Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Corrections to OLPC Mode-1 Equation (Section 15.3.9.4.1)**
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Re:	Category: P802.16m/D2 comments for LB30a Area: Section 15.3.9.4.1 UL Open-Loop Power Control
Abstract	This submission corrects some errors in the Mode 1 UL OLPC equation.
Purpose	Discuss and adopt
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Corrections to OLPC Mode 1 Equation (Section 15.3.9.4.1)

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1. Introduction

Section 15.3.9.4.1, UL Open-loop Power Control, contains this equation:

:

$$SINR_{Target} = \begin{cases} 10\log 10\left(max\left(10^{\Lambda}\left(\frac{SINR_{MIN}^{(dB)}}{10}\right), \gamma_{IoT} \times SINR_{DL} - \alpha\right)\right) - \beta \times 10\log 10(TNS), & OLPC \text{ Mode 1} \\ C/N, & OLPC \text{ Mode 2} \end{cases} \quad (273)$$

Close examination of the "OLPC Mode 1" equation reveals errors which will be discussed and corrected below.

2. Discussion

To see the problem with the Mode 1 equation it is helpful to first simplify it.

For clarity, define the functions $db(x) = 10\log_{10}(x)$ and $undb(x) = 10^{x/10}$. Using these functions we may write the Mode 1 equation as:

$$SINR_{Target} = db\left(\max\left(undb(SINR_{MIN}), \gamma_{IoT} \times SINR_{DL} - \alpha\right)\right) - \beta \times db(TNS)$$

This can be further simplified to:

$$SINR_{Target} = \max\left[SINR_{MIN}, db(\gamma_{IoT} \times SINR_{DL} - \alpha)\right] - \beta \times db(TNS)$$

The problem is with the term $db(\gamma_{IoT} \times SINR_{DL} - \alpha)$.

1. It is evident that $SINR_{DL}$ is already in dB, and one normally doesn't take the dB of something that's in dB to begin with.
2. α is a linear gain term that takes on values [1, 1/2 , ¼, …] to reflect the number of receive antennas at the EBS. It doesn't make sense to subtract this term from a dB value; instead, one would subtract the db() of this term from a dB value.

It is clear that this term was intended to be written $\gamma_{IoT} \times SINR_{DL} - db(\alpha)$. In that case the Mode-1 equation becomes:

$$SINR_{Target} = \max\left[SINR_{MIN}, \gamma_{IoT} \times SINR_{DL} - db(\alpha)\right] - \beta \times db(TNS)$$

3. Proposed Text Changes

[Modify the 1st case in equation 273 on p.512 to read]

$$SINR_{T\arg et} = \max\left[SINR_{MIN}, \gamma_{IoT} \times SINR_{DL} - db(\alpha)\right] - \beta \times db(TNS), \text{ OLPC Mode 1}$$

[Insert under line 50 on p.512 the definition]

$$db(x) \equiv 10\log_{10}(x)$$