Source: **Motorola**
Title: **SCM Urban Canyon Model Verification**
Document for: **Discussion**

1. SUMMARY

The urban canyon model, which is described in the current version of the SCM text[1], is examined and simulation results are described for validation purposes.

Results indicate a match to expected values.

2. URBAN CANYON PROPAGATION MODELS

In [2] and [3], an Urban Canyon model was presented which was based on measurements in a dense urban non-line-of-sight area. From these measurements, as seen in Figure 1, the canyon effects can be seen to varying degrees. In this figure the direction of arrival is shown for the six strongest paths. From this measurement data, calculations with the median per-path AS = 35˚ produce an average composite AS = 68.7˚.

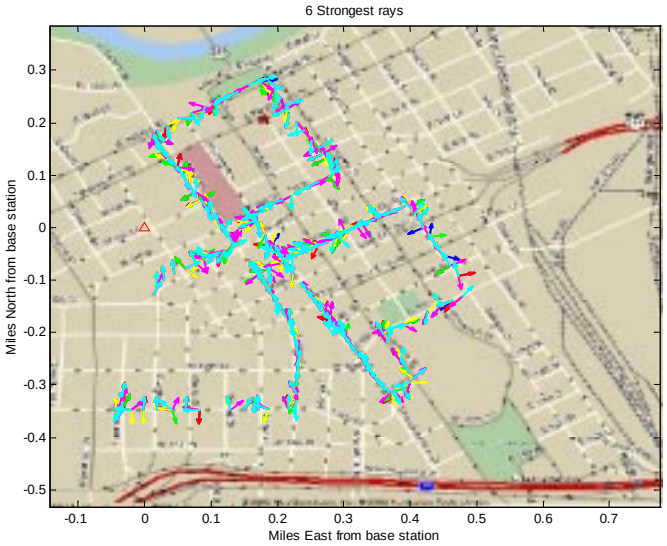

Figure 1, Measurements showing Urban Canyon directional effects

In the model, a multi-step procedure[1] is given, which characterizes the AoAs of the various delayed paths, resulting an AoAs for the six path components.

In the first step, a random street orientation is chosen, and the AoA of the first arriving path is selected from the CDF shown in Figure 2.

This figure is plotted from 0-180˚ with negative angles being equally likely. Several regions can be seen. At 0˚ and 180˚, there is a high probability of seeing AoAs of +/- 15 degrees. (Note that this is the average AoA and does not include the 35˚ per-path angle spread.) At around 90˚ there is a high probability of seeing signals coming from side streets, between buildings, or the rooftops of shorter buildings.

After this AoA is established, the AoAs of the remaining paths are chosen from a second CDF shown in Figure 3, where the reference angle of zero degrees is set to be the direction of the first AoA.

This figure illustrates the relative behavior of the various paths with respect to the first arriving path. Note that there is a high probability of seeing paths that are aligned with the first arriving path.

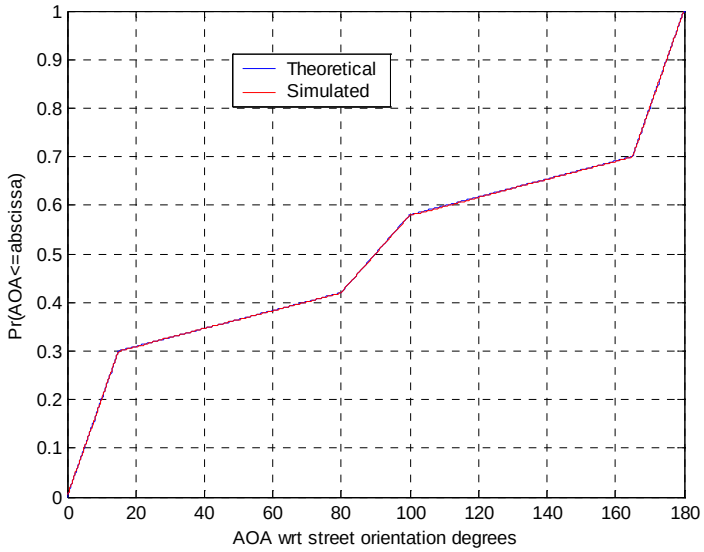

Figure 2, CDF of the 1st arriving path

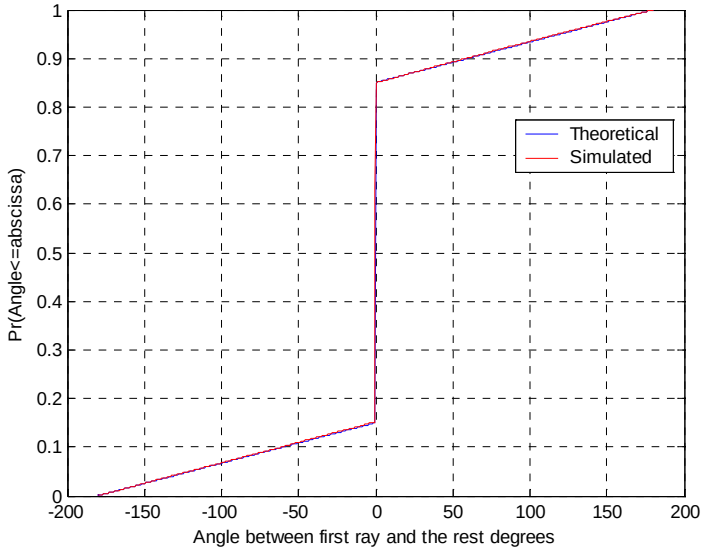

Figure 3, CDF of paths 2-6

As shown in Figures 2 & 3, the simulated data is drawn from the theoretical distributions represented by the CDFs, and easily reproduces these distributions as shown.

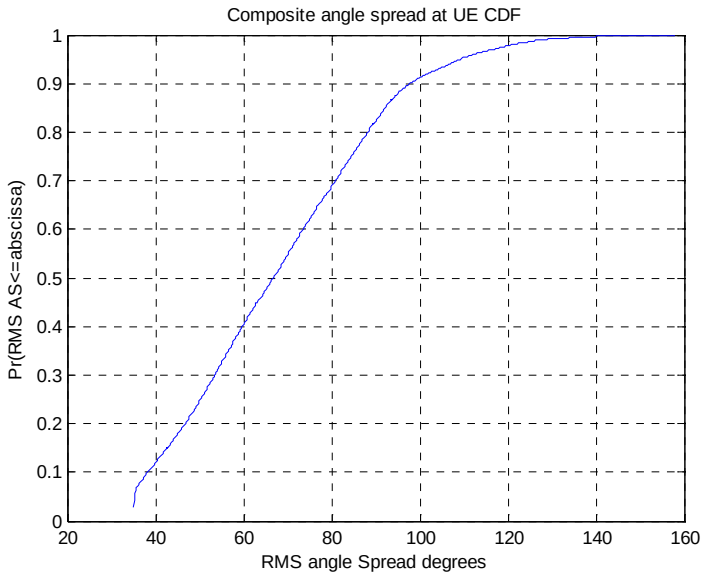

Figure 4 Simulated composite AS at UE CDF

From the model, Figure 4 illustrates the composite AS at the UE. The mean value is 68˚, which is very close to the result from the measured data used to establish the statistics of the urban canyon model. From this data, the measured value was 68.7˚.

3. CONCLUSION

The SCM Urban Canyon model was simulated according to the specifications in [1].

Results for composite UE AS match the values from measurements. The mean value was simulated to be 68˚, with the original calculations from measurements being 68.7˚.

4. REFERENCES

[1] SCM Ad-Hoc, SCM-083, "SCM Text ver 2.1", Teleconference, December 19th, 2002.

[2] Motorola, SCM-067, "Urban Canyon & Parameters", Quebec City, October 22nd, 2002.

[3] Motorola, SCM-064, "Polarization and Path Statistics", Teleconference, October 10th, 2002.