# CSA.30

Cellular OTA TRP Testing

## Outcomes and Deliverables

- Full 3D TRP analysis.
- Report detailing obtained TRP values for required bands.

## Duration

2 days (this is a typical estimated duration – actual duration on quote may differ).

## What We Need

- 2 fully functioning samples.
- Instructions for operating device.

## What is the problem or concern we are addressing?

For a device to be allowed to use the cellular network of a particular network carrier in the US, the device must pass certain regulatory requirements. One of these requirements is to meet and/or exceed certain Total Radiated Power (TRP) minimum levels.

These requirements enforce a minimum level of performance on the wireless product. This is done to ensure end customer use-experience expectations are met, thus protecting the carrier's network brand.

These requirements are dependent on which module is being used, which technology the device will make use of (LTE, CAT-1, CAT-M1, NBIoT, GSM, etc…), the intended environment surrounding the device (i.e. a human head) and how large the device is. Smaller devices will receive some leeway from carriers due to their smaller ground-plane sizes.

TRP is a measure of real received power, typically in dBm, of the power outputted by the device module and transmitted through the antenna. TRP is directly dependent on the antenna performance and cellular modem integration. Testing TRP (and other performance parameters) early in the design cycle can reduce risk of certification failure and costly design and tooling changes late in the design cycle.

The table below illustrates a typical testing plan for AT&T for a CAT-M1 device in free-space.

| Band | TRP Requirements **Power Class 3** | TRP Requirements **Power Class 5** |
|---|---|---|
| 2 | +20 dBm | +17 dBm |
| 4 | +20 dBm | +17 dBm |
| 12 | +18 dBm | +15 dBm |

Currently only US carriers enforce these requirements. Carriers in other regions could have similar requirements but would be considered advisory. Taoglas recommends checking with local carriers to confirm no such requirements have been implemented.

## The Process

### Part 1 – Measurement

Taoglas will identify the required bands of operation based on which regions you intend to use your product, which carrier certification you require (if any) and which module you are using. Taoglas will also determine the required TRP levels required for certification.

Taoglas will setup your device in an anechoic chamber and power the device as per your instructions. If the device is intended to be used on a person, an appropriate phantom will be used.

- A base station emulator will be used to establish a call or test-mode connection with the device.
- Taoglas' automated test system will perform the TRP tests at the high, middle, and low channels of the appropriate bands.
- Taoglas will complete the test report detailing the setup and results.

*What does Taoglas need?*

In all cases Taoglas will require two complete functioning devices. The devices need to be functional enough to enable the cellular modem and enable AT command access to the modem. The devices should include as many of the final components as possible. Batteries, displays, and metallic sub-assemblies will impact the test results and should be included.

One complete set of any support devices such as spare battery packs, battery charger, interface cables, etc.

Instructions on how to connect the device, power on the device, and connect to the AT command interface, if applicable. If the battery will need to be charged or replaced, include instructions on how to do so.

## Part 2 – Reporting

Taoglas engineers, in consultation with the your design team, will determine if the measured performance factors are sufficient for the product to meet the performance and certification requirements. If the antenna performance is not acceptable, Taoglas sales and engineering can make recommendations to improve the antenna performance. This may include changes to the current antenna, changing to a different antenna, or starting a custom antenna design. If the antenna performance is acceptable the next step would be the commencement of the CSA.31 - active mode TIS testing. TIS testing is also required for carrier certification.

## Part 3 – Next Steps

Taoglas offers a number of services which would typically follow on from this service. These services are intended to optimize the RF performance and maximize likelihood of certification for your design.

These services include:

- **CSA.31:** Cellular OTA TIS Testing
- **CSA.70:** Failure Mode Mitigation
- **CSA.50:** Custom Antenna Design

Visit Taoglas Website or contact Taoglas sales for further information.

Please note - devices, systems and equipment falling within the scope of Annex I of the EU Dual Use Regulation 821/2021 are not eligible for this service. For queries, please consult your legal department or contact exportcompliance@taoglas.com.