



GCF[™]
Global Certification Forum

Key Performance Metrics

GCF Certification confirms that a mobile phone or wireless device has demonstrated an industry-agreed benchmark of interoperability across network elements and infrastructure equipment from different suppliers. With its ethos of “Test once, use anywhere”, the scheme involves a combination of conformance and interoperability tests undertaken in laboratories with field trials on multiple commercial networks.

As wireless connectivity becomes ever more central to everyday life, there is a growing need for quantitative data to characterise certain aspects of a mobile device’s performance that are not necessarily related to interoperability. To meet this need, GCF operator and manufacturer members have jointly defined an optional Key Performance Metrics Programme to complement the GCF’s core device Certification scheme.

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Test once, use anywhere

GCF was established in 1999 to provide a certification scheme for mobile devices focused on interworking and interoperability with mobile networks and other devices. From the outset, GCF pursued two core objectives.

- To provide a common means for documenting and assessing compliance with industry-agreed Certification Criteria.
- To minimise duplication of testing for new devices by promoting global recognition and acceptance of certification and the related test results.

At the time GCF was founded, operators played the dominant role in handset distribution and each operator typically had its own device acceptance regime. As a result, manufacturers often found themselves undertaking multiple tests of each device attribute in order to present test data to each operator in their preferred format.

A common certification scheme accepted by a broad cross-section of operators had the potential to benefit the wider industry by improving efficiencies and economies of scale while reducing costs and time-to-market. With its ethos of “Test once, use anywhere”, GCF Certification has delivered efficiencies and made an important contribution to expanding the range of devices available to the global market. (The white paper “*GCF Certification: ‘test once use anywhere’ certification for mobile devices*”, available from the GCF website¹, provides a more in-depth overview of the scheme.)

The mobile communications landscape continues to undergo significant and profound change. In more mature markets, the smartphone has replaced the feature phone: for many end-users, mobile applications, social-media and web browsing now account for the majority of device usage. Basic telecoms services and operators’ traditional business models are being challenged by the rise of alternative, internet-based, communication services.

In the predominantly circuit-switched world of 2G and 3G core services, manufacturers and operators alike shared a high degree of confidence in the operation of a GCF-Certified device. In the IP-world, certification still provides a valuable and important assurance of conformance and interoperability for operators and manufacturers, but the end-users’ view of their device can be more nuanced and will be heavily influenced by their individual usage scenarios and attributes such as a device’s antenna performance may have a significant influence on the user experience. A more detailed understanding of factors such as these can provide valuable input to operators’ network and service optimization efforts and so contribute to enhanced customer satisfaction.

Responding to these evolving industry needs, GCF has developed a programme consistent with the ethos of “Test once, use anywhere” that provides a unified means of assessing device performance in areas that the industry agrees are important, and which can be applied across the industry.

¹ <https://www.globalcertificationforum.org/asset/4E55EDFB%2DC2D9%2D492E%2D9CC9B89C874B1F6B/>

GCF Key Performance Metrics programme

The Key Performance Metrics programme is optional and complementary to GCF Certification and allows manufacturers to quantify and report in a standardized way on agreed aspects of the performance of a mobile device that do not necessarily, or directly, relate to interoperability.

The programme allows:

- Manufacturers to choose which performance characteristics to quantify - giving them flexibility to address performance attributes most relevant to the device and its intended use
- Maintain control of the commercially sensitive performance data: test results are only available to GCF's Operator members under the Manufacturer's control.

Key Performance Metrics derived by applying standardized testing methodologies, contribute to greater efficiencies that benefit the whole industry:

- Manufacturers can report against a common performance standard to all GCF Operators
- Operators benefit from requirements that have been developed efficiently, and reflect best practice
- The test industry can offer test expertise against a common industry requirement

GCF's Key Performance Metrics currently cover Battery life, Acoustics, Over-the-Air (OTA) Antenna performance and Data-throughput.

Battery Life Metrics

Battery life is an important device parameter for end-users, especially given the levels of processor-hungry features and applications that are now the norm. The use of standardised test methods allows Manufacturers to promote battery life in a meaningful way, and to follow a single measurement method to suit the product acceptance regimes of multiple GCF operators.

Referencing the GSMA Terminal Steering Group PRD TS.09 "Battery Life Measurement Technique"², Battery Life Metrics includes a selection of measurements that represent typical use scenarios of a mobile device, and which may be used to extrapolate indicative power consumption data under complicated usage scenarios.

Battery Life Measurements are applicable to GSM/GPRS, 3G/WCDMA, LTE and multimode terminals. Test methods have been defined for specific radio technologies and applications such as voice calling, video streaming, web browsing and music playback. For measurements involving radio technologies the manufacturer is required to report measurement information for at least one band in each technology.

Currently 16 individual scenarios for Battery Life performance criteria have been defined:

- Standby Time GSM/GPRS
- Standby Time 3G/WCDMA
- Standby Time LTE
- Talk Time GSM
- Talk Time 3G/WCDMA
- 3G/WCDMA Browsing HTML
- LTE Browsing HTML

² Available for download at <http://www.gsma.com/newsroom/ts-09-battery-life-measurement-and-current-consumption-technique/>

- Video Streaming 3G/WCDMA
- Video Streaming LTE
- Music Playback
- Camera Operation
- Talk Time with Bluetooth headset - GSM/GPRS
- Talk Time with Bluetooth headset – 3G/WCDMA
- Music Playback with Bluetooth headset
- Standby Time with device in Bluetooth discovery mode - GSM/GPRS
- Standby Time with device in Bluetooth discovery mode - WCDMA

Acoustic Performance Metrics

Even in the age of the smartphone, the ability to make and receive calls, and to hear and recognise the other person clearly, is paramount to the device’s quality as perceived by end users. Many network operators realise the importance to their customers of high quality audio and request devices that will meet their customer’s expectations in this key area.

Some aspects of acoustic performance can also impact on network efficiency: echoes can be misinterpreted as speech, placing avoidable demands on network resources.

GCF’s Acoustic Performance Metrics enable device manufacturers to record standardised measurements of the device’s acoustic performance under industry agreed scenarios. Operators procuring devices for their device line-up compare devices on a like-for-like basis to ensure that they source in line with their customers’ expectations.

GCF’s Acoustic Performance Metrics reference 3GPP TS 26.132 which specifies test methods to assess the actual performance of a number of technical device attributes for both narrowband and wideband codecs:

- Sending Loudness Rating and Receiving Loudness Rating
- Idle Channel noise – Sending and Receiving
- Sensitivity / frequency characteristics – Sending and Receiving
- Side Tone Masking Rate & Side Tone Delay
- Acoustic Echo Control
- Distortion – Sending and Receiving
- Delay – Sending and Receiving
- Quality of Speech in presence eight defined environments

The above attributes are measured in each of the following scenarios:

- Normal handset use
- Handset in loudspeaker hands-free mode
- Vehicle-mounted hands-free
- Desktop hands-free
- With a headset specified by the manufacturer (optional).

OTA Antenna Performance Metrics

The performance of the device’s antenna represents a significant factor in overall device performance, the resulting service that end users will receive and the ability for the network to perform infrastructure optimisations.

In areas of marginal coverage, data throughput has been shown to increase significantly for each 1 dB increase in received RF signal. Simply put, better antenna performance means more signal “bars” in more places and more end-users being able to make calls, access their favourite social media sites and send and receive emails without delays.

A number of Antenna Metrics are offered to give a standardised method for comparing the performance of different devices in this key area. These metrics include support for measurements on GSM, 3G/WCDMA and LTE technologies and cover a range of common device usage scenarios.

For GSM and 3G/WCDMA the following OTA Antenna Performance Metrics are available:

Total Radiated Power (TRP) and Total Radiated Sensitivity (TRS) for the device in a low, mid and high channel for each of its supported bands, under the following usage scenarios:

- Free Space (All device types)
- Head and Hand Right Side (Devices supporting voice as the primary function)
- Head and Hand Left Side (Devices supporting voice as the primary function)
- Hand Left Side Browsing (Devices supporting data as the primary function)

For LTE the following metrics are currently defined:

- Free Space (all device types)
- Speech mode (Devices supporting VoLTE)
- Browsing mode (Devices supporting data as the primary function)

To enable a device to be fully tested with both antennas operating, TIS (TRS) is measured in SIMO mode if the device supports MIMO.

The Free Space mode provides insight into basic antenna characteristics such as gain, efficiency and directivity and also gives a representation of a device in idle mode.

The Head and Hand criteria represent Talk mode and are only applicable to devices that support speech. The Hand Left Side Browsing tests are applicable to data-centric devices such as USB wireless modems and tablets.

GCF is actively evolving its OTA Antenna Performance Metrics to reflect more widespread use of MIMO technologies, accelerating uptake of LTE, the move to “all-IP”, and the introduction of VoLTE,

Data Throughput Performance Metrics

As consumer behaviour shifts ever more towards using a myriad of internet-based services and applications, the performance of a device with respect to data throughput becomes increasingly important, both to the end-user and to network operators seeking to offer high quality cellular data connections to their customers.

GCF’s Performance Metrics programme gives device manufacturers the option of reporting data throughput measurements in a standardised way. Covering both HSPA and LTE devices, data throughput metrics are measured at the application layer under various network conditions. The metrics include both data throughput where the data is terminated in the device and data throughput where the device’s data connection is tethered to a PC.

The measurement procedure measures the achieved application-layer data rates under various simulated, but typical network and radio conditions, in a repeatable, lab-based environment. Testing is based on 3GPP TR 37.901.

For HSPA devices, Performance Metrics include:

- FTP uplink and downlink performance
- UDP uplink and downlink performance
- Stress Test performance
- UDP Power Sweep performance
- Throughput vs Geometry Factor Performance

For LTE Devices, Performance Metrics include

- FTP downlink performance (for seven different scenarios)
- UDP downlink performance (for seven different scenarios)
- FTP uplink performance
- UDP uplink performance
- Stress Test performance (two scenarios)
- UDP Power Sweep performance (two scenarios)
- UDP downlink vs SNR performance (4 scenarios)

Future developments

GCF's membership continues to grow with many new members being drawn from businesses seeking to capitalise on new opportunities in Machine-to-Machine (m2m) communications and the Internet of Things (IoT). While continuing to support the market for handsets and personal connectivity devices, GCF members could consider additional Performance Metrics relevant to the emerging needs of the m2m devices and services sectors.

About the Global Certification Forum

The Global Certification Forum (GCF) is an independent certification scheme for mobile phones and wireless devices that are based on 3GPP and 3GPP2 standards. With a philosophy of "test once, use anywhere", and an industry-agreed set of Certification Criteria that includes conformance, interoperability and field trial testing, GCF aims to ensure that a mobile device will work effectively on mobile networks anywhere in the world. GCF members include leading mobile network operators representing all the key markets worldwide, more than 100 device manufacturers and other stakeholders, such as, the test system suppliers and test laboratories.

For more information, visit globalcertificationforum.org