

GSA¹ response to Ofcom Consultation

“Award of the 2.3 and 3.4 GHz spectrum bands”

January 2017

GSA welcomes the opportunity to respond to the Ofcom consultation on the “Award of the 2.3 and 3.4 GHz spectrum bands.”

An EU Commission study² forecasting the socio-economic benefits of 5G, estimates that in 2025 benefits from the introduction of 5G capabilities could reach €113.1 billion per year in four key sectors that will be using 5G connectivity: automotive, health, transport and energy. Investments of approximately €56.6 billion will likely create 2.3 million jobs in Europe. The European Commission has identified early introduction of 5G as being a key priority for Europe’s communications industries.

¹ The Global mobile Suppliers Association (GSA) represents mobile suppliers worldwide, engaged in infrastructure, spectrum, semiconductors, devices, services and applications development, and support services. The GSA Spectrum Group (GSG) develops strategies and plans, and contributes studies and technical analysis to international, regional and individual country policy-makers and regulators to facilitate the timely availability of spectrum for use by mobile network operators. GSG is the GSA focus group for technical and regulatory matters of radio spectrum pertaining to the successful evolution of International Mobile Telecommunication (IMT) and associated radiocommunication systems and comprises a team made up of spectrum and regulatory affairs specialists from GSA Executive Member and GSA Member companies. The GSG is participating in the study work leading up the World Radiocommunications Conference meeting in 2019 (WRC-19). In addition GSA reports regularly on global spectrum harmonisation efforts and developments including auctions, assignments, allocations, and re-farming activities.

² *"Identification and quantification of key socio-economic data to support strategic planning for the introduction of 5G in Europe" (SMART 2014/0008)*

Availability of spectrum is a key requirement to enable testing and early 5G deployment before 2020 and GSA do believe that the 3400-3800 MHz will be the primary band in the spectrum between 1 GHz and 6 GHz for the introduction of 5G in Europe, as recommended by the Radio Spectrum Policy Group and in the EC 5G Action plan. Making spectrum in 3400-3600 MHz band available in 2017 would allow the UK to be prepared for the 5G roll-out and give the UK the advantage of being a leading country.

Parts of the C-band (3300 – 4200 MHz) are being considered for early trials and introduction of 5G services in a number of countries/regions in the world including China and Japan. The 3500 MHz band might also be a good candidate in the U.S. and Korea for 5G deployments – in the U.S. “The Mobile Now Act” proposes further studies for a number of bands including 3100-3550 MHz and 3700-4200 MHz.

In Europe, Germany and France have recently signaled in their public consultations their willingness to auction this spectrum for 5G. In Ireland, ComReg published an Information Memorandum for the forthcoming award of spectrum rights of use for the 3.4 – 3.8 GHz frequency band. In Italy, the telecom regulator has published their proposed auction rules for the 3.6 – 3.8 GHz band and in Spain the regulator has provided information on their refarming activity regarding the 3.6 – 3.8 GHz band and their intention to tender it for MFCN according to market and operators’ needs.

The proximity of 3400-3600 MHz to existing bands used for mobile, the potential reuse of existing infrastructure in areas where dense networks are deployed and bandwidths considerably wider (in the order of 100 of MHz) than those of today in currently available bands makes this band very attractive for 5G. Also, the 3400-3800 MHz frequency range can assist to address 5G use cases in the short/medium term as it provides an excellent combination of capacity and coverage. By design, 5G NR (New Radio) will optimally support wideband operation, allowing operators to fully take advantage of larger allocations of contiguous spectrum to increase peak rates and user experience, with manageable terminal complexity and minimal power consumption. Ongoing standardization for the 5G NR new air interface in 3GPP is considering bandwidth in the order of 100MHz and higher. LTE can use Carrier Aggregation to aggregate multiple 20MHz channels,

but as the number of channels to be aggregated increases, there will be some technical limitations in terms of terminal complexity. The following table provides theoretical 5G data rate per channel BW based on calculation:

RF channel Bandwidth (MHz)	Peak data rates ³	Average data rates ⁴	5th percentile data rates ⁵
40	1.2 Gb/s	0.312 Gb/s	9 Mb/s
100	3 Gb/s	0.78 Gb/s	22.5 Mb/s
200	6 Gb/s	1.56 Gb/s	45 Mb/s
400	12 Gb/s	3.12 Gb/s	90 Mb/s

Furthermore, 5G NR is being designed to inherently incorporate advanced wireless techniques across a wide range of requirements. For example, massive MIMO is an important enabler to meet 5G requirements. As an example, massive MIMO at frequency band 3400-3800 MHz allows re-use of existing macro sites at same transmit power and obtain a significant throughput gain at cell edge. Simulations have been carried out using the following characteristics:

- macro cell deployment with inter-site distance of 1.7 km,
- 46dBm transmit power at base stations,
- 10 users per cell and
- 24 x 4 MIMO at 4 GHz using an 80 MHz channel.

This provides a 3.9x to 4.1x gain at the cell edge compared to 2 x 4 MIMO using the same 80 MHz bandwidth and delivers an average cell throughput of 808 Mbps. It is important to highlight that key element for successful deployment of massive MIMO is the availability of larger contiguous bandwidth.

³ Peak spectral efficiency (SE) of NR: 30 bit/s/Hz in DL (from draft New Report IMT-2020.TECH PERF REQ in ITU-R WP 5D). Peak data rate in IMT-2020.TECH PERF REQ is 20 Gbit/s in DL (roughly equivalent to a total of 667 MHz with the considered SE).

⁴ Average SE of NR: 7.8 bit/s/Hz in DL for Dense Urban scenario (3 x SE of IMT-Advanced, also considered in IMT-2020.TECH PERF REQ)

⁵ 5th percentile SE of NR: 0.225 bit/s/Hz in DL for Dense Urban scenario (3 x SE of IMT-Advanced, also considered in IMT-2020.TECH PERF REQ). User experience data rate in IMT-2020.TECH PERF REQ is 100 Mbit/s in DL (roughly equivalent to a total of 444 MHz with the considered SE). Studies in ITU-R are still ongoing regarding these numbers also in the context of the spectrum needs of IMT-2020 above 24 GHz.

In conclusion, GSA:

- supports that spectrum in the 3.4 – 3.6 GHz band should be auctioned during 2017 to allow 5G trials spanning eMBB, mission critical and IoT services paving the way for eMBB commercial rollout before 2020.
- agrees with an auction design based on 5 MHz blocks with the possibility for operators to purchase contiguous blocks without a cap in this band. It is important to allow operators, which wish so, to get access to wider contiguous spectrum of at least 80 MHz and ideally 100 MHz, as this will help reap the full benefits of this frequency band for 5G.
- believe that Ofcom should consider releasing also the remaining parts of the 3.6 – 3.8 GHz band that are not yet assigned to operators in a timely manner and ideally in 2018 in order to enable the full benefits of the 3400-3800 MHz band for 5G as outlined in the CEPT Roadmap for 5G as well as the RSPG Opinion and EU Action Plan for 5G. In that context, the existing authorisation structure in the entire 3400-3800 MHz band should be defragmented based on the guidance developed by ECC.