ZTE (UK) Ltd

Response to Ofcom's second consultation on assessment of future mobile competition and proposals for award of 800MHz and 2.6GHz spectrum and related issues

Confidentiality: Nothing

ZTE (UK) Ltd and ZTE Corporation Background

ZTE (UK) Ltd is the UK sales subsidiary of ZTE Corporation, and closely aligned with the objectives of the parent company. ZTE Corporation is a leading International manufacturer and provider of integrated telecommunications solutions. Its shares are publicly listed on the Shenzhen Stock Exchange and the Main Board of the Hong Kong Stock Exchange.

In November 1997, the Company conducted an initial public offering of A shares for listing on the Shenzhen Stock Exchange. In December 2004, the Company conducted an initial public offering of H shares for listing on the Main Board of the Hong Kong Stock Exchange, becoming the first A-share companyto be listed on the Main Board of Hong Kong.

The Company is dedicated to the design, development, production, distribution and installation of a broad range of advanced telecommunications systems and equipment, including carriers' networks, terminals and telecommunications software systems, services and other products.

The company has provided innovative technology and product solutions to telecommunications service providers in more than 140 countries and regions, enabling voice, data, multi-media, and fixed and wireless broadband communications across the World.

ZTE Corporation's operating revenue in 2011 exceeded US$10bn, of which 21% derived from the US and European markets.

ZTE Involvement in LTE

As a Global vendor of advanced communication solutions, ZTE is a leading provider of products and solutions that facilitate the deployment of both FDD (Frequency Division Domain) and TDD (Time Division Domain) LTE (Long Term Evolution) networks at both the macro cell and small cell levels. These solutions are optimised for operation in the 800MHz and 2.6GHz spectrum bands.

ZTE Corporation's Response to Ofcom

ZTE Corporation welcomes the opportunity to respond to this Ofcom consultation in order to offer our opinion and experience in the area of LTE technology deployment, and the benefits that it can bring to citizens, consumers and the overall economy of the UK.

In this response, we seek specifically to address small cell in-building deployment in the 2.6GHz band. We believe that this is an area that offers considerable potential in terms of retail service business innovation that goes beyond the standard wholesale operator model, and offers major opportunites for extended high speed network coverage.

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Unless otherwise indicated, all statements in this response apply to the allocation of shared use spectrum in the 2.6GHz band for use with in-building small cell networks.

Response to Question 4.4

> *Do you believe that geographically split license for a particular block of 2.6GHz spectrum between standard power use and lower power use is likely to create significant additional benefits for consumers?*

We note that Ofcom is "…minded to favour the reservation of 2 x 10MHz for shared low power usage…".

We strongly support the approach for a reserved allocation of 2.6GHz shared low power spectrum, for the reasons already outlined by Ofcom in the consultation document. In addition, we believe that considerable value can be provided to citizens and consumers through the provision of innovative retail services enabled by an allocation of at least 2 x 10MHz of shared low power spectrum at 2.6GHz. Please see our response to this question, and Question 4.5, below, for our reasoning.

With regard to a geographic split between the allocation of low power shared spectrum in rural areas and standard power shared spectrum in non-rural areas, it is our view that this would create less value for citizens and consumers than nationwide coverage of a reserved block of low power shared spectrum. We have a number of reasons for this view, as laid out in the following.

Although the consultation does not provide any specific reasons for a split along rural and non-rural lines, one reason that can be envisaged is to enable the provision of greater rural broadband coverage in line with BDUK and European Commission Digital Agenda objectives. However, in our opinion, 2.6GHz low power spectrum alone is not best suited to this purpose for the following reasons:

- In general, even at standard power, 2.6GHz spectrum provides a smaller coverage area per cell site and has lower building penetration than sub-1GHz spectrum. At lower powers (e.g 0.1W), building penetration is poor. Therefore, low power spectrum is best suited for in-builiding small cell applications close to the user, where the capacity efficency can be maximised.

- In-building small cell deployment is dependent upon the availability of suitable, generally, fixed-line backhaul capacity (e.g. a fixed broadband connection). In rural areas these are often absent and prohibitively expensive to deploy.

- However, we recognise that alternative wireless based backhaul solutions could be used in conjunction with small cell deployments in rural areas to provide the necessary backhaul, for example, 800MHz digital dividend spectrum and the associated TV White Spaces.

- Correspondingly, 800MHz provides greater geographical coverage and higher in-building penetration, which is more suited to the provision of rural broadband either alone at the macro cellular level, or as supporting backhaul for 2.6GHz in-building small cell deployment as described above. When compared to 2.6GHz standard power macro cell deployment for

rural broadband coverage, the use of 800MHz requires fewer cell sites to provide the same coverage. This would reduce the overall network deployment and operating costs, with an associated reduction in the cost to consumers of a retail services. However, it is possible to combine this cost advantage with small cell in-building coverage using 2.6GHz shared low power spectrum in order to bring higher bandwidths closer to the consumer, i.e. in the case where 800MHz macrocells provide backhaul for in-building small cells. This combination can increase the potential of meeting UK government targets for national high speed broadband coverage at 25Mbps, and/or EU Digital Agenda targets of 30Mbps.

Shared low power spectrum at 2.6GHz also has considerable value for in-building coverage in non-rural areas, where a large number of multi-tenant business premises (such as office blocks and shopping centres) are located. In-building small cell deployment, using shared low power spectrum, in these locations extends both coverage at 2.6GHz; and increases the overall capacity effiency by lowering power loss and enabling the reuse of the same spectrum within a single building. In non-rural areas these buildings are likely to be served with sufficient fixed-line access to support the necessary backhaul requirements.

As a result, our preferred approach would be a nationwide allocation of at least 2 x 10MHz shared low power spectrum, rather than a rural/non-rural geographic split. We believe this approach has the following advantages for citizens and consumers:

- Where applicable, as described above, shared low power spectrum can enhance consumer experience through in-building coverage in rural broadband deployments subject to the availability of suitable wireless backhaul where sufficient fixed line backhaul facilities are absent.

- Where applicable, shared low power spectrum can be used in non-rural deployments to provide in-building coverage in multi-tenant buildings, where due to low propogation characteristics of 2.6GHz low power signals multiple small cells can be deployed close to end users increasing spectrum re-use and usable capacity.

- Nationwide coverage has the potential to increase economies of scale that maybe absent if the allocation of shared 2.6GHz low power spectrum is limited to rural areas. The increased market size afforded by nationwide deployment of small cell equipment, even when these services are provided by different retail service providers, will ensure lower equipment unit costs. This in turn has the potential to reduce overall network deployment and operating costs, with the corresponding effect of lowering the prices charged to the consumer.

- Furthermore, nationwide availability of shared low power spectrum has the potential to increase the number of market entrants for the provision of retail services, for example by stimulating sub-national deployments in specific regions (i.e. opening up the market to new regional mobile network operators). This also increases the potential for service innovation at the retail and wholesale levels in different national locations with differing social requirements (i.e. in both rural and non-rural regions).

- Ofcom's proposal that a block of 2 x 10MHz low power spectrum is shared between 10 players implies that there will be an opportunity for new market entrants beyond the

traditional large wholesale operators. In our opinion, limiting the market size with a geographic split could act as a disincentive to market entry by smaller niche players as a result of a higher opportunity costs and a potentially lower return on investment than might otherwise be the case. Additionally, smaller players acting alone may not have access to same levels of funding for spectrum investments in competition with the larger wholesale operators. Therefore, we believe that it is essential to reserve at least 2 x 10MHz shared low power spectrum to enable market entry by these niche players. It is difficult to quantify the additional value that these new market entrants could bring to the UK economy, however, the potential they bring for the development of innovative business models and the resulting retail services could be of considerable benefit consumers and the wider economy.

- The deployment of in-building small cell networks do not faced the same challenges as macro cellular networks with respect to planning approval, which tends to delay network deployments. This situation has a particular impact for 2.6GHz macro cells, for which more cell sites are required to achieve the same coverage and capacity throughput in comparison to sub-1GHz macro cell deployments. As a result, correspondingly more planning approval is necessary. We therefore suggest that the reservation of at least 2 x 10MHz of low power shared spectrum suitable for in-building use both in rural and non-rural locations provides a unique opportunity for the early deployment of LTE networks in the UK that may otherwise be delayed by the planning approval process.

As noted above, building penetration at 2.6GHz is limited. As a result greater capacity effiency can be achieved through the deployment of in-building small cells closer to the end-user than is achieveble for the same spectrum allocation at standard power in macro-cellular deployments. The use of low power spectrum in-building combined with interference management allows multiple small cells to be deployed within the same building using the same spectrum band. This ability to re-use spectrum within a small area, such as a single building ensures greater value is derived from a single block than is available from an allocation of the same block for standard power use.

We have analysed two scenarios for the deployment of in-building small cells using 2 x 10MHz of 2.6GHz spectrum. Our findings suggest that with the correct intercell coordination and interference management:

- Four operators could independently provide small cell services within a single multi-tenant building using power levels of 1W.

- Seven operators could independently provide small cell services within a single multi-tenant building using power levels of 0.1W.

Due to the commercially sensitive nature of these simulation results, we are not in a position to provide full details in this consultation response, however we are open to further discussion with Ofcom if required.

Response to Question 4.5

> *Please provide your views including the reasons for them on which options you believe should be taken in relation to promoting lower power shared use of 2.6GHz spectrum.*

In line with our response to Question 4.4 above, we favour Ofcom's proposal given in option A – *Reservation of spectrum*. Additionally, we welcome the proposal that a further 2 x 10MHz maybe made available through competition between shared low power users and national wholesalers, as identified in the variant to option A, proposed.

It is clear that the greater the bandwidth available, the higher the peak and average cell throughput for a specific block of spectrum at a single cell site. We include below our analysis of the difference in throughput between a 2 x 10MHz blocks and a 2 x 15MHz blocks of low power spectrum.

The peak throughput for 2 x 10MHz blocks of paired spectrum using a 2T2R (2 transmit 2 receive) MIMO (Multiple Input Multiple Output) configuration is around 73Mbps. The value for 2 x 15MHz of paired spectrum is around 110Mbps. However, the average cell throughput is impacted by a number of factors including the deployment environment, intersite distance, intra-cell interference and MIMO configuration. The average rate is therefore dependent upon the deployment scenario, however, it can be safely be assumed that the throughput for a 2 x 15MHz block will be around 1.5 times that of 2 x 10MHz block, and correspondingly 2 x 20MHz around 2 times greater.

Considering that the absolute peak spectral efficiency is 5 bps/Hz. Our simulations show that the average cell spectral efficiency for an indoor environment, is around 2.5-3bps/Hz. This corresponds to an average cell throughput for 2 x 10MHz of 25Mbps and for 2 x 15MHz of 37Mbps.

At this point, we would like to indicate that this is well within the backhaul capability of the fixed-line access technologies available today, particularly considering the ongoing deployment of VDSL2 as the preferred high speed fixed access technology in the UK. Given that the latest Access Network Frequency Plan published by the NICC will enable VDSL2 speeds of up to 80Mbps, we see that there is also the potential to support the backhaul of services provided from a small cell using 2 x 20MHz of paired spectrum.

We would like to point out that the greater the overall size of the allocated block, the easier it is to share the spectrum between multiple retail service providers. For example, if each operator at a specific location were to require 2 x 5MHz, then it is self evident that:

- 2 x 10MHz could support two operators
- 2 x 15MHz could support three operators
- And, 2 x 20MHz could support four operators

An allocation of less than 2 x 5MHz per network operator would start to have a detrimental impact on the services available to the end user, particularly where this bandwidth is shared between several end users. However, we do recognise that this is not the only way to meet agreement for sharing spectrum between operators.

As we indicated above in response to Question 4.4, from our simultation results we believe that four operators could operate small cell networks in close proximity using power levels of 1W and up to seven at power levels of 0.1W. The ability to support four network operators at a single location is desirable as described further below. However, we acknowledge Ofcom's concerns regarding the

proportionality of allocating a 2 x 20 MHz block of shared low power spectrum, but would encourage the allocation of at least 2 x 15MHz.

As alluded to above in our response to Question 4.4, we consider that there is a potential for two types of in-building deployment scenario using different power levels:

- 1W to support coverage in public spaces with a relatively large coverage area, such as shopping centres and transport hubs.
- At 0.1 W to support coverage in smaller private spaces, such as office and the home environment.

Our view is that 0.1W would not provide sufficient coverage in a public space, or alternatively would require the deployment of a greater number of small cells to achieve the same coverage with a corresponding increase in the cost of deployment.

Here, again, an allocation of 2 x 15 MHz or 2 x 20 MHz to be shared by three to four operators each with blocks of 2 x 5 MHz would be of great value. We consider this is particularly important for the promotion of competition in the public space environment to avoid situations where only one retail operator is able to serve its subscribers at such locations.

Alternatively, the split of an allocation of 2 x 15MHz or 2 x 20 MHz shared between operators for mixed use at a particular location, some for 1W and some for 0.1W usage would also be advantageous. Or even a mix of these two scenarios.

Response to Question 6.2

> *Do you agree with our revised proposals for the packaging of the 2.6GHz band? Please state the reasons for your views.*

Please see our response to Questions 4.4 and 4.5, above.