Response to Ofcom's consultation:

Developing a framework for the long term future of UHF spectrum bands IV and V

Ericsson Ltd.

June 2011

Introduction

Ericsson welcomes the opportunity to comment on this wide reaching review of UHF spectrum policy by Ofcom. Its is clear that this consultation represents the start of a journey which Ofcom intends to take with industry to inform the UK's position in the discussion of the Radio Spectrum Policy Programme at EU level. It is also clear that domestic policy decisions around the future centrality of DTT as the default platform for Public Services Broadcasting as well as issues around Local Broadcasting and unicasting need to be urgently addressed.

The comments are made under the general headings raised in the Ofcom document. Ericsson would be grateful if Ofcom consider that this response represents our initial views on the issue and would welcome being involved in the ongoing dialogue using resources across Ericsson and discussing the worldwide environment since it has such a large bearing on the most efficient and cost effective way forwards for the UK.

Demand and supply of services that are based on UHF spectrum

Internet growth

Recently the Broadband Stakeholder's Group commissioned a study by Analysis Mason (http://www.broadbanduk.org/component/option,com_docman/task,doc_view/gid,1246/Itemid,63/) looking at the costs of building a wireless based broadband infrastructure on a basis which is comparable to the earlier work done on the costs of a fibre network. The most striking feature of the higher growth figures is that the largest single element of growth is video. The underlying assumption was that TV network operators could not get sufficient capacity on DTT to support simulcast of all channels in High Definition.

The implementation of Digital Switch Over has given the TV network operators a good platform for the Public Service Broadcasters output, while clearly providing extra capacity for growth. Changing all three PSB multiplexes to DVB-T2 will yield 16 Mbits of additional capacity each for the BBC and ITV/Channel4/Five.

It is popular to suggest that linear TV is declining and will be over taken by internet viewing. However the dominant force remains with programming, content and the brands created. These brands appear in many media forms and the growth in PVR usage will not make them less accessible than the internet content. TVs and PVRs are making internet content accessible trough televisions and it would be wrong to make the mistake that innovation is less intense in Television than in the internet content world.

Mobile broadband

The growth in mobile broadband is well understood and expected to grow at 92% CAGR for the period until 2015 (Cisco Visual Network Index: Mobile Data Traffic Forecast). Beyond that we could reasonably expect data growth to slow to the rates in the more mature fixed internet, 35% CAGR according to Cisco's Visual Networking Index. This can be characterised as an initial growth due to the increased take up of more capable browsers and playing devices whereupon the growth is similar in scale to the growth in the more mature fixed internet. There is no obvious reason why this growth will not continue on the same trend.

Sometimes the term mobile broadband causes the market to forget the nature of the demand. In earlier times stakeholders might have called this Portable Broadband and that is why they expect the demand ultimately to follow the fixed internet. The content may be viewed at home in the garden or anywhere else on the pause as well as on the move, where users pause as a passenger. The kind of interactions users will experience on portable devices are not very different from those made on fixed devices. The main difference is that is rather difficult to carry round an HD display. However higher screen resolutions are obviously popular but full HD content clearly cannot be appreciated with displays of reasonable size held at arm's length.

The reason why UHF spectrum is so important is, of course, building and vehicle penetration losses. Since much content is expected to be consumed on the pause in vehicles and in buildings the characteristics of UHF are especially suited to mobile broadband use. The importance of video content as a fraction of the data on mobile broadband is brought out in both the Cisco Visual Network Index and the Analysis Mason reports referenced above.

PPDR

Ericsson expects that there will be an increasing demand from the emergency services for broadband connectivity whilst attending incidents. There has been work done in ETSI to identify UHF Spectrum requirements in the System Requirements Document, TR 102 628 v1.1.1 (http://www.etsi.org/deliver/etsi_tr/102600_102699/102628/01.01.01_60/tr_102628v010101p.pdf)

UHF is uniquely suited for Public Protection and Disaster Relief (PPDR) because of its building penetration characteristics. Currently Emergency responders expect communications to work both inside and outside buildings in a seamless way and irrespective of whether there is a an Emergency Service vehicle in the vicinity.

Whilst the Emergency Services have a clear need for this kind of broadband service in addition to voice services there is also an understandable doubt about whether the public finances can afford the necessary expense. One of the great successes of Tetra was the way in which public services aggregated their demand to effectively ensure that emergency services have sufficient capacity when they need it. The intention of the US Public Safety Radio scheme was that the Public Service had some guaranteed capacity but shared other capacity on the same infrastructure with the General Public but had a priority for use of the public network if it is needed. It did not work well because the terms offered were clearly not attractive enough for bidders in the FCC Spectrum Auction. However the opportunity for shared infrastructure is there to be seized whereby the Public Sector provides a contribution to a shared network rather than bearing the whole cost of a private network run in parallel with and complementary to the public network.

A further advantage of using the UHF spectrum and LTE technology, in particular, for such a network is that the equipment in the network and carried by the emergency services could be purchased across the EU and would considerably increase the market size for the specialist equipment. This ought to ensure that the value for money achieved by the public service is maximised.

Technological developments that will influence UHF spectrum usage

Convergence

Today TVs are increasingly able to run internet based applications, connect to home based DLNA servers as well as to show content. Personal Video Recorders (PVR) go further and let users time-shift content. You View has the potential to go even further with content split between the internet and broadcast technologies. To the viewer in future it will not necessarily be apparent how content arrived at the display or whether it was broadcast, streamed or downloaded overnight. This is what consumers will see in a converged environment.

What consumers want is the same choice and availability wherever they live and for some this will not include fixed super-fast broadband. The plans for BDUK's framework require rapid conclusions to contracts at modest prices and for many wireless systems will provide the best way of getting that content.

The spectral efficiency achieved in DVB-T2 is on par with LTE; however when we look at LTE Advanced the barriers are pushed further than can be expected from DVB-T2. The reason is not so much modulation schemes and such technical details but the framework in which it is used.

A key tenet of the DVB work for DVB-T and T2 appears to be the use of existing working consumer premises antennas used for analogue TV. This has worked well and delivered a reliable multichannel TV capability throughout the transmitter network so far. However those existing antennas were originally installed as far back as 1969 for the switchover from 405 lines to 625 line UHF PAL services. The requirements then included high gain roof-top antennas and that is what the design assumption has remained. It is the potential cost to consumers of replacing these antennas that has made their retention such a clear part of the design aims for digital TV.

There has been a call for higher signal strengths to allow the more reliable use of portable antennas but so far this has not happened. The BBC has experimented with using MIMO techniques to increase digital capacity with some success (BBC Research White Paper 157, October 2007) but the replacement of the installed base of high gain, single polarization, outdoor antennas with deteriorating down-leads remains a barrier to introducing such new techniques.

In evidence submitted to the FCC (http://fjallfoss.fcc.gov/ecfs/document/view?id=7021034720), Ericsson showed the performance possible if using a cellular based LTE network to distribute TV. Whilst this was aimed squarely at what are the characteristics of US digital TV and looked at typical locations, there is an important message here. The paper embedded in the evidence looks at complete replacement of the broadcast infrastructure but the point is that the framework in which cellular and broadcast are designed are different. Using the best of both worlds to provide a truly converged network could benefit both industries and give better service to consumers.

At the heart of bit rate improvements in LTE-Advanced are MIMO schemes as well as aggregated transmissions. Devices can receive multiple OFDM systems, each of which can occupy up to 20 MHz of spectrum. The data for a particular bit stream can be carried across more than one 20 MHz slot. This is significantly more flexible than the limited capabilities in DVB-T. In addition MIMO allows multiple channels to be formed with feedback to allow control of which data is sent over which channels. Now these systems are already implemented for 3G in USB sticks that fit into routers and provide Ethernet connectivity. Ericsson expects the same scheme to work with LTE but with much greater capacity. This allows indoor antennasbut more importantly indoor antennas that can be fitted inexpensively by the householder and used for wireless broadband as well as enhancing broadcast capacity. It offers a shared use facility which offers more choice and greater flexibility. Of course in building penetration is needed to get to most place where users want to site receivers.

Such a framework does not seek to replace the current broadcasting services, unless that proves appropriate, rather it seeks to enhance the broadcasting offer as well as providing other services based on internet access. The internet access can be used with unicasting to offer additional channels as and when needed or to give access to on demand content.

Now a further reason to consider this scheme is the frequency re-use potential. Today's broadcasting TV architecture uses a Multi-Frequency Network (MFN) based on high power transmitters with a myriad of lower power repeaters, some of which form local Single Frequency Networks (SFN). The reasons for this are rooted in the planning done for digital switchover and the need to accommodate the large number or regional channels. The regional nature is valued by consumers and even more localism is proposed. Ericsson believes that using LTE with lower power transmitters for broadcasting, by using localised SFNs, it would be possible to extend the capacity of the broadcast industry in a way which is simply not possible with today's MFN design.

It is clearly impracticable to quickly engineer a complete change and it would also not allow consumers to gain value from their existing equipment. However over time migration of capacity to a shared use network with local content over LTE seems to offer real benefits to consumers. It may be possible to stave off replacement of rooftop antennas all together so that the addition of LTE on a different band which is useable with a new outside

antenna allows extra capacity into the proposition, although the majority of down-leads are likely to be unsuitable for re-use.

International developments

RSPP

The Radio Spectrum Policy Program (RSPP) is being pursued vigorously by the members of the European Parliament with a purpose of freeing up spectrum for mobile data use. It is hoped that the input to this consultation will help Ofcom to position the UK within the framework of the RSPP.

Ericsson understands that Ofcom is fully aware that the eco-system for low cost wireless systems are critically dependent on having spectrum that is harmonised. The cost of components is critically dependent on the possible market volumes and use of spectrum on a global basis is key to obtaining the lowest costs.

What is not said so often is that the growth of mobile broadband use in the UK is fuelled by low prices which are the result of competitive offerings using equipment and standards which are truly global. Non-standard frequency bands do not give the same low cost eco-system. As data grows the potential margins in the mobile industry will narrow and a low cost base is essential. The terminals for data must be low cost, based on large volumes in global bands.

Looking at making spectrum use compatible with the US market to the greatest extent possible meets the conditions for low cost use.

Potential costs and benefits to citizens and consumers from different uses of UHF spectrum

Service Availability

The use of cellular techniques for broadcasting will improve the localness and the overall choice of programming and other services accessed using Internet Protocol. The greater availability of content for indoor portable devices will be a particular boon and it can be expected that many receiving devices will not use traditional external antennas. The extension of data services using internal wireless data connections will further improve access in both home that have fixed network internet access as well as those that do not.

The costs for some consumers will be a change to their external antenna for DTT but many consumers will benefit from replacing their installation for the first time in many years. The current advice to use wide-band antennas will limit the potential costs for new households.

Greater capacity and reduced upgrade costs

The total network capacity will clearly be greater through the use of local SFNs and more base stations. It is to be hoped that consumers will see real benefit to them. For consumers the cost of adding the new services will fall if LTE base stations are implemented and only replacement of a small number of DTT antennas is needed whilst many more portable systems get new services.

Consideration will be needed on the way in which the new base stations are used and funded and the competition issues that are raised. It is useful to consider the future now whilst the decisions are being taken in Europe so that the best policy outcome can be reached.

Timescales associated with any possible future adjustment to the use of UHF spectrum

Broadcasting equipment

TV sets traditionally have a very long life but recently HD TVs have taken a massive position in the market and the use of data connected PVRs as well as connected TV is growing rapidly. It seems likely that Set Top Boxes and PVR will have replacement cycles which are shorter than TV sets given that a large display is still a large part of the cost of newer TVs. Newer sets will bring Internet style features into the family living room and make internet services available in ways that the PC has never done. This is particularly true for those older consumers who would not feel capable of owning and maintaining a PC but the TV represents more familiar territory. These consumers need internet and TV combined and also need data where they live which will often need a radio connection if it is to be affordable everywhere.

The UK will finish the Digital Switchover only to embark on the 800 MHz clearance. Whilst the number of consumers that will need antenna changes is small the public's appetite for further changes beyond the 800 MHz clearance may well be limited for some time. However, by end 2016 much of North-West England will be seven years past switchover with an ageing population of digital receivers. It seems possible that by 2020 a set of changes would be acceptable to the public if they start with adding devices. Between 2015 and 2017 it is likely that a lot of hard to reach communities will get superfast broadband using radio. These two time frames, the aging of DSO equipment and BDUK rollout, may give us an important time window for change.

Antenna replacement

The change-out of roof top antennas is inevitable eventually but it has been delayed considerably. The lifetime of Band I antennas was up to 40 years, Band III antennas reached 30 years but the oldest band IV/V aerials were installed in 1964 for BBC2 and are already 48 years old. All TV reception was on UHF in January 1985 so that all properties built at that time had a UHF antenna which is now 26 years ago. Many of the installed base of antennas and down leads will be at the end or beyond their design life and we need to reconsider the sense in sticking rigidly to the current antenna grouping strategies and building new services that reinforce today's limitations. The operators could change to 2x2 MIMO and DVB-T2 as a one off change but it is questionable whether it could be done fast enough to meet the capacity demand for HD or whether it is flexible enough as a way forwards. The change to a lower cost body of antenna and moving to support indoor reception seems like a more future proof way forwards than sticking to the limitations of the single service rooftop antenna paradigm.

Releasing the 700 MHz band for data use and compressing traditional broadcasting in digital form need to be done together. At the same time as providing additional benefits to the consumer in the form of more choice in broadcasting and data. It is not possible to do this until the 2020s because of consumer equipment age considerations. By then the antenna stock will have aged to 35 years other than on properties build after 1985. This means that the release of the 600 MHz band earlier than 2020 should probably be avoided since it reduces the flexibility of response to the market needs at that time. One must also bear in mind that everything could change if the RSPP defines a different outcome. It is best to avoid an early decision on the use of UHF spectrum and particularly one which is not based on global or EU harmonisation.