

IN THE COURT OF APPEAL (CIVIL DIVISION)
ON APPEAL FROM THE HIGH COURT OF JUSTICE
CHANCERY DIVISION
PATENTS COURT
MR JUSTICE BIRSS
[2013] EWHC 3768 (Pat)

Royal Courts of Justice
Strand, London, WC2A 2LL

Date: 11/11/2014

Before :

LORD JUSTICE PATTEN
LORD JUSTICE FLOYD
and
SIR STANLEY BURNTON

Between:

ADAPTIVE SPECTRUM AND SIGNAL ALIGNMENT **Respondent**
INC **/Appellant**
- and -

BRITISH TELECOMMUNICATIONS PLC **Appellant/**
 Respondent

Roger Wyand QC and Hugo Cuddigan (instructed by **Bird & Bird LLP**) for **British
Telecommunications PLC**
Iain Purvis QC and Joe Delaney (instructed by **Wragge Lawrence Graham & Co LLP**) for
Adaptive Spectrum and Signal Alignment Inc.

Hearing date: 7-9 October 2014

Judgment

Lord Justice Floyd:

Introduction

1. This is an appeal from a decision of Birss J dated 3 December 2013 in a patent action. There are two patents in suit, both in the name of the claimant, Adaptive Spectrum and Signal Alignment Inc. (“ASSIA”). The patents relate, in general terms, to asymmetric digital subscriber line (“ADSL”) technology. ADSL technology is used to send data over telephone lines, for example in providing broadband internet access to customers. The inventions are concerned with the ways in which those lines are managed. Both patents were alleged to be infringed by the defendant, British Telecommunications plc (“BT”), in its Dynamic Line Management System, which is responsible for controlling the operation of BT’s broadband services. The first patent (in order of priority date) was European patent (UK) 2,259,495 (“495”). 495 was held by the judge to be valid, but not infringed by BT. The second patent was European patent (UK) 1,869,790 (“790”). 790 was held to be both valid and infringed. Both sides appeal with the judge’s permission.
2. Although we still have a very large number of issues to deal with, the issues on this appeal are less extensive than they were before the judge. The judge was faced with three separate alleged infringements of the 495 patent: BT’s 20CN, 21CN and NGA systems. Only the NGA system (NGA stands for “Next Generation Access”) raises live issues before us. The judge also had to deal with multiple grounds of invalidity of both patents. Before us, there is no longer any attack on the validity of 790. On 495, there is no validity attack if the patent is construed narrowly, as the judge construed it. ASSIA accepts that if claim 1 is construed widely enough to cover the NGA system, then it is invalid. In those circumstances it relies instead on claim 6, which BT contends is both invalid and not infringed.
3. The case for BT on both appeals was presented by Mr Roger Wyand QC with Mr Hugo Cuddigan, and that for ASSIA by Mr Iain Purvis QC with Mr Joe Delaney. We heard the argument on 790 first, followed by 495, and I will approach the appeals in that order, after I have introduced some of the technical background, common to both actions.

Technical Background

4. As is the case with almost all patent cases in the field of telecommunications technology, it is necessary to negotiate some technical background in order to make sense of the issues which divide the parties.
5. Data is transmitted down telephone lines at a rate called the bit rate. In ADSL there are rates for upstream (away from the customer) and downstream (towards the customer) which are not the same – hence the description “asymmetric”. In order to ensure that the data is received at the other end it must be transmitted with sufficient power relative to the noise on the channel, otherwise errors will occur in the received data. The signal to noise ratio (SNR) is used to measure the power of a signal as compared with noise. An SNR margin is used to specify a margin which the signal power must have above a minimum signal power for a specified error rate.

6. Various techniques exist to correct errors. The bit error rate (BER) is a measure of the uncorrected errors as a proportion of the total number of bits transferred per unit time.
7. Interleaving is a technique used to enhance error correction caused by bursts of errors in the transmitted data. Interleaving (for example by writing data into a buffer in rows and reading it out in columns) spreads out the errors, making them easier to correct. A drawback is that interleaving increases the delay between data transmission and the time when the decoded data is available: an effect known as latency.
8. From the foregoing it will be understood that there is a trade-off between the rate at which data can be sent down a telephone line and the number of errors. Higher speeds will give rise to a greater number of errors. A balance needs to be struck.
9. A typical ADSL system connects terminal equipment at a customer's premises, such as a home computer connected to a broadband router, to the central office or CO run by the network operator. Inside the broadband router is a modem which communicates via a channel to a second modem in the CO.
10. In order for the two modems to communicate successfully, they must have a shared communications protocol. To achieve this they automatically negotiate the appropriate values for certain parameters. This process is called initialisation. The experts used the term "transmission parameters" to describe the set of negotiated and mutually shared parameters needed to ensure successful communication between the modems. Following initialisation the modems start working normally to transmit data upstream and downstream in what is called SHOWTIME.
11. Another expression used in the evidence is "configuration parameters". These are the values given to the modems by the operator of the line, ahead of initialisation. These configuration parameters are not used directly by the modems during SHOWTIME but they set the boundaries or requirements that the operator wishes the modem pair to comply with in operation. An example of a configuration parameter specified by the DSL Management Standard is MAXNOMPSD.
12. At the priority date of both patents, any change to configuration parameters used in a particular DSL line was typically effected through a process of manual human evaluation and intervention at the central office.

The 790 patent

13. The specification of 790 is entitled "DSL state and line profile control". The invention is said to relate to managing line profiles in a DSL system. An example of a line profile is set out at [0003], identifying, amongst other things, maximum and minimum upstream and downstream data rates as controllable profile parameters. At [0004] it is explained that operators currently use these profiles in a simple manner to control only an individual line's data rate, and perhaps forward error correction margin. These were, therefore, often controlled manually, thereby causing that line to remain in the same profile until maintenance personnel intervened to set a new profile, perhaps in response to a customer request for a faster service. Even when a line is permitted to change profile automatically, only a few transitions are considered. Thus the specification explains at [0006] that:

“Systems, methods and techniques that permit implementation of a wide variety of line profiles and transitions between such profiles automatically and with ease in communication systems such as DSL systems would represent a significant advancement in the art. In particular, prioritization and implementation of transition options in the communication system would represent a considerable advancement in the field of DSL service rates and associated ranges.”

14. Having thus set out its overall objective, the patent then sets out two aspects of the invention, along the lines of the independent claims. The claims refer to three concepts which are important: a “state transition matrix”, “priority” and “feasibility”. An understanding of these can be gleaned from the specification at [0043] to [0048]. The judge summarised them in this way:

197. The patent uses two concepts which are key to the method of selecting profiles it discloses. These are priority and feasibility. Neither expression is a term of art and the skilled reader’s understanding of them would come from reading the patent itself. Essentially the idea is that the system will extract out from a set of possible profiles which a line could adopt, a set of feasible profiles. That is a set of profiles which would provide acceptable operation of the line in the given circumstances. The set of possible profiles is divided into those which are feasible and those which are infeasible. This still presents a problem since the system has to have a means for selecting a particular profile to use from the group of profiles which are determined to be feasible. This is the point at which the priority concept plays a part. The possible profile transitions have an allocated priority which is independent of line conditions. It is an inherent property of each transition from a given profile to each target profile. The transition to a feasible profile with the highest priority is the one which is selected. The DSL line is then operated using this profile.

198. To carry out the method disclosed, the patent describes the use of a profile state transition matrix. The profile state transition matrix is a matrix which records the state transitions which are allowed and contains the priority of each possible transition. An example is matrix T in figure 4 as follows:

$$\mathbf{T} = \begin{bmatrix} 2 & 3 & 4 & 8 & 6 & 7 & 8 & 8 \\ 6 & 2 & 3 & 4 & 5 & 6 & 7 & 7 \\ 1 & 6 & 7 & 3 & 0 & 5 & 6 & 0 \\ 5 & 1 & 2 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

In this matrix each column relates to a given starting profile. So if the current profile for the DSL line in question is profile 1, the first column is the relevant column to use. If the current profile was profile 2, the second column would be the relevant one, and so on. Thus although T is a matrix, when one is considering a given current profile the data is really just a single column of values, i.e. a list. The numbers in the list represent the target profiles. Thus starting with profile 1 as the current profile, profile 2 has the highest priority since it is at the top of the list. Profile 6 has the next priority, then profile 1 itself and then profile 5. The presence of an entry for the current profile in the list shows that this arrangement would prioritise changing to profiles 2 or 6 (if they were feasible) ahead of staying put at profile 1. On the other hand if profiles 2, 6 and the current profile 1 are found not to be feasible but profile 5 is feasible then profile 5 should be selected.”

15. The patent explains “feasibility” a little further at [0052]:

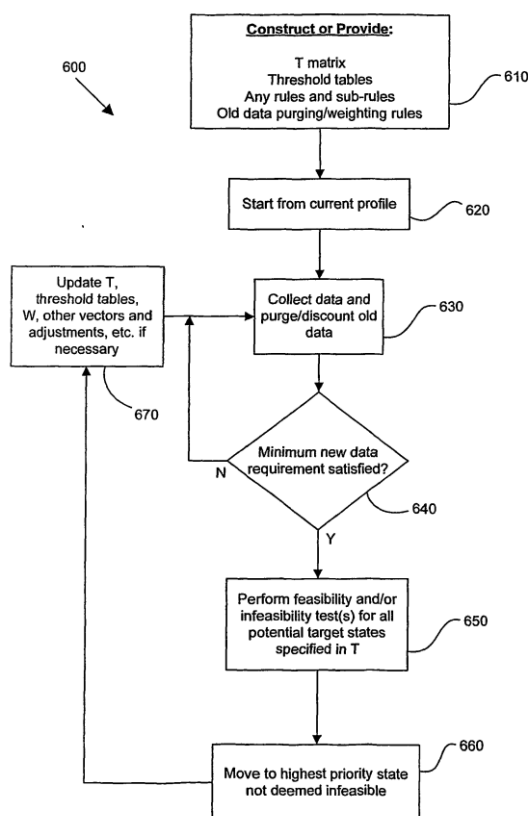
“[0052] Knowing the prioritization of states is not sufficient in all embodiments of the present invention. In some embodiments, to assist in determining prioritization to states/profile, the feasibility of available states is evaluated and, in some cases, quantified. For example, for any line of interest in one embodiment, the information in the transition matrix T and current state is always available. Because priorities are already specified in T, a controller such as a DSL optimizer simply needs to examine the feasibility of candidate transitions and choose the feasible next state with highest priority (the state/profile with the lowest priority may be deemed to be feasible at any time without examination). As will be appreciated by those skilled in the art, feasibility may be determined in different ways. The “best state” and “best line profile” or “best available line profile” mean the state and/or line profile that is both feasible and possesses the highest priority. In cases where a “presumption of innocence” is used, as in some of the embodiments of the present invention the best state and /or line profiles that has not been deemed infeasible and possesses the highest priority.”

16. The patent explains at [0054] that to perform a feasibility test two types of operational data are used as inputs: reported and estimated data. Where the line is in state *n* and is considering a transition to state *m*, directly observed performance data for the line while it was in state *m* is reported data, whilst data based on the estimated operation and/or performance of the line in state *m* is estimated data. The specification explains that the estimated data may be available when the line has never been in state *m*. At [0070] the patent explains that reported and estimated data complement one another. Reported data tends to be more complete than estimated data, which can suffer from errors. On the other hand estimated data is guaranteed to be available since it is generated by the controller, while reported data may not be.

17. Feasibility is a binary decision taken by the controller: a profile is determined to be feasible or infeasible. In practice, based on the reported/estimated data, the controller applies a set of conditions, which it calls sub-rules, and then an overall rule to determine feasibility. A sub-rule is effectively defined at [0073] as:

“one of multiple conditions that must be satisfied for a rule governing state transition.”
18. An example of the invention commencing at [0076] considers a case where it is of interest to change only the data rate of a line from 1.3Mbps in profile *n* (which has a maximum rate of 1.5Mbps) to a profile *m* (which has a maximum rate of 3Mbps). It suggests, initially, the application of a rule whereby the line should move to profile *m* if *all* values of the reported maximum rate are above 3.5Mbps. However this rule might be too conservative for lines which satisfy the 3.5Mbps test most of the time but occasionally only achieve 3Mbps. Thus a more nuanced rule would be to move the line to state *m* if the maximum reported rate was over 3.5Mbps for more than 50% of the time AND more than 3.0Mbps for 99% of the time AND more than 2.5Mbps for 100% of the time. Those cumulative conditions are set out in a table at [0078], which shows the criteria for transition to state *m* only. A table showing criteria for transition to a whole series of states is set out at [0088], and is referred to as a “threshold table”. Other examples are shown in [0092] and [0095].
19. In addition to the sub-rules, the specification also refers to an “overall” rule. At [0107] it explains that the overall rule may simply be a function whose inputs are the results from the sub-rules and whose output is either “yes” or “no” to the transition from state *n* to *m*.
20. The overall operation of the method of the invention can then be seen by reference to Figure 6, reproduced below:

Figure 6

**Claim 1 of 790**

21. The only claim of 790 which needs to be considered is Claim 1. I set it out below, omitting the reference numerals, but adding letters in brackets to denote individual features for convenience:

1. (a) A method in a DSL controller coupled to a DSL line, the method comprising:

(b) operating the DSL line in the current line profile;

(c) collecting operational data relating to operation of the DSL line in the current line profile;

(d) evaluating whether to transition operation of a DSL line from a current line profile to one of a plurality of target line profiles (e) by implementing in hardware or software or a combination thereof:

(f) a profile state transition matrix indicating: a plurality of possible transitions from the current line profile to one of the plurality of target line profiles, and a priority value specifying the priority of transitions for each profile,

(g) a plurality of sub-rules, each to evaluate a feasibility or infeasibility of the plurality of target line profiles within the profile state transition matrix,

(h) a plurality of threshold tables, wherein each of the plurality of threshold tables emphasize or de-emphasize the individual sub-rules, and

(i) an overall rule that utilizes the one or more sub-rules to determine the feasibility or infeasibility for each of the plurality of target line profiles, (j) wherein the plurality of sub-rules and the overall rule are based on reported and estimated data from the collected operational data;

(k) determining the feasibility or infeasibility of the current line profile and each of the plurality of target line profiles based on the collected operational data and dependent on the outputs from some or all of the sub-rules and the overall rule; and

(l) selecting a one of the plurality of target line profiles in which to operate the DSL line, wherein the selected line profile comprises whichever of the current line profile and the plurality of target line profiles has a highest priority in the profile state transition matrix, and is not evaluated to be infeasible; and

(m) operating the DSL line in the selected profile.

The 790 pleading point

22. Before turning to the merits of the appeal, it is convenient to deal with a point taken by BT at the forefront of its argument. BT contends that the case of infringement of the 790 patent on which ASSIA ultimately succeeded was not pleaded. The relevant ground of appeal asserts that, as the case of infringement was not a pleaded one, the judge should have upheld BT's objection to its being run at all.
23. CPR Part 63 permits a defendant in a patent action to produce a product or process description setting out the details of alleged infringement with sufficient particularity to determine the issue. If he does so he does not have to give disclosure in relation to that issue. In this case, BT produced a confidential product and process description ("PPD") explaining, among other things, the operation of its NGA system. In March 2013 BT complained through its solicitors that it had been unable to identify features of its systems which could be said to infringe the patents in suit, and asked ASSIA to produce a statement of case on infringement. BT made an application to Hildyard J, who by paragraph 3 of his order dated 16 April 2013 (to which ASSIA consented) ordered the production of such a statement of case in the following terms: "*identifying for each claim of the patents in suit the Claimant will say at trial are infringed by the Defendant the part or parts of the Defendant's Confidential Product and Process Description relied upon in respect of each such feature of every such claim.*"

24. ASSIA served its statement of case on infringement (“SOCOI”) in response to this order on 24 May 2013. The relevant entries in this document are those appearing against claim feature 1.5, that is to say “*a profile state transition matrix indicating: a plurality of possible transitions from the current line profile to one of the plurality of target line profiles and a priority value specifying the priority of transitions for each profile.*” Against this feature the pleading identifies the fact that, in NGA, there are two types of logic, red and green, for each of upstream and downstream. So far as the green logic is concerned, the pleading identifies paragraphs 146 and 146A of the PPD which it summarised as follows:

“If the green logic is run, Paragraphs 146 and 146A disclose that the line can transition to any profile with a cap rate greater than the current cap rate, and RAMBo will preferentially instruct the line to transition to the highest cap rate, subject to the cap level being the closest rate above the “safe rate” calculated in accordance with Paragraph 123.3). Profiles having rates below the maximum cap level have sequentially lower priority values which specify the priority of transitions for each profile. Paragraphs 148 and 149 disclose that, if a profile with an increased cap rate cannot be selected, RAMBo will instruct transition to the profile with the same cap rate but one level less interleaving.” (original emphasis).

25. The paragraphs of importance in the PPD thus identified included a footnote, added by amendment on 25 April 2013, to the effect that RAMBo, in order to determine the corresponding rates for a cap level, uses a cap level table listing the cap level and the corresponding maximum and minimum bit rates.
26. The pleading did not however, as it could have done, content itself with identifying these paragraphs of the PPD. It went on to explain that, for each profile, the plurality of possible transitions for either upstream or downstream included, in order of priority, profiles with the same interleaving level, from the highest cap level to the cap level immediately above the current level, the profile with the same cap level but one lower interleaving level, the current level, the profile with the same cap level but a higher interleaving level, and finally profiles with the same interleaving level from the cap level immediately below the current level to the lowest cap level.
27. The pleading went on to refer to the expert report of Professor McLaughlin served on behalf of ASSIA, in which Professor McLaughlin had purported to construct, effectively by reverse engineering, what was described as a “full STM”, and to discuss a number of “infringement scenarios” which included both interleaving and cap rate in the matrix, and therefore accommodated all possible transitions from the current profile. For present purposes the important point is that there was no explicit suggestion in the SOCOI that the requirement for the PSTM could be satisfied by the cap level table itself, without reference to interleaving level.
28. BT’s expert was Dr Adams. He made clear in his first expert report that he considered that Professor McLaughlin’s approach, involving reverse engineering, was not sufficient to demonstrate the presence of a PSTM. The software needed to have an “identifiable” PSTM. He would expect to be able to access and extract the PSTM:

a reverse-engineered or constructed PSTM would not do. It was also his position that the matrix needed to encompass all possible transitions.

29. If Dr Adams' construction of the patent were to be accepted, ASSIA appreciated that it would have to identify something within BT's software which met Dr Adams' conception of a PSTM. In its skeleton argument for trial dated 17 October 2013 ASSIA pointed out that BT had never disclosed the contents of its software. Although it by no means accepted that Dr Adams' construction was correct, ASSIA pointed to the inconsistency between running a case of non-infringement based on the details of the actual software in these circumstances. Apparently in response to this point, on 21 October 2013 and thus two days before the start of the trial, BT produced a witness statement from Mr Croot which explained the way in which the cap level table was used in more detail. Further explanations followed in the second and third witness statements of Mr Croot. The last of these witness statements was served on the first day of the trial.
30. In the course of his opening on the first day of the trial Mr Purvis referred to this alternative way of putting the infringement case. Mr Wyand dealt with this in his own oral opening on the third day. He took two points. Firstly the list of cap levels was only in respect of a fraction of the possible transitions. Secondly, he asserted that it was not pleaded. Although a different pleading point was ventilated more fully, the issue of whether there needed to be an amendment to the pleadings was taken no further at that stage. Mr Purvis cross-examined Dr Adams about the functioning of the cap table: but did not cross-examine him about whether a table which worked in that way could be described as a PSTM.
31. In written closing submissions ASSIA again identified the two ways in which it put its case on the PSTM: that based on reverse engineering and that based on an actual table (see paragraph 102). BT's written closing maintained that the second way of putting the case had not been pleaded and therefore "*had no relevance to this part of the case*". BT went on to submit that, in any event, the case was "*hopeless as an STM for the reasons Professor McLaughlin made very clear. Any STM for the NGA system would have to include at least one entry for the priority of an interleaving transition. This table makes no reference to interleaving at all. It is just a list of cap levels and associated data rates.*"
32. In his oral closing, Mr Wyand dealt first with the reverse-engineering case, which he described as "*the pleaded infringement*". So far as the alternative, cap table case was concerned he reiterated orally the point about the lack of an entry for the priority of an interleaving transition. He made no explicit oral reference to the fact that it was not pleaded, although the judge no doubt had the written submissions in front of him at this point. Mr Purvis, in response, maintained his position that the case had been adequately pleaded, by reference to the order of Hildyard J, the relevant paragraphs of the PPD having been identified.
33. The judge did not refer to any pleading point in his judgment. He rejected the reverse-engineering case, both on the facts and because he preferred BT's construction, and there is no appeal from any of that. He did however find infringement on the basis that the cap level table functioned as a PSTM on BT's construction.

34. At a subsequent hearing on the form of order BT contended that account should be taken of the fact that the infringement case on which ASSIA had succeeded had not been “*properly pleaded*”. The significance of this was, so BT contended, that if the matter had been squarely raised earlier, it would have been possible for BT to make a simple change to the NGA system to avoid infringement. This in turn would have meant that an immediate injunction against infringement would not have had any effect. The judge dismissed this argument as having no weight in relation to the grant of an injunction, but said this at paragraph 18 of his judgment:

“There is some force in Mr Wyand’s submission that his clients were to some extent taken by surprise by the allegation of infringement as it was drawn at trial. I will not decide in this judgment whether it was pleaded or not. Mr Purvis says it was. Mr Wyand says it was not. Whether it was or was not properly pleaded, it is certainly fair to say it did not emerge very clearly until the trial. ...”

35. A number of points emerge from this history. Firstly, the judge never resolved the question of whether the alternative, cap level case, fell within the existing pleading. Secondly, BT’s objections to the pleading were muted in the extreme and, importantly, it never suggested to the judge at any stage that it would be prejudiced if ASSIA was allowed to run its alternative case. Its position was, instead, that the point could easily be dismissed as a matter of simple argument. BT did not draw its contention to the judge’s attention when he released his judgment in draft, notwithstanding the fact that its position is now that the judge was deciding the case on a basis which was not open to him. Had it done so, the judge could have clarified whether he considered that the alternative case fell within the existing pleading, or whether he considered that it did not but that he had nevertheless dispensed with the need for a formal amendment.
36. In support of this ground of appeal Mr Wyand maintains his submission that it was not open to ASSIA to run the alternative infringement case on the existing pleading. He submits to us, notwithstanding the fact that he did not do so to the judge, that BT was prejudiced by the introduction of this argument in the following way. Had BT appreciated that ASSIA was contending for a construction of the claim wide enough to encompass a simple cap table, they would have been able to spread their net for *prior art* more widely. This would have given BT a greater chance of invalidating the patent.
37. Mr Purvis submitted that once ASSIA had identified the relevant sections of the PPD, they had done all that was required of them under the order of Hildyard J. That order did not require ASSIA to identify every argument which they could run based on the identified passages of the PPD, even though the SOCOI did in fact go further and identify one such argument. He submitted that that is the standard by which it is to be judged whether ASSIA had pleaded its case, and ASSIA had met that standard. Mr Purvis also challenges the suggestion that BT were prejudiced by the introduction of the alternative argument.
38. I accept Mr Purvis’ submission that the allegation fell within the existing pleading. Reduced to its essentials the argument is that ASSIA had both complied with Hildyard J’s order and pleaded all the material facts. Hildyard J’s order did not go

further and require an explanation of every argument which could be founded on the relevant passages in the PPD. It was open to ASSIA to formulate such legal arguments for infringement as it was able to based on those passages of the PPD.

39. It follows that BT's objection to the late introduction of the argument cannot be that it was not pleaded. It may be that they believed, based on the SOCOI, that the only argument which would be advanced based on the relevant paragraphs of the PPD was the reverse engineering case. But that is a different point. The only ground of appeal is that the judge should have decided that the infringement case was not pleaded.
40. However, even if that were wrong, and BT could legitimately complain that it had been misled by the SOCOI into thinking that the widest construction of 790 that was going to be advanced was one consistent with the reverse engineering case, it was in my judgment incumbent on it to explain to the judge why it was prejudiced by that fact. There was no shortage of opportunities for it to do so: in its opening address, at any stage during the trial when the matter could have been raised as an outstanding issue of housekeeping, in its written and oral closings and on the handing down of the judgment. Even if it was not clear to BT before, the judge's judgment would have made it transparently clear that he had in fact allowed the point to be run. Yet even then there was no protest, let alone a suggestion of prejudice, of any kind. Even now, no hard evidence that BT was prejudiced in any way can be pointed to.
41. It is correct, as the judge said in his later judgment, that the point did not emerge clearly until trial. That was because BT did not put in its detailed evidence as to how the table worked until Mr Croot supplied it, his last witness statement coming in on the first day of the trial. No complaint is made that BT did not fully understand the allegation that was being made based on the cap level table once it was made, or that it was not clear. Thus I am not persuaded that, even viewing the matter independently of the pleadings, that BT was in any way prejudiced by the late identification of the point.
42. In those circumstances the judge might have considered directing ASSIA to spell out the alternative argument in the SOCOI when it was raised by Mr Purvis in his opening speech. His failure to do so however does not give rise to any procedural unfairness of any kind.
43. I would reject the pleading ground of appeal.

Construction of 790

44. Before the judge, the meaning of virtually the whole claim was in dispute. On this appeal the number of points in dispute has marginally reduced, but there is still a very large number of them. The case cried out for a list of issues, and by mid-morning on the first day of the appeal Mr Wyand had produced one. This has formed the basis of the identification of the issues on the appeal.
45. Subject to a point which arises in connection with 495, the parties did not dispute that the correct approach to construction of a patent is that explained by Lord Hoffmann in his speech in *Kirin Amgen v Hoechst Marion Roussel* [2004] UKHL 46; [2005] RPC 9. The object is to ascertain what the person skilled in the art would understand the patentee to be using the words in the claim to mean. The Court of Appeal

summarised the relevant principles in *Virgin Atlantic Airways v Premium Aircraft Interiors UK* [2009] EWCA Civ 1062 at [5]. There is no need to repeat them here. It is however worth emphasising one point. A number of BT's arguments on this appeal involve reading limitations into the claim which are not there as a matter of language, on the grounds that to do so would follow more closely that which is disclosed by way of example in the body of the specification. It must be remembered, however, that the specification and claims of the patent serve different purposes. The specification describes and illustrates the invention, the claims set out the limits of the monopoly which the patentee claims. As with the interpretation of any document, it is conceivable that a certain, limited, meaning may be implicit in the language of a claim, if that is the meaning that it would convey to a skilled person, even if that meaning is not spelled out expressly in the language. However it is not appropriate to read limitations into the claim *solely* on the ground that examples in the body of the specification have this or that feature. The reason is that the patentee may have deliberately chosen to claim more broadly than the specific examples, as he is fully entitled to do.

46. With that introduction I can turn to the features of the claim about which there were disputes on construction. I will then deal, separately where necessary with whether the claims, on that construction, are infringed by the NGA system.

Feature (f): "A profile state transition matrix indicating: a plurality of possible transitions from the current line profile to one of the plurality of target line profiles, and a priority value specifying the priority of transitions for each profile".

47. The first issue in relation to this feature is whether, as BT contends, the PSTM must include all the possible transitions, or whether, as ASSIA contends, a sub-set of the transitions will suffice. It is now common ground that the requirement for a PSTM is not satisfied by demonstrating that it is possible to reverse engineer the software to produce such a matrix. The claim requires, as the judge held, "*an actual matrix to be identifiably present*".
48. BT's submissions on this issue ran as follows. The claim feature under consideration requires consideration of the technical features of a PSTM before one goes on to consider the remainder of the characteristics which the PSTM is described in the claim as having, such as the plurality of possible transitions and the priority values for the transitions which it covers. BT submits that the judge was in error in failing to appreciate that the requirement for a PSTM imported the requirement that it catered for all the available states in the system. They submit that although the expression "*profile state transition matrix*" was not a term of art, the expression "*state transition diagram*" was. Dr Adams' unchallenged evidence was that a state transition diagram needed to represent all the possible transitions. The fact that the term "*state transition diagram*" was a term of art informed the meaning of "*state transition matrix*", and carried across the requirement of the former term that it should cover all possible transitions.
49. ASSIA submitted that, as the expression "*profile state transition matrix*" was not a term of art, the only question was how the skilled person would understand the term was being used in the patent, and the evidence of what the experts thought it meant out of that context was not to the point. The judge had been right to treat it as a pure question of construction. The language which followed the words "*profile state*

transition matrix indicating:” and in particular “*a plurality of possible transitions*” made it clear that PSTM was not being used in a sense which required it to cover every possible transition, but only a plurality, i.e. more than one.

50. In my judgment, ASSIA is plainly right on this issue. Once it is accepted that PSTM is not a term of art, its meaning is not rigidly dictated by reference to any acontextual use of the term, far less by any acontextual use of a different term such as state transition diagram. What is critical is how the term is being used in the patent and its claims. To my mind, as a matter of language, the claim is making it as clear as it could that not all possible transitions need to be covered by the matrix. Quite apart from this, the judge said, and I agree, that it is difficult to think of any reason why the skilled reader would conclude that the patentee had intended to exclude a method which used the PSTM and the other steps in claim 1 to choose between a given subset of profiles in some circumstances but use a different method in other circumstances or for different profiles. The method would still be taking the benefit of the invention. Whilst arguments based on taking the benefit of the invention are not always persuasive where the language admits of a narrower construction, they can provide a powerful reason for supposing that the patentee meant exactly what he said.
51. The second point which BT raise under this head is whether, on the assumption that it is wrong on the first point and a sub-set of possible transitions suffices, the PSTM must cover all possible transitions for the sub-set of logic, and in particular whether it needs to indicate priority for all the possible transitions. The point arises because there are some circumstances where the NGA system will decide to change interleaving level. This is a profile transition which is not identified or accorded a priority in the cap level table.
52. I think BT is, again, trying to read too much into the claim. The matrix has to indicate a plurality of possible transitions to one of a plurality of target line profiles and specify a priority for each of those transitions. The fact that there are transitions which are not recorded in the matrix and not accorded a priority does not matter. The target line profiles may be a sub-set of all possible profiles. That is in substance what the judge held. BT focused on the following sentence at [240] in the judgment, in a passage where he was dealing with infringement, and not construction:

“When the loop is operating, the table represents all the possible transitions and the table indicates the priority of those transitions.”
53. BT tries to build on the judge’s reference to “*all the possible transitions*”, and argues that this passage shows that the judge thought that the matrix must nevertheless include all possible transitions from the current profile and the priority for those transitions. I do not agree. The judge went on to explain that he had construed “*plurality of possible targets*” as including some but not all possible targets. Accordingly, the fact that the table did not prioritise every possible target did not matter. In this context the judge cannot have meant that the table identifies all possible transitions, including those not included in the table.
54. The third and final point on this feature of the claim is whether the PSTM is allowed to indicate as possible a transition which is impossible. This is one of the more convoluted of BT’s arguments and can only be understood by explaining the use

which it seeks to make of the argument in relation to infringement. When the NGA system runs the green logic, the cap level table includes entries for profiles with lower cap levels but the system cannot transition to these profiles because there is no possible outcome of the logic which will cause one of those profiles to be selected.

55. In the patent, impossible transitions are excluded from the final matrix, T, as shown in Figure 4, but other matrices include zero values, indicating that they are impossible. I would accordingly accept the submission that it must be possible from the matrix to obtain an indication of which are the possible transitions and which are not. However, care must be taken with what is meant by a “possible” profile for the line. The mere fact that a profile is subsequently excluded from use by running a particular version of the software does not mean it is an impossible profile. It was still a possible state into which the system could transition, depending on the choice of logic.

Feature (j) “... estimated data from the collected operational data”

56. BT submits that the estimated data component of the operational data must be “*profile-specific*”. They point to the fact that the claim requires the feasibility of each of the target line profiles to be determined “*based on the collected operational data*”. Unless the estimated data is profile-specific it will not be useful for the purpose of determining the feasibility of an individual target line profile.
57. The judge held that there was no requirement in the claim for the estimated data to be profile specific. He observed at [221] that:
- “... “estimated data” is data that is estimated by the controller relating to the performance of the line. The reported and estimated data can relate to the performance either of the current or target line profiles.”
58. BT argues that, because estimated data is relied on where the line has never been operated in a particular profile, estimated data should be regarded as a “synthetic” version of the data which would have been reported if the system had been operated in that particular profile. The controller must estimate what the return would be if the line ran in a particular profile. Thus there must be something like an estimate of mean time between errors (MTBE).
59. ASSIA contends, supporting the judge, that estimated data does not have to be profile specific but may relate to the performance of the line more generally. Such data is also useful for informing the decision about whether to transition to another profile. Data relating to the reliability of the line more generally under existing line conditions could be used for this purpose, whether or not it relates to a particular profile.
60. I am not persuaded by BT’s argument. Estimated data does not have to be profile specific in order to be useful for determining whether to make a transition to a particular profile. It is true that the examples in the specification use data which is profile-specific, but that is not conclusive. The data has to be an estimate – in the sense of a rough calculation - of something to do with the line. There is no requirement for it to be a synthetic version of some parameter such as MTBE.

61. BT also submitted that estimated data had to be data in the sense of a record or datum. I do not agree. Data in this context means no more than technical information. It may include a record or datum, but may also include the result of a rough calculation.

Feature (g): “a plurality of sub-rules, each to evaluate the feasibility or infeasibility of the plurality of target line profiles within the profile state transition matrix”

62. BT poses two questions in relation to this feature. The first is whether the sub-rules must operate *only* on the profiles in the matrix. The second is whether the sub-rules operate on *all* the target profiles.
63. The significance of the first question is that the relevant logic in the NGA system requires (at step B) a decision which, if answered in the affirmative, would result in the cap level table not being used at all. Instead step B will in some circumstances result in a change of interleaving level. BT says that this routine fails to implement what is required of a sub-rule, which is to eliminate some of the profiles in the matrix, whilst leaving others in play.
64. I think BT’s question is again apt to divert attention from the language of the claim. The sub-rule has to evaluate the feasibility of the target line profiles within the matrix. If the sub-rule performs that task it is irrelevant whether it performs some other task as well.
65. The second question is whether the sub-rule must operate on all the target profiles. Mr Wyand did not spend much time in his oral argument on this point. It seems to me that it again poses a question which the claim does not ask. The sub-rule has to evaluate the feasibility of the plurality of target profiles. The claim does not say anything about “operating” by which I understood BT to mean “individually evaluating or addressing”.

Feature (h) “a plurality of threshold tables, wherein each of the threshold tables emphasize or de-emphasize the individual sub-rules”

66. There was some debate before us as to the meaning of “table”. I do not think that there is any great difficulty in recognising a table in this context. The difficulty may centre on what the minimum requirements for a table are. It will be easier to consider this point in the context of the alleged infringement.

Feature (i): “an overall rule that utilizes the one or more sub-rules to determine the feasibility or infeasibility for each of the target line profiles”

67. BT submits that the overall rule must have substance independent of the sub-rules, or that it must be capable of returning an output distinct from that of the sub-rules. It submits that, based on the specific embodiments described in the patent, the overall rule does not merely take the outputs from the sub-rules. As the next feature of the claim, feature (k), demonstrates, there must be a determination of feasibility dependent on the outputs from some or all of the sub-rules and the overall rule.
68. I accept that the skilled person would understand the overall rule to be adding something to the individual sub-rules, and Mr Purvis did not in the end argue to the contrary. But that is not the same thing as saying that the overall rule must be capable

of returning a distinct output from one of the sub-rules. The overall rule may be constituted by the way in which the sub-rules are linked together: for example “IF sub-rule A = yes AND sub-rule B = yes THEN FEASIBLE”.

Feature (k): “determining the feasibility or infeasibility of ... each of the plurality of target line profiles”

69. BT contends that this feature requires each target profile to be individually considered and resolved. ASSIA support the judge’s conclusion that all that was required was that the feasibility of all profiles was resolved. This would include a method in which profiles were deemed to be excluded without being individually examined.
70. BT’s contention does not sit happily either with the language of the claim or the text of the body of the specification. All that the claim requires is that feasibility is determined: it does not require that the feasibility of each profile is individually considered and resolved. Although Figure 6, which I have reproduced above refers to performing feasibility tests for all potential target states, the specification also makes it clear e.g. at [0052] that individual assessment and resolution is not always required. I have set out paragraph [0052] above, and much the same point is made at [0127]. Mr Wyand submitted that the specification was here pointing out an exception to the general rule that individual assessment is always required. I do not read it in that way. The specification is pointing out that the system may arrive at a profile without having to check every profile for feasibility. The general rule does not emerge from the language of the claim or the specification as a whole.

Infringement of 790

71. Only the NGA network was and is alleged to infringe 790. The NGA network is controlled by a RAMBo (standing for Rate Adaptive Monitoring Box), that is to say a network management system. The NGA network offers several products to service providers, each of which has a pre-determined set of profiles. Each profile contains a set of configuration parameters (data rates, margin, interleaving parameters) for the modem pair. There are 36 different downstream profiles and 18 different upstream profiles.
72. The RAMBo instructs the modems to use a particular profile selected from the set of available profiles. The RAMBo uses data collected from the modems to determine whether it is necessary to change the profile on the line, and if so, what profile to change to. For this purpose RAMBo receives a data file once per day containing operational data about the operation of the line.
73. Each profile employed by the NGA system has a cap level which specifies a maximum and minimum data rate. The profiles are given a number, ranking them in order of rate. A downstream cap level of 36, for example, represents the highest maximum data rate, 80Mbps; a downstream level of 1 represents a maximum data rate of 2 Mbps
74. The logic used by the RAMBo is in broad terms as follows. The daily operational data is analysed so as to allocate an Indicated Line Quality (ILQ). These are characterised by colour: red and green indicating a change is necessary. If a change is indicated, a further assessment occurs to decide what the change should be. Broadly,

the red logic may reduce the cap rate or increase interleaving; the green logic may increase the cap rate or reduce interleaving. Lastly, once a new profile is selected, a message is sent to cause the modem to re-initialise using the new profile.

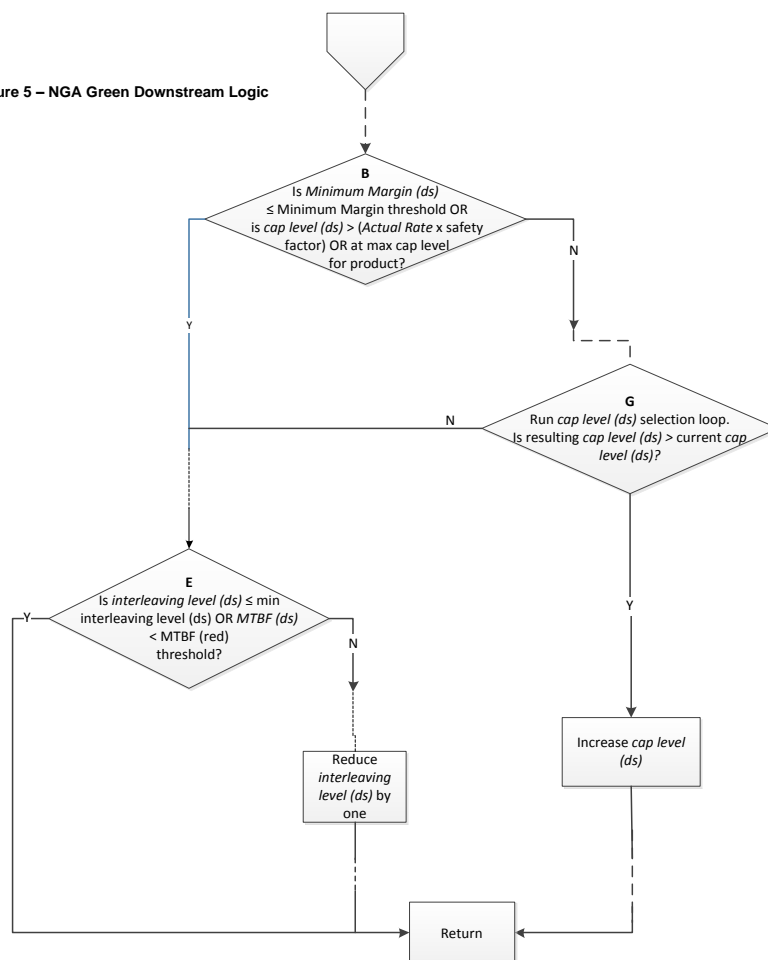
75. The logic employed in certain circumstances makes use of a parameter called the “safe rate”. This is a calculated parameter arrived at by the formula:

$$\text{Safe rate} = (0.7 \times \text{actual rate}) + (0.3 \times \text{maximum attainable rate})$$

The safe rate is thus a rate somewhat higher than the actual rate, but lower than the maximum attainable rate. The maximum attainable rate is an indication from the modem pair as to the data rate that it could achieve with appropriate new configuration parameters.

76. On a red ILQ the logic will try to decrease the cap rate; on a green ILQ it will try to increase the cap rate. In order to achieve this, the logic runs a loop. The system calculates the safe rate which is used in selecting the correct profile. The objective is to find the profile with a maximum data rate just higher than the safe rate. The profiles are arranged in a table in descending order of cap rate. The logic then examines the cap levels in descending order asking whether the maximum rate is above the cap rate. If it is above the safe rate, it will continue and ask the same question in relation to the next level down, and so on until it arrives at one where the maximum rate is below the safe rate. It will then select the profile which is the last one to have been above the safe rate.
77. The infringement case focuses on the green downstream logic. This is illustrated in Figure 5 of the PPD, but a simplified version of that figure was produced in BT’s skeleton, and is sufficient for these purposes:

Figure 5 – NGA Green Downstream Logic



78. At decision B the system chooses between two branches, representing different types of profile change. One branch allows for the possibility of a reduction in interleaving level. The other branch allows for increasing the cap level. In essence decision B asks a number of questions. For example, if the cap level is already at the maximum allowable cap level, a further increase in cap level is not possible and reduction in interleaving is the only possibility. Two further tests are employed, both of which are also concerned with selecting between a reduction in interleaving level and a cap level change.
79. In the case where the logic decides, at decision B, that a cap level change is in order, the system is directed to decision box G. Within this stage of the logic the words “run cap level selection loop” appear. The system runs a loop described in the PPD as follows:

“The loop operation begins with the maximum cap level (i.e. cap level 36 downstream in the 80/20 product) and checks whether the next lowest cap level's maximum rate is above the safe rate (i.e. 74Mbps for cap level 35 downstream in the 80/20 product). If so, the loop operation then considers the next lowest cap level (i.e. cap level 35) and checks whether the next lowest cap level's maximum rate is above the safe rate (i.e. 67Mbps for cap level 34 downstream in the 80/20 product). The process is repeated until the loop reaches a cap level for

which the next lowest cap level's maximum rate is not above the safe rate: the loop ends on that cap level (the one with the maximum rate above but closest to the safe rate). If the selected cap is not greater than the current cap level, RAMBo will proceed to Decision D but if the selected cap level is greater than the current cap level then that is the cap level that RAMBo determines for use.”

Feature (f): “A profile state transition matrix indicating: a plurality of possible transitions from the current line profile to one of the plurality of target line profiles, and a priority value specifying the priority of transitions for each profile”.

80. ASSIA contends that the cap level table is a PSTM. The different profiles are indicated by their cap levels and their priority by their order in the table. It is correct that the table does not include all possible transitions for the system, but it does not have to: a sub-set will do.
81. BT’s point here is that, if one follows the green downstream logic, there still comes a point, within decision box G, when the logic can opt for a reduction in interleaving. This is represented on the figure as a horizontal line to the left from box G. This is a possible transition, but it is not one indicated in the table and it is not accorded a priority.
82. In their summary of issues BT describe this infringement issue as: “Does the cap level table “indicate the possible transitions”. This is a highly misleading way of characterising it. This claim requires the matrix to indicate “a plurality of possible transitions”, not “the possible transitions”. The cap level table indicates a plurality of possible transitions, and a priority for each of those transitions. On the approach which the judge took to construction, which I consider to be correct, the claim is not concerned with whether there are other possible transitions, not set forth in the table.

Feature (j) “... estimated data from the collected operational data”

83. The judge held that the safe rate used in the NGA system was estimated data. At [253] of his judgment he concluded:

“It is clear that the safe rate is not a measured rate, it has been calculated. I think that calculation can fairly be called an estimate. The safe rate is a data rate which is estimated based on the actual rate but is higher than it by a simple factor of the highest possible rate. The safe rate represents a rough calculation of a rate which is higher than the current actual rate but not too high so as to cause too many errors. ”
84. BT’s arguments here were simply a reflection of their points on construction. They submitted that the safe rate was not profile-specific, was not data, and not a synthetic version of recorded data. I have rejected the arguments on the need for profile specific data, the meaning of data and on the requirement for there to be a synthetic version of recorded data. The safe rate is an estimate of how fast the line can run without causing too many errors. It is an estimate of something properly regarded as

data in relation to the operation of the line. It follows that this non-infringement point fails.

Feature (g): “a plurality of sub-rules, each to evaluate the feasibility or infeasibility of the plurality of target line profiles within the profile state transition matrix”

85. No issue independent of construction arose on this feature. It is important to note, however, that the judge identified two sub-rules in [243] to [244] of his judgment. These were both in the downstream green logic. The first was at step B. One of the tests at step B was whether the minimum margin was less than or equal to the minimum margin threshold. This determines whether the logic goes down the interleaving branch or the cap level branch. The judge held this to be a feasibility test, because if the logic goes down the interleaving branch it will have made a decision about the feasibility or infeasibility of target profiles in the cap level table.
86. The second test accepted by the judge as a sub-rule was the test applied in the loop within box G, which he accepted evaluated the feasibility of target profiles in turn.
87. BT’s point, put as a matter of non-infringement, is that step B is not a relevant sub-rule, because it comes into play before the logic addresses the cap level table. But there is nothing in the claim to require that the system must be addressing the cap level table at the time when it considers whether a condition is satisfied. It is not difficult to see why the judge accepted that both these rules satisfied the patent’s definition in [0073] which I have set out above.

Feature (h) “a plurality of threshold tables, wherein each of the threshold tables emphasize or de-emphasize the individual sub-rules”

88. The judge identified certain threshold tables in the PPD as satisfying this feature of the claim. He held that these tables played a part in determining whether the green or red logic paths were taken and accordingly whether the sub-rules he had identified (step B and step G) were either emphasised or de-emphasised.
89. BT’s first point about the judge’s conclusion is really the same as the point they take about the sub-rules, namely that step B is not a qualifying sub-rule because it comes into play before the logic addresses the cap table. It stands or falls with the point about the sub-rule.
90. The second point taken was that the thresholds in question were not to be regarded as “a plurality of threshold tables”. This was a purely semantic argument. The table indicated thresholds for three parameters. Whether it is a single table or three tables joined together seems to me to be of no technical significance.
91. In its reply skeleton BT takes the point that there needs to be a one-to-one relationship between thresholds and rules. They draw attention to the use of the word “individual” in the claim. I do not think that the use of that word creates the need for a one-to-one relationship between tables and rules. I suspect it was inserted to make it clear that the thresholds do not *have to* operate on all the sub-rules: it is enough if any one threshold is used to influence any individual threshold.

Feature (i): “an overall rule that utilizes the one or more sub-rules to determine the feasibility or infeasibility for each of the target line profiles”

92. BT’s submission was that the NGA system (after applying steps B and G) produced an output of a single profile. This was the output of the sub-rules. There was therefore nothing left for the overall rule to do. It simply had to take the output from step G and apply the profile. The overall rule had to do something more.
93. The judge dealt with this argument at [249] and [250]:

“249. First, the fact that the NGA system only ever produces a single profile output does not show it is different from the claim. The claimed method is supposed only to produce a single profile at the end. Second, although the NGA system only ever produces a single profile as an output, in reaching this result it will, if necessary, evaluate multiple profiles to decide which one to choose. This takes place in the loop processing which uses the profile cap level table. Unless the first profile tested passes the test, the loop method will evaluate at least two profiles. The use of loop logic means that the testing is carried out sequentially but I do not see why that matters. Whether the evaluations are performed in parallel or in series cannot be relevant. There is nothing in the language of the claim which the skilled reader would think mandated only parallel logic. Third, as I have held already on construction, the claimed method does not need to test every possible profile. I have rejected the defendant’s interpretation of “each” in feature (k). The method can stop once it has found the highest priority feasible profile.

250. Although it is fair to describe the method described in the embodiment described in the patent as having a parallel nature to some extent, for the reasons set out above, I reject the defendant’s submission that the claim is limited to parallel logic. The claim requires the overall rule to be one that “*utilizes the one or more sub-rules to determine the feasibility or infeasibility for each of the plurality of target line profiles*”. Thus a rule which selects which sub-rules to apply will be an overall rule. That is what the overall logic of the NGA method does. It satisfies feature (i).”

94. I think the judge was right to look at the matter in this holistic way. The sub-rules do not operate in a vacuum, but they are “utilized” by the overall logic of the system to make the feasibility/infeasibility decisions. That is all the claim requires.

Feature (k): “determining the feasibility or infeasibility of ... each of the plurality of target line profiles”

95. BT submits that the operation of the NGA system does not fulfil this feature of the claim because the process of examining profiles stops when the system has identified a profile which satisfies its selection criterion. I do not accept this argument. I have

rejected the suggestion, as did the judge, that the system has to examine every profile. It may deem some profiles to be feasible. The skilled person would not expect the system to plough through profiles unnecessarily.

Conclusion on the 790 patent

96. I am not persuaded that the judge fell into error in any respect in his conclusion that the NGA system infringed claim 1 of the 790 patent. I would dismiss BT's appeal.

The 495 patent

97. By contrast to the vast array of points taken by BT in relation to 790, ASSIA's appeal on 495 raises a single point of construction, namely the use of the words "generating" and "generated" in claim 1. Somewhat unusually, ASSIA argues for a construction which it concedes results in a finding of invalidity of claim 1 in the light of a document, called Kerpez, which the judge held formed part of the common general knowledge. In that event, however, ASSIA contends that claim 6 was both valid and infringed. The judge held that claim 6 was valid. It was however not infringed by the NGA system only because of the "generating" point on claim 1. The added feature of claim 6 was, the judge held, present in NGA.
98. The invention of 495 is concerned with a controller in a network which collects both current and historical data from the modem pair, analyses to determine how it is working, and instructs the modem pair to adopt a new set of parameters which will improve the performance of the line. 495 is concerned in this respect with "*margin-related parameters*", that is to say parameters such as SNR margin. It is these margin-related parameters which the claim requires the system to "*generate*".
99. The background section of the patent includes a discussion of the relevant applicable standards. At [0009] the specification explains that the ADSL1-G.992.1 standard (sometimes referred to as "ADSL 1") has a "MAXSNRM *maximum margin limit that can be set by operators.*" It also explains that another margin related parameter, MAXNOMPSD, is between -40 and -52 dBm/Hz in 2 dB steps. This means that only 7 discrete values of the parameter between these limits can be selected by the operator to send to the modem pair.
100. When the specification turns to the ADSL 2 standard, the limits for MAXNOMPSD are normally -40 to -60 dBm/Hz in 0.1 dB steps. This gives rise to some 200 possible values for MAXNOMPSD.
101. At [0026] under "*Brief summary of the invention*" the patentee explains that the invention can be used in connection with ADSL-1, ADSL 2, ADSL-2+, VDSL and other types of DSL systems and equipment.
102. The patent explains the idea behind the invention at [0065]:

"The basic idea is that the spectrum level, power, spectrum shape, etc. may all be changed in response to reported margin history/distribution. In other words, after evaluating data about prior performance of a modem pair, and knowing one or more of the modem pair's margin related parameters, a controller or

the like can suggest or force the modem pair to adopt operational values that will assist the modems in meeting one or more margin targets, whether imposed by a standard or not.”

103. The description continues at [0071] to explain that “a controller *provides* a margin-related parameter (for example a MAXNOMPSD value)” to the modem. At [0072] it is explained, specifically in relation to ADSL 1, that the controller “*calculates* the margin-related parameter (for example, the MAXNOMPSD value), based on operational data collected by the controller”. However at [0090] the specification explains that the margin-related parameter is “*chosen and calculated*”. There are further references to a margin-related parameter being “*chosen*” at [0143] and [0148].

The claims of 495

104. The relevant claims of 495 are claims 1 and 6, which I set out below along with claim 8 which is referred to in an argument on construction:

1. A method in a controller communicably attached with a Digital Subscriber Line modem pair, the method comprising:

collecting operational data from the DSL modem pair, wherein the operational data comprises current operational data and historical operational data;

analyzing at least a portion of the collected operational data;

generating a margin-related parameter set based on the operational data analyzed; and

instructing the DSL modem pair to operate in accordance with the generated margin-related parameter set.

6. The method of Claim 1, wherein analyzing the operational data comprises determining what margin-related parameter value will cause the DSL modem pair to meet a performance target or target threshold.

8. The method of claim 1, wherein analyzing at least the portion of the collected operational data comprises one or more operations selected from the group consisting of:

comparing a current margin related parameter value of the DSL modem pair represented within the current operational data against a corresponding threshold to determine whether a target value is met; and

comparing a historical margin-related parameter value of the DSL modem pair represented within the historical operational data against a corresponding threshold to determine whether a target value is met.

Construction of 495

105. BT argues that the terms “*generating*” and “*generated*” in claim 1 exclude the possibility that the controller uses a table of values from which it *selects* the margin related parameter to send to the modems. ASSIA contends that selection is included within the meaning of those terms as they would be understood by the person skilled in the art.
106. The judge made some findings as to the consequences of the broader construction at [0088] in his judgment. He held, firstly, that the difference between the two options was simply one of programming. Secondly he held that, as far as the modem is concerned, it made no difference whether the margin-related parameter was one which was created afresh or selected from a pre-stored group. The judge clearly regarded the matter as finely balanced, recording that there was “no conclusive argument for either party’s construction of this part of the claim”. It appears that what was decisive for him was that the difference between the two ways of carrying out the process could make a difference in the controller in some cases and could make a difference to the operator since a bespoke set of parameters may be able to be configured more closely to the actual line conditions.
107. Mr Wyand submitted that the court should be slow to arrive at a construction which resulted in a finding of invalidity for obviousness over common general knowledge. He relied on a passage in Terrell on the Law of Patents, 17th Edition at paragraph 9-107:
- “The overall principle is therefore that a construction which leads to a foolish result should, if possible, be rejected as being without the intention of the patentee, for a construction which does not lead to an absurd result is to be preferred. However a finding of invalidity cannot of itself be regarded as an absurd result, unless the relevant piece of prior art is specifically acknowledged in the patent, or unless the invention would to the knowledge of the ordinary reader then be obvious simply in the light of common general knowledge.”
108. This passage follows a discussion of two cases. The first is a decision of this court in *Ocli Coating Laboratory v Pilkington* [1995] RPC 145. In that case the court concluded that a good reason for confining the meaning of the claims to what it described as a literal construction was that, if the wider construction was adopted, the patent would be rendered obvious in the light of the prior art. As the authors of Terrell point out, however, that cannot be a universal proposition. Where there is no reason to assume that the patentee was aware of a particular piece of prior art, his claim may well have been framed in ignorance of it. In such circumstances it would be wrong to impute to the patentee an intention to frame a claim so as to avoid attacks which could be based on it. It is also perhaps relevant to observe that that case was decided at a time when the courts decided construction by making a distinction between the strict, literal or acontextual meaning of the language and its purposive meaning, as opposed to adopting the unitary approach propounded in *Kirin Amgen*. One aspect of that approach invited speculation as to whether there was a possible reason why the patentee might have wanted to restrict himself to the strict, literal meaning.

109. The second case cited was a decision of Jacob J in *Beloit v Valmet (No 2)* [1995] RPC 705. At page 720 Jacob J pointed out:
- “... there is normally no reason to suppose the patentee when he set the limits of his monopoly knew of a particular piece of prior art ... Of course the position is different if the prior art is specifically acknowledged in the patent...”
110. Even if prior art is specifically acknowledged, much may turn, as Lewison J pointed out in *Ultraframe v Eurocell* [2005] RPC 7 at [73], on the way in which the prior art is referred to in the patent.
111. As with any canon of construction, one must be wary of treating it as a rigid rule. Moreover as soon as one departs from documents specifically acknowledged in the specification, the skilled reader has no basis for assuming that the patentee was aware of the document in question. Still further, where the objection is one of obviousness rather than lack of novelty, a value judgment is involved on which widely differing views are possible. It is true that if the document is said to form part of the common general knowledge, it might be said to be more likely that the patentee is aware of it. But a patentee may have been isolated from the common general knowledge, or may, despite the later finding of obviousness, have genuinely believed that he had made an invention over it. As will be seen below, the argument of invalidity over Kerpez involved, amongst other things, resolving a dispute between experts as to the feasibility of identifying noise sources. I am not persuaded therefore that it would be right to give weight to this factor in the present case.
112. To my mind, the key to unlocking this dispute is a consideration of the purpose of the invention. The idea behind the invention is, as the patentee says at [0065], to allow margin-related parameters to be changed in response to reported margin history/distribution. As that paragraph states, after evaluating data about prior performance of a modem pair, and knowing one or more of the modem pair’s margin related parameters, the controller can suggest or force the modem pair to adopt operational values that will assist the modems in meeting one or more margin targets. The invention is in no sense about the method by which one arrives at the parameters to be sent: the idea is that they should be based on the current and historical data, by analysing and evaluating it, and producing an output which is dependent on it.
113. The background of the standards is also informative. The skilled person would understand that the standards did not necessarily permit fine grained control of parameters such as MAXNOMPSD, particularly when operating according to ADSL-1. The skilled person would understand that the patentee was intending to cover the use of his invention in connection with the relevant standards, including ADSL-1. Mr Purvis points out that one thing which emerges very clearly from the claim is that it requires both “*generating a margin-related parameter set*” and “*instructing the DSL modem pair to operate in accordance with the generated margin-related parameter set.*” Thus the parameter which is generated must be that which is sent to the modems. Suppose a system which calculates a precise value for MAXNOMPSD, say x, but is then forced to adopt one of the discrete permitted, pre-determined values from the standard, y. On the narrow meaning of “generating”, the only “generated” parameter is “x” and the parameter sent to the modem is “y”, obtained from the lookup table, and thus not “generated” in the narrow sense. Thus the narrow meaning

has the result that operation of the invention in accordance with ADSL-1 is outside the claim.

114. True it is that the claim is broad enough to include other parameters, such as transmission parameters, which are not subject to such constraints, a point much stressed by BT. However, because the patentee clearly contemplates operating in accordance with the standard – see for example [0026] - the skilled person would not, in my judgment, be inclined to read the claim in a way that excluded the use of a lookup table to choose a pre-determined value once the result of the analysis of the current and historical values was known.
115. The judge’s finding that the difference between the two options was simply one of programming is also of significance. There was no evidence that there would be difficulties at the relevant date in carrying out the invention by pre-storing all the possible values to select from. Furthermore his finding that, as far as the modem is concerned, it made no difference whether the margin-related parameter was one which was created afresh or selected from a pre-stored group, is also important, as the invention is primarily concerned with the control of the modem. It is true that the difference between the two ways of carrying out the process could make a difference in the controller in some cases, but I cannot see how this would be a difference of significance to the skilled person in the context of this invention. Finally, the judge’s point that it could make a difference to the operator since a bespoke set of parameters may be able to be configured more closely to the actual line conditions, is to my mind outweighed by the consideration that this would not be possible if the system was to operate to the standard.
116. For these reasons, I have come to the conclusion that I prefer ASSIA’s construction of “*generating*” and “*generated*”. The claims do not exclude the use of a look up table to identify pre-selected margin-related parameters.

Infringement of 495

117. In the NGA system RAMBo carries out calculations on the operational data which generate a number which represents a cap level. The cap level represents a particular set of margin related parameters which the modem pair is instructed to adopt. If the broader construction is correct, there is no dispute that the NGA system would infringe claim 1 were it not invalid.

Claim 6 of 495 – infringement

118. The additional step required by claim 6 is that of “*determining what margin-related parameter value will cause the DSL modem pair to meet a performance target or target threshold.*” As the judge said:

“The point of claim 6 is to require the system to actually determine what value will meet a given threshold rather than simply come to a conclusion that a parameter should be increased or decreased by a preset amount.”

119. The judge held that the NGA system infringed because:

“When the NGA system checks whether a profile is the one with a maximum data rate above but closest to the safe rate, it is determining what margin-related parameter value will cause the DSL modem pair to meet a performance target.”

120. BT’s first point is that the judge thought that the margin related parameter was the cap level. This is based on a sentence in the judgment which deals with an argument of BT that the cap level was not a performance target. That argument was relevant because of the way ASSIA had pleaded its case, but the judge was right to dismiss BT’s point as a semantic one. As he observed “the cap level corresponds to the maximum data rate for a given profile”. The judge’s reasoning is encapsulated in the sentence I have quoted in the preceding paragraph.
121. BT’s second point is that the judge was saying that the maximum data rate was both the margin related parameter value and the performance target: the same feature cannot serve as both. ASSIA submits that the performance target is to operate at an available maximum data rate above but closest to the safe rate. As the safe rate represents a rough calculation of a rate which is higher than the current actual rate but not too high so as to cause too many errors, it is accurate to describe this overall operation as meeting a performance target.
122. Although the judge’s reasoning on this point is understandably compressed, I have no doubt that he was analysing the matter as ASSIA asserts. That analysis is, in my judgment correct. BT’s argument ignores the fact that the safe rate is related to performance. The system is choosing a value of a margin related parameter which meets a performance target.

Claim 6 of 495 - validity

123. The judge held claim 1 to be obvious over Kerpez essentially because, so construed, it was “*a broad claim to an automatic DSL manager*”. Although it was limited to margin-related parameters, they were disclosed and would be obvious. Similarly, the limitation to collecting both current and historical data led nowhere because the standard provided for this. Although “*a narrower claim to a particular technique would stand in a different light*”, and having accepted the evidence of Dr Adams over Professor McLaughlin on the feasibility of identifying noise sources, there was nothing inventive in claim 1 over Kerpez.
124. The judge considered that claim 8 (as dependent on claim 1) came down to requiring that the system compares a reported margin-related parameter value with a threshold to see if a target was met. The judge accepted Dr Adams’ view that since Kerpez suggested analysing the impact of various impairments such as noise, the comparison required by claim 8 would almost certainly be required. Thus, he concluded, claim 8 was obvious if claim 1 was obvious.
125. The judge considered that claim 6 (as dependent on claim 1) went further. It did not simply require the system to compare a margin-related parameter with a threshold, but required it to determine the value of such a parameter which would cause the modem pair to meet a performance threshold.

126. The evidence before the judge on the validity of claim 6 was extremely limited. In his first report Dr Adams said this at [268]:

“[Claim 6] is directed to determining the margin-related parameter values such that they will have the effect of meeting a performance target or threshold. Kerpez teaches analysing the operational data arising from the use of various configuration parameters to calculate the expected performance. This is done to determine if the proposed change will be effective. This must be by reference to a performance target or threshold such as data rate, transmit power and SNR margin.”

127. Dr Adams was not cross-examined on this evidence, which the judge thought was essentially to the effect that following Kerpez led inevitably (“this must be...”) to a method within claim 6. The judge rejected Dr Adams’ evidence that claim 6 was obvious on this basis, for reasons which he explained as follows:

“[ASSIA] point out in argument that there are simpler ways of proceeding than complying with claim 6. A much simpler system would be to move up and down a list of possible profiles as the defendant’s 20CN and 21CN systems do. It seems to me that the claimant is right. The fact that the 20CN and 21CN systems do not infringe claim 6 shows that it is not inevitable that a DSL management system has to operate this way. The 20CN/21CN method is a simpler approach than claim 6. I bear in mind that this point was not put to Dr Adams, nevertheless, it shows that performing the test required by claim 6 would not be inevitable over Kerpez. Since that is the only basis on which claim 6 is said to be obvious, the argument falls away. Thus I find that even if claim 1 was obvious, claim 6 would not be.”

128. Mr Wyand’s submissions on this point are very simple. He says the judge should have accepted Dr Adams’ evidence, and not sought to undermine it by other evidence which was not put to him. Dr Adams should have been given an opportunity to explain why he had concluded that, in Kerpez, the determination to see whether the proposed change was effective was performed by reference to a performance target.
129. I think there are two different points in play here, depending on whether or not one treats Dr Adams’ evidence, as the judge did, as saying that following the teaching of Kerpez inevitably leads to a method falling within claim 6. If that had been the effect of his evidence, then I think Mr Wyand would be right that the judge ought not to have rejected it simply because there was another way which could be proposed which would not fall within the claim.
130. However I am not persuaded that the judge was right to say that the effect of Dr Adams’ evidence in [268] is that carrying out Kerpez inevitably leads to a method within claim 1. All that Dr Adams says in that paragraph is that Kerpez teaches analysing the operational data to calculate expected performance, in order to determine if the proposed change will be effective, and that this “must be” done by

reference to a performance target or threshold such as data rate. Dr Adams' evidence leaves open what is to happen next, whereas the claim goes further and requires the generated parameter set to be sent to the modem. There was therefore a significant gap between what Dr Adams said was the effect of the disclosure of Kerpez and the claim. Did Kerpez effect the change in discrete increments, or by sending the final parameter to the modem pair? The distinction may seem a subtle one, but it means that the failure to cross-examine Dr Adams on this paragraph of his evidence did not lead to the result that the judge was faced with uncontroverted evidence of the obviousness of claim 1.

131. This does not mean that the judge's reference to other ways of operating the system was not in point. The fact that the 20CN and 21CN systems used an incremental approach was some evidence to suggest that the step from Kerpez to the claim was not obvious. Viewed in this way, I do not consider that BT had shown claim 6 to be obvious.

Conclusions on 495

132. Claim 6 is valid. I would allow ASSIA's appeal against the finding of non-infringement of claim 1 and substitute a finding of infringement of claim 6.

Overall conclusion

133. For the reasons I have given I would dismiss BT's appeal on 790, but allow ASSIA's appeal against the finding of non-infringement of claim 1 of 495 and substitute a finding of infringement of claim 6.

Sir Stanley Burnton

134. I agree.

Lord Justice Patten

135. I also agree.