

EMI Compliance Test vs. EMI Pre-Compliance Test

Why Do We Need to Measure EMI Emissions?

Electromagnetic interference (EMI) is caused by unintentional emissions from electronic equipment. Compared to natural sources of EMI, such as lightning and solar storms, engineers are more concerned about man-made, unintentional EMI emissions. Devices that emit these range from modern cellular communication systems and broadcasting systems to a host of electrical components, which generate burst, pulse, CW or modulated signals.

EMI Emissions

Cause unintentional emissions from electronic equipment.

To gain global market access for their products, the manufacturers of electronic devices must comply with region or country specific EMC directives and ensure that their devices are compliant.



The Value of EMI Pre-Compliance Testing

1. Reduce the risk of failing EMI compliance at the end of a project

Most manufacturers prefer to have their products certified by an authorized third-party service provider that is familiar with global standards and requirements. EMI compliance testing would ensure that products are completely certified.

However, EMI compliance tests are usually conducted at the end of project. Referring to the product development cycle chart below, you can see that 90% of tests and measurements (including EMI diagnostic tests) happen during the prototyping and pilot run phases. EMI compliance tests, on the other hand, comprise only 10% of the process and occur at the end of a project. EMI compliance test failures can be costly for a project team, time and money wise. Therefore, you should take the opportunity during the early stages of a product development cycle to minimize the risk of failing an EMI compliance test by conducting EMI diagnostic tests or pre-compliance tests.

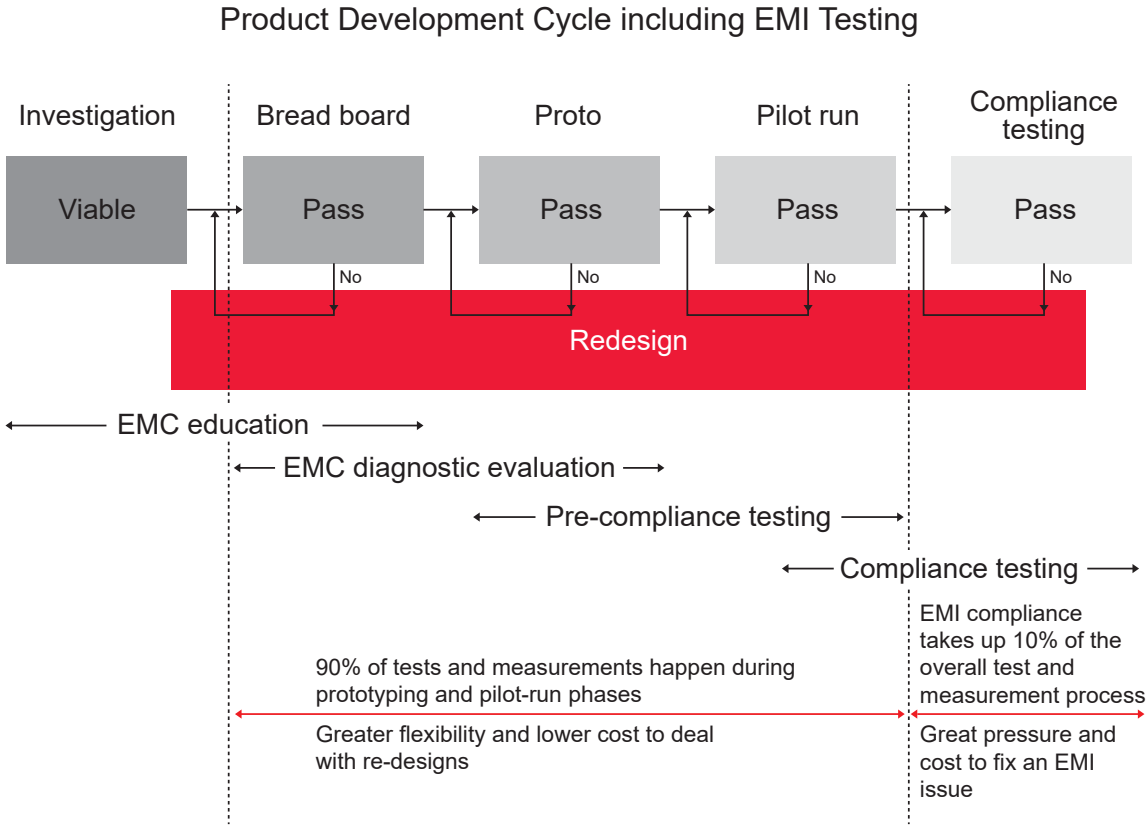


Figure 1. A typical product development cycle and where EMC testing should occur

2. Identify Exact EMI Sources

It can be difficult to tell where EMI failures are coming from since compliance tests themselves won't tell you where exactly the source of the problem is. Radiated emissions may come from a USB port, a LAN port, the seam of a shield, a cable, a buffer, a clock or even a power cord. You need to either troubleshoot yourself or obtain troubleshooting services from a lab or a third party. In this situation, near-field tests are the only way to locate such emission sources and is typically performed using a signal analyzer and a set of near-field probes.



Figure 2. Near-field probe and CXA signal analyzer test the emission of PC LAN port during design cycle before full compliance testing

EMI Compliance Testing vs. EMI Pre-Compliance Testing

	Compliance test	Pre-compliance test
Purpose	To achieve certification (e.g. C-tick, CE, UL, KC, CCC, FCC)	To increase the confidence level at final compliance testing
Overall	Must follow the standard procedure	Not identical to, but able to follow the standard procedure as much as possible
Physical setup requirements	Must be done at a testing facility (for certification)	Can be done in-house, throughout the design process
	Must be in an anechoic chamber	Can be done in a shielded room, or an open room
	Must use an EMI receiver	EMI receiver or spectrum analyzer
	Must comply with test setup	Simplified test setup
Cost	Very costly and time consuming	Much lower cost incurred, quick turn-around

Figure 3. The differences between EMI compliance and pre-compliance testing



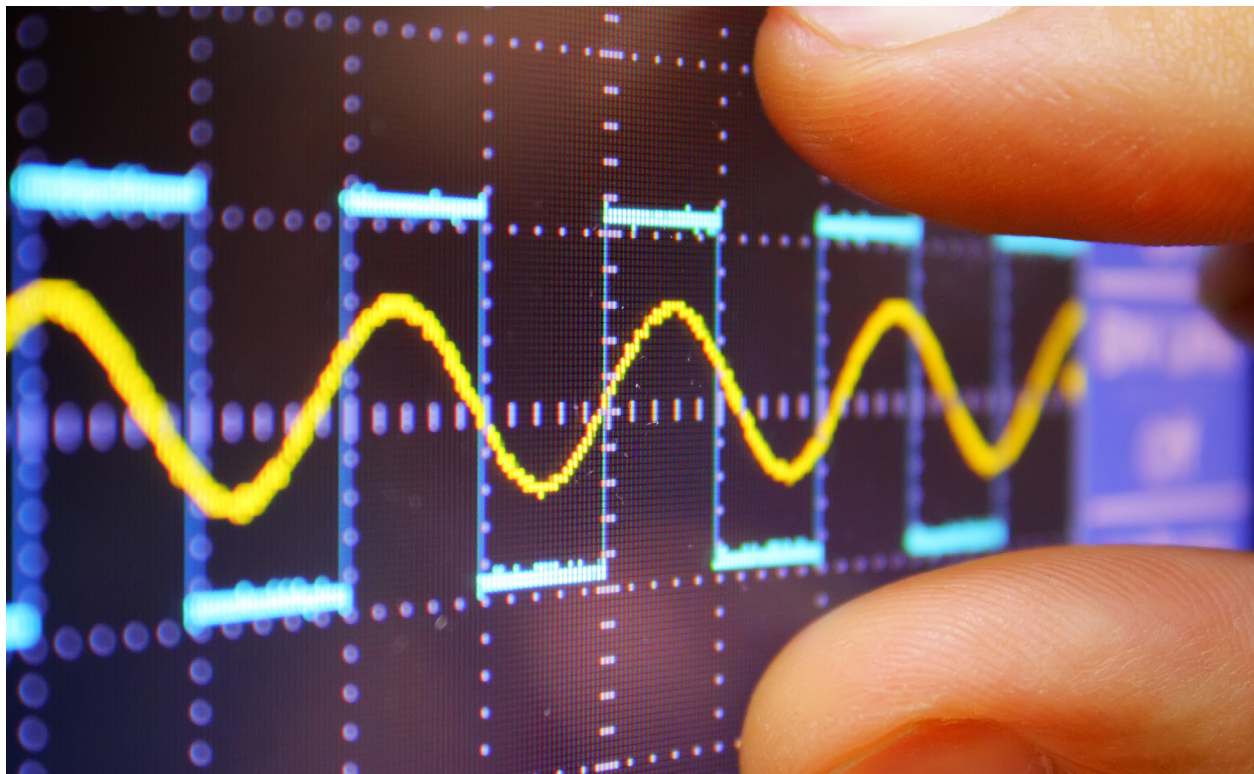
The Differences Between EMI Receivers and General-Purpose Signal Analyzers

The functionality of an EMI receiver and a general-purpose signal analyzer optimized for EMI emissions measurement applications are similar.

EMI pre-compliance tests can be covered by either EMI receivers or signal analyzer with basic EMI features such as CISPR 16-1-1 compliant detectors and resolution bandwidth. Signal analyzers are usually less expensive than EMI receivers. EMI compliance testing also requires conformance to a standard testing environment, which is hard for the majority of companies to achieve.

In short, EMI receivers enable you to do full compliance testing. They have been designed with all the compliance standards in mind and most organizations recommend using a EMI receiver for EMI applications.

On the other hand, general-purpose signal analyzers can be used for pre-compliance testing. Signal analyzers are a versatile tool and can be optimized to be used for EMI testing. If you are an RF engineer in the early R&D product development phase, a signal analyzer equipped with basic EMI features will provide just enough functionality for pre-compliance testing.



Conclusion

The advantage of running an EMI pre-compliance test with a signal analyzer is that you can make a good estimation of the EMI performance of your new product and reduce the risk of failing EMI compliance at the end of a project.

Now that you have a better idea of the differences between pre-compliance testing and compliance testing, learn more about Keysight's EMC pre-compliance solutions:

- [N9010B EXA Signal Analyzer](#)
- [N9020B MXA Signal Analyzer](#)
- [N9311X-100 Close Field Probe Set, 30 MHz – 3 GHz](#)
- [N6141C EMI Measurement Application, Multi-Touch UI](#)

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