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Re:	IEEE 802.16 Working Group Letter Ballot #29
Abstract	This contribution gives the reciprocal interference estimation method.
Purpose	Discussion and accept.
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Reciprocal Interference Estimation Method

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Introduction

We have an ad hoc on SSURF transmission and contribution C802.16h-07/102 has presented during meeting #52. Contribution C802.16h-07/102 contains two main points, SSURF transmission mechanism and reciprocal interference identification. Some comments are proposed during the face to face discussion and the TG decided to continue the ad hoc on SSURF transmission and reciprocal interference identification.

This contribution focuses on reciprocal interference identification only.

In P80216h/D3, to identify the uplink interference source, SS should send something during specific slots and the neighbor BS will detect it and determine if the SS is the uplink interference to itself. To identify the downlink interference source, BS should send something during specific slots and the neighbor SS will detect it and determine if the BS is its downlink interference.

Considering the path loss of uplink and downlink is similar in most cases, we can use the downlink interference detection result to estimate the uplink interference and vice versa. This will reduce the work for active interference identification. After the initial interference estimation based on reciprocal calculation, system may send interference identification signal, such as SSURF message or radio signature actively to confirm.

Proposed Text

15.3.6 Interference Identification

The interferer may be identified using CXCC procedures or using Radio Signature procedures or through a reciprocal interference estimation.

15.3.6.3 Reciprocal Interference Estimation

15.3.6.3.1 Reciprocal Uplink Interference Estimation

After detect a interference neighbor BS, SS will report the interference power of neighbor BS to its serving BS

The serving BS can estimate the uplink interference power SS to its neighbor BS based on the interference

detection report from SS and other information.

The following equation can be used by serving BS to estimate the interference power one SS to its neighbor BS, I_{SS_NBS},

$I_{SS\_NBS} = P_{MAX\_TX\_SS} + G_{RX\_NBS} - P_{EIRP\_NBS} + P_{RX\_NBS} + (G_{TX\_SS} - G_{RX\_SS})$

Where P_{RX_NBS} is the received signal strength at antenna output of SS from neighbor BS, $P_{MAX\_TX\_SS}$ is the maximum transmission power of SS, P_{EIRP_NBS} is the EIRP of neighbor BS, G_{RX_NBS} is the receive antenna gain of neighbor BS, G_{TX_SS} is the transmit antenna gain of SS, G_{RX_SS} is the receive antenna gain of SS.

Then if I_{RX_SS} is greater than a threshold, serving BS can determine SS is the unlink interference source to neighbor and may perform corresponding interference avoidance mechanism or may send some interference identification signal such as radio signature or SSURF message to confirm.

If I_{RX_SS} is greater than destructive interference threshold, BS may think SS causes destructive interference to the corresponding neighbor BS. If I_{RX_SS} is greater than acceptable interference threshold and less than destructive interference threshold, BS may think SS causes harmful interference to the corresponding neighbor BS. If I_{RX_SS} is greater than light interference threshold and less than harmful interference threshold, BS may think SS causes acceptable interference to the corresponding neighbor BS.

If G_{TX_SS} is equal to G_{RX_SS}, the interference power one SS to its neighbor BS, P_{RX_SS}, can be calculated from,

$P_{RX\_SS} = P_{MAX\_TX\_SS} + G_{RX\_NBS} - P_{EIRP\_NBS} + P_{RX\_NBS}$.

Serving BS can get the value of $P_{MAX\_TX\_SS}$, P_{EIRP_NBS} and G_{RX_NBS} from the interference detection report of SS or from the neighbor BS through the CXP.

15.3.6.3.2 Reciprocal Downlink Interference Estimation

BS may detect the uplink interference. However, if a new uplink interference SS is identified, the following equation can be used by the BS to estimate the interference power it will cause to neighbor SS, I_{BS_NSS},

$I_{BS\_NSS} = P_{MAX\_TX\_BS} + G_{RX\_NSS} - P_{EIRP\_NSS} + P_{RX\_NSS} + (G_{TX\_BS} - G_{RX\_BS})$

Where P_{RX_NSS} is the received signal strength at antenna output of the BS from neighbor SS, $P_{MAX\_TX\_BS}$ is the maximum transmission power of BS, P_{EIRP_NSS} is the maximum EIRP of neighbor SS, G_{RX_BS} is the receive antenna gain of BS, G_{TX_BS} is the transmit antenna gain of BS, G_{RX_NSS} is the receive antenna gain of neighbor SS.

Then if I_{RX_SS} is greater than a threshold, BS can determine it will cause interference to SS and perform corresponding interference avoidance mechanism.

So if I_{BS_NSS} is greater than destructive interference threshold, BS may think it will cause destructive interference to the corresponding neighbor SS. If I_{BS_NSS} is greater than acceptable interference threshold and

less than destructive interference threshold, BS may think it will cause causes harmful interference to the corresponding neighbor SS. If I_{BS_NSS} is greater than light interference threshold and less than harmful interference threshold, BS may think it will cause acceptable interference to the corresponding neighbor SS.

Reference

[1] C802.16h-07/106, Action Items from Session #52

[2] 80216h-07/053r2, Comment database on 16h draft D3

[3] C80216h-07/102, Ad hoc on CMI TX and RX