EMC Prequalification

One of the side-effects of the growing use of electrical and electronic equipment is an increase in electromagnetic disturbances. When these disturbances reach high levels, they may cause nearby equipment or systems to malfunction. This concerns all electrical or electronic equipment, as well as equipment containing electronic components, such as computers, mobile phones, radios, televisions, industrial machinery, lighting, etc.

Since 1996, every product marketed in Europe has had to comply with the Electromagnetic Compatibility standards covering emission and immunity. For measurement instruments, the generic standard is EN61326-1.

The challenge

The challenge involves limiting the electromagnetic interference produced by or affecting electrical or electronic equipment.. Guaranteeing EMC helps to ensure correct operation of such equipment and extend its life span.

The standards

These define the essential requirements for protecting equipment and systems against electromagnetic disturbances.
To be electromagnetically compatible, the system must comply with the standards covering emission and immunity, i.e.:

- **not cause any interference with other systems:** the level of the electromagnetic disturbances produced must not exceed the threshold where other equipment and instruments no longer operate correctly
- **not be sensitive to the emissions from other systems:** the system must have sufficient immunity to electromagnetic disturbances to operate correctly
- **not cause any interference with itself** (disturbances generated by the system's components or its operation).

EMC prequalification tests

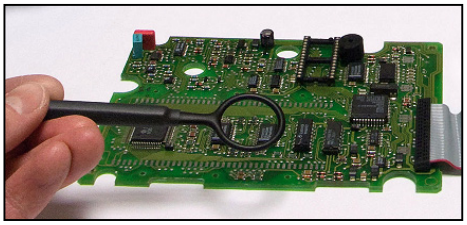
These tests may take place throughout the product design and development phases. Prequalification tests help to save time and ensure that the finished product will comply with the applicable standards. Moreover, satisfactory results during these tests offer a better probability of successful EMC qualification later on. In this way, they avoid extra spending on modifying the product after failing the qualification tests.

These tests cover all the aspects that help to limit disturbances:

- choice of the components and their layout on an electronic circuit board
- reduction in the length of the cabling and, if possible, use of shielded cables
- separation of circuits/cables of different types (e. analogue or digital)
- verification of electrical continuity (connections, welds, etc.)
- verification of the floorplan and shielding, etc.

This list is not exhaustive. Any steps likely to reduce the electromagnetic fields should be investigated in order to optimize the product's operation.

The tests are divided into 2 main categories: **immunity tests** and **emission tests**. There are also 2 distinct modes for carrying them out: **"conducted mode"**, which covers the disturbances present in cables or printed-circuit traces, and **"radiated mode"**, which covers the electromagnetic field in the air.



Example of measurement in radiated mode using a Metrix® near-field probe

Use of near-field probes

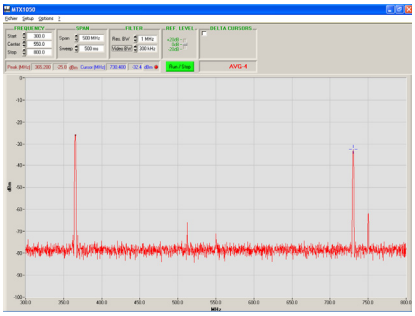
Les différents champs mesurés par ce type de sondes permettent la localisation d'une source de champ électromagnétique Haute Fréquence, source de perturbations.

Active H-field probes work by observing the disturbance currents. Insensitive to external disturbances, they measure the intensity of the field directly associated with the currents flowing in the conductors.
It is not necessary to disconnect the existing wiring to use them. They are used with a spectrum analyser equipped with **Peak & Q-Peak detection modes**.

These modes are ideal for measurements in the context of EMC prequalification.

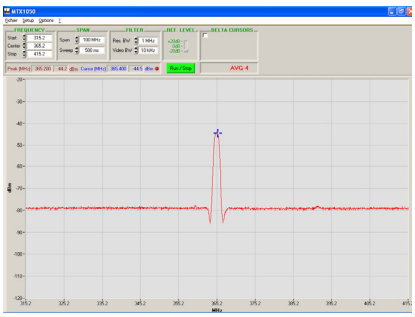
In "conducted mode", a **contact probe** will be used to detect any electromagnetic fields emitted vertically from flat surfaces (example 1). It allows precise measurements on specific areas (floorplan, trace, shielding, etc.). It is ideal for detecting disturbances emitted from surfaces which are difficult to access.
In "radiated mode", a **proximity probe** will be used to detect all the electromagnetic fields present in the space involved (example 2).
For greater accuracy, these probes may be used with an amplifier to reduce the noise floor level. This makes it possible to measure very slight disturbances.

Example 1:



Disturbances due to an oscillator.
To ensure EMC, a wide frequency spectrum from 150 kHz to 1 GHz must be scanned.

Example 2:



Observation of a disturbance line at 365 MHz.
The loop probe allows the overall electromagnetic emissions to be observed.

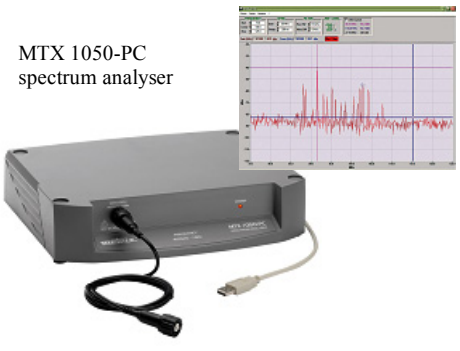
Conclusion

The use of mobile phones is currently prohibited in aircraft mainly because of electromagnetic compatibility problems.
Only a tiny part of EMC testing has been discussed here. Other tests in an anechoic chamber or Faraday cage are used to define a system's immunity correctly and equipment must be checked in such installations to guarantee EMC qualification.

Dedicated products for EMC prequalification

HX0082
near-field probes

HX0083 20 dB
amplifier for HX0082
near-field probes



MTX 1050-PC
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