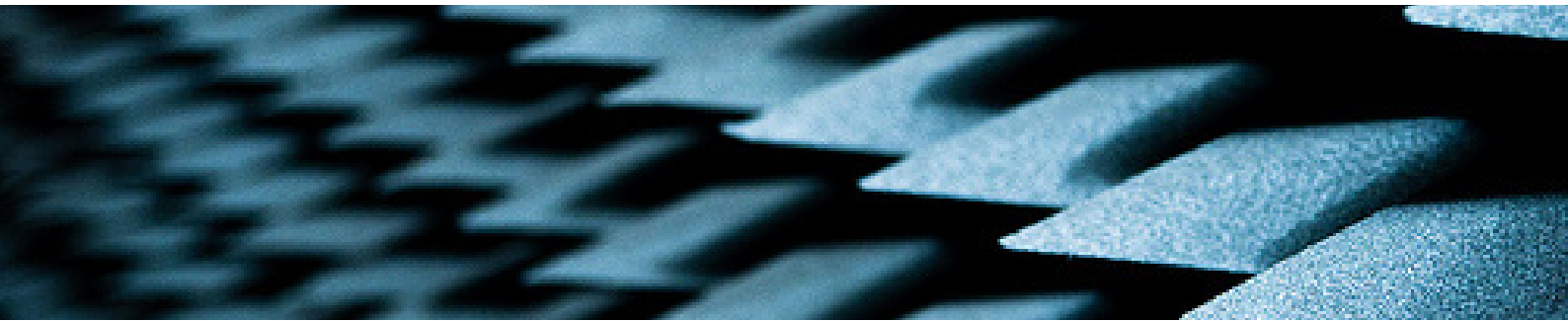


CSA.21

LTE Antenna Passive Implementation Optimization/ Matching & ECC Measurements



Service name:

CSA.21 LTE Antenna Passive Implementation Optimization/Matching & ECC Measurements

Deliverables

Report

Duration:

1 Week

Items

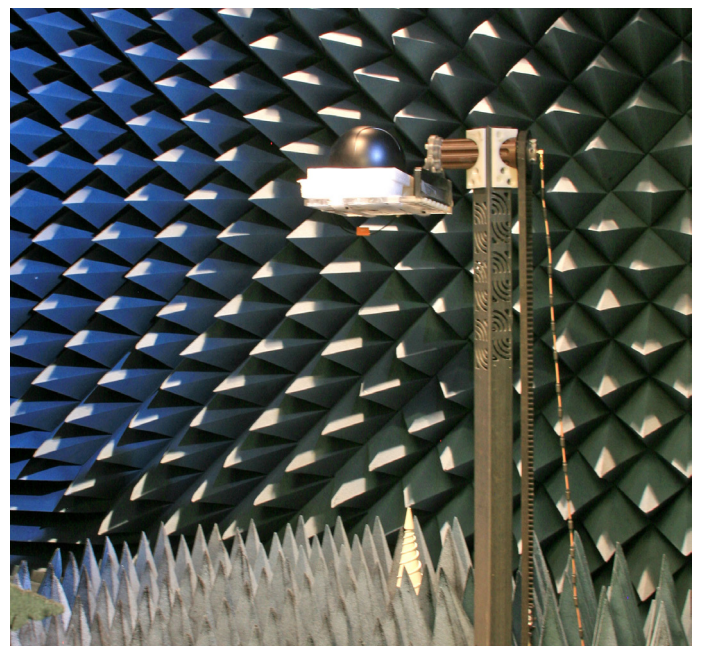
- A. Antenna installed on a customer device prototype board, with extra antenna prototypes
- B. Matching circuit diagram and documentation of values if relevant (or cable routing diagram, antenna position/mounting etc.)
- C. Return Loss, VSWR, Average Gain, Efficiency, Peak Gain, Radiation Patterns
- D. Documented performance measurements



What is the problem or concern we are addressing?

We provide post-integration verification of device TIS (Total Isotropic Sensitivity) performance. 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.

Many LTE devices are required to have two antennas in order to support downlink spatial multiplexing (MIMO), improving data throughputs. Integrating and optimizing this second antenna can be just as important as the primary antenna. The second antenna is affected by its surrounding environment the same as the primary antenna. In order for MIMO to perform well, the primary and secondary antennas need to receive signals differently. This is characterized by a parameter, Envelope Correlation Coefficient (ECC). This needs to be measured for high-throughput LTE devices.



The Processes

- Taoglas will modify your prototype device to allow for direct access to the antenna feed point at the beginning of your feed transmission lines.
 - The primary and secondary antennas will be matched 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 tuning is intended to account for everything in the system in the typical use-case so 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.
 - Measure radiation pattern and efficiency of the antennas installed in the device or on the board and in as much as the real use case as possible.
 - Complete report detailing test setup, results and conclusion.
- * **Note:** Tuning is not comparable to a custom antenna. It is a simpler onboard or transmission line or cable modification that can be implemented to improve performance but use the same antenna part number and avoid new parts that require new design techniques and tooling etc. to implement that part.
- ** 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?

- Two copies of your device including all the bits and pieces. Elements such as battery, LCD display, peripherals, cables, etc. all mounted in some sort of enclosure that's at least close to what the final enclosure will be like. SLA or FDM proto enclosures are sufficient but the final plastic material can yield slight differences in performance.
- 3D PDF or eDrawing files for your mechanical assembly. We need the ability to hide parts, do cross sections and make measurements so an eDrawing with these features turned on is highly recommended.
- We need the schematic for all the boards in the device. PDF format at a minimum and native Altium files if you happen to use Altium.
- PDFs of your PCB layout for each board, all layers. Again if you use Altium, then native Altium files would also be helpful. Please include a document defining the PCB stackup, layer thicknesses, materials and finishes for the PCB.
- A spreadsheet of your bill of material for each PCB in the design.

Part 2

Taoglas engineering in consultation with the customer on the final report will determine if the measured performance factors are sufficient for the product to meet its performance and certification requirements. If the antenna performance is not acceptable, Taoglas sales and engineering can make recommendations to improve the antenna performance. If the antenna performance is acceptable the next step would be active device performance measurements such as TRP (Total Radiated Power), TIS (Total Isotropic Sensitivity) or radiated receive sensitivity and RSE (Radiated Spurious Emissions) testing. Taoglas offers a number of follow-on test services; your Taoglas sales contact can cover all the various options.

Deliverables

Taoglas will compile a report on the antenna measurements including:

- Details of any electrical or mechanical tuning techniques.
- Matching network diagram and values including device sample with implemented changes.
- Return loss plots of before and after.
- Radiation pattern plots for each band.
- Efficiency plots vs. frequency for each band.
- ECC vs. frequency for each band.