Digital TV Component Rating

Rating of RF Components

The rating of transmission lines, filters and combiners in the digital era require more thought. At UHF the voltage rating of multichannel analogue systems is not a consideration. However with Digital modulation the situation has changed.

When we refer to an analogue transmission of 10kW we imply 10kW Peak sync Vision with a sound carrier of –10dB single carrier or –13dB and –20dB for dual sound carriers. Hence to calculate the peak voltage we add up the peaks of the three individual carriers.

P=V2/R V= Ö(P x R) Vpk = Ö(2 x P x R)

Which in a 50 ohm system becomes Vpk = 316 ÖPkw

For a conventional Analogue TV signal :

Carrier	**Relative Power**	**Power**	**Peak Voltage**
Vision	0dB	20kW	1,413V
Sound 1	-13dB	1kW	316V
Sound 2	-20dB	200W	141V
Total Peak Voltage			**1,870V**

Which can be simplified to Vpeak = 1.323 x 316 ÖPkw Sync

Vpeak = 418 x ÖPkw Sync

In the case of DVB-T Modulation there are thousands of carriers which have to be considered. The transmitter power is defined as the mean power of the sum of all the carriers in a multiplex. The ratio of peak to mean power is considered to be 10dB (3.16 X) in the DVB-T OFDM modulation system.

Hence 1kW Mean Power OFDM = 316 x 3.16 x Ö1 = 1000V

Vpk =1,000 x ÖPmean

Thus 3.5kW Digital OFDM produces a peak voltage of 1,870V, the same as a 20kW Analogue TV Signal! Thus in the case of the UHF antenna which was designed for 4 x 20kW Analogue TV signals is equivalent to 7.5kV peak. If we require to run six digital multiplexes the peak voltage of 6 x 1.5kW would be 7.4kV !

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Safety Factors

Not withstanding the above calculations experience has taught us to make provisions for the unforeseen and we therefore add a safety factor to the calculated voltage and power handled by a component. The Safety factors Alan Dick Broadcast employ have been in use for more than 30 years and they are the margin between the manufacturer's ratings and the normal working parameters. They are required to allow for variations in the transmitter power, an allowance for tolerances in VSWR, as well as general tolerance errors. We use a Voltage Safety factor of 1.5X and a Power Safety Factor of 1.5X.

Combiners

The star point combiner is the simplest form of combiner and relies on having quarter wave lines between each filter and the common point. Each filter passes one channel and is a short circuit for the other channels. The voltage on the line is doubled for all rejected signals, the standing wave, hence very high voltages can be found on the line. In the case of a 2 way star point combiner the peak voltage will be 3 times the voltage of one channel into a matched 50 ohm load.