6 GHz – Geofenced Variable Power (GVP)

October 2024

Geofenced Variable Power ("GVP") Device Class

- **The FCC's *2nd FNPRM* proposed to adopt a new class of indoor/outdoor 6 GHz devices governed by geofencing.** To implement this proposal, we proposed:
  - **Designation:** Identifying the new device class as "Geofenced Variable Power" or "GVP" to distinguish it from the substantially different VLP class.
  - **Geofencing:** Adoption of the FCC's proposal to calculate geofences based on the conservative -6 dB I/N metric to create a boundary around receivers.
  - **Power:** A maximum power of +8 dBm/MHz PSD and an EIRP of 21 dBm, but with fully flexible exclusion zones that change in size to match any power level below the maximum.

- **Revised Power Limit Proposal.** In response to the record, we now propose a revised, simpler approach to GVP power:
  - Simplifying down to two maximum power levels and two corresponding geofence sizes/shapes per FS receiver: (a) +1 dBm/MHz PSD and (b) +8 dBm/MHz PSD (both with an EIRP limit of 21 dBm).
  - Devices could only operate under one or the other power maximum, outside the geofenced exclusion zone calculated for that power level.

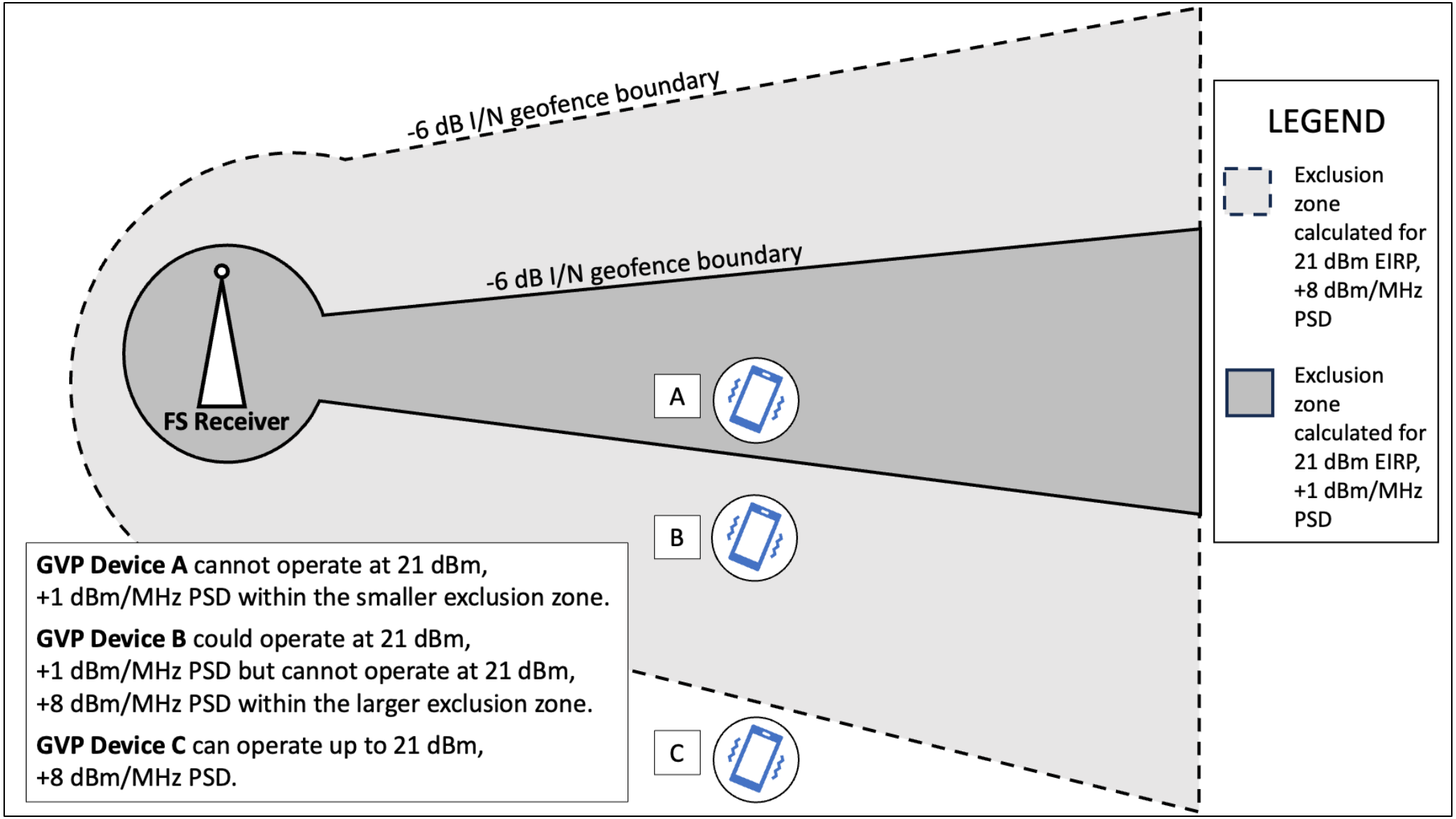
Why Higher Powers Are Important

	CHANNEL SIZE					
	20 MHz	**40 MHz**	**80 MHz**	**160 MHz**	**320 MHz**	
-5 dBm/MHz PSD, 14 dBm EIRP Limit	8 dBm	11 dBm	14 dBm	14 dBm	14 dBm	← Current VLP Baseline
1 dBm/MHz PSD, 14 dBm EIRP Limit	14 dBm	14 dBm	14 dBm	14 dBm	14 dBm	← FCC Current EIRP Proposal
			No added benefit compared to VLP.			
1 dBm/MHz PSD, 21 dBm EIRP Limit	14 dBm	17 dBm	20 dBm	21 dBm	21 dBm	← GVP Proposed Power Level #1
8 dBm/MHz PSD, 21 dBm EIRP Limit	21 dBm	21 dBm	21 dBm	21 dBm	21 dBm	← GVP Proposed Power Level #2

Geofencing Calculations

- Geofencing calculations would follow the AFC calculations that the FCC proposed in the *2nd FNPRM*, as follows:
  - Step 1: Calculate exclusion zones around incumbent receivers using the AFC methodology to create a shape outside of which GVP transmissions would not exceed the -6 dB I/N level. *2nd FNPRM* ¶ 124.
    - This would use the same combination of propagation models that are used for AFC.
    - Instead of determining the feasibility of standard-power operation at a single point, it would determine a shape outside of which GVP operation would not exceed -6 dB I/N.
    - The geofencing system would calculate two zones around each FS receiver—one zone based on a PSD of +1 dBm/MHz and a second based on a PSD of +8 dBm/MHz.
  - Step 2: The GVP device checks its location in relation to the geofences to determine (1) if it can operate; and (2) its maximum power level. *2nd FNPRM* ¶ 156.

Geofencing Calculations



Summary of Geofencing System Specifics

TOPIC	2nd FNPRM PROPOSAL	GVP PROPOSAL
Exclusion Zone Calculation	Based on -6 dB I/N interference criteria using the same combination of propagation models used in calculating AFC exclusion zones. ¶¶ 124, 127.	✓
Body Loss Assumption	4 dB. ¶ 125.	✓
Database Recheck Interval *(updating exclusion zones)*	Once-per-day database recheck interval. ¶ 160.	✓
Location Recheck Approach	The FCC proposes a "flexible" location recheck approach. The FCC would review location update algorithms during equipment certification to determine compliance. ¶ 156.	✓
RLAN Elevation	1.5 meters above ground level. ¶ 127.	✓
TPC	Devices must employ a TPC mechanism that allows operations at least 6 dB below the max EIRP. ¶ 108.	✓

Incumbents Seek to Relitigate the 2020 6 GHz Order and 2023 VLP Order.

- **Aggregate Interference.** The FCC already rejected the argument that interference analyses should take aggregate effects into account.

- **Device Elevation.** The FCC already determined that 1.5 m was a reasonable assumption for antenna height above ground.

- **4 dB Body Loss Assumption.** The FCC already determined that 4 dB is a reasonable assumption for body loss in exclusion zone calculations and did not impose a body-worn mandate for VLP devices.

- **Free-space Propagation.** The FCC already determined that a combination of free-space path loss, WINNER II, and ITM is appropriate for calculating exclusion zones.

GVP Is Necessary in Addition to AFC.

- **Mobile Operations.** The FCC banned standard power APs from operating in cars, trains, ships, or small aircraft, but GVP is intended to facilitate mobility.

- **Energy Efficiency.** Geofencing will preserve a GVP device's battery power by not requiring the device to recheck a database each time it moves.

- **Consumer Privacy.** GVP devices would not be required to report their location to a centralized system.

- **Flexibility.** The geofencing system provides greater flexibility to manufacturers to design different systems for different equipment use cases.

GVP Is a Complement for VLP.

- GVP is not a substitute for VLP but a complement.

- With higher power levels, the GVP device class would have:
  - Better link resiliency
  - More reliable performance
  - Improved performance of peripheral devices

- With access to U-NII-5 through U-NII-8, the GVP device class could utilize Wi-Fi 7’s newly available 320-megahertz wide channels.

Questions?