Samsung Electronics UK

Additional comments:

Question 1: How much do you expect UK mobile data demand to change in the period 2015-2030? Please provide evidence for the trend and, where possible, please indicate how demand might vary across the device categories listed in paragraph 4.7. How should we account for factors (including pricing) that would constrain demand?:

Samsung Electronics expects UK mobile data demands to increase in line with global industry forecasts over this period. It is difficult to be precise about the exact demand and the uncertainty increases beyond 2020, however personal mobile device capabilities in terms of processing power and display capabilities will continue to drive consumer demands for faster more data intensive services and applications. Examples of new areas these applications may move into include health screening and monitoring, M2M and energy management, more financial transactions and personal financial management. It might be expected that some of these applications may take some capacity away from existing fixed broadband connectivity as more elements become "mobile".

Samsung believes that the mobile broadband demand will continue to be lead principally by the capabilities of personal mobile devices however it could be foreseen that home/office routers and portable computing devices could provide an element too. M2M applications (including CCTV) may also increase demand perhaps dependant on the nature of network penetration/density in the future.

However according to traffic demand forecasts (e.g. CISCO, Real Wireless and others), even 4G technologies (LTE Rel8/9, Rel10) will struggle to meet the demand around 2016 to 2020.

Additionally Samsung is cautious about the part that licence exempt services might play especially if greater security and QoS are required. Samsung believes there could be drivers to retain traffic in IMT mobile broadband networks and that it should not be assumed that licence exempt WiFi networks will provide a complete solution to support mobile broadband services into the future.

Question 2: What evidence do you think is relevant to assessing the extent of consumer benefits associated with meeting the increase in demand for mobile data?:

No response.

Question 3: What proportion of mobile data traffic do you expect to be carried over (a) Wi-Fi and similar systems in licence-exempt spectrum and (b) mobile networks in licensed spectrum? How do you expect this to change over the period 2015-2030 and how do you expect total data demand for Wi-Fi and similar systems in licence-exempt spectrum to change over the same period? How might this vary by location, environment etc.?:

In the longer term (into 2020 and beyond) Samsung believes there may be a case for assuming a greater proportion of mobile data traffic remaining within the licensed spectrum with the current usage of licence exempt WiFi networks seen as a convenience driven by limited mobile network capacity and penetration. New air interfaces and increased network densification are likely to improve the mobile network capacity and user experience. As a result the consumers' need to switch away from the mobile network itself may diminish.

Therefore Samsung expects less reliance in the future on public WiFi support to mobile networks and that a greater proportion of traffic will remain in the mobile networks.

Question 4: What factors will act to change the spectral efficiency of mobile technologies in the future? What spectral efficiency values are appropriate for consideration in our study for the period 2015-2030?:

Samsung believes that the upper bound of capacity through air interface spectral-efficiency is almost already achieved. Future advances in overall efficiency are most likely to come from network configuration and developments in antenna technology through the use of, for example, massive MIMO techniques. Studies in 3GPP suggest around 10x to 20x improvements in cell edge throughput with the deployment of Full Dimensional MIMO (FD-MIMO). However these techniques might be difficult to implement in lower frequencies and are more likely to lend themselves to operation in higher frequency ranges (above around 10GHz).

Question 5: What service bit rate values are appropriate for consideration in our study for the period 2015-2030? What evidence do you have of changing needs for service bit rates?:

Samsung Electronics believes that the ITU-R spectrum estimate activities taking place in the context of WRC-15 preparation are somewhat dependent upon the traffic requirements being averaged across a cell coverage area. They do not consider maintenance of high data delivery targets more consistently to users at the cell edge. Therefore Samsung believes that technological enhancements should be striving to improve the peak data rate delivery across the entire cell for all users. Certainly from 2020 onwards the target should be 1Gbps possible for all users, even at the cell edge.

This may require new network topologies to satisfy this demand.

Question 6: What proportion of traffic do you consider should be assumed to be carried on each cell types for the period 2015-2030? How will this vary with service environment i.e. between home, office, public areas, rural, suburban and urban? What evidence do you have of the factors affecting the uptake of small cells in licensed spectrum in the future?:

No response.

Question 7: Given the current mix of services on cellular networks what is the ratio of downlink to uplink capacity currently dimensioned for and how would you expect this to change over time by 2015, 2020, 2025 and 2030? How

do you expect the ratio of downlink to uplink demand to vary for the service categories given in Table A5.4 of Annex 5, and what factors might affect this? How does this ratio of downlink to uplink capacity change (if at all) with network radio access technology and offload to licence-exempt systems?:

No response.

Question 8: What are your views about the pros and cons of the frequency ranges in Table A6.1 in Annex 6 for mobile broadband and for existing applications using this spectrum? Do you have views on other bands that are not in Table A6.1?:

470-694MHz: Samsung Electronics recognises that these frequencies may be attractive for mobile broadband applications in the future - particularly for coverage purposes. However Samsung Electronics also recognises that these frequencies are currently used for delivery of DTT services and are likely to continue at least into the next decade. The spectrum usage by DTT after this period is linked with the future of DTT.
Therefore Samsung Electronics support views that studies should be initiated on cooperative or converged networks, taking into account all regulatory, technical, business aspects of the involved stakeholders.
The spectrum should remain for DTT as long as studies have not concluded that converged, cooperative networks or mobile networks will supersede DTT in an appropriate way. Moreover, there is likelihood that the band 470 - 694 MHz will be maintained for DTT broadcast also for some countries. In that case opening the band to mobile broadband could lose its benefits due to lack of harmonization for both mobile and consumer electronics industry

1300 - 4200MHz bands: Samsung Electronics has no specific view on the level of suitability or priority of these bands individually. However Samsung stresses the following principles that are important considerations when identifying suitable frequency ranges.
Samsung Electronics supports those frequency bands that:
a. Maximise global harmonisation for IMT.
b. Have close proximity to existing IMT frequency ranges.
c. Facilitate the accommodation of wider system bandwidth for increased system efficiency.
13.4 - 39.5GHz bands: Samsung Electronics supports IMT identification for at least one of these frequency ranges. High capacity delivery is possible in these frequency ranges suitable for the expected delivery of localised very high data rate services. IMT identification will focus the efforts of innovators and developers as well as setting a starting point for the long lead time required for the processes required for any change of use of these bands.

Question 9: Are there any other bands that are not in Table A6.1 for which you think we should be considering their pros and cons for mobile broadband and for existing applications using this spectrum? :

No.

Question 10: What are your views on bands which should be a priority for consideration for mobile broadband?:

From Samsung Electronics' perspective, to meet the future high capacity challenges from around 2018 onwards and considering the long lead times required for change of spectrum use, the higher frequency bands above 6GHz in Q8 are a strong priority.