PLEASE NOTE: The following paragraphs respond only to Questions 2 and 3 of Ofcom's consultation document published on 7 April 20011, because the other four Questions relate to frequency bands which are not used by Intelsat satellites.

Ofcom's Question 2)

"*Do you agree with our proposal to exempt the use equipment for safety-related ITS infrastructure from the need to hold a Wireless Telegraphy Act licence?*"

From the text in sections 4.2, 4.3 and 4.12 of the consultation document this question relates to the frequency band 5850 – 5905 MHz. The FSS (Earth-to-space) is one of the services to which this band is allocated in the ITU Radio Regulations, and also in the UK Frequency Allocation Table. Consequently a number of Intelsat satellites plus satellites of other operators have been providing UK up-link coverage in this band for many years. Hence Intelsat has considered whether a proliferation of vehicle-based wireless telegraphy stations in safety-related intelligent transport systems (ITS) would be likely to create harmful interference to satellites receiving in this band.

In Annex 1 of this response we have considered the potential interference from such wireless telegraphy stations to a satellite receive beam of 5-degree beamwidth covering western Europe, including the UK. Although the example is hypothetical it comprises parameters that are typical of satellites providing continental coverage in C-band. Although most such satellites also provide coverage via 'global' beams, the antenna gain is lower for those beams and hence the impact of each interferer is lower. Currently most C-band satellites do not provide beams substantially narrower than 5 degrees.

In order to estimate the number of wireless telegraphy stations within the beam footprint that would lead to aggregate interference at a commonly used protection threshold (steady-state clear-air up-link I/N of -6 dB), it was necessary to make assumptions regarding (a) the percentage of vehicles in Europe equipped with such stations likely to be in use at peak times, and (b) the percentage of stations in use likely to be transmitting simultaneously. Information in ECC Report 101 (one of the documents referenced by Ofcom) suggests that reasonable assumptions for these percentages are 10% for (a) and (2%) for (b). Using these figures our estimate in Annex 1 is that for a typical C-band satellite the aggregate interference would be unlikely to reach harmful level unless the number of vehicles in Europe equipped with safety-related wireless telegraphy stations exceeded about 3.7 million. A number of this magnitude seems unlikely to be reached in the foreseeable future.

Noting that the above estimate is of similar magnitude to the results of studies summarised in the ECC Report, we have no objection to the proposal in Ofcom's Question 2.

Ofcom's Question 3

"*Do you agree with our proposal to exempt the use of terminals operating in the 3400 to 3800 MHz band from the need to hold a Wireless Telegraphy Act licence?*"

Regarding the band 3400-3600 MHz Intelsat notes that, although it is allocated inter-alia to the FSS (space-to-Earth) in the ITU Radio Regulations and is used by the FSS in many countries, it is not allocated to the FSS in the UK national Frequency Allocation Table. Therefore this response is confined to the band 3600-3800 MHz.

Annex 2 of this response shows a contour around a hypothetical but typical C-band earth station in middle-England, within which any wireless telegraphy terminal transmitting at an e.i.r.p. of 25 dBm/MHz would cause interference to that earth station exceeding a commonly used protection criterion. As can be seen, although the region is only moderately hilly the contour is irregular and fragmented owing to terrain effects. However it is clear that the distance of the contour from the earth

station ranges from about 2.5 km to more than 25 km, and that the total area it encloses substantially exceeds 100 sq km. In a region of flatter terrain the area enclosed would be even greater.

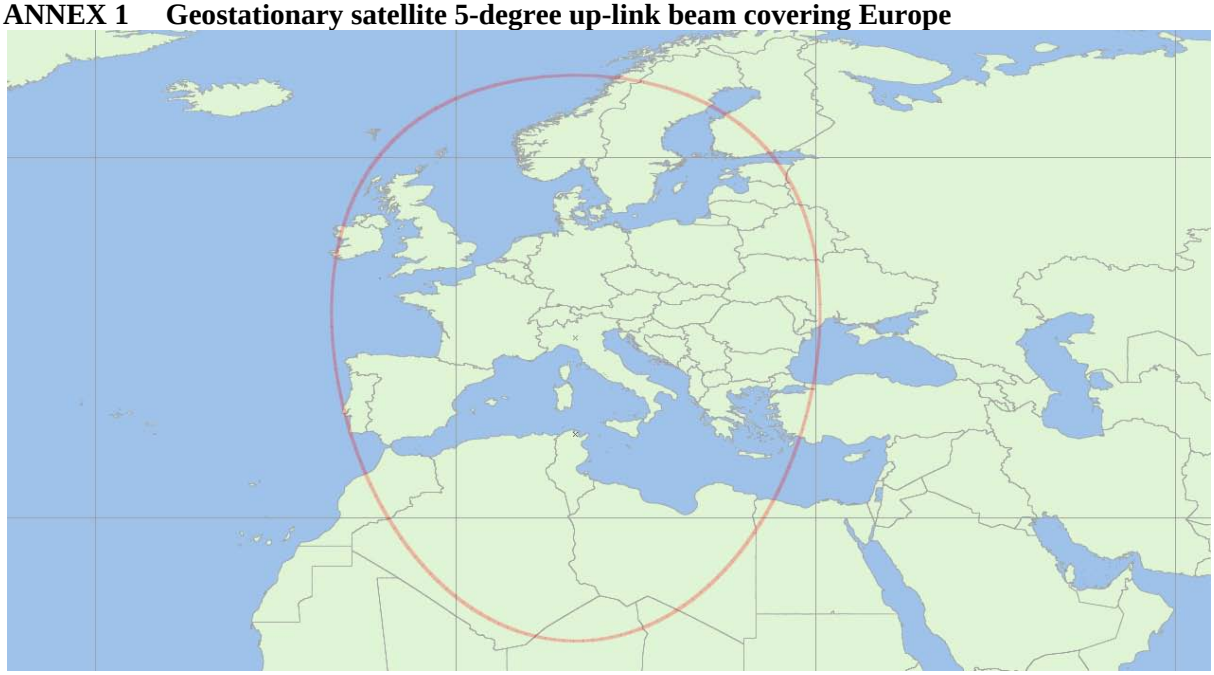
In section 5.8 of the consultation document Ofcom implies that the wireless access user terminals will have no interference impact because their "*base stations are subject to coordination and terminal stations do not transmit except when they are within the coverage of a base station.*" Since the e.i.r.p. per MHz of a base station is likely to be much higher than that of a user terminal, if separation distance is the method used to achieve coordination between the base station and the earth station the distance concerned is likely to be considerably greater than the radius of that base station's service area. Intelsat would agree that under such circumstances the user terminals concerned would be unlikely to cause significant interference to the earth station. However, if some other method should be proposed to coordinate the base station, for example using frequencies outside the subject band for the transmissions from base station to user terminals, then the base station could be much closer to the earth station and the user terminal transmissions would pose an in-band interference threat to the earth station. Under such circumstances a contour like the example shown in Annex 2 would effectively become an exclusion zone for the wireless access service, which would impact negatively on the coordination – especially in highly populated areas.

In view of these considerations we do **not** agree with Ofcom's proposal that wireless access terminals should operate on a licence-exempt basis within the frequency band 3600-3800 MHz.

Additionally the reference in section 5.2 of the consultation document, to the fact that one of the spectrum access licences issued by Ofcom to UK Broadband Ltd includes the band 3925-4009 MHz, prompts further comment. We note with approval that Ofcom does not include this band in its current proposals to licence-exempt wireless access terminals. Nevertheless we take this opportunity to reiterate our view that, since in the band 3800-4200 MHz there is no primary allocation to the Mobile Service in Region 1 either in the ITU Radio Regulations, in EC Decisions, or in the UK Frequency Allocation Table, no part of that band should be used for the provision of service to mobile user terminals.

{*See Annexes 1 and 2 below.*}

ANNEX 1 Geostationary satellite 5-degree up-link beam covering Europe



Satellite longitude - 10°E

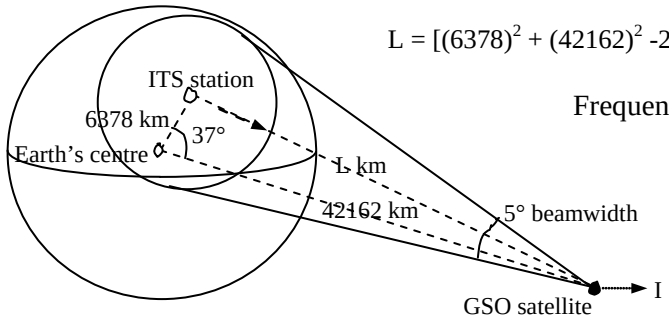
Latitude of beam centre - 37°N

Longitude of beam centre - 10°E

Circular beam, -3 dB beamwidth – 5.0°

Approximate area on Earth's surface covered by -3 dB beamwidth – **12.5 million sq km**.

Geographical density of Wireless Telegraphy safety-related ITS Stations that would cause harmful interference to a 5-degree up-link beam of a geostationary satellite



$L = [(6378)^2 + (42162)^2 - 2 \times 6368 \times 42162 \times \text{Cos}(37)]^{0.5} = 37266.5$ km

Frequency (f) = 5.9 GHz

Beamwidth = $70\lambda/D$ where λ = wavelength, $= 3 \times 10^8/f$ and D = satellite antenna diameter.

Also, antenna effective aperture (A_e) = $0.65\pi D^2/4$

Hence $A = 0.65\pi[(70 \times 3 \times 10^8)/(5.9 \times 10^9 \times 5)]^2/4 = 0.2587$ sq m.

So if E is the on-axis e.i.r.p. per MHz of the ITS station, and the gain in the satellite direction is 12 dB below peak, then the interference (I) received by the satellite is given by

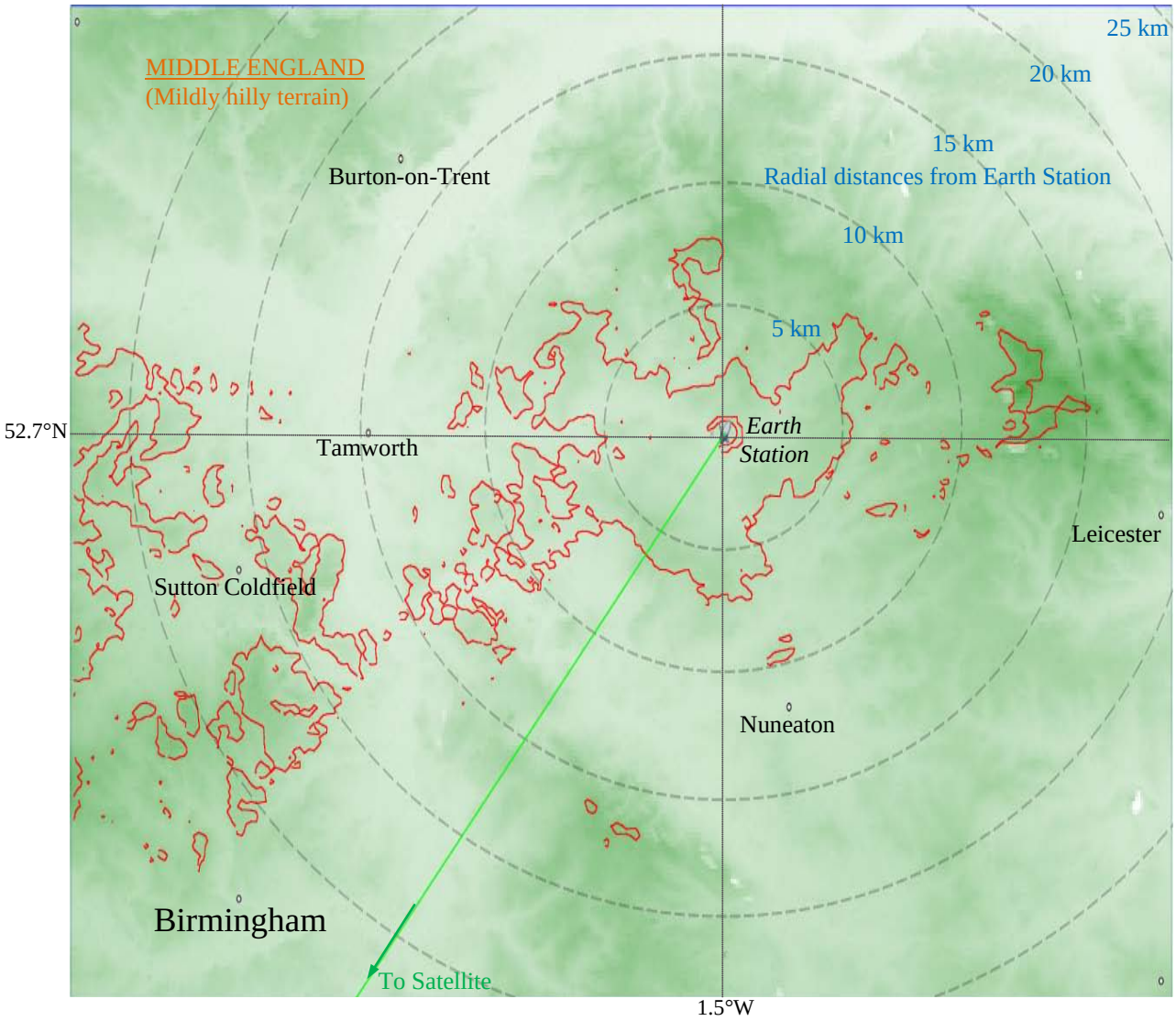
$$I = E - 12 - 10\text{Log}[4\pi \times (37266500)^2] + 10\text{Log}(0.2587) \text{ dBW/MHz.}$$

Thus for E = 23 dBm/MHz (i.e. -7 dBW/MHz), then for one active interferer I = -187.29 dBW/MHz.

A typical up-link noise temperature (T) for a C-band satellite is 400°K, for which the corresponding thermal up-link noise (N) per MHz of bandwidth is 10Log(kTB) where 10Log(k) is -228.6 dB(W/°K.Hz) (Boltzmann's Constant) and B is 1000000 Hz. Hence N = -142.58 dBW/MHz.
A typical protection criterion for aggregate up-link interference is that I_{ag}/N should not exceed -6 dB. Hence I_{ag} should be no greater than -148.58 dBW/MHz.

According to CEPT reports only about 10% of ITS stations are active at any one time, and only about 2% of those are transmitting simultaneously. Thus assuming all ITS stations transmit at the maximum mean e.i.r.p. density, interference will not be excessive unless the number of co-frequency stations within the satellite's footprint exceeds approximately $10^{0.1[-148.58 - (-187.29)]} \times 10 \times 50 =$ **3715096**.

ANNEX 2 Long-Term Contour for interference from Wireless Access terminal to C-Band Earth Station in 3400-3800 MHz band



Contour within which interference from a Wireless Access terminal would exceed the long-term protection criterion at the input to an Earth station at 52.7°N/1.5°W.

Long-term criterion – I/N not to exceed -10 dB for more than 20% of the time.

Wireless Access terminal e.i.r.p spectral density = 25 dBm/MHz (-5 dBW/MHz).

Wireless Access terminal antenna – 2m above ground, omnidirectional pattern in horizontal plane.

Frequency – 3600 MHz.

Earth station Antenna – 5m diameter, centre 3m above ground, pattern ITU-R Rec. S.465-5, pointing to satellite at 59.79°W (i.e. at 10 degrees elevation).

Earth station receive noise temperature - 100°K.

Propagation losses on interference paths calculated according to ITU-R Rec. P.452-14, and using a 90m terrain database.

Since $\pi(5.64)^2 = 100$ the area enclosed by the contour can be seen to substantially exceed **100 sq km**.