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Paper 40
Entered: May 25, 2018

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DELL INC., EMC CORPORATION, HEWLETT-PACKARD ENTERPRISE CO., HP ENTERPRISE SERVICES, LLC, TERADATA OPERATIONS, INC., and VERITAS TECHNOLOGIES, LLC,
Petitioners,[1]

v.

REALTIME DATA LLC,
Patent Owner.

Case IPR2017-00179
Case IPR2017-00808[2]
Case IPR2017-01690[3]
Patent 9,054,728 B2

Before JASON J. CHUNG, SCOTT C. MOORE, and KAMRAN JIVANI, *Administrative Patent Judges.*

MOORE, *Administrative Patent Judge.*

FINAL WRITTEN DECISION
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

[1] The Petitioners in the three cases covered by this Decision have been identified in this consolidated manner for the purpose of brevity.
[2] Case IPR2017-00808 was consolidated with Case IPR2017-00179.
[3] Case IPR2017-01690 was joined with Case IPR2017-00179.

I. INTRODUCTION

On November 14, 2016, Dell Inc., EMC Corporation, Hewlett-Packard Enterprise Co., and HP Enterprise Services, LLC filed a Petition (IPR2017-00179, Paper 1, "the '179 Petition" or "'179 Pet.") to institute an *inter partes* review of claims 1–10, 15, 20, and 24 of U.S. Patent No. 9,054,728 B2 (IPR2017-00179, Ex. 1001, "the '728 patent"). The Petition was accompanied by a supporting declaration from Charles D. Creusere, Ph.D. IPR2017-00179, Ex. 1002 ("the '179 Creusere Decl.") Realtime Data LLC ("Patent Owner") filed a Preliminary Response on March 1, 2017. IPR2017-00179, Paper 14. On May 30, 2017, we instituted an *inter partes* review as to all challenged claims. IPR2017-00179, Paper 20 ("the '179 Institution Decision" or "'179 Inst. Dec.").

On January 30, 2017, Teradata Operations, Inc. filed a Petition (IPR2017-00808, Paper 1, "the '808 Petition" or "'808 Pet.") to institute an *inter partes* review of claims 1–3, 9, 10, 15, 20, and 24, of the '728 patent. This Petition was accompanied by a supporting declaration from Charles D. Creusere, Ph.D. (IPR2017-00808, Ex. 1002, "the '808 Creusere Decl."). Patent Owner Realtime Data LLC filed a Preliminary Response on May 22, 2017. IPR2017-00808, Paper 13. On August 14, 2017, we instituted an *inter partes* review as to all challenged claims. IPR2017-00808, Paper 16 ("the '808 Institution Decision" or "'808 Inst. Dec.").

On September 8, 2017, we entered an order consolidating and coordinating IPR2017-00808 ("the '808 IPR") with IPR2017-00179 ("the '179 IPR"). '808 IPR, Paper 18 ("Consolidation Order"). The Consolidation Order provided that the '179 and '808 IPRs would proceed on the same schedule, that Patent Owner would file one common Patent Owner

Response in both proceedings, that Petitioners would file one common Reply for both proceedings, that the parties would file copies of all exhibits in both proceedings, and that the August 4, 2017 Deposition of Dr. Creusere and any future depositions would be treated as having been taken in both proceedings. Consolidation Order 4–5. Accordingly, when this Decision cites to non-identical papers or exhibits that were filed in these proceedings before the Consolidation Order (e.g., the separate Petitions and Creusere Declarations), the citation will specify both the ’179 IPR and the ’808 IPR proceedings and the paper or exhibit numbers. When this Decision cites to papers or exhibits that are common to both proceedings (e.g., the ’728 patent, the relevant prior art references, Creusere Deposition Transcript, and papers and exhibits filed after the Consolidation Order), the citation will specify a paper or exhibit number without identifying a specific proceeding. Such citations refer to the copies of the common papers or exhibits that were filed in the’179 IPR.

On June 28, 2017, Veritas Technologies LLC (“Veritas”) filed a third Petition. *See* IPR2017-01690 (“the ’1690 IPR”), Paper 1, 1 (“the ’1690 Petition” or “’1690 Pet.”). The ’1690 Petition was substantively identical to the ’179 Petition and was accompanied by a Motion asking that Veritas be joined as a party to the ’179 IPR. ’1690 IPR, Paper 2. Patent Owner Realtime Data LLC did not file a Preliminary Response.

On December 15, 2017, we granted Veritas’ Motion for Joinder, ordering that Veritas be joined as a petitioner in the ’179 IPR, that the grounds of unpatentability asserted in IPR2017-00179 remain unchanged, that all future filings be made in the ’179 IPR, and that the ’1690 IPR be terminated as a separate proceeding. ’1690 IPR, Paper 11, 8. Therefore, the filings and evidence in the ’179 IPR govern the claims raised by Veritas in IPR2017-01690, and this Decision does not cite separately to filings or evidence in the ’1690 IPR.

On September 22, 2017, Patent Owner filed its Response (Paper 31, “Patent Owner Response” or “PO Resp.”), which was accompanied by a supporting declaration from Kenneth A. Zeger, Ph.D (Ex. 2004, “Zeger Decl.”). Petitioners[4] filed their Reply on December 6, 2017. Paper 34 (“Reply”).

An oral hearing took place on February 20, 2018, and a transcript of the oral hearing is included in the record. Paper 38 (“Hearing Tr.”). On May 15, 2018, the Board issued an order pursuant to the parties’ written consent modifying the Institution Decisions in the ’179 IPR, ’808 IPR, and ’1690 IPR, so that those decisions institute review of all challenged claims on all grounds presented in the corresponding petitions. Paper 39 (citing Exs. 3001–3006). By consent of the parties, this Decision addresses all claims and all grounds raised in the petitions. *See id.*

We have jurisdiction over this dispute under 35 U.S.C. § 6. This Final Written Decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons discussed below, Petitioners have not shown by a preponderance of the evidence that any claim of the ’728 patent is unpatentable.

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[4] The term “Petitioners,” as used in the remainder of this Decision, encompasses Dell Inc., EMC Corporation, Hewlett-Packard Enterprise Co., HP Enterprise Services, LLC, Teradata Operations, Inc., and Veritas Technologies LLC.

II. BACKGROUND

A. Related Proceedings

The ’728 patent was challenged in IPR2017-00108 (terminated Apr. 11, 2017 (*see* IPR2017-00108, Paper 17)) and IPR2017-01354 (institution denied on Nov. 13, 2017 (*see* IPR2017-01354, Paper 16)).

The ’728 patent claims priority to or through the applications that issued as U.S. Patent Nos. 8,643,513 B2 and 7,161,506 B2. *See* Pet. 4. These two related patents are the subject of several *inter partes* review proceedings. *See* Paper 25, 1–3.

The Parties indicate that the ’728 patent is the subject of multiple lawsuits pending in several U.S. District Courts. ’179 Pet. 3–4; ’179 IPR, Paper 25, 5–8; ’808 Pet. 3–4; ’808 IPR, Paper 24, 5–9; ’1690 Pet. 2–4; ’1690 IPR, Paper 6, 5–8.

B. The ’728 Patent

The ’728 patent, titled “Data Compression Systems and Methods,” discloses systems and methods for analyzing data within a data block in order to select a method of compression to apply to the data. Ex. 1001, Title, Abst. The disclosed systems and methods provide “fast and efficient data compression using a combination of content independent data compression and content dependent data compression.” *Id.* at 3:59–62.

One embodiment disclosed in the ’728 patent is illustrated in Figures 13A and 13B. Figure 13A is reproduced below.

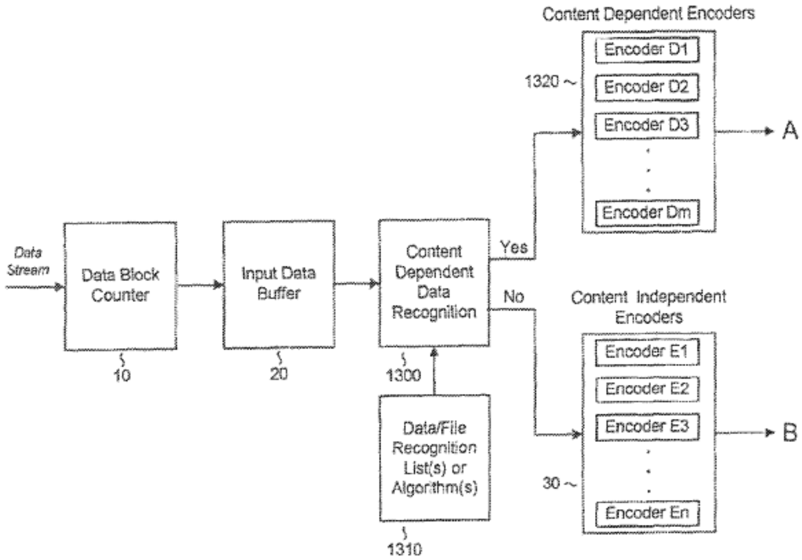


FIGURE 13A

Figure 13A, above, depicts a data compression system that employs both content independent and content dependent compression. Ex. 1001, 15:63–67. The system receives an input data stream of data blocks. *Id.* at 15:63–16:3. Content dependent data recognition module 1300 analyzes the incoming data stream to recognize "data types" and/or other parameters indicative of the "data type/content." *Id.* at 16:22–28. If module 1300 recognizes the data type of a data block, module 1300 routes the data block to content dependent encoder module 1320 (*id.* at 16:31–33); if not, module 1300 routes the data block to "content independent" (or "default") encoder module 30 (*id.* at 16:33–34, 4:3–4, 15:67–16:3, 18:25–29, 20:37–39).

Content dependent encoder module 1320 comprises any number of lossy or lossless encoders. Ex. 1001, 16:35–44. Content independent encoder module 30 comprises any number of lossless encoders. *Id.* at 16:50–57. Lossy encoders provide for an "inexact" representation of the original uncompressed data, such that decoded data differs from the original uncompressed data. *Id.* at 2:7–10. In contrast, lossless encoders provide for an "exact" representation of the encoded data, such that decoded data is identical to the original uncompressed data. *Id.* at 2:21–24.

C. Illustrative Claims

Challenged claims 1 and 24 are independent, and the remaining challenged claims all depend from claim 1. Claims 1 and 24 are reproduced below, with bracketed references added.

> 1. A system for compressing data comprising;
>
> [1a] a processor;
>
> [1b] one or more content dependent data compression encoders; and
>
> [1c] a single data compression encoder;
>
> wherein the processor is configured:
>
> [1d] to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block;
>
> [1e] to perform content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified; and
>
> [1f] to perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified.
>
> 24. A system for compressing data comprising;
>
> [24a] a processor;
>
> [24b] one or more data compression encoders; and
>
> [24c] a default data compression encoder;

wherein the processor is configured:

[24d] to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block; and

[24e] to compress the data block to provide a compressed data block, wherein if one or more encoders are associated with the one or more parameters or attributes of the data, compressing the data block with at least one of the one or more data compression encoders, [24f] otherwise compressing the data block with the default data compression encoder.

Ex. 1001, 26:29–48, 28:12–30.

D. Cited References

Petitioners rely on the following references in support of the asserted grounds:

Reference	Patent/Printed Publication	Published/ Issued Date	Exhibit
Franaszek	U.S. Patent No. 5,870,036	Feb. 9, 1999	1004
Hsu	W. H. Hsu and A. E. Zwarico, "Automatic Synthesis of Compression Techniques for Heterogeneous Files," *Software—Practice and Experience*, Vol. 25(10), 1097–1116	1995[5]	1005
Aakre	U.S. Patent No. 4,956,808	Sept. 11, 1990	1021
Sebastian	U.S. Patent No. 6,253,264 B1	June 26, 2001	1030

E. Instituted Grounds of Unpatentability

Ground	Challenged Claims	Statutory Basis	References	Applicable Proceedings
1	1–3, 9, 10, 15, 20, and 24	35 U.S.C. § 103	Franaszek and Hsu, or, alternatively, Franaszek, Hsu, and Sebastian	’179 IPR, ’808 IPR, and ’1690 IPR

[5] Petitioners contend that Hsu was publicly available as of 1995. Pet. 16 (citing Ex. 1026 ¶ 35). Patent Owner did not dispute this assertion in its Response. *See generally* PO Resp.. For purposes of this Decision, we treat Hsu as being prior art as of 1995.

Ground	Challenged Claims	Statutory Basis	References	Applicable Proceedings
2	4–8	35 U.S.C. § 103	Franaszek, Hsu, and Aakre, or, alternatively, Franaszek, Hsu, Sebastian, and Aakre	’179 IPR and ’808 IPR only

III. ANALYSIS

A. Principles of Law

A claim is unpatentable under 35 U.S.C. § 103 if the differences between the claimed subject matter and the prior art are “such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which such subject matter pertains.” 35 U.S.C. § 103(a). The question of obviousness under 35 U.S.C. § 103 is resolved on the basis of underlying factual determinations, including: (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of nonobviousness, i.e., secondary considerations.[6] *Graham v. John Deere Co.*, 383 U.S. 1, 17–18 (1966).

B. Level of Ordinary Skill in the Art

Petitioners’ declarant, Dr. Creusere, opines that a person of ordinary skill in the art to which the ’728 patent pertains would have had a minimum of “a bachelor’s degree in computer science, computer engineering, electrical and computer engineering, electrical engineering, or electronics”

[6] Patent Owner does not allege that secondary considerations are present in this case. *See generally* Paper 31.

and "at least two years of experience working with data compression or a graduate degree focusing in the field of data compression." '179 IPR, Ex. 1002 ¶ 26; '808 IPR, Ex. 1002 ¶ 26. Patent Owner's declarant, Dr. Zeger, "does not disagree" with Petitioners' formulation, and does not offer any alternative formulation. *See* Ex. 2004 ¶ 20.

Based on our review of the '728 patent, the types of problems and solutions described in the '728 patent and cited prior art, and the testimony of Petitioners' declarant, we adopt and apply Dr. Creusere's formulation regarding the level of ordinary skill in the art. The cited prior art references also reflect the appropriate level of skill at the time of the claimed invention. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001). We find that the level of appropriate skill reflected in these references is consistent with Dr. Creusere's formulation regarding the level of ordinary skill in the art.

C. Claim Construction

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b). Under that standard, and absent any special definitions, we give claim terms their ordinary and customary meaning, as would have been understood by one of ordinary skill in the art at the time of the invention. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007).

Petitioners requested that we construe the claim term "the data block being included in one or more data blocks," which is recited in claims 2 and 3. '179 Pet. 13, '808 Pet. 11–12. Patent Owner did not request that we provide explicit constructions of any claim terms.

On this record, we determine that it is unnecessary to provide an explicit construction of the claim term "the data block being included in one or more data blocks" in order to resolve the issues in dispute. Accordingly, we decline to adopt an express construction of this claim term. *Wellman, Inc. v. Eastman Chem. Co.*, 642 F.3d 1355, 1361 (Fed. Cir. 2011) ("claim terms need only be construed 'to the extent necessary to resolve the controversy'" (citing *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

D. Asserted Grounds of Unpatentability

1. Ground 1: Alleged Obviousness of Claims 1–3, 9, 10, 15, 20, and 24 over Franaszek and Hsu, or, Alternatively, Franaszek, Hsu, and Sebastian[7]

a. Overview of Franaszek

Franaszek discloses systems and methods for compressing and decompressing data blocks using a plurality of data compression mechanisms. Ex. 1004, Abst. Representative samples of each block are tested to select an appropriate compression mechanism to apply to the block. *Id.* The data block is then compressed using the selected compression mechanism. *Id.*

Figure 2, which is reproduced below, depicts an embodiment that may employ "default" compression algorithms. *See* Ex. 1004, 4:25–27, 5:47–54.

[7] *See* '179 Pet. 17; '808 Pet. 16.

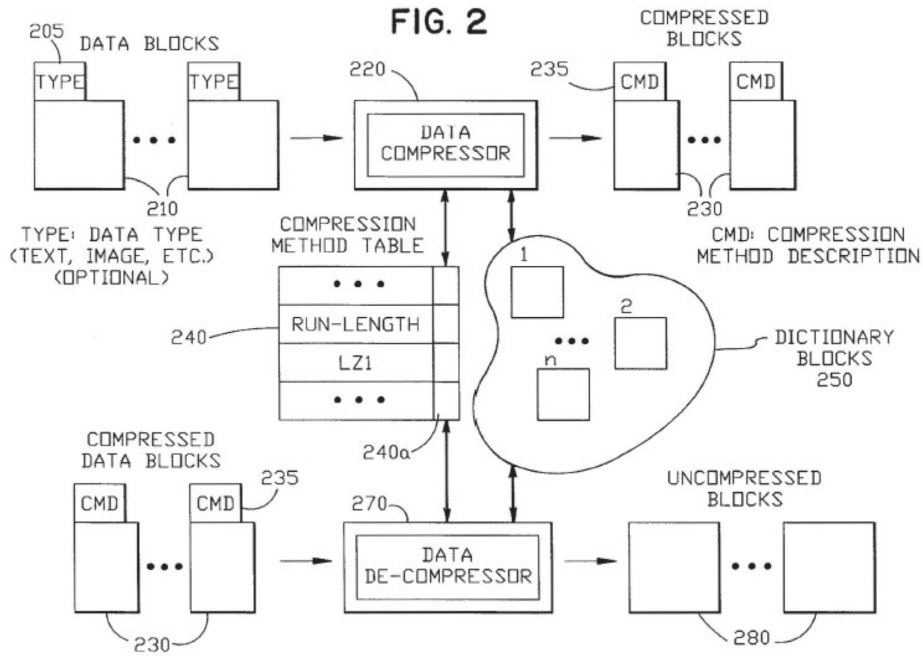
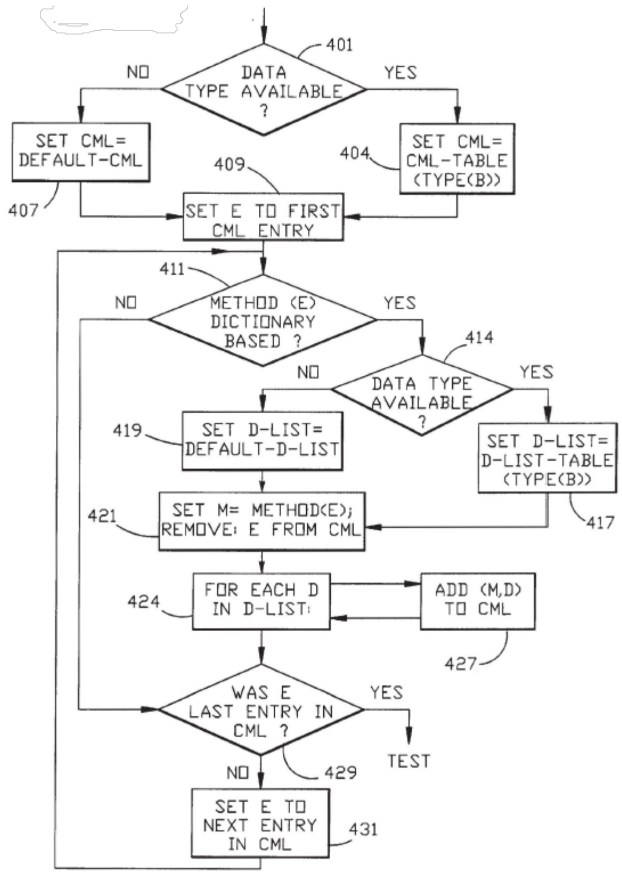


Figure 2, above, illustrates data compressor 220 and data de-compressor 270, as well as data blocks 210 that may contain "type information." *Id.* at 4:25–31. The "type information" of data blocks 210 may be image data encoded in a given format, source code for a given programming language, etc. *Id.* at 4:32–34.

In the depicted embodiment, data blocks 210 are input to data compressor 220. Ex. 1004, 4:34–38. Data compressor 220 and data de-compressor 270 share a compression method table 240, and a memory 250 that contains a number of dictionary blocks. *Id.* Data compressor 220 selects a compression method to compress the data. *Id.* at 4:52–53. The compressor outputs compressed data blocks 230, together with compression method description (CMD) 235 that identifies the selected compression method. *Id.* at 4:55–59. Data de-compressor 270 de-compresses the compressed data block using the specified method found in compression method table 240 (using the compression method identifier as an index), and outputs uncompressed data blocks 280. *Id.* at 5:1–7. In Figure 2, compression method table 240 is depicted as indicating the use of a Lempel-Ziv compression method. *See id.* at 2:24–25, 7:60–61.

Figure 4A of Franaszek, reproduced below, depicts the operation of data compressor 220. Ex. 1004, 5:47–48.



As depicted in Figure 4, above, data compressor 220 receives an uncompressed data block at step 401. Data compressor 220 then determines whether data "type" information (e.g., text, image, etc.) is available for the data block. *Id.* at 5:49–50. If so, at step 404, the compression method list (CML) is set to a list of compression methods that have been preselected for this data type. *Id.* at 5:50–53. Otherwise, if no data type is available, at step

407, the CML is set to a default list of compression methods. *Id.* at 5:53–54. The system subsequently tests each method from the CML on a sample taken from the uncompressed data block, and identifies the method from the CML that results in the best compression. *Id.* at 5:18–25. If this best compression method does not satisfy a threshold condition (e.g., at least 30% compression as compared to the uncompressed sample), the data block is stored in uncompressed format. *Id.* at 5:25–33. Otherwise, the data block is compressed using the best compression method. *Id.* at 5:33–39.

b. Overview of Hsu

Hsu is titled "Automatic Synthesis of Compression Techniques for Heterogeneous Files," and discloses a compression technique for "heterogeneous files"—files that contain "multiple types of data such as text, images, binary, audio, or animation." Ex. 1005, Title, 1097. Hsu discloses a heterogeneous compressor that automatically chooses the best compression algorithm to use on a given variable-length block of a file, based on both the qualitative and quantitative properties of that segment, and "treats a file as a collection of fixed size blocks (5K in the current implementation), each containing a potentially different type of data and thus best compressed using different algorithms." *Id.* at 1102. Hsu teaches a two phase compression system. *Id.* In the first phase, the system uses statistical methods to analyze the data within each block and determine the best compression algorithm to use in compressing that block of data. *Id.* at 1097, 1102; *see also id.* at 1103 ("The compressibility of a block of data and the appropriate algorithm to do so are determined by the type of data contained in a block."). In the second phase, compression and an optimization process occur. *Id.* at 1102.

Before compression begins, Hsu's heterogeneous compressor generates a compression plan, consisting of instructions for each block of input data, based on the statistical properties of the input data. Ex. 1005, 1098, 1100. Hsu's system bases its compression upon statistics gathered from the 5K (i.e., five kilobyte) blocks of data. *Id.* Hsu states that "[t]his allows us to handle much larger changes in file redundancy types. This makes our system less sensitive to residual statistical fluctuations from different parts of a file." *Id.* Hsu's system performs an "in-depth statistical analysis" in order to "make a more informed selection from the database of [compression] algorithms" when looking at the blocks of data to be compressed. *Id.* at 1101. Hsu's system analyzes an entire block of data (as opposed to sporadic or random sampling from parts of each block). *Id.*

In Hsu's system, the compressibility of a block of data and the appropriate compression algorithm are determined based upon the type of data contained in a block and the type of redundancy (if any) in the data. *Id.* at 1103. These two properties are represented by four parameters: the "block type," and the three "redundancy metrics." *Id.* The "block type" describes the nature of a segment of input data. *Id.* The redundancy metrics are quantitative measures that are used to determine the compressibility of a block of data. They are: the degree of variation in character frequency or alphabetic distribution, M_{AD}; the average run length of the block, M_{RL}; and the string repetition ratio of the block, M_{SR}. *Id.* at 1104. According to Hsu, these three manifestations of redundancy are independent, and each of the redundancy types is exploited by different compression algorithms. *Id.*

The compression algorithms and attendant heuristics of Hsu are organized into Table 1, a table with 10 rows and 3 columns that is reproduced below.

	M_{AD}	M_{RL}	M_{SR}
ANSI	arithmetic coding	run-length encoding	Lempel–Ziv
	*	byte-wise encoding	freeze
hexadecimal	arithmetic coding	run-length encoding	Lempel–Ziv
	*	n-bit run count	freeze
natural language	arithmetic coding	*	Lempel–Ziv
	*	*	freeze
source code	arithmetic coding	run-length encoding	Lempel–Ziv
	*	n-bit run count	freeze
low redundancy	*	run-length encoding	Lempel–Ziv
binary	*	n-bit run count	*
audio	*	run-length encoding	Lempel–Ziv
	*	byte-wise encoding	freeze
low resolution	*	run-length encoding	Lempel–Ziv
graphic	*	n-bit run count	freeze
high resolution	JPEG	run-length encoding	JPEG
color graphic	improved Huffman	n-bit run count	improved Huffman
high redundancy	arithmetic coding	run-length encoding	Lempel–Ziv
binary	*	n-bit run count	freeze
object	arithmetic coding	run-length encoding	Lempel–Ziv
	*	byte-wise encoding	freeze

As depicted in Table 1, above, the 10 file descriptors are the row indices and the 3 redundancy metrics are the column indices. Ex. 1005, 1106. Each entry of the table contains descriptors that are used to access the code for an algorithm-heuristic pair. *Id.* Hsu teaches the use of four basic compression algorithms to be used in its system: arithmetic coding, Lempel-Ziv, run length encoding (RLE), and JPEG for image/graphics compression. *Id.* An optimal algorithm is selected for each data block of a file, and the system creates a record of each data block and its optimal algorithm, which Hsu refers to as the file's "compression plan." *Id.* at 1109. Hsu notes that "recent implementations of 'universal' compression programs execute the Lempel-Ziv algorithm and dynamic Huffman coding in succession, thus improving performance by combining the string repetition-based compression of Lempel-Ziv with the frequency based compression strategy of dynamic Huffman coding." *Id.* at 1100.

c. Overview of Sebastian

Sebastian teaches a preferred coding network that integrates format-specific compression into a general purpose compression tool that serves a wide range of data formats. Ex. 1030, Abst., 1:45–50. Sebastian teaches that source data is parsed into blocks of similar data, and each parsed block is compressed using a respectively selected compression algorithm. *Id.* at Abst. This algorithm can be chosen from a static model of the data or it can be adaptive to the data in the parsed block. *Id.* The parsed blocks are then combined into an encoded data file. *Id.*

In one embodiment, Sebastian teaches a system with different "filters" that each support a specific "data format," such as for Excel XLS worksheets or Word DOC files. Ex. 1030, 1:50–51. If an installed filter "matches the format of the data to be encoded, the advantages of format-specific compression can be realized for that data." *Id.* at 1:55–57. Otherwise, a "generic" filter is used which achieves performance similar to other non-specific data compression systems (such as PKZip, Stacker, etc.). *Id.* at 1:58–60; *see also id.* at 4:9–23 (other suitable generic filters include those similar to Lempel- Ziv (LZ) variants).

d. Analysis of Petitioners' Assertions Regarding Independent Claims 1 and 24:

Claim 1 Preamble	**Claim 24 Preamble**
1. A system for compressing data comprising;	24. A system for compressing data comprising;

Petitioners contend that the preambles of claims 1 and 24 are not limiting. '179 Pet. 19, 49; '808 Pet. 17, 48.

Claim 1	Claim 24
[1a] a processor; [1b] one or more content dependent data compression encoders; and	[24a] a processor; [24b] one or more data compression encoders; and

Petitioners contend that both Franaszek and Hsu teach "a processor," as recited in claims 1 and 24. '179 Pet. 19–20, 49–50; '808 Pet. 17–19, 48–49. Petitioners also contend that both Franaszek and Hsu disclose "one or more content dependent data compression encoders," as recited in claim 1 ('179 Pet. 20–30; '808 Pet. 19–28), as well as the similar recitation of "one or more data compression encoders" in claim 24 ('179 Pet. 50; '808 Pet. 49).

Claim 1	Claim 24
[1c] a single data compression encoder;	[24c] a default data compression encoder;

Petitioners contend that Franaszek discloses the "single data compression encoder" of claim 1, and the "default data compression encoder" of claim 24. '179 Pet. 23–27, 50–51; '808 Pet. 22–26, 49–50. In particular, Petitioners contend that if no "data type" is available, Franaszek's system sets the CML (i.e., the compression method list) to a default list of compression methods, and then selects one encoder from the CML. '179 Pet. 23–25, 50–51; '808 Pet. 22–24, 49–50. Petitioners contend that this selected encoder is a "single data compression encoder" and a "default data compression encoder." '179 Pet. 25, 51; '808 Pet. 24, 49–50. Petitioners alternatively contend that Sebastian's "generic" filter is a "single data compression encoder" of the type recited in claim 1, and a "default data compression encoder" of the type recited in claim 24. '179 Pet. 28, 51; '808 Pet. 27–28, 50. Petitioners contend that one of ordinary skill in the art would have found it obvious to substitute Sebastian's "generic" filter for

Franaszek's system of selecting an encoder from a default list of compression methods. '179 Pet. 29–30, 51; '808 Pet. 28, 50.

Claim 1	**Claim 24**
wherein the processor is configured: [1d] to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block;	wherein the processor is configured: [24d] to analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block to identify the one or more parameters or attributes of the data excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes of the data within the data block; and

Petitioners concede that Franaszek's processor is not "configured" to "analyze data within a data block to identify one or more parameters or attributes of the data wherein the analyzing of the data within the data block . . . excludes analyzing based solely on a descriptor that is indicative of the one or more parameters or attributes within the data block," as recited in claim elements 1d and 24d. *See* '179 Pet. 31, 52; '808 Pet. 29, 51. Petitioners instead rely on Hsu with respect to these claim elements. *See id.* In particular, Petitioners contend that Hsu's "block type," and Hsu's "redundancy metrics" (M_{AD}, M_{RL}, and M_{SR}), are all "parameters or attributes of the data" that are identified by an analysis of data that "excludes analyzing based solely on a descriptor that is indicative of the one or more parameters of the data within the data block." *See* '179 Pet. 32–34, 52; '808 Pet. 31–33, 51; *see also supra* Section III.D.1.b.

Petitioners contend that one of ordinary skill in the art would have realized that Hsu's block type and redundancy metrics advantageously could have been used in Franaszek's system, together with Franaszek's "type" information, in order to give "further insight into optimal methods for compressing the data block." '179 Pet. 35–36 (citing Ex. 1005, 1106–07; Ex. 1002 ¶ 125), 52; '808 Pet. 33–34 (citing Ex. 1005, 1106-07; Ex. 1002 ¶ 125), 51. Petitioners contend that this modification of Franaszek also would have allowed for improved compression of "heterogeneous" files (i.e., files that include multiple types of data). '179 Pet. 36–38 (citing Ex. 1005, 1097–99, 1104, 1108–1109; Ex. 1004, 4:49–54; Ex. 1002 ¶¶ 126, 129–133); '808 Pet. 34–36 (citing Ex. 1005, 1097–99, 1104, 1108–1109; Ex. 1004, 4:49–54; Ex. 1002 ¶¶ 126, 129–133).

Claim 1	**Claim 24**
wherein the processor is configured: . . . . [1e] to perform content dependent data compression with the one or more content dependent data compression encoders if the one or more parameters or attributes of the data are identified; and	wherein the processor is configured: . . . . [24e] to compress the data block to provide a compressed data block, wherein if one or more encoders are associated with the one or more parameters or attributes of the data, compressing the data block with at least one of the one or more data compression encoders,

Petitioners contend that the allegedly obvious combinations of Franaszek and Hsu, or alternatively, Franaszek, Hsu, and Sebastian, would have performed content dependent data compression if one or more parameters or attributes of the data were identified. Pet. 39–40 (citing Ex. 1004, 5:49–53, 6:1–11, 6:22–50; Ex. 1002 ¶¶ 135–140); '808 Pet. 38 (citing Ex. 1004, 5:49–53, 6:1–11, 6:22–50; Ex. 1002 ¶¶ 135–140).

Petitioners similarly contend that such a combination would have compressed a data block with at least one of the one or more data compression encoders if such encoder were associated with one or more attributes or parameters of the data. Pet. 53–54 (citing Ex. 1004, 5:49–53, 6:1–11, 6:22–50; Ex. 1002 ¶¶ 187–190); ’808 Pet. 53 (citing Ex. 1004, 5:49–53, 6:1–11, 6:22–50; Ex. 1002 ¶¶ 187–190).

Claim 1	**Claim 24**
wherein the processor is configured: . . . . [1f] to perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data are not identified	wherein the processor is configured: . . . . to compress the data block to provide a compressed data block . . . [24f] otherwise compressing the data block with the default data compression encoder.

Claim element 1f requires a processor configured to “perform data compression with the single data compression encoder, if the one or more parameters or attributes of the data” are not identified. Claim element 24f similarly requires that the processer be configured to compress “the data block with the default data compression encoder” in circumstances where *none* of the “one or more data compression encoders” is “associated with the one or more parameters or attributes of the data.”

As set forth above, when discussing claim elements 1d and 24d, Petitioners allege that one of ordinary skill in the art would have found it advantageous to calculate Hsu’s block type and redundancy metrics (i.e., one or more parameters or attributes of the data), and employ Hsu’s block type and redundancy metrics in Franaszek’s system, together with Franaszek’s “type” information, in order to give “further insight into optimal methods for compressing the data block” and improve compression of “heterogeneous” files. When discussing claim limitations 1f and 24f, however, Petitioners allege that in certain circumstances, a skilled artisan would have had reason to *refrain* from calculating Hsu's block type and redundancy metrics, and to instead use Franaszek's default list of encoders or Sebastian's generic filter (i.e., the recited "single data compression encoder" of claim 1 and "default data compression encoder" of claim 24). *See* Pet. 40–41 (citing Ex. 1002 ¶¶ 66, 131–133, 146), 54–56; '808 Pet. 39–40 (citing Ex. 1002 ¶¶ 66, 131–133, 146), 54–56. In particular, Petitioners contend that such a person would have known that calculating Hsu's block type and redundancy metrics without Franaszek's type information would have been time-consuming, and that using a generic filter or default encoder in this situation could be more efficient and less time-intensive. *See id.* This assertion—that a skilled artisan would have refrained from calculating Hsu's block type and redundancy metrics in a situation where Franaszek's "type" information was not already present—is the focus of the parties' dispute. We now analyze the evidence and arguments on this issue put forth by the parties on this issue.

When discussing limitations 1d and 24d, Petitioners' declarant, Dr. Creusere provides extensive testimony that a skilled artisan would have had reason to combine Hsu's teachings regarding the calculation of block type and redundancy metrics with Franaszek's system, even though Franaszek's system already includes "type" information:

> It would have been obvious to a person of ordinary skill in the art . . . to modify a data compression system in which descriptors [i.e., Franaszek's "type" information] are solely relied upon to identify a data type or attribute of a data block, such as that disclosed by Franaszek, to include additional

> analysis of the data within the data block in the manner described by Hsu. . . .
>
> First, a person of ordinary skill in the art would have recognized that Hsu's analysis of the compressibility of a data block using the redundancy metrics would supplement Franaszek's use of data type indicators and provide more information and insight into the selection of an optimal compression method for that particular data block. . . .
>
> As another reason a person of ordinary skill in the art would have been motived to look to Hsu's system for a way to improve Franaszek was based on Hsu's recognition that a data block could contain multiple types of data. . . . [T]o reinforce that information included in Franaszek's type descriptor, a person of ordinary skill in the art would have looked to Hsu's methods for analyzing data blocks in a data compression system. . . .
>
> A person of ordinary skill in the art would have understood that while a descriptor of the sort utilized by Franaszek, if available, could provide a valuable source of information about the type of data in the received file/block, a particular block could be heterogeneous—regardless of whether or not a descriptor is available for that particular block, thus making an examination of its contents and the "majority vote" scheme discussed in Hsu a desirable feature. Thus, a person of ordinary skill in the art would have been motivated to analyze each block using Hsu's data sampling methods to evaluate the actual contents of the block even when Franaszek's blocks had block type information available.

'179 IPR, Ex. 1002 ¶¶ 124–129, 182; '808 IPR, Ex. 1002 ¶¶ 124–129, 182 (citation omitted).

Dr. Creusere also testifies that certain synergies would result from employing Franaszek's "descriptors" (i.e., "type" information) together with Hsu's block type and redundancy metrics:

> A person of ordinary skill in the art would also have noted that the information provided by Franaszek's input descriptors

> remained useful for making the heterogeneous file compression approach proposed by Hsu more efficient without any loss in compression performance. Specifically, a person of ordinary skill in the art would have known that the Franaszek's descriptors could be used to limit the number of data types needing be evaluated to determine the data type of a heterogeneous data block. . . .
>
> . . . While Hsu examines for 10 data types, a person of ordinary skill in the art would have appreciated that the number of potential file types was increasing over time. . . . Thus, as data file types have increased, a person of ordinary skill in the art would have recognized that iterating through every possible data type in Hsu's "collection of known data patterns" would have likely slowed the program down, perhaps considerably. . . .
>
> Thus, one optimization of Hsu's "new-file" procedure would have been apparent to those of ordinary skill in the art when viewing Franaszek's system: the block type descriptor (205), when present, could provide a short cut to identifying the appropriate type of a data block. . . .
>
> . . . In particular, a person of ordinary skill in the art would have found the ability of Franaszek's descriptors to reduce Hsu's table search times to be a particularly compelling use of such a descriptor in a system designed to identify a specific data type from this very large number of possible data types.

'179 IPR, Ex. 1002 ¶¶ 130–133, 182; '808 IPR, Ex. 1002 ¶¶ 130–133, 182.

In contrast, Dr. Creusere's discussion of limitations 1f and 24f provides little support for Petitioners' contention. Dr. Creusere testifies that the *unmodified* Franaszek system employs a single or default compression encoder when *Franaszek's* type information is not present. *See* '179 IPR, Ex. 1002 ¶¶ 144–146, 191–94; '808 IPR, Ex. 1002 ¶¶ 144–146, 191–194. This testimony is not persuasive because Petitioners' unpatentability contentions are based on the allegedly obvious *combination* of Franaszek and Hsu, and because Petitioners allege that *Hsu's* block type and redundancy metrics (*not* Franaszek's type information) correspond to the recited "parameters or attributes."

Notably, Dr. Creusere never opines that a person of ordinary skill in the art would have had reason to *refrain* from calculating Hsu's block type and redundancy metrics when Franaszek's type data was not present, in the manner Petitioners allege would have satisfied claim limitations 1f and 24f. *See* '179 IPR, Ex. 1002 ¶¶ 141–146, 191–202; '808 IPR, Ex. 1002 ¶¶ 141–146, 191–202. In fact, during his deposition, Dr. Creusere confirmed that he was *not* offering an opinion that a person of ordinary skill in the art would have refrained from calculating Hsu's block type and redundancy metrics when Franaszek's "type" information was not present:

> Q. And in your declaration, you don't propose that a POSA would only use Hsu when Franaszek already has a data type and *not use Hsu when Franaszek doesn't have a data type, right*?
>
> A. I don't propose that a POSA has to do that. Though I do discuss the advantages that one could achieve if one had a data type, and one were to combine that with Hsu, *but I don't say* -- *I don't say that you can only apply Hsu when you -- when you have a data type*.
>
> Q. You don't have an opinion that a POSA would have been motivated to use Hsu only when Franaszek has a data type, *but would not have been motivated to use Hsu when Franaszek doesn't have a data type, right*?
>
> A. *I don't believe that I expressed an opinion on that in my declaration*.

Ex. 2003, 130:18–131:12 (emphases added).

Dr. Creusere also testified at deposition that advantages would result from incorporating Hsu's block type and redundancy metrics into

Franaszek's system, *regardless* of whether Franaszek's type information was present:

> Q. And you propose to modify Franaszek based on Hsu, correct?
>
> A. Yes.
>
> Q. And . . . the reason you propose your modification is you say that it would have improved Franaszek's ability to select the appropriate compression algorithm, allowing the system to choose a compression algorithm that was likely able to be better able to compression the particular data block thus reducing its size more, right?
>
> A. Yes.
>
> Q. That same reasoning applies to Franaszek regardless of whether Franaszek already has a data type or not, right?
>
> A. The same reason he applies, but actually if Franaszek has a data type, then it could make the system even more efficient.
>
> Q. *But if Franaszek does not have a data type, using Hsu to recognize the data type would have the same benefits of helping Franaszek pick a better compression technique and get more compression, right*?
>
> A. *Yes, it would*.

Ex. 2003, 129:15–130:17 (emphases added).

In contrast, Patent Owner's declarant, Dr. Zeger, directly addresses the issue in dispute, and testifies that a person of ordinary skill in the art would *not* have had reason to refrain from calculating Hsu's block type and redundancy metrics when Franaszek's type data was not present:

> While I do not agree that a POSA would be motivated to combine Franaszek with Hsu at all, I do agree with Dr. Creusere that if a POSA were to make such a combination, the POSA would rely on Hsu's powerful data type recognition and compressibility analysis approach to identify a data type and redundancy metrics for each of Franaszek's data blocks. I also agree with Dr.

> Creusere's testimony that using Hsu in such circumstances would help Franaszek "pick a better compression technique and get more compression." *Id.* at 130:12-17. I certainly do not believe that a POSA would want to *refrain* from using Hsu's powerful data type recognition and compressibility analysis approach when Franaszek lacks data type information. To the contrary, Hsu describes a system that avoids any content independent compression and that instead uses an entirely content-dependent approach, and its teachings are thus heavily directed toward an approach for always identifying a data block's data type as well as its three redundancy metrics. Thus a POSA would have to disregard a core aspect of Hsu's teachings in order not to use Hsu when Franaszek lacks a data type. I agree with Dr. Creusere that a POSA would not take such an approach. It would certainly not be obvious for a POSA to do so.

Ex. 2004 ¶ 24. We find Dr. Zeger's testimony persuasive, especially in view of Dr. Creusere's deposition testimony that advantages would result from using Hsu's block type and redundancy metrics, regardless of whether Franaszek's type data was or was not present.

Petitioners argue in their Petitions that a person or ordinary skill in the art would have understood that, "if a data type was unavailable from Franaszek's type field, it may take a significant amount of time to employ Hsu's sampling method." '179 Pet. 40 (citing Ex. 1002 ¶¶ 131–133); '808 Pet. 39 (citing Ex. 1002 ¶¶ 131–133). The cited portions of Dr. Creusere's declaration support Petitioners' assertion increasing the number of file types identified by Hsu's program might have slowed down Hsu's calculations. *See* Ex. 1002 ¶¶ 131–133. However, as discussed above, Dr. Creusere *does not* testify that these potential advantages would have led a person of ordinary skill to *refrain* from calculating Hsu's block type and redundancy metrics when Franaszek's type information was not present.

The Petitions also reiterate Dr. Creusere's argument that the *unmodified* Franaszek system employs a single or default compression encoder when *Franaszek's* type information is not present. '179 Pet. 54–55 (citing Ex. 1002 ¶¶ 192–194); '808 Pet. 54 (citing Ex. 1002 ¶¶ 192–194). As discussed above, however, this argument is not persuasive because it does not address the allegedly obvious *combination* of Franaszek and Hsu, and because Petitioners do not allege that *Franaszek's* type information corresponds to the recited "parameters or attributes."

Petitioners raise four additional arguments in their Reply. *First*, Petitioners argue that Patent Owner is "presuppos[ing] that a POSA would only see one obvious way to combine prior art teachings." Reply 5. Petitioners are correct that there may be more than one obvious way to combine prior art teachings. However, it is Petitioners' burden to show that *one particular* combination of the references renders obvious *all* limitations of a given claim. Thus, it is entirely proper for Patent Owner to point out the tension between Petitioners' stated rationale for combining the teachings of Hsu and Franaszek to arrive at limitations 1d and 24d, and Petitioners' stated rationale for further modifying this combination to *refrain* from calculating Hsu's block type and redundancy metrics when Franaszek's type information is not present in order to arrive at limitations 1f and 24f. To prevail on Ground 1, Petitioners must demonstrate that a person of ordinary skill in the art would have had sufficient reason to make both modifications. We find Petitioner has not persuasively harmonized the disparate rationales it proffers.

Second, Petitioners argue that Patent Owner is improperly making a bodily incorporation argument. Reply 6–7. However, we do not interpret the Patent Owner Response as making an improper bodily incorporation argument. In any event, this issue is moot because this Decision does not rely on any purported contentions regarding bodily incorporation.

Third, Petitioners argue that Dr. Creusere "never testified that Hsu would always be used to determine data type." Reply 7. This Decision, however, does not rely on Dr. Creusere's testimony on this point. Instead, this Decision focuses on the advantages identified by Dr. Creusere that would result from combining Hsu's teachings of block type and redundancy metrics with Franaszek's system, and the lack of testimony from Dr. Creusere that the alleged disadvantages cited by Petitioners would have lead a person of ordinary skill to *refrain* from calculating Hsu's block type and redundancy metrics when Franaszek's type information was not present. Accordingly this argument also is moot.

Fourth, Petitioners argue that the fully-developed record contains ample evidence that a skilled artisan would have refrained from calculating Hsu's block type and redundancy metrics when Franaszek's type data was not present. Reply 7–13. In support of this assertion, Petitioners cite paragraphs 130–33 of Dr. Creusere's declaration to argue that calculating Hsu's block type and redundancy metrics could be time-consuming given the increasing number of data types. Reply 9. As discussed above, however, Dr. Creusere never testified that this possible disadvantage would have outweighed the advantages of Hsu in a way that would have led a person of ordinary skill in the art to refrain from calculating Hsu's block type and redundancy metrics when Franaszek's type information was not present. Petitioners also attempt to support this assertion by arguing that in the absence of Franaszek's data type, Hsu "would provide the wrong type information, rendering the system less efficient and slower—just as contended in the Petition."[8] Reply 10. Petitioners contend that Dr. Zeger admitted this during his deposition. *See* Reply 11–13 (citing Ex. 1031, 53:1–13; 53:24–54:17; 55:1–13; 55:16–22; 95:25–98:25). But the cited portions of Dr. Zeger's deposition provide little support for Petitioners' assertion. In particular, on pages 51–55 of his transcript, Dr. Zeger testifies that there may be scenarios in which Franaszek's type information is inaccurate or not present, and that it is "certainly possible" that a particular compression system may not recognize a particular data type. Ex. 1031, 51:7–55:22. Also, on pages 95–98 of his transcript, Dr. Zeger testifies that it is *possible* that Hsu's algorithm may not properly categorize data blocks that are not one of the types Hsu's system is programmed to identify, or that contain random data. *Id.* at 95:25–98:25. Petitioners, however, do not identify any admissions from Dr. Zeger that these types of errors would be common, much less so common that they would outweigh the benefits of calculating Hsu's block type and redundancy metrics. Petitioners' argument also is undermined by Dr. Creusere's admission that it would be advantageous to calculate Hsu's block type and redundancy metrics, even

[8] We note that this portion of the Reply is effectively a new rationale for why a person of ordinary skill in the art would have had reason to combine the prior art references in the claimed manner. Petitioner implicitly asserts that this new rationale arose from Dr. Zeger's post-petition deposition testimony. As discussed below, we disagree that Dr. Zeger's deposition testimony provides a sufficient basis for this new rationale. Thus, this argument was waived. Even if Petitioner had not waived this new argument, however, this argument would remain unpersuasive for the reasons discussed below.

when Franaszek's type information was not present. *See* Ex. 2003, 129:15–130:17.

For the reasons set forth above, and after conducting a thorough review of the entire record of this case, including the arguments set forth by both parties and the evidence cited in support thereof, we find that Petitioners have failed to demonstrate by a preponderance of the evidence that a person of ordinary skill in the art would have had reason to refrain from calculating Hsu's block type and redundancy metrics (i.e., the recited "parameters or attributes") in the situation where Franaszek's type information was not present, in the manner Petitioners allege would have satisfied claim limitations 1f and 24f. In reaching this determination, we credit the opinion of Dr. Zeger—which Dr. Creusere does not dispute directly—that a person of ordinary skill in the art would *not* have had reason to refrain from calculating Hsu's block type and redundancy metrics in this circumstance. Petitioners' evidence and argument are insufficient to outweigh Patent Owner's evidence—and, specifically, the opinion of Dr. Zeger—particularly in view of Petitioners' failure to offer testimony from a qualified witness that a person of ordinary skill in the art would have had reason to refrain from calculating Hsu's block type and redundancy metrics when Franaszek's type information was not present.

Accordingly, Petitioners have failed to demonstrate by a preponderance of the evidence that claims 1 and 24 are rendered obvious by Franaszek and Hsu, or, alternatively, Franaszek, Hsu, and Sebastian.

e. Analysis of Petitioners' Assertions Regarding Dependent Claims 2, 3, 9, 10, 15, and 20:

Claims 2, 3, 9, 10, 15, and 20, each depend from claim 1, and Petitioners' contentions regarding these claims all rely on Petitioners' assertion that the cited references render obvious claim 1. Accordingly, for the same reasons set forth above with respect to claim 1, Petitioners have failed to demonstrate by a preponderance of the evidence that claims 2, 3, 9, 10, 15, and 20 are rendered obvious by Franaszek and Hsu, or, alternatively, Franaszek, Hsu, and Sebastian.

2. Ground 2: Alleged Obviousness of Claims 4–8 over Franaszek, Hsu, and Aakre, or, Alternatively, Franaszek, Hsu, Sebastian, and Aakre[9]

a. Overview of Aakre

Aakre teaches a real time data transformation and transmission apparatus. Ex. 1021, Abst. Petitioners contend that Aakre's system provides data to second data medium 24 "in real time," and that one of ordinary skill in the art would have had reason to incorporate Aakre's controller and output buffer into the combination of Franaszek, Hsu, and Sebastian. '179 Pet. 57.

b. Analysis of Petitioners' Assertions as Applied to Claims 4–8

Claims 4–8 each depend from claim 1, and Petitioners' contentions regarding these claims all rely on Petitioners' assertion that Franaszek and Hsu, or, alternatively, Franaszek, Hsu, and Sebastian, render obvious

[9] Ground 2 is only asserted in the '179 IPR and the joined '1690 IPR; the consolidated '808 IPR does not include this ground. *Compare* '179 Pet. 7, *with* '808 Pet. 7.

claim 1. Petitioners do not allege that Aakre cures the deficiency identified above in Petitioners' contentions regarding claim 1. Accordingly, for the same reasons set forth above with respect to claim 1, Petitioners have failed to demonstrate by a preponderance of the evidence that claims 4–8 are rendered obvious by Franaszek, Hsu, and Aakre, or, alternatively, Franaszek, Hsu, Sebastian, and Aakre.

IV. ORDER

Accordingly, it is

ORDERED that claims 1–10, 15, 20, and 24, of U.S. Patent No. 9,054,728 B2, have not been shown to be unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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