Tr. (Min) at 3007-08).) According to Samsung, for the reasons previously discussed, MacWilliams does not disclose encoding a 10-bit TFCI information input into a 32-bit codeword; nor does it disclose outputting a 30-bit codeword that is equivalent to a 32-bit codeword. (*Id.*) Samsung argues that, for the same reasons, it would not have been "inherent" to a person of ordinary skill in the art, reading Chapters 1 and 13 of MacWilliams, to derive how to output a 30-bit codeword that is equivalent to the 32-bit codeword output by the controller. (*Id.* (citing Tr. (Min) at 3008).)

Samsung argues that, for the same reasons Samsung previously put forth, MacWilliams does not anticipate claims 75 and 76. (*Id.* at 76 (citing Tr. (Min) at 3008-09).) According to Samsung, MacWilliams does not teach "a controller for outputting a 30 bit codeword from among a plurality of 30 bit codewords that corresponds to a 10 bit TFCI information input." (*Id.*) Samsung says that MacWilliams never discloses a 30-bit codeword; therefore, there is no 30-bit codeword to correspond to a 10-bit TFCI information input. (*Id.*) Similarly, MacWilliams does not teach "the 30 bit codeword output by the controller is equivalent to a 32 bit codeword that corresponds to the 10 bit TFCI information input" from claim 75 or any of the limitations set forth in claim 76. (*Id.*) MacWilliams never creates a 32-bit codeword or a 30-bit codeword that is equivalent to a 32-bit codeword that corresponds to a 10-bit TFCI information input, argues Samsung. (*Id.*)

Samsung argues that Dr. Davis's three methods for deriving the claimed limitations improperly require hindsight. (*Id.*) According to Samsung, Dr. Davis, knowing that MacWilliams does not teach the asserted claims, resorted to deriving the claimed coding scheme. (*Id.*) Samsung says Dr. Davis claimed that three derivations—Basis Sequences Approach, Corollary 17 Approach, and Theorem 5 Approach—teach the asserted claims. (*Id.*) Each of these approaches requires taking teachings from one section and applying them to other sections. (*Id.*) These several sections do not cite to one another or provide any motivation for one of ordinary skill in the art to relate and integrate the information contained in these several sections in the process of piecing together the derivation rationalized by Apple. (*Id.* (citing Tr. (Min) at 3010-13).) Instead, argues Samsung, Dr. Davis, knowing about the '348 patent invention, because of his involvement in this Investigation, used hindsight to reverse engineer the '348 coding scheme, parlaying the teachings in MacWilliams. (*Id.* (citing Tr. (Min) at 3010-12).) However, argues Samsung, the derivations, nevertheless, fall short of the teaching of the asserted claims. (*Id.*)

Samsung says that Corollary 17 and Theorem 5 of MacWilliams essentially disclose the same information. In fact, says Samsung, Dr. Davis claims that these approaches disclose selecting the specific sequences to encode a 10-bit TFCI information input into a 30- or 32-bit codeword with a minimum distance of 12. (*Id.*) Corollary 17 states that this codeword can be obtained by extending the cyclic sub-codes, which is another chapter of MacWilliams. (*Id.*) Samsung argues that Dr. Davis did not provide any information showing how a person of ordinary skill in the art would take the teachings of cyclic sub-codes, apply them to Corollary 17, and thereby obtain a 30- or 32-bit codeword from a 10-bit TFCI information input. Samsung argues that Theorem 5 says that there exists a Matrix B which can have a certain weight that is a number of non-zero elements. (*Id.* (citing Tr. (Min) at 3013; RX-367 at 441).) Samsung says that Theorem 5 just describes how many of those vectors can exist at different weights. (*Id.*) Samsung contends that Dr. Davis failed to identify how a person of ordinary skill in the art would go from Theorem 5 to the encoding scheme in the asserted claims. (*Id.* at 77-78.)

Samsung denies that the June 1999 Standard in combination with MacWilliams would render the asserted claims obvious. (*Id.* at 78 (citing Tr. (Min) at 3014).) To invalidate the asserted claims based on obviousness, argues Samsung, the combination must disclose all of the limitations of the claims. (*Id.*) Samsung says that the June 1999 Standard and MacWilliams do not teach a 30-bit codeword output by the controller that is equivalent to a 32-bit codeword that corresponds to the 10-bit TFCI information input, as required by claims 75 and 82. (*Id.*)

Samsung argues that there are secondary considerations that support the fact that the '348 asserted claims are not obvious. (*Id.*) The members of the standard-setting organization, after analyzing and discussing the proposed technology, voted to adopt the best technology to be used for the standard. (*Id.* (citing JX-25C (Park Dep.) at 25).) When Samsung proposed the technology that is disclosed in the '348 patent, the 3GPP members were initially skeptical of Samsung's results, and in response, the '348 patent inventors conducted additional simulations, which they presented to the 3GPP at the following working-group meeting. (*Id.* (citing Tr. (Min) at 3015, (Kang) at 205-207).) After reviewing the additional simulation results, the industry experts who participated in the 3GPP working group meetings approved Samsung's proposal and included it in the standard. (*Id.* (citing Tr. (Min) at 3015, (Kang) at 207).)

Samsung argues that there were no viable alternatives to the '348 patent, contrary to Dr. Davis's assertion that the Nokia proposal and the June 1999 Standard provide evidence that there were alternatives. (*Id.*) The Nokia proposal and the June 1999 Standard failed to set forth a TFCI codeword that would fit the new standard transmission frame size of 15 slots and, also, did not provide optimal results. (*Id.*) The 3GPP members, after recognizing the importance of the technology in the '348 patent, adopted Samsung's proposal over Nokia's proposal. (*Id.*)

In its reply brief, Samsung argues that MacWilliams and the June 1999 Standard, either separately or in combination, fail to disclose many feature elements of claims 75 and 82 and fail to teach a person of ordinary skill in the art how to obtain the claimed limitations. (CRBr. at 29.) For example, they do not teach a 30-bit codeword output that is equivalent to a 32-bit codeword that corresponds to the 10-bit TFCI information input, as required by claims 75 and 82. (*Id.* (citing Tr. (Min) at 3014).) No combination of these references would lead one of ordinary skill in the art to this claim limitation, says Samsung. (*Id.* (citing Tr. (Min) at 3104).)

Samsung, citing *KSR,* 550 U.S. at 421, noted that a finding of obviousness is supported in situations where a finite number of solutions exist, and Samsung points out that in *Ortho-MacNeil Pharmaceutical, Inc. v. Mylan Laboratories, Inc.*, 520 F.3d 1358, 1364 (Fed. Cir. 2008), the Federal Circuit pointed out that *KSR* "posits a situation with a finite, and in the context of the art, small or easily traversed, number of options that would convince an ordinarily skilled artisan of obviousness." (*Id.* at 30.) Samsung argues that Apple and Dr. Davis, in order to devise their obviousness theory, make the conclusory and unsupported statement that there were two primary options to encode 10 inputs into a 32-bit codeword. (*Id.*) Samsung argues that the only evidence that Apple points to for support is the prior standard for encoding the basic TFCI and Samsung's proposal in relation thereto. (*Id.* at 30-31.) Samsung contends that simply because the prior standard utilized Reed-Muller codes to encode the basic TFCI into a 32-bit codeword does not limit the number of encoding schemes for the extended TFCI. (*Id.*) In fact, argues Samsung, the 3GPP members found that utilizing the basic Reed-Muller code, which was used to encode the basic TFCI, proved ineffective and resulted in less-than-optimal codewords for coding the extended TFCI. (*Id.*) Unlike Apple's suggestion that there were only two available options, the '348 inventors had in front of them many tools. (*Id.*) MacWilliams itself is direct evidence of this fact, argues Samsung, because each chapter and each section of this more-than 700 page textbook describes a different tool that designers can choose to use in order to meet their specific constraints. (*Id.* (citing RX-0367).) The '348 inventors researched numerous codes, determined the best tools that would work in the TFCI coding environment, and strategically pieced together a solution that provided optimal results that satisfied the constraints for coding TFCI information. (*Id.* (citing Tr. (Kang) at 192).) After testing numerous approaches, the inventors found the claimed encoding scheme in the '348 patent. (*Id.*)

On the other hand, Dr. Davis, improperly using hindsight, attempted to show that the '348 encoding scheme was disclosed in MacWilliams and the June 1999 Standard, argues Samsung. (*Id.*) However, choosing the specific tools to encode, and combining these tools to produce to produce a novel encoding scheme that provides optimal results was a crucial part of the '348 invention. (*Id.*) Merely taking the result, which the '348 inventors discovered, and "backwards" engineering the pieces, as Dr. Davis attempted to do, does not demonstrate that the asserted claims of the '348 patent are invalid. (*Id.* (citing *Orthopedic Equip. Co., Inc. v. U.S.* 702 F.2d 1005, 1012 (Fed. Cir. 1983)).)

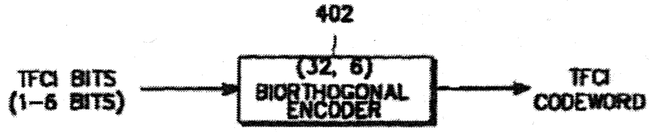
Samsung argues that the June 1999 Standard teaches away from the '348 patent because it did not provide optimal results. (*Id.* at 31-32.) For this reason, the '348 inventors were driven to find another solution. (*Id.* at 32 (citing Tr. (Kang) at 186, 191-192).) Therefore, Samsung maintains that the June 1999 Standard teaches away from the '348 invention. (*Id.* (citing *Certain MEMS Devices & Products Containing the Same,* 337-TA-700, Initial Determination at 136 (U.S.I.T.C., 2010)).) Since the June 1999 Standard provided such poor results, a person of ordinary skill in the art would have been discouraged from following the encoding set forth in this standard, and therefore, it would not have been obvious to such a person to use the encoding scheme that the 3GPP members had already determined was ineffective to develop an optimized coding scheme for the extended TFCI. (*Id.*)

Samsung says that the fact that the June 1999 Standard produced sub-optimal results shows that there would have been little motivation to combine this reference with any other reference, including MacWilliams. Instead, the inventors had a plethora of tools available to them to choose from in order to encode the extended TFCI. (*Id.* (citing RX-367; Tr. (Kang) at 195).) Samsung says that Apple incorrectly assumes that because MacWilliams discloses Reed-Muller codes as one of many different error correcting tools, a person of ordinary skill would have directly gone to the chapters in MacWilliams that discuss Reed-Muller codes. (*Id.* at 33.) Samsung argues that there is no reason to conclude that a person of ordinary skill in the relevant art, knowing that the Reed-Muller code previously did not work well for TFCI, would then go to the Reed-Muller chapters in MacWilliams. (*Id.*)

Samsung says that secondary considerations support the fact that the '348 asserted claims are not obvious. (*Id.*) First, according to Samsung, Apple incorrectly claims that Dr. Min did not provide any support for why experts were skeptical about the '348 invention. Samsung says that Dr. Min knew that the 3GPP members, made up of industry experts, questioned the inventors' solution during the July 1999 working-group meeting where the inventors first presented their proposal to the 3GPP members. (*Id.* (citing Tr. (Min) at 1162 and (Kang) at 205-207).) Samsung argues that the facts do not support Apple's assertion that the "experts believed the invention would work and that they wanted performance data to evaluate how well it worked." (*Id.* (citing RBr. at 58).) According to Samsung, the July 1999 proposal already set forth simulation results that proved that the proposed encoding scheme provided optimal results. (*Id.* (citing CX-0234).) At the July 1999 meeting, the industry experts remained skeptical and asked the inventors to run additional simulations on their proposed encoding scheme. (*Id.* (citing Tr. (Kang) at 205-207).) In response to this skepticism, the '348 inventors went back and conducted additional tests to prove these experts that their encoding scheme did in fact produce optimal results in all conditions. (*Id.* (citing CX-1873).) After reviewing these results, argues Samsung, the experts approved Samsung's proposal and adopted it as part of the standard. (*Id.* (citing Tr. (Kang) at 208).)

d) Staff's contention that claim 82, but not the other asserted claims of the '348 patent is invalid for obviousness.

Staff believes that the combination of the June 1999 Standard and MacWilliams render claim 82 of the '348 patent invalid as obvious, but Staff does not believe that there is clear and convincing evidence that the other asserted claims of the '348 patent are rendered obvious by this alleged prior art. (SBr. at 52-53.) Staff notes that in June 1999, shortly before the filing of the Korean application, to which the '348 patent claims priority, many of the technological developments discussed in the '348 patent were already well-known among persons of ordinary skill in the art. (*Id.* at 54-55.) Staff notes that the inventors of the '348 patent did not claim to have invented the concept of TFCI, which was already standardized in the industry by the time they filed their Korean patent application on July 6, 1999. (*Id.* (citing Tr. (Davis) at 1977; JXM-1 at 1:8-16).) The original TFCI standard called for six bits of TFCI information, as illustrated in Figure 4A (Prior Art) of the '348 patent:



(*Id.* (citing JXM-1, Fig. 4 at Samsung-AppleITC000008).) Staff also cites RX-374 § 5.4.1.1 (UMTS XX.04, Version 1.0.0, UMTS Terrestrial Radio Access Network (UTRAN), UTRA FDD, multiplexing, channel coding and interleaving description (Feb. 1999), depicted here:

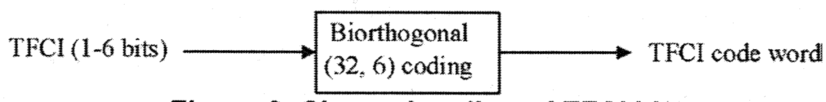


Figure 6: Channel coding of TFCI bits

(*Id.* (citing RX-374 § 5.4.1.).)

Staff says that in November 1998 Nokia proposed extending the length of TFCI information from 6 bits to up to 10 bits. (*Id.* (citing RX-378 (1998 Nokia proposal); Tr. at 1979 (Davis)).) Staff says Nokia's proposal was adopted in the revised TFCI standard that issued in June 1999. (*Id.* at 55-56 (citing RX-371 (3GPP TS 25.212 v. 2.0.0 (June 1999))).) Staff says that Section 4.3.1.1 of the June 1999 Standard reflected the old process for coding TFCI information of up to six bits, as shown here:

4.3.1.1 Coding of default TFCI word

If the number of TFCI bits is up to 6, the TFCI bits are encoded using biorthogonal (32, 6) block code. The coding procedure is as shown in Figure 4-10.

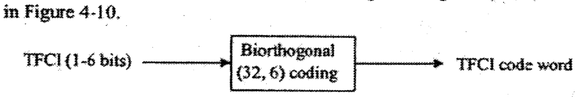


Figure 4-10. Channel coding of TFCI bits.

If the TFCI consist of less than 6 bits, it is padded with zeros to 6 bits, by setting the most significant bits to zero. The receiver can use the information that not all 6 bits are used for the TFCI, thereby reducing the error rate in the TFCI decoder. The length of the TFCI code word is 32 bits. Thus there are 2 bits of (encoded) TFCI in every slot of the radio frame. The code words of the biorthogonal block code are from the level 32 of the code three of OVSF codes defined in document S1.13. The code words, $C_{32,l}$, $l = 1,...,32$, form an orthogonal set, $S_{C_{32}} = \{C_{32,1}, C_{32,2},..., C_{32,32}\}$, of 32 code words of length 32 bits. By taking the binary complements of the code words of $S_{C_{32}}$, another set, $\bar{S}_{C_{32}} = \{\bar{C}_{32,1}, \bar{C}_{32,2},..., \bar{C}_{32,32}\}$ is formed. These two sets are mutually biorthogonal yielding total of 64 different code words.

(*Id.* at 56 (citing RX-371 § 4.3.1.1 (TS 25.212 (June 1999)).) Staff notes that Dr. Davis testified that Section 4.3.1.1 discusses encoding up to six bits of TFCI information using "a 32, 6 bit biorthogonal encoder, and that's just a different way of saying the first order of Reed-Muller code of length 32." (*Id.* (citing Tr. (Davis) at 1979).) According to Staff, Section 4.3.1.2 of the June 1999 Standard described a new process for encoding an extended TFCI of seven to ten bits:

> **4.3.1.2 Coding of extended TFCI word**
>
> If the number of TFCI bits is 7-10 the TFCI information field is split into two words of length 5 bits as shown in the following formula: .
>
> $n := \lfloor \sqrt{TFCI} \rfloor$; n is the largest integer being smaller than or equal to the square root of the transmitted TFCI value.
>
> if $TFCI < n^2 + n$
>
> then $Word1 := n$; $Word2 := TFCI - n^2$
>
> else $Word2 := n$; $Word1 := n^2 + 2n - TFCI$
>
> Both of the words are encoded using biorthogonal (16, 5) block code. The code words of the biorthogonal (16, 5) code are from two mutually biorthogonal sets, $S_{C_{16}} = \{C_{16,1}, C_{16,2}, ..., C_{16,16}\}$ and its binary complement, $\bar{S}_{C_{16}} = \{\bar{C}_{16,1}, \bar{C}_{16,2}, ..., \bar{C}_{16,16}\}$. Words of set $S_{C_{16}}$ are from the level 16 of the code three of OVSF codes defined in document TS 25.213. The mapping of information bits to code words is shown in the Table 4-6.

(*Id.* (citing RX-371 § 4.3.1.2 (TS 25.212 (June 1999); Tr. (Davis) at 1981-82[56]).) Staff says Section 4.3.3.2 of the June 1999 Standard describes that the resulting two 16-bit words are then combined, or "interleaved," to create a single 32-bit codeword, as shown here:

> **4.3.3.2 Interleaving of extended TFCI word**
>
> After channel encoding of the two 5 bit TFCI words there are two code words of length 16 bits. They are interleaved and mapped to DPCCH as shown in the Figure 4-13. Note that $b_{1,i}$ and $b_{2,i}$ denote the bit *i* of code word 1 and code word 2, respectively.

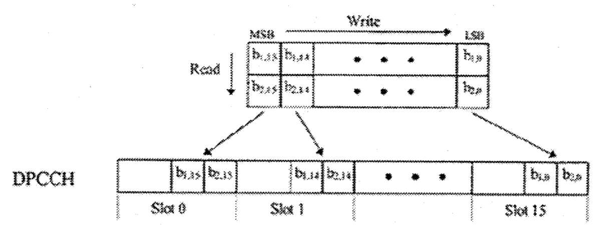


Figure 4-13. Interleaving of TFCI code words.

(*Id.* (citing RX-371 § 4.3.3.2; Tr. (Davis) at 1982).)

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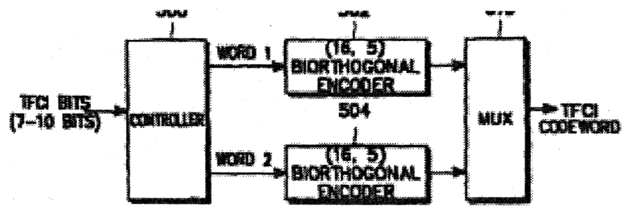
[56] "This describes the Nokia proposal, which is that extended TFCI. In this particular case, they have a more complicated way of splitting the 10 input bits into words of length 5. That's what those formulas are describing. But it's essentially that same idea that I described earlier."

The process described in Sections 4.3.1.2 and 4.3.3.2 of the June 1999 Standard is illustrated in Figure 5A (Prior Art) of the '348 patent (JXM-1 Fig. 4A at Samsung-AppleITC000009), as shown here:



(*Id.* at 58.) Thus, according Staff, at the time of the '348 invention, persons of ordinary skill in the art were aware of a TFCI encoding process that accepted an input of 10 bits of TFCI information and output an encoded equivalent 32-bit codeword. (*Id.*)

With respect to MacWilliams, Staff maintains that although it discloses several elements of the '348 asserted claims, it does not anticipate any of the claims because it does not disclose TFCI encoding in a CDMA mobile communication system or a 30-bit output from the controller. (*Id.*) MacWilliams, argues Staff, fails to disclose the following aspects of the asserted claims:

Claim Element	Present in MacWilliams & Sloane
A Transport Format Combination Indicator (TFCI) encoding apparatus in a CDMA mobile communication system, . . . (claims 75 and 82)	No. MacWilliams & Sloane, which was published in 1977, predates the development of CDMA and TFCI encoding. Hearing Tr. at 1940:21-1941:6 (Davis). However, the term "TFCI encoding apparatus" appearing in the preambles of claims 75 and 82 is not limiting. Order No. 63 at 15.
a controller for outputting a 30 bit codeword from among a plurality of 30 bit codewords that corresponds to a 10 bit TFCI information input to the controller from a plurality of possible 10 bit TFCI information, (claim 75)	No. MacWilliams & Sloane does not disclose "outputting a 30 bit codeword[.]" Rather, it discloses outputting a 32-bit codeword and then puncturing it to remove two bits. RX-367 (MacWilliams & Sloane) at 27-32.
wherein the 30 bit codeword output by the controller is equivalent to a 32 bit codeword that corresponds to the 10 bit TFCI information input to the controller. (claim 75)	No. MacWilliams & Sloane does not disclose "outputting a 30 bit codeword[.]" *Id.*
a controller for outputting a 32 bit codeword from among a plurality of 32 bit codewords that corresponds to a 10 bit TFCI information input to the controller from a plurality of possible 10 bit TFCI information; and (claim 82)	Yes. MacWilliams & Sloane teaches a code that receives a 10-bit input and outputs a 32-bit codeword. First, MacWilliams & Sloane teaches the sixteen basis sequences for a (32, 16) second-order Reed Muller code. To make this a "subcode" that accepts 10 inputs rather than 16, MacWilliams & Sloane teaches that one simply uses 10 of the 16 "basis sequences." Second, MacWilliams & Sloane defines the high-level properties (*N*, *K*, *D*) for subcodes of a second-order Reed Muller code and teaches how to construct a subcode that can encode a 10-bit input into a 32-bit codeword with optimal minimum distance 12. Third, MacWilliams & Sloane teaches how to construct four matrices that define a subcode of a second-order Reed Muller code that accepts a 10-bit input and outputs a 32-bit codeword with an optimal minimum distance of 12. RX-367 (MacWilliams & Sloane) chs. 1, 13-15.

a puncturer for puncturing two bits from the 32 bit codeword output by the controller, each of the two bits being punctured at a predetermined position, and outputting a 30 bit codeword that is equivalent to the 32 bit codeword output by the controller. (claim 82)	Yes. MacWilliams & Sloane teaches that codewords generated by any of the above approaches can be "punctured" to remove two bits and obtain an "equivalent" 30-bit codeword. RX-367 (MacWilliams & Sloane) at 27-32 ("The inverse process to extending a code *C* is called puncturing, and consists of deleting one or more coordinates from each codeword.").
The TFCI encoding apparatus of claim **75**, wherein each of the plurality of possible 10 bit TFCI information and each of the plurality of 30 bit codewords correspond to each other based on a combination of a basis orthogonal sequence, a basis mask sequence, and an all "1" sequence, the basis orthogonal sequence and the basis mask sequence being two bit punctured equivalents of a basis orthogonal sequence and a basis mask sequence corresponding to the equivalent 32 bit codeword. (claim 76)	No. MacWilliams & Sloane does not disclose an encoder "outputting a 30 bit codeword[,]" and therefore does not disclose the "plurality of 30 bit codewords" referenced in claim 76. *Id.* MacWilliams & Sloane also does not disclose a "TFCI encoding apparatus" as the reference predates the development of CDMA and TCFI encoding. Hearing Tr. at 1940:21-1941:6 (Davis).
The TFCI encoding apparatus of claim **76**, wherein a length of the combination of the basis orthogonal sequence, the basis mask sequence and the all "1" sequence is identical to a length of the TFCI information. (claim 77)	No. MacWilliams & Sloane does not disclose a "TFCI encoding apparatus" as the reference predates the development of CDMA and TCFI encoding. *Id.*
The TFCI encoding apparatus of claim **82**, wherein each of the plurality of possible 10 bit TFCI information and each of the plurality of 32 bit codewords correspond to each other based on a combination of a basis orthogonal sequences, a basis mask sequences, and an all "1" sequence. (claim 83)	No. MacWilliams & Sloane does not disclose a "TFCI encoding apparatus" as the reference predates the development of CDMA and TCFI encoding. *Id.*
The TFCI encoding apparatus of claim **83**, wherein a total number of the basis orthogonal sequences, the basis mask sequences and the all "1" sequence are identical to a number of bits of each TFCI information. (claim 84)	No. MacWilliams & Sloane does not disclose a "TFCI encoding apparatus" as the reference predates the development of CDMA and TCFI encoding. *Id.*

For these reasons, Staff contends that MacWilliams does not anticipate any of the asserted claims of the '348 patent. (*Id.* at 61.)

The evidence, argues Staff, does demonstrate that independent claim 82 is invalid as obvious in light of the standards-setting documents that were known in June 1999 and were discussed in the '348 patent, particularly the June 1999 version of 3GPP TS 25.212. (*Id.*) First, according to Staff, it is undisputed that CDMA mobile communication systems containing a TFCI encoding apparatus were known in the prior art. (*Id.* (citing RX-374 § 5.4.1.1 (UMTS XX.04 Version 1.0.0 (Feb. 1999), RX-371 §§ 4.3.1.1, 4.3.1.2, and 4.3.3.2 (TS 25.212 (June 1999)).) Figure 5A of the '348 patent, for example, shows a prior art "extended TFCI bits encoding structure in the conventional IMT 2000 system." (*Id.* (citing JXM-1 at 3:61-62, Fig.5A); JX-12 (Kang Dep.) at 94).) Staff notes that Figure 5A depicts the system for encoding from seven to ten bits of TFCI information as described in the June 1999 version of the 3GPP TS 25.212 standard. (*Id.*)

Second, the '348 patent explains that, "for the input of 10 extended TFCI bits," the prior art encoder shown in Fig. 5A outputs "a final 32-symbol TFCI codeword" (*id.* at 62 (citing JXM-1 at 4:4-37)), although there is no similar example of prior art in which the encoder outputs a 30-bit symbol TFCI codeword, as disclosed in claim 75 (*id.* at n.17). This is consistent with the June 1999 version of prior art 3GPP TS 25.212, which states:

> If the number of TFCI bits is 7-10 the TFCI information field is split into two words of length 5 bits.... After channel encoding of the two 5 bit TFCI words there are two codewords of length 16 bits. They are interleaved and mapped to DPCCH as shown in Figure 4-13."

(*Id.* (citing RX-371 §§ 4.3.1.2, 4.3.3.2 (TS 25.212 (June 1999))).)

Third, the prior art discussed in the '348 patent includes a 15-slot transmission system, which requires a final TFCI codeword of no more than 30 bits. (*Id.* (citing JXM-1 at 31:15-18).) Staff notes that the proposal that led to the change in the standard included this explanation:

> The current TFCI coding is dependent on a 16 slot structure.... For a 15 slot frame structure the TFCI code should be of the form (*n, k*), where *n* is instead a multiple of 15 and *k* takes the values 5 or 6.... The most straightforward solution is to shorten the existing codes, *i.e.* the last one or two bits are removed. The punctured symbols are then just replaced with zeros in the first Hadamard transform coding.

(*Id.* (citing RX-372 § 2.2 (Alcatel, et al., *Impact of OHG harmonization recommendation on UTRA/FDD and UTRA/TDD,* TSG #5 (99) (677) (presented June 1-4, 1999))).) According to Staff, the concept of puncturing would have been well-known to persons of ordinary skill in the art at the time. (*Id.* (citing RX-367 (MacWilliams) at 28; Tr. (Davis) at 2021).) The resulting 30-bit transmission is equivalent to the original 32-bit codeword, because both uniquely identify the 10-bit input when decoded. (*Id.* (citing Tr. (Davis) at 2021-22).) Thus, in Staff's view, the standard-setting documents in the '348 patent anticipate claim 82, because they disclose every element of that claim. (*Id.* at 62-63.)

Staff says that Apple, in its pre-hearing brief, did not assert that the admitted prior art renders obvious dependent claims 83 and 84. (*Id.* at 63 (citing Apple's pre-hearing brief at 20-22).) Staff argues that Ground Rule 7.2 provides that any invalidity contentions not set forth in detail in the pre-hearing brief should be "deemed abandoned or withdrawn." (*Id.* (citing Order No. 43 (March 23, 2012)).) In Staff's view, Apple has waived the opportunity to argue that claims 83 and 84 are invalid for obviousness based on the admitted prior art. (*Id.*) And with respect to MacWilliams, Staff says the textbook by itself does not disclose several elements of the claims and Dr. Davis's treatment of the dependent claims is wholly conclusory. (*Id.* (citing Tr. (Davis) at 2022-23).) For these reasons, Staff says it does not believe that Apple has carried its burden to present clear and convincing evidence of obviousness with respect to claims 83 and 84. (*Id.*)

As concerns claims 75 and 76, Staff contends that the standards-setting documents referred to in the '348 patent and the MacWilliams textbook, either singly or in combination, do not render claim 75 invalid on the grounds of obviousness, because they do not disclose "a controller for outputting a 30 bit codeword," as claim 75 requires. (*Id.*) The controllers that are described in the original standard, corresponding to 6-bit TFCI information, in Nokia's proposal to extend TFCI information to 10 bits, and in 3GPP TS 25.212 (June 1999), output 32-bit codewords. (*Id.* (citing RX-374 § 5.4.1 (UMTSA XX.04 Version 1.0.0 (Feb. 1999); RX-371 §§ 4.3.1.1 and 4.3.3.2 (TS 25.212 (June 1999); RX-378 (Nokia proposal); and JXM-1 Figs. 4A and 5A).) They do not disclose a controller that directly outputs a 30-bit codeword without the intermediate step of puncturing a 32-bit codeword, in the manner that is described in claim 82. (*Id.* at 63-64.)

In Staff's view, MacWilliams also does not teach a controller capable of outputting a 30-bit codeword that is equivalent to the original 10-bit TFCI input, without resorting to puncturing to reduce the number of bits in the final codeword. (*Id.* at 64.) Therefore, according to Staff, Apple has not established by clear and convincing evidence that claim 75 is invalid for obviousness. (*Id.*)

With regard to dependent claim 76, Staff says that Apple's pre-hearing brief did not assert that the admitted prior art renders claim 76 invalid. (*Id.* (citing Apple's pre-hearing brief at 20-22).) Staff contends that, under Ground Rule 7.2, Apple waived the opportunity to argue that claim 76 is invalid and, in any event, Apple has not met its burden of proof for the reasons already discussed, as mentioned herein. (*Id.*)

e) Apple's response to Samsung and Staff on the issue of invalidity of the '348 patent.

Apple responds that neither Samsung nor Staff cross-examined Dr. Davis on his testimony that, once the parameters for extended TFCI encoding were established in the June 1999 Standard, it would have been obvious to a person of ordinary skill in the art to use MacWilliams to construct a Reed-Muller error-correcting code to fit those parameters. (RRBr. at 24.) Apple contends that Dr. Davis's testimony thoroughly explained three separate disclosures in MacWilliams that, to Dr. Davis's undergraduate students, would have disclosed codes that are within the scope of all of the asserted claims. (*Id.*) Apple argues that neither Samsung nor Staff challenged Dr. Davis on this point. (*Id.*) Dr. Davis, according to Apple, explained that, because a new use of a known apparatus cannot be patented, MacWilliams alone anticipates or renders obvious the claims. (*Id.*) Although MacWilliams pre-dates the creation of TFCI information by 20 years, the same encoders used to encode information in 1977 could be used to encode so-called "TFCI information." (*Id.* (citing Tr. at 2025 (Davis)).) Apple argues that, reading it as Samsung does, in order to assert infringement, the June 1999 Standard alone renders the independent claims anticipated and obvious. (*Id.* at 25.)

Apple says that although Staff agrees that the evidence demonstrates that claim 82 was obvious in light of the prior art, neither Staff nor Samsung disputes that, as of June 1999, a person of ordinary skill in the art would have known that an extended TFCI requires encoding of up to 10 bits and that 30 bits are to be transmitted and that Reed-Muller codes are used for TFCI encoding. (*Id.*) Apple says that neither Staff nor Samsung contests the fact that a person of ordinary skill would have been motivated to combine the June 1999 Standard with MacWilliams, as the inventors themselves in fact did. (*Id.*) Nor does Staff or Samsung identify any innovative aspect of the asserted claims that is distinguishable from the disclosures in MacWilliams. (*Id.*)

Rather, argues Apple, Staff and Samsung reason as follows. First, the specific numerical requirements, such as 30 bits in some of the claim limitations, are not precisely disclosed in one or both of the prior art references. (*Id.*) Second, Dr. Davis's analysis employs impermissible hindsight. (*Id.*) And third, Apple did not argue in its pre-hearing brief that the combination of the June 1999 Standard and MacWilliams rendered claims 83 and 84 invalid. (*Id.*) Apple contends that none of these arguments has merit. (*Id.*)

The first argument, argues Apple, confuses the law of anticipation with the law of obviousness. (*Id.*) In order to be patentable, a claim need not only be different from the prior art, it also must be "non-obvious," and an obviousness analysis does not require precise disclosure of every limitation in the prior art. (*Id.* (citing *KSR,* 550 U.S. at 418).) The second argument regarding hindsight ignores the evidence because, prior to the time of the alleged invention, the specific requirements of the claimed code were known to all ETSI/3GPP members, and there is no element of the claims that is only known by hindsight. (*Id.*) Apple says that the third argument, waiver, is squarely refuted at pages 23 and 28 of Apple's pre-hearing brief, where Apple expressly argued this issue. (*Id.*)

Apple says that Samsung does not identify a single element of claims 82-84 that is missing from the June 1999 Standard and MacWilliams in any meaningful way, and Apple argues that Samsung provides no explanation why any claim element was not an obvious choice to a person of skill in the art who knew the parameters established by ETSI. (*Id.*) Apple says there is very little Samsung or Staff can challenge, based on the clear disclosures of the June 1999 Standard and MacWilliams, according to this chart, constructed by Apple:

Claim	Staff's and Samsung's Position	Staff's Position
Claim 82. A Transport Format Combination Indicator (TFCI) encoding apparatus in a CDMA mobile communication system, comprising:		
a controller for	**Samsung agrees** that the	**Staff agrees** the June 1999

outputting a 32 bit codeword from among a plurality of 32 bit codewords that corresponds to a 10 bit TFCI information input to the controller from a plurality of possible 10 bit TFCI information;	standards body imposed the following constraints for TFCI encoding prior to the '348 patent: 1) encoding a 10-bit TFCI information and 2) "a transmission frame that could hold only 30-bits of coded TFCI information" (SSPostHB at 21-22.) **Samsung** failed to provide any reason why, given the constraints for TFCI encoding that existed prior to the to the '348 patent, it was not obvious to a person of ordinary skill in the art to encode a 10-bit TFCI information as a 32-bit codeword using a subcode of second-order Reed-Muller code taught in MacWilliams. (*See* SSPostHB at 78.)	Standard and MacWilliams both disclose this limitation. (STPostHB at 59, 61.)

(*Id.* at 26.)

and a puncturer for puncturing two bits from the 32 bit codeword output by the controller, each of the two bits being punctured at a predetermined position, and outputting a 30 bit codeword that is equivalent to the 32 bit codeword output by the controller.	**Samsung agrees** puncturing is disclosed in MacWilliams, and disputes only that it would have been obvious to puncture 2 bits to reduce the codeword from 32 to 30 bits. (SSPostHB at 75.)	**The Staff agrees** the June 1999 Standard and MacWilliams both disclose this limitation. (STPostHB at 59, 62.)
Claim 83. The TFCI encoding apparatus of claim 82,		
wherein each of the plurality of possible 10 bit TFCI information and each of the plurality of 32 bit codewords correspond to each other based on a combination of a basis orthogonal sequences, a basis	Samsung identified no specific limitation of this claim that MacWilliams fails to disclose. Samsung merely makes a blanket assertion that MacWilliams does not disclose "any of the limitations set forth in claims 75-76 and 82-85."	Staff agrees that MacWilliams discloses "how to construct a subcode of a second-order Reed Muller code that accepts a 10-bit input and outputs a 32-bit codeword with optimal minimum distance 12" (STPostHB at 59.) Staff asserts Apple waived the argument that these claims are obvious. (STPostHB at 63.)

mask sequences, and an all "1" sequence.		But, Apple expressly argued that these claims are rendered obvious by MacWilliams and the June 1999 Standard. (APreHB at 23, 28.)
Claim 84. The TFCI encoding apparatus of claim 83,		
wherein a total number of the basis orthogonal sequences, the basis mask sequences and the all "1" sequence are identical to a number of bits of each TFCI information.	Samsung identified no limitation of this claim that MacWilliams fails to disclose. Samsung merely makes a blanket assertion that MacWilliams does not disclose "any of the limitations set forth in claims 75-76 and 82-85."	Staff does not dispute that these limitations are met by all linear codes. Staff asserts Apple waived the argument that these claims are obvious. (STPostHB at 63.) But, Apple expressly argued that these claims are rendered obvious by MacWilliams and the June 1999 Standard. (APreHB at 23, 28.)

(*Id.* at 27.)

According to Apple, its opening brief demonstrated that both the June 1999 Standard and MacWilliams disclose the following limitation of claim 82:

> a controller for outputting a 32 bit codeword from among a plurality of 32 bit codewords that corresponds to a 10 bit TFCI information input to the controller from a plurality of possible 10 bit TFCI information

(*Id.* at 27-28.) Apple points out that Staff agrees on this point, while Samsung makes two unavailing arguments in an attempt to overcome this evidence. (*Id.* at 28 (citing SBr. at 62).) First, Samsung argues that MacWilliams does not disclose "TFCI information." (*Id.* (citing CBr. at 73).) Apple maintains that in this respect Samsung's position is irrelevant to whether the June 1999 Standard, which Apple contends is replete with references to TFCI, alone renders claim 82 obvious, as Staff and Apple contend it does, or to whether obviousness exists by reason of the combination of the June 1999 Standard and MacWilliams. (*Id.*) Regardless of whether MacWilliams alone discloses "TFCI information," Apple argues that it is undisputed that the combination of the June 1999 Standard and MacWilliams discloses TFCI information. (*Id.*) As a matter of law, Apple says that specifying the manner in which an encoding apparatus derived from MacWilliams should be used for the purpose of encoding TFCI information does not make the apparatus patentable. (*Id.* (citing *In re Schreiber,* 128 F.3d 1473, 1477 (Fed. Cir. 1997) ("It is well settled that the recitation of a new intended use for an old product does not make a claim to that old products patentable.")).)

Second, with respect to Samsung's argument that MacWilliams does not disclose encoding a 10-bit input using 32-bit codewords, Apple says that page 374 of MacWilliams expressly discloses length 32 basis sequences for Reed-Muller codes, and immediately after Figure 13.2, on page 374, 32-bit sequences are disclosed. (*Id.*) Apple says page 374 of MacWilliams also discloses that length 32 sequences can "very simply" be obtained by applying the |u|u+v| ("Plotkin") construction. (*Id.* at 28-29.)

Third, as regards Samsung's argument that the TFCI encoding apparatus referred to in the June 1999 Standard does not output a 32-bit codeword, but, instead, two 16-bit codewords, which are never combined into a single codeword, this would likewise mean that the Accused Products do not infringe, because they output 15 two-bit codewords that also are "never combined." (*Id.* at 29.) Apple says that, if Samsung's infringement allegations are applied, the output is a 32-bit codeword, because the two 16-bit codewords are mapped together, one bit from each codeword, into each of 16 slots, which combine to make a total of 32 encoded bits. (*Id.*) More important, Samsung's argument directly contradicts the testimony of the '348 patent inventor, Dr. Kang, who testified that the June 1999 Standard already incorporated encoding a 10-bit TFCI information as a 32-bit codeword. (*Id.* (citing JX-12C (Kang Dep.) at 44).)

Apple contends that its opening brief also demonstrated that the following limitation of claim 82 is also disclosed by the asserted prior art:

> a puncturer for puncturing two bits from the 32 bit codeword output by the controller, each of the two bits being punctured at a predetermined position, and outputting a 30 bit codeword that is equivalent to the 32 bit codeword output by the controller

(*Id.*) Apple says Samsung has interposed two arguments in order to overcome the evidence that was cited by Apple in its opening brief. (*Id.*) First, Samsung says that MacWilliams makes no reference to puncturing two bits from a 32-bit codeword to obtain a 30-bit codeword; that is, MacWilliams does not expressly recite the arithmetical process by which the number 2 is subtracted from the number 32 in order to obtain the number 30. (*Id.* at 29-30.) Apple argues that Dr. Min did not dispute the fact that MacWilliams discloses how to puncture two bits. (*Id.* (citing Tr. (Min) at 3007).) Apple argues that Samsung appears to misunderstand the law of obviousness, because Samsung fails to appreciate that a person with a bachelor's degree in engineering, or the equivalent—in other words, a person of ordinary skill in the art—would grasp the notion that in order to reduce a codeword from 32 to 30 bits something has to be done with 2 bits of the 32 bits and, thus, would readily know that one way to obtain an equivalent 30-bit codeword form a 32-bit codeword would be to puncture 2 bits. (*Id.*) Apple says there is no reason to speculate about the obviousness of this solution, because one month before the alleged invention, in June 1999, the ETSI participants, who proposed changing the transmission frame from 16 to a 15 slots, not only identified puncturing 2 bits as a way to adjust TFCI encoding for the new requirements, but called puncturing 2 bits "the most straightforward solution" for doing so. (*Id.* (citing RX-372 at 6373).) Dr. Davis testified that applying MacWilliams to the June 1999 Standard to puncture 2 bits from a 32-bit codeword involves only a basic coding technique that undergraduate students perform routinely. (*Id.* (citing Tr. (Davis) at 1962-63).) Apple again points to fact that Dr. Davis's testimony on these points was never challenged on cross-examination. (*Id.*)

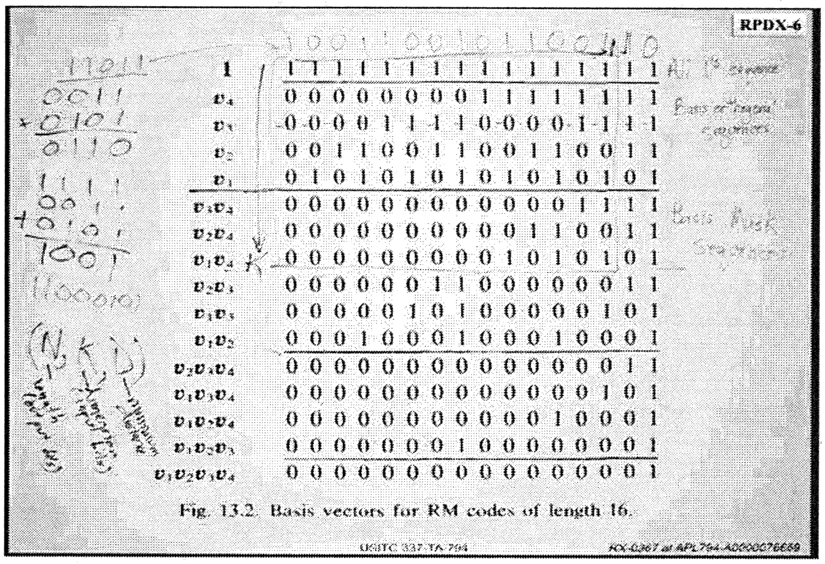
Second, Apple says that Samsung asserts that the June 1999 Standard, by itself, fails to disclose puncturing, because it uses 16 slots, and therefore there is no need for puncturing. (*Id.*) Apple responds that, in making this statement, Samsung ignores the fact that in the June 1999 ETSI meeting it was proposed that a 15-slot frame be adopted. (*Id.* (citing RX-372 at 6372-73).) Apple says that one month before the alleged conception of the '348 invention the 23 companies who had proposed the change said that puncturing 2 bits was the "most straightforward solution." (*Id.* (citing RX-372 at 6373).) Therefore, according to Apple, the June 1999 Standard itself renders the idea of puncturing 2 bits in order to achieve a 30-bit codeword obvious. (*Id.*)

As regards Samsung's and Staff's arguments that claims 83 and 84 are not invalid, Apple responds that its opening brief demonstrated that the following limitations are disclosed in the asserted prior art:

> wherein each of the plurality of possible 10 bit TFCI information an d each of the plurality of 32 bit codewords correspond to each other based on a combination of a basis orthogonal sequences, a basis mask sequences, and an all "1" sequence"
>
> * * *
>
> wherein a total number of the basis orthogonal sequences, the basis mask sequences and the all "1" sequences are identical to a number of bits of each TFCI information.

(*Id.* at 30-31.)

Apple notes that Staff agrees that MacWilliams discloses "how to construct a subcode of a second-order Reed Muller code that accepts a 10-bit input and outputs a 32-bit codeword with optimal minimum distance 12." (*Id.* at 31 (citing SBr. at 59).) Apple argues that Dr. Davis demonstrated, using RPDX-6, that the code basis for the second-order Reed-Muller code consists of the "all 1s sequence" (demarcated in red), basis orthogonal sequences (demarcated in blue), and "basis mask sequences" (demarcated in green), as required by claim 83, and that there is one basis sequence for each input as required by claim 84:



1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
v_4	0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1
v_3	0 0 0 0 1 1 1 1 0 0 0 0 1 1 1 1
v_2	0 0 1 1 0 0 1 1 0 0 1 1 0 0 1 1
v_1	0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1
v_3v_4	0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1
v_2v_4	0 0 0 0 0 0 0 0 0 0 1 1 0 0 1 1
v_1v_4	0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 1
v_2v_3	0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 1
v_1v_3	0 0 0 0 0 1 0 1 0 0 0 0 0 1 0 1
v_1v_2	0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1
$v_2v_3v_4$	0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1
$v_1v_3v_4$	0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1
$v_1v_2v_4$	0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 1
$v_1v_2v_3$	0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 1
$v_1v_2v_3v_4$	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1

Fig. 13.2. Basis vectors for RM codes of length 16.

(*Id.* at 31.)

Apple notes that Staff also agrees that MacWilliams teaches how to construct a sub-code of a second-order Reed-Muller code that can encode a 10-bit input into a 32-bit codeword with optimal minimum distance 12. (*Id.* at 32 (citing SBr. at 59.) Apple says that Dr. Davis explained that Corollary 17 (shown in RX-367 at 76750) provides that there are sub-codes of the second-order Reed-Muller code with known properties. (*Id.* (citing Tr. (Davis) at 1971).) For 32-length codewords, the length that was used for encoding TFCI information in the June 1999 Standard, Corollary 17 states that there are sub-codes that can encode up to 11 input bits as 32-bit codewords, with a minimum distance 12. (*Id.* (citing Tr. (Davis) at 1971-74).) Apple argues that Corollary 17 explains precisely how to construct these codes. (*Id.* (citing Tr. (Davis) at 1974).) At the hearing, Dr. Davis presented an optimal minimum distance code that results from Corollary 17, and Apple says that Dr. Davis's testimony in this respect was not challenged on cross-examination. (*Id.* (citing Tr. (Davis) at 1972-74).)

Apple points out that Staff also agrees that Theorem 5 in MacWilliams discloses "how to construct four matrices that define a sub-code of a second-order Reed-Muller code that accepts a

10-bit input, and outputs a 32-bit codeword with an optimal minimum distance of 12." (*Id.* (citing SBr. at 59).) Because each of these disclosures yields a sub-code of a second-order Reed-Muller code, each meets all of the limitations of dependent claims 83 and 84. (*Id.* (citing Tr. (Davis) at 2025).) Apple says that Samsung does not dispute that the Reed-Muller codes disclosed in MacWilliams teach all limitations specific to the dependent claims, but instead, offers two unavailing arguments against a finding of obviousness. (*Id.*)

First, Samsung erroneously charges that Dr. Davis had to resort to improper hindsight and Samsung falsely argues that MacWilliams does not teach "coding a 10-bit TFCI information input into a 32-bit codeword." (*Id.* (citing CBr. at 77).) According to Apple, Samsung accepts the fact that the standards organization imposed the following constraints for TFCI encoding prior to the inventors' work on the '348 patent: (1) encoding 10-bit TFCI information and (2) "a transmission frame that could hold only 30-bits of coded TFCI information." (*Id.* (citing CBr. at 21-22).) Apple argues that Samsung's allegation of improper hindsight ignores the fact that a person of ordinary skill, working on TFCI encoding, would have been aware of these constraints before undertaking any tasks that would have to conform therewith. (*Id.*) Apple argues that using MacWilliams to construct a Reed-Muller code that aims satisfy encoding the required 10-bit TFCI information input into a 32-bit, or even a 30-bit, codeword is not an exercise in hindsight, since these constraints would have been dictated at the start of the process and would have perforce prompted a person of ordinary skill to resort to the disclosures in MacWilliams, which provide the solution that was ultimately arrived at by the inventors. (*Id.* at 32-33 (citing Tr. (Davis) at 1993).) According to Apple, knowing only the constraints imposed by ETSI, and having never seen the '348 patent, Dr. Davis located a sub-code of a second-order Reed-Muller code in MacWilliams that met the claims requirements in just a one-hour effort, using only pencil and paper. (*Id.* at 33 (citing Tr. (Davis) at 1969).)

Second, Apple says that Samsung is, in effect, arguing that an electrical engineer with several years of work experience in wireless communication would not have been able to apply Corollary 17 or Theorem 5. (*Id.* (citing CBr. at 77).) Apple says that Samsung does not dispute that Corollary 17 says that a Reed-Muller code, with 10 input bits, 32 output bits, and an optimal minimum distance of 12, can be obtained by extending cyclic sub-codes as shown in Corollary 17. (*Id.*) However, Samsung asserts that Corollary 17 "does not disclose how to develop a codeword." (*Id.*) Apple argues that this contention is belied by the text of MacWilliams, because the third sentence of Corollary 17 discloses precisely how to develop the code: "These subcodes are obtained by extending the cyclic subcodes…." (*Id.* (citing RX-367 at APL794-A0000076750).)

Apple says that Samsung contends that Corollary 17 does not actually provide the alleged disclosure, because understanding Corollary 17—assuming a person of ordinary skill has never taken an undergraduate course in error correcting codes—requires reference to "a teaching of cyclic subcodes in yet some other chapter of MacWilliams. (*Id.* (citing CBr. at 33).) Apple says this argument ignores the fact that a person of ordinary skill in the art would have possessed a bachelor's degree in electrical engineering, or an equivalent such as mathematics, and that Order No. 63 has determined that "[t]he training or education in coding theory, while useful, is not necessary, given the level of understanding of mathematics required for bachelor degrees in either mathematics or engineering and incidental to having two or more years of experience working in telecommunications technology, inclusive of digital cellular standards." (*Id.* (citing Order No. 63 at 15).) Apple says that Dr. Min, himself, never said that a person of skill in the art would not have understood how to apply Corollary 17 for the purpose of constructing the codes it discloses, and therefore such a person would have readily understood the earlier teaching on cyclic sub-codes in MacWilliams. (*Id.*)

Apple says that its initial post-hearing brief demonstrated that there was a clear motivation to combine the June 1999 Standard with the teachings of MacWilliams. (*Id.*) Apple maintains that neither Samsung nor Staff disputed that contention in their initial briefs. (*Id.*) Apple says that Samsung argues that there was no motivation to combine the chapters of MacWilliams discussing the Reed-Muller codes with other, related, chapters in MacWilliams. (*Id.*) Apple argues that there was clear motivation to use Reed-Muller codes, as taught in chapters 13 to 15, with puncturing and other introductory material taught in chapter 1. (*Id.*) Apple notes that, in its initial brief, Apple pointed out that Dr. Davis testified that chapter 1 provides the "foundational material" intended to be used throughout the book, and because the ETSI working group limited TFCI codewords to 30 bits per frame, a person of ordinary skill in the art would have been motivated to puncture 2 bits from a 32-bit codeword so as to obtain a 30-bit codeword. (*Id.* (citing Tr. (Davis) at 2021).) Apple also says that Samsung is in error in arguing that applying Corollary 17 requires familiarity with cyclic codes, which are described and instructed in the earlier sections of MacWilliams. (*Id.*) Apple argues that, even if there is related background information in other chapters, there is no need to combine Corollary 17 with that material because Corollary 17 itself states how to construct the code. (*Id.* (citing RX-367 at APL794-A0000076750).)

As for Staff's waiver contentions, Apple replies that the obviousness of combining the parameters disclosed in the June 1999 Standard with the coding theory taught in MacWilliams was, and has always been, a primary focus of Apple's obviousness allegations. (*Id.* at 34-35 (citing Apple's pre-hearing brief at 26 ("Given the constraints imposed by 3GPP standards group at the time (i.e., a 10-bit input and a 30-bit encoded output), any system designer would have been motivated to look to coding texts like M&S[57] as well as prior art applications of coding theory, such as the [June 1999 Standard]" construct [sic] an encoder that worked well within those constraints.)).)

Apple says that it specified multiple times in its pre-hearing brief that its obviousness case for all of the claims was based on the combination of June 1999 Standard and MacWilliams. (*Id.* (citing Apple's pre-hearing brief at 22-23 ("M&S renders the asserted claims obvious alone or in combination with the [June 1999 Standard]."')).) Apple says that, in its pre-hearing brief, Apple walked step-by-step through its argument that the June 1999 Standard and MacWilliams rendered claims 83 and 84 invalid and explained that it would have been obvious to a person of skill to use MacWilliams to modify the June 1999 Standard in order to meet the constraints imposed by ETSI for TFCI encoding. (*Id.* at 35-36 (citing Apple's pre-hearing brief at 26).) Apple maintains that it explained that the June 1999 Standard already used the Reed-Muller codes for TFCI encoding and that MacWilliams discloses how to construct Reed-Muller codes that fit the constraints imposed by ETSI for TFCI encoding, including codes with optimal minimum distances. (*Id.* (citing Apple's pre-hearing brief at 24-26).) Apple argues that it also explained that these codes use an "all 1s" sequence, five "basis orthogonal sequences," and four "basis mask sequences," as required by asserted dependent claims 83 and 84, to encode a 10-bit TFCI input as a 32-bit codeword; that that the 32-bit codeword can be punctured to obtain an equivalent 30-bit codeword, as required by claim 82; or a 30-bit codeword can be output directly, as required by claim 75. (*Id.* (citing Apple's pre-hearing brief at 24-26).) Apple says that it also

[57] MacWilliams & Sloane.

explained that a person of skill would have been motivated to combine the June 1999 Standard and MacWilliams, for several reasons, including that TFCI encoding already used Reed-Muller codes taught in MacWilliams and that a system designer would be motivated to look to coding sources like MacWilliams in order to construct an encoder that worked well within the constraints of TFCI encoding. (*Id.* (citing Apple's pre-hearing brief at 30).)

Apple says that the only support Staff provides for its waiver contention is a citation to an incorrect section of Apple's brief, and on that basis, Staff asserts that pages 20 and 22 of Apple's pre-hearing brief do not assert that the dependent claims are obvious. (*Id.* (citing SBr. at 63) ("In its prehearing brief, Apple did not assert that the admitted prior art renders obvious dependent claims 83 and 84.").) But, argues Apple, its pre-hearing brief set forth its argument that the June 1999 Standard anticipates the asserted claims 75 and 82: "Because Samsung and the Staff construe the asserted claims so broadly, the prior art discussed in the '348 patent itself—proposals for encoding and mapping TFCI that existed as of June 1999—anticipates independent claims 75 and 82." (*Id.* (citing Apple's pre-hearing brief at 20).) Apple says it addressed obviousness elsewhere in its pre-hearing brief. (*Id.* at 37 (citing Apple's pre-hearing brief at 25-30).)

On this point, the Administrative Law Judge concludes that Apple has not waived the obvious arguments set forth in its post-hearing brief. Apple did sufficiently disclose in its pre-hearing brief its contentions that the all of the asserted claims are rendered obvious under 35 U.S.C. § 103 and generally described its rationale with respect to the two prior art references argued in its post-hearing brief. (*See* Apple's re-hearing brief at 25-30.)

Apple says that Dr. Davis's testimony thoroughly addressed the obviousness of claims 83 and 84, first, because he explained, using RPDX-6 that a "subcode of second-order Reed Muller" is constructed from a combination of an all ones sequences, basis orthogonal sequences, and basis mask sequences, as required by claim 83, and that the number of bits they encode is equal to the number of basis sequences, as required by claim 84. (RRBr. at 37 (citing RBr. at 8-14; Tr. (Davis) at 1953-62).) According to Apple, Dr. Davis explained that a first-order Reed-Muller code uses an all ones sequence and basis orthogonal sequences and that a sub-code of second-order Reed-Muller contains the first-order code, and is extended with basis mask sequences. (*Id.* (citing RBr. at 13-14; Tr. (Davis) at 1990).) Dr. Davis then testified that these are the requirements of claim 83 and therefore they are met by any of three (32, 10) sub-codes of second-order Reed-Muller codes which he testified about. (*Id.* (citing Tr. (Davis) at 1960).)

Apple says that Dr. Davis explained that linear codes, such as Reed-Muller, use one basis sequence for each input bit and, therefore, always meet the limitations of claim 84. (*Id.* (citing Tr. (Davis) at 2023).) Dr. Min did not contest that MacWilliams discloses all elements, except TFCI, of these dependent claims, argues Apple. (*Id.*) Nor does Samsung's initial post-hearing brief identify any additional limitations specific to claims 83 and 84 as not disclosed in MacWilliams. (*Id.* at 37-38.)

Apple says that Dr. Davis testified that it would have been obvious to use any of the codes mentioned in MacWilliams, which Staff agrees are discussed within, to encode TFCI information in a CDMA mobile communication system described in the June 1999 Standard. (*Id.* at 38.) According to Apple, referring to his earlier explanation of each code, Dr. Davis testified that the limitations of claim 83 "wherein each of the plurality of possible 10-bit TFCI information and each of the plurality of 32 bit codewords correspond to each other based on a combination of a basis orthogonal sequences, a basis mask sequences, and an all 1 sequence" are disclosed in each of the three disclosures of MacWilliams because "all of the codes contain a first-order Reed-Muller code inside the code, and that's what that language, the basis orthogonal sequences, basis mask sequence, and all-1 sequences are referring to." (*Id.* (citing Tr. (Davis) at 2022).)

For claim 84, Apple argues that Dr. Davis referred back to his previous explanation that all linear codes use one basis sequence per input bit. (*Id.* (citing Tr. (Davis) at 2023).) Dr. Davis concluded that the limitation "wherein a total number of the basis orthogonal sequences, the basis mask sequences and the all '1' sequence are identical to a number of bits of each TFCI information" was obvious because, as is true of any linear code, the code necessarily uses sequences to encode a 10-bit TFCI information. (*Id.* (citing Tr. (Davis) at 2023).) None of this, argues Apple, was challenged by Samsung. (*Id.*) Apple says that there was nothing "conclusory" about Dr. Davis's testimony and that Staff has not identified any specific failure of proof. (*Id.*) Instead, argues Apple, because the dependent claims add only elements that are needed in order to use a sub-code of a second-order Reed-Muller code, it was impossible for Dr. Davis, or anyone else, to say much more. (*Id.*)

f) Findings and conclusions of the Administrative Law Judge.

The Administrative Law Judge concludes that neither MacWilliams nor the June 1999 Standard anticipates the '348 patent. MacWilliams does not mention or address the subject of coding of Transport Format Combination Indicator (TFCI). As for the June 1999 Standard, Apple's argument is that if Dr. Min's infringement analysis is accepted, that standard discloses all of the elements of the asserted claims for similar reasons. Infringement, under Dr. Min's analysis, has not been accepted (*see* discussion above regarding infringement of the '348 patent), and since there is no other argument, rationale, or explanation offered by Apple as to how the evidence demonstrates that the June 1999 Standard anticipates all of the limitations of the asserted claims, the Administrative Law Judge concludes that the asserted claims have not been shown to be invalid as anticipated.

With respect to Apple's and Staff's contentions that claim 82 is invalid as obvious, the Administrative Law Judge concludes that the June 1999 Standard in combination with MacWilliams does not render this claim obvious. Dr. Davis essentially takes the position argued by Dr. Min with respect to infringement, that simply by using 30 bits of the Reed-Muller code, instead of 32 bits, puncturing has occurred. However, for the same reasons that Dr. Min's contention regarding infringement was rejected, Apple's contention regarding invalidity must be rejected. Dr. Davis testified that MacWilliams discusses puncturing, but what he did not describe is how the limitation of claim 82 that each of two bits of the 32 bits output by the controller are punctured at a predetermined position is satisfied. In this respect, Dr. Davis's testimony is similar to Dr. Min's in assuming that the use of 30 bits instead of 32 bits evidences puncturing. The Administrative Law Judge disagrees and finds that the evidence cited by Apple does not disclose the puncturing element of claim 82.

The Administrative Law Judge concludes that Apple has not waived its right to argue invalidity of claims 83 and 84, for the reasons mentioned above. Although claims 83 and 84 depend from claim 82 and to that extent are not obvious, for the same reasons as given in respect to claim 82, the additional limitations they disclose are found not to be obvious as well. Claim 83 adds the limitation of a combination of a basis orthogonal sequences, a basis mask sequences and an all "1" sequence, while claim 84 adds the limitation that the total number of the basis orthogonal sequences, the basis mask sequences and the all "1" sequences are identical to a number of bits of each TFCI information. Dr. Davis's testimony with respect to these limitations does not demonstrate, clearly and convincingly, that the combination of the June 1999 Standard and MacWilliams render these claim obvious. With respect to the limitations of claim 83, Dr. Davis testified, "That's disclosed in the approaches from MacWilliams and Sloane, because all of those codes contain a first order Reed-Muller code inside of the code, and that's what that language, the basis orthogonal sequences, basis mask sequences, and all-1 sequences are referring to." (Tr. at 2022.) That is too conclusory a statement to justify a finding that there is clear and convincing evidence of that MacWilliams renders obvious the limitations of claim 83. With respect to claim 84, Dr. Davis testified, "That's simply saying that the number of input bits is equal to the number of sequences that you've chosen for your basis, and that's been true—or was true in claim 83." (Tr. at 2023.) That does not expand what he said about claim 83 and does not provide clear and convincing evidence that the additional limitations of claim 84 are met. Therefore, the Administrative Law Judge concludes that the evidence of record does not demonstrate clearly and convincingly that claims 83 and 84 are invalid.

With respect to claims 75 and 76, Apple argues that all of the elements of these claims are present in the combination of the June 1999 Standard and MacWilliams. (RRBr. at 38.) Apple says that neither Samsung nor Staff makes any argument with respect to claims 75 and 76 that is different from their arguments with respect to claims 82, 83, and 84, except that each argues that neither the June 1999 Standard or MacWilliams discloses the "30-bit codeword" limitation. (*Id.* at 38-39 (citing CBr. at 71, 72, 76; SBr. at 63-64).) Apple contends that Dr. Davis explained, at length, that it would have been obvious to a person of ordinary skill in the art that deleting two columns from a 32-bit code basis, so that the code directly outputs 30-bit codewords, rather than outputting a 32-bit codeword and puncturing two bits. (*Id.* at 39 (citing Tr. (Davis) at 2017-18).) Apple says that Samsung does not dispute that MacWilliams discloses modifying a code by deleting columns from the code basis, but only that MacWilliams does not do so for a 32-bit code basis. (*Id.* (citing CBr. at 75.) As for Staff's contention, Apple notes that Staff asserts that Apple failed to meet its evidentiary burden of showing that MacWilliams discloses "a controller for outputting a 30 bit codeword." (*Id.* (citing SBr. at 64, n. 17).) These arguments, Apple contends, fail because, for claims 82-84, as previously discussed, the constraint to encode a 10-bit input and to transmit that data within a 15-slot framework was dictated by the ETSI working group, and as Dr. Davis explained, it would have been obvious to a person of skill in the art to delete two columns from a 32-bit Reed-Muller code basis, so that 30-bit codewords that are equivalent 32-bit codewords could be output. (*Id.* (citing Tr. (Davis) at 2017).) Thus, the first limitation of claim 75 was obvious, based on the disclosures in MacWilliams and the June 1999 Standard. (*Id.*)

Apple again says that, as in the case of claims 83 and 84, Apple did not, as Staff contends, waive an obviousness argument using the June 1999 Standard and MacWilliams for dependent claim 76. (*Id.* (citing SBr. at 64).) Apple says it made the same obviousness arguments for claims 76 in its pre-hearing brief as it made in its initial post-hearing brief, and Dr. Davis fully and thoroughly addressed the obviousness of claim 76 by first explaining that the codes disclosed in MacWilliams for encoding a 10-bit input as a 30-bit codeword use an all ones sequences, basis orthogonal sequences, and basis mask sequences as required by claim 76, and explained that, by combining the June 1999 Standard with MacWilliams, it would have been obvious to a person of skill in the art to use these codes to encode TFCI information. (*Id.* (citing Tr. (Davis) at 2018-19).)

Apple says that based solely on attorney argument, because Dr. Min offered no opinion on the issue, Samsung challenges Apple's evidence that, to the extent the June 1999 Standard does not anticipate the asserted claims, it was a viable alternative. (*Id.* at 40.) Specifically, Apple says that Samsung argues that the June 1999 Standard would not work with a 15-slot frame and did not provide optimum results. (*Id.* (citing CBr. at 79).) These arguments, according to Apple, are belied by the proposal to move from 16 slots to 15 slots that was submitted by the ETSI participants, stating that the June 1999 Standard could be used by puncturing two bits to accommodate the new frame size. (*Id.* (citing RX-372 at 6373).) Moreover, argues Apple, Dr. Davis testified that, even if the extended TFCI encoding proposal in the June 1999 Standard corrected fewer errors, it was a viable alternative, as testified by Dr. Davis, who was unchallenged by Samsung in cross-examination. (*Id.* (citing Tr. (Davis) at 2060-61).)

The Administrative Law Judge concludes that claim 75 is not invalid as obvious by reason of the June 1999 Standard in light of MacWilliams. Claim 75 requires a controller for outputting a 30-bit codeword that corresponds to a 10-bit TFCI information input to the controller. (JXM-1 at 45:55-58.) Dr. Davis testified that each of the elements of claim 75 is disclosed in the June 1999 Standard and MacWilliams. (Tr. 2017-18.) He based his testimony on Section 4.3.1.2 of the June 1999 Standard and Corollary 17 and Theorem 5 in MacWilliams. Section 4.3.1.2 discusses (16, 5) biorthogonal TFCI coding. Dr. Davis concludes that MacWilliams discloses how to produce 30-bit codewords from a 32-bit code set, but he does not provide sufficient information that the two references render obvious that a 30-bit codeword obtained from using the Reed-Muller codes of MacWilliams is equivalent to a 32-bit codeword that corresponds to the 10-bit TFCI information input to the controller. It is more than simply a matter of mathematics or abstract coding techniques, although Dr. Davis appears to suggest otherwise. There is no empirical support for Dr. Davis's conclusions, and in the face of the countervailing testimony of Mr. Kang, the Administrative Law Judge concludes that the evidence does not demonstrate clearly and convincingly that the June 1999 Standard and MacWilliams render claim 75 invalid for obviousness. As for dependent claim 76, that too has not been shown to be invalid, for the same reasons.

For the foregoing reasons the Administrative Law Judge concludes that the asserted claims of the '348 patent are not invalid by reason of anticipation or obviousness.

The Administrative Law Judge further concludes that the asserted claims of the '348 patent are not invalid by reason of non-patentable subject matter, as contended by Apple. This is not simply a matter of mathematical formulations, but involves radio frequencies and how to encode while adhering to constraints established for radio access networking. The '348 patent states that the invention concerns an apparatus and method for encoding/decoding a transport format combination indicator (TFCI) in a CDMA mobile communication system. There is considerably more than mathematical formulae involved, and to the extent that mathematics is involved, the same can be said for most patentable scientific and technical subjects.

2. '644 Patent.

a) Whether the asserted claims of the '644 are invalid under 35 U.S.C. § 102(f)

(1) *Apple's Contentions*

Apple alleges that the '644 patent is invalid under 35 U.S.C. § 102(f) because Siemens conceived of the claimed invention and communicated it to the named inventors through their mutual participation in RAN[58] 1, a European standards-setting group under the auspices of the European Telecommunications Standards Institute (ETSI). (RBr. at 104 (citing RX-54, RX-1527C; RX-927 at R1-041520).) Apple contends that Siemens's prior art RAN 1 submissions

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[58] 3GPP Technical Standards Group, Radio Access Network Working Group No. 1. (RBr., Glossary of Terms at iii.)

concerning a rate-matching-pattern finding rule (a BER[59] per bit position is equal to the overall BER) for HS-SCCH[60], together with Siemens's prior definition of the coding chain for E-AGCH claimed in the '644 claims, was admittedly communicated to the '644 patent's inventors and was actually used by them to derive the E-AGCH[61] pattern. (*Id.* (citing Tr. (Kim) at 326-327, 347-348).)

Apple says that in September 2004, at meeting # 38bis, RAN 1 was developing the control channel for HSUPA[62] that eventually became known as E-AGCH. (*Id.* at 105 (citing Tr. (Stark) at 2219-20).) E-AGCH was to perform the same sort of control functions for HSUPA (uplink) that a prior art control channel called HS-SCCH performed for HSDPA[63] (downlink). (*Id.*) Apple says that Siemens had developed HS-SCCH and the rate matching pattern included in it in 2002. (*Id.*) Because HS-SCCH had solved the same control-channel issues in an analogous context, Siemens proposed at RAN 1 meeting # 38bis that a "similar solution may be used" for E-AGCH as had been developed "for the HS-SCCH in HSDPA." (*Id.* (citing RX-52 at 1; Tr. (Stark) at 2222-23, (Kim) at 288).) Although the E-AGCH would transmit a different number of information bits, the transmission required a nearly-identical encoding process to ensure that the information received by the UE[64] was accurate. (*Id.* (citing Tr. (Stark) at 2223-24).) In particular, the HS-SCCH coding chain used a 16-bit UE-ID[65]-specific CRC[66], which was 1/3 convolutional encoding, rate matching, and physical channel mapping. (*Id.*) Moreover, Siemens's HS-SCCH rate matching employed a non-equidistant pattern that punctured bits more

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59 Bit Error Rate. (JXM-3 at 5:63.)
60 High Speed Shared Control Channel defined by 3GPP TS 25.212 § 4.6. (RBr., Glossary of Terms at ii.)
61 Enhanced Absolute Grant Channel defined by 3GPP TS 25.212 § 4.10. (RBr., Glossary of Terms at ii.)
62 High Speed Uplink Packet Access. (RBr., Glossary of Terms at ii.)
63 High Speed Downlink Packet Access. (RBr., Glossary of Terms at ii.)
64 User Equipment. (JXM-3 at 1:50-51.)
65 User Equipment Identifier. (RBr., Glossary of Terms at iii.)
66 Cyclic Redundancy Check. (JXM-3 at Abstract.)

intensely near the start and end of the block of channel-coded bits than through the middle section in order to minimize the change of BER at each position of the block. (*Id.* (citing RX-927 at 69; RX-54 at 4-5 and Figures 2, 5, and 6; Tr. (Stark) at 2195).) In November 2004, at RAN 1 meeting # 39, Siemens proposed the specific coding chain for E-AGCH in R1-041520. (*Id.* (citing RX-927 at 77-79).) All of the named '644 inventors attended RAN 1 # 39 and knew of Siemens's proposals that were made there, argues Apple. (*Id.* (citing RX-414; Tr. (Kim) at 335-336; RX-0135 at APL794-A0000009510-3).) Apple says that for a 6-bit AG[67], R1-041520 taught all elements of the asserted '644 claims, except the specific bit locations to be punctured by rate matching. (*Id.* at 105-106 (citing RX-927 at 77-79, § 4.10 and Figure 24; Tr. (Stark) at 2261-63, (Min) at 3080-81; JX-0018C (Kim Dep.) at 182-183).) Apple says that Siemens also addressed the rate-matching pattern to be used, proposing at RAN # 39 that E-AGCH rate-matching should "us[e] the same method as HS-SCCH." (*Id.* (citing RX-0392C at 20; Tr. (Stark) at 2245-47; RX-0129C at 5).)

Apple claims that Siemens developed the HS-SCCH pattern in 2002, delivering a 0.2 dB performance gain over the then-existing "R99" pattern. (*Id.* (citing RX-54 at 2; Tr. (Kim) at 332-333).) Apple says that R99 was an equidistant rate-matching pattern that "assures equal distribution of the puncturing over the frame." (*Id.* (citing RX-54 at 2; Tr. (Kim) at 328).) In RAN 1, submission R1-02-0604, Siemens taught that equidistant patterns were a problem for small convolutionally-coded blocks of control information, such as those used in HS-SCCH (and E-AGCH), because they resulted in the start and end of the block having low BERs, while the middle of the block had a high BER. (*Id.* (citing RX-54 at 2; Tr. (Stark) at 2193-95).) Siemens solved this problem, according to Apple, by developing a rate-matching approach that decreased

[67] Absolute Grant.

the change of BER at each bit position of the rate-matched block, and thus improved BLER[68] performance. (*Id.* (citing RX-54 at 2; Tr. (Stark) at 2195-96, 2217-19).) Siemens's rate-matching approach was to puncture more bits near the start and end of the block, where bit protection is greater, and to reduce puncturing in the middle of the block, where the bits are less protected. (*Id.* (citing RX-54 (Stark) at 2195, 2217).) Siemens taught to search for a rate-matching pattern that produces a BER that is "homogenous" (uniform) for all bits in the block. (*Id.* (citing RX-54C at 1-3; Tr. (Stark) at 2195).) Use of this finding rule (the BER at each bit position equals the overall BER) yields a pattern that improves decoding performance by about 0.2 dB. (*Id.* (citing RX-54C at 5; Tr. (Kim) at 332-333, (Stark) at 2195).) Siemens's pattern was adopted by 3GPP for HS-SCCH in 2002, according to Apple. (*Id.* (citing Tr. (Kim) at 313; RX-927 at § 4.6.6).)

Apple says that in order to derive the '644 patent the named inventors merely copied Siemens's HS-SCCH pattern of RX-54, following Siemens's finding rule that was taught there and apply it to the channel coding constraints Siemens defined for E-AGCH in RX-927. (*Id.*) In particular, the '644 patent identifies the identical problem with equidistant rate matching that Siemens first defined in RX-54. (*Id.*) Apple says the '644 patent proposes solving this problem in the identical way, by rate matching to minimize the change of BER at each bit position and thereby improve BLER. (*Id.*) Apple argues that the '644 rate-matching pattern produces the identical performance gain first achieved by Siemens and the named inventors' contemporaneous internal documents {

}. (*Id.* (citing RX-0739C at 4; RX-0741C at 6; CX-1857C at 3).) Apple says that one of the named inventors of the '644 patent, Young-Bum Kim,

[68] Block Error Rate. (JXM-3 at 5:60.)

flatly and repeatedly admitted to the 3GPP that he "took" the concept for his '644 pattern from Siemens's HS-SCCH. (*Id.* at 107-108 (citing (RX-125 ("we took the similar concept as used for the HS-SCCH which has the benefit for the convolutional coding of short length block"); RX-893C)).)

Apple says that Siemens previously invented the complete subject matter of the '644 patent and it is undisputed that, for the case of a 6-bit AG, Figure 24 of Siemens R1-041520 (RX-927) taught each and every limitation of the asserted '644 claims, except the specific puncture positions of the rate-matching pattern. (*Id.* (citing RX-927 at 77-79, § 4.10 and Figure 24; Tr. (Stark) at 2261-63 (explaining that R1-041520 discloses each element of the '644 claims); (Min) at 3080-81 (admitting that when w = 6, RX-927 discloses all of the '644 claim elements).) Apple argues that although Samsung's pre-hearing brief suggests that a person of ordinary skill at the # 39 meeting would never have known that the AG could be 6-bits long, that suggestion collapsed at the hearing. (*Id.*) As an initial matter, Mr. Kim and his named co-inventors did not just derive one rate-matching pattern from a 6-bit AG from Siemens; they derived numerous patterns for every AG bit length that was then under consideration, which was five to six bits. (*Id.* (citing Tr. (Kim) at 376).) The patentees filed patent applications on every one of these derived combinations before ever making a proposal to RAN 1, so that it did not matter what AG length the 3GPP ultimately picked. (*Id.* (citing RX-455; Tr. (Min) at 863-867).) Moreover, the '644 patent acknowledges that a 6-bit AG was under consideration in the prior art. (*Id.* (citing JXM-3 at 5:8-10).) Apple says that Dr. Min conceded on cross-examination that a 6-bit AG was known before the '644 patent. (*Id.* (citing Tr. (Min) at 3070-74, 3078).) Apple says that Mr. Kim testified similarly at the hearing. (*Id.* (citing Tr. (Kim) 337-339).) Also, argues Apple, named inventor Ju-He Lee testified that a 6-bit AG was under consideration at the # 39 meeting, until he changed his testimony by "errata." (*Id.* (citing JX-0022 (Lee Dep.) at 203).) According to Apple, Mr. Kim's own report of the # 38bis meeting, dated October 4, 2004, shows that the delegates to RAN 1 were considering AGs ranging from four bits to eight bits as of September 2004. (*Id.* (citing RX-418C ("Ericsson: 4," "Qualcomm: 5 + 2," "Samsung: 6 + 2").) As Dr. Stark explained, the most obvious compromise from these competing proposals would be the one exactly in the middle of those ranges, which is a 6-bit AG. (*Id.* at 108-109 (citing Tr. (Stark) at 2251).)

According to Apple, even without these admissions on the part of Samsung, Siemens's Figure 24 itself defines a practical range for the number of bits in the AG, where six would be obvious to try. (*Id.* at 109.) Figure 24 expressly identifies a minimum a three bits for the AG. (*Id.* (citing RX-927 at 78 ("X_{ag1}, X_{ag2},...X_{agw}").) Apple argues that Dr. Stark explained that for each additional bit added to the AG there are diminishing marginal returns. (*Id.* (citing Tr. (Stark) at 2248-50).) For example, Siemens's Figure 24 teaches that, in addition to the minimum of 3 bits in the AG, there will also be a 16-bit UE-ID-specific CRC and 8 tail bits, for a total of 27 bits before encoding. (*Id.* (citing RX-927 at 78 ("y_1, y_2,...y_w + 16"), 18 ("8 tail bits with binary value 0 shall be added to the end of the code block before encoding")).) That means that, after rate 1/3 convolutional encoding there will be a minimum of 81 coded bits. (*Id.*) Apple says that Figure 24 teaches that only a 60-bit rate-matched block can be transmitted, meaning that a minimum of 21 bits will already have to be punctured by rate matching. (*Id.* (citing RX-972 at 78 ("r1, r2,...r60").) As a result, for every one bit added to the AG, three additional bits will have to be punctured during rate-matching. (*Id.*) Apple says that Dr. Stark explained that a person of ordinary skill would recognize that this places a practical upper boundary on the number of bits in the AG of about 10 bits. (*Id.* (citing Tr. (Stark) at 2248-50).) Where a limited number of design choices exist, and a 6-bit AG was squarely within the range of available choices, it would have been obvious to try a 6-bit AG, argues Apple. (*Id.*) Doing so would have been the product of ordinary skill and common sense, not the work of invention, according to Apple. (*Id.* (citing *KSR*, 127 S.Ct. at 1732).)

Apple says that it was undisputed at the hearing that for the case of a 6-bit AG Siemens's Figure 24 (RX-927 at 78) teaches that the E-AGCH pattern would puncture 30 bits from 90 coded bits. (*Id.* (citing RX-927 at 79, § 4.10.4 and Figure 24; Tr. (Stark) at 2224; JX0018C (Kim Dep.) at 182-183).) Apple says that Siemens's R1-041520 (RX-927) also disclosed the HS-SSCH rate-matching pattern, which punctured 31 bits from 111 coded bits. (*Id.* (citing RX-927 at 69).) In light of Siemens's express suggestion at the # 39 meeting that for E-AGCH "rate matching, we can fix a suitable pattern using the same approach as for HS-SSCH" (RX-392C at 20), it would have been obvious to derive an E-AGHC rate-matching pattern from the HS-SCCH pattern, and that is what Mr. Kim did. (*Id.* at 109-110.) Specifically, it would have been obvious to copy the 31-bit puncturing pattern of HS-SCCH onto the 90 coded bits of the E-AGCH, dropping the one superfluous puncturing position so that only 30 bits would be punctured. (*Id.* at 110 (citing Tr. (Stark) at 2223-25).) Doing so yielded the { }, according to Apple. (*Id.* (citing Tr. (Kim) at 359-360).) Apple contends that it would have been obvious to apply the finding rule taught by Siemens's R1-02-0604 (RX-54; RX-1527C), which holds that the BER per each bit position should equal the BER overall, in order to { }, which is just what Mr. Kim did. (*Id.* (citing Tr. (Stark) at 2263, 2267-68, (Kim) at 367 (admitting { })).) Form Siemens's R1-02-0604 finding rule, Apple contends that it was obvious to adjust the rate-matching pattern until it produced a BER at each bit position that was as homogeneous as possible, such as a pattern with minimum variance of BER at each bit position. (*Id.* (citing Tr. (Stark) at 2223-25).) This is precisely what Samsung did to develop its pattern, and as Dr. Stark testified, applying Siemens's teachings from R1-02-0604 and R1-041520 would produce thousands of rate-matching patterns, all of which were equally capable of delivering the same approximately 0.2 dB performance gain over Release 99, including the specific pattern claimed in the '644 patent. (*Id.* (citing Tr. (Stark) at 2223-27).) Therefore, reasons Apple, Siemens conceived the teachings of both the coding and the rate-matching pattern of the '644 claims before the named inventors. (*Id.*)

Apple contends that it is undisputed that Siemens communicated R1-02-0604 (RX-54; RX-1527C) and R1-041520 (RX-927) to the named '644 inventors. (*Id.* (citing Tr. (Kim) at 239, 344 (admitting that he { }), 350-351 (stating that { })).) Apple says it is also undisputed that the named '644 inventors followed Siemens's road map to develop the rate-matching pattern claimed in the '644 patent. (*Id.* at 110-111.) For example, Mr. Kim admitted at the hearing that he at least { } (Tr. at 293), and the inventors' own documents demonstrate that the inventors { }. (*Id.* (citing CX-1857C at 2; RX-0739C at 4; RX-0741C at 5; RX-850C at 6; RX-0129C at 1-5; RX-1527C at 2, 5-6; RPX-0031C at tabs { })).) Further, argues Apple, the named inventors repeatedly admitted to 3GPP—but never told the USPTO—that the inventors merely "took the similar concept as used for the HS-SCCH" to derive their '644 pattern. (*Id.* (citing RX-0125 at 1; RX-0152 at 1; RX-0893C).)

Apple says that on October 4, 2004, shortly after Siemens suggested at RAN 1 #38bis that E-AGCH should simply re-use the HS-SCCH coding chain, Mr. Kim { }. (*Id.* (citing CX-1857C at 1-2; Tr. (Kim) at 326).) In doing so, Mr. Kim { }. (*Id.* (citing CX-1857C at 3; Tr. (Kim) at 345-346, (Stark) at 2225-26).) Apple argues that, demonstrating that he knew doing so required no more than ordinary skill, Mr. Kim { } (*Id.* (citing CX-1857C at 2, 3; Tr. (Kim) at 346, (Stark) at 2254-55).) Also the named co-inventors Lee, Hoo, Cho, and Kwak { }. (*Id.* (citing RX-0741C; RX-0739C; CX-1858C; Tr. (Kim) at 346-347, (Stark) at 2252).) Apple says that named inventor Heo { }. (*Id.* at 112 (citing RX-0379C at 4).) And named inventor Kwak {

} (*Id.* (citing RX-0741C at 6).)

Apple notes that on October 7, 2004, Mr. Kim {

} (*Id.* (citing RX-0418C at 5; RX-0850C at 6).) Apple says that all of the named inventors of the '644 patent attended RAN # 39 in November 2004 and knew of Siemens's proposals. (*Id.* (citing RX-414; Tr. (Kim) at 335-336; RX-0135 at 37-40).) Siemens's Dr. Juergen Michel published R1-041520 at this meeting thereby disclosing the complete coding chain for E-AGCH and every '644 limitation except the specific bit positions of the rate-matching pattern. (*Id.* (citing RX-927 at 77-79, § 4.10 and Figure 24; Tr. (Kim) at 335-336, (Stark) at 2261-63, (Min) at 3080-81; JX-0022 (Lee Dep.) at 203).) According to Apple, Siemens also proposed that the E-AGCH pattern should be fixed "using the same approach as for HS-SCCH," and the rest of the RAN 1 participants agreed. (*Id.* (citing RX-0392C at 20; Tr. (Stark) at 2245-46).)

After the RAN 1 # 39 meeting, Mr. Kim and Mr. Zhang developed an E-AGCH pattern derived from the ideas that Siemens had put forward, and armed with Siemens's E-AGCH proposal (RX-927), the two men {

}. (*Id.* at 113 (citing Tr. (Kim) at 344; JX-22C (Lee Dep.) at 142-143).) Apple contends that the two men knew from RAN 1 #38bis that {

} (*Id.* (citing CX-1857C at 3; RX-739C at 4).)

Apple says that Mr. Kim wrote several internal Samsung memos between December 2004 and January 2005 in which he said that {

}. (*Id.* (citing RX-850C; Tr. (Kim) at 366).) Apple notes that Mr. Kim testified at the hearing that he had arrived at {

}. (*Id.* at 113-114 (citing Tr. (Kim) at 359-360).) Apple references Mr. Kim's "approach" as reflected in the RDX-2-4 and 2-5, shown here: {

}

(*Id.* at 114.) Apple argues that these exhibits demonstrate that Mr. Kim first {

}. (*Id.* (citing Tr. (Kim) at 357).)

Apple points out that Mr. Kim testified that his {

}; Tr. (Stark) at 2228-29; JX-0018 (Kim Dep.) at 86-91).) Apple argues that Mr. Kim's copying is shown in RPDX-2–6, as shown below. {

} (*Id.* at 115 (citing Tr. (Kim) at 359-360).)

Apple says that in {

}. (*Id.* at 115 (citing Tr. (Kim) at 360).) Thus, argues Apple, it is clear that to derive his E-AGCH pattern, Mr. Kim {

} (*Id.* (citing Tr. (Stark) at 2232-34; RX-0850C at 6).)

Apple says that these iterations were not inventive, and instead, were a predictable application of Siemens's finding rule to reduce the variance in BER, which yielded the exact result the {

} (*Id.* (citing Tr. (Kim) at 345-346; *KSR*, 550 at 420).) Apple contends that Samsung's own {

}. (*Id.* at 117 (citing RX-850C at 11; Tr. (Stark) at 2234-35).)

Apple says that Samsung proposed its rate-matching candidates, including the claimed '644 pattern, to RAN 1 in February 2005, in a contribution entitled "E-AGCH SF and channel coding." (*Id.*) In describing their pattern, Samsung's representatives at RAN 1 said, "[W]e took the similar concept for HS-SCCH…." (*Id.* (citing RX-0125; Tr. at 374 (Kim)).) Apple says that this statement was true when made, and merely taking the work of another does not entitle Samsung to a patent. (*Id.*) To the contrary, as shown in its 3GPP contributions, R1-041520 and R1-02-0604, Siemens had originally conceived all of the elements of the asserted '644 claims, including the rate-matching pattern. (*Id.*) The invention was communicated to Samsung through Siemens's 3GPP proposals and discussions at RAN 1 meetings and Siemens's documents and communications enabled Samsung, as well as any person of ordinary skill in the art, to derive the '644 pattern because they taught both the starting point (the HS-SCCH patterns which Mr. Kim adapted to fit a 90 bit block) and the method for derivation {

}. (*Id.*) Siemens's prior invention of the E-AGCH coding chain, the HS-SCCH rate-matching pattern, and the finding rule, combined with the enabling communication of those teachings, demonstrates that the '644 patent claims were derived from Siemens and, at a minimum, Samsung's copying and use of Siemens's prior art rate-matching pattern, in conjunctions with Siemens's finding rule, demonstrates obviousness. (*Id.* (citing Tr. (Stark) at 2223).)

(2) *Samsung's response*

Samsung responds that Mr. Young Bum Kim and his co-inventors were involved in the WG1[69] standards organization that was developing the next generation technology in 2004. (CRBr. at 62 (citing Tr. at 284-285 (Kim)).) The inventors sought to figure out the best technology to improve and optimize HSUPA communications. (*Id.* (citing Tr. at 286-288 (Kim)).) Not wanting to reinvent the wheel, the '644 inventors first looked to older technology. (*Id.* (citing Tr. at 289 (Kim)).) They needed to figure out the best way to transmit very important control information to a mobile device to increase uplink communication speed on the HSUPA. (*Id.* (citing Tr. at 287-288 (Kim)).) They {

}. (*Id.* citing Tr. at 288 (Kim); CPX-031C).) The channel characteristics for the E-AGCH channel were completely different from those of the HS-SCCH and the approach proposed by Siemens years before was not good enough. (*Id.* at 62-63 (citing Tr. at 288 (Kim)).) The inventors had to come up with something new, and faced with that challenge, they put their heads together and {

}. (*Id.* at 63 (citing Tr. at 288-293; RPX-0031C).)

Knowing they used the Siemens HS-SCCH proposal as a baseline, but also knowing that it was not good enough for the E-AGCH, the inventors made a contribution to the 3GPP by proposing their ideas. (*Id.* (citing Tr. at 294-296 (Kim)).) Although there was prior discussion regarding the E-AGCH, there were no other adequate solutions, according to Samsung. (*Id.*

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[69] Working Group 1. (JXM-3 at Samsung-AppleITC000047 at "Other Publications.")

(citing Tr. (Kim) at 299-301).) Samsung says that even Siemens was clear that it did not have the solution to the problem that the Samsung inventors solved. (*Id.* (citing Tr. (Min) at 3038-39; RX-0136 at 79 (Statement from Siemens that the "exact number of bits and the rate matching pattern needs to be clarified.").) Samsung argues that there were other proposals regarding E-AGCH, such as Motorola's proposal for "tailbiting." (*Id.* (citing Tr. (Kim) at 299; RBr. at 128-129).) This proposal was discussed at the 3GPP, but tailbiting was a brand new technology that would have required an entire overhaul of all decoders that were already implemented in UMTS systems. (*Id.* (citing Tr. (Kim) at 299-300).) Therefore, it was simply not an option for the 3GPP to adopt. (*Id.* (citing Tr. (Kim) at 299-301).) Eventually, after much discussion, the members of 3GPP adopted Samsung's proposal, recognizing that it was the best solution to the problem they were facing. (*Id.* (citing Tr. (Kim) at 300-301).) In fact, argues Samsung, Siemens "co-sourced" Samsung's proposal, because they recognized the advantages of Samsung's invention. (*Id.* (citing Tr. (Kim) at 296-298; RX-0153).) Eventually, the technology in the '644 patent was adopted into the 3GPP standard and is practiced by all HSUPA-capable products today. (*Id.* at 63-64 (citing CX-1748).)

Samsung says that Apple admits that it does not have a single piece of evidence that discloses the '644 rate-matching pattern that preceded the '644 invention and in order to prove Siemens is the true inventor, under the doctrine of derivation, Apple has to show by clear and convincing evidence that Siemens previously possessed and communicated the entire invention. (*Id.* at 64-65 (citing *Gambro Lundia AB v. Baxter Healthcare,* 110 F.3d 1573, 1578 (Fed. Cir. 1997)).) Samsung says that in *Gambro* the Federal Circuit found that obviousness is insufficient to show derivation under § 102(f) and held that the lower court had applied the wrong legal standard by concluding that the defendant in that case "did not need to prove communication of the entire conception, but rather only so much of the invention 'as would have made it obvious to one of ordinary skill in the art.'" (*Id.* (citing *Gambro* at 1578).) Samsung says that the Federal Circuit reversed the district court's finding on derivation, clarifying that the correct legal standard was "whether the communication enabled one of ordinary skill in the art to make the patented invention" and finding that there was "insufficient evidence of communication" under that standard. (*Id.* at 65-66 (citing *Gambro* at 1578).) Samsung notes that the Federal Circuit has further explained that enablement, for the purposes of derivation, requires a showing that "one skilled in the art would have been capable, without undue experimentation," of making the invention. (*Id.* at 66 (citing *Brand v. Miller*, 487 F.3d 862, 870 (Fed. Cir. 2007)).) The inventors { }, and in order to find the pattern that is disclosed in the patent, they had to identify numerous candidates out of a possibility of more than 6 times 10^{23} just to choose 30 out of 90 bits to puncture, and they had to { }. Siemens's HS-SCCH proposal did not enable a person of ordinary skill in the art to achieve what the inventors disclose in the '644 invention. (*Id.* (citing Tr. (Min) at 3031-33).)

Samsung says that Apple has not identified a single document that shows that Siemens possessed all of the limitations of the '644 claims. (*Id.*) For example, there is no evidence that the E-AGCH was to perform "the same sort of control functions for HSUPA (uplink) that a prior art channel called HS-SCCH performed for HSDPA (downlink)." (*Id.*) However, argues Samsung, there is testimony that the E-AGCH approach is completely different from the HS-SCCH approach. (*Id.* (citing Tr. (Min) at 3029-32, 3039-40).) Samsung says that Dr. Stark admitted that there were differences. (*Id.* (citing Tr. (Stark) at 2332).) Mr. Kim testified that the inventors did look at the Siemens HS-SCCH solution as a baseline, but ultimately that approach did not work and the inventors {

}. (*Id.* at 66-67 (citing Tr. (Kim) at 288, 312, 385).)

Contradicting Apple, Samsung says that there is no evidence that shows that the inventors considered R1-041520 in developing the '644 invention. (*Id.* at 67.) In the testimony cited by Apple, Mr. Kim testified that he was on an e-mail reflector, so "perhaps [he had] received it." (*Id.* (citing Tr. (Kim) at 77-79).) Samsung argues that, just because Mr. Kim received a subscribed-to e-mail reflector does not mean that he and the other inventors even read every e-mail received via the reflector or considered every document that was circulated via that reflector in developing the '644 invention. (*Id.*) More important, even if he had received R1-041520, that proposal was missing all of the key elements of the '644 invention. (*Id.* (citing RX-0927).) Even Siemens admits that the size of the control information and the rate-matching pattern were missing from the change requests it submitted around the time of that meeting:

4.10.4 Rate matching for E-AGCH

From the input sequence $z_1, z_2, \ldots, z_{[illegible]}$ the bits $z_{[illegible]}, \ldots, z_{[illegible]}$ are repeated (or punctured) to obtain the output sequence $r_1, r_2, \ldots,$ $r_{[60 or 120]}$.

[Editor's note: The exact number of bits and the rate matching pattern needs to be clarified.]

(*Id.* (citing RX-0136 at 79 (highlight added); Tr. (Min) at 3038-39).)

Samsung argues that Apple cites no evidence for its argument that to "derive the '644 patent, the named inventors merely copied Siemens's HS-SCCH pattern in RX-54, following Siemens's finding rule taught there, and applied it to the claimed coding constraints that Siemens defined for each E-AGCH in RX-927." (*Id.* (citing RBr. at 107.) This is because there is no evidence and Mr. Kim did not "take" the HS-SCCH concept. (*Id.*) Samsung says that Mr. Kim testified at the hearing that he and the other named inventors merely {

}. (*Id.* at 67-68 (citing Tr. (Kim) at 288, 312, 375).)

The inventors developed the { } in RX-927. (*Id.* at 68 (citing Tr. (Kim) at 288-292; RPX-0031C; JXM-3: RX-0136 at 79).) According to Samsung, the rate-matching pattern used in the HS-SCCH proposal, including the fact that it is optimized to ensure that at least one bit for each encoded bit is transmitted, and it is asymmetrical to account for the tail bits added onto the end. (*Id.* (citing Tr. (Kim) at 281-282).)

(3) *Staff's response*

Staff rejects Apple's claims of invalidity of the '644 patent. (SBr. at 82.) With respect to R1-041520, Staff says that the 3GPP working group tasked with developing the E-AGCH for the HSUPA standard decided that scheduling grants issued from a base station to mobile devices would be transmitted in a form similar to that used for an existing UMTS channel, which was HS-SCCH. (*Id.* (citing RX-52 (R1-041140, 3GPP TSG RAN WGI #38bis, Seoul, South Korea, Sept. 20-24, 2004)).) In November 2004, Siemens proposed that the group adopt an E-AGCH coding chain that Siemens disclosed in 3GPP document R1-041520. (*Id.* (citing RX-927 at 77-79 (proposed §§ 4.10-4.10.5) (Siemens Change Request, R1-041520, TSG RAN Working Group 1 Meeting #39, Yokohama, Japan (Nov. 15-19, 2004))).)

Staff says that R1-041520 proposed that scheduling grants transmitted over the AG channel, that is, E-AGCH, should be encoded at the base station in the manner shown in Figure 24 of RX-927, as depicted here:

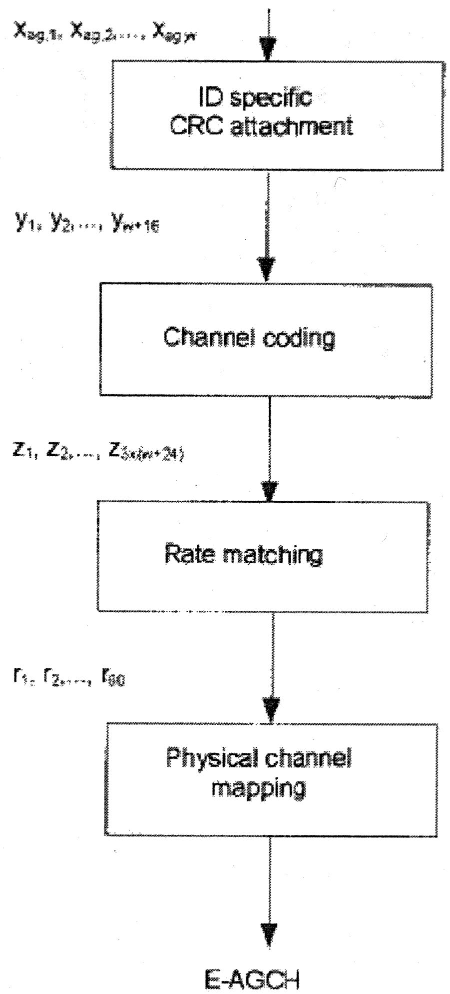

Figure 24: Coding for E-AGCH

(*Id.* at 83-84 (citing RX-927 § 4.10.1 Coding for E-AGCH).)

Staff says this document does not render the '644 patent invalid, for two reasons. First, Siemens's proposal was directed to encoding scheduling-grant information at the base station. (*Id.* (citing RX-927 at § 4.10.1, Figure 24).) Staff says that claims 9 and 13 of the '644 patent are directed, instead, to decoding that information after it is received by a mobile device. (*Id.* (citing JXM-3 at 27:31-33, 28:15-17).) Second, Staff notes that Apple acknowledges that R1-041520 did not teach the specific bit locations to be de-punctured in the rate-matching process (*id.* (citing Apple's pre-hearing brief at 54-55), and rather than proposing a specific rate-matching pattern, Siemens merely suggested { }. (*Id.* (citing RX-392C (Ericsson, Limited Internal Minutes of Meeting, 3GPP RAN WG1#39) ("{

})).) Staff notes that Dr. Min testified that the Siemens E-DCH proposal RX-0927 does not disclose any specific rate-matching pattern. (*Id.* at 84-85 (citing Tr. (Min) at 3021).) Thus, says Staff, R1-041520 neither contains nor suggests key elements of the asserted claims.

(4) *Administrative Law Judge's findings*

Apple relies on 35 U.S.C. § 102(f) for its invalidity contention. That statute states: "A person shall be entitled to a patent unless…(f) he did not himself invent the subject matter sought to be patented…." Apple has to show by clear and convincing evidence that Siemens previously possessed and communicated the entire invention to the '644 inventors. *Gambro Lundia AB v. Baxter Healthcare,* 110 F.3d 1573, 1578 (Fed. Cir. 1997).) The evidence does not clearly and convincingly establish that the inventors did derive their invention from Siemens. Mr. Kim testified that although the inventors did {

}. Also, there is valid expert testimony that Siemens's HS-SCCH proposal did not enable a person of ordinary skill in the art to achieve what the inventors disclose in the '644 invention. (Tr. (Min) at 3031-33.) For these reasons and the additional arguments put forth by both Samsung and Staff, the Administrative Law Judge concludes that there is not clear and convincing evidence that the invention disclosed in the '644 patent was the discovery of Siemens, as Apple contends.

b) Whether the asserted claims of the '644 patent are invalid under 35 U.S.C. § 103

(1) *Apple's Contentions*

(a) *The asserted claims generally*

Apple says the asserted '644 claims are obvious over R1-041520, which was published on or before November 25, 2004 and is therefore prior art under 35 U.S.C. § 102(a) and (f). (RBr. at 118 (citing Tr. (Stark) at 2248, 2251 (describing how an AG of 4 to 10 bits was under consideration by 3GPP RAN Working Group 1); Tr. (Kim) at 337-339, 402-403; Tr. (Min) at 3070-74, 3077-78; JX-22C (Lee Dep.) at 203; RX-418C at 1 (showing that companies had proposed 4, 7, and 8 bits as the possible size of the AG).) Moreover, argues Apple, it would have been obvious for a person of ordinary skill in the art to choose a 6-bit AG, because 6 bits is in the middle of the range of bits that was being considered, and would have been a reasonable compromise between the low and high possibilities. (*Id.* (citing Tr. (Stark) at 2251).)

The '644 patent itself explains that "[a] 4 to 8-bit allowed maximum data rate or power offset, a 1-bit AG validity duration indicator, and 1-bit AG validity process indicator [was] under consideration" by the 3GPP standards body. (*Id.* (citing Tr. (Min) at 3070-74, 3077-78; JXM-3 at 5:8-10; Tr. (Kim) at 402-403).) The option of a 4-bit power offset, 1-bit validity duration indicator, and a 1-bit validity process indicator disclosed by the '644 patent prior art constitutes a 6-bit AG. (*Id.* (citing Tr. (Kim) at 402-403).) Indeed, as described in Section E, a 6-bit AG would have been obvious to try, based on the teaching of Siemens's Figure 24 alone, Apple contends. (*Id.* (citing Tr. (Stark) at 2248-50; RX-927 at 78).)

R1-045120 defined the AG as an integer variable "w," where 6 was a known value for "w." (*Id.* (citing Tr. (Stark) at 2248-50 (explaining that a person of ordinary skill would understand a 6-bit AG to be within the "sweet spot, so to speak, for the choice of W"); JXM-3 at 5:8-10; Tr. (Min) at 3070-74, 3077-78; Tr. (Kim) at 402-403).) For a 6-bit AG, Apple contends that R1-041520 discloses every limitation of the'644 patent, except the specific rate-matching bit positions. (*Id.* (citing Tr. (Stark) at 2260-63 (when w = 6, Figure 24 discloses all elements of the claim 9 receiver chain, except the specific rate-matching pattern); Tr. (Min) 308 (RX-927 teaches all elements of claim 1 except the specific puncture positions); RX-927 at 77-79).) At the RAN 1 # 39 session, Siemens suggested that E-AGCH rate-matching could "us[e] the same method as HS-SCCH." (*Id.* (citing RX-927 at 69).) Therefore, according to Apple, the teachings of R1-041520 renders the asserted '644 claims obvious in light of the contemporaneous knowledge of a person of ordinary skill. (*Id.* (citing Tr. (Stark) at 2223).)

(b) *Claims 9 and 13*

Apple notes that the preamble of claims 9 and 13 recites "receiving control information associated with an uplink packet data transmission in a mobile communication system." (*Id.* at 119 (citing JXM-3 at 27:31-33, 28:15-17).) Apple reports that R1-041529 § 4.10 teaches this preamble. (*Id.* (citing RX-927 at 77-79 and Figure 24).) Although Section 4.10 is directed to transmitting, Apple contends that it would have been obvious to reverse the steps of Figure 24 to arrive at the limitations of the claimed receiver. (*Id.* (citing Tr. (Stark) at 2260-63, 2220-22; RX-927 at 77-79, (Min) at 308).) Thus, contends Apple, the claims' "extracting a 60-bit rate-matched block" limitation is obvious over the teaching in R1-041520 of a physical channel mapper that maps a 60-bit rate-matched block ("r_1, r_2..., r_{60}") onto a Node B signal. (*Id.* (citing Tr. (Stark) at 2260-63, (Min) at 3081).) The "generating 90 coded bits" limitation is also obvious over the teaching in R1-041520 of a rate matcher for generating a 60-bit rate-matched block ("output sequence $r_1, r_2\ldots, r_{60}$") from 90 coded bits ("input sequence $z_1, z_2\ldots, r_{60}$") onto a Node B signal. (*Id.* (citing RX-927 at Figure 24 and § 4.10.5; Tr. at 2260-63 (Stark), 3081 (Min)).) The "decoding the coded bits at a coding rate of 1/3" limitation is also obvious over the teaching in R1-041520 of a channel coder for encoding 6-bit control information and a 16-bit UE-ID-specific CRC ("the sequence of bits $y_1, y_2,\ldots, y_{w+16}$") at a coding rate of 1/3 ("[r]ate 1/3 convolutional coding…is applied") to generate 90 coded bits ("the sequence of bits $z_1, z_2\ldots, z_{3 \times (w+24)}$"). (*Id.* at 119-120 (citing RX-927 at 17-18, 77-78, Figure 24, § 4.10.3; Tr. at 2260-63 (Stark), 3081 (Min)).) The "outputting…by checking the UE-ID-specific CRC" limitation is obvious over the teaching in R1-041520 of a UE-ID-specific CRC generator that masks a 16-bit UE-ID with a 16-bit CRC, according to Apple. (*Id.* (citing RX-927, Figure 24, § 4.10.2; Tr. at 2260-63, 2220-22 (Stark), 3031 (Min)).)

Apple says the '644 claims recite a specific rate-matching pattern and R1-041520 teaches the use of a pattern that likewise punctures 30 bits from 90 coded bits to generate a 60-bit rate-matched block. (*Id.* (citing RX-927 at 78; Tr. at 2263 (Stark)).) Although R1-041520 does not state which specific bit positions are to be punctured, at the WG1 Meeting #39, where R1-041520 was submitted, Siemens proposed that E-AGCH rate-matching should "us[e] the same method as HS-SCCH." (*Id.* (citing RX-039C at 20; Tr. at 2245-47 (Stark); RX-129C at 5 ('644 inventor Yujian Zhang stating: "[f]or HS-SCCH, Siemens proposed optimized patterns which are superior to R99 RM algorithms…For E-AGCH, R = 1/3 convolutional encoding will be used. In RAN 1 #39, it was decided that a similar approach as HS-SCCH should be adopted for the rate-matching of E-AGCH. Therefore the puncturing pattern should be found.")).) Apple says that it would have been obvious, based on R1-041520, to start with the HS-SCCH pattern and to search for patterns suitable for E-AGCH, using the finding rule of Siemens HS-SCCH submission R1-02-0604. (*Id.* (citing RX-0054; RX-1527C; Tr. at 2226-27 (Stark)).) Apple claims that R1-041520 discloses the HS-SCCH pattern, which punctures 31 bits at bit positions with greater frequency near the ends of the block than in the middle. (*Id.* (citing RX-927 at 69).) A person of ordinary skill would therefore know to start out from this pattern and use Siemens's criterion to minimize BER variations in order to arrive at the claimed '644 pattern, for the reasons previously discussed. (*Id.*)

(c) *Claims 10 and 14*

Apple says that claims 10 and 14 add the limitation "wherein the control information comprises an indication of an allowed maximum data rate for transmission of uplink packet data." (*Id.* at 120-121.) Apple contends that this disclosure was obvious from the teaching in R1-041520 of an AG, which represents control information that indicates an allowed maximum data rate for transmission of uplink packet data. (*Id.* at 121 (citing RX-927 at 77-79; Tr. at 2264 (Stark); JXM-3 at 2:3-8 ("scheduling grant" that defines "an allowed maximum data rate" was known)).)

(d) *Dependent claims 11 and 15*

Apple says that claims 11 and 15 add the limitation "wherein the control information comprises a 5-bit power offset...and a 1-bit validity process indicator." (*Id.*) That, too, says Apple, was obvious from the teaching in R1-041520 of an AG. An AG discloses to a person of ordinary skill the use of a power offset and validity process indicator, inasmuch as an AG that comprises a 5-bit power offset and validity process indicator was admitted prior art and was disclosed in numerous RAN 1 #39 proposals, demonstrating that claims 11 and 15 were obvious