Bruce Officer

From: Susie Stone [Susie.Stone@kordia.co.nz]
Sent: Friday, 19 September 2008 08:18
To: Bruce Officer
Subject: re the use of formula 1 or formula 2.

Bruce

Ian is unfortunately out of the office today and so unable to answer the questions more fully. I have the below text from him which I think clarifies matters. Ian will be available from Monday for any questions you may have re interpreting what he has provided below. I have other Radio Engineers available should you need something today.

"ITU-R Recommendations quoted in Kordia's cross submission use formula (1) to specify the "receiver noise floor elevation" for acceptable interference threshold:

1) [N + I(ext)] / N

Those ITU-R Reports indicate 1 dB maximum receiver noise floor elevation using formula (1).

In the Submissions and draft Code, receiver noise floor elevation has been referred to as Link Budget loss. Kordia agrees with ITU-R formula (1) and a 1dB receiver noise floor elevation using this formula.

However others have interpreted the expression "Link Budget loss" to imply the use of formula (2):

2) [N + I(int) + I(ext)]/ [N + I(int)]

Because cellular engineers typically plan for I(int) to be approximately equal to N, a link budget that for a given maximum level of external interference (I(ext)), that experiences a loss of 1dB calculated under formula (1) would appear for the same external interference, to be a Link Budget loss of approximately 0.51dB if calculated using formula (2).

We understand that cellular operators interpreting the draft code proposing a Link Budget loss of 1dB, would be concerned if they understood that equation (2) was intended to be used, because 1dB using formula (2) is twice the Link Budget loss that would exist physically compared to a 1dB loss calculated using formula (1).

Hence Kordia believes that either ITU-R formula (1) should be used with a value of 1dB, or if the industry prefers to use equation (2), then a value of 0.51 (or a rounded value of 0.5dB) would be equivalent.

Explaining the arithmetic:

Equation (1) is expressed in decibels as:

Link Budget Loss = 10*log ([N + I(ext)] / N)

For a normalised noise level of N = 1, and for I(ext) = 0.25

= 10*log([1 + 0.25] / 1)

= 1dB

Equation (2) is expressed in decibels as:

Link Budget Loss = 10*log ([N + I(int) + I(ext)]/ [N + I(int)])

For a normalised noise level of N = 1, I(int) = 1, I(ext) = 0.25

= 10*log([1 + 1 + 0.25]/[1 + 1])

= 10*log(2.25 / 2)

= 0.51dB"

Regards

Susie

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