

Keysight Technologies

Validate Battery Run-time Under Real-world Conditions

Technical Overview

Introduction

When you are validating battery run-time, conduct testing with realistic user profiles based on how your mobile device is really operated.

Basic talk- and standby-time tests no longer realistically validate battery run-time. Today's smart mobile devices provide a wide variety of innovative data-based applications. Many of these applications run simultaneously. A consequence of all this is battery run-time continues to worsen. Battery run-time is better defined and validated by user profiles that reflect how mobile devices are realistically operated. Cellular service providers and industry-standard compliance tests are moving in this direction. Employing realistic user profiles when validating battery run-time will assure your device performs to expectations. Table 1 shows examples of some realistic user profiles.

Table 1. Realistic user profile examples

	Teen	Soccer mom	PC data user	Business user	Grandparent
Data download	10%	10%	70%	20%	5%
Data upload	0%	0%	20%	5%	0%
Content type	http, UDP streaming	http	ftp, http, UDP, streaming	ftp, http, UDP, streaming	http
Voice usage	20%	80%	0%	40%	90%
Modem usage	0%	0%	100%	10%	0%
SMS usage	60%	20%	0%	20%	5%
MMS usage	10%	0%	0%	5%	0%
E-mail	5%	5%	10%	50%	0%
Cell mobility	Range: -95 to -30 dBm Occurrence: 50%	Range: -105 to -30 dBm Occurrence: 70%	Range: -85 to -30 dBm Occurrence: 15%	Range: -105 to -30 dBm Occurrence: 70%	Range: -95 to -30 dBm Occurrence: 50%
Handovers	40%	70%	15%	70%	50%
Back light	40%	70%	15%	70%	50%

Note: Simultaneous activities; not all user profiles are the same sequences of events

Validating battery run-time under real-world conditions requires realistic emulation of user activities and network conditions.

Battery drain is not simply a weighted sum of currents for individual activities. User activities and network conditions take place both simultaneously and sequentially. To achieve realistic results when you are validating battery run-time, the test system needs to emulate these user activities and network conditions in comparable fashion. It needs to log these activities and conditions in conjunction with the battery current drain over a suitable period of time to account for statistical variation. It needs to have sufficient automation to make tests as "turn-key" as possible to quickly and routinely run them when and where needed for reproducibility. It should have flexibility to let you easily modify tests to address new or updated requirements.

Creating such a test system requires a substantial amount of equipment, software, development work, and documentation. This task can be greatly simplified by pairing Keysight Technologies', Inc. N5972A interactive functional test (IFT) software and the 8960 or E6621A wireless communications test set with either the 14585A control and analysis software and N6781A source/measure unit or the 14565B device characterization software and 66319D DC source. A representative setup is depicted in Figure 1. You can readily set up and run several activities and conditions,

both simultaneously and sequentially, with the N5972A software to emulate realistic user profiles. The N5972A sets up the 14565B or 14585A software and respective DC source to log your device's battery drain together with its activities and network conditions. When using the N5972A in its interactive mode, you can automatically generate programming code and drop it into a script editor. The code can then be further enhanced for quickly developing automated tests.

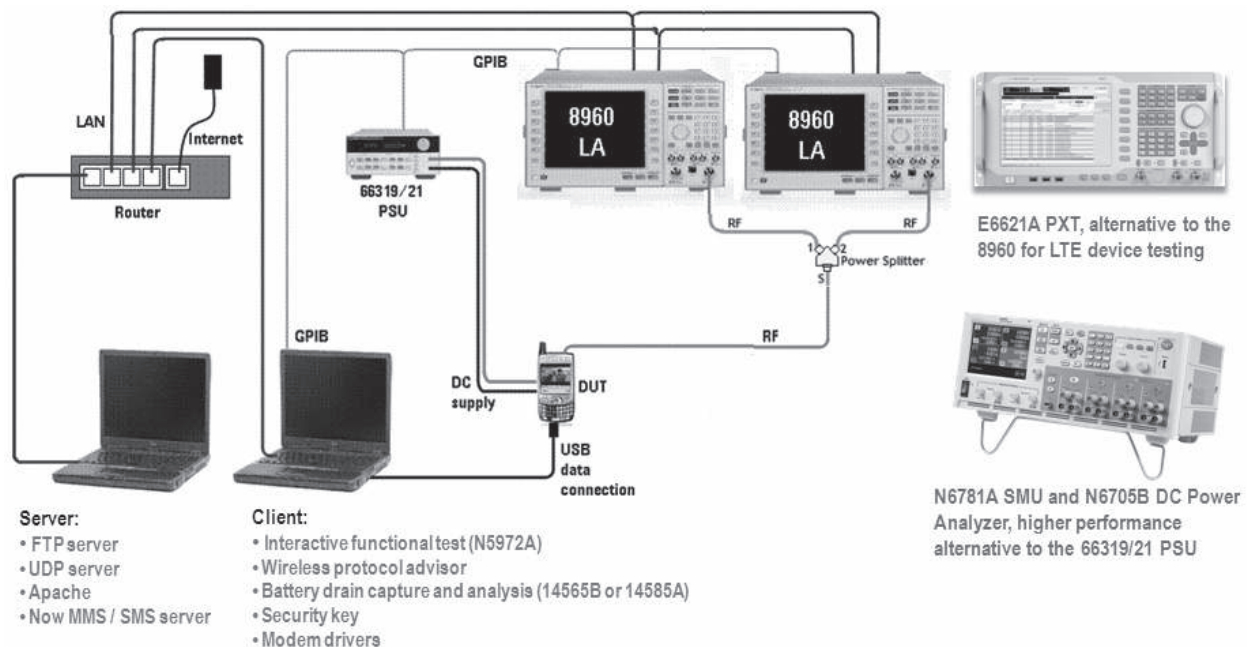


Figure 1. Keysight Technologies Interactive Functional Test (IFT) platform solution

Test results for representative realistic user-profile-based compliance tests.

Long-term battery current drain tests were set up and run on a mobile phone for the teen, soccer mom, and PC data user profiles shown in Table 1, using the test platform in Figure 1. Battery current drain was also taken for talk time and standby time for comparison. There is a considerable

difference in battery run time for the different user profiles, something you would not have been able to accurately estimate based only on the talk and standby battery current drain test results.

Table 2: Battery current drain

	Teen	Soccer mom	PC data user	Talk	Standby
Average current (ma)	389	318	238	343	55
Peak current (ma)	555	819	842	671	656
Peak current (ma)	2.57	3.14	4.20	2.92	18.2

Your smart mobile device is used for a variety of innovative applications that go well beyond just talk and standby operation. Battery run-time continues to worsen as a result. To assure your battery run-time is not a major dissatisfier, base your tests on realistic user profiles that you expect for your device.

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