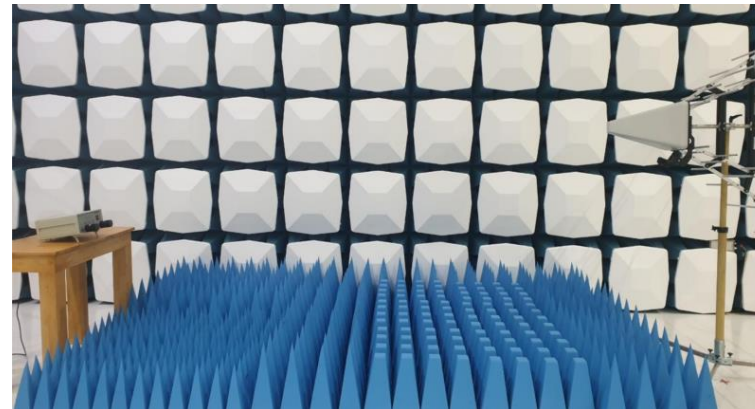


**Definition:**

- EMC tests performed prior to submitting the product to an EMC test-lab.
- EMC tests performed to improve a device after failing type approval
- Often performed in the design labs of companies that develop and manufacture electronic products.
- Often performed with equipment, lab space, and budget constraints.
- Keep the test setup as basic as feasible while also closely mimicking a standard compliant setup as possible.

**Target:**

New products should be tested for EMC performance during the design process to prevent failing type approval, which would result in a costly redesign, a delayed manufacturing ramp up, and a delayed market entry. Pre-compliance testing must result in successful type approval on the first pass.

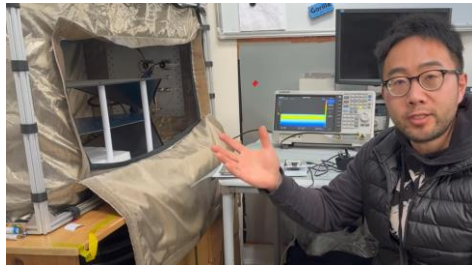
Pre-compliance testing constraints

Budget

- affordable spectrum analyzers with EMI option (Rigol, R&S, Siglent) instead of measurement receivers
- Affordable EMC test software (Tekbox EMCview)
- Affordable transducers (Tekbox LISN, current probes, antennas, CDN,...)

Lab space

- Shielded tents or shielded bags as replacement of shielded chambers
- Lab or open area instead of anechoic chamber
- Space requirements for wooden measurement table and groundplanes



Complexity:

- Non standard compliant setup
- Simplified setup
- Effects on measurement results

Which tests?

Most frequent failures

- Conducted emissions
- Conducted immunity
- Radiated emissions
- Radiated immunity

Tests with low level of difficulty

- Conducted emissions on supply lines
- Conducted emissions on control and data lines
- Conducted immunity on supply lines
- Conducted immunity on control and data lines

Tests with medium level of difficulty

- Radiated immunity

Tests with high level of difficulty

- Radiated emissions

Pre-compliance test setup - how accurate can it be ?

Conducted emission tests

- Excellent correlation with test-house reports
- With careful setup, pretty much spot on

Conducted immunity tests

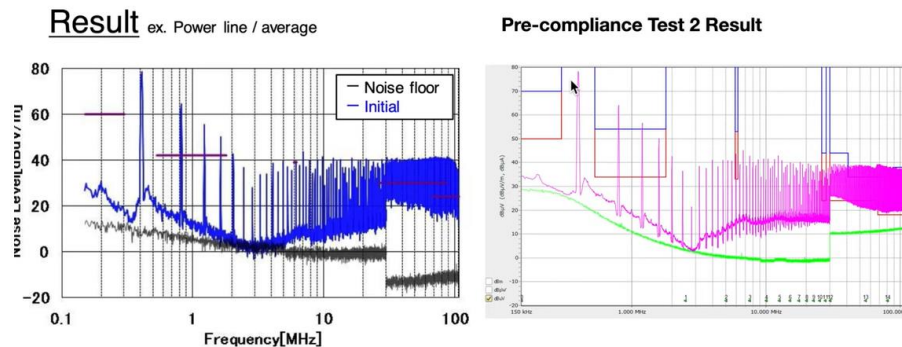
- Excellent correlation with test-house results

Radiated immunity tests

- Good correlation with test-house results

Radiated emission tests

- Requires effort and experience, to achieve a satisfying correlation with test-house reports



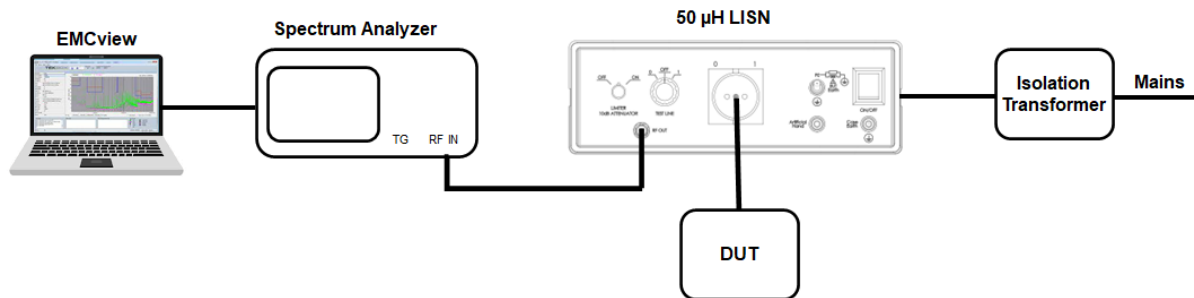
<https://www.youtube.com/watch?v=KHxbk4eToXs>

Conducted emission tests

Conducted emission tests

- The majority of conducted emission tests are carried out using a LISN
- 50 μ H LISN for products intended for use in industrial or domestic environment
- 5 μ H LISN for automotive products

Simplified setup



Refer to the relevant standard for the correct setup

Other transducers

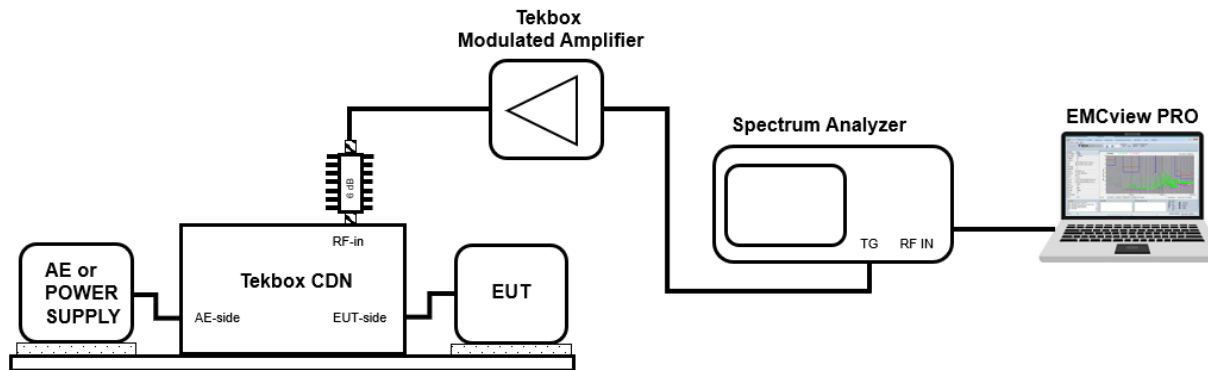
- RF Current monitoring probes
- CDNE's
- Voltage probes

Conducted immunity tests

Conducted immunity tests

- The majority of conducted emission tests are carried out CDN's

Simplified setup



Refer to the relevant standard for the correct setup

Other transducers

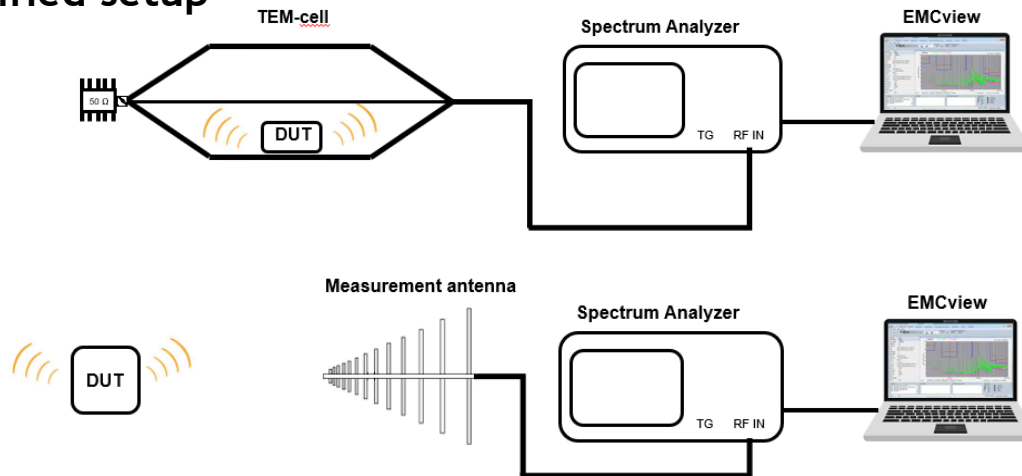
- Bulk current injection probes
- Electromagnetic clamp
- Tubular wave coupler

Radiated emission tests

Radiated emission tests

- The majority of radiated emission tests are carried out with antennas in the far field and set up in an anechoic chamber

Simplified setup



Refer to the relevant standard for the correct setup

Other transducers

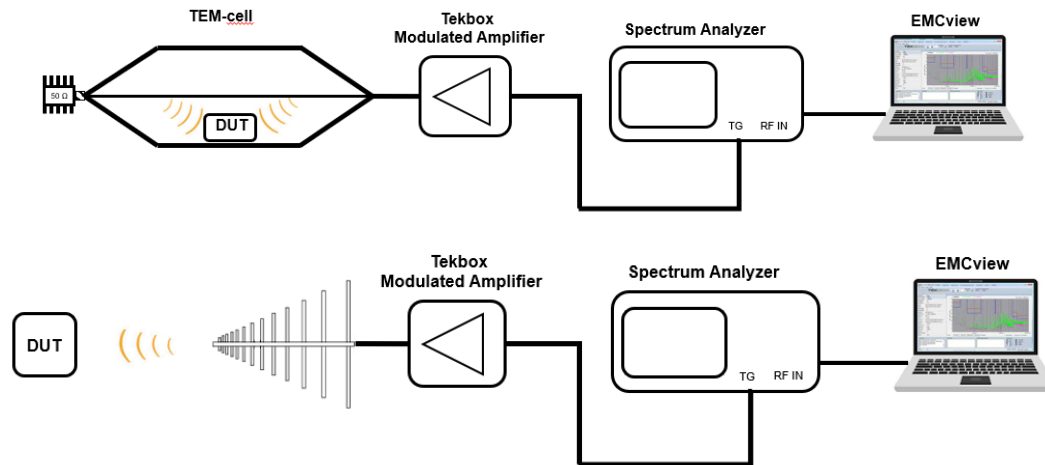
- GTEM-cell
- TEM-cell
- Large Loop Antenna

Radiated immunity tests

Radiated emission tests

- The majority of radiated immunity tests are carried out with antennas in the far field and set up in an anechoic chamber

Simplified setup



Refer to the relevant standard for the correct setup

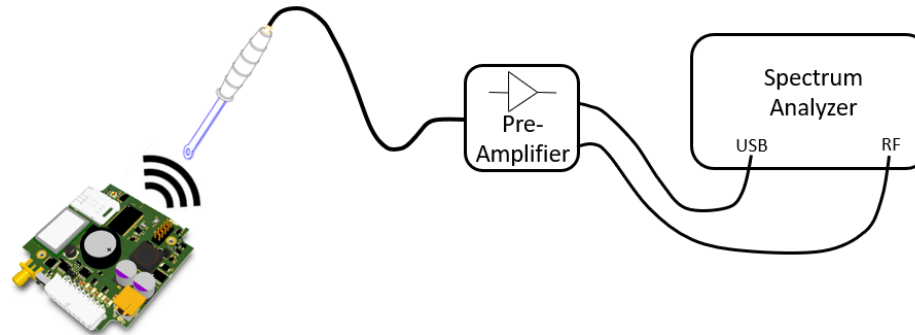
Other transducers

- GTEM-cell
- TEM-cell
- Stripline

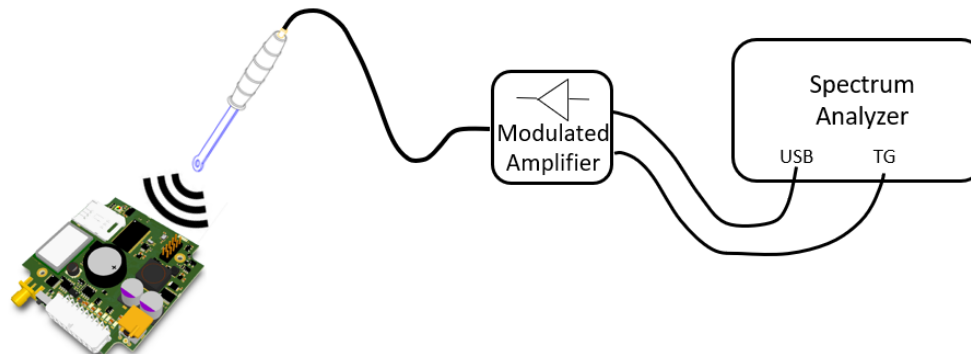
Debugging of EMC issues

Use near-field probes to identify the location of radiated emissions or susceptibility to electromagnetic radiation

Radiated emission



Radiated immunity



Further information on www.tekbox.com