

## **Response**

**to the Radiocommunications Agency Consultation  
Document:**

**“Use of Licence-Exempt Spectrum  
for Provision of Public Telecommunication Services”**

**of October 2001**

**by**

**Megabeam Networks Limited**

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**Megabeam Networks Limited  
7/8 Kendrick Mews  
South Kensington  
London SW7 3HG**

**[www.megabeam.com](http://www.megabeam.com)**

**Contact:  
G. K. Smith, CTO  
020 7590 8811  
ksmith@megabeam.com**

## **Response to the Radiocommunications Agency Consultation Document “Use of Licence-Exempt Spectrum for Provision of Public Telecommunication Services”**

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This response is submitted by Megabeam Networks Limited (MNL).

### **Summary**

Megabeam is pleased to have this opportunity to provide inputs to the Radiocommunications Agency in this Consultation. We consider the Consultation very important and timely for the development of new services and business models for telecommunications in the UK.

We have reviewed the Questions contained in the Consultation Document and have attached herewith our responses, considering also the three Scenarios presented in the document.

We have made use of, and reference to, the ‘Mason Report’ commissioned and made available by the Agency<sup>1</sup>. Our own analyses and conclusions in most respects very closely match the conclusions of that report. We appreciate the Agency’s making that report generally available.

Megabeam has focussed its attention in this response on the 2.4GHz and 5GHz licence-exempt bands, as described below. For these bands, Megabeam is strongly in favour of the Agency’s Scenario 3; that is in permitting public telecommunications services in these bands without a WT licence, but with base station registration. Megabeam is also of the view that the necessary changes in regulations should be completed as early as possible, and that in the meantime a temporary licensing process be maintained.

### **Company Background and the Importance of this Consultation**

Megabeam was incorporated in 2000 with the purpose of enabling local wireless access to wideband data communications services throughout Europe, in locations frequented by business travellers and the general public, using existing wireless technology operating in licence-exempt spectrum. Permission to operate public telecommunications services in licence-exempt spectrum is therefore vital to the development of its business in the UK.

A separate document describes in more detail Megabeam’s service proposition, programme status, and market estimates. Megabeam is also prepared and willing to enter into review with the Agency on the details underlying this Response.

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<sup>1</sup> RADIOCOMMUNICATIONS AGENCY: SPECTRUM MANAGEMENT STRATEGIES FOR LICENCE-EXEMPT SPECTRUM: FINAL REPORT by MASON COMMUNICATIONS LTD AND DOTECON LTD. November 2001

## **Innovative Service Opportunities**

Megabeam is convinced that permission to operate public telecommunications services in certain of the bands identified by the Agency will open the way for innovative, broadband services and business models, which would not otherwise be feasible in the UK.

These services most importantly include provision of wireless access to broadband Internet services within limited areas used by business travellers and the general public, based on available wireless technology. Portable devices, such as laptop computers, with wireless capability, communicate by wireless means to 'access points' (APs) which in turn provide broadband access to the Internet. The services are nomadic rather than mobile, and are currently being implemented in many countries, for example in the USA and in Scandinavia. It is therefore important for UK business that they become available here too.

In addition to their innovative nature from the viewpoint of the end-user, these services provide opportunities for radically new business models: they also allow new service providers to enter the market at reasonable cost, which in turn will stimulate competition.

## **Frequency Bands and Technologies Addressed in this Response**

Megabeam does not plan to limit its wireless access services to one specific licence-exempt band or technology. Its aim is to support the widest range of services to the maximum potential number of users, cost-effectively. The service approach is therefore premised upon users already owning wireless devices which are connected to, or integrated with, laptop computers and personal digital assistants (PDAs). The associated wireless equipment for users is in all cases type-approved, and mass-produced.

For these reasons, the bands of most interest to Megabeam for service development in the UK are those for which affordable wireless terminal equipment is, or soon will be, available, and this applies particularly in the range 2400-2483.5MHz ('2.4GHz') and 5150- 5875MHz ('5MHz').

Megabeam considers the 2.4GHz band is the appropriate band in which to launch broadband public wireless access in the UK, using the IEEE802.11b technical standard, because of the maturity and wide international acceptance of the technical specifications, the low cost of approved wireless equipment, and the wide international availability of this band for this purpose. The availability of this band will therefore allow UK users to enjoy international roaming for this type of service, and will allow visitors to the UK likewise to obtain similar services to those they use at home.

Megabeam however believes that it is vital to plan, and is planning, to extend service into the 5GHz bands, consistent with service growth and demand. The 5MHz bands are currently the subject of a separate Consultation in respect of Technical Requirements. Megabeam will comment separately on that consultation, but considers it vital that technical requirements be established for the UK which permit the greatest possible opportunity for economies of scale in wireless equipment.

Responses to the Agency's structured Questions are given below.

**Q1: *What are the potential gains and benefits to the UK of allowing commercial services in licence-exempt bands, in terms of new innovative services (business models), promoting competition, and making Britain the best place to do e-business?***

Allowing commercial services in the licence-exempt bands would stimulate the introduction of innovative high-speed wireless Internet access services in 'hot-spot' locations. Under this hot-spot location model, customers of the service will use their own existing portable devices ('client devices' – for example, laptop computers and PDAs) to gain access to the Internet, and hence secure access to their corporate networks, when they are travelling and out of their normal office environment. Typical hot-spots are airport lounges, railway stations, hotels, conference venues, and ultimately even coffee-shops: in fact, any location where business travellers and commuters tend to linger and congregate.

The basic business proposition for these people and their employers is that convenient, high-rate Internet access can dramatically improve the effectiveness of time spent out of the office, converting waiting-times into potentially productive 'connected' working sessions. Megabeam has conducted hundreds of interviews with the owners of 'hot-spot' locations and with business travellers and their corporate employers, and is convinced that there is a large pent-up demand for such services. A major enabler for the services is the availability of reasonably-priced wireless access functions for client devices. Increasingly, these are being built-into higher-end devices such as laptops, but are most widely available in PCMCIA card format which will permit virtually any modern laptop device to have access to a wireless network.

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Megabeam has developed its business plan around the hot-spot access proposition, on a Europe-wide basis, and over the past two years has agreed service models with location owners and with potential users of wireless Internet access. These agreements cover thousands of potential locations throughout the UK and continental Europe. Megabeam is currently introducing services in Continental Europe, where the regulatory climate is generally permissive, and is conducting tests using a pilot system at sites in the UK: however for as long as commercial operation is precluded in the UK, the UK will continue to lag behind the rest of Europe in this area.

The hot spot market is already growing quickly in the US, Asia and Australia. As these markets grow further, the probability of enabled users from overseas wishing to access similar service in the UK will become obvious. Relaxation of the regulations governing commercial gain will enable more creative business models to be considered and allow the service to be made more widely available thus keeping the UK in a lead position for International Trade.

As important as the innovative nature of the wireless access service itself, the commercial availability of this spectrum will allow innovative business models, which could transform the way in which telecommunications services are provided in the UK. The infrastructure cost of entry into this business is moderate in

comparison with most telecommunications services, and this will permit a range of new players to enter the market, provided that a level playing field of regulation exists. This will ensure a competitive environment, which can only be to the benefit of the end-users of the service. Megabeam expects to see far more collaboration between national service providers than has been visible in Telecommunications.

Megabeam, for example, has adopted a wholesale business model which will allow resellers to service their existing customers over its shared network. Megabeam is working to establish a clear brand positioning for a pan-European hot-spot network which can be used in association with national and international roaming partners. Megabeam will be securing limited Roaming Agreements even within National territories to target the broadest user base.

As device availability becomes the norm and as the cost of technology falls, Megabeam intends to broaden the target market initially to smaller businesses then eventually mass-market use enabling more people to have access to broadband services.

As this wireless infrastructure develops and grows, we expect that it will greatly encourage the growth of true broadband services and content, and will promote the growth of e-commerce and e-business in the UK. This growth can begin in a matter of weeks, not years: virtually as soon as regulations permit. The necessary equipment is already available and, in the case of user equipment, is already widely distributed being currently used for private WLAN purposes. This is truly an innovative service: in the near-term, there is no practical alternative means of delivering broadband services to travellers outside an office or home environment.

**Q2: *Will the introduction of public telecommunication services into existing licence-exempt frequency bands, within the conditions of use identified in Appendix B, result in unacceptable levels of interference to existing users, and if so, in what geographic locations might this be expected?***

According to the Mason Report under the specified conditions of use, it appears very unlikely that the introduction of public telecommunications services into licence-exempt bands will result in unacceptable levels of interference.

Megabeam believes that, given the use of type-approved equipment, the efficient use of spectrum will be “self-regulating”, and there will be no need for further regulation as it is in the interests of both the location owner and of the wireless service provider to maintain a high Quality of Service. In planning services at hot-spots, Megabeam encourages the location owners to responsibly manage the wireless environment at each location to allow the most productive use of the resource, and provides the necessary support to that end. Location owners will be helped to determine whether there are any existing wireless operations in the unlicensed bands at their locations, and to ensure that those services are protected. As part of this process, locations will be competently RF-surveyed before installation, both to ensure that wireless coverage is restricted to the areas intended, and to help identify existing services and interference.

In practice, this implies suitable contractual arrangements between location owners and the operators (for example, location owners could impose obligations on operators located in proximity, but preferably a location owner should only permit a single wireless access operator to be in control of operations at that location. This precaution, taken with the limited range of the services, will minimise the possibility of unacceptable interference, and will allow the location owner, through its wireless access operator, to protect known existing services operating on that site.

In addition to the above considerations, it is expected that most wireless hot-spots will be located indoors. This will help to minimise any potential interference outside the immediate environment.

**Q3: *Would the introduction of public telecommunication services, into existing licence -exempt allocations, and within the current conditions of use identified in Appendix B, result in congestion of the frequency bands?***

For the purpose of responding to this question, we define 'congestion' as being a condition in which Quality of Service is significantly degraded on a regular basis, or service is precluded altogether.

As discussed below, in our view, this is unlikely to be a significant problem especially with traffic of the e-business 'bursty' type such as file transfers, email, transactions, routine web browsing. For such traffic, any individual user can only generate and absorb a certain amount of data on average, also the limited range of a wireless access point means that the number of simultaneous users of spectrum at that location is self-limiting.

Of the two bands of main interest for public telecommunications (2.4GHz and 5GHz) the potential for congestion is clearly greater for the 2.4GHz band. In this band, we estimate that 100 or more WLAN users may be active simultaneously in a given location with average bit rates per user of the order of 200kbit/s. This user experience will be better than the typical experience on, say, a domestic ADSL service.

We have also reviewed such situations with an existing US wireless operator, and its experience has not shown any significant problems, even with up to 300 users active during a conference.

Congestion is more likely to be an issue with the use of IP streaming services, especially video. Wireless access is very capable of supporting these services, which typically run at sustained rates of 300-500kbit/s. Clearly though, each such 'channel' will use a significant part of the spectrum capacity, and contention is likely to limit the number of simultaneous users to 5-10 per access point with WiFi (2.4GHz) technology. This situation is clearly much improved in the 5GHz bands, which therefore are to be preferred for this type of service.

In practice, capacity limitations at an access point are equally likely to be imposed by the Internet connection rate. From an economic viewpoint, service providers will not provide arbitrarily high interconnect rates, and for many locations a rate of the order of 2Mbit/s appears to be the most economically viable, until traffic is seen to build up.

Megabeam plans to consider and implement techniques to minimise capacity restriction using caching and location-based web technologies to aggregate user backbone demand and present streamed content from its own managed 'web channels'. The WLAN technologies will allow the partitioning of bandwidth and the alignment of these segments to differing service level agreements.

The management of congestion is therefore very similar to the management of interference referred to in Question 2, and the solution, in terms of the ability of the location owner to control access to the network, is very similar. The location owner should select a single wireless access operator who will have to work closely with that operator to agree and implement congestion policies. These in turn require more sophisticated web caching / server technology to be installed at the location which support the view that a single Master Service Provider should operate the zone working with others as required to deliver services.

**Q4: *In bands where channel access techniques have been identified for specific services, will these techniques be sufficient to avoid future congestion? If not, please give information about other techniques that might be applicable.***

Effective channel access standards have been developed for both the 2.4GHz and 5GHz bands.

For the former bands, the most commonly applicable standards for public service provision are "WiFi" (IEEE Standard 802.11b) and Bluetooth. These are different technologies, and their spectrum usage is therefore different. However, both of these techniques have been developed with the nature of the licence-exempt spectrum in mind. They are intrinsically robust against interference, and the effects of increasing interference are typically to cause a reduction in data throughput rate, not to preclude transmission.

A key consideration is therefore the ability of Bluetooth and WiFi standard equipment to co-exist, each still providing an acceptable service, and there have been numerous studies of this, summarised in the Mason report. The studies have concluded that these techniques can indeed co-exist successfully, provided that sufficient separation is provided between the client device and the access point working on the other technology. Techniques have also been developed by manufacturers of wireless access points and client devices to improve the ability of these two technologies to co-exist, including adaptive identification of clearest frequencies in which to operate. It is Megabeam's intent to exploit such technologies to the maximum extent feasible, and we believe it to be in the interest of other operators to do likewise.

In the 5GHz bands, the technology currently being planned for use in Europe is HiperLAN2. Being dominated by a single group of standards, it should be easier to manage spectrum and congestion than the case where inconsistent standards are mixed. Furthermore, since HiperLAN2 operates at 54Mbit/s, it does not appear likely that congestion will become a factor in public-access context.

Products already exist which can support both 5GHz and 2.4GHz wireless LAN standards within the same device simultaneously, and these will aid the eventual migration to the less-congested 5GHz bands.

**Q5: *What type of public telecommunication services could be offered in licence-exempt spectrum and what is the anticipated market potential?***

Megabeam's detailed views of the nature of the possible services and the market potential are given in an accompanying document. The nature of the licence-exempt spectrum under the conditions of Appendix B of the Consultation document leads to consideration of services which are:

- Available only in a restricted locality around the wireless access point
- High bit-rate, compared with dial-up data connection
- Able to fulfil an unmet demand for remote access at hotspots
- Complementary to users' main internet connections (not a substitute)

A controlling factor on public telecommunication services in the licence-exempt spectrum is the ready availability of user equipment and of affordable infrastructure equipment

Public WLAN service providers will enable Internet access in its purest form. Ideally this will be completely transparent to the user and their corporations, leaving them completely free to choose what applications and services they want to run over the connection. Megabeam will work with selected partners to provide a catalogue of best-in-class applications.

The service is not a replacement for mobile or fixed telecommunications services. It is 'Nomadic', not truly mobile. Owing to the type of devices involved, the service is highly visual and will enable businesses to make more effective use of time. We have outlined Megabeam's forecasts of market size in a separate submission.

Research has shown that users want a comfortable and secure environment in which to use these new services. Whilst we can all imagine a PDA user accessing e-mail in a busy station, it is not appropriate to consider using an expensive business laptop late at night in a problematic area.

Megabeam is working with location partners to provide a new range of facilities to support users to maximise their downtime when travelling. Examples of this can be seen in Lap Top Lane in the US and Skyport in Europe.

**Q6 : *Assuming that there would be a lower quality of service available from public telecommunication services using licence-exempt spectrum, compared to those using licensed spectrum, how could potential end users be informed of this?***

There are a number of ways in which the users could be advised of limitations on service quality. These would typically depend on the way in which the user is made aware of the service itself, and pays for it.

One class of users will be employees of organisations which have contracted to obtain the wireless access service. These users will typically have client devices pre-configured by their employers' IT department, and will have instructions on the nature of the service and the means of obtaining help when there are service difficulties. These would include information on service quality.

In the more general case of subscription to service by individual members of the public or smaller businesses, users would be informed about service details at the time of purchase of the service package. Service packages can include annual, weekly, daily, or even hourly subscriptions.

As for a cellular communications network, users would require to be authenticated onto the network. For cellular systems in Europe, this is normally achieved by means of a SIM card. For wireless access services in hot-spot scenarios, a similar method could be used. However, while cellular services aspire to provide ubiquitous coverage, by definition the hot-spot service model provides only an 'opportunistic' capability depending on the movements of the user. Much of the time, the aspiring user will not be in hot-spot coverage. Therefore the willingness of individual users to take out subscriptions cannot be relied on, and the payment model needs to provide for short-term access

Although the air interface supports high speed connection of 11mbps, it will often be the case that cost considerations will necessitate that hot spots be connected to the Internet via lower speed connections, via an aggregation facility. This aggregation facility will have inbuilt intelligence for example through a web server, to provide information, statistics and updates to end - users.

Megabeam is currently considering the use of different branding implementations to designate different grades of service. If a location has few concurrent users such as a petrol station, then ISDN connectivity would probably suffice. Higher profile locations like airports will require more bandwidth.

Megabeam is working in partnership with the locations to create and designate specific areas where users are able to get good coverage, securely and comfortably.

**Q7: Which, if any, frequency bands identified in Appendix B are not suitable for the introduction of public telecommunication services and why?**

In terms of the Internet access services it wishes to support, Megabeam has considered only the 2.4GHz and 5GHz bands, which it considers suitable for these purposes owing to the current and expected availability of client devices and infrastructure equipment for these bands, at commercially viable prices. Additionally, there is sufficient bandwidth available in these bands to be able to create these innovative, high-rate access services.

None of the other licence-exempt bands appear to offer the same opportunity for affordable broadband access in the near future: however this does not necessarily mean that they are not suitable for other types of public telecommunications services which have not been considered by Megabeam.

**Q8: *Are there any potential problems associated with allowing commercial services in licence-exempt spectrum?***

To the extent that commercial services overlap with services provided in licensed bands (for example, overlap with planned 3G services) these services can be perceived as disruptive and liable to 'rob' traffic from the licensed-band operators, thereby reducing their ability to make revenues. However, it is the view of Megabeam that the wireless access to Internet capability in the unlicensed bands will be complementary to 3G services, not competitive. It will augment the 'ubiquitous' 3G coverage, with selected locations offering very high bandwidths, especially as 5GHz services are increasingly introduced. This is likely to increase the appetite for higher-rate data services (above 30kbit/s) and the availability of applications dependent on those rates. It is Megabeam's view that the availability of higher bit-rates in 3G systems will take some years to build out, and in the meantime the hot-spot concept will go some way to addressing the need for higher bandwidth at least in some limited locations. Meanwhile, the designated 3G licence-exempt spectrum at 2010 to 2025 MHz is also available, but the lack of exploitation today, compared with the activity in the 2.4GHz band, reflects among other things the lack of user equipment.

The introduction of WLAN capability will also foster an early appetite by application and platform developers to build 'sniffer' and other intelligent software to optimise and simplify the user experience. Ultimately this will create an environment of mutual dependency within the supply side of the industry to satisfy users connectivity needs in the same way that the world wide web satisfies their information needs.

A potential technical problem arising from commercial services in this spectrum is the possibility of multiple service providers attempting to serve the same location, without effective coordination. This could lead to spectrum conflict, inefficiencies, and unnecessary deterioration in service quality. This problem should be self-limiting as location owners become aware of it. Advice should be given to all owners of locations to explain the dangers of uncontrolled use of the unlicensed spectrum on their property.

Further problems could be caused by the careless installation and use of wireless systems. Again, it is important that Location Owners have a responsible approach, recognise the importance of the resource, and that they are incentivised to keep the situation under control.

**Q9: *Assuming that public telecommunication services are permitted in licence-exempt spectrum, what would be considered suitable time scales for making these changes in each of the bands identified in Appendix B?***

For the 2.4GHz band, changes should be made in the earliest possible timeframe to permit public telecommunications services. The technology is mature and affordable, and is basically standardised on a global basis. There is also an evident immediate demand in the UK, and the technology is actually being brought into service elsewhere in Europe. Until appropriate regulatory changes are made in the UK, businesses operating in the UK will be denied the benefits which will accrue to others operating in continental Europe.

For operation in the 5GHz band, changes should be made to open the band to public telecommunication service in the same timeframe as for the 2.4GHz band. There are currently differences though between the technical standards of systems in use and planned in the USA, and those in Europe – respectively IEEE802.11a and HiperLAN2. There is yet another standard for Japan. Although principles for public telecommunications in the 5GHz band should be established, the finalisation of the technical specifications should provide latitude for convergence of the applicable standards on a worldwide basis.