

Common Mode Radiated Emissions From a Single RJ-45 Port

In order to help determine the acceptable level of noise from a DTE powered port, I decided to run a radiated emission test in a 10 meter anechoic chamber.

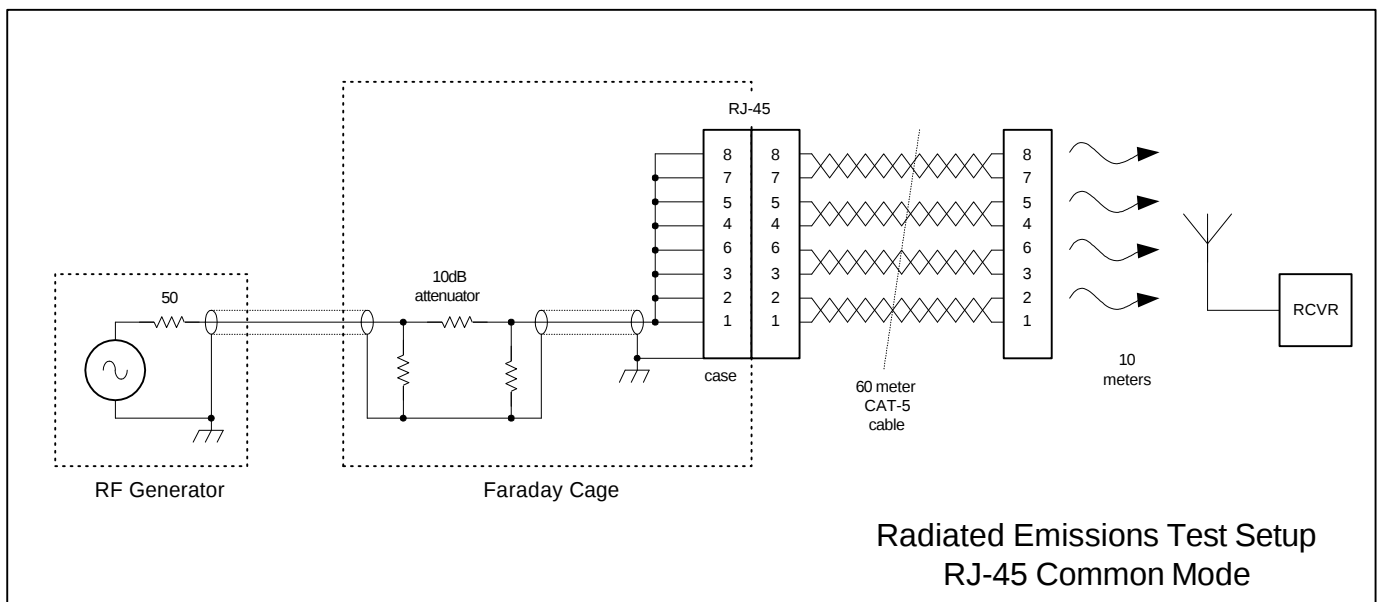
I first constructed a cable that would take a single ended signal off of a 50 ohm coax, and send it out all 8 pins of an RJ-45 connector. This cable device and connector was housed in a faraday cage resting on the ground plane inside the anechoic chamber. A single 61 meter long CAT-5 UTP cable plugs into the RJ-45 port located in the wall of the faraday cage. The UTP runs over a non-conducting cable gantry, and contains a couple of large loops (see photo).

The coax that drives the RJ-45 through a 10 dB pad, is driven by an RF generator, located in the chamber control room.

At each frequency, starting at 30 MHz, the RF generator power level required to bring the received radiated emissions up to the Class B limit (30 dBuV per meter below 230 MHz) is recorded.

As a practical matter, the noise out of a powered port, or unpowered port, must be low enough to pass a radiated emissions requirement. So this data helps to guide what common mode output noise is tolerable, it is not intended to replace emissions testing, but help the IEEE802.3af write a spec.

One key issue is that radiated emissions compliance generally only covers 30 MHz and higher frequencies. Noise below 30 MHz, for example from 500 kHz to 30 MHz, could easily corrupt 10/100 data transmission without necessarily violating any radiated emissions requirements. This frequency range is not covered by the data presented herein, but does need to be addressed.



Test Setup

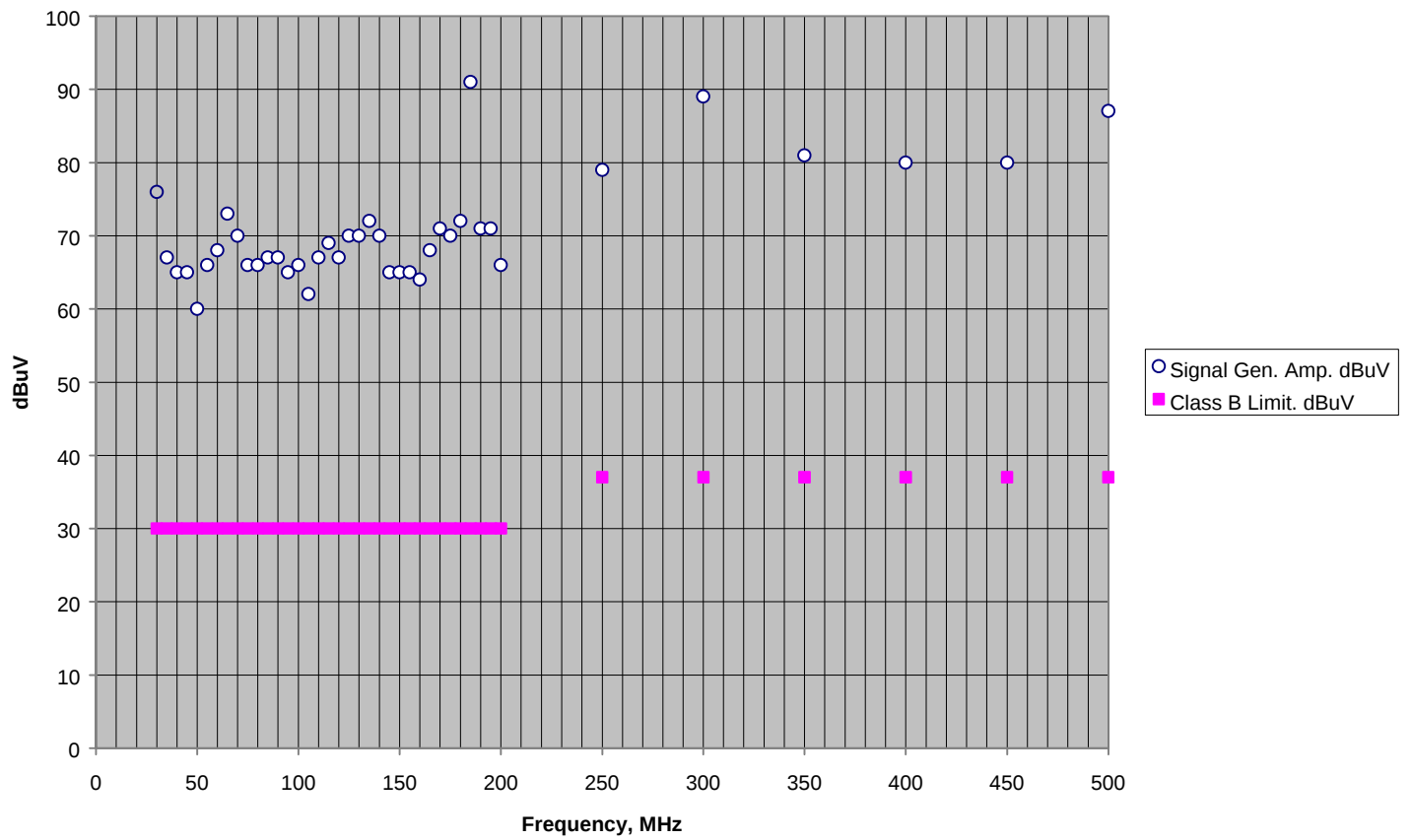
Baseline Measurements @ 50 Mhz

Signal Generator	Receiver	Antenna	Table
Freq. Mhz	Amplitude dBuV	Height cm	Polarity Degrees
50	67	131	Vert 207
50	60	131	Vert 207

Test Data

Signal Generator	Receiver	Antenna	Table
Signal Gen.	Receiver Amp.	Height cm	Polarity Degrees
Freq. Mhz	Amp. dBuV		
30	76	131	Vert 207
35	67	131	Vert 207
40	65	131	Vert 207
45	65	131	Vert 207
50	60	131	Vert 207
55	66	131	Vert 207
60	68	131	Vert 207
65	73	131	Vert 207
70	70	131	Vert 207
75	66	131	Vert 207
80	66	131	Vert 207
85	67	131	Vert 207
90	67	131	Vert 207
95	65	131	Vert 207
100	66	131	Vert 207
105	62	131	Vert 207
110	67	131	Vert 207
115	69	131	Vert 207
120	67	131	Vert 207
125	70	131	Vert 207
130	70	131	Vert 207
135	72	131	Vert 207
140	70	131	Vert 207
145	65	131	Vert 207
150	65	131	Vert 207
155	65	131	Vert 207
160	64	131	Vert 207
165	68	131	Vert 207
170	71	131	Vert 207
175	70	131	Vert 207
180	72	131	Vert 207
185	91	131	Vert 207
190	71	131	Vert 207
195	71	131	Vert 207
200	66	131	Vert 207
250	79	131	Vert 207
300	89	131	Vert 207
350	81	131	Vert 207
400	80	131	Vert 207
450	80	131	Vert 207
500	87	131	Vert 207

RF Generator Voltage Required to reach Class B Limit



Graph of Results, 30MHz to 500 MHz



picture of Faraday cage, and UTP loops