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RE: Consultation Paper on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed

The undersigned companies appreciate the opportunity to respond to the Telecom Regulatory Authority of India’s (“TRAI”) Consultation Paper on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed.¹ The Consultation Paper raises a number of important questions on broadband connectivity. We, however, focus our comments on one specific area: the need for additional mid-band license-exempt spectrum to support both mobile broadband connectivity and fixed broadband access in homes and businesses.

The undersigned companies have been aligned globally to open new spectrum opportunities for license-exempt devices, and to urge regulators to act. Specifically, we see an important opportunity to open 5925-7125 MHz (the “6 GHz band”) for license-exempt use as part of an overall strategy to support broadband connectivity and advance India’s transformation to the digital future. Global momentum is building behind this opportunity as regulators see the benefit of allowing license-exempt devices to access the band at low power levels and on a non-interference basis immediately, rather than deal with the delay and cost of relocating incumbents. We urge TRAI to consider this initiative as part of its efforts to promote broadband connectivity more broadly, and to move forward expeditiously with a consultation to examine the technical considerations associated with opening the 6 GHz band for license-exempt use.

I. License-exempt technologies are critical to broadband connectivity.

License-exempt technologies are transforming society and the economy of every country around the world. Technologies like Wi-Fi dramatically enhance the value of fixed broadband access to consumers, increase the efficiency and productivity of a variety of economic sectors, and address critical societal goals, such as connecting those without home access to the Internet. Wi-Fi also plays a critical role in ensuring that the mobile operators’ networks function better, by providing a means for consumers to offload data from cellular networks. The Wi-Fi Alliance projects the total global economic value of Wi-Fi in 2023 will be nearly US\$3.5 trillion.² That

¹ https://traf.gov.in/sites/default/files/Broadband_CP_20082020.pdf

² “What is the value of Wi-Fi?” Wi-Fi Alliance, at <https://www.wi-fi.org/value-of-wi-fi>.

measure of economic value reflects that more than half of all Internet traffic globally begins or ends on Wi-Fi, more than 60% of the data traffic on smartphones are offloaded to Wi-Fi, and that the number of devices per capita and the throughput capacity of those devices will continue to grow.

In the consumer segment, fixed broadband speeds and mobile broadband speeds are rising to meet consumer demand. In India, Cisco projects that by 2023, the average fixed broadband connection will be capable of delivering 40.9 Mbps compared to 15.1 Mbps in 2018. The number of Wi-Fi devices at the edge of a fixed broadband connection is projected to grow as well, from 359.8 million in 2018 to 697.4 million 2023. And during this same period, mobile operators will be continuing to advance the capability of their 4G networks and will begin the transition to much faster 5G, enabling 100+ Mbps average data rates. Yet – unless action is taken – Wi-Fi will become the weak link or the bottleneck. Cisco projects that by 2023, Wi-Fi speeds in India will reach only 40.9 Mbps from mobile devices.³ As a fundamental tenet of broadband policy, it is critical that regulators enable all parts of the broadband ecosystem to advance in capabilities, and even more critical in the case of license-exempt technologies given their important role in supporting broadband requirements.

Societal needs such as healthcare and education are also becoming increasingly facilitated by license-exempt technologies such as Wi-Fi. Facilities such as hospitals are particularly benefited by Wi-Fi as they are highly dependent upon the efficient flow of information about hospital operations and patient care. Similarly, educational institutions turn to Wi-Fi technology for operations, security, and to enhance the educational experience of their students.

Economic sectors as diverse as oil and gas, manufacturing, agriculture and tourism are all utilizing Wi-Fi at an accelerating pace. Not only do these enterprises want to pull operational and sensor data from their facilities to better maintain operations, digitizing their business provides new visibility and new insights that allow them to become more efficient and productive, as well as more responsive to their customers. For sectors like tourism, Wi-Fi is a necessary part of a country's infrastructure, enabling tourists to get access to local information and tourists services to create a better customer experience.

License-exempt spectrum can also be used effectively to address the digital divide between urban and rural areas. Public Wi-Fi hotspots in India are projected to grow four-fold from 2018 to 2023 from 1.5 million in 2018 to 6.3 million by 2023.⁴

³ <https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html>.

⁴ <https://www.cisco.com/c/en/us/solutions/executive-perspectives/annual-internet-report/air-highlights.html>.

II. More spectrum is needed to support license-exempt technologies, and the 6 GHz band is uniquely suited for this purpose.

Despite our increasing reliance on license-exempt technology such as Wi-Fi, and the enormous growth in traffic demands being placed on the technology globally, the spectrum allocated to its use remains as it was 12-15 years ago. This spectrum, in the 2.4 GHz and 5 GHz bands, has worked for the technology that historically was in use. At the time, Wi-Fi radio channelization typically was 20 or 40 MHz wide, representing the early generations of technology designed to meet the broadband demands of the day. Today, newer technology is using much wider channelization to meet the far more intensive broadband needs of consumers and businesses alike. The latest generation of Wi-Fi technology, Wi-Fi 6, can utilize radio channels as broad as 80 or 160 MHz, and a future generation of Wi-Fi technology that is already in development will utilize channels of 320 MHz.⁵

The existing Wi-Fi spectrum footprint, divided into 2.4 GHz, the lower part of 5 GHz and a separate portion of 5 GHz in the upper part of the band does not have a sufficient number of 80 and 160 MHz wide channels to serve current generation 802.11ax / Wi-Fi 6 standards. Nor will the existing 5 GHz spectrum be able to address future 802.11be / Wi-Fi 7 standards which relies on 320 MHz wide channels. Furthermore, we expect the existing spectrum will become more crowded and congested as demand grows. Additional spectrum is needed if Wi-Fi is to continue to play its critical role in the broadband ecosystem.

The 6 GHz band is uniquely suited for the expansion of Wi-Fi 6 technology. The 6 GHz band is already allocated for some mobile use, and although it contains incumbents, Wi-Fi's radio emission characteristics are highly complementary with other technologies – meaning that the band is ideal for sharing. A number of coexistence studies prepared and presented in both the United States and the European Union support this conclusion with respect to incumbent fixed

⁵“Wi-Fi 6 Certified, Capacity, efficiency, and performance for advanced connectivity,” Wi-Fi Alliance, <https://www.wi-fi.org/discover-wi-fi/wi-fi-certified-6>. There are a number of technological improvements contained in Wi-Fi 6 that make this generation of technology the most spectrally efficient version of Wi-Fi in history, including multi-user MIMO, beamforming, and “target wake time” to improve network efficiency and device battery life. When deployed in 6 GHz, Wi-Fi 6 will be called Wi-Fi 6E.

service,⁶ fixed satellite systems,⁷ and broadcast systems.⁸ These technical studies show that with proper technical rules to mitigate the license-exempt transmitter behavior, incumbents face no long term or short term risk of harmful interference. The findings support coexistence, indicating that mitigation measures such as constraining equipment to indoor deployments, and allowing only very low power levels outdoors, will allow license-exempt devices to enter the band safely.

Moreover, opening up the full 6 GHz band for license-exempt use will have tremendous benefits for connectivity in India. 6 GHz Wi-Fi (Wi-Fi 6E) will support popular 5G use cases, such as high definition (HD) video streaming, Wi-Fi calling, smart home devices, hotspot access, automation of city-wide services, augmented reality and virtual reality (AR/VR) applications, health monitoring devices, wearables, and seamless roaming. 5G and Wi-Fi 6 together will deliver dramatically better performance to consumers, remote workers, and organizations.

III. Global momentum supports opening the 6 GHz band for license-exempt use.

Global momentum is building behind opening up 6 GHz to unlicensed use on a non-interfering basis. The United States Federal Communications Commission (FCC) was among the first to examine the question, launching a proceeding that culminated in a Report and Order

⁶ For example, studies have shown coexistence between license-exempt devices and incumbent Fixed Service: RKF Engineering Solutions, LLC Frequency Sharing for Radio Local Area Networks in the 6 GHz Band (January 2018): <https://s3.amazonaws.com/rkfengineering-web/6USC+Report+Release+-+24Jan2018.pdf>; ECC Report 302: Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz,(approved 29 May 2019) which contains multiple studies developed by European administrations and industry:<https://www.ecodocdb.dk/download/cc03c766-35f8/ECC%20Report%20302.pdf>; ECC Report 316: Sharing studies assessing short-term interference from Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) into Fixed Service in the frequency band 5925-6425 MHz (approved 21 May 2020), which studies short-term interference and sharing with VLP devices <https://www.ecodocdb.dk/download/8951af9e-1932/ECC%20Report%20316.pdf>; Industry coalition of companies (6USC Group) Fixed Link Interference Testing:[https://ecfsapi.fcc.gov/file/108230735019254/6GHz%20FS%20coexistence%20study%20ex%20parte%20\(final\).pdf](https://ecfsapi.fcc.gov/file/108230735019254/6GHz%20FS%20coexistence%20study%20ex%20parte%20(final).pdf); RKF Engineering Solutions LLC, Frequency Sharing for Very Low Power Radio Local Area Networks in the 6 GHz Band <https://ecfsapi.fcc.gov/file/1063041931946/6%20GHz%20FNPRM%20Comment%20Submission%206.29.20.pdf>.

⁷ RKF Engineering Solutions, LLC Frequency Sharing for Radio Local Area Networks in the 6 GHz Band (January 2018): <https://s3.amazonaws.com/rkfengineering-web/6USC+Report+Release+-+24Jan2018.pdf>; ECC Report 302: Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz,(approved 29 May 2019) which contains multiple studies developed by European administrations and industry:<https://www.ecodocdb.dk/download/cc03c766-35f8/ECC%20Report%20302.pdf>.

⁸ 6USC Group Analysis of sharing with broadcast systems: [https://ecfsapi.fcc.gov/file/1022876707131/NAB%20Response%20\(Feb%2028%2C%202020\).pdf](https://ecfsapi.fcc.gov/file/1022876707131/NAB%20Response%20(Feb%2028%2C%202020).pdf); RKF Engineering Solutions LLC, Frequency Sharing for Very Low Power Radio Local Area Networks in the 6 GHz Band (analyzed BAS deployments) <https://ecfsapi.fcc.gov/file/1063041931946/6%20GHz%20FNPRM%20Comment%20Submission%206.29.20.pdf>

in April 2020.⁹ Ofcom in the United Kingdom recently approved both low power indoor use and very low power portable use of the lower 6 GHz band (5925-6425 MHz) as an initial matter and will continue to review use of 6425-7125 MHz in the future.¹⁰

A number of other regions and countries are also considering license-exempt use of the 6 GHz band. The European Commission adopted a mandate directing CEPT to study the feasibility and identify harmonized technical conditions for radio local access networks (RLANs) in the lower 6 GHz band (5925-6425 MHz). The sharing studies have been recently approved by the Electronic Communications Committee (ECC) in Europe, specifically Reports 302¹¹ and 316.¹² According to the studies, the European Conference of Postal and Telecommunications Administrations (CEPT) concluded in its Draft Report B that coexistence between RLANs, including very low power portable devices, and fixed service links is technically feasible.¹³ CEPT has issued a public consultation on its recommendation to the European Commission.¹⁴

In Korea, the Ministry of Science and ICT has announced an Administrative Order regarding its decision to make the full 6 GHz band (5925-7125 MHz) license-exempt for use by low power indoor devices and the lower half of the band for use by portable very low power devices.¹⁵ In addition, ANATEL, the regulatory authority of Brazil, initiated a proceeding to examine license-exempt use of the full 6 GHz band (5925-7125 MHz).¹⁶ Furthermore, Taiwan has launched a consultation exploring the technical parameters of making the 6 GHz band license-exempt, and a number of other regulatory authorities have already devoted staff resources to examine the issue, including in Canada, Argentina, Columbia, and Mexico.

⁹ https://ecfsapi.fcc.gov/file/0424167164769/FCC-20-51A1_Rcd.pdf.

¹⁰ Statement: Improving Spectrum access for wifi—spectrum use in the 5 and 6 GHz bands (24 July 2020) available at https://www.ofcom.org.uk/data/assets/pdf_file/0036/198927/6ghz-statement.pdf (“Ofcom 6 GHz Statement”).

¹¹ See ECC Report 302, Sharing and compatibility studies related to Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) in the frequency band 5925-6425 MHz (approved May 29, 2020) <https://www.ecodocdb.dk/document/10170>.

¹² See ECC Report 316, Sharing studies assessing short-term interference from Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) into Fixed Service in the frequency band 5925-6425 MHz (approved May 21, 2020) <https://www.ecodocdb.dk/document/14482>.

¹³ See Draft ECC Report B, Harmonised technical parameters for WAS/RLANs operating on a coexistence basis with appropriate mitigation techniques and/or operational compatibility/coexistence conditions, operating on the basis of a general authorization, “The following use cases were identified for use by WAS/RLANs in the bands 5925-6425 MHz: [...] Very low power (VLP) portable use, max 25 mW e.i.r.p., that may both operate indoor and outdoor.” https://cept.org/Documents/wg-fm/59048/fm-20-070annex1_draft-cept-report-b-6ghz-was-rlan.

¹⁴ Draft ECC Decision (20)01, On the harmonized use of the frequency bands 5945 to 6425 for the implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) (released July 3, 2020), available at <https://cept.org/ecc/tools-and-services/ecc-consultation>.

¹⁵ See Ministry of Science and ICT, Ministry of Science and ICT supplies 6 gigahertz (GHz) band as a broadband unlicensed frequency (October 16, 2020) <https://www.msit.go.kr/web/msipContents/contentsView.do?catelId=policycom2&artId=3140715>.

¹⁶ See ANATEL, National Telecommunications Agency, Proposed review of the radio frequencies set forth in the Regulation on Equipment for Restricted Radiation approved by Resolution n. 680 of June 27, 2017, on the terms of the draft SEI n. 5181470.” ANALYSIS N. 29/2020/CB, Case n. 53500.012176/2019-58 (Apr. 30, 2020).

IV. Conclusion

We therefore urge TRAI to move forward with a consultation examining the technical parameters of making the 6 GHz band available for license-exempt use. Because license-exempt use cases can immediately make use of this spectrum without the need to relocate incumbents, we recommend that the TRAI seek comment on the technical conditions required to make the full 6 GHz band (5925-7125 MHz) available. By making the full 6 GHz band license-exempt, India would reap the economic benefits of license-exempt spectrum, enhanced connectivity, and a building ecosystem of innovative use cases and broadband technologies in the band.

Respectfully submitted,

Broadcom Inc.,
Cisco Systems, Inc.,
Facebook, Inc.,
Google LLC,
Hewlett Packard Enterprise,
Intel Corporation,
Microsoft Corporation, and
Qualcomm India Pvt Ltd.