3GPPSA4#124 S4-231057

22-26 May 2023, Berlin, Germany

**Source: Editor[[1]](#footnote-1)**

**Title: IVAS-6: Selection Deliverables, version 0.5.0**

## Agenda Item: 14.2

# Introduction

This Permanent Document describes the Deliverables for the IVAS Selection Phase and certain post-selection deliverables including characterization.

The deliverables shall meet the schedule specified in IVAS-2, IVAS Project Plan.

The objective of the Selection Deliverables is to provide sufficient amount of information about the candidate for decision by SA4 and to ensure that all work item outputs expected by the WID are provided.

# Selection Deliverables

The following deliverables are required for IVAS codec selection.

## Funding payment

Below is provided the Funding Agreement for the IVAS standardization process. Executing this document is required for a codec proponent to take part in the process with a codec candidate.

The text reflects the SA4 working assumption that there will be a single common candidate codec to be submitted for selection. The current document structure was provided by ETSI/3GPP MCC and EVS SWG Chairman and was then vetted by the ETSI legal.

#  Funding Agreement for IVAS Standardization

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|  | XXX logo (a practice, not a requirement) |

**Co - Funding agreement for the Testing and Characterization Process for the 3GPP IVAS Codec**

Made between:

XXXX

Hereinafter referred to as the Funding Party,

and

The European Telecommunications Standards Institute **(ETSI)**

650, Route des Lucioles

F-06921 Sophia Antipolis Cedex

FRANCE

Represented by Luis Jorge Romero Saro

ETSI Director-General

Hereinafter referred to as ETSI,

The Funding Party and ETSI are hereinafter collectively referred to as the “Parties”

**Considering that**

* The **European Telecommunications Standards Institute** ("**ETSI**") is an industry-led standards development organization with a membership of over 900 manufacturers, network operators, service providers, research bodies, regulatory bodies and academia from over 60 countries. ETSI undertakes pre-standardization and standardization activities in areas common to telecommunications, information technology, sound and television broadcasting. **ETSI** aims to produce globally applicable standards and is the recognized European Standardization Organization for telecommunications.
* ETSI is one of the 3GPP Partners and is taking care of 3GPP’s secretariat.
* The 3GPP working group TSG SA WG4 launched a process to select a new IVAS Codec.
* The opportunity to submit an IVAS codec candidate is open to all TSG SA WG4 members.
* Based on declarations and reconfirmations by companies indicating interest to submit candidate codecs for IVAS codec selection, SA WG4 adopted the working assumption that there will be a single common candidate codec to be submitted for selection. Note that since the standardization process is open, SA4 may make any relevant revision/decision related to standardization of IVAS codec, compliant with the goals and the relevant IVAS permanent documents.
* Such selection requires the execution of specific selection tests by independent listening laboratories, to evaluate the quality of the codec candidate(s); the testing shall follow a procedure and service specifications agreed by SA WG4 participants and shall be conducted on an anonymous basis, as far as testing conditions are concerned.
* IVAS codec selection is followed by characterization testing, executed by listening laboratories chosen by SA WG4, to evaluate further the quality of the selected codec; the testing shall follow a procedure and service specifications agreed by SA WG4 participants.
* ETSI will manage and execute, accordingly with 3GPP rules and procedures, the legal and contractual framework of the above cited selection testing for all candidates and the characterization testing for the selected codec.
* The costs for such selection and characterization testing are to be borne by the entities submitting a candidate.
* SA WG4 has adopted the working assumption according to which such costs shall be covered by funds collected through payments from these entities associated with a funding agreement.
* Whereby the funding shall be paid in two instalments, as defined in the present agreement,
* The Funding Party intends to take part in the IVAS codec selection and characterization.

**Parties now agree the following:**

1. The present agreement defines the conditions in which the Funding Party provides funding for the process of selecting a codec candidate as 3GPP standard and characterization of the selected codec candidate.

The Funding Party acknowledges that such funding is required to take part in the process with a codec candidate. Costs related to the common candidate are to be shared by the said entities. In this case, taking part to the process requires that each entity agrees to contribute to the funding and fulfill their payment obligation.

1. The total amount of funding to be provided by all Funding Parties for the common candidate is 1.2 Million euros.

This total amount shall be paid corresponding to the share of funding due by the Funding Party for the common candidate. The pro-rata share of the funding shall be borne by the Funding Party, calculated according to the number of parties in equal shares of 1.2 M euros / 11 contributing the common candidate.

Should another entity (Additional Entity) participate as an additional proponent of the common candidate before the beginning of the testing process and if ETSI is informed, ETSI shall ask the Additional Entity to contribute to the funding.

In this case, ETSI shall decrease the new amount due by each entity submitting the joint candidate. The overpayment shall in this case either be refunded at the end of the project or considered when invoicing the second instalment, accordingly with article 4 hereafter.

However, the Funding Party acknowledges that ETSI cannot guarantee the effective signing of a funding agreement by an Additional Entity. Should the Additional Entity refuse to enter the funding agreement, the initial entities submitting the common candidate shall continue to bear the entire corresponding costs.

1. Funds shall be managed by ETSI, under the responsibility of its Director General. Funds shall be used exclusively to finance the testing process for the IVAS codec and the related evaluation, accordingly with the relevant IVAS permanent documents.

The payment obligation in the present agreement shall survive changes to the IVAS permanent documents as may be approved by TSG SA WG4, accordingly with 3GPP’s rules.

1. Funds shall be paid accordingly with the following schedule:
* First payment: 55 K euros after signing the agreement and within 45 days, or a time period agreed by both parties, from the receipt of the invoice from ETSI;
* Second payment: 55K euros accordingly with IVAS-2 Project Plan and within 45 days, or a time period agreed by both parties, from the receipt of the invoice from ETSI.

ETSI shall account for the expenditure to the Funding Party at the end of the agreement and any unused funds shall then be refunded by ETSI.

1. The 3GPP working group TSG SA WG4 shall be responsible of the technical coordination of the process and for the final selection of the codec candidate.
2. The contacts for the follow-up of the present agreement are:

For ETSI:

Corinne Elena, CFO

For the Funding Party:

…………

1. The present agreement shall enter into force at the latest date of signing by the Parties, for the duration of the selection and characterization process. However, the present agreement shall be terminated before the end of selection and characterization process if:
* The standardization process is cancelled by 3GPP SA4.
* All the funds for a common candidate have not been received by ETSI when the contracts have to be signed with the listening labs according to the IVAS Project Plan.
* All the concerned entities decide not to submit their common candidate or to withdraw their common candidate.

In case of termination before the end of selection and characterization process, sums which have already been engaged by ETSI to the listening labs at the date of termination, and accordingly with the IVAS-2 Project Plan, shall not be refunded to Funding Parties.

If a Funding Party has to give up its participation in a common candidate for reasons outside of its control (i.e. force majeure), any remaining amount of its share not already engaged by ETSI, will be reimbursed to the withdrawing Funding Party. In this case, the amount of the shares to be borne by the remaining Funding Parties of that common candidate shall be increased equally on a pro-rata basis.

1. The present agreement is governed by French Law. Any dispute arising in relation with the present agreement and which the Parties cannot resolve amicably shall exclusively be settled by the competent Court of Grasse, France.

Signed in two samples,

|  |  |
| --- | --- |
| Dated: | Dated: |
| **Luis Jorge Romero Saro***ETSI Director-General* |  |
| **European Telecommunications** **Standards Institute (ETSI)**  | **XXX** |
| 650, Route des Lucioles F-06921 Sophia Antipolis CedexFRANCE<http://www.etsi.org>  |  |

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## Legal framework to cover use model parameters, unprocessed audio test material, processed audio test material, and test results

Unless such materials are publicly available, a multiparty NDA will be signed by the deadline specified in IVAS-2 among proponent companies, Host Lab, Cross-check Lab, Material Collection entity, listening labs, GAL to cover use of model parameters, audio test material (unprocessed and processed), test results (raw voting data) and test reports.

It is agreed that signed and scanned electronic pdf files are sufficient for starting the selection testing, however all signed paper originals will be exchanged as stipulated in the NDA.

## Candidate Codec Executable (floating-point)

The proponent companies shall deliver a copy of the candidate codec executables to ETSI and an identical copy to the Host and Cross-check Labs.

The executables delivered to ETSI and the Host and Cross-check Labs shall be obtained from non-instrumented source code of the candidate solution. In addition, executables built from instrumented code of the candidate solution shall be provided, allowing for complexity and memory estimations according to the respective guidelines in IVAS-7a. The underlying code version of the candidate codec executable is assumed to be floating-point.

The proponent companies should not change the behaviour of the codec executables for the conditions evaluated in the selection tests after the submission deadline. Note that if it is determined that the delivered executables are broken or show unexpected behaviour, the proponent companies should be informed and this shall be reported to SA4. Any code changes affecting the conditions evaluated in the selection tests shall be reported to SA4.

The codec executables shall be received by ETSI by the submission deadline specified in IVAS-2, Project Plan. It is the responsibility of the proponents to be sure that the executables will effectively be delivered by the due date. ETSI will register the executable arrival date and will report the effective arrival date to SA4. ETSI will not check the correct operation of the executables delivered.

The codec executables may be used after the end of the Selection Phase to verify that the C source code of the selected candidate codec can be built to executables that are able to regenerate the processed audio samples used during the Selection tests. Volunteering company/ies will obtain the executables under a suitable legal framework for verification purposes.

## High level technical description of the candidate algorithm

The proponent companies shall provide a technical description of their solution to 3GPP SA4. The description should contain sufficient details to allow analysis of the solution.

## Report covering the compliance to Design Constraints

The proponent companies shall provide a report showing that the proposal fulfils all design constraints in the approved IVAS Design Constraints (IVAS-4) document as a contribution to the IVAS codec selection meeting (SA4). All Design Constraints with associated parameters listed in IVAS-4 shall be reported. This includes a complexity evaluation and an evaluation of memory (RAM, ROM and Program ROM) consumption based on the provided draft C source code.

## Draft overview specification

The proponent companies shall provide draft specification TS 26.250 (General overview).

## Candidate Codec Source Code (floating-point)

The proponent companies shall deliver draft specification TS.26.258 (C source code (floating point)) including of the draft C source code attachment to SA4 at the start of the selection meeting at the latest.

It shall be possible to verify that executables built from this source code can bit-exactly regenerate the processed audio samples used during the Selection tests and to verify the reported complexity and memory consumption figures. To that purpose, the proponent companies shall also deliver instructions on how to compile the source code and how to generate the processed audio samples.

Volunteering company/ies will obtain the source code under a suitable legal framework for verification purposes after the end of the Selection Phase.

## IPR declaration

The proponent companies shall provide an acceptable IPR declaration, according to the IPR policy of their 3GPP Partner Organization.

## Optional additional information incl. demo material

The proponent companies may provide optional additional information which may support selection decision in 3GPP SA4. This may cover information on design constraints not exposed during selection or on features not tested during selection. Part of the optional additional information may also be results of in-house evaluations by the codec proponents of how their candidate codec meets IVAS objective performance requirements and objectives as specified in IVAS-3.

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# Post selection deliverables

The following deliverables are required after IVAS codec selection to ensure that all work item outputs expected by the WID are provided.

## Draft specifications and change request(s)

The proponent companies shall provide a full set of draft specifications and change request(s) in line with the work item outputs expected by the WID according to the schedule specified in the project plan IVAS-2. An exception is TS 26.251 (C source code (fixed-point)) which is created as part of the IVAS codec characterization.

The specifications shall also cover

* an RTP payload format specification compliant with the design constraints.
* an interface specification to external renderer.
* a format specification of HRIR / BRIR filter sets supported by the IVAS decoder/renderer.
If applicable (SOFA format not natively supported by IVAS decoder/renderer): tools and specification of how HRIRs/BRIRs in SOFA format may be converted into the internal format of a candidate codec.
Note: The proponent may provide tools with limited conversion support of SOFA conventions.
* specification of supported sets of object metadata for object-based audio input format.
* specification of binaural reverb parameters.

## Characterization

Successful completion of IVAS codec characterization is a further post selection deliverable. IVAS codec characterization entails the conversion of IVAS floating-point code to fixed-point code and characterization testing. The code conversion will produce TS 26.251 (C source code (fixed-point)) from TS 26.258 (C source code (floating point)) where both shall be fully equivalent and interoperable IVAS reference implementations.

The characterization test results including a detailed evaluation proving the equivalence (in terms of functionality and quality) of the fixed-point source code with the floating-point source code shall be documented in TR 26.997 (IVAS codec performance characterization).

In addition, a CR to TS 26.252 (Test sequences) for the IVAS fixed-point code shall be delivered.

The schedule of IVAS codec characterization shall follow the time plan IVAS-2.

# Annex: Working assumptions

## Working assumptions as of SA4#117-e meeting on IVAS codec selection and characterization funding

Editor’s note: *The following points were agreed as working assumption with the aim to give SA4 the necessary planning security for the IVAS codec selection and characterization test campaigns and a basis for working on further details of IVAS selection and characterization phases including discussions with potential external labs. Sufficiently before the steps of this working assumption become due for action, SA4 will be requested to endorse them in formal decisions.*

Editor’s note 2: *As of meeting SA4#117-e, the working assumption with of two binding LoIs has been superseded by the assumption that codec proponent companies will be required to sign a co-funding agreement. In that regard the below bullets are outdated while the general concept with funding the standardization exercise by the proponents in two payment instances remains valid.*

Working assumption:

* The registered IVAS proponent companies shall reconfirm their interest to submit an IVAS codec candidate together with an optional indication if this will be a joint submission together with other proponents.

This information will result in an up to date indication of the number of IVAS codec candidates to plan with. The reconfirmation should take place soon when the proponents had enough time for their considerations.

* IVAS proponents are requested to issue a first binding Letter of Intent (LoI) for initial funding of the selection and characterization process for the IVAS codec. Signing the LoI commits the proponent to support the selection tests and, through a corresponding payment, to contribute to a codec candidate’s share of the IVAS codec testing funds. It has the following purposes:
	+ Give SA4 planning security about the maximum number of IVAS codec candidates to consider in selection tests.
	+ Secure a basic level of funds for the selection testing campaign, with an amount per codec candidate to be agreed in SA4.

For participation of a candidate codec in the IVAS codec selection, the first LoI and the required payments associated with that codec must be submitted/completed by certain dates specified by SA4. These deadlines should be set such that there is sufficient time for SA4 to work with good planning security on the relevant IVAS selection phase Pdocs like the selection test plan or the selection rules.

* IVAS proponents are subsequently requested to issue a second binding LoI for the remaining funding of their candidate codec in the selection and characterization process. Signing the second LoI commits the proponent to a second payment. It has the following purposes:
	+ Cover the actual costs of the selection phase campaign, which will most likely exceed the previously collected funds (associated with the first LoI).
	+ Secure sufficient funds for the characterization phase campaign and give corresponding planning security.

The submission date of the second binding LoI and the deadline for the associated payment should be after finalization of the relevant selection phase Pdocs and shortly before the candidate codec submission deadline for IVAS codec selection. SA4 should determine the specific dates as soon as a detailed selection phase planning is complete and listening lab resources for the selection testing have been secured.

* Since groups of companies are likely to submit joint candidates (which is clear in the case of public collaboration), the LoIs should cater for the possibility to make partial payments associated with joint candidate codecs.
* To be entitled to submit a given candidate codec to the IVAS selection tests, SA4 should require that first and second LoIs pertaining this candidate are signed and that the associated payments fulfilling the total amount required for a candidate are done by the specified dates. No refunds shall be possible for withdrawing proponent companies except a proportionate share of potentially unused funds after the closure of the IVAS codec work item (see last bullet).
* The total budget for IVAS codec testing campaigns (selection and characterization) shall be 1.2 M€. The funds will be collected by ETSI/MCC from the IVAS codec proponents via the first and the second LoIs, which each shall raise 600 k€. These numbers may be subject to adjustments depending on the actual number of candidate codecs, cost and number of the experiments, and potential support functions by external and internal labs.
* The amount to be paid for each candidate codec in association with the first LoI will depend on the number of reconfirmed codec candidates in the first step. However, since after the deadline for the payments the actual number of codec candidates may turn out to be lower, this may result in that the funds collected with the first LoI may be substantially lower than the expected 600 k€. In that case SA4 should be prepared to decide if/when the proponents of the remaining candidates must make an extra payment to close this gap.
There may also arise the case that first LoIs and corresponding payments from proponent companies associated with a given candidate codec arrive after the deadlines and even if that candidate codec has already fully been paid for. In that case, this extra payment should be credited as an advance payment associated with that candidate codec for the funds to be collected under the second LoI. This means, the payment for that candidate required under the second LoI will be reduced accordingly.
* Based on previous 3GPP experience with speech/audio codec standardizations incl. EVS, splitting the total funds for selection and characterization with a 2/1 ratio is a good guideline. This leads to the working assumption of 800 k€ available for the selection phase and 400 k€ available for characterization. Potentially unused funds from the selection phase shall be added to the characterization phase funds. Unused funds after closure of the IVAS codec work item shall be refunded to the IVAS codec proponents unless they decide otherwise.

## Working assumptions as of SA4#124 meeting on IVAS fixed-point code and characterization

1. The conversion of IVAS floating-point to fixed-point code and the characterization testing are main tasks of the IVAS codec characterization phase.
2. The conversion of IVAS floating-point to fixed-point code may be done by a third party specialized in this kind of work, in collaboration with the codec proponents.
3. According to the current selection phase planning, IVAS selection will leave about 150 kEuro of the 800 kEuro selection phase budget unused. This amount and any unused funds from IVAS characterization testing may be taken to cover at least parts of the cost for the floating-point to fixed-point code conversion.
4. If the cost for IVAS floating-point code to fixed-point code conversion exceeds the unused funds for IVAS codec testing, the question of how to top up the funds to the required level needs to be solved.

# Revision history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Date** | **Meeting** | **Subject/Comment** | **Old** | **New** |
| 2021-04-14 | SA4#113-e | Agreement of Initial Skeleton including Annex on working assumptions | N/A | 0.1.0 |
| 2022-02-18 | SA4#117-e | Inclusion of draft funding agreement, editor’s note in Annex 1  | 0.1.0 | 0.2.0 |
| 2022-04-12 | SA4#118-e | Revision of funding agreement  | 0.2.0 | 0.3.0 |
| 2022-11-07 | SA4#121 | Inclusion of edits proposed at 3GPPSA4-e (AH) Audio SWG post 120-e telcos and further updates to list of deliverables covering the compliance to Design Constraints (Section 3) | 0.3.0 | 0.3.1 |
| 2022-11-16 | SA4#121 | General updates made during Audio SWG drafting session | 0.3.1 | 0.4.0 |
| 2023-05-24 | SA4#124 | Major revision to reflect updated scheduling of deliverables and post selection deliverables  | 0.4.0 | 0.5.0 |

1. Stefan Bruhn, e-mail: stefan.bruhn@dolby.com [↑](#footnote-ref-1)