Hutchison 3G UK Ltd ("3UK") response to Ofcom's consultation on their response to Vodafone's and Telefonica's requests to update the technical conditions of their mobile licences to enable the deployment of newer technologies including 5G ("Consultation")

Thank you again for allowing 3UK the time in which to provide a meaningful response to Ofcom's provisional decision that it is appropriate to update the conditions contained in the relevant licences which are currently held by Vodafone and Telefonica, as proposed in the Consultation.

3UK supports Ofcom's "policy goal to remove regulatory barriers that prevent the deployment of the latest available technology, where appropriate". 3UK also supports Ofcom's assessment framework for considering licence variations which derive from their statutory duties and are set out in section 3 of the Consultation.

3UK's response is focused on the proposed variations to Vodafone's licences, specifically their potential impact on other users of the radio spectrum as a result of out-of-block emissions. Insofar as is relevant, in their assessment of the impact on other spectrum users, Ofcom state they "*have reviewed the conclusions for adjacent service coexistence with AAS base stations in the* [1800/2100] *MHz band, from EEC Report* [297/298]*, to confirm their validity for the UK context of licence variations to include AAS. We consider that the findings remain valid, and the introduction of AAS will not worsen the compatibility situation for those services studied".*

3UK considers this assessment and conclusion is insufficient to address the risk of interference with other holders of spectrum in the band, in particular given the severe impact on citizens and consumers should such interference occur. There would be a clear absence of responsibility for remedying the interference since both parties would be able to rely on the fact they were operating in accordance with the terms and conditions of their respective licences. 3UK considers the appropriate safeguard would be to introduce an obligation on the licence holder who deploys AAS equipment – in this case Vodafone or any other licensee that wants to adopt the same changes – to remedy any interference caused with spectrum user who has held their spectrum prior to changes to Vodafone's licence coming into effect. This is precisely what is provided for in the 1400 MHz band – paragraph 4 of Schedule 1 to 3UK's 1400 MHz licence deals with the avoidance of undue influence. The extent of the obligations on the licence holder is determined by whether the fixed link constitutes an "*Existing Licensed Link*" or a "*New Licensed Link*". If it is the former, the licence holder must "*pay to the licensee of such Existing Licensed Link all costs which may be reasonably incurred by that licensee to mitigate the risk of undue interference with such Existing Licensed Link from Radio Equipment established by the Licensee*". In 3UK's view, the addition of such an obligation would achieve the right balance between enabling the deployment of the latest technology whilst also providing sufficient safeguards for other holders of spectrum in the band.

The 1800 and 2100 MHz are deployed today on all sites (by 4x MNOs) using a passive antenna. The antenna transmits power according to the existing technical conditions in the spectrum licenses based on the EIRP concept. In simple terms, the radiated power cannot exceed predefined thresholds (inside or outside the permitted blocks), which is easy to calculate and manage based on radio equipment power and the antenna gain.

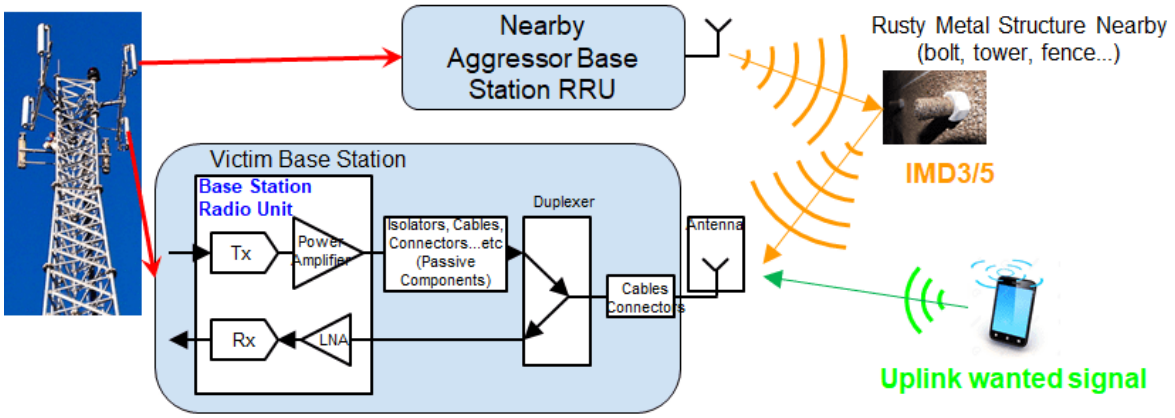
The concern of installing an active antenna (i.e., massive MIMO) in an FDD system comes from the fact that new technical conditions do not mandate the max transmit power based on EIRP but instead based on TRP. The relation between TRP and EIRP is not linear. Thus, the equipment may comply with TRP-based technical conditions (including within and outside the Permitted Frequency blocks), but the radiated power level is high, which could increase the noise level (i.e., interface) to adjacent carries.

There are two risks of interference as a result of such high power:

1. Downlink interference (network to devices): due to high power outside the permitted transmitted power level. This type of interference reduces the DL capacity.

2. Uplink interference (devices to network): due to air-induced passive intermodulation (so-called ”rusty-bolt” effect [1]) that could hit the receiver side (i.e., uplink) of an adjacent carrier. This type of interference reduces the UL capacity and causes outages.

Air-induced passive intermodulation: Often, PIM is caused due to passive non-linearity within the transmitter hardware chain (such as duplexers, connectors, cables, and antennas). However, it is also possible for external passive elements in the radiation field of the TX antennas to act as PIM sources which reflect interference in the Rx side of the site. For example, A site deployed with massive MIMO on an 1800 MHz spectrum (transmitting high power) located near any structure with rusty components can create strong PIM and act as a nonlinear source of interference. This can create unwanted signals impacting the nearby receiver of the adjacent carriers. It is worth mentioning that the risk of such interference is higher in the FDD spectrum than in the TDD spectrum because the transmitter and receiver operate simultaneously.



Base station receiver being impacted by external components such as rusty components which act as non linear transmitters and create inter-modulation products

Source: www.4g-lte.net

[1] ‘’Air-induced passive intermodulation in FDD networks: Modeling, cancellation and measurements’’ V Lampu, L Anttila, M Turunen, M Fleischer, J Hellmann, M Valkama. IEEE 2021 55th Asilomar Conference on Signals, Systems, and Computers, 983-988.