Neutral Citation Number: [2020] EWHC 2746 (Pat)

Case No: HP-2019-000006

BUSINESS AND PROPERTY COURTS OF ENGLAND AND WALES
INTELLECTUAL PROPERTY LIST (ChD)
PATENTS COURT

Royal Courts of Justice
The Rolls Building
7 Rolls Buildings
Fetter Lane
London EC4A 1NL

Date: 16/10/2020

Before :

MR JUSTICE BIRSS

- -

Between :

(1) OPTIS CELLULAR TECHNOLOGY LLC **(2) OPTIS WIRELESS TECHNOLOGY LLC** **(3) UNWIRED PLANET INTERNATIONAL LTD**	**Claimants**
- and -	
(1) APPLE RETAIL UK LTD **(2) APPLE DISTRIBUTION INTERNATIONAL LTD** **(3) APPLE INC**	**Defendants**

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- -

Adrian Speck QC, **Mark Chacksfield QC** and **Thomas Jones** (instructed by **EIP and Osborne Clarke LLP**) for the **Claimants**
Guy Burkill QC, and **Brian Nicholson QC** (instructed by **WilmerHale**) for the **Defendants**

Hearing dates: 5th-7th, 12th, 13th October 2020

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Approved Judgment

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

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MR JUSTICE BIRSS

Mr Justice Birss:

1. This is a patent action. The judgment relates to the first in a series of trials between these parties. This trial (Trial A) is about patent EP (UK) 1 230 818 entitled "Method for improving handovers between mobile communications systems". The application was filed on 20th October 2000 claiming priority from a US filing dated 17th November 1999. The patent therefore expires on 20th October 2020, 7 days after the scheduled end date of the trial.

2. The patent is part of a portfolio of declared standards essential patents held by the Optis group of which the claimants are each members. Optis contends the patent is valid and essential to versions of standard 3GPP TS 45.008 concerning GSM. The particular aspects relied on are (i) 3GPP TS 45.008 v.5.22.0 relating to enhanced measurement reporting about UMTS cells, (ii) 3GPP TS 45.008 v.8.12.0 relating to enhanced measurement reporting about both UMTS and LTE cells, and (iii) the same 3GPP TS 45.008 v.8.12.0, this time relating to normal measurement reporting about UMTS cells. Aside from essentiality, there is no distinct issue of infringement. If the patent is valid and essential, then it is being infringed by Apple.

3. The defendants are members of the Apple group of technology companies. Apple denies that the patent is essential and also contends it is invalid. The grounds on which invalidity are alleged are obviousness and insufficiency. The obviousness case has three bases: (i) International Patent Application published in 1998 as WO 98/50909 ("Losh), (ii) an ETSI Tdoc published in September 1999 as Tdoc SMG2 1145/99 ("Tdoc 1145/99), and (iii) ***Agrevo*** obviousness. The insufficiencies are (i) ***Biogen*** insufficiency, (ii) insufficiency by uncertainty.

4. I dealt with that patent in 2016. My judgment was given on 22nd March 2016, finding the patent valid and essential to the then relevant mobile telecommunications standard. It is [2016] EWHC 576 (Pat). It was Trial C of the overall dispute between Unwired Planet and Huawei, which led to the recent judgment of the Supreme Court on FRAND. Some of the arguments in the present case are similar to issues I addressed in that judgment and some are different. For example in 2016 the two obviousness attacks (which failed) were based on common general knowledge alone and on Tdoc 1145/99. This is a distinct case and Apple are not bound by any findings in the 2016 case. Some passages of the text in this judgment were written by starting from related passages in the 2016 judgment and editing them to my satisfaction. Nevertheless, I have considered all the arguments and evidence afresh.

Summary of what this case is about

5. The patent is about handover between different "RATs" or Radio Access Technologies. GSM (2G), UMTS (3G) and LTE (4G) are different RATs because the ways in which the radio signals are used to make the communication link between a mobile phone and a base station are different. Optis contends that the patent is essential to the part of the GSM standard which relates to hand over to UMTS and to LTE. It is useful to understand at a high level how different these different RATS are from GSM, focussing mostly on UMTS.

6. The first generation of cellular mobile phones (1G) were analogue rather than digital. A system called AMPS was one of those. In Europe the second generation of cellular phones, which launched commercially in 1992, was GSM.

7. GSM is an FDMA/TDMA system. When a phone call is in progress the phone transmits digital signals to the base station at a particular frequency which has been allocated to it and in one of eight time slots at that frequency. Each time slot is 577 microseconds long. The uplink signals from each phone in a cell are on a different combination of frequency and time slot. From the point of view of the receiver, all the radio signal energy at that frequency at a particular time is signal from just one phone. Everything else in that time and frequency is noise. The downlink from the base station to the phones works the same way.

8. In the 1990s across the world GSM was not the only digital cellular system in use. Another was an American system called IS-95. It was based on CDMA radio access technology, which I will explain below.

9. By the late 1990s work was progressing on the next generation system to follow GSM in the 3rd Generation Partnership Project (3GPP). The system 3GPP was developing was called UMTS. By the November 1999 priority date of the patent, ETSI (which was responsible for GSM) and 3GPP were working in parallel.

10. Unlike GSM, UMTS uses radio access technology called wideband CDMA (Code Division Multiple Access). All the phones in a cell transmit in the same broad frequency band at the same time. What distinguishes one signal from another is a scrambling code. Each transmitter has a different code. The codes are orthogonal which means that (in theory) they can all be uniquely distinguished from one another. From the point of view of the receiver, the radio signal energy in a frequency band at all times is made up of all the transmitters "talking" at once. If the receiver wants to "listen" to a particular transmitter it uses the right code to pull out from that overall radio energy the signal sent by that transmitter. Everything else, including all the other transmitters, is effectively noise. The base stations in UMTS (called Node Bs) also broadcast something called the CPICH. This is a "pilot" channel which allows phones to find the signals from that base station using the primary scrambling code for the cell.

11. LTE is the next (4th) generation system after UMTS. It was developed well after 1999. It works in a different way again. Its radio access technology uses OFDMA and SC-FDMA.

Handover

12. In a cellular telecommunications network handover is crucial in order to maintain connections (phone calls or data). The quality of the channel between the phone and the base station in one cell may start to deteriorate but there may be another cell available which can provide a better connection. The phone is handed over from one base station to another. This can happen seamlessly in the middle of the phone call or data connection so that the user does not notice. It may need to happen very quickly. There are different kinds of handover. One sort is known as network controlled mobile assisted handover. The decision to handover is made by the network not the phone, but the phones assist the process by using their radio receivers to make measurements of

neighbouring cells and then reporting these results to the network so that the network can make a decision. Another sort of handover can be controlled by the phone itself.

13. When the GSM system began, the only handovers contemplated within its standard were GSM to GSM, in other words intra-RAT handovers. These included handovers between different frequency bands within GSM. Nevertheless given the variety of RATs which were in existence in the 1990s, the general idea of inter-RAT handover was well known. Focussing in particular on GSM and UMTS, by the priority date it was clear that so called dual mode phones would be available which were capable of working in GSM or UMTS and there would be a need for inter-RAT handovers in which a phone could be handed over from a GSM cell to a UMTS cell and vice versa.

14. The situation the patent is most concerned with is handover from GSM to UMTS (but it is not limited to that). The claimed invention works in this way. The phone has a GSM connection with a serving GSM base station. The phone makes measurements of local GSM neighbour cells and also local UMTS neighbour cells. The GSM measurements measure different things from the UMTS measurements because GSM and UMTS work in different ways. The invention requires the phone to "convert" the UMTS measurements into GSM measurements, compare the converted measurements to a threshold and if they pass to send converted measurement(s) to the GSM base station. That way the network has the information needed to make inter-RAT handover decisions. For present purposes I am ignoring significant arguments about claim construction.

The claims

15. The claims alleged to be independently valid are method claims 1, 2, 3, and 8. Claim 1 (suitably labelled) is in this form:

> [a] A method for conveying measurement information from a terminal in a first communication system to a second communication system, characterised by the steps of:
>
> [b] converting a plurality of downlink measurement values associated with said first communication system to a plurality of down link measurement values for said second communication system;
>
> [c] comparing said converted plurality of downlink measurement values with at least one threshold measurement value; and
>
> [d] if at least one of said converted plurality of downlink measurement values exceeds a predetermined threshold measurement value, sending said at least one of said converted plurality of downlink measurement values on a control channel to a control node in said second communication system.

16. Most of the time in this case one is thinking of a phone in the GSM system in a context in which there may be an inter-RAT handover to UMTS or LTE. In that context GSM would be the second communication system referred to in claim 1, and UMTS or LTE would be the first communication system.

17. Claim 2 requires the first communication system to be a UMTS. Claim 3 requires the second communication system to be a GSM. Claim 8 requires the control channel in feature [d] to be a SACCH. SACCH is a GSM control channel (see below). These claims use the indefinite article even though mostly one talks about GSM, UMTS and SACCH rather than a GSM etc. The phrasing is odd and probably serves to emphasise how wide the claims are meant to be, but in the end nothing turns on it.

The witnesses

18. Optis called Dr Howard Thomas as an expert witness in the field of telecommunications. Dr Thomas is an engineer, with a PhD in mobile radio propagation. After his PhD, he worked at Communication Research Laboratory in Japan from 1992 to 1994 and then at Motorola. He was working at Motorola at the priority date. He left in 2011 and joined Nokia until 2013. Dr Thomas has worked for VIAVI Solutions, previously JDSU Ltd, since 2013 and acted as managing director and principal consultant at Ichigo Consulting since 2012 and JDSU Ltd (2013 to date).

19. Apple called Mr Paul Simmons as an expert witness in the field of telecommunications. Mr Simmons is also an engineer, with a master's degree in electrical and electronic engineering. Since 1985, he has worked in the development of telecommunication standards. Mr Simmons has worked for a series of telecommunications companies including GEC Telecommunications, Matra Communication, Nortel and Tamum Consulting. At the priority date Mr Simmons was working at Nortel.

20. Both experts have been involved in the 2G, 3G and 4G systems, including in relation to handover. Both Dr Thomas and Mr Simmons were at the same standardisation meeting in 1999 at which one of the papers presented was the Tdoc 1145/99 prior art paper.

21. Optis made some observations about particular aspects of Mr Simmons evidence, which are best dealt with in context, but did not suggest Mr Simmons was giving his evidence other than in a manner intended to help the court. I agree.

22. Apple criticised Dr Thomas about a particular aspect of his written evidence. This related to the relationship between the form of the Ec/Io values in the GSM standard, which Dr Thomas said were converted in accordance with the claims, and the form of those values in the UMTS standard. However, it turned out, as Dr Thomas accepted, that the mappings and the number of bits used for Ec/Io in the GSM standard (a 6 bit scheme in ½ dB increments starting at -24 dB) is the same as in the UMTS standard. Given that Mr Thomas's view (at least at one stage) was that using the same encoding scheme (mapping and number of bits) would not be understood as conversion, it followed that there was no conversion of Ec/Io in GSM. Optis dropped their reliance on Ec/Io in their written closing. Mr Speck explained to the court in his oral closing that his own understanding had been that the value had been a 7 bit number in UMTS but that this was wrong, it was 6 bits.

23. Dr Thomas ought to have made this point clear in his written evidence and if he had, the issue would either have been dropped much sooner, or perhaps would never have arisen at all. All the same, part of Dr Thomas's response when the point was put in cross-examination was to refer to the previous trial, in which Dr Thomas appeared for Unwired Planet, Optis' predecessor. He explained that the point had not arisen in that

case and as far as I can tell that is correct. It does not absolve Dr Thomas of responsibility but it does put the point into context. Apple is right that this is a distinct case from the previous one, and I am dealing with the issues afresh, but from the point of view of an individual expert witness who is appearing in both (Dr Thomas) this context is relevant.

24. Apple also submitted that Dr Thomas blew hot and cold in relation to conversion. That is why I refer to his acceptance that using the same mapping and format scheme would not be understood as conversion, as something he did accept at least at one stage. At other points in his evidence he seemed not to accept that, without giving a clear explanation justifying the different stance. Apple relied on this relating to the uncertainty insufficiency objection and I will address that below.

25. Overall, in my judgment Dr Thomas was an expert who set out to help the court and give his evidence mindful of his duties. His lapse relating to Ec/Io and the inconsistency mentioned above have a bearing on the particular points in issue, but having heard the whole of Dr Thomas' oral evidence they do not cause me to apply less weight to his opinions overall.

The person skilled in the art

26. Broadly, the skilled person would be an engineer with a number of years practical experience of mobile telecommunications in general and, measurement reporting and handover technologies in particular.

27. At one stage there was a dispute about the extent to which the skilled person would be working on the detail of standardisation. The issue is the same whether the skilled person is regarded as a team, in which one of the members could be closely involved in standardisation, or whether the skilled person is an individual and that is part of their work.

28. In my judgment the skilled person would be well aware of the standardisation work which was being actively pursued at the time (Nov 1999) but they would not be immersed in the detail, following closely every document presented to the various meetings and tracing the relationship between them. Their knowledge would be of the broad outline of what was going on. If they wanted to delve into the detail of how an aspect of the standard was developing, they would know who to ask (or how to do it themselves) but the skilled person would need a reason to embark on that exercise before undertaking it.

29. Another (possible) dispute is about the extent of the skilled person's knowledge of earlier RATs such as IS-95. I find that a skilled person working on GSM and thinking about GSM-UMTS interRAT handover in November 1999 would know the broad outline of what IS-95 was but they would not carry the details of IS-95 as part of their common general knowledge.

Common general knowledge

30. Save for the references to LTE, which came later, the background material addressed above in paragraphs 5 to 10, 12 and 13 would be part of the common general knowledge.

31. RATs have a land side, which refers to the fixed part of the network, as distinct from the air side, i.e. the phone. The phone is mobile. The land side communicates with the phone over the air interface. The land side of GSM consisted of essentially three kinds of boxes: the MSC, the BSC and the BTS. The BTS is the base station. It is often depicted as an aerial. Each cell has a BTS. The BSCs control a number of BTSs and an MSC in turn sits above a number of BSCs forming a hierarchy. The distinction between circuit switching and packet switching and everything to do with GPRS does not need to be explored. The BSC and BTS together can be referred to as the BSS.

32. When measurements are made in GSM for handover purposes the phone can measure the received signal level of a cell such as a neighbour. This is called RXLEV. RXLEV is a measure of power and its units are dBm. The quality of the received signal can be represented by a value called RXQUAL. RXQUAL is a kind of signal to noise ratio. As a ratio its units are dB. Generally a phone can measure RXLEV for both the serving cell to which it is connected and neighbour cells while it only measures or reports RXQUAL for the serving cell.

33. In GSM there are two available control channels on the uplink, SACCH and FACCH. These letters stand for Slow Associated Control Channel and Fast Associated Control Channel. The SACCH worked as follows. Together the eight time slots of 577 μsec each form one single frame of about 4.6 msec. A multiframe amounts to 26 frames and takes up about 120 msecs. In the normal case 24 of those 26 frames in a multiframe are used to carry traffic channels. The 26^{th} frame is empty for various reasons. The 13^{th} frame is used to send control data. One SACCH message requires four bursts, in other words four of these 13^{th} frames. So to send one SACCH message takes about half a second (4 x 120 msecs = 480 msecs).

34. The FACCH works in a different way. Traffic channel frames are used to send FACCH messages. That means those traffic frames cannot be used to send data such as voice data. The traffic frames are said to be "stolen". A FACCH message needs four frames worth of data sent over five successive frames. So it is much faster than the SACCH. Moreover, owing to the error correction methods which are used it is possible to steal a small number of traffic data bits without sacrificing connection quality at all. However for various reasons the error correction may not be able to compensate for a FACCH message, in which case using the FACCH frequently may degrade connection quality.

35. So using the SACCH to send messages does not "steal" from the voice or data traffic, whereas using the FACCH may well do, especially if it is used repeatedly or if conditions are poor.

36. In GSM the SACCH is used to send regular measurement reports from the phone to the BSS. The normal measurement report provides the RXLEV and RXQUAL for the serving cell and the RXLEV of the 6 neighbouring cells. The 6 cells to report are the ones with the highest RXLEV. This normal measurement report takes up one whole SACCH message. Therefore if nothing else was sent on the SACCH, the phone could send two normal measurement reports per second. However the standard permits some other messages to be sent on the SACCH too. An example of another message is an SMS text message. In GSM SMS messages are sent on the SACCH. There was no dispute about what the rules in the standard are or how they work, but there was a dispute about how to characterise what the skilled person would think of them.

37. The rule is that a normal measurement report may be sent in every SACCH message and must be sent in every other SACCH message. So if, for example there was no other message to be sent, then every SACCH message would be a normal measurement report. The SACCH is never empty. The reason for this is because the regular measurement reports are used by the network to build up a picture of how conditions around the phone are changing over time. This helps make handover decisions. Nevertheless if another message such as an SMS message needed to be sent, then that other message could only use up to half the capacity of the SACCH. The SACCH would still send normal measurement reports every half a second, but every other SACCH message could be used to send the SMS (which might only need one SACCH message or might require more). This way some capacity on the SACCH was available. But that availability was at the expense of sending some measurement reports.

38. The way Mr Simmons put it was that the SACCH had 50% spare capacity. Knowing how it works, one can understand what he means, but I do not accept that as a statement of the skilled person's thinking. The skilled person understood the rules for the SACCH I have explained. They would know that there is some capacity on the SACCH to send some messages but they would also know that any use of the SACCH was at the expense of some measurement reporting. It did not have 50% "spare" capacity.

39. Part of the common general knowledge would involve GSM multiband handover. At the relevant time two separate frequency bands, GSM 900 and DCS 1800, were established in GSM. Dual mode handsets capable of operating on either band became available, and handover between the different bands had to be catered for. The GSM standard at the time had special provisions relating to multiband handsets. The network could require multiband reporting to take place using a parameter called MULTIBAND_REPORTING. One setting meant that the phone would report the six strongest neighbouring cells irrespective of the band they were in. Picking these cells would require the phone to compare the RXLEV measurements from the various GSM cells in the two bands.

UMTS

40. Turning to knowledge of UMTS, the skilled person knew in November 1999 that the structure of the land side of the UMTS network was also going to consist of essentially three kinds of boxes: the MSC, the RNC and the Node B.

41. The Node B is the radio transceiver. The RNCs control a number of Node Bs and an MSC in turn sits above a number of RNCs forming a hierarchy. The UMTS network is sometimes called UTRAN. UMTS works in two ways, FDD and TDD. They are different. The argument has focussed on FDD. There is no need to deal with TDD.

42. In UMTS measurements can be made of the strength and quality of a received signal. The value RSCP is a measure of signal strength for the cell. The letters stand for Received Signal Code Power. The reason this measure is concerned with code power is because UMTS is a CDMA system and what distinguishes each cell from its neighbour is the code (i.e. the scrambling code). Strictly the value is CPICH RSCP, i.e. RSCP after despreading on the pilot channel. The units of RSCP are dBm.

43. In UMTS signal quality can be expressed as the ratio Ec/Io (strictly E_c/I_0). This is the ratio of code energy to interference. Another measure is the ratio between code energy

and noise power spectral density, written as Ec/No. These two are not the same but for the purposes of this case they can be treated interchangeably. Both quantities represent a measure of signal to noise ratio and hence quality. Strictly Ec refers to energy per chip. A chip can be thought of as a single bit of a given scrambling code. The units in which Ec/Io and Ec/No are expressed are dB.

44. As of the priority date, candidates for signal characteristics to be measured and reported by the mobile for inter-frequency handover in UMTS were identified in the list in the October 1999 standard TS 25.331 version 3.0.0 ("RRC [Radio Resource Control] Protocol Specification"). The list identified five candidate characteristics including RSCP and Ec/Io. The list made clear that while one of them would be mandatory, it had not been decided which one. That was "FFS" (For Further Study). Moreover the range over which the individual measurement had to be expressed was undecided and so also was the mapping and format in which that information would be conveyed in UMTS.

Message design, mappings and formats

45. Part of the task of a skilled person would be to design messages to be sent over the air interface. Techniques to do this were part of the common general knowledge. One aspect is the mapping and formatting of information.

46. In GSM that value (RXLEV) is encoded or "mapped" into a 6 bit format in the standard GSM measurement report. A 6 bit binary number provides 64 integer values expressed in decimal numbers as 0-63. The scheme works as follows. The received power level for a cell can be expressed as a value in watts. A value in watts can also be expressed in dBm. dBm is a logarithmic scale which allows a range of powers which differ by several orders of magnitude to be expressed in a convenient way. For example -90 dBm is 10^{-12} watts or 1 picowatt and -30 dBm is 10^{-6} watts or 1 microwatt, a power level six orders of magnitude greater. In GSM the default encoding scheme is that values less than -110 dBm are all mapped to zero in the 6 bit format. Values within the range -110 to -48 dBm are mapped to the integers 1 to 62 in 1dBm increments. Values greater than -48 dBm are all mapped to the integer 63. It will be seen that there are 62 steps of 1 dBm each between -110 and -48. So if the phone measures a received power level for a GSM cell of 56 picowatts (which is 5.6×10^{-11} watts), expressed in dBm that is -72.5 dBm. That value would be encoded in the 6 bit format as 100110 (or 38). The GSM scheme has further aspects (such as a SCALE parameter) but that is not relevant. Note that this encoding is not arbitrary because, within the range a higher encoded value will represent a higher power and the steps are the same size in dBm (although not the same size in watts). That is commonly done and for good reason but it is not a necessary part of encoding. An encoding scheme could be entirely arbitrary provided both the sender and the receiver know what the rules are. The term RXLEV sometimes means the measured value and sometimes means the encoded integer. Usually there is no problem with this and the skilled person understands, but nevertheless they are two distinct entities. All of this understanding of formats and the GSM encoding of RXLEV was part of the common general knowledge of the skilled person.

47. There is no reason why the encoding of one value in one communications protocol (say RXLEV in GSM measurement reports) has to correspond to the encoding of a different value in a different protocol (say RSCP in UMTS measurement reports). At this stage the point is simply that encoding formats can differ. In fact as I have explained above

the mapping, formatting and range of UMTS signal characteristics had not been decided upon at the priority date.

48. Moreover, as the skilled person also understands, encoding or mapping does not have any necessary connection with the comparability of two pieces of information. Mr Speck illustrated this point with the same example he used in the previous trial, based on Fahrenheit and Celsius temperature scales.

Textbooks

49. At times Apple relied on a 1992 textbook by Mouly which described the GSM system. In my judgment by 1999 that textbook in particular was regarded as a good introductory text which might be given to a new engineer joining a group, but that is all. The standards themselves would be the primary source an engineer would use. Characterisations in Mouly of how or why the GSM standards work in a particular way do not necessarily represent the common general knowledge of the skilled person in 1999.

The 818 patent

50. The patent starts by explaining that the technical field relates to handover. Paragraphs [0002] – [0003] describe the background under the heading "related art". Paragraph [0002] explains that GSM has been established for a number of years and UMTS is under development. In order to offer global coverage for UMTS when it starts, it will need to be possible to carry out handovers between UMTS and GSM. In this way, GSM networks will be able to provide coverage in those regions where UMTS network coverage has not, or has not yet, been provided. So when a phone sets up a call in a region where there is only GSM, it will set up a GSM connection but then if the phone moves into an area with UMTS coverage it will be "handed back" to a UMTS network.

51. Paragraph [0003] states that a basic problem to be resolved for handovers from GSM to UMTS is working out how to transport UMTS measurement information from a phone in GSM to the BSC. The patent explains that currently, the GSM standard provides no spare signalling capacity on the uplink in the relevant circumstances. "Consequently", states the patent, the transport of UMTS measurement information from a phone to the BSC will have to be performed at the expense of other information.

52. At paragraph [0004] the patent describes a proposed solution and the drawback of that proposal. The proposed solution is to send the measurement information on the FACCH. However "a significant problem" with the FACCH is that it operates in stealing mode, exchanging speech data for signalling information required for the handover. This would "severely reduce the quality of the speech information being conveyed". The paragraph ends by stating that the invention "successfully resolves this pressing handover problem and other related problems".

53. Mr Simmons did not agree with the way the patent presented the problem it was setting out to solve. His view was that the statement in paragraph [0003] that there was no spare signalling capacity on the uplink was not wholly accurate, amongst other things this because in his opinion there was 50% spare capacity on the SACCH. His view was also that the skilled person would not agree with the statement in paragraph [0004] that the need to avoid using the FACCH was a pressing problem and that the skilled

person would consider the statement in the same paragraphs that the use of the FACCH would "severely reduce" speech quality was something of an exaggeration.

54. I have addressed Mr Simmons's view about 50% spare signalling capacity already. Overall, I do not accept Mr Simmons's evidence about the skilled person's view of the problem the patent is setting out to solve. The skilled person reading these paragraphs as a whole would understand that the problem was, as the last sentence of paragraph [0003] puts it, that the transport of UMTS measurement information from a phone to a GSM BSC will have to be performed at the expense of other information. They would know that sending occasional FACCH messages in good conditions did not cause a severe reduction in speech quality, but they would also believe that, as the patent explains, using the FACCH in this context had a drawback because it was based on stealing speech frames.

55. Paragraph [0005] explains that the preferred embodiment provides a method of conveying measurement information which can function in a non-stealing mode. For example, UMTS measurement information can be conveyed from a phone to a GSM BSC, in a GSM message on the SACCH.

56. Apple points out that claim 1 is not limited by reference to the use of a non-stealing channel. This is one of the ***Agrevo*** points. At this stage I will say that it is clear that claim 1 is not so limited. However claim 8 is. It is also fair to note that the paragraphs can be read as enabling rather than requiring the use of a non-stealing channel. I will come back to that.

57. Paragraphs [0006] – [0008] describe what the patent calls "important technical advantages" of the invention, namely (i) that measurement information can be conveyed effectively between different mobile communication systems without sacrificing the quality of speech information being conveyed, (ii) that handovers between different types of mobile communication systems can be effectively performed and (iii) that coverage for a UMTS network can be expanded using GSM network coverage. The same point can be made about advantage (i) as has been mentioned above, namely that claim 1 is not limited to a system which requires (rather than permits) no sacrifice in speech quality. Also for advantage (iii), only claims 2 and 3 are limited to those particular systems.

58. The patent contains two figures. Figure 1 depicts a phone (22) in a car. On the left of the figure is a GSM network (10) with a central VLR and MSC, a BSC (14) which controls the cell, and a base station (16). On the right of the dotted line 18 is a UMTS cell (20). The Node B for that UMTS cell is not shown. Figure 1 is:

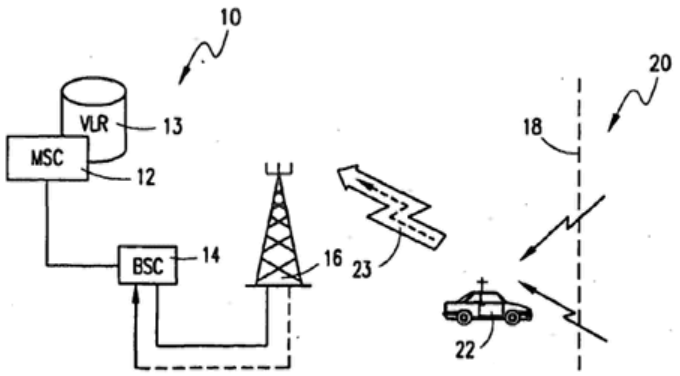

FIG. 1

59. Figure 2 is an exemplary flow diagram:

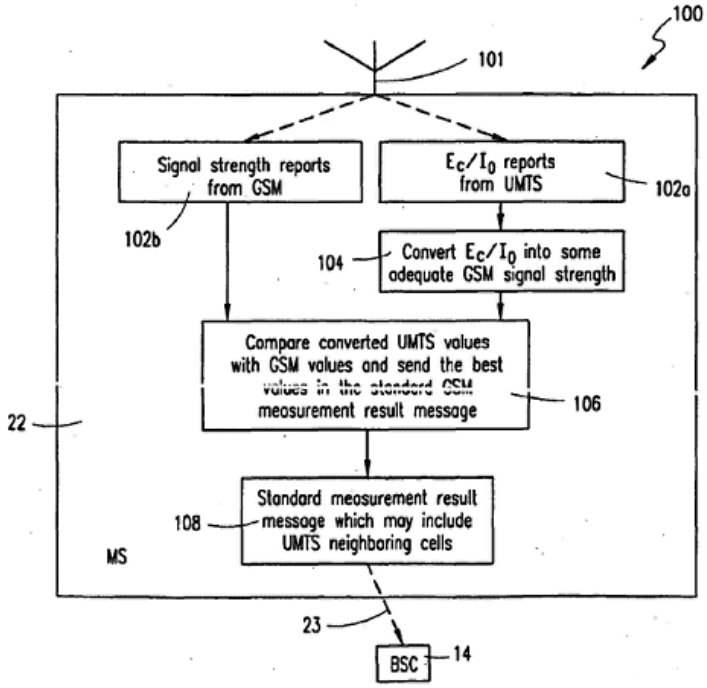

FIG. 2

60. The detailed description of the preferred embodiment runs from paragraph [0010] to [0017]. The phone is connected to the GSM network. It can make measurements and transmit them to the GSM base station, which then conveys them on to the BSC (paragraph [0017]). So far this is a conventional GSM system.

61. The phone operating in a GSM cell is capable of making UMTS measurements related to the UMTS cell. It conveys them in measurement reports to the GSM BSC on the SACCH for handover decisions (paragraph [0013]). The patent states (p3 ln32-33): "Notably the UMTS measurement information being reported is different from the typical GSM measurement information being reported." In paragraph [0014] the patent explains this in more detail:

> "For example, a typical GSM MS continuously measures and reports (on the [*uplink*]) signal strength (dBm) and quality (Bit

> Error Rate or BER) of its own cell, and signal strength of the Broadcast Control Channel (BCCH) carriers of the neighboring cells. On the other hand, instead of measuring signal strength in a UMTS cell, a UMTS MS measures and reports (on the [*uplink*]) the Code Energy-to-Interference Ratio (E_c/I_0) or Received Signal Code Power (RSCP in dBm) of the UMTS cell."

62. Consequently in order for a phone to convey UMTS measurement information to a GSM BSC, the UMTS measurement information is "converted to an appropriate GSM measurement format". The text goes on to state that an example of this will be given in relation to Figure 2.

63. The description of Figure 2 starts at paragraph [0015]. The large rectangle represents what is going on in a micro-computer in the phone. It is described as the exemplary conversion method 100. The phone's computer retrieves from memory the UMTS measurements the phone has already made. This is shown in box 102a by reference to E_c/I_0 but the text makes clear it could be some other value such as RSCP. At step 102b the phone's computer retrieves GSM signal strength information. At step 104, the phone's computer "converts the retrieved UMTS E_c/I_0 or RSCP measurement information to appropriate GSM signal strength information, which can be used by the GSM BSC 14 for making handover decisions." (p3 ln48-49). An example of the sort of "appropriate GSM signal strength information" referred to is RXLEV. The reference to “appropriate” would be understood as referring to its utility for making handover decisions in the BSC.

64. An exemplary equation is set out at lines 50-57. It is

$$RXLEV = RSCP + OFFSET (RSCP)$$

65. This equation is concerned with making the measurements comparable rather than with mapping and formatting. The offset to be added does not have to be a constant, as the notation indicates, the offset to be added can be a function of RSCP itself. Part of Apple’s case was that this equation would be taken by the skilled reader to mean that conversion of measurements to render them comparable had to, by definition, involve some arithmetic or mathematical operation. Whether conversion can always be written in terms of mathematics or not is a different matter, however I do not accept that the presence of this equation in the patent specification, which is presented simply as an example, would be understood by the skilled person to have the significance Apple proposes.

66. At paragraph [0016] the description turns to the next steps in the conversion method 100 shown in figure 2. The paragraph describes alternatives which I will call first and second for convenience. The first is as follows:

> "At step 106, the MS 22 compares the converted UMTS signal strength values (derived from step 104) with the set of stored GSM signal strength values (derived from step 102b). The MS 22 then retrieves a predetermined number (e.g., 6, or the maximum number of neighboring cells included in a GSM measurement report) of the "best" measurement values from step 106 to be reported in a measurement report to the GSM BSC 14.

> At step 108, for this exemplary embodiment, the MS 22 sends a GSM-type measurement report for receipt at the BSC 14 (via BTS 16) on the GSM SACCH over the radio air interface 23. The GSM-type measurement report can include signal strength information about UMTS neighboring cells."

67. The text in box 106 of figure 2 is relevant. It states "Compare converted UMTS values with GSM values and send the best values in the standard GSM measurement result message".

68. The first alternative works in this way. The phone has a set of converted UMTS signal strength values for various UMTS cells and a set of best measurement values for various GSM cells. Normally in GSM the scheme is to report the best GSM values, and normally in the GSM standard at the time there was space in the measurement report to report values for a total of six cells. The phone compares the converted UMTS values against the GSM values. The cells to be reported are the "best" cells in the comparison of the converted UMTS values against GSM values. In the specification, although not in the figure, the word best appears in inverted commas. The skilled reader would understand the writer to be doing this to indicate that best is being used in a figurative sense alluding to their suitability for handover, while not pretending that necessarily one is really better than another because real handover decisions are more complicated than that and take in other factors such as loading.

69. The measurement report which is sent is a GSM-type measurement report. The box 106 in figure 2 calls it a standard GSM measurement result message. The skilled person would understand that the standard message is the one described above in the common general knowledge section. The difference being that now with the invention the six cells reported will include both UMTS cells and/or GSM cells depending on the comparison.

70. The second alternative in paragraph [0016] is then described, as follows:

> "Alternatively, at step 106, instead of comparing the converted UMTS measurement values with GSM measurement values, the MS can convert each stored UMTS measurement value to an appropriate GSM signal strength value, and select each converted UMTS measurement value that exceeds a predetermined signal strength threshold value, for reporting to the GSM BSC 14."

71. In the second embodiment the comparison of the converted UMTS values is against a signal strength threshold rather than against real GSM cell measurements. A significant issue in this case is about how this passage would be understood. I will deal with that once I have reached the end of the specification.

72. Paragraph [0017] finishes by explaining that by using what it called the above-described method (100), i.e. the exemplary conversion method:

> "… the UMTS measurement information from the MS 22 can be converted to a GSM measurement format and sent to the GSM BSC 14 on the SACCH for use in making handover decisions.

> Consequently, since the SACCH does not operate in a stealing mode, the quality of the speech and on-line data being conveyed between the MS 22 and the GSM network 10 will not be diminished due to the use of speech frames for measurement signalling."

73. The skilled person would understand that this result in paragraph [0017] happens for two reasons. First, by converting the UMTS measurements into a GSM measurement format, the reporting can be carried out using the existing GSM measurement report. UMTS and GSM measurements have the same format and so they can replace one another in the existing report. The best cells from a pool of GSM and UMTS cells can be sent in the report. That report message is sent on the SACCH and so the reporting of UMTS measurements can take place on the SACCH and as a result does not steal from speech. Second, by converting the UMTS measurements into what is described as "appropriate GSM signal strength information" (para [0015] ln49) and "some adequate GSM signal strength" (box 102a of Fig 2) the UMTS values can be compared against GSM values. This comparison can be carried out in the BSC when making handover decisions (para [0015] ln49) and can be done in the phone in order to work out which UMTS cells to include in the standard GSM measurement report instead of GSM cells.

74. I now need to address the dispute about the second alternative in paragraph [0016]. Optis, supported by Mr Thomas, submitted that the only difference between the first alternative and the second alternative was at the comparison step, otherwise the two schemes are the same. In both schemes the UMTS measurements are converted in the same way so as to render them comparable and in a GSM format. In the first scheme the comparison is with real GSM measurements and in the second scheme it is with a threshold. Once that comparison has been done, in both schemes the UMTS measurements can be reported, in a GSM format, in a standard GSM measurement result message (referring also to box 106 and also box 108).

75. Apple, supported by Mr Simmons' evidence, submitted that the second alternative was quite different from the first. Once the comparison with the threshold had been done, there was no teaching that the UMTS measurements were sent in a standard measurement result message. There could be any number of UMTS measurements which passed the threshold, more or less than six, and so such a message could not be used. Mr Simmons re-drew figure 2 to comply with the second alternative as he saw it. In that redrawn figure the line on the left between box 102b and 106 (conveying GSM signal strength reports to box 106 and on to the report at 108) was cut. The text in box 106 was replaced with language from paragraph [0016] which refers to selecting for reporting each converted UMTS measurement value which exceeds the threshold. That change also removes the reference to a standard GSM result message. The word standard was deleted from box 108. Other changes were made too to include references to the threshold.

76. Part of the forensic objective of Apple's case is to support a submission that the skilled person would not think conversion relating to format was relevant to the second alternative and that the only conversion required there is conversion for comparability.

77. I do not accept Apple's case as to how the second alternative would be understood by the skilled person. In my judgment the approach of Optis is correct, for the following reasons.

78. First, one must read the document as a whole. Overall in the specification conversion is described as one exercise albeit it has two aspects –comparability and format. The reader would not think the conversion in the context of the second alternative was different from the conversion in the first alternative. Also, looking at the document overall, the second alternative is presented as an alternative at step 106 in conversion method 100. It is not stated to be an alternative to paragraph [0017]. As written paragraph [0017] applies to both alternatives. The same goes for earlier paragraphs [0014] and [0015]. The language referring to preferred embodiments does not justify excluding either alternative from these other parts of the disclosure.

79. Second, it is true that the second alternative refers to selecting "each" converted UMTS value which exceeds the threshold for reporting, but that would not be understood by the skilled person as a statement that an unlimited number of UMTS values should be sent. The skilled person would know that there ought to be a limit on the number sent and would see that these words were not being used to mean that the idea of using the standard GSM message was being abandoned. Far from it. The skilled person was familiar with message design and would understand, based on their common general knowledge, that there were various ways of carrying this out. That could include e.g. providing that up to six UMTS measurements would be reported with the remainder being used by GSM measurements, or providing some form of partitioning of the available space (e.g. 3 for UMTS and 3 for GSM) or some other approach again.

80. Third, it is also true that the sentence at the end of paragraph [0016] in which the second alternative is contained does not mention a standard GSM report but the skilled person would not think that that meant a completely different approach was being proposed. The reader would not think that using the standard GSM report was mandatory, but nor would they think the second alternative excluded any such thing.

81. Fourth, in cross-examination Mr Simmons, when he was pressed on this by counsel, recognised that while he could believe it was the intention of the writers of the patent that the rest of the method for the second alternative was indeed to be as shown in figure 2, he maintained it was not what the text says. However the correct approach to construction is to understand what the skilled person would understand the intention of the writer to have been in using the language they have.

82. It follows from this conclusion that it is fair to say that what the patent discloses is the idea that when the phone does the comparison it may be done using real GSM measurements (first embodiment) or a GSM threshold (second embodiment). Although not stated in the patent expressly for the second embodiment, the reader would understand that both embodiments could result in a measurement report containing both UMTS and GSM cells. If (say) only three converted UMTS measurements passed the threshold test and were to be reported in a standard GSM message report with room for six cells, the phone could report the three best GSM cells in the available spaces.

83. Mr Speck, as he did in the previous case, described this as the invention enabling the phone to "flexibly and intelligently" allocate the limited signalling capacity available on the SACCH such that it was likely that the most useful cells are reported. This is

correct to the extent that starting with a standard GSM measurement report which can include six cells, this does not enable more cells to be reported but it does allow the phone to select from the pool of both GSM and UMTS cells, choose the six "best", and flexibly allocate space to those six. It is flexible in the sense that next time a report is sent, a different mix of UMTS and GSM cells may be sent. Whether it is right to call it intelligent does not matter.

Claim construction

84. The principles are well established and undisputed.

85. Claim 1 refers to a first and a second communication system. These terms are wide, as Apple pointed out. The claim also refers to measurement values in general. Again this term is wide and not limited to RSCP, RXLEV, Ec/Io or any other particular kind of measurement.

86. Even though the claim is not limited this way, it is convenient to approach the claim thinking of the case of handover from GSM to UMTS, in other words when the first communication system is UMTS and the second is GSM. The claim covers a method for conveying UMTS measurements to a GSM system. It covers a method which works the other way round too but nothing turns on that.

87. The method has three steps. The first is converting the UMTS measurements to measurement values for GSM (feature [b]). The measurements are of the downlink, in other words the signals sent by the base station down towards the phone. The second step is comparing the converted values with a threshold measurement value (feature [c]). In the UMTS/GSM example under consideration the threshold measurement value referred to in feature [c] is a GSM value because the claim requires the UMTS measurement to be converted. The third step (feature [d]) involves sending the converted values to the GSM network on a control channel. In GSM the FACCH or the SACCH qualify as a control channel within the claim. By claim 8 the method is limited to using the SACCH as the control channel. Claim 1 refers to sending to a control node, which is probably best seen as the BSC but need not be. The sending of values in feature [d] is subject to a condition that the measurement value exceeds the threshold.

88. The particular issues on construction are:

    i) Conversion

    ii) Comparability

    iii) Threshold

Conversion

89. It is clear from the specification that the conversion described has two aspects, comparability and formatting. At this stage I will put to one side any argument about what comparability means. Apple submitted that what was claimed was only conversion for comparability and not anything to do with formatting. Optis submitted that both had to be done to satisfy the claim.

90. For this debate I will treat the claim as being limited to inter RAT handover from GSM to UMTS because it makes it much easier and clearer to refer to things like a "UMTS measurement" and a "GSM format", rather than measurement or format of a first or second communication system.

91. Part of this argument involves examining the relationship between the claim and the two alternatives. As Apple points out, the method of claim 1 corresponds to the second alternative described in the specification in that it requires a comparison with a threshold. Apple also argued that the claim does not require comparisons between GSM measurements and UMTS measurements. That is true, which is why it is right to identify the claim as relating to the second alternative rather than the first. However this general point is capable of being taken too far because, contrary to Apple's case addressed above in relation to the specification of the patent, the two alternatives are not as different from one another as Apple contends.

92. Another point was that since (as Apple contend) the second alternative does not require sending the UMTS measurement in a standard GSM message, there is no need for the UMTS measurement to be converted into a GSM format in that second alternative, and since that is the alternative which is claimed, no reason to read that into claim 1. The fact I have rejected Apple's case on the second alternative hinders although it does not completely undermine, this part of Apple's case on construction of conversion.

93. In my judgment the skilled reader would understand the patent as a whole to refer to conversion as a process with both aspects. Its purpose is to render the UMTS measurement in a form both (i) comparable with a GSM measurement and (ii) expressed in a GSM measurement format. The former makes it useful for handover decisions and the latter helps send it on the SACCH in a non-stealing mode. The reader of the patent would not think the conversion referred to had taken place if only one of these two things was achieved.

94. The reader would understand the term conversion as it is used in the claim to have the same meaning as in the rest of the specification. This is not to read a gloss from the specification into the claim, it is to interpret the claim in its proper context.

95. Apple pointed out that the claim referred to converting measurement values of the first communication system into measurement values of a second communication system (my emphasis), and submitted that this would be understood to refer only to a process of rendering the measurements comparable and not to formatting. I do not agree with that. For one thing, if one did take an approach based on meticulous verbal analysis, in fact when the specification does refer to the change to make things comparable it refers to converting UMTS information into appropriate GSM signal strength measurement information (my emphasis) at para [0015] ln 50-51 when introducing the exemplary equation. Moreover, elsewhere (e.g. paragraph [0014] ln 39 and [0017] ln12) the specification refers to converting UMTS measurement information into an appropriate GSM measurement format. So there information is converted to a format.

96. A further aspect of this is the following. There is only one conversion step shown in the method depicted in figure 2, at step (104). In the context of the first alternative this would be understood to be conversion for comparability and formatting, since the converted value will be placed in a standard GSM measurement report in place of a GSM measurement value. This conversion takes place before step 106. At the start of

paragraph [0016] when the description turns to step 106 in the first alternative, it refers to the "converted UMTS signal strength values" which must mean a value converted both for comparability and formatting.

97. Turning to the second alternative, there is no reason why the term "converted UMTS measurement values" in the same paragraph now at line 9 should have a different meaning. In my judgment it does not. In other words "value" is just as apt to refer to the measurement itself in dBm or to the mapped integer value.

98. Overall in my judgment there is no reason based on the specification for the reader to attribute any particular significance to the use of the term "value" as a way of drawing a distinction between the measurement information and the format in which it is expressed. The term is apt to refer to both. This is similar to the way RXLEV can mean the measurement or the formatted number. They are both values for RXLEV, as the skilled person understands.

99. The fact that claim 1 does not expressly set out what the purpose of the conversion is is not determinative. It does not have to. The purposes of features in patent claims may be stated in those claims but it may not. The purpose may only be understood from the specification. In this case the skilled reader understands what the purpose of conversion is from the patent as a whole.

100. For the same reasons, the fact claim 1 is not limited to sending the message on the SACCH does not justify a different understanding of conversion from the one arising from the patent overall.

101. To some extent Apple's case involves suggesting that the specification draws a sharp distinction between a format to format change and an information to information change. I do not accept that.

102. At the risk of repetition, I do not accept Mr Simmons' opinion that conversion requires some form of mathematical or arithmetic process. I rather think that with appropriate mathematical notation it will always be possible to represent the conversion of a measured value into a n-bit binary encoded format, but representing the transformation in that way is not what the skilled person would understand the patent was getting at.

Comparability

103. To make UMTS measurements comparable with GSM measurements as required by the patent as part of conversion, what is required is that the UMTS value be expressed as if it was a GSM measured value, even though it is not, and thereby allow ranking of the cells from both GSM and UMTS on a common scale.

104. As the exemplary equation in the specification shows, one way of doing this could be to add an offset to the UMTS value to make it comparable. However that is not the only way. As the skilled person would understand, information from different sources can also be made comparable by a process of encoding and mapping to an appropriate scale. The temperature example relied on by Mr Speck illustrates the point.

Threshold

105. I believe the point is not in issue but in any case I find that the claim does not require the sending of every value which exceeds the threshold. No skilled person would understand the claim that way.

106. At one stage there was some debate about the difference between a case in which a measurement exceeding the threshold triggered a report to be sent at all and a case in which a measurement exceeding the threshold leads to that measurement being included in a report which was going to be sent anyway. I do not believe the point is now disputed but in any case, I find that claim 1 covers both.

Other claims

107. Claims 2, 3 and 8 do not present any issues of construction.

Essentiality

108. Optis contends that the Patent is essential to the GSM standard. Two versions of the standard are relied on:

i) 3GPP TS 45.008 release 5, version 5.22.0 dated April 2006; and

ii) 3GPP TS 45.008 release 8, version 8.12.0 dated September 2011.

109. For the April 2006 version of TS 45.008 the provisions for enhanced measurement reporting about UMTS cells are relied on. For the later version of TS 45.008 enhanced measurement reporting is also relied on, but in this updated version of the standard it now relates to UMTS and LTE. In addition, as a third aspect of its case, in the later standard Optis also relies on the normal measurement reporting of GSM and UMTS cells. It is convenient to take the issues in that order.

110. As I have mentioned already, Optis dropped its case relating to essentiality when the reported measurement from the new RAT is signal quality. In other words the case based on reporting in GSM either the UMTS Ec/Io measurements or the LTE RSRQ measurements was dropped. That is because Optis now accepts there is no conversion in those cases.

Standard TS 45.008, release 5 version 5.22.0 April 2006 – enhanced measurement reporting

111. The standard addresses the process of handover, including handover between GSM and other RATs. Section 3 of the April 2006 version contains an overview of the handover process. This explains (3.1) that measurements will be made by phones and reported to the BSS for assessment. The BSS will also measure the uplink performance for the phone being served and assess signal level interference on its idle traffic channels. Handover strategy (3.4) will be based on reported measurement results and various parameters set for each cell. An example of a basic algorithm is given in the standard. It is an example because the actual algorithms are not standardised. Section 8 of the standard deals with radio link measurements to be used in the handover process. Section 8.1 deals with signal level. Sections 8.1.2 – 8.1.4 deal with GSM and section 8.1.5 deals with other RATs. The relevant other RAT is UTRAN FDD.

112. In GSM the RMS received signal level is measured. In GSM the signal level is RXLEV. Section 8.2 deals with signal quality. In GSM received signal quality is RXQUAL.

Section 8.4 deals with measurement reporting. There are two types of measurement reports - "normal" and "enhanced". Section 9 Table 2 sets out the control parameters used in handover.

113. The standard requires that the phone measures both signal level and signal quality on the serving cell and signal level on neighbouring GSM cells.

114. In the context of a potential handover from GSM to UMTS, the serving cell will be a GSM cell and so the phone will be measuring RXLEV and RXQUAL on the GSM serving cell. The neighbouring cells may be GSM or UMTS cells. In the case of neighbouring GSM cells, the phone will be measuring RXLEV and, in the case of neighbouring UMTS FDD cells, the phone will measure RSCP and Ec/No.

115. The encoding of measured RXLEV values into the 6 bit format is set out in paragraph 8.1.4.

116. The two kinds of measurement reports, normal and enhanced are sent on the SACCH. The structure of normal and enhanced reports is quite different. As mentioned above, in addition to reporting measurements from the serving cell, the "normal" report provides the RXLEV values for the six neighbouring GSM cells with the highest RXLEV. The enhanced measurement report is organised very differently. There is a neighbour cell list which places the neighbouring cells in order. My 2016 judgment went into this in some detail but I do not believe the detail matters for present purposes. The important things are, first, that the enhanced report is based on a list of neighbouring cells which both the phone and the BSS know. That means there is no need to send cell identifiers because the placing of data in the report acts as a key to indicate which cell the reported value relates to. The other important thing is that in the enhanced report measurement values are reported in a 6 bit format. That applies whether the values are RXLEV from a GSM cell or whatever measurements are being reported from a UMTS cell.

117. For the relevant kind of UMTS (UTRAN FDD) the standard requires the measurement of RSCP and Ec/No for the neighbour cells. Although two values are measured only one is reported. Which one is to be reported is set by a parameter called FDD_REP_QUANT. The standard states (8.1.5) that the measured value which is to be reported "shall replace RXLEV in the measurement reports". So in the 6 bit fields for RXLEV described above, if a cell being reported is a UMTS cell the 6 bits will be used to report a value of RSCP or Ec/No as the case may be.

118. There is no need now to focus on Ec/No. The case turns on RSCP.

119. In relation to RSCP there are a number of points to note. The encoding is similar to but not the same as the encoding of RXLEV. The increments are the same (1dBm). For RXLEV (without SCALE) the integer zero represents less than -110 dBm whereas for RSCP it represents less than -115 dBm. So in a sense one scale is offset by 5dBm relative to the other. For RXLEV the integer 63 represents greater than -48 dBm whereas for RSCP measurements > -53 dBm is mapped to 63.

120. Enhanced measurement reporting in accordance with the April 2006 standard is dealt with in section 8.4.8. With enhanced measurement reporting, the phone is not limited to sending back measurement information for six neighbouring cells, but may send back

information for a greater number of cells. In order to populate the enhanced measurement report, the various cells have to be ranked in order of reporting priority. That is done as follows:

i) Priority level 1: the relevant GSM cells with the highest reported value (RXLEV) are reported. The phone is told how many such cells may be reported, the maximum number is 3.

ii) Priority level 2: the cells to be reported work in the same way as priority level 1 but for cells in other GSM frequency bands.

iii) Priority level 3: the number of best valid cells whose reported values equal or exceed a pre-defined threshold in each supported other RAT, again up to a maximum of 3 per additional RAT. Where the other RAT is UTRAN FDD, then the non-reported value has to be equal or greater than a distinct pre-defined threshold. This second threshold can be disabled by being set to zero. For each RAT the cells with the highest reported values are reported.

iv) Priority level 4: the remaining valid GSM cells and valid cells of other RATs are reported as long as the cells pass the relevant threshold for that RAT. Within this level, the reporting priority for UTRAN FDD cells is based upon RSCP even if Ec/No is reported and the non-reported value has to be equal or greater than the pre-defined threshold.

121. For each of the four priority levels used in enhanced reporting, two additional rules apply:

i) if there are spaces unfilled within each priority level, those spaces are to be left over for the lower-prioritised cells; and

ii) if there is not enough space in the report for all valid cells, then the cells that shall be reported are those with the highest sum of the reported value and the parameter XXX_REPORTING_OFFSET.

122. Thus within priority levels 1 to 3, the phone selects cells within each RAT or band entirely independently of the measurement values obtained from other RATs or bands. The selection is done from a specific pool of cells (either GSM serving band; GSM non-serving band(s) or UMTS). Thresholds are applied to the reported values. Only values above the appropriate threshold are reported. Within the levels the ranking is in order of reported value.

123. At priority level 4 the pool of potential candidate cells is mixed as between GSM and UMTS (and other GSM bands and other RATs). In order to choose which cells to report at priority level 4 the encoded measured values are compared with each other. So the 6 bit integer encoded RXLEV value for a GSM cell is compared to the 6 bit integer encoded RSCP value for a UMTS cell. The higher integer gets a higher priority. The comparison can be affected by offsets, which can be set separately for each kind of cell. At that priority level only candidates that meet the RAT-specific entry requirements can enter the pool – i.e. for UMTS the second threshold can be applied. Even if Ec/No is the value which is going to be reported, in order to assess priority it is the encoded RSCP value which is used in the comparison with other candidates.

Does this fall within the claims?

124. There was no dispute about how the standard works as explained above. The disputes are about whether this arrangement falls within the claims. Optis contends that the operation of priority levels 1 to 3 in enhanced measurement reporting amounts to the use of a method as claimed in claim 1. The issue can be considered in relation to claim 1 only. If claim 1 is infringed, so too are the other relevant claims 2, 3, and 8.

125. It is clear that feature [a] of claim 1 is satisfied. The method is a method for conveying measurement information from a terminal in a first communication system to a second communication system. Feature [b] is conversion. It is addressed below. Feature [c] is satisfied, subject to conversion. The method compares a plurality of encoded downlink measurement values with at least one threshold measurement value. For feature [d], as I have construed the claim, this is satisfied subject to conversion.

126. The outstanding issue is whether the method specified in the standard amounts to converting a plurality of downlink measurement values associated with UMTS to a plurality of down link measurement values for GSM and reporting those converted values. As I have construed the term, conversion has two aspects: formatting and direct comparability.

127. The starting point can be addressed using a useful table produced by Mr Simmons. The table shows how three things relate to each other. The three things are: how GSM RXLEV measurements are encoded into a 6 bit format in GSM; how UMTS RSCP measurements are encoded into a 7 bit format in the UMTS standard; and how they are encoded into a 6 bit format in the GSM standard. The table is:

A **B** **C** **D**

	RXLEV (dBm)			RSCP (dBm)			UMTS RSCP Mappings		
0	< -110			< -115			< -115		
1	-110	to	-109	-115	to	-114	-115	to	-114
2	-109	to	-108	-114	to	-113	-114	to	-113
3	-108	to	-107	-113	to	-112	-113	to	-112
4	-107	to	-106	-112	to	-111	-112	to	-111
...		...			...			...	
44	-67	to	-66	-72	to	-71	-72	to	-71
45	-66	to	-65	-71	to	-70	-71	to	-70
46	-65	to	-64	-70	to	-69	-70	to	-69
47	-64	to	-63	-69	to	-68	-69	to	-68
48	-63	to	-62	-68	to	-67	-68	to	-67
49	-62	to	-61	-67	to	-66	-67	to	-66
...		...			...			...	
59	-52	to	-51	-57	to	-56	-57	to	-56
60	-51	to	-50	-56	to	-55	-56	to	-55
61	-50	to	-49	-55	to	-54	-55	to	-54
62	-49	to	-48	-54	to	-53	-54	to	-53
63	> -48			> -53			-53	to	-52
64							-52	to	-51
65							-51	to	-50
66							...		
...							-24	to	-23
89							-25	to	-24
90							-26	to	-25
91							> -25		

128. The first column A is the integer value in decimal of the binary encoding. A 6 bit number in decimal can be from zero to 63. That is how RXLEV and RSCP are encoded in the GSM standard as shown in the next two sections of the table, B and C. A 7 bit number could code for zero up to 127. In the UMTS standard RSCP uses a 7 bit format and codes up to the integer value 91. This is shown in section D.

129. Moving from the UMTS to GSM way of encoding RSCP, involves losing the 7th bit. In order to do that in GSM all measurements above -53 dBm are encoded as 63, whereas in UMTS integer 63 means -53 to -52 dBm and integers above 63 encode measurements up to more than -25 dBm.

130. I find that the formatting requirement is satisfied by the encoding of the RSCP measured values into the specified 6 bit format. By being encoded as 6 bits the value can be put into the GSM report in the same field as would be used by the GSM reported value RXLEV. As the table shows, there is also a difference between the meaning of the encoding of RSCP measurements in the GSM standard as compared to the way they are encoded in the UMTS standard. Integer 63 has a different meaning in the two schemes and no distinction is made in GSM between measurements above -53 dBm. Accordingly the encoding scheme for the magnitude of the RSCP measurement in the GSM standard is different from the way that magnitude is encoded in its native standard (the UMTS standard).

131. Turning to comparability, the defendants submitted, supported by Mr Simmons, that this was not satisfied while Optis submitted, supported by Dr Thomas, that it was.

132. Optis contended that what takes place at priority level 4 proves that the reported values are directly comparable.

133. Optis did not contend that carrying out priority level 4 fell within the claim as a series of method steps, its case was that the comparison between encoded integers representing values from different RATs at priority level 4 demonstrates that the RSCP measured value has been rendered directly comparable with the encoded RXLEV value by converting the UMTS measured value into a measurement value for the GSM system. The priority assessment at level 4 works by ranking UMTS and GSM cells on the same numerical scale (the scale from 0 to 63 shown above) and choosing the highest ranked values to report, with a further ability to introduce prioritisation via offsets. So, it is submitted, priority level 4 proves that the encoding of RSCP in the GSM standard, in the form in which it is reported to the GSM network, satisfies all the requirements for the conversion required by claim 1.

134. For example consider priority level 4 and assume first that the offsets are set at zero. Assume also that there are two candidate cells each of which has its reported value above the relevant threshold: a GSM cell with RXLEV of -64.5 dBm and a UMTS cell with RSCP of -70.5 dBm. The encoding in the standard renders these measured values into integer 46 for the GSM cell and 45 for the UMTS cell. At priority level 4 these numbers are directly compared and the GSM cell is given a higher priority. If there is only one more space in the enhanced report then the GSM cell will be reported with its value and not the UMTS cell.

135. Optis contends that priority level 4 is a scheme for reporting the best cells chosen by directly comparing converted measurement values. Thus the claimed conversion has been undertaken, and the overall method infringes the claim because it creates, uses and reports converted UMTS values.

136. Apple contends that this is all wrong because it ignores the offsets. Apple agrees that in order to meaningfully compare the two values it is necessary for some conversion to take place, but contends that the necessary conversion is provided by the offsets, which are controlled by the network. Note that it is the values without the offsets which are reported. So Apple argues that while it is true that the values are converted in the phone for the purposes of direct comparison, using the offsets, nevertheless there is no reporting of the converted values because the values reported are the ones without the offsets which had been applied. Apple also submits that the fact that, when both offsets are zero (or equal to one another) a valid comparison can be made, is true as far as it goes, but is not meaningful. Rather it is like a stopped clock which still happens to be right twice a day.

137. Optis argued that this is wrong. The offsets used at priority level 4 are there to allow the network to bias the results. However they are not what makes the values directly comparable. The fact the values can be compared in this stage at all, using offsets which are constants to adjust or bias the comparison, shows that the encoding schemes for the reported values of RXLEV and RSCP as mandated by the GSM standard are directly comparable and therefore shows that RSCP has been converted appropriately.

138. In my judgment Optis's approach to this is the right one. I was not persuaded by Mr Simmons' approach to this. The fact that the patent does give, as an example, an equation in which a constant offset is added to the RSCP to make it comparable to

RXLEV does not mean that the existence of a method which allows constant offsets to be used for prioritisation between RATs (or frequency bands) proves that the values before those offsets were added were not comparable. They may or may not have been. Moreover using a constant offset is clearly not the only way of converting measurements in such a way as to make them comparable. Another way expressly disclosed is to use an offset which varies as a function of RSCP and another way, which does not involve offsets at all (or not really) is mapping measurements to appropriate integers. That is how it is done in this case. Further, the contention that the fact offsets are added in level 4 proves that before the offsets were added the numbers were not comparable simply does not follow as a matter of logic. Moreover, as Optis pointed out, part of the same offsetting process involves applying offsets to RXLEV measurements from different frequency bands of GSM. Those RXLEV measurements plainly were directly comparable, prior to the application of the offsets.

139. A number of the arguments, from both sides, appeared to be focussed on what the intentions of the operators or the people who set the standards were. They may not be irrelevant as evidence but it bears pointing out that the question is a question of objective fact about the nature of the converted values themselves.

140. Another point is that the issue is about the effect of the scheme itself. I think that is the point of Apple's analogy with the clock. I agree that the schemes by which the values are encoded need to make the values comparable or not, as a whole. Comparability does not exist if it is only present when offsets are set to certain values. But to be fair, Optis's line of argument about starting by assuming the offset is zero is not meant to be that the values are only comparable with offsets set at zero.

141. I find as a fact that the encoding of the RSCP measurements from the UMTS RAT into the 6 bit integer values provided for in the GSM standard produces a set of values which are directly comparable to a set of RXLEV values in GSM. That is why they are comparable whatever values are selected for the offsets. The offsets allow the operator to adjust what the result would be in a given case but they are not what makes the encoding schemes themselves comparable in the first place.

142. Accordingly operating in accordance with the older standard would infringe claim 1. Claim 1 is essential. The same conclusion follows for claims 2, 3 and 8.

143. An aspect of Optis's argument which I do not accept was the reliance on the fact that zero is the default offset. This was emphasised by Optis but does not help. That is because the standard requires each of the various offset parameters to be sent in every relevant message. In other words the default value never matters.

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144. It is not necessary to address the way in which UMTS RSCP measurements in the later standard are encoded because it is the same as the earlier standard.

145. The first additional aspect of the case arising from this later standard involves the inter-RAT transfer to LTE. The LTE measurement relied on by Optis is RSRP. In the LTE standard RSRP is encoded in a 7 bit format with an element of companding. Companding means that the size of the step going from one mapped value to the next is not always the same. For RSRP the lower ranges and upper ranges have a 2dBm

step, however the middle range of values have a 1dBm step. The range starts at -140 dBm and zero codes for < -140 dBm. This technique allows the encoding to produce finer detail in the mid range. The difference between the encoding of RSRP in LTE and in GSM is similar to the difference between the encoding of RSCP in UMTS and in GSM. In GSM the RSRP measurement is encoded in 6 bits rather than 7 bits as in the LTE standard. The highest integer value (63) in the GSM encoding represents the whole upper range which would have been encoded by the 7th bit in LTE. Thus, for the same reasons as applied to RSCP in the older standard, this encoding puts the RSRP measurement in a GSM format and the encoding scheme for the magnitude of the RSRP measurement in the GSM standard is different from the way that magnitude is encoded in its native standard (the LTE standard).

146. The first three priority levels in enhanced measurement work in the same way as in the previous standard save that they now include LTE as well as UMTS at level 3. Reporting thresholds are used in the same way. This process falls within claim 1, 2, 3, and 8, subject only to the question of comparability.

147. Turning to comparability, the first point is that the companding makes no difference to the analysis. The comparison is still worth carrying out by comparing encoded integer values.

148. Just as in the previous standard the highest priority level 4 involves comparisons between the measurement values for different RATs (now GSM, UMTS and LTE) and different GSM bands too. However the method of comparison is distinct from the one in the previous standard. The question is whether the distinction makes a material difference to the conclusion about comparability.

149. The value which goes into the comparison for a given cell is the incremental difference between the encoded measurement and the threshold, with the relevant offset added. So whereas what was compared in the previous standard was the actual encoded measurement (plus offset) what is now compared is the incremental difference between the measurement and the relevant threshold (plus offset). Dr Thomas explained that this change did not affect his views that the comparison showed the encoded measurements were comparable. I accept that. The distinction between this and the previous standard does not make a material difference. Accordingly enhanced measurement reporting of RSRP falls within the relevant claims and the patent is therefore essential to that standard.

150. Turning to normal reporting in the later standard, the issue here is that now thresholds are used to decide whether a measurement is to be reported. Therefore the process falls within the relevant claims, subject always to comparability. There is no comparison step in normal reporting of the kind at priority level 4 of enhanced reporting. Optis's point is that since the values sent in the normal report are the same encoded 6 bit GSM and UMTS values as are sent in enhanced reporting, a conclusion that the comparison at priority level 4 shows they have been rendered comparable applies just as much. I agree. I find that the normal reporting in the later standard also infringes the relevant claims. The values reported are converted within the meaning of the claim.

Obviousness

151. In terms of ***Pozzoli*** the skilled person and the common general knowledge have been addressed already.

152. The next step in ***Pozzoli*** is to identify the inventive concept of the claim in question (claim 1). Identifying the inventive concept involves the same kinds of considerations as identifying the technical contribution made by an invention and as identifying the problem to be solved in a problem/solution analysis. These three things relate to one another although they are not necessarily the same thing.

153. The problem posed in paragraph [0004] of the patent is to find a way of conveying measurement information without using the FACCH, because that operates in stealing mode. Paragraph [0005] explains that a preferred embodiment of the invention solves that problem because with it the information can be conveyed on a channel which can function in non-stealing mode. For example in GSM, UMTS information is capable of being conveyed in a GSM message on the SACCH.

154. Apple rightly point out that claim 1 is not limited to using a control channel which operates in non-stealing mode. I agree. It follows that one should not characterise the inventive concept as being something which requires use of such a channel.

155. In opening Apple characterised Mr Simmons' evidence as to the inventive concept of claim 1 as follows:

> So far as the features that are in claim 1 are concerned, the claim has two elements:
>
> a) Conversion of measurement values from one system, to measurement values for a second system *[…]*
>
> b) Sending values that exceed a threshold to the network in the second system [in their converted form].

156. With the ellipsis I have removed some wording from (a) related to Mr Simmons' view on the meaning of conversion which I have not accepted. With the square brackets in (b) I have added a detail missing from that sub-paragraph. Leaving aside the scope of conversion itself, in my judgment this is a fair summary of the important concepts in claim 1. Claim 1 has other features, for example it is a claim to a method of conveying information, but in terms of the concepts which matter, that deals with them.

157. However in order to understand the inventive concept of the claim and its technical contribution, it is necessary to address conversion. The fact that the method applies to converted values is critical. The conversion means that measurements from the first communications system are made comparable with those in the second system, and it means that measurements from the first communications system can be conveyed in the second system in the same format as measurements in that second system. These two aspects of conversion mean that the converted values have beneficial properties and so the method itself has benefits. There are two benefits. The first arises because the conversion means that the values are directly comparable between the two systems. This makes them useful for making handover decisions. It also allows a comparison to be made, between the two systems, to decide which measurements to report. The second benefit means that the values can be treated alike where format matters, such as

by filling up space in a measurement report. This shows why conversion is a crucial aspect of the inventive concept.

Losh

158. Losh is a Motorola patent application published in November 1998. It relates to subscriber handover between multiple access communication systems, in other words inter-RAT handover. In Losh handover is called handoff. They are the same. The particular circumstance considered in detail in Losh is a phone capable of operating in the AMPS analogue system and the CDMA system called IS-95, and to handover from IS-95 to AMPS. The reason that circumstance was relevant was to handle a case in which the newer IS-95 network was expanding but a user would reach the edge of the IS-95 coverage and then have to connect to AMPS. This is depicted in figure 1. Each RAT in Losh is called an "MA". The idea is to do away with the need for beacons in the current MA which mark its edge.

159. The specification describes two alternative embodiments of dual band (AMPS/CDMA) phone. Fig 2 is a "sellotape" phone (not Losh's words) which one can think of as two distinct technologies stuck together in a phone with minimal sharing – just the aerial, some control and the clock. Fig 3 shows a "alternative embodiment" – a more integrated dual band phone in which more hardware features are shared such as the local oscillator. Figure 4 shows more detail of the CDMA system for performing handover. It is as follows:

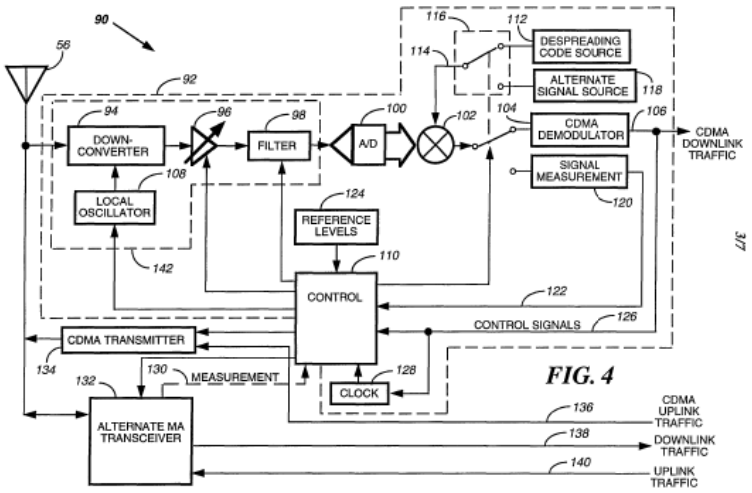

FIG. 4

160. This system is based on the figure 3 alternative embodiment rather than the figure 2 embodiment although I do not think anything turns on that. Figures 5 and 6 relate to alternative detailed ways of measuring signal characteristics. Figures 7 to 10 are flow charts illustrating the method of performing the invention. They are in fact directed to the fig 3 alternative embodiment although again I do not think anything turns on that.

161. The first paragraph of Losh states that the invention there relates in general to wireless communication systems, and two paragraphs later lists a number of multiple access systems such as AMPS, GSM and CDMA. As I have already explained, the detailed part of the document is all concerned with CDMA and AMPS.

162. There is a relatively detailed description of the hardware and circuitry required to have a dual band phone, particularly on how a phone based on CDMA can be set up to make signal characteristic measurements of the analogue AMPS MA. Amongst other things there are references to adjusting the gain control, which the skilled person would understand concerned the measurement circuitry itself. As an aside looking ahead, this gain control is nothing to do with conversion or comparison with thresholds as required by the claims of the patent in suit.

163. After describing how to make the measurements, at p13 ln 7 the description turns to the method and the flow charts. Various ideas are presented, a number of which are optional, depending on what other choice has been made. For example that means that in the main flowchart at figure 7, the reader would understand that some of the boxes shown are optional even though that is not provided for in the figure.

164. The steps mentioned by Losh in this passage include the following: First is initialising the handover process (p13 ln7-15 and fig 8). This would involve sending some kind of measurement order to the phone. The reader would understand that in Losh this may arise because the IS-95 network knows that the phone is nearing the edge of the area of coverage of the current MA. The second is making signal characteristic measurements of the alternate MA (p13 ln16-24). This is about measuring the characteristics of the MA into which the phone may be handed over from IS-95. It may be accomplished using the hardware in figs 2, 3 and 4. The third idea is optionally measuring signal characteristics of the current MA (p13 ln25-p14 ln2). This section includes the sentence "*However some systems may be designed to compare the signal characteristics of the signal from the alternative MA with the signal characteristic of the signal from the current MA.*" I think it is common ground but in any event I find that this sentence would be understood as referring to the idea of making the comparison for the purpose of making a handover decision. It is not a teaching to make a comparison for the purpose of deciding what to report or to trigger a report. Whether that would be obvious is another matter.

165. The next step deals with what to do after appropriate signal measurements are made (p14 ln3-14). There are two options. If the network is to make the handover decision then the appropriate signal measurements are reported to the network. Losh proposes that some measurements may only be reported if they exceed a certain threshold which itself could be negotiated at the initialisation step. The other option is for the phone to make the handover decision, in which case there is no reporting of measurement values to the network, the phone just has to ask the network to be handed over (assuming that is what it has decided it wants).

166. The next step, at p14 ln15-24, is concerned with the case in which the network makes the handover decision. If the handover cannot be attempted then the process returns to the point of making measurements.

167. The next few passages (from p14 ln25 to p15 ln12) are concerned with whether the alternative MA can accept handover and what happens once handover has been carried out (if it has). After that, from p15 ln14 onwards, there is a more detailed description of the other flow charts, on to a summary section at p19 ln 19. This part contains another reference to the wider applicability of what is disclosed and also some detail about the process of making signal characteristic measurements. In addition this section makes another reference (p16 ln1-10) to only reporting measurement values above a

threshold, this time explaining that the reason for doing this is to reduce reporting traffic between the phone and the base station.

168. Finally there is a brief summary section from p19 ln19. It emphasises the idea that beacons are not needed, that the teaching is of wider applicability to handover between other MAs in general, and that various circuits and a specialised signal source have been proposed for making signal measurements in the alternate MA.

169. I turn to identify the differences (***Pozzoli***) between Losh and claim 1. Feature [a] of claim 1 is disclosed. In terms of feature [b], there is no explicit reference to conversion of values in Losh. However it is right to note that in order to carry out the comparison between measurements from the current MA and the alternate MA, some form of conversion to produce comparability would be required. If the comparison was done in the phone (which is taught by Losh), then that conversion would of course also happen in the phone.

170. Turning to features [c] and [d], Losh does describe comparing measurements with thresholds and only reporting those which exceed the threshold. There is no explicit reference in Losh to do any of this threshold comparison or reporting with converted measurement values.

171. There is no reference in Losh to converting alternate MA measurements into the measurement format of the current MA.

Is claim 1 obvious in the light of Losh?

172. The obviousness case is focussed on Losh being read by a skilled person interested in inter-RAT handover from GSM to UMTS at the priority date. Optis argued that so much of the disclosure in Losh concerns circuitry and the specifics of how the phone is constructed that the reader would not think it had any relevance to the problem they are concerned with. Optis argued that it was hindsight to alight on the method steps themselves and think about what they might teach the skilled person, who would not be interested in the rest of Losh. I do not agree. It is true that Losh contains much detail that the relevant skilled person would not be interested in. Nevertheless in my judgment the skilled person reading Losh would see the method steps and at least consider that that disclosure may have some information useful to them. This is not a finding based on some principle that just because the skilled person is deemed to read a document with interest it therefore follows as a matter of principle that any teaching, no matter how deeply buried in and closely integrated into a document whose contents are otherwise of little interest, must be at least considered further by the skilled person. There is no such principle. Whether, having read the document with interest, the skilled person is still interested enough to do anything with anything they have read, just depends on the particular facts and circumstances. In this case the disclosure about circuitry would be seen by the skilled person as not detracting from the disclosure of the method steps. I reject this part of Optis's case. The skilled person would be sufficiently interested in the description of the method to at least consider what it was saying in relation to the task they are thinking about. It is therefore necessary to examine where it might take that skilled person.

173. However where it would take them, without an inventive step, is not to claim 1 of the patent in suit. The skilled person reading Losh would see that one approach to handover

in the GSM to UMTS context could be for the phone, connected to the GSM system, to make measurements of signal characteristics of UMTS. One obvious one would be RSCP. I should say that for this purpose a dual band phone which is physically capable of operating in both GSM and UMTS would be a given for the skilled person, just as the patent takes that for granted.

174. As Losh says, and the skilled person would think as a matter of common general knowledge anyway, one could have the handover decision made by the phone or by the network. A critical problem with Apple's obviousness case here is that the idea of comparing values in Losh is disclosed only as something for the purpose of making handover decisions. To the skilled person it would be obvious to do that in the phone if the phone was making handover decisions, but in that case there would be no reason to send any UMTS measurement values in a report to the GSM network. That line of thinking does not take the skilled person to a system within claim 1. On the other hand if the skilled person was not considering handover decisions in the phone, they would be considering network directed, mobile assisted, handover. Indeed that is the more attractive option for the skilled person. In that case it would be obvious (from common general knowledge anyway but also based on Losh) to send UMTS measurement information to the network. However the reference to comparison in Losh would not be understood to have any relevance to that. There is no reason to make any conversion in the phone – for the purpose of comparability. I am not persuaded that the fact that the RXLEV comparisons both in band and between GSM bands which are made for normal reporting of handover in GSM itself, which are common general knowledge, would make it obvious over Losh to start making comparisons between different RATs in the phone for the purpose of reporting. It is only hindsight to see the reference to comparisons in Losh which would be understood in one context, and seek to turn that into a hint to make inter-RAT measurement comparisons in the phone for a different purpose.

175. In other words the only obvious way forward from Losh in the case in which the network makes handover decisions does not involve conversion for the purposes of comparability. Comparison with a threshold would be an obvious thing to do to reduce reporting traffic but while that is part of claim 1, it still does not involve any conversion.

176. There is no teaching in Losh at all about reporting and formats. For a skilled person thinking about GSM to UMTS handover, the SACCH would not be the obvious channel to use to send UMTS measurement information. It is slow and as specified in GSM, it has a role all the time. Using the SACCH for this as well would take up capacity which would otherwise be used for GSM measurement information. The obvious channel to take forward would be the FACCH. Although it would steal from the traffic channel, it is useful for an event driven process, which the skilled person would have in mind from Losh. In any case the message which would be used would report UMTS measurements on their own, in a UMTS format. There would be no obvious reason to convert UMTS measurements into a GSM format (I deal with this again in relation to Tdoc 1145, the same considerations apply).

177. I reject the obviousness case over Losh.

Tdoc 1145/99

178. T Doc 1145/99 was presented to SMG 2 by Ericsson for the Bordeaux meeting in September 1999. Its title is "GSM to UMTS handover". In other words it is concerned with multi-RAT handover from GSM to UMTS.

179. The introductory paragraph is as follows:

> "This document describes a concept for a packet and circuit switched handover from GSM to UMTS with focus on release 99 of GSM specifications. The basic concepts outlined are downloading of measurement orders, the UE measurements, the UMTS measurement reporting and the Handover execution. The handling of the userplane is seen as a separate issue."

180. On the face of it therefore, from this paragraph, the reader would expect the document to be describing a proposal for a concept, a way of doing handover between GSM and UMTS. The document is going to deal with four aspects, each of which would make sense to the reader as things to be addressed – (i) measurement orders (i.e. directions from the network to the phone to carry out measurements), (ii) the measurements made by the phone (UE means phone), (iii) the reporting of UMTS measurements (bearing in mind this is a phone connected to the GSM network), and (iv) the execution of the handover itself. The reference to the userplane does not matter for present purposes.

181. The document then continues in a number of sections. The bulk of it is section 2 "Description". Then a short section 3 refers to the impact on the GSM standard. Then there are a list of references. Description section 2 is divided into eight parts (2.1 to 2.8) broadly corresponding to the four aspects referred to in the introduction. Sections 2.1 to 2.3 deal with measurement orders in various circumstances; section 2.4 deals with measurements; 2.5 deals with measurement reporting; and 2.6 deals with handover execution. Then at the end section 2.7 is concerned with "other aspects". This includes at 2.7.2 the issue of cell reselection from which a point arises which will be addressed below. Finally 2.8 deals with something called UE capability (which is irrelevant).

182. At various points in the document more than one option is referred to. Two important examples are: the channel on which to send measurement reports, when both the SACCH and the FACCH are mentioned in section 2.5; and the entity in the network which will in effect make the handover decision, when all three of the phone, the GSM base station (BSS), and the UMTS base station (RNC), are mentioned in section 2.6. A critical part of Apple's obviousness case is based on Mr Simmons' view that it would have been obvious for the skilled person to follow up the proposals to use the SACCH and to use the GSM base station (BSS) for handover decision making. For the obviousness case to succeed (at least on claim 8) these have to be the obvious way forward or at least an obvious way forward among other obvious routes (cf ***Brugger v Medicaid***).

183. Optis, supported by Dr Thomas, denies that that is so. Optis's case is that the document proposes a particular idea – which is an event driven approach based on sending UMTS measurements on the FACCH (and not the SACCH), and based on the RNC being the place in which handover decisions are made (and not the UE nor the BSS). Optis also point out that Mr Simmons and Dr Thomas agreed that the skilled person would regard the idea of making the handover decisions in the RNC as not something they were in favour of.

184. Apple, in response, contend that this approach to Tdoc 1145 is wrong. It is a discussion document which presents multiple ideas and it would be obvious for the skilled person to follow up the ideas about handover decisions in the BSS and using of the SACCH.

185. I do not accept Mr Simmons' view of Tdoc 1145. Of course to a certain extent it is a discussion document but the proper way to characterise the document as the skilled person would read it at the relevant time is one which advances a specific proposal. For one thing the introductory paragraph makes that clear. It is also clear in the detail of the document. For example, in section 2.5 when measurement reporting is discussed, it is true that the text includes the words "the SACCH may be used" but that is immediately followed at the next bullet point by the words "However by using the FACCH the UMTS measurement reports may be sent without delay.". The reader would understand this section as a whole as one which acknowledges the existence of the SACCH as a channel which could be used but expressing a clear preference for using the FACCH because it can be used without delay – which is an advantage, not least given that the proposal is for a kind of event driven reporting triggered by the UMTS measurement passing a threshold (section 2.1). Yet further, in section 2.6, the document again acknowledges the concepts of making hand over decisions in the phone or in the BSS in the first two paragraphs of the section, but that is followed by two fuller paragraphs and a diagram focussed on the handover decisions being made in the RNC (and so the UMTS measurement report being sent to the RNC via the network). One of the explicit points being made is that this proposal avoids the implementation cost and problem of future proofing which would be caused if the BSS made the handover decision because if that was done the UMTS handover algorithm would have to be implemented in the BSS.

186. I turn to identify the differences (***Pozzoli***) between Tdoc 1145 and the claim. As ever it is convenient to refer to UMTS and GSM while bearing in mind the claim is wider.

187. In terms of claim 1, Tdoc 1145 discloses feature [a].

188. As for feature [b], there is no disclosure of converting a UMTS measurement value to a GSM measurement value.

189. The closest to this which can be found in the document relates to section 2.7.2 on cell selection and reselection. That relates to the behaviour of a phone in idle mode when there is no traffic data passing between the phone and the network. The passage explains that the cell selection should include both GSM and UMTS neighbouring cells and refers to the use of thresholds and decision tables to decide which cell is best. A simple diagram is given which shows a dual mode terminal and contains an oval which shows the phone making a choice between GSM and UMTS. Mr Simmons view was that this implies a comparison between the two, which in turn necessarily would require some form of conversion to achieve comparability. (No reporting is involved). I will assume, without deciding, that the skilled person would get as far as seeing this passage as a proposal to perform a comparison of some measurements from a GSM cell and a UMTS cell in the phone. In fact there is a serious issue about that. There is a lot to be said for Optis's case that without hindsight the reader would simply see this as a reference to the then known proposed way of performing cell reselection in the draft standards of the time, which does not involve a direct comparison, but I will not get into that now.

190. Therefore at best, the document discloses, in the context of cell selection, an idea which can be understood to propose a comparison and which implicitly therefore would involve conversion for comparability. It is not disclosed in a context involving feature [a] of claim 1 (conveying measurement information).

191. There is no disclosure anywhere of converting a UMTS measurement into a GSM format.

192. Turning to feature [c], at section 2.1 concerning measurement orders, there is a clear disclosure of comparing a UMTS measurement with a threshold. The context is to trigger a report. The section also proposes downloading these thresholds (and offsets) in a measurement order and indicating what sort of UMTS characteristic to measure. That includes what would in fact be RSCP ("signal strength"). However there is no disclosure of making this comparison with the threshold using converted values.

193. There is another reference to thresholds in the cell selection section 2.7.2 but again no reference to doing this with converted values. Note that the implicit conversion here is not about comparison with thresholds, it only arises if GSM and UMTS values are compared.

194. Feature [d] is about reporting measured values to the network if it exceeds the threshold. That is disclosed. The document describes a UMTS measurement report which would be triggered to be sent if a UMTS measurement exceeds a threshold. The proposal in the document would be understood to be that it is sent on the FACCH – but that is no distinction over claim 1. Moreover the report is not a standard GSM measurement report – it is a special UMTS measurement report – but that is no distinction over claim 1 either. The proposal is that the report is being sent to the BSS to be forwarded to the RNC but that is no distinction over claim 1 either.

195. However what is not disclosed is sending a converted value in this measurement report. No detail of the report is provided.

196. In relation to claim 8, the document does contemplate sending on the SACCH as a possibility but expresses a clear preference for the FACCH.

Is claim 1 obvious over Tdoc 1145?

197. In my judgment claim 1 is not obvious over Tdoc 1145 for a number of reasons.

198. First, the document makes a specific proposal, to perform handover decisions in the RNC. That is the natural way forward for a skilled person reading the document. However as part of that disclosure (in section 2.6) there is a clear statement that the ranking of GSM and UMTS cells will be done separately and that therefore there will be "*no direct comparison between a measurement on a UMTS cell and a measurement on a GSM cell*". In other words for a skilled person following up the proposal to use the RNC, there is an express teaching away from anything which might involve comparability between GSM and UMTS measurements. Accordingly irrespective of anything else, it would not be obvious in that case to convert the UMTS measurements to make them directly comparable with GSM measurements.

199. Second, in fact the skilled person would not adopt the proposal of handover decisions in the RNC. The question is what follows after that? In my judgment the answer is simple. The skilled person, having read the document with interest, would reject its central teaching and put it aside. The reader would see that it presents an argued case for what it proposes, which involves acknowledging the alternatives (such as handover in the BSS), but those acknowledgements do not make it obvious for the skilled person to adopt them. This document does not make them worth following up and the skilled person would put this document down. Any further work they did on handover would not be driven by what is in that document and therefore any case of obviousness based on this document as prior art fails.

200. Third, even if the skilled person did decide to follow up other aspects of what is in Tdoc 1145, that does not make claim 1 obvious. The problem the skilled person is concerned with is handover from GSM to UMTS when a phone is in active contact with the GSM network. There is nothing in the parts of the document describing that sort of handover (sections 2.1 - 2.6) which would prompt the skilled person to embark on a path which in fact leads to converting values in any way in the context of handover. To end up with conversion for comparability, the only conceivable prompt for the skilled person in the document is the section on cell selection. However this is not the handover the skilled person is concerned with. They are different things. Critically, no report of measurement values needs to be sent to the network in cell selection. Mr Simmons' opinion on obviousness was based on taking the idea of comparing GSM and UMTS values in cell selection and applying it in the context of handover as described elsewhere in the document. I reject that as an obvious thing for the skilled person to do. Nor am I persuaded that the common general knowledge of how the normal GSM measurement reporting compares RXLEV measurements makes it obvious for a skilled person in this context to start making comparisons between measurements in different RATs. In truth there is no reason, other than hindsight, to do that over Tdoc 1145.

201. Fourth, there is no teaching to convert to the GSM format and no convincing reason why the skilled person would do that. Mr Simmons's view was that putting the UMTS measurement values into a GSM format was a natural implementation which was worth considering so as to minimise the changes to the algorithms in the GSM base station. I reject that. First if the skilled person was adopting the approach of the decision being made in the RNC, then the only obvious thing to do is send the UMTS measurements in the UMTS format. Second, if the skilled person had decided to follow up Tdoc 1145 but with the handover decision in the BSS (which I doubt), then the only obvious way to report the UMTS measurements is to use a special UMTS measurement message. In such a case there would be no obvious reason based on report formatting to use the GSM format. In other words no need for conversion. The idea that the phone would convert the UMTS value into a GSM format simply to save the BSS some effort is fanciful. The obvious place to make that conversion, without hindsight knowledge of the invention, is in the BSS.

202. Standing back, what Tdoc 1145 actually proposes is an event driven, threshold triggered UMTS measurement report sent to the RNC via the BSS. The UMTS measurement values would be unconverted. As I have said, that proposal would not be regarded as worth following up. Even if the skilled person started down the road of taking a different path but still based on aspects of Tdoc 1145, the most the case gets to is an event driven, threshold triggered UMTS measurement report with unconverted values

sent to the BSS. I don't believe that is really obvious over Tdoc 1145 but even if it is, it is not within claim 1. Even if the skilled person decided to use the SACCH and not the FACCH for the message (which I doubt was obvious) they would not see any reason to use GSM formatting for the UMTS measurements. To get within claim 1 requires further steps (conversion both for formatting and comparability), neither of which are obvious.

203. I reject the case over Tdoc 1145.

Internal invalidity

204. The heading "internal invalidity" is a convenient heading to pull together three issues: ***Agrevo*** obviousness, ***Biogen*** insufficiency, and uncertainty insufficiency. These three issues interrelate at least to some extent.

205. I can deal with uncertainty insufficiency shortly. The argument was that the meaning of conversion was so uncertain that the claim was insufficient. I disagree. The expression has the meaning I have arrived at. The skilled person would understand it and be able to apply. I do not agree that the fact that Optis dropped the allegation of essentiality based on Ec/Io tells one anything useful about this. Even if it was true that it shows Optis changing its construction at the last minute, that does not amount to an indication that the claim is uncertain in the relevant sense. Moreover Mr Speck explained why his clients had dropped the point when they did. As for Dr Thomas's inconsistent evidence about it, the term conversion is not a term of art. Its construction is a matter for the court. In my judgment the skilled person would not be faced with any material uncertainty.

206. The allegation of ***Agrevo*** obviousness in this case involved a point of principle, arising from the judgment of Floyd J in ***Samsung v Apple*** [2013] 468 (Pat). There Floyd J (as he then was) held a Samsung patent was invalid on a number of grounds. One of them was ***Agrevo*** obviousness. The decision is notable because hitherto it might have been thought that ***Agrevo*** obviousness was an issue which only really arose in chemical/pharmaceutical patents – when the claimed compounds or sub-classes of them were arbitrary and did not amount to a solution to the problem to be solved. I respectfully agree with Floyd J that there is no reason why ***Agrevo*** obviousness cannot apply to the field in which he did apply it in that case (telecommunications) or in any other technical field. The principle is a general one.

207. However one needs to take care in stating what the principle is. The principle is not that a claim which contains an arbitrary feature is invalid. Merely having an arbitrary feature in a claim is not a ground of invalidity. The point of ***Agrevo*** obviousness is that if a claim is found to contain an arbitrary limitation in it, then that limitation cannot assist the patentee in defending an obviousness case. The claim still does have to be obvious over something in the state of the art –perhaps common general knowledge or some cited prior art.

208. In terms of analogies, a claim to a 9 ½ inch plate is often mentioned as an example of arbitrary uninventive claims. Such a claim would be ***Agrevo*** obvious but the reason why that is so is not just because the 9 ½ inch diameter is arbitrary and irrelevant, it also depends on the often unspoken proposition that plates are obvious. A different issue again, sometimes equated with ***Agrevo***, is the submission that a claim which

makes no technical contribution at all is invalid on that ground. It is not necessary to address that in this case.

209. The passage in ***Apple v Samsung*** which relates to ***Agrevo*** is paragraphs 140-145. The conclusion is stated at paragraph 145 as: "In my judgment Apple are correct that the claim is to a class of configurations which do not have any common technical benefit. It is obvious on the ***Agrevo*** basis as well." Taken out of context that paragraph might be read as if the claim was invalid simply because it claimed a class with no common benefit (and was therefore arbitrary) and for no other reason. I do not believe that is what Floyd J thought nor do I believe those were the facts in that case. The sentence is a brief summary of the conclusion. I do not read it as seeking to lay down a wider principle based on ***Agrevo*** than the one I have explained above.

210. Turning to the specifics, if conversion was an arbitrary feature then I agree with Apple that the claim would be ***Agrevo*** obvious. That would be because, stripped of the conversion feature, claim 1 would cover a process in the context of inter-RAT handover from GSM to UMTS in which the phone measures a UMTS value like RSCP, compares it against a threshold and sends that UMTS measurement to the GSM network on a control channel if measurement exceeds the threshold. Whether the report itself was triggered by exceeding the threshold or whether passing the threshold led to the measurement being included in a report which was to be sent anyway does not matter. The claim covers both. The claim also covers a report on any control channel and does not require the use of any particular report. That process, couched at that level of generality, would be obvious to the skilled person at the priority date.

211. However this ***Agrevo*** obviousness objection fails because conversion is not arbitrary. At the risk of repetition, conversion has the result that the converted values have the two beneficial properties referred to above. I will not go over them again. These beneficial properties are shared by everything within the claim. In a case in which the beneficial properties exist across the full width of the claim, there is no reason based on ***Agrevo*** or anything else why the inventors should have limited their claim to particular instances of the taking advantage of those benefits.

212. The fact that claim 1 is not limited to particular measurement reports or to a non-stealing channel like the SACCH does not mean there is any further ***Agrevo*** obviousness case.

213. Finally I turn to ***Biogen*** insufficiency. As with ***Agrevo***, it bears keeping in mind that the core objection is one of insufficiency, that the claim covers something which is not enabled by what is disclosed. I am not satisfied that this point is well founded either, given my conclusion on conversion. Claim 1 covers a case in which a converted measurement which passes the threshold is reported by the phone on a stealing channel like the FACCH and on an event driven basis. It is not limited to using a non-stealing channel. However if someone did set up a system which worked in that way, and assuming it did convert the UMTS measurements in the phone, compare them with a threshold, and then send the converted measurements on the FACCH, they would be doing something which is only enabled by the disclosure in the patent, owing to their use of converted values.

Conclusion

214. I find claim 1 of EP (UK) 1 230 818 valid and essential to the various standards 3GPP TS 45.008 concerning GSM. The claim for infringement brought by Optis succeeds. Apple's counterclaim for revocation fails.