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| ToR TTF T005 (TC STQ) |
| Version: 0.5 |
| Author: STQ Management Team |
| Last updated by: ETSI/FA – CTI -TC STQ – Date: 2020-06-12 |
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Terms of Reference –Testing Task Force Proposal

TTF T005 (TC STQ)

Characterization of the New ETSI speech codec

based on subjective Test data bases – CNET

Summary information

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| --- | --- | --- | --- |
| Approval status | Approved by TC STQ (doc ref: STQ(20)063044r1) | | **YES** |
| Reference Body | TC STQ | | |
| ETSI Funding | **Maximum budget : 92 500 EUR** | | |
| Minimum of 4 ETSI Members Support | **YES** | | |
| Time scale | **From** | 2020-07-15 | |
| **To** | 2021-08-15 | |
| Work Items | *Characterization Methodology and Requirement Specifications for the ETSI LC3plus codec* | | |
| TTF Roadmap reference | Contained in TTF Roadmap 2020, ETSI/Board(19)124\_016.  TTF budget approved in GA#74, December 2019 | | |

Part I –TTF Technical Proposal

# Rationale & Objectives

## Rationale

The subjective and objective methodology for the characterization of the new ETSI speech codec has been developed in cooperation between TC STQ and TC DECT. It also specifies the performance requirements for this codec.

TS 103 624 which was developed in that respect provides information on the characterization methodology and requirements. It describes experimental tests and conditions to be tested. Additionally, objective evaluation to be applied is described.

The Low Complexity Communication Codec Plus (LC3plus) which was developed under the jurisdiction of TC DECT (TS 103 634) will be the new ETSI codec if it can be characterized according to the requirements specified in TS 103 624 with the intention to be able to standardize a high-quality codec for the use in modern telecommunication networks, including but not limited to DECT and VoIP. A special focus is paying tribute to the fact that end-to-end connections, i.e. from user to user, are in many cases of a hybrid nature concatenating different technologies and thus tandeming different codecs.

## Objectives of the work to be executed

The work to be performed is to create a set of high-quality recordings for the codec tandeming scenarios stipulated by TS 103 624 (test sequences) and conduct a statistically sufficiently large number of auditory tests (subjective tests).

There are 2 main tasks to be completed:

* creation of a set of test sequences
* conducting and analysing subjective tests

The work should be completed by 06/2021.

## Previous funded activities in the same domain

TC STQ did benefit of STF support in this domain during the past 5 years for STF 504 on Detection of Emotions in Telecommunication Measurement Applications. The resources used amounted approximately to 60kEUR.

This work dealt with development of a standard on emotion detectors. Initially, the classification of Emotion Detectors for written text and its performance assessment were made. This included analysis of existing solutions. Consequently, a classification of Emotion Detectors for spoken speech and its performance assessment was performed, including analysis of existing solutions.

As a next step and based on the results of previous tasks, the set of minimum requirements for emotion detectors in telecommunications was defined. The final clause contains minimum mandatory and optional input and output requirements, memory and power requirements, and types of operation.

In addition, there is currently ongoing STF575, which is on Methods for Objective assessment of Listening Effort based on subjective test data bases. The resources are limited to a maximum budget of 73.5 kEUR.

The work being performed is to create, at acoustical interfaces in the presence of background noise, a set of:

* high quality reference speech samples
* test conditions which impair the reference items
* high quality recordings of the impaired reference items (test sequences)
* to conduct a statistically significant number of auditory tests (subjective tests) for objective model training (this task is not included in the STF work plan) and model validation (this task is included in the STF workplan).

## Consequences if not agreed

If the TTF is not accepted, the work will not be undertaken and the candidate codec will not formally be characterized outside the DECT community.

The VoIP market will be fragmented by non-standardized solutions and uncertainty will prevail to whether this codec can be used with confidence in maintaining high speech quality under all circumstances.

The LC3plus codec technology is also contributed to the SIG Bluetooth providing a significant improvement to previous technologies. In order to provide the technical benefits also to ETSI groups, this TTF activity is required.

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **#** | **ETSI Member** | **Supporting delegate** |
| 1 | Focus Infocom | Wolfgang Balzer |
| 2 | Fraunhofer IIS | Markus Schnell |
| 3 | Swisscom | Christoph Furer |
| 4 | Ericsson LM | Jonas Svedberg |
| 5 | HEAD acoustics GmbH | Hans Wilhelm Gierlich |
| 6 | DSPG Edinburgh Ltd | Heinz Thürauf |
| 7 | Mesaqin.com s.r.o (Ltd.) | Jan Holub |

# Deliverables

## Base documents

|  |  |  |
| --- | --- | --- |
| **Document** | **Title** | **Status** |
| ETSI TS 103 624 | Characterization Methodology and Requirement Specifications for the ETSI LC3plus codec | Approved |
| ETSI TS 103 634 | Digital Enhanced Cordless Telecommunications (DECT);  Low Complexity Communication Codec Plus (LC3plus); | Approved |

## New deliverables

|  |  |  |  |
| --- | --- | --- | --- |
| **Deliv.** | **Work Item code**  **Standard number** | **Working title** | **Expected date for publication** |
| D1 | RTS/STQ-292 | Working title: Characterization Methodology and Requirement Specifications for the ETSI LC3plus codec: Annex to TS 103 624 | 07/2021 |
| D2 | RTS/STQ-292 | Working title: Results from Characterization Testing of the ETSI LC3plus codec: Annex to TS 103 624 | 07/2021 |

# Maximum budget

## Task summary/Manpower Budget

It is expected that for tasks 1 to 2 qualified test labs will submit bids with a full package price tag which includes cost of manpower, operational costs of the lab and for task 2 remuneration of test subjects, and that the internal split-up of these costs must not be revealed.

For task 3, senior expert(s) should be responsible.

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| --- | --- |
| **Task short description** | Budget (EUR) |
|
| #1: Creation of a set of test sequences | 12 000 |
| #2: Conducting and analysing subjective tests  Training databases 7 x 10 000 € | 70 000 |
| #3: Overall coordination and project management | 7 000 |
| **TOTAL** | **89 000** |

## Travel budget

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| --- | --- |
| **Expected travels** | **Cost estimate** |
| 2 times TTF leader to attend TB meeting | 2 000 |
| 1 time TTF leader to disseminate work to ITU-T SG12 | 1 500 |
| **Total cost** | **3 500** |

Part II – Details on TTF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

The work will be organized following, where relevant, the procedures successfully used in the subjective characterization of the EVS codec.

A steering committee will be created. The committee will meet in conjunction with STQ regular meetings and by conference call as necessary. The steering committee will be chaired by a member of the STQ management *team and* will include interested participants from the DECT TB.

The relations with other stakeholders, e.g. TB DECT, will be managed via liaison communication and attendance of their meeting(s) to present the status of the TTF work.

## Other interested ETSI Technical Bodies

Technical Body DECT is the primary stakeholder. At least one representative of TB DECT will be a member of the TTF steering committee. The TTF will also maintain open communications with TB DECT through the formal channels of liaison statements.

## Other stakeholders

No other stakeholders are identified at this time.

However, ITU-T and 3GPP will be informed about the progress and the results of the TTF. This will be of interest for these standardization bodies, e.g. for interworking situations.

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

Task 1 – Preparation of the materials for the listening tests

This task is to prepare the materials for the listening tests defined in Task 1. This work may entail selection of speech source material, and will include processing the speech materials in accordance with the methods and conditions defined in Task 2.1 (In practice Task 2.1 will be the initial one, in conjunction with task 1)

Task 2 is divided in several parts

Task 2.1 – Definition of the characterization test plan and requirements

This task is to define the characterization test plan and expected performance requirements for the LC3plus codec. Where possible, relevant methods will be adapted from the test plans created for the characterization of the Enhanced Voice Services (EVS) codec [3GPP TS 26.441 EVS General Overview; TR 26.952 EVS Performance Characterization; S4-141131; EVS Permanent Document EVS-8c: Test plan for characterization phase; S4-141392; EVS Permanent Document EVS-7c: Processing functions for characterization phase]. There is a strong interaction between tasks 1 and 2.1. This will appear in the timetable.

Task 2.2 – Conduct the listening tests

This task is to conduct the listening tests according to the methods defined in Task 2.1, using the materials created in Task 1.

Task 2.3 – Analysis of results of listening tests

This task is to analyse the results of the listening tests, performing all required statistical comparisons across conditions.

Task 3 – Preparation of final report, overall management and tasks coordination

This task is to summarize the outcomes of the other tasks and to create all necessary reports. The coordination and overall management task will provide all the needed coordination, communications and the reports of the TTF.

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| **Task # 1** | **Preparation of test materials** |
| **Objectives** | To prepare all speech materials for all test conditions defined in the Characterization Test Plan and make available for use by the listening lab(s). |
| **Input** | The Characterization Test Plan, Deliverable 1.  Appropriate source speech materials as defined in the Qualification Test Plan, or skills and equipment required to collect such source speech if not existent. |
| **Output** | Speech samples for all test conditions, in all aspects (language, processing, number of sentences, etc.) as defined in the characterization test plan, Archival methods for the processed speech samples, including file formatting and naming, are to be agreed with the listening lab(s). |
| **Interactions** | Coordination with the Steering committee. Interactions with the authors of Deliverable 1, if clarifications are needed. Coordination with the listening lab(s) for proper speech sample archival methods and delivery. |
| **Resources required** | Appropriate source speech materials as defined in the Characterization Test Plan, or skills and equipment required to collect such source speech if not existent. All required signal processing tools for all conditions defined in the Characterization Test Plan, along with expertise in applying said tools. |
| **Task # 2.1** | **Definition of the characterization** **test plan and requirements** |
| **Objectives** | To define the listening methods, test conditions, and performance requirements and objectives to be met by the candidate codec. |
| **Input** | ETSI TS 103 634, Digital Enhanced Cordless Telecommunications (DECT); Low Complexity Communication Codec Plus (LC3plus)  3GPP TR 26.952 EVS Performance Characterization  3GPP Permanent Document EVS-8C: Test Plan for Characterization Phase |
| **Output** | The characterization test plan will include detailed definitions of all test conditions, including but not limited to: languages (minimum English and Mandarin), bandwidths, acoustic conditions, and transport channel characteristics and codec processing, both test and reference, for creation of test materials. It will also identify listening methods as appropriate for test conditions (e.g ACR, DCR, etc.) and composition of listening panels. It will include performance requirements and objectives for each set of conditions including relevant reference codecs. |
| **Interactions** | Coordination with the Steering committee on progress and issues  Approval of the TB STQ of the characterization test plan as Deliverable 1 |
| **Resources required** | Resources will include the input documents, and expertise in design of subjective listening test plans for speech codecs. |
| **Task # 2.2** | **Conduct of listening tests** |
| **Objectives** | To accept the speech samples as prepared in Task #1  To conduct all listening tests using the methods and plan defined in the Characterization Test plan, generating results for each test condition. |
| **Input** | Characterization Test Plan, Deliverable 1, from Task # 2.1.  Speech test materials, from Task # 1. |
| **Output** | The listening lab(s) will deliver results for each condition defined in the Characterization test plan. In addition, results will be provided on the quality of the listening panels (e.g. number of listeners excluded for cause, etc.). |
| **Interactions** | Coordination with the Steering Committee. Interactions with the authors of Deliverable 1, if clarification of the test methods are required. Interactions with the creators of the test materials for agreement in archival format, for efficient hand-over. |
| **Resources required** | Definitions of all test methods from the Characterization test plan, Task #2.1.  Speech materials for all tests, outcome of Task #1.  Expertise in the conduct of subjective listening tests, including ability to recruit, screen, and appropriately train persons for listening panels. |
| **Task # 2.3** | **Analysis of results of listening tests and preparation of Deliverable D2** |
| **Objectives** | To perform statistical analyses of the results of the listening tests in accordance with the performance requirements defined in the Characterization Test Plan.  To write the final report describing the outcomes. |
| **Input** | Characterization Test Pan, Deliverable 1, from Task # 2.1.  Results from subjective listening tests, from Task # 2.2. |
| **Output** | The output will be the final report, Results from Characterization Testing of the ETSI LC3plus codec: Annex to TS 103 624, as Deliverable D2. |
| **Interactions** | Coordination with the Steering committee. Consultation with the authors of Deliverable 1, if clarification of the performance requirements is needed. Consultation with the listening lab(s) if clarification of the results is needed.  Approval by TB STQ as Deliverable 2. |
| **Resources required** | Characterization Test Plan, Deliverable 1 from Task # 2.1.  Results from the listening labs, from Task # 2.2. |
| **Task # 3** | **Overall coordination and project management** |
| **Objectives** | To coordinate all work streams among all participants. |
| **Input** | Characterization Test Pan, Deliverable 1, from Task # 2.1.  Results from subjective listening tests, from Task # 2.3. |
| **Output** | Progress reports to the TC STQ.  Presentation of results to ITU-T SG-12. |
| **Interactions** | Coordination with the Steering committee and all workstream participants. Presentation of progress reports to TC STQ, and presentation of final results to ITU-T SG-12. |
| **Resources required** | Timely communications with all participants and stakeholders. |

## Milestones

Milestone A – Definition of the characterizationtest plan and requirements

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| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | Early draft of the Annex to TS 103 624 to be made available for review by the Steering Committee (SC) prior to the finalization of the test materials | 2020-09-15 |
| TC STQ | Early Draft D1 delivered to SC:  Working title: Characterization Methodology and Requirement Specifications for the ETSI LC3plus codec: Annex to TS 103 624 |
| ETSI Secretariat | Progress Report approved by TC STQ |

Milestone B – Definition of the characterizationtest plan and requirements and test materials

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| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | Definition of the characterization test plan and requirements. | 2020-10-23 |
| TC STQ | Final Draft D1 accepted by TC STQ:  Working title: Characterization Methodology and Requirement Specifications for the ETSI LC3plus codec: Annex to TS 103 624 |
| ETSI Secretariat | Progress Report approved by STQ |

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| **Milestone** | **Description** | **Cut-Off Date** |
| **B’** | Delivery of the test materials | 2020-11-23 |
| TC STQ |  |
| ETSI Secretariat |  |

Task 2.1 completed by two months after the project start. Early draft of the Annex to TS 103 624 to be made available for review by the steering committee prior to the finalization of the test materials. Draft of Annex to TS 103 624 expected for acceptance by STQ, as deliverable D1.

Task 1 initiated at project start and completed not more than four months after the project start, and within two months of the review of the characterization plan by the steering committee.

Milestone C – Conduct of subjective listening tests and analysis of results

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| **Milestone** | **Description** | **Cut-Off Date** |
| **C** | Results from listening lab for each condition defined in the Characterization test plan and provided on the quality of the listening panels.  Results to be made available for review by the SC | STQ  2021-06-15 |
| TC STQ | Stable Draft D2 delivered to TC STQ:  Working title: Results from Characterization Testing of the ETSI LC3plus codec: Annex to TS 103 624 |
| ETSI Secretariat | Progress Report approved by STQ |

Task 2.2 completed by five months after the completion of Milestone A.

Task 2.3 completed two months after the completion of Task 2.2. Draft of Deliverable D2, Working title: Results from Characterization Testing of the ETSI LC3plus codec: Annex to TS 103 624, to be reviewed by TC at STQ (2021-03-05). Progress report to be delivered at STQ.

Milestone D – Final Drafts and Final Report approved by TC STQ

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| **Milestone** | **Description** | **Cut-Off Date** |
| **D** | Final Drafts and Final Report approved by TC STQ | 2021-07-15 |
| TC STQ | Final Drafts D1 & D2 approved by TC STQ |
| ETSI Secretariat | TTF Final Report approved by TC STQ |

Final deliverables and Final Report approved at STQ or by remote consensus, for publication in July 2021.

Milestone E – Deliverables published, TTF closed

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| **Milestone** | **Description** | **Cut-Off Date** |
| **E** | Deliverables published, TTF closed | 2021-08-15 |
| ETSI Secretariat | Deliverables published, TTF closed |

## Task summary

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| --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | Target Date | | Estimated Cost (EUR) |
| From | To |
|  | Start of work |  |  |  |
| T1 | Preparation of test materials | Jul 2020 | Oct 2020 | 12 000 |
| T2.1 | Definition of the characterization test plan and requirements | Jul 2020 | Sep 2020 | 7 000 |
| Milestone A | Early draft of the Annex to TS 103 624 to be made available for review by the Steering Committee (SC) prior to the finalization of the test materials  Progress report approved by TC STQ |  | 2020-09-15 |  |
| Milestone B | Definition of the characterization test plan and requirements.  Progress Report approved by TC STQ#65 and Final draft of D1 accepted by TC STQ#65 |  | 2020-10-23 |  |
| Milestone B’ | Delivery of the test materials |  | 2020-11-23 |  |
| T2.2 | Conduct of listening tests | Nov 2020 | Mar 2021 | 56 000 |
| T2.3 | Analysis of results of listening tests and preparation of Deliverable D2 | Mar 2021 | Apr 2021 | 7 000 |
| Milestone  C | Results from listening lab for each condition defined in the Characterization test plan and provided on the quality of the listening panels.  Results to be made available for review by the SC  Stable draft of Deliverable D2 made available for TC STQ;  Progress Report approved by TC STQ |  | 2021-06-15 |  |
| T3 | Overall coordination and project management | Jul 2021 | Jun 2021 | 7 000 |
| Milestone D | Final Draft D1 & D2 and TTF Final Report approved by TC STQ |  | 2021-07-15 |  |
| Milestone E | Deliverables published, TTF closed |  | 2021-08-15 |  |
|  | | | | **89 000** |

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| **Task/ Mil.** | **J** | **A** | **S** | **O** | **N** | **D** | **J** | **F** | **M** | **A** | **M** | **J** | **J** | **A** |
| T1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.1 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. A |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. B |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. B’ |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T2.3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. C |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. D |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Mil. E |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

# Expertise required

## Team structure

Up to two labs and one senior expert to ensure the following mix of competences:

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| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | A Laboratory able to produce test sequences in a high quality and to be able to provide any impairment needed for the characterizationof the codec. |
| High | A laboratory able to conduct the subjective tests according to the rules |
| High | Experts able to define the test plan and the relevant test conditions |
| High | Expert(s) able to manage the work program according to the time and requirements plans, and to produce all the needed reports and communications |

Part IV: TTF performance evaluation criteria

# Performance Indicators

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| --- | --- |
| **Select relevant Performance indicators applicable for these ToR (X)** | |
| Contribution from ETSI Members to TTF work | |
| Direct financial contribution (co-funding) |  |
| Support to the TTF work (e.g., provision of test–beds, organization of workshops, events) | X |
| Steering Group meetings (number of meetings / participants / duration) | X |
| Number of delegates directly involved in the review of the deliverables | X |
| Contributions/comments received from the Reference Bodies | X |
| Contributions/comments received from other Reference Bodies | X |
|  |  |
| **Contribution from the TTF to ETSI work** | |
| Contributions to Reference Body meetings (number of documents / meetings / participants) | X |
| Contributions to other Reference Bodies | X |
| Presentations in workshops, conferences, stakeholder meetings | X |
|  |  |
| **Liaison with other stakeholders** | |
| Stakeholder participation in the project (category, business area) | X |
| Cooperation with other standardization bodies | X |
| Potential interest of new members to join ETSI |  |
| Liaison to identify requirements and raise awareness on ETSI deliverables | X |
| Comments received on drafts (e.g. on WEB site, mailing lists, etc.) |  |
|  |  |
| **Quality of deliverables** | |
| Approval of deliverables according to schedule | X |
| Respect of time scale, with reference to start/end dates in the approved ToR | X |
| Comments from Quality review by Reference Body | X |
| Comments from Quality review by ETSI Secretariat | X |
|  |  |

# Document history

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| --- | --- | --- | --- | --- |
| **Version** | **Date** | **Author** | **Status** | **Comments** |
| STQ(20)063044r1 | 2020-02 | STQ Management Team | TB Approved | For submission to ETSI CTI Director Ultan Mulligan |
|  | 2020-02 | UJM |  | Editorial updates (added Milestones C & D for secretariat purposes, copied descriptions of milestones and tasks to the summary table, removed template guidance text in italics) |
| 0.1 | 2020-02-24 | ETSI/FA | Stable draft | Update before CL publication |
| 0.2 | 2020-04-09 | ETSI Secretariat | Final | Update before CL publication |
| 0.3 | 2020-06-05 | ETSI Secretariat | Final | Update before TTF Prep. meeting |
| 0.4 | 2020-06-09 | ETSI Secretariat+ TC STQ Chair | Final | Update on milestones after TTF Prep. meeting |
| 0.5 | 2020-06-12 | ETSI Secretariat | Final | Update on start date and on reference to STQ. Para 6.2 |