AMERICAN PETROLEUM INSTITUTE

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Via Electronic Filing

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

Re: WT Docket No. 12-354; DA 15-1208

The Telecommunications Subcommittee of the American Petroleum Institute ("API") submits these Comments regarding an appropriate method for determining the protected contours for grandfathered 3650-3700 MHz band licensees. API recommends the Commission adopt a 37 dBu interference contour for CBRS units instead of the proposed 44 dBu contour. API also recommends the FCC apply an additional protection zone to base stations used with Registered Customer Premises Equipment ("RCPE") to account for "look past" interference as described herein.

I. BACKGROUND

API is a national trade association representing more than 650 companies involved in all phases of the petroleum and natural gas industries, including exploration, production, refining, marketing and transportation of petroleum, petroleum products and natural gas. Among its many activities, API acts on behalf of its members before federal and state regulatory agencies. The API Telecommunications Subcommittee evaluates and develops responses to state and federal proposals affecting telecommunications facilities used in the oil and gas industries. API is supported and sustained by companies that make use of a wide variety of wireline, wireless and satellite communications services on both a private and commercial basis.

Under the FCC's 3.5 GHz Order, grandfathered 3650-3700 MHz base stations are entitled to protection from harmful interference from Citizens Broadband Radio Service users for a fixed period. API believes that the FCC protection boundary proposal in this docket is less that adequate for over half of the use cases for existing equipment. Examples of unregistered operations around a registered base station that would be affected by the FCC proposal include such things as support vessels in the Gulf of Mexico that surround a platform, or mobile work locations within a oil field. In the registered subscriber/base station

space it involves conventional point-to-multipoint plus 802.16d and 802.16e wimax systems that service oil and gas SCADA, business intranet, and regular internet connectivity.

II. The Commission Should adopt a 37 dBu Interference Countour For CBRS Units

A. Interference into Registered Customer Premises Equipment Units

For registered base stations with RCPE, the Commission proposed a protection zone based on the azimuth and beamwidth of grandfathered base stations in relation to the furthest RCPE unit in ULS. The Commission proposed that a 44 dBu interference contour from a CBRS user may not overlap this protection zone. API believes that the 44 dBu interference contour must be modified to 37 dBu in order to adequately protect grandfathered 3.65 GHz band users.

The Commission's calculations assume that interference will originate from the backside of the victim RCPE antenna and effectively apply a 20 dB antenna discrimination from ETSI documentation at 180 degrees (or "front-to-back" ratio) as indicated in Appendix C. API does not take issue with the use of a 20 dB front-to-back ratio. However, the underlying assumption that interference will only originate from 180 degrees behind the RCPE is not reasonable. Directional antennas typically have side-lobes and backlobes that offer less than 20 dB discrimination. Also, subscriber antennas typically have beamwidths that allow for a wider field of view than just the base station.

As a result, in many instances interference from a CBRS device will not be reduced by the 20 dB assumed by the Commission (alternatively, this could be viewed as interference and may be amplified by RCPE antenna gain beyond levels assumed by the Commission). API believes that the interfence level should reduce the discrimination factor to a value of 13 (by 7 dB) to account for sidelobes. This number is based on observed data of sidelobe level values for high gain antennas. Effectively this results in a change from the 44 to the 37 dBu contour limit.

B. Interference into Unregistered Customer Premises Equipment CPE Units

API believes the same 37 dBu contour limit should apply to Unregistered Customer Premises Equipment ("UCPE") devices. The calculations used by the Commission assume that the major limitation is that a link with a UCPE operating at the maximum permissible EIRP would be 4.4 km away from a base station in order to "hit" the base station at a signal level commensurate with the lowest order modulation state sensitivity. The FCC further allows for a 15 dB fade margin in order to increase the reliability of this connection. It is unclear whether the FCC consider this as a simple fade margin or the combination of the mimimum SINR (Signal to Interference+Noise Ratio) plus fade margin. Nonetheless, what is calculated by the FCC is that a 44 dBu protection zone is required. This is the equivalent of a -95.5 dBm interfering signal level at a 9 dBi receive antenna.[1]

[1] *See* Sanders, Frank, "Derivations of Relationships among Field Strength, Power in Transmitter-Receiver Circuits and Radiation Hazard Limits", NTIA Technical Memorandum TM-10-469, June 2010, Page 6, Equation (20)

While on the surface this may sound reasonable, given that most systems in this band are Time-Division-Duplexed (TDD) one cannot ignore the downlink path since interference measured at the UCPE will depend on the location and operation of the CBRS device. Consider the facts that both UCPE and CBRS devices are most likely using omnidirectional antennas of gains in the 6-9 dBi range, instead of directional antennas. This extends by virtue of the fact that their location is not fixed. The use of omnidiectional antennas effectively provides an enhancement to interfering signals on the downlink. Thus additional separation is required.[2]

As in the example by the FCC, the downlink path from a base station operating at 35.6 dBm with the same maximum allowable path loss being received by a 9 dBi UCPE antenna under the same fade margin conditions would equal: 35.6 – 116.7 – 15 + 9 = -87.1 dBm. Given that 44 dBu is equivalent to -95.5 dBm, the downlink path would have an SNR of 8.4 dB based on the new system's base station. However, the CBRS device could be location 0.4 km (1/4 mile) from the UCPE, creating a noise level of -80.3 dBm (21.5-95.8-15 + 9) as mesured at the UCPE since the path loss is far less due to proximity. This would exceed the receive level of -87.1 dBm by nearly 7 dB. Consequently, the SINR requirements based on downlink criteria required atleast another 7 dB of protection considering a 0.4 km buffer.

API believes that using a single 37 dBu contour for both RCPE and UCPE to adminstratively simplify the process would be acceptable even though it may underprotect UCPE somewhat.

III. The Commission Should Apply an Additional Protection Area to Base Stations Used With RCPE

Although the Commission proposed a 4.4 km radius protection area for UCPE around each registered grandfathered base station it does not appear to provide a similar protection zone for base stations used with only RCPE. Instead, the Commission solely proposed an RCPE protection zone based on the azimuth and beamwidth of the base station and the location of associated RCPE. API believes that the current azimuth/beamwidth/distance methodology should be retained, but that an additional protection zone should be applied to base stations used with RCPE.

[2] The trend that modern information needs typically require more throughput on the downlink that the uplink. That means that it is a de facto throughput requirement for most systems that the downlink run at a higher modulation state than the uplink. Since modulation states for the uplink and downlink are determined independently by their associated links, and adaptive modulation technologies use SINR triggers (not simply a minimum signal level) value to determine the modulation state, the noise level created at the UCPE from the nearest neighbor on the downlink needs to be considered. In effect, often the downlink must provide higher performance than the uplink to be "balanced". This is very relevant to the use of wireless broadband and should not be overlooked.

This additional protection distance is necessary to prevent RCPE units that are relatively close to the base station from seeing interference from CBRS units located on the ”backside” of the base station or slightly to the side of the Commission’s proposed azimuth/beamwidth/distance but within the beamwidth of the RCPE. This type of interference exists today in many congested use areas (sometimes called “look past” interference). For example, noise from incumbents located behind the base station would impact RCPE (likely by prompting the RCPE to operate at higher power or reducing modulation) due to an interference contour that ends at the base station.

To reduce this “look past” interference, API proposes adding interference protection zones around every base station with RCPE to be a minimum of 6.4 km radius, along with sectors extending to protect further out RCPEs up to the actual distance. This will add needed separation “behind” and “around” the base station. In the event the FCC does not agree that the 37 dBu contour is justifiable, this protection zone should be increased to 10 km.

IV. CONCLUSION

Based on these conclusions, API believes the following adjustments to the site grandfathering limits are required:

1) Keep the proposed 4.4 km radius for all registered base stations that support UCPEs. Protect them by using a 37 dBu contour limit

2) Provide a second 6.4 km radius protection zone around all registered base stations that support RCPEs, in addition to the FCC proposed sector of protection out ot the furthest RCPE. Protect them by using a 37 dBu contour limit. Should the FCC not agree that the 37 dBu contour is justifiable, increase this second zone to 10 km.

Sincerely,

/s/

Stephen Comstock