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October 10, 2021

Via e-mail: mailto:spectrumplanning@mcmc.gov.my

Re: **MCMC Public Consultation on Wireless Local Area Networks in the 6 GHz Frequency Band**

Dear Colleagues:

Wi-Fi Alliance[1/] commends the Malaysian Communications and Multimedia Commission (the "MCMC") on its ongoing work in the area of spectrum management. The Public Consultation on Wireless Local Area Networks in the 6 GHz Frequency Band (the "*Consultation*") will provide information to help the MCMC optimize the socioeconomic benefits delivered by Wireless Local Area Networks ("WLANs"), such as Wi-Fi. Wi-Fi Alliance enthusiastically supports the stated goal of the *Consultation* to investigate the potential use of the 6 GHz frequency band for Wi-Fi under the Class Assignment regulatory regime.[2/] Meeting this goal will ensure that the Malaysian consumers as well as business and public institutions will have access to the latest wireless telecommunications services at affordable prices.

As the MCMC accurately observed, the latest **Wi-Fi 6E** technology operating in the 5.925-7.125 GHz band, empowers tremendous connectivity benefits.[3/] Wi-Fi Alliance member companies are already delivering a wave of new Wi-Fi 6E products and services. And the connections provided by Wi-Fi technology through low-cost, license-exempt devices provide billions of ringgits in economic value. Indeed, a recent study by Telecom Advisory Services found that license-exempt Wi-Fi networks deliver significant economic benefits around the world.[4/]

Policymakers worldwide recognize that wireless connectivity is increasingly dependent on Wi-Fi and other license-exempt technologies. And this *Consultation* represents an important step toward making

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1/ Wi-Fi Alliance is a global, non-profit industry association of over 850 leading companies from dozens of countries devoted to seamless interoperability. With technology development, market building, and regulatory programs, Wi-Fi Alliance has enabled widespread adoption of Wi-Fi worldwide, certifying thousands of Wi-Fi products each year.

2/ *See* Public Consultation on Wireless Local Area Networks in the 6 GHz Frequency Band at Paragraphs 1-8, (August 12, 2021) ("Consultation").

3/ Consultation at Paragraph 15.

4/ *See* Global Economic Value of Wi-Fi 2021-2025, September 2021, available at: https://www.wi-fi.org/download.php?file=/sites/default/files/private/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf

much-needed spectrum capacity available for license-exempt operations in Malaysia. Wi-Fi Alliance appreciates the opportunity to contribute to the MCMC efforts. Answers to the *Consultation's* questions are provided in the Annex to this cover letter.

Respectfully submitted,

/s/ Alex Roytblat

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ANNEX
Wi-Fi Alliance Responses to
MCMC Public Consultation on Wireless Local Area Networks in the 6 GHz Frequency Band

Question	Response
Question 1 *MCMC seeks your views and comments on the demand for spectrum for Wi-Fi in the 6 GHz frequency band*.	Wi-Fi has become increasingly important in connecting people and devices everywhere. Hundreds of millions of people rely on Wi-Fi to connect billions of devices every day, and studies show this trend is rapidly increasing.[5/] Devices using spectrum that supports Wi-Fi are now the primary means by which majority of Malaysians connect to the Internet.[6/] This central role will only increase in the future, since Wi-Fi technology will be an essential complement to Fifth Generation wireless ("5G") networks, as highlighted by the Cisco VNI Mobile Report showing that traffic offloaded to Wi-Fi increase with each successive technology generation.[7/] UK's Ofcom, for example, projects that the demand for Wi-Fi will increase by up to 10 to 15 times over the next 10 years.[8/] All of this traffic over Wi-Fi-enabled devices requires spectrum capacity. Wi-Fi Alliance's previously released *Spectrum Needs Study*[9/] demonstrated that significantly more spectrum access is required to meet immediate connectivity needs. Already several countries recognized the unique

[5/] *See Wi-Fi Celebrates 20 Years with More Than 20 Billion Anticipated Device Shipments over the Next Six Years,* ABI Research (Jun. 13, 2019) available at: https://www.abiresearch.com/press/wi-fi-celebrates-20-years-more-20-billion-anticipated-device-shipments-over-next-six-years/,

[6/] CISCO, *VNI Complete Forecast Highlights Tool*, Asia Pacific, Wired Wi-Fi and Mobile Growth (2016), http://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html (select "Asia Pacific" drop-down menu select "Rest of APAC" and check "Devices/Connection and applications" --- note that according to VNI, in India, there will be 583.2 million wired/Wi-Fi connected devices by 2023, up from 324.7 million in 2018 (12.4% CAGR).

[7/] Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022**,** White Paper at page 18, available at https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white-paper-c11-738429.pdf

[8/] UK Ofcom Consultation at Appendix 6.

[9/] Wi-Fi Alliance, *Spectrum Needs Study* at p. 23, Feb. 2017, available at https://www.wi-fi.org/downloads-registered-guest/Wi-Fi%2BSpectrum%2BNeeds%2BStudy_0.pdf/33364

	benefits of making the 5925-7125 MHz spectrum available to Wi-Fi access.[10/] There is clear consensus that currently available spectrum capacity (in 2.4 GHz and 5 GHz bands) is insufficient to accommodate existing Wi-Fi traffic, let alone the growth expected in the future. Moreover, the COVID-19 pandemic has dramatically increased the rate of growth in demand for Wi-Fi connectivity. A recent study indicates that the demand for Wi-Fi connectivity has increase at unprecedented rate particularly for Wi-Fi data consumption and number of actively used devices.[11] In this pandemic, Wi-Fi plays a particularly important role because it delivers ubiquitous connectivity needed to support distance learning, telework, telemedicine, entertainment and much more. [12/] This surge in demand highlights the need for faster, more robust Wi-Fi networks enabled by the next generation of Wi-Fi technology and, importantly, with access to the necessary spectrum capacity -- Wi-Fi 6E. [13/] It is difficult to predict the post-pandemic "new-normal", but there is no doubt that the demand for Wi-Fi will continue to grow. And this demand cannot be met in slivers of highly congested spectrum that was made available decades ago in the 2.4 GHz and 5 GHz bands.
Question 2 *MCMC seeks your views and comments on the emerging technologies utilizing the 6 GHz frequency band.*	The *Consultation* comes at a pivotal time in the development Wi-Fi ecosystem. Earlier this year, Wi-Fi Alliance introduced new Wi-Fi 6E terminology to distinguish the latest generation Wi-Fi 6 devices that are capable of 6 GHz operation.[14/] Wi-Fi 6E brings a

10/ *See, e.g.*, Countries Enabling Wi-Fi 6E at https://www.wi-fi.org/countries-enabling-wi-fi-6e

11 *See* AirTies Wireless, The Catalyst Effect at https://airties.com/the-catalyst-effect?utm_source=wifi_now&utm_medium=article&utm_campaign=catalyst_effect_1020

12/ *See Analyzing Mobile Experience during Coronavirus Pandemic: Time on Wi-Fi* , available at https://www.opensignal.com/2020/03/30/analyzing-mobile-experience-during-the-coronavirus-pandemic-time-on-wifi

13/ *See Wi-Fi Alliance Brings Wi-Fi 6 into 6 GHz*, available at https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-brings-wi-fi-6-into-6-ghz

14/ *See* Wi-Fi Alliance® brings Wi-Fi 6 into 6 GHz, WI-FI ALLIANCE (Jan. 3, 2020) *https://www.wi-fi.org/news-events/newsroom/wi-fi-alliance-brings-wi-fi-6-into-6-ghz.*

	common industry name for Wi-Fi users to identify devices that offer the features and capabilities of Wi-Fi 6 – including higher performance, lower latency, and faster data rates – extended into the 5925–7125 MHz band. Wi-Fi 6E devices are quickly becoming available, following regulatory approvals in several countries. As the 6 GHz regulatory landscape evolves, Wi-Fi Alliance member companies will expand the Wi-Fi 6E ecosystem even further.[15/] In 2021, over 300 million Wi-Fi 6E devices are expected to enter the market.[16/] Regulatory harmonization in the 5925–7125 MHz band will create economies of scope and scale and produce a robust equipment market, benefitting businesses, consumers, and the economy. And the next generation of Wi-Fi (Wi-Fi 7) will be designed to support VR/AR/XR, Industrial IoT, automotive, telepresence, immersive 3-D and other applications that require higher data rates, stringent latency, reliability and QoS. Wi-Fi 7 optimal performance will depend on access to multiple wider (e.g., 320 MHz) channels – without spectrum access, consumers will not realize full benefits of Wi-Fi 7 and future generations of Wi-Fi technologies. Wi-Fi Alliance respectfully asks MCMC to recognize that the 5925-7125 MHz frequency band is uniquely suited to meet growing demand for Wi-Fi connectivity which cannot be addressed in another (alternative) spectrum now or in the future.
Question 3 *MCMC seeks your views and comments on the frequency range within the 6 GHz frequency band that could be considered for Wi-Fi under the Class Assignment in Malaysia. Should MCMC consider*	Optimal performance of the current and future generations of Wi-Fi depends on access to necessary spectrum. Precluding Wi-Fi access to 6425-7125 MHz portion of the 6 GHz band would substantively reduce Wi-Fi 6E performance in terms of latency and

[15/] See Product Finder, WI-FI ALLIANCE (last visited on Feb. 22, 2021) https://www.wi-fi.org/product-finder-results?sort_by=certified&sort_order=desc&certifications=1335.

[16/] *See* Wi-Fi 6E: The Market Opportunity for Wi-Fi 6 in the 6GHz Spectrum Band, IDC Market Presentation (Apr. 2020) https://www.idc.com/getdoc.jsp?containerId=US46220720.

allowing Wi-Fi to operate in the entire 1200 MHz (5925 MHz to 7125 MHz frequency band) or only in the 500 MHz (5925 MHz to 6425 MHz frequency band)?	data throughput. The 5925-6425 MHz band does not offer sufficient spectrum to support future Wi--Fi connectivity. And, importantly, there are no alternative frequency bands that can support expanding Wi-Fi spectrum requirements in the future. Both the 5925-6425 MHz and 6425-7125 MHz bands are uniquely suited to accommodate the urgent need for additional Wi-Fi spectrum access for the following reasons: 1. Self-coordinating, multi-channel Wi-Fi networks relying on dynamic random spectrum access and contention-based protocols require access to multiple channels to maintain acceptable performance. The current Wi-Fi standard (Wi-Fi 6/6E) specifies channel bandwidths of up to 160 MHz, while the next amendment under consideration (Wi-Fi 7, Extremely High Throughput) will specify channel bandwidths of up to 320 MHz. The 500 MHz (i.e., 5925-6425 MHz) is simply insufficient to accommodate multiple 320 MHz channels. 2. Existing Wi-Fi equipment designed for the 5 GHz band can be rapidly adapted and deployed across the 6 GHz frequency range, offering significant economies of scale and other benefits. 3. Efforts to enable Wi-Fi in the full 6 GHz range are already underway in many countries.[17/] While some regulators (e.g., Europe) completed the initial step of opening the 5925-6425 MHz band (lower 6 GHz) for WAS/RLANs, there is broad recognition that a follow-up action is needed to address the projected demand for Wi-Fi spectrum in the upper 6 GHz band (i.e. 6425-7125 MHz). The 1200 MHz of contiguous spectrum would enable 14 additional 80 MHz channels, 7 additional 160 MHz channels or 3 additional 320 MHz channels which are needed for high-bandwidth applications that require faster data throughput such as high-

17/ *See* Countries Enabling Wi-Fi 6E at https://www.wi-fi.org/countries-enabling-wi-fi-6e

	definition video streaming and virtual reality. Wi-Fi 6E and subsequent generations of Wi-Fi technology will leverage these wider channels and additional capacity to deliver greater network performance and support more Wi-Fi users at once, even in very dense and congested environments. WI-FI Alliance also notes that considerable technical and regulatory efforts already have been undertaken to analyse spectrum sharing conditions in 6 GHz frequency range. [18/] The result of these efforts identified a set of conditions that are necessary to protect Fixed, Fixed Satellite and other important existing operations. These conditions are feasible for deployment of lower power WLANs under the Class Assignment regime, but they are not feasible for higher power wide area (licensed) cellular solutions (i.e., IMT).[19] In light of the above, Wi-Fi Alliance encourages MCMC to advance with WLAN deployments in the 5925-7125 MHz band.
Question 4 *MCMC seeks your views and comments on:* *i. the coexistence between Wi-Fi and incumbent services (i.e. fixed service and fixed-satellite service); and* ii. *ii. the potential interference mitigation between these services.*	(i) Authorization of the WLAN under the Class Assignment (e.g., Wi-Fi) in the 5925-7125 MHz frequency band is feasible and the best use of this spectrum resource. Extensive technical analyses conducted in Europe and US confirm the feasibility of WLAN operations in the in the 5925-7125 MHz frequency band without interference to the incumbent services (see for example ECC Report 302, CEPT Report 75, RKF Study, FCC Report and Order). Wi-Fi Alliance agrees that introduction of new WLAN operations must not disrupt or constrain important incumbent operations in the 5925-7125

18/ *See* ECC Decision (ECC/DEC/(20)01) on the harmonised use of the frequency bands 5945-6425 MHz for WAS/RLANs, available at https://docdb.cept.org/document/16737

19 *See ITU-R Report* **M.2376-0 (07/2015)**, Technical feasibility of IMT in bands above 6 GHz, available at https://www.itu.int/pub/publications.aspx?lang=en&parent=R-REP-M.2376-2015

		MHz frequency band. Unlike IMT, Wi-Fi can operate in the 5925-7125 MHz frequency band without causing interference to incumbent operations or requiring their relocation to another frequency band (if such frequency band is even available). Built on IEEE 802.11 standards, Wi-Fi has demonstrated ability to coexist with and protect other spectrum users. These protections are inherent to Wi-Fi technology and are critical to its efficient operations on unlicensed basis worldwide. And Wi-Fi industry is committed to implementing technical, operational, and regulatory solutions that ensure coexistence with other services in the 5925-7125 MHz band. It is important to emphasize that these regulatory solutions are viable for Wi-Fi 6E implementations but are not practical for commercial IMT networks. Commercially viable IMT deployments require exclusive access to spectrum. It is, therefore, unrealistic to expect that ubiquitously deployed IMT networks can avoid interfering with and tolerate interference from other, incumbent operations in the 6425-7125 MHz band.
	(ii)	Contention-based protocols such as Wi-Fi's carrier sense multiple access with collision avoidance, already enable co-existence of multiple unlicensed device types. The same contention-based protocols used by unlicensed devices to ensure that they do not interfere with one another will reduce interference potential to incumbent operations in the 5.925-7.125 GHz band. The IEEE specification for Wi-Fi, for example, requires energy detection at -62 dBm/20 MHz. Wi-Fi Alliance members report that their implementation can sense at an even lower threshold to ensure compliance with the IEEE specification. So, in real world implementations, the contention-based protocol is even

	more effective in protecting incumbent operations. Accordingly, currently employed contention-based protocols would effectively augment protection of the licensed services and facilitate coexistence among various unlicensed technologies.
Question 5 *MCMC seeks your views and comments on the potential technical and operational conditions to be imposed if the 6 GHz frequency band is introduced for Wi-Fi under the Class Assignment. Should part of the frequency band be limited to indoor operation? Should standard power devices operating under the Automatic Frequency Coordination (AFC) system be adopted in Malaysia?*	Recognizing that international regulatory harmonization is key to ensuring commonality and availability of Wi-Fi devices, economies of scale and other benefits, Wi-Fi Alliance recommends that, to extent possible, the MCMC should align its regulatory framework with other countries. Specifically, in authorizing WLANs in the 5925-7125 MHz, regulators in Asia, Americas and Europe converged on a regulatory model based on three types of RLAN devices: a. Very Low Power WLAN devices ("VLP"). These short-range devices for personal connectivity entail negligible interference potential due to low transmit power, low-duty cycles, transitory operational environments, and other interference mitigating factors. The VLP interference potential is reduced even further due to the fact that these largely personal network devices operate predominately indoors. The appropriate VLP transmissions limits are 17 dBm e.i.r.p. and 1 dBm/MHz power spectral density. [20/] These limits would facilitate consistent performance for wider channel of up to 320 MHz, advance the rapidly evolving Wi-Fi 6E ecosystem and enable implementation of new use cases in healthcare, wearables, IoT and other sectors.

[20/] Brazil ANATEL Act No. 1306, 26 February 2021 at ¶ 11.7.1.1 and at ¶ 11.7.3.1 available at https://sei.anatel.gov.br/sei/modulos/pesquisa/md_pesq_documento_consulta_externa.php?eEP-wqk1skrd8hSlk5Z3rN4EVg9uLJqrLYJw_9INcO7uvjUt3vSOwT_4Z5fukj9yIzPErY4KWH5cpE9W_9hcTZkCG-vLPIdpXyuhgMG-L9M-uBLoSdAAXO0clb3Slt1i

	b. Low Power Indoor-only WLAN devices("LPI"). The signals transmitted by these devices are significantly attenuated when passing through the walls of buildings and other obstacles. The median signal loss from a traditionally constructed building is 17 dB and newer (i.e., taller), energy-efficient buildings provide even higher signal attenuation (see ITU-R P.2109-1). Wi-Fi Alliance recommends harmonizing the LPI transmit power limits at 30 dBm e.i.r.p. and 11 dBm/MHz power spectral density. [21/] These power levels allow Wi-Fi 6E enhanced data throughput capabilities to reach beyond one or two rooms without the need for signal extenders or additional equipment. To ensure that the LPI WLAN operate indoors, administrations require that these (LPI) devices should comply with the following constraints: c. cannot be weather resistant (i.e., no weatherized enclosures). d. include integrated antennas and prohibit the capability of connecting other antennas to the devices, which will prevent substituting higher gain directional antennas and make the devices less capable or suitable for outdoor use. e. operate off mains power and prohibit these devices from operating on battery power. f. Standard-Power WLAN devices. These devices access spectrum on coordinated basis to avoid transmissions on frequencies that may be used by other terrestrial systems. Such coordination can be enabled with the AFC system. Prior to initiating transmission, the standard power WLANs should be required to obtain a list of permissible frequencies from the AFC system. The AFC's function is to

[21/] FCC published Report and Order (FCC-20-51) ¶ 18 and 47 CFR.§ 15.407 (5).

	determine permissible frequencies at a specified geographic location. Recognizing that incumbent operations in the 5925-7125 MHz frequency band are not static, the AFC system should be designed to account for new and modified operations. Wi-Fi Alliance is actively developing technical specifications to enable implementation of the 6 GHz AFC system. Recently, Wi-Fi Alliance released specifications necessary for the 6 GHz AFC system implementation: g. **AFC System Reference Model:** describes the overall end-to-end AFC system architecture, covering the topology and related elements that make up the entire system. h. **AFC Device and AFC System Compliance Test Plan:** describes test programs for compliance of AFC Device under test (DUT) and AFC System under test (SUT) to the relevant regulatory requirements. i. j. **AFC System to AFC Device Interface Specification**: provides interface specifications for communication between an AFC device and an AFC system. By bringing together technical experts from a broad section of the industry, Wi-Fi Alliance is rapidly enabling Wi-Fi 6E standard power capabilities worldwide. In the meantime, multiple entities have already demonstrated AFC system prototypes.[22] And the U.S. Federal Communication Commission ("FCC") initiated the AFC operator approval and AFC system certification processes.[23] In light of all these developments, Wi-Fi Alliance encourages MCMC to proceed with its proposal to allow 6 GHz standard-power WLAN operations. Wi-Fi Alliance recommends harmonizing the 6 GHz standard power e.i.r.p. limit at 36 dBm and maximum permitted

8/ *See* for example: https://ecfsapi.fcc.gov/file/100302586574/2019-10-01%20OET%20AFC%20Demo%20Ex%20Parte.pdf

23 FCC ET Docket No. 21-352, The Commission Begins the Process for Authorizing 6 GHz Band Automated Frequency Coordination Systems at https://www.fcc.gov/document/authorizing-6-ghz-band-automated-frequency-coordination-systems

	power spectral density of 23 dBm/MHz. This recommendation comports with the limits adopted by the U.S. FCC and the Innovation, Science and Economic Development Canada ("ISED").[24] Similarly., the MCMC should also consider allowing standard-power access points used in fixed point-to-point WLANs to operate at power levels greater than 36 dBm e.i.r.p. This allowance would provide wireless internet service providers additional flexibility needed to relieve congestion in the 5 GHz band and extend the Wi-Fi connectivity success to the 6 GHz band. To ensure that higher e.i.r.p. levels are used primarily for point-to-point operations, MCMC may specify a limit on the maximum conducted transmitter power (e.g., 30 dBm) and allow standard power point-to-point Wi-FI access points to employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted power, thereby encouraging the use of higher gain, highly directional antennas. The AFC system is not needed to protect Fixed Satellite Service (Earth-to-space) operation because the limits on radiated power will prevent interference to space station receivers from individual WLAN devices. The significant separation distances between ground-based WLAN transmitters and space-based satellite receivers provide ample isolation to mitigate against the potential of harmful interference. There is no need to require the out-of-band emission (OOBE) limits on relatively low power RLANs to protect adjacent channel operations within the 5925-7125 MHz frequency band. The RLAN implementation offers sufficient OOBE inter-channel suppression. The OOBE limits are required at the lower edge (below 5925 MHz) band and the upper edge (above 7125 MHz) to ensure full

[24] *See* SMSE-006-21, ISED Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band, May 2021 at Paragraph 60

	incumbent protection. The -27 dBm/MHz is the appropriate level as it is applied to WLANs operating in the adjacent 5 GHz band. In addition, to derive most benefits and maximize harmonization, the MCMC should permit low-power indoor WLAN client devices to communicate directly with other low-power indoor WLAN client devices (i.e., client-to-client), not just with WLAN access points. Client-to-client connectivity supports a number of important use cases including onboarding equipment using smartphones, sharing streaming video from one device to another, and sharing files among users or devices quickly and efficiently. That is why the European regulators adopted rules that permit client-to-client connectivity [25/] while similar rules are under consideration in the U.S.[26/]
Question 6 *What other key issues need to be considered in introducing Wi-Fi in the 6 GHz frequency range?*	MCMC should consider allowing standard-power WLAN access points, under AFC control, to be used in mobile applications. Mobile and transportable standard power access points will constitute important use cases in the Wi-Fi ecosystem. Examples of some of those use cases include: 1) mobile industrial clients with uses such as forklifts, top loaders, rail cranes, and tractors; 2) maritime ports with uses such as gantry cranes and transiting and docked harbor ship-to-shore communications; 3) airport gatelink systems; 4) rail uses such as train/subway car-to-car and car-to-trackside mesh; 5) emergency responders for mobile incident command centers and temporary surveillance and monitoring; 6) mobile agriculture mesh;

[25/] ECC Decision (20)01 On the harmonized use of the frequency bands 5945 to 6425 MHz for implementation of Wireless Access Systems including Radio Local Area Networks (WAS/RLAN) at Table 1 on Pg. 6 available at https://docdb.cept.org/download/50365191-a99d/ECC%20Decision%20(20)01.pdf

[26/] *The Office Of Engineering & Technology Seeks Additional Information Regarding Client-to-Client Device Communications in the 6 GHz Band*, Public Notice, ET Docket No. 18-295 and GN Docket No. 17-183, DA 21-7 (Jan. 11, 2021) ("*6 GHz Public Notice*"), available at https://www.fcc.gov/document/oet-seeks-info-6-ghz-u-nii-client-client-device-communications

	7) repositionable construction data-networks; 8) repositionable mining data-networks; and 9) entertainment venues, stadiums, concert arenas, audio-visual mixing booths, and media tents. The same technical requirements that apply to fixed standard power WLAN access points should apply to mobile and transportable access points. For example, the MCMC may allow 6 GHz WLAN mobile or transportable devices to operate on platforms within geo-fenced areas. Geo-fenced operations would enhance connectivity, particularly in rural areas, by enabling improved communications on moving vehicles such as school buses and agricultural equipment, and for applications such as monitoring roaming livestock. Many mobile standard power operations can be addressed through the AFC geo-fencing, which will allow an access point to load channel availability information for multiple locations, (*i.e.*, in the vicinity of its current location) and use that information to define a geographic area within which it can operate on the same available channels at all locations. Other applications may require real-time computation, taking into account a mobile access point's speed, trajectory and other factors.