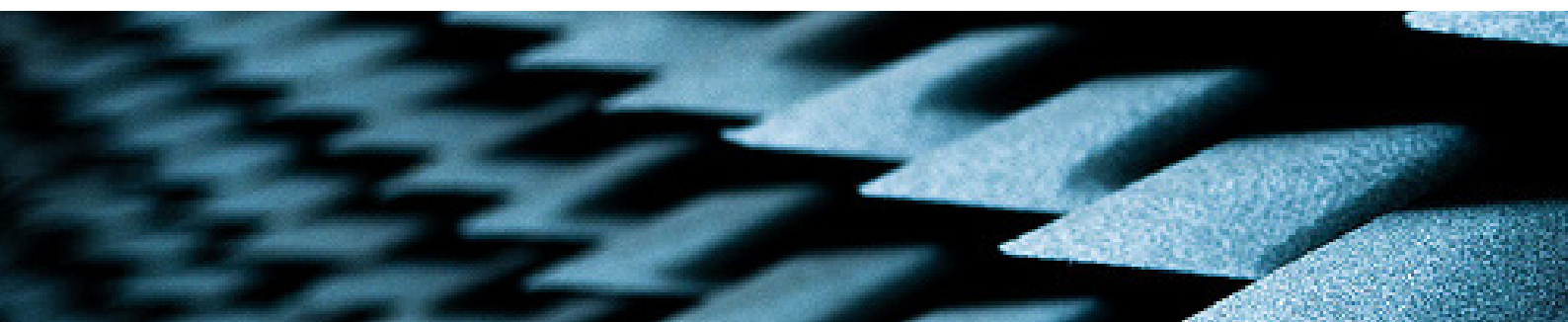


CSA.70

Cellular RSE and TIS Mitigation Analysis



Service name:

CSA.70 Cellular RSE and TIS Mitigation Analysis

Deliverables

Report of tests done, results of each & recommended changes
Modified copy of hardware if possible

Duration:

3-9 Weeks

Items

- A. A Detailed analysis of implemented hardware and all design files
- B. Reproduce problem with callbox and anechoic chamber
- C. Interference Frequency Analysis
- D. Interactive mitigation experiments to existing hardware
- E. Report of experiments, results and recommended changes



What is the problem or concern we are addressing?

Taoglas can evaluate and solve issues that relate to the antenna and RF performance, receiver interference and spurious transmitter emissions that cause performance and certification issues.

All wireless, and particularly cellular devices face common performance and certification challenges, regardless of the types of radios being used. These challenges are never obvious and different types of wireless systems and products exacerbate different issues more than others. This service offering is focused on addressing problems found during design verification test where real hardware has been built, tested and some aspect of performance must be improved to meet certification or customer expectations.

Taoglas's experienced engineering staff will evaluate your device, the testing that has been done, any additional testing that may need to be done and the failures identified in the testing. We'll determine what the failure is from the test results. From this evaluation we will design and execute experiments to reproduce the failure in our controlled lab environment. Once we can reproduce and measure the failing symptom, we will design and execute experiments to determine the underlying failure mode. Knowing that failure mode, the next experiments will attempt to specifically mitigate that failure mode on the existing hardware to the extent it is physically possible to do so.

Many failure modes are closely tied to PCB layout details and as such it may not be possible to prove out a fix without doing a PCB spin but the goal is always to verify as much of the proposed mitigation changes as possible before doing a PCB revision. Once all avenues of mitigation have been exhausted with the existing hardware a PCB revision will likely be needed to make changes to the PCB layout. After these PCB changes, testing is repeated to verify success. If there are still open issues, the process is repeated.

It's important to note that depending on the holistic system design it's possible that the product cannot ever achieve acceptable radio performance. In these cases significant system level changes are required including major changes to mechanical factors such as battery, electronics, sensors, display, antenna location and the system enclosure. The CSA.70 service can address any type of radio performance issue but cellular and LTE certification and performance problems are the most common.

Note that radio certification testing simply shows compliance as per the regulating organization standards (e.g. PTCRB or carrier certification). Many of the network operators in North America have specific tests and metrics for radiated performance on transmit (TRP), receive (TIS) and co-existence/ interference (RSE). These tests 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. Product performance itself however is not the responsibility of a certification body. FCC in the US has no test standards for the quality of a receiver. You can build a Wi-Fi or GPS product that passes FCC's requirements but does not actually function effectively as a Wi-Fi or GPS product.

The problem however will be identified in the market when users experience "poor range", "no GPS fix" etc. It's not enough to pass certification; the radio elements of the product have to actually work well. Taoglas engineering understands these issues at the deeper levels and at the source. We have experience in resolving not just antenna issues or noise issues but system issues - what the problems are, what causes them, how to avoid most of them in the first place and how to mitigate the few that get through. We can get you to market faster and in a cost effective way by supporting your engineering team dealing with these issues.

The Processes

Part 1

This service consists of the following:

- Analysis of the testing done to date and recommendations of additional testing as needed to determine exactly what aspect of performance or certification is insufficient.
- Reproduction of the failure mode in our controlled lab environment.
- Experimentation on the existing physical hardware to determine the failure mode and the root cause of the failure mode.
- Analysis of mechanical design, schematics, PCB layout and bill of materials for each board in the product, component by component, connection by connection to create a series of experiments to mitigate the root cause of the failure mode.
- Experimentation on the existing hardware of specific mitigation measures selected to address the root cause of the failure mode.
- A specific list of the mitigations to be applied to the device to address the failure mode.
- Iteration through these test steps as PCB changes are made to ensure the issues are resolved.

What does Taoglas need?

In all cases Taoglas will require the following:

- PDF format copies of your schematics for each board in the design. The best format is native Altium files.
- Design files for all PCBs in the design. The best format is native Altium files or gerber files. Please include a document defining the PCB stackup, layer thicknesses, materials and finishes for the PCB.

- A spreadsheet of the bill of material for each PCB in the design.
- An eDrawing files for the mechanical assembly. The ability for Taoglas to hide parts, do cross sections and make measurements etc., an eDrawing is essential.
- In the situation where a product that has already had prototypes built, then testing on those prototypes is done to identify the baseline. If testing has been already been performed (e.g. prescans) Taoglas requires all the test data gathered including summary reports, raw data and pictures of the test setup.
- Four (4) fully functional copies of the existing device hardware. These devices will be consumed in the process.
- One complete set of any support devices such as spare battery packs, battery charger, programming interfaces or cables.

Part 2

The output of the mitigation experiments will be a list of changes to your design that will mitigate the failure modes observed in testing. Your engineering team will implement the changes in a new set of design files. All the changes are equally important and need to be executed. Most failing products have several factors causing the same failure mode and they all have to be addressed without compromise or the risk of failure remains.

Taoglas will review the changes to the design files. Output from this review will be appended to the initial design report and distributed to you and your engineering team. This is included as part of this service. In the event it is not possible to apply physical mitigations to the existing hardware to prove all failure modes have been addressed, changes will be required to the design to apply additional mitigations as part of a full design revision including schematic, PCB & BOM changes. In the event the provided changes are insufficient to address all failure modes, the process is repeated until all failure modes are addressed.

Once the mitigations have addressed the failure modes, Taoglas can then perform passive antenna performance testing, active mode receiver sensitivity testing as well as active mode intentional and unintentional radiator testing. This testing is offered as separate service offerings to allow for different types of testing to the needs of different types of radios. Taoglas also offers a number of other testing services which can address the design verification test needs of your project.

Deliverables

The output from this effort will be presented in a written report with major sections for each of the design file types mentioned above as well as subsections on a per page basis. (i.e. CPU page, power supply page, etc.) These sections will detail the specific mitigations to be applied to each circuit in the system. To the extent it is possible to modify the existing device to demonstrate the effectiveness of the mitigations, a copy of the physical device will be provided. There will be an appendix with any comments from the post implementation review.