



To check out smartphones, connect relies on measurements made in its own Testlab laboratory, where, for example, considerable efforts are taken to measure wireless performance.

TESTING THE NUTS AND BOLTS

For many mobile phone manufacturers, the Mobile World Congress in Barcelona is a welcome opportunity to show off their latest mobile devices to journalists from all over the world and impress the media with their new features. Less than an hour after the presentation, the first tests for a new cutting-edge model are generally posted online – the first to publish gets the most clicks. But can this short check – often less than half an hour long – in the midst of a crowded press event really be called a test? connect does not think so and calls these short but intense encounters with a new smartphone a check that can give a first impression. A connect test starts there where others have long since stopped.

Objective comparison

A real test involves extensive testing of various features and objective comparison with rival devices. This requires an in-depth, multiday exploration of the display, interface, camera and much more. But even this is not enough for a definitive assessment about durability, acoustics, wireless performance, and more.

Measurements are essential here – like when testing the braking distance of a tyre or consumption of a car – which need to be carried out under real-life conditions to be relevant. Therefore connect operates its own laboratory, the Testlab, dedicated to the measurement of all parameters important for the practical use of smartphones, tablets, audio components, and much more.

Which measurements are relevant for smartphones and why, and the efforts required, will be shown here with the example of a radio measurement; more examples will follow in other articles.

Testing the connection quality

In radio measurements, the transmission power of a smartphone and its sensitivity for incoming signals from the base station are measured. Technicians call this



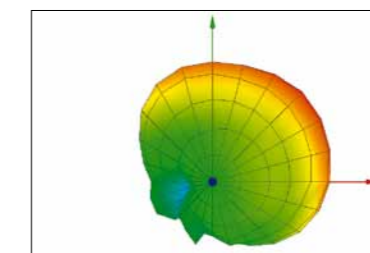
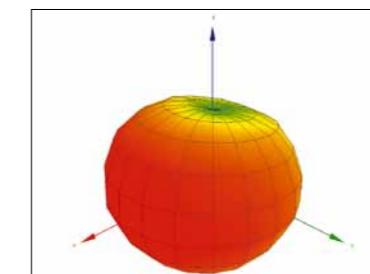
Including calibration it took nearly a month to install the absorber chamber in the new connect and Testlab facility in Haar near Munich.

Our OTA measurement station Rohde & Schwarz TS8991 with the CMW500 Wideband Communication Tester for LTE measurements.

TRP (total radiated power) and TIS (total isotropic sensitivity). The connect Testlab has a shielded room to measure the wireless properties of a device. Six shielding metal walls, held together with over 2000 bolts, make sure that mobile networks out there are not disturbed and have no impact on the sensitive measurements.

Inside, the cabin is lined with expensive high-frequency acoustic wedges. These ensure that the signals sent by the tested device and the measuring antenna (that carried a price tag of 4,000 euros) are not falsified by reflections from the walls. The smartphone is placed on a pedestal that is revolved around its vertical axis by a precision motor; the motordriven antenna can be rotated around the pedestal on the horizontal axis. This allows the device to be measured from any position.

The Testlab captures the radiated power with an angular resolution of less than 15 degrees of angular resolution, equivalent to 240 measurements distributed around the circumference of a smartphone. To ensure the smartphone is at the point of intersection of the axes of rotation from base and antenna, the room is equipped with a laser device that marks it with red and green crosses.



The polar plot at the top shows a nearly optimal TRP measurement, in the bottom more directivity is displayed

The measurements for determining the transmission power, which are supplemented by sensitivity measurements, refer to a radio standard. The Testlab measures GSM900, GSM1800, UMTS2100, LTE800, LTE1800 and LTE2600. For this, two communication testers are available, a CMU 200 and a CMW 500, from the renowned German testing instrument manufacturer Rohde & Schwarz (R&S), which represent both base stations with extended measurement capability and set up mobile radio networks in the chamber. An R&S FSP 3 spectrum analyser and an R&S SMBV100A vector signal generator ensure highest measuring accuracy. The costs to convert the R&S TS8991 OTA (Over the Air) measuring system from GSM/UMTS to LTE amounted to 360,000 euros – a price we are willing to pay to achieve trustworthy measurements.

Radio reception and data rate

If you're thinking: But I live in a city and reception is always OK, you should bear this in mind: As soon as the connection between your smartphone and the mobile base station worsens, both negotiate with each other to achieve a less failure-prone transmission. The result: dramatic drops in the data rates. Next time the bits seem to only dribble slowly into your smartphone, don't just blame your network operator but check whether your smartphone actually has a strong reception – by looking up the connect test.

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