ISO/IEC JTC 1/SC 29/WG 1 N101166

107th meeting – Brussels – April 12-18, 2025

ISO/IEC JTC 1/SC 29/WG 1
(ITU-T SG16)

Coding of Still Pictures

JBIG Joint Bi-level Image Experts Group

JPEG Joint Photographic Experts Group

TITLE: Final Call for Proposals on Objective Metrics for JPEG Pleno Quality Assessment – Light Fields

SOURCE: WG 1

PROJECT: JPEG Pleno

STATUS: Approved

REQUESTED ACTION: For distribution

DISTRIBUTION: Public

Contact:
ISO/IEC JTC 1/SC 29/WG 1 Convener – Prof. Touradj Ebrahimi
EPFL/STI/IEL/GR-EB, Station 11, CH-1015 Lausanne, Switzerland
Tel: +41 21 693 2606, Fax: +41 21 693 7600, E-mail: Touradj.Ebrahimi@epfl.ch

Table of contents

ISO/IEC JTC 1/SC 29/WG 1 N101166

107th meeting – Brussels – April 12-18, 2025

Final Call for Proposals on Objective Metrics for JPEG Pleno Quality Assessment – Light Fields

Summary

JPEG Pleno Quality Assessment – Light Fields, which constitutes the seventh part of the JPEG Pleno standard (ISO/IEC 21794), aims to define a framework including both subjective quality assessment protocols and objective quality assessment methods for lossy decoded data of light field modality in the context of multiple use cases. The standard will include two components, one dedicated to subjective quality assessment and another to objective quality assessment related to this call. The standard addressing subjective quality assessment methods for light fields is currently being developed, and it will be published as part of the ISO/IEC 21794-7 standard. The forthcoming quality assessment standard for objective metrics will be integrated as a new edition of this part.

This document contains the Final Call for Proposals (CfP) on Objective Metrics for JPEG Pleno Quality Assessment – Light Fields. The scope of this CfP is to collect objective light field quality assessment methods from proponents to assess the artifacts induced by coding algorithms. The focus is on full-reference methods to quantify the visual fidelity of processed light fields compared to a pristine source light field. Subjectively-annotated light field datasets will support the evaluation of the objective quality assessment proposals.

1. Introduction

The JPEG Pleno standard provides a framework for coding new imaging modalities derived from representations inspired by the plenoptic function. The image modalities addressed by the current standardization activities are light field, holography, and point clouds. Currently, six parts of the standard have been published or are close to being published [1-5], notably:

- Part 1: Framework [1];
- Part 2: Light Field Coding with Amendment 1: Profiles and Levels for JPEG Pleno Light Field Coding System [2-3];
- Part 3: Conformance Testing [4];
- Part 4: Reference Software [5];
- Part 5: Holography [6]
- Part 6: Learning-based Point Cloud Coding [7]

JPEG Pleno Part 1, defines a framework for capturing, representing, and exchanging plenoptic imaging modalities, including point clouds, light fields, and holography, while also offering advanced system-level functionalities and ensuring privacy and ownership protection. Part 2 specifies the light field codestream syntax with two decoding modes: 4D-Prediction, leveraging depth-based warping, and 4D-Transform, using 4D Discrete Cosine Transform (DCT) and hexadecatree decoding. Part 3 establishes a conformance testing methodology to ensure compliance with the JPEG Pleno coding standard. Part 4 provides reference decoder software and a sample encoder for codestreams conforming to Parts 1 and 2. Part 5 is published as the first standard that offers a versatile solution for efficient compression of holograms and Part 6 is the first learning-based standard to support compression for the increasing volume of point cloud data.

In the context of the JPEG Pleno standardization process, various subjective visual quality assessment procedures have been designed and used, although never standardized; thus, significant knowledge has been built up with respect to challenges, good practice guidelines, and methodological aspects.

2. Scope

The scope of JPEG Pleno Quality Assessment – Light Fields is to define a framework for subjective and objective quality assessment methodologies for lossy decoded data of light field modality in the context of multiple use cases.

In this context, this Call for Proposals asks for full-reference objective quality assessment methods to assess artifacts induced by light field coding. The proposed methods shall quantify the perceptual difference/similarity between a source (original, reference) light field and its distorted/processed version. Additionally, submissions shall address compression artifacts, and demonstrate reliability across diverse image content. Subjectively-annotated light field databases will support the evaluation of the objective quality assessment methods in this call.

3. Use cases and requirements

The JPEG Committee has issued a document entitled "Use Cases and Requirements for Light Field Quality Assessment" [8] to assist this standardization effort, defining use cases and requirements to support the development of both subjective and objective light field quality assessment standards.

The use cases refer primarily to static light fields, corresponding to a single time sample, where spatial and angular information of a tri-dimensional scene are simultaneously captured.

4. Evaluation conditions and procedures

The JPEG Committee is inviting proposals to contribute to the standardization process of objective quality assessment technologies for light fields to be included in the JPEG Pleno Quality Assessment – Light Fields standard.

The selection process is based on performance evaluated through the conditions and procedures outlined in the Common Test Conditions (CTC) for JPEG Pleno Quality Assessment – Light Fields [9], and adherence to the General and Objective quality assessment requirements as defined in Sections 3.1 and 3.3 of the document "Use Cases and Requirements for Light Field Quality Assessment" [8]. This section describes the three phases of the standardization process allowing transition from proposals to a standard specification. In this process, the "Common Test Conditions for JPEG Pleno Quality Assessment – Light Fields" [9] plays a major role.

4.1. Proposal phase

- Proposals shall address at least one of the objective quality assessment requirements specified in [8], assessed under the conditions specified in [9]. The proposal shall provide a full-reference evaluation of the perceptual visual quality.
- Proposals are encouraged to include proof-of-concept implementations on relevant platforms.
- Proponents are responsible for running their proposed model on the evaluation dataset and submitting the resulting objective scores for validation.

  The Common Test Conditions for JPEG Pleno Quality Assessment – Light Fields [9] document defines an *example* dataset for proponents and establishes evaluation criteria for objective quality assessment methodologies. After the submission deadline, a final subjectively-annotated *evaluation* dataset will be released to assess the performance of the proposed objective quality assessment methods, by JPEG experts who are not involved in any proposal.
- Proposals adopting a learning-based approach and requiring training and validation material will be accepted under the condition that all materials, parameters and processes used for training and testing the method are described and provided. Furthermore, all training and validation material should also be made available for free use in the posterior standardization process and associated publications. Proponents are allowed to use the example dataset provided by JPEG, as well as any

public light field datasets, for training purposes, provided that the specific training protocol is described in the proposal.

- Proponents are not required to be accredited JPEG experts at the time of submission (open to everyone).

4.2. Evaluation phase

After receiving the proposals, an extensive evaluation will be conducted according to the following basic principles:

- The evaluation shall be open, transparent, fair and unbiased. The subjective scores will be made available to enable a transparent and verifiable evaluation.
- The evaluation shall allow a detailed and deep technical discussion (as possible).
- The evaluation shall be efficient and timely towards the final goal, i.e., working towards the JPEG Pleno Quality Assessment – Light Fields standard.

Following these principles, the evaluation process will be organized as:

1) Proposals may be cross-checked by the JPEG committee under the CTC [9].
2) Proposals are discussed and assessed, requirement by requirement, as detailed in [8] under the conditions defined in [9].
3) Proponents shall present their proposal at the JPEG meeting just after the submission deadline and participate in the discussion.
4) Selection of the initial technology for building the standard is based on consensus. The concept is to build an initial specification that selects and combines the best technology from all proposals with the goal of fulfilling as many of the requirements as possible [8].

Proponents are expected to present their proposals at the 109th JPEG Meeting, in October 2025, and to participate in the following discussions.

4.3. Standardization phase

After the evaluation phase, a collaborative process for standardization will be initiated under the following principles:

- The standard shall be built based on the requirements assessment performed during the evaluation phase and following a defined and agreed strategy.
- Elements from complementary proposals may be combined into a single coherent specification.
- Experiments might be designed and performed to compare specific elements among proposals to support better decisions.
- Proponents, notably with selected elements, are expected to engage with the JPEG committee as part of the development of the standard.

All decisions during the evaluation and standardization phases will be made by consensus in line with ISO processes.

5. Timeline

The following timeline is targeted for the JPEG Pleno Objective Light Field Quality Assessment.

Date	Task
106th WG1 meeting: January 2025	Draft Call for Proposals on Objective Metrics for JPEG Pleno Quality Assessment – Light Fields.
107th WG1 meeting: April 2025	Final Call for Proposals on Objective Metrics for JPEG Pleno Quality Assessment – Light Fields, Updated Use Cases and Requirements for Light Field Quality Assessment, and Final Common Test Conditions for JPEG Pleno Quality Assessment – Light Fields.
June 27th, 2025	Registration of interest (not mandatory).
108th WG1 meeting: July 2025	Status evaluation of the Call for Proposals.
Sep 8th, 2025	**Deadline 1**: Submission of proposals, including the description and a platform-independent executable of the proposed objective quality assessment method.
Sep 23rd, 2025	Release of the evaluation dataset by JPEG (source and coded light fields) and beginning of the preparation for the subjective experiments on the evaluation dataset.
Oct 10th, 2025	**Deadline 2:** Submission, by proponents, of the objective quality scores computed on the evaluation dataset.
109th WG1 meeting: Oct 2025	First presentation of the submissions and their results on the evaluation dataset.
Dec 19th, 2025	Ground-truth subjective scores for the evaluation dataset released by JPEG.
110th WG1 meeting: Jan 2026	Proposals presented, discussed, and subjective and objective results evaluated together with the proponents. Start of the collaborative phase.

The preliminary timeline for the Objective Light Field Quality Assessment standardization process is as follows:

April 2026	Working Draft (WD)
Oct 2026	Committee Draft (CD)
April 2027	Draft International Standard (DIS)
Oct 2027	International Standard (IS)

6. Proposal composition and requirements

This section lists the elements that should be delivered to the JPEG Committee when submitting a proposal answering this CfP. A summary of the timeline for the proponent submission process is given in Section 5.

6.1. Proposal elements

The following elements are required for **Deadline 1**:

[C1] Name of the objective quality assessment method and a summary of the proposal.

[C2] A detailed technical description of the proposal in the form of a text document or presentation slide.

[C3] Requirements compliance table: proponents shall indicate which requirements from [8] their proposal addresses and how they are addressed using the attached “Proposal Delivery” spreadsheet to be provided by JPEG.

[C4] A platform-independent executable of the method. Proponents shall provide the command-line parameters intended to be used for the objective evaluation.

[C5] In the case of learning-based methods, information about the training dataset and process used in the development of the objective method must be provided by the proponents.

The following elements are optional for Deadline 1:

[C6] Supporting evidence for the proposed objective quality assessment method.

[C7] Software implementation (source code) of the objective quality assessment method.

[C8] Any other relevant evidence or literature.

The following elements are required for **Deadline 2**:

[C9] Objective quality scores produced by the proposed method, including individual scores for each decoded light field in the test dataset, as produced by the executable.

[C10] An updated, even more detailed description of the proposal.

[C11] Software implementation (source code) of the objective quality assessment method.

6.2. Proposal registration and delivery

Proposals shall be submitted by the deadline specified in Section 5 and shall contain the elements listed in Section 6.1.

Registration of interest should be done by sending an email that contains a summary of the proposal to the listed contacts in Section 10.

To submit the proposals, a ZIP archive file containing all the proposal elements as listed in Section 6.1 should be: i) registered and uploaded to the ISO document register as an input document to the 109th JPEG meeting; or ii) proponents without access to the ISO registry should provide a ZIP archive file through a link (external) send by email to the listed contacts in Section 10. An acknowledgment of receipt will be sent to the proponents.

6.3. IPR conditions (ISO/IEC Directives)

Proponents are advised that this call is being made in the framework and subject to the common patent policy of ITU-T/ITU-R/ISO/IEC and other established policies of these standardization organizations. The contacts listed in Section 10 can assist potential submitters in identifying the relevant policy information.

6.4. Contribution to standardization

Proponents are informed that based on the submitted proposals, a standard specification will be created. If they submit a proposal and (part of) the proposed technology is accepted for inclusion in the standard, they will hence need to attend subsequent JPEG meetings and contribute to the creation of the various standardization documents. Within this process, evolution and changes are possible as several technologies may be combined to obtain a better performing solution.

7. Free and open source encouragement

Proponents are welcome and encouraged to develop and provide free and open source implementations as well as tools (frontend, backend, test set generation, etc.) to conduct evaluation experiments and data analysis specified in the standard.

8. Royalty-free goal

The royalty-free patent licensing commitments made by contributors to previous standards, e.g. JPEG 2000 Part 1, have arguably been instrumental to their success. JPEG expects that similar commitments would be helpful for the adoption of new standards.

9. Participation

The Ad Hoc Group (AhG) on JPEG Pleno Light Field was established to develop standards in relation to the light field imaging modality. All interested parties are encouraged to register to the email reflector of the AhG (Email reflector: jpeg-lightfield@jpeglists.org).

To subscribe to the email reflector, please visit http://listregistration.jpeg.org; in case of problems, please contact lists@jpeg.org.

10. Contacts

Touradj Ebrahimi (JPEG Convener)
Email: Touradj.Ebrahimi@epfl.ch

Eduardo A. B. da Silva (JPEG Requirements Subgroup Chair)
Email: eduardo@smt.ufrj.br

Peter Schelkens (JPEG Plenoptic Coding and Quality Subgroup Chair)
Email: Peter.Schelkens@vub.be

Carla Pagliari (Ad Hoc Group on JPEG Pleno Light Field Chair)
Email: carla@ime.eb.br

Saeed Mahmoudpour (Ad Hoc Group on JPEG Pleno Light Field Co-Chair)
Email: Saeed.Mahmoudpour@vub.be

References

[1] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 1: Framework.” ISO/IEC 21794-1:2020 (Aug. 2020).

[2] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 2: Light field coding.” ISO/IEC 21794-2:2021 (Apr. 2021).

[3] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 2: Light field coding Amendment 1: Profiles and levels for JPEG Pleno Light Field coding system.” ISO/IEC 21794-2:2021/AMD1:2021 (Aug. 2021).

[4] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 3: Conformance testing.” ISO/IEC 21794-3:2021 (Dec. 2021).

[5] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 4: Reference software.” ISO/IEC 21794-4:2022 (May 2022)

[6] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 5: Holography". ISO/IEC 21794-5 (under publication).

[7] “Information technology — Plenoptic image coding system (JPEG Pleno) — Part 6: Learning-based point cloud coding". ISO/IEC 21794-6 (under development).

[8] "ISO/IEC JTC 1/SC 29/WG 1, "Use Cases and Requirements for Light Field Quality Assessment v6.0", Brussels, N101165, April 2025.

[9] "ISO/IEC JTC 1/SC 29/WG 1, "Common Test Conditions for JPEG Pleno Quality Assessment – Light Fields v2.0", Brussels, N101186, April 2025.