**UNITED STATES PATENT AND TRADEMARK OFFICE**

**BEFORE THE PATENT TRIAL AND APPEAL BOARD**

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner,

v.

ONE-E-WAY, INC.,
Patent Owner.

Case: IPR2025-01540
U.S. Patent No. 10,129,627

# SUPPLEMENTAL DECLARATION OF MICHAEL ALLAN MARTIN DAVIES IN SUPPORT OF *INTER PARTES REVIEW* OF CLAIMS 1-12 OF U.S. PATENT NO. 10,129,627

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I, Michael Allan Martin Davies, do hereby declare as follows:

## I. INTRODUCTION

1. I make this declaration based upon my own personal expertise and knowledge and, if called upon to testify, would testify competently to the matters stated herein.

2. I have been asked to provide my expert opinion in connection with the Petition for *Inter Partes Review* of U.S. Patent No. **10,129,627** ("the '627 patent") to Woolfork concerning whether the '627 patent is unpatentable over certain prior art. This declaration is a statement of my opinions on issues relating to the patentability of claims 1-12 (the "Challenged Claims") of the '627 patent.

3. I incorporate my qualifications (EX1012 ¶¶7-19; EX1030), the level of ordinary skill in the art (EX1012 ¶¶20-23), the legal standards of which I was informed and which I applied (EX1012 ¶¶24-30), the claim constructions I applied (EX1012 ¶¶100-102), and my descriptions of the '627 patent and the prior art (EX1012 ¶¶31-99). As I explain more fully below, it is my opinion that all of the Challenged Claims would have been obvious to a person of ordinary skill in the art ("POSA") at the time of the alleged invention.

4. In particular, I have been asked to provide my expert opinion on certain issues on which Dr Melendez has provided an opinion.

5. The first issue is whether the 2003 Application inherently disclosed "direct conversion," "DPSK," and "intersymbol interference."

6. There are four other issues on which I also provide my specific opinion:

- whether the Miyake and Walley prior art require central control to preserve code orthogonality
- whether a POSA would have expected a predictable benefit from combining Walley's variable length pseudo- noise (PN) codes adaptation with Miyake's service- and user-discriminating spreading-code architecture
- whether Walley in view of Rappaport renders obvious that the portable spread spectrum audio receiver is configured to perform a plurality of demodulations on at least one of the wireless modulation transmissions
- whether the transmitter-side limitation of the preamble of Claim 5 is addressed in my Declaration

7. I have been retained on behalf of Samsung Electronics Co., Ltd. ("Petitioner"). I am being compensated for my work in this matter at my standard hourly rate. I am also being reimbursed for reasonable and customary expenses associated with my work and testimony in this investigation. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

8. I have reviewed and considered the following documents in connection with my analysis of the '627 patent:

| Exhibit | Description |
|---|---|
| 1001 | U.S. Patent No. 10,129,627 to Woolfork ("'627 patent") |
| 1002 | File history of U.S. Application No. 15/003,242, filed January 21, 2016 ("the 2016 application") |

| Exhibit | Description |
|---|---|
| 1003 | File history of U.S. Application No. 10/027,391, filed December 21, 2001 ("the 2001 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1003 |
| 1004 | U.S. Publication No. 2003/0118196 ("the '196-Publication"), as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1004 |
| 1005 | File history of U.S. Application No. 10/648,012, filed August 26, 2003 ("the 2003 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1005 |
| 1006 | U.S. Patent No. 7,412,294, as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1006 |
| 1007 | Excerpts from file history of U.S. Application No. 12/144,729, filed July 12, 2008 ("the 2008 application"), as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1007 |
| 1008 | Comparison of the 2003 application as-filed with the 2001 application as-filed, as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1008 |
| 1009 | Comparison of figures from the 2003 and 2001 applications as- filed, as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1009 |
| 1010 | Comparison of the '294 patent with the as-filed 2003 application, as originally filed in *Sony Corp. v. One-E-Way, Inc.,* IPR2016-01638 as Exhibit 1010 |
| 1011 | Comparison of the 2016 application as-filed with the 2008 application as-filed |
| 1012 | Declaration of Michael Davies |
| 1013 | *One-E-Way, Inc. v. Apple Inc.*, No. 2:20-cv-06339, Dkt. 86 (C.D. Cal. Mar. 9, 2022) ("Apple *Markman* order") |
| 1014 | *In the Matter of Certain Consumer Elecs. And Display Devices with Graphics Processing and Graphics Processing Units Therein,* 337-TA-943, Order 12 (ITC July 24, 2015) ("ITC *Markman* order") |
| 1015 | U.S. Patent No. 6,744,808 ("Walley") |
| 1016 | U.S. Patent No. 5,546,424 ("Miyake") |
| 1017 | Reserved |
| 1018 | "Wireless Communications: Principles & Practice" by Theodore S. Rappaport (1996) ("Rappaport") |

| Exhibit | Description |
|---|---|
| 1019 | Reserved |
| 1020 | Reserved |
| 1021 | U.S. Patent No. 6,256,303 ("Drakoulis") |
| 1022 | "The Communications Handbook" (1997) by Jerry D. Gibson ("Gibson") |
| 1023 | One-E-Way's Opening Claim Construction Brief<br>*One-E-Way, Inc. v. Apple Inc.*, 2:20-cv-6339-JSK-PD (D.I. 65) (C.D. Cal. Dec. 6, 2021) |
| 1024 | Order Re Motion For Summary Judgment of Non-Infringement ("*Apple* Summary Judgment Order")<br>*One-E-Way, Inc. v. Apple Inc.*, 2:20-cv-6339-JSK-PD (D.I. 102) (C.D. Cal. June 15, 2022) |
| 1025 | Library of Congress Record for "Wireless Communications: Principles & Practice" by Theodore S. Rappaport (1996) |
| 1026 | U.S. Patent No. 5,933,421 |
| 1027 | Library of Congress Record for "The Communications Handbook" (1997) |
| 1028 | U.S. Patent No. 5,953,669 |
| 1029 | Opinion Affirming *Apple* Summary Judgment Order<br>*One-E-Way, Inc. v. Apple Inc.*, 2022-2020 (D.I. 32) (Aug. 14, 2023) |
| 1030 | *Curriculum Vitae*, Michael Allan Martin Davies |
| 1031 | Reserved |
| 1032 | Declaration of Joseph C. McAlexander<br>*Apple Inc. v. One-E-Way, Inc.*, IPR2021-00286, Exhibit 2001 |
| 1033 | Declaration of Joseph C. McAlexander<br>*Sony Corp. v. One-E-Way, Inc.*, IPR2016-01639, Exhibit 2007 |
| 1034 | Deposition of Dr. Jose Luis Melendez, August 20, 2026 |
| 1036 | Oral Argument Transcript<br>*Sony Corp. v. One-E-Way, Inc.*, IPR2016-01638/-01639, Paper 35 |

9. In forming the opinions expressed below, I have considered:

a) the documents listed above;

b) the relevant legal standards, including the standard for obviousness, and for inherency, and any additional authoritative documents as cited in the body of this declaration; and

c) my own knowledge and experience based upon my work in the field of wireless communications as described below, as well as the following materials.

10. Unless otherwise noted, all emphasis in any quoted material has been added.

## II. RELEVANT LEGAL STANDARDS

11. I am not an attorney. In preparing and expressing my opinions and considering the subject matter of the ’627 patent, I am relying on certain basic legal principles that counsel have explained to me, which include the principles outlined in paragraphs 24-30 of my original Declaration and the principles set out below.

### A. Doctrine of Inherency

12. I have been informed that in determining whether a specification provides written description support for a patent claim, one must ascertain whether it supports each limitation of that claim. I have been informed that this requirement relies on an objective inquiry into what is contained within the specification, and

there must be sufficient detail in the specification that a POSA can clearly conclude that the invention described in the claims had been invented as of the filing date sought. I understand that it is not enough for the disclosure to merely render the claim obvious, but instead that the disclosure must expressly disclose or inherently (i.e., show it is necessarily present) disclose all limitations of the claim. I have been informed that for the disclosure to be inherent, the missing descriptive matter must necessarily be present in or unavoidably be taught by the specification, such that a POSA would recognize such disclosure.

## III. SUPPORT FOR THE CHALLENGED CLAIMS IN THE 2003 APPLICATION AS FILED

13. Dr. Melendez uses the written description requirement of 35 U.S.C. §112, which indicates that a specification need not explicitly recite well-known components where the identified functional goals necessarily point to their inclusion, to argue that a POSA would have understood that the 2003 Application inherently disclosed a "direct conversion module," "differential phase shift keying (DPSK)," and "reduced intersymbol interference," as claimed in the '627 patent.

## IV. THE 2003 APPLICATION DOES NOT INHERENTLY DISCLOSE A DIRECT CONVERSION MODULE

14. Dr. Melendez wrongly argues that a POSA would have understood that the following disclosure inherently disclosed a "direct conversion module":

> The *battery powered transmitter* 20 may have a transmitting antenna 24 that may be omni-directional for transmitting a coded digital modulated signal to a receiving antenna 52 of a *battery powered receiver* 50 that may be a headphone receiver.
> …
> [T]he digital modulated signal *from transmit antenna 24 may be received by receiving antenna 52 and then demodulated.*

EX1005 at 0005 (¶¶0009-10) (emphasis added). In particular, Dr. Melendez's argument that a POSA would have reached that conclusion given that direct conversion receivers were known to have the following functional attributes: (1) benefit battery operated devices, and (2) be more power efficient than active intermediate stage receivers is unfounded and wrong.

15. Dr. Melendez wrongly indicates that a POSA would have understood that the demodulation of an RF carrier signal discussed in the above disclosure would involve down converting the RF carrier signal received by the "receiving antenna 52" to baseband or very near baseband. Dr. Melendez incorrectly claims that a POSA would have understood the functional attributes of the receiver in the disclosure mimic those described in the construction of the term "direct conversion module" (i.e., a "module for converting radio frequency to baseband or very near baseband in a single frequency conversion without an intermediate frequency.")

16. I disagree with Dr. Melendez. The 2003 Application does not inherently disclose "direct conversion module" as there were a number of alternate receiver architectures in 2003 that did not utilize direct conversion for demodulation. Simply put a "direct conversion module" was not necessarily present. Battery powered

receivers were also not inherently capable of direct conversion. "Direct conversion modules" would not have been the natural result of the disclosure of battery powered receivers by the 2003 Application.

17. Moreover, the 2003 Application disclosure did not specify the type of demodulation used and it did not necessarily need to utilize "direct conversion" for demodulation.

### A. There were a number of different receiver architectures in use in 2003 to demodulate a radio frequency signal to baseband apart from direct conversion

18. Dr. Melendez wrongly argues that the demodulation disclosure inherently discloses a "direct conversion module" because the receiver describes the functional attribute of demodulation. In reality, there were a number of different receiver architectures in use in 2003 to demodulate a radio frequency signal to baseband and a direct conversion receiver was by no means inherent to demodulation. "Direct conversion modules" would not have been the natural result of the disclosure of "demodulation" by the 2003 Application.

#### 1. Superheterodyne receiver (including multi-stage/double-conversion designs)

19. A superheterodyne receiver converts the RF signal intercepted by the receiving antenna into one or more lower intermediate frequencies (IF), which are

then amplified and demodulated to a baseband signal.[1] In a typical superheterodyne receiver, the RF signal is intercepted by the receiving antenna and is filtered, then applied to the mixer stage. In the mixer stage, the RF signal is mixed with a signal from a local oscillator to obtain the intermediate frequency through a process called heterodyning. The local oscillator is tuned to ensure the frequency difference between the local oscillator and the RF signal is kept constant. The intermediate frequency carrier is applied to filters, and an IF-amplifier prior to being demodulated. In superheterodyne receivers the RF signal is converted to an intermediate frequency before ultimately being converted to baseband.

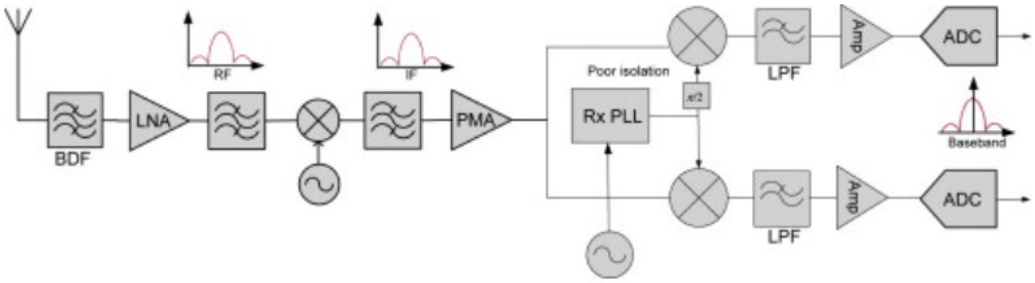


Figure 1 *The superheterodyne receiver.*[2]

20. Because the IF filtering is performed at a fixed, predictable frequency regardless of which channel is tuned, superheterodyne designs achieve excellent

[1] https://www.radartutorial.eu/09.receivers/rx05.en.html

[2] Wireless Receiver Architectures and Design, 2014, Chapter 8.

selectivity (rejection of nearby unwanted signals) and sensitivity. The trade-off is increased complexity: multiple mixers, multiple local oscillators, and dedicated IF filters, which increase component count, size, cost, and power consumption, and introduce an "image frequency" interference problem that requires additional filtering to resolve.[3]

**2. Direct conversion receiver (also called "zero-IF")**

21. A direct conversion receiver, or a zero-intermediate-frequency (zero-IF) receiver, has an intermediate frequency of zero. Essentially, the RF signal intercepted by the receiving antenna is converted directly from RF to baseband in a single mixing step, using a local oscillator tuned at (or near) the incoming carrier frequency, without any intermediate frequency stage. This eliminates the need for IF filters, a second local oscillator, and image-reject filtering, meaningfully reducing component count, power consumption, size, and cost. The trade-off is increased susceptibility to DC offset, local-oscillator ("LO") leakage back into the signal path, and I/Q amplitude/phase imbalance, each of which requires additional design effort to manage adequately.[4]

[3] https://wirelesspi.com/the-heterodyne-principle-and-the-superheterodyne-receiver/

[4] https://wirelesspi.com/direct-conversion-zero-if-receiver/

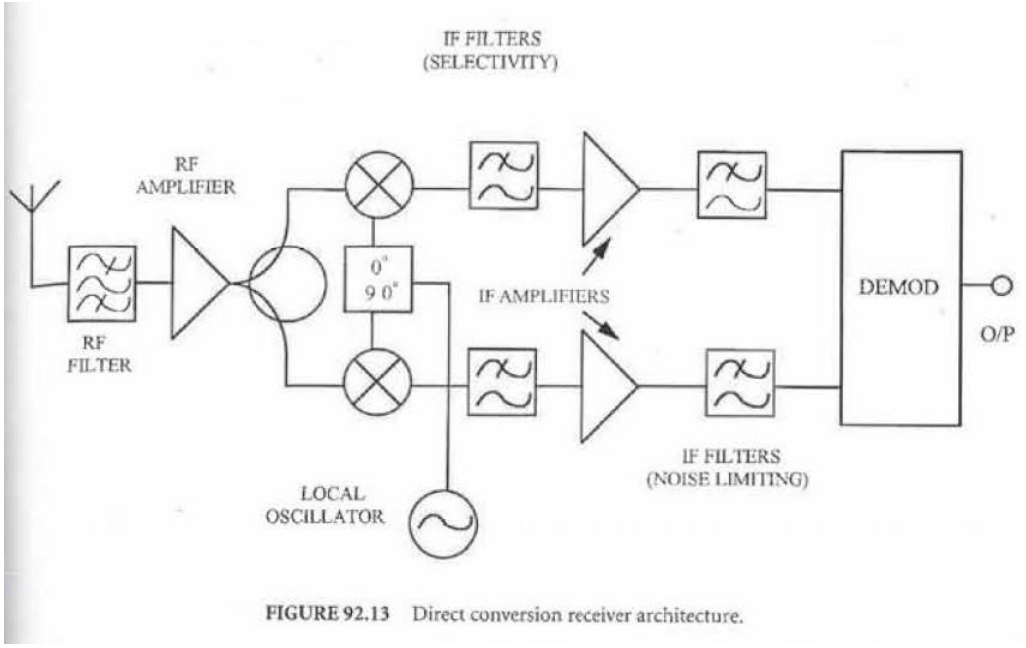


Figure 2 *Direct conversion receiver architecture shown in EX1022.*[5] EX1022 pg. 1323, FIG. 92.13.

**3. Low-IF receiver**

22. Low-IF is a middle-ground receiver architecture in which the received signal is converted, in a single mixing step, to a low but nonzero intermediate frequency—far lower than the fixed IF used in superheterodyne designs, but not zero as in direct conversion.[6] This approach retains many of direct conversion's component-count and power-consumption advantages while avoiding its DC-offset and LO-leakage problems, however this comes at the cost of some of the selectivity

[6] https://gophertrunk.org/reference/low-if/



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advantages of a true superheterodyne design.[7]

23. Each of these receiver architectures was a real, commercially available, and separately documented engineering choice as of the time of the invention. These receiver architectures reflected different trade-offs among selectivity, power consumption, component count, and cost, and there was no hierarchy where one architecture would have been inherently preferred by any particular design goal, including low power consumption or battery operation.

**B. Direct conversion capabilities were not "necessarily present" in battery powered receiver**

24. While Dr. Melendez uses the functional attribute of "battery powered" to argue that a POSA would have understood that the receiver in the disclosure inherently disclosed "direct conversion receiver," not all battery powered receivers were capable of direct conversion.

25. Therefore, a "battery powered" receiver does not equate with a "direct conversion receiver." "Direct conversion modules" would not have been the natural result of the disclosure of "battery powered receiver" by the 2003 Application.

**C. The generic "demodulation" language used in the 2003 Application does not predicate or require "direct conversion"**

26. The 2003 Application indicates:

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[7] J. Crols and M. S. J. Steyaert, "Low-IF topologies for high-performance analog front ends of fully integrated receivers," in *IEEE Transactions on Circuits and Systems II: Analog and Digital Signal Processing*, vol. 45, no. 3, pp. 269-282, March 1998, doi: 10.1109/82.664233.

> Referring to Figure 1, the digital modulated signal from transmit antenna 24 may be received by receiving antenna 52 and then demodulated, decoded and deinterleaved in the battery powered receiver 50 headphones.

EX1005 at 0005-06 (¶0010). This excerpt does not indicate what type of receiver was used, nor does any part of the 2003 Application's specification, it only establishes that the receiver was battery powered.

27. In addition, neither the above disclosure or the broader 2003 Application specification provide any details about the circuit description of the receiver which would provide a POSA indications as to the type of receiver in use.[8] Because the specific type of receiver used was not disclosed a POSA would have understood that the receiver could have been any one of a number of receivers (such as direct conversion, low IF, or superheterodyne) in use at the time of the invention. Therefore, since the type of receiver was not disclosed and no circuit description was provided to narrow the possibility of possible receivers to "direct conversion," the

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[8] https://www.rfcafe.com/references/ai/electronics-technology-principles/heterodyne-vs-superheterodyne-ai.htm, if the receiver was a direct conversion receiver (or 'zero IF receiver') the circuit description would have indicated that the local oscillator signal (LO) which the RF signal was mixed with had a frequency that was identical to the RF signal's carrier frequency, so that the RF signal would be directly downconverted to baseband without passing through an intermediate frequency stage. If the receiver was a heterodyne receiver the RF signal received from the antenna would undergo amplification, then it would be mixed with a local oscillator signal to produce sum and difference frequencies, the difference frequency is selected as the intermediate frequency and then filtered and amplified for further demodulation. If the receiver was a superheterodyne receiver, the antenna would receive the RF signal, which would undergo amplification, then be mixed with a local accelerator signal to produce an IF, then the IF signal would be filtered and amplified through several stages prior to final demodulation.

2003 Application does not disclose a "direct conversion receiver." Moreover, demodulation is not unique to "direct conversion receivers," as each and every one of the receiver types detailed above (low IF and superheterodyne) also include a demodulation step. "Direct conversion modules" would not have been the natural result of the disclosure of "demodulation" by the 2003 Application.

28. Moreover, Dr. Melendez's inherency theory is undermined by the applicant's own prosecution history. The 2003 Application as originally filed (EX1005) contains no reference whatsoever to "direct conversion." The term first enters the specification via an amendment filed February 10, 2006 (further amended March 14, 2006) in response to a December 30, 2005 Office Action, more than two years after the Continuation-in-Part's original filing. (EX1005 at 0252–0271 (Reply to Office Action of December 30, 2005).

29. Critically, the applicant's own remarks in that amendment distinguish "direct conversion" from superheterodyne receiver architectures through their use of different components:

> Schotz's '343 incorporates a superheterodyne receiver...This superheterodyne receiver incorporates filtering, oscillator and frequency synthesis components that are not needed when a direct conversion receiver is used.

EX1005 at 0270.

30. The Applicant's own remarks admit that direct conversion and superheterodyne receivers are architecturally distinct, which directly rebuts Dr

Melendez's argument that a "direct conversion receiver" would have been a natural result of the disclosure of "demodulation" by the 2003 Application.

## V. DISCLOSURE OF "DPSK" IN THE 2003 APPLICATION

31. Dr. Melendez's assertion that a POSA would understand that the 2003 application inherently discloses DPSK because it utilized Manchester encoding/decoding schemes, one of which such schemes includes Differential Manchester encoding, which is a specific form of bi-phase signaling that is logically and functionally analogous to Differential Phase Shift Keying (DPSK), is wrong.

32. The Manchester encoding disclosed in the 2003 application is distinct from differential Manchester encoding. Furthermore, differential Manchester encoding is not logically and functionally analogous to Differential Phase Shift Keying (DPSK). A POSA would not have understood "DPSK" to be a natural result of the disclosure of "Manchester encoding/decoding." by the 2003 Application.

### A. Manchester encoding and DPSK solve different problems at different layers

#### 1. Manchester encoding

33. Manchester encoding is a line-coding scheme (a method of representing digital bits as physical voltage transitions at the baseband/bit-transmission layer, before any RF modulation occurs). In standard Manchester encoding, every bit is represented by a transition in the middle of the bit period (e.g., low-to-high for one bit value, high-to-low for the other), rather than by a fixed voltage level. Because

every bit guarantees a mid-bit transition, Manchester encoding is self-clocking (i.e., the receiver can recover bit timing directly from the data stream itself) and has no inherent DC bias, since each bit period spends equal time high and low.[9]

**2. Differential Manchester encoding is a variant of ordinary/general Manchester encoding**

34. Differential Manchester encoding is a variant of Manchester encoding that retains the same mid-bit transition (preserving self-clocking) but encodes the bit value differently. Rather than using the direction of that mid-bit transition to define a 1 or 0, it determines bit values based on whether an additional transition occurs at the start of the bit period. By standard convention, a transition at the beginning of the bit interval represents a binary 0, while the absence of a transition represents a binary 1. Because bit values depend entirely on relative signal changes rather than absolute voltage levels, Differential Manchester provides enhanced reliability and remains completely unaffected if physical signal wires are accidentally inverted.[10]

35. Differential Manchester encoding remains a baseband line-coding scheme, operating at the same layer as ordinary Manchester encoding.[11]

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[9] https://ieeemilestones.ethw.org/Milestone-Proposal:Manchester_Code

[10] https://www.technologyuk.net/telecommunications/telecom-principles/line-coding-techniques.shtml#ID10

[11] https://www.technologyuk.net/telecommunications/telecom-principles/line-coding-techniques.shtml#ID10

### 3. Differential Phase Shift Keying (DPSK)

36. DPSK is a carrier-modulation scheme (a method of impressing a bit stream onto an RF carrier wave for wireless transmission that occurs after baseband line coding has been performed). In DPSK, information is encoded at the transition in phase between consecutive transmitted symbols, rather than in the absolute phase of the carrier. This allows the receiver to recover the transmitted data by comparing each symbol's phase to the previous symbol's phase (noncoherent detection), without needing to generate or track an absolute phase reference locked to the transmitter's carrier—in contrast to ordinary (coherent) PSK or M-ary QAM, which generally require the receiver use a coherent reference to aid in phase matching and demodulation.[12]

37. Both Differential Manchester and DPSK share a comparison to a preceding state, which is why each can be described as "differential." But Manchester/Differential Manchester encoding operate at the baseband line-coding layer, while DPSK operates at the RF carrier-modulation layer.

## B. In the 2003 Application the disclosure concerning "Manchester encoding/decoding schemes" does not refer to Differential Manchester encoding; instead it describe a general Manchester line encoding

38. The 2003 Application indicates:

> Note that Figure 2 shows that -1 equals the maximum low bit energy representation and 1 equals the maximum high bit energy

[12] EX1018 at 242-43.

> representation to illustrate that this design may utilize Manchester encoding/decoding schemes.

EX1005 at 0006-07 (¶0014). The 2003 Application indicates in the above disclosure and FIG. 2 that data bits have just two states: a rising edge (1) or a falling edge (1-1=0) with a transition at the midpoint of a time period, enabling the clock signal to be embedded into the data signal, just as in Manchester line encoding.[13] Differential Manchester encoding on the other hand represents the transitions at the midpoint of the time period as data bits rather than the data signal itself; therefore the data bit should be one at the transition and zero for the data signal which is the reverse of what is shown in FIG. 2 and in the above disclosure.[14]

39. Dr. Melendez himself admits that Differential Manchester encoding is a type of Manchester encoding, and is not the same thing as Manchester encoding:

> A POSA would understand that there were multiple types of known Manchester encoding schemes, including Differential Manchester encoding.

EX2022 at 19-20 (¶36). Dr. Melendez also concedes that Differential Manchester encoding is not the same as Manchester encoding when he shares that "Differential Manchester encodes data based on the presence or absence of a transition at the start of a bit interval relative to the prior state." EX2022 at 20 (¶36). A POSA would have

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[13] https://www.youtube.com/watch?v=nbJc8nc_aAU

[14] https://www.geeksforgeeks.org/computer-networks/difference-between-manchester-and-differential-manchester-encoding/

understood that Manchester encoding was disclosed in the 2003 Application as the data bits themselves were encoded rather than the transitions between them.

### C. Dr. Melendez concedes Differential Manchester encoding is not a form of DPSK

40. Dr. Melendez indicates:

> A POSA would recognize Differential Manchester encoding as a specific form of bi-phase signaling that is logically and functionally analogous to Differential Phase Shift Keying (DPSK). Specifically, just as DPSK encodes information by shifting the phase of a carrier wave relative to the preceding signal – rather than relying on an absolute phase reference – Differential Manchester encodes data based on the presence or absence of a transition at the start of a bit interval relative to the prior state. Consequently, a POSA would understand that both techniques share the same 'differential' logic to resolve the technical challenge of signal polarity inversion (or 180° phase ambiguity) characterizing Differential Manchester as an implementation of the same principles of DPSK modulation. Additionally, a POSA would have recognize[d] Differential Manchester encoding as a 'bi-phase' signaling architecture. See, e.g., EX2016 at 4 (Appendix 1) (defining 'bi-phase' as '[a] term used to signify two-phase (+/-90°) phase shift keying').

EX2022 at 19-20 (¶36). Differential Phase Shift Keying (DPSK) modulation and Differential Manchester encoding are not logically or functionally analogous to each other. Functionally, DPSK is a digital modulation technique used in digital wireless communication systems where the input binary sequence is first differentially encoded (where the next bit depends upon the previous bit; when the data bit is low (i.e., 0) the phase of the signal continues as it was, when the data bit is high (i.e., 1) the phase of the signal is reversed) and then modulated onto a carrier frequency using

a BPSK modulator. EX1018 at 242.

41. Moreover, the applicant's own prosecution history confirms DPSK was not understood as inherent in the original disclosure. In the amendment filed July 1, 2005, nearly two years after the Continuation-in-Part (CIP) was filed, the applicant needed to construct a multi-page comparative bit-error-rate performance analysis, citing Rappaport (Ch. 5) and Simon/Hinedi/Lindsey's "Digital Communication Techniques," to argue that DPSK "may be" (not "necessarily is") read into the original spread-spectrum-modulation language. EX1005 at 0087–89 (Remarks/Arguments, July 1, 2005 amendment).

## VI. DISCLOSURE OF "REDUCED INTERSYMBOL INTERFERENCE" IN THE 2003 APPLICATION

42. Dr. Melendez wrongly asserts that a POSA would have understood that using convolutional encoding and interleaving reduces intersymbol interference.

### A. The 2003 Application disclosure "to reduce the effects of channel noise, the battery powered transmitter 20 may use convolutional encoding and interleaving" does not inherently disclose "intersymbol interference"

43. Channel noise is extraneous noise within a communication channel.[15] Key types of channel noise include thermal noise, interference, atmospheric noise, etc. This noise combines with a transmitted signal in a linear fashion as it is additive. The higher the noise in the channel the lower the signal-to-noise ratio (SNR) in the

[15] https://www.technologyuk.net/telecommunications/telecom-principles/noise-and-the-shannon-limit.shtml

received signal, making it more difficult for the receiver to reliably reproduce the originally transmitted signal.[16]

44. Intersymbol interference (ISI) is caused by multipath propagation and bandwidth limitations, which cause the energy of one transmitted symbol to spread into an adjacent symbol, causing those symbols to interfere with one another at the receiver. ISI is a distinct engineering problem that is addressed by different techniques than those applied to (extraneous) channel noise.[17] ISI is typically addressed through equalization, pulse shaping (e.g., raised-cosine filtering), or partial response signaling, not through "convolutional encoding or interleaving."

45. The 2003 Application disclosure "to reduce the effects of channel noise, the battery powered transmitter 20 may use convolutional encoding and interleaving" does not inherently disclose "intersymbol interference." A POSA would have understood that "intersymbol interference" would not have been the natural result of the disclosure of "convolutional encoding and interleaving" being used "to reduce the effects of channel noise" by the 2003 Application.

46. Convolutional encoding adds redundancy to a signal to account for any errors caused by extraneous noise (channel noise) but does not address the ISI cases.

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[16] https://www.technologyuk.net/telecommunications/telecom-principles/noise-and-the-shannon-limit.shtml

[17] https://technav.ieee.org/topic/intersymbol-interference/

47. U.S. Patent 7,412,294 (EX1006), which issued from this same Continuation-in-Part (CIP) in 2008, reflects the end state of this addition: Claim 14 recites "a first encoder receiving output from said digital low pass filter and being configured to reduce intersymbol interference (ISI)." EX1006 at claim 14 (see also claim 19, same limitation). Read together with the prosecution history above, EX1006 and EX1005 Part 2 corroborate one another: the specific, dateable window in which ISI language entered the claims (2006-2007) is consistent with, and independently confirms, the same pattern already established for direct conversion and DPSK—each entering the claimed invention years after the 2003 filing, never as part of the original disclosure.

**1. Convolutional encoding is a forward error correction technique intended to prevent random errors not reduce intersymbol interference**

48. Channel encoding receives a compressed digital signal from an encoder and adds redundancy to it in the form of error detection and correction codes which helps ensure that any errors caused by extraneous noise during transmission can be corrected by the receiver. EX1022 at 166-67, 1254, FIG. 88.5. **Convolutional encoding** is a particular forward error correction (FEC) coding technique that introduces redundancy by adding parity symbols to the compressed digital signal. EX1022 at 166-67. Once a transmitted signal that has undergone convolutional encoding is received by the receiver and after it undergoes demodulation and de-

interleaving, the Viterbi decoder can perform a reciprocal function to remove the redundancy and provide a reliable reproduction of the compressed digital signal. EX1018 at 315-16, 354.

49. As an analog signal travels over-the-air from a transmitter to a receiver, its waveform dissipates over distance and time resulting in its distortion and the dispersion of its energy.[18] The resultant spreading waveforms begin to overlap with one another creating a phenomenon known as intersymbol interference.[19] In order to prevent or reduce intersymbol interference, a signal is often pre-coded at the transmitter which involves altering the amplitudes and phases of its waveform based on knowledge of the channel.[20]

50. Convolutional encoding does not remove intersymbol interference; rather it introduces redundancy into the bit stream so that random bit errors caused by "channel noise" can be detected and corrected at the receiver. A POSA would have understood that "intersymbol interference" would not have been the natural result of the disclosure of "convolutional encoding" being used "to reduce the effects of channel noise" by the 2003 Application.

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[18] https://www.eeworldonline.com/what-is-intersymbol-interference-and-why-should-i-care-about-it/

[19] https://www.eeworldonline.com/what-is-intersymbol-interference-and-why-should-i-care-about-it/

[20] https://www.analogictips.com/what-is-precoding-and-what-are-benefits-faq/

### 2. Interleaving reorders the bits or symbols of the digital signal to mitigate burst errors, and does not reduce intersymbol interference

51. While the channel encoder provides error correction, in the form of error correcting codes (ECCs), in an attempt to avoid errors in decoding and maintain the data fidelity of a transmission, this method is not effective in maintaining quality when dealing with burst errors. Burst errors occur when several consecutive bits or blocks of data are transmitted with errors.

52. The **interleaver** reorders the bits or blocks of the digital signal from the channel encoder, with the goal of avoiding or mitigating the impact of "burst errors" which might affect a block of contiguous data. Such errors can result from a burst of interference or a short period of low signal strength. EX1022 at 177, 179, 1254, Figure 88.5. The interleaver functions to distribute the errors over multiple blocks of data so that error correction methods (employed by the channel encoder and Viterbi decoder) are able to work more effectively, in particular in the event of "burst errors." *Id*. Essentially, it is easier to fix one error in a sequence of good data rather than to correct multiple contiguous errors (burst errors) in a block of good data.

53. Interleaving is a complement to forward error correction against channel noise and fading. Interleaving does not itself correct errors, and it is not a technique for reducing or preventing intersymbol interference. A POSA would have understood that "intersymbol interference" would not have been the natural result of the disclosure of "interleaving" being used "to reduce the effects of channel noise"

by the 2003 Application.

### B. "Partial response signaling" (PRS) does not utilize "convolutional encoding"

54. "Partial response signaling, (PRS)" is a signaling technique which introduces a controlled and deterministic amount of intersymbol interference to shape the transmitted spectrum. EX1022 at 338.

55. "Convolutional encoding" is an FEC coding technique that introduces redundancy by adding parity symbols to the compressed digital signal. EX1022 at 166-67. At the receiver, after demodulation and de-interleaving, the Viterbi decoder can perform a reciprocal function to remove the redundancy and reveal a reliable reproduction of the compressed digital signal. EX1018 at 315-16, 354.

56. "Convolutional coding" involves adding additional bits to the signal to overcome channel noise, whereas PRS intentionally adds overlap (i.e., intersymbol interference) between signals to combat intersymbol interference. PRS is an independent technique from convolutional encoding: neither requires the other, and the presence of one does not imply or suggest the other to a POSA.

### C. "Convolutional encoding" would not suggest "partial response signaling" to a POSA

57. "Convolutional encoding" is a type of channel encoding that is used to reduce the effects of channel noise, whereas "partial response signaling" is a type of precoding that is used to reduce the effects of intersymbol interference.

"Convolutional encoding" and "partial response signaling" solve for two different problems, as such a POSA would understand that "convolutional encoding" would not suggest "partial response signaling."

58. PRS and convolutional encoding are independent techniques that may or may not be used together, and the mere disclosure of convolutional encoding does not suggest PRS (or ISI reduction) to a POSA.

### D. Gibson's disclosure of "interleaving the bits to be transmitted over two time slots is introduced to diminish the effects of short deep fades" indicates fade mitigation not intersymbol interference mitigation

59. As a signal travels from a transmitter to a receiver it may encounter multiple reflectors. When the signal encounters these reflectors, it fractionates into multiple copies each of which follow its own path before reaching the receiver.[21] Each signal copy experiences different attenuation, delays, and phase shifts during its propagation toward the receiver.[22]

60. A short deep fade occurs when destructive interference attenuates the signal power received at the receiver.[23] A short deep fade dramatically reduces the signal-to-noise ratio (SNR) and causes a sharp spike in bit errors, and potentially momentary link outages. A short deep fade results in a dramatic reduction in the

[21] https://www.everythingrf.com/community/what-is-signal-fading

[22] https://www.everythingrf.com/community/what-is-signal-fading

[23] https://www.everythingrf.com/community/what-is-signal-fading

strength of the received signal, whereas intersymbol interference is the result of an overlap in the received signal which affects the timing of and the ability to isolate distinct signals within the received signal. A POSA would understand that short deep fades and intersymbol interference cause different issues in the received signal. A POSA would have also understood that interleaving designed to increase the strength of a received signal (and mitigate short deep fades) could not be used to resolve an overlap in received signals (and mitigate intersymbol interference) as interleaving is a complement to forward error correction against channel noise and fading. Interleaving does not itself correct errors, and it is not a technique for reducing or preventing intersymbol interference.

61. Gibson's disclosure of "interleaving the bits to be transmitted over two time slots is introduced to diminish the effects of short deep fades" indicates mitigation of short deep fades not mitigation of intersymbol interference.

**E. THSS was not mentioned in the 2003 Application**

62. Time-Hopping Spread Spectrum (THSS) is a spread-spectrum technique in which transmission occurs in short, pseudo-randomly-timed pulses across time slots, rather than continuously.[24] As THSS has short pulse durations

[24] Q. Su, R. E. James, T. R. Blackburn, R. Tychsen and J. Simpson, "On-line calibration pulse injection through high frequency current transformers for partial discharge locations," Conference Record of the 1992 IEEE International Symposium on Electrical Insulation, Baltimore, MD, USA, 1992, pp. 367-370, doi: 10.1109/ELINSL.1992.246974.

compared to the delay spread caused by multipath propagation, it may be used to reduce the impact of intersymbol interference in some implementations. However, reducing intersymbol interference is not the primary objective of THSS.

63. The 2003 Application does not refer to THSS, let alone indicate that THSS was capable of contributing to the reduction of intersymbol interference, therefore Dr. Melendez's citation to THSS is unfounded.

## VII. DISCLOSURE OF MULTIPLE USERS OPERATING WIRELESS TRANSMISSION DEVICES IN THE '627 PATENT

### A. Independent CDMA

#### 1. CDMA does not require orthogonality

64. Dr. Melendez opines that because CDMA is code division multiple access, "it does require orthogonality between the codes." EX1033 at 147:14-21; EX2022 ¶¶46-50. A POSA would not have shared that understanding. Orthogonality requires a cross-correlation of zero between codes, which is a property of particular CDMA implementations, principally synchronous systems in which transmissions are time-aligned. CDMA systems also operate asynchronously, without time alignment, using code families having nonzero cross-correlation. In such systems users are separated statistically, through the low cross-correlation of pseudo-noise sequences, rather than through deterministic orthogonality. EX1018 at 275-78, 336, 405; EX1022 at 94, 105, 200; EX2020 at 209. As long as CDMA is sufficiently orthogonal (i.e., it has sufficiently low cross-correlation properties), decoding errors

will be rare. This is consistent with how the applicant described the "present invention" during the prosecution of the 2003 application. EX1005 at 0265 ("The present invention uses frequency hopping spread spectrum (FHSS) transmission technology with a unique pseudo-noise (PN) code that is long enough, and ***that has low cross-correlation properties*** so that the hop pattern is unique for each individual user.") (emphasis added), 298 (same), 324 (same).

65. In practice, spreading-code families are only approximately orthogonal, and the resulting cross-correlation interference can be mitigated and managed through the processing gain and error correction, rather than eliminated. EX2020.

66. Dr. Melendez acknowledged this at deposition. He agreed that CDMA systems exist in which the same code is deliberately reused, forgoing orthogonality—for example, receivers designed to intercept transmissions not addressed to them. EX1034 at 147:22-148:14.

67. Even where orthogonality is maintained, a POSA would not have understood that it requires a controller operating at run time to assign codes. Codes known to be mutually separable can be provisioned in advance—assigned at manufacture, configured at installation, or exchanged once during an initial setup between two devices, and thereafter stored and reused each time they communicate. In each of these cases each of the two communicating devices already possess the shared code, and no third-party authority participates in their subsequent

communications.

68. Dr. Melendez agreed. He testified that spreading codes "could be assigned and the orthogonality can be maintained centrally **or not**," and that where orthogonality is not maintained centrally it would be "fair" to describe the system as independent of central control. EX1034 at 154:7-8, 154:10-16, 154:18-155:2 (emphasis added). He further agreed that "[i]ndependent CDMA is a form of CDMA." *Id.* at 160:9-12. And he agreed that the presence of a base station does not itself resolve the question, because "[i]t depends on what the base station is doing." *Id.* at 145:10-146:3. He confirmed that he did not analyze the pre-provisioning alternatives I describe above—device-selected codes, codes preassigned by a base station having no further role, or manufacturer-assigned codes. *Id.* at 147:6-13; 168:25-169:21; 238:23-241:4.

69. Dr. Melendez incorrectly asserts that both Miyake and Walley require central control to preserve code orthogonality (Miyake through its central "transmission station's" dual code-generator architecture; Walley through the code-tree/OVSF-style management required when the length of spreading-code is variable), and that a POSA would not be motivated to combine them because they solve "different problems under conflicting design constraints," and that Walley "teaches away" from independent CDMA because omitting central control would render Walley's system inoperable.

### B. Dr. Melendez is addressing a strawman combination: the Petition's combination uses only Miyake's teaching of user-specific spreading codes, not Miyake's central control architecture

70. Dr. Melendez attacks a combination the Petition never proposed. I relied only on Miyake's teaching that spreading codes may be "**specific to individual users**" (EX1016 at 5:49-56, 7:12-21) as a substitution for Walley's system-wide PN code—not on another feature of Miyake, that is its code-assignment architecture with a central controller. EX1012 ¶¶230-39, 261-69. Dr. Melendez's extensive discussion of how Miyake's "transmission station" assigns and manages codes addresses a feature of Miyake the combination does not import.

#### 1. Miyake discloses a pair of symmetric peer stations, not a base station serving multiple terminals

71. Responding to Dr. Melendez's characterization of Miyake's "transmission station" as a base station (EX2022 ¶¶49-52), I note that Miyake states each of "the stations of the transmitter side and receiver side may comprise both of a transmission circuit (modulator) and a reception circuit (demodulator)." EX1016 at 9:13-17. A POSA would understand that as describing symmetric peer stations, each capable of both transmitting and receiving—not an asymmetric arrangement in which a common base station serves multiple terminals.

72. Miyake immediately follows the above description of peer stations by expressly describing an embodiment including both a transmission circuit and reception circuit. This embodiment is depicted in Miyake's FIG. 9 and comprises

transmission circuit 81, reception circuit 82, control section 85, key input section 86, display device 87, memory 88, microphone 89, and loudspeaker 90. *Id.* at 9:20-47. A POSA would recognize that combination—keypad, display, microphone, and loudspeaker in a single station containing both transmit and receive circuits—as a user device, such as a handheld user terminal.

**2. Miyake places the selection of the operative spreading code under user control**

73. Miyake's spreading code generators 62 and 64 include switching circuits 62E and 64F that select among the attribute-oriented spreading code generators "in accordance with an operation of **an external manual switch**" 63 or 65. EX1016 at 8:15-53. Miyake states the consequence: attribute-oriented codes "can be switched by operating the manual switch 63 or 65. Therefore, when a plurality of transmission stations are broadcasting different information programs, it is possible for the user to select and receive any of these programs." *Id.* at 8:54-60. Because the operative spreading code in Miyake is the combination of the user-specific code and the attribute-oriented code (*id.* at Abstract, 5:49-56), a POSA would understand that in these embodiments the user physically selects a component of the operative code. That is not code assignment performed by a central authority.

**C. User specific spreading codes can be pre-provisioned during device manufacturing or paired without requiring run-time central control**

74. A user-specific spreading code, once assigned, can be pre-provisioned

at manufacture, configured during installation, or established during a pairing process, in a away that is directly analogous to how Bluetooth devices exchange and store a fixed pairing key without requiring run-time central coordination.

**1. Walley teaches applications that do not require central control, such as headphones and speakers**

75. Walley's variable-length PN code teaching is relied upon only for its noise-immunity/range benefit (lengthening the code to "increase...noise immunity and the transmission range," EX1015 at 4:23-25), not for any code-management or orthogonality-preservation architecture.

76. Dr. Melendez's orthogonal variable spreading factor (OVSF) code-tree/orthogonality-management argument is based on features that are neither recited in nor required by Walley (OVSF code trees and central management of codes to maintain orthogonality), and that the Petition does not rely upon, and is accordingly not responsive to the combination actually proposed. Notably, Walley itself lists "wireless Speaker applications" among its intended uses (EX1015 at 2:60-63)—a use case directly analogous to the headphone/speaker system claimed in the '627 patent.

77. Walley's own wireless-speaker embodiment further confirms that its teachings do not require central control. Walley describes this embodiment as a simple, one-directional, point-to-point system, "several channels of high fidelity sound... carried a short distance, but only in one direction", in which the base unit's

spreading code is chosen once, based on the known, fixed data rate to be delivered to the speaker. EX1015 at 11:47-56. Nothing in this description involves a central controller coordinating communications amongst multiple users or devices. Applications such as headphones and speakers are exactly the kind Walley itself identifies as not requiring central control, directly undermining Dr. Melendez's position that Walley's teachings are inherently tied to centrally-controlled operation.

**2. Walley discloses handset-initiated spreading-code control**

78. Walley affirmatively describes the portable device, rather than a controller, determining the spreading code. In Walley's portable telephone embodiment, "[t]he portable telephone unit can then signal the base unit that it will switch to an eight-bit spreading code," EX1015 at 10:48-51, and later the "portable telephone unit… signals the base unit that it will switch off the spreading code," *id.* at 11:1-5. In the PDA embodiment, "[t]he PDA 1001 could then instruct the base unit 1011 as to which PN code is the minimum size needed to accurately receive the messages." *Id.* at 12:6-12. A POSA would understand each passage as describing the handset or PDA making the determination and informing the base unit, which conforms to the selection by the handset or PDA. Walley's transmit controller 805 is consistent with that reading: it adjusts spreading-code length using inputs local to the device—data queue length, data receive rate, interference level, and signal strength. *Id.* at FIG. 8, 8:62-9:12. A POSA would understand those to be

measurements available at the device itself, requiring no external coordinating authority.

**3. Varying spreading-code length does not require a code tree**

79. Dr. Melendez opines that preserving separability while varying spreading-code length requires management of an orthogonal variable spreading factor code tree, with parent-child relationships among codes. EX2022 ¶¶57-58. Walley does not describe a code tree; the terms "orthogonal variable spreading factor" and "code tree" do not appear in Walley, as Dr. Melendez confirmed. EX1034 at 245:9-14; 249:21-250:16. A POSA would not import that structure into Walley. Nor is a code tree necessary to enable variable code length while preserving separability: separability can be preserved by using code sets that are separable at each length in use, by coordinating length changes between the two devices of a given link—which is what Walley's handset-initiated signaling accomplishes—or, in the combination proposed, by using the fixed-length, user-specific codes that Miyake describes. EX1015 at 10:48-51, 11:1-5, 12:6-12, 8:62-9:12, FIG. 8; EX1012 ¶¶230-234 (citing EX1016 at 7:12-21, 5:49-56, 8:12-60, 2:23-26).

**D. Neither Walley nor Miyake criticize independent operation**

80. A reference "teaches away" only where it criticizes, discredits, or discourages the claimed combination. Neither Walley nor Miyake do so. Walley never once mentions "independent control" anywhere in its specification, describing

itself instead as "generic type spread spectrum controllers which can be used in a variety of applications" (EX1015 at Abstract), silence on the topic, is not discouragement of "independent operation." Miyake, for its part, is concerned with simplifying the management of users and services as their numbers grow (EX1016 at 1:35-45 (Summary of the Invention)), a scalability observation, not a criticism of independent operation.

## VIII. MOTIVATION TO COMBINE WALLEY AND MIYAKE

### A. Walley and Miyake do not solve 'different problems under conflicting design constraints'

81. Dr. Melendez wrongly argues that "[a] POSA would not have expected a predictable benefit from combining Walley's variable length PN codes adaptation with Miyake's service- and user-discriminating spreading-code architecture because the two disclosures address different problems under conflicting design constraints and combining them would defeat Miyake's core goal of simplified multi-user/service management." EX2022 at 30 (¶61). Both Walley and Miyake, like the '627 patent, are directed to wireless communication devices using spread spectrum techniques. Moreover, both Walley and Miyake utilize spreading codes. Moreover, far from addressing different problems, Miyake describes using spreading codes in the context of a spread spectrum system like Walley's. A POAA would have understood that implementing user-based spreading codes (Miyake) in Walley's system instead of system-based spreading codes (Walley) would have only

required routine knowledge as user accounts and user-specific systems were well known, and Miyake describes its spread spectrum system as something "which can be designed easily." Ex1016 at 2:23-26. Moreover, Miyake's core goal of simplified multi-user/service management would be maintained when implementing user-based spreading codes in Walley's system as the spreading code according to the attribute of each service and the spreading code according to each user would continue to be separately managed as discussed in Miyake. EX1016 at 7:32-35. Moreover, the multi-user/service management would actually be improved under Walley as increasing the length of user-specific and service attribute codes could increase interference tolerance or increase the transmit range of the transmit signal. EX1015 at 8:40-43.

## IX. ADDRESS FOR §VI.A.5 (CLAIM 5 PREAMBLE)

82. The Patent Owner's Response (POR) incorrectly asserts that, unlike claim 1 (where the unique user code is used at the receiver), Claim 5's preamble requires the transmitter itself to transmit a unique user code, and that this transmitter-side limitation is "not addressed anywhere within the Petition's or the Davies Declaration's discussion" of Grounds 2 or 3.

83. This characterization is incorrect. My original declaration directly addresses Claim 5's preamble in Ground 2 at EX1012 at ¶¶300-05, expressly stating that "Walley in view of Miyake, Gibson and Rappaport renders obvious a wireless

digital coded audio spread spectrum **transmitter** … **configured to transmit a unique user code**," cross-referencing the [1P] preamble analysis (emphasis added).

84. My original declaration further addresses the substance of transmitter-side unique code transmission at EX1012 at ¶¶322-23 (limitation [5D]), explaining that Walley discloses a receiver using the transmitter's unique spreading code to separate that transmission from others, and that Miyake discloses the corresponding one-to-one relationship in which "the spreading code set on **the** transmitter side should coincide with the spreading code set on **the** receiver side" (emphasis added). In a CDMA system, the spreading code is a single shared artifact between transmitter and receiver—teaching the receiver's use of a unique code and teaching the transmitter's transmission of that same code are not independent propositions; one necessarily entails the other.

85. In a direct-sequence spread spectrum system the spreading code is not sent separately from the data; the two are combined and the combined signal is transmitted. Walley describes the operation: each bit of the PN code is "exclusive Exor'ed with each bit of the data code," and "[t]he output of the Exor (Exclusive Or) gate 207 is coupled to the modulator 213, for modulating the carrier frequency 215," whose output is "coupled to a RF power amplifier 217 and the antenna 219 for broadcasting the signal." EX1015 at 6:10-34, FIG. 2. Miyake describes the same operation. EX1016 at Abstract, 5:49-56. A POSA would understand that a

transmitter operating this way necessarily transmits the spreading code as part of the transmitted signal, and that Miyake's requirement that the receiver's code coincide with the transmitter's (EX1016 at 6:63-7:18) presupposes that transmission.

86. I directly quote, in EX1012 at ¶¶300-05 and 322-23 to correct the POR's "not addressed" characterization, and I add an explicit sentence connecting the transmitter-side and receiver-side analysis to preempt any argument that cross-referencing prior analysis is insufficient treatment of the limitation.

Date: August 27, 2026

Michael Allan Martin Davies