

Cisco Comments on Publication 789033

Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15,
Subpart E

Section H, Measurement of Emission at Elevation Angle Higher than 30 degrees from Horizon
5/20/2014

The measurement methods as outlined in the document are shown below. Section 1, subsections a) and b) are of interest to Cisco at this time.

Note: For the sake of clarity, we define the elevation angle where 0° is horizontal and 90° is straight-up.

1. For fixed infrastructure, not electrically or mechanically steerable beam antenna

a) If elevation plan radiation pattern is available:

- i) Determine the device intended mounting elevation angle and define 0° reference angle on the elevation plan radiation pattern.
- ii) Indicate any radiation pattern between 30° and 90° which has highest gain.
- iii) Calculate the EIRP based on this highest gain and conducted output power.
- iv) Compare to the limit of 125 mW to find compliance.

b) If antenna elevation plan pattern is not available, but the antenna type (such as dipole omnidirectional, Yagi, parabolic, or sector antenna) has symmetrical elevation plane pattern referenced at main beam and all lobes on the main beam elevation plan have highest gains, then the following measurement method is acceptable to determine compliance:

- (i) Determine the device's intended mounting elevation angle referenced to the horizon.
- (ii) Rotate EUT antenna by 90° around the main beam axis in horizontal position to transform measurement in elevation angle into measurement in azimuth angle and define 0° reference angle based on device's intended mounting elevation angle.
- (iii) Move test antenna along the horizontal arc, or rotate the turn table with EUT antenna placed at the center, between 30° and 90° relative to the 0° reference angle while maintaining the test antenna pointing with constant distance to the EUT antenna and search for the spot which has the highest measured emission. Both horizontal and vertical polarization shall be investigated to find out the maximum radiated emission level.
- (iv) Calculate the EIRP based on the highest measured emission and compare to the limit of 125 mW to determine compliance.

Cisco Comments:

1. Vendors purchasing antennas from ODMs will certainly be able to come up with the proper patterns. However, these patterns are unlikely to have symmetrical side-lobes even though they are "standard" types of antennas.
2. Devices with integrated or internal antennas are more likely to be those for which patterns are not available. In the case of integrated antennas, patterns will most likely be asymmetrical and if the patterns are unavailable, then sweeping from 30° - 90° will be inadequate. Cisco recommends sweeping 30° - 90° and then continuing down from 90° to 30° on the other side of the pattern.
3. The procedure outlined in b) describes a method to search for side lobes or power radiated from the side lobes. The side lobes will most likely be fairly narrow in beam width and there will likely be several associated nulls. Cisco recommends a minimum angular step size of 3° for the measurements described in b) in order to be fairly certain that the maximum of each side lobe has been captured. We do recognize that 1-degree steps would be better but we also recognize the potential increase in measurement time required to resolve the measurements at that level.

Cisco Questions

1. Current regulations allow an end user to select their own antennas for use with our unlicensed band gear as long as the gain is the same as the antenna with which we gained our approval. Does the commission foresee allowing this to continue for UNII-1 antennas deployed outdoors? Cisco would prefer that the end users deploy only the antennas with which Cisco was granted approval.
2. Will the commission be adding anything to the measurement procedure about how to account for correlated antenna gain outside the main lobe, i.e., in the side lobes?