Comments on Draft KDB Publication 987594
U-NII 6 GHz devices 5.925-7.125 GHz DR02-45002

Submitted by Broadcom Inc.
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Broadcom appreciates the OET Laboratory's work to develop Draft KDB publication 987594 DR02-45002, implementing the rules adopted in the Commission's 6 GHz First Report and Order for Standard Power devices while addressing the practical needs of device manufacturers and consumers.[1] Below, we provide targeted recommendations to address inconsistencies between the Draft KDB and the 6 GHz rules and to further improve the fit between the proposed equipment certification procedures and the needs of industry.

1. The KDB Should Allow Chipmakers to Receive Persistent Inquiry Approvals for Geolocation Systems.

Broadcom strongly supports the Persistent Inquiry Approval ("PIA") concept described in the Draft KDB. We commend OET for creating a process that avoids unnecessary duplication, given the fact that manufacturers will commonly use the same geolocation system in multiple products.

However, the Draft KDB appears to incorrectly assume that geolocation systems will be developed by access-point manufacturers themselves and, therefore, apparently requires that a PIA be associated with a given equipment authorization grantee. For example, the Draft KDB stipulates that "[a] new and separate and complete PIA is required for different Grantees, including a change in ID."[2]

In practice, however, geolocation solutions will often be developed by the chipmakers whose components are used in an access point, or potentially other third-party providers. Broadcom, for example, is in the advanced stages of developing a geolocation solution that its equipment-manufacturer customers can integrate into their products. Under these circumstances, the most efficient approach would be for Broadcom to obtain the PIA and authorize its customers to reference that PIA in their own equipment certification filings. In addition, as the Draft KDB notes, geolocation PIAs are likely to include a significant amount of information about the geolocation system architecture, test results, and other technical details. The developer of the geolocation solution, such as Broadcom, would be better positioned to provide this information to OET and respond to technical questions than the access-point manufacturer.

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[1] *See 6 GHz UNII 5-8 Bands*, Draft Laboratory Division Publications Report, Publication No. 987594 DR02-45002 (rel. Mar. 17, 2023) ("Draft KDB"); *see also Unlicensed Use of the 6 GHz Band*, Report and Order ad Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852 (2020) ("*6 GHz Report and Order*").

[2] *Id.* at 21.

This approach may not be appropriate where the functioning of the geolocation system depends on design choices made by the access-point manufacturer. In these cases, it may still be necessary for the equipment manufacturer to obtain its own PIA. However, where the geolocation system is self-contained and does *not* depend on the design of the access point, there is no evident reason why different access-point manufacturers should be required to obtain PIAs for the same third-party geolocation system.

2. The KDB should clarify that devices used in mesh networks can be certified as Standard-Power Access Points.

The Draft KDB notes that Subordinate Devices "include[ ] equipment such as Wi-Fi extenders and mesh networks."[3] Mesh networking is an essential use case for 6 GHz unlicensed devices, and it is important that OET provide a clear path to certification of devices intended to serve as mesh nodes. Therefore, it is critical that OET clarify that indoor subordinate devices are not the *only* device class that can operate as mesh nodes. This would effectively prohibit any outdoor mesh networks in the 6 GHz band, with no basis in the 6 GHz rules.

On the contrary, the 6 GHz rules make clear that "[a]ccess points and subordinate devices may connect to other access points or subordinate devices."[4] Thus, access points as well as subordinate devices, are permitted to operate as mesh nodes under the rules. Accordingly, OET should clarify that mesh nodes can be certified under equipment classes 6ID (Indoor Access Points), 6SD (Standard-Power Access Points), *or* 6PP (Subordinate Devices). Of course, Standard-Power Access Points operating as mesh nodes would still be required to comply with the geolocation requirements for these devices. But, so long as the manufacturer can demonstrate that a mesh device complies with these and all other rules that apply to Standard-Power Access Points, they should be certified as such under equipment class 6SD.

3. The Lab should correct Table 3 of the Draft KDB to properly apply the elevation/EIRP limit for outdoor devices.

Table 3 of the Draft KDB summarizes the application requirements for Standard-Power Access Points, Standard-Power Clients, and Fixed Clients. For all three device classes, Table 3 indicates that an applicant must demonstrate that emissions at elevation angles greater than 30 degrees will not exceed 125 mW EIRP. However, the rules require only that "[s]tandard power access points and fixed client devices located outdoors must limit their maximum e.i.r.p. at any elevation angle above 30 degrees."[5] Thus, Table 3 is inconsistent with the rules in two respects.

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[3] *Id.* at 8.

[4] 47 C.F.R. § 15.407(d)(5).

[5] *Id*. § 15.407(n). *See also id.* § 15.407(a)(4) ("For a standard power access point and fixed client device operating in the 5.925-6.425 GHz and 6.525-6.875 GHz bands, the maximum power spectral density must not exceed 23 dBm e.i.r.p in any 1-megahertz band. In addition, the maximum e.i.r.p. over the frequency band of operation must not exceed 36 dBm. For outdoor devices, the maximum e.i.r.p. at

First, Table 3 incorrectly requires Standard-Power Clients to observe the EIRP restriction above 30 degrees. Neither the *6 GHz Report and Order* nor the 6 GHz Part 15 rules require any client device, other than a Fixed Client, to observe this limit.[6] In fact, the *6 GHz Report and Order* makes clear that the 30-degree restriction is a limitation that generally only applies to outdoor access points, and applies to Fixed Clients only because they must comply with the access-point rules generally: "[for Fixed Clients], we will treat the client device as another access point with respect to operational rules, provided it complies with all of the requirements for access points, including . . . the limit on upward antenna radiation from outdoor devices (no greater than 21 dBm at more than 30 degrees above the horizon)."[7]

Second, Table 3 incorrectly requires *all* Standard-Power Access Points to observe the EIRP restriction above 30 degrees. However, both the *6 GHz Report and Order* and the 6 GHz Part 15 rules make clear that only outdoor Standard-Power Access Points must observe this limit. For example, section 15.407(a)(4) provides general power limits for Standard-Power Access Points and then additionally imposes the elevation/EIRP limit only "[f]or outdoor devices." Likewise, section 15.407(n) imposes this restriction only on "[s]tandard power access points and fixed client devices *located outdoors.*"[8] Moreover, the language in the *6 GHz Report and Order* is carefully limited to only require "*outdoor* standard-power access points to limit the maximum EIRP above a 30 degree elevation angle to 21 dBm."[9] Therefore, the KDB should recognize, at a minimum, that Standard-Power Access Points that will be deployed solely indoors need not demonstrate compliance with this outdoor-only rule. The clearest case where this showing should not be required is for access points certified as both Standard-Power Access Points (6SD) and Indoor Access Points (6ID) and which, accordingly, must satisfy all of the requirements for Indoor Access Points designed to prevent operation outside.

4. The Lab should simplify the procedures for testing a client device's ability to operate at reduced power levels.

The Draft KDB provides a required test procedure for verifying that a client device associated with a Standard-Power Access Point can change its power level to ensure that its EIRP remains 6 dB below the access point's authorized EIRP. In broad strokes, this procedure requires the client to first be tested with the access point authorized to operate at 36 dBm and then tested again at successively lower authorized power levels until the client device's "rated minimum power level" is reached.[10] While Broadcom agrees that client devices should be tested

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any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).").

[6] *See generally 6 GHz Report and Order; see also* 47 C.F.R. § 15.407(a)(4).

[7] *6 GHz Report and Order* at ¶ 192.

[8] 47 C.F.R. § 15.407(n) (emphasis added).

[9] *6 GHz Report and Order* at ¶ 92 (emphasis added). *See also id*. at ¶ 184 (referring to "antenna pointing restrictions which limit outdoor devices to antenna elevation angles less than 30 degrees."); *id*. at ¶ 192 (requiring fixed clients to comply with "the limit on upward antenna radiation from outdoor devices").

[10] Draft KDB at 43.

to verify that they will operate at reduced power as the rules require, the specific procedure in the KDB is very burdensome and is likely to create confusion.

One major issue is that, for most client devices, there is no such thing as a "rated minimum power level." Because regulatory requirements typically relate only to a device's *maximum* power level, manufacturers generally do not design and test their devices to achieve a specific minimum power level. As a result, manufacturers would be required to determine minimum rated power levels for their devices solely to allow them to be tested under this procedure, a significant and unnecessary burden.

Relatedly, this procedure is likely to require a very large number of tests in many cases, well beyond what would ordinarily be required for this type of functional measurement. For a client device capable of operating at 0 dBm, for example, eleven separate tests would be required to cover the range from 0 dBm to 30 dBm (6 dB below the maximum authorized AP power level) in 3 dB increments. The Lab should simplify this by requiring only two tests: one at 36 dBm, and a second with the access point's authorized power level set 3 dB higher than the client device's maximum EIRP, which will ensure that the client device would demonstrate the ability to reduce power no matter its maximum authorized transmit power. The manufacturer should be permitted to satisfy the requirement to operate at still-lower power levels by attestation.[11]

Finally, the Draft KDB's approach to client-device testing will require manufacturers to develop a special access-point "test mode." Standard-Power Access Points will be designed to obtain their maximum authorized EIRPs from the AFC. But the Draft KDB's test procedure requires the user to manually change the access-point's authorized power to create different client-device test scenarios. To allow this, manufacturers will have to require special test-mode software for access points that is not made available to the general public. While this may be an appropriate way to conduct these tests, the Lab should consider the fact that this will impose additional regulatory burdens on manufacturers which, in combination with the other hurdles presented by the proposed testing and certification procedures, contribute to the overall costs and benefits of these policies.

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The Draft KDB represents a major step on the road to standard-power operations in the 6 GHz band and operations outdoors. Broadcom asks that the Lab quickly finalize its guidance for certification of standard-power devices, with the revisions described above. This will provide manufacturers with the information and certainty they need to hit the ground running with

[11] At the very least, Broadcom recommends that the Lab adopt an increment substantially larger than 3 dB to reduce the number of tests that must be conducted. Requiring power reduction in 6 dB increments, for example, would reduce the number of tests required in the example above from eleven to six. However, while this would be a notable improvement, it would only be a partial solution. Conducting five tests is still a significant burden and this would not address the issue of identifying a minimum rated power level, discussed above. Another option could be to allow for random selection of a measurement point over the operating power range of the client.

standard-power devices once the Commission certifies AFC systems and allows standard-power operations to begin.