Measurement of an RF Filter with the help of RFME Signal Source and Power Detector:

This application note describes the usage of RFME Signal Source and Power Detector to test RF Filters of various frequency bands. By using these testing setups the designers and manufacturers can measure the performance of the components and circuits used in various systems. This Application note also includes transmission of a known signal with RFME Signal Source and measuring of an amplitude level with RFME Power Detector.

RF Filters are electronic filters designed to operate on signals in MHz and GHz frequency ranges. Most RF and microwave devices will include some kind of filtering on the signals transmitted or received which includes broadcast radio, television and wireless communication (cellphones, Wi-Fi, etc.).

There are four general filter functions which are:
1) Low-pass filter: It passes the signals with a frequency lower than a selected cutoff frequency and attenuates signals with frequencies higher than the cutoff frequency. Frequency response of the filter depends on the filter design.
2) High-pass filter: It passes the signals with a frequency higher than a cutoff frequency and attenuates signals with frequencies lower than the cutoff frequency. The amount of attenuation for each frequency depends on the filter design.
3) Band-pass filter: It passes frequencies within a certain range and attenuates frequency outside that range.
4) Band-reject filter: This filter passes most of the frequencies but attenuates those in a specific range to very low levels. Band-pass filter is opposite of this filter. Another type of band-reject filter is the notch filter which has a narrow stopband (high Q factor).

RF filters are made up of coupled resonators thus any technology that can be used to make resonators can also be used to make filters. Various filter technologies are lumped element LC filters, planar filters, coaxial filters, cavity filters, microstrip filters, dielectric filters and waveguide filters.

In order to do the measurement of any component the user needs to take the direct reading with the help of two 50 Ohms coaxial cables and an adaptor in between. Following are the setups for better understanding of the measurement of RF filters.

For eg. Take the RFME Signal Source, set its frequency to 2.45GHz and signal level is -1dBm which is given as an input to the RFME Power Detector with the help of the coaxial cable as shown in the Figure: 1. The user can easily measure the received signal at RFME Power Detector of -1.1dBm if there is a loss of -0.1dB in the coaxial cable connected in between both the units.
The below setup shows selection of Single mode with the switch position at 'S" on RFME Signal Source and in the RFME Power Detector the switch is selected for dBm. Thus on RFME Signal Source it will be displayed as "2.450" for 2.45GHz and on RFME Power Detector results will be displayed in dBm as "-01.1" for -1.1 dBm.

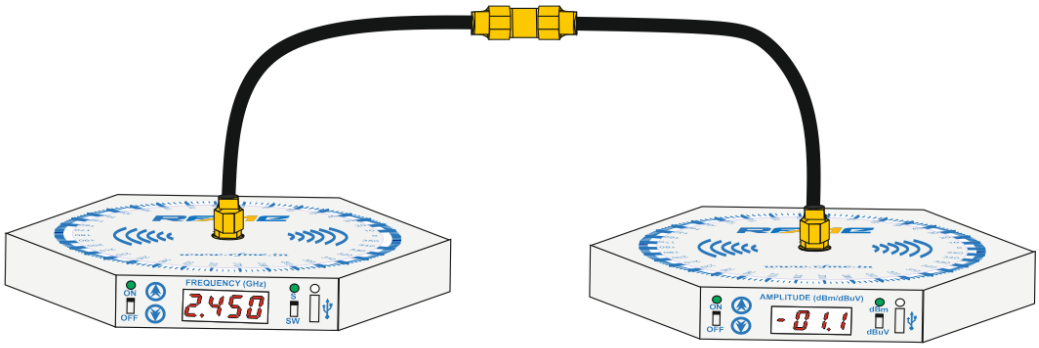

Figure: 1

In Figure: 2 A setup for testing of RF Filter as a device under test (DUT) can be observed. With the same frequency of 2.45 GHz. It can be observed that the result on RFME Power Detector with the dBm selection is "-02.1" that means a loss of 1dB is there in the RF filter at 2.45GHz. *1

Now if any other frequency which comes under the band of RFME Signal Source and RF Filter is to be tested than it can be easily done by following the same procedures. *2

Note: *1) 1.1 dB loss in the direct reading is measured.
*2) RF Filter can be checked in single mode only.

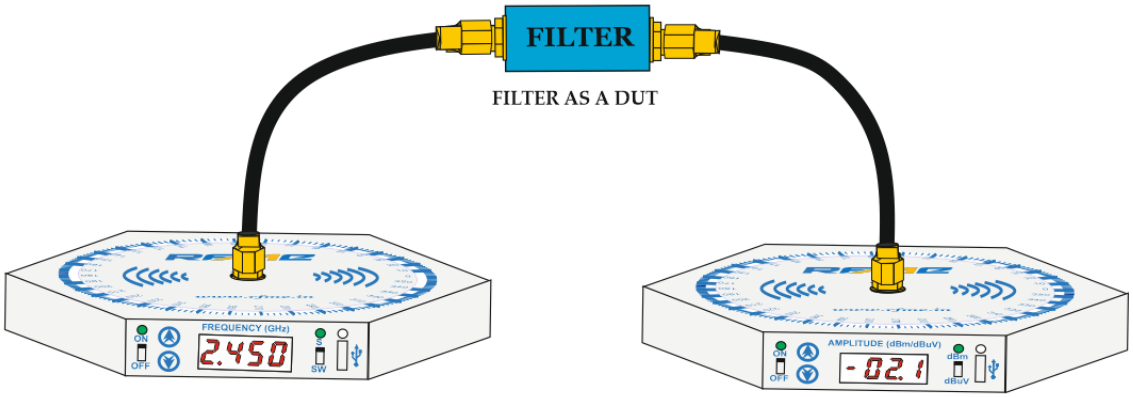

Figure: 2

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