

Pacific Wave delivers innovative and reliable RF Component with its solution for Telecommunication Industry. The following information describes and defines the most common Application / Engineering Notes :

### **FREQUENCY RANGE**

Range of frequency defined which Range of Frequency Signal Spectrum can be transmitted through the RF System.

### **IMPEDANCE**

Impedance is defined by the ratio of wave voltage to wave currents at each pint along the transmission path. This ratio of voltage to current is constant for the superimposed waves (going and reflected signal); thus represents a characteristic of RF Component.

### **ATTENUATION**

Attenuation is one of main criteria of selecting any type of In-Building RF Material. Attenuation is the decrease in signal lever over a distance in the direction of propagation. Attenuation is expressed as a ratio(dB) over distance (in feet or meter). The higher frequency, the greater attenuation value. Every transmission system attenuated the signal when the various components are connected.

In addition to frequency, the main factors that influence attenuation are the cross section of the conductors and the dimensions and characteristics of the materials.

### **PASSIVE INTERMODULATION**

Passive Inter-modulation represents a further potential in the frequency range for transmission. It arises when two transmission signals form inter-modulation products as the result of component nonlinearities. In particular, the third order is critical because it lies in the transmission range and can interfere with transmission signals.

Passive Inter-modulation mainly depends on the characteristics of materials and the quality of contact between each connector.

Inter-modulation are measured by imputing two signals with defined frequencies into the transmission system. The degree of inter-modulation is expressed as a signal level in either dBm or dBc. The measurement is conducted using carrier signals at levels of +43dBm (20Watt) and a frequency based on the range of application. Typical measured values are <-140dBc.

### **CUT OFF FREQUENCY**

Cut off Frequency is defined as the highest radio frequency that will pass though any RF Component. Above this frequency there is a risk of undefined modes (waves) arising and exerting a negative influence (increased attenuation) on the transmission.

### **MAXIMUM OPERATION FREQUENCY**

The maximum operating frequency is normally based on the cut off frequency and includes a defined safety factor.

### **PEAK POWER RATING**

Peak Power rating is the input power achieved when operating RF Component with the maximum RF operating voltage (peak value). The peak power rating is a calculated value which is independent of the frequency

### **MEAN POWER RATING**

The values quoted for the maximum continuous power rating are based on an ambient temperature (normally 40<sup>0</sup>C) and a voltage standing wave ration of 1.0. The higher ambient temperature, the lower maximum permissible continuous power rating. Increasing the voltage standing wave ration has the same effect. The continuous power rating is also affected by other ambient condition like direct sunlight.

### **TEMPERATURE RANGE**

Temperature ranges are defined for RF Material in storage, during installation and operation. Manufacturers should define temperature ranges of continuous duty.

### RETURN LOSS & VSWR

Return Loss is defined as the ratio in decibel (dB) of the input signal power level to the signal power that is reflected from the irregularities along the path of cable system.

Irregularities along the path of cable and fluctuations of impedance can cause reflections of the transmitted wave. The outcome can be interfering signals over the complete frequency spectrum of the transmission system. Periodic deviations will cause immense interference at a specific frequency through accumulation. The fact that all manufacturing processes are subject to certain fluctuations; Reflections can also arise at all cable to connector junctions.

These reflections are also defined by VSWR (Voltage Standing Wave Ratio). VSWR is a measure of the ratio of maximum voltage to minimum voltage in the standing wave. The larger the impedance mismatch (fluctuations in impedance along the path of cable system) the larger amplitude of standing wave.

How well cable and connectors are matched in impedance have a major impact on VSWR performance. When impedance are improperly matched, reflections occur (increasing the amplitude of standing wave) resulting in signal loss / attenuation of transmission.

**The Effect of VSWR on Transmission Power**

VSWR	VSWR [dB]	Return Loss [dB]	Trans. Loss [dB]	Volt. Refl. Coeff.	Power Trans. [%]	Power Refl. [%]	VSWR	VSWR [dB]	Return Loss [dB]	Trans. Loss [dB]	Volt. Refl. Coeff.	Power Trans. [%]	Power Refl. [%]
1.00	.0	∞	.000	.00	100.0	.0	1.64	4.3	12.3	.263	.24	94.1	5.9
1.01	.1	46.1	.000	.00	100.0	.0	1.66	4.4	12.1	.276	.25	93.8	6.2
1.02	.2	40.1	.000	.01	100.0	.0	1.68	4.5	11.9	.289	.25	93.6	6.4
1.03	.3	36.6	.001	.01	100.0	.0	1.70	4.6	11.7	.302	.26	93.3	6.7
1.04	.3	34.2	.002	.02	100.0	.0	1.72	4.7	11.5	.315	.26	93.0	7.0
1.05	.4	32.3	.003	.02	99.9	.1	1.74	4.8	11.4	.329	.27	92.7	7.3
1.06	.5	30.7	.004	.03	99.9	.1	1.76	4.9	11.2	.342	.28	92.4	7.6
1.07	.6	29.4	.005	.03	99.9	.1	1.78	5.0	11.0	.356	.28	92.1	7.9
1.08	.7	28.3	.006	.04	99.9	.1	1.80	5.1	10.9	.370	.29	91.8	8.2
1.09	.7	27.3	.008	.04	99.8	.2	1.82	5.2	10.7	.384	.29	91.5	8.5
1.10	.8	26.4	.010	.05	99.8	.2	1.84	5.3	10.6	.398	.30	91.3	8.7
1.11	.9	25.7	.012	.05	99.7	.3	1.86	5.1	10.4	.412	.30	91.0	9.0
1.12	1.0	24.9	.014	.06	99.7	.3	1.88	5.5	10.3	.426	.31	90.7	9.3
1.13	1.1	24.3	.016	.06	99.6	.4	1.90	5.6	10.2	.440	.31	90.4	9.6
1.14	1.1	23.7	.019	.07	99.6	.4	1.92	5.7	10.0	.454	.32	90.1	9.9
1.15	1.2	23.1	.021	.07	99.5	.5	1.94	5.8	9.9	.468	.32	89.8	10.2
1.16	1.3	22.6	.024	.07	99.5	.5	1.96	5.8	9.8	.483	.32	89.5	10.5
1.17	1.4	22.1	.027	.08	99.4	.6	1.98	5.9	9.7	.497	.33	89.2	10.8
1.18	1.4	21.7	.030	.08	99.3	.7	2.00	6.0	9.5	.512	.33	88.9	11.1
1.19	1.5	21.2	.033	.09	99.2	.8	2.50	8.0	7.4	.681	.43	81.6	18.4
1.20	1.6	20.8	.036	.09	99.2	.8	3.00	9.5	6.0	1.249	.50	75.0	25.0
1.21	1.7	20.4	.039	.10	99.1	.9	3.50	10.9	5.1	1.603	.56	96.1	30.9
1.22	1.7	20.1	.043	.10	99.0	1.0	4.00	12.0	4.4	1.938	.60	94.0	36.0
1.23	1.8	19.7	.046	.10	98.9	1.1	4.50	13.1	3.9	2.255	.64	59.5	40.5
1.24	1.9	19.4	.050	.11	98.9	1.1	5.00	14.0	3.5	2.553	.67	55.6	44.4
1.25	1.9	19.1	.054	.11	98.8	1.2	5.50	14.8	3.2	2.834	.69	52.1	47.9
1.26	2.0	18.8	.058	.12	98.7	1.3	6.00	15.6	2.9	3.100	.71	49.0	51.0
1.27	2.1	18.5	.062	.12	98.6	1.4	6.50	16.3	2.7	3.351	.73	46.2	53.8
1.28	2.1	18.2	.066	.12	98.5	1.5	7.00	16.9	2.5	3.590	.75	43.7	56.2
1.29	2.2	17.9	.070	.13	98.4	1.6	7.50	17.5	2.3	3.817	.76	41.5	58.5
1.30	2.3	17.7	.075	.13	98.3	1.7	8.00	18.1	2.2	4.033	.78	39.5	60.5
1.32	2.4	17.2	.083	.14	98.1	1.9	8.50	18.6	2.1	4.240	.79	37.7	62.3
1.34	2.5	16.8	.093	.15	97.9	2.1	9.00	19.1	1.9	4.437	.80	36.0	64.0
1.36	2.7	16.3	.102	.15	97.7	2.3	9.50	19.6	1.8	4.626	.81	34.5	66.5
1.38	2.8	15.9	.112	.16	97.5	2.5	10.00	20.0	1.7	4.807	.82	33.1	68.9
1.40	2.9	15.6	.122	.17	97.2	2.8	11.00	20.8	1.6	5.149	.83	30.6	69.4
1.42	3.0	15.2	.133	.17	97.0	3.0	12.00	21.6	1.5	5.466	.85	28.4	71.6
1.44	3.2	14.9	.144	.18	96.7	3.3	13.00	22.3	1.3	5.762	.86	26.5	73.5
1.46	3.3	14.6	.155	.19	96.5	3.5	14.00	22.9	1.2	6.040	.87	24.9	75.1
1.48	3.4	14.3	.166	.19	96.3	3.7	15.00	23.5	1.2	6.301	.88	23.4	76.6
1.50	3.5	14.0	.177	.20	96.0	4.0	16.00	24.1	1.1	6.547	.88	22.1	77.9
1.52	3.6	13.7	.189	.21	95.7	4.3	17.00	24.6	1.0	6.780	.89	21.0	79.0
1.54	3.8	13.4	.201	.21	95.5	4.5	18.00	25.1	1.0	7.002	.89	19.9	80.1
1.56	3.9	13.2	.213	.22	95.2	4.8	19.00	25.6	.9	7.212	.90	19.0	81.0
1.58	4.0	13.0	.225	.22	94.9	5.1	20.00	26.0	.9	7.413	.90	18.1	81.9
1.60	4.1	12.7	.238	.23	94.7	5.3	25.00	28.0	.7	8.299	.92	14.8	85.2
1.62	4.2	12.5	.250	.24	94.4	5.6	30.00	29.5	.6	9.035	.94	12.5	87.5