

A recent response to a client's question in respect of EMC evaluation.

CLIENT RSE SYSTEM

RADIATED EMC TEST PROTOCOL NOTES

The question of how to test an RSE installation against radiated EMC has arisen and it is necessary to consider a practical – albeit general – methodology.

At this stage field strengths and frequency ranges are unknown. It is also not clear whether a formal specification exists against which the DUT is to be evaluated.

Video

The evaluation of video systems against radiated EMC by direct measurement is universally recognised as a very difficult problem. In simple terms this is because the connection of test equipment to the DUT drastically changes the RF field conditions to which it is exposed. For some military and safety-critical industrial applications it is possible in principle to filter and bypass the connections and perform the testing in half-octave bands, changing the filtering as required. However, the process is very time-consuming and repeatable results are notoriously difficult to obtain.

For this reason current European consumer-electronics industry practice for video equipment requiring CE or e-marking is almost always to evaluate the DUT against radiated EMC via subjective disturbance testing (SDT) using a five-point scale assessing parameters agreed between supplier and manufacturer. Such testing is normally performed in an anechoic chamber or a large screened room although useful results can also be obtained for pre-compliance and evaluation purposes in a large open space where there are no other near-field RF sources or other sources of high RF field strength.

Parameters usually evaluated include visible noise, visible pattern disturbance, loss of sync, false colour, loss of colour or other chroma disturbance, line tearing, field jitter, field roll, hum bars and superimposed audio. All parameters are scored on a scale in which 1 represents total loss of video information, 2 is a severe disturbance, 3 is a just-unacceptable level of disturbance, 4 is a just-acceptable level of disturbance and 5 is no disturbance. The DUT is deemed to have met the requirements if all parameters score 4 or 5.

Audio

The audio performance of the RSE against radiated EMC can in principle be evaluated in various ways. If the DUT incorporates an FM modulator whose characteristics are known in advance, the best method is to examine the RF output of the modulator directly (to assess whether the incident RF field is having any effect on the modulator's own RF performance) and also to examine the audio signal-to-noise ratio. If the FM modulator is being affected by the incident RF, it is very likely that either its carrier frequency will vary or the deviation will change. Both are trivially easy to observe in real time with either a spectrum analyser or a modulation analyser, and a methodology can be produced if required.

If the associated audio circuitry is being affected, it is very likely that either the signal/noise ratio of the recovered audio will worsen or there will be a marked change in the observed THD. Here again, both are trivially easy to observe in real time using suitable instrumentation.

In terms of pass/fail parameters, a proposed starting-point would be that the DUT shall be deemed to have failed if any of the following occur during testing:

- The RF carrier frequency varies by more than 500Hz from nominal.
- With the modulator AF input level set to give a deviation of 50kHz, the deviation of a 1kHz (L+R) sine wave varies by more than 1kHz.
- The unweighted (L+R) signal/noise ratio becomes less than 35dB.
- Measured at 1kHz, the overall THD increases beyond 5%.

In addition to these measurements there is some merit in additionally carrying out an SDT and scoring the DUT against parameters agreed between supplier and manufacturer. In general terms these would incorporate any transient or sustained audible disturbance to the audio output as monitored on a standard car radio.

IR links

If the RSE incorporates an IR link used for headphone output, the measurements outlined above can be easily carried out using an industry-standard dummy head. If it incorporates IR remote control, this can best be checked by manual methods.

Conclusions

For the LCD monitor element of the RSE it is not considered feasible or appropriate to carry out radiated EMC performance assessment by direct measurements. This should be carried out by SDT. For the audio element, off-air (wireless) measurements can easily be carried out and can be augmented by SDT if required.