

Ten Cues You Need a 5G MIMO Channel Modeler

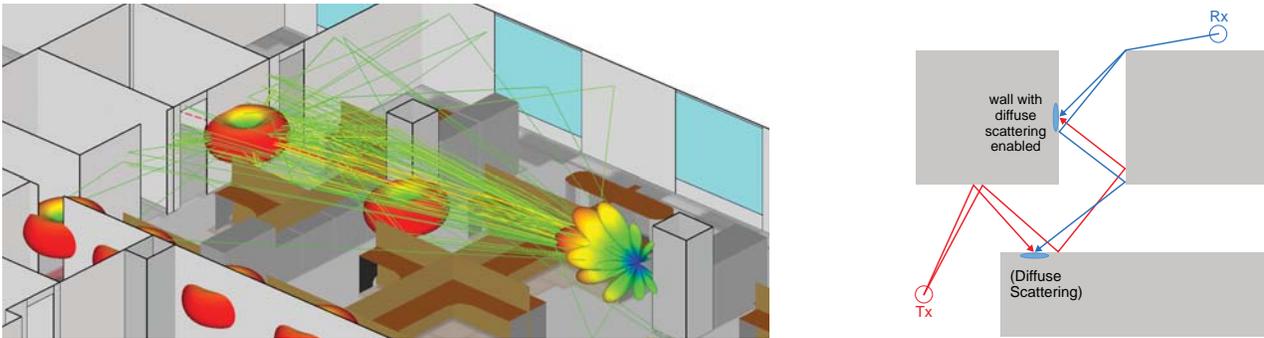
A question we're often asked is, "How is Wireless InSite[®] different from our planning tools?" While every tool is a little different, the most important differences between Wireless InSite and planning tools emerge when users need to simulate 5G mmWave and MIMO systems. Below are ten cues that your organization may need a channel modeling tool like Wireless InSite to supplement your network planning efforts.

- 1) **Millimeter wave matters.** Many planning tools were designed for modeling frequencies below 6 GHz. At 15 GHz or above, the physics built into these models can break down. Wireless InSite can handle frequencies from 100 MHz to 100 GHz, including diffuse scattering effects.
- 2) **Materials matter.** Some planning tools make broad assumptions about the materials comprising the structures in the scene under consideration. Control over the individual materials - types of glass, concrete, brick, foliage, etc. - is crucial to obtaining good results from the simulation. Wireless InSite allows users to define materials down to the individual facet, ensuring that each structure best represents the real-world properties of the scene.

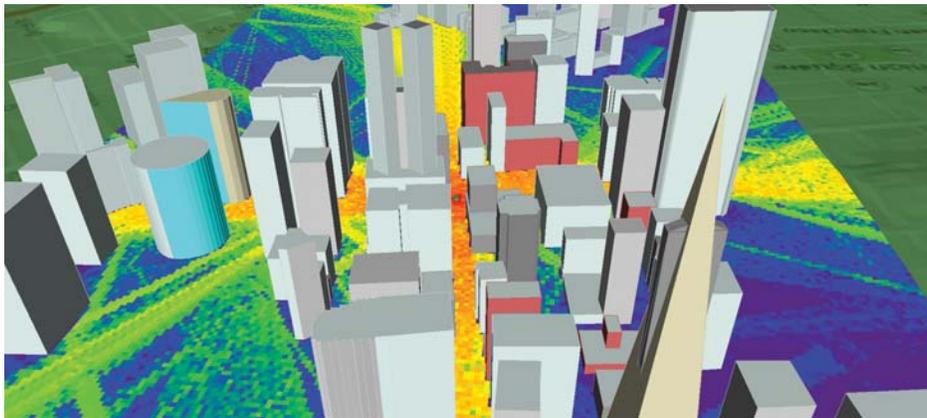


- 3) **Details matter.** The use of mmWave frequencies has shifted users' focus from a macroscale, like studies of citywide or regional coverage, to microscale modeling, like neighborhoods, city centers, or in-building scenarios. Within these smaller scenes, interactions at mmWave require the inclusion of finer detail in each structure, like window frames, office furniture, cars, trees and tree trunks, and street furniture, like benches, bus enclosures, and lamp posts. Wireless InSite allows users to import all of these important structures, and Remcom's support staff can help determine the appropriate level of facetization to help users with the balance between fidelity and run time.
- 4) **Scattering matters.** Traditional ray-tracing utilizes the uniform and/or general theory of diffraction to simulate energy moving about a simulation space. At mmWave, the surface roughness of the scattering objects in a scene can have a huge bearing on scattered energy. Wireless InSite's propagation models include diffuse scattering phenomenon and this capability can be enabled or disabled for any surface in one's simulation.

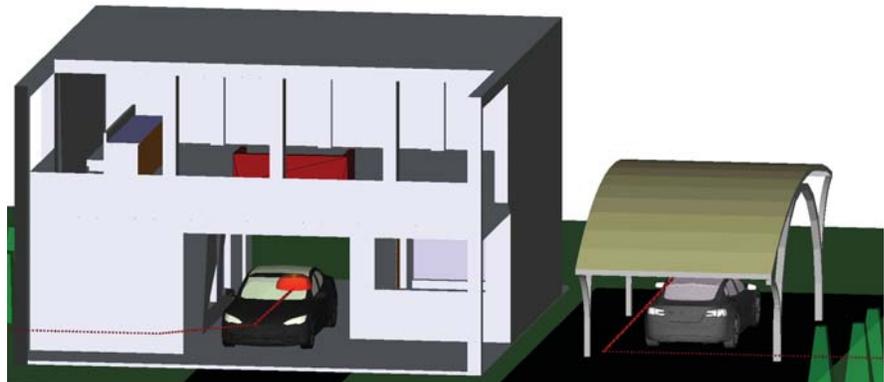
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- 5) **Speed matters.** Traditional planning tools can consider tens or hundreds of kilometers in a single simulation. Channel modeling tools, like Wireless InSite, consider smaller areas in great detail. To examine many smaller areas in detail requires many simulations. To address this, Remcom has built many unique optimizations into Wireless InSite, including our X3D GPU-accelerated ray-tracer, our APG (Adjacent Path Generation), and our external queue integration, which allows many simulations to be run concurrently on a local machine or shared cluster.

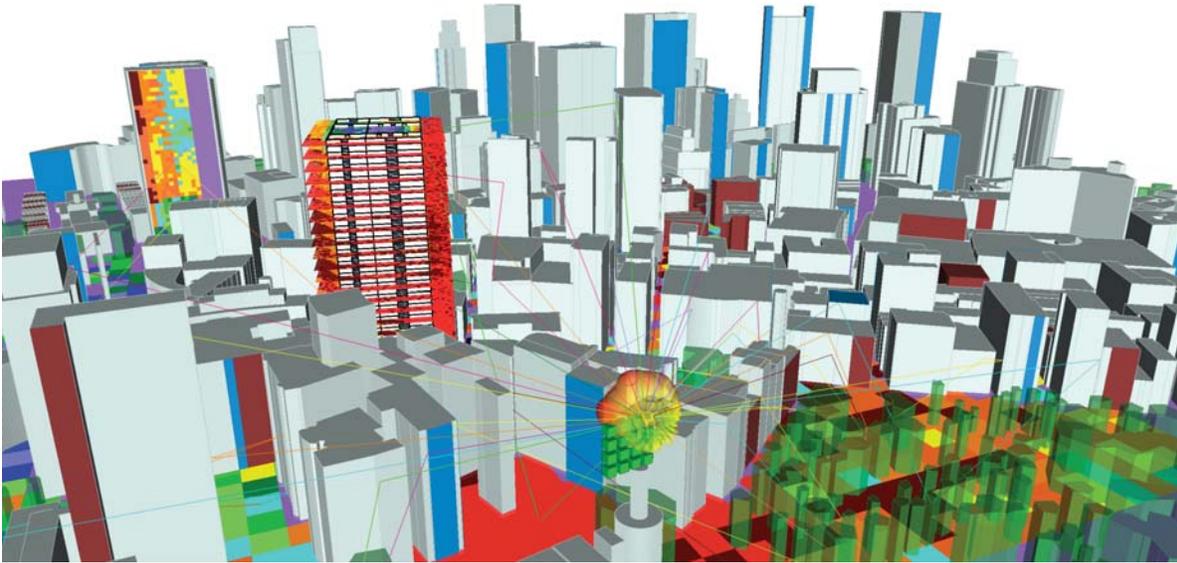


- 6) **Motion matters.** Objects in the real world have a pesky habit of moving around. This can present a challenge for a lot of planning tools, which are designed to simulate static base stations. When considering the dynamic elements of a scene, Wireless InSite can help in two ways. First, Wireless InSite allows users to define transmitters and receivers in motion, on arbitrary routes or trajectories with a user-defined velocity, accounting for Doppler effects. Second, users can set scattering objects, like cars or buses, in motion. Currently, this capability can be accommodated via script and will be implemented through the GUI in a future release.

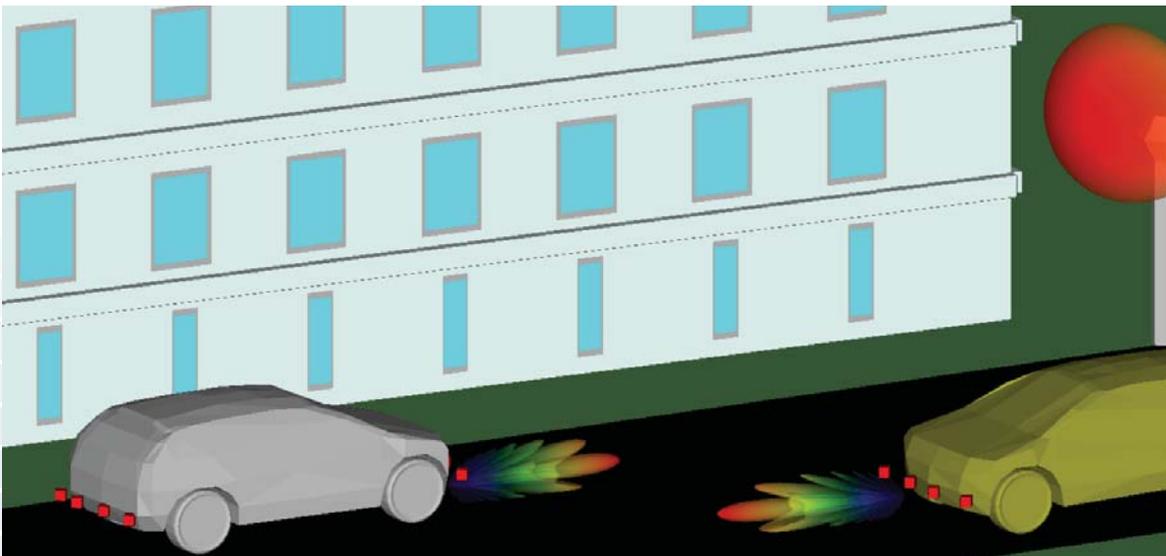


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- 7) **Indoor and outdoor space matters.** We know that traditional planning tools are great for simulating large-scale, outdoor scenarios. Contemporary 5G simulations must also consider outdoor, indoor, indoor-to-outdoor, and outdoor-to-indoor scenarios. Wireless InSite provides users the ability to create or import floor plans with furniture, and its propagation models can accommodate transmissions through walls and glass.

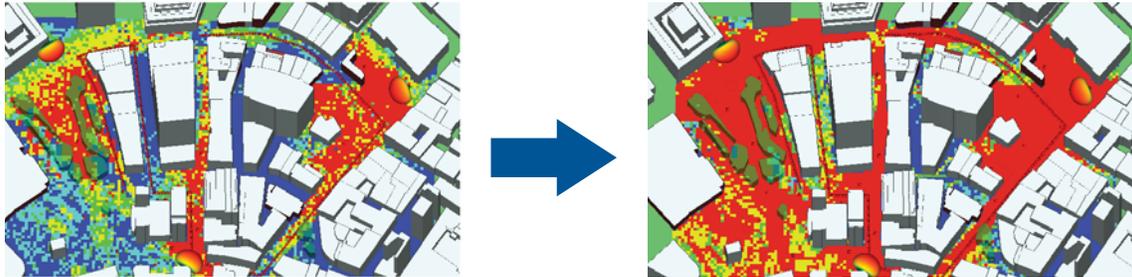


- 8) **CAD matters.** We've discussed how the material and detail in the model matters. Unfortunately, not all CAD vendors are created equal. Our experience shows that, depending on the vendor, CAD models come with widely varying quality and cost. Some models may include structures that poorly match the real-world building position. Others may include geometry elements with invalid, inverted, or duplicate structural data. Since the selection of model data is critical to the success of the simulation, Remcom can help users source CAD models and evaluate models on-hand or under consideration.



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- 9) **Beamforming matters.** Beamforming is complicated business. Complex MIMO systems can involve hundreds of channels between transmitting and receiving arrays. Planning tools simply weren't built for the intricacies of these sophisticated interactions. Wireless InSite utilizes a unique ray-tracing model to capture the interactions between each transmitting element in an array to each receiving element in an array in a single simulation. Beamforming techniques, like zero-forcing and MRT, may be applied to the resulting H-Matrices to assess in situ performance.



- 10) **Support matters.** The use of channel modeling tools, like Wireless InSite, is a bit different than planning tools. Each scenario is unique and the application of experience and rules-of-thumb can help users tweak the scene for best performance in Wireless InSite. Remcom's staff of engineers and CAD experts is ready to help users over the learning curve with expert training and assistance.

Conclusion: Part of an engineer's job is selecting the right tool for the right occasion. When considering areas like a state or country, a planning tool is up to the task. The rise of 5G and the use of mmWave and beamforming techniques, however, requires engineers to view the world with more granularity. For this higher level of sophistication, Wireless InSite is the optimal tool for successful network planning.

To learn more about Wireless InSite, please visit:

www.remcom.com/wireless-insite

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