"signal" and "symbol" interchangeably in his textbook. *See generally* Gitlin, et. al., DATA COMMUNICATIONS PRINCIPLES. For example, in Chapter 2 ("Theoretical Foundations of Digital Communications"), pages 72-78, Dr. Gitlin repeatedly alternates between "transmitted signal" and "transmitted symbol."[1] On the other hand, the book never uses the word "pattern" in this excerpt. Dr. Gitlin's own book confirms that in its plain and ordinary meaning, a symbol is a "modulated signal," and not a "modulated pattern."

21. Dr. Gitlin's declaration also acknowledges that the plain meaning of "symbol" refers to "signals." His declaration explains that Quadrature Amplitude Modulation is represented by a "signal constellation of symbols." Gitlin Decl. at ¶57. A signal constellation is a set of points in the two-dimensional plane. Each point represents a symbol. The magnitude and angle of each point identifies the symbol by specifying, respectively, the amplitude and phase of a sinusoidal signal. Thus in Dr. Gitlin's statement, "symbol" is used in its plain and ordinary sense to refer to a type of modulated signal. This usage is the same usage of "symbol" in the '792 patent, and is the same plain and ordinary usage of "symbol" by one of ordinary skill in the art.

3.) Apple's construction, "a modulated <u>pattern</u>," is incorrect

22. Apple's use of "modulated pattern" is incorrect, because "pattern," as used in the '792 patent, refers to a pattern of systematic and parity bits. These bits are then encoded by the mapper to produce a signal. Under the plain and ordinary meaning of "symbol" in the claims, a symbol may **represent** a pattern of systematic and parity bits, but a symbol itself is not a pattern. A symbol is a signal. The plain language of the claims does not suggest that a "symbol" is the same as a "pattern."

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[1] See, for example, page 75 where the book manipulates an equation regarding the probability of error. Equation (2.6b) presents a criterion for a decision rule governing when to "choose s_1 as the transmitted **symbol**." Equation (2.7b) presents the corresponding criterion for the case of a discrete observation space for a decision rule governing when to "choose s_1 as the transmitted **signal**." In both cases, $\mathbf{s}_1$ is being chosen as both the transmitted signal and the transmitted symbol.

23. The plain language of the claims is contrary to the idea that a "symbol" is a "pattern." In Claims 11 and 14, the received symbol is demodulated into "systematic bits and parity bits." Here, the demodulator is acting in an ordinary fashion to convert a received signal into bits. Only **after** demodulation does the system generate a "pattern" of bits. Thus, the plain language of the claims confirms that a "symbol" is not itself a "pattern."

24. The specification confirms that a "symbol" is distinct from a "pattern." It states, "if the size of the buffer (buffer size={the number of systematic bits}+{the number of parity bits}) is minimized, a **symbol pattern** for the 64QAM cannot be optimally mapped." '792 patent at 10:53-56. Here, "symbol pattern" describes the pattern of systematic and parity bits that will be mapped onto a symbol, and not the symbol itself. Thus, the specification further confirms that a "symbol" is not a "pattern." *See also id.* at 20:13 (describing "symbol pattern" as a pattern of bits in a modulator).

25. Similarly, the patent Abstract distinguishes "symbol" from the pattern of bits, stating, "A modulator alternatively collects the permutated bits on a column by column basis from the first and second interleavers, and maps collected bits from the first and second interleavers onto **one modulation symbol**." Again, a "symbol" may represent a pattern of bits, but the symbol is itself a modulated signal.

b.) <u>"representing a number of bits specified according to the modulation technique" v. "that represents a plurality of bits"</u>

26. Under plain and ordinary meaning, a symbol represents a number of bits specified according to the modulation technique. In customary usage, "symbol" encompasses a wide variety of modulated signals that represent various numbers of bits. The modulation scheme fixes the number of bits. For example, BPSK (Binary Phase-Shift Keying) uses only two distinct symbols, and each symbol represents a single bit. QPSK (Quadrature Phase-Shift Keying) uses 4 distinct symbols to represent 2 bits. 64QAM (64-ary Quadrature Amplitude Modulation) uses 64 distinct symbols to represent 6 bits. While the number of bits varies, the modulation technique

determines the number of bits that the symbol represents. This understanding is included in the plain and ordinary meaning of "symbol."

1.) Intrinsic Evidence - "representing a number of bits specified according to the modulation technique"

27. The '792 patent claims confirm that the number of bits is specified by the modulation technique. For instance, Claim 5 states, "[Claim 1], wherein if the modulation scheme is 16QAM (16-ary Quadrature Amplitude Modulation), mapping onto one modulation symbol 2 bits from the first interleaver and 2 bits from the second interleaver." *See also* '792 patent, Claim 10. Claims 5 and 10 implicitly acknowledge that the number of bits is specified according to the modulation technique. Systems using the 16QAM modulation technique produce symbols representing 4 bits (in this particular case, 2 each from the first and second interleaver). Again, a person of ordinary skill would be aware of this plain meaning.

28. The specification also explains that the number of bits represented by a symbol is specified by the modulation technique. For instance, it states, "The DEMUX demultiplexes as many input bits as a prescribed number according to a modulation technique…." '792 patent at 22:11-13, *see also id.* at 9:33-37 (describing that symbols are "commonly" mapped "according to … a modulation technique."). The specification provides specific examples of this relationship, such as: "if the modulation technique is 16QAM, 4 coded bits are mapped to one symbol." *Id.* at 13:49-53. The figures confirm that the number of bits is specified by the modulation technique, with 16QAM generating symbols representing 4 bits, and 64QAM generating symbols representing 6 bits.

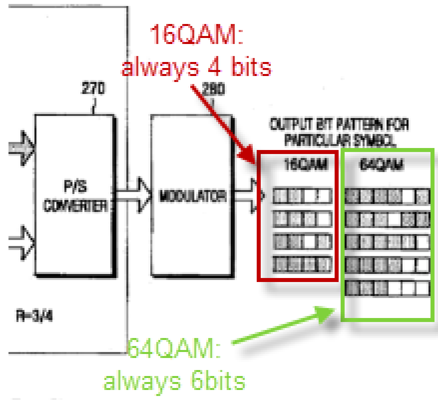

FIG.5

('792 patent, Fig. 5, annotations added)

29. The specification identifies other modulation techniques as well. The specification states, "The interleaved coded bits are subject to symbol mapping in a modulator **according to a modulation technique** of QPSK (Quadrature Phase Shift Keying), 8PSK (8-ary Phase Shift Keying), 16QAM (16-ary Quadrature Amplitude Modulation) or 64QAM." *Id.* at 2:40-44. Thus, the specification encompasses a wide range of symbols that are generated "according to a modulation technique." This relationship between the modulation technique and the number of bits represented by a symbol is basic, foundational knowledge for one of ordinary skill in the art.

2.) Extrinsic Evidence - "representing a number of bits specified according to the modulation technique"

30. Dr. Gitlin agrees that a "symbol" represents a number of bits specified according to the modulation technique. For example, Dr. Gitlin states, "in 16QAM, there are sixteen unique symbols and each symbol represents 4 bits." Gitlin Decl. at ¶58. Furthermore, "Some forms of modulation, e.g., binary phase-shift keying (BPSK), use only two distinct symbols and each symbol represents a single bit." Gitlin Decl. at ¶53. In both these examples, the number of bits is specified according to the modulation technique.

3.) Apple's construction, "that represents a plurality of bits" is incorrect

31. As discussed above in ¶¶27-30, a person of ordinary skill would know that the number of bits represented by a symbol varies according to the modulation technique used. Thus, a "symbol" might represent only one bit using the BPSK modulation technique, six bits using

64QAM, or some other number of bits. While the number of bits may vary, the number can be one and it is specified according to the modulation technique that is used. The plain and ordinary meaning of “symbol” encompasses signals generated by all these modulation techniques. Thus, no construction is needed.

32. Indeed, Dr. Gitlin himself acknowledges that “symbol” ordinarily refers to symbols that may represent only one bit. As he states, “Some forms of modulation, e.g., binary phase-shift keying (BPSK), use only two distinct symbols and each symbol represents a single bit. In other words, **one of ordinary skill in the field of the '792 patent would be aware of symbols that do not represent a plurality of bits**.” Gitlin Decl. ¶53 (emphasis added).

33. Dr. Gitlin proceeds to argue that “symbol” as used in the '792 patent deviates from ordinary meaning because it refers only to signals with “a plurality of bits.” *See* Gitlin Decl. ¶53. However, Dr. Gitlin's definition needlessly limits the meaning of “symbol” within the context of Claims 11 and 14. The term “symbol” need not be limited to symbols representing two or more bits; instead, Claims 11 and 14 themselves contain explicit limitations. Claim 11 reads, “… a demodulator for demodulating a received symbol into a **plurality** of systematic bits and parity bits.” If “symbol” inherently meant signals representing “a plurality of bits,” then the use of “plurality” in Claim 11 would be redundant. In other words, “symbol” is used according to its plain and ordinary meaning in Claims 11 and 14, while the claim itself contains explicit limitations with respect to “a plurality of systematic bits and parity bits.”

C.) <u>“representing a number of bits specified according to the modulation technique” v. “in a sequence”</u>

1.) Intrinsic Evidence – “in a sequence” is incorrect

34. Apple's interpretation that a symbol must exist “in a sequence” is inconsistent with the plain and ordinary meaning of “symbol.” While a symbol may appear in a sequence of symbols, it does not necessarily do so. A symbol can exist by itself. Although as a matter of practice, data communications systems nearly always transmit symbols in a sequence, there is no

reason to define “symbol” this way. As an analogy, a word normally appears in a sequence of words, as in a sentence or a paragraph. However, a word standing alone is still a word.

35. I agree with Dr. Gitlin when he says, “Digital communication systems of the type disclosed in the ‘792 patent communicate by transmitting a sequence of symbols.” Gitlin Decl. at ¶58. As Dr. Gitlin states, “[I]n a communication system of the type disclosed in the ‘792 patent, any one symbol would be part of a larger sequence of symbols that carry the transmitted bits.” *Id.* at ¶59. The specification clearly teaches that the deinterleaver described by Claims 11 and 14 respectively do operate on sequences of symbols, because the deinterleaving process only makes sense in the context of a sequence of symbols. However, I disagree that this aspect of the invention should be imported into the construction of the term “symbol.”

2.) Extrinsic Evidence – “in a sequence” is incorrect

36. Dr. Gitlin's own hypothetical confirms that signals do not necessarily exist in a sequence. Dr. Gitlin states, “For example, in 16QAM, there are sixteen unique symbols and each symbol represents four bits. To transmit 40 bits, a 16QAM based system would need to transmit ten symbols (i.e. ten symbols of four bits each results in communicating forty bits).” Gitlin Declaration at ¶58. By extension, to transmit 4 bits, a 16QAM system would need to transmit **only one symbol**. Under Apple's definition, however, a symbol representing four bits, if isolated, would suddenly cease to be a “symbol” because it is by itself, and not “in a sequence.” Such an interpretation defies ordinary common sense.

37. Moreover, Dr. Gitlin himself uses “symbol” to refer to a single bit that is not in a sequence of bits. *See* Gitlin, et. al., DATA COMMUNICATIONS PRINCIPLES at 72-78 (discussing the probability of error of a single symbol). Dr. Gitlin is simply using “symbol” in its plain and ordinary sense, which does not require a sequence of symbols.

38. Dr. Gitlin appears to be concerned about the ability to distinguish a single symbol from a sequence of symbols. *See* Gitlin Decl. ¶ 74. Specifically, Dr. Gitlin suggests that a sequence of symbols might incorrectly be construed as one giant “super-symbol” with many bits. However, Apple's proposed definition, requiring “a sequence” of symbols does not solve Dr.