/NS6	1
07	4A/21	Street	9	AMR@5.9	AMR@5.9/NS1	1
08	4A/22	Street	9	AMR@5.9	AMR@5.9/NS2	1
09	4A/23	Street	9	AMR@5.9	AMR@5.9/NS3	1
10	4A/24	Street	9	AMR@5.9	AMR@5.9/NS4	1
11	4A/25	Street	9	AMR@5.9	AMR@5.9/NS5	1
12	4A/26	Street	9	AMR@5.9	AMR@5.9/NS6	1
13	4A/27	Babble	9	AMR@5.9	AMR@5.9/NS1	1
14	4A/28	Babble	9	AMR@5.9	AMR@5.9/NS2	1
15	4A/29	Babble	9	AMR@5.9	AMR@5.9/NS3	1
16	4A/30	Babble	9	AMR@5.9	AMR@5.9/NS4	1
17	4A/31	Babble	9	AMR@5.9	AMR@5.9/NS5	1
18	4A/32	Babble	9	AMR@5.9	AMR@5.9/NS6	1
19	4B/15	Car	12	AMR@5.9	AMR@5.9/NS1	1
20	4B/16	Car	12	AMR@5.9	AMR@5.9/NS2	1
21	4B/17	Car	12	AMR@5.9	AMR@5.9/NS3	1
22	4B/18	Car	12	AMR@5.9	AMR@5.9/NS4	1
23	4B/19	Car	12	AMR@5.9	AMR@5.9/NS5	1
24	4B/20	Car	12	AMR@5.9	AMR@5.9/NS6	1
25	4B/21	Street	15	AMR@5.9	AMR@5.9/NS1	1
26	4B/22	Street	15	AMR@5.9	AMR@5.9/NS2	1
27	4B/23	Street	15	AMR@5.9	AMR@5.9/NS3	1
28	4B/24	Street	15	AMR@5.9	AMR@5.9/NS4	1
29	4B/25	Street	15	AMR@5.9	AMR@5.9/NS5	1
30	4B/26	Street	15	AMR@5.9	AMR@5.9/NS6	1
31	4B/27	Babble	15	AMR@5.9	AMR@5.9/NS1	1
32	4B/28	Babble	15	AMR@5.9	AMR@5.9/NS2	1
33	4B/29	Babble	15	AMR@5.9	AMR@5.9/NS3	1
34	4B/30	Babble	15	AMR@5.9	AMR@5.9/NS4	1
35	4B/31	Babble	15	AMR@5.9	AMR@5.9/NS5	1
36	4B/32	Babble	15	AMR@5.9	AMR@5.9/NS6	1
37	5A/15	Car	12	AMR@12.2	AMR@12.2/NS1	1
38	5A/16	Car	12	AMR@12.2	AMR@12.2/NS2	1
39	5A/17	Car	12	AMR@12.2	AMR@12.2/NS3	1
40	5A/18	Car	12	AMR@12.2	AMR@12.2/NS4	1
41	5A/19	Car	12	AMR@12.2	AMR@12.2/NS5	1
42	5A/20	Car	12	AMR@12.2	AMR@12.2/NS6	1
43	5A/21	Street	15	AMR@12.2	AMR@12.2/NS1	1
44	5A/22	Street	15	AMR@12.2	AMR@12.2/NS2	1
45	5A/23	Street	15	AMR@12.2	AMR@12.2/NS3	1
46	5A/24	Street	15	AMR@12.2	AMR@12.2/NS4	1
47	5A/25	Street	15	AMR@12.2	AMR@12.2/NS5	1
48	5A/26	Street	15	AMR@12.2	AMR@12.2/NS6	1

Cond.No Exp. 1	Original Cond.No.	Noise	SNR (dB)	Reference	Processed	Tandems
49	5A/27	Babble	15	AMR@12.2	AMR@12.2/NS1	1
50	5A/28	Babble	15	AMR@12.2	AMR@12.2/NS2	1
51	5A/29	Babble	15	AMR@12.2	AMR@12.2/NS3	1
52	5A/30	Babble	15	AMR@12.2	AMR@12.2/NS4	1
53	5A/31	Babble	15	AMR@12.2	AMR@12.2/NS5	1
54	5A/32	Babble	15	AMR@12.2	AMR@12.2/NS6	1
55	5B/15	Car	12	AMR@12.2	AMR@12.2/NS1	1
56	5B/16	Car	12	AMR@12.2	AMR@12.2/NS2	1
57	5B/17	Car	12	AMR@12.2	AMR@12.2/NS3	1
58	5B/18	Car	12	AMR@12.2	AMR@12.2/NS4	1
59	5B/19	Car	12	AMR@12.2	AMR@12.2/NS5	1
60	5B/20	Car	12	AMR@12.2	AMR@12.2/NS6	1
61	5B/21	Street	15	AMR@12.2	AMR@12.2/NS1	1
62	5B/22	Street	15	AMR@12.2	AMR@12.2/NS2	1
63	5B/23	Street	15	AMR@12.2	AMR@12.2/NS3	1
64	5B/24	Street	15	AMR@12.2	AMR@12.2/NS4	1
65	5B/25	Street	15	AMR@12.2	AMR@12.2/NS5	1
66	5B/26	Street	15	AMR@12.2	AMR@12.2/NS6	1
67	5B/27	Babble	15	AMR@12.2	AMR@12.2/NS1	1
68	5B/28	Babble	15	AMR@12.2	AMR@12.2/NS2	1
69	5B/29	Babble	15	AMR@12.2	AMR@12.2/NS3	1
70	5B/30	Babble	15	AMR@12.2	AMR@12.2/NS4	1
71	5B/31	Babble	15	AMR@12.2	AMR@12.2/NS5	1
72	5B/32	Babble	15	AMR@12.2	AMR@12.2/NS6	1
73	2A/05	—	—	AMR@12.2	AMR@12.2/NS1	1
74	2A/06	—	—	AMR@12.2	AMR@12.2/NS2	1
75	2A/07	—	—	AMR@12.2	AMR@12.2/NS3	1
76	2A/08	—	—	AMR@12.2	AMR@12.2/NS4	1
77	2A/09	—	—	AMR@12.2	AMR@12.2/NS5	1
78	2A/10	—	—	AMR@12.2	AMR@12.2/NS6	1
79	2A/17	—	—	AMR@5.9	AMR@5.9/NS1	1
80	2A/18	—	—	AMR@5.9	AMR@5.9/NS2	1
81	2A/19	—	—	AMR@5.9	AMR@5.9/NS3	1
82	2A/20	—	—	AMR@5.9	AMR@5.9/NS4	1
83	2A/21	—	—	AMR@5.9	AMR@5.9/NS5	1
84	2A/22	—	—	AMR@5.9	AMR@5.9/NS6	1
85	2A/11	—	—	AMR@12.2	AMR@12.2/NS1	2
86	2A/12	—	—	AMR@12.2	AMR@12.2/NS2	2
87	2A/13	—	—	AMR@12.2	AMR@12.2/NS3	2
88	2A/14	—	—	AMR@12.2	AMR@12.2/NS4	2
89	2A/15	—	—	AMR@12.2	AMR@12.2/NS5	2
90	2A/16	—	—	AMR@12.2	AMR@12.2/NS6	2
91	2A/23	—	—	AMR@5.9	AMR@5.9/NS1	2
92	2A/24	—	—	AMR@5.9	AMR@5.9/NS2	2
93	2A/25	—	—	AMR@5.9	AMR@5.9/NS3	2
94	2A/26	—	—	AMR@5.9	AMR@5.9/NS4	2
95	2A/27	—	—	AMR@5.9	AMR@5.9/NS5	2
96	2A/28	—	—	AMR@5.9	AMR@5.9/NS6	2

5.2 Listeners

The subjective assessment was performed using Six “expert” subjects fluent in the Spanish language. The listener selection criteria were compliant with the AMR NS Selection Test Plan. The pre-test listener orientation used by COMSAT conformed to that specified in the Test Plan.

5.3 Audio Presentation

The processed speech material was presented to the subjects in listening stations contained within an acoustically conditioned sound room meeting the requirements for an NC 20 acoustic facility. Presentation was made binaurally using an AKG Studio Monitor headset, driven by a distribution amplifier set to deliver an active level of -18 dBPa (76 dB SPL) in each ear, using a B&K 4153 Artificial Ear with circumaural headphone adapter, 4134 Microphone element and 2610 Measurement Amplifier.

The processed speech files were stored within the main facility computer and presented to the listeners under program control as 16 kHz samples. The signals were passed through a 16-bit D/A converter coupled to the input of the distribution amplifier. The reference and test signals were available to the subjects via an A/B switch box, where the P position corresponded to the Processed signal and the R position corresponded to the Reference signal. The subjects were free to switch between the P and R position as many times as they wanted, before casting a vote for each of the three conditions. On average, each of the subjects took 2 hours to perform the test.

5.4 Scoring

The test plan specified that subjects would respond to three questions about each sample. These questions were designed to target the convergence behavior of the noise suppressors and to identify the presence of artifacts in the sample. Subjects were instructed to compare the test and reference samples to determine whether an audible artifact was present in the original sample or added by the noise suppressor. Where artifacts were identified, the subjects are asked to provide a short description.

The questions were:

A. *Assess the convergence of the noise suppression.*

1. Not audible
2. Audible, but fast
3. Audible and relatively slow

B. *Assess the presence of artifacts during the silence at the beginning of the sample:*

1. No audible artifacts
2. Audible
3. Clearly audible

C. *Assess the presence of artifacts at the onset of the speech and during the speech:*

1. No audible artifacts
2. Audible
3. Clearly audible

The responses to these assessment questions yielded quantitative estimates of the number and severity of artifacts heard, as well as a description of those artifacts (see Annex A).

The listener responses were registered on paper for each of the questions and for each of the 96 test conditions after they listened to the processed and reference material to their satisfaction. The scores were later entered into a database for subsequent analysis and presentation.

6. Statistical Analysis

The statistics to be reported for this expert experiment are the average of scores for each of the three questions asked to the subjects. However, since the population sample is too small, standard deviation values are not useful.

Table 3 presents the basic statistical analysis data produced by COMSAT for AMR NS Selection Experiment 1, and is sorted in test condition order. Each test condition received a total of 6 votes. In the table, *Cond* represents the test condition number in Experiment 1, *SNR/Tandem* is the circuit impairment, *Yconv*, *Ysil*, and *Ysp* are the mean scores for the convergence question A, for the artifacts in silence question B, and for the artifacts in speech question C, respectively. *Sdconv*, *SDsil*, and *SDsp* are the standard deviation for Questions A, B, and C, respectively. The Table also presents the histogram of votes for Questions A (*Convergence*), B (*Silence*), and C (*Speech*)

Table 4 is an alternative presentation of the data in Table 3, whereby the data is grouped by Noise Suppressor and sorted by increasing *Yconv* and *Ysil*.

It can be seen from Tables 3 and 4 that in general the car noise conditions had the largest number of perceived effects. On the other end, babble and quiet background were the conditions that elicited the least comments. The overall figures for each noise suppression candidate were as follows:

NS	Grand-means			Percentage 2&3 votes		
	Yconv	Ysil	Ysp	Yconv	Ysil	Ysp
1	1.3	1.3	1.5	18%	25%	39%
2	1.6	1.6	1.4	52%	51%	33%
3	1.4	1.4	1.4	29%	34%	30%
4	1.5	1.5	1.5	41%	41%	38%
5	1.8	1.6	1.4	47%	51%	35%
6	1.4	1.4	1.5	29%	34%	42%

The grand-means for each NS algorithm, computed across the 16 impairments, indicate no major difference across the algorithms. However, the proportion of votes 2 and 3 showed a large variance for the different NS candidates, which slightly contradicts the indications of the grand means.

7. Conclusion

COMSAT performed AMR NS Selection Experiment 1 for the Spanish language in compliance with the test plan. Six expert subjects were used. This experiment was designed to determine any initial convergence artifacts introduced by the noise suppression candidate algorithms for the AMR codec operating at 12.2 and 5.9 kbit/s. It was observed that in general the car noise conditions had the largest number of perceived effects. On the other end, babble and quiet background conditions elicited the least comments. The grand-means for each NS algorithm, computed across the 16 test impairments, indicate no major difference across the algorithms. However, the proportion of votes 2 and 3 showed a large variance for the different NS candidates, which slightly contradicts the indications of the grand means.

References

- [1] SMG11SQ, “Test Plan for the AMR Specification for the AMR-NS Selection Phase”; Tdoc SMG11 288/99.
- [2] SMG11SQ, “Processing Functions for the GSM AMR Noise Suppression Selection Tests”; Tdoc SMG11 281R/99
- [3] COMSAT Laboratories, “Host Laboratory Processing for ETSI/AMR Noise Suppression Selection Tests”, Tdoc SMG11 417/99

Table 3 (Part 1/3):
Experiment 1: Artifacts in initial convergence

Cond.	Noise/Tandem	Processed	Reference	N	Histograms														
					Convergence			Silence											
					1	2	3	1	2	3									
01	Car@6dB/1x	AMR@5.9/NS1	AMR@5.9	6	1.5	0.8	1.3	0.5	1.5	0.5	4	1	1	4	2	0	3	3	0
02	Car@6dB/1x	AMR@5.9/NS2	AMR@5.9	6	2.2	0.4	2.5	0.8	1.8	0.8	0	5	1	1	1	4	2	3	1
03	Car@6dB/1x	AMR@5.9/NS3	AMR@5.9	6	1.3	0.5	1.3	0.5	2.0	0.9	4	2	0	4	2	0	2	2	2
04	Car@6dB/1x	AMR@5.9/NS4	AMR@5.9	6	2.2	0.4	2.5	0.5	2.0	0.9	0	5	1	0	3	3	2	2	2
05	Car@6dB/1x	AMR@5.9/NS5	AMR@5.9	6	2.7	0.5	2.5	0.5	2.0	0.6	0	2	4	0	3	3	1	4	1
06	Car@6dB/1x	AMR@5.9/NS6	AMR@5.9	6	1.7	0.5	2.0	0.9	2.2	0.8	2	4	0	2	2	2	1	3	2
07	Street@9dB/1x	AMR@5.9/NS1	AMR@5.9	6	1.5	0.5	1.8	0.8	1.7	0.8	3	3	0	2	3	1	3	2	1
08	Street@9dB/1x	AMR@5.9/NS2	AMR@5.9	6	1.7	0.8	1.7	0.8	1.5	0.5	3	2	1	3	2	1	3	3	0
09	Street@9dB/1x	AMR@5.9/NS3	AMR@5.9	6	2.0	0.9	1.8	0.8	1.5	0.8	2	2	2	2	3	1	4	1	1
10	Street@9dB/1x	AMR@5.9/NS4	AMR@5.9	6	1.5	0.5	1.5	0.5	1.3	0.5	3	3	0	3	3	0	4	2	0
11	Street@9dB/1x	AMR@5.9/NS5	AMR@5.9	6	1.7	0.8	1.5	0.5	1.2	0.4	3	2	1	3	3	0	5	1	0
12	Street@9dB/1x	AMR@5.9/NS6	AMR@5.9	6	1.2	0.4	1.2	0.4	1.5	0.5	5	1	0	5	1	0	3	3	0
13	Babble@9dB/1x	AMR@5.9/NS1	AMR@5.9	6	1.0	0.0	1.2	0.4	1.2	0.4	6	0	0	5	1	0	5	1	0
14	Babble@9dB/1x	AMR@5.9/NS2	AMR@5.9	6	1.2	0.4	1.2	0.4	1.3	0.5	5	1	0	5	1	0	4	2	0
15	Babble@9dB/1x	AMR@5.9/NS3	AMR@5.9	6	1.0	0.0	1.2	0.4	1.2	0.4	6	0	0	5	1	0	5	1	0
16	Babble@9dB/1x	AMR@5.9/NS4	AMR@5.9	6	1.2	0.4	1.2	0.4	1.2	0.4	5	1	0	5	1	0	5	1	0
17	Babble@9dB/1x	AMR@5.9/NS5	AMR@5.9	6	1.3	0.8	1.3	0.5	1.2	0.4	5	0	1	4	2	0	5	1	0
18	Babble@9dB/1x	AMR@5.9/NS6	AMR@5.9	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0	6	0	0	5	1	0
19	Car@12dB/1x	AMR@5.9/NS1	AMR@5.9	6	2.0	1.1	1.8	0.8	1.8	0.8	3	0	3	2	3	1	2	3	1
20	Car@12dB/1x	AMR@5.9/NS2	AMR@5.9	6	2.0	0.0	2.3	0.5	1.7	0.5	0	6	0	0	4	2	2	4	0
21	Car@12dB/1x	AMR@5.9/NS3	AMR@5.9	6	2.0	0.6	2.2	0.4	1.5	0.8	1	4	1	0	5	1	4	1	1
22	Car@12dB/1x	AMR@5.9/NS4	AMR@5.9	6	2.5	0.5	2.2	0.4	1.5	0.8	0	3	3	0	5	1	4	1	1
23	Car@12dB/1x	AMR@5.9/NS5	AMR@5.9	6	2.7	0.5	2.3	0.5	1.7	0.5	0	2	4	0	4	2	2	4	0
24	Car@12dB/1x	AMR@5.9/NS6	AMR@5.9	6	2.0	0.9	1.8	0.4	2.0	0.6	2	2	2	1	5	0	1	4	1
25	Street@15dB/1x	AMR@5.9/NS1	AMR@5.9	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0	6	0	0	5	1	0
26	Street@15dB/1x	AMR@5.9/NS2	AMR@5.9	6	1.7	0.5	1.8	0.8	1.0	0.0	2	4	0	2	3	1	6	0	0
27	Street@15dB/1x	AMR@5.9/NS3	AMR@5.9	6	1.2	0.4	1.2	0.4	1.0	0.0	5	1	0	5	1	0	6	0	0
28	Street@15dB/1x	AMR@5.9/NS4	AMR@5.9	6	1.3	0.5	1.3	0.5	1.2	0.4	4	2	0	4	2	0	5	1	0
29	Street@15dB/1x	AMR@5.9/NS5	AMR@5.9	6	1.5	0.5	1.5	0.5	1.5	0.5	3	3	0	3	3	0	3	3	0
30	Street@15dB/1x	AMR@5.9/NS6	AMR@5.9	6	1.0	0.0	1.2	0.4	1.3	0.5	6	0	0	5	1	0	4	2	0
31	Babble@15dB/1x	AMR@5.9/NS1	AMR@5.9	6	1.0	0.0	1.0	0.0	1.7	0.8	6	0	0	6	0	0	3	2	1
32	Babble@15dB/1x	AMR@5.9/NS2	AMR@5.9	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0	6	0	0	4	2	0
33	Babble@15dB/1x	AMR@5.9/NS3	AMR@5.9	6	1.2	0.4	1.2	0.4	1.2	0.4	5	1	0	5	1	0	5	1	0
34	Babble@15dB/1x	AMR@5.9/NS4	AMR@5.9	6	1.0	0.0	1.0	0.0	1.0	0.0	6	0	0	6	0	0	6	0	0
35	Babble@15dB/1x	AMR@5.9/NS5	AMR@5.9	6	1.3	0.8	1.3	0.5	1.3	0.8	5	0	1	4	2	0	5	0	1
36	Babble@15dB/1x	AMR@5.9/NS6	AMR@5.9	6	1.3	0.5	1.3	0.5	1.5	0.5	4	2	0	4	2	0	3	3	0

Table 3 (Part 2/3):
Experiment 1: Artifacts in initial convergence

Cond.	Noise/Tandem	Processed	Reference	N	Histograms								
					Convergence			Silence			Speech		
					1	2	3	1	2	3	1	2	3
37	Car@6dB/1x	AMR@12.2/NS1	AMR@12.2	6	2.0	1.1	2.0	0.9	1.7	0.8	3	0	3
38	Car@6dB/1x	AMR@12.2/NS2	AMR@12.2	6	2.0	0.0	2.3	0.5	2.0	0.6	0	6	0
39	Car@6dB/1x	AMR@12.2/NS3	AMR@12.2	6	1.8	1.0	1.8	0.8	1.8	0.8	3	1	2
40	Car@6dB/1x	AMR@12.2/NS4	AMR@12.2	6	2.5	0.5	2.3	0.5	2.3	0.5	0	3	3
41	Car@6dB/1x	AMR@12.2/NS5	AMR@12.2	6	2.8	0.4	2.3	0.5	1.8	0.8	0	1	5
42	Car@6dB/1x	AMR@12.2/NS6	AMR@12.2	6	2.0	0.7	1.8	0.4	2.5	0.5	1	3	1
43	Street@9dB/1x	AMR@12.2/NS1	AMR@12.2	6	1.5	0.8	1.3	0.5	1.5	0.5	4	1	1
44	Street@9dB/1x	AMR@12.2/NS2	AMR@12.2	6	1.8	0.4	2.0	0.6	1.2	0.4	1	5	0
45	Street@9dB/1x	AMR@12.2/NS3	AMR@12.2	6	1.2	0.4	1.3	0.5	1.5	0.8	5	1	0
46	Street@9dB/1x	AMR@12.2/NS4	AMR@12.2	6	1.7	0.5	1.8	0.8	1.7	0.5	2	4	0
47	Street@9dB/1x	AMR@12.2/NS5	AMR@12.2	6	2.0	0.9	1.7	0.5	1.0	0.0	2	2	2
48	Street@9dB/1x	AMR@12.2/NS6	AMR@12.2	6	1.8	1.0	1.7	0.8	1.5	0.8	3	1	2
49	Babble@9dB/1x	AMR@12.2/NS1	AMR@12.2	6	1.2	0.4	1.3	0.5	1.5	0.5	5	1	0
50	Babble@9dB/1x	AMR@12.2/NS2	AMR@12.2	6	1.2	0.4	1.2	0.4	1.3	0.5	5	1	0
51	Babble@9dB/1x	AMR@12.2/NS3	AMR@12.2	6	1.2	0.4	1.2	0.4	1.0	0.0	5	1	0
52	Babble@9dB/1x	AMR@12.2/NS4	AMR@12.2	6	1.2	0.4	1.2	0.4	1.0	0.0	5	1	0
53	Babble@9dB/1x	AMR@12.2/NS5	AMR@12.2	6	1.3	0.8	1.3	0.5	1.2	0.4	5	0	1
54	Babble@9dB/1x	AMR@12.2/NS6	AMR@12.2	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0
55	Car@12dB/1x	AMR@12.2/NS1	AMR@12.2	6	1.8	1.0	1.8	0.8	1.7	0.8	3	1	2
56	Car@12dB/1x	AMR@12.2/NS2	AMR@12.2	6	2.2	0.4	2.2	0.4	1.8	1.0	0	5	1
57	Car@12dB/1x	AMR@12.2/NS3	AMR@12.2	6	2.0	0.6	2.0	0.6	1.7	0.8	1	4	1
58	Car@12dB/1x	AMR@12.2/NS4	AMR@12.2	6	2.2	0.4	2.3	0.5	2.2	0.8	0	5	1
59	Car@12dB/1x	AMR@12.2/NS5	AMR@12.2	6	2.3	0.5	2.2	0.4	1.5	0.8	0	4	2
60	Car@12dB/1x	AMR@12.2/NS6	AMR@12.2	6	1.8	0.8	1.8	0.4	1.8	1.0	2	3	1
61	Street@15dB/1x	AMR@12.2/NS1	AMR@12.2	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0
62	Street@15dB/1x	AMR@12.2/NS2	AMR@12.2	6	1.7	0.5	1.7	0.5	1.2	0.4	2	4	0
63	Street@15dB/1x	AMR@12.2/NS3	AMR@12.2	6	1.3	0.5	1.3	0.5	1.2	0.4	4	2	0
64	Street@15dB/1x	AMR@12.2/NS4	AMR@12.2	6	1.8	1.0	1.8	1.0	1.5	0.8	3	1	2
65	Street@15dB/1x	AMR@12.2/NS5	AMR@12.2	6	1.8	1.0	1.5	0.5	1.3	0.5	3	1	2
66	Street@15dB/1x	AMR@12.2/NS6	AMR@12.2	6	1.3	0.5	1.5	0.5	1.3	0.5	4	2	0
67	Babble@15dB/1x	AMR@12.2/NS1	AMR@12.2	6	1.0	0.0	1.2	0.4	1.2	0.4	6	0	0
68	Babble@15dB/1x	AMR@12.2/NS2	AMR@12.2	6	1.2	0.4	1.2	0.4	1.0	0.0	5	1	0
69	Babble@15dB/1x	AMR@12.2/NS3	AMR@12.2	6	1.0	0.0	1.2	0.4	1.0	0.0	6	0	0
70	Babble@15dB/1x	AMR@12.2/NS4	AMR@12.2	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0
71	Babble@15dB/1x	AMR@12.2/NS5	AMR@12.2	6	1.7	1.0	1.5	0.5	1.3	0.5	4	0	2
72	Babble@15dB/1x	AMR@12.2/NS6	AMR@12.2	6	1.3	0.5	1.3	0.5	1.2	0.4	4	2	0

Table 3 (Part 3/3):
Experiment 1: Artifacts in initial convergence

Cond.	Noise/Tandem	Processed	Reference	N	Yconv	Sdconv	Ysil	Sdsil	Ysp	SDsp	Histograms		
											Convergence		
											1	2	3
73	Quiet/1x	AMR@12.2/NS1	AMR@12.2	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0
74	Quiet/1x	AMR@12.2/NS2	AMR@12.2	6	1.7	0.8	1.5	0.5	1.2	0.4	3	2	1
75	Quiet/1x	AMR@12.2/NS3	AMR@12.2	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0
76	Quiet/1x	AMR@12.2/NS4	AMR@12.2	6	1.3	0.8	1.2	0.4	1.3	0.5	5	0	1
77	Quiet/1x	AMR@12.2/NS5	AMR@12.2	6	1.3	0.8	1.2	0.4	1.3	0.5	5	0	1
78	Quiet/1x	AMR@12.2/NS6	AMR@12.2	6	1.3	0.8	1.2	0.4	1.3	0.5	5	0	1
79	Quiet/1x	AMR@5.9/NS1	AMR@5.9	6	1.0	0.0	1.0	0.0	1.5	0.8	6	0	0
80	Quiet/1x	AMR@5.9/NS2	AMR@5.9	6	1.2	0.4	1.2	0.4	1.3	0.5	5	1	0
81	Quiet/1x	AMR@5.9/NS3	AMR@5.9	6	1.3	0.8	1.2	0.4	1.3	0.5	5	0	1
82	Quiet/1x	AMR@5.9/NS4	AMR@5.9	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0
83	Quiet/1x	AMR@5.9/NS5	AMR@5.9	6	1.3	0.8	1.2	0.4	1.5	0.5	5	0	1
84	Quiet/1x	AMR@5.9/NS6	AMR@5.9	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0
85	Quiet/2x	AMR@12.2/NS1	AMR@12.2	6	1.0	0.0	1.0	0.0	1.7	0.8	6	0	0
86	Quiet/2x	AMR@12.2/NS2	AMR@12.2	6	1.3	0.5	1.3	0.5	1.2	0.4	4	2	0
87	Quiet/2x	AMR@12.2/NS3	AMR@12.2	6	1.3	0.8	1.2	0.4	1.3	0.5	5	0	1
88	Quiet/2x	AMR@12.2/NS4	AMR@12.2	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0
89	Quiet/2x	AMR@12.2/NS5	AMR@12.2	6	1.3	0.8	1.2	0.4	1.2	0.4	5	0	1
90	Quiet/2x	AMR@12.2/NS6	AMR@12.2	6	1.2	0.4	1.2	0.4	1.2	0.4	5	1	0
91	Quiet/2x	AMR@5.9/NS1	AMR@5.9	6	1.0	0.0	1.0	0.0	1.5	0.8	6	0	0
92	Quiet/2x	AMR@5.9/NS2	AMR@5.9	6	1.2	0.4	1.2	0.4	1.2	0.4	5	1	0
93	Quiet/2x	AMR@5.9/NS3	AMR@5.9	6	1.3	0.8	1.2	0.4	1.7	0.5	5	0	1
94	Quiet/2x	AMR@5.9/NS4	AMR@5.9	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0
95	Quiet/2x	AMR@5.9/NS5	AMR@5.9	6	1.0	0.0	1.0	0.0	1.3	0.5	6	0	0
96	Quiet/2x	AMR@5.9/NS6	AMR@5.9	6	1.0	0.0	1.0	0.0	1.2	0.4	6	0	0

Table 4 (Part 1/3):
Experiment 1: Artifacts in initial convergence, grouped by noise suppressor and sorted by Convergence and Silence scores

Cnd	Noise/Tandem	Processed	Reference	N	Yconv	Ysil	Ysp	Histograms			Convergence			Silence			Speech		
								1	2	3	1	2	3	1	2	3	1	2	3
25	Street@15dB/1x	AMR@5.9/NS 1	AMR@5.9	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
31	Babble@15dB/1x	AMR@5.9/NS 1	AMR@5.9	6	1.0	1.0	1.7	6	0	0	6	0	0	3	2	1			
61	Street@15dB/1x	AMR@12.2/NS 1	AMR@12.2	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
73	Quiet/1x	AMR@12.2/NS 1	AMR@12.2	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
79	Quiet/1x	AMR@5.9/NS 1	AMR@5.9	6	1.0	1.0	1.5	6	0	0	6	0	0	4	1	1			
85	Quiet/2x	AMR@12.2/NS 1	AMR@12.2	6	1.0	1.0	1.7	6	0	0	6	0	0	3	2	1			
91	Quiet/2x	AMR@5.9/NS 1	AMR@5.9	6	1.0	1.0	1.5	6	0	0	6	0	0	4	1	1			
13	Babble@9dB/1x	AMR@5.9/NS 1	AMR@5.9	6	1.0	1.2	1.2	6	0	0	5	1	0	5	1	0			
67	Babble@15dB/1x	AMR@12.2/NS 1	AMR@12.2	6	1.0	1.2	1.2	6	0	0	5	1	0	5	1	0			
49	Babble@9dB/1x	AMR@12.2/NS 1	AMR@12.2	6	1.2	1.3	1.5	5	1	0	4	2	0	3	3	0			
1	Car@6dB/1x	AMR@5.9/NS 1	AMR@5.9	6	1.5	1.3	1.5	4	1	1	4	2	0	3	3	0			
43	Street@9dB/1x	AMR@12.2/NS 1	AMR@12.2	6	1.5	1.3	1.5	4	1	1	4	2	0	3	3	0			
7	Street@9dB/1x	AMR@5.9/NS 1	AMR@5.9	6	1.5	1.8	1.7	3	3	0	2	3	1	3	2	1			
55	Car@12dB/1x	AMR@12.2/NS 1	AMR@12.2	6	1.8	1.8	1.7	3	1	2	2	3	1	3	2	1			
19	Car@12dB/1x	AMR@5.9/NS 1	AMR@5.9	6	2.0	1.8	1.8	3	0	3	2	3	1	2	3	1			
37	Car@6dB/1x	AMR@12.2/NS 1	AMR@12.2	6	2.0	2.0	1.7	3	0	3	2	2	2	3	2	1			
32	Babble@15dB/1x	AMR@5.9/NS 2	AMR@5.9	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
14	Babble@9dB/1x	AMR@5.9/NS 2	AMR@5.9	6	1.2	1.2	1.3	5	1	0	5	1	0	4	2	0			
50	Babble@9dB/1x	AMR@12.2/NS 2	AMR@12.2	6	1.2	1.2	1.3	5	1	0	5	1	0	4	2	0			
68	Babble@15dB/1x	AMR@12.2/NS 2	AMR@12.2	6	1.2	1.2	1.0	5	1	0	5	1	0	6	0	0			
80	Quiet/1x	AMR@5.9/NS 2	AMR@5.9	6	1.2	1.2	1.3	5	1	0	5	1	0	4	2	0			
92	Quiet/2x	AMR@5.9/NS 2	AMR@5.9	6	1.2	1.2	1.2	5	1	0	5	1	0	5	1	0			
86	Quiet/2x	AMR@12.2/NS 2	AMR@12.2	6	1.3	1.3	1.2	4	2	0	4	2	0	5	1	0			
62	Street@15dB/1x	AMR@12.2/NS 2	AMR@12.2	6	1.7	1.7	1.2	2	4	0	2	4	0	5	1	0			
74	Quiet/1x	AMR@12.2/NS 2	AMR@12.2	6	1.7	1.5	1.2	3	2	1	3	3	0	5	1	0			
26	Street@15dB/1x	AMR@5.9/NS 2	AMR@5.9	6	1.7	1.8	1.0	2	4	0	2	3	1	6	0	0			
8	Street@9dB/1x	AMR@5.9/NS 2	AMR@5.9	6	1.7	1.7	1.5	3	2	1	3	2	1	3	3	0			
44	Street@9dB/1x	AMR@12.2/NS 2	AMR@12.2	6	1.8	2.0	1.2	1	5	0	1	4	1	5	1	0			
20	Car@12dB/1x	AMR@5.9/NS 2	AMR@5.9	6	2.0	2.3	1.7	0	6	0	0	4	2	2	4	0			
38	Car@6dB/1x	AMR@12.2/NS 2	AMR@12.2	6	2.0	2.3	2.0	0	6	0	0	4	2	1	4	1			
56	Car@12dB/1x	AMR@12.2/NS 2	AMR@12.2	6	2.2	2.2	1.8	0	5	1	0	5	1	3	1	2			
2	Car@6dB/1x	AMR@5.9/NS 2	AMR@5.9	6	2.2	2.5	1.8	0	5	1	1	1	4	2	3	1			

Table 4 (Part 2/3):

Experiment 1: Artifacts in initial convergence, grouped by noise suppressor and sorted by Convergence and Silence scores

Cnd	Noise/Tandem	Processed	Reference	N	Yconv	Ysil	Ysp	Histograms			Convergence			Silence			Speech		
								1	2	3	1	2	3	1	2	3	1	2	3
75	Quiet/1x	AMR@12.2/NS 3	AMR@12.2	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
15	Babble@9dB/1x	AMR@5.9/NS 3	AMR@5.9	6	1.0	1.2	1.2	6	0	0	5	1	0	5	1	0			
69	Babble@15dB/1x	AMR@12.2/NS 3	AMR@12.2	6	1.0	1.2	1.0	6	0	0	5	1	0	6	0	0			
27	Street@15dB/1x	AMR@5.9/NS 3	AMR@5.9	6	1.2	1.2	1.0	5	1	0	5	1	0	6	0	0			
33	Babble@15dB/1x	AMR@5.9/NS 3	AMR@5.9	6	1.2	1.2	1.2	5	1	0	5	1	0	5	1	0			
51	Babble@9dB/1x	AMR@12.2/NS 3	AMR@12.2	6	1.2	1.2	1.0	5	1	0	5	1	0	6	0	0			
45	Street@9dB/1x	AMR@12.2/NS 3	AMR@12.2	6	1.2	1.3	1.5	5	1	0	4	2	0	4	1	1			
81	Quiet/1x	AMR@5.9/NS 3	AMR@5.9	6	1.3	1.2	1.3	5	0	1	5	1	0	4	2	0			
87	Quiet/2x	AMR@12.2/NS 3	AMR@12.2	6	1.3	1.2	1.3	5	0	1	5	1	0	4	2	0			
93	Quiet/2x	AMR@5.9/NS 3	AMR@5.9	6	1.3	1.2	1.7	5	0	1	5	1	0	2	4	0			
3	Car@6dB/1x	AMR@5.9/NS 3	AMR@5.9	6	1.3	1.3	2.0	4	2	0	4	2	0	2	2	2			
63	Street@15dB/1x	AMR@12.2/NS 3	AMR@12.2	6	1.3	1.3	1.2	4	2	0	4	2	0	5	1	0			
39	Car@6dB/1x	AMR@12.2/NS 3	AMR@12.2	6	1.8	1.8	1.8	3	1	2	2	3	1	2	3	1			
21	Car@12dB/1x	AMR@5.9/NS 3	AMR@5.9	6	2.0	2.2	1.5	1	4	1	0	5	1	4	1	1			
57	Car@12dB/1x	AMR@12.2/NS 3	AMR@12.2	6	2.0	2.0	1.7	1	4	1	1	4	1	3	2	1			
9	Street@9dB/1x	AMR@5.9/NS 3	AMR@5.9	6	2.0	1.8	1.5	2	2	2	2	3	1	4	1	1			
34	Babble@15dB/1x	AMR@5.9/NS 4	AMR@5.9	6	1.0	1.0	1.0	6	0	0	6	0	0	6	0	0			
70	Babble@15dB/1x	AMR@12.2/NS 4	AMR@12.2	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
82	Quiet/1x	AMR@5.9/NS 4	AMR@5.9	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
88	Quiet/2x	AMR@12.2/NS 4	AMR@12.2	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
94	Quiet/2x	AMR@5.9/NS 4	AMR@5.9	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
16	Babble@9dB/1x	AMR@5.9/NS 4	AMR@5.9	6	1.2	1.2	1.2	5	1	0	5	1	0	5	1	0			
52	Babble@9dB/1x	AMR@12.2/NS 4	AMR@12.2	6	1.2	1.2	1.0	5	1	0	5	1	0	6	0	0			
76	Quiet/1x	AMR@12.2/NS 4	AMR@12.2	6	1.3	1.2	1.3	5	0	1	5	1	0	4	2	0			
28	Street@15dB/1x	AMR@5.9/NS 4	AMR@5.9	6	1.3	1.3	1.2	4	2	0	4	2	0	5	1	0			
10	Street@9dB/1x	AMR@5.9/NS 4	AMR@5.9	6	1.5	1.5	1.3	3	3	0	3	3	0	4	2	0			
46	Street@9dB/1x	AMR@12.2/NS 4	AMR@12.2	6	1.7	1.8	1.7	2	4	0	2	3	1	2	4	0			
64	Street@15dB/1x	AMR@12.2/NS 4	AMR@12.2	6	1.8	1.8	1.5	3	1	2	3	1	2	4	1	1			
58	Car@12dB/1x	AMR@12.2/NS 4	AMR@12.2	6	2.2	2.3	2.2	0	5	1	0	4	2	1	3	2			
4	Car@6dB/1x	AMR@5.9/NS 4	AMR@5.9	6	2.2	2.5	2.0	0	5	1	0	3	3	2	2	2			
22	Car@12dB/1x	AMR@5.9/NS 4	AMR@5.9	6	2.5	2.2	1.5	0	3	3	0	5	1	4	1	1			
40	Car@6dB/1x	AMR@12.2/NS 4	AMR@12.2	6	2.5	2.3	2.3	0	3	3	0	4	2	0	4	2			

Table 4 (Part 3/3):

Experiment 1: Artifacts in initial convergence, grouped by noise suppressor and sorted by Convergence and Silence scores

Cnd	Noise/Tandem	Processed	Reference	N	Yconv	Ysil	Ysp	Histograms			Convergence			Silence			Speech		
								1	2	3	1	2	3	1	2	3	1	2	3
95	Quiet/2x	AMR@5.9/NS 5	AMR@5.9	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
77	Quiet/1x	AMR@12.2/NS 5	AMR@12.2	6	1.3	1.2	1.3	5	0	1	5	1	0	4	2	0			
83	Quiet/1x	AMR@5.9/NS 5	AMR@5.9	6	1.3	1.2	1.5	5	0	1	5	1	0	3	3	0			
89	Quiet/2x	AMR@12.2/NS 5	AMR@12.2	6	1.3	1.2	1.2	5	0	1	5	1	0	5	1	0			
17	Babble@9dB/1x	AMR@5.9/NS 5	AMR@5.9	6	1.3	1.3	1.2	5	0	1	4	2	0	5	1	0			
35	Babble@15dB/1x	AMR@5.9/NS 5	AMR@5.9	6	1.3	1.3	1.3	5	0	1	4	2	0	5	0	1			
53	Babble@9dB/1x	AMR@12.2/NS 5	AMR@12.2	6	1.3	1.3	1.2	5	0	1	4	2	0	5	1	0			
29	Street@15dB/1x	AMR@5.9/NS 5	AMR@5.9	6	1.5	1.5	1.5	3	3	0	3	3	0	3	3	0			
11	Street@9dB/1x	AMR@5.9/NS 5	AMR@5.9	6	1.7	1.5	1.2	3	2	1	3	3	0	5	1	0			
71	Babble@15dB/1x	AMR@12.2/NS 5	AMR@12.2	6	1.7	1.5	1.3	4	0	2	3	3	0	4	2	0			
65	Street@15dB/1x	AMR@12.2/NS 5	AMR@12.2	6	1.8	1.5	1.3	3	1	2	3	3	0	4	2	0			
47	Street@9dB/1x	AMR@12.2/NS 5	AMR@12.2	6	2.0	1.7	1.0	2	2	2	2	4	0	6	0	0			
59	Car@12dB/1x	AMR@12.2/NS 5	AMR@12.2	6	2.3	2.2	1.5	0	4	2	0	5	1	4	1	1			
23	Car@12dB/1x	AMR@5.9/NS 5	AMR@5.9	6	2.7	2.3	1.7	0	2	4	0	4	2	2	4	0			
5	Car@6dB/1x	AMR@5.9/NS 5	AMR@5.9	6	2.7	2.5	2.0	0	2	4	0	3	3	1	4	1			
41	Car@6dB/1x	AMR@12.2/NS 5	AMR@12.2	6	2.8	2.3	1.8	0	1	5	0	4	2	2	3	1			
18	Babble@9dB/1x	AMR@5.9/NS 6	AMR@5.9	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
54	Babble@9dB/1x	AMR@12.2/NS 6	AMR@12.2	6	1.0	1.0	1.3	6	0	0	6	0	0	4	2	0			
84	Quiet/1x	AMR@5.9/NS 6	AMR@5.9	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
96	Quiet/2x	AMR@5.9/NS 6	AMR@5.9	6	1.0	1.0	1.2	6	0	0	6	0	0	5	1	0			
30	Street@15dB/1x	AMR@5.9/NS 6	AMR@5.9	6	1.0	1.2	1.3	6	0	0	5	1	0	4	2	0			
12	Street@9dB/1x	AMR@5.9/NS 6	AMR@5.9	6	1.2	1.2	1.5	5	1	0	5	1	0	3	3	0			
90	Quiet/2x	AMR@12.2/NS 6	AMR@12.2	6	1.2	1.2	1.2	5	1	0	5	1	0	5	1	0			
78	Quiet/1x	AMR@12.2/NS 6	AMR@12.2	6	1.3	1.2	1.3	5	0	1	5	1	0	4	2	0			
36	Babble@15dB/1x	AMR@5.9/NS 6	AMR@5.9	6	1.3	1.3	1.5	4	2	0	4	2	0	3	3	0			
72	Babble@15dB/1x	AMR@12.2/NS 6	AMR@12.2	6	1.3	1.3	1.2	4	2	0	4	2	0	5	1	0			
66	Street@15dB/1x	AMR@12.2/NS 6	AMR@12.2	6	1.3	1.5	1.3	4	2	0	3	3	0	4	2	0			
6	Car@6dB/1x	AMR@5.9/NS 6	AMR@5.9	6	1.7	2.0	2.2	2	4	0	2	2	2	1	3	2			
60	Car@12dB/1x	AMR@12.2/NS 6	AMR@12.2	6	1.8	1.8	1.8	2	3	1	1	5	0	3	1	2			
48	Street@9dB/1x	AMR@12.2/NS 6	AMR@12.2	6	1.8	1.7	1.5	3	1	2	3	2	1	4	1	1			
24	Car@12dB/1x	AMR@5.9/NS 6	AMR@5.9	6	2.0	1.8	2.0	2	2	2	1	5	0	1	4	1			
42	Car@6dB/1x	AMR@12.2/NS 6	AMR@12.2	6	2.0	1.8	2.5	1	3	1	1	5	0	0	3	3			

Annex A

Subjects comments

Table A.1
Comments for Question B on Artifacts during the leading silence

Cnd	Subject					
	1	2	3	4	5	6
1	click	-	-	-	-	whoosh
2	-	-	-	whoosh	shush	whoosh
3	shush	-	-	-	-	-
4	-	wavey	shush	whoosh	ocean noise	whoosh
5	shush	wavey	shush	whoosh	-	click
6	shush	-	shush	whoosh	-	whoosh
7	voice like musical tones	-	shush	whoosh	-	whoosh
8	scratch and clicking	-	shush	-	-	musical tones
9	-	bumpy	shush	-	shush	whoosh
10	shush	-	shush	noise burst	-	-
11	shush	wavey	shush	-	-	-
12	-	bumpy	shush	-	-	-
13	-	-	little shush	-	-	-
14	-	-	-	whoosh	-	-
15	shush, pumping	-	-	-	-	-
16	-	popping	-	-	-	-
17	shush	-	little shush	-	-	-
18	-	-	-	-	-	-
19	shush	wavey	little shush	-	-	-
20	shush	wavey	shush	whoosh	-	whoosh
21	shush at the start	wavey	shush	burst at beginning	shush	whoosh
22	shush	wavey	shush	noise fades out	-	whoosh
23	shush	wavey	shush	noise fades out	ocean noise	whoosh
24	shush	popping	little shush	noise fades out	-	whoosh
25	-	-	-	-	-	-
26	shush	whoosh	fast shush	whoosh	-	-
27	-	-	little shush	-	-	-
28	shush	whoosh	-	-	-	-
29	shush	wavey	shush	-	-	-
30	-	-	little shush	-	-	-
31-32	-	-	-	-	-	-
33	long shush	-	-	-	-	-
34	-	-	-	-	-	-

35	shush	-	little shush	-	-	-
36	-	-	little shush	-	-	-
37	shush	wavey, pause	shush	-	shush	-
38	shush	whoosh	shush	whoosh	shush, broken noise	whoosh
39	shush	whoosh	shush	-	shush	-
40	shush	wavey	shush	whoosh	shush	whoosh
41	shush	wavey	shush	whoosh	shush	whoosh
42	shush	popping	shush	whoosh	shush	whoosh
43	-	pause	shush, click	-	-	-
44	shush	pause	shush	noise fades out	shush	-
45	-	pause	shush	-	-	-
46	shush	whoosh	shush	noise fades out	-	-
47	shush	whoosh	shush	whoosh	-	-
48	very fast shush	ping	-	-	-	-
49	-	pause	tiny shush	-	-	-
50	-	pause	-	-	-	-
51	fast shush	-	-	-	-	-
52	-	pause	-	-	-	-
53	shush	-	little shush	-	-	-
54	-	-	-	-	-	-
55	shush	pause	shush	-	shush	-
56	shush	wavey,pop	shush	whoosh	shush	whoosh
57	shush	wavey	shush	whoosh	-	-
58	shush	wavey	shush	noise fades out	shush, ocean noise	whoosh
59	shush	wavey,pause	shush	whoosh	shush	-
60	shush	ping	little shush	fast whoosh	shush	-
61	-	-	-	-	-	-
62	shush	pause	shush	fast whoosh	-	-
63	super fast shush	bang	-	-	-	-
64	shush	wavey	-	-	shush	-
65	shush	wavey	little shush	-	-	-
66	fast shush	pause	little shush	-	-	-
67	-	-	little shush	-	-	-
68	-	ping, pause	-	-	-	-
69	-	-	little shush	-	-	-
70	-	-	-	-	-	-
71	shush	-	little shush	-	shush	-
72	fast shush	ping	-	-	-	-
73	-	-	-	-	-	-
74	shush	-	-	noise pumping	-	-
75-76	-	-	-	-	-	-

77	-	-	-	-	-	shush	-
78	-	-	-	-	-	shush	-
79	-	-	-	-	-	-	-
80	shush	-	-	-	-	-	-
81	-	-	-	-	-	shush	-
82	-	-	-	-	-	-	-
83	-	-	-	-	-	shush	-
84-85	-	-	-	-	-	-	-
86	-	-	-	-	noise pumping	-	-
87-88	-	-	-	-	-	-	-
89	shush	-	-	-	-	-	-
90	-	-	-	-	noise pumping	-	-
91	-	-	-	-	-	-	-
92	fast shush	-	-	-	-	-	-
93-96	-	-	-	-	-	-	-

Table A.2
Comments for Question C on Artifacts during speech

Cnd	Subject					
	1	2	3	4	5	6
1	pumping	-	modulation	-	-	pumping
2	voice is scratched	-	-	muffling	tunel	-
3	modulation	-	-	-	pumping	modulation
4	distorted voice	-	modulation	-	crackling	pumping
5	distorted voice	-	like being a small room	envelope distortion	pumping	-
6	voice is echoing	echo	-	metallic voice	pumping	modulation
7	void like a robot	-	-	granular	crackling	-
8	-	-	-	cracking voice	modulation	-
9	-	-	-	-	pumping	modulation
10	-	-	-	muffling	pumping	-
11	-	-	-	slightly muffing	-	-
12	-	-	-	muffling	modulation	-
13	-	-	-	-	pumping	-
14	modulation, shush, and scratched	-	-	-	-	modulation
15	-	more bass	-	-	-	-
16	-	-	-	-	pumping	pumping
17	-	-	-	-	-	pumping
18	-	-	-	-	pumping	-
19	metallic	-	-	muffling	pumping	muffling

20	the end of sentence is a echo	-	little change in clarity	-	modulation	pumping
21	-	-	-	slightly muffing	pumping	-
22	-	stronger	-	-	modulation	-
23	pumping at the end	more bass	-	low pass muffling	pumping	-
24	metallic	more bass	-	envelope distortion	broken	modulation
25	-	-	-	-	-	muffling
26-27	-	-	-	-	-	-
28	-	-	-	-	pumping	-
29	sounds like a empty space	more bass	little shush at end of sentence	-	-	-
30	-	-	modulation	-	-	muffling
31	metallic	-	-	-	pumping	-
32	-	-	little scratching	-	pumping	-
33	voice is hit with something	-	-	-	-	-
34	-	-	-	-	crackling	-
35	-	more high end	-	-	-	-
36	interference middle by shushing	-	-	muffling	-	pumping
37	hits within the voice	more bass	-	-	crackling	-
38	metallic	-	shush in background	muffling	pumping	-
39	-	-	shush in background	-	pumping	muffling
40	voice clipping at the end	more bass	modulation	envelope distortion	modulation	modulation
41	voice echo	more bass	shush in background	-	pumping, crackling	-
42	metallic	more bass	shush in background	tonal distortion	pumping	noise close effect
43	-	-	shush in background	cracking voice	-	-
44	-	-	-	-	tremble on the voice	-
45	-	more volume	shush in background	-	-	-
46	voice goes very low at end	-	shush in background	-	pumping	modulation
47	-	-	-	-	-	-
48	-	-	little modulation	-	pumping, trembled on voice	-
49	-	more bass	-	-	pumping	pumping
50	-	-	-	envelope distortion	pumping	-
51	-	-	-	-	shortness in the voice	-
52	-	-	-	-	clear voice	-
53	-	-	-	-	pumping	-
54	metallic	-	-	-	pumping	modulation
55	-	more clearer	little shush in the background	-	pumping	-
56	-	more clearer	modulation	-	pumping, modulation	-
57	-	-	not change in clarity in voice	tonal distortion	pumping	-
58	pumping voice	clearer	not change in clarity in voice	coding artifacts	pumping	-
59	-	-	clear voice	-	pumping, broken voice	-
60	-	deeper	little change in modulation	-	modulation	-

61	-	-	-	-	clear voice	pumping
62	-	-	-	-	-	modulation
63	-	more bass	-	-	-	-
64	-	-	-	-	pumping, broken voice	-
65	-	more bass	little shush in the background	-	-	-
66	voice echo	-	-	envelope distortion	-	-
67	modulation like a robot	-	-	-	-	-
68-69	-	-	-	-	-	-
70	voice echo	-	-	coding artifacts	pumping	-
71	get like a flut horn	-	-	-	pumping	-
72	modulation gets slower	-	-	-	-	-
73	-	-	-	pumping	-	-
74	-	-	little shush in the background	-	-	-
75	-	-	little shush in the background	-	-	-
76	-	-	little shush in the background	-	modulation	-
77	-	-	little shush in the background	-	-	-
78	-	-	shush in background	-	modulation	-
79	metallic	-	-	-	pumping	-
80	metallic	-	little shush in the background	-	-	-
81	-	-	little shush in the background	-	modulation	-
82	-	-	little shush in the background	coding artifacts	broken	-
83	-	-	little shush in the background	-	modulation	-
84	-	-	little shush in the background	-	-	-
85	the voice is scratched	-	-	-	pumping	modulation
86	-	-	little shush in the background	-	pumping	-
87	-	-	little shush in the background	-	pumping	-
88	-	-	little shush in the background	-	pumping	-
89	-	-	little shush in the background	-	pumping	-
90	-	-	little shush in the background	-	pumping	-
91	metallic	more bass	-	-	pumping	-
92	a little bit pumped	-	-	-	pumping, like in a tunel	-
93	voice got pumped	modulation	little shush in the background	-	pumping	-
94	echo	-	little shush in the background	-	no changes	-
95	voice scratched	-	little shush in the background	-	pumping	-
96	-	-	little shush in the background	-	pumping	-