Noise margin analysis, Triton Models [TNS29-SNP12-XXX-XX]

Measurements for radiate spurious emissions from the transmitter section of the device were made down to the noise floor of the measurement equipment. The receiver was a Tektronix 2784 Spectrum analyzer; above 40 GHz a set of standard horns with integrated external mixers was used. This set is specifically matched to the Tektronix 2784 and the mixer conversion factors are incorporated in the display settings for the spectrum analyzer. Spurious emission measurements were investigated as part of the FCC part 15 test up to 2 GHz (at 10 meters) and from 1 to 200 GHz at 1 meter from the EUT. The 1 meter measurements were made using standard horns (EMCO 3115, 3116 and Millitech series horns with integral external mixers).

The limit is 43 dB + 10 log(P0) where P0 is the nominal (conducted) output power. The measurement sensitivity at the limit needs to be 43dB + 10Log(0.2) below the reference level for spurious emission measurements. For a 20 dB margin below the limit a level of 56 dB below the carrier output needs to be recognizable at the noise floor of the measurement instrumentation.

The reference output power for the spurious emission measurements is the nominal output power with the transmitter in normal operating (modulation) condition. All power levels are referenced to a standard dipole.
The EIRP of the transmitter is -7 dB(W) + 36 dB(i) antenna gain or 29 dB(W) EIRP. A standard dipole with a maximum gain of 6 dB would require a comparable power of 23dB(W) to produce the same field strength .

At a 1 meter measurement distance (where most measurements were made in this case), the worst case sensitivity of the Tektronix 2784 with a 1 MHz BW and the associated Millitech mixers is listed in the following table. The equivalent power into a standard dipole to generate the field just at the noise level is calculated from the standard isotropic field equation and allowing for the dipole gain.

Freq	Noise floor dBuV	AF dB/m	Min FS dBuV/m	Equiv. subst. Pwr in transmit dipole 1 meter away from receive horn in dBm
40 GHz	32	37.22	69.22	-38.56
50 GHz	30	39.16	69.16	-38.62
100 GHz	36	45.18	81.18	-26.60
130 GHz	50	47.46	97.46	-10.32
170 GHz	57	49.79	106.79	-0.99
200 GHz	60	51.20	111.20	3.56

For most of the frequency range, the sensitivity would be sufficient to measure signals 56 dB (36 dB limit plus 20 dB margin) under the main transmit level of the transmitter. Only in the range of 130 – 200 GHz would the margin degrade to worst case 53-36-3.6 = 13.4 dB. Exploratory measurements above 40 GHz were made as close as 10 cm to the product and did not show any spurious emissions. Specific attention was paid to internally generated frequencies and their mixing products.