

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2018/012589

International filing date (day/month/year)
05.01.2018

Priority date (day/month/year)
06.01.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04N19/122 H04N19/126 H04N19/176 H04N19/186 H04N19/42 H04N19/70

Applicant
QUALCOMM INCORPORATED

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0
Fax: +49 89 2399 - 4465


Date of completion of this opinion

see form PCT/ISA/210

Authorized Officer

Lombardi, Giancarlo

Telephone No. +49 89 2399-0



Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-40</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-40</u>
Industrial applicability (IA)	Yes: Claims	<u>1-40</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

- D1 F. Le L?annec ET AL: "Asymmetric Coding Units in QTBT",
4. JVET MEETING; 15-10-2016 - 21-10-2016; CHENGDU; (THE JOINT
VIDEO EXPLORATION TEAM OF ISO/IEC JTC1/SC29/WG11 AND ITU-
T SG.16); URL: HTTP://PHENIX.INT-EVRY.FR/JVET/, JEVT-D0064r1,
10 October 2016 (2016-10-10), pages 1-10, XP055417365,
Chengdu,CN; Retrieved from the Internet:
URL:file:///C:/data-heising/MPEG/JEVT_D0064_10Oct17.pdf
[retrieved on 2017-10-19];
- D2 John C. Russ ET AL: "Introduction to Image Processing and Analysis",
31 October 2007 (2007-10-31), CRC Press, Boca Raton, FL, USA,
XP055462417, ISBN: 978-0-8493-7073-1, pages 133-142;
- D3 MADHUKAR BUDAGAVI ET AL: "Core Transform Design in the High
Efficiency Video Coding (HEVC) Standard", IEEE JOURNAL OF
SELECTED TOPICS IN SIGNAL PROCESSING, vol. 7, no. 6,
1 December 2013 (2013-12-01), pages 1029-1041, XP055200337,
ISSN: 1932-4553, DOI: 10.1109/JSTSP.2013.2270429.

1 The present application does not meet the criteria of Article 33(3) PCT,
because the subject-matter of claims 1,10,18,28,38-40, does not involve an
inventive step.

1.1 Document D1 is regarded as being the prior art closest to the subject-matter
of claim 10, and discloses a method of encoding video data (*page 1,*
paragraph 1: a HEVC base coder, according to the HEVC specification
10/2014, cf. reference [2], shown on page 9, paragraph 6), the method
comprising:

receiving a block of video data (*feature of HEVC based coding*);
predicting the block of video data to create residual video data (*feature*
of HEVC based coding);
determining a transform for the residual video data, wherein the
transform has a size S that is not a power of two (*said paragraph 1: the*

coding units may have sizes $3 \cdot 2^n$, thus not a power of two; indeed, according to Re Item VIII below, this feature is understood in the sense that the block of residual data is to be transformed and has a size S being not a power of two);
~~rounding S to a power of two creating a transform with a modified size S' ;~~
~~applying the transform with the modified size S' to the residual video data to create transform coefficients (feature of HEVC based coding);~~
and
encoding the transform coefficients in an encoded video bitstream
(feature of HEVC based coding).

1.2 The subject-matter of claim 10 therefore differs from this known method in the additional feature that S is rounded to a power of two creating a transform with a modified size S' , applied to the residual video data.

1.2.1 The problem to be solved by the present invention may therefore be regarded as the well-known problem of simplifying the transform operation.

1.3 The solution proposed in claim 10 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT), because said additional feature constitutes basic common general knowledge in image processing, shown e.g. in document D2 (*Figure 3.4 and text above it, paragraph bridging the two pages and 2nd typographic paragraph: the modified size is a power of 2 to be able to apply the simple well-known FFT based algorithm*).

Therefore, the subject-matter of claim 10 does not involve an inventive step.

1.4 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent claims 1, 18, 28, 38-40, which therefore is also considered not inventive (Article 33(3) PCT).

Indeed, with specific reference to the claims referring to decoding, they comprise steps or means, which are the perfect inversion of the corresponding ones which are comprised in the claims referring to coding.

Therefore, the skilled person would straightforwardly derive their subject-matter from the teaching provided by the prior art disclosed by document D1 in combination with common general knowledge, as explained above.

- 1.5 Dependent claims 2-9,10-17,19-27,29-37 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step (Article 33(3) PCT), as follows.

Claims 2-8,11-17,19-25,29-35

The features added over the claims they depend on are features of HEVC, disclosed in document D1 (*passages cited above*) or rendered obvious therein.

Claims 9,26

According to the interpretation provided in Re Item VIII below, the features added over the claims they depend on are derived in an obvious manner from well-known features of HEVC, shown in an exemplar manner in document D3 (*pages 1033-1034, paragraph II.F*).

Indeed, as clear from the bullets in said paragraph II.F, the scale factors (corresponding to the claimed shifts) for the forward transform are construed in HEVC as depending on the transform size, with a formulation such that the corresponding ones for the inverse transform are not dependent on it.

A complementary implementation, wherein the dependency of the scale factors on the transform size is transferred to the inverse transform, thus making the forward transform scale factors independent on such size, is a matter of design measure. Indeed, as shown in document D3, the full forward transform-inverse transform chain is designed to be as linear as possible, so that scale factors may be moved along this chain according to necessities.

Claims 27,36

The features added over the claims they depend on are standard design options.

Re Item VIII

Certain observations on the international application

- 1 The requirements of clarity (Article 6 PCT) are not met for the following reasons.

- 1.1 In the independent claims 1,10,18,28,37-40, steps or means are included, wherein it is determined a transform for a block of video data, wherein the transform has a size S that is not a power of two, and, further, S is rounded to a power of two creating a transform (or an inverse transform, respectively) with a modified size S' to be applied to the block of video data.

Given that the transform (or its inverse) applied to the block of video data, it is technically unclear why a transform with a size not a power of two must be determined for the block of video data, if it is not indeed applied to the block of video data.

The relevant part of the description for the claims 1-40 on file is constituted by paragraphs [0135]-[0140]. It appears that, in presence of blocks having at least one dimension not equal to a power of 2, a transform of size equal to the power of 2 closest to said dimension is applied to video data block.

Therefore, from the description, it may be understood that it is determined that the size of the block to be transformed may not be expressed in terms of a power of two and that, therefore, a transform of size equal to the power of 2 closest to said size is determined and applied to video data block.

Said independent claims are interpreted for the purpose of the present opinion accordingly.

- 1.2 In claims 4,13,21,31, it is added the feature that the video data block has a non-square shape.

That makes unclear the wording "size" in the corresponding independent claims 1,10,18,28. However, the size must be then understood as a vector with two elements and said claims may be interpreted accordingly.

- 1.3 In claims 9,26, the wording "shift values" is undefined and the dependency claimed on S' is vague.

In the light of the description, paragraphs [0140],[0145], said claims must be interpreted in the sense that the $\log_2 S'$ dependency is removed from the forward transform values in paragraph [0139], equations (2)',(3)', and included in the inverse transform values, according to equations (4)",(5)" in paragraph [0145].