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Case No: HC11C02180

**IN THE HIGH COURT OF JUSTICE**  
**CHANCERY DIVISION**  
**PATENTS COURT**

Royal Courts of Justice  
Rolls Building London EC4A1NL

Date: 07/03/2013

**Before:**

**THE HON MR JUSTICE FLOYD**

**Between:**

**SAMSUNG ELECTRONICS CO. LIMITED**

**Claimant**

**- and -**

**(1) APPLE RETAIL UK LIMITED**

**(2) APPLE SALES INTERNATIONAL**

**Defendants**

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**Henry Carr QC** (instructed by **Bristows**) for the **Claimant**  
**Guy Burkill QC** and **Tom Hinchliffe** (instructed by **Freshfields Bruckhaus Deringer LLP**)  
for the **Defendants**

Hearing dates: 28<sup>th</sup>-30<sup>th</sup> November, 5-6 December 2012

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**Approved Judgment on 726 and 675 patents**

I direct that pursuant to CPR PD 39A para 6.1 no official shorthand note shall be taken of this Judgment and that copies of this version as handed down may be treated as authentic.

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THE HON MR JUSTICE FLOYD

**Mr Justice Floyd:**

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**Introduction**

1. In this action and counterclaim, the claimant Samsung Electronics Co. Limited (“Samsung”) alleges infringement of three patents by the defendants Apple Retail UK Limited and Apple Sales International Limited (together “Apple”). The alleged infringements include certain Apple 3G-enabled devices, including the iPhone 4, iPhone 4S and the iPad2 3G. The trial of the action fell into two quite distinct parts, the first part concerned with two of the patents and the second part with the third patent. There was virtually no overlap between the patents concerned in the first part and that involved in the second. Different counsel argued the two parts of the case and different experts were called for each side. This judgment deals with the first two patents only<sup>1</sup>. Those patents are European Patents UK Nos. 1,005,726 and 1,357,675 (“726” and “675” respectively). Apple denies infringement and counterclaims for revocation of both patents. Shortly before trial, Samsung

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<sup>1</sup> The third patent is dealt with in a separate judgment: [2013] EWHC 468 (Pat)

abandoned their allegation of infringement of 675, but its validity remained in issue.

2. The respective cases on these patents were advanced by Mr Henry Carr QC for Samsung and by Mr Guy Burkill QC and Mr Tom Hinchliffe for Apple.

### **The 726 patent**

3. The 726 patent claims a priority date of 31st March 1998, based on Korean national patent application number 9811380. The specification is entitled “*Turbo encoding device and method for processing data according to QoS*”. The 726 patent is concerned with an aspect of channel coding in a mobile telecommunications system using turbo codes. Channel coding is the process of adding extra information to a digital bitstream for the purposes of error detection and correction. Turbo codes, invented by a French engineer, Claude Berrou and his co-workers, are an advanced and highly powerful method of channel coding, error detection and correction. A detailed understanding of how turbo codes work is not necessary for the purposes of this case. I will explain a little more about them when I have dealt with other aspects of the technical background. “QoS” stands for “quality of service”. The 726 patent concerns itself with a small aspect of a channel coding system using turbo codes, namely how one decides on the number of frames of input data to put together into a larger block or super-frame in the encoder. According to its teaching, one does so according to a parameter which is connected with the quality of service.

### **Technical background**

4. The general architecture of a mobile communications system has been described in a number of judgments. The following aspects need to be explained further here. I acknowledge the assistance of both sides’ expert reports in preparing this section of my judgment.

#### *Layered structure*

5. There are two common conventions used to describe the design of communication networks – the layered protocol model, and logical channels. The layered protocol model describes systems in terms of communicating peer entities. These entities are described at different levels of abstraction, from the most abstract at the top – a user communicating with another user, to the most detailed at the bottom, the transmitter communicating physically with the receiver. Each layer logically communicates with its corresponding element at the other end of the link, but does so physically by passing data to the layer below it.
6. The lowest layer, in which the transmission occurs, is called the physical layer. The physical layer performs all the tasks related to transmission and reception of data bits over the wireless radio channel.
7. In UMTS, the layer immediately above the physical layer is called the Data Link Layer. The Data Link Layer comprises two sub-layers, the Medium

Access Control (MAC) layer and the Radio Link Control (RLC) layer. The MAC layer coordinates access to the transmission channel and passes data to the physical layer from the RLC.

### *Logical channels*

8. Different streams of communication to the terminal are considered to form different channels, where each channel has a different function or has different characteristics. These channels are “logical” in that, in reality, they are simply categorisations which the system makes of different parts of the data. Logical channels can be control channels, which carry information used to manage the system, or data channels, which carry information which forms the content of the user service. Logical channels are not the same as physical channels, although the concept – a conduit for carrying information to the receiver – is the same. Within the system, all logical channels are eventually carried over physical channels, although many logical channels are usually carried over the same physical channel by multiplexing.

### *Services*

9. A service is anything an entity provides to another entity within the system. Examples are data services, voice services and moving image services. Data rates vary significantly between services. Text message (SMS) delivery requires only a few hundred bits per second, whereas high quality streaming video will require over a megabit per second. Speech requires about 10 kbits/s, depending on the specific coding scheme used. The full rate speech coding scheme used in GSM requires 13kbit/s.

### *The radio environment*

10. The wireless environment is a harsh environment for communications. The wireless channel’s characteristics vary with time and are frequency dependent. Additionally, because many users share the same channel, there will be interference between users. These factors result in the distortion of signals transmitted over the wireless channel.
11. The key effect of distortion is to produce errors in the received bits. In a binary system, an error is defined as receiving a “1” when a “0” is transmitted, or *vice versa*. Such errors are known as “bit errors”. The larger the numbers of errors at the receiver, the higher the distortion of the finally recovered information signal.

### *Frames*

12. The bits which carry information are normally grouped by a transmitter into one or more blocks of data called a block or frame. The frames can be defined by a number of bits or by a time interval at a given transmission rate. Frames or blocks may be combined for transmission purposes into larger frames in a process called frame assembly or concatenation.

*Bit error rate*

13. The bit error rate (BER) of a transmission channel is a measure of the quality of that transmission channel. It is the number of bits that are received in error divided by the number of bits which have been transmitted over the measurement time interval. An objective of designers of radio systems is to reduce the bit error rate.

*Latency*

14. Most functions undertaken within the system operate on blocks of data. Operations therefore require that all the data for a particular block be available before the function can be performed. For this reason, longer blocks of data introduce increased delay because more data must be received before the function can be performed. This delay is called “latency”.
15. In many cases, aspects of performance (such as bit error rate) are improved by considering larger blocks of data, but such large blocks increase latency. For many services there are strict constraints on the delay that can be permitted within the system before the quality of service to the user is reduced. In the case of voice services, delays above about half a second are noticeable and disconcerting for the user. A streaming video service does not have these constraints, because latency simply causes the video to start slightly later. Data services can therefore have larger block sizes and higher latency without degrading the performance of the service.

*Interleaving*

16. Errors in the signal tend to occur in groups known as bursts. As a result, one block of data may have many errors while other blocks of data remain error free. Any error correction method would have to be designed to be able to cope with the largest number of errors occurring in any specific block. Radio systems use interleaving to spread these error bursts out. The device for doing this in the transmitter is called an interleaver. It is matched by a de-interleaver in the receiver.
17. In a simple rectangular interleaver, bits are read in to the interleaver memory horizontally and read out vertically. This is illustrated in the figure below. It can be seen that the first six bits, marked in the lighter shading, are spaced out across the transmitted frame using this method. The de-interleaver in the receiver reverses this process. If a burst of errors occurs due to fading during transmission (marked with crosses) then the de-interleaving process takes the burst in the transmitted data and breaks it up in the received data passed to the channel decoder. Each input block to the channel decoder therefore has only a proportion of the burst, which the interleaver has averaged out over the whole length of the interleaver block.

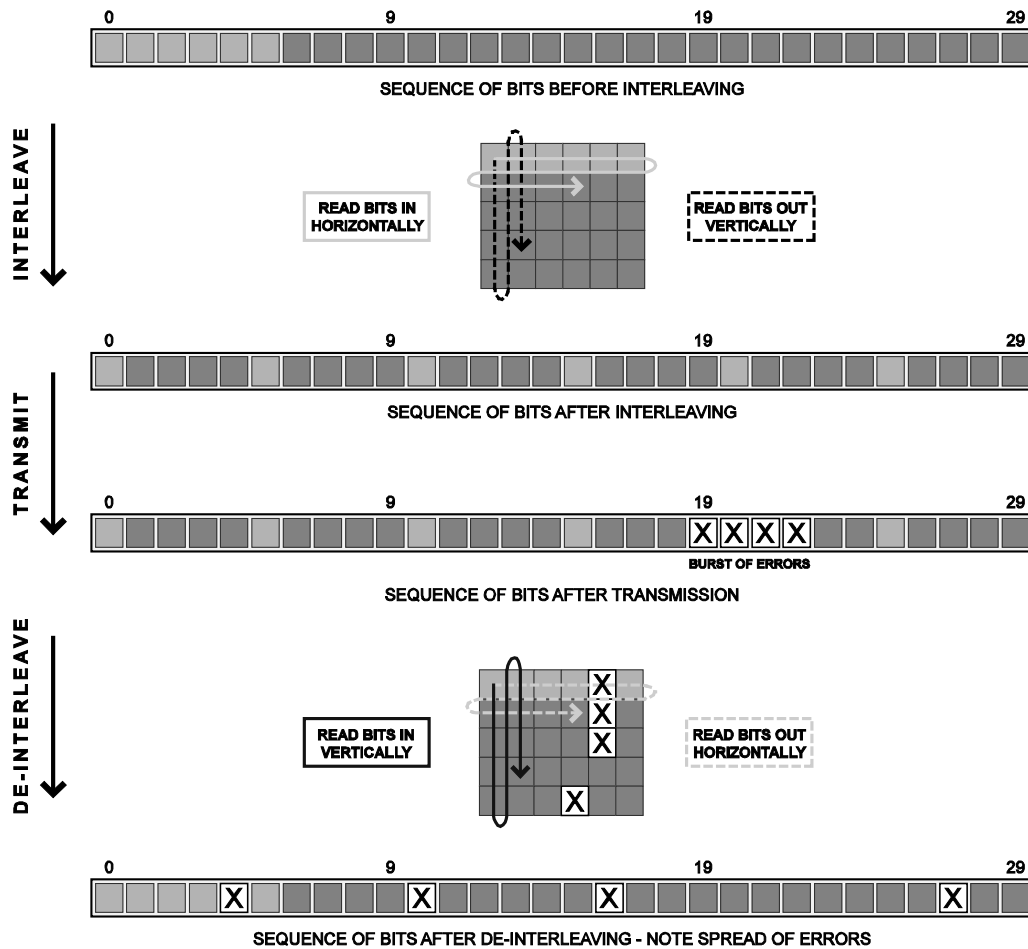


Figure 5 – Interleaving

18. It can be seen that interleaving is most effective at this averaging process if the length of the data block being interleaved is large. If the block is small, then the errors cannot be spread over many bits, and a block of errors will still have a significant impact. For this reason, performance improves as the blocks over which data is interleaved are made larger. However, interleaving introduces delay, because the entire block must be received before it can be read out of the interleaver. This introduces a delay equal to the length of the data block being interleaved. Wireless system designers have to trade off the improvement in error performance given by longer interleavers against the increased latency this causes.

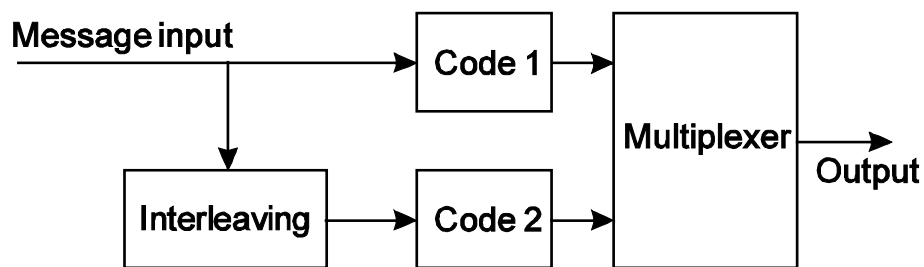
*Channel coding and error correction and detection*

19. Radio systems are capable of correcting for errors which occur in transmission. Error correcting codes work by adding additional ‘symbols’, called ‘parity symbols’, to the message being sent in order to allow errors to be distinguished. For example, an additional bit can be added to messages such that the number of 1s in the overall codeword is even. If any single error occurs, i.e. a 0 is transformed into a 1 or a 1 transformed to a 0, then the resulting number of the 1s in the codeword when received will be odd, and it is possible to ascertain that an error has occurred.

20. Whilst this simple check will not correct errors, the same principle can be used to detect the position of an error and therefore correct it.
21. Larger numbers of errors can be detected by adding more bits. However, this means that more bits have to be transmitted, reducing efficiency.
22. The process of adding these symbols to the data for the purposes of error correction is called channel coding.

*Concatenated Codes and Turbo Codes*

23. The performance of error correction can be significantly improved by using two separate error correcting codes. This can be done in series, or in parallel. In the parallel configuration, as illustrated in the figure below, two codes operate on the message data at the same time.



24. In a turbo coding system, both constituent codes are the same, but there is an interleaver so that each code operates on the message bits in a different order. Corresponding decoders operate on the data at the other end of the transmission. The aim of the interleaver is to de-correlate error patterns as much as possible so that the error patterns are different when received by the decoders. This gives each decoder the best possible chance of decoding the message in combination with the estimate from the other decoder. If the error patterns were correlated as between the two decoders, then this correlation would reduce the amount of information that could be received from the other decoder estimate. An immediate consequence of this is that the decoding will work best when either the errors themselves are random (i.e. are uncorrelated) or the interleaver is successful at effectively de-correlating them. In a radio environment, the fading channel will mean that errors will be correlated – they will occur in bursts. This means that the interleaver will need to de-correlate them. The effectiveness of this correlation is directly related to the length of the interleaver – the longer interleaver will de-correlate the errors more than shorter ones. This means that turbo codes have a higher performance in a radio channel when the interleaver length is long.

*Quality of service*

25. The term quality of service or “QoS” refers to how well a particular service is delivered. At the priority date a number of different definitions of the term existed, not all coincident. I will have to decide its meaning, as well as the meaning of the term “quality of service parameter” in the context of the patent in suit.

*Data rate*

26. The term data rate is used to describe the rate of data transmission or processing in bits per second. However, a number of different measures of data rate exist. One may specify a maximum or minimum bit rate. A service provider may guarantee a data rate at which data will be received. Data rate may also refer to the instantaneous data rate in the case of a variable data rate service, or a constant data rate in the case of a fixed data rate service. There are other usages of the term as well. Where the measure of data rate is not specified much will depend on context in attempting to understand what is meant.

**The skilled addressee of 726 and 675**

27. There was no relevant dispute that the skilled addressee in the case of both 726 and 675 is a communications engineer working as part of a team with experience of cellular systems, RF design, CDMA systems, digital signal processing and related implementation software. The engineer would be designing communications systems.
28. The layered structure of the communication system (see above) allows teams of engineers to work on individual layers. The engineer to whom the 726 patent is addressed would need to be knowledgeable about the physical layer, because that is where the coding and transmission occur, but he would also know enough about the other layers in order to do his job.

**The witnesses on 726 and 675**

29. Each side called one expert witness in relation to both 726 and 675. Samsung called Dr James Irvine and Apple called Professor Izzat Darwazeh. Dr Irvine is a Reader at the Institute of Communications and Signal Processing of the Department of Electronic and Electrical Engineering at the University of Strathclyde. Professor Darwazeh is Head of Communications and Information Systems Group and Chair of Engineering Communications at University College, London.
30. Mr Burkill made two criticisms of the evidence of Dr Irvine. First, he submitted that Dr Irvine was so steeped in “link adaptation technology” that he had a tendency to read the patent with that notion too much in mind. I do not think this is a point which really matters except to the following extent. Dr Irvine’s written evidence did use the term “link adaptation system” repeatedly in relation to the patent. Indeed he expressed the view that the essence of the invention was a link adaptation system. This gave rise to a lively debate about the meaning of this phrase, even though it is not used anywhere in the patent. In the end it emerged that Dr Irvine was using the term “link adaptation” in a very broad sense, which did not add anything to the express wording of the claim. I did not find the excursion into the meaning of link adaptation helpful. It is an illustration of the danger of deciding patent cases by reference to “some vague paraphrase based upon the extent of his disclosure in the description” and not by reference to the claim: see per Lord Hoffmann in



*Conor v Angiotech* [2008] UKHL 49 at [19]. It did not render Dr Irvine's evidence less helpful overall.

31. More importantly Mr Burkill suggested that Dr Irvine, whilst on the whole giving his evidence fairly, "*let his desire to defend Samsung's case overcome his objectivity*". I should take this opportunity soundly to reject this suggestion, which was never put to Dr Irvine in terms. The passages in Dr Irvine's cross-examination which Mr Burkill cited in support of this submission go nowhere to support a criticism of this nature.
32. Mr Burkill also sought to discount some evidence given by his own witness Professor Darwazeh which was not favourable to one aspect of Apple's case. Professor Darwazeh stated very clearly that he did not consider the 726 patent to be obvious on Samsung's construction of the claims. Accordingly, Mr Burkill submitted that the Professor must have been applying too demanding a test of obviousness, and was confusing the tests of obviousness and lack of novelty. However Mr Burkill elected not to re-examine Professor Darwazeh, which would have been the course to take if there was or might have been a misunderstanding of that nature. I am not therefore prepared to proceed on the basis that Professor Darwazeh was applying the wrong standard. The ultimate resolution of the issue of obviousness is of course a matter for me based on my analysis of the evidence as a whole, and is not solely a question for any individual witness. The fact that Professor Darwazeh was not prepared to advance a case of obviousness in his oral evidence against the claims as Samsung construed them must be given appropriate weight in that analysis.
33. Mr Carr submitted that some of Professor Darwazeh's written evidence was not supported by him in cross-examination. The focus of this criticism was the fact that Professor Darwazeh had not supported the obviousness of the 726 patent on Samsung's construction. Where the point matters, I have relied on Professor Darwazeh's oral evidence, which Mr Carr accepts was given fairly.

### **Common general knowledge**

34. Everything I have set out in the section of this judgment on the technical background would be part of the common general knowledge of the skilled team. Professor Darwazeh appeared to have a slightly extended notion of what was included in the legal concept of common general knowledge. However there was, in the end, no significant issue on the content of the common general knowledge on which either side wished to rely.

### **The disclosure of the 726 patent.**

35. Neither the 726 patent, nor the document from which it claims priority is a well drafted document. Not only have they both suffered in translation, but there is a looseness of definition and lack of clarity which must, it seems, go back to the original Korean. It is more important than ever to recall that it is the technical understanding of the skilled person, rather than the patent lawyer or grammarian, which one is seeking to extract from the document.

36. The 726 patent begins by describing the “conventional” turbo coder and decoder. In such a conventional turbo coder, the coder side includes two encoders with an interleaver between them which, as was well known, de-correlates the data. Three bit streams leave the coder: the unmodified stream, the encoded (but not interleaved) bit stream and the encoded and interleaved stream. The interleaver uses the same frame size (in bits) in this conventional encoder as the input data frame size.
37. On the decoder side, the decoder reverses the coding operation using an iterative process which improves the error correction at each cycle. Whilst the overall complexity of this aspect of the system must be kept in mind, a detailed understanding of it is not necessary for this case.
38. Paragraph [0006] of the specification explains that, because of the involvement of the interleaver, turbo codes operate on frame units of data. The operations in the decoder are made more complex for larger frame sizes. Accordingly, a larger interleaver size implies greater complexity in the decoder.
39. Paragraph [0007] of the specification explains that the data rate may vary from several Kbps to several Mbps, and that the duration of the frame length may vary from several milliseconds to several hundred milliseconds. From this it follows that the number of bits per frame may vary widely according to the data rate and the frame duration. Although the specification does not always make it clear whether the authors are talking about frame length in bits or frame length in time, the meaning in this paragraph - bits per frame - is clear.
40. The specification explains that although error correction is enhanced with a frame with a greater number of bits, the complexity in the decoder is increased. On the other hand, paragraph [0008] explains that, with too short a frame length (in bits), the interleaver cannot sufficiently de-correlate the data. This leads to less good error correction and a higher bit error rate.
41. At paragraph [0009] the specification explains that it is possible to reduce complexity in the decoder by appropriately varying the processing size of the data input to the encoder:

“independent of the data rate for the corresponding service, while fully securing the low BER required...”

This paragraph is recognising that data rate is one of the factors which affects the frame size (in bits), the other being its duration in time. For a given time length of frame, the data rate for the service will directly affect the number of bits in the frame. It is suggesting that alterations can be made to the frame size (in bits) which are not solely dependent on data rate for the service.

42. At [0010] the specification starts to introduce the invention by referring to the constituent parts of the turbo encoder, namely the first and second coder and interleaver. Both are said to encode the bits of a “superframe”. At [0011] the specification refers to the assembly of superframes, or concatenation. It says that:

“The turbo encoder makes a determination as to whether to assemble several input frames into one super frame.”

It is this “determination” which is at the heart of the invention claimed. There is an issue of construction about the word “determined” in the claim.

43. The object of the invention is stated at [0013] in these terms;

“It is, therefore, the object of the present invention to provide a channel encoding device and method for variably encoding input data frames to super frames of appropriate length according to QoS (quality of service) of data to transmit.”

Thus the method is capable of assembling varying sizes of super frame dependent on quality of service. The patentee did not include a definition of what was meant by quality of service or of the subsequently used expression “QoS parameter”. The reader is left to glean what he or she can from various references in the specification. Paragraph [0016] is the first, and most important of these:

“It is further still another aspect of the present invention to provide a turbo channel encoding/decoding device and method for determining an optimal length of the superframes by analyzing a quality of service (QoS) such as *frame length, time delay tolerance, error tolerance, receiver complexity (especially receiver memory), a data rate correspondence to a service type of input frame data to be transmitted* and combining an input data frame into super frames according to the determination.” (emphasis supplied)

44. There are a number of points to make about this passage:

- i) *Time delay tolerance* and *error tolerance* would be understood as common QoS parameters. They are measures against which a given delivered service can be judged. It is clear that the patentee regarded these measures as a QoS which could be analysed for the purposes of the determination.
- ii) It is unclear which type of *frame length* is being referred to here: bits or time. It is clear, however, that it is a characteristic of the input data stream. The reader would infer that frame length (in bits or time) is regarded by the patentee as a QoS which could be analysed for the purposes of the determination.
- iii) “[D]ata rate correspondence to a service type of input frame data to be transmitted”, a rather convoluted expression, is also recognised as a QoS parameter. “Correspondence” should read “corresponding”. It would be understood to be a data rate applicable to a particular service.

The expression would have the same meaning as the expression already encountered “*data rate for the corresponding service*”. It is not clear what measure of data rate is being used. Although the expression is very unclear, it is clear that the patentee intended this data rate to be regarded as something which could be analysed for the purposes of the determination.

45. The specification then moves on to a description of specific embodiments. Paragraph [0019] explains that communication systems of the future will have capabilities for providing a plurality of services with varying QoS characteristics and parameters. QoS parameters expressly include time delay and error rate. It goes on to explain that services may be divided into high error rate services and low error rate services, depending on the requirements of the service. It also explains that the same service may have different time delays and data rates.

46. Paragraph [0020] reads as follows:

“For example, in the image service for transmitting and receiving picture information, a data rate is 32-2048Kbps and a permissible time delay is in the range of 10-400ms: the data rate and the permissible time delay can be, however, varied according to a number of criteria including a class of the user or terminal using the service, a class of the base station providing the service, or a channel condition during the corresponding service.”

Samsung draw particular attention to the reference to “*a channel condition during the ... service*”. They point out that this passage recognises that data rate and permissible time delay may vary during a service due to changes in channel conditions. The passage is of course also discussing criteria which do not vary during transmission.

47. Paragraphs [0023] to [0047] describe the invention by reference to a block diagram, Figure 3. A dispute developed between the experts as to whether this block diagram contained any pointers towards the proper construction of claim 1 of the patent. In short, Dr Irvine saw aspects of the buffering arrangement as unnecessary unless the system was designed to cope with instantaneous variations in frame size. Professor Darwazeh was unconvinced that it would work for such variations. I will have to return to this issue in the context of construction where its relevance may be more easily understood.

48. Paragraph [0023] introduces the term “message information”. It states as follows:

“The turbo encoder shown in FIG. 3 assembles several input frames into one super frame by counting bits of the input user data in accordance with provided message information, and thereafter encodes the assembled frames with a turbo code to transmit the encoded frames

via a transmission channel. The term "message information" as used herein refers to *information about the QoS, i.e., service type, rate of data such as voice, character, image and moving picture data, size of the input data frame, permissible delay, and permissible error*. The message information is exchanged between a base station and a mobile station during a call setup and the exchange of the message information *is continued till termination of the corresponding service*. Further, *predetermined information between the base station and the mobile station predetermined during the call setup can also be varied during the corresponding service by data exchanging*. That is, the message information including information representing the size of the frame to be processed in the turbo encoder can be reset according to a rate of the data to be serviced." (emphasis supplied).

49. It would appear that message information may include parameters which have already been identified as QoS parameters ("size" of input data frame permissible delay and error rate) and parameters which have not, such as "service type". "[R]ate of data such as voice, character, image and moving picture data" is another rather convoluted expression, which, rather like the earlier "data rate correspond[ing] to a service type of input frame data to be transmitted" suggests a data rate for a particular service. There is a dispute about whether "service type" *simpliciter* can be a quality of service parameter, as opposed to merely forming part of "message information".
50. Samsung rely on this passage to show that it is contemplated by the patentee that message information (which may, at least, include quality of service parameters) should be exchanged not only during call set up but also while the call is continuing. They point out that there would be no point in doing so unless the information was *permitted to vary during transmission*. They make a similar point about the change in predetermined information in the third passage emphasised above.
51. At [0025] the patentee continues to describe the operation of his Figure 3 embodiment. It is pointed out that:

"The processing size can be different with respect to data rate or frame length"

The frame length here appears, in context, to be length in time of input frame. The processing size would appear to be a reference to the size of the superframe. At [0026] the patentee explains that the *message information* may be sent to the decoder on a separate transmission channel. However it goes on to point out that the "data size information" may be sent as "*a header of a transmission frame during data transmission*". Samsung again rely on this passage as showing that it is contemplated that there may be variations in the information transmitted. They read it as saying that every frame includes such information, but I do not think that is justified.

52. Next the patentee moves on to details of the determination of the number of frames to be assembled. It says, at [0027]:

“Referring to FIG. 3, the CPU 46 reads, from a frame assemble information storage unit 48, QoS information including information about service type of data to be transmitted, corresponding data rate, permissible delay, permissible error rate (BER or FER) and frame length, and information about service class of the base station or the mobile station. Next, the CPU 46 makes a determination to assemble the required frames and therefore must also determine the number of frames to be assembled, using the read information. Based on the determination, the CPU 46 provides a frame assemble control signal and an interleaving mode signal to the bit counter 50 and a programmable interleaver 52, respectively, to perform turbo encoding. That is, according to the QoS of the data to transmit, the CPU 46 determines how many consecutive input frames should be assembled to generate a super frame. The turbo encoder then turbo encodes data bits of the super frame. As previously stated, the QoS may include input frame length, user data rate, permissible delay, permissible error rate, etc. The size of the input frame can be determined based on input frame length and user data rate.”

The patentee has therefore introduced a third descriptor “QoS information”, which seems similar to the “message information” previously discussed. Not for the first time, the data rate is said to be one that corresponds to the service type to be transmitted. The specification is explaining that the CPU makes the crucial determination based on the QoS information which it reads, which includes service type. The penultimate sentence includes “input frame length, user data rate, permissible delay and permissible error rate” in the QoS, although this is “as previously stated”. The last sentence means that the size of the input frame in bits can be determined from its length in time and the data rate.

53. Paragraph [0029] gives a simple example. A packet data service has a frame length in time of 10ms and the encoder allows a time delay of 40 ms. The CPU can take the decision based on frame length in time (10ms) and the permissible time delay (40ms) to assemble four 10ms frames into a single superframe, thereby decreasing the bit error rate.
54. A further example is given in [0032]. It assumes a “frame size” of data input to the turbo encoder as 20480 bits/10 ms for a low BER service having a data rate of 2048Kbps. This means that the 10ms frames are filled at the rate of 2048Kbps, so as to give 20480 bits per frame. Paragraph [0033] explains that it is possible to divide this large frame to reduce complexity in the decoder. This segmentation aspect of the invention is not claimed.

55. By comparison, [0034] describes a low BER service having “a data rate of 32Kbps/10ms”. The frame size in bits is said to be 320 bits. It is said that if encoding is performed with a frame size of 2560 bits (as opposed to 320) the BER will be reduced at the expense of increased latency (80 ms as opposed to 10 ms). The skilled person would appreciate that this would involve combining 8 input frames into a superframe. All this appears to assume a fixed data rate.
56. Having described these two examples, the specification goes on in [0035] to explain the significance:

“In the mobile communication system, not all the users or mobile stations are provided with the same degree of services. Instead, the available data rate is limited according to the user class, the mobile station or the base station. In addition, the available data rate may be limited due to the memory capacity determined according to the class of the respective mobile stations. Accordingly, when the data rate is variable from 32Kbps to 2048Kbps according to the service type (or service option) and the permissible time delay also varies from 10ms to 400ms, the device according to the present invention can vary the length of the frames input to the turbo encoder according to the class of the user or mobile station, the class of the base station, service type or the channel condition while satisfying the required error rate of the corresponding service. For example, when the channel conditions [are] bad, the device according to the present invention can satisfy the error rate required by a corresponding service by increasing the length of the frames input to the turbo encoder and thereby permitting an increase in the time delay rather than increasing the transmission power.”

57. Samsung again focus on changes in the number of frames to be assembled because of channel conditions. However, the paragraph is also pointing out that different service types may have different data rates and permissible time delays. Variation because of channel conditions is just one example of a case where one might want to alter the number of frames.
58. Paragraph [0036] explains, amongst other things, that the [super] frame size “*is determined according to the user data rate, input frame length, permissible delay, permissible error rate and the channel conditions etc.*”
59. The summary at [0047] of the description of the specific embodiment by reference to Figure 3, so far as relevant, merely states:

“Thus, the novel channel transmission device 30 shown in FIG. 3 assembles the input data frames into super frames to increase the bit number N when a low BER is required from an analysis of the QoS information such

as the user's service type (e.g. voice, character, image and moving picture).”

### **The claims of 726**

60. The 726 patent contains 25 claims. Despite judicial and other encouragement, Samsung made no attempt whatsoever to identify those claims which could realistically be maintained independently if earlier claims were held invalid. This is contrary to the established practice in this court. It is worth recalling the reason for this practice. Patent actions become unmanageable if the court is called upon to decide each issue by reference to multiple potential alternative monopolies. In recognition of this fact, in some jurisdictions (including the EPO) a patentee is required to identify main and auxiliary requests. The court will then accept or reject each request depending on whether **all** the claims of the request are valid. Our practice is different. The patentee is allowed to retreat to a subsidiary claim if an earlier claim is invalid. Unless subject to constraints, this practice would allow unreasonable numbers of alternative monopolies to be litigated. Thus the practice has developed of requiring a patentee to identify the claims it may wish to put forward as realistic alternatives by way of an order made at the case management stage. The burden is not a heavy one. It is no more than a pleading requirement. It does however enable the evidence to be kept within bounds, and the issues at trial to remain focussed. It saves costs.
61. Samsung responded to the usual direction in the present case by saying that each of the 25 claims had independent validity. However, in opening the case, Mr Carr did not identify any reason why any claim other than encoder claim 1 and method claim 14 could realistically have independent validity, although he said that other claims were relevant to construction of those claims. In reply, in response to an argument on priority, he sought to rely on claim 7. I will come to that argument in its proper place.
62. Samsung’s insistence on pleading independent validity of each of the claims never had any proper basis. For example claim 2 claims features of the conventional turbo coder, which they acknowledge were part of the common general knowledge. Claims 12 and 13 claim the encoder of claim 1 installed in a base station or mobile phone. One might ask legitimately why it was not obvious to install one there.
63. I came to the conclusion that I should proceed on the basis that if claims 1 and 14 are invalid, the other claims are invalid as well. Parties who make no realistic attempt to identify independently valid claims should realise that this will be the consequence. Samsung’s reticence meant that Professor Darwazeh’s evidence had to deal with each subsidiary claim over some 34 paragraphs of his first report.
64. As neither side identified any material difference between claims 1 and 14 for any purpose, it is sufficient if I set out claim 1, which is in the following terms:



“An encoder for a mobile communication system comprising:

a central processing unit for determining a number of consecutive input frames required to combine a super frame,

according to quality of quality of service QoS parameter

which at least includes information that can define input frame length;

and a turbo encoder for turbo encoding the determined number of consecutive input frames.”

65. I also set out claim 7, which is relevant to construction:

“7. The encoder as claimed in claim 6 wherein the quality of service QoS parameter at least includes data rate, and the number of input frames to be assembled into the superframe is determined by said input frame data rate and input frame length.”

### **Issues of construction**

66. There was no dispute about the correct approach to construction of a patent specification. In *Kirin Amgen v TKT* [2005] RPC 9 the House of Lords explained that the determination of the extent of protection only involves asking what a person skilled in the art would have understood the patentee to have used the language of the claim to mean. Guidelines to assist the court in construing the patent are summarised by the Court of Appeal in *Virgin Atlantic v Premium Aircraft* [2009] EWCA Civ 1062; [2010] FSR 10 at paragraph 5, approving the statement by Lewison J (as he then was) at first instance in the same case:

“[5] One might have thought there was nothing more to say on this topic after *Kirin-Amgen v Hoechst Marion Roussel* [2005] RPC 9. The judge accurately set out the position, save that he used the old language of Art 69 EPC rather than that of the EPC 2000, a Convention now in force. The new language omits *the terms of* from Art. 69. No one suggested the amendment changes the meaning. We set out what the judge said, but using the language of the EPC 2000:

[182] The task for the court is to determine what the person skilled in the art would have understood the patentee to have been using the language of the claim to mean. The principles were summarised by Jacob LJ in *Mayne Pharma v Pharmacia Italia* [2005] EWCA Civ 137 and refined by Pumfrey J in

*Halliburton v Smith International* [2005] EWHC 1623 (Pat) following their general approval by the House of Lords in *Kirin-Amgen v Hoechst Marion Roussel* [2005] RPC 9. An abbreviated version of them is as follows:

(i) The first overarching principle is that contained in Article 69 of the European Patent Convention;

(ii) Article 69 says that the extent of protection is determined by the claims. It goes on to say that the description and drawings shall be used to interpret the claims. In short the claims are to be construed in context.

(iii) It follows that the claims are to be construed purposively—the inventor's purpose being ascertained from the description and drawings.

(iv) It further follows that the claims must not be construed as if they stood alone—the drawings and description only being used to resolve any ambiguity. Purpose is vital to the construction of claims.

(v) When ascertaining the inventor's purpose, it must be remembered that he may have several purposes depending on the level of generality of his invention. Typically, for instance, an inventor may have one, generally more than one, specific embodiment as well as a generalised concept. But there is no presumption that the patentee necessarily intended the widest possible meaning consistent with his purpose be given to the words that he used: purpose and meaning are different.

(vi) Thus purpose is not the be-all and end-all. One is still at the end of the day concerned with the meaning of the language used. Hence the other extreme of the Protocol—a mere guideline—is also ruled out by Article 69 itself. It is the terms of the claims which delineate the patentee's territory.

(vii) It follows that if the patentee has included what is obviously a deliberate limitation in his claims, it must have a meaning. One cannot disregard obviously intentional elements.

(viii) It also follows that where a patentee has used a word or phrase which, acontextually, might have a particular meaning (narrow or wide) it does not necessarily have that meaning in context.

(vii) It further follows that there is no general "doctrine of equivalents."

(viii) On the other hand purposive construction can lead to the conclusion that a technically trivial or minor difference between an element of a claim and the corresponding element of the alleged infringement nonetheless falls within the meaning of the element when read purposively. This is not because there is a doctrine of equivalents: it is because that is the fair way to read the claim in context.

(ix) Finally purposive construction leads one to eschew the kind of meticulous verbal analysis which lawyers are too often tempted by their training to indulge."

67. I would stress only two points from this summary, given the importance of the issue of construction in this case. The first is that the exercise is one of construing the language of the claims in the context of the specification. The meaning of that language is informed by the technical understanding gained from reading the specification. Thus the specification has an important role in understanding the meaning of the language used. It is not, however, a proper approach to construction to start with the specification and ask what a patentee who has made that disclosure might be intending to claim, and then to shoe-horn the meaning of the language of the claim to fit with that understanding, whatever language he has actually used. To do so would be to afford supremacy to the description over the claims, contrary to the guidance given by Article 69 EPC and its protocol.

68. The second point is this. The patentee may have described a number of embodiments or examples of increasing sophistication in the body of the specification. Having done so, the patentee has the freedom to set the generality of his claim at the level of his choosing. There is no presumption that he will have decided to pitch his claim at the level of the most sophisticated embodiment. It is the claims which will tell the skilled reader at what level the patentee has decided to stake his monopoly claim. The skilled reader would not be justified in assuming that the patentee has elected to claim the features of the most sophisticated embodiment, so as to compel the conclusion that those features are read into the claims. Equally, as subparagraph (v) in the above summary indicates, the skilled reader does not assume that the patentee is aiming at the widest possible construction consistent with his purpose.

*"for determining a number of consecutive input frames required to combine a superframe"*

69. Some notional amendment is necessary to make sense of the latter part of this phrase. In context it is clear that what is meant is either "assemble a superframe" or "combine into a superframe".

70. The focus of the debate here was on the meaning of the “*for determining*”. Samsung submitted that the claimed encoder must be suitable for determining a superframe size which varies during transmission of a service, *as well as* one which is the same during transmission of a service. They made the same submission in relation to claim 14: the channel encoding method must be suitable for determining the size of a superframe which varies during the course of a transmission *and* one which does not vary. Apple submitted that there was nothing in the language used by the patentee to impose a requirement about being able to vary the size of a superframe during the course of a transmission. Whilst the claims might cover such a system, Apple submitted that they impose no requirement that the encoder be capable of varying the size of a superframe during transmission.
71. The specification undoubtedly refers to parameters which will be fed into the CPU for the purpose of calculating the superframe size and which may vary during the course of a transmission. I have identified a number of passages where this is so in the course of my summary of the disclosure of the specification. The specification, for example, contemplates a case where the permissible time delay might change because of a change in channel conditions. A change in channel conditions, of course, might occur during transmission of a service. It is not so clear that the specification is expressly contemplating a case where such a change during transmission can be accommodated by an appropriate change in the superframe size during transmission.
72. As mentioned previously, Samsung’s expert, Dr Irvine, sought to cement the view that the apparatus described in the specification was capable of dealing with variations in superframe size during the course of a transmission by reference to the buffer arrangements in Figure 3 of the 726 patent. That figure discloses an arrangement of two buffers, each with its own sub-buffer. This double buffer arrangement allowed pre-interleaving of a super frame in one buffer whilst data was being unloaded from the other buffer. This was useful, according to Dr Irvine, in the case of a superframe size which varied during transmission, as it avoided the delay that would occur in a single buffer arrangement.
73. Professor Darwazeh accepted that a single buffer arrangement with two sub-buffers would have been satisfactory for the case where the super frame size did not vary during a single transmission. However he thought (a) that the single buffer arrangement would work satisfactorily in the case of variable frame size and (b) that the double buffer arrangement would not work satisfactorily in the case where interleaver size varied during transmission.
74. I do not accept that the double buffering arrangement was a clear indication that the patentee was considering a system in which frame size would vary during the course of a transmission. The purpose of the double buffering arrangement would not be clear to the skilled person as it is not explained in terms in the patent, and would not be clear to him from his general knowledge. If he started to think about the purpose of the second buffer, and came up with the idea that it was there in order to deal with varying frame sizes during

transmission, he would, as the evidence shows, have to solve a number of problems left unresolved by the description.

75. However, in the context of the dispute on the meaning of the term “determining”, the argument about the buffers is self-defeating. Paragraph [0061] of the specification indicates that one of the buffers may be omitted. The second buffer would therefore certainly not lead the skilled person to the conclusion that the patentee was going to make it a requirement of his claims that the system be capable of dealing with a variable frame size in the course of transmission.
76. Mr Carr put the matter in this way in his final written submissions:
- “Given that the experts agree that the technical disclosure expressly contemplates that the QoS parameters may vary during the course of a transmission of a service and that super frame size may vary during such transmission, it cannot be the intention of the patentee, objectively assessed by the person skilled in the art, to exclude such determination from the scope of all the claims.”
77. It is correct that the technical disclosure includes a case where a QoS parameter may vary during the course of a transmission of a service. For example, permissible time delay (which is expressly said to be a QoS parameter: see [0019]) is said at [0020] to be variable according to a channel condition during the service. I also agree that the skilled person would not think that Samsung have intended to exclude from the scope of their monopoly the case of an encoder which can vary the size of a superframe during the course of a transmission. Although the disclosure of doing so is anything but clear, such an encoder would still “determine” the superframe size from a value of a quality of service parameter. But the debate between the parties is not about whether the case of a superframe size which varies during transmission is excluded from the scope of the claim. The debate is about whether the claim should be read as including a requirement that the encoder must be capable of varying the size of a super frame during the course of a transmission, so that the case of an encoder which *only* determines the frame size at the start of a transmission, and not during transmission, is excluded. Samsung’s argument asks the wrong forensic question.
78. The correct question to ask, in accordance with the authorities I have cited, is what the skilled person would understand the patentee to be using the word “determine” in the claim to mean. If one asks that question, it is plain that the skilled reader would see that there is no reason to read the claims as limited in the way Samsung proposes. The specification gives examples of operation in which there is no reason to suppose that the super frame size would change during transmission. The number of frames assembled would nevertheless still be determined from quality of service parameters.
79. Samsung’s argument offends the principles of claim construction which I have highlighted above. It proceeds from a finding that a particular mode of

operating the device is arguably contemplated in the specification directly to a conclusion that the device claimed must be capable of so operating. In fact the specification contemplates making a determination based on values of, for example, permissible time delay and permissible bit error rate at the start of a call. Although these quantities may be variable in one sense, there is no reason at all to suppose they will change during the course of a transmission. The device may make a series of transmissions and make the necessary determination at the start of each call. It is Samsung's construction and not Apple's which excludes from the scope of the claim embodiments which the skilled person would understand the patentee to be intending to claim.

80. It follows that I reject Samsung's argument about the scope of this term "determining" in the unamended claim.

### **Samsung's amendment**

81. In order to improve their position in relation to this feature of the claim in the event that I concluded that the claim did not incorporate a requirement that the encoder is capable of dealing with frame sizes which vary during transmission, Samsung proposed a conditional amendment to claims 1 and 14. So far as material the claims as finally proposed would read:

#### Claim 1

"... a central processing unit for determining a number of consecutive input frames required to combine a super frame, according to a variable quality of service QoS parameter"

#### Claim 14

"...determining the number of consecutive input frames required to assemble a super frame, according to a variable quality of service QoS parameter"

82. It is notable that, unlike Samsung's construction of the claims, the amendment does not go as far as to express the requirement that the parameter varies in the course of a transmission. All the quality of service parameters mentioned in the specification are variables, at least in a broad sense. But this does not mean that the encoder is required to respond to variations in the parameter during the course of a transmission. In my judgment the amendment does not achieve Samsung's aim in this litigation of creating a claim to an encoder which responds to variations in QoS during the course of a transmission. It merely states that the parameters in question are variable.

*"an encoder ... for determining"*

83. Apple submit that the encoder is something present in the physical layer, and that accordingly, in deciding whether there is infringement, no account may be taken of anything which occurs in other, higher layers.

84. I can deal with this point more shortly. Apple's expert, Professor Darwazeh was of the view that it was only relevant to look at the physical layer because the specification did not explain in any more detail how the determination was done. He thought that if the specification had explained more about how that determination was done one might have looked at the higher layers. I do not think that this evidence reflects a correct approach to construction. The patent is not concerned with the layer in which the processes take place. The patent is written at a different level of generality, requiring the determination to be performed by a CPU. Provided that is the case, the determination may be found anywhere in the layered structure, including in layers above the physical layer.

*"according to a quality of service QoS parameter"*

85. It is common ground that the patent regards bit error rate and permissible time delay as QoS parameters. Samsung submit that service type is not a QoS parameter. Apple disagree. Apple, for their part, submit that instantaneous input data rate is not a quality of service parameter. Samsung disagree. Both sides sought to draw a distinction between a quality of service parameter and the service itself. Thus Apple submitted that the instantaneous data rate was not a quality of service parameter, because it was the service itself. Samsung submitted that service type was not a quality of service parameter because it was the service itself. Rather than ask these individual questions, it is better to try and understand what the patentee was using the term QoS parameter to mean.

86. Outside the context of the 726 patent the term "quality of service" has been given a variety of definitions. For example, in his first expert report, Dr Irvine said this, amongst other things about quality of service:

*"One of the best and most straightforward definitions of quality of service is given by Pierre Johnson (2004) ... as "QoS (Quality of Service) can be defined as the quantitative and qualitative characteristics that are necessary to achieve a level of functionality and end-user satisfaction with a service." He continues: "QoS can be thought of as providing a measure of how faithfully the various media types are reproduced, as well as how reliably and responsively the reproduction can be counted upon." Quality of service speaks to the characteristics of a particular service, rather than what the particular service is."*

87. This led Dr Irvine on to explain more about quality of service characteristics:

*"44. ... Very common QoS characteristics are bit rate (or data rate), bit error rate (BER), the amount of data corruption, and transfer delay (the latency in transmission of data). These characteristics are usually given as limits (i.e., the BER will not exceed  $10^{-6}$ ), and also bounds on variability."*

88. In his analysis of infringement, Dr Irvine did not identify instantaneous data rate as a quality of service parameter. Instead he relied on *permitted* instantaneous bit rate and *maximum* bit rate, both of which place limits or bounds on the bit rate as contrasted with the measured bit rate itself. Moreover in his analysis of the patent he explained that service type was not a QoS parameter in the following words:

“This is because a service type, in the form of a categorisation of service between voice, data and messaging, etc, is not a form of quality of service, but rather the service itself. A QoS parameter is something which the performance of the service can be judged against.”

89. In his third report Dr Irvine analysed the ITU definition in the following way:

“As I discussed in my first report, the ITU definition of Quality of Service is ... “[the] totality of characteristics of a telecommunications service that bear on its ability to satisfy stated and implied needs of the user of the service.” Breaking this definition down we have:

a) A characteristic of service – this gives a parameter;

b) A characteristic which bears on its ability to deliver service – this gives a QoS parameter; and

c) A set target or threshold for such a characteristic – this gives a particular value of the QoS parameter.”

90. Analysed in this way, Dr Irvine’s view was that bit rate was a QoS parameter. The actual instantaneous data rate could then be regarded as a particular value of that QoS parameter. Thus, in his third report, Dr Irvine now identifies instantaneous data rate as a quality of service parameter.

91. I have to say I did not find Dr Irvine’s analysis in his first and third reports, and as explained by him in his oral evidence, at all convincing. As Mr Burkill’s cross examination demonstrated, if a quality of service parameter is something against which a service can be judged, it is impossible to see how instantaneous data rate can be a quality of service parameter. Nothing is judged against an instantaneous data rate. Not surprisingly, Dr Irvine’s cited definition did not, in the end, feature largely in Samsung’s submissions about what QoS parameter meant.

92. In my judgment these definitions, whilst providing helpful background, do not get to the route of the way in which the patentee is using the term QoS parameter in the context of the patent. The specification makes it clear that the CPU analyses data rate in the determination of the number of frames to assemble into a superframe. Although the body of the specification appears to be based on the assumption that the data rate is one which corresponds to or is associated with a particular service (so as to bring to the mind of the skilled



person some measure of data rate such as maximum or guaranteed bit rate, or a fixed data rate) the claims, in particular claim 7, do not appear to contain the same limitation. That claim refers to data rate generally, and to “input frame data rate” in particular, as a QoS parameter. This latter expression does not, at least to my mind, sit comfortably with the notion of a threshold or target. Thus, in my judgment, the claims would be understood by the skilled person to be using the term QoS parameter in a wider sense, so as to include actual data rate (whether constant or varying) and not merely some specified threshold or target. Although this would be contrary to the skilled person’s normal understanding of the term, it is what the claim appears to be saying.

93. More generally the patentee appears to be making it clear that any parameter which may have an effect of the user’s satisfaction with the service received is within the term quality of service parameter. Thus he feels free to say, in the body of the specification at [0016], that receiver complexity (especially receiver memory) is a quality of service parameter. At [0035] and [0036] he explains that the superframe size may be determined according to class of user of mobile station, class of base station, or channel conditions. Accordingly I hold that QoS parameter, as used in the patent, extends to anything which may have an impact on the user’s satisfaction with the service received.
94. Service type (for example whether a service is voice or data) may have associated requirements of bit error rate and latency. A CPU could, in accordance with the invention of 726, be required to concatenate different numbers of frames according to an indication of service type. The specification makes it very clear, for example in paragraphs [0025], [0027], [0037] and [0047] that the CPU operates on information about service type. But, in my judgment, (and in accordance with Samsung’s case) the skilled person would not understand service type to be a quality of service parameter as that term is used in the patent. The type of service is not something which, on its own, can impact on the user’s satisfaction with the service delivered.
95. Accordingly, in my judgment, the patentee is using the term QoS parameter in the very broadest sense to include anything which may affect the user’s satisfaction with the service received. On this basis, instantaneous source data rate does, but service type does not fall within the term “quality of service parameter”. In particular the term is not limited to parameters against which the service can be judged, or limited to parameters which can be derived from the type of service.

*“which at least includes information that can define input frame length”*

96. This is a puzzling feature of claim 1. There is no corresponding feature in claim 14. The parties are divided over whether the input frame length referred to is the length of the input frame or the length of the assembled super frame. Apple contends for the former construction and Samsung for the latter.
97. It will be recalled that this phrase is to be found in the claim after the requirement that the CPU determines a number of consecutive input frames to assemble/combine into a super frame. So at that stage at least the draughtsman was drawing a clear distinction between input frames and the

super frames, the former being components of the latter. Moreover the phrase comes before a further phrase in which the term “input frames” again refers to the component parts. It would follow that, if Samsung are right, then the term “input frame” in the phrase under consideration has a different meaning from the two other occurrences of the identical phrase in the claim. Samsung’s reading requires the skilled reader to substitute the term “super frame” for “input frame”, even though the former term is used elsewhere in the claim. Further, Samsung’s reading would involve a further conundrum. The claim would require both that the number of input frames to combine into a super frame is *determined* according to a quality of service parameter, and, separately, that the quality of service parameter must *define* the length of a superframe. It is not at all clear what is added by the second requirement.

98. Both experts gave some thought to what this phrase means, and both were cross-examined about it. Professor Darwazeh said he found the phrase difficult to understand as he understood that the patent to be proposing a way of determining super frame size, not input frame length. However, the feature in question, if construed as Apple contend, does not mean that the patent no longer relates to a way of determining super frame size: that feature remains. The feature would introduce an additional requirement for the content of the QoS parameter, namely that it must define input frame length.
99. Dr Irvine rejected the suggestion that this feature could be referring to input frame length, because that was too obvious. I do not see why that is the case. In any event the reasoning displays an incorrect approach to construction.
100. The claim appears to be contemplating that the QoS parameter could be only the input frame length, or some information which defines input frame length. As I have indicated, the specification is not clear about how it uses the term input frame length as between duration and number of bits. Nevertheless it is clear that frame length (in whichever sense) can be a quality of service parameter: see paragraph [0016].
101. Claims 6 also refers to information that “can define...”. It requires the quality of service QoS parameter to include “an information that can define data size of a frame”. It is no clearer in this claim whether the frame referred to is the super frame or the input frame. Characteristic of the lamentable drafting of the document as a whole, claim 6 does not distinguish between input frames and superframes. If it is the input frame which is intended, then when read with claim 1 it is making clear that the information in the QoS parameter must include input frame size in bits. If it is referring to the super frame, it is requiring that the information should be sufficient to define the size of the superframe in bits.
102. Claim 7 imposes further requirements on the contents of the QoS parameter. I have set out the claim above. The QoS parameter must now include data rate, and the number of input frames to be assembled into the superframe is determined by *said input frame data rate* and input frame length.

103. This claim makes it clear, along with the other points I have noted above, that input frame length in claim 1 must be referring to the input frame and cannot be referring to the superframe.

### **Entitlement to priority**

#### *The law*

104. In *Medimmune Limited v Novartis Pharmaceuticals Limited* the Court of Appeal summarised the law on entitlement to priority in this way:

“151. Section 5(2)(a) of the Patents Act 1977 provides that an invention is entitled to priority if it is supported by matter disclosed in the priority document. By section 130(7) of the Act, section 5 is to be interpreted as having the same effect as the corresponding provisions of Article 87(1) of the European Patent Convention. Article 87(1) says that priority may be derived from an earlier application in respect of the "same invention".

152. The requirement that the earlier application must be in respect of the same invention was explained by the Enlarged Board of Appeal of the EPO in *G02/98 Same Invention*, [2001] OJ EPO 413; [2002] EPOR 167:

"The requirement for claiming priority of 'the same invention', referred to in Article 87(1) EPC, means that priority of a previous application in respect of a claim in a European patent application in accordance with Article 88 EPC is to be acknowledged only if the skilled person can derive the subject-matter of the claim directly and unambiguously, using common general knowledge, from the previous application as a whole."

153. The approach to be adopted was elaborated by this court in *Unilin Beheer v Berry Floor* [2004] EWCA (Civ) 1021; [2005] FSR 6 at [48]:

"48. ....The approach is not formulaic: priority is a question about technical disclosure, explicit or implicit. Is there enough in the priority document to give the skilled man essentially the same information as forms the subject of the claim and enables him to work the invention in accordance with that claim.

154. In *Abbott Laboratories Ltd v Evysio Medical Devices plc* [2008] EWHC 800 (Pat), I added this:

"228. So the important thing is not the consistency clause or the claims of the priority document but whether the disclosure as a whole is enabling and effectively gives the skilled person what is in the claim whose priority is in question. I would add that it must "give" it directly and unambiguously. It is not sufficient that it may be an obvious development of what is disclosed."

105. In *Unilin* Jacob LJ discussed the extent to which priority could be lost if the invention described in the priority document included features A, B and C, but was claimed in the patent with only two of those features. Such a case was discussed as part of the reasoning in *G02/98 Same Invention*, [2001] OJ EPO 413; [2002] EPOR 167, cited in *Medimmune*. At [61] Jacob LJ said this:

"Mr Carr also relied on those passages of G02/98 quoted above. He submitted that here, just as in the Board's discussion, there were three features, A+B+C (free of play, lip length limitation, and minimum thickness). They are disclosed in combination – hence, he says, a claim to one without the other two cannot have priority. I would reject that submission too. The discussion at this point in the Board's reasoning is in danger of being considered in too abstract a way. Helpful though it was in the Board's reaching its ultimate conclusion, what really matters is the conclusion itself. The fact of the matter is that when features A+B+C are disclosed, a lot must turn on what they actually are. Some inventions consist of a combination of features – the invention consists in the very idea of putting them together. In other cases that is simply not so – the features are independent one from the other. Whether, given a disclosure of A+B+C, there is also a disclosure of A or B or C independently depends on substance, not a formula. The ultimate question is simply whether the skilled man can derive the subject-matter of the claim from the priority document as a whole."

106. If I may summarise, the task for the court is therefore:

- (a) to read and understand, through the eyes of the skilled person, the disclosure of the priority document as a whole;
- (b) to determine the subject matter of the relevant claim;
- (c) to decide whether, as a matter of substance not of form, the subject matter of the claim can be derived directly and unambiguously from the disclosure of the priority document.

107. It follows from the authorities cited above that the subject matter of a claim is not the same thing as the scope of the monopoly it claims. Thus, the test for determining priority is not the same as that for novelty. In determining novelty one simply asks whether that which is described in an earlier document would, directly and unambiguously, fall within the monopoly granted by the patent claims. To put it another way, the issue is whether the earlier disclosure would infringe: see *Smithkline Beecham PLC's Patent* [2005] UKHL 59; [2006] RPC 10. That the law is different for priority can be illustrated by the example in *Unilin I* I have quoted above. The Court of Appeal there recognised that the disclosure of A+B+C may in some circumstances not provide priority for a claim to or A or B alone or to A+B. By contrast, the disclosure of A+B+C will normally deprive a claim to A, B or A+B of novelty. The additional presence of other features in the disclosure would not matter. Applying the infringement test, A+B+C will still infringe, whether the claim is to A, B or A+B. When testing for priority one must therefore guard against simply asking whether the features called for by the claim are present in the priority document. The test for claiming priority in respect of the same invention has more substance, and is less formal, than that.

*Apple's pleaded challenge to the priority of the claims of 726 as granted*

108. Apple's pleaded objections to priority were that the priority document did not give the skilled person enough information in respect of the following two features:

“according to a quality of service parameter”;

“determining a number of consecutive input frames required to combine a super frame, according to a quality of service parameter”.

*The disclosure of the priority document for 726*

109. 726 claims priority from Korean national patent application No 11380/98. It is necessary to review its disclosure without knowledge of the contents of the patent, and to see what it discloses clearly and unambiguously.

110. The priority document begins by referring to a conventional turbo encoder. In this connection it refers to a paper in the Korean Electronic Society/Telecommunications Society dated 17<sup>th</sup> April 1997 (“the KES paper”).

111. Two paragraphs on page 3 make the point that, firstly, error performance is increased as the frame length of the input data becomes longer and, secondly, that if the input frame is too short the turbo encoder cannot sufficiently decorrelate the data. Error performance suffers accordingly. The priority document then says that:

“... it is possible to decrease the required calculations and memory capacity for decoding by appropriately varying the frame size of the data input to the turbo

encoder while fully securing the high BER required in the communication system.”

112. Under the heading “Substantial Matter of the Invention” on page 4, the priority document states two objects in the following terms:

“It is, therefore, an object of the present invention to provide a channel encoding device and method for variably encoding input data frames to sub or super frames of an N-bit length *according to service quality of user data and a data transmission rate.*”

It is another object of the present invention to provide a channel decoding device and method for decoding encoded frame data whose frame length is appropriately varied *according to service quality of user data and a data transmission rate.*” (emphasis supplied)

113. These objects both refer to creating super frames according to “service quality of user data” and “a data transmission rate”. There is an issue about whether “service quality of user data” means “service type” or “quality of service”. At page 5 the priority document states:

“To achieve the above objects, a turbo channel encoding/decoding method for processing data at high transmission rate includes the steps of: analysing user service characteristics including a data rate and a service type, of input data frame, and setting the length of the sub/super frame; and disassembling or assembling the input data frame into the set length of the sub/super frame to encode and decode turbo codes”

114. So, here, the two things which are analysed are data rate and service type. The priority document then moves on to a description of the preferred embodiment. It explains that the encoder shown in Figure 3 assembles several input frames into a super frame “*by counting bits of the input user data in accordance with provided message information*” and thereafter encodes the super frame for transmission. The term “*message information*” refers to

“information about a service type such as voice, character, image and moving picture data and a data rate”

115. So, again, the message information is information about service type and a data rate.

116. The document goes on to explain (passage bridging pages 5 and 6) that user data such as character, image and moving picture data has a rate of over several tens of Kbps, as distinguished from voice data having a much lower data rate of the order of several Kbps. It also explains that voice, character,

image and moving picture data are typically encoded with fixed frame lengths of 10ms, 20ms, 80ms and 40ms respectively. It continues (on page 6):

“A central processing unit transfers information about the service type of the user data to be transmitted (e.g. voice, character, image or moving picture) and the data rate to a message information receiver 108 via a message information transmitter 44.”

117. The message information may also be sent by loading it into a head area during transmission.
118. In the second complete paragraph on page 6 the specification states that the CPU reads code commands “*for a frame length according to a service type of data to be transmitted and a corresponding data rate*”.
119. On page 8, having discussed some examples (voice, character, image and moving picture data and packet data) the document says (ignoring the sub-frame case):

“That is, the frame assemble information storage unit 48 stores frame assemble information for increasing the length N of the super frame for a service requiring the low BER and for decreasing the length N of the super frame for a service requiring a short time delay and a high BER. The CPU 46 reads the frame assemble information ... according to the service type and frame length of the input data.”

120. The paragraph on page 8 which I have set out above explains the way in which service type is taken into account in deciding on the length of the super frame. A service which requires a low BER (but can tolerate a longer time delay) is given a super frame with a greater number of frames combined, whilst a service which requires a short time delay but can tolerate a high BER gets a super frame with a smaller number of frames combined. In each case it is the service type which determines the number of frames, having regard to the requirements of that service for BER tolerance and permissible latency.
121. Once the skilled reader has understood the significance of service type in this way, the passage at the top of page 5 makes sense. The encoder is there described as analysing “user service characteristics, including a data rate and a service type”. This understanding also helps to explain the objects clauses on page 4 and their use of “service quality of user data”. They are all driving at the fact that the service type may have different requirements in respect of, in particular, BER and latency which should be reflected in the number frames to be combined into a super frame.
122. In summary the disclosure of the priority document as a whole is that data rate (or the input frame length) and service type determine the number of frames to assemble into a superframe. Service type is taken into account because of the different requirements of each service in respect of BER and latency.

*The subject matter of claim 1*

123. The subject matter of claim 1 is not limited to using data rate, input frame length and service type to determine the number of frames to assemble into a superframe. The subject matter of claim 1 is the use of a QoS parameter to determine the number of frames. As I have construed that term, it extends to any parameter which may affect the quality of service delivered to the user. The QoS parameter must include input frame length (as I have construed that term) or information which can define input frame length, such as, at least in some circumstances, a data rate.
124. Quite apart from its general meaning (anything which can affect the quality of service received by the user) the term QoS parameter as used in claim 1, once understood by reference to [0016], expressly includes “receiver complexity (especially receiver memory)”. Moreover, once understood by reference to [0020], [0035] and [0036], the term expressly includes a class of user or terminal using the service, a class of base station providing the service or a channel condition during the service.

*Is the subject matter of claim 1 derivable directly and unambiguously from the disclosure of the priority document?*

125. Samsung contended that the priority document clearly disclosed that the number of input frames to combine into a super frame is determined according to data rate and service type. Service type was related to frame length (in time) as the priority document made clear. Different data rates with a fixed duration of frame length would result in different numbers of frames being combined into a super frame. This in turn will affect BER and latency, and thus the quality of service. The priority document also explains that the criteria for calculating the number of input frames to combine into a super frame were BER and latency, because these were the factors which set the frame assemble control signal. These are commonly recognised quality of service parameters. Therefore the subject matter of claim 1 is clearly and unambiguously disclosed by the priority document.
126. I do not accept that this reasoning leads to the stated conclusion. There is no direct and unambiguous teaching in the priority document that one determines the number of frames to assemble into a superframe based on anything other than data rate, input frame length and service type. This does not provide a basis for the subject matter of claim 1, which includes the use of any parameter whatsoever which may affect the quality of service received by the user. Service type is not a quality of service parameter. The only disclosure of the use of BER and latency is because, in setting the number of frames to assemble based on service type, the BER and latency requirement *for those services*, is taken into account. There is no general disclosure of the use of BER and latency, uncoupled from a service type. Although data rate and input frame length are in fact quality of service parameters, because they may affect the user’s satisfaction with the service received, their role in the priority document is specific: they are characteristics of the data stream which is to be encoded. They would not be seen as exemplars of a general class of parameters which may impact on the user’s satisfaction with the service



received, and which can be wholly independent of the data stream being transmitted.

127. Samsung contended that the disclosure of the priority document did go further, at least so far as receiver complexity is concerned. They drew attention to the sentence on page 3 of the priority document which they contended provides support:

“That is, when the frame length of the input frame is longer, the turbo decoder structured as shown in Figure 2 requires additional calculations and memory to perform encoding and decoding”.

128. I do not think that this sentence, or any other passage in the specification, provides support for the use of receiver complexity or memory as a parameter which determines the number of frames to combine. Indeed the whole teaching of the priority document is that this number is based on the data rate and the service type, characteristics of the data stream being transmitted. Receiver complexity and memory size are independent of both these matters.
129. There is also no reference in the priority document to using channel conditions, or information derived from channel conditions, type of base station or user class to vary the number of frames.
130. Samsung contend that all this is mere semantics. The disclosure in the priority document of the use of BER and latency is a disclosure of the use of a quality of service parameter. So the claim is just giving a name to something actually disclosed. It is of course the case that the claims of a patent may, in many cases, be generalised from the specific disclosure in a priority document without loss of priority. A “nail” in the priority document may provide support for “fixing means” in the claim of the patent without loss of priority. That will be so where the skilled person could derive such a generalisation directly and unambiguously from the disclosure. But the choice of “QoS parameter” to represent “data rate” or “frame length” uncoupled from service type is not an example of such a generalisation. No generalisation of those specific terms could arrive at the notion of making the determination based on matters independent of the data stream being transmitted.
131. In my judgment, the subject of matter of claim 1 is not directly and unambiguously derivable from the priority document. The priority document only discloses the use of data rate/frame length and information derived from the service type in the determination of the number of frames. The priority document does not disclose the use of parameters independent of the datastream being transmitted, such as information derived from channel conditions or aspects of the receiver, base station and user class. Yet these are clearly and as a matter of substance part of the subject matter of claim 1.
132. Samsung offered to amend to deal with the point on receiver complexity in the event that I came to this conclusion. But I do not think that such an amendment gets to the route of the problem. The content of claim 1, and in particular of the term QoS parameter, would remain the same.

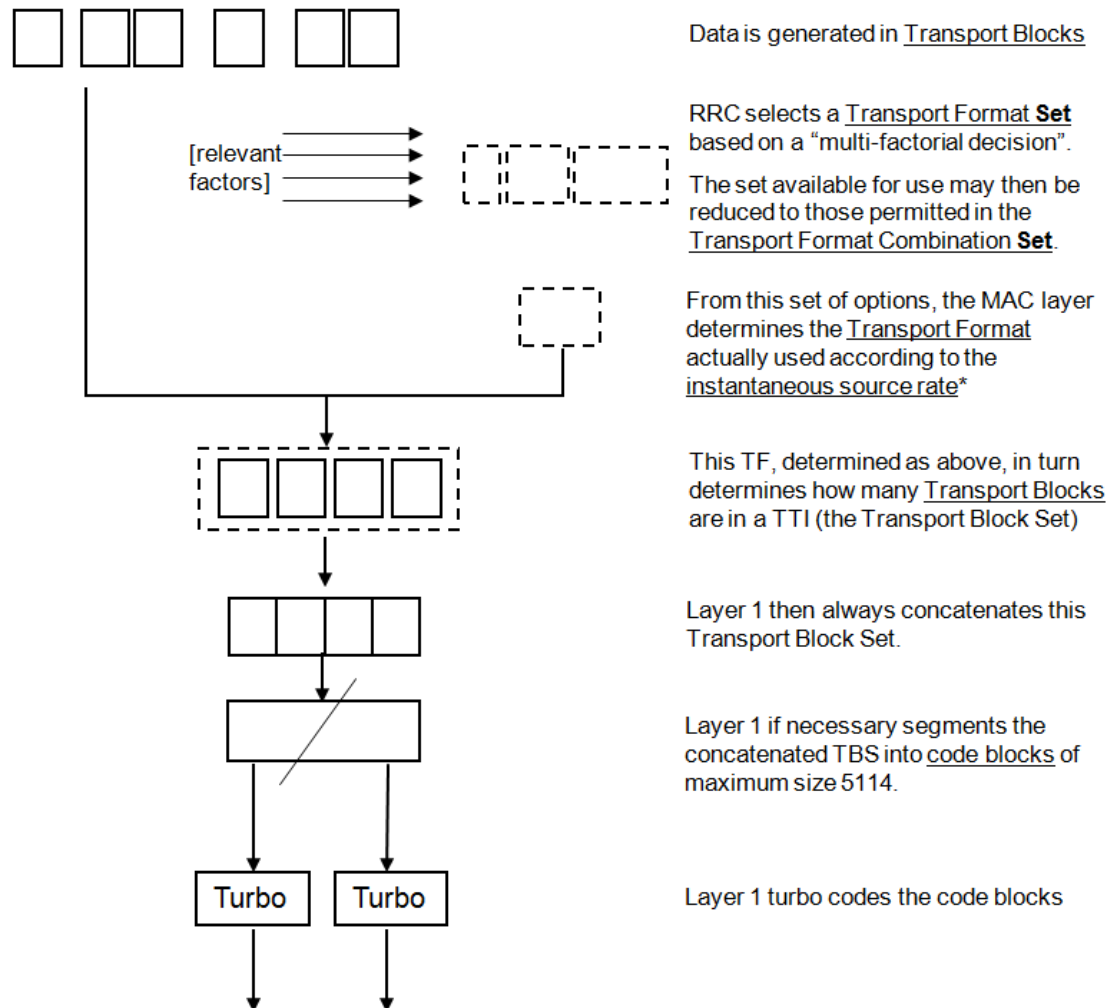
133. A point which did not emerge clearly from Apple's pleading or skeleton argument on the issue of priority was that the priority document consistently taught that the number of frames to be combined into a super frame was to be determined according to **both** a data rate and a service type, whereas claim 1 of the patent requires only a single parameter, namely information that can define input frame length. It is not until claim 7 that one has a claim which requires both a data rate and an input frame length to be used for determining the number of frames to be combined. This point - two parameters not one - is a different way of approaching entitlement to priority.
134. I do not think it is fair to allow Apple to rely on this point, to which there may well be an answer. The answer may depend on the resolution of the issue considered by Jacob LJ in *Unilin* concerning whether the deletion of a feature presented as part of a combination in a priority document can be claimed in the absence of that feature without loss of priority. It is a fact sensitive question. The point was raised after I had confined Samsung to reliance on claim 1 as granted or proposed to be amended, and probably arose from some questions I put to Mr Carr in the course of his opening. If I were now to allow Apple to rely on this point, Samsung would, with some justification, want to rely on claim 7, which in turn would give rise to different questions on validity and infringement which have not been expressly addressed. The better and proportionate course in the circumstances is to confine both parties to their opening positions.
135. I conclude that claim 1 as granted and as proposed to be amended, as I have construed them, are not entitled to priority.
136. After I had prepared the draft of this section of the judgment, Apple's solicitors sent me a copy of a preliminary opinion issued by the Bundespatentgericht (the German Federal Patent Court) dated 17<sup>th</sup> January 2013, in the corresponding validity case in Germany. The preliminary opinion deals, among other things, with the issue of priority. The trial in Germany has yet to take place, and the opinion is expressed in language which repeatedly stresses its provisional nature. Whilst the opinion appears to accord in its result with the conclusion I have reached, I mention it only to record that, I had reached my decision before I received it. Moreover, without intending any disrespect to the Bundespatentgericht, because of the expressed provisional nature of the opinion, I would not in any event have thought it right to take account of it in reaching my decision.

### **Infringement**

137. Samsung's case of infringement is based on the fact that the accused Apple devices are said to be compliant with the UMTS standard. Apple advance no independent case of non-infringement. The UMTS standard is of course enormously complex, but for present purposes only a very limited part of it is relevant.
138. In UMTS each service is delivered through a Transport Channel. Each Transport Channel operates on data organised into a Transport Format, which dictates the number of Transport Blocks which will be processed in a

Transmission Time Interval. Each Transport Channel is allocated a Transport Format Set, which consists of a set of potential transport format. A sub-set of combinations for each Transport Channel in use is authorised from the possible Transport Formats. This is the Transport Format Combination Set. The MAC layer selects a particular Transport Format Combination from the Transport Format Combination Set for use in a given Transmission Time Interval.

139. This scheme was well illustrated in a document produced by Mr Burkill to which Dr Irvine agreed in cross examination, and which I reproduce below:



140. Samsung’s case of infringement is that instantaneous source data rate is a quality of service parameter, and it is used to determine the number of blocks or frames which are combined (concatenated) for turbo coding. In order to make this case, Samsung have to rely on processes which occur in the MAC layer, that is above the physical layer or Layer 1 in the upper part of the diagram.

141. Samsung also advance alternative or additional cases based on other parameters which are shown in the diagram as “relevant factors” used to choose the Transport Format Set. These are (a) permitted instantaneous data rate, (b) maximum bit rate, (c) priority, and (d) BER/latency.

142. Apple's answer to the primary case of infringement is twofold. First Apple submit that instantaneous source data rate is not a QoS parameter. Second they submit that even if instantaneous source data rate is a QoS parameter, it is not used in the physical layer to determine the number of blocks to concatenate. It is used in the MAC layer.
143. Both points are points of construction which I have dealt with above. In my judgment, neither provides an answer to the allegation of infringement of claims 1 and 14. The instantaneous data rate is something which can affect the quality of the service received by the user. The claims are not concerned with where in the stack the determination occurs.

*Decision of the Landgericht Mannheim dated 20<sup>th</sup> January 2012*

144. On the first issue I am reaching a different conclusion from that reached by the Landgericht Mannheim (Judges Voss, Schmidt and Tochtermann) in the corresponding infringement case tried in Germany. That court was able to conclude that for data rate to be a quality of service parameter it had to be a data rate connected with a particular service. The court was plainly influenced in arriving at that construction by a consideration that the claims would be obvious if not construed in that way. The court said that if the wide construction contended for by Samsung was adopted, "*the technical teaching characterising the crux of the invention would be reduced to a mere self evident step*". Our courts have not been so willing to use considerations of obviousness as an aid to construction of claims. This is enough to explain why I have not felt able to reach the same conclusion, although, as will appear, the wider construction which I have adopted has consequences for the validity of the patent.

**Validity**

145. Samsung accept that, because of intervening prior art between the claimed priority date and the filing date of 726, the patent is invalid if it is not entitled to priority. As I have concluded that the relevant claims are not entitled to priority, there is agreement that the patent is invalid. I need therefore say no more about the details of the invalidity attack based on the intervening prior art. I will deal briefly with the attack based on obviousness, in case I am wrong and the claims are entitled to the earlier priority date.

**Obviousness**

146. Apple contend that the 726 patent is obvious over two prior art citations. The first is an article by Bömer and others entitled "*A CDMA Radio Link with 'Turbo-Decoding': Concept and Performance Evaluation*" ("Bömer"). The second is an article by Valenti and Woerner entitled "*Variable Latency Turbo Codes for Wireless Multimedia Communications*" ("Valenti").

*Law*

147. There was no dispute about the approach to obviousness. In *Conor v Angiotech* [2008] UKHL 49; [2008] RPC 28 at [42] Lord Hoffmann approved

the following statement by Kitchin J in *Generics (UK) Ltd v H Lundbeck A/S* [2007] RPC 32 at [72]:

"The question of obviousness must be considered on the facts of each case. The court must consider the weight to be attached to any particular factor in the light of all the relevant circumstances. These may include such matters as the motive to find a solution to the problem the patent addresses, the number and extent of the possible avenues of research, the effort involved in pursuing them and the expectation of success."

148. It is convenient to address the question of obviousness by using the structured approach explained by the Court of Appeal in *Pozzoli v BDMO* [2007] EWCA Civ 588; [2007] FSR 37. This involves the following steps:

“(1)(a) Identify the notional "person skilled in the art"”

(b) Identify the relevant common general knowledge of that person;

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it;

(3) Identify what, if any, differences exist between the matter cited as forming part of the "state of the art" and the inventive concept of the claim or the claim as construed;

(4) Viewed without any knowledge of the alleged invention as claimed, do those differences constitute steps which would have been obvious to the person skilled in the art or do they require any degree of invention?”

149. I have identified the person skilled in the art and the common general knowledge above. It is convenient to take the inventive concept of claim 1 as proposed to be amended, as I have construed it, for the purposes of assessing obviousness.

*Obvious over Bömer?*

150. Bömer describes simulations directed at a radio link with turbo decoding. It recognises that third generation mobile radio communications will require speech as well as data. Thus “*very low delay speech or data transmission with very low bit error rates (BERs) have to be provided*”.

151. Bömer therefore uses different size interleavers for speech and data services. Thus for the speech service, Bömer uses only one input frame as the interleaver size, whereas for the data service he concatenates 4 input frames.

152. Dr Irvine accepted that Bömer discloses the idea of using turbo coding for speech and data, and tuning via the interleaver size to get the quality of service you require.
153. Bömer gives the skilled person a concept, no more and no less. One difference between the disclosure of Bömer and the inventive concept is that, in accordance with Bömer, one determines super frame size according to service type, rather than the underlying QoS parameter. A second difference, at least so far as claim 1 is concerned, is that the inventive concept calls for a single apparatus capable of determining super frame size from the QoS parameter.
154. Dr Irvine accepted, however, that once one has the idea of using service type to determine super frame size, the service type implicitly carried with it the low BER or low time delay parameter of that particular service. One would therefore be using a QoS parameter, albeit that associated with the relevant service type, to determine the number of frames to assemble. Moreover, once one has the concept, the design of an encoder capable of dealing with two different sizes of superframe in the interleaver is routine. Neither side's expert suggested that this would present any difficulty. Both experts also expressed the view that it was obvious in the light of Bömer to specify different bit error rates, and thus different super frame sizes for the same service.
155. I have therefore come to the very clear conclusion that claims 1 and 14 are obvious in the light of Bömer.
156. Dr Irvine's evidence was based on Samsung's construction of the claims, and therefore on a version of the inventive concept which I have held to be incorrect. His view was that

“dynamic selection of a particular code for a particular time and varying between them *as the service is transmitted* is complex, and a significant extension of the work of Bömer.”

157. Despite Mr Burkill's valiant efforts in cross-examination, I do not think that he shifted Dr Irvine from his view. On the other hand, although Professor Darwazeh initially expressed the view in his written evidence that dynamic adaptation of the frame size during transmission was obvious, he made it as plain as he could do in cross-examination that he was not prepared to advance that view. Accordingly, if the claims are to be interpreted as requiring dynamic adaptation of the super frame size during transmission as Samsung contend that they are, but I have held that they are not, Apple have not established that they are obvious.

*Obvious over Valenti?*

158. In the light of my conclusion about Bömer, it is not necessary for me to deal with Valenti in any detail. For similar reasons, I have come to similar conclusions about it. Claims 1 and 14 are obvious in the light of Valenti on the correct construction of those claims, but not on Samsung's construction.

## **The 675 patent**

159. The 675 patent has a claimed priority date of 25<sup>th</sup> June 1999, claimed from Korean national patent application number 9926221. The specification is entitled “*Apparatus and method for channel coding and multiplexing in a CDMA communication system*”.

## **Common general knowledge**

### *Filler bits*

160. In many digital systems there are requirements for frames of fixed length (in bits) to ensure synchronised operation. If frames of data of fixed bit length are to be generated from data of varying bit length, then it is possible that the data will be shorter than the required frame size, leaving unfilled bit positions in the frame. The use of filler bits, sometimes also called “bit stuffing” or “padding bits” was generally known as a means of dealing with the empty bit positions in the frames. Bit stuffing involves sending useless data bits, at a cost in bandwidth. The bandwidth disadvantage of sending these few extra bits may be outweighed by avoiding the added complexity if one were to allow frames of unequal length.

### *Puncturing*

161. Puncturing is an alternative to adding filler bits, involving rounding down rather than rounding up. Puncturing involves discarding bits. It comes at the cost of increasing the bit error rate, as the omitted bits count as errors.

## **The disclosure of the 675 patent**

162. The 675 patent is concerned with converting the output of channel coders (which is in the form of transport blocks) into a form suitable for transmission on the physical channel. The specification explains at [0002] that a conventional CDMA mobile communication system provides primarily a voice service. However, future systems would provide other services as well, such as high speed data, a moving picture service, an internet browsing service and so on. At [0005] it is stated to be an object of the invention to provide a channel coding and multiplexing apparatus and method in which transport channel frame data is segmented into a plurality of radio frames in a transmitting device.
163. At [0012] the specification states that its objects are achieved by the use, in each channel, of “radio frame matchers” and “radio frame segmenters”. The radio frame matcher receives input frames from the channel coder. The length of the input frames in time (the transmission time interval or TTI) may vary (for example 10ms, 20ms, 40ms and 80ms in UMTS), whereas the length of the radio frame in time will be constant (10ms in UMTS). Within the radio frame matcher, the radio frame segmenter takes blocks from the channel coder and splits them when necessary into equal size radio frames. Thus, if the TTI is 10ms, no segmentation of the input frames will be required, but if the TTI is

20, 40 or 80ms, then the radio frame segmenter will segment each input frame into 2, 4 or 8 radio frames respectively.

164. At [0028] the specification addresses the problem of what is to happen when the number of bits in the input frame is not an integer number of the radio frame length in bits. The specification then says that in this circumstance it is preferable to insert a filler bit into the transport channel frame to make the number of bits an integer number of the radio frame length in bits. The process is explained in detail in mathematical terms starting at [0038]; but it is not thereby rendered any more conceptually complicated.
165. An example of the problem and its solution is as follows. Suppose one has an input frame of 450 bits which has a TTI of 80ms. In UMTS this 80ms frame would have to be distributed over 8 separate 10ms frames. In the language of primary school arithmetic, “8s into 450 don’t go”. If one put 56 bits into each of the 8 frames, one could only accommodate 448 bits, not the 450 in the input frame ( $8 \times 56 = 448$ ). 2 bits of the data would not be assigned to an output frame. If, on the other hand one allowed for 57 bits in each of the 8 frames, one would not have enough data to fill all the spaces. One would have 6 empty spaces ( $8 \times 57 = 456$ ). The solution is to place a filler bit in each of the six empty spaces.
166. From [0047] onwards the specification explains how radio frame segmentation may take place without using filler bits. In essence this process allows the use of different size radio frames, which are compensated for by rate matching. The patentee expresses the view at [0051] that this process is complicated and that the use of filler bits is preferable.
167. Finally the specification turns to physical channel segmentation. A segment of data having consecutive bits is assigned to each physical channel. Paragraph [0066] describes an example where 30 bits are assigned to three physical channels in the so-called “round robin” method in which bits are successively and individually assigned to channels like cards being dealt to players. Paragraph [0068] describes an alternative example where the bits are assigned to each channel in blocks of 10 consecutive bits, rather like giving each player a block of 10 cards at a time. This second method is said to be advantageous in that it makes better use of the second interleaver. It is called “sequential allocation” to distinguish it from the round robin method.
168. If one is transmitting data over a number of physical channels, a fade will affect all the channels. Although the data in each channel will be interleaved, each of the interleavers will be of the same design. The differing effects of the two allocation methods described in the 675 patent are shown by Figure 16 of Dr Irvine’s first report, reproduced below:



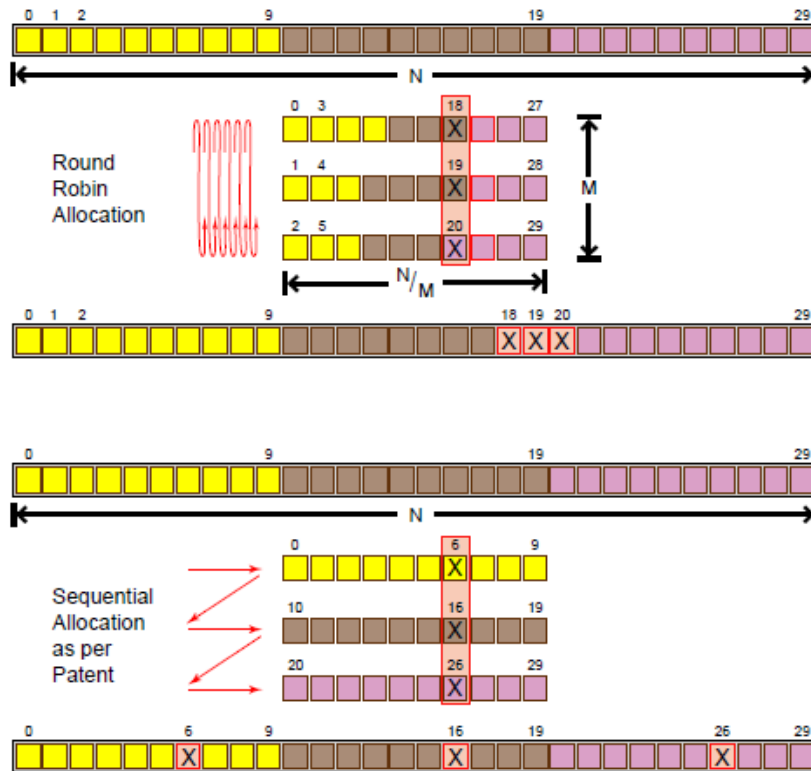


Figure 16 - Physical channel segmentation

169. The top half of the figure shows the round robin method of allocation; the bottom half of the figure shows the sequential allocation method. In each case the figure shows the input data being spread across three channels, transmitted simultaneously and then re-assembled. In the course of transmission the channels are hit by an error burst, shown by crosses in the transmitted channels. In the round robin allocation method the corrupted data (bits 18, 19 and 20) remain adjacent in the reconstituted data. But using the sequential allocation method, the affected bits are spread out, separated by the interval of 10 bits. This facilitates error correction.
170. The overall scheme for the uplink is shown in Figure 1:

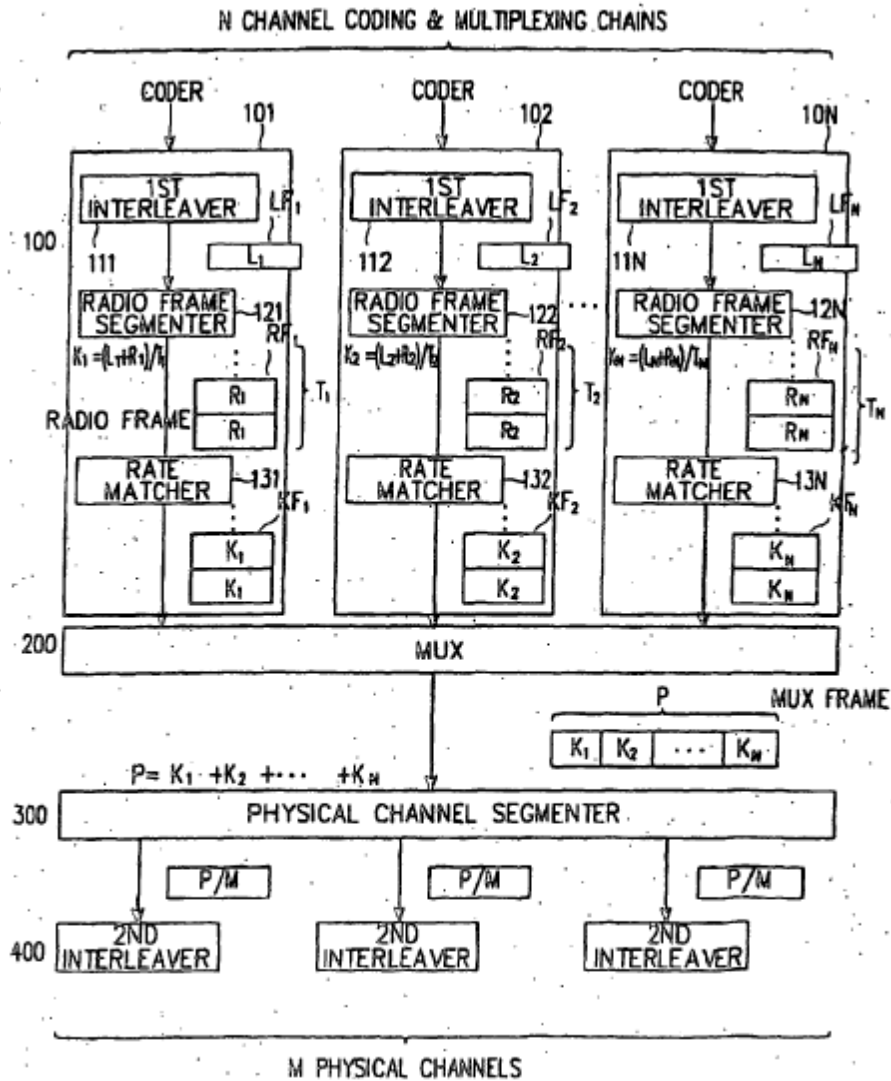


FIG. 1

The claims of 675

171. Claim 1 is in the following form, with some added lettering for clarity:

- (a) A channel coding and multiplexing apparatus for a CDMA communication system,
- (b) in which data frames that have one or more transmission time intervals (TTIs) are received in parallel via a plurality of transport channels
- (c) and converted to data frames of multi-code physical channels, the apparatus comprising:
- (d) a number of radio frame matchers, each of the radio frame matchers being adapted to receive the data frames having different frame sizes and transmission periods,

(e) to determine a number of filler bits to be inserted into each of the data frames and to insert the determined number of filler bits into the data frames,

(f) wherein each of the radio frame matchers comprises a radio frame segmenter adapted for receiving the data frames and for segmenting the data frames including the filler bits into radio frames;

(g) a multiplexer adapted for multiplexing the radio frames to form a serial data frame; and

(h) a physical channel segmenter adapted for segmenting the multiplexed serial data frame by the number of the physical channels and assigning the segmented physical channel frames to corresponding physical channels.

172. Claim 10 as granted is a method claim which is in substantially similar terms to claim 1. Samsung proposes a conditional amendment to each of claim 1 and claim 10. The effect of the amendment is that feature (h) would require the physical channel segmenter to operate in accordance with the sequential method of allocation described above.

### **Construction**

173. There was no debate about the proper construction of these claims. The key feature is that the radio frame matcher must insert a determined number of filler bits into the data frames for transmission.

### **Entitlement to priority**

174. I have set out the proper approach to issues of entitlement to priority above.

#### *The disclosure of the 675 priority document*

175. The 675 priority document explains that future CDMA communications should provide various communication services such as voice and data. However the details for simultaneous voice and data have yet to be specified (in the standard). The objects of the invention are stated in very general terms, namely to provide an apparatus and method which “*can simultaneously perform various communication services in a CDMA system*”; which is “*for generating a radio frame and a physical channel frame when performing 3GPP multiplexing and channel coding operations in a CDMA communication system*”; and which is “*for multiplexing a generated frame when performing 3GPP multiplexing and channel coding operations in a CDMA communication system*”. It is also an object of the invention to provide uplink and downlink channel communications apparatus and method.
176. At page 4 of the 675 priority document it is explained that each channel coding chain receives coded frame data from a corresponding coder. Voice,

data and images may be differently coded. In the embodiment described it is assumed that the TTI is 10, 20, 40 or 80ms. The radio frames all have the same TTI, assumed to be 10ms. The radio frame generators segment input frames into 10ms radio frames.

177. At page 7, the 675 priority document explains in mathematical terms that the number of bits in each radio frame is the total number of bits in the input frame divided by the ratio of the input TTI to the radio frame TTI. This therefore discloses, if the mathematics are taken at face value, that each radio frame will have an equal number of bits. The mathematics simply ignore the fact that the result of this division may not be an integer. There is no mention of filler bits anywhere in the 675 priority document.

*The subject matter of claim 1 of 675*

178. The relevant subject matter of claim 1 is the idea of a radio frame matcher which determines the number of filler bits to be inserted into each of the data frames, and inserts that number of filler bits into the frames.

*Is the subject matter of claim derivable directly and unambiguously from the priority document?*

179. Apple take the obvious point that there is no clear and unmistakable disclosure in the priority document of the use of filler bits. In fact, they say there is no disclosure of filler bits at all. Samsung respond by saying that, given the teaching of equal numbers of bits, the use of filler bits is implicit.
180. The evidence showed that the skilled person who read the priority document would immediately appreciate that measures would have to be taken to deal with the case where the division of the number of bits in the input frame was not an integer. The clear preference of the skilled person, based on his common general knowledge, would be to add filler bits. There were, however, other ways of dealing with the non-integer case, which the skilled person would know of, based on the common general knowledge, in particular the use of puncturing. This would still result in an equal number of bits in each radio frame. In contrast to the filler bits method, puncturing would result in data bits being lost, subject to recovery in the decoder.
181. In my judgment it is not implicit in the 675 priority document that the non-integer case is dealt with by filler bits. There is simply no disclosure about how the non-integer case is dealt with. The case illustrates the distinction between matter which is disclosed by a document and matter which is not disclosed but which is merely rendered obvious by it. The skilled person would have to think about how to deal with the non-integer case. He would consider that there was more than one option. Both may be obvious. Neither is disclosed. The claim is not entitled to priority.

## **Validity**

182. Samsung have admitted that, if the claims of the 675 patent are not entitled to priority, then the patent is invalid in the light of an intervening prior

publication. As I have held that the claims are not entitled to priority, 675 is invalid.

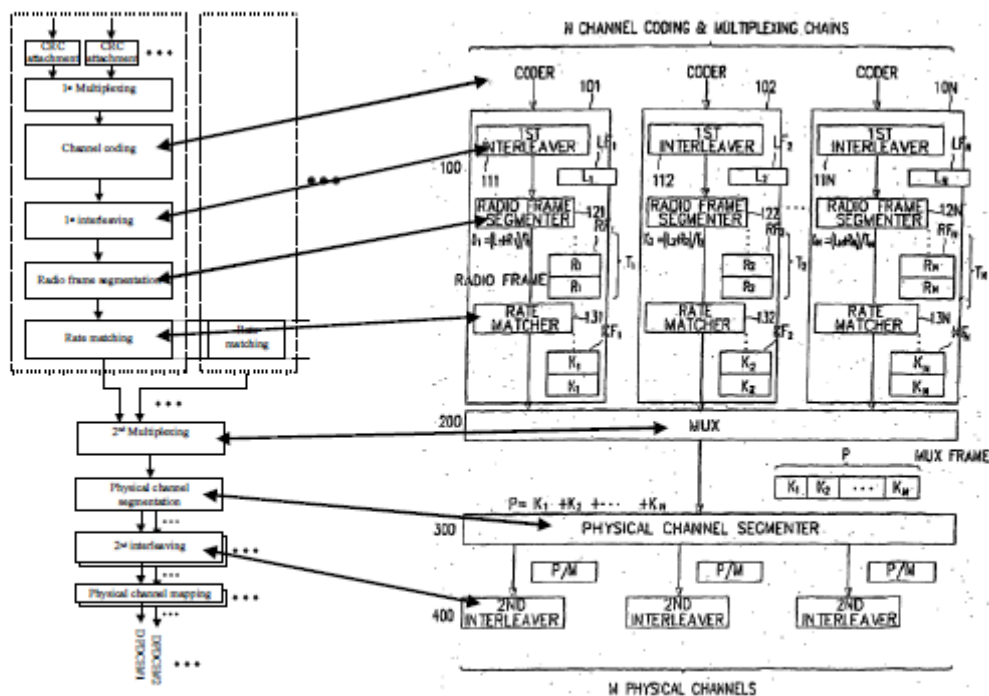
183. I should nevertheless deal briefly with the remaining points.

**Obviousness**

Over TS 25.212 v 2.00

184. TS 25.212 is the 3GPP standard which deals with multiplexing and channel coding. It deals, in particular, with how data arriving from the MAC and higher layers is encoded and decoded to offer transport services over the radio transmission link. TS 25.212 v 2.00 was the most recent version of the standard that had been published by the first claimed priority date. I will refer to it as “the standard”.

185. Figure 4.1 of the standard is a concise summary of the uplink arrangement. Mr Burkill’s skeleton argument set out a helpful comparison of the Figure 4.1 of the standard with Figure 1 of the patent, demonstrating where equivalent components are:



TS 25.212 Fig 4-1 (Prior Art)

675 Patent Fig.1

186. Paragraph 4.2.5 of the standard is the one which is allocated to radio frame segmentation. However, it merely states that the exact specification is FFS, which means “for further study”.

187. There is, accordingly, no disclosure of the use of filler bits in the standard.

188. Apple’s case of obviousness based on the standard is very simple. The output frames of the encoder in the standard will be of variable length, which may not

be an integer number of the number of the length of the radio frames to be created. Having an equal number of bits in each radio frame makes the subsequent steps of rate matching much simpler. The use of filler bits in this situation was entirely obvious.

189. Samsung's submissions in their final written closing went like this:

“The 675 Patent goes further than the prior art in that it discloses that the radio frames should have an equal number of bits. This then makes it necessary to add filler bits. Dr Irvine explained the technical advantage of equalizing the number of bits in each radio frame. The same rate matcher can then be applied to each radio frame and it is not necessary to have different schemes to cope with different numbers of bits. Given that there was no disclosure of this advantage in the prior art, the question for the Court is whether this was obvious. Samsung submits not.”

190. The question I have to consider on this issue of obviousness over the standard is not the same as that which I considered in relation to the priority document. The priority document does, and the standard does not, contain a specific disclosure that the number of bits in each radio frame should be the same.

191. Dr Irvine said that he was “not sure” that it would be obvious to proceed in the patented way, because it was possible to proceed by the rate matching route. He said that you might be persuaded to do that because filler bits represented an inefficiency. Later, however, he recognised that the inefficiency that would be introduced in connection with the specific operation in the standard would not justify the added complexity of rate matching.

192. Professor Darwazeh said that the same two options would come to mind, but that filler bits were the “*best and easiest way of dealing with this*”.

193. In my judgment, the evidence fully supported Apple's case of obviousness over the standard.

### **Amendment**

194. It was common ground that the amendment could not save the patent from the invalidity attack which arises through loss of priority. Samsung's amendment to claim the sequential allocation method was designed to overcome a finding of obviousness if the claim to priority was upheld.

195. The amendment raises an entirely different issue for the purposes of inventive step. The inventive concept has nothing to do with the inclusion of filler bits. It is concerned solely with the method of physical channel segmentation. The standard does not give any guidance on the precise method of allocation to be used.

196. Apple's evidence as to why the selected method was obvious developed in a somewhat unsatisfactory way. In his first report, Professor Darwazeh dismissed the round robin method of allocation as making no technical sense, on the basis that the interleaving performed by the first interleaver would be reversed by the second interleaver. He accepted that this was a technical error on his part. The second interleaver is a second "shuffling" of the bits, not an "unshuffling" of the first.
197. Having got off to this somewhat unpromising start, Professor Darwazeh maintained that the sequential method was still obvious. He said that he could not think of any reason why someone would want to use the round robin method, because it would get rid of the advantage (referred to in the patent) of splitting the data. He considered the advantage to be obvious.
198. Dr Irvine also appeared to accept, at the commencement of his cross-examination on this topic, that both methods were obvious. However, his evidence, when understood as a whole, was that the skilled person would have a preference for the round robin method, because it would avoid the latency associated with buffering in the sequential method. His cross examination continued like this:

"Q. But you have overlooked the fact, have you not, that because there is going to be a subsequent second interleaver, you are going to have to shuffle those columns, even in the sequential allocation, or even in the round robin allocation, and the shuffling in both cases will mean that you will not have to buffer.

A. Yes, again it depends how you actually implement this. If you were to implement it as a block, which would be the segmenter, and then pass the output of that to the different physical transmitters, then you would be buffering and then buffering. Now, actually, you are correct. In terms of an optimised implementation of this in a hardware device, then all these components basically merge into one, you start writing into buffers to save on time. My point really was that the first solution that a designer is going to think of is the round robin approach.

Q. Yes. And immediately followed by the second one which is the sequential allocation.

A. No, I am not sure that that is the case.

Q. But thinking this through, the interleaver man knows about filling rows and columns. You are saying that he would think of the round robin. As I understood your evidence, your written evidence, he would prefer the round robin because that would save him from buffering. That would save some

buffering. But, in fact, both of these will require buffering anyway in order to carry out the second stage interleaving.

A. Yes.

Q. And so there is no disincentive to the sequential allocation as opposed to the round robin. They remain equally attractive to him.

A. Except that the design becomes -- you have to optimise more of a design as a whole.

199. The debate continued, but it did not seem to me that Dr Irvine ever accepted that the sequential allocation method was obvious.
200. I accept that if the skilled person were capable of seeing simultaneously (a) the advantage of sequential allocation in terms of spreading the effects of a fade and (b) that there was no buffering disadvantage in the round robin method, then the invention would be arrived at. However I was not persuaded by the evidence that this was so. In my judgment, the proposed amended claim, if entitled to priority would not be invalid for obviousness.

### **Conclusions**

201. My principal conclusions on 726 and 675 are as follows:

- i) The 726 patent:
  - a) is not entitled to the priority claimed, and is therefore invalid based on Samsung's admission,
  - b) if entitled to priority, would nevertheless have been invalid for obviousness over both Bömer and Valenti,
  - c) if valid, would have been infringed by Apple's UMTS compliant devices.
- ii) The 675 patent:
  - a) is not entitled to the priority claimed and is therefore invalid based on Samsung's admission,
  - b) if entitled to priority, is invalid for obviousness over TS 25.212 v 2.00,
  - c) would be valid if entitled to priority and amended in accordance with Samsung's application to amend.