Response to Ofcom Consultation:

UK Broadband application for licence variation

Question: *Do you agree that the case for making changes requested by UK Broadband to its licence has been made? If not, why would it not be appropriate to vary UK Broadband's Wireless Telegraphy Public Fixed Wireless Access Operator Licence by (i) allowing application neutrality and (ii) increasing the permitted maximum in-band EIRP, and why would it not be appropriate to vary the licence as soon as practicable?*

The BBC welcomes the opportunity to respond to this consultation. Our primary concern relates to the potential effects of the proposed changes to UK Broadband's licence on the use of digital radio cameras (wireless video cameras) in the 3500 - 3580 MHz band and hence our response only addresses that aspect of the consultation. As Ofcom will be well aware, the BBC continues to be very concerned about the future availability of spectrum for wireless video cameras.

The Threat to the Availability of Spectrum for Wireless Video Cameras

Wireless video cameras are absolutely essential in gathering news and covering events of major cultural or sporting significance, precisely because they do not need to be cabled: they allow real-time, up-close coverage, including from hard-to-access areas and emergency situations. Recently they were used extensively to provide picture footage of the floods; before that they were used to provide coverage of the Formula 1 British Grand Prix and the Tour de France. They are also key in helping the UK win the right to host important cultural or sporting events, as the coverage they permit helps to maximise sponsorship and advertising revenues accruing from such events.

There are currently no other ways of providing reliably this sort of footage, nor are there likely to be in the near future. New IP or 3G-based technologies (which share networks) are very prone to falling over when demand is high, such as during emergencies and at major cultural or sporting events. On 11 September 2001 mobile phone networks were initially shut-down for security reasons; they were then unable to cope with the level of demand.

Working out what is happening with regards to future availability of spectrum for wireless video cameras is difficult, in part because Ofcom is consulting separately on the relevant bands. Indeed, it requires at least:

- assessing the implications of Ofcom's proposals for 2.5 – 2.69 GHz et al spectrum;
- assessing Ofcom's proposals with regards to 3.4 – 3.8 GHz spectrum and developments at WRC-07; and
- assessing the technological limitations of 7 GHz spectrum.

Currently the vast majority of wireless video camera users in the UK use 2.5 - 2.69 GHz spectrum, which Ofcom intends to auction at the beginning of 2008. This spectrum seems likely to be highly sought after by providers of new wireless services, and hence can be expected to command a high price at auction.

The BBC believes that it is highly likely that this award will also lead to a reduction in the amount of spectrum currently available at 2 GHz, due to interference from the services deployed using auctioned spectrum in the adjacent band. (We will be responding to Ofcom's further consultation on aspects of the 2.5 – 2.69 GHz award by the 28 September deadline). We therefore believe that the amount of spectrum available for use by wireless video cameras will be significantly reduced at the beginning of next year.

Given this substantial reduction in spectrum available for use by wireless video cameras, we are very concerned by any proposals which appear to reduce the amount of spectrum available even further. As set out in our response to Ofcom's question below, we believe that both higher power and mobile operations by UK Broadband will increase interference, and hence reduce the amount of (usable) spectrum available for wireless video camera use in the 3500 – 3580 MHz band. (We also note that Ofcom has stated that it will be supporting an assignment of 3.4 – 3.8 GHz to 3G at WRC-07).

The BBC believes that the cumulative effect of Ofcom's proposals as they currently stand could be, from as early as the beginning of next year, a severe reduction in (if not, over time, an end to) the UK's ability to cover news and events of major cultural or sporting significance in the way it does currently. The main results of this are likely to be:

- a severe reduction in the UK's ability to provide picture coverage (particularly in real-time) of emergency situations;

- a consequent reputational threat to UK broadcasters, as they fall technically behind US news organisations for example;

- a severe reduction in the UK's ability to win the right to stage key cultural or sporting events, because (unlike other countries) it is unable to provide quality coverage, and hence generate sufficient sponsorship/ advertising revenues;

- an inability of the UK to meet the commitments it made to the International Olympic Committee with regards to access to spectrum in its bid for the London Games, particularly commitments 15.8 and 15.9.

We would therefore welcome, in advance of the loss early next year of substantial amounts of the spectrum that wireless video cameras currently use, a consultation on how the UK might ensure that such equipment continues to have access to sufficient spectrum to cover news and major events in the medium- to longer-term.

Response to the Consultation Question

The BBC does not agree that Ofcom has made the technical case for the changes requested by UK Broadband to its licence, because of the potential for increased interference to wireless video camera operation in the 3500 - 3580 MHz band. Ofcom has said that it would not normally expect to grant a request to vary a licence if the change would reduce the estimated spectrum quality of neighbouring assignments below the spectrum quality benchmark based on current spectrum planning assumptions.

We believe that the proposed change to the UK Broadband licence would reduce the estimated spectrum quality (as detailed below) of the neighbouring wireless video camera band and so this means that changes would need to be made to the proposals which address the difficulties mentioned below before the licence variation could be granted. For example, the application could be revised to reflect mobile operation at a significantly lower power; alternatively Ofcom could require UK Broadband to introduce guard bands between its operation and the 3500 – 3580 MHz band (although it is recognised that it is possible that the width of the guard band needed to prevent an increase in interference might conceivably be too large to permit adequate remaining capacity for UK Broadband and this would need further investigation).

Wireless video cameras operate adjacent to the UK Broadband allocations and typically use an output power of 100mW. There are no guard bands between the UK Broadband and wireless video camera assignments. UK Broadband currently uses low power, low density fixed links and the proposed licence variation would allow deployment of a high power, high density, mobile service under Ofcom's proposals. The base stations would increase in power by 15dB to +29dBW/MHz, i.e. 39dBW (8kW) for each WiMAX carrier. These carriers will inevitably cause interference to the 100mW systems used by users of wireless video cameras.

The effect of such a high power WiMAX service on reception of adjacent and next adjacent wireless video camera operation can be estimated using protection ratio measurements on wireless video camera receivers. This was recently investigated on Ofcom's behalf by ERA in report 2007-0447. Using the results of ERA's measurements, we calculate that an 8kW WiMAX transmitter will create a footprint of reduced reception performance that extends for up to 40km in the adjacent channel (+10MHz) or up to 2km in the next adjacent channel (+20MHz). As such, depending on the density of WiMAX transmitters deployed, 4 of the 12 channels available for wireless video cameras could become unusable, particularly in urban environments.

The interference problem can be mitigated to some extent by fitting front end filters. In their report, ERA investigated using high order, fixed-tuned, passive filters. Such filters are expensive, and a wireless video camera user would need a range of filters to suit the channel licensed for a particular event. Discussions with filter manufacturers suggest that such designs may suffer with temperature stability and drift, but the results nevertheless give an indication of best case performance. Using the results in the ERA report, the zone of interference would be reduced to a radius of between 18km and 4km, depending on receiver type. Nevertheless this level of interference remains of grave concern.

The above results are based on line of sight propagation which is appropriate for city centre wireless video camera receivers on tall structures. A more complex propagation model would be appropriate for temporary installations deployed nearer ground level, where terrain clutter might help shield the PMSE receivers from the high power WiMAX carriers. An analysis using the COST-231 model shows that the interference zone would still extend up to 4km from the WiMAX base station. For full details see Annex 1.

The effect of mobile WiMAX terminals operating at -5dBW/MHz (3W in a 10MHz channel) is less extensive but also of concern because of the unpredictability. These will cause interference within a range of 800m in the worst case. This reduces to 90m if a higher performance receiver with a high selectivity filter is deployed. This is still very significant, as the mobile receiver could easily interrupt operation of a wireless video camera, particularly in a news gathering application. The mobile nature of the terminal makes this interference difficult to predict or guard against (unlike for fixed terminals) so this would create a significantly greater (and harder to protect against) potential for interference beyond what would be expected from services complying with the existing licence conditions.

For the reasons given above, the BBC does not agree that Ofcom has made the technical case for the changes requested by UK Broadband to its licence, because of the potential for increased interference to wireless video camera operation in the 3500 - 3580 MHz band.

Annex 1

This annex includes a calculation of the zone of interference based on a line of sight model (square law propagation) and a suburban propagation model that attempts to assess the effect of clutter (COST-231). These calculations make use of the selectivity measurements in ERA report 2007-0447.

The following parameters have been used for the WiMAX transmitter and the wireless video camera receive system:

WiMAX Transmitter Power	39	dBW
Frequency	3500	MHz
Tx aerial height	60	m
Rx aerial height	10	m
Receiver Noise Figure	5	dB
Demodulator Implementation	1	dB
DVB-T modulation mode	QPSK	
DVB-T FEC	1/2	
DVB-T Guard interval	1/32	

Receiver Configuration	ACS (dB)	C/N QEF (dB)	Prot. Ratio (dB)	QEF point (dBm)	Reqd. FSL (dB)	Interference radius (km) Square Law	COST-231
Rx A, No filter, N+1	48.6	3.1	-45.5	-96.1	119.6	6.51	1.41
Rx A, Filter A, N+1	51.9	3.1	-48.8	-96.1	116.3	4.45	1.12
Rx B, No filter, N+1	32.8	3.1	-29.7	-96.1	135.4	40.13	4.22
Rx B, Filter A, N+1	39.8	3.1	-36.7	-96.1	128.4	17.92	2.60
Rx A, No filter, N+2	60.2	3.1	-57.1	-96.1	108.0	1.71	0.63
Rx A, Filter A, N+2	68.4	3.1	-65.3	-96.1	99.8	0.67	0.36
Rx B, No filter, N+2	63.8	3.1	-60.7	-96.1	104.4	1.13	0.49
Rx B, Filter A, N+2	68.6	3.1	-65.5	-96.1	99.6	0.65	0.35

BBC

24 August 2007