Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
FCC Seeks Comment on Recommendations Approved by the Advisory Committee for the 2015 World Radiocommunication Conference	)	IB Docket No. 04-286

COMMENTS OF FACEBOOK, INC.

Facebook, Inc. submits these comments in response to the Commission's Public Notice seeking comments on the recommendations approved by the Advisory Committee ("WAC") for the 2015 World Radiocommunication Conference ("WRC-2015").[1] Facebook's comments are focused on Agenda Item 10 of the agenda for WRC-2015, which in turn sets forth the agenda for the 2019 World Radiocommunication Conference ("WRC-2019").

I. SUMMARY

The Commission understands well the paramount international spectrum objective of putting in place smart and flexible spectrum deployment and sharing strategies that increase the availability of broadband access to the world's currently unserved and underserved areas. Facebook, as part of its Internet.org project, is currently developing high altitude aircraft that can serve as an important component of worldwide broadband access. Facebook expresses its support for View A to WAC/117rev1(20.05.15) ("View A").[2] View A is important to

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[1] Public Notice, Federal Communications Commission, IB Docket No. 04-286, FCC Seeks Comment on Recommendations Approved by the Advisory Committee for the 2015 World Radiocommunication Conference, DA 15-604 (rel. May 21, 2015).

[2] *See* View A, WAC/117rev1(20.05.15) ("View A").

commencing a process of rigorous study that should lead to a well-informed evaluation of ways to facilitate broadband services via High Altitude Platform Stations ("HAPS") at WRC-2019. Specifically, View A proposes an agenda item for WRC-2019 that would consider, on the basis of ITU-R studies, expanding the frequency ranges available for HAPS and revising the geographic, technical, and regulatory restrictions associated with the existing HAPS identifications. This flexibility would be subject to measures that avoid harmful interference with existing services.

While these fundamental proposals of View A seem to have achieved consensus in the US delegation already, the proposal in its entirety has not yet done so. This is because another view, View B, would extend to one band not included in View A, but would exclude from the studies a number of other frequency bands. Nevertheless, the two views submitted are more notable for the vast majority of positions they share than the small minority that divide them. Both recognize the important role that HAPS can play in the cause of promoting broadband availability. In line with that recognition, the proponents of both views support studying additional spectrum requirements for HAPS, expanding the frequency ranges of existing identifications for HAPS within existing fixed service allocations, and relaxing the geographic, technical, and regulatory restrictions associated with the existing HAPS identifications. And, just as important, there is no View C arguing for no change.

Therefore, a reconciliation of Views A and B can and should be achieved, for example by making clear that any contemplated HAPS use would not be harmful to certain other services in certain bands that the View B proponents seek to exclude from study and by a carefully limited exclusion of the 23.6 GHz-24.0 GHz band included in View A to address specific concerns raised by government radio astronomy users—instead of the wholesale *a priori* exclusion attempted in View B.

The spectrum needed for HAPS has grown with the exponential growth in the bandwidth requirements of broadband access. Thus, the Commission should serve the cause of broadband availability and facilitate HAPS deployment by advocating a HAPS agenda item for WRC-2019.

II. PROMOTING GLOBAL CONNECTIVITY

With more than 1.4 billion people worldwide using Facebook on a monthly basis, Facebook is committed to its mission of giving people the power to share and making the world more open and connected.

Facebook has been advancing this mission at a time when the world is going through one of the greatest economic transitions in history, moving from economies based on physical resources to economies based on knowledge. Ideas and the ability to access, develop, and share them are increasingly becoming the drivers of innovation, growth, jobs, and productivity. Unlike physical resources, knowledge is not a zero-sum resource. One person's having it does not necessitate another's being excluded from it. It is infinitely renewable and available to everyone. This is the power of the knowledge economy.

But it is a power that remains untapped in many parts of the world. Currently, 3.2 billion people worldwide use the Internet. This is an incredible milestone, but it also means that only 43.4% of the world's population has ever been connected to the Internet.[3] It is no surprise that the unconnected are disproportionately located in developing countries—82.2% of the population in the developed world is online compared to just 35.3% in emerging

[3] International Telecommunication Union, ICT Facts and Figures (May 2015), *available at* http://www.itu.int/en/ITU-D/Statistics/Pages/facts/default.aspx.

economies.[4] Moreover, Internet adoption is slowing—the rate of growth declined for the fourth year in a row to just 6.9% in 2014 (down from 14.0% in 2010).[5] At present rates of decelerating growth, the Internet will not reach 4 billion people until 2019.

To combat this looming crisis of unequal opportunity, Facebook has created Internet.org, a Facebook-led partnership made up of technology leaders, nonprofits, local communities, and experts. Internet.org is charged with the mission of bringing Internet access to the 4.2 billion people in the world who are not yet connected to the Internet. Two of the keys to the success of this mission are relevant here: international spectrum availability for a variety of broadband systems using the radio frequencies; and flexible pro-connectivity regulatory frameworks, both international and domestic, which permit a variety of broadband access technologies.

Flexibility is important because worldwide access cannot possibly be one-size-fits-all, either economically or technically. Different communities need different technical solutions or, to put it more accurately, different mixes of solutions. In some cases, such as dense urban areas, terrestrial systems are efficient both for the end user and for the backhaul link. In other cases, such as remote, sparsely populated areas, where there are significant gaps in infrastructure, and the economic barriers of installing that infrastructure are considerably higher, satellite delivery suggests itself. And, in medium density areas, such as suburban and rural areas, where broadband infrastructure must be deployed over a wide area to be cost-effective, HAPS can provide an efficient component of the optimal solution. For these cases, Facebook primarily envisions the use of HAPS to provide backhaul-type links between the aircraft and aggregation points such as cell towers or WiFi Access Points, thereby complementing terrestrial links

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[4] *Id.*

[5] *Id.*

between these aggregation points and the end user.[6] For these areas, the high altitude, solar-powered aircraft Facebook is developing can be quickly deployed and can achieve impressive longevity of service.

III. HAPS OPERATIONS ARE HEAVILY RESTRICTED BY THE RADIO REGULATIONS

While the ITU is no stranger to the concept of HAPS, today's high-altitude systems are almost unrecognizably different from those being planned in the 1990s. Today's platforms are smaller and more agile, and they can maintain fixed station keeping for much longer periods, compared to the HAPS of yesteryear. Depending on the particular altitudes and other characteristics of their deployment, the payloads of such craft could qualify as HAPS. Moreover, the HAPS proponents of today include companies with the necessary wherewithal, "stick-to-it-iveness," budget, and resources to fund and implement such systems, as illustrated by the proponents of View A themselves, including Google and Facebook. Facebook, for one, is unequivocally committed to international advocacy, technical analysis and study, as well as system testing and implementation in connection with high altitude operations. This is another important difference from the relatively more speculative HAPS pioneers of 20 years ago.

The HAPS proponents of today also plan to use, and must use, significantly greater bandwidth than has been designated for HAPS to date. The main services of the early HAPS focused on narrowband technologies primarily supporting basic voice, text, and low-speed data, consistent with the download throughput rates for wireless connections in the 1990s, which only

[6] Other links of importance are those devoted to TT&C as well as those between the aircraft to Internet points of presence. For HAPS-to-HAPS communications, Facebook is exploring optical links.

went up to 200 Kbps.[7] Previous WRCs had these services in mind when they established the current designations. The stations that Facebook is designing will use state of the art communication technologies capable of achieving 10 Gbps and above, consistent with the increasing throughput speeds available with fourth generation technologies and planned for fifth generation technologies.[8]

These differences have a number of implications for WRC-2015 and WRC-2019. The spectral and geographic restrictions of existing HAPS fixed service spectrum designations are both unsuitable for the large data throughputs that modern and future broadband access entails, and unnecessary in light of the smaller size and greater agility of the HAPS planned for today, as well as the greater potential for sharing between a HAPS backhaul-type service and other services. These restrictions include limited frequency ranges, limited geographic scope, as well as limitations on secondary use.

Specifically, the fixed service HAPS designations today include: 600 MHz in the V-band (47.2 GHz-47.5 GHz and 47.9 GHz-48.2 GHz); 600 MHz in the Ka-band (27.9 GHz-28.2 GHz from HAPS to Earth, 31.0 GHz-31.3 GHz from Earth to HAPS); and 160 MHz in the 6 GHz range (6440 MHz-6520 MHz for HAPS to Earth, 6560 MHz-6640 MHz for Earth to HAPS).

Some of these designations are heavily restricted geographically, too. Thus, the 6 GHz designation only applies to Australia, Burkina Faso, Cote d'Ivoire, Mali, and Nigeria. Likewise, the Ka-band designation only extends to Bhutan, Cameroon, South Korea, Russia, India, Indonesia, Iran, Iraq, Japan, Kazakhstan, Malaysia, Maldives, Mongolia, Myanmar, Uzbekistan,

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[7] *See* Federal Communications Commission, Broadband Performance, OBI Technical Paper No. 4, at 19 (Aug. 10, 2010), *available at* https://www.fcc.gov/document/obi-technical-paper-no-4-broadband-performance.

[8] *See* Lisa Eadicicco, If You Think 5G Is All About Faster Network Speeds, You're Wrong, Business Insider (July 24, 2014), http://www.businessinsider.com/5g-network-speed-2014-7.

Pakistan, the Philippines, Kyrgyzstan, North Korea, Sudan, Sri Lanka, Thailand, and Viet Nam. Yet another restriction is embedded in Radio Regulation 4.23, which provides that "transmissions to or from high altitude platform stations shall be limited to bands specifically identified in Article 5."[9]

IV. THE PROPOSED AGENDA ITEM WOULD HELP HAPS TO ENHANCE BROADBAND ACCESS

View A proposes to study additional fixed service allocations for HAPS in the frequency ranges of 5925 MHz-15.35 GHz, 21.2 GHz-22.0 GHz, and 23.6 GHz-29.1 GHz. The bands under consideration for study by View A do not extend to the planned satellite bands of Appendices 30, 30A, and 30B. View A also calls for studying the potential for sharing and compatibility between broadband applications delivered over HAPS in the included bands and existing services.

In addition, View A proposes that the studies examine revisions to the existing geographic, technical, and regulatory restrictions associated with the current HAPS identifications. Specifically, the studies contemplated would examine whether the geographic limitations imposed by Radio Regulations 5.388, 5.457, 5.537A, and 5.543A are still necessary. View A also invites WRC-19 to consider other appropriate regulatory actions, based on the studies conducted.

View B, on the other hand, would exclude from study any terrestrial service bands that are shared by satellite services.[10] Specifically, View B would carve out from the studies the

[9] ITU Radio Regulations Article 4.23.

[10] Thus, View B would limit the frequency ranges for study to 7.075 GHz-8.5 GHz, 10.0 GHz-10.68 GHz, 14.8 GHz-15.35 GHz, 21.2 GHz-21.4 GHz, 22.0 GHz-23.6 GHz and 24.75 GHz-27.0 GHz.

5.925 GHz-7.075 GHz, 8.5 GHz-10.0 GHz, 10.68 GHz-14.8 GHz, 21.4 GHz-22.0 GHz and 27.0 GHz-29.1 GHz frequency bands from the studies.[11]

In Facebook's view, this wholesale exclusion would impede the effort from the get-go. For example, an efficient way to alleviate the spectral constraints faced today by broadband HAPS systems is to extend existing fixed service bands already designated for HAPS. The Ka-band is a particularly promising candidate for this treatment. In particular, the existing 300 MHz Ka-band HAPS identification at 27.9 GHz-28.2 GHz could be extended by 700 MHz in either direction to provide bandwidth that could well be sufficient for the downlinks of a HAPS broadband system (*i.e.*, transmissions from the aircraft to aggregation points on the ground). Notably, since the neighboring satellite allocations are for uplinks, the reverse band working between the two services should facilitate sharing, making these bands appropriate subjects for study and militating against their *a priori* exclusion.

But, happily, the two views are much more notable for what they have in common than what divides them. Most importantly, both views recommend study of additional frequencies for HAPS. Both views also call for the study of revisions to the existing geographic, technical, and regulatory restrictions associated with the current HAPS identifications. In sum, as aptly put at the US WRC-2015 delegation meeting held on June 4, 2015, the debate is not over *whether* to propose a robust HAPS agenda item for WRC-2019. There is consensus that such a proposal should be made. The debate, rather, is about the precise words in which to couch this proposed item.

[11] There are two other differences as well. View B would incorporate the language from WRC-12 Resolution 233 for sharing and capability studies rather than the more general sharing and compatibility language contained in View A. *See* View B at 14. View B proponents also would emphasize that the frequency allocations to be considered for any expansion of HAPS would be limited to specific fixed service allocations. *Id.*

One possible compromise is to instruct that the studies use extra caution in connection with the 5.925 GHz-7.075 GHz, 8.5 GHz-10.0 GHz, 10.68 GHz-14.8 GHz, and 21.4 GHz-22.0 GHz bands, which are shared with satellite services. In those bands, the ITU-R could study the potential of HAPS systems to operate without degrading the capabilities of existing co-primary geostationary satellite users (HAPS systems would have co-primary status with respect to all other spectrum users). Again, in the spirit of compromise, it would be appropriate to exclude from consideration under View A the 23.6 GHz-24.0 GHz band, which has received concrete objection on the part of radio astronomy users.

V. CONCLUSION

HAPS systems have the potential to be part of the broadband solution for the nearly 60% of the world's people who currently lack Internet access. The Commission should recommend that the US delegation for WRC-2015 either adopt View A to WAC/117rev1 or a compromise between Views A and B, allowing the well-informed consideration of HAPS for broadband at WRC-2019.

Respectfully submitted,

/s/

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