# Keysight Technologies Helps IoT Device Manufacturer Improve Battery Life by 50%

## EXECUTIVE SUMMARY

In mission-critical Internet of Things (IoT) applications for the smart city, access to the AC power grid is generally not an option, making battery-operated IoT devices with low-power consumption a must. Many of these devices are wirelessly connected and operate unattended in difficult to reach locations. One application alone can require thousands of IoT sensors. In this scenario, having to change batteries prematurely can be quite costly.

Keysight Technologies' CX3324A Device Current Waveform Analyzer and UXM Wireless Test Set can be used to determine the root cause of issues that threaten to degrade battery life in IoT smart city and industrial IoT applications. The CX3324A employs a patented, high dynamic range and fast-sampling power sensing technology that allows it to accurately measure current drain in battery-powered devices with just one measurement. Competing approaches all require multiple measurements, missing critical interdependencies. The UXM provides an easy way for engineers to confidently assess design readiness by testing RF performance under real-world conditions.

> *"With long battery life a key requirement for our customers, our battery drain issue threatened to be a real deal-breaker. Keysight's solutions resolved our design problems quickly, allowing us to meet customer requirements and deliver new devices on time and with full confidence they will perform as expected in the real world."*
>
> - Senior R&D Engineer

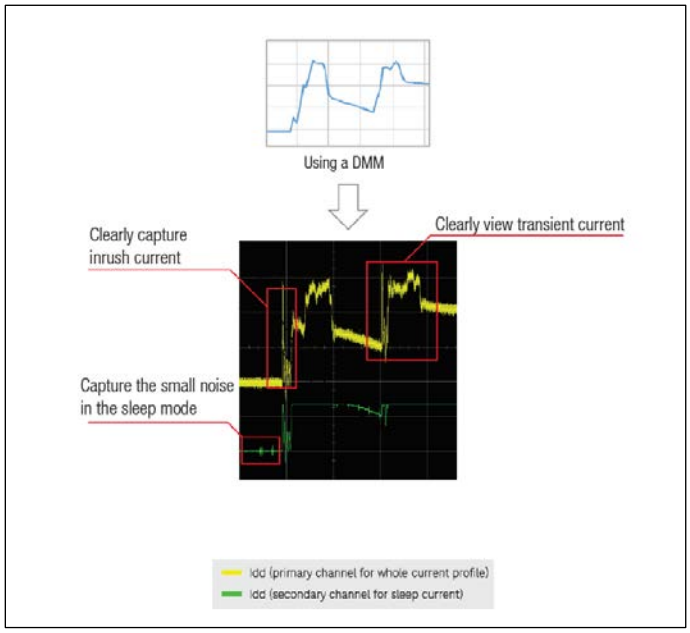
## THE CHALLENGE

An IoT device manufacturer, based in the United States, routinely develops IoT devices for large utility companies rolling out smart city applications. Its IoT devices must be reliable and able to last for at least 7 years before needing a new battery. While evaluating its IoT device prototypes, the manufacturer realized it had a significant battery drain problem. Roughly half of all prototypes tested were using more power than expected, even though prior lab testing had assured the manufacturer that the power consumption would be much lower. The manufacturer

struggled to determine the cause of the problem, while sticking to the original product release schedule and staying within budget.

## THE SOLUTION

To avoid a potentially costly misstep in terms of a required redesign, unsuccessful release or even a product recall, the manufacturer needed to find a way to isolate and identify the conditions under which battery drain would increase. For that task, the manufacturer turned to Keysight's CX3324A Device Current Waveform Analyzer and UXM Wireless Test Set.




*Example transient current measurement with the CX3324A*

Using the CX3324A, the manufacturer quickly identified a problem with coupling between its power supply components. As it turned out, the low-power operating condition demanded by the utility companies required a tighter tolerance on the power supply rails. This meant that fast transients on the power rail were being generated by data transmission and it was interfering with the device's clock. With this information, the manufacturer identified a quick fix. It simply changed some of the power supply components to eliminate the coupling.

Using the UXM test set to simulate different network conditions, including intermittent connectivity, the manufacturer discovered a second problem in its prototypes. The devices behaved as expected in most environments, but not when operating at the edge of the cell network. Here, intermittent connectivity forced the devices to retransmit data many times, draining the battery at more than fifty times the normal rate. By making a simple change in the design, the manufacturer stopped the devices from overly aggressively attempting to reconnect to the network during intermittent connectivity conditions.

## RESULTS

Using Keysight's waveform analyzer and wireless test set solutions, the manufacturer quickly and easily identified two issues negatively impacting the battery life of its IoT prototypes, before they entered final production. The CX3324A's current drain measurements helped eliminate fast transients on the devices' power rails, resulting in a 50% improvement in battery life. The UXM's emulation of different cellular network conditions allowed the manufacturer to discover and fix

a design flaw that made its devices' batteries drain too quickly. And, since the flaw was identified before the devices went into operation in the field, a potentially costly recall was avoided, saving the company millions. The manufacturer not only delivered its devices on time, within budget, and with the features its utility customers required, but it now has a winning IoT design it can confidently adapt for future customers and applications beyond the smart city.

## About Keysight Technologies

Keysight Technologies, Inc. (NYSE: KEYS) is a leading technology company that helps enterprises, service providers, and governments accelerate innovation to connect and secure the world. Keysight's solutions optimize networks and bring electronic products to market faster and at a lower cost with offerings from design simulation, to prototype validation, to manufacturing test, to optimization in networks and cloud environments. Customers span the worldwide communications ecosystem, aerospace and defense, automotive, energy, semiconductor and general electronics end markets. Keysight generated revenues of $3.2B in fiscal year 2017. In April 2017, Keysight acquired Ixia, a leader in network test, visibility, and security. More information is available at **WWW.KEYSIGHT.COM**

## About the Industrial Internet Consortium

Keysight has been a member of the Industrial Internet Consortium since 2016. The Industrial Internet Consortium is the world's leading organization transforming business and society by accelerating the Industrial Internet of Things (IIoT). Our mission is to deliver a trustworthy IIoT in which the world's systems and devices are securely connected and controlled to deliver transformational outcomes. Founded in March 2014, the Industrial Internet Consortium catalyzes and coordinates the priorities and enabling technologies of the industrial internet. Visit www.iiconsortium.org.