**3GPP TSG-SA Meeting # *S4-251025***

**Fukuoka, Japan, 19-23 May 2025 Revision of S4-250924**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network | **x** |

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|  | | | | | | | | | | |
| ***Title:*** | Support of subformats in IVAS RTP payload format | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Orange, Nokia | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | IVAS\_Codec | | | | |  | ***Date:*** | | | 2025-05-13 |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Immersive audio tests specified in TS 26.260 currently assume the possibility to test devices using a specific IVAS subformat (see Table 1: Bitrates per audio format used for testing). IVAS prototype implementations also showed that information in initial codec mode (including subformats) would be helpful for decoder/renderer initialization. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Definition of subformat request (E-byte type), subformat-related media type parameters (declarative indication for decoder initialization and negotiation for device testing). | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The reference client cannot advertise via SDP the envisioned IVAS audio format for testing sending and receiving, audio tests of immersive terminals are incomplete. IVAS implementations cannot benefit from early decoder/renderer initialization. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.3.3.3.3.3.3, A.4.1, A.4.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **x** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **x** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **x** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

CHANGE 1

A.3.3.3.3.3.3 Coded Format Request

An E-byte with ET=001 (Format Request) shall use coded format requests defined as in Figure A.3.3.3.3.3.3-1.

|  |
| --- |
| 0 1 2 3 4 5 6 7  +-+-+-+-+-+-+-+-+ |1|0 0 1|S| FMT | +-+-+-+-+-+-+-+-+ |

Figure A.3.3.3.3.3.3-1: Subsequent E byte structure for coded format request (ET=001)

The contents of this subsequent E byte has following meaning:

S (1 bit): Subformat indication.

If S=0, the coded format request is fully defined in the current E-byte.

If S=1, the FMT field shall be set to ‘111’ and a receiver shall ignore these bits.

Specifically, when S = 0, the FMT bits have the following meaning:

FMT (3 bits): Requested coded format as indicated in Table A.3.3.3.3.3.3-1.

Table A.3.3.3.3.3.3-1: FMT field in a subsequent E byte (when S=0)

|  |  |
| --- | --- |
| FMT | Definition |
| 000 | Stereo |
| 001 | SBA |
| 010 | MASA |
| 011 | ISM |
| 100 | MC |
| 101 | OMASA |
| 110 | OSBA |
| 111 | NO\_REQ |

NOTE: Mono is not included in Table A.3.3.3.3.3.3-1 as mono coding in IVAS is handled by the EVS modes.

When S = 1, the FMT bits have no meaning and an extra byte shall be inserted immediately after the current E-byte to request a subformat (see Figure A.3.3.3.3.3.3-2).

|  |
| --- |
| 0 1 2 3 4 5 6 7  +-+-+-+-+-+-+-+-+ |res| subFMT | +-+-+-+-+-+-+-+-+ |

Figure A.3.3.3.3.3.3-2: Extra byte structure to indicate a subformat request immediately after a coded format request (ET=001)

The contents of this extra byte has following meaning:

subFMT (6 bits): Requested coded subformat as indicated in Table A.3.3.3.3.3.3-2.

res (2 bits): Reserved bits.

Table A.3.3.3.3.3.3-2: subFMT field in the extra byte when S=1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| subFMT | Definition |  | subFMT | Definition |
| 000000 | FOA planar | 100000 | OMASA ISM1 1TC |
| 000001 | HOA2 planar | 100001 | OMASA ISM2 1TC |
| 000010 | HOA3 planar | 100010 | OMASA ISM3 1TC |
| 000011 | FOA | 100011 | OMASA ISM4 1TC |
| 000100 | HOA2 | 100100 | OMASA ISM1 2TC |
| 000101 | HOA3 | 100101 | OMASA ISM2 2TC |
| 000110 | MASA1 | 100110 | OMASA ISM3 2TC |
| 000111 | MASA2 | 100111 | OMASA ISM4 2TC |
| 001000 | ISM1 | 101000 | OSBA ISM1 FOA planar |
| 001001 | ISM2 | 101001 | OSBA ISM2 FOA planar |
| 001010 | ISM3 | 101010 | OSBA ISM3 FOA planar |
| 001011 | ISM4 | 101011 | OSBA ISM4 FOA planar |
| 001100 | ISM1 extended metadata | 101100 | OSBA ISM1 FOA |
| 001101 | ISM2 extended metadata | 101101 | OSBA ISM2 FOA |
| 001110 | ISM3 extended metadata | 101110 | OSBA ISM3 FOA |
| 001111 | ISM4 extended metadata | 101111 | OSBA ISM4 FOA |
| 010000 | MC 5.1 | 110000 | OSBA ISM1 HOA2 planar |
| 010001 | MC 7.1 | 110001 | OSBA ISM2 HOA2 planar |
| 010010 | MC 5.1.2 | 110010 | OSBA ISM3 HOA2 planar |
| 010011 | MC 5.1.4 | 110011 | OSBA ISM4 HOA2 planar |
| 010100 | MC 7.1.4 | 110100 | OSBA ISM1 HOA2 |
| 010101 | Reserved | 110101 | OSBA ISM2 HOA2 |
| 010110 | Reserved | 110110 | OSBA ISM3 HOA2 |
| 010111 | Reserved | 110111 | OSBA ISM4 HOA2 |
| 011000 | Reserved | 111000 | OSBA ISM1 HOA3 planar |
| 011001 | Reserved | 111001 | OSBA ISM2 HOA3 planar |
| 011010 | Reserved | 111010 | OSBA ISM3 HOA3 planar |
| 011011 | Reserved | 111011 | OSBA ISM4 HOA3 planar |
| 011100 | Reserved | 111100 | OSBA ISM1 HOA3 |
| 011101 | Reserved | 111101 | OSBA ISM2 HOA3 |
| 011110 | Reserved |  | 111110 | OSBA ISM3 HOA3 |
| 011111 | Reserved |  | 111111 | OSBA ISM4 HOA3 |

The coded format request indicated in the FMT or subFMT field shall comply with the media type parameters (allowed coded formats for IVAS) that are negotiated for the session. When an FMT or subFMT field is received, requesting a coded format that does not comply with the negotiated media parameters, it shall be ignored.

CHANGE 2

## A.4.1 IVAS Media Type Registration

The media type for the IVAS codec is to be allocated from the standards tree. This clause defines parameters of the IVAS payload format. This media type registration covers real-time transfer via RTP and non-real-time transfers via stored files. All media type parameters defined in this document shall be supported.

Media type name: audio

Media subtype name: IVAS

Required parameters: none

Optional parameters:

The parameters defined below apply to RTP transfer only:

**ptime**: see [32].

**maxptime**: see [32].

**dtx/dtx-recv**: as defined in Annex A of [3].

**max-red**: see [36].

**channels**: The number of audio channels shall not be present.

NOTE: The use of the channels parameter as defined in [35] does not permit signaling all IVAS Immersive mode coded formats; formats need to be derived from the cf/cf-send/cf-recv parameters.

**im-s**: This ivas-mode-switch (ims) parameter defines the mode at the start or update of the session for the direction specified by the session directionality attribute or the suffixPermissible values are 0 and 1. If ivas-mode-switch is 0 or not present, IVAS Immersive mode is used. If ivas-mode-switch is 1, depending on the setting of evs-mode-switch, EVS Primary or AMR-WB IO mode is used The mode initially used in the session may later be modified.

**ims-send/ims-recv**: ims parameter in send or receive direction.

NOTE: The evs-mode-switch parameter only applies to the direction for which the ivas-mode-switch parameter is 1.

**cmr:** As defined in Annex A of [3] for the EVS Primary and AMRWB-IO modes. For IVAS Immersive modes the bit rate, bandwidth and format requests are disabled when cmr is -1. The bitrate, bandwidth and format requests are enabled when cmr is 0 or the cmr parameter is not present. When cmr is 1 the bit rate requests using the initial E byte shall be present in every packet (but may be NO\_REQ); format and bandwidth requests for IVAS Immersive modes are optional when cmr is 1.

The following parameters are applicable only to IVAS Immersive operation:

NOTE: IVAS computational complexity and memory demands of depend on the setting of the following parameters for source codec bit rate, audio bandwidth, and coded format; in addition, factors beyond the signaling, such as complexity of a specific implementation and the (rendered) output format may be significant.

**ibr**: Specifies the range of source codec bitrate for IVAS Immersive mode in the session, in kilobits per second, for the direction specified by the session directionality attribute or the suffix. The ibr parameter can either have: a single bitrate (ibr1); or a hyphen-separated pair of two bitrates (ibr1-ibr2). If a single value is included, this bitrate, ibr1, is used. If a hyphen-separated pair of two bitrates is included, ibr1 and ibr2 are used as the minimum bitrate and the maximum bitrate respectively. ibr1 shall be smaller than ibr2. ibr1 and ibr2 have a value from the set in Table 4.2-2 of the present document. If this parameters is not present and not otherwise specified by ibr-send or ibr-recv, all bitrates consistent with the IVAS codec capabilities are allowed in the session.

**ibr-send/ibr-recv**: ibr parameter in send or receive direction.

**ibw**: Specifies the audio bandwidth for IVAS Immersive modes to be used in the session, for the direction specified by the session directionality attribute or the suffix. ibw has a value from the set: wb, swb, fb, wb-swb, and wb-fb. wb, swb, and fb represent wideband, super-wideband, and fullband respectively, and wb-swb, and wb-fb represent all bandwidths from wideband to super-wideband, and fullband respectively. If this parameter is not present and not otherwise specified by ibw-send or ibw-recv, all bandwidths consistent with the negotiated bitrate(s) are allowed in the session.

**ibw-send/ibw-recv**: ibw parameter in send or receive direction.

**cf**: Specifies the IVAS Immersive mode coded-format (cf) transmitted in the IVAS Immersive mode frames in the session. IVAS coded format corresponds to the format represented in the IVAS Immersive mode coded frames, which is generally the input format to the encoder. The cf parameter is a list of supported comma-separated IVAS Immersive mode coded formats in the order of preference, using the identifiers from Table A.4.1-1 of the present document (column "Identifier"). Selection of the format is application-specific and out of scope of this document. EVS frames in the session are in mono format; switching to mono shall be possible.

Table A.4.1-1: IVAS coded-format

|  |  |  |
| --- | --- | --- |
| Identifier | Full Name | Clause |
| Stereo | Stereo Operation | 4.2.3 |
| SBA | Scene-based Audio (SBA, Ambisonics) Operation | 4.2.4 |
| MASA | Metadata-assisted Spatial Audio (MASA) Operation | 4.2.5 |
| ISM | Objects (Independent Streams with Metadata, ISM) Operation | 4.2.6 |
| MC | Multi-Channel (MC) Operation | 4.2.7 |
| OMASA | Combined Objects and MASA (OMASA) Operation | 4.2.9 |
| OSBA | Combined Objects and SBA (OSBA) Operation | 4.2.8 |

Mono is not listed as an IVAS Immersive mode coded-format as EVS is always supported and shall be used for mono.

Table A.4.1-2: List of coded subformats for all coded formats except Stereo and SR

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Main format | List of allowed subformats | cf-sub values |  | Main format | List of allowed subformats | cf-sub values |
| cf=SBA | FOA planar | FOA\_P | cf=OMASA | OMASA ISM1 1TC | ISM1\_MASA\_1TC |
| HOA2 planar | HOA2\_P | OMASA ISM2 1TC | ISM2\_MASA\_1TC |
| HOA3 planar | HOA3\_P | OMASA ISM3 1TC | ISM3\_MASA\_1TC |
| FOA | FOA | OMASA ISM4 1TC | ISM4\_MASA\_1TC |
| HOA2 | HOA2 | OMASA ISM1 2TC | ISM1\_MASA\_2TC |
| HOA3 | HOA3 | OMASA ISM2 2TC | ISM2\_MASA\_2TC |
| cf=MASA | MASA1 | MASA1 | OMASA ISM3 2TC | ISM3\_MASA\_2TC |
| MASA2 | MASA2 | OMASA ISM4 2TC | ISM4\_MASA\_2TC |
| cf=ISM | ISM1 | ISM1 | cf=OSBA | OSBA ISM1 FOA planar | ISM1\_FOA\_P |
| ISM2 | ISM2 | OSBA ISM2 FOA planar | ISM2\_FOA\_P |
| ISM3 | ISM3 | OSBA ISM3 FOA planar | ISM3\_FOA\_P |
| ISM4 | ISM4 | OSBA ISM4 FOA planar | ISM4\_FOA\_P |
| ISM1 extended metadata | ISM1\_ext | OSBA ISM1 FOA | ISM1\_FOA |
| ISM2 extended metadata | ISM2\_ext | OSBA ISM2 FOA | ISM2\_FOA |
| ISM3 extended metadata | ISM3\_ext | OSBA ISM3 FOA | ISM3\_FOA |
| ISM4 extended metadata | ISM4\_ext | OSBA ISM4 FOA | ISM4\_FOA |
| cf=MC | MC 5.1 | 5\_1 | OSBA ISM1 HOA2 planar | ISM1\_HOA2\_P |
| MC 7.1 | 7\_1 | OSBA ISM2 HOA2 planar | ISM2\_HOA2\_P |
| MC 5.1.2 | 5\_1\_2 | OSBA ISM3 HOA2 planar | ISM3\_HOA2\_P |
| MC 5.1.4 | 5\_1\_4 | OSBA ISM4 HOA2 planar | ISM4\_HOA2\_P |
| MC 7.1.4 | 7\_1\_4 | OSBA ISM1 HOA2 | ISM1\_HOA2 |
|  | | | OSBA ISM2 HOA2 | ISM2\_HOA2 |
| OSBA ISM3 HOA2 | ISM3\_HOA2 |
| OSBA ISM4 HOA2 | ISM4\_HOA2 |
| OSBA ISM1 HOA3 planar | ISM1\_HOA3\_P |
| OSBA ISM2 HOA3 planar | ISM2\_HOA3\_P |
| OSBA ISM3 HOA3 planar | ISM3\_HOA3\_P |
| OSBA ISM4 HOA3 planar | ISM4\_HOA3\_P |
| OSBA ISM1 HOA3 | ISM1\_HOA3 |
| OSBA ISM2 HOA3 | ISM2\_HOA3 |
| OSBA ISM3 HOA3 | ISM3\_HOA3 |
| OSBA ISM4 HOA3 | ISM4\_HOA3 |
| NOTE1: No subformats exist for Stereo and SR.  NOTE2: IVAS payloads are self-contained for all IVAS coded formats except SR and mono, i.e., they require no additional signaling for decoding than the payload size. | | | | | | |

**cf-send/cf-recv**: cf parameter in send or receive direction. If the cf-recv parameter is not present and not otherwise specified by cf, all IVAS coded formats consistent with the negotiated bitrate(s) are allowed in the session in receive direction.

**cf-sub-info**: Specifies the IVAS Immersive mode subformats supported in the send direction for each of the coded formats included in the cf or cf-send parameter. Permissible values of subformats for each coded format are listed in the Table A.4.1-2. The subformats listed in the cf-sub-info parameter restrict the available subformats for requests in clause A.3.3.3.3.3.3.

**ivas-icm**: IVAS initial codec mode (ivas-icm) parameter contains the information required by a media receiver to initialize the decoder, renderer and playout based on the media sender configuration at the start or update of the session. The parameter contains the subformat (according to Table A.4.1-2), bitrate (in kilobits per second) and bandwidth (wb, swb or fb) used at the start of the session in a colon separated list for each coded format listed in the cf parameter. Since Stereo and SR coded formats do not have subformats, the subformat placeholder in the ivas-icm parameter uses ‘Stereo’ and ‘SR’. The ivas-icm parameter list for each coded format is separated with a comma (e.g., sub1:ibr1:ibw1,sub2:ibr2:ibw2). A media receiver may use this information to initialize the media receiver before any audio frame is received, e.g. to decrease the startup latency or to avoid computational complexity peaks. If the parameter is empty or not present, the media receiver cannot assume the behavior of the media sender at the start or update of the session.

**ivas-icm-send/ivas-icm-recv**: ivas-icm parameter in send or receive direction.

NOTE: In case some RTP packets arrive before the SDP offer/answer settles down, the media receiver determines the initialization information based on the audio frames from the RTP stream regardless of the cf or ivas-icm parameters in the SDP.

**pi-types**: Specifies the supported PI data types for the session. The pi-types parameter is a list of supported comma-separated PI data types using the SDP indications listed in tables A.3.5.5-1 and A.3.5.5-2. If the pi-types parameter is not present and not otherwise specified by pi-types-send or pi-types-recv, PI data is not enabled for the session.

**pi-types-send/pi-types-recv**: pi-types parameter in send or receive direction.

**pi-br**: Specifies the maximum peak bitrate for the PI data section (excluding the E-bytes for indication) for each packet in the session in kilobits per second. Bitrate calculation for PI data shall take the packet interval, i.e. value of ptime into account. The parameter indicates the maximum bitrate for the PI data. If pi-br parameter is not present and not otherwise specified by pi-br-send or pi-br-recv, a default value of 0 shall be used.

**pi-br-send/pi-br-recv**: pi-br parameter in send or receive direction.

The following parameters are applicable only to EVS Primary and AMR-WB IO modes:

**evs-mode-switch**: as defined in Annex A of [3]. If ivas-mode-switch is 0 or not present, evs-mode-switch should not be present and shall be ignored.

**hf-only**: as specified in Annex A of [3] except that the default and only allowed value of hf-only shall be 1 in this payload format. As the only allowed value for this parameter is 1 it is not required to include this parameter.

NOTE: There is no compact format support in this payload format, contrary to the EVS payload format in Annex A of [3] that enables the compact format by default.

**ch-send:** Shall not be present. The EVS modes in this payload format shall be mono-only

**ch-recv:** Shall not be present. The EVS modes in this payload format shall be mono-only.

The following parameters are applicable only to EVS Primary modes:

**br**: as defined in Annex A of [3]. If this parameter is not present and the ibr parameter is present, then the limits of the ibr parameter apply also to this parameter if within the allowed range of the br parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**br-send**: as defined in Annex A of [3]. If this parameter is not present and the ibr-send parameter is present, then the limits of the ibr-send parameter apply also to this parameter if within the allowed range of the br-send parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**br-recv**: as defined in Annex A of [3]. If this parameter is not present and the ibr-recv parameter is present, then the limits of the ibr-recv parameter apply also to this parameter if within the allowed range of the br-recv parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**bw**: as defined in Annex A of [3]. If this parameter is not present and the ibw parameter is present, then the limits of the ibw parameter apply also to this parameter if within the allowed range of the bw parameter. Otherwise the default limits as defined in Annex A of [3] apply.

NOTE: Narrow-band is not supported for IVAS operation

**bw-send**: as defined in Annex A of [3]. If this parameter is not present and the ibw-send parameter is present, then the limits of the ibw-send parameter apply also to this parameter if within the allowed range of the ibw-send parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**bw-recv**: as defined in Annex A of [3]. If this parameter is not present and the ibw-recv parameter is present, then the limits of the ibw-recv parameter applies also to this parameter if within the allowed range of the bw-recv parameter. Otherwise the default limits as defined in Annex A of [3] apply.

**ch-aw-recv**: as defined in Annex A of [3]

The following parameters are applicable only to EVS AMR-WB IO modes:

**mode-set**: as defined in Annex A of [3]

**mode-change-period**: see [36].

**mode-change-capability**: as defined in Annex A of [3]

**mode-change-neighbor**: see [36]

## 

CHANGE 3

### A.4.3.1 Offer-Answer Model Considerations

The following considerations apply when using SDP Offer-Answer procedures to negotiate the use of IVAS payload in RTP:

**hf-only**: Shall not be included in the SDP offer. The answerer shall include this parameter only if it is set to 1 in the SDP offer. If the value in the SDP offer is not equal to 1, the payload type shall be rejected.

**ims**: When the ivas-mode-switch (ims) is defined for the send and the receive directions, ims should be used but ims-send and ims-recv may also be used. ims can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ims and ims-send can be interchangeably used. For recvonly session, ims and ims-recv can be interchangeably used. When ims is not offered for a payload type, the answerer may include ims for the payload type in the SDP answer. When ims is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims for the payload type in the SDP answer.

**ims-send**: When ims-send is not offered for a payload type, the answerer may include ims-recv for the payload type in the SDP answer. When ims-send is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims-send for the payload type in the SDP answer.

**ims-recv**: When ims-recv is not offered for a payload type, the answerer may include ims-send for the payload type in the SDP answer. When ims-recv is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove ims-recv for the payload type in the SDP answer.

**cmr**: When cmr is not offered for a payload type, the answerer may include cmr for the payload type in the SDP answer. When cmr is offered for a payload type and the payload type is accepted, the answerer shall not modify or remove cmr for the payload type in the SDP answer.

**ibr**: When the same bitrate or bitrate range is defined for the send and the receive directions, ibr should be used but ibr-send and ibr-recv may also be used. ibr can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ibr and ibr-send can be interchangeably used. For recvonly session, ibr and ibr-recv can be interchangeably used. When ibr is not offered for a payload type, the answerer may include ibr for the payload type in the SDP answer. When ibr is offered for a payload type and the payload type is accepted, the answerer shall include ibr in the SDP answer which shall be identical to or a subset of ibr for the payload type in the SDP offer.

**ibr-send**: When ibr-send is not offered for a payload type, the answerer may include ibr-recv for the payload type in the SDP answer. When ibr-send is offered for a payload type and the payload type is accepted, the answerer shall include ibr-recv in the SDP answer, and the ibr-recv shall be identical to or a subset of ibr-send for the payload type in the SDP offer.

**ibr-recv**: When ibr-recv is not offered for a payload type, the answerer may include ibr-send for the payload type in the SDP answer. When ibr-recv is offered for a payload type and the payload type is accepted, the answerer shall include ibr-send in the SDP answer, and the ibr-send shall be identical to or a subset of ibr-recv for the payload type in the SDP offer.

**ibw**: When the same bandwidth or bandwidth range is defined for the send and the receive directions, ibw should be used but ibw-send and ibw-recv may also be used. ibw can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, ibw and ibw-send can be interchangeably used. For recvonly session, ibw and ibw-recv can be interchangeably used. When ibw is not offered for a payload type, the answerer may include ibw for the payload type in the SDP answer. When ibw is offered for a payload type and the payload type is accepted, the answerer shall include ibw in the SDP answer, which shall be identical to or a subset of ibw for the payload type in the SDP offer.

**ibw-send**: When ibw-send is not offered for a payload type, the answerer may include ibw-recv for the payload type in the SDP answer. When ibw-send is offered for a payload type and the payload is accepted, the answerer shall include ibw-recv in the SDP answer, and the ibw-recv shall be identical to or a subset of ibw-send for the payload type in the SDP offer.

**ibw-recv** When ibw-recv is not offered for a payload type, the answerer may include ibw-send for the payload type in the SDP answer. When ibw-recv is offered for a payload type and the payload is accepted, the answerer shall include ibw-send in the SDP answer, and the ibw-send shall be identical to or a subset of ibw-recv for the payload type in the SDP offer.

**cf**: When the same IVAS Immersive mode coded formats are defined for the send and the receive directions, cf should be used but cf-send and cf-recv may also be used. For sendonly session, cf and cf-send can be interchangeably used. For recvonly session, cf and cf-recv can be interchangeably used.

NOTE: The IVAS codec does not support switching of coded formats (see Table A.4.1-1) without reinitialization. Change of formats would therefore require reinitialization handling for the IVAS codec on application level.

**cf-send**: The SDP offer shall contain the cf-send parameter and list at least one but may list several IVAS Immersive mode coded formats. The SDP answer shall include at least one IVAS Immersive mode coded format in cf-recv or and should respond with the one most preferred coded format from the list in the SDP offer. If more than one format is present in the SDP answer, the first format shall be used at the start of a session and may only be modified by the adaptation mechanisms present in this specification. When cf-send is offered for a payload type and the payload type is accepted, the answerer shall include cf-recv in the SDP answer, and the cf-recv shall be identical to or a subset of the cf-send parameter for the payload type in the SDP offer. If cf-recv is not offered for a payload type, cf-send in the answer may indicate any coded format.

**cf-recv** When cf-recv is offered for a payload type and the payload type is accepted, the answerer shall include cf-send in the SDP answer, and the cf-send shall be identical to or a subset of the cf-recv parameter for the payload type in the SDP offer.

**cf-sub-info**: If present, the parameter lists supported subformats for each coded format in the cf parameter having a defined subformat according to table A.4.1-2 for the session. The cf-sub-info is a declarative parameter, and the parameter is not mirrored in the SDP answer. The media receiver may include their own cf-sub-info in the SDP answer.

**ivas-icm**: If present, the parameter shall list the subformat, bitrate and bandwidth used by the media sender at the start or update of the session in a colon separated list for each coded format in the SDP offer. In case there are multiple coded formats in the SDP offer, the ivas-icm parameter list for each of the coded format is carried as a comma separated list in the same order as the coded formats in the cf parameter (e.g., sub1:ibr1:ibw1,sub2:ibr2:ibw2). The listed parameter values shall comply with the relevant parameters (cf or cf-sub-info, ibr, ibw) in the SDP offer. The ivas-icm parameter list corresponding to only the first coded format listed in the cf parameter in the SDP answer shall be included in the SDP answer. If the SDP answer modifies the bitrate and/or bandwidth range the media receiver may lower the bitrate and/or bandwidth listed in the ivas-icm parameter in the SDP answer. When the same ivas-icm parameter values are defined for the send and the receive directions, ivas-icm should be used but ivas-icm-send and ivas-icm-recv may also be used. For sendonly session, ivas-icm and ivas-icm-send can be interchangeably used. For recvonly session, ivas-icm (or the directional variants) shall not be used.

**ivas-icm-send**: When ivas-icm-send is offered for a payload type and the payload is accepted, the answerer shall include ivas-icm-recv in the SDP answer, and the ivas-icm-recv shall be identical to or a subset of ivas-icm-send for the payload type in the SDP offer with the exception that the listed bitrate and bandwidth values may be lowered.

**ivas-icm-recv**: The ivas-icm-recv parameter shall not be present in the initial SDP offer. The ivas-icm-recv shall be present in the SDP answer only if ivas-icm or ivas-icm-send is present in the initial SDP offer.

**pi-types**: The SDP offer shall list at least one but may list several supported pi types when pi data is enabled in the offer. When one or more of the offered pi types are supported, the SDP answer shall be identical to or a subset of the pi types listed in the SDP offer. When the same pi types are defined for the send and the receive directions, pi-types should be used but pi-types-send and pi-types-recv may also be used. For sendonly session, pi-types and pi-types-send can be interchangeably used. For recvonly session, pi-types and pi-types-recv can be interchangeably used. When none of the offered pi-types is supported, the answerer shall not include pi-types in the SDP answer.

**pi-types-send:** When pi-types-send is offered in the SDP offer and it is accepted, the answerer shall include pi-types-recv in the SDP answer, and the pi-types-recv shall be identical to or a subset of the pi-types-send parameter in the SDP offer.

**pi-types-recv**: When pi-types-recv is offered in the SDP offer and it is accepted, the answerer shall include pi-types-send in the SDP answer, and the pi-types-send shall be identical to or a subset of the pi-types-recv parameter in the SDP offer.

**pi-br**: When the same bitrate is defined for the send and the receive directions, pi-br should be used but pi-br-send and pi-br-recv may also be used. pi-br can be used even if the session is negotiated to be sendonly, recvonly, or inactive. For sendonly session, pi-br and pi-br-send can be interchangeably used. For recvonly session, pi-br and pi-br-recv can be interchangeably used. When pi-br is not offered in the SDP offer, the answerer shall not include pi-br in the SDP answer. When pi-br is offered in the SDP offer and it is accepted, the answerer shall include pi-br in the SDP answer which shall be identical or lower than pi-br in the SDP offer.

**pi-br-send**: When pi-br-send is offered in the SDP offer and it is accepted, the answerer shall include pi-br-recv in the SDP answer, and the pi-br-recv shall be identical or lower than pi-br-send in the SDP offer.

**pi-br-recv**: When pi-br-recv is offered in the SDP offer and it is accepted, the answerer shall include pi-br-send in the SDP answer, and the pi-br-send shall be identical or lower than pi-br-recv in the SDP offer.

The offer-answer considerations for the remaining EVS parameters are as described in TS 26.445 Annex A.3.3.1 [3].

END OF CHANGES