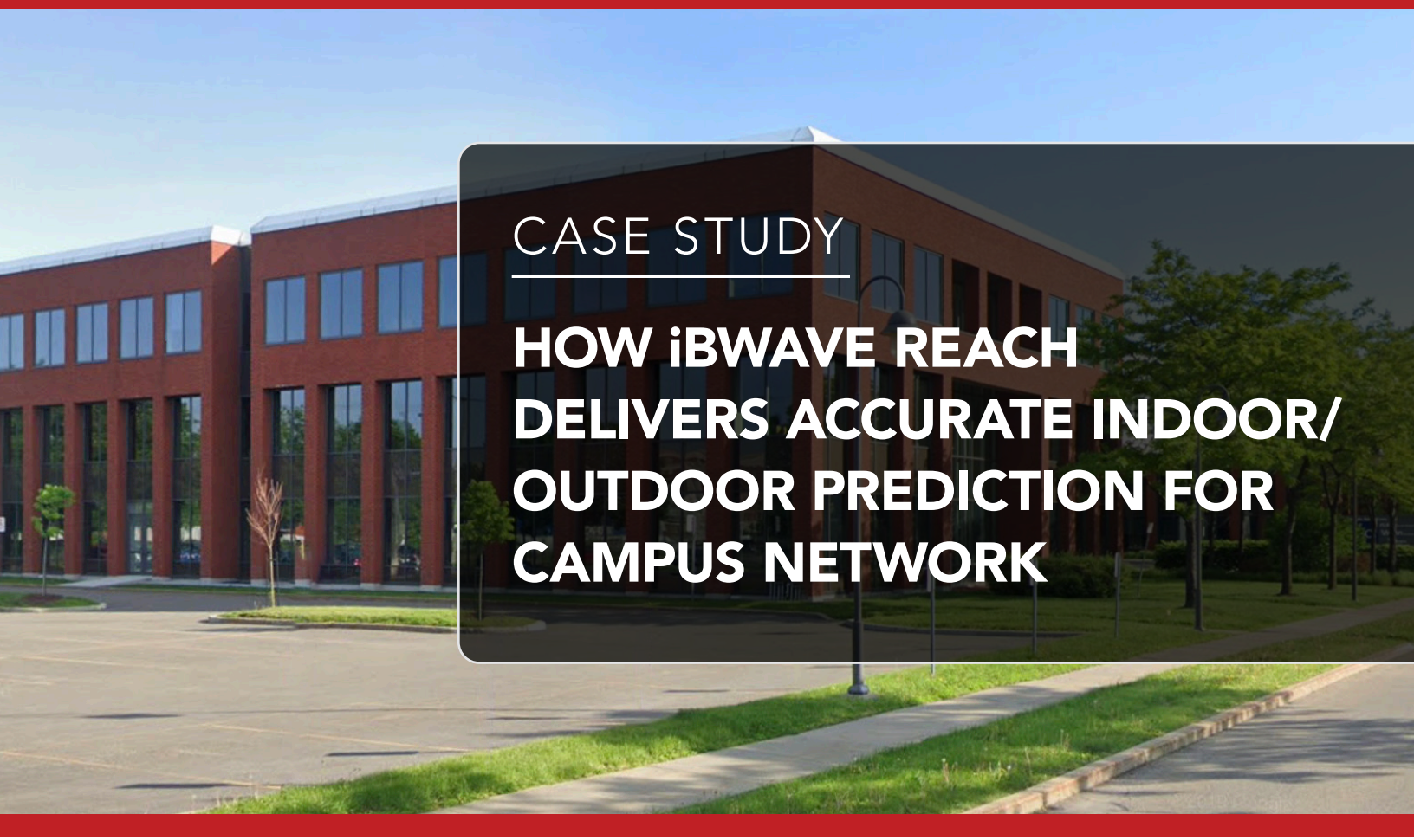


CASE STUDY

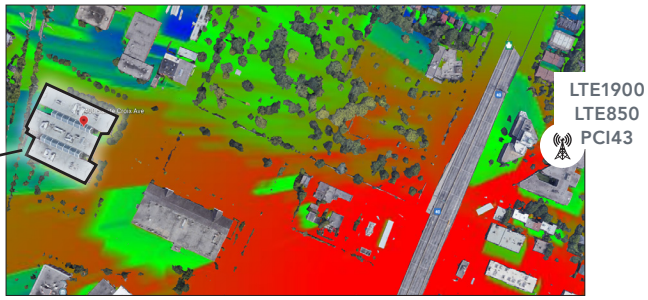
HOW iBWAVE REACH DELIVERS ACCURATE INDOOR/ OUTDOOR PREDICTION FOR CAMPUS NETWORK

See how iBwave demonstrated the accuracy of iBwave Reach's integrated Indoor & Outdoor cellular prediction, with results of the installed networks matching survey measurements.

INTRODUCTION

To demonstrate the seamless integration of tools and accuracy of iBwave Reach cellular prediction for indoor/outdoor campus environments, the iBwave RF design team performed a test project at the iBwave HQ.

iBwave corporate office.



Macro signal representation near office.

THE CHALLENGES

1 Demonstrate the integration of iBwave Reach, iBwave Design Enterprise and popular macro network design tools

Our targeted users might not have interest in changing their existing macro-tool. Because some may perceive iBwave Reach and iBwave Design as two different software and not a single source solution, it was critical to demonstrate the seamless integration of indoor, outdoor and macro tools in the context of our new campus design solution.

2 Avoid lengthy site walks

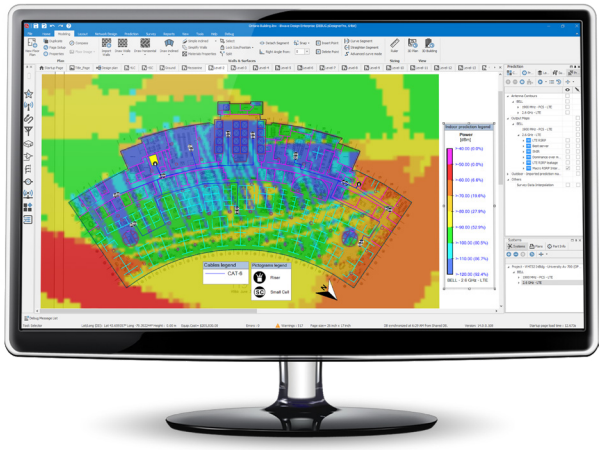
To compile macro data of the surrounding area, site walks must be performed which can be time consuming and costly. Site walks often add delays to the completion of the project; they require security clearance and scheduling which can take weeks to plan.

3 Prove the accuracy of the tool compared to site measurements

When dealing with campus networks, RF engineers must have a holistic view of the project by considering the indoor, outdoor and macro signal sources. They also need to assess the indoor RF interference on macro signal. Ignoring these challenges can result in erratic coverage and ineffective campus network performance.

THE SOLUTION

Delivering indoor/outdoor cellular prediction matching site walk survey measurements



iBwave Reach was able to import macro data of the surrounding outdoor area using *Infovista Planet* in just fifteen minutes.

Accuracy was confirmed after comparing prediction results generated in iBwave Design with survey measurements. The results have been positive showing that, after running interpolation, prediction vs. measurement was within the expected dB range of variance level in terms of mean error and standard deviation.

This is especially useful to eliminate multiple site surveys when limitations are in place to access certain buildings due to sanitary restrictions.

THE RESULTS

The new solution extends the reach of available design data beyond indoor floor plans by importing outdoor macro information from third party sources.

In this case, iBwave used *Infovista*'s macro design tool *Planet* to import the data of the office building's surrounding outdoor area. This eliminated the need to perform site walks and outdoor RF measurements which shortened what was normally a day-long process to fifteen minutes.

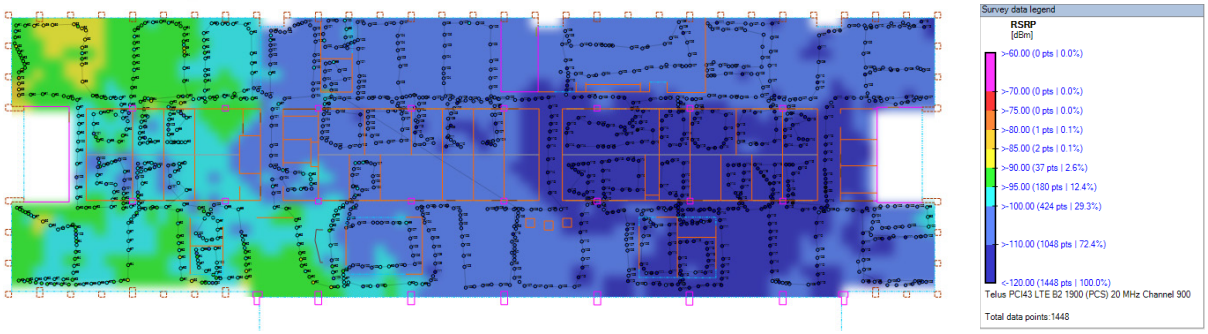
Traditional site walk process

1 DAY

iBwave Reach process

15 MIN

Survey data LTE1900 PCI43

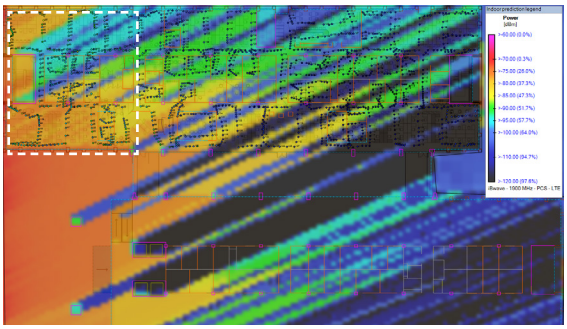


Highlighting the importance of good design practices

From there, our engineers were able to model an indoor network that properly accounted for any potential signal interference from streetlights, fences, or other surrounding objects.

The iBwave RF Design Team conducted tests without and with wall materials adjusted, ultimately achieving the expected dB range of variance level in terms of mean error and standard deviation.

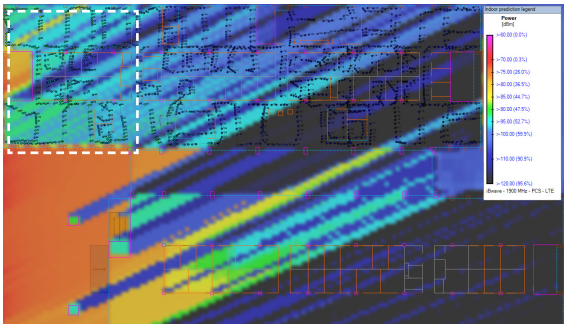
This test highlighted the importance of applying good design practices, not only for indoor but also for the outdoor environment (e.g. select the appropriate window types, brick types for the exterior walls, etc...) so the user can fully benefit from iBwave Reach when it comes to achieving great time and cost savings during the survey/planning phase.



Interpolation results - Walls not adjusted

	Value (dB)	Expected (dB)	Results
Mean error (μ)	**-7.80**	**±8.00**	**Passed**
Absolute mean error (μ)	**12.91**	**8.00**	**Failed**
Standard deviation	**12.86**	**8.00**	**Failed**

LTE1900 PCI43



Interpolation results - Walls adjusted

	Value (dB)	Expected (dB)	Results
Mean error (μ)	**2.81**	**±8.00**	**Passed**
Absolute mean error (μ)	**5.52**	**8.00**	**Passed**
Standard deviation	**6.97**	**8.00**	**Passed**

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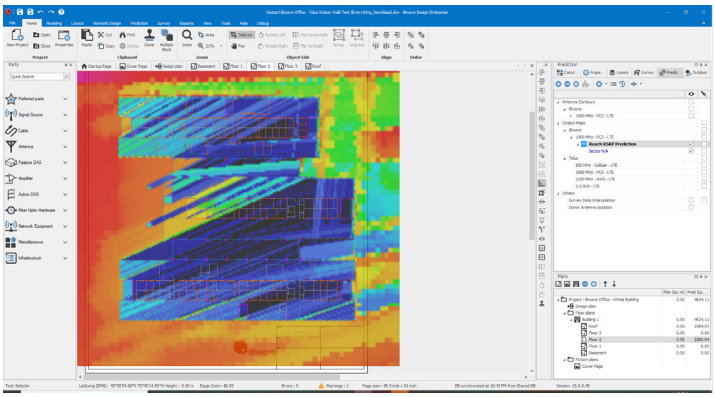
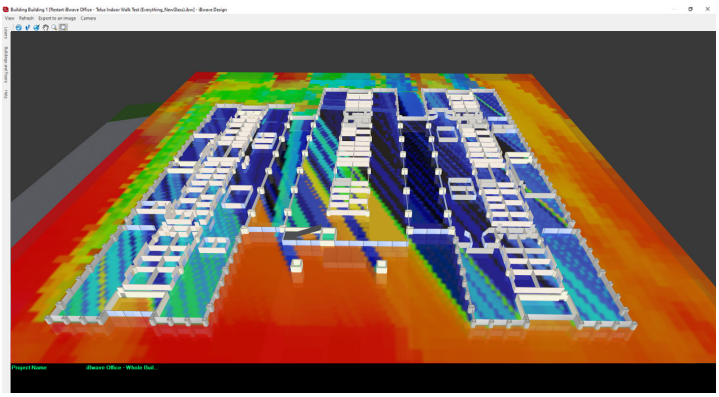


Campus network prediction results in iBwave Design with consideration of macro data from iBwave Reach.



3D buidling view of final campus network prediction.

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