Project	IEEE 802.16 Broadband Wireless Access Working Group
Title	Maximum EIRP Spectral Density for Repeaters.
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Re:	Response to a Call for Contributions for IEEE 802.16.2 (Co-existence) Task Group dated 17th December 1999; Item designated "Maximum EIRP Spectral Density for Repeaters and Inter-cell Links". This subject was also raised as a new assignment in session#4 (see minutes of session#4 page 5).
Abstract	A rationale is given for EIRP limits for repeaters in BWA systems. Text and limit values are proposed for inclusion in the Co-existence Recommended Practices document.
Purpose	For discussion at session#5 and consideration as text for inclusion in section 3 of the "Recommended Practices to Facilitate the Co-existence of Broadband Wireless Access (BWA) Systems" .
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Maximum EIRP Spectral Density for Repeaters

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Introduction

Broadband Wireless Access (BWA) systems may optionally deploy repeaters. At frequencies considered for BWA systems, line of sight or near line of sight communication is essential. Coverage from a single hub is therefore usually limited by terrain. This can be mitigated by several techniques:

- Raising the height of the hub antenna(s)
- Deploying multiple hubs, with some degree of overlapping coverage
- Adding repeaters, to fill in specific areas of coverage inaccessible from a hub
- Adding repeaters, to relay traffic to and from individual subscribers
- Deploying repeaters in a MP-MP configuration to reach subscribers via one or more repeaters

A repeater configuration used in a PMP system will typically comprise the following:

- a radio part facing a hub, with a directional antenna
- a radio part facing the subscriber or subscribers of the sub – area to be filled in, with a directional or sectored antenna
- local traffic access for a subscriber (optional)

In the direction facing the hub, the antenna will be directional and the equipment will behave similarly to a subscriber. The repeater could be anywhere within the coverage area of the hub, including the case where it is close to the cell edge. Therefore, EIRP limits similar to normal subscribers are appropriate. In the direction facing the filled –in subscribers the equipment will behave similarly to a hub but the required range will be lower. A maximum EIRP [3dB] below the hub limit is therefore proposed. In the case where the repeater serves only a single subscriber, the maximum EIRP should reflect the short range expected. A value [3dB] below that for a normal subscriber is proposed in this case. The EIRP of subscribers served by repeaters will normally be adjusted to give a balanced link budget for the two link directions. However, equipment will normally be identical to a standard subscriber so that absolute limits for EIRP for these subscribers should be unaltered.

A repeater configuration used in a MP-MP system will typically comprise the following:

- a radio part facing an access point, with a directional antenna and/or
- one or more radio parts facing other repeaters/ terminals, with directional antennas
- local traffic access for a subscriber (optional)

For MP-MP networks, most stations are repeaters and EIRP levels are deliberately kept low, so as to allow frequent re-use of channels. A maximum limit [6dB] below the PMP subscriber limit is therefore proposed.

The following text is proposed for inclusion in the Recommended Practices document:

Repeaters

Four different limits shall apply, according to the system configuration and direction faced by the repeater (i.e. whether the hub – facing direction or subscriber facing direction is specified).

Repeaters (direction facing hub): 30 dBW/MHz (Frequency Range 23.5- 43.5GHz)

BWA repeater stations in PMP systems in the direction facing a hub, using directional antennas and conforming to the equipment requirements of this practice shall not produce an EIRP spectral density exceeding 30dBW/ MHz. These limits apply to the mean EIRP spectral density produced over any continuous burst of transmission (Any pulsed transmission duty factor does not apply). The spectral density shall be assessed with an integration bandwidth of not more than 1MHz; i.e. these limits apply over any 1MHz bandwidth.

Repeaters (direction facing multiple subscribers): 11 dBW/MHz (Frequency Range 23.5- 43.5GHz)

BWA repeater stations in PMP stations the direction facing subscribers, using sectored antennas and conforming to the equipment requirements of this practice shall not produce an EIRP spectral density exceeding 11dBW/ MHz. These limits apply to the mean EIRP spectral density produced over any continuous burst of transmission (Any pulsed transmission duty factor does not apply). The spectral density shall be assessed with an integration bandwidth of not more than 1MHz; i.e. these limits apply over any 1MHz bandwidth.

Repeaters (direction facing single subscriber): 27 dBW/MHz (Frequency Range 23.5- 43.5GHz)

A BWA repeater station in a PMP system in the direction facing a single subscriber, using a directional antenna and conforming to the equipment requirements of this practice shall not produce an EIRP spectral density exceeding 27dBW/ MHz. These limits apply to the mean EIRP spectral density produced over any continuous burst of transmission (Any pulsed transmission duty factor does not apply). The spectral density shall be

assessed with an integration bandwidth of not more than 1MHz; i.e. these limits apply over any 1MHz bandwidth.

Repeaters (MP-MP system): 24 dBW/MHz (Frequency Range 23.5- 43.5GHz)

BWA repeater stations in MP-MP systems, using directional antennas and conforming to the equipment requirements of this practice shall not produce an EIRP spectral density exceeding 24dBW/ MHz. These limits apply to the mean EIRP spectral density produced over any continuous burst of transmission (Any pulsed transmission duty factor does not apply). The spectral density shall be assessed with an integration bandwidth of not more than 1MHz; i.e. these limits apply over any 1MHz bandwidth.

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