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Date 8 August 1989

*Dear Secretary of State*

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**BROADCASTING: THE CHOICE OF FREQUENCIES FOR MVDS**

Your announcement on 27 April on the future of local television services narrowed the choice of frequencies for multipoint video distribution systems (MVDS) to two bands, at 12 GHz and 40 GHz, and announced a further period of consultation on the basis of a discussion paper to be published by my Department. We allowed until the end of June for this further consultation, and have since been evaluating the results. I am now anxious that we should make known our decision without further delay, and I seek your agreement, and that of our colleagues, to an announcement later this week on the lines of the attached draft.

You will see that my proposal is for a clear decision now to assign spectrum in the 40 GHz band for MVDS, but to hold open for a year or so a decision on whether to make spectrum in the 12 GHz band available also. Additionally, I believe that it is right to signal our intention to ensure that there is a reasonable provision of spectrum to meet the requirements of both cable and MVDS for wide-band microwave links to "trunk" programme material from a central point to a series of fixed distribution points.

A distillation of the evidence and representations which we received, and of the conclusions we drew from them is contained in the paper by officials which I also attach to this letter. It is clear that interest in the use of MVDS remains fairly low-key, but that those who see themselves as

prospective users attach particular importance to the ability to deliver 25 or 30 channels of entertainment, in line with

the capacity on their cable systems. This can only be accommodated at 40 GHz. We can make spectrum available in that band with little difficulty or cost - there are no existing incumbents and no pressing alternative demands for its use - and a decision now will enable an early start to be made on the considerable further development and investment in dedicated production facilities needed to bring equipment to the market place at commercially acceptable prices.

There is some evidence to suggest that MVDS at 12 GHz, although capable of providing far fewer channels, might nevertheless be well suited to particular applications. But the case has not yet been conclusively made, and a decision now would involve a difficult choice between MVDS and the possibility of additional DBS channels, either for the UK alone or through participation in the various pan-European DBS satellites currently under discussion. I do not think that we should close the door on the possibility of spectrum at 12 GHz for MVDS in addition to that at 40 GHz. Studies are in hand to explore the possibility that low-power MVDS may be able to share the same band with DBS, thus avoiding the need to choose between the two services (though either would give us the problem of finding suitable alternative spectrum for the outside broadcast links which are the current occupants).

We should know the results of these studies within about a year, by which time some of the international uncertainties surrounding the 12 GHz band may be rather clearer, and we may be able to gauge more accurately the strength of demand both for direct-to-home satellite services and for MVDS services after legislation. Because of the compatibility of DBS and MVDS receivers at 12 GHz, only a relatively short lead time should be needed to adapt DBS receivers for 12 GHz MVDS reception. There is, I accept, some risk that so long as spectrum at 12 GHz remains a possibility, manufacturers may hold back from developing 40 GHz receivers, and this might later put us under considerable pressure to make spectrum available at 12 GHz whether at that time we wished to do so or not. Despite that, I believe that the way forward I have proposed is preferable to ruling out now use of 12 GHz band either for MVDS or for additional DBS channels.

I am sending copies of this letter and of its attachments to the Prime Minister, the Foreign Secretary, our MISC 128 colleagues and Sir Robin Butler.

Yours sincerely  
Rosalind COT

[Approved by the Secretary of State  
and signed in his absence]

THE RT HON NICHOLAS RIDLEY MP  
Secretary of State for Trade and Industry





the department for Enterprise  
DRAFT ANNOUNCEMENT

The Government have decided that, subject to the necessary legislation the band 40.5 - 42.5 GHz will be assigned to the new Independent Television Commission for the local delivery of programme services by multipoint video distribution systems (MVDS). We have not however at this stage ruled out the possibility of also making available for MVDS spectrum in the band 12.1 - 12.5 GHz (the upper sub-band of the 12 GHz broadcasting band) once some of the uncertainties currently surrounding this band have been resolved, and if there is sufficient demand from prospective users of MVDS systems.

We have noted the considerable interest expressed by some cable operators in the use of microwaves for "trunking" programme services from a central headend to a series of fixed distribution points within their franchise areas, and we note that demand for this facility could increase substantially with the use of MVDS at 40 GHz. We are therefore taking steps to ensure that sufficient spectrum at frequencies suitable for such use can be made available to meet reasonable demands for this facility.

The publication of a discussion paper by my Department in May on the choice of frequency band for MVDS resulted in representations from more than 30 prospective users and other interested parties, including equipment manufacturers and existing users of the 12 GHz band. It is clear from these representations that those who see themselves as prospective users of MVDS attach great importance to the ability to deliver 25-30 channels of entertainment, in line with the capacity on their cable systems. It is only at 40 GHz that sufficient spectrum can be made available to accommodate this requirement. Further, the 40 GHz band has no existing incumbents, and there are at present no pressing alternative uses for it. It is internationally designated as a broadcasting band, and there is currently additional spectrum in a nearby band which could be used for later expansion of the service should demand so justify. The basic technology to operate at these frequencies is already in place, but significant further development and investment in dedicated production facilities will be needed if equipment at acceptable prices is to be ready in time for the first of the new-style local delivery franchises which, under the Government's proposed broadcasting Bill, would be permitted to use either cable or MVDS, or a combination of the two. It is for that reason that we have been anxious to give a clear-cut decision now in favour of 40 GHz as the main and long-term home for MVDS.

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the department for Enterprise

However some have argued that the limited service range of transmitters at 40 GHz, perhaps 1 - 1.5 miles, make it inherently unsuited to certain types of application, and that the significantly greater service range that could be achieved at 12 GHz using frequency modulation (FM), perhaps up to 10 miles, would be preferred by some operators even though the number of channels that could be accommodated within the available spectrum would be far fewer (perhaps 6-10). Additionally, others have suggested that amplitude modulation (AM) could be employed at 12 GHz (though not at 40 GHz). The use of AM at 12 GHz would again yield only a few channels, and at acceptable power levels would give a service range scarcely better than at 40 GHz, but would provide easy compatibility with existing cable systems, and as such might be preferred by some operators.

Unlike the 40 GHz band, there are within the 12 GHz band existing users, the outside broadcast links of the broadcasting organisations and British Telecom, for whom it would prove difficult to find alternative spectrum. No less importantly, use of the upper sub-band for MVDS is at present thought likely to rule out its possible use for additional DBS channels (the lower sub-band currently houses the United Kingdom's allocation of 5 DBS channels), and there are considerable uncertainties about future international developments in the band including the likely emergence of a number of proposals for pan-European satellites. It seems likely that within the next year or so at least some of these uncertainties may have been removed or clarified somewhat, including the technical possibility that low-power MVDS systems could share the upper sub-band with DBS channels, on which the Government have commissioned further studies. It should also be possible to gauge more accurately the developments of the direct-to-home satellite market. Because of the potentially high level of compatibility between MVDS receivers at 12 GHz and those developed for satellite reception, we believe that the need for an early decision on spectrum at 12 GHz for MVDS is less pressing. With the various uncertainties mentioned above, security of tenure would in any event be at best problematic. For these reasons we have decided to leave open for perhaps the next year a decision on whether spectrum at 12 GHz should be made available for MVDS in addition to the tranche at 40 GHz referred to above.

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THE CHOICE OF FREQUENCY BANDS FOR MVDS

PURPOSE

1 This paper addresses the choice of frequency band or bands for multipoint video distribution systems (MVDS) against the background of views received from prospective users of such systems and other interested parties. It examines the various technical parameters and other considerations, and looks at possible ways forward

BACKGROUND

2 The White Paper on broadcasting outlined the Government's proposals to allow the use of multipoint video distribution systems (MVDS) by local delivery operators (LDOs), but left open the choice of the frequency band or bands to be assigned to the ITC for this purpose. It did however mention four bands which had been canvassed as possibilities, namely 2.5 GHz, 12 GHz, 27-29 GHz, and 40 GHz, and invited the views of prospective users and other interested parties.

3 By the end of March very little feedback from prospective users had been received, despite a well-attended symposium on the subject organised by the Department. This lack of interest was generally ascribed primarily to the proposal in the White Paper under which cable operators who opted to make use of MVDS under the new regime would lose their existing right to retail the programmes on all their channels. There was wide agreement that this was too high a price to pay for access to MVDS, and that cable operators would as a result make no use of MVDS.

4 In his statement on local delivery services on 27 April the Home Secretary announced that the Government no longer intended to pursue the White Paper proposal for the separation of transmission and retailing. He also announced that against the background of the Government's firm proposals on local services there would be a further period of consultation on the choice of frequency bands for MVDS, based on a discussion document to be issued shortly by the DTI. Two of the earlier possibilities had however been withdrawn. The Government had concluded that:

".....the pressures on the 2.5 GHz band, the uncertainties surrounding possible future international developments and the limited amount of spectrum that could at best be made available combine to make this band unsuitable for MVDS. We have also ruled out the band 27-29 GHz since the 40 GHz band has similar characteristics and the significant advantages of larger amounts of spectrum, no existing incumbents and is, in

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part, internationally designated for broadcasting."

5 The DTI's discussion paper was issued on 15 May. It set out in some detail the DTI's assessment of the technical characteristics of the two remaining options, the bands at 12 GHz and 40 GHz, and invited comments on the choice between them by the end of June. A copy of the discussion paper is attached at Annex A, but in very general terms the differences between the two bands are described in paragraphs 6 and 7 below.

THE TECHNICAL OPTIONS

6 12 GHz. The band at issue is the upper half, or sub-band, of the 12 GHz broadcasting band, and extends from 12.1 GHz to 12.5 GHz. (The lower half of the band, from 11.7 to 12.1 GHz, is used to accommodate the UK's five DBS channels.) Using FM modulation, the available spectrum would give only a small number of channels (6-10) at each transmitter, but relatively large service areas (typically between 10 and 20 miles in diameter). Thanks to a high level of compatibility with the receiving equipment already developed for the direct-to-home satellite market, receivers could be available quickly, and at known (low) cost. Using this configuration, MVDS would be suitable for wide-area applications in which the number of channels was not seen as a crucial factor. AM modulation could also be used, and is heavily favoured by cable operators since it would provide compatibility with existing cable technology and would thus be a simpler, cheaper option for them. AM would at first sight enable considerably more channels to be extracted from a limited amount of spectrum, since each AM channel would occupy only 8 MHz as against 27 MHz for an FM channel. But the range of AM transmitters using acceptable power levels at 12 GHz would be severely restricted, and area diameters would be unlikely to exceed about 2.5 miles. Thus the higher total of channels would need to be shared between many more transmitters, and the number available at each would probably be lower than if FM were used. AM would be unsuitable for wide area coverage. Security of tenure for MVDS in the 12 GHz band would be uncertain - DBS systems have priority in the internationally agreed pecking order, and there are considerable uncertainties about future international developments in the band. However the real dilemma is that use of the band for MVDS is currently thought likely to rule out the possibility of additional DBS channels for the UK. Thus Ministers will need to weigh the value of the band for additional DBS channels against its value to MVDS either as the sole home or as a supplement to 40 GHz (in many respects the two complement each other nicely). Use of the band for either DBS or MVDS would create the difficult problem of finding suitable alternative spectrum for the existing users - the outside broadcast links of the BBC and independent television companies, and of British Telecom.

7 40 GHz. There would be little difficulty in making the band

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40.5 - 42.5 GHz available for MVDS. It is designated internationally as a broadcasting band, there are no existing incumbents and few if any pressing rival claims (though in a few years this spectrum might become as sought after as the lower reaches of the spectrum are today). 40 GHz could provide a lot of channels (perhaps up to 30 from a single transmitter), but has a very short range. Service areas might typically be around 2.5 miles in diameter (ie about the same as 12 GHz AM). There seems to be general agreement that FM modulation would have to be used at these frequencies. 40 GHz would appear ideal for covering, for example, a number of separate market towns, or (apart from the FM modulation) for using in conurbations in conjunction with cable. As with 12 GHz AM, it could not sensibly be used on its own to provide continuous coverage of large areas. Although the basic technology at 40 GHz is already in place (BT has both experimental and limited commercial systems in operation), doubts have been expressed as to whether the receivers can be cost-reduced sufficiently to be competitive with systems at lower frequencies, and if so, whether they could be available in time for the first of the new-style franchises.

### THE EVIDENCE

8 The 30 or so organisations which responded to the discussion paper may be categorised into four main groupings: prospective users of MVDS (in this case the cable companies both individually and collectively through the Technical Committee of the Cable Television Association); the manufacturing industry, collectively through the Electronic Engineering Association and also as individual companies both UK and overseas; other with a direct interest in the 12 GHz band either as broadcasters or programme makers or both (BBC, IBA, BSB, BT); and other interested parties (eg consultants).

9 It is perhaps reasonable that most weight should be given to the views of prospective users of MVDS. It is clear that the features they would like from MVDS, if it is to become a long-term component of the local delivery systems of the future, in order of priority, are a large number of channels (minimum 25-30), AM modulation and a reasonable coverage range from each transmitter. Unfortunately, the options on offer will not provide more than one out of three of these desiderata. Thus 40 GHz can provide the channels, but not the AM compatibility with cable nor the transmitter range; 12 GHz FM can provide the transmitter range, but not the number of channels nor the compatibility with cable; whilst 12 GHz AM can provide the compatibility with cable, but not in practice the number of channels nor the transmitter range. Because each of the three possibilities has such a substantial shortfall against the requirements of the cable operators, it is perhaps not surprising that their evidence carries generally a lack of conviction that any of the three would really be of very much use to them. Much the most coherent piece of evidence from

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this group came from United Cable, which argued for 40 GHz (as the only option offering adequate channel capacity) supported by adequate broadband microwave fixed links with which to feed the multiplicity of 40 GHz MVDS transmitters.

10 The manufacturers not unnaturally argued for whichever option would in their opinion give their respective companies the best competitive advantage. Thus there was support for 40 GHz (from Philips and NEC), for 12 GHz FM (from Marconi Defence Systems and, less forcefully, from GEC Plessey Telecommunications) and for 12 GHz AM (from Waves AB). Interestingly, one manufacturer (Ferguson) indicated no strong preference for either band, but argued strongly that the decision should be for one band or another to avoid fragmenting the market; whilst another (Thorn EMI) felt that spectrum should be made available at both 12 GHz and at 40 GHz on a "horses for courses" argument, which also suggests that both AM and FM transmissions should be permitted at 12 GHz. This was also the viewpoint convincingly put forward by the EEA.

11 Of the "other interested parties", BSB predictably argued against the use of any part of the 12 GHz band for MVDS, as did the broadcasters' Joint Frequency Management Group which attaches considerable importance to the outside broadcast links and other programme-making uses of the band. The BBC also argued against the use of the 12 GHz band, partly on the same grounds as the JFMG (of which it is of course a member) but partly on the grounds that there are alternative homes for MVDS - eg 40 GHz - but only one practicable DBS band available for possible later expansion of DBS services. The IBA on the other hand (which is also a member of the JFMG) supported the use of the 12 GHz band on the grounds that there is already enough satellite capacity, but no other sensible slot for MVDS!

12 The fourth category consisted of one engineering consultant who saw the major use of MVDS as providing "in-fill" for reception black spots created by obstacles such as high rise buildings, and who favoured the use of 40 GHz for this very localised application; and Dr Brian Evans, who was very active at the time of the Select Committee arguing the merits of digital transmission for television, and who maintains those views.

POSSIBLE WAYS FORWARD

13 The remaining paragraphs explore three possible ways forward. These are for Ministers to announce

a) that 40 GHz, supported by adequate spectrum for wideband trunking, will be the sole home for MVDS; or

b) that 40 GHz (with spectrum for trunking) will be made available as the long-term home for MVDS, but that 12 GHz

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will also be made available on limited security of tenure;  
or

c) that 40 GHz (with spectrum for trunking) will be made available as the long-term home for MVDS, but that the Government will consider further, when some of the current uncertainties surrounding the 12 GHz band have been clarified, whether supplementary spectrum at 12 GHz can also be made available.

14 Each of these three possibilities includes a commitment to make available a reasonable provision of spectrum for wideband trunking. This is a facility which the cable companies had asked for quite independently of MVDS. The White Paper on broadcasting, in refusing the use of MVDS in advance of legislation, said

"There has also been interest from one or two cable operators in using microwave frequencies to distribute services to a limited number of points within their franchise area, from which they would be delivered to individual households by cable. The Government will be prepared to consider proposals of this more limited nature on their merits, subject to the availability of spectrum."

Given the very small service areas of MVDS at either 40 GHz or at 12 GHz AM, it is difficult to see how a multiplicity of transmitters could be fed with programme material in a cost-effective manner without the use of wide-band microwave links. Although the bandwidth required for a 30-channel link is substantial (240 MHz), the very narrow pencil beams that can be employed with this form of transmission mean that with careful engineering very high reuse of the frequencies can be obtained. Although it seems possible that for purely cable purposes sufficient spectrum for trunking could generally be found from within the existing fixed link bands, this might well not hold true for the level of demand that might be generated by the use of MVDS. Additional spectrum would therefore need to be found. One possibility, though it will need further exploration, is that such links could share part of the satellite up-link band at 17 GHz. Nevertheless, it is difficult to believe that an offer of 40 GHz for MVDS would carry any real conviction unless accompanied by an offer of realistic provision of spectrum for trunking.

15 The case for the first of the three possible ways forward, namely 40 GHz only (plus trunking) would rest partly on the uncertainties and competing uses - actual or potential - for the 12 GHz band, partly on the fact that it is the only option which can provide users with what has emerged from their evidence as their main priority, a multiplicity of channels, and partly on the undesirability of fragmenting the market - if what will appear to some as a softer option (12 GHz) is, or even may be, on offer, it is rather unlikely that any manufacturer will risk the substantial investment in development and dedicated production facilities that

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will be needed to bring cost-reduced equipment to the market by, say, 1992 when the new-style franchisees are likely to need it. The main disadvantages are that 40 GHz could well turn out to be a higher cost option than 12 GHz; there are technological risks that development of the equipment could take considerably longer than currently anticipated, leaving an embarrassing vacuum in 1991 or 1992; costs and/or technical performance might turn out to be less good than currently expected; and by giving MVDS no choice we risk forcing it into a technology unsuited to commercial realities. It must be remembered that the prospective users whose views we have received are the cable companies. There may well be a new breed, at present unidentified, of operators for the new-style franchises whose views might differ significantly from those of the cable companies. The market for additional television services may also look very different by 1992.

16 The second option is that of offering 12 GHz on limited security of tenure in addition to 40 GHz. This might be defined from the outset as for example five or seven years; or might be left open, accompanied by a very clear warning that security of tenure could not be guaranteed because of the present uncertainties (some of which might be resolved within the next year or two). The case for this option is that it avoids the dangers of attempting to pick a single winner, and allows the market at the time to choose between the competing technologies. It might well be, as some have suggested, that there will in practice be separate markets for 40 GHz, 12 GHz AM and 12 GHz FM for different applications, though whether such fragmented markets would be sufficiently substantial to justify the development of specialised equipment for each (with the probable exception of 12 GHz FM where there would be a high degree of compatibility) is perhaps questionable. This option pre-supposes that Ministers will not see any pressing need for additional DBS channels for the UK within the next few years - and there is of course no guarantee that we should be successful in any bid which we might make. But such are the international uncertainties concerning the future use of this band that we could not in any event offer long-term security of tenure to MVDS even if Ministers were to decide against any additional participation in DBS. The main disadvantage of this route is that once a major public service became established in the 12 GHz band, it would inevitably prove difficult and highly unpopular to attempt to withdraw the spectrum at a later stage, no matter how compelling the arguments for so doing. But there is no doubt that a commitment now to permit MVDS at 12 GHz, albeit for perhaps a fairly limited period, would ensure that equipment at commercially acceptable prices could be available by the time that the first of the new-style franchises come on-stream. We would however need to address urgently the difficult task of identifying suitable alternative spectrum for the outside broadcast links currently operating in the band. It is likely that new equipment would have to be designed and manufactured for use in the replacement band, and this would clearly take some time. The argument for designating 40 GHz as

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well as 12 GHz under this option rests in part on the low opportunity costs of so doing, in part on the limited security of tenure of the 12 GHz band for MVDS, and in part on the argument of the cable companies that the channel capacity at 12 GHz is insufficient to meet their needs. Finally, if this way forward were to be chosen, there would appear to be every advantage in leaving it for the ITC to decide whether the modulation technique to be employed at 12 GHz should be FM, AM or a mixture of the two according to application and the franchisee's preference.

17 The third way forward would designate 40 GHz as the long-term home for MVDS, but would undertake to look again at the possibility of making supplementary spectrum available in the 12 GHz band once some of the uncertainties surrounding that band had been resolved in a year or two. The case for this approach rests in part on the fact that an early commitment is needed on 40 GHz if equipment is to be developed and brought to the market by the early days of the new-style franchises, whereas the modifications needed to satellite receiving equipment to make it suitable for MVDS in the 12 GHz band could be accomplished over a much shorter timescale; and in part on the difficulties of making a decision now on use of the 12 GHz band. There are a number of aspects to this latter point. The judgement we must make at present is that DBS and MVDS cannot share the same part of the 12 GHz band, and that a straight choice would therefore have to be made between MVDS and the possibility of an additional tranche of DBS channels for the UK. The DBS considerations are set out a little more fully in the following paragraph, and in more detail in the paper at Annex B, but the short point is that it is difficult to predict at this point in time how the direct-to-home satellite market will develop over the next year or two, and therefore to know how much value to attach to additional DBS channels. Equally, doubts about the future stem also from the present situation in Europe and the likely emergence of a number of proposals for pan-European DBS services. The same MVDS/DBS sharing problem will exist for the UK if we are to participate fully in these European projects. The position on all this may look rather clearer in a year or two. Technical studies are currently in hand to take forward some purely theoretical calculations that show that it might be possible to engineer low-power MVDS systems in such a way that they could share the same band with DBS. Clearly, if the theory could be validated by practical trials, the invidious choice between DBS and MVDS would no longer be necessary, and the opportunity cost of granting MVDS access to the 12 GHz band would be a great deal less. Once again, however, it is likely to be a year or more before we know the answers. Additionally, as will be clear from the earlier paragraphs of this paper, the enthusiasm for MVDS - at least at the frequency bands on offer - from prospective users has been less than overwhelming, and might be construed as an insufficiently convincing case for making valuable spectrum at 12 GHz available in addition to a generous tranche at 40 GHz. But, as also noted earlier, the only prospective users at present identifiable are the cable companies who will inevitably

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lean instinctively towards cable rather than MVDS. Within a year or so it seems likely that new local delivery interests will begin to emerge, and it should then be possible to gauge more accurately the strength of demand for MVDS, and the ways in which it will most commonly be deployed. The obvious and potentially serious downside to this approach is that as long as the possibility of a favourable decision on 12 GHz remains open, there must be a strong probability that manufacturers will hold back from committing themselves to the necessary 40 GHz development. This could mean that as the first of the new-style franchises begin to take shape there would be no 40 GHz equipment in early prospect; which in turn would place enormous pressure on the Government to make 12 GHz available, at least in the short-term, whether they by then wished to do so or not.

DBS

18 By far the major disadvantage of making spectrum available for MVDS in the 12 GHz band concerns our freedom of manoeuvre on DBS. As will be seen from the paper at Annex B, our only realistic options for additional DBS channels for the UK, whether at 31° W (the BSB position) or at any other orbital location, lie in the upper half of the 12 GHz band. Unless the study referred to above demonstrates otherwise, MVDS and DBS cannot coexist within the same half of the band (and for this reason MVDS could not share the lower half of the band with our existing five DBS channels). The straight choice is therefore between MVDS and DBS in the upper half of the 12 GHz band, and either will involve the displacement of the outside broadcast links currently housed there. There are also longer-term international uncertainties about the future use and development of the 12 GHz band. There have been proposals for DBS satellites with pan-European beams, using channels in both halves of the band. MVDS in the upper half could substantially inhibit UK participation in any of these developments that may come to fruition. A continuing possibility is international pressure to replan the whole band to accommodate wide-bandwidth high definition television (HDTV). All these uncertainties make it most unlikely that other administrations would follow us into use of the 12 GHz band for MVDS.

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## THE CHOICE OF FREQUENCY BAND FOR MVDS: A DISCUSSION PAPER

In the White Paper on broadcasting, published last November ("Broadcasting in the '90s: Competition, Choice and Quality" Command 517), the Government set out suggestions for a new local services regime and undertook to bring forward firm proposals for legislation after a suitable period for consultation. The Government's proposals, which as a result of representations made during the consultation period contained a number of significant changes to the original suggestions, were announced by the Home Secretary on 27 April. On the choice of frequencies for MVDS he said

"We have given further thought to the choice of frequencies for MVDS. We have concluded that the pressures on the 2.5 GHz band, the uncertainties surrounding possible future international developments and the limited amount of spectrum that could at best be made available combine to make this band unsuitable for MVDS. We have also ruled out the band 27-29 GHz since the 40 GHz band has similar characteristics and the significant advantages of larger amounts of spectrum, no existing incumbents and is, in part, internationally designated for broadcasting.

"The White Paper also canvassed the possibility of frequencies being made available in the 12 GHz band. This band and that at 40 GHz have different characteristics and competing advantages and disadvantages. We shall need to consider further from which band, or bands, frequencies should be allocated to MVDS. In order to assess the reactions of potential users, now that we have put forward these firm proposals on local services, the Department of Trade and Industry will issue a short discussion paper early in May. We fully recognise the undesirability of continuing uncertainty over the choice of frequencies for MVDS, but this is an important decision which needs to take account of the interests of all parties, including other potential users of the spectrum, from whom the Government would welcome views."

The characteristics, and some of the pros and cons attributed to them, of the bands around 12 GHz and 40 GHz are set out in greater detail in later paragraphs. In many ways the 40 GHz band looks the more attractive option. There are no existing incumbents, and no immediately pressing rival claims (though this situation could of course change); and as a result the Government could readily assign sufficient spectrum to provide the 20-30 channel capability that some have argued would be necessary if MVDS is to play a long-term role in the local delivery franchises of the future. It would seem ideal, for example, for covering a number of separate market towns, or for use in conjunction with cable in conurbations. But the service area of a 40 GHz transmitter would be small (perhaps 2.5 miles in diameter), and there are doubts as

to whether MVDS in this band could be sensibly used to provide continuous coverage of large areas. Although the basic technology is already in place, doubts have also been expressed as to whether the cost of receivers can be reduced sufficiently to be competitive with systems at lower frequencies, and if so whether they could be available in time for the first of the new-style franchises.

It is for these reasons that the Government has not at this stage ruled out the option of frequencies in the 12 GHz band, although there are a number of substantial disadvantages. First, MVDS systems in this band might be restricted by the amount of spectrum available to as few as 6 channels. Second, security of tenure in the band could be limited. Direct Broadcasting Satellites (DBS) generally have priority in this band, and there are considerable uncertainties about future international developments. And third, there are existing users for whom alternative acceptable frequencies would have to be found. Nevertheless, MVDS transmitters at 12 GHz could serve areas of at least 10 and perhaps up to 20 miles in diameter. Some have argued that this characteristic makes the band better suited to continuous coverage of large areas than 40 GHz, and that if FM were to be adopted as the transmission mode, MVDS receivers could benefit from some commonality with satellite receivers.

It is of course open to the United Kingdom to bid for additional DBS channels in the 12 GHz band. Should the Government wish to do so, they would be faced with a direct choice between using the band for additional DBS channels or using it for MVDS, since there appears to be little chance that the band could accommodate both systems. We therefore need to be clear, before final decisions are taken on the choice of frequencies for MVDS, whether the particular advantages of the 12 GHz band over that at 40 GHz are widely regarded - despite the limitations and restrictions referred to above - as of paramount importance to MVDS.

12 GHz. This is the upper half (12.1 - 12.5 GHz) of the 12 GHz broadcasting band: the lower half is already used to provide the UK's five DBS channels, and could very probably not accommodate MVDS as well. The available spectrum could in theory give nationwide coverage of five or six MVDS channels, or perhaps nearly twice that number if the promise of new technology over the next year or two is fulfilled. Using present FM technology would reduce any technological risks. Consumer receiving equipment has already been developed for satellite reception in the adjacent bands. It is cheap today, and should, some argue, benefit further from additional economies of scale if MVDS were housed at 12 GHz. But in practice the pattern of local franchise areas could lead to considerable problems of overlap, and even within nominal coverage areas some 20 - 30% of households might be unable to achieve the necessary line-of-sight between their receiving aerial and the MVDS transmitting aerial, and so would not receive the service

(though of course there would be scope to make good these gaps in coverage with cable). And if these frequencies were used for MVDS, this would effectively rule out the possibility of additional DBS channels for the UK. This latter possibility could also give us five (or perhaps more) nationwide channels but, unlike MVDS, DBS channels would be genuinely national, receivable by almost all households at the outset.

There are considerable uncertainties about future international developments in this band, including various proposals for multichannel DBS satellites with pan-European beams. MVDS in this band could substantially inhibit the UK's freedom to participate in such developments. And because DBS allocations under the international plan drawn up in 1977 have precedence over other services, MVDS coverage in certain areas - for example the South East - might have to be significantly curtailed either from the outset or at some future date.

Some have argued that AM transmission could be used at 12 GHz on the grounds that this would give more channels from the available spectrum than FM (perhaps 12 channels rather than 6), and would be more readily compatible with cable systems. Others dispute this, arguing that AM at these frequencies would require unrealistic levels of transmitter power; that in practice MVDS at 12 GHz using AM would have a range scarcely better than that at 40 GHz; that a special line of equipment would need to be developed (thus losing much of the commercial synergy with satellite receivers); and that AM would not be "future proof" compared with FM in terms of such developments as enhanced definition television.

40 GHz. This is the broadcasting band 40.5 - 42.5 GHz. There is sufficient spectrum here to permit true multichannel capability - perhaps 20 to 30 channels from any one transmitting site, although not on the basis of continuous coverage of large areas. It has been suggested that this would enable a local delivery franchisee to integrate MVDS fully with cable (except of course that MVDS would not have an interactive capability) in offering throughout his franchise area single-point entry of the range of satellite and terrestrial programme services. We are told that such a facility is increasingly seen as an important marketing strategy for local delivery systems at a time when the public may be confused by the incompatibility of satellite transmission standards, encryption technologies and orbital positions. It also has important environmental advantages in reducing the proliferation of satellite and UHF aerials that will otherwise result. The band has no existing incumbents (unlike the 12 GHz band, from which the outside broadcast links of the broadcasters and British Telecom would have to be moved), and there is currently additional spectrum in a nearby band which could later be used for expansion of the service should demand justify this (again in contrast to the 12 GHz band, where there is no such scope for possible later expansion).

There may however be limitations on the way in which MVDS at 40 GHz could sensibly be used. The propagation characteristics and achievable power at these frequencies reduce the service area of a transmitter to a diameter of perhaps 2.5 miles. This compares with service area diameters of perhaps 10-20 miles at 12 GHz, whilst the distances that must be allowed before a frequency can be re-used at another transmitter are similar for both frequency bands. It has been argued that this makes MVDS at 40 GHz unsuitable for continuous coverage of large areas because in such circumstances large numbers of transmitters would be needed, and the infrastructure costs - particularly those of feeding each transmitter with programme material - would inevitably rise. Equally important, with so many transmitters in close proximity, the number of channels available from each would have to be substantially reduced. Continuous coverage of the conurbations could be achieved by a judicious mixture of cable and MVDS: in this way MVDS transmitters could be placed at greater distances from each other, allowing each to have more channels without interference, and each could be fed from the cable network. And MVDS at 40 GHz is seen by some as ideally suited to provide coverage in, for example, a franchise containing a number of small market towns, none of which might prove economic to cable.

There is one further important reservation. The basic technology to operate at these higher frequencies is now known and understood. Indeed, British Telecom have had for some time both commercial and experimental systems in operation. But these are essentially one-off, and therefore very expensive. A major further investment in development and in specialised production facilities seems necessary to achieve low-cost volume production for the consumer market. Manufacturing interests have told us that an early decision in favour of 40 GHz would enable equipment to reach the consumer market by late 1991 or soon thereafter. Others see a risk that this timescale will prove over-optimistic, and that if expressions of interest from potential customers do not come through quickly or strongly enough, the manufacturers may hold back from committing themselves. Either way, there is a danger that by the time the ITC has awarded the first of the new technology-neutral franchises (perhaps during 1991), no MVDS equipment will be available. A further argument is that a decision to make spectrum available in the 12 GHz band as well as at 40 GHz would, by fragmenting the market, add to the risk that manufacturers will hold back from committing themselves to the development and production of 40 GHz equipment.

Radiocommunications Division  
Department of Trade and Industry  
15 May 1989



## RESTRICTED

## POSSIBILITIES FOR ADDITIONAL UK DBS CHANNELS

Note by the Department of Trade and Industry

## THE ISSUE

1 This paper re-examines the possibilities for seeking additional DBS channels for the UK following the WARC ORB 88 Conference, taking into account the outcome of the Conference and other developments in the DBS field.

## RECOMMENDATION

- i) That the issues of MVDS and additional DBS channels be considered together:
- ii) That the decision to press for additional DBS channels taken last year be confirmed:
- iii) That if MVDS does not operate in the upper 12 GHz DBS sub-band, negotiations for additional channels be initiated as follows;
  - a) at 31°W, for 5 channels in the upper DBS sub-band, or
  - b) at certain positions East of 31°W for 10 channels in the upper DBS sub-band (of which 17°E is within range of an appropriate Astra antenna)
- iv) That whether or not MVDS operates in the upper DBS sub-band, the possibility be pursued for some arrangement with the Irish for use of their 5 channels in the lower DBS sub-band at 31°W; and that Europesat, Kepler Plans be tracked as these systems may offer alternative solutions, albeit at positions of 29°E and 28.5°E, respectively.

## BACKGROUND

2 Ministers took a decision in April last year that they would like the UK to have at its disposal some additional DBS channels, and that if at all possible they would like to have them at 31°W. Officials later suggested to Ministers that it would be best to wait until after WARC ORB 88 before embarking on this quest. One argument was that an immediate approach, if successful, would represent in effect a public commitment to bring in new DBS channels by 1993 (5 years after the initial notification to the IFRB). This was seen in policy terms as undesirable (especially against the background of the then moratorium in favour of BSB), and in practical terms as virtually impossible. We held out the (faint) hope that WARC ORB might be persuaded to extend the five year time limit to one of eight years. We also promised to advise further on other aspects in the light of the outcome of the Conference.

3 In the wake of the Conference we can now advise Ministers that WARC ORB was after all persuaded to extend the five year time limit to eight years, thereby removing a major obstacle to an early application for additional DBS channels if Ministers are still so minded.

4 In the meantime BSB have asked for the moratorium to be scrapped, and for the additional two UK DBS channels to be brought into operation as quickly as possible. They now clearly see that in order to compete with Astra's multi-channel capability, they need more than three channels at 31°W, even if some of those channels are run by competitors. So additional channels at 31°W, and the sooner the better, are now seen as helpful to the BSB cause; but

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additional channels elsewhere - most especially at or near Astra's 19°E - would be quite the reverse.

5 There is the apparent possibility of securing additional channels at 31°W and of keeping our options open in the upper DBS sub-band by doing a deal with the Irish. Out of the blue, the Irish Minister of Communications suggested - or appeared to be suggesting - some form a deal at a meeting in the UK of TV advertisers. This interesting lead was followed up in November by a written request (from the Home Office) for clarification of their ideas, a formal response is still awaited. Irish officials, with whom more recent informal contact has been made, have been much less forthcoming than their Minister and it is far from clear that progress with this option will be possible and as to what such a deal would actually mean in practice.

6 There have been a number of wider developments since we last reported, including the EUROPESAT and KEPLER initiatives referred to in paragraphs 18-22 below.

7 Brief details of the WARC 77 and 88 Plans are given in Annex 1 for information.

### DISCUSSION

#### The case for more channels

8 Ministers felt if there were channels available for the asking it would be sensible for the UK to put in a bid against future commercial interests.

9 There appears to be considerable interest in the 2 remaining UK DBS channels and indeed we understand there is heavy demand for the 16 Astra channels.

10 Regulated DBS at 31°W with only 5 channels begins to look a bit thin when compared with Astra's unregulated 16 channels - additional regulated DBS channels at 31°W would help to even things up.

The following paragraphs consider the issues relating to our recommendations:

#### MVDS

11 It should be noted that MVDS operation in the upper DBS sub-band would rule out DBS reception therein (the issue of MVDS is however addressed in detail in a separate DTI paper). Clearly therefore the issues of MVDS and additional DBS will have to be considered together.

#### International Considerations

12 The successfully negotiated extension to eight years for the time period between notification to the IFRB of intention to modify characteristics in one of the Regional Plans and its bringing into use, presents a more realistic timescale for the considerable negotiations required in the securing of additional DBS channels. However, it is stressed that prospects of securing additional channel assignments at 31°W, or any other position, relies not only on successful engineering negotiations but equally (and probably more so) on the political will of Administrations whose existing or planned DBS or terrestrial services may potentially be affected by such assignments. Without showing our hand it is difficult to judge reaction to any UK request for more channels at 31°W but some opposition may come from those Administrations sharing the position (eg Spain, Portugal and Ireland). It is equally

difficult to judge reactions to any UK request for more channels at other orbital positions: Both options will potentially affect a large number of European Administrations (both Eastern and Western). A clearer assessment of prospects for success, from a political standpoint, can only be made once we enter bi-lateral discussions following us showing our hand.

#### The Upper DBS sub-band at 31°W

13 As indicated at Recommendation (iii)(a), if MVDS is not to operate in the upper sub-band there are prospects for negotiating the use of 5 additional vacant DBS channels at 31°W, with the advantage that UK viewers wishing to also receive BSB would be able to do so without the need for additional or steerable receiver dishes.

14 However, there are national sharing considerations should additional DBS channels be secured in the upper sub-band. This band is presently used for OB links (outside broadcast) by the IBA, BBC and BT, some of which have or are about to migrate from the lower sub-band due to sharing problems with the existing UK DBS assignments therein: In fact there is an agreed 100MHz guard band between OB links and the highest UK DBS channel assignment (ie from 12.1 to 12.2 GHz. It follows therefore that similar DBS/OB sharing problems would arise if DBS channels were to be successfully negotiated in the upper sub-band. The result would be that OB use would once again have to migrate elsewhere in the spectrum. Such OB users are unlikely to greet this prospect happily, and it is not clear if and when the required spectrum would be found.

#### Positions other than 31°W

15 As noted at Recommendation (iii)(b), the possibility exists to negotiate the use of vacant channels (those unassigned to any Administration) at other positions than 31°W. However, those further west have greater interference potential to other services within Europe, due to the beam footprint stretching across Northern Europe. On the other hand, those further east have less interfering potential due to the beam footprint overspilling across the Northern Atlantic toward the Arctic Ocean. Either way, an additional receiving dish would be required if the UK viewer wished also to receive BSB from 31°W.

16 The search for vacant channels revealed three positions, other than 31°W, with engineering prospects for a DBS service to the UK, namely 7°W, 17°E and 23°E. At 7°W the 5 possible channels are in the lower sub-band. At both 17°E and 23°E the 10 possible channels are in the upper sub-band. Because the 17°E position also has the feature of being within 2° of the Astra position at 19°E, a single antenna of appropriate configuration would probably cover both positions though an additional LNB and set top box would be needed - Astra transmissions are in a different format, different polarisation and are not in the DBS band. As the 7°W position only offers prospects of 5 additional channels and requires an additional or steerable receiving dish this option is less attractive than 17 or 23°E.

#### The Lower DBS sub-band at 31°W

17 As indicated at Recommendation (iv), the only possibility for additional channels in the lower sub-band at 31°W is by negotiating an arrangement for sharing the 5 Irish channel assignments. This would necessitate an extension to their beam footprint such that the potential interference into the DBS assignments of our European neighbours would be significantly increased (ie to France, West Germany, Portugal, Luxembourg and Norway). However, a suitably

modified Irish beam, although not serving the UK in the same way as the UK beam, could provide a service to major population centres, such cover being limited, especially in the South East, by interference into and from West Germany. One main advantage with this option is that it is at BSB's position of 31°W, and is in the same lower sub-band: It also has no national sharing implications as identified with the upper sub-band (as described in paragraph 14). As noted at paragraph 5, informal contact with Irish officials means that it is far from clear that progress with this option will be possible.

#### EUROPESAT

18 An alternative to the "national" approach to securing additional DBS channels is the "multinational" approach taken by Eutelsat in their EUROPESAT study.

19 This concept does also serve to illustrate the magnitude of the engineering and negotiating task referred to in paragraph 12. The feasibility of this second generation pan-European medium power DBS system at 29°E has been the subject of a three year study which concludes that due to significant potential terrestrial interference problems (even with a satellite power 1/5 of BSB's) the goodwill of a large number of Administrations (greater than 30) would be necessary in order to bring it to fruition. Here the goodwill extends to some Administrations effectively having to relinquish National Plan assignments in favour of the greater European good.

20 However this concept, if sufficiently supported, does hold out the prospect of a large number of additional DBS channels (up to 30/40) for second generation DBS systems by the mid-nineties, these channels to be divided between EUROPESAT participants. The project is still under discussion within Eutelsat. The main interest was being shown by FRG with most other Eutelsat Members making sympathetic noises but without commitment (this includes the UK (BSB)). However, the FRG are now favouring a different approach for second generation DBS, separate from Eutelsat, please see the following paragraph on the KEPLER Satellite: This does not bode well for EUROPESAT at 29°E.

#### The FRG KEPLER Satellite

21 A further example of a multinational approach to additional DBS channels is that of the FRG. We have recently been advised that they have notified to the IFRB their KEPLER satellite system which they tell us is aimed at testing the political will of Administrations in supporting a second generation medium power DBS System (on a smaller scale to that of the EUROPESAT System). The system is to be located at a non-WARC 77 Plan position of 28.5°E. It has a stated coverage extending over West and Central Germany, Northern Italy, France, Benelux and Southern UK, with a capacity of 20 medium power DBS channels in addition to a number of Astra type channels in the adjacent satellite telecommunications band. In broadcasting policy terms this would make KEPLER an interesting hybrid of regulated DBS and unregulated Astra type facilities.

22 We are currently awaiting details from the FRG on this development. Indeed the FRG wish to talk further with the UK, France and Italy with a view to forming a working group to discuss the utilisation of the KEPLER satellite.

#### HDTV

23 Wide-band (second generation) HDTV is the long term objective for broadcasting world wide. This could be accommodated in the existing 12 GHz DBS band, if it were to be replanned.

24 The development of additional DBS channels based on the existing 77 Plan, which utilises the 12 GHz DBS band, would make the prospect of replanning the band unattractive, particularly as the Plan can accommodate the narrow-band first generation HDTV system developed by EUREKA (by virtue of bandwidth compression). It follows therefore that if the band is not to be replanned then attention must be focused on the range 12.7-23 GHz identified at the ORB '88 Conference for wide-band HDTV with consequent implications for Mercury and BT who currently use the major part of the band.

25 A clearer picture of the likelihood of a new band for HDTV will come from the ITU Plenipotentiary Conference (May 89) when decisions on future planning conferences are taken. The UK is advocating a spectrum planning conference in 1992. It is possible that HDTV might be on the agenda.

10 MARCH 1989

THE WARC 77 PLAN

1 Planning in the 12 GHz DBS band at WARC 77 was carried out largely on a geometric basis resulting in Administration's channel assignments at orbital positions uniformly spaced at 6° around the geostationary orbit. Channel assignments are made in groups of 5 with each channel in the group spaced by the equivalent of 4 channel widths; each group being named after the lowest channel number in the group. (eg the UK Channel Group 4 comprises channels 4, 8, 12, 16 and 20 at an orbit position of 31°W).

2 The DBS band is also effectively divided into two 400 MHz sub-bands, the lower sub-band spanning 11.7 to 12.1 GHz and the upper sub-band spanning 12.1 to 12.5 GHz: Channel Groups 1 to 4 are thus in the lower DBS sub-band and 21 to 24 are in the upper DBS sub-band.

3 These sub-bands facilitate planning of terrestrial services which share the band on an equal basis. In the UK, terrestrial services are migrating from the lower sub-band to the upper sub-band for this very reason.

4 The 77 Plan also contains a number of unassigned (vacant) Channel Groups at several orbital positions including 31°W. The prospects for utilising these vacant Channel Groups are severely constrained by either the potential interference in the group (due to existing Plan assignments), or by the stringent Plan modification procedures, or a combination of both; it should be noted that the aim of the Plan modification procedures is not only the protection of DBS Plan assignments but also the protection of terrestrial services which share the 11.7-12.5 GHz DBS band on an equal basis. In other words, the Plan is not designed to allow easy new or modified use in the band.

5 The search for channels was constrained by their ability to support a satellite beam which would serve a reasonable proportion of the UK population without suffering excessive interference, and without causing unacceptable interference to the DBS or Terrestrial Services of other Administrations in ITU Regions 1 and 3<sup>1</sup>.

THE WARC 88 PLAN

6 The 17 GHz 88 Plan is basically a linear translation of the 12 GHz 77 Plan, with national Uplink assignments matching their Downlink assignments (eg, for the UK, Channel Group 4 at 31°W). However, the Spanish and Portuguese have two assignments, one in both the upper and lower uplink sub-bands at 31°W; these are to serve the mainland and their Island groups (Canaries and Azores, respectively). This (non linear) feature of the 88 Plan, along with others, adds further complexity to the 88 Plan analysis. This could mean we would need to adopt similar ideas in support of securing additional downlink DBS channels.

7 Stringent Plan modification procedures are prescribed similar to those of the 77 Plan, with the same objectives.

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<sup>1</sup> It should be noted that the search was not constrained by possible interference into Region 2 (the Americas), however, no significant problems are anticipated: this aspect needs further study.

