IPMX JPEG XS Video Profile Requirements

Version 1.2 (December 2025)

Published by the Alliance for IP Media Solutions (AIMS)
https://aimsalliance.org
https://ipmx.io

Copyright & Permissions Notice

1. Introduction (Informative)

This document defines the requirements for the **IPMX JPEG-XS Video Profile**, establishing consistent, interoperable behavior across IPMX devices that implement constant bit-rate compressed video using the JPEG-XS codec.

This profile builds upon:

- The IPMX baseline requirements, including NMOS requirements, branding, and certification rules found in the IPMX Product Qualification and Certification Requirements (PQCR) document.
- The relevant VSF TR-10 Technical Recommendations for compressed video and JPEG-XS.

It does not restate those specifications or redefine their behavior. Instead, it:

- References the applicable TR-10 specifications.
- Defines the specific JPEG-XS format combinations required for IPMX compliance.
- Specifies sender and receiver requirements particular to this profile.
- Defines NMOS signaling expectations needed for interoperability.

Where helpful, short informative explanations are included. All uses of shall, should, and may follow RFC 2119 conventions and form the normative portion of the profile.

2. Scope (Normative)

This profile defines:

- The required JPEG-XS compressed video formats for IPMX devices implementing this profile.
- Sender-specific requirements.
- Receiver-specific requirements.
- Optional features that vendors may implement (if any).
- NMOS signaling requirements specific to this profile.

Anything not defined here or in the applicable TR-10 documents is outside this profile's scope.

3. Normative References (Normative)

Devices conforming to this profile shall comply with:

- **VSF TR-10-1:** System Timing and Definitions
- **VSF TR-10-11:** Internet Protocol Media Experience (IPMX) — Constant Bit-Rate Compressed Video
- VSF TR-10-15 Part 1: IPMX JPEG-XS Codec Requirements for Compressed Video
    - VSF TR-10-8: NMOS Requirements, referencing:
- IPMX Product Qualification and Certification Requirements (PQCR): IPMX Baseline Requirements, including NMOS requirements, branding, and certification rules.

This profile does not redefine concepts such as packet pacing, network timing, SDP structures, or Info Blocks already defined elsewhere.

4. Terms and Definitions (Informative)

The terms used in this document are as defined in:

- VSF TR-10-1
- VSF TR-10-11
- VSF TR-10-15 Part 1

This profile introduces no additional terms.

5. General Provisions (Normative)

Parameter	Requirement
Essence Type	JPEG-XS Compressed Video
Codec	JPEG-XS as defined in TR-10-15

Parameter	Requirement
Transport Class	Constant Bit-Rate Compressed Video (TR-10-11)
Required Formats (TX)	At least one of Format A or Format B (defined Section 6.1.1)
Required Formats (RX)	Both Format A and Format B (defined Section 6.2.1)
Minimum Compression Efficiency	≤ 4.0 bits per pixel (bpp), i.e., at minimum the Sublev4bpp sublevel. Support for sublevels above 4 bpp is permitted per TR-10-15 Part 1 §7.1.
Resolution	Undefined / Any (as supported and signaled by the device)
Frame Rate	Undefined / Any (as supported and signaled by the device)

A sender **may** support additional JPEG-XS profiles, color samplings, and bit depths beyond these minimum requirements, as permitted by TR-10-11 and TR-10-15.

6. Profile Format Requirements (Normative)

The media essence for this profile shall be JPEG-XS compressed video as defined in TR-10-11 and TR-10-15.

This profile introduces no additional essence-level constraints beyond those specified below.

6.1 Required Sender Behavior

A device declaring support for this profile as a **sender** shall implement all requirements in this section.

6.1.1 Required Sender Format Combinations

1. The sender shall encode JPEG-XS video in accordance with TR-10-11 and TR-10-15.
2. At minimum, the sender shall support **at least one** of the following format combinations:
    - **Format A — RGB 4:4:4 8-bit**
        - JPEG-XS profile: High444.12
        - Color representation: RGB
        - Sampling: 4:4:4
        - Bit depth: 8-bit per component
    - **Format B — YUV 4:2:2 10-bit**
        - JPEG-XS profile: High444.12
        - Color representation: YUV (YCbCr)
        - Sampling: 4:2:2
        - Bit depth: 10-bit per component

    Note (Informative): While the High444.12 profile designation includes support for up to 12-bit precision, devices conforming to this profile are not required to support 12-bit. The required bit depths are 8-bit for Format A and 10-bit for Format B as specified above.

3. For the purposes of this profile:
    - Resolution is **Undefined / Any**.
    - Frame rate is **Undefined / Any**.

A sender may support additional JPEG-XS profiles, color samplings, and bit depths beyond these minimum requirements, as permitted by TR-10-11 and TR-10-15.

6.1.2 Additional Sender Format Requirements (Bit-Rate & Sublevel)

1. The sender shall comply with the constant bit-rate behavior defined in **TR-10-11 §7**.

2. The sender shall comply with the JPEG-XS profile, sublevel, and encoder configuration requirements of **TR-10-15 Part 1**, including the IPMX JPEG XS Video Profile defined in §8 and the sublevel rules of §7.1.
3. The sender shall support a minimum compression efficiency of 4.0 bits per pixel (bpp) or lower (Sublev4bpp baseline).
4. Support for JPEG-XS sublevels above 4 bpp is permitted per **TR-10-15 Part 1 §7.1**. Where such sublevels are supported, the sender shall signal them consistently using the JPEG-XS Media Info Block defined in **TR-10-15 Part 1 §9** (see §6.1.4) and the SDP object.

6.1.3 Transport & Timing Requirements

1. The sender shall use RTP transport and system timing as defined in TR-10-11 §9 in combination with TR-10-1.
2. All packet pacing, RTP timestamping, and media-clock behavior shall follow TR-10-11 and TR-10-1.

6.1.4 Required Sender Signaling (RTCP, IPMX Info Block, and SDP)

1. The sender shall transmit RTCP Sender Reports containing the IPMX Info Block extension required by **TR-10-1**, populated with the timing information defined therein.
2. The IPMX Info Block transmitted by the sender shall include both Media Info Blocks required for JPEG-XS, in the following order:
    a. The **CBR Compressed Video Media Info Block,** defined in **TR-10-11 §12**, populated with the essence parameters of the active flow, including:
        i. Frame width and height
        ii. Grain rate (frame rate)
        iii. Color sampling
        iv. Component depth
    b. The **JPEG-XS Media Info Block,** defined in **TR-10-15 Part 1 §9**, appended immediately after the CBR Compressed Video Media Info Block, with all required JPEG-XS codestream parameters populated, including:
        v. `transmode` (T)
        vi. `packetmode` (P)
        vii. `Ppih` (encoding profile and level)
        viii. `Plev` (encoding sublevel and, where applicable, fbblevel)
3. Reserved fields in either Media Info Block shall be set to zero by the sender, as specified in **TR-10-11 §12** and **TR-10-15 Part 1 §9** respectively.

4. The sender shall populate the associated SDP fields required by **TR-10-11 §10**, ensuring that SDP, both Media Info Blocks, and the active JPEG-XS stream are consistent in resolution, frame rate, color sampling, bit depth, profile, level, and sublevel.
5. All values reported in the IPMX Info Block shall be consistent with the values registered via NMOS resources (see §7).

   Note: The effective stream sublevel is allowed to be a lower bpp than the stream's media info block.

6.2 Required Receiver Behavior

A device declaring support for this profile as a receiver shall implement all requirements in this section.

6.2.1 Required Receiver Format Combinations

1. The receiver shall decode JPEG-XS video in accordance with TR-10-11 and TR-10-15.
2. The receiver shall support **both** of the following JPEG-XS format combinations:
   - **Format A — RGB 4:4:4 8-bit**
     - JPEG-XS profile: High444.12
     - Color representation: RGB
     - Sampling: 4:4:4
     - Bit depth: 8-bit per component
   - **Format B — YUV 4:2:2 10-bit**
     - JPEG-XS profile: High444.12
     - Color representation: YUV (YCbCr)
     - Sampling: 4:2:2
     - Bit depth: 10-bit per component
3. For the purposes of this profile:
   - Resolution is Undefined / Any.
   - Frame rate is Undefined / Any.

Any JPEG-XS stream conforming to TR-10-11 and TR-15 Part 1 using either Format A or Format B shall be consumable by a receiver that claims conformance with this profile, subject to the receiver's advertised capabilities (e.g., maximum resolution, frame rate).

6.2.2 Additional Receiver Format Requirements

1. The receiver shall comply with the receiver conformance behavior for constant bit-rate compressed video defined in TR-10-11, and with the JPEG-XS profile, sublevel, and decoder configuration requirements of TR-10-15 Part 1, including the IPMX JPEG XS Video Profile defined in §8 and the sublevel rules of §7.1.
2. A receiver may support additional JPEG-XS profiles, color samplings, bit depths, or sublevels beyond those required above; where it does so, these capabilities shall be accurately represented in signaling (TR-10-11 / VSF TR-10-15 Part 1 and NMOS).

6.2.3 Interpretation of Transport & Signaling

Provided a flow that the receiving device is capable of processing, when a receiver receives a stream whose parameters match the receiver's declared capabilities, the receiver determines a match from the combination of SDP, NMOS IS-05 transport parameters, and the Media Info Blocks carried in the IPMX Info Block.

> **NOTE:** Capability sets may not accurately represent the precise combinations of media parameters that the device can support. Therefore, testing is done on a known flow that is known to be compatible with the device.

The receiver shall validate the stream against its capabilities on at least:

1. Resolution
2. Frame (grain) rate
3. Color sampling
4. Component depth
5. JPEG-XS profile, level, and sublevel

> **NOTE:** The method by which the receiver reads or reconciles SDP, NMOS, and the Media Info Blocks is not constrained by this profile.

7. NMOS Representation (Normative)

Devices claiming support for this profile shall model and advertise their JPEG-XS media resources through NMOS in a manner consistent with:

- TR-10-8
- The IPMX PQCR NMOS Baseline Requirements
- The required format combinations defined in Section 6 of this document

Only profile-specific NMOS constraints appear in this section.

7.1 Sender NMOS Representation

A device acting as a sender for this profile shall model its NMOS resources as follows.

7.1.1 Flow Format & Media Type

1. The Flow's format attribute shall be:
    - `urn:x-nmos:format:video`

   The Flow's media type (encoding) shall indicate JPEG-XS, for example:

    - `video/jxsv` as defined in **TR-10-8** and **TR-10-11**.

7.1.2 Transport Requirements

1. Sender resources shall use an RTP-based NMOS transport URN, such as:
    - `urn:x-nmos:transport:rtp` or
    - `urn:x-nmos:transport:rtp.mcast`
      as required by **TR-10-8** and **TR-10-11**.
2. Transport parameters exposed through NMOS (destination address, source port, packetization parameters, etc.) shall match the actual TR-10-11 behavior and SDP.

7.1.3 Sender Capabilities

1. The sender shall expose Sender Capabilities accurately describing which required format combination(s) it supports (Format A, Format B, or both) as defined in Section 6.
2. Capabilities shall use appropriate NMOS Parameter Register identifiers to describe:
    - Frame width / height
    - Grain rate (frame rate)
    - Color sampling
    - Component depth
    - JPEG-XS profile / level / sublevel (where exposed through capabilities).

7.2 Receiver NMOS Representation

A device acting as a receiver for this profile shall model its NMOS resources as follows.

7.2.1 Receiver Format Support

1. Receiver resources shall indicate support for:
    - `urn:x-nmos:format:video`
2. Receiver media type declarations shall indicate support for JPEG-XS (e.g., `video/jxsv`) consistent with TR-10-8 and TR-10-11.

7.2.2 Receiver Capabilities

1. A receiver shall expose Constraint Sets permitting **both** required JPEG-XS format combinations defined in Section 6:
    - High444.12 RGB 4:4:4 8-bit
    - High444.12 YUV 4:2:2 10-bit
2. Constraint Sets shall use NMOS Parameter Register identifiers relevant to JPEG-XS compressed video, TR 10-15 §7.

7.2.3 IS-11 Behavior

1. IS-11 compatibility resources shall describe the receiver's true decoding capabilities for JPEG-XS.
2. IS-11 data shall not restrict or redefine any format combination that is mandatory under Section 6.

7.2.4 Alignment With TR-10-11 Signaling

1. All NMOS properties including width, height, grain rate, color sampling, bit depth, and JPEG-XS-specific transport parameters shall be consistent with:
    - the JPEG-XS Media Info Block, and
    - the SDP signaling required by TR-10-11 and TR-10-15.

7.2.5 EDID-Derived Behavior

If the device exposes EDID or EDID-derived capabilities, it shall follow the EDID-to-Receiver-Capabilities behavior required by **TR-10-8 §7.t**.

8. Optional Features (Normative)

No additional profile-specific optional features are defined for the IPMX JPEG-XS Video Profile in this version of the document.

9. Interoperability Notes (Informative)

This section provides context on how the IPMX JPEG-XS Video Profile relates to ST 2110-22 and other ecosystems. These are not additional requirements.

9.1 Resolution and Frame Rate

This profile intentionally does not define a baseline resolution or frame rate.

Vendors are responsible for:

- Supporting the resolutions and frame rates appropriate to their application domains (e.g., HD, UHD, DCinema, LED walls).
- Signaling these accurately via TR-10-11 and NMOS.

9.2 Relationship to SMPTE ST 2110-22

By relying on TR-10-11 and TR-10-15, this profile is compatible with ST 2110-22-based systems and workflows that support the same JPEG-XS format combinations.

Key points for implementers:

- IPMX receivers that implement this profile can consume ST 2110-22 JPEG-XS streams that match the required format combinations and timing assumptions of TR-10-11 / TR-10-15.

- ST 2110-22 receivers typically expect PTP-synchronous, constant bit-rate JPEG-XS flows. IPMX senders targeting 2110-22 receivers must ensure their clocking, bitrate, and JPEG-XS configuration meet those expectations.
- Many existing ST 2110-22 receivers in broadcast environments primarily support YUV 4:2:2 10-bit video. Support for RGB 4:4:4 8-bit is less common.
    - IPMX senders that implement only Format A (RGB 4:4:4 8-bit) may find limited interoperability with such receivers.
    - Implementers targeting traditional broadcast 2110-22 systems should strongly consider supporting Format B (YUV 4:2:2 10-bit).

Market expectations, interoperability marks (such as CEA/CTA format specifications, UHD Alliance, and similar programs), and the requirements of a vendor's specific vertical are generally better tools for determining which resolutions, frame rates, and color formats to support than any single fixed baseline defined here.

Appendix A: Revision History (Informative)

Version	Date	Summary of Changes
1.2	2025-12-05	Updated normative references for the published VSF TR-10-15 Part 1 (2025-12-16). Restructured §6.1.4 and §6.2.3 to require both Media Info Blocks defined for JPEG-XS — the CBR Compressed Video Media Info Block (type 0x0003, TR-10-11 §12) and the JPEG-XS Media Info Block (type 0x0008, TR-10-15 Part 1 §9) — replacing the prior single-block model. Added explicit Sublev4bpp compression efficiency floor to §5 and §6.1.2, with the >4 bpp extension permitted per TR-10-15 Part 1 §7.1. Added 12-bit clarification note to §6.1.1. Routed all NMOS citations through TR-10-8 and consolidated normative references to remove direct citations to TR-08:2022, ISO/IEC 21122-1, ISO/IEC 21122-2, BCP-006-01, BCP-004-01, BCP-004-02, BCP-005-01, and IS-11 — all now reached transitively via the TR-10 stack. Fixed cross-reference in the §5 General Provisions table.
1.1	2026-01-15	Formatting Update
1.0	2025-12-01	Public Release

Version	Date	Summary of Changes
0.2	11/30	Revised version with new format
0.1	11/19	Initial Draft