

UNITED STATES PATENT AND TRADEMARK OFFICE

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**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

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HTC Corporation, and

HTC America, Inc.,  
Petitioners

v.

INVT SPE LLC,  
Patent Owner

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IPR Case No. IPR2018-01557  
Patent 6,760,590

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**PETITION FOR *INTER PARTES* REVIEW  
UNDER 35 U.S.C. § 311 *ET SEQ.* AND 37 C.F.R. § 42.100 *ET SEQ.*  
(CLAIMS 1 THROUGH 8 OF U.S. PATENT NO. 6,760,590)**

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**EXHIBIT LIST**

| Exhibit No. | Description                                                                                                                                                                                                               | Date                                  | Identifier                  |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------|
| 1001        | United States Patent No. 7,206,587 to Miyoshi et al.                                                                                                                                                                      | December 18, 2002<br>(Filing Date)    | '587 Patent                 |
| 1002        | File History for the '587 Patent                                                                                                                                                                                          | n/a                                   | '587 Patent<br>File History |
| 1003        | Complaint, <i>Inventergy, Inc. v. HTC Corporation, and HTC America, Inc.</i> , C.A. No.: 17-cv-200-VAC-CJB (D. Del. 2017)                                                                                                 | February 27, 2017                     | Inventergy<br>Complaint     |
| 1004        | Inventergy's Voluntary Dismissal Without Prejudice                                                                                                                                                                        | May 25, 2017                          |                             |
| 1005        | Complaint, <i>INVT SPE LLC v. HTC Corporation, and HTC America, Inc.</i> , 2:17-cv-03740-JMV-JBC (D.N.J. 2017)                                                                                                            | May 25, 2017                          | INVT SPE<br>Complaint       |
| 1006        | HTC Corp. and HTC America, Inc.'s Motion To Transfer                                                                                                                                                                      | March 9, 2018                         |                             |
| 1007        | INVT'S Opposition to HTC Corp. and HTC America, Inc.'s Motion to Transfer                                                                                                                                                 | March 23, 2018                        |                             |
| 1008        | HTC Corporation and HTC America, Inc.'s Reply Brief In Support Of Their Motion To Transfer                                                                                                                                | April 2, 2018                         |                             |
| 1009        | PCT Application No. PCT/US98/23428 to Padovani et al.                                                                                                                                                                     | November 3, 1997<br>(Priority Date)   | Padovani                    |
| 1010        | W. van Gils, "Design of error-control coding schemes for three problems of noisy information transmission, storage and processing," Ph.D., dissertation, Eindhoven Univ. of Technology, Eindhoven, the Netherlands, 1988. | January 1, 1988<br>(Publication date) | Gils                        |

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| Exhibit No. | Description                                                                                                                                                                                                          | Date                                  | Identifier       |
|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------|
| 1011        | European Patent No. 0083127 B1 to Driessen                                                                                                                                                                           | December 14, 1982<br>(Filing Date)    | Driessen         |
| 1012        | B. Masnick and J. Wolf, “On Linear Unequal Error Protection Codes,” IEEE Transactions on Information Theory, vol. IT 13, no. 4, pp. 600-607, July 1967.                                                              | October of 1967<br>(Publication Date) | Masnick          |
| 1013        | United States Patent No. 7,245,594 to Esteves et al.                                                                                                                                                                 | May 12, 2000 (Filing Date)            | Esteves          |
| 1014        | United States Patent No. 7,079,550 to Padovani et al.                                                                                                                                                                | Dec. 12, 2002 (Filing Date)           | Padovani 550     |
| 1015        | United States Patent No. 6,975,611 to Balachandran et al.                                                                                                                                                            | Mar. 3, 2000 (Filing Date)            | Balachandran     |
| 1016        | K. Balachandran, R. Ejzak, S. Nanda, S. Vitebskiy, S. Seth, “GPRS- 136: High-Rate Packet Data Service for North American TDMA Digital Cellular Systems,” IEEE Personal Communications, vol. 6, pp. 34-47, June 1999. |                                       | Balachandran 136 |
| 1017        | Declaration of Paul Min, Ph.D. and Curriculum Vitae                                                                                                                                                                  | n/a                                   | Min              |
| 1018        | A.O. Mabogunje, P.G. Farrell, “Construction of Unequal Error Protection Codes,” Lecture Notes in Computer Science, vol. 514, Eurocode '90, pp. 87-93, November 1990.                                                 | June of 1991<br>(Publication Date)    | Mabogunje        |
| 1019        | U.S. Patent No. 5,691,992 to Molnar et al                                                                                                                                                                            | October 12, 1995 (Filing Date)        | Molnar           |

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| Exhibit No. | Description                                                                                                                                                | Date                             | Identifier           |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------|
| 1020        | United States Patent 6,665,831 to Yoshida et al.                                                                                                           | January 6, 2000 (Filing Date)    | Yoshida              |
| 1021        | United States Patent No. 4,747,104 to Piret                                                                                                                | June 5, 1986 (Filing Date)       | Piret                |
| 1022        | United States Patent 6,292,917 to Sinha et al.                                                                                                             | September 30, 1998 (Filing Date) | Sinha                |
| 1023        | Philips Journal of Research, Vol. 39, no. 6, 1984                                                                                                          |                                  | 1984 Philips Journal |
| 1024        | Declaration of Ximena Solano                                                                                                                               | n/a                              | Solano               |
| 1025        | Webpages from WorldCat.org database re Gils Dissertation                                                                                                   | July 27, 2018                    |                      |
| 1026        | Correspondence with University of South Wales re Gils Dissertation                                                                                         | July 29, 2018 – August 7, 2018   |                      |
| 1027        | Webpages from the German National Library of Science and Technology (“TIB - Leibniz Information Centre for Science and Technology and University Library”) |                                  |                      |
| 1028        | Correspondence with TIB re Gils Dissertation                                                                                                               | July 30, 2018 – July 31, 2018    |                      |
| 1029        | Correspondence with Karlsruher Institute of Technology (KIT)                                                                                               | July 28, 2018 – July 31, 2018    |                      |
| 1030        | Correspondence with Hamburg University of Technology (TUHH)                                                                                                | July 28, 2018 – July 31, 2018    |                      |
| 1031        | Correspondence with Saxon State and University Library Dresden (SLUB)                                                                                      | July 28, 2018 – August 13, 2018  |                      |

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| Exhibit No. | Description                                                                                | Date                             | Identifier |
|-------------|--------------------------------------------------------------------------------------------|----------------------------------|------------|
| 1032        | Correspondence with Eindhoven University of Technology (TU/e)                              | July 28, 2018 – July 29, 2018    |            |
| 1033        | Correspondence with Tilburg University                                                     | July 28, 2018 – July 30, 2018    |            |
| 1034        | Philips Technical Review 1988 (downloadable today)                                         | August 14, 2018                  |            |
| 1035        | Screenshot from Stanford University Library website displaying Philips Tech. Rev.          | August 20, 2018                  |            |
| 1036        | Screenshot from Stanford University Library website displaying Philips Journal             | August 21, 2018                  |            |
| 1037        | Declaration of Oliver Heinisch                                                             | n/a                              | Heinisch   |
| 1038        | Certified translated copy of Correspondence with Hamburg University of Technology (TUHH)   | July 31, 2018 – August 2, 2018   |            |
| 1039        | Certified translated copy of Correspondence with TIB                                       | August 1, 2018 – August 15, 2018 |            |
| 1040        | Certified translated copy of Correspondence with the Universitätsbibliothek Stuttgart      | August 1, 2018 – August 14, 2018 |            |
| 1041        | Certified translated copy of Correspondence with Karlsruher Institut für Technologie (KIT) | August 1, 2018 – August 14, 2018 |            |
| 1042        | Declaration of Otto Steinbusch                                                             | n/a                              | Steinbusch |

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| Exhibit No. | Description                                                                                                                                                      | Date                           | Identifier |
|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|
| 1043        | Certified translated copy of correspondence with Eindhoven University of Technology                                                                              | July 30, 2018 – August 2, 2018 |            |
| 1044        | Certified translated copy of correspondence with Bibliotheek UvA/HvA (AMSTERDAM)                                                                                 | July 30, 2018 – August 1, 2018 |            |
| 1045        | Certified translated copy of correspondence with the KB National Library of The Netherlands                                                                      | July 30, 2018 – August 1, 2018 |            |
| 1046        | Declaration of Bruce Liebman                                                                                                                                     | n/a                            | Liebman    |
| 1047        | Correspondence with University of California Riverside (UCR) re the 1984 Philips Journal                                                                         | August 15, 2018                |            |
| 1048        | Correspondence with California State University, Sacramento (CSU) re the 1988 Philips Tech. Rev.                                                                 | August 15, 2018                |            |
| 1049        | Online Catalog Records for the 1984 Philips Journal                                                                                                              | August 16, 2018                |            |
| 1050        | Online Catalog Records for the Philips Tech. Rev.                                                                                                                | August 16, 2018                |            |
| 1051        | Declaration of Gerard P. Grenier (“IEEE Declaration”)                                                                                                            | n/a                            | Grenier    |
| 1052        | Declaration of Steve Wasserman (“Retriev-it Declaration”)                                                                                                        | n/a                            | Wasserman  |
| 1053        | United States patent 6,167,031 to Oloffson et al.                                                                                                                | August 29, 1997                | Olofsson   |
| 1054        | L. Dunning and W.E. Robbins, “Optimal Encodings of Linear Block Codes for Unequal Error Protection,” <i>Information and Control</i> vol. 37, pp. 150-177 (1978). | 1978                           | Dunning    |

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| Exhibit No. | Description                                                                                                                                         | Date       | Identifier  |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------|
| 1055        | A. B. Carlson, “Communication Systems An Introduction to Signals And Noise in Electrical Communication,” McGraw-Hill, Inc., 1975.                   | 1975       | Carlson     |
| 1056        | Léon M. H. E. Driessen, “On an Infinite Series of $[4n, 2n]$ Binary Codes,” IEEE Transactions on Information Theory, Vol. IT-30, No. 2 (March 1984) | March 1984 | Driessen II |

## TABLE OF AUTHORITIES

|                                                                                   | Page(s) |
|-----------------------------------------------------------------------------------|---------|
| <u>Cases</u>                                                                      |         |
| <i>In re Am. Acad. of Sci. Tech. Ctr.</i><br>367 F.3d 1359 (Fed. Cir. 2004) ..... | 15      |
| <i>In re Paulsen</i><br>30 F.3d 1475 (Fed. Cir. 1994) .....                       | 15      |
| <i>Phillips v. AWH Corp.</i><br>415 F.3d 1303 (Fed. Cir. 2005) .....              | 15      |
| <i>In re Translogic Tech., Inc.</i><br>504 F.3d 1249 (Fed. Cir. 2007) .....       | 15      |
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| 35 U.S.C. section 102(b) .....                                                    | 20      |
| 35 U.S.C. section 102(e) .....                                                    | 17, 50  |
| 35 U.S.C. sections 311–319 .....                                                  | 1       |
| <u>Other Authorities</u>                                                          |         |
| 37 Code of Federal Regulations pt. 42 .....                                       | 1       |
| 37 Code of Federal Regulations section 42.8 .....                                 | 1, 2    |
| 37 Code of Federal Regulations section 42.15(a) .....                             | 2       |
| 37 Code of Federal Regulations section 42.100(b) .....                            | 14      |
| 37 Code of Federal Regulations section 42.103 .....                               | 2       |
| 37 Code of Federal Regulations section 42.104 .....                               | 3       |
| Trial Practice Guide, 77 Federal Register 48756 (August 14, 2012) .....           | 15      |

## **I. INTRODUCTION**

HTC Corporation and HTC America, Inc. (collectively, “Petitioners” or HTC”) petition for *Inter Partes* Review (“*IPR*”) under 35 U.S.C. §§ 311–319 and 37 C.F.R., Part 42, of claims 1 through 8 (“the *IPR* Claims”) of U.S. Patent No. 6,760,590, and assert there is a reasonable likelihood that they will prevail with respect to each of the *IPR* Claims. Therefore, Petitioners respectfully request cancellation of the *IPR* Claims.

## **II. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8**

### **A. Real Parties-In-Interest (§ 42.8 (b)(1))**

The real parties-in-interest are HTC Corporation and HTC America, Inc.

### **B. Related Matters (§ 42.8 (b)(2))**

As part of a licensing dispute, Patent Owner originally sued Petitioners for patent infringement, in an action styled *Inventergy, Inc. v. HTC Corporation, and HTC America, Inc.*, C.A. No.: 17-cv-200-VAC-CJB (D. Del. 2017), on February 27, 2017. Ex. 1003. On May 25, 2017, Patent Owner filed a voluntary dismissal without prejudice of the aforementioned action under Rule 41(a)(1)(A)(i). Ex. 1004.

On the same day, Patent Owner sued Petitioners for patent infringement, in an action styled *INVT SPE LLC v. HTC Corporation, and HTC America, Inc.*, 2:17-cv-03740-JMV-JBC (D.N.J. 2017) – asserting the ’590 Patent. Ex. 1005. On

March 9, 2018, Petitioners filed a motion to transfer the action to the Northern District of California under 28 U.S.C. §1404(a) (Ex. 1006), and Patent Owner opposed said motion on March 23, 2018. Ex. 1007. On April 2, 2018, Petitioners filed a reply to the opposition. Ex. 1008. Petitioners' motion to transfer is currently pending.

**C. Lead and Backup Counsel (§ 42.8 (b)(3))**

HTC appoints Stephen S. Korniczky (Reg. No. 34,853) of Sheppard Mullin Richter & Hampton LLP as Lead Counsel, and appoints Martin R. Bader (Reg. No. 54,736), Nam H. Kim (Reg. No. 64,160), Ericka J. Schulz (Reg. No. 60,665), Eric K. Gill (Reg. No. 71,709), and Hector A. Agdeppa (Reg. No. 58,238), of the same firm, as Back-Up Counsel. An appropriate Power of Attorney is filed concurrently herewith.

**D. Service Information (§ 42.8 (b)(4))**

Service of any documents to Counsel can be made via hand-delivery to Sheppard Mullin Richter & Hampton LLP, 12275 El Camino Real, Suite 200, San Diego, California 92130. Petitioners consent to service by e-mail at LegalTm-HTC-INVT-IPRs@sheppardmullin.com. Tel: 858.720.8900; Fax: 858.509.3691.

**III. FEE FOR *IPR* (37 C.F.R. § 42.15(a) and § 42.103)**

Petitioners have paid the required fees. The Office is authorized to charge any fee deficiency, or credit any overpayment, to Deposit Account No. 50-4561.

**IV. REQUIREMENTS FOR *IPR* UNDER 37 C.F.R. § 42.104**

**A. Grounds for Standing (§ 42.104 (a))**

Petitioners certify that (1) the '590 Patent is available for *IPR*; and (2) Petitioners are not barred or estopped from requesting *IPR* of the claims of the '590 Patent on the Grounds identified in this Petition.

**B. Identification of Challenged Claims (§ 42.104 (b)(1))**

Petitioners request *IPR* of ***Claims 1 through 8*** of the '590 Patent, and request that the Patent Trial and Appeal Board cancel those claims as unpatentable.

**C. Grounds of Challenge (§ 42.104 (b)(2))**

The Grounds of unpatentability presented in this Petition are as follows.

| Ground | Basis | Reference(s)                          | Claims Challenged |
|--------|-------|---------------------------------------|-------------------|
| 1.     | § 103 | Padovani in view of Gils              | 1-4               |
| 2.     | § 103 | Padovani in view of Gils and Olofsson | 5-8               |

Neither Padovani (Ex. 1009), nor Gils (Ex. 1010), nor Olofsson (Ex. 1053) were cited during the prosecution of the '590 Patent. The invalidity Grounds set

forth in this Petition are confirmed and supported by the Declaration of Dr. Paul Min (Ex. 1017), which accompanies this Petition.

**V. PROPOSED GROUNDS ARE NOT REDUNDANT**

There are no redundant grounds presented.

**VI. RELEVANT INFORMATION CONCERNING THE '590 PATENT**

**A. State of the Art at the Time the '590 Patent was Filed**

Error-correction coding is a process of adding redundant data to a message, such that it can be recovered by a receiver even when a number of errors (up to the capability of the code being used) were introduced. Ex. 1017, ¶ 83. Error-correction codes/coding have been known since The 1940's . Ex. 1017, ¶ 83. Initially, most error-correcting codes capabilities were described in terms of the correct reception of the entire message. Ex. 1010, 6; Ex. 1017, ¶ 83. These codes [could] successfully be applied in those cases where all positions in a message word require equal protection against errors. Ex. 1010, 6.

However, “many applications exist in which some message positions are more important than others. For example in transmitting numerical data, errors in the sign or high-order digits are more serious than are errors in the low-order digits.” Ex. 1010, 6. To solve this problem, unequal error protection (UEP) codes were developed that protect some positions in a message word against a larger number of errors than other ones. Ex. 1017, ¶ 84.

UEP codes refer to a class of error-correction codes that allow certain digits of a message to be protected against a greater number of errors than other digits in the message. Ex. 1012; Ex. 1017, ¶ 85. UEP codes have been known since at least 1967. Ex. 1012; Ex. 1017, ¶ 85.

Various UEP coding schemes have been applied to different technology areas before August 2, 2000, the earliest alleged priority date of the '590 Patent. Ex. 1017, ¶ 86. For example, UEP coding schemes have been used to solve the problem “concern[ed] with the transmission and storage of messages in which different parts are of mutually different importance.” Ex.1010, v. This can be done by using different coding schemes for the different parts, but more elegantly by using a single so-called Unequal Error Protection coding scheme. *Id.* As another example, a European patent application filed in 1982 discloses applying UEP codes to the “transmitting information of a television picture....” Ex. 1011, 1:3-26. Most pertinently, UEP coding schemes were applied to digital wireless communication systems before August 2, 2000. Ex. 1017 ¶ 86; Ex. 1011, 1:1-25. For example, U.S. Patent No. 5,691,992 entitled “Punctured Coding System For Providing Unequal Error Protection In a Digital Communication System” describes operation of a digital communication system and the use of unequal error protection to combat “[c]orruption of the transmitted symbol stream [of significant and insignificant symbols]” recognized as being “a particular problem for wireless

transmission channels due to the high level of noise....” Ex. 1019, 1:14-23; 4:40-65. U.S. Patent No. 6,665,831 entitled “Unequal Error Protection In Multi-Carrier Transmission” (Ex. 1020, Abstract), U.S. Patent No. 4,747,104 entitled “Data Transmission System Employing a Combination of Block Encoding and Convolution Encoding for Error Protection,” (Ex. 1021, Abstract, 9:27-33), and the publication entitled “Construction of unequal error protection codes” to Mabogunje (Ex. 1018, [introduction]) all describe implementing some form of unequal error protection in a communications system.

Regarding wireless digital communications, channel characteristics, such as downlink channel/forward link quality were and are still used to determine information rates or levels of service that can be supported on those downlink channels/forward links. Ex. 1009, 4:3-13; Ex. 1013, 2:52-64; Ex. 1017 ¶ 87. Signal-to-noise-and-interference ratio (SNIR), also referred to as signal-to-interference-plus-noise ratio (SINR) or carrier-to-interference ratio (CIR or C/I) is an indicator of the downlink channel/forward link quality. Ex. 1009, 4:3-13; Ex. 1013, 2:52-64; Ex. 1017, ¶ 87-88. Generally, a mobile station or access terminal measures the downlink channel/forward link quality based on a signal, such as a paging or pilot signal received from a network relay point (e.g., base station, access point, or similar network element). Ex. 1009, 9:34-38; Ex. 1013, 5:51-58; Ex. 1017, ¶ 87. The mobile station/access terminal then informs the network relay

point of the downlink channel/forward link quality by transmitting a signal containing or indicative of the downlink channel/forward link quality (e.g., a data rate control (DRC) message) to the network relay point. Ex. 1009, 9:28-10:9; Ex. 1013, 5:64-6:6; Ex. 1017, ¶ 87. For example, a mobile station/access terminal may include an SNIR estimation component that outputs an SNIR measurement to a DRC component for generating a DRC message that ultimately is transmitted to an access point. Ex.1013, 12:29-50; *Id.*, FIG. 6 (reproduced below).

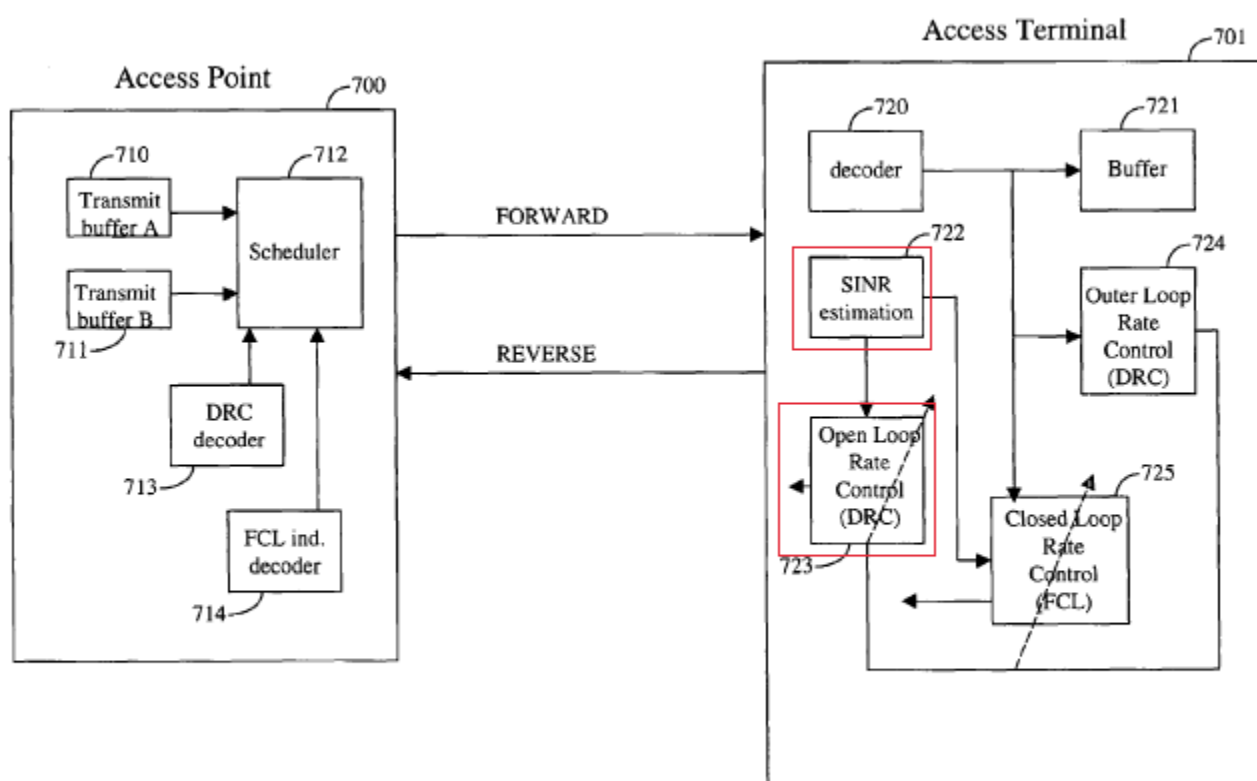


FIG. 6

## B. Person of Ordinary Skill in the Art (“POSITA”)

Based on expert opinion, a person of ordinary skill in the art with respect to the '590 Patent would have had a bachelor's degree in electrical engineering, computer engineering, mathematics, or a related field, and one to two years of experience in wireless/mobile communications or equivalent education and experience. Ex. 1017, ¶ 53. This represents the level of skill a person of ordinary skill in the art would have possessed on April 1, 2002, the alleged priority date of the '590 Patent. Ex. 1017, ¶ 53. Such a person would have the capability of understanding the scientific and engineering principles applicable to the pertinent art. Ex. 1017, ¶ 53.

### **C. Overview of the '590 Patent**

#### **1. The Purported Improvement of the '590 Patent**

The '590 Patent describes High Data Rate (HDR) communications as a method utilized in cellular communication systems whereby a base station (BS) uses time division to schedule the allocation of communication resources to communication terminals. *See, e.g.*, Ex. 1001, 1:14-26. Additionally, a BS may set a transmission rate for each communication terminal in accordance with an estimated downlink channel quality relative to a particular communication terminal. *Id.*

In particular, the '590 Patent describes that a BS may transmit a pilot signal to each communication terminal with which the BS is communicating. *Id.*, 1:30-

31. Each communication terminal, in turn, estimates the downlink channel quality between it and the BS “using a CIR (desired carrier to interference ratio) based on the pilot signal, etc.” and finds a transmission rate at which communications are possible. *Id.*, 1:31-35. Based on the identified transmission rate, “each communication terminal selects a communication mode,” described by the ’590 Patent as “a combination of packet length, coding method, and modulation method.” *Id.*, 1:35-41. Each communication terminal informs the BS of its respective, selected communication mode by transmitting a data rate control (DRC) signal to the BS. *Id.*

The ’590 Patent indicates that DRC signals are generally “represented by numbers 1 to N, with a higher number indicating a proportionally better downlink channel quality.” *Id.*, 1:53-56. Based on each communication terminal’s indicated DRC, the BS sets a transmission rate for each communication terminal, and transmits a signal to each communication terminal indicating communication resource allocation to each communication terminal. *Id.*, 1:57-62.

The ’590 Patent identifies problems with HDR communications, and purports solving those problems by transmitting information indicative of a communication terminal’s communication mode in a manner that is less susceptible to transmission error. *See, e.g., Id.*, 2:7-51.

In particular, the '590 Patent suggests that if the communication mode (determined by a communication terminal) is erroneously received by the BS due to, e.g., deterioration of uplink channel conditions, the communication terminal would be unable to demodulate/decode data transmitted to the communication terminal. *Id.*, 2:14-22. Additionally, the '590 Patent describes a scenario in which a BS transmits data to a particular communication terminal over some allocated time period (recalling that time division is used to schedule communication resource allocation). *Id.*, 2:24-33. If there is a mismatch in communication modes, the allocated communication resources go unused, resulting in reduced downlink throughput. *Id.*

In accordance with various embodiments (referred to as Embodiments 2 and 5), the '590 Patent describes converting the DRC signal to a code word whose code word minimum distance with respect to other DRC signal code words varies in accordance with downlink channel quality between a communication terminal and BS (indicated by the DRC signal). *Id.*, 10:17-23, 18:24-29. That is, as downlink channel quality gets better, the code word minimum distance of a code word into which the DRC signal is converted correspondingly gets larger. *Id.* The '590 Patent defines the term “code word distance” as “the number of bits that differ between code words, and the term “code word minimum distance” as “the minimum number of bits by which a particular code word differs with respect to all

other code words.” *Id.*, 10:60-63. *See, also Id.*, 10:63-11:4 and FIG. 7

(reproduced below).

| DRC<br>NUMBER | CODE WORD | CODE WORD MINIMUM<br>DISTANCE |
|---------------|-----------|-------------------------------|
| 1             | 000000000 | 1                             |
| 2             | 000000001 | 1                             |
| 3             | 000000110 | 2                             |
| 4             | 000111000 | 3                             |
| 5             | 111111111 | 6                             |

FIG.7

The '590 Patent suggests that the larger the code word minimum distance, the less likely the code word will be mistaken for another code word. *Id.*, 11:5-9. As previously noted, code word minimum distance is a function of the DRC number, and DRC numbers are indicative of downlink channel quality. *Id.*, 10:18-23, 10: 60-11:4. Accordingly, a DRC signal corresponding to a communication mode that can be supported on a good quality downlink channel can be better protected by being converted to a code word with a greater code word minimum distance. *Id.*, 11:22-31.

The '590 Patent describes still another embodiment (referred to as Embodiment 6), in which a communication terminal may transmit with less

susceptibility to errors in the propagation path in proportion to information for which the amount of change regarding CIR information is large. *Id.*, 19:35-43. The '590 Patent defines "information for which the amount of change is large" with an example. *Id.*, 19:44-46. The example described in the '590 Patent is a CIR value with a decimal integer and a decimal fraction, e.g., 8.7 dB. *Id.*, 19:46-53. The phrase "information for which the amount of change is large," in the given example, refers to the decimal integer "8." That is, the amount of change in the decimal integer part of the CIR value can be 1dB. A change of 1dB is greater than the amount of change, i.e., 0.1dB per the decimal fraction portion of the CIR value (0.7dB). *Id.* In other words, if the decimal integer portion of the CIR value is received erroneously by a BS, the degree of error is large compared to a case where the decimal fraction portion of the CIR value is received erroneously. *Id.*, 19:53-58.

Accordingly, the '590 Patent describes converting a CIR value to a code word, where the code length of the code word is proportional to the value of the "upper" digit (in the above example, decimal integer portion "8") making up the CIR value. *Id.*, 20:8-26. For example, the value of the upper digit (upon measuring) can be output to a 6-bit coding section, while the value of the lower digit (in the above example, decimal portion "0.7") can be output to a 4-bit coding section. *Id.*, 20:33-45. The result is that the upper digit of the CIR value is

converted into a 6-bit code word, and the lower digit of the CIR value is converted into a 4-bit code word, the total number of bits being used to indicate the complete CIR value being 10 bits. *Id.*, 20:46-54, 21:7-10. Because the number of different code words that can be represented with 6 bits is  $2^6$  and the number of different code words that can be represented with 4 bits is  $2^4$ , the code word minimum distance between code words can be made larger for those represented with 6 bits. *Id.*, 21:11-17. The '590 Patent purports that the 6-bit code word (compared to the 4-bit code word) is less susceptible to errors. *Id.*, 21:20-33.

The '590 Patent concludes with eight independent claims directed to the following UEP coding schemes applied to (1) information comprising an upper digit and a lower digit indicative of a result of downlink channel quality estimation (claims 1 and 3); (2) information comprising an upper digit and a lower digit used for assignment of the downlink channel (claims 5 and 7); (3) encoding the information such that the upper digit has a larger code word minimum distance than the lower digit (claims 1 and 5); (4) encoding the information such that the upper digit is assigned a larger number of bits than the lower digit (claims 3 and 7); and the upper digit containing a most significant bit (MSB) of information (claims 2, 4, 6, and 8). Ex. 1017, ¶ 48.

As demonstrated in detail below, and confirmed in the testimony of Dr. Paul Min (Ex. 1017), these claimed UEP coding schemes were well known in the art,

before the earliest claimed priority date of the '590 Patent. Ex. 1017, ¶ 49.

Moreover, a POSITA would have known to apply the well-known UEP coding schemes to error code a message indicative of a result of channel quality estimation to achieve the well-known goal of protecting more important messages and/or more important part(s) of the message than other, less important parts of the message. Ex. 1017, ¶ 49.

**D. Effective Filing Date and Prosecution History of the '590 Patent**

The '590 patent issued on July 6, 2004 from Application No. PCT/JP01/06654 filed on August 2, 2001 (Ex.1002, 136-205), and filed as U.S. Application No. 10/089,605 (the “ '605 application”) on April 1, 2002. *Id.*, 5-133. The earliest claimed priority date of the '590 patent is August 2, 2000. *Id.*, 134-135.

On December 16, 2002, Patent Owner preliminarily amended the application to highlight additional patentable features of the invention. *Id.*, 224-228..

On February 4, 2003, Patent Owner filed a petition asking that the '605 application be granted special status. *Id.*, 237-246. On November 26, 2003, the petition was granted, and the '605 application, was forwarded to the Examiner for accelerated examination. *Id.*, 247-248. On December 24, 2003, a Notice of Allowance was issued. *Id.*, 249-256.

## VII. CLAIM CONSTRUCTION

For purposes of this *IPR*, each challenged claim must be given “its broadest reasonable construction in light of the specification.” 37 CFR § 42.100(b). The broadest reasonable construction or interpretation (“BRI”) standard requires that claim terms be “given their ordinary and customary meaning,” as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007) (quoting *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (en banc)). A special definition for a claim term must be set forth in the specification with “reasonable clarity, deliberateness, and precision.” *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994). Indeed, to the extent Patent Owner contends a term in the challenged claims should be read to have a special meaning, those contentions should be disregarded unless the claims are amended to expressly correspond to the contended meaning. See Trial Practice Guide, 77 Fed. Reg. 48756, 48764 at col. 2 (August 14, 2012).

However, because the standard of claim construction used in an *IPR* differs than that used in litigation, Petitioners reserve the right to present different constructions of terms in litigation under claim construction standards appropriate for such cases. See *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1369 (Fed. Cir. 2004). Accordingly, Petitioners submit the following claim constructions, as

proposed by Petitioners' expert, for purposes of this Petition only.<sup>1</sup> Any claim terms that are not defined below are presumed to take on their ordinary and customary meaning.<sup>2</sup>

**A. “code word minimum distance” (Claims 1 and 5)**

This term is used in claims 1 and 5, which recites “encodes... such that the upper digit has a larger code word minimum distance than the lower digit.” Ex. 1001, 25:31-32;26:28-29. The specification of the '590 Patent describes that “‘code word distance’ is the number of bits that differ between code words.” Ex. 1001, at 10:60-61. The specification of the '590 Patent, then goes on to describe that “‘code word minimum distance’ is the minimum number of bits by which a particular code word differs with respect to all other code words.” *Id.*, 10:61-63. Accordingly, a POSITA would find, in light of the specification and the claim language, the meaning of the term “code word minimum distance” to include “*the minimum number of bits by which a particular code word differs with respect to all other code words.*” Ex. 1017, ¶ 108.

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<sup>1</sup> Petitioner has addressed claim construction under the current standard for IPR of the broadest reasonable interpretation. 37 CFR §42.100(b). To the extent the Board adopts a different standard, for example by applying the standard under *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005), Petitioner reserves the right to supplement briefing on this issue.

<sup>2</sup> Petitioner does not concede that any term not construed herein meets the statutory requirements of 35 U.S.C. § 112.

## VIII. PRECISE REASONS FOR RELIEF REQUESTED

### A. Padovani in View of Gils Invalidates Claims 1-4

#### 1. Overview of Padovani

Padovani issued on July 31, 2003, and has an effective filing date of November 3, 1997, making it prior art under at least 35 U.S.C. § 102(e). Padovani discloses a Code Division Multiple Access (CDMA) system, in which a mobile station transmits a data request message to a base station containing an indication of the forward link channel quality. *See, e.g.*, Ex. 1009, Abstract and 9:8-10:6; Ex. 1017, ¶ 110. Moreover, Padovani discloses encoding a data request channel/data rate control (DRC) message using an error correcting code. Ex. 1009, 45:15-25; ; Ex. 1017 ¶ 110.

In particular, Padovani seeks to “improve[] the efficiency of a CDMA system by providing for means for transmitting data on the forward and reverse links” for high rate packet data transmission. *Id.*, 5:22-24; Ex. 1017 ¶ 111. Padovani’s goal of increasing efficiency in at least the forward link for high rate packet data transmission is akin to that of the ’590 Patent which purports providing systems and method for “prevent[ing] the downlink throughput from decreasing” in the HDR context. *See supra*, sec. VI.C.1; Ex. 1001, 2:50-51; Ex. 1017 ¶ 111. It should be noted that the ’590 Patent describes downlink transmissions as going from a BS to a communication terminal (Ex. 1001, 1:19-22). This comports with

Padovani's description of the forward link. Ex. 1009, 2:1-4, 8:37-38; Ex. 1017 ¶ 111.

Like the '590 Patent, Padovani describes a mobile station "measur[ing] the signal-to-noise-and-interference ratio (C/I) of the forward link pilot from the base stations in the active set, as received at the mobile station." *Id.*, 9:12-14. A POSITA would understand that the signal-to-noise-and-interference ratio is also known as the carrier-to-interference ratio (CIR).<sup>3</sup> Ex. 1017, ¶ 112. Like the '590 Patent, Padovani describes transmitting "to the selected base station a data request message (hereinafter referred to as the DRC message) on the data request channel (hereinafter referred to as the DRC channel)." Ex. 1009, 10:3-6.<sup>4</sup> Ex. 1017 ¶ 112. Again like the '590 Patent, Padovani indicates that the DRC message can contain "an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate)." Ex. 1009, 10:6-9.

In the event data is to be transmitted to a mobile station, Padovani describes that, "[f]or example, the best base station can be selected based on the largest C/I measurement." *Id.*, 10:2-3. Upon identifying the best base station, the mobile

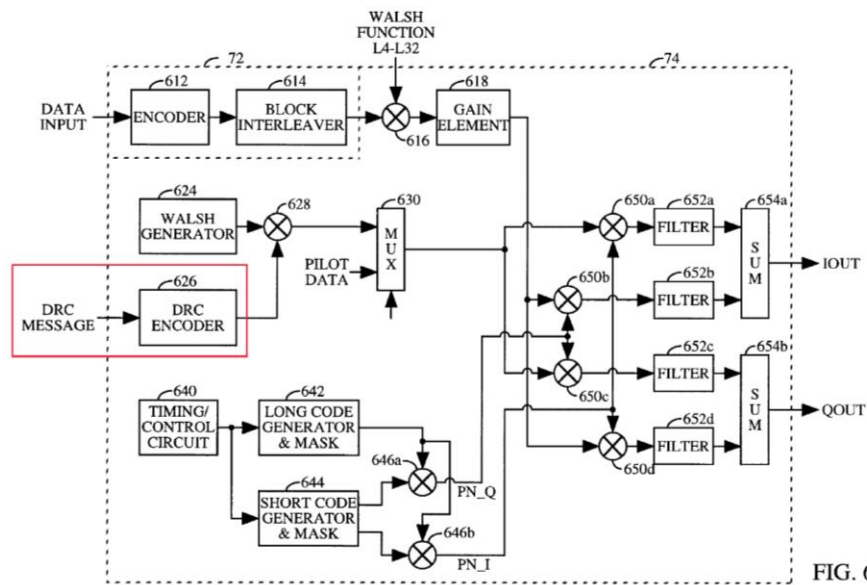
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<sup>3</sup> The acronym C/I can also be interpreted to mean "Carrier-to-Interference." See, e.g., Ex. 1014, claims 35 and 41.

<sup>4</sup> The acronym DRC can also be interpreted to mean "Data Rate Control." See, e.g., Ex. 1014, claims 34, 40, 46, 49, and 41.

terminal may send the DRC message to that base station, and the base station may “decode the DRC message and configure the hardware for data transmission....” *Id.*, 17:21-24. In this way, a “base station... transmits at the maximum power available... and at the maximum data rate supported by the data communication system...” where “[t]he maximum data rate that can be supported... depends on the C/I of the forward link signal as measured by mobile station....” *Id.*, 24:26-31.

Padovani teaches providing the DRC message to a DRC encoder “which encodes the message in accordance with a predetermined coding format.” *Id.*, FIG. 6, 45:15-17; Ex. 1017 ¶ 113.



Drawing further parallels to the '590 Patent, Padovani notes the importance of coding the DRC message, i.e., “since the error probability of the DRC message needs to be sufficiently low because incorrect forward link data rate determination

impacts the system throughput performance.” *Id.*, 45:17-20. As an example, Padovani describes using a “rate (8,4) CRC block encoder that encodes the 3-bit DRC message into an 8-bit code word. *Id.*, 45:20-22. POSITA would understand that Padovani’s (8,4) CRC block encoder incorporates one bit (in addition to the 3-bit DRC message) to effectuate the cyclical redundancy check. Ex. 1017, ¶ 114.

## 2. Overview of Gils

Gils was published January 1, 1998 making it prior art under at least 35 U.S.C. § 102 (a), (b). At a high level, Gils discloses the design of error-control coding schemes for different problems including noisy information transmission. Ex. 1010, v. Gils describes that in “the transmission and storage of messages in which different parts are of mutually different importance,” “it is natural to give parts of mutually different importance different protection against errors.” *Id.*

Like the ‘590 Patent, Gils recognizes that “many applications exist in which some message positions are more important... [f]or example in transmitting numerical data, errors in the sign or in the high-order digits are more serious than the errors in the low-order digits.” *Id.*, 14; *see also* Philips Journal, 293. Gils also considers scenarios involving “the transmission of message words from different sources simultaneously... where the different sources have different demands concerning the protection against errors,” as a scenario in which unequal error protection may be useful. *Id.*

Gils describes the generation and use of linear unequal protection (LUEP) codes to “protect some positions in a message word against a larger number of errors than other ones,” (crediting Masnick and Wolf with the introduction of unequal error protection (UEP) codes by considering single position error protection). *Id.*; see also Philips Journal, 293. In coding theory, “[a] linear  $[n,k]$  block code  $C$  of length  $n$  and dimension  $k$  ( $k < n$ ) over the alphabet  $GF(q)$ , the Galois field containing  $q$  elements, is a  $k$ -dimensional subspace of the  $n$ -dimensional vector space  $GF(q)^n$ . *Id.*, 1 (emphasis in original). Additionally, Gils notes that “(linear) encoding of the message set... is a linear mapping from  $M$  onto the code space  $C$ ; a message  $\underline{m} = (m_1, m_2, \dots, m_k) \in M$  is mapped onto the codeword  $\underline{c} = \underline{m}G$ ,” where the matrix  $G$  is referred to as a generator matrix. *Id.* (emphasis in original).

Further still, Gils describes that if a message is to be transmitted, “the codeword attached to it” is transmitted, and that “[d]uring transmission... the codeword can be corrupted,” where “[t]he nature of the corruption depends on the specific channel used.” *Id.* Gils indicates that it is up to the decoder “at the receiving end of the channel” to estimate the original message “as good as possible,” which is based on Hamming weight and distance. *Id.*, 2. Hamming distance can be defined as “the number of positions in which  $\underline{x}$  and  $\underline{y}$  differ, and can be characterized in terms of a separation vector  $\underline{s}(G)$ . *Id.*, 2, 16. See also, *Id.*,

3 (“the minimum (Hamming) distance is defined as the minimum distance between two different codewords...”).

Gils explores various possibilities for LUEP codes, examples of which are listed in Table 1 (reproduced below), where the separation vectors of the LUEP codes have lengths equal to or less than 15. *Id.*, 24-26; *see also* Philips Journal, 295-296.

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 102, I 94, I 86                |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: *The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.*

| <i>n</i> | <i>k</i> | <i>d(n, k)</i> | separation vector                                                     |
|----------|----------|----------------|-----------------------------------------------------------------------|
| 11       | 6        | 4              | A 622222, J 544442, B 533333                                          |
| 11       | 7        | 3              | A 5222222, J 4444222, J 4333322                                       |
| 11       | 8        | 2              | A 42222222, J 33332222                                                |
| 11       | 9        | 2              | A 322222222                                                           |
| 12       | 2        | 8              | A 11.2, I 10.4, I 96                                                  |
| 12       | 3        | 6              | A 10.22, C 944, E 864, K <sub>2</sub> 774, K <sub>1</sub> 766         |
| 12       | 4        | 6              | A 9222, C 8444, K <sub>1</sub> 7644                                   |
| 12       | 5        | 4              | A 82222, C 74444, E 66444, M 55554                                    |
| 12       | 6        | 4              | A 722222, C 644444, G 554444                                          |
| 12       | 7        | 4              | A 6222222, J 5444422, J 5333332                                       |
| 12       | 8        | 3              | A 52222222, J 44442222, J 43333222                                    |
| 12       | 9        | 2              | A 422222222, J 333322222                                              |
| 12       | 10       | 2              | A 3222222222                                                          |
| 13       | 2        | 8              | A 12.2, I 11.4, I 10.6, I 98                                          |
| 13       | 3        | 7              | A 11.22, C 10.44, K <sub>1</sub> 964, E 884, L 866                    |
| 13       | 4        | 6              | A 10.222, C 9444, L 8644, F 7744, K <sub>1</sub> 7666                 |
| 13       | 5        | 5              | A 92222, C 84444, K <sub>1</sub> 76444, L 66664,<br>H 66555           |
| 13       | 6        | 4              | A 822222, C 744444, D 664444, M 555544                                |
| 13       | 7        | 4              | A 7222222, J 6444442, B 6333333,<br>J 5544442, K <sub>1</sub> 5444444 |
| 13       | 8        | 4              | A 62222222, J 54444222, J 53333322                                    |
| 13       | 9        | 3              | A 522222222, J 444422222, J 433332222                                 |
| 13       | 10       | 2              | A 4222222222, J 3333222222                                            |
| 13       | 11       | 2              | A 32222222222                                                         |
| 14       | 2        | 9              | A 13.2, I 12.4, I 11.6, I 10.8                                        |
| 14       | 3        | 8              | A 12.22, C 11.44, L 10.64, K <sub>1</sub> 984, K <sub>1</sub> 966     |
| 14       | 4        | 7              | A 11.222, C 10.444, K <sub>1</sub> 9644, L 8844,<br>L 8666            |
| 14       | 5        | 6              | A 10.2222, C 94444, L 86444, F 77444,<br>N 76666                      |

Table I(continued): The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

As explained in Gils, “n denotes the length of the code, k denotes the dimension [the length of the data input or data word], and d(n,k) denotes the maximal minimum distance of a binary linear code of length n and dimension k. *Id.*, 24; see also Philips Journal, 294. It should be noted that the separation vectors in Table I are identified with particular (n,k) codes generated using different

generator matrices (denoted by “A”, “C”, “I”, “J”, etc.), constructions of which are described in the Appendix of Gils. *Id.*, 56-64; *see also* Philips Journal, 297-304.

### 3. **Motivation to Combine**

Padovani discloses a CDMA system where a mobile station transmits a request based on a channel quality measurement to a BS. Ex. 1009, 5:21-22. The mobile station measures the C/I (signal-to-noise-and-interference-ratio) of the forward link channel. *Id.*, 5:32-38, 47:17-36. It then transmits a DRC (data request) message to the BS. *Id.*, 5:38-6:3. The DRC message carries the C/I measurement or another indication of quality of the forward link channel. *Id.*, 9:39-10:9. Padovani also discloses a DRC encoder that encodes a DRC message with an error correcting code prior to transmission to the BS. *Id.*, 45:16-33. Gils discloses error coding message words for transmission using LUEP codes. *See, e.g.*, Ex. 1010, 14.

Gils discloses error coding message words for transmission using LUEP codes. *See, e.g.*, Ex. 1010, 14; *see also* Philips Journal, 293-294. Gils further discloses various LUEP codes (Table I) with unequal protection against errors in which a first column of the table gives the length of a code word, a second column gives the length of a data word to be converted into the code word, a third column gives a maximal minimum distance of the code word relative to other code words in a code word set, and a fourth column gives the degree(s) of error protection for

each bit of the data word as a Hamming distance. *Id.*, 14 and 24-28; *see also* Philips Journal, 295-296.

Each row of Table I reflects different  $(n,k)$  coding schemes that result in protecting certain part(s) of the message better than other parts of the message. For example, the  $(n,k)$  coding scheme (8,3) results in the encoding of 3 bits into a plurality of 8 bit codewords, where according to a first construction (A), one bit (which can be considered a most significant bit) is more important than two other bits. *Id.*, 25; *see also* Philips Journal, 295. The resulting code words have a Hamming distance of 6 and the other bits each have Hamming distances of 4, indicating unequal error protection for different bits. Ex. 1017, ¶ 124.

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 10.2, I 94, I 86               |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

Ex. 1010, 25; *see also* Philips Journal, 295.

It would have been obvious for a POSITA to have modified the DRC encoder of Padovani by using an encoder configured to implement a coding scheme, like those disclosed by Gils, in order to ensure that error probability of the encoded DRC message is sufficiently low. Ex. 1017, ¶ 125. Moreover, POSITA would have understood that the use of one coding scheme versus another would

depend on, e.g., the type of data to be encoded and/or the amount of error protection desired. Ex. 1017, ¶ 125.

Both Padovani and Gils contemplate transforming or converting data into a code word prior to transmission using an encoder. Ex. 1017, ¶ 126. As noted above, Padovani describes converting DRC data prior to transmission from a mobile station to a BS in a CDMA system, while Gils discusses, generally, LUEP in any context where a message is to be transmitted and where unequal error protection may be beneficial to protect the message. *See supra*, secs. VIII.A.1 and 2. Thus, both references are in the same general field of endeavor (error coding data prior to transmission of that data). As recognized by the Supreme Court, known work in one field of endeavor may prompt variations of it for use in either the same field or a different one based on design incentives or other market forces if the variations are predictable to one of ordinary skill in the art. *See KSR Int'l co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007).

Gils also recognizes the need for an error coding scheme that provides improved error correction when transmitting data. For example, Gils recognizes that greater error protection may be needed for certain bits, e.g., one or more higher order or more significant bits. Ex. 1010, 6; *see also* Philips Journal, 293. Inasmuch as Padovani contemplates encoding a DRC message that can include actual C/I measurements which may be represented in terms of a decimal integer

and decimal fraction (like the '590 Patent), POSITA would have been motivated to provide greater protection for the decimal integer portion (an error in which would be magnified versus an error in the decimal fraction portion). Ex. 1009, 23:29-24:02, Ex. 1017, ¶ 127.

Further still, Padovani recognizes that “the difference between the highest and lowest [C/I] value can be as large as 10,000,” resulting in “information bit rates that can vary by as much as a factor of 100.” Ex. 1009, 4:25-34. Moreover, Table 1 of Padovani (reproduced below) illustrates a plurality of data rates ranging from 38.4 Kbps to 2457.6 Kbps, each corresponding to a particular rate index (0 – 6).

TABLE 1

---

Traffic Channel Parameters

| Parameter                    | Data Rates |        |        |        |        |        |                   | Units     |
|------------------------------|------------|--------|--------|--------|--------|--------|-------------------|-----------|
|                              | 38.4       | 76.8   | 153.6  | 307.2  | 614.4  | 1228.8 | 2457.6            | Kbps      |
| Data bit/packet              | 1024       | 1024   | 1024   | 1024   | 1024   | 2048   | 2048              | bits      |
| Packet length                | 26.67      | 13.33  | 6.67   | 3.33   | 1.67   | 1.67   | 0.83              | msec      |
| Slots/packet                 | 16         | 8      | 4      | 2      | 1      | 1      | 0.5               | slots     |
| Packet/transmission          | 1          | 1      | 1      | 1      | 1      | 1      | 2                 | packets   |
| Slots/transmission           | 16         | 8      | 4      | 2      | 1      | 1      | 1                 | slots     |
| Walsh symbol rate            | 153.6      | 307.2  | 614.4  | 1228.8 | 2457.6 | 2457.6 | 4915.2            | Ksps      |
| Walsh channel/<br>QPSK phase | 1          | 2      | 4      | 8      | 16     | 16     | 16                | channels  |
| Modulator rate               | 76.8       | 76.8   | 76.8   | 76.8   | 76.8   | 76.8   | 76.8 <sup>1</sup> | ksps      |
| PN chips/data bit            | 32         | 16     | 8      | 4      | 2      | 1      | 0.5               | chips/bit |
| PN chip rate                 | 1228.8     | 1228.8 | 1228.8 | 1228.8 | 1228.8 | 1228.8 | 1228.8            | Kcps      |
| Modulation format            | QPSK       | QPSK   | QPSK   | QPSK   | QPSK   | QPSK   | QAM <sup>1</sup>  |           |
| Rate index                   | 0          | 1      | 2      | 3      | 4      | 5      | 6                 |           |

Note:

<sup>1</sup>16-QAM modulation

Better quality channels, i.e., those having higher C/I values can support the higher data rates, e.g., 2457.6 Kbps. *Id.*, 4:18-21; Ex. 1017, ¶ 131. A POSITA

would have understood that in order to support the range of potential C/I values /data rates, a non-linear distribution would be needed (or at least preferable) – hence the supported data rates reflected in Table 1 that double at each step.

A result of this non-linear distribution is that the effect of errors in data rates at the upper range is more pronounced, e.g., an error in coding a data rate of 2457.6 Kbps could potentially drop the data rate by half (down to 1228.8 Kbps), whereas an error in coding a data rate of 76.8 Kbps could also drop the data rate by half, but the result is only a drop of 38.4 Kbps. Accordingly, a POSITA would have understood that although Gils is directed to protecting certain portions of a data word, Gils is not divorced from protecting an entire data word. That is, protecting an entire data word could be important in addition to protecting, e.g., a most significant bit of that data word. As shown below, e.g., with respect to Claim 1, a POSITA would have been motivated to use the teachings of Gils to protect entire data words with code words having some desired code word minimum distance from other code words rather than or in addition to one or more portions of a code word.

Moreover, Gils is agnostic as to the context in which LUEP codes may be used. Ex. 1017, ¶ 133. That is, Gils describes designing “error-control coding schemes for... problems of noisy information transmission” without limiting the use of LUEP to any particular application or environment. Ex. 1010, v; Ex. 1017,

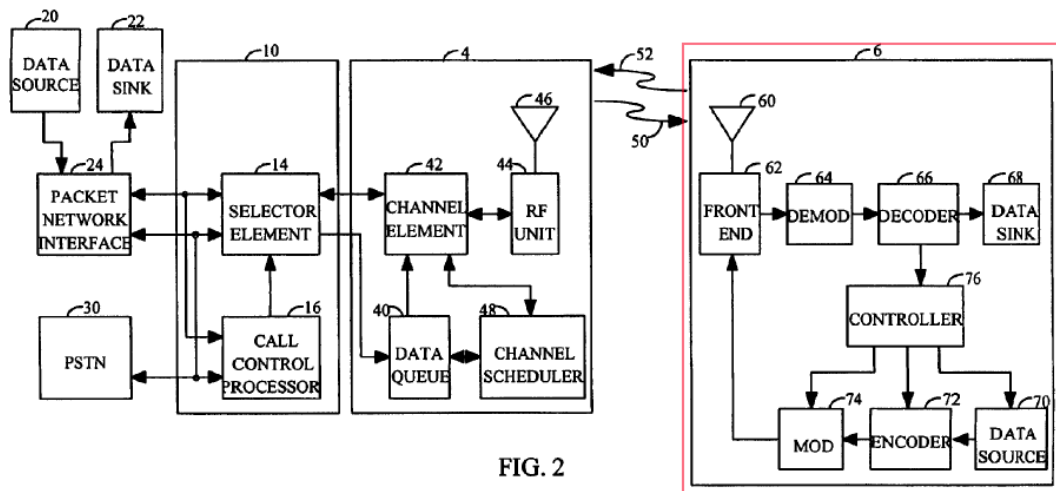
¶ 133. Indeed, Gils notes that “[t]hese problems... are of interest from a practical, industrial point of view....” Ex. 1010, v. Because a variety of systems and situations were known to experience noisy transmissions, a POSITA would have understood that Gils’ LUEP codes could be used to combat noisy transmissions in any of these systems and/or situations, including the transmission of DRC messages as is the case in Padovani. Ex. 1017, ¶ 133. Indeed, the use of UEP to encode transmitted messages/data in communications (or other systems) was well known. *See supra*, Sec. VI.A.

**1. Padovani in View of Gils Renders Claim 3 Obvious**

Petitioners note that Claim 3 of the ’590 Patent was asserted against Petitioners. *See supra* Sec. II.B. Accordingly, Petitioners address Claim 3 first.

**Claim 3 pre recites “[a] communication terminal apparatus[.]”**

Padovani teaches a communication terminal apparatus. Ex. 1009, FIG. 2 (element 6).



In particular, Padovani describes a data communication system in which embodiments may be implemented as follows:

Base station controller 10 interfaces with packet network interface 24, PSTN 30, and all base stations 4 in the data communication system (only one base station 4 is shown in FIG. 2 for simplicity). Base station controller 10 coordinates the communication between *mobile stations* 6 in the data communication system and other users connected to packet network interface 24 and PSTN 30. *Id.*, 12:13-19. (emphasis added).

Accordingly, Padovani teaches Claim 3pre. Ex. 1017, ¶ 136.

Claim 3a recites “a measurer that measures a downlink channel quality and outputs information that is generated in association with said downlink channel quality and composed of a plurality of digits including an upper digit and an lower digit[.]”

Padovani teaches a measurer that measures a downlink channel quality and outputs information that is generated in association with said downlink channel quality and composed of a plurality of digits including an upper digit and a lower digit.

In particular, Padovani describes that “[u]pon decoding the paging messages, and for each time slot until the data transmission is completed, **the mobile station measures the C/I of the forward link signals from the base stations** in the active set, as received at the mobile station.” (emphasis added). Ex. 1009, 9:34-37. Moreover, Padovani teaches transmitting to a base station “a data request message (hereinafter referred to as the DRC message) on the data request channel (hereinafter referred as the DRC channel). The DRC message can contain the requested data rate or, alternatively, an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet error-rate).” *Id.*, 10:3-9. Additionally still, Padovani describes that as noted above, the C/I of the forward link (as taught by Padovani) is analogous to the downlink channel quality of the ’590 Patent. *See supra*, sec. VIII.A.1.

As would have been recognized by a POSITA, by virtue of Padovani’s teaching that a mobile station measures the downlink channel quality (i.e., C/I of the forward link), the mobile station of Padovani includes a measuring device that measures downlink channel quality and outputs information, or at the least, it

would have been obvious to include such a measuring device in the mobile station that outputs information. Ex. 1017, ¶ 139.

Moreover as discussed supra Sec. VI.A, it was known for a mobile station/access terminal to have an SNIR estimation component that outputs an SNIR measurement to a DRC component for generating a DRC message that ultimately is transmitted to an access point. Ex.1013, 12:29-50; FIG. 6.

Additionally, as discussed supra Sec. VI.C.1, a CIR value may have decimal integer and decimal fraction portions. In the case of the '590 Patent example, the decimal integer portion of the CIR value may be the decimal integer “8,” where the amount of change in the decimal integer part of the CIR value can be on the order of a single digit decimal integer, i.e., 1 dB. Ex. 1001, 19:43-52. A change of 1dB is greater than the amount of change, i.e., 0.1 dB per the decimal fraction portion of the CIR value (0.7 dB). *Id.* In other words, if the decimal integer portion of the CIR value is received erroneously by a BS, the degree of error is large compared to a case where the decimal fraction portion of the CIR value is received erroneously. *Id.*, 19:52-57. The decimal integer portion of the CIR value can be interpreted as being an “upper digit,” while the decimal fraction portion of the CIR value can be interpreted as being a “lower digit.” *Id.*, 20:33-45; Ex. 1017, ¶ 141.

Similarly, Padovani indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement

itself, the bit-error rate, or the packet-error rate).” Ex. 1009 at 10:6-9. An actual C/I measurement may comprise a value that includes a decimal integer portion and a decimal fraction portion, e.g., 3.5 dB. *Id.*, 23:34-24:2. Thus, when transmitting actual C/I measurements, a POSITA would have recognized that the decimal integer portion of the actual C/I measurement is an upper digit and the decimal fraction portion of the actual C/I measurement is a lower digit. Ex. 1017, ¶ 142.

Accordingly, Padovani teaches Claim 3a. Ex. 1017, ¶ 143.

**Claim 3b recites “a coder that encodes the information such that the upper digit is assigned a larger number of bits than the lower digit[.]”**

Padovani in combination with Gils teaches a coder that encodes the information such that the upper digit is assigned a larger number of bits than the lower digit.

As discussed *supra* Sec. VIII.A.1, Padovani contemplates transmitting information (C/I measurements transmitted as/in DRC messages) represented by a plurality of digits that include an upper digit (e.g., 3) and a lower digit (e.g., 5). Ex. 1009, 23:34-24:2. Padovani also contemplates encoding binary representations of such information. *Id.*, 45:15-22. Gils derives a plurality of LUEP (n,k) coding schemes that when applied to a k-bit (binary) data word, result in n-bit code words. Ex. 1010, 24-27; *see also* Philips Journal, 294-296.

As described *supra* Sec. VIII.A.3., it would have been obvious to a POSITA to have combined Padovani and Gils such that the DRC encoder of Padovani could be configured to encode the C/I measurement in accordance with one or more of the coding schemes set forth Gils directed to providing unequal error protection for portions of a data word. Ex. 1017, ¶ 146. Moreover, although Gils seeks to provide unequal error protection for one or more portions of a data message, different coding schemes provided by Gils also result in code words that have different lengths (i.e., n-bit code words where n can vary). Ex. 1017, ¶ 146. A POSITA would have naturally understood that greater error protection (vis-a-vis longer code word length) should or could have been provided to a digit the greater the significance a digit has. Ex. 1017, ¶ 146.

In particular, the '590 Patent describes encoding a decimal integer portion 8 using a coding scheme that results in a first code word having a first code word length, and encoding a decimal fraction portion 7 using a coding scheme that results in a second code word having a second code word length, where the first code word is longer than the second code word. Ex. 1001, 20:36-49. A POSITA would have understood that encoding or converting a digit, such as decimal integer 8, into a code word having a certain length results in “assigning” a number of bits to that digit. Ex. 1017, ¶ 147.

Similarly, Padovani indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate).” Ex. 1009, 10:6-9. An actual C/I measurement may comprise a value that includes a decimal integer portion and a decimal fraction portion, e.g., 3.5 dB. *Id.*, 23:34-24:2. Thus, when transmitting actual C/I measurements, a POSITA would have recognized that the DRC encoder of Padovani would benefit from the improved error protection provided by Gils. Ex. 1017, ¶ 148.

Gils seeks to solve the very same issue set forth in the ’590 Patent, and solves the issue in a very similar way. Ex. 1017, ¶ 149. For example, by encoding a data word (in the case of Padovani, the DRC message) that comprises, e.g., a decimal integer portion and a decimal fraction portion (3 and 5, respectively), wherein errors with the decimal integer portion would be more significant than errors with the decimal fraction portion, one or more of Gils’ coding schemes would afford the decimal integer portion (i.e., a digit having more significance than the digit representative of the decimal fraction portion) greater protection. Ex. 1017, ¶ 149.

As an example, Gils provides a table of binary optimal LUEP codes having lengths less than or equal to 15. Ex. 1010, 25; *see also* Philips Journal, 295.

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 10.2, I 94, I 86               |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

Table I of Gils shows a plurality of possible  $(n,k)$  coding schemes for encoding data words represented by  $k$  number of bits into sets of possible code words having  $n$  bits. *Id.*; see also Philips Journal, 295. For example, in the case of an  $(8,4)$  coding scheme, a data word (e.g., decimal integer 3 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 8. *Id.*; see also Philips Journal, 295. Because use of the  $(8,4)$  coding

scheme results in an 8-bit code word, a POSITA would have understood this to be assigning 8 bits to the upper digit 3. Ex. 1017, ¶ 151. Likewise, a data word (e.g., decimal fraction 5 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 6 using a (6,4) coding scheme. *Id.* Because use of the (6,4) coding scheme results in a 6-bit code word, a POSITA would have understood this to be assigning 6 bits to the lower digit 5. And 8 being larger than 6, a larger number of bits is assigned to the upper digit. *Id.*, ¶ 151.

A POSITA would have known to select the two coding schemes that could be used to derive code words for a 4-bit data word. Ex. 1017, ¶ 152. By selecting an (8,4) coding scheme to encode the digit representing the decimal integer portion of a C/I measurement, and a (6,4) coding scheme to encode the digit representing the decimal fraction portion of the C/I measurement, each of the digits representing the C/I measurement would have code words whose code word minimum distance is larger for the decimal integer portion (i.e., upper digit) compared to that of the decimal fraction portion (i.e., lower digit). Ex. 1017, ¶ 152.

Thus, based on the teaching set forth by Gils, a POSITA would have known to encode different portions of data to be encoded in accordance with coding schemes that result in different code word minimum distances. Ex. 1017, ¶ 153. Indeed, Gils describes that "it is natural to give parts of mutually different importance different protection against errors. This can be done by using

“different coding schemes for the different parts,” albeit a single UEP coding scheme could also be used depending upon how a POSITA would have wanted to implement unequal error protection. Ex. 1010, v; Ex. 1017, ¶ 153; Ex. 1012, 600. Again, *see also* Sec. VIII.A.3 *supra*.

Accordingly, Padovani in combination with Gils teaches Claim 3b. Ex. 1017, ¶ 154.

**Claim 3c recites “a transmitter that transmits the encoded information to a base station apparatus.”**

Padovani teaches a transmitter that transmits the encoded information to a base station apparatus.

In particular, Padovani describes transmitting “to the selected base station a data request message (hereinafter referred to as the DRC message) on the data request channel (hereinafter referred to as the DRC channel).” Ex. 1009, 10:3-6. Padovani further indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate).” *Id.*, 10:6-9; *see also Id.*, 17:16-18; 46:16-18 indicating “the DRC message carries an indication of the forward link quality (e.g., the C/I information as measured by the mobile station 6).

Moreover, Padovani describes that “the DRC message is provided to DRC encoder 626, which encodes the message in accordance with a predetermined

coding format.” *Id.*, 45:15-17. Padovani further describes that “the DRC message is [then] transmitted to the selected base station 4,” after being covered with a Walsh code. *Id.*, 45:20-33. In order to transmit the DRC message to the selected BS, Padovani uses a transmitter, i.e., “the interleaved data is covered with Walsh codes, spread with a long PN code, and further spread with the short PN codes. The spread data is provided to a **transmitter** within front end 62 [of the mobile station 6].” (emphasis added). *Id.*, 14:39.

Accordingly, Padovani teaches Claim 3c. Ex. 1017, ¶ 158.

**2. Padovani in View of Gils Renders Claim 1 Obvious**

**1 pre recites “[a] communication terminal apparatus[.]”**

As discussed above regarding Claim 3 pre, Padovani teaches a communication terminal apparatus.

Accordingly, Padovani teaches Claim 1pre. Ex. 1017, ¶ 160.

**Claim 1a recites “a measurer that measures a downlink channel quality and outputs information that is generated in association with said downlink channel quality and composed of a plurality of digits including an upper digit and an lower digit[.]”**

As described above regarding Claim 3a, Padovani teaches a measurer that measures a downlink channel quality and outputs information that is generated in

association with said downlink channel quality and composed of a plurality of digits including an upper digit and a lower digit.

Accordingly, Padovani teaches Claim 1a. Ex. 1017, ¶ 160.

**Claim 1b recites “a coder that encodes the information such that the upper digit has a larger code word minimum distance than the lower digit[.]”**

Padovani in combination with Gils teaches a coder that encodes the information such that the upper digit has a larger code word minimum distance than the lower digit.

As discussed *supra* Sec. VIII.A.1, Padovani contemplates transmitting information (C/I measurements transmitted as/in DRC messages) represented by a plurality of digits that include an upper digit (e.g., 3) and a lower digit (e.g., 5). Ex. 1009, 10:3-9. Padovani also contemplates encoding binary representations of such information. *Id.*, 27:35-36. Gils derives a plurality of LUEP (n,k) coding schemes that when applied to a k-bit (binary) data word, result in n-bit code words. Ex. 1010, 24-27; *see also* Philips Journal, 294-296.

As described *supra* Sec. VIII.A.3., it would have been obvious to a POSITA to have combined Padovani and Gils such that the DRC encoder of Padovani could be configured to encode the C/I measurement in accordance with one or more of the coding schemes set forth by Gils directed to providing unequal error protection for portions of a data word. Ex. 1017, ¶ 165. Moreover, although Gils seeks to

provide unequal error protection for one or more portions of a data message, different coding schemes provided by Gils also result in code words that have different lengths (i.e., n-bit code words where n can vary). Ex. 1017, ¶ 165. As admitted by the '590 Patent, the longer the length of a code word, the greater the code word minimum distance, and a POSITA would have naturally understood that greater error protection should or could have been provided to a digit the greater the significance a digit has. Ex. 1017, ¶165.

In particular, the '590 Patent describes encoding a decimal integer portion 8 using a coding scheme that results in a first code word having a first code word length, and encoding a decimal fraction portion 7 using a coding scheme that results in a second code word having a second code word length, where the first code word is longer than the second code word. Ex. 1001 at 19:43-20:45. When that upper digit is encoded or converted into a code word having some number of bits, one of those bits may be the most significant bit. Ex. 1017, 166. In order to achieve error protection such that the upper digit is converted into a code word whose length is proportional to the digit's degree of significance, the '590 Patent describes encoding an upper digit using a 6-bit encoder, and encoding a lower digit using a 4-bit encoder. *Id.*, 20:46-54. The '590 Patent describes that “the code word minimum distance between code words can be made larger for code words

represented by 6 bits... [making it] less susceptible to being mistaken for another code word than a code word represented by 4 bits.” *Id.*, 21:11-17.

Similarly, Padovani indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate).” Ex. 1009, 10:6-9. An actual C/I measurement may comprise a value that includes a decimal integer portion and a decimal fraction portion, e.g., 3.5 dB, 3 being the decimal integer portion and 5 being the decimal fraction portion. *Id.*, 23:34-24:2. Thus, when transmitting actual C/I measurements, a POSITA would have recognized that the DRC encoder of Padovani would benefit from the improved error protection provided by Gils. Ex. 1017, ¶ 167.

Gils seeks to solve the very same issue set forth in the ’590 Patent, and solves the issue in a very similar way. Ex. 1017, ¶ 168 For example, by encoding a data word (in the case of Padovani, the DRC message) having, e.g., a decimal integer portion and a decimal fraction portion, one or more of Gils’ coding schemes would afford the decimal integer portion (i.e., a digit having more significance than the digit representative of the decimal fraction portion) greater protection. Ex. 1017, ¶ 168. A POSITA would have understood that errors with the decimal integer portion would be more significant than errors with the decimal fraction portion. Ex. 1017, ¶ 168.

As an example, Gils provides a table of binary optimal LUEP codes having lengths less than or equal to 15. Ex. 1010, 25; *see also* Philips Journal, 295-296.

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 10.2, I 94, I 86               |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: *The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.*

Table I of Gils shows a plurality of possible (n,k) coding schemes for encoding data words represented by  $k$  number of bits into sets of possible code words having  $n$  bits. *Id.*; *see also* Philips Journal, 295. For example, in the case of an (8,4) coding scheme, a data word (e.g., decimal integer 3 of Padovani's C/I

measurement) represented by 4 bits can be encoded into a code word having a bit length of 8 and a maximal minimum code word distance ( $d(n,k)$ ) of 4. *Id.*; *see also* Philips Journal, 295. Likewise, a data word (e.g., decimal fraction 5 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 6 and a maximal minimum code word distance of 2 using a (6,4) coding scheme. *Id.*; *see also* Philips Journal, 295.

A POSITA would have known to select the two coding schemes that could be used to derive code words for a 4-bit data word. Ex. 1017, ¶ 171. By selecting an (8,4) coding scheme to encode the digit representing the decimal integer portion of a C/I measurement, and a (6,4) coding scheme to encode the digit representing the decimal fraction portion of the C/I measurement, each of the digits representing the C/I measurement would have code words whose code word minimum distance is larger for the decimal integer portion (i.e., upper digit) compared to that of the decimal fraction portion (i.e., lower digit). Ex. 1017, ¶171.

As another example, Gils describes coding schemes, such as the (12,4) coding scheme, where a 4-bit data word could be encoded into at least one resulting 12-bit code word derived using a  $K_1$  generator matrix has separation vectors 7,6,4,4. Ex. 1010, 25; *see also* Philips Journal, 295..

| $n$ | $k$ | $d(n, k)$ | separation vector                                                    |
|-----|-----|-----------|----------------------------------------------------------------------|
| 11  | 6   | 4         | A 622222, J 544442, B 533333                                         |
| 11  | 7   | 3         | A 5222222, J 4444222, J 4333322                                      |
| 11  | 8   | 2         | A 42222222, J 33332222                                               |
| 11  | 9   | 2         | A 322222222                                                          |
| 12  | 2   | 8         | A 11.2, I 10.4, I 96                                                 |
| 12  | 3   | 6         | A 10.22, C 944, E 864, K <sub>2</sub> 774, K <sub>1</sub> 766        |
| 12  | 4   | 6         | A 9222, C 8444, K <sub>1</sub> 7644                                  |
| 12  | 5   | 4         | A 82222, C 74444, E 66444, M 55554                                   |
| 12  | 6   | 4         | A 722222, C 644444, G 554444                                         |
| 12  | 7   | 4         | A 6222222, J 5444422, J 5333332                                      |
| 12  | 8   | 3         | A 52222222, J 44442222, J 43333222                                   |
| 12  | 9   | 2         | A 422222222, J 333322222                                             |
| 12  | 10  | 2         | A 3222222222                                                         |
| 13  | 2   | 8         | A 12.2, I 11.4, I 10.6, I 98                                         |
| 13  | 3   | 7         | A 11.22, C 10.44, K <sub>1</sub> 964, E 884, L 866                   |
| 13  | 4   | 6         | A 10.222, C 9444, L 8644, F 7744, K <sub>1</sub> 7666                |
| 13  | 5   | 5         | A 92222, C 84444, K <sub>1</sub> 76444, L 66664,<br>H 66555          |
| 13  | 6   | 4         | A 822222, C 744444, D 664444, M 555544                               |
| 13  | 7   | 4         | A 7222222, J 6444442, B 6333333,<br>J 5544442, K <sub>1</sub> 544444 |
| 13  | 8   | 4         | A 62222222, J 54444222, J 53333322                                   |
| 13  | 9   | 3         | A 522222222, J 444422222, J 433332222                                |
| 13  | 10  | 2         | A 4222222222, J 3333222222                                           |
| 13  | 11  | 2         | A 32222222222                                                        |
| 14  | 2   | 9         | A 13.2, I 12.4, I 11.6, I 10.8                                       |
| 14  | 3   | 8         | A 12.22, C 11.44, L 10.64, K <sub>1</sub> 984, K <sub>1</sub> 966    |
| 14  | 4   | 7         | A 11.222, C 10.444, K <sub>1</sub> 9644, L 8844,<br>L 8666           |
| 14  | 5   | 6         | A 10.2222, C 94444, L 86444, F 77444,<br>N 76666                     |

Table I(continued): The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

A POSITA would have understood that an upper digit, e.g., Padovani's decimal integer 3, could have been converted into a 2-bit data word, while a lower digit, e.g., Padovani's decimal fraction value 5 could have been converted into another 2-bit data word. Ex. 1017, 173. For example, the decimal integer portion 3 can be represented as two bits "11," while the decimal fraction portion 5 can be represented as "10" assuming the fractional value is divided into 4 equal

quantization steps – decimal fraction 0.0 is represented as “00,” decimal fraction 0.25 is represented as “01,” decimal fraction 0.5 is represented as “10,” and decimal fraction 0.75 is represented as “11.” If more bits are available to represent the decimal fraction values, then the quantization step will be smaller. This type of quantization is widely used in an analog-to-digital (A/D) conversion, which is commonly known to any one of ordinary skill in the art. Ex. 1017, 173.

Using the (12,4) coding scheme, as reflected by the corresponding separation vectors, the upper digit could have been protected with at least a 6 bit minimum code word distance, i.e., the separation vectors for the two most significant bits is 7,6. Ex. 1010, 25, 62; Ex. 1017, 173. The lower digit could have been protected with at least a 4-bit minimum code word distance, i.e., the separation vectors for the two least significant bits is 4,4. Ex. 1010, 25, 62; Ex. 1017, 173.

Thus, based on the teaching set forth by Gils, a POSITA would have known to encode different portions of a data word in accordance with one or more coding schemes that result in different code word minimum distances. Ex. 1017, ¶1 74. Indeed, Gils describes that “it is natural to give parts of mutually different importance different protection against errors. This can be done by using “different coding schemes for the different parts,” albeit a single UEP coding scheme could also be used depending upon how a POSITA would have wanted to

implement unequal error protection. Ex. 1010, v; Ex. 1017, ¶ 174; Ex. 1012, 600  
Again, *See also* Sec. VIII.A.3 *supra*.

Accordingly, Padovani in combination with Gils teaches Claim 1b. Ex.  
1017, ¶ 175.

**Claim 1c** recites “a transmitter that transmits the encoded information  
to a base station apparatus.”

As described with respect to Claim 3c, Padovani teaches a transmitter that  
transmits the encoded information to a base station apparatus.

Accordingly, Padovani teaches Claim 1c. Ex. 1017, ¶ 177.

**3. Padovani in View of Gils Renders Claim 2 Obvious**

**Claim 2** recites “the upper digit contains a most significant bit of the  
information.”

Padovani teaches that the upper digit contains a most significant bit of the  
information.

Padovani describes using a “rate (8,4) CRC block encoder that encodes the  
3-bit DRC message into an 8-bit code word. *Id.*, 45:20-22. A POSITA would  
have understood that Padovani’s (8,4) CRC block encoder incorporates one bit (in  
addition to the 3-bit DRC message) to effectuate the cyclical redundancy check.  
Ex. 1017, ¶179. A bit refers to a binary digit, e.g., 0 or 1. For a group of  $n$  bits, it  
is possible to represent  $2^n$  values. Therefore, in the case of a 3-bit word, it is

possible to represent  $2^3$  values. In a binary number, a bit's value depends on its position, starting from the right, similar to ones, tens, hundreds, and thousands in a decimal number. A bit's value grows by a power of two as it goes from right to left as shown below.

|               |       |       |       |
|---------------|-------|-------|-------|
| Binary number | 1     | 1     | 1     |
| Value         | $2^2$ | $2^1$ | $2^0$ |

For example, a 3-bit representation of the decimal value 5 is 101, a 3-bit representation of the decimal value 7 is 111. In a 3-bit representation of a value, the most significant value would be that of  $2^2$ , in other words, the leftmost bit. As described above with respect to Claim 1a and 1b, Padovani in combination with Gils describes encoding, e.g., a decimal integer (the upper digit of the information). Inasmuch as the decimal integer or upper digit portion of the information is, prior to encoding, represented as a binary representation, e.g., a 3-bit representation, the leftmost bit of the 3-bit representation is a most significant bit of the information. Ex. 1017, 180.

Accordingly, Padovani teaches Claim 2. Ex. 1017, ¶ 183.

**4. Padovani in View of Gils Renders Claim 4 Obvious**

**Claim 4** recites “the upper digit contains a most significant bit of the information.”

As described with respect to Claim 2, Padovani teaches that the upper digit contains a most significant bit of the information.

Accordingly, Padovani teaches Claim 4. Ex. 1017, ¶ 183.

**B. Padovani in View of Gils Invalidates Claims 5-8**

**1. Overview of Olofsson**

Olofsson was published December 26, 2000 and filed on August 29, 1997 making it prior art under at least 35 U.S.C. § 102 (e). At a high level, Olofsson discloses a method for selecting a combination of modulation and channel coding schemes in a digital communication system. Selection of this combination is made by “select[ing an] optimum RF link by measuring link quality parameters, such as C/I ratio.” Ex. 1053, Abstract.

Olofsson describes that “depending on the modulation and channel coding schemes, grades of service deteriorates more rapidly as link quality decreases.” *Id.* at 2:35-39. Accordingly, Olofsson describes that “link adaptation methods, which provide the ability to dynamically change modulation scheme, channel coding, and/or the number of used times slots, based on the channel conditions, are used to balance the user bit rate against link quality. *Id.*, 2:47-51. In particular, Olofsson describes that “these methods dynamically adapt a system’s combination of channel coding, modulation, and a number of assignable time slots to achieve optimum performance over a broad range of C/I conditions.” *Id.*, 2:51-54. The

combination of at least channel coding and assigned time slots corresponds to a downlink channel. Ex. 1017 ¶54. Moreover, Olofsson contemplates that “[t]he present invention may also be used in CDMS or a hybrid of CDMA and TDMA communication systems. Ex. 1053, 6:14-16.

## 2. **Motivation to Combine**

As discussed supra Sec. VIII.A.1, Padovani discloses a CDMA system in which a mobile station transmits a data request message to a base station containing an indication of the forward link channel quality. See, e.g., Ex. 1009, Abstract and 9:8-10:6. Moreover, Padovani describes that “[D]ata is partitioned into data packets, with each data packet being transmitted over one or more time slots (or slots),” and that “[a]t each time slot, the base station can direct data transmission to any mobile station which is in communication with the base station.” Id., 9:1-4. See, also Id., 6:17-19 describing “[i]t is yet another object of the present invention to enhance efficiency by allowing the base stations to transmit data packets to each mobile station for a variable number of time slots.”

Whether Padovani is characterized as being a CDMA system or a hybrid CDMA system (inasmuch as Padovani transmits data packets over one or more time slots), Padovani is the type of communications system that a POSITA would have understood could have been improved by the methods of Olofsson. Ex. 1017 ¶187. Indeed, both Padovani and Olofsson seek to improve efficiency/achieve

optimal operation of a digital communications system through at least the assignment of time slots for data transmission purposes. Ex. 1009, 6:17-19; Ex. 1053, 2:51-54; Ex. 1017 ¶187. Moreover, because Padovani already teaches measuring the C/I of a forward link/downlink channel (See, e.g., Ex. 1009, 4:44-56) and Oloffson teaches basing at least channel coding and time slot(s) assignment on C/I conditions, a POSITA would have been motivated to assign a downlink channel per the teachings of Oloffson based on the C/I measurements contemplated by Padovani while relying on the teachings of Gils' LUEP coding schemes for encoding the DRC messages of Padovani as previously discussed. Ex. 1017, 187.

3. **Padovani in View of Gils and Oloffson Renders Claim 5 Obvious**

**Claim 5 pre** recites “A coding and transmission method for use in a communication system where a base station apparatus assigns a downlink channel to each of a plurality of communication terminal apparatuses on a time division basis.”

Padovani teaches a coding and transmission method for use in a communication system where a base station apparatus assigns a downlink channel to each of a plurality of communication terminal apparatuses on a time division basis.



added). *Id.* Additionally, Padovani describes that “Data is partitioned into data packets, with each data packet being transmitted over one or more time slots (or slots),” and that “[a]t each time slot, the base station can direct data transmission to any mobile station which is in communication with the base station.” *Id.*, 9:1-4.

In order to “improve utilization of the forward and reverse link capacity in the data communication system,” a mobile station “measures the signal-to-noise interference ration (C/I) of the forward link signals... at every time slots[sic].” *Id.*, 5:32-38. Moreover, “[t]he mobile station transmits to the selected base station on a dedicated data request (DRC) channel a request for transmission at the highest data rate which the measured C/I can reliably support.” *Id.*, 5:38-6:3.

Padovani further describes that “[t]he DRC message is provided to DRC encoder 626, which **encodes the message in accordance with a predetermined coding format**,” where “[c]oding of the DRC message is important since the error probability of the DRC message needs to be sufficiently low because incorrect forward link data rate determination impacts the system throughput performance.” (emphasis added). (emphasis added). *Id.*, 45:15-20.

As noted above *supra* Sec. VIII.B.2, it would have been obvious for a POSITA to have combined the teachings of Padovani and Olofsson such that a base station assigns a downlink channel to each of a plurality of communication terminal apparatuses on a time division basis.

Accordingly, Padovani teaches Claim 5pre. Ex. 1017, ¶ 194. .

**Claim 5a recites “[wherein said each of a plurality of communication terminal apparatuses] encodes information that is used for the assignment of the downlink channel and composed of a plurality of digits including an upper digit and a lower digit such that the upper digit has a larger code word minimum distance than the lower digit[.]”**

As described above with respect to Claim 5pre, Padovani in combination with Gils teaches that each of a plurality of communication terminal apparatuses encodes information used for the assignment of the downlink channel.

Additionally, Padovani in combination with Gils teaches that the information is composed of a plurality of digits including an upper digit and a lower digit such that the upper digit has a larger code word minimum distance than the lower digit.

As described *supra* Sec. VIII.A.3., it would have been obvious to a POSITA to have combined Padovani and Gils such that the DRC encoder of Padovani could be configured to encode the C/I measurement in accordance with one or more of the coding schemes set forth Gils directed to providing unequal error protection for portions of a data word. Ex. 1017, ¶ 197.

As discussed above with respect to Claim 1b, the '590 Patent describes encoding different digits of a CIR measurement into code words having different bit lengths and correspondingly different code word minimum distances.

Similarly, Padovani indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate).” Ex. 1009, 10:6-9. An actual C/I measurement may comprise a value that includes a decimal integer portion and a decimal fraction portion, e.g., 3.5 dB. *Id.*, 23:34-24:2. Thus, when transmitting actual C/I measurements, a POSITA would have recognized that the DRC encoder of Padovani would benefit from the improved error protection provided by Gils. Ex. 1017, ¶ 199.

Gils seeks to solve the very same issue set forth in the '590 Patent, and solves the issue in a very similar way. Ex. 1017, ¶ 200. For example, by encoding a data word (in the case of Padovani, the DRC message) that comprises, e.g., a decimal integer portion and a decimal fraction portion (3 and 5, respectively), wherein errors with the decimal integer portion would be more significant than errors with the decimal fraction portion, one or more of Gils' coding schemes would afford the decimal integer portion (i.e., a digit having more significance than the digit representative of the decimal fraction portion) greater protection. Ex. 1017, ¶ 200.

As an example, Gils provides a table of binary optimal LUEP codes having lengths less than or equal to 15. Ex. 1010, 25; *see also* Philips Journal, 295..

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 10.2, I 94, I 86               |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

Table I of Gils shows a plurality of possible (n,k) coding schemes for encoding data words represented by  $k$  number of bits into sets of possible code words having  $n$  bits. *Id.* For example, in the case of an (8,4) coding scheme, a data word (e.g., decimal integer 3 of Padovani's C/I measurement) represented by

4 bits can be encoded into a code word having a bit length of 8 and a maximal minimum code word distance ( $d(n,k)$ ) of 4. *Id.*; see also Philips Journal, 295. Likewise, a data word (e.g., decimal fraction 5 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 6 and a maximal minimum code word distance of 2 using a (6,4) coding scheme. *Id.*; see also Philips Journal, 295.

A POSITA would have known to select the two coding schemes that could be used to derive code words for a 4-bit data word. Ex. 1017, ¶ 202. By selecting an (8,4) coding scheme to encode the digit representing the decimal integer portion of a C/I measurement, and a (6,4) coding scheme to encode the digit representing the decimal fraction portion of the C/I measurement, each of the digits representing the C/I measurement would have code words whose code word minimum distance is larger for the decimal integer portion (i.e., upper digit) compared to that of the decimal fraction portion (i.e., lower digit). Ex. 1017, ¶ 203.

Thus, based on the teaching set forth by Gils, a POSITA would have known to encode different portions of a data word in accordance with coding schemes that result in different code word minimum distances. Ex. 1017, ¶ 204. Indeed, Gils describes that "it is natural to give parts of mutually different importance different protection against errors. This can be done by using "different coding schemes for the different parts," albeit a single UEP coding scheme could also be used

depending upon how a POSITA would have wanted to implement unequal error protection. Ex. 1010, v; Ex. 1017, ¶ 204; Ex. 1012, 600. Again, *see also* Sec. VIII.A.3 *supra*.

Accordingly, Padovani in combination with Gils teaches Claim 5a. Ex. 1017, ¶ 205.

**Claim 5b** recites “[wherein said each of a plurality of communication terminal apparatuses] transmits the encoded information to said base station apparatus.”

As described above with respect to Claim 3c, Padovani teaches a communication terminal apparatus that comprises a transmitter that transmits the encoded information to a base station apparatus. A POSITA would have understood that each communication terminal apparatus (or mobile station as described in Padovani) transmits the encoded information (DRC message) to an appropriate base station. Ex. 1009, FIG. 1, 12:5-11.

Accordingly, Padovani teaches Claim 5b. Ex. 1017, ¶ 209.

**4. Padovani in View of Gils and Olofsson Renders Claim 6 Obvious**

**Claim 6** recites “the upper digit contains a most significant bit of the information.”

As described with respect to Claim 2, Padovani teaches that the upper digit contains a most significant bit of the information.

Accordingly, Padovani teaches Claim 6. Ex. 1017, ¶ 211.

5. **Padovani in View of Gils and Olofsson Renders Claim 7**

**Obvious**

**Claim 7 pre recites “[a] coding and transmission method for use in a communication system where a base station apparatus assigns a downlink channel to each of a plurality of communication terminal apparatuses on a time division basis.”**

As described with respect to Claim 5pre, Padovani in combination with Olofsson teaches a coding and transmission method for use in a communication system where a base station apparatus assigns a downlink channel to each of a plurality of communication terminal apparatuses on a time division basis.

Accordingly, Padovani teaches Claim 7pre. Ex. 1017, ¶ 213.

**Claim 7a recites “[wherein said each of a plurality of communication terminal apparatuses] encodes information that is used for the assignment of the downlink channel and composed of a plurality of digits including an upper digit and a lower digit such that the upper digit is assigned a larger number of bits than the lower digit[.]”**

As discussed above regarding Claim 7pre, Padovani teaches that each of plurality of communication terminal apparatuses encodes information used for the assignment of the downlink channel.

Padovani in combination with Gils teaches that encoded information is composed of a plurality of digits including an upper digit and a lower digit such that the upper digit is assigned a larger number of bits than the lower digit.

As described *supra* Sec. VIII.A.3., it would have been obvious to a POSITA to have combined Padovani and Gils such that the DRC encoder of Padovani could be configured to encode the C/I measurement in accordance with one or more of the coding schemes set forth Gils directed to providing unequal error protection for portions of a data word. Ex. 1017, ¶ 216.

As discussed above with respect to Claim 1b, the '590 Patent describes encoding different digits of a CIR measurement into code words having different bit lengths and correspondingly different code word minimum distances.

Similarly, Padovani indicates that the DRC message can contain “an indication of the quality of the forward link channel (e.g., the C/I measurement itself, the bit-error rate, or the packet-error rate).” Ex. 1009, 10:6-9. An actual C/I measurement may comprise a value that includes a decimal integer portion and a decimal fraction portion, e.g., 3.5 dB. *Id.*, 23:34-24:2. Thus, when transmitting actual C/I measurements, a POSITA would have recognized that the DRC encoder

of Padovani would benefit from the improved error protection provided by Gils.

Ex. 1017, ¶ 218.

Gils seeks to solve the very same issue set forth in the '590 Patent, and solves the issue in a very similar way. Ex. 1017, ¶, 219. For example, by encoding a data word (in the case of Padovani, the DRC message) that comprises, e.g., a decimal integer portion and a decimal fraction portion (3 and 5, respectively), wherein errors with the decimal integer portion would be more significant than errors with the decimal fraction portion, one or more of Gils' coding schemes would afford the decimal integer portion (i.e., a digit having more significance than the digit representative of the decimal fraction portion) greater protection. Ex. 1017, ¶ 219.

As an example, Gils provides a table of binary optimal LUEP codes having lengths less than or equal to 15. Ex. 1010, 25; *see also* Philips Journal, 295..

| $n$ | $k$ | $d(n, k)$ | separation vector                |
|-----|-----|-----------|----------------------------------|
| 4   | 2   | 2         | A 32                             |
| 5   | 2   | 3         | A 42                             |
| 5   | 3   | 2         | A 322                            |
| 6   | 2   | 4         | A 52                             |
| 6   | 3   | 3         | A 422                            |
| 6   | 4   | 2         | A 3222                           |
| 7   | 2   | 4         | A 62, I 54                       |
| 7   | 3   | 4         | A 522                            |
| 7   | 4   | 3         | A 4222                           |
| 7   | 5   | 2         | A 32222                          |
| 8   | 2   | 5         | A 72, I 64                       |
| 8   | 3   | 4         | A 622, C 544                     |
| 8   | 4   | 4         | A 5222                           |
| 8   | 5   | 2         | A 42222, J 33332                 |
| 8   | 6   | 2         | A 322222                         |
| 9   | 2   | 6         | A 82, I 74                       |
| 9   | 3   | 4         | A 722, C 644, G 554              |
| 9   | 4   | 4         | A 6222, C 5444                   |
| 9   | 5   | 3         | A 52222, J 44442, B 43333        |
| 9   | 6   | 2         | A 422222, J 333322               |
| 9   | 7   | 2         | A 3222222                        |
| 10  | 2   | 6         | A 92, I 84, I 76                 |
| 10  | 3   | 5         | A 822, C 744, L 664              |
| 10  | 4   | 4         | A 7222, C 6444, G 5544           |
| 10  | 5   | 4         | A 62222, C 54444                 |
| 10  | 6   | 3         | A 522222, J 444422, J 433332     |
| 10  | 7   | 2         | A 4222222, J 3333222             |
| 10  | 8   | 2         | A 32222222                       |
| 11  | 2   | 7         | A 10.2, I 94, I 86               |
| 11  | 3   | 6         | A 922, C 844, K <sub>1</sub> 764 |
| 11  | 4   | 5         | A 8222, C 7444, E 6644           |
| 11  | 5   | 4         | A 72222, C 64444, G 55444        |

Table I: The separation vectors of all binary optimal LUEP codes of length less than or equal to 15.

Table I of Gils shows a plurality of possible (n,k) coding schemes for encoding data words represented by  $k$  number of bits into sets of possible code words having  $n$  bits. *Id.* For example, in the case of an (8,4) coding scheme, a data word (e.g., decimal integer 3 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 8. *Id.* Because use of the (8,4) coding scheme results in an 8-bit code word, a POSITA would have

understood this to be assigning 8 bits to the upper digit 3. Ex. 1017, ¶ 221.

Likewise, a data word (e.g., decimal fraction 5 of Padovani's C/I measurement) represented by 4 bits can be encoded into a code word having a bit length of 6 using a (6,4) coding scheme. *Id.* Because use of the (6,4) coding scheme results in a 6-bit code word, a POSITA would have understood this to be assigning 6 bits to the lower digit 5. And 8 being larger than 6, a larger number of bits is assigned to the upper digit.

A POSITA would have known to select the two coding schemes that could be used to derive code words for a 4-bit data word. Ex. 1017, ¶ 222. By selecting an (8,4) coding scheme to encode the digit representing the decimal integer portion of a C/I measurement, and a (6,4) coding scheme to encode the digit representing the decimal fraction portion of the C/I measurement, each of the digits representing the C/I measurement would have code words whose code word minimum distance is larger for the decimal integer portion (i.e., upper digit) compared to that of the decimal fraction portion (i.e., lower digit). Ex. 1017, ¶ 222.

Thus, based on the teaching set forth by Gils, a POSITA would have known to encode different portions of data to be encoded in accordance with coding schemes that result in different code word minimum distances. Ex. 1017, ¶ 223. Indeed, Gils describes that "it is natural to give parts of mutually different importance different protection against errors. This can be done by using

“different coding schemes for the different parts,” albeit a single UEP coding scheme could also be used depending upon how a POSITA would have wanted to implement unequal error protection. Ex. 1010, v; Ex. 1017, ¶ 223; Ex. 1012, 600. Again, *see also* Sec. VIII.A.3 *supra*.

Accordingly, Padovani in combination with Gils teaches Claim 7a. Ex. 1017, ¶ 224.

**Claim 7b** recites “[wherein said each of a plurality of communication terminal apparatuses] transmits the encoded information to said base station apparatus.”

As described with respect to Claim 1c, Padovani teaches that each communication terminal apparatus comprises a transmitter that transmits the encoded information to said base station apparatus.

Accordingly, Padovani teaches Claim 7b. Ex. 1017, ¶ 226.

**6. Padovani in View of Gils and Olofsson Renders Claim 8**

**Obvious**

**Claim 8** recites “the upper digit contains a most significant bit of the information.”

As described with respect to Claim 2, Padovani teaches that the upper digit contains a most significant bit of the information.

Accordingly, Padovani teaches Claim 8. Ex. 1017, ¶ 228.

## IX. CONCLUSION

Based on the foregoing, Petitioners respectfully request that a Trial be instituted and that the *IPR* Claims be canceled as unpatentable.

Dated: August 22, 2018

Respectfully submitted,

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**CERTIFICATION OF WORD COUNT**

The undersigned certifies pursuant to 37 C.F.R. §42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. §42.8, certificates of service or word count, or appendix of exhibits, contains 13,473 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: August 22, 2018

BY: /Stephen S. Korniczky/  
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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(a), the undersigned hereby certifies that the foregoing **PETITION FOR INTER PARTES REVIEW UNDER 35 U.S.C. § 311 ET SEQ. AND 37 C.F.R. § 42.100 ET SEQ. (CLAIMS 1 TROUGH 8 OF U.S. PATENT NO. 6,760,590)**, including all exhibits and supporting evidence, was served in its entirety on August 22, 2018, by EXPRESS MAIL upon the Patent Owner at the correspondence address of record for U.S. Patent No. 6,760,590 as follows:

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