Frequently Asked Questions
5G

Q: When do you expect to see R16, and would you be able to test those?

The UL team froze the development of Release 16 (R16) in early July 2020. New Third Generation Partnership Project (3GPP) 5G R16 modem-RF solutions may greatly accelerate 5G R16 device launches. We supported 5G testing for many devices already on the market and we have the necessary capabilities to cover 5G R16 test requirements.

Q: There is much discussion over the web on SAR testing for 5G. Can you explain this?

Yes. As of now, specific absorption rate (SAR) standards only apply up to 6 GHz, so SAR testing only applies to frequency range (FR) 1 devices. We intend to adopt new standards to extend SAR up to 10 GHz in the near future.

Radio frequency (RF) exposure requires power density measurements above 6 GHz.

UL has executed SAR tests for decades and has used the isotropic near field probe systems necessary to measure portable device RF exposure up to 110 GHz for more than three years, so we are already set up to test both FR1 and FR2 phones for RF exposure.

Q: 5G band n258 covers 24.25 to 27.5 GHz. Why does the FCC have a gap between 24.45 and 24.75 GHz and not cover the part above 25.25 GHz?

Other services already addressed these frequency bands. Consequently, the Federal Communications Commission (FCC) determined that there would be too much of an interference potential and that those services could not coexist with 5G.

Q: Please elaborate on making measurements in the far field of the transmitting or receiving antenna.

For fundamental and out-of-band emissions, the transmitting antenna radiates the signal and we know this antenna's dimensions, so we base the measurement distance on either the device antenna's far field boundary or the measurement antenna's far field boundary, whichever distance is larger.

For spurious emissions, we generally do not know the transmitting antenna structure. For example, such an emission could leak out of a gap in an enclosure seam or radiate from a random wire, so we base the measurement distance only on the measurement antenna's far field boundary distance.

Q: Why are two different coordinate systems shown for the TRP tests?

Device and antenna dimensions are easy to measure as rectangular coordinates.

Since we must perform all the measurements for a total radiated power (TRP) test at the same distance, we prefer to use spherical coordinates to describe the orientation of an emission, the measurement cuts and the measurement points as a matter of ease.

Note that we can easily convert from theta and phi to azimuth and elevation; azimuth corresponds directly to phi while elevation corresponds to 90 degrees minus theta.

Q: What UL locations have 5G testing capabilities?

Fremont, California, and Research Triangle Park (RTP), North Carolina, in the U.S.; the United Kingdom; Japan; China; Singapore; and South Korea.

Q: Does UL support FR2 SAR testing?

Yes, we cover FR1 SAR and FR2 near field power density testing.

We have been using the required near field probes for FR2 for almost three years.

Q: What are the 5G differences between EU RED and FCC testing?

Fundamental power, out-of-band and spurious emissions limits generally resemble one another. However, the European Union (EU) has more stringent, spurious requirements below 1 GHz, as well as additional spurious requirements near protected bands.

Q: Do countries follow similar testing? The EU has a few different limits. Do most of the countries across the globe follow either FCC or EU rules?

In general, many countries accept testing from the FCC and/or the EU. However, Japan and China historically tend to conform to their own standards.

In the specific case of 5G FR2 and because of the different countries' unique frequency allocations (spectrum allocation is still an ongoing activity), specific countries can require specific testing based on the frequency bands; this is still undecided.

FR2 is not widely adopted yet. The U.S. and South Korea pioneer this area.

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