In-Building Path Loss Model Analysis: Testing Assumptions and Identifying Outliers in Propagation Models

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We measured in-building path loss of public safety Band 14 LTE signals at six locations in and around the University of Colorado's Discovery Learning Center. We then developed linear regression models of the distance versus path loss relationships for each location with the data we collected. In this presentation, we will present our in-building path loss models, discuss model development, and present methods that can be used to identify outliers and influential observations. Our main focus will be on model analysis.

Developing a model that can describe a sample (i.e., data we collect) is only the first step of any modeling effort. Ultimately, our ambition (and that of any researcher) is to use the sample to learn about the population from which it came. When a model is generalizable to the population, we have learned much more about the phenomena we are studying, and our models become more useful. Generalizability of a model is determined by validating the four underlying assumptions of regression analysis: independence of errors, linearity of errors, homoscedacity of errors, and normality of errors. These assumptions concern the model's residuals. We will present quantitative statistical methods for validating the four assumptions.

Since outliers and influential observations can have excessive influence on a model, it is necessary to identify these observations and assess the impact they have on the (validated) model. We present quantitative statistical methods that can be used to assess outliers and influential observations in both the x-dimension (distance) and y-dimension (path loss).

The new knowledge we present to this field is the application of Six Sigma modeling techniques to propagation models.