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IN THE COURT OF APPEAL (CIVIL DIVISION)
ON APPEAL FROM THE HIGH COURT OF JUSTICE
BUSINESS & PROPERTY COURTS OF ENGLAND & WALES
PATENTS COURT
MR JUSTICE ARNOLD
[2018] EWHC 1224 (Pat); [2018] EWHC 1732 (Pat); [2018] EWHC 1826 (Pat)

Royal Courts of Justice
Strand, London, WC2A 2LL
Date: 17/12/2019

Before :

LORD JUSTICE PATTEN
LORD JUSTICE FLOYD
and
LORD JUSTICE HENDERSON

- -

Between:

KONINKLIJKE PHILIPS N.V.	**Claimant**
- and -	
(1) ASUSTEK COMPUTER INCORPORATION	
(2) ASUSTEK (UK) LIMITED	
(3) ASUS TECHNOLOGY PTE. LTD	
(4) HTC CORPORATION	
(5) HTC EUROPE CO. LTD	**Defendants**

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Thomas Hinchliffe QC, James Abrahams QC and Jeremy Heald (instructed by **Taylor Wessing LLP**) for the **First to Third Defendants and by Hogan Lovell International LLP for the Fourth and Fifth Defendants)**
Mark Vanhegan QC and Adam Gamsa (instructed by **Bristow LLP**) for the **Claimant**

Hearing dates: October 28-31, 2019

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Approved Judgment

Lord Justice Floyd:

1. These appeals concern three patents in the field of mobile telecommunications owned by the claimant, Koninklijke Philips N.V. ("Philips"). The judge, Arnold J (as he was then), held two of the patents valid and one invalid. In each case the unsuccessful party or parties appeal, with permission granted by the judge, challenging the judge's conclusion on the issue of obviousness. In one case there is, in addition, an issue of construction which is relevant to infringement.

2. A patent is said to be "essential" to a telecommunications standard if equipment complying with the standard cannot be sold without infringing the patent. The three patents in suit, European Patent (UK) No. 1 440 525 ("525"), European Patent (UK) No. 1 685 659 ("659") and European Patent (UK) No. 1 623 511 ("511") have all been declared by Philips as essential to the European Telecommunications Standards Institute (ETSI) Universal Mobile Telecommunications System (UMTS) standard ("the Standard"), and in particular the sections of the Standard which relate to the operation of the system known as High Speed Packet Access (HSPA). The first, second and third defendants ("the Asus defendants") and the fourth and fifth defendants ("the HTC defendants") all sell mobile telephones which are compatible with HSPA. Philips accordingly allege infringement of the patents by reason of their essentiality to the HSPA sections of the Standard.

3. Although there was one action, the validity of the patents was decided in the course of two trials (designated Trial A and Trial B). The judge recorded his reasons in three separate judgments which can be found under the neutral citations [2018] EWHC 1224 (Pat); [2018] EWHC 1732 (Pat); and [2018] EWHC 1826 (Pat). These judgments contain detailed explanations of the technical background to each of the patents based on an agreed Technical Primer which the parties prepared relating to all three patents. It is not necessary to set out all that material in this judgment, which is concerned only with narrow issues which arise on the appeals. I will, however, briefly summarise some essential technical background when dealing with each appeal. The reader can refer to the technical background sections of the judgments in the court below for further explanations of the concepts involved, if necessary.

4. In addition, this court received the benefit of a short but helpful technical teach-in from Professor Mohammad Shikh-Bahaei. Professor Shikh-Bahaei is Professor of Telecommunications at King's College London. He was jointly instructed by the parties to provide the teach-in, which was attended by the parties' junior counsel only. Professor Shikh-Bahaei had not previously been involved in the proceedings in any other way. He was provided with the Technical Primer and the Technical Background sections only of each of the three judgments below, and asked to assist us generally with our understanding of the technology. I am grateful to the parties for agreeing to assist us in this way.

5. This is a field in which abbreviations are rife. A glossary of the abbreviations used in this judgment is included at Appendix A. I will, however, endeavour to use the term "mobile" for what is sometimes referred to as "MS" and sometimes as "UE", and "base station" for what is sometimes referred to as "BS" and at others as "node B".

6. Mr Thomas Hinchliffe QC and Mr Jeremy Heald presented the case for the Asus defendants and the HTC defendants (who presented a common front) on the 525 and

659 patents, and Mr James Abrahams QC did likewise on the 511 patent. Mr Mark Vanhegan QC and Mr Adam Gamsa presented the case for Philips on all three patents. We heard the appeal over four sitting days in three self-contained sections, one dedicated to each of the patents in suit. This judgment is divided up in like fashion.

The 525 patent

7. A major issue in mobile telecommunications technology is how to deal with errors caused by corruption of data sent over the network. One strategy, abbreviated as HARQ, is for the mobile to send back a message to the base station acknowledging safe receipt of a packet of data. This is called an "ACK" message. If the packet of data is not safely received at the mobile, a negative acknowledgement or "NACK" message is sent to the base station.

8. Errors may occur not only in the reception of the original data packet, but also in the detection of the ACK and NACK messages sent in consequence of the successful or unsuccessful receipt of the packets. There is an important and significant difference between the consequences of errors in the detection of the two types of message. In an ordinary case, if a NACK is detected, the base station will retransmit the original packet, having previously maintained a record of it in a buffer whilst waiting to hear back from the mobile. If the base station detects a NACK when an ACK was sent (a "false NACK"), then the packet is retransmitted anyway. Retransmission is unnecessary (because the packet has in fact been safely received) but only wastes a little system resource. On the other hand, if a NACK is sent, but detected as an ACK (a "false ACK"), no retransmission occurs, as the base station will understand that the packet has been successfully received (when it has not). This situation can only be recovered by using higher layer processes, which is more of a problem because it adds delay to the overall data transmission. A false ACK can also require the retransmission of a larger portion of the data, which would represent a significant waste of system resources. The upshot is that the "cost" (in resource terms) of a false ACK is generally much more significant than the cost of a false NACK, particularly where error-free data transmission is required. For this reason, it was recognised in the art that it was desirable to control the probabilities of errors in decoding ACKs and NACKs, in order to make false ACKs less likely, and therefore less common.

9. The 525 patent, which has an earliest possible priority date of 19 October 2001, proposes to achieve this objective by transmitting the different acknowledgment signals (i.e. the ACKs and NACKs) at different power levels. Increased power will, in general, give rise to fewer errors in detection. Adopting this scheme gives the system the ability to manipulate the probability of the receiver correctly interpreting those signals. Thus, by transmitting NACKs at a higher power than ACKs, the error probability for NACKs can be reduced without increasing the power for ACKs.

10. At [0003] the specification of the 525 patent notes that a conventional component of a packet data transmission system is an ARQ process. The specification goes on:

> "[0004] A problem with such an ARQ scheme is that the consequences of errors in the ACK and NACK are significantly different. Normally the BS would re-transmit a packet if a NACK were received. If the BS receives a NACK when a ACK

> was sent, then the packet is re-transmitted anyway, which only wastes a little system resource. If a NACK is sent, but received as a ACK, then no re-transmission is made. Without special physical layer mechanisms, this situation can only be recovered from by using higher layer processes, which adds delay and is a significant waste of system resources. Hence, the cost of an error in a NACK is much more serious than the cost of an error in a ACK.
>
> [0005] In order to optimise system performance, it is desirable to control the relative probabilities of errors in decoding ACKs and NACKs. In one UMTS embodiment this is done by setting different detection thresholds at the BS, which requires the MS to transmit the ACK/NACK codeword with a specific power level (e.g. relative to uplink pilot power). This power level and the detection threshold can therefore be chosen to balance costs of ACK/NACK errors, interference generated by the MS, and battery power used by the MS. With DTX, the situation is a little more complex. However, the BS, as the source of the packet, is aware of when a ACK/NACK should be sent by the MS and it should therefore not normally be necessary to specifically detect the DTX state."

11. The problem referred to at [0004] is the known problem described above. The second and third sentences of [0005] refer to a previous proposal to solve this problem in UMTS, which the skilled person would also have been aware of, but which does not use differential power between the ACKs and NACKs. By changing the power of those messages and biasing the detection threshold at the base station, the error rate can be adjusted. The solution proposed by the patent is to send the different acknowledgment signals (i.e. the ACKs and NACKs) at different power levels "to increase the probability of the primary station retransmitting a data packet when necessary".

12. The claims are directed to an embodiment of the invention, which is explained at [0029] of the specification, in which it is the base station which signals whether differential power is to be used for the ACKs and NACKs:

> "In one preferred embodiment, particularly suitable for UMTS HSDPA, the ACK/NACK power offset used by the MS 110, as well as the ACK power level would be determined by higher layer signalling from the network. Alternatively, the offset could be signalled using a single information bit, signifying 'no offset' (i.e. equal transmit power for ACK 206 and NACK 204) or 'use offset', signifying the use of a pre-determined value of power offset. More signalling bits could be used to indicate a larger range of values of offset."

13. Then, at [0048] the specification says this:

> "In general, the power levels at which the ACK/NACK … commands are transmitted may be adjusted in order to achieve

> a required level of reliability. These power levels could be controlled by messages sent from the BS … to the MS …. These could specify the power level relative to the pilot bits on the uplink dedicated control channel, or relative to the current power level for the channel quality metric. In the case of the dedicated control channels of one MS … being in soft handover with more than one BS … the power of the uplink dedicated control channel is not likely to be optimal for all the BSs … involved. Therefore, a different power level, preferably higher, may be used for sending the ACK/NACK … commands. This power difference could be fixed, or determined by a message from a BS …. When the transmission of ACK/NACK … is directed to a particular BS …, the power level may be further modified to take into account the quality of the radio channel for that transmission. For example, if the best radio link from the active set is being used, the power level may be lower than otherwise."

14. The judge pointed out at [143] that the 525 patent contains no details of how to implement the invention. It provides no details of any modulation scheme or how the power levels are to be determined, or of the signalling from the base station. It was, however, common ground that the skilled person would be able to implement the invention. The evidence of Mr Edwards, Philips' expert, was that the invention could be implemented by using a target signal-to-noise ratio (SNR) for the pilot bits and arranging for the base station to monitor whether this signal to noise ratio was above or below the target, and then to use this information to adjust the ACK/NACK channel.

15. Only claim 10 of the 525 patent need be considered. It was broken down into the following claim elements by the judge:

> "[1] A secondary station [i.e. MS] for use in a radio communication system
>
> [2] having a communication channel for the transmission of data packets from a primary station [i.e. BS] to the secondary station,
>
> [3] wherein receiving means are provided for receiving a data packet from the primary station
>
> [4] and acknowledgement means are provided for transmitting a signal to the primary station to indicate the status of a received data packet,
>
> [5] which signal is selected from a set of at least two available signal types,
>
> [6] wherein the acknowledgement means is arranged to select the power level at which the signal is transmitted depending on its type

> [7] and in dependence on an indication of the power level at which each type of signal is transmitted, the indication being signalled from the primary station to the secondary station."

16. The judge noted the following advantages of the invention at [145]:

> "There is no dispute that the invention has a number of advantages, although the Defendants contend that the advantages can also be realised from Shad. In particular, the scheme is a flexible one that permits the powers of the ACKs and NACKs to be modified independently, allowing error performance targets to be achieved at lower average power and different data services to be handled differently; and it facilitates soft handover in the uplink when using HSDPA in the downlink. This is achieved with only a modest increase in system complexity."

17. As the judge noted at [147], the claim is not limited to the *independent* setting of the power levels for the ACKs and NACKs. The embodiment described at [0029], set out above, uses a fixed offset. Independent setting is, however, disclosed. He noted further that the claim does not define any particular performance level for the system either.

18. Before the judge, there was a dispute as to the identity of the skilled person to whom the 525 patent was addressed. This dispute was said to have consequences for the extent of the common general knowledge which it was proper to attribute the reader of the patent. The judge resolved this dispute in favour of Philips, but the grounds of appeal sought to resurrect it. In the end, however, Mr Hinchliffe did not pursue his attack on the judge's conclusion as to the identity of the skilled person, because the common general knowledge on which he wished to rely was, he said, now common ground.

19. The judge's finding was that the skilled person would have a degree in electronic engineering (or something similar) and would have worked in the mobile telecommunications industry for at least two years. This person would be someone working on UMTS and especially HSDPA.

20. As to the common general knowledge of the skilled person, the judge held that the contents of the Technical Specification for HSDPA, designated TS 25.308, would form part of it. The judge recorded that the following points were agreed to be common general knowledge:

> "i) The cost of a false ACK is more significant than the cost of a false NACK.
>
> ii) Signals sent at higher powers are more reliably detected at the BS, but the use of more power may increase interference between signals in a CDMA system. The probability of a receiver correctly interpreting a signal can be manipulated by varying the power at which the signal is sent, and increasing interference at a BS would decrease the total system capacity.

> This can be thought of as "Shout louder if you want to be more sure you will be heard".
>
> iii) Reducing interference at the BS is beneficial in that it makes it easier for the BS to receive signals from the MSs it is serving.
>
> iv) In conventional modulation, the further away the received voltage of a signal from the decision threshold, the lower the probability of error.
>
> v) As discussed above, the generally accepted method of power control for uplink channels was for the BS to control the MS.
>
> vi) The way fast fading was dealt with in CDMA was by closed loop power control. This worked by the BS monitoring the uplink signal from the MS and comparing it to a target SNR, which was related to the number of errors (the higher the SNR, the lower the errors, and vice-versa).
>
> vii) At the Priority Date a new uplink control channel for HSDPA was proposed and specified in TS 25.308.
>
> viii) It had been decided that the HARQ protocol for HSDPA would use a Multi-Channel SAW process, which was asynchronous on the downlink and synchronous on the uplink. The acceptable error rates for the ACK and NACK messages in HSDPA had not been agreed at the Priority Date, however.
>
> ix) It was known that in UMTS Release 4 the closed loop power control mechanism ensured that a MS in soft handover with two or more BSs transmitted sufficient power to communicate with at least one BS (i.e. the BS(s) with the best uplink channel quality).
>
> x) It was known from UMTS Release 4 that uplink power levels could be set by the BS relative to the uplink power of the pilot bits sent on the DPCCH.
>
> xi) The skilled person would not be concerned by the possibility of errors due to DTX in the context of ACK/NACK signalling in HSDPA."

21. Before us, it was common ground that a "conventional approach" to controlling the relative probabilities of errors in decoding ACKs and NACKs was to set different threshold values at the base station and require the mobile to transmit the ACK/NACK codeword with a specific power relative to the uplink pilot power (i.e. power controlling the ACK/NACK field separately to other transmitted fields, but not differentially as between ACKs and NACKs).

22. At the trial (Trial A) there was no issue on essentiality or infringement. The Asus and HTC defendants presented a common case of invalidity of claim 10 of the 525 patent on the basis that it involved no inventive step over two prior documents:

> i) Document TSGR1/R2-12A010021 entitled "Control Channel Structure for High Speed DSCH (HS-DSCH)", a contribution submitted to the 3GPP TSG-RAN Working Group 1 and 2 ad hoc meeting in Sophia Antipolis, France on 5-6 April 2001 by Motorola ("Motorola"); and
>
> ii) Document 3GPP2/TSG-C C50-20010709-024 entitled "Optimal Antipodal Signaling", a contribution submitted to the 3GPP2 TSG-C meeting in Montreal, Canada on 9-13 July 2001 by Faisal Shad and Brian Classon of Motorola ("Shad").

23. The judge rejected both of these attacks. The defendants no longer pursue their case of obviousness over Motorola. The sole issue on appeal in relation to the 525 patent is therefore whether he was right also to reject the case based on Shad.

24. In a section of the judgment from [203] to [225] the judge summarised the teaching of Shad. It is not necessary to repeat all that here, but it is worth setting out the abstract of Shad, which reads:

> "In this contribution the transmit gains for an antipodal signaling scheme in which the transmit probabilities are known a priori is jointly optimized with the receiver hard decision device threshold value in order to obtain the required error probabilities for a minimum bit SNR. This type of signaling for example applies to the Hybrid ARQ acknowledgement channel in which the average frame error rate is known to the transmitter, and certain false acknowledgement and false negative acknowledgement probabilities are prescribed by the upper layers."

25. This requires a little unpacking:

i) "the transmit probabilities are known a priori" means that the probability of sending an ACK or NACK is known;

ii) The "receiver hard decision device threshold value" is a threshold value set in the detector;

iii) The "required error probabilities for a minimum bit SNR" is stated to be the object of the joint optimisation i.e. sending the ACKs and NACKs at minimum power for a given error probability;

iv) The "hybrid ARQ acknowledgement channel" refers to a channel in which the signals are ACKs and NACKs;

v) The "frame error rate" is a measure of how often the MS has not correctly received a transmitted data packet;

vi) The reference to false acknowledgement and false negative acknowledgement probabilities being "prescribed by the upper layers" means that the target required probabilities of false ACK and false NACK are not set at the physical layer of the protocol stack but at some higher layer.

26. Shad continues in section 1:

> "The objective of this contribution is to obtain the optimal power allocations to an antipodal signaling scheme such that the required performance is achieved with a minimum bit SNR. This is done by applying unequal gains to the transmit voltages of the two possible signals. At the receiver, the threshold of the hard decision device is biased so that the required error rate is achieved for each of the two types of errors."

27. Accordingly, Shad's proposal is that ACKs and NACKs are transmitted using different powers and the detection threshold at the base station is biased so as to achieve the required error rates i.e. the required levels of false ACKs and false NACKs.

28. Shad uses a number of mathematical variables to describe his proposal. The different power to be applied to the ACKs and NACKs depends on a variable *p* which is the probability that an ACK rather than a NACK is being transmitted at a given time. If *p* is 0.5, equal amounts of ACKs and NACKs are being sent. *k* is the gain to be applied to the power of the ACK signals. *l* is the gain to be applied to the power of the NACK signals. *z* is the decision threshold in the receiver. In addition, Shad uses the terms p_{fack} and p_{fnack} for the false ACK and false NACK rates.

29. Shad describes a search optimisation algorithm that models an idealised system to find the optimum values of *k, l* and *z*, i.e. the error rate at the minimum possible power. If a received signal is higher than z it is assumed to be an ACK, otherwise it is assumed to be a NACK. In section 3 Shad shows the results in the form of a table, Table 1, showing the values of *k, l* and *z* for the optimal detector. The judge held that Shad showed that power savings could be made by differentially powering the ACKs and NACKs depending on the probability of transmission.

30. Section 4 of Shad is also important. It is headed "Implementation Considerations" and says:

> "Due to the fading channel and power control, the actual EbNt requirement and optimal values of z, k, and l may be quite different from the values reported in Table 1. <u>One possible approach</u> for obtaining the correct values for z, k, and l … is as follows. The ratio of k to l can be determined by the measured FER on the Forward Shared Channel. The mobile keeps track of p_{fack} and p_{fnack}. It can gather these statistics based on the number of duplicate and missing frames that are observed. If either p_{fack} or p_{fnack} are too high, the values of k and l are scaled up by a constant. If both p_{fack} and p_{fnack} are too low, then k and l are scaled down by a constant. The value of z can be initialized based on a Gaussian channel assumption. Then it can be

> adjusted based on feedback from the mobile" (emphasis added).

31. Shad thus discloses that *one possible approach* is that the mobile can determine the ratio of *k* and *l* from the measured frame error rate on the downlink channel (and hence derive *p*, since *p* = 1-FER). It can then calculate p_{fnack} and p_{fack} by observing the number of duplicate and missing frames, and then scale the values of *k* and *l* up or down, keeping the ratio between them constant for a given *p*.

32. At [222] the judge dealt with the benefits promised by Shad:

> "Furthermore, as Mr Edwards also accepted, it can be seen from Table 1 that there is not just an advantage between the optimal detector and the MAP detector [a comparator]. Both detectors show that there is an average power saving for each detector of several dB as between the SNR required to achieve the error rate at p=0.5 and the required SNR at low or high p value. Thus Shad shows that power savings can be made by differentially powering the ACKs and NACKs depending on the probability of transmission."

33. At [225] the judge observed:

> "Shad does not say, and the experts were agreed that the skilled person would be unable to tell, what overall benefit would be achieved by implementing Shad in a real system."

34. The judge dealt with lack of inventive step of claim 10 over Shad between [226] and [267]. It was common ground that the only difference between Shad and claim 10 was that Shad did not disclose that the values of the ACK and NACK gains are indicated to the mobile by a message sent from the base station.

35. From [227] to [234] the judge dealt with and rejected an argument advanced by Philips that the skilled person, having read Shad with interest, would simply put the document to one side and would not consider that it was worth taking forward, whether generally or in the specific context of UMTS. Philips' case was that the skilled person would be sceptical as to whether the theoretical power saving promised by Shad would translate into a real-world benefit. A first point was that Shad did not take into account the real-world issues of uncompensated fading and imperfect power control, and so the values in Table 1 would not be the optimum in a real-world system. There were several such points, but the judge was not sufficiently impressed by any of them. He concluded at [234] that the skilled person would not simply put Shad to one side, but would follow it up.

36. At [235] the judge explained that the defendants' case "in a nutshell" was not that the skilled person would implement Shad in the manner described, that is to say with the mobile performing the operations I have explained in [31] above. Rather, their case was that the skilled person who was engaged in developing HARQ for HSDPA in UMTS:

> "would see the potential benefits of applying differential gains to the ACKs and NACKs as proposed by Shad in that context, but would perceive problems in implementing Shad as proposed in section 4 and would realise that an obvious alternative way in which to implement Shad would be for the BS to set the gains"

37. At [237] the judge noted Mr Edwards' non-acceptance of the suggestion that implementation of Shad in the context of HSDPA would lead the skilled person to do anything different to what is taught in Shad. He further pointed out that Mr Gould's evidence did not go quite that far. The key question, the judge said at [238], was whether it would have been obvious to the skilled person that, rather than simply trying to implement Shad in the manner it proposes, an alternative way in which to implement Shad would be for the BS to signal to the MS the gains to be applied by the MS to the ACKs and NACKs.

38. At [239] the judge recorded that it was common ground between the experts that Shad could be implemented in the manner suggested by Shad in section 4 by generating optimised values of *k, l,* and *z* in advance and storing those values in one or two look-up tables, in the mobile or the base station or both. Having summarised the evidence of the two experts he concluded that the skilled person would not propose implementing Shad by means of a single look-up table containing *k, l,* and *z* in the mobile. This was because unnecessary signalling could be avoided if the base station estimated *p* itself and thereby found *z* from a look-up table stored at the base station.

39. At [240] to [244] the judge dealt with the suggestion made by Mr Gould, the defendants' expert, that the skilled person would see disadvantages in having a look-up table for *k* and *l* in the mobile and instead would prefer a single set of look-up tables in the base station, enabling the base station to derive the values of *k, l,* and *z* and to signal the values of *k* and *l* to the mobile. The judge considered each of these alleged disadvantages in turn, and the response of Mr Edwards, Philips' expert. The conclusion he drew at [244] was that, whilst there was some force in these points, they were all directed at showing that the skilled person would not simply implement Shad, but be prompted to consider an alternative way of implementing his proposal for differential gains, and yet not be put off Shad altogether.

40. This was an important step in the judge's reasoning. He had concluded that the skilled person would not be put off Shad altogether, but would be drawn in to investigating whether the theoretical promise of power saving could be realised in real-world conditions. At [244] he was explaining that the skilled person would carry on down the logic of that path to discover the answer to the question of whether Shad's promise could be realised by the implementation of Shad's teaching. He was expressing caution at the suggestion that the skilled person would be diverted from that path in order to investigate other ways of implementing Shad.

41. Next, at [246] onwards, the judge considered Mr Edwards' view that the skilled person would perceive disadvantages in the base station signalling *k* and *l* to the mobile, and Mr Gould's counter-arguments. One particularly telling point was that there was circularity in requiring the base station to provide information to the mobile which the mobile already had (*p* or 1-FER). All these points fell to be considered on the hypothesis that the skilled person had had the idea of varying Shad's

implementation so as to signal the gains from the base station. The effect of the arguments was, as the judge said at [250], to focus attention on the question of whether Mr Gould's implementation of Shad at the base station would be obvious to the skilled person.

42. From the evidence, the judge identified four steps which it would be necessary to take to arrive at Mr Gould's implementation. These were:

i) to abandon the collection of error statistics gathered by the MS;

ii) to hit upon the idea of approximating ACK/NACK error statistics with SNR;

iii) to envisage replacing Shad's table with a table calculated on a different basis;

iv) to envisage multiple tables for different channel conditions and geographies.

43. The judge thought that there was an element of double-counting in this analysis, but that the key steps were the second and fourth. He analysed these between [253] and [258]. At [259] he reached the conclusion that the arguments were finely balanced. He said:

> "…In my judgment the arguments on obviousness are quite finely balanced. At first blush, at least with the benefit of hindsight, it appears that implementing Shad's proposal for differential gains on the ACKs and NACKs at the BS rather than the MS would be an obvious alternative. On the other hand, the evidence with respect to Mr Gould's proposed approach shows that changing Shad's implementation is less straightforward than it appears. Moreover, the logic of Mr Gould's reading of Shad actually points in a different direction if the skilled person is minded to do anything other than simply following Shad's teaching.
>
> 260. Counsel for the Defendants submitted that the implementation issues did not matter, because the right question was how the skilled person would develop the HSDPA HARQ scheme after reading Shad with interest. I accept that that is a legitimate question, but Mr Gould's evidence does not establish that the implementation issues would disappear from the skilled person's mind on that hypothesis (let alone Mr Edwards' evidence). Counsel for the Defendants also submitted that Philips' case based on the implementation issues with Shad involved an inconsistency, because it was common ground that the skilled person could implement the Patent without difficulty. I do not accept this: Shad discloses differential gains for ACKs and NACKs in a highly specific context, which is Shad's proposed optimisation algorithm. The Patent not only discloses the idea free of that context, but also discloses signalling the gains from the BS and adds the possibility of setting them independently. Furthermore, neither of these arguments meets the point that

> the logic of Mr Gould's reading of Shad points in a different direction. I would add that no less than 100 paragraphs and 34 pages of the Defendants' written closing submissions are devoted to their arguments that claim 10 is obvious over Shad, which would hardly be necessary if it was really that simple."

44. The judge's point that the "the logic of Mr Gould's reading of Shad points in a different direction" is important. Mr Gould was the expert who thought Shad of sufficient interest to be worth pursuing, because he thought that real-world power saving could be achieved by implementing Shad. The logic of that approach would be to implement Shad and optimise his algorithm, rather than to think of ways in which his implementation could be varied.

45. The judge was accordingly not satisfied that claim 10 was obvious over Shad. That view was fortified by secondary evidence in the form of a report by Qualcomm, commenting on Shad. Their evaluation was that Shad:

> "increases the mobile station complexity with an insignificant, if any, performance improvement. So we recommend that the baseline approach using the same power levels for ACK and NACK be retained."

46. The judge thought that this comment, and other material in the report, showed that Qualcomm did not think the benefits to be gained from Shad's proposal warranted the additional complexity at the mobile. It evidently did not occur to Qualcomm that the gains could be signalled from the base station.

47. Paragraphs 1 to 9 of the grounds of appeal concern the attack on the judge's identification of the person skilled in the art and the common general knowledge. These grounds are no longer live for reasons which I have explained. From paragraph 10 to 23, the defendants make a series of points as to why the judge's conclusion of obviousness over Shad was wrong. Whilst not pretending to summarise the whole of this somewhat discursive document, the points which emerge are:

    i) The judge failed to take proper account of the common general knowledge which included the facts (a) that the skilled person knew that in UMTS the base station was in control of power; (b) that it was undesirable to allow the mobiles to control their own power without the base station being able to control it (paragraph 12).

    ii) The judge proceeded on a misunderstanding of the defendants' case when he said at [235] that the defendants' case depended on the skilled person perceiving problems with Shad's implementation. Although this was one way of putting their case, it was not the only way in which they advanced their case of obviousness. This had led the judge to fail to take account of the matters relied on in paragraph 12 of the grounds of appeal. He had also failed to take account of the following facts: (a) that Shad proposed the implementation at the mobile as "one possible approach"; (b) that there were only two possible implementations, the mobile and the base station (paragraphs 13 and 14).

iii) The judge wrongly held at [237] that Mr Gould's evidence did not go so far as to suggest that implementing Shad in the context of HSDPA would lead the skilled person to do anything different to what Shad taught. Mr Gould's written evidence had indeed gone that far (paragraph 15).

iv) The judge wrongly held at [250] that the issue of obviousness depended on whether Mr Gould's implementation of Shad at the base station was obvious. That was wrong because Mr Gould's implementation involved features which were not features of the claim (paragraph 16).

v) The judge had wrongly relied on implementation difficulties which might arise, when the patent contained no detail of how to resolve those difficulties (paragraph 17 and 18).

vi) The judge therefore erred in principle at [260] in rejecting the defendants' case of obviousness on the basis that Shad disclosed the idea of differential gains in a different context (paragraph 19).

vii) The judge wrongly relied at [261] on the fact that the patent gave the possibility of setting the gains for ACKs and NACKs independently (paragraph 20).

viii) The judge erred in principle in holding that only one of the two approaches as to implementation of Shad was obvious, when both were obvious (paragraph 21).

ix) The judge wrongly took into account the length of the defendants' submissions on the issue of obviousness (paragraph 22).

x) The judge had been wrong to draw the conclusions he did from the secondary evidence (paragraph 23).

48. Perhaps recognising that this scattergun approach on an issue such as obviousness was unlikely to hit any target in this court, Mr Hinchliffe made four much broader submissions as to why the judge's assessment of obviousness was flawed:

i) The judge should have treated Shad and the patent at a comparable level of generality from the perspective of the skilled person, because the patent is devoid of implementation details, and concerns only the idea of setting the differential gains from the base station.

ii) The specific implementation issues which the judge considered went to the way in which the base station set the gains. This was an error because these details were not features of the claim. How the base station set the gains was a performance issue, which was not relevant to inventive step.

iii) The judge had wrongly taken into account the ability in the patent to set the gains independently. This was not a feature of all the embodiments claimed and was accordingly irrelevant to inventive step.

iv) The issues which the judge held would have deterred the skilled person from proceeding to implement Shad at the base station remained issues for the

implementation of the patent, in the sense that the patent did not teach the skilled person how to overcome them.

49. The starting point for Mr Hinchliffe's argument was that the skilled person, reading Shad with interest, would appreciate that Shad's essential idea of using differential gains for the two signals could be implemented either at the mobile or at the base station. Those were the only two alternatives. The skilled person would know from the way uplink power control was implemented in UMTS that it was the base station which controlled the power of the mobiles.

50. In developing these submissions Mr Hinchliffe drew attention to the judge's finding at [143] that the patent was devoid of details as to how to implement the invention. He also relied heavily on his findings at [147] firstly that the claims were not limited to the *independent* setting of the gains on the two signals and secondly that the patent was not to be judged by reference to performance levels of the system, since these were not features of the claim.

51. Mr Hinchliffe submitted that when the judge came to assess obviousness, he had lost sight of the fact that performance and implementation issues did not form part of the claimed invention. Accordingly, when the judge had asked himself the crucial question for obviousness at [250], namely whether Mr Gould's proposed implementation of Shad at the base station was obvious, he had wrongly built into the inventive concept features which were not claimed.

52. It was implicit in the judge's consideration of the implementation issues that the skilled person would have the idea of implementing differential gains at the base station, but then would run into difficulties of implementation and performance. Mr Hinchliffe submitted that all these implementation issues should have been placed to one side as they were not relevant to obviousness. The invention as claimed in the patent could be implemented by setting a simple offset between the gains from the base station. It was not necessary to have multiple tables to implement Shad at the base station unless one was optimising it. Moreover it was clear from Mr Edwards' evidence that once one has the idea of setting the differential gains in the base station, the skilled person would have no difficulty implementing it using his common general knowledge.

53. Then, at [256] to [258], the judge had relied on the fact that the logic of Mr Gould's approach was to point to optimising Shad's algorithm, rather than implementing elsewhere. Optimisation was a performance issue, however, and was separate and distinct from the issue of where the decision on gains should be made.

54. Mr Vanhegan supported the judge's reasoning. He relied on the judge's finding at [145], which I have set out at [16] above, showing that the invention had numerous benefits. He submitted that the judge had not found that the broad idea of implementing Shad's differential gain proposal in the base station was obvious. The way in which the case had developed was that Mr Gould had explained how he considered that the skilled person would think of implementing the proposal in the base station with certain modifications. Mr Gould's proposed implementation was challenged by Mr Edwards as impractical, without accepting that the broad idea was itself obvious. The judge should not be taken as having concluded that the skilled person would have had the idea of implementation in the base station at all.

55. Mr Vanhegan submitted further that there was ample evidence before the judge for him to find that the skilled person would not have the broad idea of implementing in the base station. Mr Edwards had explained that it was the mobile which had the necessary data to set the gains. There was a circularity involved in requiring that information to be sent back to the mobile. The judge had recognised this circularity at [246]. Moreover the skilled person would not be able to see that the base station could assess the channel conditions to the level required by Shad. Some of Mr Vanhegan's submissions strayed well beyond the actual findings made by the judge. It is not necessary to summarise these arguments as there was no respondent's notice asking this court to make additional findings of fact.

56. Mr Vanhegan continued by submitting that the implementation difficulties which Shad presents are not implementation difficulties for the patent. Shad was to be viewed as a complete proposal, not a proposal of a broad idea divorced from its implementation in the mobile.

57. I turn to consider the law. I start by pointing out that where a trial judge has correctly directed himself as to the law, his evaluation of obviousness is entitled to great respect by an appellate court: see (amongst other places) *Biogen v Medeva* [1997] RPC 1 per Lord Hoffmann at 45 lines 20-45. As Lord Hoffmann explains, an appellate court should be "very cautious" before interfering where the application of the legal standard is simply "a matter of degree". For that reason, it is necessary to focus on the points made by the defendants which are said to represent an error of principle by the judge.

58. There is no dispute that it is not legitimate in considering obviousness to identify aspects of the invention which are possessed only by a sub-group of embodiments covered by the claim, and then to assess inventiveness by reference to the characteristics of that sub-group: see *Brugger and others v Medi-Aid Ltd* (No 2) [1996] RPC 635 at 656 line 15-657 line 9, per Laddie J.

59. In *Pozzoli SPA v BDMO SA* [2007] EWCA Civ 588; [2007] FSR 37, Jacob LJ referred to a problem which exists in patent law where an invention is said to consist in doing something which could be conceived of but would be thought (wrongly) by those skilled in the art not to work. He argued that a patentee who demonstrated that this prejudice (sometimes called "a lion in the path") was misconceived, and showed that the invention did work, contrary to the prejudice, deserved patent protection. He said:

> "25. There is an intellectual oddity about anti-obviousness or anti-anticipation arguments based on "technical prejudice." It is this: a prejudice can only come into play once you have had the idea. You cannot reject an idea as technically unfeasible or impractical unless you have had it first. And if you have had it first, how can the idea be anything other than old or obvious? Yet when a patent demonstrates that an established prejudice is unfounded – that what was considered unfeasible does in fact work, it would be contrary to the point of the patent system to hold the disclosure unpatentable…

> 27. Patentability is justified because the prior idea which was thought not to work must, as a piece of prior art, be taken as it would be understood by the person skilled in the art. He will read it with the prejudice of such a person. So that which forms part of the state of the art really consists of two things in combination, the idea *and* the prejudice that it would not work or be impractical. A patentee who contributes something new by showing that, contrary to the mistaken prejudice, the idea will work or is practical has shown something new. He has shown that an apparent "lion in the path" is merely a paper tiger. Then his contribution is novel and non-obvious and he deserves his patent.
>
> 28. Where, however, the patentee merely patents an old idea thought not to work or to be practical and does not explain how or why, contrary to the prejudice, that it does work or is practical, things are different. Then his patent contributes nothing to human knowledge. The lion remains at least apparent (it may even be real) and the patent cannot be justified.
>
> 29. This analysis does not require a different way of looking at the inventive concept depending on whether or not the patentee has shown the prejudice is unjustified as the Judge thought at [67]. It is simply that in the former case the patentee has disclosed something novel and non-obvious, and in the latter not. The inventive concept, as I have said, is the essence of what is in the claim and not dependent on any question about a prejudice being overcome."

60. Mr Hinchliffe sought to rely on this principle in the present case by characterising the judge's conclusion as including the finding that the skilled person would be put off the obvious idea of moving the implementation of Shad to the base station because of the implementation and performance issues found by the judge. I shall need to consider whether this characterisation is correct.

61. That brings me to the first error of principle relied on by the defendants. This is that, because the patent is devoid of implementation details, and concerned only with the idea of setting the differential gains from the base station, the judge should have treated Shad at a comparable level of generality from the perspective of the skilled person. I am not able to accept this as a general principle. The task for the party attacking the patent on the ground of obviousness is to show how the skilled person would arrive at the invention claimed from the disclosure of the prior art. If the invention claimed is, as it is here, a simple idea, then it is correct that this simple idea is the target for the obviousness attack. That does not mean, however, that the court is entitled to assume that the skilled person takes a different approach to the prior art, stripping out from it detail which the skilled person would otherwise have taken into account, or ignoring paths down which the skilled person would probably be led: see the passage from *Pozzoli* cited above. The nature of the invention claimed cannot logically impact on the way in which the skilled person approaches the prior art, given

that the prior art is to be considered without the benefit of hindsight knowledge of the invention.

62. I do not think the judge's reasoning displays any error of principle on this ground. The judge analysed the path which was said to be obvious from Shad and subjected it to proper analysis. The logic of the defendants' case was that the skilled person who did not reject Shad altogether would be sucked in to investigating whether his claim to save power could be demonstrated in the real world. That approach necessarily involved looking at Shad at a level of detail which was not required by the patent. The approach was not a sound basis for making alterations to Shad, or looking for alternative ways of deriving the necessary data for calculating the gains. There is no illogicality in looking at Shad at the level of detail which the evidence required. To strip Shad of its detail was not justified by the evidence, and could only be justified by hindsight.

63. It is convenient to deal here with the defendants' suggestion that the judge wrongly characterised their case at [235] when he said that their case involved the skilled person seeing potential benefits in Shad's proposal, but also perceiving problems in implementing Shad at the mobile, and thus realising that an obvious alternative way would be to implement at the base station. This was indeed one way in which the defendants' put their case, but not the only way. The defendants say that the judge should be taken in that paragraph to have overlooked the defendants' more general, primary case. This was that the skilled person, knowing of the manner in which power is controlled from the base station in UMTS, would readily appreciate that implementation in the base station was an obvious alternative.

64. I think that this point is based on an excessively literal reading of [235] of the judgment. That paragraph comes after the judge had dismissed, at [234], a series of six numbered points advanced by Philips as to why the skilled person would simply put Shad to one side. The first of these points, made at [228], involved the proposition that Shad expressly acknowledges the problem of real-world fading not being accounted for in his theoretical treatment, and proposes "gathering statistics at the MS and applying scaling to make corrections". The judge's "nutshell" summary of the defendants' case [235] was then the preface to [236] in which he said:

> "It follows that, although I do not consider the skilled person would simply put Shad to one side, Mr Edwards' first point remains relevant to the Defendants' obviousness case."

The judge was thus reminding himself that, despite rejecting Philips' argument on rejecting Shad, he nevertheless needed to bear in mind, in considering the defendants' case, the first point made by Mr Edwards, namely that it was an integral part of Shad's disclosure that the statistics would be gathered, scaled and corrected at the mobile.

65. The defendants' more general case is then rejected by the judge at [237], where, as I have explained above, the judge noted Mr Edwards' non-acceptance of the suggestion that implementation of Shad in the context of HSDPA would lead the skilled person to do anything different to what is taught in Shad, and further pointed out that Mr Gould's evidence did not go quite that far.

66. That brings me to the defendants' criticism of [237] of the judgment. Mr Hinchliffe challenges the judge's finding that the evidence of Mr Gould did not go as far as to suggest that "implementation in the context of HSDPA would in itself lead the skilled person to do anything different to what Shad taught." Mr Hinchliffe took us to some passages of the evidence of Mr Gould which showed that he considered that there were two practical implementations which the skilled person would consider when seeking to implement Shad in UMTS, namely a base station implementation and a mobile implementation. Having considered these passages I agree with the judge that the evidence did not suggest that implementation in the context of HSDPA would in itself lead the skilled person to implement in the base station. Moreover, Mr Edwards did not accept this to be the case. The judge was therefore entitled to pursue the analysis of the defendants' obviousness case on the basis that the skilled person would proceed to investigate Shad's proposal as he had set it out.

67. The second error of principle asserted by the defendants is that the specific implementation issues which the judge considered went to the way in which the base station set the gains. This is said to be an error because these details were not features of the claim. How the base station set the gains was a performance issue, which was not relevant to inventive step.

68. In my judgment this argument states the underlying principle too widely. It is certainly the case that if Shad had contained a pointer towards implementing at the base station, Philips would have needed to show that the skilled person would be deterred for some reason from implementing the idea at the base station. That might amount to an impossible burden, given the lack of technical implementation detail in the patent. It would create a classic patent lawyer's "squeeze" between obviousness and insufficiency. But, given that Shad's implementation was in the mobile, the first question was whether the skilled person would have had the idea of implementing it in the base station at all. The judge was entitled to look at how Shad implemented his idea, and ask himself whether there was anything there which would lead the skilled person to an implementation in which the differential power gains on the ACKs and NACKs were determined in the base station.

69. In this connection, Mr Gould's evidence was that the skilled person who read Shad as a whole would see that there was a simple way in which Shad's approach could be implemented in the base station. The judge tested that evidence by seeing where it led, and concluded that the transfer of Shad's implementation to the base station was bedevilled by difficulties which Mr Gould had not thought through. The judge was entitled to treat that evidence as, in effect, driven by hindsight. He was entitled to conclude that Mr Gould's logic for arriving at the inventive idea was not representative of the thinking of the skilled person.

70. I do not think that this conclusion is altered by the fact that Shad states that his implementation is "one possible approach". Again, there is a real danger of hindsight here. The phrase in question prefaces the detail of his implementation in the mobile. No doubt this would be sufficient to lead the skilled person to understand that other detailed implementations were not excluded, but it is a long way from anything which would make it obvious to the skilled person to investigate implementing in the base station.

71. The judge's conclusion betrays no error of principle on this account. He did not treat the implementation requirements as if they were features of the claim. It often happens that what appears with hindsight to be a small and simple step from the prior art turns out, when analysed, not to be obvious. Even with small steps, the danger of hindsight is real. The judge did no more than subject the evidence of Mr Gould to proper scrutiny in order to determine whether he could accept it.

72. The third point raised by the defendants is that the judge wrongly took into account the ability in the patent to set the gains independently. This was not a feature of all the embodiments claimed and was accordingly irrelevant to inventive step: see *Brugger* cited above. The basis for this argument is the judgment at [260]. Here, the judge explains the different contexts of the patent and Shad. The purpose of this explanation was to deal with the defendants' point that, because of the common ground that the skilled person could implement the patent without difficulty, it was inconsistent to say that the invention was not obvious in the light of Shad. Thus, the judge was explaining that the different starting points raised different questions as to how the skilled person would proceed and his motivation to do so. Starting from Shad, the skilled person would see a developed proposal for an implementation in the mobile. He or she would see good reasons for pursuing that implementation, not least that the relevant statistics can conveniently be gathered there. There was nothing to prompt the skilled person to implement the idea elsewhere. By contrast the patent made its case for implementing in the base station, and enabled the skilled person to see how that might advantageously be implemented, including with independent setting of the gains. The judge was right to draw attention to the different context in which the idea of differential gains appears in Shad and the patent. It is quite possible for the detail of a prior art document to operate as a set of technical blinkers which prevents a skilled person from going in an alternative direction. That is what the judge effectively found here. The skilled person thinks that, if he is to implement Shad, he needs to take in all Shad's details. Once the blinkers are taken off by the patent, with its clear suggestion of messaging from the base station, the skilled person can see how the invention is to be implemented when he would not have done so starting from Shad. There was thus no inconsistency. I do not think that the judge fell into the trap, which he himself had earlier identified, of treating independently settable gains as part of the inventive concept.

73. Finally, the defendants contend that the issues which the judge held would have deterred the skilled person from proceeding to implement Shad at the base station remained issues for the implementation of the 525 patent, in the sense that the patent did not teach the skilled person how to overcome them. This is the point based on the passage from *Pozzoli* which I have cited above. The principle is that you cannot have a patent for doing something which the skilled person would regard as old or obvious but difficult or impossible to do, if it remains equally difficult or impossible to do when you have read the patent. To put it another way, the perceived problem must be solved by the patent.

74. I do not think this principle avails the defendants in the present case. On my reading of his judgment, the judge did not accept that the idea of implementing Shad at the base station was, on its face, obvious. The judge concluded that the skilled person would follow up Shad's proposal to optimise his algorithm, and would not be prompted to think of alternative ways of implementing it. The argument, therefore,

does not get off the ground. Secondly, the judge deployed the difficulties involved in implementing Shad at the base station as a legitimate means of testing Mr Gould's evidence that the idea of implementing it there would readily occur to the skilled person. He did not fall into the trap of placing imaginary lions (some call them paper tigers) in what was otherwise an obvious path.

75. That leaves two points which I have not dealt with elsewhere. The first is the judge's reliance on the length of the defendants' closing written submissions as being suggestive of a case of non-obviousness. Mr Hinchliffe points out that much of this material was directed to de-constructing Philips' argument that Shad would be placed to one side. This was a complex case and the length of a party's closing submissions is a crude and misleading guide to their merit.

76. It is true that, in general, a case of obviousness ought to be capable of being stated shortly, and a complex step-by-step argument is unlikely to succeed. I do not think that the judge was doing more than placing limited weight on those propositions. I am not persuaded that he was engaging in a crude exercise of weighing the submissions in kilograms rather than properly scrutinising their persuasiveness.

77. The final point is the judge's reliance on the secondary evidence. Mr Hinchliffe makes a fair point that Qualcomm's reaction to the document as adding unnecessary complexity might have been a reason for accepting Philips' case that Shad would have been put to one side. The judge rejected that case, however. So, the argument goes, the judge should have ignored the Qualcomm document. I do not think there is anything in this point. The judge expressly acknowledged that the document did not assist on the question of whether the skilled person would pursue Shad. What he relied on it for was Qualcomm's reaction that, despite their conclusion that the benefits to be gained from Shad's proposal did not warrant the additional complexity at the mobile, it did not occur to Qualcomm that the gains could be signalled from the base station. I see no error whatsoever in the judge's reliance on the document for that purpose.

78. Standing back, the judge's analysis betrays no error of principle. Despite Mr Hinchliffe's elegantly constructed submissions, this court would not be justified in disturbing the judge's conclusion that the 525 patent was not obvious. I would therefore dismiss the appeal in relation to the 525 patent.

The 659 Patent

79. A recurrent problem with wireless mobile telecommunications is how to make the most efficient use of system resources, such as the available bandwidth on the radio interface. Self-evidently, it is desirable to avoid burdening the system by sending unnecessary data or control information. The invention underlying the 659 patent is concerned with freeing up system resources.

80. The priority date of the 659 patent is 12 November 2003, some two years after that of the 525 patent. By the priority date of 625, UMTS Release 5 had been published and work was under way on Release 6. By then, UMTS was being rolled out across Europe and in South Korea. Release 4 of UMTS had been launched commercially in the UK in March 2003.

81. Elsewhere, the cdma2000 standard (developed by 3GPP2) had been released and been put into use commercially in the US and South Korea, but not in the UK or in Europe. There were some 50 million cdma2000 subscribers worldwide in December 2002.

82. The technical concepts necessary for understanding the 659 patent include the following. Multiple access schemes are mechanisms which allow individual users to be allocated a portion of the radio resources so that they can communicate with the base station using a mobile. The multiple access scheme of relevance to this part of the case is CDMA. In CDMA, several users are permitted to send information simultaneously over a single radio frequency channel. The transmissions of the different mobiles are separated from each other through the use of codes, hence the name for which the abbreviation stands, code division multiple access.

83. CDMA uses spreading codes. Spreading involves multiplication of low rate data signals representing digital information with channel-specific high rate code signals. There are a finite number of such codes and each physical layer channel is assigned a single code for transmission. When a code is assigned, it blocks the use of some codes for other channels because codes are selected from a logical structure known as a code tree. Codes are thus an important system resource. As Mr Vanhegan put it, "the efficient use of these codes was, and always has been, a well-known and ever present issue in all CDMA systems, ever since they were invented…"

84. There are, at least to the lay person, a baffling number of different channels specified by UMTS. Of relevance to this case is the Dedicated Physical Control Channel (DPCCH) which is used for power control. Power control is an important feature of all these systems. Power control techniques existed to adjust the power according to channel conditions. Open-loop power control relies on an assumption that the conditions on the uplink and downlink are similar, whereas closed-loop power control uses a feedback loop from the receiver to the transmitter, and allows the system to accommodate differences in current channel conditions on the uplink and downlink. Transmit power control commands or bits (TPCs) are sent by the base station to the mobile to regulate the power at which the mobile transmits.

85. Pilot signals are predetermined sequences of symbols known to both transmitter and receiver. Pilot signals can be sent on common or dedicated channels. UMTS uses both common and dedicated pilots. The Common Pilot Channel is transmitted to all mobiles and is not power controlled. The channel identifies a particular base station (through a cell-specific code).

86. The common pilots perform two functions in a connection between the mobile and a base station: (a) idle mode mobility and handover, and (b) assisting demodulation of downlink physical channels. The details of this do not matter. As to dedicated pilots, the DPCCH contains dedicated pilots. These are transmitted at the end of each slot, and at lower power than the Common Pilot Channel.

87. Dedicated pilots can be used for the following purposes:

    1. demodulation of the DPCCH/DPDCH (i.e. channel estimation);

    2. layer 1 synchronisation;

3. downlink power control;

4. closed-loop transmit diversity with antenna verification; and

5. user-specific beamforming.

88. For simplicity I will refer to these purposes as "Purpose 1" etc. Dedicated pilots are technically necessary for Purposes 4 and 5. They are not technically necessary for Purposes 1, 2 or 3. Again, the detail of these Purposes does not matter.

89. With that very brief introduction it is possible to turn to the specification of the 659 patent. The specification begins by explaining the use of TPC commands and pilot signals in power control systems. At [0005] it says that the transmission of the pilot signals and TPC commands utilises system resources. It explains that, in CDMA, channel codes are needed for these signals and commands. At [0007] the specification says:

> "An object of the invention is to reduce the requirement for system resources."

90. At [0011] the specification states:

> "The invention is based on the realisation that downlink closed loop power control may be operated by measuring the quality of received downlink non-predetermined data symbols instead of predetermined pilot symbols, and that in some circumstances, separate downlink pilot symbols for each active mobile station are not necessary for channel estimation. In some circumstances, downlink channel estimation is not required at all, and in other circumstances a common downlink pilot signal transmitted at a constant power level may be used instead of separate pilot signals. In some circumstances, the base station transmits a second, non-power controlled downlink signal, or a constant power level downlink signal, the mobile station being adapted to derive a channel estimate from this signal. Consequently, operation is possible using fewer downlink system resources."

91. At [0014] the specification explains that one application for the invention is in UMTS. At [0015] it introduces the concept of a fractional dedicated channel (which was not novel at the priority date). Such a channel incorporates only pilot symbols and TPC commands. Multiple users are multiplexed on to the same channel code in such a way that each user uses the channel code for only a fraction of each time slot (hence a "fractional channel"). This is therefore a form of time division, superimposed on the code division of CDMA. The specification explains that such a code-sharing system frees up channel codes and can be used to increase system capacity. The specification goes on to say, however, that the invention requires even fewer resources.

92. At [0017] the specification explains that one can dispense with dedicated pilot bits in two cases. Then, at [0018]:

> "[0018] So, in accordance with the invention the downlink fractional DCH can consist only of non-predetermined information bits multiplexed between users. A special case of interest is where these information bits carry TPC commands. The amplitude of individual TPC bits may be adjusted by the base station according to power control commands received from the relevant mobile station. The mobile station determines the radio channel phase characteristics from the appropriate common pilot signal, demodulates the TPC commands, and increase or decreases the mobile station uplink DPCCH power as required. In addition, the mobile station uses the amplitude of the received TPC bits to determine any TPC commands sent in the uplink."

93. The judge summarised the invention in the following terms at [127]:

> "In a nutshell, the invention is to dispense with the dedicated pilot bits in the fractional DCH and to use the common pilot signal or the TPC bits instead. This frees up system resources."

94. Mr Vanhegan, in his written submissions, criticised this summary as failing to recognise that the features of the invention included the fractional channel. This, he said, betrayed the hindsight with which the judge had viewed the 659 patent. It is convenient to deal with this point here. Quite apart from the fact that this point is not to be found in the 24 discursive paragraphs of Philips' grounds of appeal, it is one that leads nowhere. The judge was fully cognisant of the full terms of the claim, which he went on to set out two paragraphs later. Moreover, as the judge later went on to explain, the fractional dedicated channel which is claimed was disclosed in the prior art relied on, and is clearly the jumping off point for the invention, as may be inferred from paragraph [0015] of the patent, which describes it. So if the judge had said "the <u>inventive step</u> is to dispense with the dedicated pilot bits in the known fractional DCH and to use the common pilot signal or the TPC bits instead", there could have been no possible criticism. The inventiveness or otherwise of that step is what the judge went on to assess in the remainder of his judgment. I therefore reject this free-standing criticism of the judgment.

95. Philips proposed amendments to the claims in the course of the litigation, which the judge was prepared to allow if claim 1 was valid. As proposed to be amended and broken down into integers, omitting reference numerals, claim 1 is in the following terms:

> "[1] A mobile station for use in a UMTS communication system in FDD mode operating HSDPA having a base station, the mobile station comprising:
>
> [2] receiver means for receiving from the base station a first downlink signal on a downlink dedicated channel configured as a fractional dedicated channel which comprises only second power control commands, with multiple users multiplexed on to the same channel code;

> [3] measurement means for measuring a parameter of the received first downlink signal;
>
> [4] power control means for generating first power control commands in response to the measured parameter; and
>
> [5] transmitter means for transmitting the first power control commands to the base station;
>
> [6] wherein the first power control commands are used by the base station to adjust the power of the part of the fractional dedicated channel corresponding to the mobile station;
>
> [7] wherein the measurement means is adapted to measure the parameter of the first downlink signal while the first downlink signal is modulated with non-predetermined data values
>
> [8] and is subjected to transmit power control in accordance with the first power control commands."

96. The judge concluded at [134] to [138] that the skilled person for the purposes of the 659 patent was someone who was working on UMTS, particularly HSDPA. Because the problem which the patent sought to address was to improve the UMTS radio interface from Release 5 in order to reduce code usage, he accepted that the skilled person would be focused on developing the Standard rather than simply implementing Release 5. He added the cautionary note, however, that "This does not mean that he would be oblivious to implementation issues".

97. Between [139] and [164] of his judgment the judge dealt with relevant aspects of the common general knowledge. The conclusions which he drew related to what the UMTS skilled person knew about the Standard, as well as about the cdma2000 standard with which he or she would be less familiar, but not wholly ignorant. His conclusions included knowledge of the following:

i) The basic power control procedure in cdma2000 is similar to that in UMTS.

ii) cdma2000 performs power control measurements on TPC bits, not on pilot bits.

iii) Dedicated pilot bits were useful for power control.

iv) However, the necessary measurements for power control could be performed on any type of bit, whether pilot or otherwise. Whilst dedicated pilot bits were optimal, TPC bits would be satisfactory.

v) Depending on certain factors, the skilled person would know that (i) dedicated pilot bits; (ii) common pilot bits; (iii) both the dedicated and common pilots could be used for channel estimation.

vi) The common pilot channels cannot be used for Purposes 4 and 5 listed in paragraph [81] above. Purpose 4 requires dedicated pilot bits, but is more beneficial for high-power than for low-power channels. Purpose 5 could also

only be achieved with dedicated pilot bits, but a fixed grid variant could make use of common channels. There were pros and cons of both Purpose 5 and its variant.

vii) Backwards compatibility, in the sense of a property of a system that allows for interoperability with an older legacy system, such as an earlier release of the same standard, was something that the skilled person would seek to maximise, but which he or she would not regard as an absolute requirement.

viii) The skilled person's preference would be to use both the common and dedicated pilots for phase estimation. It is only in the circumstances identified in the sub-paragraph (vi), however, that the dedicated pilot bits were technically necessary.

98. The judge then went on to summarise the disclosure of what was in effect a single prior art citation relied on by the defendants. This was document R1-031074, a contribution submitted to the 3GPP TSG-RAN Working Group 1 meeting number 34 in Seoul, South Korea on 6-10 October 2003 by Nortel Networks ("**Nortel October**"), read together with document R1-030546, a contribution submitted to the 3GPP TSG-RAN Working Group 1 meeting number 32 in Marne La Vallee, France on 19-23 May 2003 by Nortel Networks ("**Nortel May**") which is cross-referenced in Nortel October. These documents were submitted to the Working Groups as part of the progression towards UMTS Release 6, and were concerned with improving HSDPA.

99. Nortel May is entitled "Fractional dedicated physical channel". The introduction explains that:

> "The principles explained here allow to reduce the number of codes needed to operate HSDPA in a cell. It was designed to ensure a maximum backwards compatibility with existing UMTS features thus minimising the impact on both the UE [i.e. the mobile] and the node B [i.e. the base station]".

100. Nortel May explains at paragraph 3.1 that in order to achieve its goal of maximum backwards compatibility with existing features for the mobile and the base station it took into account a number of technical constraints. It goes on to explain the code-sharing technique on the fractional channel in more detail than in the patent. The fractional channel consists only of TPC and pilot bits. At 3.4 it states:

> "When considering the number of TPC and pilot bits dedicated to a given user, maximum backwards compatibility should be targeted i.e. when possible numbers derived from existing slot formats should be considered so that layer 1 synchronisation and features e.g. beamforming are not affected."

"Layer 1 synchronisation" is a reference to Purpose 2 and "Beamforming" is a reference to Purpose 5.

101. Nortel May concludes by saying that the proposal:

> "… allows a wider use of HSDPA by reducing the code limitation problem … and therefore is a good candidate technology for the HSDPA enhancement discussions"

102. Nortel May also includes a draft text proposal detailing the Fractional dedicated physical channel for inclusion in the standard.

103. Nortel October, after cross-referring to Nortel May, expands on the draft text proposal for inclusion in the standard. The judge found that the skilled person would notice that, compared with Nortel May, the minimum number of TPC symbols had been reduced whereas the minimum number of pilot symbols had remained unchanged.

104. The judge identified the difference between Nortel October (including Nortel May) and the claim as being that Nortel October did not disclose omitting pilot bits from the fractional dedicated channel. No criticism is made by Philips of this formulation. He went on to summarise the parties' cases. The defendants' case was that the skilled person reading Nortel October would have been presented with an obvious choice: retain the dedicated pilot bits and with them the ability to perform Purpose 4 and Purpose 5, or remove the dedicated pilot bits and reduce code usage, and lose certain functionality. This was a straightforward trade-off, and not a trade-off that the patent avoids. The patent simply accepts the loss of functionality in return for reduced code usage. Philips' case stressed (a) the fact that Nortel October already delivered a three-fold advantage in terms of code usage whilst at the same time maintaining maximum backwards compatibility; (b) that there was no suggestion in Nortel of removing the dedicated pilot bits: on the contrary the skilled person would understand that the dedicated pilot bits had been retained for backwards compatibility; (c) the skilled person would notice that, as between Nortel May and Nortel October the ratio of the number of pilot bits relative to the number of TPC bits had been increased; (d) the skilled person would know that dedicated pilot bits were essential for Purposes 4 and 5, and were in fact used for the other Purposes in devices which complied with UMTS Release 5; (e) thus the skilled person would be concerned at the consequences for mobile phone manufacturers of omitting the dedicated pilot bits; (f) in those circumstances it would go against the grain of the skilled person's thinking to omit the dedicated pilot bits.

105. The judge's conclusions are set out in paragraphs [193] and [194], in which references to Mr Kahtava are to Philips' expert witness, and to Professor Purat are to the defendants' expert witness:

> "193. In my judgment the evidence of the experts shows that omitting the dedicated pilot bits from the F-DPCH proposed in Nortel October was a technically obvious choice for the reasons given by the Defendants which I have summarised above. Mr Kahtava agreed that the skilled person would be interested in Nortel October's proposal and would want to pursue the F-DPCH. Moreover, he agreed that a skilled person who was developing Release 5 would want to maximise the number of MSs on a code. He also agreed that the skilled person would be able to implement a modified F-DPCH with no pilot bits using his common general knowledge, and would see benefits from omitting the pilot bits. Although Mr Kahtava made a point

about performance issues in relation to the one-slot delay, this is not a requirement of the claim or something the Patent addresses. As for the point about the ratio of TPC bits to pilot bits, Mr Kahtava agreed that they have different functions and thus the ratio between them in Nortel October is not of any particular significance. It was clear from Mr Kahtava's evidence that his reasons for saying that it would go against the grain of the skilled person's thinking to omit the dedicated pilot bits from the F-DPCH in Nortel October were because of the impact on backwards compatibility and implementation issues. The impact on backwards compatibility in term of the technical capabilities of the system would be limited for the reasons given by the Defendants, however. Moreover, as Mr Kahtava accepted, the skilled person would appreciate that it would be possible to have two slot structures for the F-DPCH, one with and one without pilot bits. That would enable the skilled person to retain the capability for user-specific beamforming and closed-loop transmit diversity with antenna verification if so desired. Thus the key factor in Mr Kahtava's reasoning was that of the costs of implementing the new channel without the pilot bits. When Mr Kahtava was asked to assume that the skilled person was not concerned with costs, he readily accepted that it would be obvious to remove the pilot bits.

194. Prof Purat's evidence was that, given Nortel October's objective, the skilled person would naturally consider whether the number of users on a single code could be increased further. The skilled person would see that the only options to reduce code usage were to reduce the number of TPC bits to one or to remove the pilot bits. The skilled person would know that the pilot bits were not technically necessary and would be aware that cdma2000 did not have dedicated pilot bits. Accordingly, omitting the pilot bits would be an obvious choice. Although this would involve the disadvantage that user-specific beamforming and closed-loop transmit diversity with antenna verification could not be applied to the F-DPCH, the skilled person would consider that a minor disadvantage which was outweighed by the increase in the number of users for each code. Prof Purat accepted that the skilled person would appreciate that open-loop transmit diversity could not be used with the first three slot formats ("structures") proposed in section 6.x.1.3 of Nortel October, but did not accept that this meant that it was not obvious that the dedicated pilot bits could be omitted. For the reasons explained above, I have approached Prof Purat's evidence in relation to Nortel October with caution because of the risk that his opinions may have been based on hindsight. Given that Mr Kahtava's evidence was largely consistent with that of Prof Purat, however, I have concluded that Prof Purat's opinions were not tainted by hindsight."

106. The judge also considered some contemporaneous secondary evidence, which he considered provided support for the defendants' case. He concluded that claim 1 was obvious.

107. Philips' grounds of appeal are, as I have mentioned, discursive. What follows is my summary. In what I will call **Grounds 1(a) to (d)**, Philips contends that the judge's conclusion on obviousness was in error because he failed to find "consistent with the evidence and the law" that:

> (a) The skilled person had a mindset that dedicated pilot bits should be used such that he or she would not have been caused even to think of not using them absent specific directions to do so (and there was no such direction in Nortel).
>
> (b) Nortel's requirement for backwards compatibility would be understood by the skilled person as a technical requirement for the use of dedicated pilot bits.
>
> (c) To the extent that backward compatibility was to be understood as an implementation or cost issue, that remained a relevant factor in law when assessing obviousness.
>
> (d) The skilled person reading Nortel with his or her common general knowledge would therefore not even consider removing the pilot bits from the channel and therefore not have got to the point of asking whether there was a trade off in so doing.

108. In what I will call **Ground 2**, Philips contends that the judge's summary of Philips case at [192] "omits consideration of Philips' mindset case".

109. In what I will call **Ground 3**, Philips contends that the judge misunderstood Mr Kahtava's evidence, summarised in [192]. The judge understood that the key factor in Mr Kahtava's reasoning was that the skilled person would be discouraged from altering the channel by removing the bits because of the costs of doing so. Mr Kahtava's evidence had in fact been that it would be possible to have a slot structure without pilot bits **if** the skilled person were not concerned with issues of implementation.

110. Paragraphs 10 to 22 of the Grounds of Appeal are headed "The skilled person's CGK and Philips' Mindset case." These paragraphs are not proper grounds of appeal. They consist of reasoning, and legal and factual argument. This is contrary to CPR 52 PDC 5(1), which requires grounds of appeal to identify as concisely as possible the respects in which the judgment is wrong or unjust. Paragraph 5(2) of the same Practice Direction makes the point that the reasons why the judgment is wrong or unjust should be confined to the skeleton argument. The importance of this rule is illustrated by a case such as this. Unless the court and the parties stick to the discipline of attempting to find a defined error of principle in the judgment below, it is too easy to be drawn into a wholesale re-assessment of the judge's findings. That is not the function of an appellate court. It can be seen from the sub-headings of this section of the grounds ("The Mindset to Use Dedicated Pilot Bits"; "Nortel Teaches Away from Removing Dedicated Pilot Bits", "Nortel's Requirement for Backwards Compatibility was a Technical Consideration or a partly Technical Consideration", "Even if Backwards Compatibility and Implementation Issues were solely

commercial matters, the Learned Judge erred by failing to take them into account") that they seek to argue out the case made under the previously identified grounds. This should have been left to the skeleton argument.

111. In paragraphs 22 to 24 Philips contends that the judge erred in his consideration of the secondary evidence. According to these paragraphs, the judge should have held, first, that Nortel's decision to include dedicated pilot bits after Nortel October "is consistent only with Philips' case of obviousness." Secondly, the judge did not consider an argument that if the trade-off were obvious, it would have been discussed sooner. I will call these points **Ground 4**.

112. **Ground 1(c)** raises an issue of law which it is convenient to deal with at the outset. Philips contends that, even if the reasons for not pursuing a particular path are solely commercial matters, or are purely commercially driven, they ought not, in law, to be excluded from a consideration of obviousness.

113. In *Hallen Co and another v Brabantia (UK) Ltd* [1991] RPC 195 the invention was coating the helix of a well-known self-puller type of corkscrew with a friction reducing material. This made it easier for the user to insert the helical screw into the cork. The evidence showed that (a) coating the self-puller in this way was something the skilled person could do, but (b) for purely commercial reasons it was not obvious to *manufacture* such a corkscrew. In fact, if one made such a corkscrew, the friction reducing material would do more than aid insertion of the helix, but would aid extraction of the cork with the self-puller mechanism as well. The trial judge (Aldous J as he was then) had, in a passage cited at page 209 of the report of this court's judgment, directed himself in the following terms:

> "The word 'obvious' in section 3 is I believe directed to whether or not an advance is technically or practically obvious and not to whether it is commercially obvious. Although the law is encapsulated in section 3 of the Patents Act 1977, the law on obviousness goes back many hundreds of years. The basis of the law is that the public are entitled to manufacture that which has been published, in the sense of made available to the public, with obvious modifications. By 'obvious modifications' are meant that which technically or practically would be obvious to the unimaginative skilled addressee in the art. Such a skilled man should be assured that his actions will not be covered by any monopoly granted to another if he does that which is part of the state of the art with modifications which are workshop alterations or otherwise technically or practically obvious alterations. He does not and should not have to look further and consider whether the step he is taking is obvious or not for commercial reasons. The prize for a good commercial decision or idea is a head start on the competition and not a monopoly for twenty years.
>
> Section 3 of the 1977 Act is directed to preventing patents being granted when the inventive step could or, in appropriate cases, would be obvious from a technical or practical point of

> view, even if the step was commercially not an obvious one to take."

114. Slade LJ, delivering the judgment of this court which also included Taylor LJ, agreed with this formulation at 213 lines 31 to 49:

> "If the plea of obviousness is to succeed, the court has to be satisfied that it would have appeared to the hypothetical technician, skilled in the art but lacking in inventive capacity, worthwhile to coat the helix of a self-pulling corkscrew with a friction-reducing material for purpose (a) or purpose (b) above or both of them. As cases such as *Technograph* and *Beecham* show, he is not to be expected to take steps or try processes which he would not regard as worthwhile. In using the word "worthwhile", we mean worthwhile as a possible means of achieving or assisting in practice the objective which he has in view. This, we infer, was what the judge had in mind in saying that the word "obvious" in section 3 is directed to whether or not an advance is "technically or practically obvious". We do not think that the hypothetical technician must also be taken as applying his mind to the commercial consequences which might follow if the step or process in question were found in practice to achieve or assist the objective which he had in view. As Oliver L.J. said in the Windsurfing case, [1985] R.P.C. 59 at 72 , "What has to be determined is whether what is now claimed as invention would have been obvious, not whether it would have appeared commercially worthwhile to exploit it". We thus agree with the judge that the word "obvious" in section 3 is not directed to whether an advance is "commercially obvious". We do not think that he misdirected himself in the relevant passage of his judgment."

115. In *Dyson Appliances Ltd v Hoover Ltd* [2002] RPC 22 the invention was a vacuum cleaner which used dual cyclones for purifying air as opposed to the familiar paper bag filter. The trial judge found that the skilled person had, as part of his common general knowledge, a mindset which would have prevented him or her from devoting effort to purifying air with anything other than a bag. This was a mindset driven by the commercial consideration that the supply of bags provided a continuing source of income and profit. Although the skilled person was assumed to have some interest in any prior art proposal, the mindset would cause the skilled person to regard any "bagless" proposal with scepticism (see paragraph 156 of the judgment of HHJ Fysh sitting as a deputy High Court Judge, quoted at [55] of the report in this court). Having cited the passage from the judgment of this court in *Hallen* set out in paragraph [107] above, Aldous LJ said:

> "56. … Since at least the *Hallen* case, it has been recognised that the patent system is not available to protect mere commercial improvements. The observations of Slade LJ were directed at that issue …

> 57. I do not believe the judge fell into error in paragraph 156 of his judgment. The mantle of the skilled person is that of an actual skilled person. The purpose of assuming the mantle of the skilled person is to enable the decision as to what is obvious to be a decision based on actual facts. They include all the attitudes and perceptions of such a person."

116. In the same case Sedley LJ said:

> "87. … it remains the case that the perceived limits of technical practicability are a matter of mindset, and that mindset is characteristically affected by awareness of need, of which commercial potential is both a function and an index. Just as it is highly improbable that the idea of the wheel would have occurred to anyone in a society which had no need to move loads, it is hard to believe that either the heretical idea of a heliocentric universe or the observations and calculations which eventually demonstrated its existence would have happened in a society to which chronology and marine navigation were unimportant. Historically there is always something which makes the inventive think the unthinkable and by the same token inhibits the unimaginative from doing so.
>
> 88. If then the intellectual horizon of practical research and innovation is in part set by the economic milieu, commercial realities cannot necessarily be divorced from the kinds of practical outcome which might occur to the law's skilled addressee as potentially worthwhile. It is one thing to accept that this technologically skilled but wholly unimaginative person is a lawyer's construct – a ventriloquist's dummy, Mr Hobbs calls him – who thinks only of how things work or could be made to work. It is another to expel him altogether from the real world, where ideas do not occur to people in (so to speak) a vacuum.
>
> 89. The present case, on the deputy judge's findings, is a very good illustration. The vacuum-cleaner industry was functionally deaf and blind to any technology which did not involve a replaceable bag. The fact that the handicap was entirely economically determined made it if anything more entrenched. The industrial perception of need was consequently, in the judge's happy coinage, bagridden. It is entirely in accordance with what we know about innovation that this commercial mindset will have played a part in setting the notional skilled addressee's mental horizon, making a true inventor of the individual who was able to lift his eyes above the horizon and see a bag-free machine."

117. Arden LJ said this:

"94. Insofar as that mindset reflects on commercial motivation, I would add that, as the passage from the judgment of Slade LJ in *Hallen & Co v Brabantia (UK) Ltd* [1991] RPC 195 at 213, cited by Aldous LJ, demonstrates, the question of obviousness does not compel or require any proof of commercial obviousness. Indeed, as Sedley LJ points out, the skilled but unimaginative addressee is a legal construct. In some respects he is superhuman: he is deemed to have read all the publicly available documents, in whatever jurisdiction or language. But he is also deemed never to think laterally (see per Laddie J in *Pfizer Ltd's Patent* [2001] FSR [61] at [62]). With regard to the skilled addressee, the investigation into obviousness is unreal, and thus removed from the real world where commercial motives may dominate. The question, however, whether (as of the priority date) the differences between the Dyson claims on the one hand and the Campbell and Johnston/Donaldson claims on the other hand were obvious or required a degree of invention is answered at the fourth stage in the Windsurfing enquiry by considering the technical differences between the Dyson claims and the prior art. This involves a technical comparison of such differences.

95. Hoover contends on this appeal that the judge erred in law in his general approach in the way he took into account the interests, motives and prejudices of the addressee in the prior art. On its submission, the judge was wrongly influenced by the "mindset" in favour of bags: that was not a proper consideration and resulted in an over-restrictive reading of the prior art. Despite the persuasive (though commendably economical) submissions of Mr Geoffrey Hobbs QC, for Hoover, I am satisfied that the judge attached appropriate significance to the mindset and decided the issue of obviousness on technical grounds in accordance with well-established case law: see in particular paragraphs 156, 158 and 162 of his judgment. The judge expressly recognised that there was a legal requirement that the addressee should take a practical interest in the prior art (see judgment, paras 156 and 162). However, at the end of the day, the prior art would have required substantial changes to bring the Dyson claims within it (see judgment, para 156). The "mindset" in favour of bags was, as the judge held relevant to the skilled addressee's "active repertoire of skill" (judgment, para 45) and the enthusiasm and ease with which he could have been able to make those changes, without showing the imagination which he is presumed not to have (see judgment, paras 156, 157)…

97. In some circumstances, commercial motivation or the lack of it may be relevant because it sheds light on some issue itself relevant to obviousness or inventive step. In relation to obviousness, the burden of proof is on the party challenging the

> validity of the patent. However, to repeat, the fact that it was not foreseen that an invention would be a commercial success is neither a necessary nor a sufficient requirement for refuting a claim of obviousness, or vice-versa, just as the subsequent commercial success of an invention does not prove inventive step. The validity of a patent is to be ascertained by rigorous application of the provisions of section 1 of the Patents Act 1977 together with the jurisprudence of the courts which it codifies or which explains its requirements. But commercial motivation or "mindset" may have some indirect relevance to the issue of obviousness, as for the reasons given above this case illustrates."

118. These passages show that a commercially driven mindset can be a relevant aspect of the skilled person's common general knowledge. Thus, what the skilled person does in the light of a given prior disclosure has to be decided with that mindset in mind. If the technical differences from the prior art to the invention are trivial, then the mindset may not matter, but if more substantial changes are involved, the court may conclude that the reluctant and prejudiced skilled person would not make them. If the court reaches the conclusion that the claimed invention would be arrived at by the skilled person, there is no further hurdle to be crossed concerned with whether the invention would be perceived as likely to lead to sufficient commercial success to make its manufacture worthwhile.

119. Mr Vanhegan submitted that the judge had lost sight of this distinction in paragraph 193 of the judgment. The judge had recognised that Mr Kahtava's evidence was that it would go against the grain of the skilled person's thinking to remove the dedicated pilot bits because of the impact on backwards compatibility and implementation issues. Having then gone on to recognise the costs of implementation as a key factor in Mr Kahtava's reasoning, he wrongly relied on Mr Kahtava's evidence that, if he was asked to assume that costs were not a factor, it would be obvious to remove the pilot bits. The considerations on which Mr Kahtava relied were part of the real-world mindset of the skilled person which would prevent him from having the idea of removing the dedicated pilot bits in the first place.

120. I do not think that the judge lost sight of the relevant legal principles. Mr Vanhegan's argument misconstrues paragraph 193 of the judgment. The judge commenced paragraph 193 by recording his finding that omitting the dedicated pilot bits was "*a technically obvious choice*" for the reasons given by the defendants. The reasons for that conclusion are those given by the judge at [191] and which I have summarised in paragraph [104] above. In short, it was obvious to the skilled person reading Nortel that the dedicated pilot bits could be dispensed with if you were prepared to dispense with the functions for which they were technically necessary. There is nothing in the least surprising about that conclusion, given that Nortel tells the reader that the dedicated pilot bits are retained for backwards compatibility, as Philips indeed asserted. The patent taught omitting those bits, but did not suggest that the accompanying disadvantage of doing so would be avoided.

121. In the remainder of paragraph 193 the judge is assessing the points made by Philips in paragraph 192, explaining why none of these affected his preliminary conclusion that the invention was technically obvious. First, he explains the respects in which the

evidence of Mr Kahtava supported that conclusion. Mr Kahtava had agreed that the skilled person would:

i) want to pursue the fractional channel;

ii) want to maximise the number of mobiles on a code;

iii) be able to implement a modified fractional channel with the dedicated pilot bits removed, using only his common general knowledge;

122. The judge then dismissed two further technical objections. One was a performance issue not addressed by the patent, and the other, relating to the ratio of TPC bits to pilot bits, was not of any particular significance. Having dealt with these points which went to technical obviousness, the judge turned to Mr Kahtava's reasons for saying that it would go against the grain of the skilled person's thinking to omit the dedicated pilot bits. The first was the impact on backwards compatibility. The judge accepted the defendants' case that this impact would be limited, and could be avoided by having a two slot structure if considered important enough. It followed that none of the technical reasons advanced by Philips contradicted the conclusion that there was a technically obvious choice to be made.

123. What that left, as the judge explained in the latter part of [193], was Mr Kahtava's reliance on the costs of implementation of the new channel without pilot bits. Given that the judge had already done enough to show why the invention was technically obvious, the judge was fully entitled, applying *Hallen* as explained in *Dyson*, to treat this consideration as irrelevant. It was irrelevant that the skilled person might, or would prefer to maintain Purposes 4 and 5 when he or she comes to decide which branch of the obvious choice to go down. The judge was not in error in analysing matters in that way, and did not therefore make the error of law for which Mr Vanhegan contends.

124. This leads one naturally to Ground 1(a), which asserts that the mindset or prejudice of the skilled person was so strong in favour of maintaining backwards compatibility that he or she would not have perceived the obvious choice which the judge found existed.

125. This is a very bold submission. This is not a case, like *Dyson*, where the skilled person is required to make extensive modifications to the prior art to arrive at the invention, and where his mindset would make him disinclined to devote much effort to such a project. On the contrary, the invention is the idea of dispensing with the dedicated pilot bits, and accepting the consequent loss of functionality and expense of implementation, which the patent does nothing to avoid. Mr Vanhegan's submission involves the assertion that the skilled person would be so focused on the need to maintain existing functionality, that he would not be capable of thinking of a relatively modest modification of the existing structure if it involved losing some aspect of that functionality.

126. Mr Vanhegan nevertheless sought to persuade us that this was the effect of Mr Kahtava's evidence. He accepted that Professor Purat's evidence was to the contrary effect. This was that neither the teaching in Nortel which places importance on backwards compatibility, nor any common general knowledge mindset, would prevent the skilled person thinking about removing the dedicated pilot bits. Mr

Vanhegan's submission was that the judge had failed to grapple with the conflict between Mr Kahtava's and Professor Purat's evidence, and to give any proper reasons for rejecting Philips' mindset case.

127. It was certainly Mr Kahtava's evidence that the skilled person would regard the pilot bits in the proposed fractional dedicated channel taught by Nortel as important for Nortel's purposes. He said at paragraph 267 of his first report that:

> "The mind-set of the skilled person would be firmly that the pilot bits were an important feature for the operation of the fractional dedicated channel proposed in Nortel 1 and 2. Indeed, Nortel 1 and 2 make it clear that the pilots bit [sic] are a fundamental feature of the fractional dedicated channel."

128. Professor Purat's evidence was to the contrary. He said at paragraph 6.39 of his first report:

> "I disagree with §267 of Mr. Kahtava's first report. The skilled person would know the purpose of the dedicated pilot bits from Release 99, 4, and 5. They exist to enable user-specific beamforming and antenna verification for transmit diversity. Moreover, they can be used to take SIR measurements on the dedicated channel. The skilled person would know that pilot bits are transmission overhead and they would know that a removal of pilot bits provides the option to transmit other useful data. In considering the presence of pilot bits, they would always weigh the benefits of removing them versus the benefits of retaining them. Neither Nortel May nor Nortel October describes the pilot bits as fundamental to the Fractional Dedicated Channel and I do not believe that the skilled person would have understood them to be fundamental."

129. Moreover at paragraph 10.22 Professor Purat said:

> "The skilled person would understand that one of the targets in Nortel is maximising backward compatibility, but he or she would be well aware that dropping aspects of backward compatibility may provide further options to improve the system."

130. In cross-examination Professor Purat held to his view that the skilled person would see that removing the dedicated pilot bits was a trade-off. At one point, being pressed about the desirability of maintaining existing functionality, he said:

> "Certainly, the skilled person, if they knew that they were implemented, and there is a good reason why you could continue to use them, but things developed, and I think when you specify new releases, the skilled person would also know that you should not always use the old hardware or software implementations that you used for the first releases."

131. Mr Vanhegan peppered his submissions with references to the fact that Professor Purat's evidence about what was obvious in relation to a different prior art document had been criticised by the judge as having "reeked of hindsight". He rightly held back, however, from saying that the judge was bound to accept Mr Kahtava's evidence wherever it was in conflict with that of Professor Purat. The judge was not bound to reach that conclusion. In fact, having made the specific finding about hindsight, the judge did not reject the totality of Professor Purat's evidence, but instead delivered to himself a warning that he needed to be cautious about the Professor's evidence elsewhere.

132. Mr Vanhegan also submitted that the judge had dismissed his concern about Professor Purat's evidence suffering from hindsight on erroneous grounds. The reason given by the judge at the end of [194] was that the evidence of the two experts was "largely consistent". However, on the critical question of whether the desire for backwards compatibility was so strong that the skilled person would not have the idea of removing the dedicated pilot bits at all, there had been a head-on conflict.

133. I do not think the judge was wrong to say that there was a large measure of agreement between the experts. This agreement enabled the judge to make his wide-ranging findings about the extent of the common general knowledge, including the limited impact that dispensing with dedicated pilot bits would have on backwards compatibility. Although the judge did not put it in quite these terms, it is plain that he thought that the skilled person would not be prevented from having the idea of removing the dedicated pilot bits, and to this extent preferred the evidence of Professor Purat. If a particular prejudice is to prevent the skilled person from having a technically obvious idea at all, it needs to be a strong one. Sedley LJ in *Dyson* said that the relevant skilled person was "functionally deaf and blind" to the relevant development. Even taking Mr Kahtava's evidence at its highest, nothing like that sort of mental block was established by the evidence in this case. I therefore reject ground 1(a)

134. Ground 1(b) complains of the judge's failure to find that Nortel's requirement for backwards compatibility would be understood by the skilled person as a technical requirement for the use of dedicated pilot bits. In a sense, the statement that Nortel's requirement would be so understood is a self-evident proposition. The skilled person would undoubtedly understand from Nortel that the dedicated pilot bits were provided for Nortel's purpose of ensuring backwards compatibility. If the attack on the patent were on the basis of lack of novelty, that fact would be determinative of the attack, as it certainly could not be said that Nortel *taught* that the pilot bits are to be omitted. To focus too intensely on this fact in the context of obviousness is, however, misguided. If the skilled person understands the purpose for which the pilot bits are present in Nortel, he or she will also readily understand the consequences of removing them. The judge's conclusion was that none of these consequences were serious, and none were avoided by the invention of the patent. I do not think that ground 1(b) discloses any error by the judge.

135. Ground 1(d) asserts that the skilled person reading Nortel with his or her common general knowledge would not even consider removing the pilot bits from the channel and therefore would not have got to the point of asking whether there was a trade off in so doing. Mr Vanhegan described this as his "double whammy mindset case". The teaching of Nortel combined with the skilled person's mindset against doing away

with backwards compatibility together made it impossible for the skilled person even to contemplate loss of the pilot bits. Mr Hinchliffe pointed out, however, that the skilled person's thinking has to be informed by all aspects of the common general knowledge, not merely those identified by Philips. These included the matters noted by the judge and which I have set out at [97] above. The judge was also entitled to take into account the concessions made by Mr Kahtava which I have referred to at [121] above. Once all those matters are taken into account, the judge was certainly not bound to conclude that the skilled person would not even consider removing the bits. There was ample material to support the judge's conclusion. That is sufficient to dispose of this ground.

136. Ground 2 asserts that the judge's summary of Philips' case at [192] "omits consideration of Philips' mindset case". For reasons which are already apparent, I am entirely satisfied that the judge properly understood Philips' case on mindset, and rejected it on grounds which were properly available to him.

137. Ground 3 complains of the judge's treatment of Mr Kahtava's evidence. I have already explained how the judge dealt with that evidence. It did not preclude his finding that the invention was technically obvious.

138. Ground 4 relates to the secondary evidence. The points made by Mr Vanhegan on the secondary evidence were the following:

i) Nortel continued to include dedicated pilot bits after Nortel October. They did not remove the dedicated pilot bits, but instead continued their investigations on the basis that user specific beamforming would be applied and maintained, thus requiring the retention of dedicated pilot bits.

ii) A Siemens post-priority date document considered that Philips had "extended" the work of Nortel.

iii) Nokia, also post priority date, suggested the removal of the dedicated pilot bits.

139. The points made above seem to me to be of little if any weight. As to the first point, it can sometimes be relevant to obviousness to show that, in the period following the publication of the prior art, the idea of the patent did or did not crop up in the industry. That is because, if it were obvious, one would expect to see it being discussed or implemented. In the present case there is nothing surprising about the fact that Nortel did not adopt the trade-off that the invention represents. They appear to have attached importance to user specific beamforming. That is what I think the judge meant when he referred to Nortel having a self-imposed restraint which required them to retain this and other specific functionality. But that does not provide significant evidence that a modification which loses that functionality is to be regarded as inventive.

140. The judge did not deal specifically with the second and third of these points, but I do not think that he had to. The fact that Siemens used the word "extended" in relation to the Philips contribution is not a testament to its inventiveness. Sometimes in obviousness cases the patentee is able to rely on subsequent third party recognition of the invention, but to be of any effect such documents must go to the inventiveness of

the step taken, not merely to the existence of the step. The Nokia document is said to assist Philips because of the time which elapsed between the Nortel publications and the published suggestion of the abandonment of the dedicated pilot bits by Nokia. But one does not know when Nokia thought of the idea, which may have been much sooner. If so, it would support the defendants not Philips.

141. The judge committed no error of principle in relation to his treatment of the secondary evidence.

142. I would therefore dismiss the appeal in relation to the 659 patent.

The 511 Patent

143. The appeal in relation to this patent raises two issues. The first is an issue of construction of the claim which, the defendants say, means that the patent is not infringed by operation of the Standard. The second issue concerns an obviousness case, advanced in the alternative, against the validity of the patent.

144. The judge found that the 511 patent was addressed to a person working on power control as part of the air interface of a cellular communications system. Such a person would have a background and experience in UMTS, but he or she would not be restricted to UMTS, and could be working on implementing the power control aspects of cdma2000. The skilled person's common general knowledge would therefore include some aspects of cdma2000 as well. There is no challenge to these findings of the judge.

145. The principal technical background needed for an understanding of the appeal on this patent is the following:

i) Power control on the uplink is designed to ensure, so far as possible, that the received power at the base station from different mobiles is approximately the same. This requires mobiles which are far away from the base station to turn up their power, and those which are close to turn it down. Greater power is also desirable when other channel conditions are poor, for example when the propagation path is interrupted by buildings and other obstructions which reflect the radio waves.

ii) UMTS systems used closed-loop power control. The inner loop on such systems involves the base station making measurements of short-term signal quality and comparing these measurements with a target value. On the basis of these measurements the base station sends TPC commands to the mobile, instructing the mobile to raise or lower the power. This is done very rapidly in power control slots, some 1500 times per second, or every 670 microseconds.

iii) The effect of using closed-loop power control is that the power at the mobile will rise as channel conditions get worse, and decrease as channel conditions improve.

iv) The net effect, and the object of the exercise, is that the received power at the base station is relatively constant.

146. The priority date of the 511 patent fell at a time when the current Release of UMTS was Release 5, and the industry was working towards Release 6. Release 5 had the following features:

i) There were a number of dedicated uplink physical channels, including the Dedicated Physical Control Channel (DPCCH);

ii) The DPCCH contains control data, which the mobile required to maintain its connection with the BS.

iii) The DPCCH was subject to closed-loop power control. The mobile increased or decreased the transmission power based on the TPC commands from the BS on a slot-by-slot basis.

iv) The other physical channels had their transmit power increased or decreased in response to the transmit power of the DPCCH, in a specified relationship.

v) Each mobile had a maximum permitted transmit power. If a TPC command required the mobile to raise its power above this level, it would not do so. Instead, it calculated and applied a scaling factor to maintain the total transmit power at the maximum level, whilst maintaining the relative powers between the various channels.

vi) The process of scaling down to keep the power below the maximum is referred to as "clipping".

147. The specification of the 511 patent begins at [0001]-[0005] by summarising existing transmitter power control schemes. Figure 2 shows the variation in channel quality over time without any transmit power control. Figure 3 shows the corresponding inverse variation in transmit power that would be provided by a perfect closed-loop scheme to maintain a constant signal quality. It can be seen that the two curves are reflections of one another: high channel quality corresponding to low power and *vice versa*.

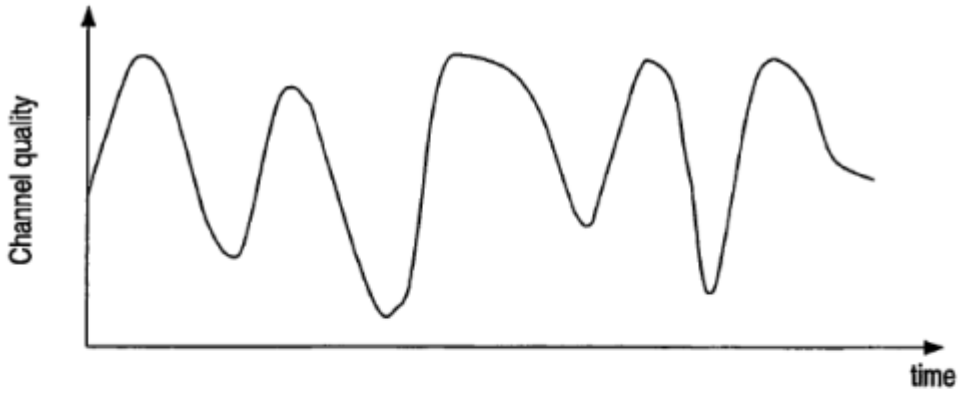

FIG.2

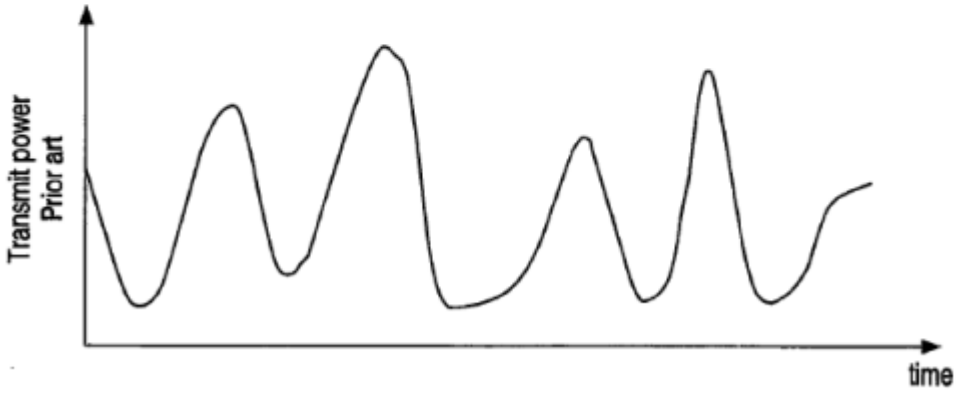

FIG.3

148. At [0006] the specification identifies two problems with existing TPC schemes, power consumption and interference at increased power:

> "One problem with the TPC schemes described above is that power consumption of the transmitter increases when channel conditions are poor, and therefore the schemes may not be power efficient. Another problem is that the increase in transmitted power increases the interference to other users, which can degrade system efficiency."

149. At [0008] the specification states that it is an object of the invention "to contribute to improved efficiency".

150. There follows what patent lawyers call a "consistory" clause at [0009]:

> "According to a first aspect of the invention there is provided a radio station comprising transmitter means for transmitting over a channel in a predetermined time period a data block comprising information symbols and parity check symbols and

> control means responsive to an indication of a reduction in channel quality according to a first criterion for decreasing the data transmit power and responsive to an indication within the predetermined time period of an increase in channel quality according to a second criterion for increasing the data transmit power."

151. As the judge observed, the skilled person would appreciate that the concept of decreasing transmit power in response to an indication of a reduction in channel quality is the opposite of the usual response of a power control system, which is to increase transmit power as the channel quality reduces. The same goes for the corresponding concept of increasing transmit power in response to an indication of increasing channel quality. The patent proposes elsewhere that the obvious downside of this approach, namely a corresponding increase in error rate as a result of reducing the power of the mobile, is compensated by the presence of parity bits. The details of this do not matter.

152. The specification explains the advantage of this approach at [0010]:

> "By decreasing the data transmit power while the channel quality is poor, power is saved and interference is reduced."

Thus the invention seeks to address the problems identified in [0006].

153. Both [0009] and [0010] use the expression "data transmit power". This expression is not used in the preceding paragraphs of the specification, and it is not defined anywhere in the specification. It is used repeatedly, however, in the remainder of the specification.

154. The specification explains at [0026] by reference to Figure 4 how transmit power varies over time in accordance with the invention:

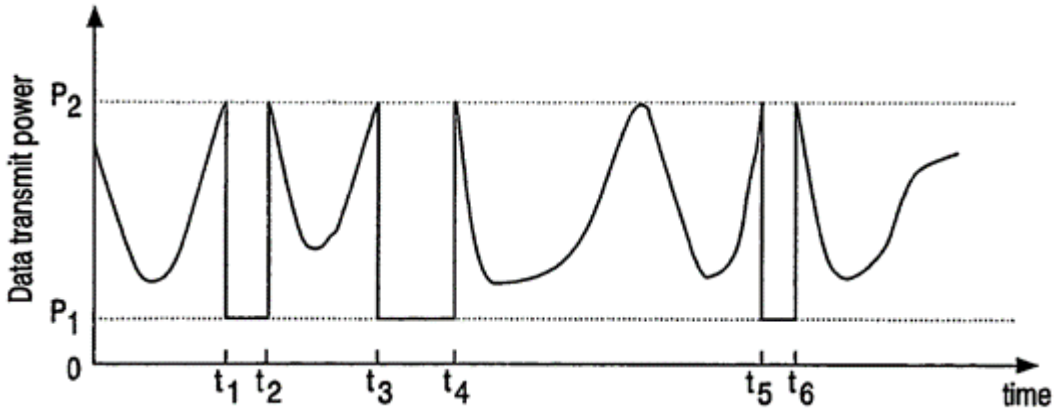

FIG.4

155. If the channel quality degrades to an extent determined by a first criterion, instead of increasing the transmit power above the level P_2, the transmitter instead decreases the "transmit power of the data" to a lower level, P_1. This occurs at times t_1, t_3 and t_5. When the channel quality increases to an extent determined by a second criterion, the

"transmit power of the data" is increased and normal power control is resumed. This occurs at times t_2, t_4, and t_6. The three periods t_1-t_2, t_3-t_4 and t_5-t_6 represent periods during which channel quality is particularly low. The specification refers (in Figure 6) to the transmitter being in a "bad channel" state during these periods. Outside those periods, the transmitter performs conventional power control; but during those periods, the transmitter does not.

156. At [0031] the specification explains that, where the transmitter transmits more than one data signals simultaneously, the power levels P_2 and P_1 can relate either to the transmit power level of one of the data signals or to the total combined transmit power of all those data signals. In the former case, the reduction to the transmit power is effected by reducing the power of that signal, and in the latter case it "may be effected by reducing the transmit power level of one or more of the data signals".

157. At [0032] the specification describes an example by reference to Figure 7 in which the first radio station transmits three data signals simultaneously. The power levels P_2 and P_1 may relate to "one of the data signals or the total combined transmit power of a plurality of the data signals". If the former, the reduction in transmit power is effected by reducing the transmit power of that data signal. If the latter, the reduction in transmit power is effected by a reduction in the transmit power of one or more of the data signals, for example the highest powered signals, or all of the signals.

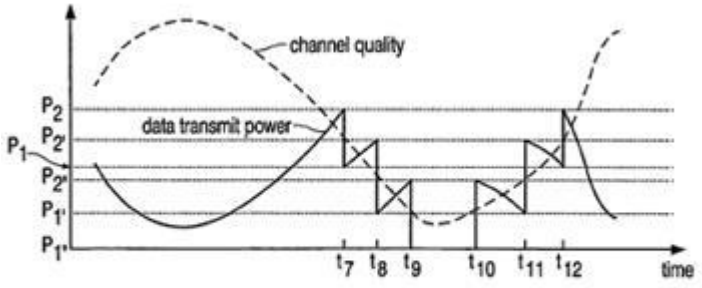

FIG.7

158. In this example, the transmit powers of the three signals are reduced to zero progressively, as the channel conditions worsen. The first signal is switched off at t_7, the second signal is switched off at t_8, and the third signal is switched off at t_9. The signals are switched back on progressively as the channel quality improves at t_{10}, t_{11}, and t_{12}. The line marked "data transmit power" shows the total combined transmit power of the data signals.

159. At [0033] the specification explains:

> "… after decreasing the transmit power following the first criterion being met and before the second criterion is met, any control signal transmitted by the first station 100 may be either
>
> a) switched off, or
> b) continued with varying power to continue to track the changes in channel quality to some extent, or
> c) continued at a constant level."

160. It is common ground that it is only necessary to consider claim 3 as amended, which is successively dependent on claims 1 and 2. Claim 1, with added numbering of features and omitting reference numerals from the claim, is as follows:

> "[1] A radio station comprising transmitter means for transmitting over a channel in a predetermined time period (0 to t_F) a data block comprising information symbols (I) and parity check symbols (C) and
>
> [2] control means responsive to an indication of a reduction in channel quality according to a first criterion for decreasing the data transmit power and
>
> [3] responsive to an indication within the predetermined time period of an increase in channel quality according to a second criterion for increasing the data transmit power,
>
> [4] wherein, during operation, after decreasing the transmit power following the first criterion being met and before the second criterion is met, the transmission of the data block continues at a lower power level."

161. Claim 2, is as follows:

> "A radio station as claimed in any of claims 1 to 8, wherein the indication of a reduction in channel quality according to the first criterion is an indication to increase transmit power above a predetermined threshold (P2)."

162. Claim 3 is as follows:

> "A radio station as claimed in claim 2, wherein the indication to increase transmit power is a received command."

163. Integer [4] of claim 1 requires that transmission is not stopped altogether, but is continued at a reduced level. It is common ground that the claims require everything to happen within a single data block, as a result of the requirement for a "predetermined period of time".

164. Infringement turns on the construction of the term "the data transmit power" in features [2] and [3]. The defendants contend that the data transmit power means the total transmit power of the transmitter, and does not cover a situation where the transmit power on a single physical channel is decreased or increased whilst the total transmit power remains the same. Philips contend to the contrary. It is common ground that if Philips is correct, and subject to the validity issue, the defendants infringe. The judge decided the issue in favour of Philips.

165. Mr Abrahams submitted that the judge's construction was clearly wrong. The introductory passages of the specification made it clear that the patentee was setting out to solve two problems which the skilled person would recognise as genuine and real. These were the twin problems of increased use of power and interference. The patent promised a solution to these problems in which the mobile transmits at reduced

power until channel conditions improve. All this only made sense if the mobile reduces the total transmission power. Merely re-arranging the power levels in various channels, whilst at the same time maintaining maximum total transmit power, would not provide any of the benefits of the invention.

166. Mr Abrahams continued that the judge had been wrongly influenced by passages occurring later in the specification, which did not detract from the very clear exposition of the invention in the patent. In any event, in all of the embodiments described later in the specification, the total transmit power decreased in the bad channel state.

167. Mr Vanhegan supported the judge's reasoning which was, in summary, as follows. Whilst it was correct that the specification at [0006] to [0010] explains that the invention aims to reduce the total power, it did not necessarily follow that the skilled person would understand that the patentee was intending to restrict the claims to such systems. Later passages, including [0031] and [0032], supported Philips' construction because they explained how each data signal was treated separately. They showed that the transmit power of one or more data signals could be reduced while the transmit power of one or more data signals remained unchanged. This passage also referred repeatedly to "the total combined transmit power" of the three signals, in contradistinction to the "transmit power" of the individual signals. This distinction suggests that in the claim "data transmit power" refers to the transmit power of a single data signal. The fact that Figure 7 was labelled "data transmit power" rather than "total combined transmit power" did not carry weight given the clear description in [0032]. Further, the specification at [0010] to [0013] and [0030] and [0033] made it clear to the skilled person that there can be a control signal separate from the data signal whose transmit power could be increased when the transmit power of the data signals is decreased. Although the specification referred at [0035] to "the relative priority of each data signal" in the context of applying the second criterion to a plurality of data signals, it would be a small step for the skilled person to realise that the transmit power of the individual signals could be adjusted in accordance with their relative priorities

168. In my judgment, the judge was right to accept Philips' construction and to reject that advanced by the defendants. In particular, he was right to approach the issue of construction by considering the entirety of the specification and not just the introductory paragraphs. When the issue is approached in that way, the skilled person would understand that the 511 patent describes a counterintuitive strategy for dealing with bad channel conditions. He or she would readily understand from the specification as a whole that the strategy could be applied to the transmit power of a single data signal. The fact that the invention permitted an overall reduction in transmission power would not drive the skilled reader to the conclusion that it was only intended to claim the use of the inventive strategy in that situation.

169. The defendants' validity attack is presented as an alternative to their non-infringement argument. They contend that, if the 511 patent is construed so widely as to include a system in which there is a reduction in transmission power only on some channels, the invention is obvious in the light of Physical Layer Standard for cdma2000 Release 0 version 3.0 dated 15 June 2001. I will refer to this document, as the parties did, as "cdma2000". The judge referred to it as "C.S0002".

170. Although the defendants put their case in three different ways before the judge, all of which the judge rejected, their sole case on this appeal depends for its success on the correct interpretation of an 11-line paragraph on page 2-47 of cdma2000. The parties were diametrically opposed as to the correct interpretation of this paragraph. The parties referred to it as "the disputed paragraph", and so shall I. It is common ground that, in order for the defendants' obviousness case to succeed, they must be correct as to their interpretation of the paragraph. Likewise, Philips accepts that if the defendants are correct on their interpretation then the patent will be invalid for obviousness.

171. The judge dealt with interpretation of the disputed paragraph at [163] to [225]. He accepted Philips' interpretation. Although the issue was primarily one of interpretation for the court, guided by the primary evidence of the experts, he was comforted in his conclusion on construction by some "secondary evidence" which he dealt with at [231] to [235].

172. Before coming to the interpretation of the disputed passage, the judge set out the context in which it appeared. In the course of doing so he made a number of important findings of fact as to the skilled person's understanding and common general knowledge. I set these out below in the order in which the judge did in his judgment.

173. At [164] the judge explained that the skilled person would not be able to understand cdma2000 in isolation and would need to refer to parts of related documents as well. Nevertheless, once the skilled person had read and understood the relevant sections he would notice (as also recorded in the textbook *Holma & Toskala*) that some aspects of power control in cdma2000 were similar to power control in UMTS, but that there were also differences.

174. Next the judge found at [165] that, by the priority date, millions of cdma2000 phones had been deployed in networks. This was a point to which he returned in connection with his reliance on secondary evidence later in the judgment.

175. At [166] the judge recorded his finding that the skilled person would regard UMTS Release 5, which was current at the priority date, as technically superior to cdma2000 in terms of its power control. In particular it had a faster closed-loop response time and faster response to fast fading.

176. The judge then turned to the disclosure of the power control aspects of cdma2000. The structure of the uplink channels (called reverse link in cdma2000) is illustrated in the following figure taken from page 2-57 of cdma2000:

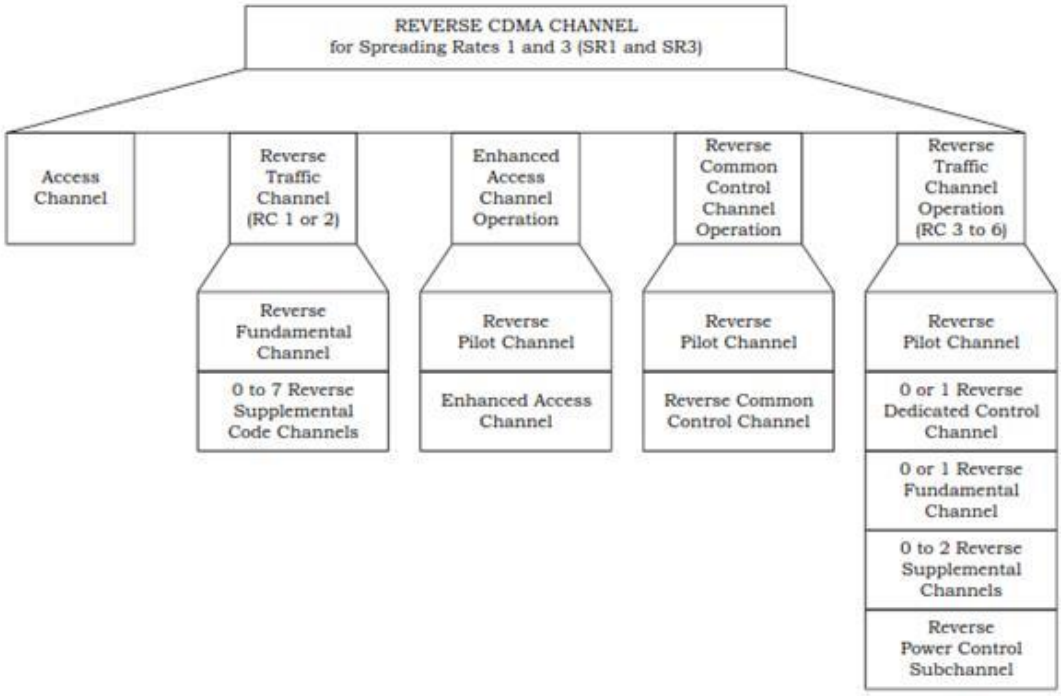

Figure 2.1.3.1.1-1. Reverse CDMA Channels Received at the Base Station

177. It can be seen from the right-hand part of this figure that the Reverse Traffic Channel for RC (Radio configuration) 3 to 6 comprises:

(i) the Reverse Pilot Channel;

ii) 0 or 1 Reverse Dedicated Control Channels;

iii) 0 or 1 Reverse Fundamental Channels;

iv) 0, 1 or 2 Reverse Supplemental Channels; and

v) the Reverse Power Control Subchannel.

178. The channels identified at (ii), (iii) and (iv) are made up of frames, in each case 5 or 20 ms long, in the case of the Reverse Supplemental Channel also 40 or 80 ms long.

179. The judge then went on to explain how cdma2000 effected power control of these channels. This was done by three elements: (i) open-loop estimation, (ii) closed-loop estimation and (iii) code channel attribute adjustment for RC 3-6. The details are set out at [170] to [185] of the judgment. He noted that the skilled person would recognise that the closed-loop power control of UMTS could go four times as fast as cdma2000. As to code channel attribute adjustment, the skilled person would regard it as being more complex, unwieldy and inefficient than UMTS.

180. So far as closed-loop power control is concerned, this occurs when the mobile receives its first power control bit or TPC. The mobile must adjust the output power on the Reverse Pilot Channel in response to each TPC bit received from the base station. TPC bits are received at 800 per second. The mobile must react within 500

microseconds. The other channels all follow the Reverse Pilot Channel, with their powers determined by a formula on page 2-49 of cdma2000.

181. Next, at [186], the judge turned to maximum uplink transmission power. cdma2000 mandated at page 2-34 that the MS should not exceed the maximum permitted uplink power levels "under any circumstances". It may happen, however, that open- and closed-loop power control ask the mobile to raise its power above the maximum permitted level. Page 2-47 describes in two paragraphs how the mobile is to deal with this invitation to contravene the power limit. The first paragraph relates to RC 1 and 2:

> "For the Reverse Traffic Channel with Radio Configurations 1 or 2, if the mobile station is unable to transmit at the requested output power level, it shall terminate transmission on at least one Reverse Supplemental Code Channel not later than the transmission of the next 20ms frame to maintain the requested output power on the Reverse Fundamental Channel."

182. This, therefore, is an instruction in the case of RC 1 and 2 for the mobile to switch off transmission on one or more Reverse Supplemental Code Channels by the next frame boundary. The purpose of switching off this channel or channels is to reduce the overall power so that the power on the Reverse Fundamental Channel can be maintained. It must be done no later than the next frame boundary. The judge found that it would preferably be done at that boundary and not before.

183. The next paragraph is the disputed paragraph, which goes on to deal with RC 3-6. The judge numbered the sentences of the paragraph for ease of discussion:

> "[**1**] For the Reverse Traffic Channel with Radio Configuration 3 through 6, if the mobile station is unable to transmit at the requested output power level, it shall reduce the data rate on the Reverse Fundamental Channel, or reduce the transmission power or terminate transmission on at least one of the following code channels that are active: the Reverse Fundamental Channel, the Reverse Supplemental Channels, or the Reverse Dedicated Control Channel. [**2**] The mobile station shall perform this action not later than the 20 ms frame boundary occurring no later than 40 ms after determining that the mobile station is unable to transmit at the requested output power level. [**3**] The mobile station should attempt to reduce the transmission power, the data rate, or terminate transmission first on the code channel with the lowest priority. [**4**] The mobile station shall transmit at the commanded output power level on the Reverse Pilot Channel."

184. It is important to note that the disputed paragraph, which deals with RC 3-6, gives the mobile longer to perform the required action than was given to RC 1 and 2 to terminate transmission. RC 1 and 2 must terminate "not later than the transmission of the next 20ms frame", whereas RC 3 to 6 are given until "the 20 ms frame boundary occurring no later than 40 ms after determining that the mobile station is unable to

transmit at the requested output power level". This has important consequences for interpretation.

185. As the judge observed at the outset of his discussion of the interpretation of this paragraph, it appears to give the MS three different options for dealing with a command to increase its transmission power above the maximum permitted level:

i) reduce the data rate on the Reverse Fundamental Channel;

ii) reduce the transmission power on at least one of the Reverse Fundamental Channel, the Reverse Supplemental Channels or the Reverse Dedicated Control Channel; or

iii) terminate transmission on at least one of the channels referred to in (ii).

186. The dispute as to interpretation is about the second of these options, namely the skilled person's understanding as to how and when the transmission power was to be reduced in accordance with (ii). Timing was of critical importance because, to comply with the claims, the reduction in transmission power needed to occur within the frame, and not be delayed until the next frame boundary.

187. The judge set out the parties' rival contentions at [194] to [195]:

> "194. Philips contends that the skilled person reading the disputed paragraph in context as at the Priority Date would understand that there were in fact two possible courses of action for the MS:
>
> i) the MS would ignore any further power up commands within the existing frame and freeze the existing power levels of the channels until it could make a data rate change on one or more of the three specified channels, which would take place at the next possible 20 ms frame boundary, but within the 40 ms time limit, so that at that time the commanded output power level of the Reverse Pilot Channel would be achieved; or
>
> ii) the MS would terminate the transmission of one or more of the three specified channels, and that termination would preferably also occur at a frame boundary (although it would be possible mid-frame).
>
> This was Dr Irvine's interpretation.
>
> 195. The Defendants contend that the skilled person would understand that there was a third possibility, namely a direct and immediate reduction in transmission gain on one or more of the three specified channels. This was Dr Brydon's interpretation."

188. It will be seen that Philips' construction, in contrast to the defendants' construction, elides the first two options in sentence [1], and only makes use of a reduction of data

rate (as opposed to directly controlling the transmission gain). Although Philips recognises that a literal reading of the passage encompasses a direct reduction of transmission gain, it submits that the skilled person would not take that meaning from the passage. The defendants point to sentences [1] and [3], which they say strongly support the existence of three options, and which emphasise the difference between changing the data rate and reducing transmission power.

189. A number of important technical facts fed into the judge's acceptance of Philips' interpretation:

i) Reduction in data rate on a channel will normally result in a reduction in transmission power. Thus, the difference between options (i) and (ii) in the sentence [1] is not as clear-cut as the language suggests;

ii) Reduction in data rate on a channel can only be achieved at a frame boundary due to the need to reconfigure the channel to the new data rate. Thus, if the data rate option (option (i)) is taken, the reduction cannot occur immediately and must wait until the frame boundary. In the meantime, however, something would have to be done to avoid the maximum power being exceeded.

iii) The skilled person would notice a number of similarities between the power control scheme in cdma2000 and that in UMTS Release 5. Both systems have a lead control channel which is subject to fast closed-loop power control and follower channels that set their power by reference to the lead channel. In these systems normal power control depends on maintaining the power ratios between the follower and lead channels. Both systems have a maximum transmit power and a section dealing with what happens when the MS receives a command which takes it above this value.

iv) The skilled person would also know of the method utilised in UMTS Release 5 for dealing with the situation where the MS is being commanded to increase its power above the maximum permitted. This was for the MS to ignore any further power up commands within the current frame, and thus to freeze powers at the existing levels maintaining the ratio between them: the process known as "clipping". The judge held that this method "would colour the skilled person's thinking when trying to understand the disputed paragraph", particularly as the skilled person would be much more familiar with UMTS than with cdma 2000.

190. The judge next undertook a detailed consideration of the various sentences in the disputed paragraph, starting with sentence [4]. One issue here was the question of *when* the mobile station was required to transmit at the commanded output power level on the Reverse Pilot Channel. This was of significance to the interpretation of the earlier sentences, because, if it had to occur immediately, this would have an impact on the timing of the actions required in the earlier parts of the paragraph. Ultimately the experts agreed that sentence [4] required transmission of the commanded output level at the expiry of the 40 ms time limit, but was not mandatory before that point. Dr Brydon's evidence was that, in an ideal world, the mobile would transmit at that level all the time and that reducing the transmission power is something that enables the mobile to do that immediately.

191. The judge regarded the agreement on the timing of the action required by sentence [4] as significant for three reasons:

> "First, as can be seen from the extracts quoted above, this removes the principal basis which Dr Brydon had given in his first report for discounting the possibility that the MS would clip the transmission powers of the channels. Secondly, Dr Irvine was cross-examined on the basis that, whatever interpretation of the disputed paragraph was adopted, it involved non-compliance with one or more other mandatory parts of C.S0002. If sentence [4] is interpreted in the way that the experts ultimately agreed, however, then it is possible to avoid non-compliance with mandatory aspects of the standard on Philips' interpretation. As I shall explain, the same is not true of the Defendants' interpretation. Thirdly, if sentence [4] is interpreted in the way that the experts ultimately agreed, then it does not push the skilled person in the direction of taking immediate action."

192. The judge then turned to sentence [2] of the disputed paragraph which requires the MS to perform the action no later than the 20 ms frame boundary occurring no later than 40 ms after determining that the mobile station is unable to transmit at the requested power level. The time limit meant that the mobile is given an extra 20 ms as compared with RC 1 and 2 in which to take action. This gave rise to the question of why the mobile was given this extra 20 ms as compared with RC 1 and 2. A related question was why the disputed paragraph appeared to treat the Reverse Fundamental Channel differently to the Reverse Supplemental Channel and the Reverse Dedicated Control Channel in that it gave the option of reducing the data rate as an option for the former but not the latter.

193. RC 1 and 2 only required the mobile to terminate transmission, and the time period allowed was sufficient, normally occurring at the next 20 ms frame boundary. In RC 3 to 6 the Reverse Fundamental Channel data rate can be varied on a frame-by-frame basis, and can be varied unilaterally by the mobile. This could be achieved in the time period allowed for RC 1 and 2, and the extended period allowed for RC 3-6 would not be required. The process required for the other two channels was different, and could not be effected autonomously by the mobile. It required interaction with the BS, which would take time. Dr Irvine's evidence was that this explained the longer time period for RC 3 to 6. If the second option was an immediate reduction in transmission power, as opposed to a reduction in data rate, the additional time period allowed would not be necessary for any purpose.

194. This gave rise to a dispute in the evidence as to whether even the extended time period was sufficient to enable reconfiguration. Dr Irvine explained that this would be done using 5 ms mini-messages, prescribed elsewhere in the standard. Whilst Dr Brydon agreed that this made it more likely that the base station could respond in time in the case of 20 ms frames, the evidence showed that the time would not be sufficient for the 40 and 80 ms frames which were permitted for the Reverse Supplemental Channels. Dr Irvine's answer was that the alternative of terminating mid-frame was always available. The judge concluded on this aspect at [216]:

> "Counsel for the Defendants submitted that the uncertainty as to whether the data rate on the Reverse Supplemental Channels and the Reverse Dedicated Control Channel could be reconfigured in time provided a technical reason for the skilled person to interpret the disputed paragraph in the manner contended for by the Defendants. I do not accept this submission. In my judgment the skilled person would understand that the disputed paragraph proceeds on the basis that, in RC 3 to 6, the MS can and will (apart from some exceptional circumstances) take the appropriate action within the extended period allowed. The skilled person would understand that the Reverse Fundamental Channel was different to the other two types of channels for the reasons explained above, and that the extended time limit was provided to enable reconfiguration of the Reverse Supplemental Channels and the Reverse Dedicated Control Channel."

195. Thus far, the judge had concluded that sentence [4] did not compel immediate action of any of the specified kinds, and a rational explanation for sentence [2] was to allow sufficient time, except in what he described as "exceptional circumstances", to reconfigure and adopt a lower data rate.

196. The judge next went to sentence [3] of the disputed paragraph. He declined to place weight on an acceptance by Dr Irvine that, read together with sentence [4], sentence [3] was telling the skilled person that the MS must sacrifice one of the other channels in order to allow the Reverse Pilot Channel to continue to transmit at the commanded power level.

197. The judge did, however, place weight on a consequence of the defendants' interpretation which led to a conflict with section 2.1.2.3.3 of cdma2000. On the defendants' interpretation there would have to be interim changes in channel power prior to the change in channel configuration. Yet section 2.1.2.3.3 mandated the maintenance of power ratios between the channels. Finally, the judge noted at [223] that there was nothing in the text which specifies a timeframe for the reduction of transmission power. He accepted Dr Irvine's evidence that, if such a reduction had been intended, that would have been specified.

198. Mr Abrahams submitted that sentence [1] should be interpreted as meaning what it says, and giving three options, one of which was an immediate reduction in transmission power. He made the following points in that connection:

i) The words "reduce the transmission power" were clear and similar to language used earlier on the same page when referring to normal power control;

ii) The words were being used to describe something which is different from reducing the data rate and terminating transmission;

iii) The sentence gives the alternative options of reducing data rate and reducing transmission power for the same channel, the Reverse Fundamental Channel, further emphasising that they are different things;

iv) The sentence provides for reducing the data rate on the Reverse Fundamental Channel but not for the other channels, for reasons the skilled person would understand, namely that the mobile could do this unilaterally, reliably and quickly, as opposed to having to wait for a response from the BS;

v) The distinction is reinforced in sentence [3] when all three options are listed again.

199. Mr Abrahams also submitted that this interpretation made sense for the additional technical reason that, unlike the case of the Reverse Fundamental Channel, the skilled person would understand that he or she could not rely on being able to change the data rate on the Reverse Supplemental Channel or the Reverse Dedicated Control Channel within the time limit provided by sentence [2]. He further submitted that sentence [4] pushed the skilled person in the direction of taking immediate action, even if it did not mandate it. There were numerous benefits in reacting quickly, rather than waiting to configure the channels.

200. Mr Abrahams went on to make submissions as to why the judge's construction was in error. First, in focusing on sentences [2], [3] and [4] the judge had lost sight of the fact that the issue of interpretation turned on the meaning of sentence [1]. He had failed to give primacy to the actual words of the sentence. Secondly, the judge had been wrong in his approach to why the disputed paragraph treats the Reverse Fundamental Channel differently from the other two channels. He had been wrong to say that this distinction was explained by the fact that more time was needed for data rate changes, when there were many circumstances when the time afforded would not be sufficient. Rather, given the fact that the data rate changes could not always be accommodated within the time limit, he ought to have regarded this as a pointer to the fact that the alternative of an immediate reduction in transmission power was being taught. Thirdly, the judge had wrongly concluded at [208] that, if sentence [4] was interpreted as not mandating immediate action, it was possible to avoid non-compliance with all mandatory aspects of the standard. Dr Irvine had accepted that his construction involved more departures from the standard than had the defendants' interpretation. Fourthly, to the extent that he did, the judge had been wrong to accept Dr Irvine's argument that the time limit of sentence [2] supported Philips' interpretation, because it was longer than necessary to effect a reduction in transmission power. If sentence [1] provided for three options, as it appeared to do, it was no answer to say that it provided more time than necessary for one of them. Fifthly, the judge had ignored the much more important evidence that, in the context of inner loop power control, the skilled person was used to taking action within milliseconds. Sixthly the judge had misunderstood the evidence concerning section 2.1.2.3.3 of cdma2000. Finally the judge had been wrong to conclude that the skilled person's reading would be coloured by knowledge of UMTS.

201. Mr Vanhegan supported the judge's reasoning, which I have endeavoured to summarise above.

202. The exercise of interpretation which the judge performed was directed at discerning how the skilled person would understand the disputed paragraph. It was therefore necessary for him to assemble the relevant common general knowledge which the skilled person would bring to bear on a reading of the paragraph. Whilst this included the technical considerations to which I will come, it was also necessary to understand

that the document was a technical standard. Such documents are intended to define with reasonable clarity the steps which implementers must take to ensure they comply with the standard. Once all this mental scaffolding had been erected, however, the question of what it meant was a matter for him, not the expert witnesses.

203. How then is the disputed passage to be understood? The defendants' argument is undoubtedly superficially attractive, at least as a matter of language. The distinction between a reduction in data rate and a reduction in transmission power is a real, not merely a linguistic one. Sentence [1] appears to draw exactly this contrast by prescribing both actions for the Reverse Fundamental Channel and the latter only for the other two. It is odd, to say the least, for the authors of the standard to use a different term for the same thing when prescribing alternatives, particularly when the two alternatives are for actions in relation to the same channel. Moreover, one would have expected the confusion to be resolved in sentence [3] by using a single term for what was intended. Instead, however, sentence [3] again spells out the distinct actions.

204. A number of points are beyond dispute. First, as a matter of words, there are three options mentioned in the disputed paragraph, both in sentence [1] and sentence [3]. These are (i) data rate reduction, (ii) transmission power reduction and (iii) transmission termination. Secondly, in sentence [1], and again as a matter of the words used, data rate reduction is only an option for one channel (the Reverse Fundamental Channel), whilst transmission power reduction is a second option for that channel and others, namely the Reverse Supplemental Channels and the Reverse Dedicated Control Channel. Thirdly, read in this literal way, the additional time allowed as compared with RC 1 and 2 to perform the actions would not be necessary, because reducing the data rate on the Reverse Fundamental Channel, or the transmission power on any of the mentioned channels, were actions which could all be accommodated in the more limited time period given for RC 1 and 2. The additional time allowed would only be necessary if the second option in sentence [1], on its face limited to reducing transmission power, also somehow included reducing data rate. Then, the time necessary for the associated messaging with the base station and implementation of the change would exceed that allowed for RC 1 and 2.

205. These preliminary points mean that a purely literal construction of the words does not make sense from a technical perspective. The skilled person, who recognises the value of a system being asked to respond quickly, would seek to find a purpose in the extended time period allowed for a response in RC 3 to 6 as compared with RC 1 and 2. The purpose is plainly to allow for actions which take longer than the time allowed by RC 1 and 2. It was common ground that performing data rate reduction on the Reverse Supplemental Channels and the Reverse Dedicated Control Channel would require this extra time. That is no less the case because there are some circumstances – the judge described them as exceptional – where this extra time would not be sufficient. He was right to hold that the paragraph is written on the basis that extra time is necessary. It therefore makes sense to interpret the second option in sentence [1] as *including* data rate reduction on these channels in addition to the Reverse Fundamental Channel.

206. Having got this far it is advisable to take stock. The defendants' reliance on the literal meaning of sentence [1] cannot carry them home, because it leads to a result which would strike the skilled person as in conflict with sentence [2]. Read as a whole the

paragraph is obviously seeking to cater for the consequences of actions which take longer than the time period allowed for RC 1 and 2. Data rate reduction on all channels cannot therefore be excluded.

207. Two possible interpretations of the disputed paragraph could accommodate data rate reduction on all three channels. Both interpretations necessarily involve departing from the literal meaning of the words. One interpretation would be that all three options for the action to be taken (data rate reduction, transmission power reduction and termination of transmission) would be available for all the specified channels. This interpretation leads one to question why data rate reduction on the Reverse Fundamental Channel was singled out for separate treatment as option (i). It effectively "red pencils" the first occurrence of the words "Reverse Fundamental Channel" so that the options read:

> "reduce the data rate ~~on the Reverse Fundamental Channel~~ or reduce the transmission power or terminate transmission on at least one of the Reverse Fundamental Channel, the Reverse Supplemental Channels, or the Reverse Dedicated Control Channel".

208. The other possible interpretation would be that the reference to transmission power in option (ii) was to be read, as Philips contends, as "transmission power as a consequence of data rate reduction". As the judge observed at [193], a reduction in data rate will generally allow a reduction in transmission power. This interpretation makes the separate treatment of the Reverse Fundamental Channel in option (i) pure surplusage, as that case is dealt with by the second option, so interpreted. This second interpretation can be illustrated in this way:

> "~~reduce the data rate on the Reverse Fundamental Channel or~~ reduce the transmission power **by reducing the data rate** or terminate transmission on at least one of the Reverse Fundamental Channel, the Reverse Supplemental Channels, or the Reverse Dedicated Control Channel".

209. The first interpretation is consistent with sentence [3], which gives a choice of all three options. The second interpretation requires sentence [3] to be read as:

> "The mobile station should attempt to reduce the transmission power~~,~~ **by reducing** the data rate, or terminate transmission on the code channel with the lowest priority."

210. To my mind, the first of these interpretations does far less violence to the language. It preserves the three options which a natural meaning of the disputed paragraph implies in sentences [1] and [3]. It also respects the fact that data rate and transmission power reduction are distinct actions. They have different timing consequences. Data rate can only be reduced at a frame boundary, whereas transmission power can be reduced almost immediately. Although both parties had explanations as to why the Reverse Fundamental Channel might have been singled out for separate treatment, I am not persuaded that these arguments throw much light on the correct conclusion.

211. I would accordingly reject a construction that does not allow for transmission power reduction for all the mentioned channels, unless there were some cogent reason why the skilled person would think that transmission power reduction could not, as a technical matter, have been intended as an alternative to data rate reduction. Three types of reason were advanced as to why this might be so: (i) non-compliance with other aspects of the standard, (ii) lack of detailed implementation instructions in the standard and (iii) technical impracticability.

212. As to the first of these reasons, Dr Brydon's solution as to how immediate transmission power reduction would be implemented brought the disputed paragraph into conflict with other provisions of the standard, in particular the obligation to maintain the ratio between the lead and follower channels. The disputed paragraph was, he said, an exception, designed to deal with the situation where the mobile receives a command which it is unable to fulfil. The temporary disobedience with the ratio requirement was therefore permissible.

213. Mr Abrahams countered that Dr Irvine's solution also involved conflict with the standard, not least the fact that the mobile does not obey TPC commands. Failure to meet other requirements of the standard was not a basis on which to exclude any of the specified actions. I am not persuaded by that argument. As I have explained, there are positive reasons arising from the extended time limit in sentence [2] why data rate reduction must be being referred to. I do agree, however, that the conflict with the power ratio requirement is not by itself a reason for excluding a direct reduction in power. It may nevertheless, as I shall explain, have an influence on the timing of such a reduction.

214. As to the second reason, the skilled person would not, in my judgment, be led to reject the option of reducing transmission power because of the lack of implementation detail in the standard of such an option. The standard lacks detail in other respects. For example, because data rate reduction can only occur at a frame boundary, it was necessary for the skilled person to fill in the detail of what was to happen between the point at which maximum power is exceeded and the implementation of the reduction. Dr Irvine's view, which the judge accepted, was that this lack of detail would be filled in from the skilled person's common general knowledge of the UMTS clipping method: but there is no reference to this in cdma2000.

215. The judge found it persuasive at [223] that there was nothing in the text which specified a timeframe for the reduction in transmission power when, if such a reduction had been intended, it was Dr Irvine's evidence that it would have been specified. Yet the option of terminating transmission can occur immediately, albeit preferably at a frame boundary. I did not understand there to be anything in cdma2000 which was more precise as to the timeframe for termination.

216. As to the third reason, I do not understand the judge to have made any express finding that there was any reason why the transmission power reduction option would be impracticable in the sense that it would not work. Mr Vanhegan showed us some passages from the evidence which emphasised that in these circumstances the standard would be allowing uncontrolled power variations, but the judge did not make any finding about this.

217. Having considered these matters, I would hold, differing from the judge, that the disputed paragraph allowed for all three options: transmission power reduction, data rate reduction and termination.

218. That is not an end of the matter, however. The fact that the disputed paragraph specifies three options for actions to be taken in the event that the TPC command calls for the maximum power to be exceeded does not mean that the skilled person would understand the paragraph to be requiring or permitting an immediate reduction in power. The disputed paragraph certainly contains no express direction that the action is taken immediately, or even that it be taken as soon as possible. There was, in the end, agreement that sentence [4] did no more than require that the action in respect of the Reverse Pilot Channel be taken by the end of the time limit imposed by sentence [2]. There was also agreement that both termination and direct power reduction *can* be performed immediately and other than at a frame boundary, whereas data rate reduction can only be performed at a frame boundary.

219. It is on this issue, it seems to me, that the skilled person's common general knowledge comes into play. The judge found that there were a number of aspects of the common general knowledge which were relevant. Firstly, the skilled person would notice that in both cdma2000 and in UMTS Release 5, a lead control channel sets the power of follower channels by maintaining power in a given ratio. Secondly both standards provide for a maximum power and provide for a situation where a power up command may cause the maximum power to be exceeded. Thirdly, the process of clipping, which maintains the power ratios but freezes the total power, would be known to the skilled person.

220. Drawing these matters together, I do not think that the skilled person would interpret the disputed paragraph as teaching immediate, mid-frame alterations to transmission power. Such an interpretation would result in conflict with the requirement to maintain power ratios, which is nowhere allowed for in the standard. The skilled person would, consistently with his understanding of how power control worked in UMTS, interpret the disputed paragraph as requiring changes to be made at frame boundaries, where the channel can be reconfigured with conforming power ratios. In the meantime the risk of exceeding the maximum power can be prevented by clipping.

221. For my part, I did not find the secondary evidence to be of assistance on the meaning of the disputed paragraph. The absence of phones deploying an immediate reduction in transmission power could be explained by the fact that implementers had chosen to reduce data rate instead. This was, however, not a significant part of the judge's reasoning.

222. Mr Abrahams had an additional ground of appeal in which he challenged the judge's approach to the expert evidence. He said that the judge had impermissibly discounted the effect of answers favourable to the defendants given by Dr Irvine in cross-examination. This was particularly unfair, he said, as the judge had decided that he preferred the evidence of Dr Irivine to that of the defendants' expert, Dr Brydon.

223. The judge explained his approach to the evidence of Dr Irvine at [16]:

> "Counsel for the Defendants accepted that Dr Irvine had striven to give his evidence fairly and to assist the Court. I found him

> an excellent witness who was very lucid in his explanations; but he tried so hard to be fair that he sometimes assented to propositions without insisting upon objections or qualifications he had previously expressed. It is therefore important to consider his evidence as a whole."

224. One instance relied on heavily by Mr Abrahams was Dr Irvine's agreement that the disputed paragraph "is telling the reader … that the mobile must sacrifice one of the other channels in order to allow [the Reverse Pilot Channel] to be transmitted at the commanded output power." The judge explained however at [218] why he did not place weight on that agreement:

> "Counsel for the Defendants relied upon the acceptance by Dr Irvine in cross-examination that, when read together with sentence [4], sentence [3] was telling the skilled person that the MS must sacrifice one of the other channels in order to allow the Reverse Pilot Channel to be transmitted at the commanded output level. But this acceptance was predicated upon (i) counsel putting it to Dr Irvine that sentence [4] was mandatory and Dr Irvine replying that that was contradictory and (ii) counsel then saying he would come to that and asking Dr Irvine to accept that "in its own terms" that was what the end of the disputed paragraph was saying. Moreover, counsel then put it to Dr Irvine that, if the MS transmitted the Reverse Pilot Channel at the commanded output level, it would also transmit the other channels at their commanded output levels apart from the one sacrificed, to which Dr Irvine replied, "That is where the tension comes in". Thus the answers relied upon by counsel for the Defendants must be seen in the context of the other evidence concerning sentences [2] and [4] considered above."

225. There were other examples of the same kind. Having considered them all, I was not persuaded that the judge had fallen into any error in his treatment of the evidence of Dr Irvine, for the following reasons. First, the exercise of interpretation of the disputed paragraph was principally a matter for the judge, guided by the evidence of the experts. It was never going to be to be resolved by putting questions as to the overall meaning of the paragraphs to the experts and treating their answers as conclusive. Secondly, the important evidence for the purposes of eliciting the meaning of the contested paragraph was the evidence which the experts provided as to the common general knowledge, which was largely agreed and which is not challenged on appeal. Thirdly, the judge was entitled to conclude that some of Dr Irvine's answers were to be read subject to his earlier objections and reservations. Finally, the judge was right to consider Dr Irivine's evidence as a whole. The overall effect of his evidence was a matter for him.

226. In the result, although I arrive at this conclusion by a slightly different route, the judge was correct that the disputed paragraph does not render the 511 patent obvious.

227. I would therefore dismiss the appeal in relation to the validity of the 511 patent.

Conclusion

228. If my Lords agree, all three appeals will be dismissed.

Lord Justice Henderson:

229. I agree.

Lord Justice Patten

230. I also agree.

Appendix A

Table of Abbreviations	
2G	Second Generation
3G	Third Generation
3GPP	Third Generation Partnership Project (i.e., an international standardisation project)
4G	Fourth Generation
ACK	A positive acknowledgment signal sent from the receiver to the transmitter when it has correctly received data from the BS
BS	Base Station (e.g., a cell tower)
CDMA	Code Division Multiple Access
CDMA2000	A version of CDMA that was an evolution of IS-95 towards 3G
DPCCH	Dedicated Physical Control Channel
DPCH	Dedicated Physical Channel
DPDCH	Dedicated Physical Data Channel
ETSI	European Telecommunications Standards Institute
False ACK	A signal detected as an ACK when a NACK was sent

False NACK	A signal detected as a NACK when an ACK was sent
FDMA	Frequency Division Multiple Access
HARQ	Hybrid Automatic Repeat ReQuest
HSDPA	High-Speed Downlink Packet Access
MS	Mobile Station (e.g., a mobile phone)
NACK	A negative acknowledgment signal sent from receiver to the transmitter when it has not received data sent from the BS correctly
Node B	The BS in UMTS
Packet	A block of data or a discrete unit of data that is transmitted from one network element to another
R-DCCH	Reverse Dedicated Control Channel (i.e., a CDMA2000 channel)
R-FCH	Reverse Fundamental Control Channel (i.e., a CDMA2000 channel)
R-PICH	Reverse Pilot Channel (i.e., a CDMA2000 channel)
R-SCH	Reverse Supplemental Channel (i.e., a CDMA2000 channel)
R-TCH	Reverse Traffic Channel (i.e., a CDMA2000 channel)
SIR	Signal-to-Interference Ratio

SNR	Signal-to-Noise Ratio
TPC	Transmit Power Control
TR	Technical Report
TS	Technical Specification
UE	User Equipment (i.e., the MS in UMTS)
UMTS	Universal Mobile Telecommuications System (i.e., a 3G network for mobile communications)
WG1, WG2, etc.	Working Group 1, 2, etc.