RESPONSE TO IMDA SECOND PUBLIC CONSULTATION ON 5G MOBILE SERVICES AND NETWORKS

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Summary and conclusion:

With increasing evidence of the health impact of non-ionizing radiation, it would be prudent to explicitly incorporate safety considerations in the 5G rollout.

In particular, responding to Question 6 of the consultation paper:-

1. Under "Network Rollout and Performance", consider to require the spectrum right holders to:-
   (a) Follow a consultative rollout approach with relevant authorities to minimize radiation exposure on our children population by, inter-alia, optimally siting and sharing network cells, and position them away from school locations;
   (b) Place network cells in areas that would avoid close proximity to children for indoor installations such as in homes, offices and shops;
   (c) Provide effective 5G safety education to property owners and occupants for the equipment installed at the property.

2. Under "Network Design and Resilience", consider:
   (a) Stating a clear preference, in the CFP, for 5G network architecture and equipment selection that minimize peak and total radiation exposure;
   (b) Modeling of radiation hotspots in Singapore due to existing and anticipated RF networks so that the relevant regulator could set up ongoing RF radiation monitoring at such hotspots.

In conclusion, a 5G network design that consciously incorporates health and safety best practices would engender greater public trust as Singapore moves into the digital economy.

Comments:

Question 6: IMDA would like to seek views, comments and suggestions on:

i. **The proposed network rollout and performance obligations to be imposed on the spectrum right holders;**
ii. **... ;**
iii. **The network design and resilience challenges of 5G (...) and possible measures to address them, and whether there are other aspects that should be considered to enable trusted and resilient 5G network.**

With increasing adoption of mobile technology around the world, scientific studies into the health effects of non-ionizing radiation have also attracted greater interests. To illustrate this point, the "Annotated Bibliography of Scientific Papers Finding Evidence of Harm from Cell Phone Radiation Exposure" compiled by Dr. Joel Moskowitz, School of Public Health University of California Berkeley, is included as Appendix 1. The compilation contains 92 peer-reviewed papers published in scientific journals between August 2016 and July 2018.

In view of such potential health concerns, the World Health Organization (WHO) International Agency for the Research on Cancer classified radiofrequency (RF) fields, like those emitted from mobile phones, as a Class 2B Possible Human Carcinogen in May 2011.

The National Environment Agency (NEA) adopts the International Commission on Non-Ionizing Radiation Protection (ICNIRP) guidelines for RF and commissioned a RF baseline study in 2018 to measure background RF levels in Singapore. The NEA also enforces the Radiation Protection Act (RPA) and its regulations which govern and regulate activities and safety issues pertaining to ionizing and non-ionizing radiations.

However, existing RF exposure limits are based on adverse biological effects from short-term over-heating of tissues. As shown in Appendix 1, there is mounting scientific evidence showing adverse health effects from long-term, non-thermal exposures. Existing guidelines also do not generally consider the special vulnerabilities of particular population such as children and pregnant mothers.

Given the increasing scientific understanding, the ICNIRP is in the midst of updating its RF guidelines. Nevertheless, regulatory efforts are inevitably lagging behind technological developments, and with 5G moving into the mmWave bands which have so far received limited research on their health impact, it will take years for regulations to be put in place. Examples of such regulatory time lapse would include banning leaded petrol to minimize heavy metal accumulation in developing brains, and banning smoking in commercial flights to avoid the impact of passive smoking.

In the absence of updated RF exposure guidelines, various country regulators have taken a cautionary approach to protect their population. As an example, in April this year, the Belgian government halted the 5G pilot project planned for Brussels citing that the pilot is not compatible with Belgian radiation safety standards.

A review, attached as Appendix 2, was conducted by Dr. Mary Redmayne, School of Public Health & Preventive Med, Monash University on the policy and advisory response regarding children's exposure to RF-EMF. The review outlined five policy approaches adopted by regulatory authorities, with some measures involving education whilst others being infrastructural.

As Singapore is on the verge of setting up the 5G infrastructure, it is an opportune time to consider and incorporate health and safety measures ahead of expensive infrastructural spending. Also given that Singapore is a city state, 5G pilots would cover a greater percentage of our population vis-à-vis similar 5G pilots in other countries. Therefore it is wise to exercise greater caution in our approach.

As the authors of this submission are simply concerned citizens and not experts in this field, the suggestions outlined below are largely meant to promote greater awareness and debate, and should not be taken as comprehensive recommendations.

1. Under "Network Rollout and Performance", consider to require the spectrum right holders to:-
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   (a) Stating a clear preference, in the CFP, for 5G network architecture and equipment selection that minimize peak and total radiation exposure;
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