

# CSA.20

## Passive Antenna Testing, Matching & Fine-Tuning



### Outcomes and Deliverables

- Details of any electrical or mechanical tuning techniques.
- Matching circuit diagram and documentation of values if relevant (or cable routing diagram, antenna position/mounting etc.).
- Technical report detailing the measurements that were performed and the measurement results.

### Duration

1 week (this is a typical estimated duration – actual duration on quote may differ).

### What We Need

- 3D CAD files – preferably STEP files.
- Mechanical drawings.
- PCB files and circuit schematics – preferably native Altium files.
- 2 samples of your device/PCB.

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

All antennas are sensitive to their surrounding environment. Once an antenna is integrated into a product it is very common for the exact tuning of the antenna to differ from the design target or development board implementation.

The resonant frequencies for most antennas can be adjusted either by implementing a lumped element electrical matching network, or through small physical modifications to the antenna itself. This tuning effort results in optimal performance of the product as a whole.

### The Process

#### Part 1 – Passive Testing & Matching

- Taoglas will determine the number of antennas to test, as well as the radio technology associated with each antenna, to determine the bands of operation.
- Performance requirements for each antenna will be set, based on the use case, your instruction and our engineers' experience.
- Taoglas will modify your prototype device to allow for direct access to the RF paths. Typically, measurements will be performed at the point the RF path enters the radio module, to ensure all losses are included.
- Our engineers will perform passive measurements on a VNA to determine the Return Loss, as well as anechoic chamber measurements to determine the Antenna Efficiency, Peak Gain and Radiation Patterns.
- If required, the antennas will be matched and fine-tuned to the desired operational frequencies of the product with all mechanical system elements in place including the enclosure, any batteries, displays or other system elements. The matching/tuning is intended to account for all components in the system in the typical use-case. This includes any human body interaction that would be encountered in certification. If the device is worn or held by a person a human body phantom part will be used to account for this.

\* Note: Matching/Tuning is not comparable to a custom antenna. It is a simpler modification that can be implemented to improve antenna performance, while using the same antenna part number. This avoids new parts that require new design techniques, tooling, etc.

\*\*Note: While the device itself may have more than one physical use-case, the tuning of the antenna is limited to

a single use-case unless active tuning is implemented, which is beyond the scope of this effort.

#### *What does Taoglas need?*

We require two samples of your device, including as many of the components present in the final design as possible. Components like batteries, LCD displays, peripherals, cables, etc., all mounted in some sort of enclosure to approximate the final design.

The board does not need to be a functioning device, as we will be performing passive testing. We will be modifying the device and as such it will not be suitable for use after.

We require any 3D CAD and 2D design files you may have. We require these files to do cross sections, hide components and make accurate measurements. We accept a variety of 3D file formats, but STEP files are preferred.

We also require any documents you have relating to the PCB of the device. These documents should define the PCB stack-up, layer thicknesses, materials and finishes for the PCB. A bill of materials for each PCB is also recommended. Ideally these files should be native Altium files.

Circuit schematics of all the PCBs in your device are also required. This is to better understand the RF paths in your design. Once again, these files should ideally be native Altium files.

## Part 2 – Reporting

A complete report detailing test set up, results and conclusion will be compiled and presented. Our engineers will present the report and answer any questions or concerns you may have.

Taoglas engineers, in consultation with you on the final report, will determine if the measured performance parameters are sufficient for the product to meet the defined performance and certification requirements. If the antenna performance is not acceptable, Taoglas sales and engineering can make recommendations to improve the antenna performance.

Taoglas offers a number of follow-on test services; your Taoglas sales contact can cover all the various options.

## 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.10:** Antenna Feasibility Study
- **CSA.50:** Custom Antenna Design

- **CSA.30:** Cellular OTA TRP Testing
- **CSA.31:** Cellular OTA TIS Testing
- **GSA.30:** GPS Acquisition & Tracking Sensitivity
- **GSA.40:** GNSS Field Testing

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](mailto:exportcompliance@taoglas.com).