Technical Guidance Note TGN 18

ECANB Technical Guidance Note TGN 18 on Calibration of Quasi-Peak Receivers – CISPR 16-1-1 QP Detector

1. Introduction

A calibration lab reported that using the calibration method in CISPR 16-1-1 could result in damage to the front-end of the receiver.
The problem was raised to The UK test lab organisation and then on to CISPR A who agreed to modify the standard. In the interim the ECANB has agreed this TGN.

2. Guidelines:

To understand the requirement, consider the indication at any given point on the meter scale of a receiver employing a quasi peak detector. At the extremes, this indication can be due to a continuous sine wave, or a single pulse of duration much shorter than the reciprocal of the measurement bandwidth (any pulse shorter that the reciprocal of the bandwidth will become that time in duration and the amplitude reduced, thus maintaining the same pulse area). The peak amplitude of the single pulse will be much higher than the peak of the sine wave. Taking the example of Bands C/D, at the input to the detector, i.e. after the measurement bandwidth filtering (to 126 kHz impulse bandwidth) this is 43.5dB.

The dynamic range required is dependent on the bandwidth of each receiver stage. A measuring receiver may have a range selection filter of 300MHz bandwidth (for the 700MHz to 1GHz range for example). The dynamic range required at the output of the filter is more than 100dB.

To verify that all the stages in the receiver have their required ‘headroom‘ above the level needed for a sine wave, it is necessary to perform the pulse response curve test, maintaining a constant indication as the pulse repetition frequency is changed.

This calibration result applies to any indication of the receiver within the measurable range of signals. The test is not intended to give information about the highest signal that can be measured, only the dynamic range of the active circuits and the accuracy of the impulse bandwidth, detector and meter time constants. The maximum signal that can be measured is dependent on the characteristics of the signal and the ratings of the input attenuators (peak voltage and power dissipation).

The following paragraphs give some practical guidance on the process.

Connect the CISPR pulse generator via precision attenuators (see Note below) to the receiver; set the generator to 60dBµV at a repetition frequency of 100Hz (25Hz for Band A) and the external attenuator to 35dB. Reduce the receiver attenuation as needed to display the reading of the signal with adequate signal to noise ratio. Modern receivers may have a choice of manual or auto ranging, ideally both should be tested. The indication will be approximately 25dBµV, depending on the sine/pulse

accuracy and if the auto calibration function of the receiver meter scale/display has been designed to be correct for sine wave, pulse or in between. This value is the reference indication for the test.

As the pulse repetition frequency is changed to each of the values in Table 3 of CISPR16-1-1, adjust the 35dB external attenuation to maintain the same indication as closely as possible. The attenuator will probably be in 1dB steps, so some interpolation within $\pm$ 1dB will be needed.

Many receivers have a wide range meter display (bargraph, digital) of 60dB or more. Typically (depending on the design of the receiver) the scale range is reduced when quasi peak is selected, compared with the peak detector selection (because of the quasi peak dynamic range requirement the top 30dB or so of the display A/D convertor will not be used), but may still be 40 dB, for example. This is still quite a large range and so has the potential to fail near the top of the scale, due to bad design or malfunction. Ideally the test should be carried out very near the top of the meter scale. This may be possible under manual attenuation control, but auto ranging will usually defeat this. Testing both modes if available and possible will give good coverage of the ways in which the receiver can be used to make measurements.

Note: the Schwarzbeck IGUU 2916 can be used without the need for external attenuators. Using them however can reduce the overall laboratory test equipment calibration costs and measurement uncertainty for the pulse curve test.