



PATENTS ACT 1977

APPLICANT Intel Corporation

ISSUE The Patents Act 1977:
Whether patent application GB1011084.9 complies
with sections 1(1)(b), 14(5) and 76(2)

HEARING OFFICER Dr L Cullen

DECISION

Introduction

1. This decision concerns patent application GB1011084.9 entitled “*OFDMA based communication system*”, and whether the invention as claimed in this application involves an inventive step as defined in section 1(1)(b) of the Patents Act 1977 (the “Act”), whether the application as amended comprises added matter under section 76(2) of the Act and whether the claims, as amended, are supported by the description as required under section 14(5) of the Act.
2. The application was filed under the provisions of the Patent Cooperation Treaty (PCT) on 2 December 2008, claiming an earliest priority date of 31 December 2007, and was initially published as WO2009/088585 on 16 July 2009. On entering the national phase in UK, it was subsequently re-published as GB2468095A on 25 August 2010.
3. Throughout the examination process the examiner has consistently reported that the invention as defined in the claims, as filed and subsequently amended, lacked an inventive step and that some of the claims lacked support in the application as filed. Also, in relation to the most recent set of amended claims filed, the examiner considers that these amendments introduce added matter. The applicant has not been able to persuade the examiner that the invention is patentable, and the matter came before me at a hearing conducted by video-link between the premises of the agent, Harrison Goddard Foote LLP, acting for the applicant, Intel Corporation Ltd (hereafter Intel), and the IPO on 11 April 2013.
4. The applicant, Intel, was represented by David Hufton of Harrison Goddard Foote LLP. Also present at the hearing was the examiner, Mr Owen Wheeler.
5. In following paragraphs, I will use the terms 1D and 2D to indicate one-dimensional and two dimensional respectively, for example, when referring to co-ordinates.

Compliance Date

6. The usual period under section 20 of the Act for putting this application in order to meet all the requirements of the Act expired on 28 January 2013. I note that the applicant did not seek an extension of this period, as they are entitled to do, under rule 108(2) of the Patents Rules 2007 ('the Rules'), as amended. This request could have been made anytime up to the end of the period of two months beginning with the date on which the section 20 period expired, i.e., up to 28 March 2013, by filling the necessary Patents Form 52 and paying the appropriate fee. No such request was made by this deadline.
7. Thus, in my decision below, the question to be determined is whether or not the application was in order at the end of the compliance period.

Background

8. Multiple access networks are networks where several devices can access a shared communications channel to communicate with each other. Such systems will require means to arbitrate access to the channel amongst the devices. The right to access the channel may be unmanaged, for example, bus networks of computers using the CSMA-CD (carrier sense multiple access – collision detection) protocol, or managed, for instance, most cellular phone networks.
9. Managed networks will typically include a management device, for example, the base station in a cellular phone network, which will decide which devices have the right to access which shared channel resources, known as *allocation*, and then communicate these allocations to the other managed devices, known as *signalling*.
10. One known technique for modulating data on to a shared channel is OFDMA (orthogonal frequency division multiple access). This technique modulates data on to digital representations of multiple sub-carriers at different frequencies and then combines these sub-carriers using an IFFT (inverse fast Fourier transform) before sending them over the channel. A receiver will use a FFT (fast Fourier transform) to separate the sub-carriers and thence recover the data modulated on to them.
11. This technique allows the channel resource to be sub-divided to the level of particular modulation symbols on particular sub-carriers. Thus the channel resource can be thought of as a grid with sub-carriers on the frequency axis and modulated symbols on the time axis. Thus devices can be allocated particular symbols on particular sub-carriers (effectively, squares on the grid).

The Application

12. The application discloses such a system and the claimed invention concerns the signalling used to advise devices of their allocations within a grid of resources, specifically the format of the signalling used. It is also concerned with the allocation itself, to the extent that this is constrained by the choice of signal format.

13. The invention signals the start locations of each allocation, referred to as a burst, within the grid and then derives the size of the allocation (or burst) from adjacent start locations. This avoids the need to explicitly transmit the size of the allocation (or burst) and reduces signalling overhead.
14. Furthermore, the invention allows the start locations of each burst to be signalled using *one-dimensional (1D) signalling* where each symbol/sub-carrier square is assigned a unique number often referred to as an index; or *two-dimensional (2D) signalling* where each square is identified using a sub-carrier number and a symbol number, thus providing greater flexibility.

The Claims

15. There were three independent claims in the application as filed. Independent claims 1, 12 and 22 to a method, a computer readable medium and an apparatus respectively. These claims, as originally filed, read:

1. *A method comprising:
specifying the location of a burst using the starting location of said burst; and
determining the length of a burst by subtracting the starting location of one burst from the starting location of another burst*

12. *A computer readable medium storing instructions that are executable to:
specify the location of a burst using the starting location of said burst; and
determining the length of a burst by subtracting the starting location of one burst from the starting location of another burst*

22. *An apparatus comprising:
a fast Fourier transfer engine;
an encoder coupled to said engine; and
a memory storing instruction to specify the location of a burst using the starting location of said burst; and
determining the length of a burst by subtracting the starting location of one burst from the starting location of another burst*

16. The inclusion of a Fourier transform engine and an encoder in the apparatus claim are considered to be standard features and not fundamental to the invention.
17. Following amendment by the applicant in response to the objections raised by the examiner, three independent claims remain, claim 1 to a method, claim 9 to a computer readable medium and claim 16 to an apparatus.
18. Independent claim 1, as currently amended, reads (my emphasis added in bold):

1. *A method comprising:
determining in a computer whether a starting location is specified in terms of a one or a two coordinate system;
if the starting location is specified in a two coordinate system,
determining in a computer, the starting location from a sub-channel offset and OFDMA symbol offset;*

if the starting location is specified in a one coordinate system, determining in a computer the starting location from an index of a rectangle of a frame;

specifying the location of a burst in a computer using the starting location of said burst; and

determining the length of a burst in a computer by subtracting the starting location of one burst from the starting location of another burst.

19. Independent claim 9, as currently amended, reads (my emphasis added in bold):

9. A computer readable medium storing instructions that are executable to:

determine whether a starting location is specified in terms of a one or a two coordinate system;

if the starting location is specified in a two coordinate system, determine the starting location from a sub-channel offset and OFDMA symbol offset;

if the starting location is specified in a one coordinate system, determine the starting location from an index of a rectangle of a frame;

specify the location of a burst using a starting location of said burst; and

determine the length of a burst by subtracting the starting location of one burst from the starting location of the next burst.

20. Independent claim 16, as currently amended, reads (my emphasis added in bold):

16. An apparatus comprising

a fast Fourier transfer engine

an encoder coupled to said engine; and

a memory storing instructions to specify the location of a burst,

determine whether a starting location is specified in terms of a one or a two coordinate system;

if the starting location is specified in a two coordinate system, determine the starting location from a sub-channel offset and OFDMA symbol offset;

if the starting location is specified in a one coordinate system, determine the starting location from an index of a rectangle of a frame using a starting location of the burst;

and to determine the length of a burst by subtracting the starting location of one burst from the starting location of another burst.

This apparatus includes a Fourier transform engine and an encoder, but as noted above, these are standard features of such apparatus and not fundamental to the invention.

21. The features of the claims shown in bold above indicate those features added by the applicant to the original claims in an effort to overcome the examiner's objections. I note that these additional features all refer to being able to recognise which type of coordinate system – 1D or 2D – has been used and then the use of that coordinate system to identify the starting location of the burst.

22. The examiner has raised objections under section 1(1)(b) of the Act that the

invention as currently claimed does not involve an inventive step; under section 76(2) of the Act that the application as amended comprises added matter and under section 14(5) of the Act that the claims as amended are not supported by the description as required.

The Law

Inventive Step

23. Section 1 of the Act read as follows:

1(1). A patent may be granted only for an invention in respect of which the following conditions are satisfied, that is to say:

- (a) ...;*
- (b) It involves an inventive step;*
- (c) ...;*
- (d)*

24. Section 2(2) of the Act, which refers to the state of the art, reads:

The state of the art in the case of an invention shall be taken to comprise all matter (whether a product, a process, information about either, or anything else) which has at any time before the priority date of that invention been made available to the public (whether in the United Kingdom or elsewhere) by written or oral description, by use or in any other way.

25. Section 3 of the Act, entitled 'Inventive Step' reads:

An invention shall be taken to involve an inventive step if it is not obvious to a person skilled in the art, having regard to any matter which forms part of the state of the art by virtue only of Section 2(2) above (and disregarding Section 2(3) above).

26. The approach to assessing inventive step is the structured approach found in *Windsurfing International Inc. v Tabur Marine (Great Britain) Ltd*, [1985] RPC 59 ("Windsurfing") as modified by Jacobs LJ in *Pozzoli SPA v BDMO SA* [2007] EWCA Civ 588 ("*Pozzoli*"). The modified approach, which Mr Hufton accepted was the appropriate one to follow, involves the following steps:

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

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

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

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

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

27. In approaching steps 1(a) and 1(b) of the test above, I will bear in mind the comments of Sachs LJ in *General Tire & Rubber Co v Firestone Tyre & Rubber Co Ltd* (see [1972] RPC 457), that the skilled person "is not a highly skilled expert or Nobel prize winner, nor is he some form of lowest common denominator. Instead he is best seen as someone who is good at their job, a fully competent worker"; and that "he should be taken to be a person who has the skill to make routine workshop developments but not to exercise inventive ingenuity or think laterally".

Support

28. It is a requirement of section 14(5) of the Act that the claims be properly supported by the description. Section 14(5)(c) reads:

Section 14(5)

The claim or claims shall -

(a)...

(b)...

(c) be supported by the description; and

(d)...

In considering whether or not the claims are supported by the description, I will follow the approach outlined by Aldous J in *Schering Biotech Corp's Application* [1993] RPC 249 where he found (see page 252, line 49 to page 253, line 4) that "to decide whether the claims are supported by the description, it is necessary to ascertain what is the invention which is specified in the claims and then compare that with the invention which has been described in the specification. Thereafter the court's task is to decide whether the invention in the claims is supported by the description. I do not believe mere mention in the specification of features appearing in the claim is not necessarily sufficient support. The word 'support' means more than that and requires the description to be the base which can fairly entitle the patentee to a monopoly of the width claimed."

Added Matter

29. Section 76(2) of the Act indicates that an amendment to a patent application is not allowed to add anything to the specification that was not in the application as filed. It reads:

No amendment of an application for a patent shall be allowed under section 15A(6), 18(3) or 19(1) if it results in the application disclosing matter extending beyond that disclosed in the application as filed.

30. The approach to assessing if matter has been added to an application is provided in *Bonzel and Schneider (Europe) AG v Intervention Ltd [1991] RPC 553* (hereafter 'Bonzel')

(1) to ascertain through the eyes of the skilled addressee what is disclosed, both explicitly and implicitly in the application;
(2) to do the same in respect of the patent as granted;
(3) to compare the two disclosures and decide whether any subject matter relevant to the invention has been added whether by deletion or addition. The comparison is strict in the sense that subject matter will be added unless such matter is clearly and unambiguously disclosed in the application either explicitly or implicitly.

31. In relation to a patent application which has not yet been granted, as in this case, the first step is to ascertain what was disclosed in the application as filed, both implicitly and explicitly; then consider what is disclosed by the application as amended and then compare the two to decide what, if any, subject matter relevant to the invention has been added, whether by deletion or addition

Analysis

32. In order to decide whether or not the invention as claimed is inventive, I must first consider which set of claims properly describe the invention. The examiner has raised objections under support and added matter to the latest set of amended claims (as noted above). Thus I must first consider whether or not the amendments made by the applicant in response to the objections raised by the examiner are supported and whether or not these amendments add matter. Having done so, I will then be able to decide which set of claims filed by the applicant I need to consider in relation to the inventiveness of the application, i.e., the latest set of amended claims filed by the applicant dated 22 October 2012 or the claims as originally filed when the application entered the national phase.

Added matter & Support

33. Independent claims 1, 9 and 16 are listed above with the amended text highlighted (in bold) in comparison to the corresponding independent claims 1, 12 and 22 as published in the national phase. As noted briefly above, the highlighted features of the amended independent claims all refer to being able to recognise which type of coordinate system – 1D or 2D – has been used and then to use that coordinate system to identify the starting location of the burst.

34. The examiner, as outlined in his official examination report dated 5 April 2013, considers that amended claims 9 and 16 comprise added matter in so far as these claims require a device that is capable of handling start location signalling in both 1D and 2D formats, that it determines which format is being used and that it processes the start location accordingly. Thus, the computer readable medium of amended claim 9 and the apparatus of amended claim 16 have to be able to complete these steps in order to be able to determine the location and length of the burst. The examiner also considers that claim 1 as amended, which relates to a method, does

not require that all the steps of this method occur within the same device, and it is only if such a 'narrow' construction is put on claim 1, that this claim will also comprise added matter.

35. In the agents letter dated 22 October 2012 and, at the hearing, Mr Hufton reiterated that the basis for the amended claims including this 1D or 2D recognition step was the disclosure on page 4, lines 20-33 and page 7, lines 1-12 of the specification as published (WO 2009/088585 A1) which reads:

“The dimension of the DL (i.e., downlink) and UL (i.e., uplink) bursts can be one or two. In one dimensional DL and UL bursts, each burst has a start location and a length. On the other hand, a two dimensional burst has a start location, length, and width. The unit of length and width is the minimum amount of resource that can be allocated.”

and

“The start location can be specified in either a two co-ordinate system or a one co-ordinate system. In the two co-ordinate system, the starting location is specified in terms of the sub-channel offset and OFDMA symbol offset. In the one co-ordinate system, the starting location is specified in terms of the index of the rectangle in the frame, where each rectangle can be one OFDMA sub-channel versus one OFDMA symbol or one slot. The OFDMA symbol offset in case of the two co-ordinate system and rectangle index in the case of one coordinate system can be encoded either on per-frame basis or on per sub-frame basis.”

At the hearing, Mr Hufton also brought my attention to the preceding part of the description on page 6, line 11 to page 7, line 1 as providing further support for these amendments. I consider that the reference to one dimensional and one coordinate system in these two passages are references to the same thing – the means to define the start of a burst using a one dimensional or a two dimensional coordinate system.

36. The specification discusses in some detail how many bits are used by each co-ordinate system (see pages 7, line 13 to page 10, line 17) when providing the information necessary to identify how the resources are allocated i.e., to identify a user or terminal or device where the data is coming from/going to; to identify the start location of the burst and the start of the next allocation. The specification also discusses how to allocate resources in relation to communication in both the upstream and downstream directions. The purpose of all this to make it easier to transmit and to reduce to a minimum the amount of information necessary to properly identify the location and duration of a burst.
37. In all the situations discussed, the specification discloses that this information can be provided in either 1D or 2D coordinate format – see, for example page 4, lines 20-25; page 7, lines 13-15; page 9, lines 7-11; page 11, lines 8-15. As the method of the invention is designed to work in a cable-based or wireless linked network which may include a number of users, terminals or electrical devices, I am also satisfied that as a consequence, the system will recognise the coordinate system used to signal the allocation because, if it cannot, it will not be able to carry out the subtraction step;

i.e., to subtract the start location of the present burst from that of the next adjacent one in order to determine the duration of the burst. Thus, the system has to be able to recognise how the location has been coded in all cases.

38. Thus, while I do not find that there is an explicit disclosure that the invention involves the initial step of determining whether the location is defined in terms of a 1D or 2D coordinate system and then using the appropriate format to define the start location of a burst and then work out its duration, I do consider that this is implicit otherwise one is unable to determine the length of the burst.
39. Mr Hufton, when asked at the hearing what was the basis for 1D or 2D recognition step in the amended claims, pointed out, that while there was no explicit disclosure of this feature in the application, this step was implied and would be understood as such when read by the skilled man who would appreciate that both coordinate systems could be used and that it would be necessary to make sure that the appropriate one was used to identify the start location.
40. My finding in relation to added matter above, allows me also to quickly dispose of the support objection raised by the examiner. I consider that a person skilled in the art reading this application would be satisfied that if it is possible to use both 1D and 2D coordinate systems to identify the location of a burst, then the system must also be able to determine which coordinate system has been used in order to be able to work out its duration. Thus, I consider that support for amended claims 1, 9 and 22 can be reasonably implied from the description.

Inventive Step

41. Given my conclusion in relation to added matter and support, I will now go on to consider whether or not the invention as claimed in amended claims 1, 9 and 12 is inventive.
42. I will consider the inventive step objection in relation to the inventive concept of claim 1 as amended using the four step approach outlined in *Pozzoli*.

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

43. I consider that the person skilled in the art in relation to this application would be a designer of communications protocols, with particular emphasis on resource allocation and signalling issues. Given the complexity of modern communications protocols, the skilled person might reasonably be considered to be a member of a team whose members specialise in particular aspects of communications protocols. The members of this team would be familiar with practice in the field of communication protocol design and the various communication standards which are commonly found in this technical area.

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

44. The skilled team would be familiar with the communication standards relating to OFDMA communication systems. The examiner has identified two documents as examples of such standards which were well known before the priority date of the application. These are identified in the official examination report dated 5 April 2013

and I will use the same shorthand to identify both communication standards – IEEE 802.16e¹ and 3GPP TS 36.213² - in the discussion below. The full text of these standard specifications is available on line^{1,2}.

45. The examiner provides a summary of the relevance of these standards in paragraphs 8-16 of his official examination report, dated 5 April 2013, and concludes that at the priority date of the application, the common general knowledge of the skilled team will include knowledge of a variety of resource allocation schemes. It will also include the fact that allocations can be signalled as either virtual resources or physical resources and that signalling can either use a numerical (1D format) system or one based on symbols and sub-channels (2D format). The skilled team will consider it normal practice to combine allocation and signalling schemes to create efficient communication protocols.
46. I agree with this assessment of the common general knowledge.

(2) Identify the inventive concept of the claim in question or if that cannot readily be done, construe it.
47. It is straight-forward in my view to identify the inventive concept of claim 1 as amended. The claim relates to a system that signals the allocation of resource blocks in a multiplexed or multiple access communication system to different users, terminals or devices; this signalling comprises the location of the starting resource block of the allocation to a given receiver or terminal (hereafter 'burst'); this signalling uses a 1D or 2D format; the system can make a determination of the signalling format as either 1D or 2D; and, having identified the format used to identify the location, the length of a burst is determined by subtracting the starting location of one burst from the starting location of the next adjacent one.
48. The overall purpose of the invention appears to be to reduce signalling overhead by not transmitting data on burst lengths in addition to data on burst start. Instead this can be achieved when required by subtracting the start of one burst from the start location of the following the one.
49. Claim 9 is to a computer readable medium with instructions to perform steps identical to those in claim 1. Claim 16 is to apparatus which also performs the steps. Thus I consider that all these claims relate to the same inventive concept.

¹ **IEEE 802.16e** – 28th February 2006, IEEE; "IEEE Standard for Local and metropolitan area networks; Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems". Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands; and Corrigendum 1. See especially Sections 8.4.3.1; 8.4.3.4; 8.4.4.6.4; 8.4.5.3 & 8.4.5.4; Figures 216-218, Table 275 and Table 287. The full text of IEEE 802.16e is found at <http://standards.ieee.org/getieee802/download/802.16e-2005.pdf>

² **3GPP TS 36.213 v8.1.0** – 20th December 2007, 3GPP – 3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 8). See especially parts 7.1.1 and 7.1.2. The full text of GPP TS 36.213 v8.1.0 is found at <http://www.3gpp.org/ftp/Specs/html-info/36213.htm>.

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

50. The prior art that is cited by the examiner is US2007/0189197A1 (hereafter KWON). This document was published on 16th August 2007, some 4.5 months before the earliest priority date of the application in suit.
51. KWON discloses an OFDMA (orthogonal frequency division multiple access) system that allocates communication resource blocks to multiple receivers and signals the allocations to these receivers. A 1D dimensional coordinate scheme is used and allocations are indicated by specifying the absolute index of the last slot allocated to each user. The start slot of the next user is thence implicitly the immediately succeeding slot. Whilst the burst length is not explicitly calculated it can clearly be determined from the end slot information and would be if required for processing the transmitted data. The allocations are performed in a 1D logical resource space and signalling comprises sending the 1D number of the last block in each user's allocation. Users determine their allocation in the logical space from the last block number signalled for their allocation and that of the previous user's allocation.
52. The system also performs a mapping operation between the logical resources and physical resources (symbols/sub-carriers) in a physical resource space, i.e., the logical allocations (described above) are followed by a mapping on to physical resources.
53. It is noted that in paragraph 19 of KWON, it is stated that the communication scheme described is implemented as part of the IEEE 802.16e standard, that this standard uses the 1D resource allocation scheme and reduces signalling overhead (i.e. amount of data that has to be sent as part of the signal which indicates how to allocate the resources). KWON describes a further improvement in signalling overhead as the system disclosed takes account of the type of resource allocation that is suitable for each terminal (or user or device) connected to the communications system. The signalling overhead can be reduced if the system is able to distinguish between those situations where the amount of resource allocation changes each transmission period – a dynamic resource allocation service - from those where the amount of resource allocation is fixed and does not change each transmission period – a static resource allocation service. This improvement is achieved in the way that the base station in the system orders the allocation of resources – it first determines what type of resource allocation is suitable for the terminal receiving the data, sending the static resource allocation information first, then sending the dynamic resource allocation information which includes the additional control information needed to ensure it is properly identified and received. Control information in relation to the static resources allocation is only sent when there is a change, e.g., one of the terminals involved closes its services and is no longer in use. The system does not need to provide as much data indicating the static resource allocation as it does the dynamic resources allocation, hence reducing the signalling overhead.
54. Turning to the application in suit, there appears to be two areas of difference between the invention as currently claimed and the prior art. Firstly, the use of the 2D signalling format as well as the 1D signalling format within the same system to

identify the location of the burst. This necessitates that the system is able to identify which format has been used to specify the location of the burst. Knowing this, the system is then able to correctly determine the length of the burst by subtracting the start location of the burst from that of the next adjacent burst. Secondly, KWON refers to the use of the end location of each burst to identify its duration whereas the application in suit refers to the use of the start location of each burst as means to identify its duration.

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

55. If we consider first, the use of the start or end location of each burst as the means to identify its duration.
56. Firstly, while KWON does not explicitly refer to the determination of the burst length, it is the case that receivers (or terminals or users) determine their resource block allocation from the end block locations alone and such an approach is clearly implied. A one dimensional coordinate scheme is used and allocations are indicated by specifying the absolute index of the last slot allocated to each user (see for example, paras [0045] & [0046]). The start slot of the next user is thence implicitly the immediately succeeding slot. Whilst the burst length is not explicitly calculated it can clearly be determined from the end slot information and would be, if required for processing the transmitted data.
57. In order to determine the length of a burst, there are only two possibilities, use the end point of the burst and subtract it from that of the previous one to find out the duration or length of the burst, or, alternatively, use the start point of the burst and subtract it from the start point of the adjacent burst. The choice of which to use appears to be arbitrary. There does not appear to be any advantage to using one over the other. Whilst KWON transmits end slot numbers with start slots being implied and the application in suit transmits start slot numbers with end slots being implied, the difference in approach is not, in my view, anything other than obvious. If one works, the other will work.
58. I do note that in KWON the use of end block signalling avoids the need for a specific indication of the end or boundary between static and dynamic resource allocation blocks. However this simply amounts to an aesthetically neater solution (all end blocks instead of start blocks and one boundary block) since the same data must be transmitted either way.
59. Thus, the decision about whether to signal the start or end resource blocks appears to be independent of the numbering format (1D or 2D) used and the choice of whether the numbering format used to identify the block needs to be signalled. I consider that a member of the team skilled in the art would not perceive any difference in these two approaches and thus I do not consider that the signalling of start resource blocks in contrast to end resource blocks provides an inventive step over the prior art.

60. If I now turn to consider the type of numbering used in the application in suit and its identification so the correct format can be used to carry out the subtraction step and determine the length (or duration) of the burst.
61. The team skilled in the art with the requisite common general knowledge and being familiar with the disclosure in KWON would be aware that logical resources can be allocated using a 1D numbering scheme, that these resources can be mapped onto physical resources in a manner where contiguous logical resources are scattered amongst the physical resources. This allocation is signalled using values in the 1D logical numbering scheme, and the recipient (or terminal) devices perform the necessary operation (e.g. an inverse mapping step) to extract this data.
62. The skilled team would also be aware from their common general knowledge that the allocation of physical resources in both scattered and contiguous formats is well known. In applying KWON they would be aware that it was not restricted to the scattered allocation of Figure 1 and would consider that the approach disclosed could be implemented with a mapping to contiguous physical resources.
63. I consider that the team skilled in the art would be aware that there are four possible ways to represent the user endpoint allocation information disclosed in KWON, three of which they would consider as realistic options. Firstly, 1D signalling of logical resources, as disclosed in KWON, is flexible with regards to the logical to physical mapping and the shape of the physical allocation space. A mapping to link logical resource blocks to particular symbols/sub-carriers would be necessary. Secondly, 1D signalling of physical resources would necessitate a contiguous allocation in the physical resource space, but would be flexible as to the shape of that physical resource space. A mapping to link the numbered blocks to particular symbols/sub-carriers would probably be necessary. Thirdly, 2D signalling of physical resources would also necessitate contiguous physical allocations, and would in general be less efficient than 1D signalling if the physical resource space is not rectangular. The receiver (or terminal) would be directly informed of symbols/sub-carriers without mapping.
64. The fourth possibility - a 2D logical space, although possible would probably not be useful in many situations and so I think the skilled team would consider it unlikely to be useful and would discount it.
65. These options and their attributes would be readily apparent to the skilled person from their common general knowledge. Given this knowledge, the skilled person would reasonably be expected to select an appropriate signalling format within an overall protocol, and that selection would be based upon simple analysis rather than being the result of inventive insight. Thus, I do not consider that the choice of a 2D format would of itself provide an inventive step over KWON.
66. Given the common general knowledge represented by IEEE 802.16e and 3GPP TS 36.213, I consider that it would be regarded as normal practice within the art for a communications protocol to use multiple allocation schemes and multiple number formats for signalling allocations. It would be obvious to the skilled team to adopt similar practices in designing other communications protocols.

67. Devices which have the ability to operate in multiple networks and which can routinely switch between substantially different protocols were commonplace by the priority date of the invention. In particular, in Europe, mobile phone devices which can switch between the GSM (Global System for Mobile Communications) 2G and UMTS (Universal Mobile Telecommunications System) 3G network protocols were widely deployed. Thus, I consider it reasonable that the skilled team would readily consider a multi-protocol device and would implement one if networks using multiple protocols were available. Any such system would adopt the signalling norms of whichever protocols were being implemented. Thus a device which switched between 1D and 2D formats would be obvious in light of such common general knowledge.
68. As noted above, the decision to use 1D or 2D signalling within a given communications protocol does not provide an inventive step. Furthermore, the decision-making in relation to how to allocate resources in any one such protocol is, in general, unrelated to that in any other protocol. Thus, it is reasonable to expect that some protocols using 1D signalling and some protocols using 2D signalling will arise. As also noted above, a skilled person will incorporate as many or as few communications protocols into a device as is useful and efficient. This decision will, in general, be unrelated to the specifics of the protocols involved, it will relate more to the types of data to be transmitted and the nature of the network that the device will be used with.
69. Thus a skilled person can reasonably be expected to put together a protocol signalling start locations using a 1D format with one using a 2D format in a device that switches between the two when changing protocols. This result is arrived at through normal practice with respect to multi-protocol devices and does not involve the exercise of any inventive input on the part of the skilled person.
70. Taking account of the above, I consider that none of the differences between the inventive concept outlined in the application in suit as claimed in the method of claim 1, the computer readable medium of claim 9 and the apparatus of claim 16 constitute an inventive step over the prior art as represented by KWON.
71. I also consider that the features disclosed in claims 2, 3, 10 and 17 of the application as currently amended are also disclosed in KWON. These features are all considered to be obvious to the team skilled in this art. The use of resource blocks of n by m sub-carriers/symbols is also considered common general knowledge and thus claims 4 and 11 are considered obvious. The decision about whether to adopt a single co-ordinate system covering both down-link and up-link information or whether to have separate systems to do so is considered to be workshop in nature. Thus claims 5-8 and 12-15 are also considered to be obvious.

Conclusion

72. Taking account of all of the above, I consider that amended claims 1, 9 and 12 that relate to a method, a computer readable medium and an apparatus respectively do not add matter under section 76(2) and are supported by the description under

section 14(5). I also consider that the invention as claimed in independent claims 1, 9 and 12 lacks an inventive step over the prior art as required under section 1(1)(b).

73. Having considered the specification of this application, and the various dependent claims, I have not been able to identify any possible amendment which would appear to overcome the inventive step objection outlined above.
74. As noted above, the period for putting the application in order under section 20 of the Act expired on 28 January 2013. No request was made by the applicant to extend this compliance period as-of-right under rule 108(2) within the relevant time period. Thus, as the application did not meet the requirements of the Act before expiry of the compliance period, the application is refused under section 18(3) of the Act.

Appeal

75. Any appeal must be lodged within 28 days.

Dr LAWRENCE CULLEN

Deputy Director acting for the Comptroller