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|  | **GSTP-GSAD**  **Generic Sound Activity Detector** | | | |
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Summary

Recommendation ITU-T G.720.1 describes an independent front-end processing module implementing a generic sound activity detector (GSAD) that can be applied prior to signal processing applications and can operate on narrow-band or wideband audio input using a 10 ms frame length (without lookahead), such as used by speech or audio codecs. The primary function of the GSAD is to indicate the input frame activity for performing voice activity detection (VAD). For an active frame, it further indicates if the input frame is speech or music (speech/music discrimination), and for an inactive frame it indicates whether the frame is a silence frame or an audible noise frame (silence detection). The GSAD can also operate when only the primary function of indicating the input frame activity is used. In order to apply GSAD in specific cases, an adaptation layer may be required.

This technical paper compiles technical information, some of which has only been available previously in Temporary Documents, on ITU-T Recommendation G.720.1 "Generic Sound Activity Detector (GSAD)". The paper includes an overview description of the algorithm and its application, the test methodology used during the development, and performance assessment results of the algorithm alone and in conjunction with codecs.

Keywords

Sound activity detection, voice activity detection

Change Log

This document contains Version 1 of the ITU-T Technical Paper on "*Generic Sound Activity Detector*" approved at the ITU-T Study Group 16 meeting held in Geneva, 30 April – 11 May 2012 (TD 523/Plen).

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ITU-T Technical Paper GSTP-GSAD

ITU-T G.720.1 "Generic sound activity detector (GSAD)"

# Scope

This technical paper compiles technical information, some of which has only been available previously in Temporary Documents, on ITU-T Recommendation G.720.1 "Generic Sound Activity Detector (GSAD)". The paper includes an overview description of the algorithm and its application, the test methodology used during the development, and performance assessment results of the algorithm alone and in conjunction with codecs.

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# Abbreviations and acronyms

|  |  |
| --- | --- |
| BT | Better than |
| DSAF | Delta sound activity factor |
| MisRtA2I | Misclassification rate from active to inactive |
| MisRtM2S | Misclassification rate from music to speech |
| MisRtS2M | Misclassification rate from speech to music |
| MisRtSil | Misclassification rate between silence and other classes |
| NWT | Not worse than |
| OTP | Objective table for PWMC score |
| PoW | Poor-or-worse |
| PWMC | Perceptually Weighted Misclassification Counting |
| RTA2I | Requirement table for misclassification rate from active to inactive |
| RTD | Requirement table for DSAF |
| RTM2S | Requirement table for misclassification rate from music to speech |
| RTM2SIt | Requirement table for misclassification rate from music to speech for music interlaced with speech test vector |
| RTP | Requirement table for PWMC score |
| RTS2M | Requirement table for misclassification rate from speech to music |
| RTS2MIt | Requirement table for misclassification rate from speech to music for music interlaced with speech test vector |
| SMD | Speech/Music discriminator |
| VAD | Voice activity detector |

# Area of application

Rec. G.720.1 (GSAD) is an independent front-end processing module which can be applied prior to signal processing applications that operate on narrowband or wideband audio input at frame length of 10 ms or its multiple (without lookahead), such as speech or audio codecs. Its primary function is to indicate the input frame activity. For an active frame it further indicates if the input frame is speech or music, and for an inactive frame it indicates whether the frame is a silence frame or an audible noise frame. G.720.1 contains all the necessary pre-processing inside, so the input could be the original PCM signal after A/D converter or after A/D + re-sampling or A/D + re-sampling + filtering mask.

In practice, when used with a codec, a codec dependent layer is used in conjunction with G.720.1 as shown in Figure 1.

The codec dependent layer takes the signal type output from GSAD and provides specific control functions appropriate to the codec, such as selection of coding scheme (speech/music) and DTX/‌CNG control.



Figure 1 ‑ Architecture of GSAD in conjunction with a codec

# Algorithm overview

The primary function of the GSAD is to indicate the input frame activity for performing voice activity detection (VAD) robust to multimedia signals such as music. For an active frame, it further indicates if the input frame is speech or music (speech/music discrimination), and for an inactive frame it indicates whether the frame is a silence frame or an audible noise frame (silence detection). The GSAD can also operate when only the primary function of indicating the input frame activity is used.

An external control signal indicates to the GSAD algorithm which one of three different operating points to use, namely: *bandwidth-saving*, *balanced* and *quality-preferred* operating points*.* For the activity detection functionality, these operating points provide selectable balancing between bandwidth saving and audio quality, which can be utilized for high-performance DTX schemes that can balance between the end-users speech and audio subjective quality needs and the system and network traffic requirements.

The three different operating points also control the GSAD emphasis and balance between speech and music classification for the active frames, which can be utilized for fine-tuning of source-controlled audio compression systems.

The VAD module uses a dual-parameters classification scheme, where one parameter is a differential zero crossing rate measure and the other parameter is a modified segmental SNR measure. An initial VAD decision is made with a pair of inequalities, with factors that are adaptive to the long term SNR of the input signal. A final VAD decision is obtained by an adaptive hangover scheme. The Speech/Music Discrimination module calculates the variance of a spectral deviation measure and applies an adaptive threshold to make an initial decision between speech and music. Two spectral peakiness measures further modify that initial decision and a one-frame hangover is used to obtain the final speech/music discrimination decision. The Silence Detection module uses an energy threshold to discriminate between a silence frame and an audible noise frame.

# Complexity and memory

Table 1 shows the GSAD complexity in WMOPS for its different modes and signal sampling frequencies. The RAM used for GSAD is 3284 bytes and the table ROM is 1674 bytes.

Table 1 – Complexity of the GSAD

| Modes | Complexity (WMOPS) |
| --- | --- |
| GSAD\_WB | 2.935 |
| GSAD\_NB | 1.897 |
| VAD\_WB | 2.397 |
| VAD\_NB | 1.475 |

# Algorithmic delay

GSAD does not introduce lookahead, therefore the algorithmic delay is the frame length of 10ms with 0 added delay.

# Selection phase tests

GSAD was formally evaluated during the Selection phase performance assessment tests. The test plan was derived from the ToR [1] and can be found in [2], with the associated processing plan in [3]. Due to the generality of GSAD in that the GSAD is a stand-alone generic sound activity detector intended for use prior to any applicable application, the test plan for its Selection phase test only used objective testing methodologies. The tests were conducted in a cross-check manner by two labs, Huawei and France Telecom Orange, and the test reports can be found in [4], [5] respectively. The tests evaluated GSAD for various signals including speech only, music only, interlaced speech-music and in various conditions including backgrounds of car, babble, office, interfering talkers, background music, SNRs of 30dB, 20dB, 10dB, input levels of high, nominal and low levels.

## Objective metrics

The Objective metrics used in the Selection phase performance assessment test are described below.

### Perceptually weighted misclassification counting (PWMC)

PWMC is based on the evaluation of the perceptual degradation resulting from misclassification of a speech frame from active to inactive by GSAD. Since GSAD does not involve any further coding, it is assumed that the degradation can be measured by replacing the misclassified active frame signal with the original underlying background noise and measuring the perceptual difference between this modified signal and the unmodified signal.

PWMC is intended to be used as a relative measure, i.e. the PWMC score of the candidate GSAD algorithm will be compared to the PWMC score of a reference algorithm. PWMC is also intended to be used for speech signal i.e. no validation test for applying PWMC to other signals such as music was conducted.

The following is a more detailed description of the PWMC approach:

1. The true activity marks of the test speech material are obtained, using an energy threshold on the clean speech, before the noise addition.
2. The test speech material is prepared by adding background noises at different SNRs to the clean speech.
3. The test speech material is processed by the GSAD candidate and a reference VAD algorithm to generate the output activity marks of each frame for both the GSAD candidate and the reference VAD.
4. The output activity marks generated by both the candidate and reference in step 3 are compared to the true activity marks. For each misclassified active speech frame, the frame is replaced by the original underlying background noise resulting in two modified (degraded) versions of the test speech material one for the GSAD candidate and the other for the reference VAD, using fade out – fade in windows as described in Appendix 1.
5. The two degraded versions of the test speech material are compared to the non-degraded test speech material using an objective perceptual measure based on PESQ (P.862) [2], known as PWMC. The PWMC scores are then evaluated to specify the relative performance of the GSAD candidate against the reference VAD.

### Other metrics

MisRtA2I

For music test vectors and the music segments of the music-interlaced-with-speech test vectors, counts will be kept of the number of times the candidate or the reference algorithm's output marks are incorrectly designated as inactive (silence or noise) when the corresponding true mark is active (speech or music). The MisRtA2I of candidate or reference algorithm will be calculated according to the formula below:



MisRtS2M and MisRtM2S

For speech test vectors and the speech segments of the music-interlaced-with-speech test vectors, count will be kept of the number of times the candidate marks are incorrectly designated as music when the corresponding truth mark is speech. For music test vectors and the music segments of the music-interlaced-with-speech, another count will be kept of the number of times candidate marks are incorrectly designated as speech when the corresponding truth mark is music, as well as counts for the real number of speech and music frames. MisRtS2M and MisRtM2S of candidate algorithm will be calculated according to the formula below:





DSAF

For any test vectors, the DSAF of candidate or reference algorithms are calculated according to the formula below:



Where, the true SAF is calculated by dividing the count for real active frames by the total number of frames and the candidate SAF is calculated by dividing the count for frames designated as active by the candidate by the total number of frames.

MisRtSil

MisRtSil of candidate algorithm is calculated by adding the count for frames incorrectly designated as silence by the candidate and the count for frames incorrectly designated as non-silence by the candidate.

## Organization of the tests

The Selection phase performance assessment test was organized in 13 experiments as shown in Table 2. "FC-GSAD" means the full complexity configuration of GSAD executing all the VAD, SMD and SiD functions. "LC-VAD" means the low complexity configuration of GSAD executing only the VAD function.

Tables A.1 – A.13 in Appendix A show the key factors for each experiment. Requirements and/or Objectives for each experiment can be found in [1].

Table 2 – Organization of the selection phase of performance assessment tests

| Experiment | Name of Experiments |
| --- | --- |
| 1 | FC-GSAD for WB clean and noisy speech |
| 2 | FC-GSAD for WB clean and noisy music |
| 3 | FC-GSAD for WB clean and noisy music interlaced with speech |
| 4 | FC-GSAD for NB clean and noisy speech |
| 5 | FC-GSAD for NB clean and noisy music |
| 6 | FC-GSAD for NB clean and noisy music interlaced with speech |
| 7 | LC-VAD for WB clean and noisy speech |
| 8 | LC-VAD for WB clean and noisy music |
| 9 | LC-VAD for WB clean and noisy music interlaced with speech |
| 10 | LC-VAD for NB clean and noisy speech |
| 11 | LC-VAD for NB clean and noisy music |
| 12 | LC-VAD for NB clean and noisy music interlaced with speech |
| 13 | FC-GSAD for silence detection |

## Summary of the test results

Tables 3 and 4 show respectively the summary of the test results reported by the laboratory of France Telecom Orange and by the laboratory of Huawei. Detailed test results can be found in Appendix 1 of [4], [5].

Figures 2 to 8 show selected results from Experiments 1, 2 and 7 (based on results reported in [4]).

Table 3 – Summary of selection test results (FT Orange)

| Exp. | Aspect | Requirement | Objective |
| --- | --- | --- | --- |
| 1 | Bandwidth Saving Operating Point | Passed 55 requirements out of 56. |  |
| Balanced Operating Point | Passed all 56 requirements. |  |
| Quality Preferred Operating Point | Passed 53 requirements out of 56. | Passed all objectives but two. |
| 2 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements but one. |  |
| Quality Preferred Operating Point | Passed all requirements but one. |  |
| 3 | Bandwidth Saving Operating Point | Passed all requirements but one. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives. |
| 4 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 5 | Bandwidth Saving Operating Point | Passed 11 requirements out of 14. |  |
| Balanced Operating Point | Passed 12 requirements out of 14. |  |
| Quality Preferred Operating Point | Passed all requirements but one. |  |
| 6 | Bandwidth Saving Operating Point | Passed 37 requirements out of 42. |  |
| Balanced Operating Point | Passed 38 requirements out of 42. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives. |
| 7 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 8 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 9 | Bandwidth Saving Operating Point | Passed all requirements but one. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. | Passed all objectives. |
| 10 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 11 | Bandwidth Saving Operating Point | Passed 4 requirements out of 7. |  |
| Balanced Operating Point | Passed 6 requirements out of 7. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 12 | Bandwidth Saving Operating Point | Passed 16 requirements out of 21. |  |
| Balanced Operating Point | Passed 18 requirements out of 21. |  |
| Quality Preferred Operating Point | Passed all requirements. | Passed all objectives. |
| 13 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |

Table 4 – Summary of selection test results (Huawei Technologies)

| Exp. | Aspect | Requirement | Objective |
| --- | --- | --- | --- |
| 1 | Bandwidth Saving Operating Point | Passed 55 requirements out of 56. |  |
| Balanced Operating Point | Passed all 56 requirements. |  |
| Quality Preferred Operating Point | Passed 54 requirements out of 56. | Passed all objectives but two. |
| 2 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 3 | Bandwidth Saving Operating Point | Passed all requirements but one. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. | Passed all objectives. |
| 4 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 5 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 6 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but one. |
| 7 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 8 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 9 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. | Passed all objectives but one. |
| 10 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements but one. | Passed all objectives but two. |
| 11 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |
| 12 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. | Passed all objectives but one. |
| 13 | Bandwidth Saving Operating Point | Passed all requirements. |  |
| Balanced Operating Point | Passed all requirements. |  |
| Quality Preferred Operating Point | Passed all requirements. |  |



Figure 2 – Experiment 1, PWMC versus SNR



Figure 3 – Experiment 1, DSAF versus SNR



Figure 4 – Experiment 1, MisRtS2M versus SNR



Figure 5 – Experiment 2, MisRtA2I versus SNR



Figure 6 – Experiment 2, MisRtM2S versus SNR



Figure 7 – Experiment 7, PWMC versus SNR



Figure 8 – Experiment 7, DSAF versus SNR

# Characterisation of GSAD with specific codecs

The G.720.1 GSAD has recently been characterised for use as a VAD in conjunction with specific codecs, reported in [6] and [7].

## G.729.1

### Description of the testing exercise

The formal quality assessment test plan for this characterization phase was organized in 2 subjective experiments based on the requirements described in the ToRs.

Experiment 1a tested the coder quality under narrow band noisy speech conditions and Experiment 1b tested the coder quality under wideband noisy speech conditions. Three types of noise were considered:

* office noise SNR=20dB;
* babble noise (128 voices) SNR=20dB;
* babble noise (40 voices) SNR = 30dB.

The three modes of G.720.1A were included in the testing exercise: (1) bandwidth saving, (2) balanced and (3) quality preferred.

All experiments used the modified DCR method with the five-point degradation scale.

5 - Degradation not perceived or even some improvement

4 - Degradation perceived but not annoying

3 - Degradation slightly annoying

2 - Degradation annoying

1 - Degradation very annoying

Experiments 1a and 1b were run in two different languages. The laboratories and languages are reported in Table 5.

Table 5 – Laboratories and languages for G.729.1 tests

| Experiment | Lab | Language | Lab designator |
| --- | --- | --- | --- |
| 1a | Huawei | Chinese | C |
| 1a | France Telecom | French | F |
| 1b | Huawei | Chinese | C |
| 1b | France Telecom | French | F |

### Results

All results are reported in Table 6 for exp1a and in Table 7 for exp 1b, for both languages tested.

Table 6 – Experiment 1a test results for G.729.1

| Laboratory | | | Huawei  (Lab C) | | | France Telecom (Lab F) | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Condition | Codec | Noise | DMOS | SD | PoW | DMOS | SD | PoW |
| c01 | MNRU, Q = 6 dB | No background noise | 1.23 | 0.56 | 183 | 1.03 | 0.16 | 192 |
| c02 | MNRU, Q = 12 dB | No background noise | 1.71 | 0.77 | 162 | 1.33 | 0.48 | 191 |
| c03 | MNRU, Q = 18 dB | No background noise | 2.32 | 0.83 | 111 | 2.05 | 0.62 | 153 |
| c04 | MNRU, Q = 24 dB | No background noise | 3.09 | 0.80 | 43 | 3.03 | 0.78 | 45 |
| c05 | MNRU, Q = 30 dB | No background noise | 3.81 | 0.87 | 14 | 3.91 | 0.79 | 5 |
| c06 | MNRU, Q = 36 dB | No background noise | 4.41 | 0.70 | 1 | 4.64 | 0.62 | 1 |
| c07 | Direct | No background noise | 4.66 | 0.57 | 0 | 4.89 | 0.31 | 0 |
| c08 | Direct | Office noise | 4.52 | 0.63 | 0 | 4.78 | 0.41 | 0 |
| c09 | Direct | Babble noise (40) | 4.60 | 0.58 | 0 | 4.83 | 0.39 | 0 |
| c10 | Direct | Babble noise (128) | 4.42 | 0.67 | 0 | 4.78 | 0.43 | 0 |
| c11 | [G.729.1@12k](mailto:G.729.1@12k) | Office noise | 4.53 | 0.67 | 1 | 4.58 | 0.55 | 0 |
| c12 | G.729.1@12k | Babble noise (40) | 4.52 | 0.61 | 0 | 4.59 | 0.60 | 1 |
| c13 | G.729.1@12k | Babble noise (128) | 4.44 | 0.66 | 0 | 4.54 | 0.57 | 0 |
| c14 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 1) | Office noise | 4.53 | 0.64 | 1 | 4.58 | 0.55 | 0 |
| c15 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (40) | 4.55 | 0.63 | 0 | 4.71 | 0.50 | 0 |
| c16 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (128) | 4.45 | 0.67 | 0 | 4.52 | 0.61 | 1 |
| c17 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 2) | Office noise | 4.52 | 0.68 | 1 | 4.65 | 0.55 | 0 |
| c18 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (40) | 4.47 | 0.69 | 2 | 4.65 | 0.52 | 0 |
| c19 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (128) | 4.41 | 0.74 | 3 | 4.43 | 0.67 | 1 |
| c20 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 3) | Office noise | 4.57 | 0.62 | 0 | 4.67 | 0.53 | 0 |
| c21 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (40) | 4.54 | 0.69 | 1 | 4.60 | 0.57 | 0 |
| c22 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (128) | 4.49 | 0.66 | 0 | 4.56 | 0.63 | 1 |
| c23 | [G.729.1@12k](mailto:G.729.1@12k) | No background noise | 4.62 | 0.61 | 1 | 4.85 | 0.36 | 0 |
| c24 | [CuT@12k](mailto:G.729.1@12k) (DTX on, mode 2) | No background noise | 4.57 | 0.57 | 0 | 4.82 | 0.39 | 0 |

Table 7 – Experiment 1b test results for G.729.1

| Laboratory | | | Huawei  (Lab C) | | | France Telecom (Lab F) | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Condition | Codec | Noise | DMOS | SD | PoW | DMOS | SD | PoW |
| 1 | MNRU, Q = 15 dB | No background noise | 1.65 | 0.94 | 174 | 1.23 | 0.55 | 180 |
| 2 | MNRU, Q = 25 dB | No background noise | 2.45 | 1.05 | 105 | 1.86 | 0.76 | 156 |
| 3 | MNRU, Q = 35 dB | No background noise | 3.60 | 0.95 | 19 | 3.43 | 1.06 | 39 |
| 4 | MNRU, Q = 45 dB | No background noise | 4.66 | 0.56 | 0 | 4.63 | 0.65 | 1 |
| 5 | Direct | No background noise | 4.79 | 0.43 | 0 | 4.90 | 0.32 | 0 |
| 6 | Direct | Office noise | 4.56 | 0.64 | 0 | 4.86 | 0.34 | 0 |
| 7 | Direct | Babble noise (40) | 4.73 | 0.49 | 0 | 4.86 | 0.34 | 0 |
| 8 | Direct | Babble noise (128) | 4.63 | 0.63 | 2 | 4.78 | 0.45 | 0 |
| 9 | [G.729.1@22k](mailto:G.729.1@22k) | Office noise | 4.63 | 0.55 | 0 | 4.66 | 0.55 | 0 |
| 10 | G.729.1@22k | Babble noise (40) | 4.51 | 0.69 | 4 | 4.63 | 0.60 | 1 |
| 11 | G.729.1@22k | Babble noise (128) | 4.52 | 0.66 | 2 | 4.51 | 0.67 | 0 |
| 12 | [G.729.1@32k](mailto:G.729.1@32k) | Office noise | 4.65 | 0.57 | 0 | 4.82 | 0.39 | 0 |
| 13 | G.729.1@32k | Babble noise (40) | 4.69 | 0.57 | 0 | 4.85 | 0.36 | 0 |
| 14 | G.729.1@32k | Babble noise (128) | 4.63 | 0.53 | 0 | 4.70 | 0.51 | 0 |
| 15 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 1) | Office noise | 4.50 | 0.66 | 1 | 4.34 | 0.82 | 5 |
| 16 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (40) | 4.51 | 0.68 | 2 | 4.51 | 0.68 | 1 |
| 17 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (128) | 4.46 | 0.70 | 3 | 4.25 | 0.79 | 7 |
| 18 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 1) | Office noise | 4.51 | 0.59 | 0 | 4.50 | 0.69 | 3 |
| 19 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (40) | 4.60 | 0.66 | 5 | 4.64 | 0.60 | 1 |
| 20 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 1) | Babble noise (128) | 4.47 | 0.68 | 1 | 4.32 | 0.68 | 3 |
| 21 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 2) | Office noise | 4.55 | 0.65 | 0 | 4.43 | 0.74 | 2 |
| 22 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (40) | 4.54 | 0.60 | 0 | 4.49 | 0.67 | 1 |
| 23 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (128) | 4.41 | 0.70 | 2 | 4.30 | 0.70 | 3 |
| 24 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 2) | Office noise | 4.48 | 0.68 | 2 | 4.60 | 0.63 | 2 |
| 25 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (40) | 4.63 | 0.57 | 0 | 4.59 | 0.56 | 0 |
| 26 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 2) | Babble noise (128) | 4.48 | 0.71 | 4 | 4.42 | 0.71 | 2 |
| 27 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 3) | Office noise | 4.49 | 0.82 | 5 | 4.54 | 0.65 | 2 |
| 28 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (40) | 4.55 | 0.71 | 5 | 4.52 | 0.66 | 1 |
| 29 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (128) | 4.42 | 0.74 | 4 | 4.22 | 0.78 | 4 |
| 30 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 3) | Office noise | 4.53 | 0.69 | 4 | 4.59 | 0.64 | 2 |
| 31 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (40) | 4.57 | 0.60 | 2 | 4.57 | 0.64 | 2 |
| 32 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 3) | Babble noise (128) | 4.49 | 0.66 | 0 | 4.40 | 0.75 | 5 |
| 33 | G.729.1@22k | No background noise | 4.55 | 0.65 | 0 | 4.64 | 0.56 | 1 |
| 34 | [G.729.1@32k](mailto:G.729.1@32k) | No background noise | 4.58 | 0.63 | 0 | 4.69 | 0.59 | 2 |
| 35 | [CuT@22k](mailto:G.729.1@12k) (DTX on, mode 2) | No background noise | 4.66 | 0.57 | 0 | 4.65 | 0.55 | 0 |
| 36 | [CuT@32k](mailto:G.729.1@12k) (DTX on, mode 2) | No background noise | 4.60 | 0.60 | 0 | 4.68 | 0.56 | 0 |

### Conclusions

Requirement and objectives comparisons are reported in Table 8 for 12 kbit/s operation, Table 9 for 22 kbit/s operation and Table 10 for 32 kbit/s operation.

As it can be seen in Table 8, all requirements are passed in both labs. Only one objective is failed in lab F. In lab C, all objectives are passed.

As it can be seen in Table 9, all requirements are passed in both labs. Four objectives out of nine are passed in lab C. In lab F, all objectives are failed.

As it can be seen in Table 10, all requirements are passed in both labs. Only one objective is passed in lab C. In lab F, all objectives are failed.

All requirements were passed for the 3 bitrates considered in two labs, lab F in French language, lab C in Chinese language.

Concerning the objectives, for the 12 kbit/s, one objective is failed in lab F. In lab C, all objectives are passed. For the 22kbit/s, four objectives out of nine are passed in lab C. In lab F, all objectives are failed. For the 32 kbit/s, one objective is passed in lab C. In lab F, all objectives are failed.

Figures 9 and 10 illustrate a selection of the above results.

Table 8 – Requirement and objectives comparisons at 12 kbit/s for G.729.1

| 12 kbit/s | Test Condition | Reference condition | Criterion | Results (Chinese) | Results (French) |
| --- | --- | --- | --- | --- | --- |
| Req | C14-CuT@12k (DTX on, mode 1) | C11-G.729.1@12k | PoW | pass | pass |
| Req | C15-CuT@12k (DTX on, mode 1) | C12-G.729.1@12k | PoW | pass | pass |
| Req | C16-CuT@12k (DTX on, mode 1) | C13-G.729.1@12k | PoW | pass | pass |
| Req | C17-CuT@12k (DTX on, mode 2) | C11-G.729.1@12k | PoW | pass | pass |
| Req | C18-CuT@12k (DTX on, mode 2) | C12-G.729.1@12k | PoW | pass | pass |
| Req | C19-CuT@12k (DTX on, mode 2) | C13-G.729.1@12k | PoW | pass | pass |
| Req | C20-CuT@12k (DTX on, mode 3) | C11-G.729.1@12k | PoW | pass | pass |
| Req | C21-CuT@12k (DTX on, mode 3) | C12-G.729.1@12k | PoW | pass | pass |
| Req | C22-CuT@12k (DTX on, mode 3) | C13-G.729.1@12k | PoW | pass | pass |
| Obj | C14-CuT@12k (DTX on, mode 1) | C11-G.729.1@12k | nwt | pass | pass |
| Obj | C15-CuT@12k (DTX on, mode 1) | C12-G.729.1@12k | nwt | pass | pass |
| Obj | C16-CuT@12k (DTX on, mode 1) | C13-G.729.1@12k | nwt | pass | pass |
| Obj | C17-CuT@12k (DTX on, mode 2) | C11-G.729.1@12k | nwt | pass | pass |
| Obj | C18-CuT@12k (DTX on, mode 2) | C12-G.729.1@12k | nwt | pass | pass |
| Obj | C19-CuT@12k (DTX on, mode 2) | C13-G.729.1@12k | nwt | pass | fail |
| Obj | C20-CuT@12k (DTX on, mode 3) | C11-G.729.1@12k | nwt | pass | pass |
| Obj | C21-CuT@12k (DTX on, mode 3) | C12-G.729.1@12k | nwt | pass | pass |
| Obj | C22-CuT@12k (DTX on, mode 3) | C13-G.729.1@12k | nwt | pass | pass |

Table 9 – Requirement and objectives comparisons at 22 kbit/s for G.729.1

| 22 kbit/s | Test Condition | Reference condition | Criterion | Results (Chinese) | Results (French) |
| --- | --- | --- | --- | --- | --- |
| Req | C15-CuT@22k (DTX on, mode 1) | C9-G.729.1@22k | PoW | pass | pass |
| Req | C16-CuT@22k (DTX on, mode 1) | C10-G.729.1@22k | PoW | pass | pass |
| Req | C17-CuT@22k (DTX on, mode 1) | C11-G.729.1@22k | PoW | pass | pass |
| Req | C21-CuT@22k (DTX on, mode 2) | C9-G.729.1@22k | PoW | pass | pass |
| Req | C22-CuT@22k (DTX on, mode 2) | C10-G.729.1@22k | PoW | pass | pass |
| Req | C23-CuT@22k (DTX on, mode 2) | C11-G.729.1@22k | PoW | pass | pass |
| Req | C27-CuT@22k (DTX on, mode 3) | C9-G.729.1@22k | PoW | pass | pass |
| Req | C28-CuT@22k (DTX on, mode 3) | C10-G.729.1@22k | PoW | pass | pass |
| Req | C29-CuT@22k (DTX on, mode 3) | C11-G.729.1@22k | PoW | pass | pass |
| Obj | C15-CuT@22k (DTX on, mode 1) | C9-G.729.1@22k | nwt | fail | fail |
| Obj | C16-CuT@22k (DTX on, mode 1) | C10-G.729.1@22k | nwt | pass | fail |
| Obj | C17-CuT@22k (DTX on, mode 1) | C11-G.729.1@22k | nwt | pass | fail |
| Obj | C21-CuT@22k (DTX on, mode 2) | C9-G.729.1@22k | nwt | fail | fail |
| Obj | C22-CuT@22k (DTX on, mode 2) | C10-G.729.1@22k | nwt | pass | fail |
| Obj | C23-CuT@22k (DTX on, mode 2) | C11-G.729.1@22k | nwt | fail | fail |
| Obj | C27-CuT@22k (DTX on, mode 3) | C9-G.729.1@22k | nwt | fail | fail |
| Obj | C28-CuT@22k (DTX on, mode 3) | C10-G.729.1@22k | nwt | pass | fail |
| Obj | C29-CuT@22k (DTX on, mode 3) | C11-G.729.1@22k | nwt | fail | fail |

Table 10 – Requirement and objectives comparisons at 32 kbit/s for G.729.1

| 32 kbit/s | Test Condition | Reference condition | Criterion | Results (Chinese) | Results (French) |
| --- | --- | --- | --- | --- | --- |
| Req | C18-CuT@32k (DTX on, mode 1) | C12-G.729.1@32k | PoW | pass | pass |
| Req | C19-CuT@32k (DTX on, mode 1) | C13-G.729.1@32k | PoW | pass | pass |
| Req | C20-CuT@32k (DTX on, mode 1) | C14-G.729.1@32k | PoW | pass | pass |
| Req | C24-CuT@32k (DTX on, mode 2) | C12-G.729.1@32k | PoW | pass | pass |
| Req | C25-CuT@32k (DTX on, mode 2) | C13-G.729.1@32k | PoW | pass | pass |
| Req | C26-CuT@32k (DTX on, mode 2) | C14-G.729.1@32k | PoW | pass | pass |
| Req | C30-CuT@32k (DTX on, mode 3) | C12-G.729.1@32k | PoW | pass | pass |
| Req | C31-CuT@32k (DTX on, mode 3) | C13-G.729.1@32k | PoW | pass | pass |
| Req | C32-CuT@32k (DTX on, mode 3) | C14-G.729.1@32k | PoW | pass | pass |
| Obj | C18-CuT@32k (DTX on, mode 1) | C12-G.729.1@32k | nwt | fail | fail |
| Obj | C19-CuT@32k (DTX on, mode 1) | C13-G.729.1@32k | nwt | fail | fail |
| Obj | C20-CuT@32k (DTX on, mode 1) | C14-G.729.1@32k | nwt | fail | fail |
| Obj | C24-CuT@32k (DTX on, mode 2) | C12-G.729.1@32k | nwt | fail | fail |
| Obj | C25-CuT@32k (DTX on, mode 2) | C13-G.729.1@32k | nwt | pass | fail |
| Obj | C26-CuT@32k (DTX on, mode 2) | C14-G.729.1@32k | nwt | fail | fail |
| Obj | C30-CuT@32k (DTX on, mode 3) | C12-G.729.1@32k | nwt | fail | fail |
| Obj | C31-CuT@32k (DTX on, mode 3) | C13-G.729.1@32k | nwt | fail | fail |
| Obj | C32-CuT@32k (DTX on, mode 3) | C14-G.729.1@32k | nwt | fail | fail |

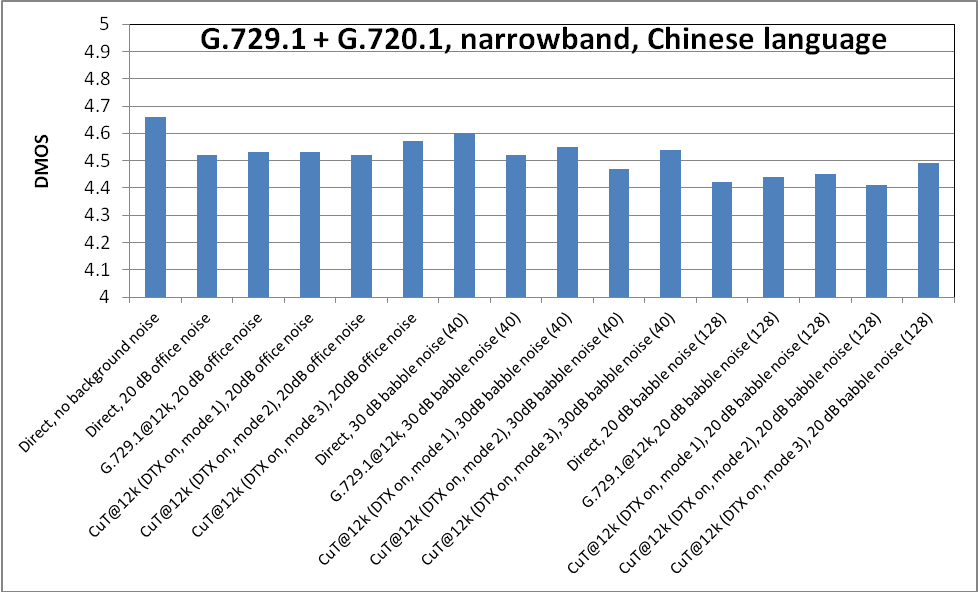


Figure 9 – Subjective results for G.729.1 with G.720.1, narrowband

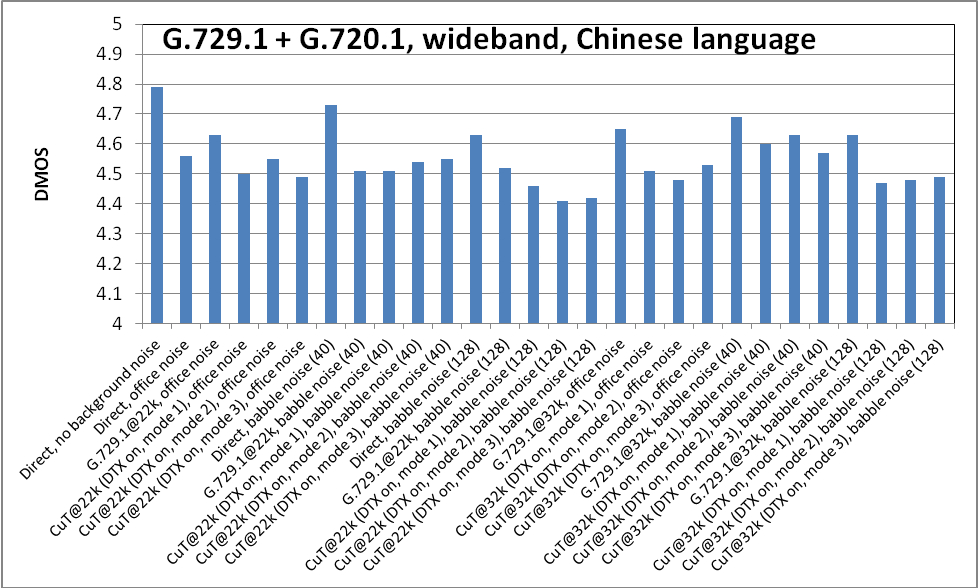


Figure 10 – Subjective results for G.729.1 with G.720.1, wideband

## G.729 Annex B

### Description of the testing exercise

The formal quality assessment test plan for this characterization phase was organized in one subjective experiment based on the requirements described in the ToRs.

Experiment 1a tested the coder quality under noisy speech conditions in narrowband. Three types of noise were considered:

* office noise SNR=20dB;
* babble noise (128 voices) SNR=15dB;
* Music background SNR = 25dB.

In this experiment, the three modes of G.720.1A have been tested: (mode BS) bandwidth saving, (mode B) balanced and (mode QP) quality preferred.

The experiment used the modified DCR method with the five point degradation scale.

5 - Degradation not perceived or even some improvement

4 - Degradation perceived but not annoying

3 - Degradation slightly annoying

2 - Degradation annoying

1 - Degradation very annoying

Experiment 1a was run in two different languages. The laboratories and languages are reported in Table 11.

Table 11 – Laboratories and languages for G.729 Annex B tests

| Experiment | Lab | Language | Lab designator |
| --- | --- | --- | --- |
| 1a | Huawei | Chinese | C |
| 1a | Dynastat | American English | E |

### Results

All results for Chinese and North-American English (NAE) are reported in Table 12.

### Conclusions

Required comparisons are reported in Table 13.

All comparisons show that each tested condition is not worse than its specified reference condition. In presence of music, in both labs, the tested conditions are better than the reference conditions.

The results also show very good agreement between the two languages tested.

Figure 11 illustrates a selection of the above results.

Table 12 – Experiment 1a test results for G.729 Annex B

| Condition | Condition | Noise | Chinese | | NAE | |
| --- | --- | --- | --- | --- | --- | --- |
| DMOS | SD | DMOS | SD |
| 1 | MNRU, Q = 7 dB | None | 1.36 | 0.64 | 1.55 | 0.94 |
| 2 | MNRU, Q = 14 dB | None | 2.09 | 0.90 | 2.52 | 0.99 |
| 3 | MNRU, Q = 21 dB | None | 2.92 | 0.85 | 3.55 | 0.83 |
| 4 | MNRU, Q = 28 dB | None | 3.83 | 0.86 | 4.39 | 0.70 |
| 5 | MNRU, Q = 35 dB | None | 4.68 | 0.53 | 4.82 | 0.41 |
| 6 | Direct | None | 4.85 | 0.39 | 4.85 | 0.40 |
| 7 | Direct | 20dB Office | 4.67 | 0.53 | 4.70 | 0.55 |
| 8 | Direct | 15dB Babble | 4.49 | 0.64 | 4.40 | 0.83 |
| 9 | Direct | 25dB Music | 4.74 | 0.52 | 4.79 | 0.47 |
| 10 | G.729B with App II | 20dB Office | 4.51 | 0.64 | 4.48 | 0.65 |
| 11 | G.729B with App II | 15dB Babble | 4.42 | 0.63 | 4.22 | 0.73 |
| 12 | G.729B with App II | 25dB Music | 3.98 | 0.85 | 3.91 | 0.84 |
| 13 | G.729B with App III | 20dB Office | 4.46 | 0.66 | 4.52 | 0.62 |
| 14 | G.729B with App III | 15dB Babble | 4.39 | 0.68 | 4.26 | 0.71 |
| 15 | G.729B with App III | 25dB Music | 3.86 | 0.87 | 3.81 | 0.94 |
| 16 | G.729B with G.720.1 DL (BS) | 20dB Office | 4.56 | 0.60 | 4.58 | 0.56 |
| 17 | G.729B with G.720.1 DL (BS) | 15dB Babble | 4.34 | 0.76 | 4.26 | 0.73 |
| 18 | G.729B with G.720.1 DL (BS) | 25dB Music | 4.14 | 0.81 | 4.16 | 0.71 |
| 19 | G.729B with G.720.1 DL (B) | 20dB Office | 4.53 | 0.63 | 4.48 | 0.68 |
| 20 | G.729B with G.720.1 DL (B) | 15dB Babble | 4.38 | 0.64 | 4.30 | 0.69 |
| 21 | G.729B with G.720.1 DL (B) | 25dB Music | 4.41 | 0.68 | 4.43 | 0.66 |
| 22 | G.729B with G.720.1 DL (QP) | 20dB Office | 4.52 | 0.62 | 4.52 | 0.59 |
| 23 | G.729B with G.720.1 DL (QP) | 15dB Babble | 4.35 | 0.74 | 4.24 | 0.78 |
| 24 | G.729B with G.720.1 DL (QP) | 25dB Music | 4.43 | 0.71 | 4.38 | 0.69 |

Table 13 – Comparisons of G.729 Annex B results

| Noise type | Ref Condition | Cr | Test Condition | Ct | Results (Chinese) | Results (NAE) |
| --- | --- | --- | --- | --- | --- | --- |
| 20dB Office noise | G.729B with App II | 10 | G.729B with G.720.1 DL (BS) | 16 | nwt | BT |
| 20dB Office noise | G.729B with App II | 10 | G.729B with G.720.1 DL (B) | 19 | nwt | nwt |
| 20dB Office noise | G.729B with App II | 10 | G.729B with G.720.1 DL (QP) | 22 | nwt | nwt |
| 20dB Office noise | G.729B with App III | 13 | G.729B with G.720.1 DL (BS) | 16 | BT | nwt |
| 20dB Office noise | G.729B with App III | 13 | G.729B with G.720.1 DL (B) | 19 | nwt | nwt |
| 20dB Office noise | G.729B with App III | 13 | G.729B with G.720.1 DL (QP) | 22 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App II | 11 | G.729B with G.720.1 DL (BS) | 17 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App II | 11 | G.729B with G.720.1 DL (B) | 20 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App II | 11 | G.729B with G.720.1 DL (QP) | 23 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App III | 14 | G.729B with G.720.1 DL (BS) | 17 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App III | 14 | G.729B with G.720.1 DL (B) | 20 | nwt | nwt |
| 15dB Babble noise (128) | G.729B with App III | 14 | G.729B with G.720.1 DL (QP) | 23 | nwt | nwt |
| 25dB Music background | G.729B with App II | 12 | G.729B with G.720.1 DL (BS) | 18 | BT | BT |
| 25dB Music background | G.729B with App II | 12 | G.729B with G.720.1 DL (B) | 21 | BT | BT |
| 25dB Music background | G.729B with App II | 12 | G.729B with G.720.1 DL (QP) | 24 | BT | BT |
| 25dB Music background | G.729B with App III | 15 | G.729B with G.720.1 DL (BS) | 18 | BT | BT |
| 25dB Music background | G.729B with App III | 15 | G.729B with G.720.1 DL (B) | 21 | BT | BT |
| 25dB Music background | G.729B with App III | 15 | G.729B with G.720.1 DL (QP) | 24 | BT | BT |

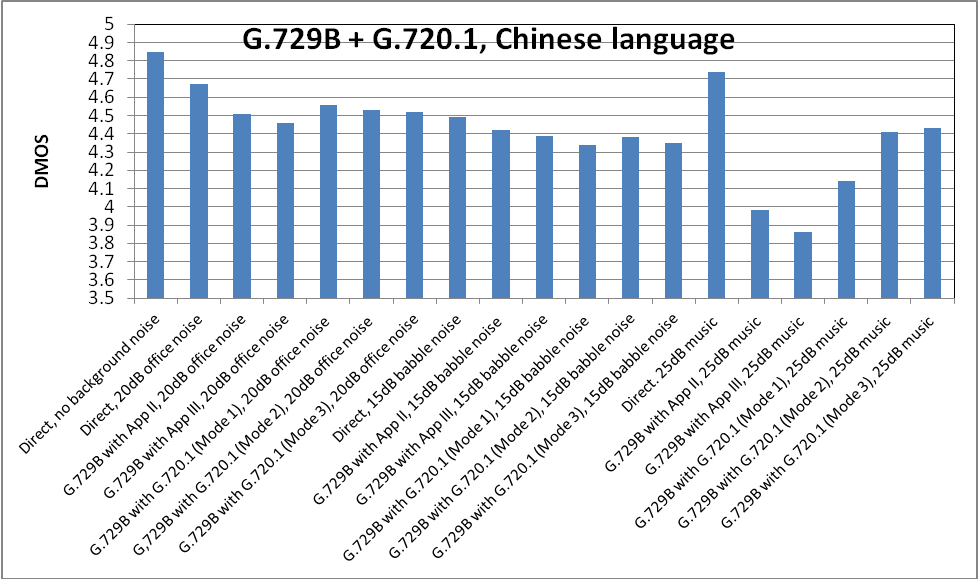


Figure 11 – Subjective results for G.729B with G.720.1

Appendix A:  
GSAD Selection test details

Table A.1 – Factors for Experiment 1

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office, interfering talkers, music |
| SNR | Infinite (∞), 30dB, 20dB, 10dB |
| Test Conditions | See condition set 1 in Table 16 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtS2M |
| Requirement | RTP, RTD, RTS2M |
| Objective | OTP, activity detection not worse than LC-VAD under the same condition for all test data |

Table A.2 – Factors for Experiment 2

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy music |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | MisRtA2I, MisRtM2S |
| Requirement | RTA2I, RTM2S |
| Objective | Activity detection not worse than LC-VAD under the same condition for all test data |

Table A.3 – Factors for Experiment 3

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy music interlaced with speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtA2I, MisRtS2M, MisRtM2S |
| Requirement | RTP, RTD, RTA2I, RTS2MIt, RTM2SIt |
| Objective | OTP, activity detection not worse than LC-VAD under the same condition for all test data |

Table A.4 – Factors for Experiment 4

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office, interfering talkers, music |
| SNR | ∞, 30dB, 20dB, 10dB |
| Test Conditions | See condition set 1 in Table 16 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtS2M |
| Requirement | RTP, RTD, RTS2M |
| Objective | OTP, activity detection not worse than LC-VAD under the same condition for all test data |

Table A.5 – Factors for Experiment 5

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy music |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | MisRtA2I, MisRtM2S |
| Requirement | RTA2I, RTM2S |
| Objective | Activity detection not worse than LC-VAD under the same condition for all test data |

Table A.6 – Factors for Experiment 6

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Clean and noisy music interlaced with speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtA2I, MisRtS2M, MisRtM2S |
| Requirement | RTP, RTD, RTA2I, RTS2MIt, RTM2SIt |
| Objective | OTP, activity detection not worse than LC-VAD under the same condition for all test data |

Table A.7 – Factors for Experiment 7

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy speech |
| Input Level | -16, -26, -36 dBov |
| Background | car, babble, office, interfering talkers, music |
| SNR | ∞, 30dB, 20dB, 10dB |
| Test Conditions | See condition set 1 in Table 16 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF |
| Requirement | RTP, RTD |
| Objective | OTP |

Table A.8 – Factors for Experiment 8

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy music |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | MisRtA2I |
| Requirement | RTA2I |
| Objective | N/A |

Table A.9 – Factors for Experiment 9

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy music interlaced with speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtA2I |
| Requirement | RTP, RTD, RTA2I |
| Objective | OTP |

Table A.10 – Factors for Experiment 10

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy speech |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office, interfering talkers, music |
| SNR | ∞, 30dB, 20dB, 10dB |
| Test Conditions | See condition set 1 in Table 16 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF |
| Requirement | RTP, RTD |
| Objective | OTP |

Table A.11 – Factors for Experiment 11

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy music |
| Input Level | -16, -26, -36 dBov |
| Background | Car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | MisRtA2I |
| Requirement | RTA2I |
| Objective | N/A |

Table A.12 – Factors for Experiment 12

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | LC-VAD |
| Input Signal | Clean and noisy music interlaced with speech |
| Input Level | -16, -26, -36 dBov |
| Background | car, babble, office |
| SNR | ∞, 30dB, 20dB |
| Test Conditions | See condition set 2 in Table 17 |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter |
| **Measurement** |  |
| Metric | PWMC score, DSAF, MisRtA2I |
| Requirement | RTP, RTD, RTA2I |
| Objective | OTP |

Table A.13 – Factors for Experiment 13

|  |  |
| --- | --- |
| **Conditions** |  |
| Codec Under Test | FC-GSAD |
| Input Signal | Alternating artificial noise with segmental levels above and below silence threshold |
| Input Level | Alternating above or below silence threshold |
| Background | N/A |
| SNR | N/A |
| Test Conditions | N/A |
| Input Characteristic | 16 kHz sampled, 16-bit input, to be processed with P.341 filter (for WB input)  16 kHz sampled, 16-bit input, to be processed with P.341 filter, then to be filtered and down sampled to 8 kHz by HQ2 filter (for NB input) |
| **Measurement** |  |
| Metric | MisRtSil |
| Requirement | The number of misclassified frames between silence and other signals should be lower than the twice the number of times the threshold is crossed in the test vector |
| Objective | N/A |

Table A.14 – Condition set 1

| Condition | SNR | Noise |
| --- | --- | --- |
| 1 | ∞ dB | N/A |
| 2 | 30 dB | Car |
| 3 | 30 dB | Babble |
| 4 | 30 dB | Office |
| 5 | 30 dB | Music |
| 6 | 30 dB | Interfering talkers |
| 7 | 20 dB | Car |
| 8 | 20 dB | Babble |
| 9 | 20 dB | Office |
| 10 | 20 dB | Music |
| 11 | 20 dB | Interfering talkers |
| 12 | 10 dB | Car |
| 13 | 10 dB | Babble |
| 14 | 10 dB | Office |

Table A.15 – Condition set 2

| Condition | SNR | Noise |
| --- | --- | --- |
| 1 | ∞ dB | N/A |
| 2 | 30 dB | Car |
| 3 | 30 dB | Babble |
| 4 | 30 dB | Office |
| 5 | 20 dB | Car |
| 6 | 20 dB | Babble |
| 7 | 20 dB | Office |

## A.1 Detailed selection test results from France Telecom

Table A.16 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.135 | 0.011 | Pass | 4.35 | Pass | 0.020 | -0.010 | Pass | 2.00% | 0.10% | Pass |
| 30dB | car | 4.30 | 4.36 | -0.062 | 0.010 | Pass | 4.36 | Pass | 0.050 | 0.022 | Pass | 3.00% | 0.10% | Pass |
|  | bab | 4.35 | 4.39 | -0.043 | 0.007 | Pass | 4.39 | Pass | 0.050 | 0.016 | Pass | 3.00% | 0.10% | Pass |
|  | off | 4.33 | 4.39 | -0.063 | 0.008 | Pass | 4.39 | Pass | 0.200 | 0.077 | Pass | 3.00% | 0.10% | Pass |
|  | mus | 4.36 | 4.48 | -0.119 | 0.008 | Pass | 4.48 | Pass | 1.287 | 0.520 | Pass | 5.00% | 1.40% | Pass |
|  | int | 4.32 | 4.42 | -0.098 | 0.008 | Pass | 4.42 | Pass | 0.355 | 0.344 | Pass | 2.00% | 0.20% | Pass |
| 20dB | car | 4.34 | 4.40 | -0.056 | 0.007 | Pass | 4.40 | Pass | 0.150 | 0.085 | Pass | 7.00% | 0.20% | Pass |
|  | bab | 4.32 | 4.38 | -0.059 | 0.006 | Pass | 4.38 | Pass | 0.150 | 0.087 | Pass | 7.00% | 0.10% | Pass |
|  | off | 4.38 | 4.41 | -0.037 | 0.005 | Pass | 4.41 | Pass | 0.400 | 0.251 | Pass | 7.00% | 0.10% | Pass |
|  | mus | 4.42 | 4.49 | -0.069 | 0.005 | Pass | 4.49 | Pass | 1.266 | 0.953 | Pass | 10.00% | 10.60% | Fail |
|  | int | 4.36 | 4.45 | -0.084 | 0.007 | Pass | 4.45 | Pass | 0.656 | 0.656 | Pass | 3.00% | 0.50% | Pass |
| 10dB | car | 4.33 | 4.37 | -0.033 | 0.005 | Pass | 4.37 | Pass | 0.200 | 0.113 | Pass | 12.00% | 0.10% | Pass |
|  | bab | 4.06 | 4.23 | -0.167 | 0.012 | Pass | 4.23 | Pass | 0.200 | 0.199 | Pass | 15.00% | 0.20% | Pass |
|  | off | 4.29 | 4.28 | 0.005 | 0.009 | Pass | 4.28 | Pass | 0.500 | 0.372 | Pass | 20.00% | 0.40% | Pass |

Table A.17 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.136 | 0.011 | Pass | 4.35 | Pass | 0.070 | -0.010 | Pass | 3.00% | 0.10% | Pass |
| 30dB | car | 4.35 | 4.39 | -0.042 | 0.010 | Pass | 4.39 | Pass | 0.100 | 0.030 | Pass | 5.00% | 0.20% | Pass |
|  | bab | 4.40 | 4.42 | -0.024 | 0.007 | Pass | 4.42 | Pass | 0.100 | 0.028 | Pass | 5.00% | 0.20% | Pass |
|  | off | 4.38 | 4.42 | -0.042 | 0.008 | Pass | 4.42 | Pass | 0.250 | 0.116 | Pass | 5.00% | 0.20% | Pass |
|  | mus | 4.41 | 4.50 | -0.086 | 0.007 | Pass | 4.50 | Pass | 1.199 | 1.287 | Pass | 10.00% | 2.10% | Pass |
|  | int | 4.37 | 4.43 | -0.056 | 0.008 | Pass | 4.43 | Pass | 0.233 | 0.355 | Pass | 3.00% | 0.30% | Pass |
| 20dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 4.42 | Pass | 0.200 | 0.104 | Pass | 10.00% | 0.20% | Pass |
|  | bab | 4.37 | 4.42 | -0.045 | 0.006 | Pass | 4.42 | Pass | 0.250 | 0.149 | Pass | 10.00% | 0.10% | Pass |
|  | off | 4.43 | 4.44 | -0.011 | 0.005 | Pass | 4.44 | Pass | 0.500 | 0.345 | Pass | 10.00% | 0.30% | Pass |
|  | mus | 4.47 | 4.50 | -0.028 | 0.005 | Pass | 4.50 | Pass | 1.199 | 1.266 | Pass | 15.00% | 13.10% | Pass |
|  | int | 4.41 | 4.45 | -0.037 | 0.007 | Pass | 4.45 | Pass | 0.554 | 0.656 | Pass | 5.00% | 0.70% | Pass |
| 10dB | car | 4.38 | 4.39 | -0.005 | 0.005 | Pass | 4.39 | Pass | 0.250 | 0.136 | Pass | 16.00% | 0.30% | Pass |
|  | bab | 4.11 | 4.28 | -0.166 | 0.011 | Pass | 4.28 | Pass | 0.300 | 0.244 | Pass | 20.00% | 0.60% | Pass |
|  | off | 4.34 | 4.34 | -0.008 | 0.008 | Pass | 4.34 | Pass | 0.600 | 0.450 | Pass | 25.00% | 0.80% | Pass |

Table A.18 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.29 | 4.35 | -0.066 | 0.009 | Pass | 4.35 | Pass | 0.100 | -0.010 | Pass | 5.00% | 0.30% | Pass |
| 30dB | car | 4.39 | 4.41 | -0.020 | 0.008 | Pass | 4.41 | Pass | 0.150 | 0.038 | Pass | 8.00% | 0.40% | Pass |
|  | bab | 4.42 | 4.43 | -0.012 | 0.005 | Pass | 4.43 | Pass | 0.150 | 0.058 | Pass | 8.00% | 0.50% | Pass |
|  | off | 4.41 | 4.44 | -0.026 | 0.007 | Pass | 4.44 | Pass | 0.300 | 0.170 | Pass | 8.00% | 0.60% | Pass |
|  | mus | 4.43 | 4.50 | -0.064 | 0.006 | Pass | 4.50 | Pass | 1.349 | 1.292 | Pass | 15.00% | 3.60% | Pass |
|  | int | 4.41 | 4.43 | -0.027 | 0.007 | Pass | 4.43 | Pass | 0.383 | 0.360 | Pass | 7.00% | 0.60% | Pass |
| 20dB | car | 4.42 | 4.43 | -0.005 | 0.006 | Pass | 4.43 | Pass | 0.250 | 0.122 | Pass | 13.00% | 0.70% | Pass |
|  | bab | 4.41 | 4.43 | -0.025 | 0.005 | Pass | 4.43 | Pass | 0.300 | 0.244 | Pass | 13.00% | 0.70% | Pass |
|  | off | 4.44 | 4.45 | -0.004 | 0.004 | Pass | 4.45 | Pass | 0.600 | 0.466 | Pass | 13.00% | 1.30% | Pass |
|  | mus | 4.48 | 4.50 | -0.021 | 0.004 | Pass | 4.50 | Pass | 1.349 | 1.273 | Pass | 20.00% | 21.90% | Fail |
|  | int | 4.43 | 4.45 | -0.015 | 0.006 | Pass | 4.45 | Pass | 0.704 | 0.657 | Pass | 8.00% | 1.70% | Pass |
| 10dB | car | 4.41 | 4.40 | 0.015 | 0.006 | Fail | 4.40 | Fail | 0.300 | 0.255 | Pass | 20.00% | 1.60% | Pass |
|  | bab | 4.21 | 4.32 | -0.109 | 0.009 | Pass | 4.32 | Pass | 0.350 | 0.319 | Pass | 25.00% | 4.20% | Pass |
|  | off | 4.38 | 4.37 | 0.005 | 0.006 | Pass | 4.37 | Pass | 0.750 | 0.509 | Pass | 30.00% | 3.10% | Pass |

Table A.19 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.90% | 0.20% | 0.20% | Pass | 7.00% | 5.60% | Pass |
| 30dB | car | 1.40% | 0.80% | 0.80% | Pass | 13.00% | 5.40% | Pass |
|  | bab | 1.40% | 0.60% | 0.60% | Pass | 13.00% | 7.30% | Pass |
|  | off | 1.30% | 0.80% | 0.80% | Pass | 13.00% | 7.30% | Pass |
| 20dB | car | 1.90% | 0.80% | 0.80% | Pass | 18.00% | 5.70% | Pass |
|  | bab | 2.50% | 1.60% | 1.60% | Pass | 18.00% | 10.00% | Pass |
|  | off | 2.10% | 1.80% | 1.80% | Pass | 18.00% | 10.60% | Pass |

Table A.20 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.90% | 0.20% | 0.20% | Pass | 5.00% | 5.20% | Fail |
| 30dB | car | 1.40% | 0.20% | 0.20% | Pass | 10.00% | 4.90% | Pass |
|  | bab | 1.40% | 0.20% | 0.20% | Pass | 10.00% | 6.50% | Pass |
|  | off | 1.30% | 0.30% | 0.30% | Pass | 10.00% | 6.50% | Pass |
| 20dB | car | 1.90% | 0.60% | 0.60% | Pass | 15.00% | 5.00% | Pass |
|  | bab | 2.50% | 1.10% | 1.10% | Pass | 15.00% | 8.50% | Pass |
|  | off | 2.10% | 0.80% | 0.80% | Pass | 15.00% | 9.40% | Pass |

Table A.21 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.90% | 0.10% | 0.10% | Pass | 3.00% | 4.20% | Fail |
| 30dB | car | 1.40% | 0.10% | 0.10% | Pass | 7.00% | 3.50% | Pass |
|  | bab | 1.40% | 0.10% | 0.10% | Pass | 7.00% | 4.80% | Pass |
|  | off | 1.30% | 0.10% | 0.10% | Pass | 7.00% | 4.70% | Pass |
| 20dB | car | 1.90% | 0.10% | 0.10% | Pass | 10.00% | 3.80% | Pass |
|  | bab | 2.50% | 0.40% | 0.40% | Pass | 10.00% | 5.50% | Pass |
|  | off | 2.10% | 0.50% | 0.50% | Pass | 10.00% | 6.30% | Pass |

Table A.22 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.23 | 4.33 | -0.096 | 0.011 | Pass | 4.33 | Pass | 0.90% | 0.30% | 0.30% | Pass | 0.02 | -0.003 | Pass | 2.10% | 0.10% | Pass | 9.10% | 6.00% | Pass |
| 30dB | car | 4.31 | 4.36 | -0.054 | 0.010 | Pass | 4.36 | Pass | 1.40% | 0.60% | 0.60% | Pass | 0.05 | 0.011 | Pass | 3.20% | 0.40% | Pass | 16.90% | 7.10% | Pass |
|  | bab | 4.35 | 4.38 | -0.032 | 0.008 | Pass | 4.38 | Pass | 1.40% | 0.80% | 0.80% | Pass | 0.05 | 0.009 | Pass | 3.20% | 0.20% | Pass | 16.90% | 8.30% | Pass |
|  | off | 4.34 | 4.39 | -0.056 | 0.007 | Pass | 4.39 | Pass | 1.40% | 1.00% | 1.00% | Pass | 0.20 | 0.031 | Pass | 3.20% | 1.00% | Pass | 16.90% | 9.70% | Pass |
| 20dB | car | 4.33 | 4.40 | -0.072 | 0.007 | Pass | 4.40 | Pass | 1.90% | 0.70% | 0.70% | Pass | 0.15 | 0.057 | Pass | 7.40% | 0.30% | Pass | 23.40% | 9.80% | Pass |
|  | bab | 4.30 | 4.36 | -0.065 | 0.007 | Pass | 4.36 | Pass | 2.70% | 2.20% | 2.20% | Pass | 0.15 | 0.069 | Pass | 7.40% | 0.60% | Pass | 23.40% | 14.20% | Pass |
|  | off | 4.36 | 4.41 | -0.049 | 0.005 | Pass | 4.41 | Pass | 2.30% | 3.30% | 3.30% | Fail | 0.40 | 0.102 | Pass | 7.40% | 1.50% | Pass | 23.40% | 12.60% | Pass |

Table A.23 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.23 | 4.33 | -0.096 | 0.011 | Pass | 4.33 | Pass | 0.90% | 0.20% | 0.20% | Pass | 0.07 | -0.003 | Pass | 3.30% | 0.20% | Pass | 6.00% | 5.40% | Pass |
| 30dB | car | 4.36 | 4.40 | -0.036 | 0.009 | Pass | 4.40 | Pass | 1.40% | 0.40% | 0.40% | Pass | 0.10 | 0.014 | Pass | 5.50% | 0.40% | Pass | 12.00% | 6.50% | Pass |
|  | bab | 4.40 | 4.41 | -0.015 | 0.007 | Pass | 4.41 | Pass | 1.40% | 0.10% | 0.10% | Pass | 0.10 | 0.013 | Pass | 5.50% | 0.30% | Pass | 12.00% | 6.60% | Pass |
|  | off | 4.39 | 4.43 | -0.038 | 0.007 | Pass | 4.43 | Pass | 1.40% | 0.20% | 0.20% | Pass | 0.25 | 0.050 | Pass | 5.50% | 1.10% | Pass | 12.00% | 6.90% | Pass |
| 20dB | car | 4.38 | 4.42 | -0.047 | 0.007 | Pass | 4.42 | Pass | 1.90% | 0.30% | 0.30% | Pass | 0.20 | 0.064 | Pass | 11.00% | 0.30% | Pass | 18.00% | 7.80% | Pass |
|  | bab | 4.35 | 4.42 | -0.073 | 0.007 | Pass | 4.42 | Pass | 2.70% | 1.50% | 1.50% | Pass | 0.25 | 0.105 | Pass | 11.00% | 1.70% | Pass | 18.00% | 11.60% | Pass |
|  | off | 4.41 | 4.44 | -0.033 | 0.005 | Pass | 4.44 | Pass | 2.30% | 2.30% | 2.30% | Pass | 0.50 | 0.148 | Pass | 11.00% | 2.10% | Pass | 18.00% | 12.10% | Pass |

Table A.24 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.30 | 4.33 | -0.031 | 0.009 | Pass | 4.33 | Pass | 0.90% | 0.20% | 0.20% | Pass | 0.10 | -0.003 | Pass | 5.80% | 0.40% | Pass | 3.30% | 3.80% | Fail |
| 30dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 4.42 | Pass | 1.40% | 0.10% | 0.10% | Pass | 0.15 | 0.017 | Pass | 9.20% | 0.60% | Pass | 7.70% | 3.80% | Pass |
|  | bab | 4.42 | 4.43 | -0.010 | 0.006 | Pass | 4.43 | Pass | 1.40% | 0.10% | 0.10% | Pass | 0.15 | 0.024 | Pass | 9.20% | 0.60% | Pass | 7.70% | 4.20% | Pass |
|  | off | 4.42 | 4.44 | -0.025 | 0.006 | Pass | 4.44 | Pass | 1.40% | 0.20% | 0.20% | Pass | 0.30 | 0.071 | Pass | 9.20% | 1.60% | Pass | 7.70% | 4.40% | Pass |
| 20dB | car | 4.41 | 4.43 | -0.027 | 0.006 | Pass | 4.43 | Pass | 1.90% | 0.20% | 0.20% | Pass | 0.25 | 0.081 | Pass | 15.00% | 0.70% | Pass | 11.00% | 4.90% | Pass |
|  | bab | 4.39 | 4.43 | -0.048 | 0.006 | Pass | 4.43 | Pass | 2.70% | 1.20% | 1.20% | Pass | 0.30 | 0.141 | Pass | 15.00% | 3.30% | Pass | 11.00% | 7.40% | Pass |
|  | off | 4.43 | 4.45 | -0.022 | 0.004 | Pass | 4.45 | Pass | 2.30% | 1.70% | 1.70% | Pass | 0.60 | 0.205 | Pass | 15.00% | 3.00% | Pass | 11.00% | 9.60% | Pass |

Table A.25 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.42 | 4.47 | -0.045 | 0.005 | Pass | 4.47 | Pass | 0.020 | -0.010 | Pass | 2.00% | 0.10% | Pass |
| 30dB | car | 4.38 | 4.44 | -0.056 | 0.006 | Pass | 4.44 | Pass | 0.050 | 0.028 | Pass | 3.00% | 0.10% | Pass |
|  | bab | 4.41 | 4.46 | -0.046 | 0.003 | Pass | 4.46 | Pass | 0.050 | 0.019 | Pass | 3.00% | 0.00% | Pass |
|  | off | 4.40 | 4.46 | -0.053 | 0.003 | Pass | 4.46 | Pass | 0.200 | 0.081 | Pass | 3.00% | 0.10% | Pass |
|  | mus | 4.42 | 4.49 | -0.070 | 0.003 | Pass | 4.49 | Pass | 1.395 | 0.558 | Pass | 5.00% | 0.90% | Pass |
|  | int | 4.41 | 4.47 | -0.062 | 0.004 | Pass | 4.47 | Pass | 0.367 | 0.350 | Pass | 2.00% | 0.20% | Pass |
| 20dB | car | 4.40 | 4.45 | -0.049 | 0.003 | Pass | 4.45 | Pass | 0.150 | 0.098 | Pass | 7.00% | 0.00% | Pass |
|  | bab | 4.41 | 4.46 | -0.045 | 0.002 | Pass | 4.46 | Pass | 0.150 | 0.109 | Pass | 7.00% | 0.00% | Pass |
|  | off | 4.43 | 4.46 | -0.034 | 0.002 | Pass | 4.46 | Pass | 0.400 | 0.259 | Pass | 7.00% | 0.00% | Pass |
|  | mus | 4.44 | 4.49 | -0.054 | 0.002 | Pass | 4.49 | Pass | 1.391 | 1.022 | Pass | 10.00% | 8.20% | Pass |
|  | int | 4.43 | 4.48 | -0.058 | 0.003 | Pass | 4.48 | Pass | 0.663 | 0.662 | Pass | 3.00% | 0.50% | Pass |
| 10dB | car | 4.40 | 4.43 | -0.035 | 0.003 | Pass | 4.43 | Pass | 0.200 | 0.126 | Pass | 12.00% | 0.00% | Pass |
|  | bab | 4.32 | 4.35 | -0.032 | 0.006 | Pass | 4.35 | Pass | 0.200 | 0.158 | Pass | 15.00% | 0.20% | Pass |
|  | off | 4.40 | 4.40 | -0.002 | 0.005 | Pass | 4.40 | Pass | 0.500 | 0.402 | Pass | 20.00% | 0.50% | Pass |

Table A.26 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **T-Test Pass** | **PWMC Cut LC** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** | **MisRtS2M Threshold** | **MisRtS2M Cut** | **S2M Pass** |
| ∞ | N/A | 4.42 | 4.47 | -0.047 | 0.005 | Pass | 4.47 | Pass | 0.070 | -0.007 | Pass | 3.00% | 0.10% | Pass |
| 30dB | car | 4.43 | 4.45 | -0.022 | 0.006 | Pass | 4.45 | Pass | 0.100 | 0.036 | Pass | 5.00% | 0.10% | Pass |
|  | bab | 4.46 | 4.47 | -0.008 | 0.003 | Pass | 4.47 | Pass | 0.100 | 0.035 | Pass | 5.00% | 0.00% | Pass |
|  | off | 4.45 | 4.47 | -0.016 | 0.003 | Pass | 4.47 | Pass | 0.250 | 0.119 | Pass | 5.00% | 0.10% | Pass |
|  | mus | 4.47 | 4.50 | -0.030 | 0.003 | Pass | 4.50 | Pass | 1.263 | 1.395 | Pass | 10.00% | 1.40% | Pass |
|  | int | 4.46 | 4.48 | -0.018 | 0.004 | Pass | 4.48 | Pass | 0.238 | 0.367 | Pass | 3.00% | 0.20% | Pass |
| 20dB | car | 4.45 | 4.46 | -0.006 | 0.004 | Pass | 4.46 | Pass | 0.200 | 0.116 | Pass | 10.00% | 0.10% | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.002 | Pass | 4.47 | Pass | 0.250 | 0.153 | Pass | 10.00% | 0.10% | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 4.48 | Pass | 0.500 | 0.371 | Pass | 10.00% | 0.10% | Pass |
|  | mus | 4.49 | 4.50 | -0.009 | 0.002 | Pass | 4.50 | Pass | 1.263 | 1.391 | Pass | 15.00% | 11.30% | Pass |
|  | int | 4.48 | 4.49 | -0.009 | 0.003 | Pass | 4.49 | Pass | 0.559 | 0.663 | Pass | 5.00% | 0.80% | Pass |
| 10dB | car | 4.45 | 4.45 | 0.000 | 0.003 | Pass | 4.45 | Pass | 0.250 | 0.153 | Pass | 16.00% | 0.10% | Pass |
|  | bab | 4.37 | 4.40 | -0.038 | 0.005 | Pass | 4.40 | Pass | 0.300 | 0.243 | Pass | 20.00% | 0.40% | Pass |
|  | off | 4.45 | 4.45 | 0.002 | 0.004 | Pass | 4.45 | Pass | 0.600 | 0.552 | Pass | 25.00% | 0.70% | Pass |

Table A.27 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.44 | 4.47 | -0.028 | 0.004 | Pass | 4.47 | Pass | 0.100 | -0.007 | Pass | 5.00% | 0.30% | Pass |
| 30dB | car | 4.45 | 4.46 | -0.011 | 0.005 | Pass | 4.46 | Pass | 0.150 | 0.044 | Pass | 8.00% | 0.40% | Pass |
|  | bab | 4.47 | 4.48 | -0.004 | 0.003 | Pass | 4.48 | Pass | 0.150 | 0.063 | Pass | 8.00% | 0.30% | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.003 | Pass | 4.48 | Pass | 0.300 | 0.163 | Pass | 8.00% | 0.60% | Pass |
|  | mus | 4.48 | 4.50 | -0.023 | 0.002 | Pass | 4.50 | Pass | 1.413 | 1.397 | Pass | 15.00% | 2.90% | Pass |
|  | int | 4.47 | 4.48 | -0.010 | 0.003 | Pass | 4.48 | Pass | 0.388 | 0.372 | Pass | 7.00% | 0.70% | Pass |
| 20dB | car | 4.46 | 4.47 | -0.003 | 0.003 | Pass | 4.47 | Pass | 0.250 | 0.137 | Pass | 13.00% | 0.50% | Pass |
|  | bab | 4.47 | 4.48 | -0.008 | 0.002 | Pass | 4.48 | Pass | 0.300 | 0.225 | Pass | 13.00% | 0.40% | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 4.48 | Pass | 0.600 | 0.468 | Pass | 13.00% | 0.80% | Pass |
|  | mus | 4.49 | 4.50 | -0.007 | 0.001 | Pass | 4.50 | Pass | 1.413 | 1.393 | Pass | 20.00% | 20.00% | Pass |
|  | int | 4.48 | 4.49 | -0.004 | 0.002 | Pass | 4.49 | Pass | 0.709 | 0.663 | Pass | 8.00% | 1.90% | Pass |
| 10dB | car | 4.46 | 4.46 | 0.003 | 0.003 | Pass | 4.46 | Pass | 0.300 | 0.436 | Fail | 20.00% | 0.60% | Pass |
|  | bab | 4.40 | 4.44 | -0.037 | 0.004 | Pass | 4.44 | Pass | 0.350 | 0.339 | Pass | 25.00% | 1.90% | Pass |
|  | off | 4.46 | 4.46 | 0.000 | 0.003 | Pass | 4.46 | Pass | 0.750 | 0.648 | Pass | 30.00% | 2.60% | Pass |

Table A.28 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.80% | 0.60% | 0.60% | Pass | 7.00% | 6.50% | Pass |
| 30dB | car | 1.20% | 1.10% | 1.10% | Pass | 13.00% | 7.90% | Pass |
|  | bab | 1.30% | 1.60% | 1.60% | Fail | 13.00% | 6.80% | Pass |
|  | off | 1.20% | 1.40% | 1.40% | Fail | 13.00% | 9.20% | Pass |
| 20dB | car | 1.70% | 1.40% | 1.40% | Pass | 18.00% | 7.20% | Pass |
|  | bab | 2.30% | 2.50% | 2.50% | Fail | 18.00% | 8.90% | Pass |
|  | off | 1.90% | 1.40% | 1.40% | Pass | 18.00% | 9.50% | Pass |

Table A.29 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.80% | 0.50% | 0.50% | Pass | 5.00% | 6.10% | Fail |
| 30dB | car | 1.20% | 0.90% | 0.90% | Pass | 10.00% | 7.10% | Pass |
|  | bab | 1.30% | 1.30% | 1.30% | Fail | 10.00% | 6.30% | Pass |
|  | off | 1.20% | 1.10% | 1.10% | Pass | 10.00% | 8.00% | Pass |
| 20dB | car | 1.70% | 1.10% | 1.10% | Pass | 15.00% | 6.40% | Pass |
|  | bab | 2.30% | 1.70% | 1.70% | Pass | 15.00% | 7.60% | Pass |
|  | off | 1.90% | 0.80% | 0.80% | Pass | 15.00% | 8.30% | Pass |

Table A.30 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.80% | 0.30% | 0.30% | Pass | 3.00% | 4.80% | Fail |
| 30dB | car | 1.20% | 0.40% | 0.40% | Pass | 7.00% | 5.50% | Pass |
|  | bab | 1.30% | 0.70% | 0.70% | Pass | 7.00% | 4.90% | Pass |
|  | off | 1.20% | 0.50% | 0.50% | Pass | 7.00% | 6.00% | Pass |
| 20dB | car | 1.70% | 0.50% | 0.50% | Pass | 10.00% | 5.40% | Pass |
|  | bab | 2.30% | 1.10% | 1.10% | Pass | 10.00% | 5.70% | Pass |
|  | off | 1.90% | 0.50% | 0.50% | Pass | 10.00% | 6.30% | Pass |

Table A.31 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.41 | 4.45 | -0.041 | 0.006 | Pass | 4.45 | Pass | 1.00% | 1.60% | 1.60% | Fail | 0.02 | -0.002 | Pass | 2.10% | 0.20% | Pass | 9.10% | 7.70% | Pass |
| 30dB | car | 4.37 | 4.43 | -0.064 | 0.007 | Pass | 4.43 | Pass | 1.50% | 1.30% | 1.30% | Pass | 0.05 | 0.013 | Pass | 3.20% | 0.30% | Pass | 16.90% | 7.30% | Pass |
|  | bab | 4.40 | 4.45 | -0.049 | 0.004 | Pass | 4.45 | Pass | 1.50% | 2.30% | 2.30% | Fail | 0.05 | 0.010 | Pass | 3.20% | 0.30% | Pass | 16.90% | 9.80% | Pass |
|  | off | 4.40 | 4.45 | -0.055 | 0.004 | Pass | 4.45 | Pass | 1.50% | 2.20% | 2.20% | Fail | 0.20 | 0.032 | Pass | 3.20% | 0.80% | Pass | 16.90% | 10.40% | Pass |
| 20dB | car | 4.39 | 4.45 | -0.065 | 0.004 | Pass | 4.45 | Pass | 2.00% | 0.70% | 0.70% | Pass | 0.15 | 0.059 | Pass | 7.40% | 0.50% | Pass | 23.40% | 7.80% | Pass |
|  | bab | 4.39 | 4.44 | -0.046 | 0.003 | Pass | 4.44 | Pass | 2.50% | 3.10% | 3.10% | Fail | 0.15 | 0.057 | Pass | 7.40% | 0.00% | Pass | 23.40% | 14.20% | Pass |
|  | off | 4.41 | 4.45 | -0.041 | 0.003 | Pass | 4.45 | Pass | 2.40% | 4.30% | 4.30% | Fail | 0.40 | 0.102 | Pass | 7.40% | 1.60% | Pass | 23.40% | 12.80% | Pass |

Table A.32 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.41 | 4.45 | -0.043 | 0.006 | Pass | 4.45 | Pass | 1.00% | 1.40% | 1.40% | Fail | 0.07 | 0.001 | Pass | 3.30% | 0.30% | Pass | 6.00% | 7.00% | Fail |
| 30dB | car | 4.42 | 4.45 | -0.033 | 0.006 | Pass | 4.45 | Pass | 1.50% | 1.00% | 1.00% | Pass | 0.10 | 0.016 | Pass | 5.50% | 0.30% | Pass | 12.00% | 6.60% | Pass |
|  | bab | 4.45 | 4.47 | -0.016 | 0.004 | Pass | 4.47 | Pass | 1.50% | 1.20% | 1.20% | Pass | 0.10 | 0.015 | Pass | 5.50% | 0.40% | Pass | 12.00% | 8.30% | Pass |
|  | off | 4.45 | 4.47 | -0.022 | 0.004 | Pass | 4.47 | Pass | 1.50% | 1.40% | 1.40% | Pass | 0.25 | 0.050 | Pass | 5.50% | 0.90% | Pass | 12.00% | 8.90% | Pass |
| 20dB | car | 4.44 | 4.46 | -0.027 | 0.004 | Pass | 4.46 | Pass | 2.00% | 0.40% | 0.40% | Pass | 0.20 | 0.065 | Pass | 11.00% | 0.50% | Pass | 18.00% | 7.10% | Pass |
|  | bab | 4.44 | 4.46 | -0.018 | 0.003 | Pass | 4.46 | Pass | 2.50% | 2.60% | 2.60% | Fail | 0.25 | 0.078 | Pass | 11.00% | 0.10% | Pass | 18.00% | 12.70% | Pass |
|  | off | 4.46 | 4.48 | -0.015 | 0.002 | Pass | 4.48 | Pass | 2.40% | 2.80% | 2.80% | Fail | 0.50 | 0.161 | Pass | 11.00% | 1.90% | Pass | 18.00% | 12.20% | Pass |

Table A.33 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.43 | 4.46 | -0.022 | 0.005 | Pass | 4.46 | Pass | 1.00% | 0.70% | 0.70% | Pass | 0.10 | 0.001 | Pass | 5.80% | 0.70% | Pass | 3.30% | 5.10% | Fail |
| 30dB | car | 4.44 | 4.46 | -0.021 | 0.005 | Pass | 4.46 | Pass | 1.50% | 0.40% | 0.40% | Pass | 0.15 | 0.019 | Pass | 9.20% | 0.60% | Pass | 7.70% | 4.70% | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.003 | Pass | 4.47 | Pass | 1.50% | 1.00% | 1.00% | Pass | 0.15 | 0.026 | Pass | 9.20% | 0.60% | Pass | 7.70% | 5.90% | Pass |
|  | off | 4.46 | 4.47 | -0.014 | 0.003 | Pass | 4.47 | Pass | 1.50% | 0.70% | 0.70% | Pass | 0.30 | 0.067 | Pass | 9.20% | 1.30% | Pass | 7.70% | 6.30% | Pass |
| 20dB | car | 4.45 | 4.47 | -0.020 | 0.004 | Pass | 4.47 | Pass | 2.00% | 0.20% | 0.20% | Pass | 0.25 | 0.083 | Pass | 15.00% | 0.80% | Pass | 11.00% | 5.10% | Pass |
|  | bab | 4.46 | 4.47 | -0.017 | 0.002 | Pass | 4.47 | Pass | 2.50% | 2.10% | 2.10% | Pass | 0.30 | 0.124 | Pass | 15.00% | 1.70% | Pass | 11.00% | 9.20% | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.002 | Pass | 4.48 | Pass | 2.40% | 2.10% | 2.10% | Pass | 0.60 | 0.201 | Pass | 15.00% | 2.70% | Pass | 11.00% | 10.20% | Pass |

Table A.34 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.21 | 4.35 | -0.135 | 0.011 | Pass | 0.020 | -0.010 | Pass |
| 30dB | car | 4.30 | 4.36 | -0.062 | 0.010 | Pass | 0.050 | 0.022 | Pass |
|  | bab | 4.35 | 4.39 | -0.043 | 0.007 | Pass | 0.050 | 0.016 | Pass |
|  | off | 4.33 | 4.39 | -0.063 | 0.008 | Pass | 0.200 | 0.077 | Pass |
|  | mus | 4.36 | 4.48 | -0.119 | 0.008 | Pass | 1.287 | 0.520 | Pass |
|  | int | 4.32 | 4.42 | -0.098 | 0.008 | Pass | 0.355 | 0.344 | Pass |
| 20dB | car | 4.34 | 4.40 | -0.056 | 0.007 | Pass | 0.150 | 0.085 | Pass |
|  | bab | 4.32 | 4.38 | -0.059 | 0.006 | Pass | 0.150 | 0.087 | Pass |
|  | off | 4.38 | 4.41 | -0.037 | 0.005 | Pass | 0.400 | 0.251 | Pass |
|  | mus | 4.42 | 4.49 | -0.069 | 0.005 | Pass | 1.266 | 0.953 | Pass |
|  | int | 4.36 | 4.45 | -0.084 | 0.007 | Pass | 0.656 | 0.656 | Pass |
| 10dB | car | 4.33 | 4.37 | -0.033 | 0.005 | Pass | 0.200 | 0.113 | Pass |
|  | bab | 4.06 | 4.23 | -0.167 | 0.012 | Pass | 0.200 | 0.199 | Pass |
|  | off | 4.29 | 4.28 | 0.005 | 0.009 | Pass | 0.500 | 0.372 | Pass |

Table A.35 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.21 | 4.35 | -0.136 | 0.011 | Pass | 0.070 | -0.010 | Pass |
| 30dB | car | 4.35 | 4.39 | -0.042 | 0.010 | Pass | 0.100 | 0.030 | Pass |
|  | bab | 4.40 | 4.42 | -0.024 | 0.007 | Pass | 0.100 | 0.028 | Pass |
|  | off | 4.38 | 4.42 | -0.042 | 0.008 | Pass | 0.250 | 0.116 | Pass |
|  | mus | 4.41 | 4.50 | -0.086 | 0.007 | Pass | 1.199 | 1.287 | Pass |
|  | int | 4.37 | 4.43 | -0.056 | 0.008 | Pass | 0.233 | 0.355 | Pass |
| 20dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 0.200 | 0.104 | Pass |
|  | bab | 4.37 | 4.42 | -0.045 | 0.006 | Pass | 0.250 | 0.149 | Pass |
|  | off | 4.43 | 4.44 | -0.011 | 0.005 | Pass | 0.500 | 0.345 | Pass |
|  | mus | 4.47 | 4.50 | -0.028 | 0.005 | Pass | 1.199 | 1.266 | Pass |
|  | int | 4.41 | 4.45 | -0.037 | 0.007 | Pass | 0.554 | 0.656 | Pass |
| 10dB | car | 4.38 | 4.39 | -0.005 | 0.005 | Pass | 0.250 | 0.136 | Pass |
|  | bab | 4.11 | 4.28 | -0.166 | 0.011 | Pass | 0.300 | 0.244 | Pass |
|  | off | 4.34 | 4.34 | -0.008 | 0.008 | Pass | 0.600 | 0.450 | Pass |

Table A.36 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.29 | 4.35 | -0.066 | 0.009 | Pass | 0.100 | -0.010 | Pass |
| 30dB | car | 4.39 | 4.41 | -0.020 | 0.008 | Pass | 0.150 | 0.038 | Pass |
|  | bab | 4.42 | 4.43 | -0.012 | 0.005 | Pass | 0.150 | 0.058 | Pass |
|  | off | 4.41 | 4.44 | -0.026 | 0.007 | Pass | 0.300 | 0.170 | Pass |
|  | mus | 4.43 | 4.50 | -0.064 | 0.006 | Pass | 1.349 | 1.292 | Pass |
|  | int | 4.41 | 4.43 | -0.027 | 0.007 | Pass | 0.383 | 0.360 | Pass |
| 20dB | car | 4.42 | 4.43 | -0.005 | 0.006 | Pass | 0.250 | 0.122 | Pass |
|  | bab | 4.41 | 4.43 | -0.025 | 0.005 | Pass | 0.300 | 0.244 | Pass |
|  | off | 4.44 | 4.45 | -0.004 | 0.004 | Pass | 0.600 | 0.466 | Pass |
|  | mus | 4.48 | 4.50 | -0.021 | 0.004 | Pass | 1.349 | 1.273 | Pass |
|  | int | 4.43 | 4.45 | -0.015 | 0.006 | Pass | 0.704 | 0.657 | Pass |
| 10dB | car | 4.41 | 4.40 | 0.015 | 0.006 | Fail | 0.300 | 0.255 | Pass |
|  | bab | 4.21 | 4.32 | -0.109 | 0.009 | Pass | 0.350 | 0.319 | Pass |
|  | off | 4.38 | 4.37 | 0.005 | 0.006 | Pass | 0.750 | 0.509 | Pass |

Table A.37 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.90% | 0.20% | Pass |
| 30dB | car | 1.40% | 0.80% | Pass |
|  | bab | 1.40% | 0.60% | Pass |
|  | off | 1.30% | 0.80% | Pass |
| 20dB | car | 1.90% | 0.80% | Pass |
|  | bab | 2.50% | 1.60% | Pass |
|  | off | 2.10% | 1.80% | Pass |

Table A.38 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Balanced Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.90% | 0.20% | Pass |
| 30dB | car | 1.40% | 0.20% | Pass |
|  | bab | 1.40% | 0.20% | Pass |
|  | off | 1.30% | 0.30% | Pass |
| 20dB | car | 1.90% | 0.60% | Pass |
|  | bab | 2.50% | 1.10% | Pass |
|  | off | 2.10% | 0.80% | Pass |

Table A.39 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.90% | 0.10% | Pass |
| 30dB | car | 1.40% | 0.10% | Pass |
|  | bab | 1.40% | 0.10% | Pass |
|  | off | 1.30% | 0.10% | Pass |
| 20dB | car | 1.90% | 0.10% | Pass |
|  | bab | 2.50% | 0.40% | Pass |
|  | off | 2.10% | 0.50% | Pass |

Table A.40 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.23 | 4.33 | -0.096 | 0.011 | Pass | 0.90% | 0.30% | Pass | 0.02 | -0.003 | Pass |
| 30dB | car | 4.31 | 4.36 | -0.054 | 0.010 | Pass | 1.40% | 0.60% | Pass | 0.05 | 0.011 | Pass |
|  | bab | 4.35 | 4.38 | -0.032 | 0.008 | Pass | 1.40% | 0.80% | Pass | 0.05 | 0.009 | Pass |
|  | off | 4.34 | 4.39 | -0.056 | 0.007 | Pass | 1.40% | 1.00% | Pass | 0.20 | 0.031 | Pass |
| 20dB | car | 4.33 | 4.40 | -0.072 | 0.007 | Pass | 1.90% | 0.70% | Pass | 0.15 | 0.057 | Pass |
|  | bab | 4.30 | 4.36 | -0.065 | 0.007 | Pass | 2.70% | 2.20% | Pass | 0.15 | 0.069 | Pass |
|  | off | 4.36 | 4.41 | -0.049 | 0.005 | Pass | 2.30% | 3.30% | Fail | 0.40 | 0.102 | Pass |

Table A.41 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.23 | 4.33 | -0.096 | 0.011 | Pass | 0.90% | 0.20% | Pass | 0.07 | -0.003 | Pass |
| 30dB | car | 4.36 | 4.40 | -0.036 | 0.009 | Pass | 1.40% | 0.40% | Pass | 0.10 | 0.014 | Pass |
|  | bab | 4.40 | 4.41 | -0.015 | 0.007 | Pass | 1.40% | 0.10% | Pass | 0.10 | 0.013 | Pass |
|  | off | 4.39 | 4.43 | -0.038 | 0.007 | Pass | 1.40% | 0.20% | Pass | 0.25 | 0.050 | Pass |
| 20dB | car | 4.38 | 4.42 | -0.047 | 0.007 | Pass | 1.90% | 0.30% | Pass | 0.20 | 0.064 | Pass |
|  | bab | 4.35 | 4.42 | -0.073 | 0.007 | Pass | 2.70% | 1.50% | Pass | 0.25 | 0.105 | Pass |
|  | off | 4.41 | 4.44 | -0.033 | 0.005 | Pass | 2.30% | 2.30% | Pass | 0.50 | 0.148 | Pass |

Table A.42 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.30 | 4.33 | -0.031 | 0.009 | Pass | 0.90% | 0.20% | Pass | 0.10 | -0.003 | Pass |
| 30dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 1.40% | 0.10% | Pass | 0.15 | 0.017 | Pass |
|  | bab | 4.42 | 4.43 | -0.010 | 0.006 | Pass | 1.40% | 0.10% | Pass | 0.15 | 0.024 | Pass |
|  | off | 4.42 | 4.44 | -0.025 | 0.006 | Pass | 1.40% | 0.20% | Pass | 0.30 | 0.071 | Pass |
| 20dB | car | 4.41 | 4.43 | -0.027 | 0.006 | Pass | 1.90% | 0.20% | Pass | 0.25 | 0.081 | Pass |
|  | bab | 4.39 | 4.43 | -0.048 | 0.006 | Pass | 2.70% | 1.20% | Pass | 0.30 | 0.141 | Pass |
|  | off | 4.43 | 4.45 | -0.022 | 0.004 | Pass | 2.30% | 1.70% | Pass | 0.60 | 0.205 | Pass |

Table A.43 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.42 | 4.47 | -0.045 | 0.005 | Pass | 0.020 | -0.010 | Pass |
| 30dB | car | 4.38 | 4.44 | -0.056 | 0.006 | Pass | 0.050 | 0.028 | Pass |
|  | bab | 4.41 | 4.46 | -0.046 | 0.003 | Pass | 0.050 | 0.019 | Pass |
|  | off | 4.40 | 4.46 | -0.053 | 0.003 | Pass | 0.200 | 0.081 | Pass |
|  | mus | 4.42 | 4.49 | -0.070 | 0.003 | Pass | 1.395 | 0.558 | Pass |
|  | int | 4.41 | 4.47 | -0.062 | 0.004 | Pass | 0.367 | 0.350 | Pass |
| 20dB | car | 4.40 | 4.45 | -0.049 | 0.003 | Pass | 0.150 | 0.098 | Pass |
|  | bab | 4.41 | 4.46 | -0.045 | 0.002 | Pass | 0.150 | 0.109 | Pass |
|  | off | 4.43 | 4.46 | -0.034 | 0.002 | Pass | 0.400 | 0.259 | Pass |
|  | mus | 4.44 | 4.49 | -0.054 | 0.002 | Pass | 1.391 | 1.022 | Pass |
|  | int | 4.43 | 4.48 | -0.058 | 0.003 | Pass | 0.663 | 0.662 | Pass |
| 10dB | car | 4.40 | 4.43 | -0.035 | 0.003 | Pass | 0.200 | 0.126 | Pass |
|  | bab | 4.32 | 4.35 | -0.032 | 0.006 | Pass | 0.200 | 0.158 | Pass |
|  | off | 4.40 | 4.40 | -0.002 | 0.005 | Pass | 0.500 | 0.402 | Pass |

Table A.44 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.42 | 4.47 | -0.047 | 0.005 | Pass | 0.070 | -0.007 | Pass |
| 30dB | car | 4.43 | 4.45 | -0.022 | 0.006 | Pass | 0.100 | 0.036 | Pass |
|  | bab | 4.46 | 4.47 | -0.008 | 0.003 | Pass | 0.100 | 0.035 | Pass |
|  | off | 4.45 | 4.47 | -0.016 | 0.003 | Pass | 0.250 | 0.119 | Pass |
|  | mus | 4.47 | 4.50 | -0.030 | 0.003 | Pass | 1.263 | 1.395 | Pass |
|  | int | 4.46 | 4.48 | -0.018 | 0.004 | Pass | 0.238 | 0.367 | Pass |
| 20dB | car | 4.45 | 4.46 | -0.006 | 0.004 | Pass | 0.200 | 0.116 | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.002 | Pass | 0.250 | 0.153 | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 0.500 | 0.371 | Pass |
|  | mus | 4.49 | 4.50 | -0.009 | 0.002 | Pass | 1.263 | 1.391 | Pass |
|  | int | 4.48 | 4.49 | -0.009 | 0.003 | Pass | 0.559 | 0.663 | Pass |
| 10dB | car | 4.45 | 4.45 | 0.000 | 0.003 | Pass | 0.250 | 0.153 | Pass |
|  | bab | 4.37 | 4.40 | -0.038 | 0.005 | Pass | 0.300 | 0.243 | Pass |
|  | off | 4.45 | 4.45 | 0.002 | 0.004 | Pass | 0.600 | 0.552 | Pass |

Table A.45 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.44 | 4.47 | -0.028 | 0.004 | Pass | 0.100 | -0.007 | Pass |
| 30dB | car | 4.45 | 4.46 | -0.011 | 0.005 | Pass | 0.150 | 0.044 | Pass |
|  | bab | 4.47 | 4.48 | -0.004 | 0.003 | Pass | 0.150 | 0.063 | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.003 | Pass | 0.300 | 0.163 | Pass |
|  | mus | 4.48 | 4.50 | -0.023 | 0.002 | Pass | 1.413 | 1.397 | Pass |
|  | int | 4.47 | 4.48 | -0.010 | 0.003 | Pass | 0.388 | 0.372 | Pass |
| 20dB | car | 4.46 | 4.47 | -0.003 | 0.003 | Pass | 0.250 | 0.137 | Pass |
|  | bab | 4.47 | 4.48 | -0.008 | 0.002 | Pass | 0.300 | 0.225 | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 0.600 | 0.468 | Pass |
|  | mus | 4.49 | 4.50 | -0.007 | 0.001 | Pass | 1.413 | 1.393 | Pass |
|  | int | 4.48 | 4.49 | -0.004 | 0.002 | Pass | 0.709 | 0.663 | Pass |
| 10dB | car | 4.46 | 4.46 | 0.003 | 0.003 | Pass | 0.300 | 0.436 | Fail |
|  | bab | 4.40 | 4.44 | -0.037 | 0.004 | Pass | 0.350 | 0.339 | Pass |
|  | off | 4.46 | 4.46 | 0.000 | 0.003 | Pass | 0.750 | 0.648 | Pass |

Table A.46 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.80% | 0.60% | Pass |
| 30dB | car | 1.20% | 1.10% | Pass |
|  | bab | 1.30% | 1.60% | Fail |
|  | off | 1.20% | 1.40% | Fail |
| 20dB | car | 1.70% | 1.40% | Pass |
|  | bab | 2.30% | 2.50% | Fail |
|  | off | 1.90% | 1.40% | Pass |

Table A.47 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Balanced Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.80% | 0.50% | Pass |
| 30dB | car | 1.20% | 0.90% | Pass |
|  | bab | 1.30% | 1.30% | Fail |
|  | off | 1.20% | 1.10% | Pass |
| 20dB | car | 1.70% | 1.10% | Pass |
|  | bab | 2.30% | 1.70% | Pass |
|  | off | 1.90% | 0.80% | Pass |

Table A.48 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** |
| ∞ | N/A | 0.80% | 0.30% | Pass |
| 30dB | car | 1.20% | 0.40% | Pass |
|  | bab | 1.30% | 0.70% | Pass |
|  | off | 1.20% | 0.50% | Pass |
| 20dB | car | 1.70% | 0.50% | Pass |
|  | bab | 2.30% | 1.10% | Pass |
|  | off | 1.90% | 0.50% | Pass |

Table A.49 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.41 | 4.45 | -0.041 | 0.006 | Pass | 1.00% | 1.60% | Fail | 0.02 | -0.002 | Pass |
| 30dB | car | 4.37 | 4.43 | -0.064 | 0.007 | Pass | 1.50% | 1.30% | Pass | 0.05 | 0.013 | Pass |
|  | bab | 4.40 | 4.45 | -0.049 | 0.004 | Pass | 1.50% | 2.30% | Fail | 0.05 | 0.010 | Pass |
|  | off | 4.40 | 4.45 | -0.055 | 0.004 | Pass | 1.50% | 2.20% | Fail | 0.20 | 0.032 | Pass |
| 20dB | car | 4.39 | 4.45 | -0.065 | 0.004 | Pass | 2.00% | 0.70% | Pass | 0.15 | 0.059 | Pass |
|  | bab | 4.39 | 4.44 | -0.046 | 0.003 | Pass | 2.50% | 3.10% | Fail | 0.15 | 0.057 | Pass |
|  | off | 4.41 | 4.45 | -0.041 | 0.003 | Pass | 2.40% | 4.30% | Fail | 0.40 | 0.102 | Pass |

Table A.50 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.41 | 4.45 | -0.043 | 0.006 | Pass | 1.00% | 1.40% | Fail | 0.07 | 0.001 | Pass |
| 30dB | car | 4.42 | 4.45 | -0.033 | 0.006 | Pass | 1.50% | 1.00% | Pass | 0.10 | 0.016 | Pass |
|  | bab | 4.45 | 4.47 | -0.016 | 0.004 | Pass | 1.50% | 1.20% | Pass | 0.10 | 0.015 | Pass |
|  | off | 4.45 | 4.47 | -0.022 | 0.004 | Pass | 1.50% | 1.40% | Pass | 0.25 | 0.050 | Pass |
| 20dB | car | 4.44 | 4.46 | -0.027 | 0.004 | Pass | 2.00% | 0.40% | Pass | 0.20 | 0.065 | Pass |
|  | bab | 4.44 | 4.46 | -0.018 | 0.003 | Pass | 2.50% | 2.60% | Fail | 0.25 | 0.078 | Pass |
|  | off | 4.46 | 4.48 | -0.015 | 0.002 | Pass | 2.40% | 2.80% | Fail | 0.50 | 0.161 | Pass |

Table A.51 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Ref** | **PWMC Cut** | **Diff** | **CI** | **PWMC Pass** | **MisRtA2I Ref** | **MisRtA2I Cut** | **A2I Pass** | **DSAF Threshold** | **DSAF Cut** | **DSAF Pass** |
| ∞ | N/A | 4.43 | 4.46 | -0.022 | 0.005 | Pass | 1.00% | 0.70% | Pass | 0.10 | 0.001 | Pass |
| 30dB | car | 4.44 | 4.46 | -0.021 | 0.005 | Pass | 1.50% | 0.40% | Pass | 0.15 | 0.019 | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.003 | Pass | 1.50% | 1.00% | Pass | 0.15 | 0.026 | Pass |
|  | off | 4.46 | 4.47 | -0.014 | 0.003 | Pass | 1.50% | 0.70% | Pass | 0.30 | 0.067 | Pass |
| 20dB | car | 4.45 | 4.47 | -0.020 | 0.004 | Pass | 2.00% | 0.20% | Pass | 0.25 | 0.083 | Pass |
|  | bab | 4.46 | 4.47 | -0.017 | 0.002 | Pass | 2.50% | 2.10% | Pass | 0.30 | 0.124 | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.002 | Pass | 2.40% | 2.10% | Pass | 0.60 | 0.201 | Pass |

Table A.52 – Requirements Results for Experiment 13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Music Preferred | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |
| Balanced | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |
| Speech Preferred | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |

No-degradation of the VAD results from the LC-VAD to the FC-GSAD

The objectives for Exp. 1-6 are that, for each test file, the VAD results of the FC-GSAD not be worse than the VAD results of the LC-VAD.

For all test files, the results of the VAD of the FC-GSAD were identical to the results of the VAD of the LC-VAD, and therefore these objectives are met.

Table A.53 – Objectives Results for Experiment 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.36 | 4.35 | Pass |
| 30dB | car | 4.43 | 4.41 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
|  | mus | 4.46 | 4.50 | Pass |
|  | int | 4.44 | 4.43 | Pass |
| 20dB | car | 4.45 | 4.43 | Pass |
|  | bab | 4.44 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |
|  | mus | 4.48 | 4.50 | Pass |
|  | int | 4.46 | 4.45 | Pass |
| 10dB | car | 4.44 | 4.40 | Fail |
|  | bab | 4.31 | 4.32 | Pass |
|  | off | 4.42 | 4.37 | Fail |

Table A.54 – Objectives Results for Experiment 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.37 | 4.33 | Pass |
| 30dB | car | 4.43 | 4.42 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
| 20dB | car | 4.44 | 4.43 | Pass |
|  | bab | 4.42 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |

Table A.55 – Objectives Results for Experiment 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.46 | 4.47 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.48 | 4.48 | Pass |
|  | mus | 4.49 | 4.50 | Pass |
|  | int | 4.48 | 4.48 | Pass |
| 20dB | car | 4.48 | 4.47 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.49 | 4.48 | Fail |
|  | mus | 4.50 | 4.50 | Pass |
|  | int | 4.49 | 4.49 | Pass |
| 10dB | car | 4.47 | 4.46 | Fail |
|  | bab | 4.43 | 4.44 | Pass |
|  | off | 4.47 | 4.46 | Pass |

Table A.56 – Objectives Results for Experiment 6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.46 | 4.46 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.47 | Pass |
|  | off | 4.47 | 4.47 | Pass |
| 20dB | car | 4.47 | 4.47 | Pass |
|  | bab | 4.47 | 4.47 | Pass |
|  | off | 4.48 | 4.48 | Pass |

Table A.57 – Objectives Results for Experiment 7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.36 | 4.35 | Pass |
| 30dB | car | 4.43 | 4.41 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
|  | mus | 4.46 | 4.50 | Pass |
|  | int | 4.44 | 4.43 | Pass |
| 20dB | car | 4.45 | 4.43 | Pass |
|  | bab | 4.44 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |
|  | mus | 4.48 | 4.50 | Pass |
|  | int | 4.46 | 4.45 | Pass |
| 10dB | car | 4.44 | 4.40 | Fail |
|  | bab | 4.31 | 4.32 | Pass |
|  | off | 4.42 | 4.37 | Fail |

Table A.58 – Objectives Results for Experiment 9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.37 | 4.33 | Pass |
| 30dB | car | 4.43 | 4.42 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
| 20dB | car | 4.44 | 4.43 | Pass |
|  | bab | 4.42 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |

Table A.59 – Objectives Results for Experiment 10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.46 | 4.47 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.48 | 4.48 | Pass |
|  | mus | 4.49 | 4.50 | Pass |
|  | int | 4.48 | 4.48 | Pass |
| 20dB | car | 4.48 | 4.47 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.49 | 4.48 | Fail |
|  | mus | 4.50 | 4.50 | Pass |
|  | int | 4.49 | 4.49 | Pass |
| 10dB | car | 4.47 | 4.46 | Fail |
|  | bab | 4.43 | 4.44 | Pass |
|  | off | 4.47 | 4.46 | Pass |

Table A.60 – Objectives Results for Experiment 12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **PWMC Threshold OTP** | **PWMC CuT** | **PWMC Pass** |
| ∞ | N/A | 4.46 | 4.46 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.47 | Pass |
|  | off | 4.47 | 4.47 | Pass |
| 20dB | car | 4.47 | 4.47 | Pass |
|  | bab | 4.47 | 4.47 | Pass |
|  | off | 4.48 | 4.48 | Pass |

## A.2 Detailed selection test results from Huawei Technologies

Table A.61 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.135 | 0.011 | Pass | 4.35 | Pass | 0.020 | -0.010 | Pass | 2.00% | 0.10% | Pass |
| 30dB | car | 4.30 | 4.36 | -0.062 | 0.010 | Pass | 4.36 | Pass | 0.050 | 0.022 | Pass | 3.00% | 0.10% | Pass |
|  | bab | 4.35 | 4.39 | -0.043 | 0.007 | Pass | 4.39 | Pass | 0.050 | 0.016 | Pass | 3.00% | 0.10% | Pass |
|  | off | 4.33 | 4.39 | -0.063 | 0.008 | Pass | 4.39 | Pass | 0.200 | 0.077 | Pass | 3.00% | 0.10% | Pass |
|  | mus | 4.36 | 4.48 | -0.119 | 0.008 | Pass | 4.48 | Pass | 1.287 | 0.520 | Pass | 5.00% | 1.40% | Pass |
|  | int | 4.32 | 4.42 | -0.098 | 0.008 | Pass | 4.42 | Pass | 0.355 | 0.344 | Pass | 2.00% | 0.20% | Pass |
| 20dB | car | 4.34 | 4.40 | -0.056 | 0.007 | Pass | 4.40 | Pass | 0.150 | 0.085 | Pass | 7.00% | 0.20% | Pass |
|  | bab | 4.32 | 4.38 | -0.059 | 0.006 | Pass | 4.38 | Pass | 0.150 | 0.087 | Pass | 7.00% | 0.10% | Pass |
|  | off | 4.38 | 4.41 | -0.037 | 0.005 | Pass | 4.41 | Pass | 0.400 | 0.251 | Pass | 7.00% | 0.10% | Pass |
|  | mus | 4.42 | 4.49 | -0.069 | 0.005 | Pass | 4.49 | Pass | 1.266 | 0.953 | Pass | 10.00% | 10.60% | Fail |
|  | int | 4.36 | 4.45 | -0.084 | 0.007 | Pass | 4.45 | Pass | 0.656 | 0.656 | Pass | 3.00% | 0.50% | Pass |
| 10dB | car | 4.33 | 4.37 | -0.033 | 0.005 | Pass | 4.37 | Pass | 0.200 | 0.113 | Pass | 12.00% | 0.10% | Pass |
|  | bab | 4.06 | 4.23 | -0.167 | 0.012 | Pass | 4.23 | Pass | 0.200 | 0.199 | Pass | 15.00% | 0.20% | Pass |
|  | off | 4.29 | 4.28 | 0.005 | 0.009 | Pass | 4.28 | Pass | 0.500 | 0.372 | Pass | 20.00% | 0.40% | Pass |

Table A.62 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.136 | 0.011 | Pass | 4.35 | Pass | 0.070 | -0.010 | Pass | 3.00% | 0.10% | Pass |
| 30dB | car | 4.35 | 4.39 | -0.042 | 0.010 | Pass | 4.39 | Pass | 0.100 | 0.030 | Pass | 5.00% | 0.20% | Pass |
|  | bab | 4.40 | 4.42 | -0.024 | 0.007 | Pass | 4.42 | Pass | 0.100 | 0.028 | Pass | 5.00% | 0.20% | Pass |
|  | off | 4.38 | 4.42 | -0.042 | 0.008 | Pass | 4.42 | Pass | 0.250 | 0.116 | Pass | 5.00% | 0.20% | Pass |
|  | mus | 4.41 | 4.50 | -0.086 | 0.007 | Pass | 4.50 | Pass | 1.199 | 1.287 | Pass | 10.00% | 2.10% | Pass |
|  | int | 4.37 | 4.43 | -0.056 | 0.008 | Pass | 4.43 | Pass | 0.233 | 0.355 | Pass | 3.00% | 0.30% | Pass |
| 20dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 4.42 | Pass | 0.200 | 0.104 | Pass | 10.00% | 0.20% | Pass |
|  | bab | 4.37 | 4.42 | -0.045 | 0.006 | Pass | 4.42 | Pass | 0.250 | 0.149 | Pass | 10.00% | 0.10% | Pass |
|  | off | 4.43 | 4.44 | -0.011 | 0.005 | Pass | 4.44 | Pass | 0.500 | 0.345 | Pass | 10.00% | 0.30% | Pass |
|  | mus | 4.47 | 4.50 | -0.028 | 0.005 | Pass | 4.50 | Pass | 1.199 | 1.266 | Pass | 15.00% | 13.10% | Pass |
|  | int | 4.41 | 4.45 | -0.037 | 0.007 | Pass | 4.45 | Pass | 0.554 | 0.656 | Pass | 5.00% | 0.70% | Pass |
| 10dB | car | 4.38 | 4.39 | -0.005 | 0.005 | Pass | 4.39 | Pass | 0.250 | 0.136 | Pass | 16.00% | 0.30% | Pass |
|  | bab | 4.11 | 4.28 | -0.166 | 0.011 | Pass | 4.28 | Pass | 0.300 | 0.244 | Pass | 20.00% | 0.60% | Pass |
|  | off | 4.34 | 4.34 | -0.008 | 0.008 | Pass | 4.34 | Pass | 0.600 | 0.450 | Pass | 25.00% | 0.80% | Pass |

Table A.63 – Requirements Results for Experiment 1 Wideband Speech – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.29 | 4.35 | -0.066 | 0.009 | Pass | 4.35 | Pass | 0.100 | -0.010 | Pass | 5.00% | 0.30% | Pass |
| 30dB | car | 4.39 | 4.41 | -0.020 | 0.008 | Pass | 4.41 | Pass | 0.150 | 0.038 | Pass | 8.00% | 0.40% | Pass |
|  | bab | 4.42 | 4.43 | -0.012 | 0.005 | Pass | 4.43 | Pass | 0.150 | 0.058 | Pass | 8.00% | 0.50% | Pass |
|  | off | 4.41 | 4.44 | -0.026 | 0.007 | Pass | 4.44 | Pass | 0.300 | 0.170 | Pass | 8.00% | 0.60% | Pass |
|  | mus | 4.43 | 4.50 | -0.064 | 0.006 | Pass | 4.50 | Pass | 1.349 | 1.292 | Pass | 15.00% | 3.60% | Pass |
|  | int | 4.41 | 4.43 | -0.027 | 0.007 | Pass | 4.43 | Pass | 0.383 | 0.360 | Pass | 7.00% | 0.60% | Pass |
| 20dB | car | 4.42 | 4.43 | -0.005 | 0.006 | Pass | 4.43 | Pass | 0.250 | 0.122 | Pass | 13.00% | 0.70% | Pass |
|  | bab | 4.41 | 4.43 | -0.025 | 0.005 | Pass | 4.43 | Pass | 0.300 | 0.244 | Pass | 13.00% | 0.70% | Pass |
|  | off | 4.44 | 4.45 | -0.004 | 0.004 | Pass | 4.45 | Pass | 0.600 | 0.466 | Pass | 13.00% | 1.30% | Pass |
|  | mus | 4.48 | 4.50 | -0.021 | 0.004 | Pass | 4.50 | Pass | 1.349 | 1.273 | Pass | 20.00% | 21.90% | Fail |
|  | int | 4.43 | 4.45 | -0.015 | 0.006 | Pass | 4.45 | Pass | 0.704 | 0.657 | Pass | 8.00% | 1.70% | Pass |
| 10dB | car | 4.41 | 4.40 | 0.015 | 0.006 | Fail | 4.40 | Fail | 0.300 | 0.255 | Pass | 20.00% | 1.60% | Pass |
|  | bab | 4.21 | 4.32 | -0.109 | 0.009 | Pass | 4.32 | Pass | 0.350 | 0.319 | Pass | 25.00% | 4.20% | Pass |
|  | off | 4.38 | 4.37 | 0.005 | 0.006 | Pass | 4.37 | Pass | 0.750 | 0.509 | Pass | 30.00% | 3.10% | Pass |

Table A.64 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.20% | 0.00% | 0.00% | Pass | 7.00% | 2.70% | Pass |
| 30dB | car | 0.40% | 0.10% | 0.10% | Pass | 13.00% | 2.30% | Pass |
|  | bab | 0.40% | 0.10% | 0.10% | Pass | 13.00% | 2.40% | Pass |
|  | off | 0.80% | 0.10% | 0.10% | Pass | 13.00% | 2.90% | Pass |
| 20dB | car | 1.10% | 0.10% | 0.10% | Pass | 18.00% | 2.20% | Pass |
|  | bab | 1.50% | 0.30% | 0.30% | Pass | 18.00% | 4.10% | Pass |
|  | off | 1.40% | 0.20% | 0.20% | Pass | 18.00% | 4.50% | Pass |

Table A.65 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **SNR** | **Noise** | **MisRtA2I Ref** | **MisRtA2I Cut** | **MisRtA2I Cut LC** | **A2I Pass** | **MisRtM2S Threshold** | **MisRtM2S Cut** | **M2SPass** |
| ∞ | N/A | 0.20% | 0.00% | 0.00% | Pass | 5.00% | 2.40% | Pass |
| 30dB | car | 0.40% | 0.00% | 0.00% | Pass | 10.00% | 2.00% | Pass |
|  | bab | 0.40% | 0.00% | 0.00% | Pass | 10.00% | 2.30% | Pass |
|  | off | 0.80% | 0.00% | 0.00% | Pass | 10.00% | 2.70% | Pass |
| 20dB | car | 1.10% | 0.00% | 0.00% | Pass | 15.00% | 2.10% | Pass |
|  | bab | 1.50% | 0.30% | 0.30% | Pass | 15.00% | 3.10% | Pass |
|  | off | 1.40% | 0.10% | 0.10% | Pass | 15.00% | 3.90% | Pass |

Table A.66 – Requirements Results for Experiment 2 Wideband Music – FC-GSAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | MisRtM2S Threshold | MisRtM2S Cut | M2SPass |
| ∞ | N/A | 0.20% | 0.00% | 0.00% | Pass | 3.00% | 1.70% | Pass |
| 30dB | car | 0.40% | 0.00% | 0.00% | Pass | 7.00% | 1.50% | Pass |
|  | bab | 0.40% | 0.00% | 0.00% | Pass | 7.00% | 1.60% | Pass |
|  | off | 0.80% | 0.00% | 0.00% | Pass | 7.00% | 2.10% | Pass |
| 20dB | car | 1.10% | 0.00% | 0.00% | Pass | 10.00% | 1.60% | Pass |
|  | bab | 1.50% | 0.20% | 0.20% | Pass | 10.00% | 2.00% | Pass |
|  | off | 1.40% | 0.00% | 0.00% | Pass | 10.00% | 3.00% | Pass |

Table A.67 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | | Noise | | PWMC Ref | | PWMC Cut | | Diff | | CI | | T-Test Pass | | PWMC Cut LC | | PWMC Pass | | MisRtA2I Ref | | MisRtA2I Cut | | MisRtA2I Cut LC | | A2I Pass | | DSAF Threshold | | DSAF Cut | | DSAF Pass | | MisRtS2M Threshold | | MisRtS2M Cut | | S2M Pass | | MisRtM2S Threshold | | MisRtM2S Cut | | M2S Pass | |
| ∞ | | N/A | | 4.254 | | 4.355 | | -0.102 | | 0.009 | | Pass | | 4.355 | | Pass | | 0.00% | | 0.00% | | 0.00% | | Pass | | 0.02 | | -0.004 | | Pass | | 2.10% | | 0.00% | | Pass | | 9.10% | | 2.70% | | Pass | |
| 30dB | | car | | 4.324 | | 4.366 | | -0.042 | | 0.009 | | Pass | | 4.366 | | Pass | | 0.00% | | 0.00% | | 0.00% | | Pass | | 0.05 | | 0.007 | | Pass | | 3.20% | | 0.10% | | Pass | | 16.90% | | 2.60% | | Pass | |
|  | | bab | | 4.354 | | 4.395 | | -0.041 | | 0.007 | | Pass | | 4.395 | | Pass | | 0.40% | | 0.00% | | 0.00% | | Pass | | 0.05 | | 0.004 | | Pass | | 3.20% | | 0.10% | | Pass | | 16.90% | | 2.90% | | Pass | |
|  | | off | | 4.359 | | 4.392 | | -0.034 | | 0.007 | | Pass | | 4.392 | | Pass | | 0.40% | | 0.00% | | 0.00% | | Pass | | 0.2 | | 0.025 | | Pass | | 3.20% | | 1.00% | | Pass | | 16.90% | | 2.80% | | Pass | |
| 20dB | | car | | 4.351 | | 4.409 | | -0.058 | | 0.007 | | Pass | | 4.409 | | Pass | | 1.40% | | 0.00% | | 0.00% | | Pass | | 0.15 | | 0.033 | | Pass | | 7.40% | | 0.10% | | Pass | | 23.40% | | 2.70% | | Pass | |
|  | | bab | | 4.325 | | 4.415 | | -0.09 | | 0.006 | | Pass | | 4.415 | | Pass | | 1.60% | | 0.00% | | 0.00% | | Pass | | 0.15 | | 0.031 | | Pass | | 7.40% | | 0.10% | | Pass | | 23.40% | | 3.30% | | Pass | |
|  | | off | | 4.389 | | 4.419 | | -0.03 | | 0.005 | | Pass | | 4.419 | | Pass | | 1.40% | | 0.00% | | 0.00% | | Pass | | 0.4 | | 0.096 | | Pass | | 7.40% | | 1.90% | | Pass | | 23.40% | | 3.20% | | Pass | |

Table A.68 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.254 | 4.356 | -0.103 | 0.009 | Pass | 4.356 | Pass | 0.00% | 0.00% | 0.00% | Pass | 0.07 | -0.004 | Pass | 3.30% | 0.00% | Pass | 6.00% | 2.60% | Pass |
| 30dB | car | 4.374 | 4.402 | -0.028 | 0.008 | Pass | 4.402 | Pass | 0.00% | 0.00% | 0.00% | Pass | 0.1 | 0.01 | Pass | 5.50% | 0.10% | Pass | 12.00% | 2.50% | Pass |
|  | bab | 4.404 | 4.418 | -0.014 | 0.007 | Pass | 4.418 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.1 | 0.008 | Pass | 5.50% | 0.10% | Pass | 12.00% | 2.70% | Pass |
|  | off | 4.409 | 4.417 | -0.008 | 0.007 | Pass | 4.417 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.25 | 0.044 | Pass | 5.50% | 1.10% | Pass | 12.00% | 2.60% | Pass |
| 20dB | car | 4.401 | 4.419 | -0.018 | 0.006 | Pass | 4.419 | Pass | 1.40% | 0.00% | 0.00% | Pass | 0.2 | 0.041 | Pass | 11.00% | 0.10% | Pass | 18.00% | 2.60% | Pass |
|  | bab | 4.375 | 4.438 | -0.063 | 0.006 | Pass | 4.438 | Pass | 1.60% | 0.00% | 0.00% | Pass | 0.25 | 0.055 | Pass | 11.00% | 0.20% | Pass | 18.00% | 3.00% | Pass |
|  | off | 4.439 | 4.446 | -0.007 | 0.004 | Pass | 4.446 | Pass | 1.40% | 0.00% | 0.00% | Pass | 0.5 | 0.139 | Pass | 11.00% | 2.30% | Pass | 18.00% | 2.70% | Pass |

Table A.69 – Requirements Results for Experiment 3 Wideband Interlaced Material – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.315 | 4.357 | -0.041 | 0.008 | Pass | 4.357 | Pass | 0.00% | 0.00% | 0.00% | Pass | 0.1 | -0.004 | Pass | 5.80% | 0.00% | Pass | 3.30% | 2.20% | Pass |
| 30dB | car | 4.406 | 4.412 | -0.006 | 0.007 | Pass | 4.412 | Pass | 0.00% | 0.00% | 0.00% | Pass | 0.15 | 0.014 | Pass | 9.20% | 0.10% | Pass | 7.70% | 2.10% | Pass |
|  | bab | 4.428 | 4.431 | -0.003 | 0.006 | Pass | 4.431 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.15 | 0.018 | Pass | 9.20% | 0.10% | Pass | 7.70% | 2.10% | Pass |
|  | off | 4.432 | 4.432 | 0 | 0.006 | Pass | 4.432 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.3 | 0.065 | Pass | 9.20% | 1.30% | Pass | 7.70% | 2.00% | Pass |
| 20dB | car | 4.426 | 4.427 | -0.001 | 0.006 | Pass | 4.427 | Pass | 1.40% | 0.00% | 0.00% | Pass | 0.25 | 0.048 | Pass | 15.00% | 0.10% | Pass | 11.00% | 2.00% | Pass |
|  | bab | 4.406 | 4.445 | -0.039 | 0.005 | Pass | 4.445 | Pass | 1.60% | 0.00% | 0.00% | Pass | 0.3 | 0.09 | Pass | 15.00% | 0.60% | Pass | 11.00% | 2.20% | Pass |
|  | off | 4.454 | 4.452 | 0.002 | 0.004 | Pass | 4.452 | Pass | 1.40% | 0.00% | 0.00% | Pass | 0.6 | 0.19 | Pass | 15.00% | 2.80% | Pass | 11.00% | 2.00% | Pass |

Table A.70 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.42 | 4.47 | -0.045 | 0.005 | Pass | 4.47 | Pass | 0.020 | -0.010 | Pass | 2.00% | 0.10% | Pass |
| 30dB | car | 4.38 | 4.44 | -0.056 | 0.006 | Pass | 4.44 | Pass | 0.050 | 0.028 | Pass | 3.00% | 0.10% | Pass |
|  | bab | 4.41 | 4.46 | -0.046 | 0.003 | Pass | 4.46 | Pass | 0.050 | 0.019 | Pass | 3.00% | 0.00% | Pass |
|  | off | 4.40 | 4.46 | -0.053 | 0.003 | Pass | 4.46 | Pass | 0.200 | 0.081 | Pass | 3.00% | 0.10% | Pass |
|  | mus | 4.42 | 4.49 | -0.070 | 0.003 | Pass | 4.49 | Pass | 1.395 | 0.558 | Pass | 5.00% | 0.90% | Pass |
|  | int | 4.41 | 4.47 | -0.062 | 0.004 | Pass | 4.47 | Pass | 0.367 | 0.350 | Pass | 2.00% | 0.20% | Pass |
| 20dB | car | 4.40 | 4.45 | -0.049 | 0.003 | Pass | 4.45 | Pass | 0.150 | 0.098 | Pass | 7.00% | 0.00% | Pass |
|  | bab | 4.41 | 4.46 | -0.045 | 0.002 | Pass | 4.46 | Pass | 0.150 | 0.109 | Pass | 7.00% | 0.00% | Pass |
|  | off | 4.43 | 4.46 | -0.034 | 0.002 | Pass | 4.46 | Pass | 0.400 | 0.259 | Pass | 7.00% | 0.00% | Pass |
|  | mus | 4.44 | 4.49 | -0.054 | 0.002 | Pass | 4.49 | Pass | 1.391 | 1.022 | Pass | 10.00% | 8.20% | Pass |
|  | int | 4.43 | 4.48 | -0.058 | 0.003 | Pass | 4.48 | Pass | 0.663 | 0.662 | Pass | 3.00% | 0.50% | Pass |
| 10dB | car | 4.40 | 4.43 | -0.035 | 0.003 | Pass | 4.43 | Pass | 0.200 | 0.126 | Pass | 12.00% | 0.00% | Pass |
|  | bab | 4.32 | 4.35 | -0.032 | 0.006 | Pass | 4.35 | Pass | 0.200 | 0.158 | Pass | 15.00% | 0.20% | Pass |
|  | off | 4.40 | 4.40 | -0.002 | 0.005 | Pass | 4.40 | Pass | 0.500 | 0.402 | Pass | 20.00% | 0.50% | Pass |

Table A.71 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.42 | 4.47 | -0.047 | 0.005 | Pass | 4.47 | Pass | 0.070 | -0.007 | Pass | 3.00% | 0.10% | Pass |
| 30dB | car | 4.43 | 4.45 | -0.022 | 0.006 | Pass | 4.45 | Pass | 0.100 | 0.036 | Pass | 5.00% | 0.10% | Pass |
|  | bab | 4.46 | 4.47 | -0.008 | 0.003 | Pass | 4.47 | Pass | 0.100 | 0.035 | Pass | 5.00% | 0.00% | Pass |
|  | off | 4.45 | 4.47 | -0.016 | 0.003 | Pass | 4.47 | Pass | 0.250 | 0.119 | Pass | 5.00% | 0.10% | Pass |
|  | mus | 4.47 | 4.50 | -0.030 | 0.003 | Pass | 4.50 | Pass | 1.263 | 1.395 | Pass | 10.00% | 1.40% | Pass |
|  | int | 4.46 | 4.48 | -0.018 | 0.004 | Pass | 4.48 | Pass | 0.238 | 0.367 | Pass | 3.00% | 0.20% | Pass |
| 20dB | car | 4.45 | 4.46 | -0.006 | 0.004 | Pass | 4.46 | Pass | 0.200 | 0.116 | Pass | 10.00% | 0.10% | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.002 | Pass | 4.47 | Pass | 0.250 | 0.153 | Pass | 10.00% | 0.10% | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 4.48 | Pass | 0.500 | 0.371 | Pass | 10.00% | 0.10% | Pass |
|  | mus | 4.49 | 4.50 | -0.009 | 0.002 | Pass | 4.50 | Pass | 1.263 | 1.391 | Pass | 15.00% | 11.30% | Pass |
|  | int | 4.48 | 4.49 | -0.009 | 0.003 | Pass | 4.49 | Pass | 0.559 | 0.663 | Pass | 5.00% | 0.80% | Pass |
| 10dB | car | 4.45 | 4.45 | 0.000 | 0.003 | Pass | 4.45 | Pass | 0.250 | 0.153 | Pass | 16.00% | 0.10% | Pass |
|  | bab | 4.37 | 4.40 | -0.038 | 0.005 | Pass | 4.40 | Pass | 0.300 | 0.243 | Pass | 20.00% | 0.40% | Pass |
|  | off | 4.45 | 4.45 | 0.002 | 0.004 | Pass | 4.45 | Pass | 0.600 | 0.552 | Pass | 25.00% | 0.70% | Pass |

Table A.72 – Requirements Results for Experiment 4 Narrowband Speech – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass |
| ∞ | N/A | 4.44 | 4.47 | -0.028 | 0.004 | Pass | 4.47 | Pass | 0.100 | -0.007 | Pass | 5.00% | 0.30% | Pass |
| 30dB | car | 4.45 | 4.46 | -0.011 | 0.005 | Pass | 4.46 | Pass | 0.150 | 0.044 | Pass | 8.00% | 0.40% | Pass |
|  | bab | 4.47 | 4.48 | -0.004 | 0.003 | Pass | 4.48 | Pass | 0.150 | 0.063 | Pass | 8.00% | 0.30% | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.003 | Pass | 4.48 | Pass | 0.300 | 0.163 | Pass | 8.00% | 0.60% | Pass |
|  | mus | 4.48 | 4.50 | -0.023 | 0.002 | Pass | 4.50 | Pass | 1.413 | 1.397 | Pass | 15.00% | 2.90% | Pass |
|  | int | 4.47 | 4.48 | -0.010 | 0.003 | Pass | 4.48 | Pass | 0.388 | 0.372 | Pass | 7.00% | 0.70% | Pass |
| 20dB | car | 4.46 | 4.47 | -0.003 | 0.003 | Pass | 4.47 | Pass | 0.250 | 0.137 | Pass | 13.00% | 0.50% | Pass |
|  | bab | 4.47 | 4.48 | -0.008 | 0.002 | Pass | 4.48 | Pass | 0.300 | 0.225 | Pass | 13.00% | 0.40% | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 4.48 | Pass | 0.600 | 0.468 | Pass | 13.00% | 0.80% | Pass |
|  | mus | 4.49 | 4.50 | -0.007 | 0.001 | Pass | 4.50 | Pass | 1.413 | 1.393 | Pass | 20.00% | 20.00% | Pass |
|  | int | 4.48 | 4.49 | -0.004 | 0.002 | Pass | 4.49 | Pass | 0.709 | 0.663 | Pass | 8.00% | 1.90% | Pass |
| 10dB | car | 4.46 | 4.46 | 0.003 | 0.003 | Pass | 4.46 | Pass | 0.300 | 0.436 | Fail | 20.00% | 0.60% | Pass |
|  | bab | 4.40 | 4.44 | -0.037 | 0.004 | Pass | 4.44 | Pass | 0.350 | 0.339 | Pass | 25.00% | 1.90% | Pass |
|  | off | 4.46 | 4.46 | 0.000 | 0.003 | Pass | 4.46 | Pass | 0.750 | 0.648 | Pass | 30.00% | 2.60% | Pass |

Table A.73 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | MisRtM2S Threshold | MisRtM2S Cut | M2SPass |
| ∞ | N/A | 0.20% | 0.10% | 0.10% | Pass | 7.00% | 3.30% | Pass |
| 30dB | car | 0.30% | 0.00% | 0.00% | Pass | 13.00% | 2.10% | Pass |
|  | bab | 0.80% | 0.10% | 0.10% | Pass | 13.00% | 2.10% | Pass |
|  | off | 0.60% | 0.10% | 0.10% | Pass | 13.00% | 2.70% | Pass |
| 20dB | car | 1.00% | 0.10% | 0.10% | Pass | 18.00% | 2.10% | Pass |
|  | bab | 1.50% | 0.40% | 0.40% | Pass | 18.00% | 3.40% | Pass |
|  | off | 1.30% | 0.20% | 0.20% | Pass | 18.00% | 3.80% | Pass |

Table A.74 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | MisRtM2S Threshold | MisRtM2S Cut | M2SPass |
| ∞ | N/A | 0.20% | 0.10% | 0.10% | Pass | 5.00% | 3.00% | Pass |
| 30dB | car | 0.30% | 0.00% | 0.00% | Pass | 10.00% | 1.80% | Pass |
|  | bab | 0.80% | 0.00% | 0.00% | Pass | 10.00% | 1.90% | Pass |
|  | off | 0.60% | 0.00% | 0.00% | Pass | 10.00% | 2.40% | Pass |
| 20dB | car | 1.00% | 0.00% | 0.00% | Pass | 15.00% | 1.80% | Pass |
|  | bab | 1.50% | 0.30% | 0.30% | Pass | 15.00% | 3.00% | Pass |
|  | off | 1.30% | 0.10% | 0.10% | Pass | 15.00% | 3.50% | Pass |

Table A.75 – Requirements Results for Experiment 5 Narrowband Music – FC-GSAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | MisRtM2S Threshold | MisRtM2S Cut | M2SPass |
| ∞ | N/A | 0.20% | 0.00% | 0.00% | Pass | 3.00% | 2.40% | Pass |
| 30dB | car | 0.30% | 0.00% | 0.00% | Pass | 7.00% | 1.40% | Pass |
|  | bab | 0.80% | 0.00% | 0.00% | Pass | 7.00% | 1.40% | Pass |
|  | off | 0.60% | 0.00% | 0.00% | Pass | 7.00% | 1.90% | Pass |
| 20dB | car | 1.00% | 0.00% | 0.00% | Pass | 10.00% | 1.30% | Pass |
|  | bab | 1.50% | 0.20% | 0.20% | Pass | 10.00% | 2.00% | Pass |
|  | off | 1.30% | 0.00% | 0.00% | Pass | 10.00% | 2.90% | Pass |

Table A.76 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.438 | 4.463 | -0.025 | 0.004 | Pass | 4.463 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.02 | -0.004 | Pass | 2.10% | 0.10% | Pass | 9.10% | 2.60% | Pass |
| 30dB | car | 4.394 | 4.438 | -0.044 | 0.005 | Pass | 4.438 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.05 | 0.009 | Pass | 3.20% | 0.10% | Pass | 16.90% | 2.50% | Pass |
|  | bab | 4.416 | 4.46 | -0.044 | 0.003 | Pass | 4.46 | Pass | 0.60% | 0.00% | 0.00% | Pass | 0.05 | 0.003 | Pass | 3.20% | 0.10% | Pass | 16.90% | 2.80% | Pass |
|  | off | 4.416 | 4.46 | -0.044 | 0.003 | Pass | 4.46 | Pass | 0.20% | 0.00% | 0.00% | Pass | 0.2 | 0.026 | Pass | 3.20% | 1.10% | Pass | 16.90% | 2.60% | Pass |
| 20dB | car | 4.409 | 4.456 | -0.047 | 0.003 | Pass | 4.456 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.15 | 0.037 | Pass | 7.40% | 0.10% | Pass | 23.40% | 2.70% | Pass |
|  | bab | 4.413 | 4.466 | -0.053 | 0.002 | Pass | 4.466 | Pass | 1.90% | 0.00% | 0.00% | Pass | 0.15 | 0.033 | Pass | 7.40% | 0.10% | Pass | 23.40% | 4.00% | Pass |
|  | off | 4.426 | 4.465 | -0.039 | 0.002 | Pass | 4.465 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.4 | 0.095 | Pass | 7.40% | 2.00% | Pass | 23.40% | 3.20% | Pass |

Table A.77 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.438 | 4.466 | -0.028 | 0.004 | Pass | 4.466 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.07 | -0.004 | Pass | 3.30% | 0.10% | Pass | 6.00% | 2.50% | Pass |
| 30dB | car | 4.444 | 4.456 | -0.012 | 0.004 | Pass | 4.456 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.1 | 0.012 | Pass | 5.50% | 0.10% | Pass | 12.00% | 2.40% | Pass |
|  | bab | 4.466 | 4.47 | -0.004 | 0.003 | Pass | 4.47 | Pass | 0.60% | 0.00% | 0.00% | Pass | 0.1 | 0.008 | Pass | 5.50% | 0.10% | Pass | 12.00% | 2.60% | Pass |
|  | off | 4.466 | 4.473 | -0.007 | 0.003 | Pass | 4.473 | Pass | 0.20% | 0.00% | 0.00% | Pass | 0.25 | 0.044 | Pass | 5.50% | 1.30% | Pass | 12.00% | 2.50% | Pass |
| 20dB | car | 4.459 | 4.462 | -0.003 | 0.003 | Pass | 4.462 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.2 | 0.044 | Pass | 11.00% | 0.10% | Pass | 18.00% | 2.50% | Pass |
|  | bab | 4.463 | 4.475 | -0.012 | 0.002 | Pass | 4.475 | Pass | 1.90% | 0.00% | 0.00% | Pass | 0.25 | 0.053 | Pass | 11.00% | 0.30% | Pass | 18.00% | 3.40% | Pass |
|  | off | 4.476 | 4.48 | -0.003 | 0.002 | Pass | 4.48 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.5 | 0.151 | Pass | 11.00% | 2.50% | Pass | 18.00% | 2.80% | Pass |

Table A.78 – Requirements Results for Experiment 6 Narrowband Interlaced Material – FC-GSAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | T-Test Pass | PWMC Cut LC | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | MisRtA2I Cut LC | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass | MisRtS2M Threshold | MisRtS2M Cut | S2M Pass | MisRtM2S Threshold | MisRtM2S Cut | M2S Pass |
| ∞ | N/A | 4.454 | 4.467 | -0.014 | 0.003 | Pass | 4.467 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.1 | -0.004 | Pass | 5.80% | 0.10% | Pass | 3.30% | 2.20% | Pass |
| 30dB | car | 4.458 | 4.463 | -0.005 | 0.004 | Pass | 4.463 | Pass | 0.40% | 0.00% | 0.00% | Pass | 0.15 | 0.015 | Pass | 9.20% | 0.10% | Pass | 7.70% | 2.10% | Pass |
|  | bab | 4.475 | 4.475 | 0.000 | 0.002 | Pass | 4.475 | Pass | 0.60% | 0.00% | 0.00% | Pass | 0.15 | 0.018 | Pass | 9.20% | 0.10% | Pass | 7.70% | 2.30% | Pass |
|  | off | 4.475 | 4.479 | -0.004 | 0.002 | Pass | 4.479 | Pass | 0.20% | 0.00% | 0.00% | Pass | 0.3 | 0.061 | Pass | 9.20% | 1.40% | Pass | 7.70% | 2.00% | Pass |
| 20dB | car | 4.469 | 4.467 | 0.002 | 0.003 | Pass | 4.467 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.25 | 0.053 | Pass | 15.00% | 0.10% | Pass | 11.00% | 2.10% | Pass |
|  | bab | 4.472 | 4.483 | -0.010 | 0.002 | Pass | 4.483 | Pass | 1.90% | 0.00% | 0.00% | Pass | 0.3 | 0.083 | Pass | 15.00% | 0.70% | Pass | 11.00% | 2.50% | Pass |
|  | off | 4.482 | 4.483 | 0.000 | 0.001 | Pass | 4.483 | Pass | 1.50% | 0.00% | 0.00% | Pass | 0.6 | 0.189 | Pass | 15.00% | 3.30% | Pass | 11.00% | 2.20% | Pass |

Table A.79 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.135 | 0.011 | Pass | 0.020 | -0.010 | Pass |
| 30dB | car | 4.30 | 4.36 | -0.062 | 0.010 | Pass | 0.050 | 0.022 | Pass |
|  | bab | 4.35 | 4.39 | -0.043 | 0.007 | Pass | 0.050 | 0.016 | Pass |
|  | off | 4.33 | 4.39 | -0.063 | 0.008 | Pass | 0.200 | 0.077 | Pass |
|  | mus | 4.36 | 4.48 | -0.119 | 0.008 | Pass | 1.287 | 0.520 | Pass |
|  | int | 4.32 | 4.42 | -0.098 | 0.008 | Pass | 0.355 | 0.344 | Pass |
| 20dB | car | 4.34 | 4.40 | -0.056 | 0.007 | Pass | 0.150 | 0.085 | Pass |
|  | bab | 4.32 | 4.38 | -0.059 | 0.006 | Pass | 0.150 | 0.087 | Pass |
|  | off | 4.38 | 4.41 | -0.037 | 0.005 | Pass | 0.400 | 0.251 | Pass |
|  | mus | 4.42 | 4.49 | -0.069 | 0.005 | Pass | 1.266 | 0.953 | Pass |
|  | int | 4.36 | 4.45 | -0.084 | 0.007 | Pass | 0.656 | 0.656 | Pass |
| 10dB | car | 4.33 | 4.37 | -0.033 | 0.005 | Pass | 0.200 | 0.113 | Pass |
|  | bab | 4.06 | 4.23 | -0.167 | 0.012 | Pass | 0.200 | 0.199 | Pass |
|  | off | 4.29 | 4.28 | 0.005 | 0.009 | Pass | 0.500 | 0.372 | Pass |

Table A.80 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.21 | 4.35 | -0.136 | 0.011 | Pass | 0.070 | -0.010 | Pass |
| 30dB | car | 4.35 | 4.39 | -0.042 | 0.010 | Pass | 0.100 | 0.030 | Pass |
|  | bab | 4.40 | 4.42 | -0.024 | 0.007 | Pass | 0.100 | 0.028 | Pass |
|  | off | 4.38 | 4.42 | -0.042 | 0.008 | Pass | 0.250 | 0.116 | Pass |
|  | mus | 4.41 | 4.50 | -0.086 | 0.007 | Pass | 1.199 | 1.287 | Pass |
|  | int | 4.37 | 4.43 | -0.056 | 0.008 | Pass | 0.233 | 0.355 | Pass |
| 20dB | car | 4.39 | 4.42 | -0.022 | 0.007 | Pass | 0.200 | 0.104 | Pass |
|  | bab | 4.37 | 4.42 | -0.045 | 0.006 | Pass | 0.250 | 0.149 | Pass |
|  | off | 4.43 | 4.44 | -0.011 | 0.005 | Pass | 0.500 | 0.345 | Pass |
|  | mus | 4.47 | 4.50 | -0.028 | 0.005 | Pass | 1.199 | 1.266 | Pass |
|  | int | 4.41 | 4.45 | -0.037 | 0.007 | Pass | 0.554 | 0.656 | Pass |
| 10dB | car | 4.38 | 4.39 | -0.005 | 0.005 | Pass | 0.250 | 0.136 | Pass |
|  | bab | 4.11 | 4.28 | -0.166 | 0.011 | Pass | 0.300 | 0.244 | Pass |
|  | off | 4.34 | 4.34 | -0.008 | 0.008 | Pass | 0.600 | 0.450 | Pass |

Table A.81 – Requirements Results for Experiment 7 Wideband Speech – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.29 | 4.35 | -0.066 | 0.009 | Pass | 0.100 | -0.010 | Pass |
| 30dB | car | 4.39 | 4.41 | -0.020 | 0.008 | Pass | 0.150 | 0.038 | Pass |
|  | bab | 4.42 | 4.43 | -0.012 | 0.005 | Pass | 0.150 | 0.058 | Pass |
|  | off | 4.41 | 4.44 | -0.026 | 0.007 | Pass | 0.300 | 0.170 | Pass |
|  | mus | 4.43 | 4.50 | -0.064 | 0.006 | Pass | 1.349 | 1.292 | Pass |
|  | int | 4.41 | 4.43 | -0.027 | 0.007 | Pass | 0.383 | 0.360 | Pass |
| 20dB | car | 4.42 | 4.43 | -0.005 | 0.006 | Pass | 0.250 | 0.122 | Pass |
|  | bab | 4.41 | 4.43 | -0.025 | 0.005 | Pass | 0.300 | 0.244 | Pass |
|  | off | 4.44 | 4.45 | -0.004 | 0.004 | Pass | 0.600 | 0.466 | Pass |
|  | mus | 4.48 | 4.50 | -0.021 | 0.004 | Pass | 1.349 | 1.273 | Pass |
|  | int | 4.43 | 4.45 | -0.015 | 0.006 | Pass | 0.704 | 0.657 | Pass |
| 10dB | car | 4.41 | 4.40 | 0.015 | 0.006 | Fail | 0.300 | 0.255 | Pass |
|  | bab | 4.21 | 4.32 | -0.109 | 0.009 | Pass | 0.350 | 0.319 | Pass |
|  | off | 4.38 | 4.37 | 0.005 | 0.006 | Pass | 0.750 | 0.509 | Pass |

Table A.82 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.00% | Pass |
| 30dB | car | 0.40% | 0.10% | Pass |
|  | bab | 0.40% | 0.10% | Pass |
|  | off | 0.80% | 0.10% | Pass |
| 20dB | car | 1.10% | 0.10% | Pass |
|  | bab | 1.50% | 0.30% | Pass |
|  | off | 1.40% | 0.20% | Pass |

Table A.83 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Balanced Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.00% | Pass |
| 30dB | car | 0.40% | 0.00% | Pass |
|  | bab | 0.40% | 0.00% | Pass |
|  | off | 0.80% | 0.00% | Pass |
| 20dB | car | 1.10% | 0.00% | Pass |
|  | bab | 1.50% | 0.30% | Pass |
|  | off | 1.40% | 0.10% | Pass |

Table A.84 – Requirements Results for Experiment 8 Wideband Music –   
LC-VAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.00% | Pass |
| 30dB | car | 0.40% | 0.00% | Pass |
|  | bab | 0.40% | 0.00% | Pass |
|  | off | 0.80% | 0.00% | Pass |
| 20dB | car | 1.10% | 0.00% | Pass |
|  | bab | 1.50% | 0.20% | Pass |
|  | off | 1.40% | 0.00% | Pass |

Table A.85 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.254 | 4.355 | -0.102 | 0.009 | Pass | 0.10% | 0.00% | Pass | 0.02 | -0.004 | Pass |
| 30dB | car | 4.324 | 4.366 | -0.042 | 0.009 | Pass | 0.00% | 0.00% | Pass | 0.05 | 0.007 | Pass |
|  | bab | 4.354 | 4.395 | -0.041 | 0.007 | Pass | 0.40% | 0.00% | Pass | 0.05 | 0.004 | Pass |
|  | off | 4.359 | 4.392 | -0.034 | 0.007 | Pass | 0.40% | 0.00% | Pass | 0.2 | 0.025 | Pass |
| 20dB | car | 4.351 | 4.409 | -0.058 | 0.007 | Pass | 1.40% | 0.00% | Pass | 0.15 | 0.033 | Pass |
|  | bab | 4.325 | 4.415 | -0.09 | 0.006 | Pass | 1.60% | 0.00% | Pass | 0.15 | 0.031 | Pass |
|  | off | 4.389 | 4.419 | -0.03 | 0.005 | Pass | 1.40% | 0.00% | Pass | 0.4 | 0.096 | Pass |

Table A.86 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.254 | 4.356 | -0.103 | 0.009 | Pass | 0.10% | 0.00% | Pass | 0.07 | -0.004 | Pass |
| 30dB | car | 4.374 | 4.402 | -0.028 | 0.008 | Pass | 0.00% | 0.00% | Pass | 0.1 | 0.01 | Pass |
|  | bab | 4.404 | 4.418 | -0.014 | 0.007 | Pass | 0.40% | 0.00% | Pass | 0.1 | 0.008 | Pass |
|  | off | 4.409 | 4.417 | -0.008 | 0.007 | Pass | 0.40% | 0.00% | Pass | 0.25 | 0.044 | Pass |
| 20dB | car | 4.401 | 4.419 | -0.018 | 0.006 | Pass | 1.40% | 0.00% | Pass | 0.2 | 0.041 | Pass |
|  | bab | 4.375 | 4.438 | -0.063 | 0.006 | Pass | 1.60% | 0.00% | Pass | 0.25 | 0.055 | Pass |
|  | off | 4.439 | 4.446 | -0.007 | 0.004 | Pass | 1.40% | 0.00% | Pass | 0.5 | 0.139 | Pass |

Table A.87 – Requirements Results for Experiment 9 Wideband Interlaced Material – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.315 | 4.357 | -0.041 | 0.008 | Pass | 0.10% | 0.00% | Pass | 0.1 | -0.004 | Pass |
| 30dB | car | 4.406 | 4.412 | -0.006 | 0.007 | Pass | 0.00% | 0.00% | Pass | 0.15 | 0.014 | Pass |
|  | bab | 4.428 | 4.431 | -0.003 | 0.006 | Pass | 0.40% | 0.00% | Pass | 0.15 | 0.018 | Pass |
|  | off | 4.432 | 4.432 | 0.000 | 0.006 | Pass | 0.40% | 0.00% | Pass | 0.3 | 0.065 | Pass |
| 20dB | car | 4.426 | 4.427 | -0.001 | 0.006 | Pass | 1.40% | 0.00% | Pass | 0.25 | 0.048 | Pass |
|  | bab | 4.406 | 4.445 | -0.039 | 0.005 | Pass | 1.60% | 0.00% | Pass | 0.3 | 0.09 | Pass |
|  | off | 4.454 | 4.452 | 0.002 | 0.004 | Pass | 1.40% | 0.00% | Pass | 0.6 | 0.19 | Pass |

Table A.88 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.42 | 4.47 | -0.045 | 0.005 | Pass | 0.020 | -0.010 | Pass |
| 30dB | car | 4.38 | 4.44 | -0.056 | 0.006 | Pass | 0.050 | 0.028 | Pass |
|  | bab | 4.41 | 4.46 | -0.046 | 0.003 | Pass | 0.050 | 0.019 | Pass |
|  | off | 4.40 | 4.46 | -0.053 | 0.003 | Pass | 0.200 | 0.081 | Pass |
|  | mus | 4.42 | 4.49 | -0.070 | 0.003 | Pass | 1.395 | 0.558 | Pass |
|  | int | 4.41 | 4.47 | -0.062 | 0.004 | Pass | 0.367 | 0.350 | Pass |
| 20dB | car | 4.40 | 4.45 | -0.049 | 0.003 | Pass | 0.150 | 0.098 | Pass |
|  | bab | 4.41 | 4.46 | -0.045 | 0.002 | Pass | 0.150 | 0.109 | Pass |
|  | off | 4.43 | 4.46 | -0.034 | 0.002 | Pass | 0.400 | 0.259 | Pass |
|  | mus | 4.44 | 4.49 | -0.054 | 0.002 | Pass | 1.391 | 1.022 | Pass |
|  | int | 4.43 | 4.48 | -0.058 | 0.003 | Pass | 0.663 | 0.662 | Pass |
| 10dB | car | 4.40 | 4.43 | -0.035 | 0.003 | Pass | 0.200 | 0.126 | Pass |
|  | bab | 4.32 | 4.35 | -0.032 | 0.006 | Pass | 0.200 | 0.158 | Pass |
|  | off | 4.40 | 4.40 | -0.002 | 0.005 | Pass | 0.500 | 0.402 | Pass |

Table A.89 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.42 | 4.47 | -0.047 | 0.005 | Pass | 0.070 | -0.007 | Pass |
| 30dB | car | 4.43 | 4.45 | -0.022 | 0.006 | Pass | 0.100 | 0.036 | Pass |
|  | bab | 4.46 | 4.47 | -0.008 | 0.003 | Pass | 0.100 | 0.035 | Pass |
|  | off | 4.45 | 4.47 | -0.016 | 0.003 | Pass | 0.250 | 0.119 | Pass |
|  | mus | 4.47 | 4.50 | -0.030 | 0.003 | Pass | 1.263 | 1.395 | Pass |
|  | int | 4.46 | 4.48 | -0.018 | 0.004 | Pass | 0.238 | 0.367 | Pass |
| 20dB | car | 4.45 | 4.46 | -0.006 | 0.004 | Pass | 0.200 | 0.116 | Pass |
|  | bab | 4.46 | 4.47 | -0.011 | 0.002 | Pass | 0.250 | 0.153 | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 0.500 | 0.371 | Pass |
|  | mus | 4.49 | 4.50 | -0.009 | 0.002 | Pass | 1.263 | 1.391 | Pass |
|  | int | 4.48 | 4.49 | -0.009 | 0.003 | Pass | 0.559 | 0.663 | Pass |
| 10dB | car | 4.45 | 4.45 | 0.000 | 0.003 | Pass | 0.250 | 0.153 | Pass |
|  | bab | 4.37 | 4.40 | -0.038 | 0.005 | Pass | 0.300 | 0.243 | Pass |
|  | off | 4.45 | 4.45 | 0.002 | 0.004 | Pass | 0.600 | 0.552 | Pass |

Table A.90 – Requirements Results for Experiment 10 Narrowband Speech – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.44 | 4.47 | -0.028 | 0.004 | Pass | 0.100 | -0.007 | Pass |
| 30dB | car | 4.45 | 4.46 | -0.011 | 0.005 | Pass | 0.150 | 0.044 | Pass |
|  | bab | 4.47 | 4.48 | -0.004 | 0.003 | Pass | 0.150 | 0.063 | Pass |
|  | off | 4.47 | 4.48 | -0.011 | 0.003 | Pass | 0.300 | 0.163 | Pass |
|  | mus | 4.48 | 4.50 | -0.023 | 0.002 | Pass | 1.413 | 1.397 | Pass |
|  | int | 4.47 | 4.48 | -0.010 | 0.003 | Pass | 0.388 | 0.372 | Pass |
| 20dB | car | 4.46 | 4.47 | -0.003 | 0.003 | Pass | 0.250 | 0.137 | Pass |
|  | bab | 4.47 | 4.48 | -0.008 | 0.002 | Pass | 0.300 | 0.225 | Pass |
|  | off | 4.48 | 4.48 | 0.001 | 0.002 | Pass | 0.600 | 0.468 | Pass |
|  | mus | 4.49 | 4.50 | -0.007 | 0.001 | Pass | 1.413 | 1.393 | Pass |
|  | int | 4.48 | 4.49 | -0.004 | 0.002 | Pass | 0.709 | 0.663 | Pass |
| 10dB | car | 4.46 | 4.46 | 0.003 | 0.003 | Pass | 0.300 | 0.436 | Fail |
|  | bab | 4.40 | 4.44 | -0.037 | 0.004 | Pass | 0.350 | 0.339 | Pass |
|  | off | 4.46 | 4.46 | 0.000 | 0.003 | Pass | 0.750 | 0.648 | Pass |

Table A.91 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Speech Preferred (Bandwidth Saving) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.10% | Pass |
| 30dB | car | 0.30% | 0.00% | Pass |
|  | bab | 0.80% | 0.10% | Pass |
|  | off | 0.60% | 0.10% | Pass |
| 20dB | car | 1.00% | 0.10% | Pass |
|  | bab | 1.50% | 0.40% | Pass |
|  | off | 1.30% | 0.20% | Pass |

Table A.92 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Balanced Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.10% | Pass |
| 30dB | car | 0.30% | 0.00% | Pass |
|  | bab | 0.80% | 0.00% | Pass |
|  | off | 0.60% | 0.00% | Pass |
| 20dB | car | 1.00% | 0.00% | Pass |
|  | bab | 1.50% | 0.30% | Pass |
|  | off | 1.30% | 0.10% | Pass |

Table A.93 – Requirements Results for Experiment 11 Narrowband Music –   
LC-VAD Music Preferred (Quality Preferred) Operating Point

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | MisRtA2I Ref | MisRtA2I Cut | A2I Pass |
| ∞ | N/A | 0.20% | 0.00% | Pass |
| 30dB | car | 0.30% | 0.00% | Pass |
|  | bab | 0.80% | 0.00% | Pass |
|  | off | 0.60% | 0.00% | Pass |
| 20dB | car | 1.00% | 0.00% | Pass |
|  | bab | 1.50% | 0.20% | Pass |
|  | off | 1.30% | 0.00% | Pass |

Table A.94 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Bandwidth Saving Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.438 | 4.463 | -0.025 | 0.004 | Pass | 0.40% | 0.00% | Pass | 0.02 | -0.004 | Pass |
| 30dB | car | 4.394 | 4.438 | -0.044 | 0.005 | Pass | 0.40% | 0.00% | Pass | 0.05 | 0.009 | Pass |
|  | bab | 4.416 | 4.46 | -0.044 | 0.003 | Pass | 0.60% | 0.00% | Pass | 0.05 | 0.003 | Pass |
|  | off | 4.416 | 4.46 | -0.044 | 0.003 | Pass | 0.20% | 0.00% | Pass | 0.2 | 0.026 | Pass |
| 20dB | car | 4.409 | 4.456 | -0.047 | 0.003 | Pass | 1.50% | 0.00% | Pass | 0.15 | 0.037 | Pass |
|  | bab | 4.413 | 4.466 | -0.053 | 0.002 | Pass | 1.90% | 0.00% | Pass | 0.15 | 0.033 | Pass |
|  | off | 4.426 | 4.465 | -0.039 | 0.002 | Pass | 1.50% | 0.00% | Pass | 0.4 | 0.095 | Pass |

Table A.95 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Balanced Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.438 | 4.466 | -0.028 | 0.004 | Pass | 0.40% | 0.00% | Pass | 0.07 | -0.004 | Pass |
| 30dB | car | 4.444 | 4.456 | -0.012 | 0.004 | Pass | 0.40% | 0.00% | Pass | 0.1 | 0.012 | Pass |
|  | bab | 4.466 | 4.47 | -0.004 | 0.003 | Pass | 0.60% | 0.00% | Pass | 0.1 | 0.008 | Pass |
|  | off | 4.466 | 4.473 | -0.007 | 0.003 | Pass | 0.20% | 0.00% | Pass | 0.25 | 0.044 | Pass |
| 20dB | car | 4.459 | 4.462 | -0.003 | 0.003 | Pass | 1.50% | 0.00% | Pass | 0.2 | 0.044 | Pass |
|  | bab | 4.463 | 4.475 | -0.012 | 0.002 | Pass | 1.90% | 0.00% | Pass | 0.25 | 0.053 | Pass |
|  | off | 4.476 | 4.48 | -0.003 | 0.002 | Pass | 1.50% | 0.00% | Pass | 0.5 | 0.151 | Pass |

Table A.96 – Requirements Results for Experiment 12 Narrowband Interlaced Material – LC-VAD Quality Preferred Operating Point

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Ref | PWMC Cut | Diff | CI | PWMC Pass | MisRtA2I Ref | MisRtA2I Cut | A2I Pass | DSAF Threshold | DSAF Cut | DSAF Pass |
| ∞ | N/A | 4.454 | 4.467 | -0.014 | 0.003 | Pass | 0.40% | 0.00% | Pass | 0.1 | -0.004 | Pass |
| 30dB | car | 4.458 | 4.463 | -0.005 | 0.004 | Pass | 0.40% | 0.00% | Pass | 0.15 | 0.015 | Pass |
|  | bab | 4.475 | 4.475 | 0 | 0.002 | Pass | 0.60% | 0.00% | Pass | 0.15 | 0.018 | Pass |
|  | off | 4.475 | 4.479 | -0.004 | 0.002 | Pass | 0.20% | 0.00% | Pass | 0.3 | 0.061 | Pass |
| 20dB | car | 4.469 | 4.467 | 0.002 | 0.003 | Pass | 1.50% | 0.00% | Pass | 0.25 | 0.053 | Pass |
|  | bab | 4.472 | 4.483 | -0.01 | 0.002 | Pass | 1.90% | 0.00% | Pass | 0.3 | 0.083 | Pass |
|  | off | 4.482 | 4.483 | 0 | 0.001 | Pass | 1.50% | 0.00% | Pass | 0.6 | 0.189 | Pass |

Table A.97 – Requirements Results for Experiment 13

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Music Preferred | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |
| Balanced | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |
| Speech Preferred | Test Vector | Cross Num | Missed Num | Silence Pass |
|  | Wideband | 82 | 0 | Pass |
|  | Narrowband | 68 | 0 | Pass |

**No-degradation of the VAD results from the LC-VAD to the FC-GSAD**

The objectives for Exp. 1-6 are that, for each test file, the VAD results of the FC-GSAD not be worse than the VAD results of the LC-VAD.

For all test files, the results of the VAD of the FC-GSAD were identical to the results of the VAD of the LC-VAD, and therefore these objectives were met.

Table A.98 – Objectives Results for Experiment 1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.36 | 4.35 | Pass |
| 30dB | car | 4.43 | 4.41 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
|  | mus | 4.46 | 4.50 | Pass |
|  | int | 4.44 | 4.43 | Pass |
| 20dB | car | 4.45 | 4.43 | Pass |
|  | bab | 4.44 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |
|  | mus | 4.48 | 4.50 | Pass |
|  | int | 4.46 | 4.45 | Pass |
| 10dB | car | 4.44 | 4.40 | Fail |
|  | bab | 4.31 | 4.32 | Pass |
|  | off | 4.42 | 4.37 | Fail |

Table A.99 – Objectives Results for Experiment 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.377 | 4.357 | Pass |
| 30dB | car | 4.437 | 4.412 | Pass |
|  | bab | 4.452 | 4.431 | Pass |
|  | off | 4.454 | 4.432 | Pass |
| 20dB | car | 4.451 | 4.427 | Pass |
|  | bab | 4.438 | 4.445 | Pass |
|  | off | 4.469 | 4.452 | Fail |

Table A.100 – Objectives Results for Experiment 4

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.46 | 4.47 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.48 | 4.48 | Pass |
|  | mus | 4.49 | 4.50 | Pass |
|  | int | 4.48 | 4.48 | Pass |
| 20dB | car | 4.48 | 4.47 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.49 | 4.48 | Fail |
|  | mus | 4.50 | 4.50 | Pass |
|  | int | 4.49 | 4.49 | Pass |
| 10dB | car | 4.47 | 4.46 | Fail |
|  | bab | 4.43 | 4.44 | Pass |
|  | off | 4.47 | 4.46 | Pass |

Table A.101 – Objectives Results for Experiment 6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.469 | 4.467 | Pass |
| 30dB | car | 4.472 | 4.463 | Pass |
|  | bab | 4.483 | 4.475 | Pass |
|  | off | 4.483 | 4.479 | Pass |
| 20dB | car | 4.48 | 4.467 | Fail |
|  | bab | 4.482 | 4.483 | Pass |
|  | off | 4.488 | 4.483 | Pass |

Table A.102 – Objectives Results for Experiment 7

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.36 | 4.35 | Pass |
| 30dB | car | 4.43 | 4.41 | Pass |
|  | bab | 4.45 | 4.43 | Pass |
|  | off | 4.44 | 4.44 | Pass |
|  | mus | 4.46 | 4.50 | Pass |
|  | int | 4.44 | 4.43 | Pass |
| 20dB | car | 4.45 | 4.43 | Pass |
|  | bab | 4.44 | 4.43 | Pass |
|  | off | 4.46 | 4.45 | Pass |
|  | mus | 4.48 | 4.50 | Pass |
|  | int | 4.46 | 4.45 | Pass |
| 10dB | car | 4.44 | 4.40 | Fail |
|  | bab | 4.31 | 4.32 | Pass |
|  | off | 4.42 | 4.37 | Fail |

Table A.103 – Objectives Results for Experiment 9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.377 | 4.357 | Pass |
| 30dB | car | 4.437 | 4.412 | Pass |
|  | bab | 4.452 | 4.431 | Pass |
|  | off | 4.454 | 4.432 | Pass |
| 20dB | car | 4.451 | 4.427 | Pass |
|  | bab | 4.438 | 4.445 | Pass |
|  | off | 4.469 | 4.452 | Fail |

Table A.104 – Objectives Results for Experiment 10

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.46 | 4.47 | Pass |
| 30dB | car | 4.46 | 4.46 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.48 | 4.48 | Pass |
|  | mus | 4.49 | 4.50 | Pass |
|  | int | 4.48 | 4.48 | Pass |
| 20dB | car | 4.48 | 4.47 | Pass |
|  | bab | 4.48 | 4.48 | Pass |
|  | off | 4.49 | 4.48 | Fail |
|  | mus | 4.50 | 4.50 | Pass |
|  | int | 4.49 | 4.49 | Pass |
| 10dB | car | 4.47 | 4.46 | Fail |
|  | bab | 4.43 | 4.44 | Pass |
|  | off | 4.47 | 4.46 | Pass |

Table A.105 – Objectives Results for Experiment 12

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SNR | Noise | PWMC Threshold OTP | PWMC CuT | PWMC Pass |
| ∞ | N/A | 4.469 | 4.467 | Pass |
| 30dB | car | 4.472 | 4.463 | Pass |
|  | bab | 4.483 | 4.475 | Pass |
|  | off | 4.483 | 4.479 | Pass |
| 20dB | car | 4.48 | 4.467 | Fail |
|  | bab | 4.482 | 4.483 | Pass |
|  | off | 4.488 | 4.483 | Pass |

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