OFFICE OF COMMUNICATIONS

Spectrum pricing

A statement on proposals for setting Wireless Telegraphy Act licence fees

Publication date: 23 February 2005

Contents

Section		Page
1	Summary	3
2	Background	10
3	Responses to the consultation	14
4	Conclusion and next steps	34
Annex 1	List of respondents to the consultation	35
Annex 2	Responses to the pricing consultation	36
Annex 3	Fixed links algorithm	53

Section 1

Summary

1.1 On 29 September 2004, Ofcom published a consultation document on Spectrum Pricing[1]. In that document, Ofcom set out its proposals for setting fees for licences granted under the Wireless Telegraphy Act 1949 ("wireless telegraphy licences") by exercising its powers under the Wireless Telegraphy Act 1998 (the "1998 Act"). The consultation document also set out Ofcom's proposals for using 'Administered Incentive Pricing' ("AIP") in respect of certain fees, as well as its proposals for amending the methodology for determining AIP. The consultation period closed on December 3 2004. Ofcom received a total of 37 responses, of which 35 are considered in this statement. Two responses focussed solely on broadcasting issues, which are not addressed in this document.

1.2 This statement sets out Ofcom's policy decisions in respect of these proposals. In making its policy decisions, Ofcom has carefully considered every representation about the proposals that it has received from stakeholders. Ofcom's views on the consultation responses are set out in section 3 of this statement, and in further detail at Annex 2. Ofcom's policy decisions can broadly be divided into the following three subjects where Ofcom has:

- considered applying the use of AIP for setting annual fees for certain wireless telegraphy licences;
- updated the level of fees (including for those wireless telegraphy licences where AIP is not appropriate and also for new types of radio use);
- tidied up licence classes as a result of, for instance, restructuring and removal of licence classes to facilitate spectrum trading and liberalisation.

1.3 Ofcom's proposals in respect of the longer term issue of applying AIP in the broadcasting industry (see section 8 of the Spectrum Pricing consultation document) are not addressed in this statement, Ofcom expects to issue a further document in relation to these issues later in 2005. In that document, Ofcom will set out its views on the responses already received on this matter.

[1] 'Spectrum Pricing: A consultation on proposals for setting wireless telegraphy act licence fees', Ofcom, 29 September 2004, http://www.ofcom.org.uk/consultations/past/spec_pricing/spec_pricing/spec_pricing.pdf

1.4 To give legal effect to the above-mentioned policy decisions (together with certain modifications to the proposals made following the consultation), Ofcom must make regulations using its powers (exercisable by statutory instrument) under 1998 Act (as amended by the Communications Act 2003, the "2003 Act"). To achieve this, Ofcom is publishing, in parallel with this statement, a Notice of Ofcom's proposals to make regulations under section 403 of the 2003 Act (in the form of a consultation document on the draft Wireless Telegraphy (Licence Charges) Regulations 2005[2] (the "Licence Charges Regulations") on 23 February 2005. That consultation is open for comments until 24 March 2005.

Responses and Ofcom's policy decisions per licence class

1.5 Ofcom would like to re-emphasise that, in respect of many licence classes, Ofcom did not propose to make significant changes to wireless telegraphy licence fee levels or the applications of AIP. As a result, most responses were supportive and Ofcom has decided to take forward its proposals as stated.

1.6 However, there were some areas where Ofcom did propose more significant changes, or made more far reaching proposals, which received substantive comments from respondents. Those areas are:

- public wireless networks;
- business radio;
- point to point fixed links;
- programme making (PMSE).

1.7 In making its decisions on the appropriate spectrum fees for these licence classes, Ofcom has taken all respondents' comments into account, and given a firm justification for its final policy decisions. Exhibits 1-4 below summarise Ofcom's original proposals, the responses received, and Ofcom's decisions by licence class. These exhibits focus on Ofcom's short term proposals (i.e. those which Ofcom proposes to implement in the Licence Charges Regulations).

[2] Notice of Ofcom's proposals to make regulations: The Wireless Telegraphy (Licence Charges) Regulations 2005, 23 February 2005, http://www.ofcom.org.uk/consult/condocs/spec_pricing/

Exhibit 1: Summary of Ofcom pricing proposals for mobile applications

Licence class	Ofcom's proposal	Responses	Ofcom's decision
Public wireless networks (2G public mobile networks)	No proposed changes to fee level.	Arguments made both for increases and decreases in level of fees. Some responses focussed on imbalance in spectrum valuations. Agreement on need to review within 3 years.	Ofcom implements proposal to keep current fee levels.
Business radio (Private Business Radio, Public Access Mobile Radio, Common Base Stations, National Paging, 5.8GHz wireless access)	No major changes to fee levels. Ofcom proposes to remove the "step-in" arrangements and "choice and diversity" modifiers. These measures will start the process of removing differential fee rates, and support a more liberalised approach to spectrum licensing. A new flexible fee apportionment approach is proposed for national and regional licences to support partitioning of licences through trading.	Agreement with proposed removal of fee modifiers, though some respondents argue for a delay. Support for long-term approach for simplifying business radio sector licences.	Ofcom delays proposals to remove the "step-in" arrangements and "choice and diversity" modifiers until the implementation of a single re-structuring exercise for business radio (planned for later in 2005/06). Partitioning mechanisms added for some classes and some classes re-titled.
Scanning telemetry	No proposed changes to fee level.	Agreement among respondents.	Ofcom implements proposal on not changing fees, other than removal of the transitional step.

Exhibit 2: Summary of Ofcom pricing proposals for fixed applications

Licence class	Ofcom's proposal	Responses	Ofcom's decision
Point-to-point fixed links	Ofcom proposes a revised algorithm, which will increase overall fees by about 25% but will affect each user according to the efficiency of the links.	Support for overall pricing approach, but concern with both the overall level of fee increases and specific factors in the revised algorithm.	Ofcom further revises the algorithm, including the removal of two factors (antenna factor and sharing factor). The resulting overall fee increase drops to 13.5%.
Satellite services	Ofcom proposes an increase in minimum fees for permanent earth stations to ensure that direct costs are covered. Extend differential pricing formula for network licence class to include new Earth Station on Vessels and Aircraft Earth Station use. Introduce new class for earth stations working to Non-Geostationary Satellites and non-fixed satellite service.	Increase in minimum fees for permanent earth stations is considered steep. Agreement with new fees for new licence classes.	Ofcom implements proposal by adding new classes.
Point to point security CCTV services	Licence class name change (formerly 'point to multi-point services 31Ghz – 31.80 GHz) but no changes to fees.	Agreement among respondents.	Ofcom implements proposal to change the class title.
Fixed Wireless Access (FWA)	No proposed changes to fee levels.	Agreement among respondents.	Ofcom implements proposal to retain current fees. New class for Channel Isles and Isle of Man added.

Exhibit 3: Summary of Ofcom pricing proposals for PMSE

Licence class	Ofcom's proposal	Responses	Ofcom's decision
Programme making & special events	Fees to increase by 20% (averaged across fee categories) in 2005 and 2006 to meet the direct costs of external contractors.	General support for need to increase cost-based fee. Disagreement regarding the extent of fee increase required.	Ofcom implements proposals for increase of all fees in 2005, but will reconsider fee increase for 2006. Regulations re-written for ease of understanding.

Exhibit 4: Summary of Ofcom pricing proposals for other applications

Licence class	Ofcom's proposal	Responses	Ofcom's decision
Aeronautical and maritime communications	No proposed changes to fee level. Minor structural changes in maritime licence classes.	Agreement among respondents.	Ofcom implements proposal to keep current fee levels.
Aeronautical and maritime radar	No proposed changes to fee level.	Agreement among respondents.	Ofcom implements proposal to keep current fee levels.
Government & emergency services	Comparative prices being set. New fee for Airwave network to be introduced based on methodology for the public networks.	Airwave provided detailed response suggesting a methodology for setting fees.	Ofcom is in continuing discussion with Airwave. These fees will not be set in these regulations.
Science & technology	No proposed changes to fee levels. Abolish unspecified operational radio use licence class and review all non-operational development licences.	Agreement among respondents.	Ofcom implements proposal to keep current fee levels.

Exhibit 5: Summary of Ofcom pricing proposals for broadcasting

Licence class	Ofcom's proposal	Responses	Ofcom's decision
Broadcasting – radio	The current class will be widened to include Community Radio, at same fee rates as national and local radio.	No objections received.	Ofcom implements proposal to add Community radio.

Roadmap to this statement

1.8 Section 2 of this document provides further background on the Spectrum Pricing consultation document published last September, and summarises the main sections in that consultation document – including the legislative and policy framework, the economic approach to using AIP and the pricing proposals for the different licence classes.

1.9 Section 3 forms the main part of this statement, and reviews all responses received to the spectrum pricing consultation on a class–by–class basis. Together with a review of the responses, Ofcom gives its updated policy decisions regarding how it intends to take the fee proposals forward. This section deals with the pricing proposals for licence classes in the same order as presented in the consultation document, namely:

- Mobile applications (public wireless networks, business radio and other mobile applications)
- Fixed applications (point to point fixed links and other fixed applications)
- PMSE
- Other applications

1.10 Finally, section 4 contains a conclusion and the next steps in this process of setting wireless telegraphy licence fees on which Ofcom has consulted.

1.11 Annexes 1 and 2 to this statement provide further detail on the respondents and their responses Ofcom received to the spectrum pricing consultation of September. Annex 3 provides further detail on Ofcom's revised proposals for the fixed link pricing algorithm.

Section 2

Background

Introduction

2.1 This document forms one of a series setting out Ofcom's new approach to management of the radio spectrum, which is intended to promote innovation and competition in the provision of wireless services across the UK. Ofcom is committed to continue the implementation of a more dynamic and market-oriented approach, through the inter-related projects of spectrum pricing, spectrum trading and liberalisation.

2.2 This statement sets out Ofcom's decisions in respect of its proposals for setting fees for licences granted under the Wireless Telegraphy Act 1949 ("wireless telegraphy licences") by exercising its powers under sections 1 and 2(2) of the Wireless Telegraphy Act 1998 (the "1998 Act"). It follows an earlier consultation on Spectrum Pricing[3] published on 29 September 2004. In that consultation, Ofcom proposed to continue the use of AIP where appropriate in setting annual fees for wireless telegraphy licences as well as Ofcom's proposals for amending the methodology for determining AIP. In particular, Ofcom proposed to update the level of fees for certain licence classes (including those where AIP is not appropriate and for also new types of radio use). In addition, the consultation held a broader discussion on longer term applications of pricing to some licence classes (primarily for broadcasting and business radio).

2.3 Ofcom received a total of 37 responses to the consultation which closed on 3 December 2004[4]. A list of those persons that responded non-confidentially is included in Annex 1. Ofcom has considered every representation received about its proposals and this statement takes account of the views expressed by stakeholders (see questions 1-16 in sections 1-7 of the consultation document). Stakeholders' views in response to Ofcom's longer term pricing proposals for the broadcasting sector (see questions 17-23 in section 8 of the consultation document) are *not* covered in this statement. As a result, 2 of the 37 responses are not covered in this statement as they focussed solely on longer term broadcasting issues. Ofcom will, however, take account of those views in a further and separate consultation dealing with AIP in the broadcasting sector. This consultation is expected to be published later this year.

Legislative and policy framework

2.4 As explained in paragraph 2.2 above, Ofcom has powers under section 1 of the 1998 Act to prescribe by regulations fees payable for wireless telegraphy licences on their issue, or subsequently at such times during the term of the

[3] 'Spectrum Pricing: A consultation on proposals for setting wireless telegraphy act licence fees', Ofcom, 29 September 2004, http://www.ofcom.org.uk/consultations/past/spec_pricing/spec_pricing/spec_pricing.pdf
[4] http://www.ofcom.org.uk/consultations/past/spec_pricing/responses/?a=87101

licences as may be prescribed therein. Those powers also enable Ofcom to prescribe in regulations that licensees shall pay to Ofcom such fees (whether on the issue of the licence or subsequently) as Ofcom may in the particular case determine.

2.5 Current regulations[5] therefore contain provisions both as to specific fees for certain wireless telegraphy licence classes and as to other licence charges that may be decided in the particular case (see, in particular, Schedule 2 to, and regulation 6 of, those regulations, respectively).

2.6 Under section 2(2) of the 1998 Act, Ofcom may, if it thinks fit in the light of its duties under section 154 of the Communications Act 2003 (the "2003 Act"), prescribe fees which would be greater than those that would be necessary for the purposes of recovering costs incurred by Ofcom in connection with its functions under the enactments relating to the management of the radio spectrum. In particular, pursuant to that section 154, Ofcom may have regard to the desirability of promoting:

- the efficient management and use of the part of the electro-magnetic spectrum available for wireless telegraphy;
- the economic and other benefits that may arise from the use of wireless telegraphy;
- the development of innovative services; and
- competition in the provision of electronic communications services.

2.7 In other words, section 2(2) of the 1998 Act (as amended by the 2003 Act) has facilitated the use of market mechanisms in spectrum management for the first time in the UK. In particular, for non-auctioned spectrum, that provision has enabled 'Administrative Incentive Pricing' ("AIP"), whereby prices for annual licence fees are set above administrative cost to reflect the above-mentioned spectrum management objectives. Section 2 of the Spectrum Pricing consultation document sets out Ofcom's proposed economic approach in general to using AIP and other sections of that document set out Ofcom's more detailed proposals in respect of setting AIP charges for certain wireless telegraphy licence classes. This statement sets out Ofcom's conclusions on that economic approach, particularly with regard to its proposals set out in the consultation document.

2.8 The above-mentioned enabling powers are exercisable by statutory instrument under 1998 Act (as amended by the 2003 Act, which Act transferred responsibility for making regulations to Ofcom). To achieve this, Ofcom is publishing, in parallel with this statement, a Notice of Ofcom's proposals to make regulations under section 403 of the 2003 Act (in the form of a consultation document on the draft Wireless Telegraphy (Licence Charges) Regulations

[5] See the Wireless Telegraphy (Licence Charges) Regulations 2002, SI 2002/1700, the Wireless Telegraphy (Licence Charges) (Amendment) Regulations 2003, SI 2003/2983, and the Wireless Telegraphy (Licence Charges) (Amendment) (Channel Islands and Isle of Man) Regulations 2003, SI 2003/2984.

2005[6]) (the "Licence Charges Regulations") on 23 February 2005. That consultation is open for comments until 24 March 2005. The Licence Charges Regulations will revoke the current regulations (mentioned at paragraph 2.5 above). However, as explained further in that Notice, Ofcom is proposing not only to consolidate the current regulations but, in addition, make certain changes necessary to implement the policy decisions set out in this statement.

Economic approach to using AIP

2.9 As mentioned above, Ofcom has the general duty to promote the efficient use of spectrum under the 2003 Act. AIP is an important mechanism for fulfilling this duty. This is because AIP signals to spectrum users the value of the spectrum resource that they are currently using or could potentially make use of. Ensuring that users pay AIP for their spectrum creates the proper incentive for users to only use spectrum that they value as highly as any other potential user. This implies that those users to whom spectrum is worth less than AIP will not have the incentive to use this spectrum. Hence, AIP can promote the efficient use of spectrum by creating incentives that ultimately lead to the allocation of spectrum to those who value it the most.

2.10 In determining appropriate spectrum prices under AIP, fees are set to equal the marginal value of spectrum based on its opportunity cost. The opportunity cost of spectrum is the value to the user that derives the highest benefit from being able to use it (i.e. it is the costs they save from either gaining or losing a quantum of spectrum). Importantly, this may not correspond to the current licensed user of a particular band of spectrum. If this would indeed turn out to be the case, then the incentive can lead to spectrum being reallocated to a different user who attaches relatively greater value to being able to use it.

2.11 Since 1998, the use of AIP has been progressively rolled out to the majority of licences. The first spectrum valuation exercise was conducted by NERA and Smith Systems. Actual fees were set at 50% of the recommended levels. In 2002, an independent review of spectrum management (the Cave Review) urged AIP to be applied at more realistic levels, and more comprehensively across spectrum uses. The Government agreed with these recommendations, and hired a consortium led by Indepen to update NERA and Smith System's original spectrum valuation work. This new study concurred with the Cave Review that AIP be applied to an increasing range of spectrum uses, and provided a new set of illustrative values for setting AIP based prices.

2.12 Ofcom has considered these study recommendations and agrees there is a continuing role for AIP. In line with Indepen's recommendations, Ofcom has applied an amended methodology for determining AIP, setting each AIP fee in relation to both the value of the spectrum in existing uses and its value in other

[6] Notice of Ofcom's proposals to make regulations: The Wireless Telegraphy (Licence Charges) Regulations 2005, 23 February 2005, http://www.ofcom.org.uk/consult/condocs/spec_pricing/

potential uses for each band. Thus, AIP will give incentives for spectrum to move to the most valuable uses. Ofcom believes that AIP should continue despite the advent of spectrum trading, as AIP can continue to promote greater efficiency. Provided AIP fees are set conservatively, trading should not be impaired.

2.13 In some licence classes (e.g. where use of spectrum is heavily shared), AIP is not applied and instead licence fees are set to cover some of Ofcom's direct cost. The pricing consultation highlighted some licensing sectors where further work on refining costing information should be developed for future fees.

Implementation issues

2.14 Two general implementation issues were identified in the Spectrum Pricing consultation in relation to the introduction of spectrum trading. The first concerns payment dates, whereby licensees can adjust their payment dates in line with other licences, and whereby payments may be spread over the year for certain large licences (where the fee is over £100,000). The second concerns mechanisms for facilitating partitioning of tradable licences, and the calculation of fees for licences that have been partitioned in geography, frequency or time.

Pricing proposals

2.15 Ofcom agrees with the basic approach for setting AIP fees as outlined by Indepen – that is, that the opportunity cost of spectrum should follow a least-cost alternative method, iterated over time. In addition, Ofcom agrees in many cases with Indepen's recommendations about which spectrum uses AIP should apply to. Finally, Ofcom agrees with many of the illustrative examples of how values should be calculated using the methodology – though in some cases Ofcom has modified the models in the light of further analysis since the Indepen report.

2.16 In line with Ofcom's overall approach to spectrum pricing – i.e. continuing and widening the application of AIP where appropriate – Ofcom has made detailed proposals for changes in spectrum fees in several licence classes for May 2005. However it is worth re-emphasising that in many classes Ofcom also proposed to retain fees at current levels, or only update fees in line with increasing direct costs. The proposals that drew most reaction in the consultation were:

- Public wireless networks, where Ofcom proposed to maintain the current AIP levels for the next three years;
- Fixed links, where Ofcom proposed to change the algorithm used to calculate spectrum fees;
- Programme making, where Ofcom proposed to increase fees by 20% in 2005 and another 20% in 2006 to cover direct costs;
- PAMR and CBS business radio fees, where Ofcom proposed different options aimed at unifying fees for similar classes.

2.17 Ofcom's longer term and more provisional proposals regarding the implementation of AIP in the broadcasting sector are not considered in this statement, and are likely to be the subject of a further document during the course of 2005.

Section 3

Responses to the consultation

Economic approach to using AIP

3.1 Ofcom received comments that maintaining the current level of charges for certain spectrum could distort competition by, firstly, failing to provide the incentive for spectrum to move to the most valuable uses and, secondly, could advantage one firm over another (i.e. is not competitive neutral). More specifically, this was put to us in the context where a competitor had paid for spectrum via an auction whilst another had not. In the specific response it was put that the current fee level which Ofcom intends to continue is below the AIP value.

3.2 To answer that point, Ofcom would agree that, if a particular spectrum fee were significantly below AIP value, then this could distort competition for the reasons outlined above. However, it is worth noting that setting new but incorrect fees is just as likely to distort competition. In cases where Ofcom has not changed fees, this is because there is no robust evidence that AIP fees should be adjusted up or down. This may be because there is significant uncertainty concerning the key assumptions that drive the AIP fee. For example in the case of the 2G spectrum (see further below), two respondents told us that the spectrum fee is too high, whilst one respondent stated that the fee is too low. Given the uncertainty over the future liberalisation of 2G spectrum for other users and in the absence of robust estimates of a new fee (whether higher or lower), Ofcom has taken the view that it is better to maintain current levels of fees than to set new ones.

Implementation issues

Payment dates

3.3 Eleven respondents commented on the current payment arrangements (question 1, section 3), whereby licensees have the option of payment dates other than the licence anniversary, and whereby annual fees can be paid in monthly instalments. All of respondents support the continuation of these current arrangements, with three respondents specifically pointing out the relevance of being able to align payments of multiple licences and four respondents voicing support for the ability to make payments in monthly instalments. One respondent suggested improving the current general payment process.

3.4 Nine respondents made comments specifically concerning the threshold for permitting spread payments (question 2, section 3). Four respondents argued that this threshold should be lowered, suggestions ranged from £50,000 to no threshold at all. However, five respondents agreed that the current threshold is reasonable, with one respondent explaining that lowering it to include a wider audience would only exacerbate the payment issues already experienced by Ofcom. To deal with this, another respondent suggested implementing financial

penalties for consistent late payments with the option of revoking the spread payment option.

3.5 Taking these comments into account, Ofcom has decided to keep the current payment arrangements in place at present. The payment collection process will be improved further as part of a business re-engineering project that Ofcom is conducting to revisit the licensing process.

3.6 Regarding the threshold for permitting spread payments, Ofcom does not intend lowering this threshold this year as Ofcom does not have the mechanisms in place. However, Ofcom will look further into the option and implications of lowering the threshold and will comment further in a future pricing consultation.

Mechanisms for facilitating spectrum trading

3.7 A total of 14 responses were received regarding Ofcom's proposal to apportion fees for partitioned licences by three mechanisms; namely population, frequency or time (question 3, section 3). The majority of respondents agreed with this proposal, although four respondents called for a more flexible method of partitioning fees, whereas another two respondents highlighted the value of geographic area as a partitioning mechanism.

3.8 Four respondents called for more flexible ways for facilitating partitioning of tradable licences. These respondents believed that special case-by-case apportionment is required, whereby parties completing the trade are able to apportion licence fees taking into account unique applications and environments. In response, Ofcom believes such a system would be difficult to implement because it is necessary to have exact factors for determining statutory licence fees. This does not prevent parties to a trade determining for themselves how payments be apportioned between themselves and to come to a commercial arrangement.

3.9 Finally, two respondents emphasised the value of geographic partitioning. As stated in the consultation document, Ofcom intends to put in place partitioning on a geographic basis later in 2005 or 2006, when IT arrangements are ready.

3.10 One response questioned how population partitioning will account for geographic areas with high levels of transient population. In response, Ofcom has the intention of using published population databases (as is the case for broadcasting licences) to provide a snapshot of population levels in geographic areas.

3.11 As a result of the overall agreement to its proposals, Ofcom is progressing with the implementation of the proposed mechanisms to facilitate licence frequency partitioning. In specific, a mechanism for partitioning licences down to each 1 x 12.5 kHz slot is being added to several business radio licence classes. This facilitates the partitioning proposal set out in the condoc but also anticipates further traded classes being partitioned within the next year.

3.12 In addition, Ofcom is making a raft of tidying up measures and presentational changes, such as removal of redundant licence classes, restructuring of some

licence classes and changing of some class titles. These changes, as well as proposals on mechanisms for partitioning licences, are described in greater detail in the Notice and accompanying consultation document on the Licence Charges Regulations[7].

Pricing proposals for public wireless networks

Responses received

3.13 A total of 16 respondents commented on the proposal to maintain the current level of AIP for public wireless networks (2G cellular operators)[8] (question 4, section 4). Although seven respondents agreed with Ofcom's proposal, two mobile operators argue for a fee decrease, and one respondent made a case for a fee increase. Seven further parties (mostly from other mobile services sectors) argued that there are imbalances in spectrum valuations with other mobile radio services, such as PAMR and CBS. Most respondents agreed with the proposed three year review period.

Maintain level of AIP

3.14 Whilst 7 respondents agree with Ofcom's proposal to maintain the current level of AIP for the next three years, two mobile operators believe a decrease in the fee levels would be more appropriate. These two parties argue that the current level of AIP overstates the value of 2G spectrum and runs the risk of distorting spectrum usage and investment decisions. They argue this risk is especially important in a trading environment. One respondent argued that if the AIP level was maintained, then as a minimum Ofcom should eliminate the asymmetry in charging between 900MHz and 1800MHz spectrum. On the other hand, one respondent argued that these fees should be increased as 2G operators currently have access to spectrum at a subsidised rate, which, they argue, has a distortive effect on the market. Furthermore, the same respondent argued that the uncertainties referred to in the Spectrum Pricing consultation document had not been properly identified or quantified.

3.15 Ofcom agrees that the methodology for setting the AIP levels is not perfect. It has had to exercise a degree of judgement when determining the appropriate level of fees, based on the range of values produced by the AIP model and other relevant considerations, as set out in the 2003 Act (see paragraph 2.6 above). Any administrative methodology will always be second best compared with prices determined by an effective and efficient market. However, such a market does not as yet exist.

3.16 Ofcom continues to believe that current fee levels are appropriate. Any reduction in fees would appear to undervalue this spectrum, even with current restrictions

[7] Notice of Ofcom's proposals to make regulations: The Wireless Telegraphy (Licence Charges) Regulations 2005, 23 February 2005, http://www.ofcom.org.uk/consult/condocs/spec_pricing/

[8] These were previously referred to as 2G public mobile network operators. A new title is included in the Licence Charges Regulations 2005.

on use. Ofcom has no evidence that the current level of fees is, or is likely in future, to give rise to inefficient under-utilisation of this spectrum. At the same time Ofcom is not convinced that it would be appropriate to increase these fees at this time. It would not, for example, be appropriate for Ofcom to increase fees simply on the grounds that other players had paid higher prices in the past for spectrum that was now being used to provide a competing service. Whilst Ofcom aims to ensure that competition is not distorted as a result of regulation, Ofcom can only set fees in excess of the costs of administration in order to promote efficiency in the use of spectrum, not to 'level the playing field' between different market participants.

3.17 Ofcom also continues to believe that the current differential in fees between the 900MHz and 1800MHz bands is appropriate. This differential reflects differences in the value of spectrum in the two bands, arising from differences in the propagation characteristics of spectrum in the two bands. These differences continue to be relevant, despite the near universal coverage now achieved by the mobile networks, since they continue to affect network design at the margin and hence the value of spectrum in the different bands.

Imbalance of spectrum valuations

3.18 Seven respondents (mostly from other mobile services sectors) highlighted what they perceive to be an imbalance between spectrum valuations for public wireless networks and other competing mobile radio services, such as PAMR and CBS. They state that business radio fees are set too high, affecting the ability of these services to compete with the public wireless network sector. According to these respondents, it would be unfair to raise the fees for competing mobile radio services whilst maintaining licence fees for cellular networks.

3.19 Ofcom advises that the existing level of AIP for 2G mobile (based on £/MHz/Km2) is currently calculated from exactly the same basis overall as for other mobile radio services. In fact, the headline rate for 2G cellular spectrum per MHz is exactly the same as the maximum national AIP level for PMR. The difference is the way that some mobile bands (e.g. PAMR) have been discounted or the way that some bands have been differentiated between congested areas and non congested areas (e.g. CBS). On that basis, Ofcom does not consider there to be an imbalance between spectrum valuations.

Review period

3.20 There was strong support within the sector and from suppliers of competing systems for the proposal to review the levels of AIP in three years time. One respondent argued that further revision of the model over a shorter time period than three years may be warranted if sufficient progress is made regarding least cost alternatives to using 2G bands. Furthermore, two respondents would like to see the three year review period also applied in other mobile markets, where they claim uncertainty is no less than for public wireless networks. It is Ofcom's intention to keep all mobile services under the same review pattern.

3.21 Ofcom feels that maintaining the fee for three years is justified by uncertainty of what might happen to the 2G bands in the longer term. This longer term issue has been raised in a separate consultation 'Spectrum Framework Review: Implementation Plan' published January 13th 2005[9].

Ofcom's decision

3.22 In view of these responses, Ofcom has decided to maintain the current AIP level and review it within three years as proposed. Ofcom may decide to undertake a review earlier than this if circumstances warrant it- for example if this is appropriate in connection with decisions on the long term future of the 2G spectrum. Ofcom has carefully considered the points raised by respondents and has concluded that maintaining fees for public wireless network licences at their current levels still represents the best decision at this time in the light of Ofcom's statutory duties and above-mentioned functions.

Pricing proposals for business radio

Responses received

3.23 Ofcom received a total of 15 responses which related to proposals for business radio licence fees (questions 5 and 6, section 4). The majority of respondents supported Ofcom's proposals to abolish two fee modifiers in the business radio sector over the next two years, although some operators in the sector argued for a delay of these proposals as the resulting fee increase will weaken the CBS and PAMR sector. Ofcom's long-term approach for simplifying business radio sector licences was also supported by the majority of respondents, recognising the need to achieve consistency between fees in business radio licence classes.

Removal of fee modifiers

3.24 There was strong support for the phased removal of the fee modifiers "choice and diversity" factor and the "step-in" arrangements applying to Common Base Station and Public Access Mobile Radio licences. Such a removal is considered appropriate in a market which some correspondents now believe to be mature. It was also felt that the removal of these modifiers, when the grounds for them no longer exist, would support the proposed simplification of the PBR and PAMR sectors.

3.25 However, some respondents with a direct interest in providing CBS and PAMR services proposed the removal of these modifiers should be delayed, stating that the business radio sector has been weakened by recent market developments. They argued that the immediate removal of the discount would severely impact on their ability to provide a full service in this sector, and that the industry would benefit from further dialogue with Ofcom. Furthermore, some respondents called for consistency in approach between this sector and public wireless networks,

[9] 'Spectrum Framework Review: Implementation Plan', Ofcom, January 13th 2005, http://www.ofcom.org.uk/consult/condocs/sfrip/sfr-plan.pdf

arguing that the removal of these modifiers will affect the operator's ability to compete with 2G services.

3.26 In response, Ofcom would like to point out that the proposed change would bring the CBS and PAMR rates in line with 2G. However, Ofcom intends to do further work in the business radio sector, including changes to the structure and fees of the CBS and PAMR licences. Meanwhile, Ofcom will delay the proposed phased removal of the modifiers and make no changes to the CBS and PAMR fees in the Licence Charges Regulation. Ofcom wishes to emphasize its intention to proceed with proposals to bring all business radio fees to the same level in the next set of regulations. Further consultation on these proposals is expected to take place over the next year.

Long term approach

3.27 The majority of respondents concurred with Ofcom's view of a long-term phased approach to simplify business radio sector licences. There was general support for the proposed approach for calculating business radio fees, whereby Ofcom's new assignment tool (MASTS) can assist in moving towards a population coverage fee calculation. Some specific concerns were raised, such as the 'population coverage fee' in sites with transient populations, as well as potential impact of these proposals on any specific sectors. Also, Ofcom was advised by the Civil Aviation Authority ("CAA") to be mindful of increased resources that might fall to third parties following moves towards increased liberalisation in this sector.

3.28 Ofcom will have regard to these issues as it further develops proposals for the future of the business radio sector. Ofcom intends to consult on, and develop, these proposals over the next two years.

3.29 A couple of respondents also questioned Ofcom's plans regarding licence-exemption of a number of existing licences in the PBR sector. As mentioned in the Spectrum Pricing consultation document, Ofcom intends to undertake further consultation on new licence exemption proposals shortly.

Ofcom's decision

3.30 After considering these responses carefully, Ofcom has decided not to implement any business radio sector fee changes in the Licence Charges Regulations, other than some structural changes in this class to enable future partitioning of licences (see paragraph 3.11), and some re-ordering in the licence class. Instead, Ofcom proposes a single overhaul of fees in this sector in the next pricing consultation – carried out in tandem with Ofcom's developing liberalisation plans and IT plans in the new MASTS system. This decision means that current proposals for the phased removal of the "choice and diversity fee" modifiers and the fee "step-in arrangements" are delayed until future regulations (likely to be in 2006), when Ofcom expects to further consult on its longer term proposals.

3.31 Ofcom already plans to introduce steps to start to permit change of use in the business radio sector later this year. To achieve this liberalisation programme,

Ofcom will consider licence redefinition and will design more flexible pricing approaches – changes which will impact on individual fee levels (regardless of measure to maintain current spectrum values). Ofcom therefore proposes to delay current pricing proposals until next year so as to improve the clarity of Ofcom's plans for this sector, and give the stakeholders more time to respond to and prepare for the introduction liberalisation. A single re-structuring exercise will provide a more coherent message for stakeholders to understand and engage with, and avoids multiple fee changes over the coming year. Ofcom will keep stakeholders fully informed of any changes and such changes will form part of a consultation exercise.

Pricing proposals for other mobile applications

Scanning telemetry

3.32 In total, five parties responded to Ofcom's proposals to not change scanning telemetry fees (question 7, section 4). All respondents support this proposal. Ofcom has therefore decided that the current pricing arrangements will remain unchanged at this time. In addition, Ofcom has removed the transitional step for national channels. Although previously licensees were charged a £4,970 fee on issue (and £6,440 on the first anniversary of the issue of the licence), this fee has now been raised to £6,440 for both licence issue and the first anniversary. As stated in the 2003 Amendment Regulations, this transitional step was only a temporary measure to help the move to new fees.

3.33 A sixth respondent referred to scanning telemetry as an example area where it may not always be reasonable to extend AIP across markets. The respondent feels that this alleged 'PBR-creep' needs to be justified in every case. Ofcom believes that, in the case of scanning telemetry, mirroring AIP levels to business radio pricing is justified. This is because scanning telemetry systems are fixed services which utilise spectrum in a way similar to business radio.

Pricing proposals for point to point fixed links

Responses received

3.34 Ofcom received a total of 15 responses which related to the proposed algorithm for pricing point to point fixed links (question 8, section 5). The algorithm that was proposed in the Spectrum Pricing consultation document is set out below. Few respondents commented on the general pricing approach – and of those who did, the majority supported the use of an algorithm. Critics of the overall algorithm were mostly concerned with the extent of the resulting overall fee increase, and the timing of implementation of the new algorithm – rather than with the use of a pricing algorithm per se. Respondents also highlighted a range of issues regarding the individual factors in the algorithm, with the proposed antenna factor and sharing factor causing most concern.

Fixed link licence fee =	*spectrum price* × *bandwidth factor* × *band factor* × *path length factor* x *availability factor* x *antenna factor* x *sharing factor*

3.35 The sections below deal with all these issues in turn, giving Ofcom's response in each case. In summary, Ofcom's responses and the resulting amended pricing proposal are presented in 'Ofcom's decision'.

General pricing approach

3.36 Only a handful of respondents commented on the general pricing approach taken by Ofcom in setting spectrum fees in this sector through an algorithm. As the development of this algorithm has been an ongoing exercise in cooperation with the industry for over four years, the majority of respondents voiced their support for using a pricing algorithm to provide incentives for efficient spectrum use (though with reservations of certain factors or outcomes, see below). However, one respondent commented that the algorithm presents a departure from Ofcom's stated aims of achieving simplifications, as it is closely linked to 'a particular way of using spectrum', thereby obstructing liberalisation.

3.37 Ofcom agrees that a simple way of setting fees for spectrum across a range of uses and bands is the ideal approach – especially in a trading and liberalisation environment. However, in the particular case of fixed links, a range of factors needs to be taken into account in order to set a fee which is proportional to the spectrum used (and hence denied to others) by each link. Ofcom considers that it has kept this pricing algorithm as simple as possible, and in line with the general methodology used to price spectrum uses in other bands (i.e. the spectrum price is determined on the basis of an opportunity cost analysis common to other spectrum bands where AIP is applicable).

Expected overall fee increase

3.38 Although one respondent considered the estimated overall increase of fixed link fees of 25% to be reasonable, several other respondents believe this fee increase to be unjustified and excessive. In addition, some respondents suggested that the net increase could be significantly higher, up to 'well in excess of 100%'. One respondent argued that any uplift in licence cost may have a negative impact on existing deployed networks.

3.39 There are a number of points to make in addressing those responses. First, the overall fee increase does not in itself represent a target for Ofcom. The 25% increase is purely a result of Ofcom trying to set the appropriate price for this use of spectrum – the opportunity cost of fixed link spectrum. The actual extent of the increase is, however, relevant to Ofcom's assessment of the impact of the changes (see consultation document on Licence Charges Regulations[10]). Furthermore, Ofcom would like to stress that the 25% represents the estimated *overall* effect on fixed link users. Some individual users are likely to experience higher increases (mostly users deploying large bandwidth links in the lower spectrum bands), whereas others are likely to see their licence fee being reduced

[10] Notice of Ofcom's proposals to make regulations: The Wireless Telegraphy (Licence Charges) Regulations 2005, 23 February 2005, http://www.ofcom.org.uk/consult/condocs/spec_pricing/

(such as users of small bandwidth links in higher spectrum bands). Ofcom considers that 25% is an accurate estimate of the overall impact of the proposed algorithm based on an analysis of the majority of fixed links as they were recorded in Ofcom's database in July 2004.

3.40 Furthermore, Ofcom does not believe an overall increase in spectrum fees of 25% is sufficient to cause a 'negative impact on existing deployed networks'. Through the pricing algorithm, Ofcom's aim is to reflect the actual market value of spectrum. This value should encourage current fixed link users to use spectrum in the most efficient manner when updating their networks.

3.41 Finally, Ofcom would also like to note that due to several proposed amendments in the algorithm (see below), the overall fee increase is now estimated to be only 13.5%, as compared with 25% using the originally proposed pricing algorithm.

Timing of implementation of the algorithm

3.42 A number of respondents have argued that the implementation of the new pricing algorithm should be delayed until after April 2005, giving fixed link users sufficient time to plan and budget for these proposals. In particular, they have requested additional time for Ofcom to have detailed discussions with individual operators (an initial period of up to six months has been suggested) and a notice by Ofcom once discussions are complete (a minimum of twelve months notice period has been suggested). Furthermore, several respondents suggest that the fee increases should be phased-in over at least five years.

3.43 Ofcom does not believe any delay or phasing-in of the implementation of the algorithm is required. First of all, extensive discussions with the industry regarding this algorithm have already been ongoing for the past four years. Stakeholders should be familiar with most of its factors as proposed in the Spectrum Pricing consultation document. Furthermore, as a result of consultation responses to other areas of the algorithm, Ofcom has made certain modifications to its proposals which result in both a smaller overall increase in fees and deal with most concerns voiced regarding specific factors of the algorithm. As a result, Ofcom considers that it would not be appropriate to postpone implementation of these changes.

Spectrum price

3.44 Only a few respondents commented on the proposed spectrum price of £99 per 2x1 MHz. The main concern related to this was that no background data had been provided by Ofcom to support this figure (which is lower than the spectrum price proposed by Indepen at £132 per 2x1 MHz[11]). One respondent pointed out that 'a lower value for the spectrum price would be appropriate based both on relative equipment cost and the weighting of use of higher level modulation to links with capacities of 34 Mbps and above, in bands above about 2 GHz'. This respondent offered an analysis of the Indepen data, which shows that if the

[11] Reference to Indepen or Pricing consultation

weighted differentials for link capacities of 34 Mbps and above are considered, then the spectrum price would reduce to £79 per 2x1 MHz.

3.45 Ofcom notes that no responses were received which provided evidence to contradict the baseline spectrum price proposed by Indepen at £132 for 2x1 MHz. In the proposals set out in the Spectrum Pricing consultation document, Ofcom reduced this baseline to £99 for 2x1 MHz to reflect the average level of congestion across the spectrum bands (given that there is no congestion factor in the proposed algorithm). Ofcom rejects the suggestion that the spectrum price should be based on links with a capacity of 34 Mbps or more and in bands above 2 GHz, since this does not reflect all links in use today. Ofcom therefore considers that the proposed £99 spectrum price remains appropriate in the context of the average level of congestion across all the available bands.

3.46 That said, Ofcom proposes to adjust the spectrum price downwards to £88 per 2x1 to be consistent with other proposed amendments to the pricing algorithm (notably the removal of the antenna factor and the sharing factor (see paragraph 3.75 for further elaboration).

Bandwidth factor

3.47 Some respondents commented on the bandwidth factor. In so doing, they stated that 'the linear relationship between bandwidth occupied and licence fee is supported and the simple factor representing this in the algorithm provides good transparency'. Ofcom notes the support for this factor.

3.48 However, Ofcom has made certain modifications to its proposals on this bandwidth factor following the consultation. Ofcom now proposes the implementation of a minimum of 1 for this factor, thereby implying that all links with a bandwidth of less than 2 x 1 MHz are rounded-up to 2 x 1 MHz for the purpose of setting the licence fee for that link. This minimum bandwidth factor replaces the minimum fee of £150 per link proposed in the Spectrum Pricing consultation document (see paragraph 5.2.7). As a result of this alteration of the algorithm, fee levels are affected mostly in the 1.4 GHz band, where the overall fee levels decrease by almost 50%. Due to its specific characteristics, the 1.4 GHz band is generally occupied by links with narrow bandwidths and thus with fees close to the minimum. Overall spectrum fees in other fixed link bands change only marginally.

Band factor

3.49 Although the proposed band factor values already take into account previous discussions held with stakeholders from the industry, some respondents now suggest that the band factor values should be reduced by 50% if other areas of concern with the proposed algorithm are not directly addressed. Furthermore, these respondents suggest that this factor should be set at zero for closed bands. They argue that charging a spectrum fee based on AIP is inappropriate in such bands, as there is no practical possibility to improve spectrum efficiency given new assignments are not permitted.

3.50 In addition to these responses to the pricing consultation, some stakeholders have made further representations to Ofcom regarding the band factor. These stakeholders argue that the band factor needs to be adapted for higher frequency bands, as these bands face a disproportionate fee increase. For example, if the algorithm was applied as proposed, a 28 MHz link in the 38 GHz band would face a fee increase of 81%.

3.51 In response, Ofcom would like to point out that it included a band factor in the algorithm to provide a mechanism through which changes in the opportunity cost between spectrum bands are reflected in the price. The band factor reflects the balance in supply and demand on a band-by-band basis, and as such the level of congestion. Ofcom believes that most band factors currently suitably reflect the opportunity cost in these bands. Therefore, Ofcom rejects the proposal to reduce the band factors by 50%.

3.52 However, in the light of comments received and in the interests of further simplifying the fixed links algorithm, Ofcom intends to implement a revised set of band factor values, as follows:

Band (GHz)	Band Factor
1.4	1.0
2	1.0
4	1.0
L6, U6	0.74 (was 0.83)
7.5	0.74
11	0.43 (was 0.48)
13, 14, 15	0.43
18	0.30 (was 0.37)
22, 23	0.30 (was 0.35)
25, 26, 28, 31, 32	0.26 (was 0.30)
38	0.26
50, 52, 55	0.17

3.53 Whilst not directly relevant to Ofcom's considerations, it is estimated that using these band factor values the average fee increase will reduce to 13.5% (as compared with 25% using the previously proposed band factor values). In all cases, these revised band factor values are no greater than those previously proposed, and in some cases (those highlighted in red in the table) are somewhat reduced.

3.54 Ofcom rejects the argument that the band factor for closed bands should be set at zero. These bands are shared with, or planned for future use by, other uses and spectrum used for fixed links denies spectrum for these other uses. Therefore, a spectrum fee which reflects opportunity cost is valid, both for providing an incentive to fixed links users to move to alternative bands, and to provide a non-discriminatory spectrum fee relative to other spectrum uses in these bands.

Path length factor

3.55 Although no respondents were opposed to the path length factor, some suggested Ofcom should cap this factor at a value of 2 to avoid disproportionately high fees for very short links. Furthermore, these respondents argued that links assigned below the minimum path length for health and safety reasons and due to unavailability of equipment should be exempted all together from this factor.

3.56 Ofcom would like to point out that it has already revised its original proposals for the path length factor to curb the effect of this factor through the inclusion of the square root in the formula. However, to accommodate these further concerns, Ofcom proposes to further limit the effect of this factor for links much shorter than the minimum path length by capping it at a maximum value of 4, which corresponds to a link of length $1/16^{th}$ of the link length policy. Furthermore, Ofcom has decided to decrease the minimum path length of a link in the 38 GHz band to 0 km, as Ofcom accepts that no reasonably priced equipment is yet available in higher frequency bands. This effectively means that links in these bands have a path length factor of 1.

3.57 Ofcom does not agree with the request to exempt certain links from this factor (for health and safety reasons or for unavailability of equipment). The path length factor reflects the opportunity cost of spectrum in a certain band, based on the extent to which shorter links deny spectrum to other users (of potentially longer and more efficient links) in that band. Health and safety arguments are not relevant in this consideration.

Availability factor

3.58 Although respondents voiced no objections to the availability factor, there was some confusion over the way this factor is calculated as a result of changes to the assignment. Respondents assumed that the value of availability used to calculate the availability factor for a given link is not recalculated (unless the assignment is subject to an amendment that affects the link budget and made at the request of the licensee).

3.59 Ofcom agrees that the value of the availability factor for any given link will remain the one used during the assignment. In addition, Ofcom has included an algorithm within the availability factor which facilitates the interpolation/ extrapolation between the standard availability values (see Annex 3).

Antenna factor

3.60 A number of respondents commented on the proposed antenna factor. They stated that the factor (as defined) will encourage the use of larger antennas as opposed to more spectrum-efficient antennas. According to these respondents, the factor is “crude; using bore sight gain as a proxy for antenna efficiency”. Instead, basic RPE quality of the antenna should, in their view, be the main focus of this factor. Several suggestions for improvements have been received; mostly

including the ETSI classification class into the factor to produce an efficiency weighted bore sight gain.

3.61 Ofcom is of the opinion that, for each factor in this algorithm, a balance needs to be struck between simplicity and transparency, and the extent to which the factor accurately reflects the complexity of reality. Ofcom intended to define a simple and transparent antenna factor, and recognise that as a result the factor has several deficiencies. Given the responses received, Ofcom has decided to delay the implementation of this factor until the next pricing review. In the meantime, Ofcom intends to conduct further research – in cooperation with the industry – into how this factor may be defined more satisfactorily.

Sharing factor

3.62 Most respondents questioned the usefulness of the proposed sharing factor. Many termed the sharing factor as 'unpredictable'. According to these respondents, the factor lacks transparency as it depends on licence details of other operators at sharing sites – information most operators do not have access to. Equally, assignment methods would need to be updated to enable operators to make an informed decision on whether they wish their new links to share spectrum or not.

3.63 Furthermore, some respondents argued that the manner in which the proposed sharing factor has been specified effectively defines all bands as "congested" and therefore subject to AIP. As a result, they argued that this factor should automatically be set to 0.5 for links in all "uncongested" bands."

3.64 In response, Ofcom does not agree that all bands are defined as "congested" by setting a sharing factor at unity by default. Rather, this factor as proposed by Ofcom aimed to provide a discount for links that shared spectrum. The concept of congestion was not intended to form part of this factor as it is already incorporated into the Band Factor.

3.65 However, Ofcom agrees there are considerable complexities associated with the introduction of this new sharing factor. Ofcom has therefore decided not to introduce this factor in the pricing algorithm at this time. Ofcom will further examine the merits and mechanism of a sharing factor for future implementation, in conjunction with the industry.

Additional factors suggested

3.66 In addition to comments regarding the proposed factors in the algorithm, several suggestions were made to include further factors. These include:

- A mechanism to model the different interference sensitivities and hence spectrum sterilisation of links using different modulation levels occupying the same bandwidth.
- The algorithm needs to recognise the hidden costs of radio equipment deployment in several frequency bands. For example, there is a cost premium for equipment that permits co-frequency cross-polar links.

- No reference is made to the use of fixed terrestrial radio links for disaster recovery, or to the use of temporary links.

3.67 Furthermore, Intellect proposed the introduction of a new 'special circumstances' factor to cover the following circumstances:

- When two licences are issued to an operator for a pair of co-frequency cross-polar links, one of the link licences should have this factor set to 0.5.
- A unidirectional link should have this factor set to 0.75.
- Remote rural fixed link locations should be considered for additional license fee discounts.

3.68 In response, Ofcom would like to point out that a balance needs to be achieved between making the algorithm simple and transparent, and attempting to accurately reflect the complexity of reality. In general, if there is a strong industry view that certain factors need to be captured in the algorithm, then Ofcom is prepared to consider the introduction of such factors. Hence, in the run up to the next fees order, Ofcom invites further discussions on the effect of higher/ lower level modulation links on spectrum efficiency (and thus fees incurred).

3.69 Ofcom does not agree that equipment costs should be included explicitly in the algorithm, as these will inherently be included in the setting of opportunity costs for spectrum (and thus the spectrum fee).

3.70 Ofcom takes the opportunity to remind respondents that licences and assignments for periods of less than a year, charged on a monthly basis, have been available for some time. Ofcom is not proposing to change its policy regarding such links.

3.71 Furthermore, the first two circumstances of the 'special circumstances factor' were already included in Ofcom's proposals and will remain unchanged.

3.72 Ofcom agrees that for the third circumstance, a discount factor on the use of a channel in certain remote rural locations might be appropriate. Ofcom is currently in discussion with the industry to develop such a factor for specific geographical areas (primarily remote Scotland), and expects to publish its proposals in the next pricing consultation.

Ofcom's decision

3.73 Based on the comments received from the industry on Ofcom's proposals for the fixed link algorithm, Ofcom has made some modifications to the algorithm. The adapted fixed links fees algorithm is therefore as follows:

Fixed link licence fee =	*spectrum price* × *bandwidth factor* × *band factor* × *path length factor* x *availability factor*

3.74 The key modifications in this new pricing algorithm are:

- introduction of a minimum bandwidth factor of 1;
- amendment of the band factor values for the following bands;

Band (GHz)	*Band Factor*
L6, U6	0.74 (was 0.83)
11	0.43 (was 0.48)
18	0.30 (was 0.37)
22, 23	0.30 (was 0.35)
25, 26, 28, 31, 32	0.26 (was 0.30)

- introduction of a cap at a maximum value of 4 on the path length factor;
- decrease of the minimum path length for the 38 GHz band to 0 km (effectively resulting in a path length factor of 1);
- removal of the antenna factor; and
- removal of the sharing factor.

3.75 The removal of the sharing factor and the antenna factor from the proposed algorithm has an effect on the appropriate baseline spectrum price for the algorithm. The average effect of the antenna factor on the spectrum price was 1, and the average effect of the sharing factor was 0.89. Therefore, an appropriate baseline spectrum price in the new algorithm is £88 per 2 x 1 MHz (being equal to £99 per 2 x 1 MHz x 0.89).

3.76 Whilst not directly relevant to Ofcom's considerations, Ofcom estimates that implementing these key changes to the algorithm, results in an average fee increase of 13.5% (as compared with an overall fee increase of 25% under the algorithm as proposed in the spectrum pricing consultation).

3.77 The final fixed link algorithm – incorporating all changes as a result of the consultation responses – is included in Annex 3 of this statement.

Pricing proposals for other fixed applications

Satellite services

3.78 Four respondents commented on Ofcom's proposals for satellite services (question 9, section 5). Two respondents noted that the proposed increase in the minimum fee for a permanent earth station is quite steep, with a third respondent questioning the justification for such a minimum fee and proposing a minimum be applied to the total annual fee payable instead. In response, Ofcom would like to point out that this increase is only applied to minimum fees, not to average fees, and still falls far short of the high cost of supporting satellite licensing. Ofcom intends to look more closely at ensuring the costs of licensing this sector are met in future and will making a more detailed statement on costs next year. Meanwhile the regulations have been redrafted in a number of places to improve clarity, but these changes do not affect the fees being charged.

3.79 Two respondents agreed with Ofcom's proposed fees for the new licence classes (ESVs and AESs) within satellite services. Ofcom has therefore decided to implement these proposals. One respondent queried, however, the wording of paragraph 5.3.7 of the Spectrum Pricing consultation document. On reflection, Ofcom considers that this paragraph was incorrectly worded and it was therefore an error to include it in the document. That said, Ofcom does not consider that the error has any impact on the proposals that it has decided to make.

Point to point security CCTV services

3.80 Two respondents have expressed their agreement with Ofcom's proposal not to make any fee changes for point to point security CCTV services in the 31 GHz band (question 10, section 5). Ofcom has therefore decided to adhere to this proposal, although the class title has been changed and some rewording of the regulations has been made to improve clarity.

Fixed Wireless Access (FWA)

3.81 All six respondents stated their approval for Ofcom's proposal to maintain fees for the non-auctioned broadband fixed wireless access at current levels (question 11, section 5). Ofcom will therefore implement this proposal. In addition, Ofcom has made some structural changes in this licence class to enable future partitioning. A new class has also been added for use of the 3.4 GHz bands in the Channel Islands and Isle of Man following separate discussion with the Islands.

Pricing proposals for PMSE

Responses received

3.82 Ofcom received 15 responses regarding the proposals for PMSE fees (question 12, section 6), 3 of which were confidential. All respondents supported Ofcom's decision not to implement AIP to the sector. Whilst the majority acknowledged Ofcom's need to increase fees in order to recover costs, there was some disagreement regarding the extent of the increases and their distribution across PMSE categories (fees structure). Another broad concern expressed by several parties was the uncertainty caused by the introduction of spectrum trading and liberalisation.

Fees increases

3.83 Out of the 15 responses received by Ofcom, 14 agreed there was a need to increase PMSE licence fees on a cost recovery basis. One response rejected the increase on the grounds that they were a non- profit making organisation and in fact suggested a discount for users of their kind. Although 5 respondents were content with the proposed 44% increase over two years, 9 parties disapproved with the proposal feeling the level suggested was unnecessary to recover Ofcom's total (internal and contractual) costs. Of those 9 responses, 3 suggested increases remain in line with inflation, and 3 suggest a total increase of 25% spread between the two years. The remaining three suggest going ahead with

the initial 20% increase this year, but then relating the subsequent year's increases to inflation only.

3.84 Ofcom has considered the issue, and decided that it will not implement discounts for hospital radio as this would have a detrimental effect on a class where Ofcom is not currently covering costs. JFMG licence a number of such customers on Ofcom's behalf, and introducing a charity status for these would result in an even greater gap in cost recovery. Ofcom is committed to applying economic principles to all licence classes across the spectrum and therefore considers it inappropriate to charge below-cost fees in this particular instance. Furthermore, at the beginning of this consultation representatives of the Hospital Broadcasting Association indicated to Ofcom that the proposed increases would be unlikely to affect the provision of these valuable services.

3.85 Current PMSE licence fees do not provide enough income to even cover the current JFMG contract alone. Added to this the additional cost incurred by Ofcom's need to now pay VAT where the Radiocommunications Agency did not, and the total shortfall is considerable. The full extent of Ofcom's financial position with regard to PMSE will not be known until later next year when an entire year's spending of Ofcom's own costs can be analysed. Therefore, it is impossible to project the exact deficit and whether the 44% increase over two years will cover, or in fact, over recover costs. With this in mind, Ofcom has decided to go ahead with the proposed 20% increase in 2005, with a view to being in a better position of deciding the extent of further increases required in subsequent fees rounds. Ofcom will then also be able to consider the impact of reducing costs at JFMG and proposed reductions at Ofcom and any proposals JFMG may have for simplifying the approach to fees in this sector.

Fees structure

3.86 Six respondents argued that the way the fees increases had been distributed throughout the PMSE structure was incorrect. The majority stated that a flat increase across the board would be preferable, as weighting of fees brings in an element akin to AIP. One respondent argued that, whilst understanding the benefits of introducing different increases to encourage users to move out of the most congested bands, this would unfairly penalise larger PMSE users. Larger organisations make long term investments in equipment that operate in a particular band, and whilst the increases may encourage others to move, they on the other hand, will be forced to remain in the bands and incur these costs. Another area where this respondent felt unfairly penalised was the reduction of the discounts on purchasing Carnets from 10% to 7.5%, where again they felt that the larger user of the spectrum would incur the majority of the increases. Two respondents also mentioned some concern over the increase of shared radio microphone licences, as although they were subject to lesser increases than many areas, they felt it still unnecessary to increase them other than in line with inflation. Finally, Ofcom's contractors (JFMG) suggested the simplification and restructure of PMSE fees in the future.

3.87 Ofcom believes that the weighting given to the proposed fees ensures a fairer distribution of costs than the introduction of the same increase across the board. In this weighting, Ofcom is seeking to enable the smaller users to continue

operation with limited impact on their budgets, so as to encourage customers to use spectrum more efficiently. Ofcom understands the concerns regarding the reduction of the discounts for Carnets potentially distorting the weighting of fee increases. Nevertheless, Ofcom has decided to go ahead with the initial year's reduction in discount but intends to work with JFMG to re-address any potential distortions in the value of Carnets in Ofcom's further review next year. This later review will enable Ofcom to ascertain the impact of both the weighting and the Carnet discounts on the PMSE community as a whole, and reconsider if necessary. Finally, Ofcom sympathises with the suggestion by JFMG to simplify PMSE fees in general, and will consider a new format in proposals for future regulations (likely to be in 2006).

The future of PMSE spectrum

3.88 A number of responses expressed concern over the future of PMSE spectrum and feared that decisions to be made about PMSE in 2006 may be too late, as trading and liberalisation could lead to PMSE users being 'squeezed out'. In fact, one confidential response urged Ofcom to undertake a strategic review of PMSE as soon as possible. Some other responses focussed on the introduction of spectrum trading in the sector, and in particular on the need to create a dedicated Spectrum Management Organisation for programme making.

3.89 Although Ofcom welcomes the feedback provided on these matters, full comments are outside the remit of the pricing consultation and this subsequent statement. However, Ofcom will take this feedback into account when considering any future policy decisions.

Ofcom's decision

3.90 Ofcom has decided to go ahead with the introduction of the 20% fees increases as proposed in the Spectrum Pricing consultation document.

3.91 Further work will be done in the light of updated costing information to decide on the appropriate level of fees to be applied in 2006. This will be covered in the next round of pricing consultation.

Pricing proposals for other applications

Aeronautical and maritime communications

3.92 A total of five respondents commented on Ofcom's proposals for aeronautical and maritime communications (question 13, section 7). All three respondents who directly addressed this proposal agreed with Ofcom to not make any changes to current fees. There was more disagreement with regard to a view of the appropriateness of introducing AIP in the future to some services in this sector. Although two responses oppose AIP on the basis that some users cannot afford expected fee increases, three respondents favour AIP as it may encourage migration from 25 kHz to 8.33 kHz channel space working – a more spectrally efficient use of the band.

3.93 As a result of the responses, Ofcom has decided to make no changes to fees in this band – as proposed – and to further research the appropriateness of AIP for these services. However, Ofcom will work with the CAA and the Maritime and Coastguard Agency to consider future long term pricing proposals in this sector and return to this topic in a future pricing consultation. However a number of small drafting changes have been made to improve clarity.

Aeronautical and maritime radar

3.94 Five respondents remarked on Ofcom's proposals in the aeronautical and maritime radar area (question 14, section 7). Both respondents who directly addressed this proposal agreed with Ofcom to not make any changes to current fees. However, there was a variety of views regarding the extent to which there is scope for introducing AIP in this area in the future – with three respondents in favour, one opposing, and one pointing out the need for a demonstrable benefit relating to safety of life. One supporter of AIP specifically highlighted the importance of a reduction in out of band emissions in the interest of users in adjacent bands.

3.95 Given these responses, Ofcom has decided to take forward its proposal to not change any fees this time, but in conjunction with the CAA, the Maritime and Coastguard Agency and other key parties explore the extent to which there is scope for applying AIP to encourage spectrum efficiency in the future.

5.8 GHz wireless access

3.96 A total of seven respondents commented on Ofcom's proposal to consolidate the 5.8 GHz wireless access fees for Radio Local Access Network Stations (RLANS) within the Licence Charges Regulations (question 15, section 7). Six respondents are content with this proposal. However, one respondent is concerned that the current fee structure does not actually recover the licensing costs, and expected this area to be reviewed at this pricing review.

3.97 Given the overall support for this proposal, Ofcom has decided to implement the proposed consolidation. Ofcom considers that the level of fees is appropriate for the very light licensing regime and low costs involved now that the facility has been established. This new class has been inserted under Fixed Wireless Access.

Government and emergency services

3.98 Ofcom's policy is to set comparable fees for those services which are not included in the pricing regulations. For the emergency services, the approach is to set fees comparative to business radio rates (e.g. police and fire bands in relation to the business radio (PAMR) rate).

3.99 It has been agreed with the government that the Ministry of Defence will pay a substantially larger sum (more than double the previous spectrum fees) to reflect updates in comparative fees and to reflect a review of alternative possible uses of defence spectrum.

Science and technology

3.100 Ofcom received six responses regarding its proposal for science and technology (question 16, section 7). All respondents agreed with the proposal to maintain current pricing arrangements, at least until the NODL review is completed. Therefore, Ofcom has decided to implement this proposal.

Pricing proposals for broadcasting

3.101 Ofcom received twelve responses regarding its long term and provisional proposals on the application of AIP to the broadcasting sector (questions 17-23, section 8). This statement does not deal with these responses. A further document on this is likely to be conducted during the course of 2005.

Community Radio

3.102 Section 8 of the Spectrum Pricing consultation document included one short-term proposal, which will be implemented in the Licence Charges Regulations. This proposal concerned the introduction of a new licence class – Community Radio – and the fee structure charged for this class. Ofcom proposed to apply exactly the same fee structure as it uses for National and Local Radio services, which is based on population coverage.

3.103 Ofcom received no objections to this proposal, and therefore will implement this new licence class and fee structure as proposed in the Licence Charges Regulations. Some minor drafting changes have been made to improve clarity of the regulations.

Section 4

Conclusion and next steps

4.1 Ofcom has carefully considered all of the 35 stakeholder responses it has received to the proposals as set out in the Spectrum Pricing consultation document. These responses concerned pricing proposals for each of the licence classes set out in sections 4 – 7, excluding the longer term proposals for broadcasting sector.

4.2 Most pricing proposals received substantial support from respondents and will therefore be implemented without modifications. However, certain proposals raised some concerns among respondents. Where possible, Ofcom has tried to revise its proposals in the light of comments, and thoroughly justified any proposals it has felt unable to modify.

4.3 To give legal effect to the policy decisions taken by Ofcom (together with certain modifications to its proposals made following consultation), Ofcom must make regulations using its powers explained in section 2 of this statement. As explained in this section, Ofcom will commence its consultation on the Licence Charges Regulations today, on 23 February 2005. That consultation will be open for comments until 24 March 2005. Subject to considering any representations, Ofcom would then anticipate that these regulations will be signed in April 2005 in order that they can come into force in early May 2005.

Annex 1

List of respondents to the consultation

A1.1 A total of 37 responses have been received to the spectrum pricing consultation document. Two of these responses focussed solely on the questions regarding the introduction of AIP for broadcasting (ITV and a confidential response). As this issue has not been discussed in this pricing statement, these respondents have not been taken into account in this consultation. The respondents whose names Ofcom can disclose are:

1. AirRadio Ltd
2. An Investor's response (organisation details are confidential)
3. BBC
4. Better Sound Limited
5. British Telecommunications plc
6. CAA (Civil Aviation Authority)
7. Cable & Wireless
8. Channel 4
9. Chris Kirby
10. Comcir Radio Communications Ltd
11. CRCA (Commercial Radio Companies Association)
12. Emap plc
13. Fleetcomm Mobile Networks
14. Hemel Hospital Radio
15. IBS (Institute of Broadcast Sound)
16. Inmarsat
17. Intellect
18. JFMG Ltd
19. Joint Radio Company Ltd
20. MML Telecom
21. O2 (UK) Limited and Airwave mmO2 Limited
22. Orange
23. OSCA (On Site Communications Association)
24. PageOne Communications Limited (contents of this response are confidential and have therefore not been published on the website)
25. Radio Contact Service
26. SMG plc
27. Spectrum Trading Associates
28. SRH (Scottish Radio Holdings plc)
29. TAUWI (Telecommunications Association of the UK Water Industry)
30. T-Mobile (UK) Limited
31. Vodafone (part of the response is confidential)
32. Wireless Messaging Association (WMA)

A1.2 The non-confidential responses can be viewed at www.ofcom.org.uk/consultations/past/spec_pricing/responses/.

A1.3 A further three confidential responses were received.

Annex 2

Responses to the pricing consultation

A2.1 The Spectrum Pricing consultation document published in September 2004 contained 23 questions on which Ofcom sought the views of stakeholders. This statement however only deals with the first 16 questions. The last seven questions focussed on the long term proposals for introducing AIP for broadcasting – an area that will be dealt with in a separate statement due for publication later this year.

A2.2 The majority of respondents supported Ofcom's proposals surrounding the implementation issues of payment dates and mechanisms for facilitating partitioning of tradable licences. Furthermore, respondents to this consultation generally focussed on the pricing proposals relating to their specific licence classes. Some of these proposals consisted of little changes to current pricing structures, and as a result attracted only few responses (such as scanning telemetry, satellite services, point to point security CCTV services, fixed wireless access, maritime and aeronautical communications and radars, 5.8 GHz and science and technology). However, in other licence classes broader changes or more controversial pricing arrangements were proposed, and these attracted more comments from the respondents (such as public wireless networks, business radio, fixed links and PMSE). The key points raised by respondents, particularly in relation to concerns identified with Ofcom's proposed pricing arrangements, are addressed in the main body of this statement.

A2.3 In addition, a few respondents raised additional points outside the scope of the consultation, focusing on issues such as the use of AIP in a trading environment. In the main, Ofcom has not attempted to address these points in this statement as they have been dealt with in other documents, notably the Statement on Spectrum Trading[12].

A2.4 A more detailed account of the issues raised by (non-confidential) stakeholders is given in the table below. This table is organised by question in the spectrum pricing consultation – with a summary of the issues raised on the left hand-side and Ofcom's response to each specific issue on the right hand-side. This table only covers questions 1 through to 16.

Question X *Question from pricing consultation*	
Stakeholder issue organised by topic. "For illustrative purposes, summarised quotes from various (though not all) respondents are presented."	Ofcom's policy decision with regards to this specific issue (reference to relevant paragraph in section 3 for further information).

Question 1 *Do you have any views about payment dates other than the licence anniversary?*	
Eleven respondents. All respondents	Ofcom will keep the current paying

[12] 'A Statement on Spectrum Trading', Ofcom, 6 August 2004, http://www.ofcom.org.uk/consultations/past/spec_trad/statement/

expressed their satisfaction with current paying arrangements – specifically the ability to adjust payment dates and to spread payments in monthly instalments. "The possibility to harmonise payments of multiple licences to a single point in the year is helpful." "Current arrangements for adjusting multiple licences to align payment dates are essential." "The option of being able to change the renewal date of licences if required is fully supported." "The ability to make monthly payments should be retained." "Spread payments are a very useful approach to allowing licence holders to manage their cost base."	arrangements in place at present (see paragraph 3.5).
Proposed improvements "Improving the current payment processes generally would be helpful as we often experience problems in making what would be simple annual renewal payments."	The payment collection process will be improved further as part of a business re-engineering project that Ofcom is conducting to revisit the licensing process (see paragraph 3.5).
Payment in a trading environment "The condition requiring payment in full before any trades can take place may mitigate against encouraging trading." "Importance of common licence renewal date for an SMO in a trading environment."	Ofcom has already consulted on such issues related to spectrum trading and as a result has published the Spectrum Trading Statement on 6 August 2004 and the Spectrum Trading Regulations Statement on 2 December 2004. In these consultations, the issue of payment was considered and it was decided that it is important to ensure that fees are fully paid before a trade takes place.
Question 2 *Do you have any comments on the threshold for permitting spread payments?*	
Nine respondents. Half of the respondents agreed with the current threshold level, whilst the other half argued for a lower level. "The threshold is reasonable. Lowering it to include a wider audience would probably only serve to exacerbate the payment issues already being experienced by Ofcom."	Ofcom will not lower the threshold for spread payments this year as Ofcom does not have the mechanisms in place. However, Ofcom will look further into the option and implications of lowering this threshold and will comment further in a future pricing consultation (see paragraph 3.6).

"For the sake of fairness, the threshold level should be lowered to £50,000; £35,000; £10,000; no threshold at all."	
Proposed improvements "A financial penalty is recommended for consistent late payment with the options of revoking the spread payment option."	Ofcom already has the right to revoke licences in instances of consistent late payment. Ofcom will consider using this right where appropriate.
Question 3 *Do agree that fees for partitioned licences be apportioned by population, frequency or time proportion in the units exemplified?*	
Fourteen respondents. The majority of respondents agrees with the proposed mechanisms for facilitating partitioning of tradable licences.	Ofcom is progressing with the implementation of the proposed mechanisms to facilitate frequency licence partitioning (see paragraph 3.11).
Flexible method of partitioning fees "Method of apportionment should be flexible enough to include special case by case apportionments, which can take into account unique applications/ environment." "More reasonable for parties to agree the terms and price of the transfer of the partitioned licence." "What is fair apportionment could well be specific to a particular trade. How those who enter into a trade elect to apportion the costs of the sub-licences should be up to them." "Most appropriate approach should be selected by discussion as opposed to selection of a single methodology."	Ofcom believes such a system would be difficult to implement because it is necessary to have exact factors for determining statutory licence fees. This does not prevent parties to a trade determining for themselves how payments be apportioned between themselves and to come to some commercial arrangement (see paragraph 3.8).
Value of geographic partitioning "Supports the proposal to continue the apportionment by geography." "The option proposed should include geographic area."	Ofcom intends to put in place partitioning on a geographic basis later in 2005 or 2006, when IT arrangements are ready (see paragraph 3.9).
Areas with transient population "Not sure how the population method will account for geographic areas or sites with high levels of transient numbers."	Ofcom has the intention of using published population databases to provide a snapshot of population levels in geographic areas (see paragraph 3.10).

Question 4 *Do you agree with the proposal for public wireless networks to maintain the current fees?*	
Sixteen respondents. The majority of respondents agree with the proposal to maintain current fee levels. "Sensible approach in the light of substantial interest in public wireless network licences." "Support proposal as it is important that the market is kept buoyant by providing a degree of opportunity for longer term investments. " "Given sensitivity of refined model to a number of input assumptions, support the proposal not to change the level of fees for the next 3 years." "Endorse Ofcom's final proposal to retain pricing at the current AIP level, although not necessarily support the rationale put forward." "Fees should not be increased above current levels." "The proposed pricing for 2G spectrum is an overestimate and runs the risk of distorting spectrum usage and investment decisions." "There is sufficient objective evidence to show that the current AIP for mobile cellular is excessive. Ofcom fails to reflect its principle to set price at the lower end of any range of estimates."	Ofcom continues to believe that current fee levels are appropriate. Any reduction in fees would appear to undervalue this spectrum, even with current restrictions on use. Ofcom has no evidence that the current level of fees is, or is likely in future, to give rise to inefficient under-utilisation of this spectrum. At the same time Ofcom is not convinced that it would be appropriate to increase these fees at this time. It would not, for example, be appropriate for Ofcom to increase fees simply on the grounds that other players had paid higher prices in the past for spectrum that was now being used to provide a competing service. Whilst Ofcom aims to ensure that competition is not distorted as a result of regulation, Ofcom can only set fees in excess of the costs of administration in order to promote efficiency in the use of spectrum, not to 'level the playing field' between different market participants (see paragraphs 3.15 and 3.16).
Asymmetry in charges "Ofcom should, at a minimum, correct the asymmetry in charging between the 900MHz and 1800MHz operators."	Ofcom continues to believe that the current differential in fees between the 900MHz and 1800MHz bands is appropriate. This differential reflects differences in the value of spectrum in the two bands, arising from differences in the propagation characteristics of spectrum in the two bands (see paragraph 3.17).
Imbalance of spectrum valuations "There is an imbalance in relative valuation of spectrum for business radio services;	Ofcom advises that the existing level of AIP for 2G mobile (based on £/MHz/Km2) is currently calculated from exactly the same basis overall as

PAMR is set too high compared to other radio services." "Do not see the situation for 2G operators is any less uncertain that that of business radio operators who may be facing material increases in fees." "No level playing field with PAMR; proposed methodology makes PAMR provision uncompetitive." "Unfair to maintain the licence fees for the cellular networks if there are proposals to raise the fees for competing mobile radio services that are already losing customers to them."	for other mobile radio services. In fact, the headline rate for 2G cellular spectrum per MHz is exactly the same as the maximum national AIP level for PMR. The difference is the way that some mobile bands (e.g. PAMR) have been discounted or the way that some bands have been differentiated between congested areas and non congested areas (e.g. CBS). On that basis, Ofcom does not consider there to be an imbalance between spectrum valuations (see paragraph 3.19).
Review period "There is merit in minimising any uncertainty over the proposed values for the next three years." "Sufficient progress may warrant further revision of the refined model over a shorter period of time than the 3 years proposed." "Requests that Ofcom considers other markets which may be similar stage in their cycle to similarly defer the proposed increase in licence fees for three years."	Ofcom feels that maintaining the fee for three years is justified by current uncertainty of what might happen to 2G – as long as current restrictions on 2G use stay in place for that period (see paragraphs 3.21 and 3.22). Ofcom may however review the level of AIP applicable to these bands if circumstances change materially- for example if necessary in connection with decisions about the longer term future of the 2G spectrum.
Question 5 *Do you support Ofcom's proposal to abolish the "choice and diversity" factor and the "step-in" arrangements in the business radio sector over 2 years (as in option 1)?*	
Thirteen respondents. The majority of respondents support the phased removal of the fee modifiers. "It is appropriate to discontinue the factor in a phased manner, as the market (and technologies) in the segment to which 'choice and diversity' discounts are applied is now mature." "A simplified approach that offers consistency to all users and that also has a phased introduction is most appropriate." "Arrangements should be abolished and new licensees should pay the full AUIP for a licence as soon as it becomes effective." "Supports the principle for removing modifiers when the grounds for them no	Ofcom intends to do further work in the business radio sector. Meanwhile, Ofcom will delay the proposed phased removal of the modifiers and make no changes to the CBS and PAMR fees in the Licence Charges Regulation. Ofcom wishes to emphasize its intention to proceed with proposals to bring all business radio fees to the same level in the next set of regulations. Further consultation on these proposals is expected to take place over the next year (see paragraph 3.26). Please refer to paragraphs 3.30 and 3.31 for further details on Ofcom's decision for the business radio sector.

longer exist." "Support the proposal subject to consideration being given to introducing these changes over a three year as opposed to a two year period – as with public wireless networks."	
Objections against the proposal "Removal of choice & diversity factors will be extremely damaging if taken as stand alone measures." "We are not able to be fully competitive within market pricing at present level of AIP. If our spectrum costs rise any further, we have to make a choice between closure and the repositioning of our service." "The proposed treatment of 2G is inconsistent with the proposal." "The fees structure should be revised to ensure operators can compete on a level playing field with GSM." "The whole subject needs to be revisited with a view of ensuring that these services can be competitive against a background of collateral damage from GSM."	Ofcom would like to point out that the proposed change would bring the CBS and PAMR rates in line with 2G. Ofcom intends to do further work in the business radio sector. Meanwhile, Ofcom will delay the proposed phased removal of the modifiers and make no changes to the CBS and PAMR fees in the Licence Charges Regulation. Ofcom wishes to emphasize its intention to proceed with proposals to bring all business radio fees to the same level in the next set of regulations. Further consultation on these proposals is expected to take place over the next year (see paragraph 3.26). Please refer to paragraphs 3.30 and 3.31 for further details on Ofcom's decision for the business radio sector.
Question 6 *Do you support this long-term phased approach for simplifying business radio sector licences?*	
Twelve respondents. The majority of respondents support the long-term phased approach to simplify business radio sector licenses. "Strongly support the introduction of market priced spectrum and welcome the attempt to achieve parity in spectrum costs for the various business radio services by applying AIP." "Supports the long-term phased approach for simplifying business radio sector licences provided it does not impact disproportionately on any specific sectors or entities." "Unless the present inequalities are addressed the sector will continue to shrink."	Ofcom will have regard to these issues as it further develops proposals for the future of the business radio sector. Ofcom intends to consult on, and develop, these proposals over the next two years (see paragraph 3.28). Please refer to paragraphs 3.30 and 3.31 for further details on Ofcom's decision for the business radio sector.

"We support the simplification proposed, but would stress that changes in use due to liberalisation will cause the AIP calculations to be out of line with the real economic value of this spectrum." "Resources needed to support liberalisation and trading may well include those of third parties such as CAA."	
Licence exemption "Concerns about practicality of introducing licence exemption in an on-site environment." "More detail of the concept of deregulating the on-site PBR category needs to be provided."	Ofcom intends to undertake further consultation on new licence exemption proposals shortly (see paragraph 3.29).
Question 7 *Do you agree with the proposals for not changing scanning telemetry fees?*	
Five respondents. All respondents agree with the proposal to not change these fees. "Unless there are compelling reasons, it would seem unwise to change them. The scanning telemetry channels are a specialist area supporting large elements of the strategic national infrastructure."	Ofcom has decided that the current pricing arrangements will remain unchanged at this time (see paragraph 3.32).
Extension of AIP needs justification "It would appear that in some markets, for example scanning telemetry, that Ofcom propose a policy of 'PBR-creep'. It is not clear that this approach is always appropriate."	Ofcom believes that mirroring AIP levels to business radio pricing is justified. This is because scanning telemetry systems are fixed services which utilise spectrum in a way similar to business radio (see paragraph 3.33).
Question 8 *Do you agree with the proposed algorithm for the point to point fixed links sector?*	
15 respondents. Most respondents commented on the extent of the overall fee increase resulting from the algorithm, rather than on the general pricing approach. "Support Ofcom's intended approach of using AIP to improve progressively the efficiency in the use of spectrum. The algorithm is well structured." "Agree with proposals to encourage more efficient use of the spectrum." "This is a prime example of a licence fee which is based very precisely on a	Ofcom considers that it has kept this pricing algorithm as simple as possible, and in line with the general methodology used to price spectrum uses in other bands (i.e. the spectrum price is determined on the basis of an opportunity cost analysis common to other spectrum bands where AIP is applicable) (see paragraph 3.37). Paragraphs 3.73 – 3.77 and Annex 3 contain Ofcom's final proposal for the fixed links algorithm.

particular way of using spectrum. If the licences involved were liberalised or even if comparatively minor technical changes were made, then the licence fee would be quite detached from reality.“	
Expected overall fee increase “The estimated overall increase of fixed link sector income of 25% seems unjustified and excessive.” “Intellect and other industry members believe that the net increase will be significantly higher than the Ofcom figure: between 25% to well in excess of 100%.” “Any uplift in licence cost associated with the changed calculation methodology is likely to impact negatively on the existing deployed networks.” “Any increase in income should be justified as a separate exercise to the application of AIP. Without such a justification, overall sector income should be maintained by default as generally neutral.” “An increase of 25% may be considered reasonable.”	The overall fee increase does not in itself represent a target for Ofcom. The 25% increase is purely a result of Ofcom trying to set the appropriate price for this use of spectrum – the opportunity cost of fixed link spectrum. Ofcom would like to stress that the 25% represents the estimated *overall* effect on fixed link users. Some individual users are likely to experience higher increases, whereas others are likely to see their licence fee being reduced. Ofcom does not believe an overall increase in spectrum fees of 25% is sufficient to cause a ‘negative impact on existing deployed networks’. Through the pricing algorithm, Ofcom’s aim is to reflect the actual market value of spectrum. This value should encourage current fixed link users to use spectrum in the most efficient manner when updating their networks. Due to several proposed amendments in the algorithm, the overall fee increase is now estimated to be only 13.5%. (see paragraph 3.39 – 3.41 and 3.76)
Timing of implementation of the algorithm “Any ‘significant’ increases must be phased in to allow businesses to adjust.” “Any increase over 10% should be phased in over a period of at least 5 years to manage the impact on the financial stability of the operator.” “The implementation schedule should set aside an initial period for up to six months for detailed discussions with individual operators.” “Intellect proposes that a minimum of twelve months notice should be given once discussions are complete before any new	Ofcom does not believe any delay or phasing-in of the implementation of the algorithm is required. 1) Extensive discussions with the industry regarding this algorithm have already been ongoing for the past four years. 2) Ofcom has made certain modifications to its proposals which deal with most concerns voiced. Ofcom considers that it would not be appropriate to postpone implementation of these changes (see paragraph 3.43).

pricing algorithm is implemented." "Request that any increases in fees on frequencies already allocated and in use are spread over time in consultation with the operator concerned."	
Spectrum price "No background data on radio equipments costs has been provided to support the revised figure of £99 per 2x1 MHz." "A lower value is appropriate for the spectrum price based both on relative equipment cost and the weighting of use of higher level modulation to links with capacities of 34Mbps and above in bands above about 2GHz."	Ofcom reduced Indepen's proposed baseline spectrum price to £99 for 2x1 MHz to reflect the average level of congestion across the spectrum bands. Ofcom rejects the suggestion that the spectrum price should be based on links with a capacity of 34 Mbps or more and in bands above 2 GHz, since this does not reflect all links in use today. That said, Ofcom proposes to adjust the spectrum price downwards to £88 per 2x1 to be consistent with other proposed amendments to the pricing algorithm (see paragraph 3.45, 3.46 and 3.75).
Bandwidth factor "The linear relationship between bandwidth occupied and licence fee is supported and the simple factor representing this in the algorithm provides good transparency."	Ofcom notes the support for this factor. In addition, Ofcom now proposes the implementation of a minimum of 1 for this factor (see paragraph 3.48).
Band factor "The use of AIP in closed bands is not supported as operator cannot be modified in relation to efficiency. The band factor for closed bands should be set to zero." "If other areas of concern with the currently proposed algorithm are not directly addressed, the currently proposed values for band factors should be reduced by 50%."	Closed bands are shared with, or planned for future use by, other uses and spectrum used for fixed links denies spectrum for these other uses. Therefore, a spectrum fee which reflects opportunity cost is valid (see paragraph 3.54). A revised set of band factor values is proposed in paragraphs 3.51 – 3.53.
Path Length factor "The new proposed factor should be capped at a value of 2 to avoid extremely high fees for very short links." "Links that are assigned below the minimum path length for health and safety reasons and due to unavailability of equipment should be exempted from the path length modifier."	Ofcom proposes to further limit the effect of this factor by capping it at a maximum value of 4. Furthermore, Ofcom has decided to decrease the minimum path length of a link in the 38 GHz band to 0 km. (see paragraph 3.56) Ofcom does not agree with the request to exempt certain links from this factor.

	The path length factor reflects the opportunity cost of spectrum in a certain band, based on the extent to which shorter links deny spectrum to other users in that band. Health and safety arguments are not relevant in this consideration (see paragraph 3.57).
Availability factor "The proposed factor is acceptable. It is assumed that the value of availability used to calculate the availability factor for a given link will not be recalculated unless the assignment is subjected to an amendment that affects the link budget and made at the request of the licensee." "The availability for fee calculation purposes should be as that assigned on first licensing and not liable to amendment."	Ofcom agrees that the value of the availability factor for any given link will remain the one used during the assignment. In addition, Ofcom has included an algorithm within the availability factor which facilitates the interpolation/ extrapolation between the standard availability values (see paragraph 3.59 and Annex 3)
Antenna factor "This proposal does not address the fact that it is the basic RPE quality of the antenna that should be the main focus of this factor." "This factor is crude using bore sight gain as a proxy for antenna efficiency. It could be improved by including ETSI classification class to produce an efficiency weighted bore sight gain." "The antenna factor penalises those operators using antennas with above average quality and/ or performance efficiency. The algorithm encourages operators to use larger antennas."	Ofcom will delay the implementation of this factor until the next pricing review. In the meantime, Ofcom intends to conduct further research – in cooperation with the industry – into how this factor may be defined more satisfactorily (see paragraph 3.61).
Sharing factor "The manner in which the proposed sharing factor has been specified effectively defines all bands as "congested" and therefore subject to AIP. If the factor were to be implemented as proposed, then it should be automatically set to 0.5 for links in all "uncongested" bands." "The application of the algorithm to all frequency bands effectively results in all links operating in all areas being defined	Ofcom does not agree that all bands are defined as "congested" by setting a sharing factor at unity by default. Rather, this factor as proposed by Ofcom aimed to provide a discount for links that shared spectrum. (see paragraph 3.64) Ofcom agrees there are considerable complexities associated with the introduction of this new sharing factor. Ofcom has therefore decided not to

as operating in congested bands – unless one or both end(s) of the link meets the conditions for the sharing factor." "The sharing factor is unpredictable and lacks transparency as it depends on licence details of other operators at sharing sites." "The sharing factor is fundamentally flawed and should be removed; it results in unpredictability and in-transparency."	introduce this factor in the pricing algorithm at this time. Ofcom will further examine the merits and mechanism of a sharing factor for future implementation, in conjunction with the industry (see paragraph 3.65)
Additional factors suggested "The proposed algorithm does not include any mechanism to model the increased interference sensitivity and therefore higher C/I ratio and EIRP requirements of higher level modulation links." "The policy needs to be extended to provide reductions for lower level modulation links occupying the same bandwidth. Higher level modulation links for a given bandwidth are no longer being rewarded by reduced fees." "The algorithm does not recognise the hidden costs of radio equipment deployment in several frequency bands." "No reference is made to the use of fixed terrestrial radio links for disaster recovery."	If there is a strong industry view that certain factors need to be captured in the algorithm, then Ofcom is prepared to consider the introduction of such factors. Hence, Ofcom invites further discussions on the effect of higher/ lower level modulation links on spectrum efficiency (see paragraph 3.68). Ofcom does not agree that equipment costs should be included explicitly in the algorithm, as these will inherently be included in the setting of opportunity costs for spectrum (see paragraph 3.69). Licences and assignments for periods of less than a year, charged on a monthly basis, have been available for some time. Ofcom is not proposing to change its policy regarding such links (see paragraph 3.70).
Additional factors suggested – special circumstances factor "When two licences are issued to an operator for a pair of co-frequency cross-polar links, one of the link licences should have this factor set to 0.5." "One notable adjustment factor must be reintroduced if the prices are to lead to an efficient use of spectrum. There is a cost premium for equipment that permits co-frequency cross-polar links." "A unidirectional link should have this factor set to 0.75." "Remote rural fixed link locations should be considered for additional license fee discounts."	Suggested adjustment factors for a pair of co-frequency cross-polar links as well as for unidirectional links were already included in Ofcom's proposals and will remain unchanged (see paragraph 3.71). Ofcom agrees that a discount factor on the use of a channel in certain remote rural locations might be appropriate. Ofcom is currently in discussion with the industry to develop such a factor for specific geographical areas and expects to publish its proposals in the next pricing consultation (see paragraph 3.72).

Question 9 *(a) Do you agree with the proposals to make no changes to licence fees for satellite services – except an increase in the minimum fee to cover costs?*	
Three respondents. All respondents question the proposed level of increase on the minimum fee for a permanent earth station. "Agree with the proposal, although questions whether an increase of 186% is justifiable." "Increase seems very steep, especially in bands where coordination is not required." "No justification for a minimum fee, rather a minimum fee should be applied to the total annual fee payable."	Ofcom would like to point out that this increase is only applied to minimum fees, not to average fees, and still falls far short of the high cost of supporting satellite licensing. Ofcom intends to look more closely at ensuring the costs of licensing this sector are met in future and will making a more detailed statement on costs next year (see paragraph 3.78). This is a separate issue from the costs of satellite filing which Ofcom raised in the consultation on "procedures for authorisation of satellite networks" dated 4 February 2005.
Question 9 *(b) Do you agree with the proposed fees for the new licence classes within satellite services?*	
Two respondents. Both respondents agree with the proposed fees for the new licence classes (ESVs and AESs).	Ofcom will implement these proposals (see paragraph 3.79).
Wording of specific text "Respondent wishes to comment on paragraph 5.3.7 of the Consultation Document."	Ofcom considers that this paragraph was incorrectly worded and it was therefore an error to include it in the document. That said, Ofcom does not consider that the error has any impact on the proposals that it has decided to make (see paragraph 3.79).
Question 10 *Do you agree with the proposal for point to point security CCTV services to not make any fee changes?*	
Two respondents. Both respondents agree with the proposal not to make any fee changes.	Ofcom will adhere to this proposal (see paragraph 3.80).
Question 11 *Do you agree with the proposals for the non-auctioned broadband fixed wireless access to remain at current levels?*	
Six respondents. All respondents agree with the proposal to maintain fees at current levels.	Ofcom will implement this proposal (see paragraph 3.81).

Question 12 *Do you agree with the proposals for increasing PMSE fees to cover costs?*	
Fifteen respondents. Most respondents agree with the need to increase fees to cover costs, but question the level of the increase and suggest alternative (lower) increases. "Agree that any such fees should be cost reflective, on the assumption such cost levels will be efficiently and effectively managed." "Accepts to update the fees on the basis that Ofcom is liable for VAT and given the length of time since they were last updated. Not object to a one-off average 20% increase." "We support the proposed increase of 20% for 2005 as we fully understand the need to increase fees to meet contractor costs." "Agree with these proposals provided Ofcom ensures that these funds are used by JFMG." "Suggest that, at a time when programme-making costs are under pressure due to reduced commission fees, any increase is marginal rather than the significant increase proposed." "A 40% hike in the fees would severely impede our ability to continue a voluntary service." "Cannot believe an increase of 44% over two years is necessary or defensible." "We question whether an increase averaging 44% over just two years can be readily absorbed by the industry." "Ofcom has failed to provide any supporting evidence to justify 20% increases in both 2005 and 2006. Strongly urges Ofcom to limit the 2006 increase, and any subsequent increases, to no more than inflation." "JFMG estimates that a 27% increase in licence revenues from 2005 coupled with the 8% reduction in its own costs would result in the sector covering all costs by	Current PMSE licence fees do not provide enough income to even cover the current JFMG contract alone. Added to this the additional cost incurred by Ofcom's need to now pay VAT where the Radiocommunications Agency did not, and the total shortfall is considerable. The full extent of Ofcom's financial position with regard to PMSE will not be known until later next year when an entire year's spending of Ofcom's own costs can be analysed. Therefore, it is impossible to project the exact deficit and whether the 44% increase over two years will cover, or in fact, over recover costs. With this in mind, Ofcom has decided to go ahead with the proposed 20% increase in 2005, with a view to being in a better position of deciding the extent of further increases required in subsequent fees rounds. Ofcom will then also be able to consider the impact of reducing costs at JFMG and proposed reductions at Ofcom and any proposals JFMG may have for simplifying the approach to fees in this sector (see paragraphs 3.85, 3.90 and 3.91).

end of financial year 2005/2006." "Propose that the increase should be no more than to cover the essential cost base and that this should be introduced in two equal increases across the next two years of say 12%, a combined increase of 25%." "We would like to see the increase for 2006 limited to the underlining rate of inflation, or a maximum of 10%."	
Discounts for hospital radio "Would like to know if Ofcom would consider a discounted rate for hospital radio stations, as they are a not for profit broadcaster."	Ofcom will not implement discounts for hospital radio as this would have a detrimental effect on a class where Ofcom is not currently covering costs. JFMG licence a number of such customers on Ofcom's behalf, and introducing a charity status for these would result in an even greater gap in cost recovery (see paragraph 3.84).
Weighting and Carnet discounts "No rationale for the reduction in the discount for the carnet system, which penalises larger users such as BBC." "Larger users have long term requirements and make long term investments in equipment – meaning there is no flexibility." "We believe that the increase should be applied evenly across the range of fees rather than differentially." "JFMG is keen that UK Shared Radiomicrophone Licences should not be subjected to an across-the-board increase in fees. As these fees were set in 2001, it would not be justifiable to apply the full increase."	Ofcom believes that the weighting given to the proposed fees ensures a fairer distribution of costs than the introduction of the same increase across the board. In this weighting, Ofcom is seeking to enable the smaller users to continue operation with limited impact on their budgets, so as to encourage customers to use spectrum more efficiently. Ofcom understands the concerns regarding the reduction of the discounts for Carnets potentially distorting the weighting of fee increases. Nevertheless, Ofcom has decided to go ahead with the initial year's reduction in discount but intend to work with JFMG to re-address any potential distortions in the value of Carnets in Ofcom's further review next year. This later review will enable Ofcom to ascertain the impact of both the weighting and the Carnet discounts on the PMSE community as a whole, and reconsider if necessary (see paragraph 3.87).
Simplified fees structure "JFMG believes that the current structure would benefit from some rationalisation to reduce complexity and improve clarity."	Ofcom sympathises with the suggestion by JFMG to simplify PMSE fees in general, and will consider a new format in proposals for future regulations (likely to be in 2006) (see paragraph

"Ofcom is urged to fully re-design the fees tables to achieve the overall revenue increase required with due regard to usability in a dynamic operational environment."	3.87).
The future of PMSE spectrum "Continuing uncertainty about the future with JFMG contract ending march 2007. Recommend continuation of JFMG as the preferred SMO." "Looking forward, encourage ofcom to directly licence PMSE spectrum to local radio licensees, with an industry owned SMO responsible for the continued efficient use of such spectrum." "Concerned that the changes envisaged for the management of PMSE from 2007 onwards could reduce the security of tenure." "In danger of being overlooked and potentially squeezed out by other uses as liberalisation advances. Urge ofcom to undertake a strategic review of PMSE as soon as possible."	Although Ofcom welcome the feedback provided on these matters, full comments are outside the remit of the pricing consultation and this subsequent statement. However, Ofcom will take this feedback into account when considering any future policy decisions (see paragraph 3.89).
Question 13 *(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime communications?*	
Three respondents. All respondents agree with the proposal to not make any changes to current fees.	Ofcom will make no changes to fees in this band (see paragraph 3.93).
Question 13 *(b) What is your view on the appropriateness of introducing AIP in the future to some services in this sector, such as maritime business radio?*	
Five respondents. A small majority of respondents believes AIP is appropriate in this sector. "AIP should follow and distinguish between more/ less efficient use of spectrum to encourage migration from 25 kHz to 8.33 kHz channel space working." "Supports the principle of charging all users at least the opportunity cost of the spectrum they use." "The introduction of 8.33 channel spacing is an area where AIP could be considered to encourage the move to more spectrally	Ofcom will further research the appropriateness of AIP for these services. Ofcom will work with the CAA and the Maritime Coastguard Agency to consider future long term pricing proposals in this sector and return to this topic in a future pricing consultation (see paragraph 3.93).

efficient use of the band – although the benefits would be unlikely to be seen for several years. CAA would be happy to discuss with Ofcom the implementation of AIP." "Necessity should not be confused with ability to pay, and some users in this sector are already compromised." "Some of the users of those services are those who can least afford to pay increased charges."	
Question 14 *(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime radar?*	
Two respondents. Both respondents agree with the proposal to not make any changes to current fees.	Ofcom will take forward its proposal to not change any fees this time (see paragraph 3.95).
Question 14 *(b) To what extent do you believe there is scope for making use of aeronautical and maritime radar more efficient in future, through the introduction of AIP?*	
Five respondents. Most respondents believe there is scope for introducing AIP. "CAA would be happy to hold discussions with Ofcom about the suggestion that incentive pricing could be introduced to promote efficiency." "Supports principle of charging all users at least the opportunity cost of the spectrum they use." "In view of the increased usage of the radio spectrum and the pressure to maintain the minimum guard band size, in the interests of users adjacent to these guard bands any reduction in the out of band emissions would be welcomed." "Should only be considered if there is a demonstrable benefit in terms of improved protection of life & safety etc."	Ofcom will, in conjunction with the CAA, the Maritime and Coastguard Agency and other key parties, explore the extent to which there is scope for applying AIP to encourage spectrum efficiency in the future (see paragraph 3.95).
Question 15 *Are you content for Ofcom to consolidate the 5.8 GHz wireless access fees within the Licence Charges Regulations for 2005?*	
Seven respondents. The majority of respondents is content with the proposed consolidation.	Ofcom will implement this proposal and consolidate these fees within the Regulations (see paragraph 3.97).
Covering of licensing costs	Ofcom considers that the level of fees

"Understood that this area would be reconsidered at this pricing review as current fee structure does not actually recover the licensing costs."	is appropriate for the very light licensing regime and low costs involved now that the facility has been established. This new class has been inserted under Fixed Wireless Access (see paragraph 3.97).
Question 16 *Do you agree with the proposals for Science and Technology to maintain current pricing arrangements, at least until the NODL review is completed?*	
Six respondents. All respondents agree with the proposal to maintain current pricing arrangements. "There is no reason to change current pricing arrangements until the outcome of the NODL review." "Agree that the fees for T&D licences should be kept at a low level and based on cost recover. Such licences are extremely important to facilitate innovation."	Ofcom will implement this proposal (see paragraph 3.100).
Questions 17-23 *The remainder of the questions deal with longer term proposals regarding the applicability of AIP in the broadcasting sector. These questions and responses will be dealt with in a further consultation expected to be published later this year.*	
Ofcom received no objections to the short-term proposal to introduce a new licence class – Community Radio – with exactly the same fee structure as it uses for National and Local Radio services.	Ofcom will implement this new licence class and fee structure (see paragraph 3.103).

Annex 3

Fixed links algorithm

A3.1 Ofcom's final proposal for the fixed links fees algorithm, including all decisions made in this statement:

$$\text{Fixed link licence fee} = \textit{Spectrum price} \times \textit{Bandwidth factor} \times \textit{Band factor} \times \textit{Path length factor} \times \textit{Availability factor}$$

A3.2 An explanation of each of the factors in this formula is given below.

Spectrum price

A3.3 The spectrum price in the algorithm is set at £88 per 2x1 MHz of link bandwidth. This baseline spectrum price reflects the average level of congestion across all the available spectrum bands.

A3.4 In line with prices set for spectrum licences in other licence classes, this spectrum price is determined using an opportunity cost methodology, as proposed by Indepen.

Bandwidth factor

A3.5 As most point to point links operate bi-directionally with equal data rates on the "go" and "return" legs, the bandwidth factor is simply the bandwidth of either the "go" or the "return" half of the link in MHz. For example, a 2 x 28MHz bi-directional link would have a Bandwidth factor of 28.

A3.6 Uni-directional links are rare and effectively occupy half the bandwidth of the equivalent bi-directional links, hence it might be expected that the bandwidth factor used for these would be 50% of the equivalent bi-directional value. However, because the unused "go" or "return" leg may be difficult, or even impossible to assign to another user (as it can only be used by another uni-directional link in the opposite direction over the exact same path), Ofcom will only give a 25% reduction – i.e.: the bandwidth factor would be 75% of the equivalent bi-directional link value.

A3.7 When two licenses are issued to an operator for a pair of co-frequency cross-polar links, one of the link licences will have this factor set to 0.5.

A3.8 Fixed terrestrial radio links for disaster recovery, temporary links, and those that are to be decommissioned will continue to be charged on a monthly basis.

A3.9 This factor will have a minimum value of 1, meaning that any link with a bandwidth of less than 2x1 MHz will be rounded up to a bandwidth of 2x1 MHz.

Band factor

A3.10 The band factor provides a mechanism through which differences in the opportunity cost between spectrum bands are reflected in the spectrum fee. The band factor reflects the balance in supply and demand on a band-by-band basis, and as such the level of congestion. This balance of supply and demand varies band-by-band, as the nature of radio propagation in each band makes each band more or less suitable for certain links.

Band (GHz)	*Band Factor*
1.4	1.0
2	1.0
4	1.0
L6, U6	0.74
7.5	0.74
11	0.43
13, 14, 15	0.43
18	0.30
22, 23	0.30
25, 26, 28, 31, 32	0.26
38	0.26
50, 52, 55	0.17

A3.11 It might at first be thought the band factor for the 1.4GHz and 2 GHz bands should be higher than shown above. However, these bands are not what might be called “typical” fixed link bands since they have very limited spectrum available and so have to be restricted to low data rate, narrow bandwidth links. For this reason the band factor for these two bands is the same as for the lowest “real” fixed links 4GHz band.

Path length factor

A3.12 Ofcom operates a minimum path length (MPL) policy to conserve lower frequency bands for longer links which can be accommodated only in these bands. Whilst it will be Ofcom’s general policy to avoid making assignments where the link path length is less than the MPL, it will do so when requested. When such assignments are made, the path length factor adjusts the fee by placing a premium on the use of path lengths below MPL. This premium reflects the opportunity cost of spectrum, based on the extent to which shorter links deny spectrum to other users in that band.

A3.13 The MPL varies according to the frequency band and system type. The values for each band are listed in the table below.

Frequency (GHz)	Lower data rates	Higher data rates
	Minimum Path Length (km) Data rate < 2 Mbit/s	Minimum Path Length (km) Data rate ≥ 2 Mbit/s
1.4	No min path length	30
2	No min path length	30

Frequency (GHz)	Lower data rates	Higher data rates
	Minimum Path Length (km) Data rate < 140 Mbit/s	Minimum Path Length (km) Data rate ≥ 140 Mbit/s
4	24.5	16
L6/U6	24.5	16
7.5	15.5	9.5
11	10	6
13/14/15	9.5	5.5
17/18	4	2.5
22/23	4	2
25/26	3	2
28	3	2
31	0*	0*
32	2	1.5
38	0 **	0 **
50/52/55	0	0

* The 31 GHz band is used exclusively for point-to-point security closed circuit television links. As the cameras have to be placed where they are required, no minimum link length is applied.
** No minimum path length has been applied to the 38GHz band, as no reasonably priced equipment is available for the 50/52/55GHz bands. This will be regularly reviewed.

A3.14 Given the MPL for each band and system type, the path link factor will be calculated according to the following formula:

• if;	PL ≥ MPL, Path Length Factor = 1	When a link path length is at least as long as the minimum path length, the path length factor is equal to 1.
• if;	PL < MPL, Path Length Factor = SQRT (MPL/PL)	When a link path length is less than the minimum path length, the path length factor equals the square root of the minimum path length divided by the path length.

A3.15 The path length factor will be capped at 4. This means that all links having a path length (PL) less than 1/16th of the minimum path length (MPL) will have a path length factor of 4.

A3.16 A square root function (SQRT) is part of this factor to reduce the excessive effects of this factor at path lengths significantly less than the MPL. Radio wave attenuation with distance follows an inverse square law which means as the

distance increases, the power level decreases by the inverse square of the change in distance. As the factor applies a distance factor related to power, the reverse of a square – a square root – was considered appropriate.

Availability factor

A3.17 The availability factor determines the quality of spectrum a fixed link user receives (i.e. the probability that the fixed link user can receive a signal). A system availability requirement of 99.99% (sometimes referred to as "four nines" or "two nines") is the normal starting point when making assignments and is the most commonly requested value. However, other availability requirements are also available to suit customer needs. In developing the algorithm, the value of unity for the availability factor has been associated with the most common availability requirement (e.g. 99.99%). Higher (or lower) availability requirements attract a higher (or lower) availability factor, reflecting the opportunity cost of the spectrum denied to other users.

A3.18 Ofcom has defined three availability factors associated with three common availability requirements.

Availability Requirement	Availability factor
99.9%	0.7
99.99%	1.0
99.999%	1.4

A3.19 Other availability requirement values can also be requested, and the associated availability factor will be interpolated/ extrapolated using the algorithm below.

Availability Requirement	Availability factor
Availability ≤ 99.9%	0.7
99.9% < Availability ≤ 99.99%	0.7 + (Availability x 100 - 99.9) x (0.3/0.09)
Availability > 99.99%	1.0 + (Availability x 100 - 99.99) x (0.4/0.009)