INTERNATIONAL STANDARD

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Information technology — Digital compression and coding of continuous-tone still images: Registration of JPEG profiles, SPIFF profiles, SPIFF tags, SPIFF colour spaces, APPn markers, SPIFF compression types and Registration Authorities (REGAUT)

Technologies de l'information — Compression numérique et codage des images fixes de nature photographique: Enregistrement des profils JPEG, profils SPIFF, «SPIFF tags», espaces de couleur SPIFF, marqueurs APPn, types de compression SPIFF et autorités d'enregistrement (REGAUT)

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO/IEC 10918 may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 10918-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*

Information technology — Digital compression and coding of continuous-tone still images:

— *Part 1: Requirements and guidelines*

— *Part 2: Compliance testing*

— *Part 3: Extensions*

— *Part 4: Registration of JPEG profiles, SPIFF profiles, SPIFF tags, SPIFF colour spaces, APPn markers, SPIFF compression types and Registration Authorities (REGAUT)*

— *Part 5: MHEG subset for base level implementation*

Annexes A to C of this part of ISO/IEC 10918 are for information only.

Please note that the following definitions were omitted in subclause 3.2 “Abbreviations and Acronyms”:

JBIG	Joint Bi-level Image experts Group
JPEG	Joint Photographic Experts Group
PTSMCR	Profiles, Tags, colour Spaces, Markers, Compression type and REGAUT
REGAUT	REGistration AUThority
SPIFF	Still Picture Interchange File Format

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – DIGITAL COMPRESSION AND CODING OF CONTINUOUS-TONE STILL IMAGES: REGISTRATION OF JPEG PROFILES, SPIFF PROFILES, SPIFF TAGS, SPIFF COLOUR SPACES, APPn MARKERS, SPIFF COMPRESSION TYPES AND REGISTRATION AUTHORITIES (REGAUT)

1 Scope

This Recommendation | International Standard provides for the unique registration of JPEG and SPIFF Profiles, SPIFF Tags, SPIFF colour Spaces, application specific Markers, SPIFF Compression types and images Registration authorities as defined in the CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3. Unless otherwise specified, (P)rofiles, (T)ags, colour (S)paces, (M)arkers, (C)ompression types and image (R)egistration authorities will be referred to as PTSMCR items. ISO/IEC JTC 1 SC 29 will delegate to a designated Authority the role to collect, study, approve, register and disseminate the relevant information to allow for the customization of JPEG standard.

The following table gives an overview of the main issues about registration of PTSMCR items.

	Designation	Origin of requests	Qty range	Notes
P	Profile	std. implementers	units	fundamental issue
T	index Tag	application field	tens	various contents (Note 1)
S	colour Space	std implementers	units	technical issue
M	Marker	std implementers	units	restricted use
C	Compression	conceptor	units	standards use
R	REGAUT	institutions	thousands	through National Bodies (Note 2)

NOTE 1 – Tags can create a language problem, and this Recommendation | International Standard stipulates that only the English version of the content can be registered to avoid misunderstanding. The National Bodies should provide translation facilities for registrants in their countries.

NOTE 2 – Due to the large number of potential applicants, the PTSMCR Authority delegates the National Bodies to register new REGAUTs. This disposition solves the language and the legal problems raised from different countries.

2 Normative references

The following Recommendations and International Standards contain provisions which, through references in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendations and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of currently valid ITU-T Recommendations.

2.1 Identical ITU-T Recommendations | International Standards

- CCITT Recommendation T.81 (1992) | ISO/IEC 10918-1:1994, *Information technology – Digital compression and coding of continuous-tone still images: Requirements and guidelines*.
- ITU-T Recommendation T.82 (1993) | ISO/IEC 11544:1993, *Information technology – Coded representation of picture and audio information – Progressive bi-level image compression [plus Technical Corrigendum 1 (1995)]*.

- ITU-T Recommendation T.83 (1994) | ISO/IEC 10918-2:1995, *Information technology – Digital compression and coding of continuous-tone still images: Compliance testing*.
- ITU-T Recommendation T.84 (1996) | ISO/IEC 10918-3:1997, *Information technology – Digital compression and coding of continuous-tone still images: Extensions*.

2.2 Additional references

- ITU-T Recommendation T.85 (1995), *Application profile for Recommendation T.82 – Progressive bi-level image compression (JBIG coding scheme) for facsimile apparatus*.
- ITU-T Recommendation T.87 (1998) | ISO/IEC 14495-1: 1998, *Information technology – Lossless and near-lossless compression of continuous-tone still images – Baseline*.
- ISO 3166-1:1997, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes*.
- ISO 8601:1988, *Data elements and interchange formats – Information interchange – Representation of dates and times*.
- ISO 8859-1:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 1: Latin alphabet No. 1*.
- ISO 8859-2:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 2: Latin alphabet No. 2*.
- ISO 8859-3:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 3: Latin alphabet No. 3*.
- ISO 8859-4:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 4: Latin alphabet No. 4*.
- ISO 8859-5:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 5: Latin/Cyrillic alphabet*.
- ISO 8859-6:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 6: Latin/Arabic alphabet*.
- ISO 8859-7:1987, *Information processing – 8-bit single-byte coded graphic character sets – Part 7: Latin/Greek alphabet*.
- ISO 8859-8:1988, *Information processing – 8-bit single-byte coded graphic character sets – Part 8: Latin/Hebrew alphabet*.
- ISO/IEC 8859-9:1989, *Information processing – 8-bit single-byte coded graphic character sets – Part 9: Latin alphabet No. 5*.
- ISO/IEC 8859-10:1992, *Information technology – 8-bit single-byte coded graphic character sets – Part 10: Latin alphabet No. 6*.
- ISO/IEC 10646-1:1993, *Information technology – Universal Multiple-Octet Coded Character Set (UCS) – Part 1: Architecture and Basic Multilingual Plane*.
- CIE 1976 (L* a* b*) space, *CIE Publication No. 15.2, Colorimetry, 2nd Ed. (1986)*.

3 Definitions, abbreviations, and symbols

3.1 Definitions

In addition to the definitions used in CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3, the following definitions used in this Recommendation | International Standard are listed below.

3.1.1 License Plate (LP): A unique identifier, appearing in the SPIFF directory, delivered by a REGAUT in compliance with ITU-T Rec. T.84 | ISO/IEC 10918-3 containing COPIR_ID, REGCON, REGAUT and REGID. The length is 8 + 64 bits.

3.1.2 PROFILE: A specific set of capabilities, parameter values or ranges, and optionally file format. A specific implementation of the encoding processes in CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3.

3.1.3 PTSMCR Authority: ISO/IEC JTC1/SC29/WG1 or its delegate is the PTSMCR Authority.

3.1.4 PTSMCR Registration: Official unique listing of a profile, tag, colour space, marker, compression type, or image Registration Authorities (REGAUT).

3.1.5 Joint Bi-level Image experts Group (JBIG): The joint ISO/ITU committee responsible for developing standards for bi-level image coding. It also refers to the standard produced by this committee: ITU-T Rec. T.82 | ISO/IEC 11544.

3.1.6 Joint Photographic Experts Group (JPEG): The joint ISO/ITU committee responsible for developing standards for continuous tone still picture coding. It also refers to the standards produced by this committee: CCITT Rec. T.81 | ISO/IEC 10918-1, ITU-T T.83 | ISO/IEC 10918-2, and ITU-T Rec. T.84 | ISO/IEC 10918-3.

3.1.7 REGistration AUThority (REGAUT): An identifier specifying a particular registration authority as designated by ISO/IEC JTC1/SC29.

3.1.8 Still Picture Interchange File Format (SPIFF): A file format defined by ITU-T Rec. T.84 | ISO/IEC 10918-3 intended for use by a wide variety of applications to exchange still pictures.

3.2 Abbreviations and acronyms

For the purposes of this Recommendation | International Standard, the following abbreviations apply.

3.3 Symbols

For a listing of symbols used in this Recommendation | International Standard see CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3.

4 General

This Specification provides for the unique registration of JPEG and SPIFF profiles, SPIFF tags, SPIFF colour spaces, SPIFF compression types, image registration authorities, and application specific markers found in the CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3. Unless otherwise specified, (P)rofiles, (T)ags, colour (S)paces, (M)arkers, (C)ompression type, and (R)egistration Authorities (REGAUT) will be referred to as PTSMCR items. A registration authority, hereafter referred to as the PTSMCR Authority, shall collect all approved markers and disseminate this information to allow for the customization of JPEG.

Registration of JPEG and SPIFF profiles and APPn markers gives implementers the ability to document the capabilities and requirements of their JPEG and SPIFF implementations. The PTSMCR authority serves as a repository of this information which may be queried by implementers to ensure interoperability. Registration of SPIFF tags, SPIFF colour spaces and SPIFF compression types allows for the extension of SPIFF capabilities without requiring that new standards be written. Image registration authorities provide producers of digital imagery unique identifiers to be inserted inside image files for legal protection of content. Any institution which servers as an image registration authority must empowered to do so by the PTSMCR Authority via the registration process.

4.1 JPEG and SPIFF profiles (see ITU-T Rec. T.84 | ISO/IEC 10918-3, F.2.1)

Profiles shall define a specific set of capabilities and parameter values or ranges that are a subset of the JPEG standard. A profile specifies the exact value, a range of values or an excluded status for every marker allowed in JPEG parts 1 and 3. For example, a JPEG profile could require restart markers, at certain intervals in the image, whereas the basic standard provides that markers are optional.

These profiles may be assigned a SPIFF profile ID number (see the SPIFF file header syntax). There is a number reserved for profiles that have not yet been registered and a number reserved to indicate that a profile number is defined in a special tag. A profile ID number of 254 (X'FE') is reserved for use in unregistered profiles. This profile ID may be used provisionally while an applicant awaits assignment of a permanent profile ID from the PTSMCR Authority. The profile ID number 255 (X'FF') is reserved for future use and shall indicate that the profile ID number follows in a special tag.

A profile is not intended to replace the normal signalling in a JPEG data stream. All necessary tags must still be present even though they are redundant to a decoder that comprehends the profile.

NOTE – Signalling a profile shall be done either in the SPIFF header or in a separately registered APPn marker.

4.1.1 Purpose of a profile

Profiles define conforming subsets or combinations of the specific markers and tags used to provide particular JPEG functionality. The choice of options and ranges should be restricted so as to maximize the probability of achieving the objective of the profile. A profile can also describe file format or non-JPEG functionality (e.g. colour spaces).

4.1.2 Criteria for acceptance of a profile

A proposed new profile shall meet the following criteria:

- Unique – It shall not duplicate a profile already defined.
- Valid – It shall be a valid instantiation of the JPEG standard or SPIFF format.
- Correct submission – It shall be a syntactically correct submission that includes appropriate explanations of purpose.
- Utility – It shall demonstrate utility to the user.

Given these criteria are met, the profile shall be accepted.

4.1.3 Contents of the submission

The profile description shall include a normative section and an informative section. The normative section contains information necessary to properly decode the data file. This section can point to other standards or describe, in detail, application specific information necessary to understand the file. The normative section defines which markers and tags are required, excluded, or allowed. For each tag that is required or allowed, the value, set of values, and/or range of values is specified for each parameter. This section can also specify a file structure.

When a profile registrant contacts the PTSMCR Authority, they will be required to complete two sets of tables. The first set (three tables) describe which JPEG markers and SPIFF tags are required, allowed, or excluded in the profile. An example of the use of these tables is given in B.1. The second set of tables consist of the marker and tag tables from CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3.

The submission must also include an informative section that describes why this profile is important, what it is used for, and how to optimally use it. This may include special processing used by the applications of the profile that is not described in the JPEG standard. Pre- and post-processing of the compressed image that improves quality is an example of informative information. The informative section could also suggest file format, a particular parameterization, pre and post-processing, etc. Note that a new informative section can be registered to an existing profile.

An example of a JPEG profile is supplied in Annex B. This profile is included for informative purposes and illustrates the level of detail that may be contained in a profile.

4.1.4 Normative section

The normative section of a profile consists of two parts: marker and tag usage, and parameter specification. Additionally a file structure specification may be included.

4.1.4.1 Marker and tag usage

Tables A.1 to A.3 provide a format for registrants to specify marker and tag usage. Each marker and tag is listed. The registrant indicates whether a marker or tag is "required" (req.), "capable" (cap.), or "excluded" (exc.) A marker or tag that is "required" must be used with the proper parameterization in the file. A marker or tag that is "capable" may or may not be used in the file and a profile compliant application must be able to decode a stream with this marker or tag. If it is used it must have the proper parameterization. A marker or tag that is "excluded" shall not be used in the file.

4.1.4.2 Parameterization

Each marker that is "required" or "capable" in a profile must be parameterized according to its table as described in CCITT Rec. T.81 | ISO/IEC 10918-1 and ITU-T Rec. T.84 | ISO/IEC 10918-3. These tables allow the registrant to specify a single value, a set of values, a range of values, or sets of ranges of values allowed for each parameter. These values could be the full range allowed by the standard.

4.1.4.3 File structure

A description of file structure (i.e. placement of APPn markers and RSTn markers within the encoded file) should be complete with all variants described. The file structure descriptions of SPIFF in ITU-T Rec. T.84 | ISO/IEC 10918-3 provide a good example.

4.2 SPIFF tags (see ITU-T Rec. T.84 | ISO/IEC 10918-3, F.2.2)

New SPIFF tags shall be defined and registered for any purpose as long as they conform to the directory syntax of SPIFF. Note that these tags can only be used in a SPIFF directory. Such a tag would allow the addition of metadata or image information to the file format. The ETAG value X'00E00000' is reserved for unregistered tag usage. This value shall be used provisionally while an applicant awaits assignment of a permanent ETAG from the PTSMCR Authority.

4.2.1 Purpose of a SPIFF tag

In order to make SPIFF as flexible as possible, a provision has been made to allow specific applications to add information to a SPIFF conformant file that could not be described using the tag values defined in the ITU-T Rec. T.84 | ISO/IEC 10918-3. It should be noted, however, that such use is application specific and other applications may not recognize these entries. Unrecognized application specific tags should be ignored. However, many implementations can take advantage of registered tags.

4.2.2 Criteria

A proposed new SPIFF tag must meet the following criteria:

- Unique – It must not duplicate the function of another existing tag.
- Correct submission – The syntactically correct submission along with all appropriate explanations of purpose must be submitted.
- Utility – The SPIFF tag should demonstrate utility to the user.

Given these criteria are met, the tag will be accepted.

4.2.3 Contents of the submission

The submission must include a normative section that conforms to the syntax of ITU-T Rec. T.84 | ISO/IEC 10918-3, F.2.2. It must include a description of the parameters and the sizes of the parameters. The PTSMCR Authority assigns the ETAG parameter.

The submission must include an informative section that describes the reason for this tag. It should also explain and demonstrate proper usage of the tag.

4.3 SPIFF colour space (see ITU-T Rec. T.84 | ISO/IEC 10918-3, F.2.1.1)

A number of colour spaces are defined in the SPIFF file header. As this list does not contain all possible colour spaces, there is a facility for registering new ones. This Specification allows a broad interpretation of the term "colour space." For example, it could include multi-band description, or it could simply describe the character of the bands. A colour space number of 254 (X'FE') is reserved for use in unregistered colour spaces. This value may be used provisionally while an applicant awaits assignment of a permanent colour space number from the PTSMCR Authority. The colour space number 255 (X'FF') is reserved for future use and shall indicate that the colour space number follows in a special tag.

4.3.1 Purpose of a SPIFF colour space

In order to make the colour space conversion as flexible as possible, a provision has been made that allows specific applications to add information to a SPIFF colour space conversion that could not be described using the tag values defined in the ITU-T Rec. T.84 | ISO/IEC 10918-3. It should be noted, however, that such use is application specific and other applications may not recognize these colour spaces. Unrecognized application specific colour spaces should be ignored.

NOTE – This is a parameter in a SPIFF header.

4.3.2 Criteria

A proposed new SPIFF colour space must meet the following criteria:

- Unique – It must not duplicate a colour space already defined.
- Correct submission – The syntactically and technically correct submission along with all appropriate explanations of purpose must be submitted.
- Utility – The SPIFF colour space should demonstrate utility to the user.

Given these criteria are met, the SPIFF colour space will be accepted.

4.3.3 Contents of the submission

The submission should include a normative section or reference, if possible, that defines a colour space or defines an exact relation to another colour space.

The submission must also include an informative section that describes the reason for this colour space. It should also explain and demonstrate proper usage of this colour space.

Note that although the term colour space is used throughout, this identification number can designate any multi-component decorrelation or pre-processing. It could also indicate band types, such as indexed colour.

4.4 APPn marker (see CCITT Rec. T.81 | ISO/IEC 10918-1, B.2.4.6)

This Specification allows for the unique registration and promulgation of the APPn markers as defined in CCITT Rec. T.81 | ISO/IEC 10918-1. These markers were originally "reserved for application use." Since these segments could be defined differently in different applications, the previous standard recommended (but did not require) that these markers be removed for interchange. This Recommendation | International Standard offers the user a method of registering an APPn marker so that it can be understood by another application.

4.4.1 Purpose of an APPn marker

In order to make the JPEG file format as flexible as possible, a provision has been made that allows specific applications to add information to an application marker. It should be noted, however, that such use is application specific and other applications may not recognize these entries. Unrecognized application specific tags should be ignored. However, many implementations can take advantage of registered markers.

APPn markers can be used to signal anything that the registrant desires. However, understanding the marker should not be fundamental to decoding the image. This allows enhanced or expanded capabilities to be implemented without rendering useless a JPEG implementation that already conforms to the standard. More precisely, the use of an APPn marker shall not prevent the expansion of the coded image when the marker is not recognized by a given implementation. The utility of the resulting image, however, may be limited by failure to recognize an APPn marker.

4.4.2 Criteria

A proposed new APPn marker must meet the following criteria:

- Unique – It must not duplicate the null terminate identification string of another APPn marker (with the same n value).
- Correct submission – The syntactically and technically correct submission along with all appropriate explanations of purpose must be submitted.
- Utility – The APPn marker should demonstrate utility to the user.

Given these criteria are met, the APPn marker will be accepted.

4.4.3 Contents of the submission

The submission must include a normative section that specifies the value of n and a unique null terminated string for identification. Figure 4-1 shows the syntax of the marker. Also, the character and syntax of the information, if any, after the identification string must be specified.

The submission must also include an informative section that describes the reason for this tag. It should also explain and demonstrate proper usage of the tag. APPn markers can be used for anything. (Note that the APP_8 marker is specific to SPIFF and will not be assigned to another tag).