2400 MHz Wilkinson power splitter/combiner

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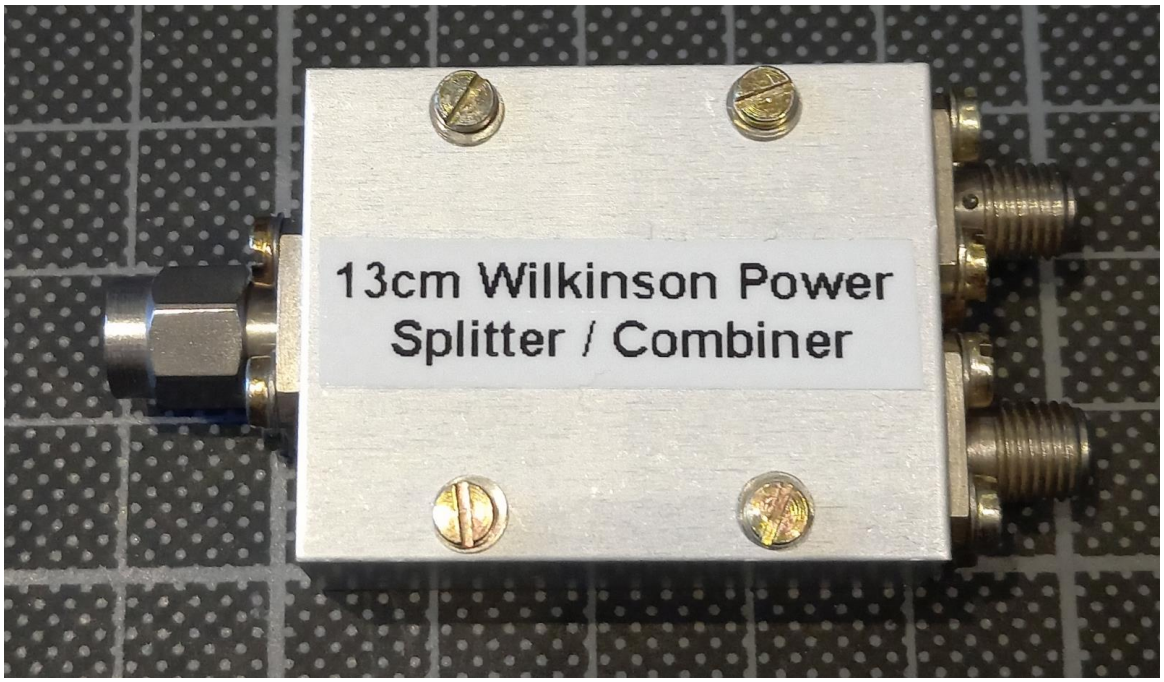
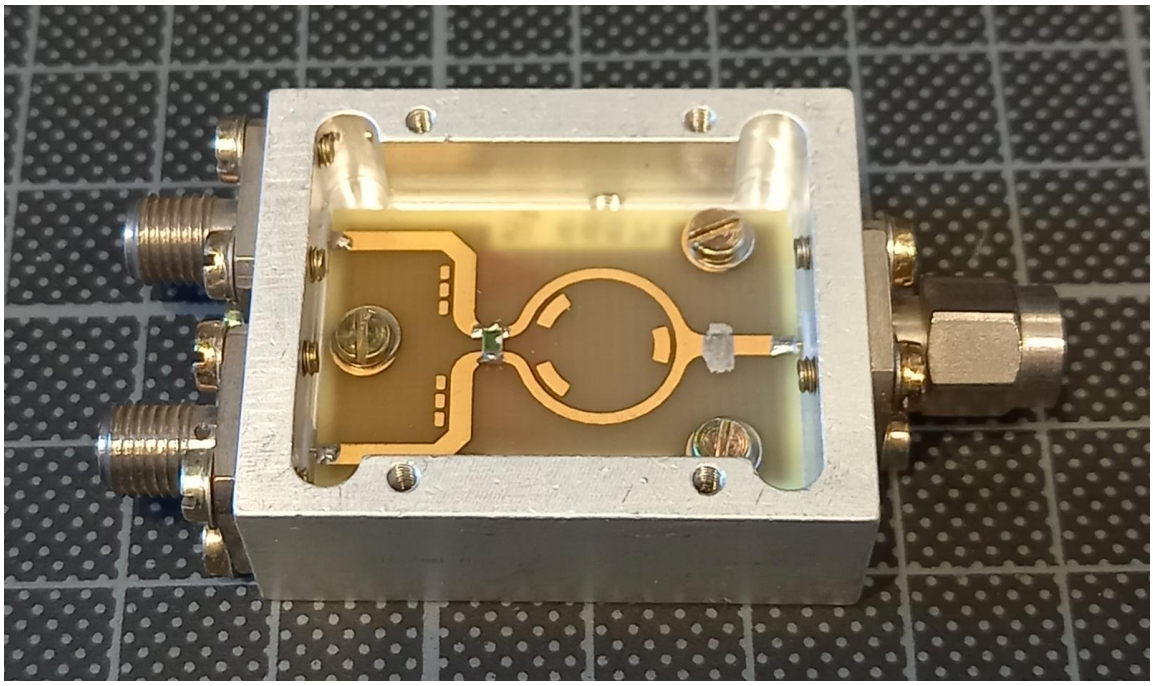
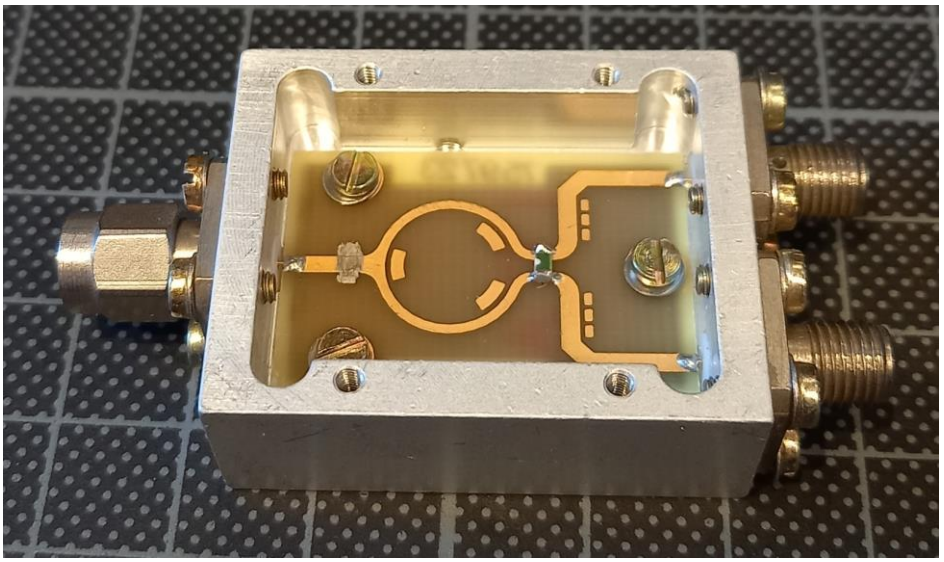
Recently I got some power splitters/combiners and as we did not find data it was time to characterize them.

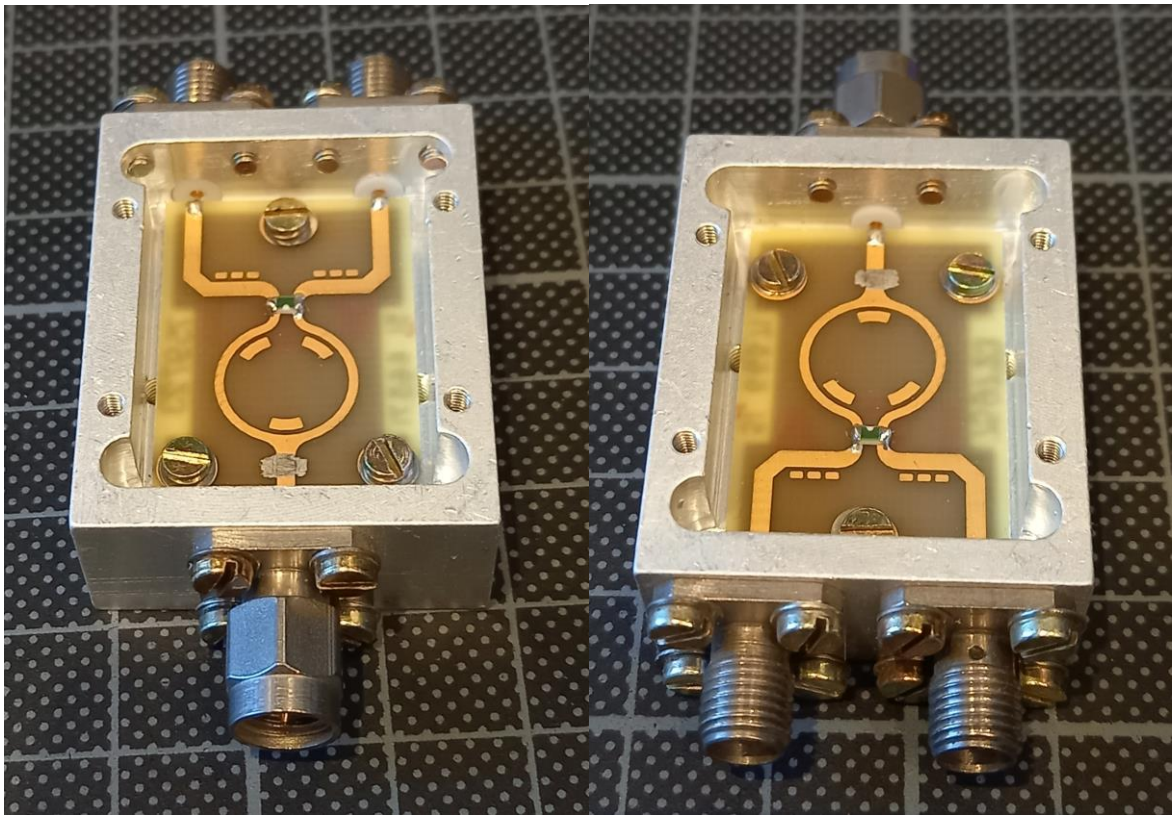
They are in a nice milled aluminium encasing with a male SMA connector at the common port and a female SMA connector at each of the split ports.

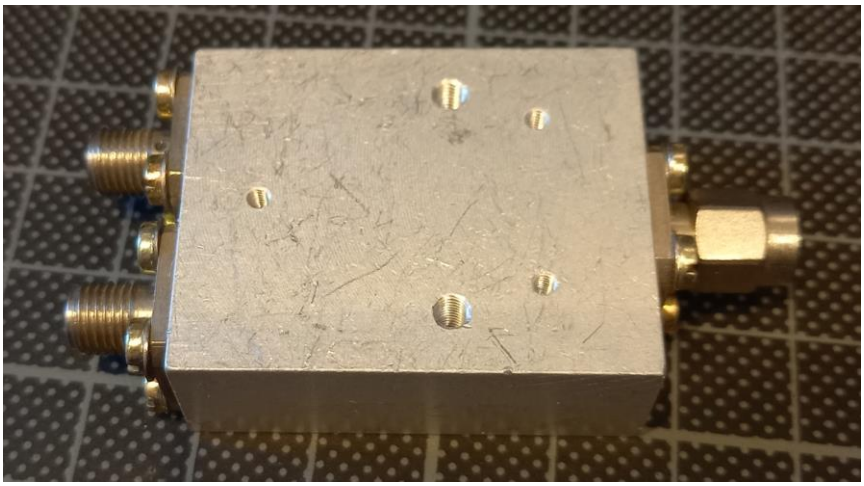


A view inside shows a classical Wilkinson type architecture.

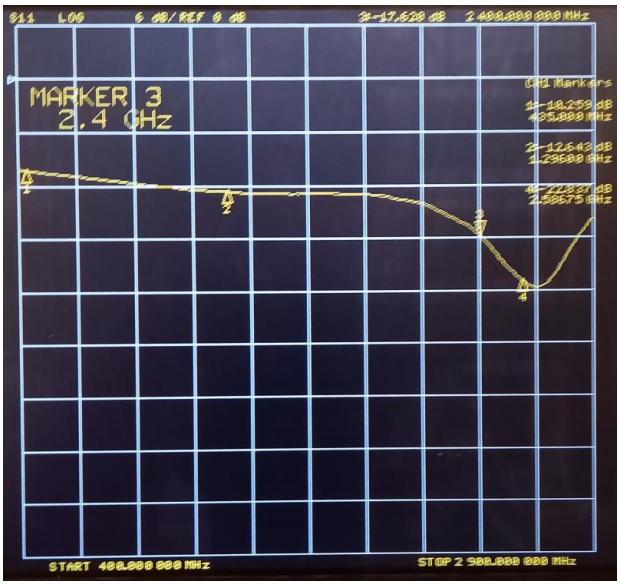


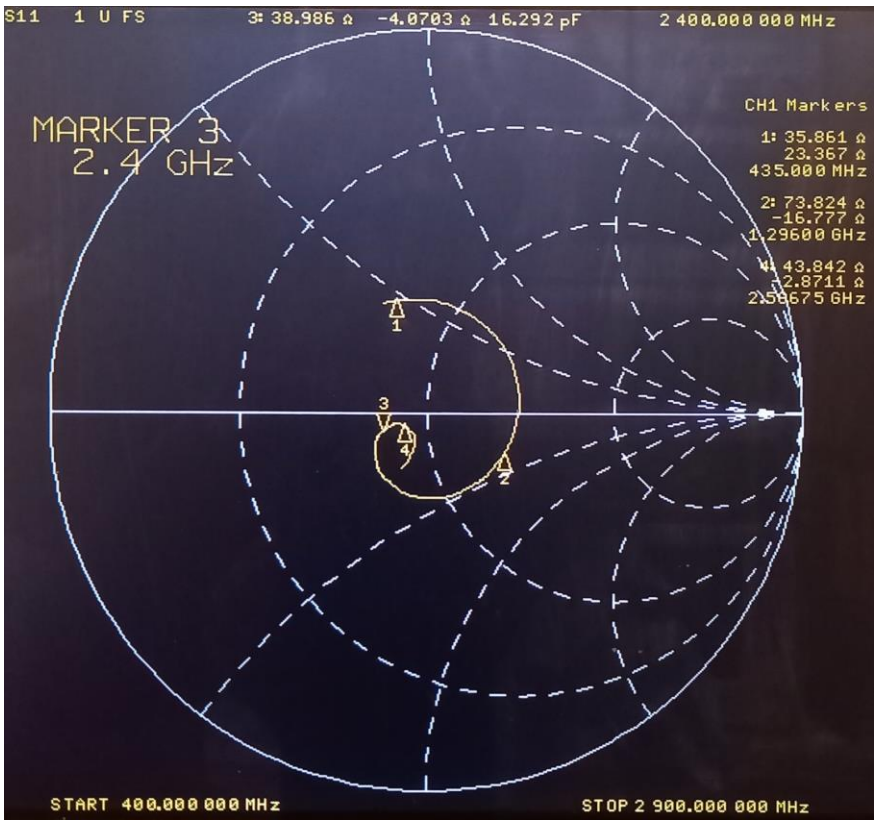




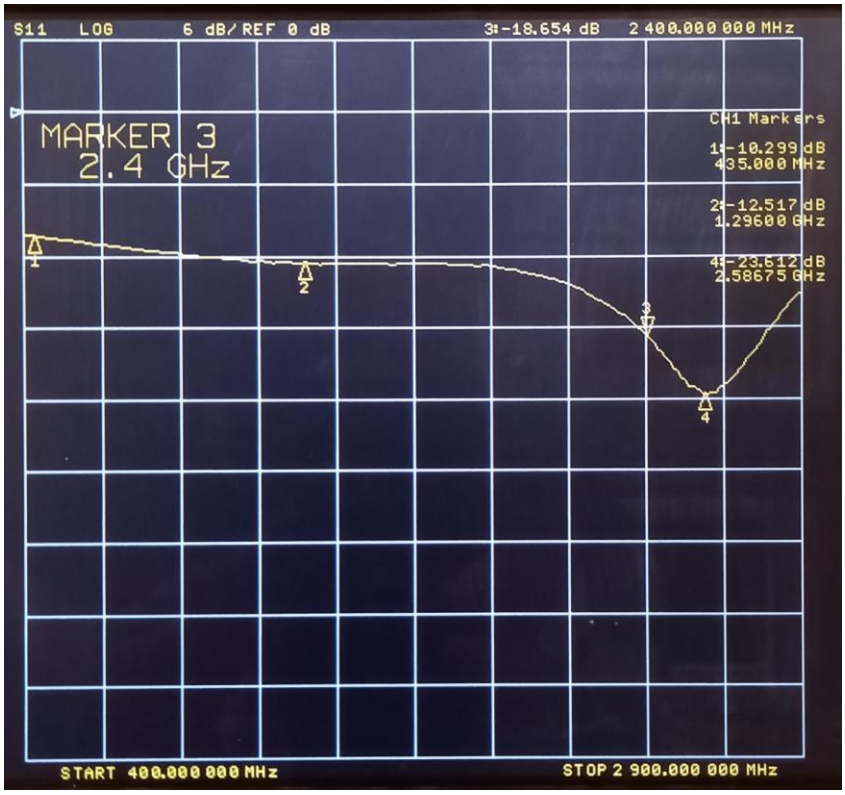


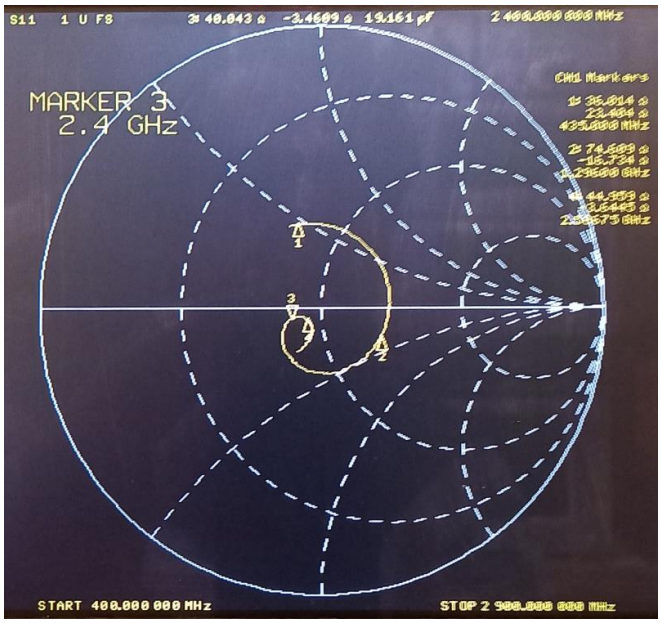
A) The first measurement was checking the input impedance at the common port with both split ports terminated with 50Ohm. The input return loss S11 is 17.6dB @2.4GHz respectively 22.8dB @2.59GHz.



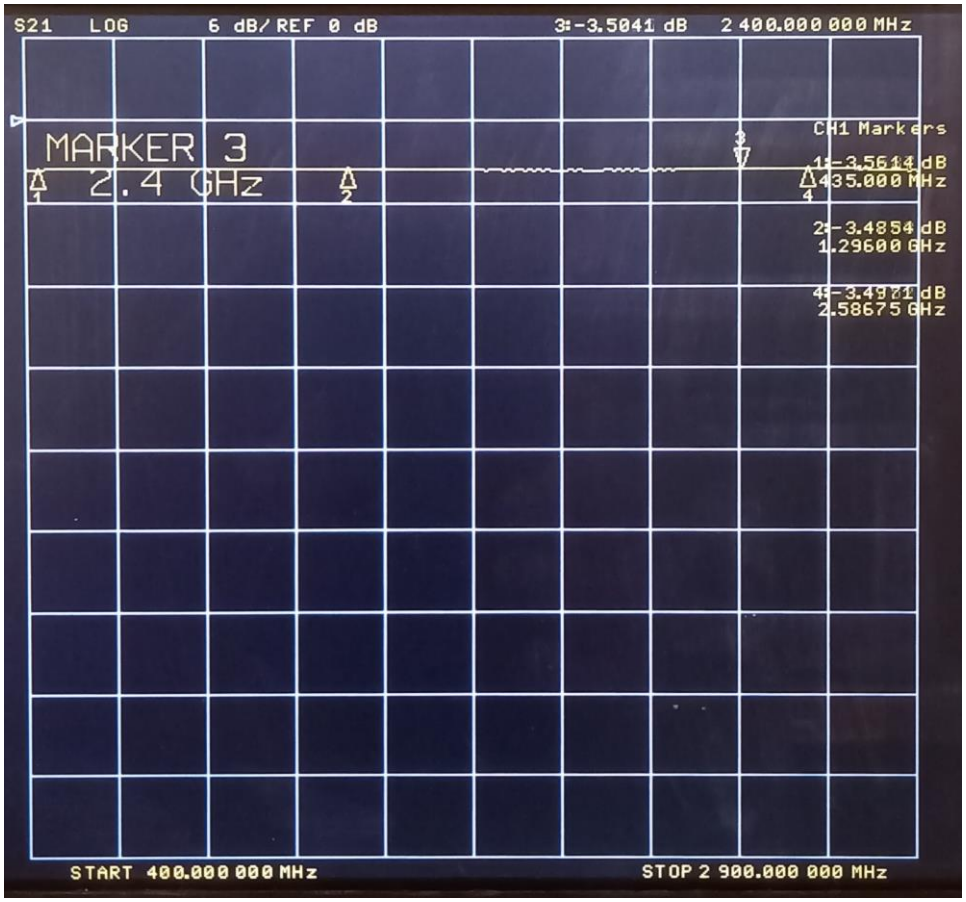


B) In the next measurement one of the split ports was terminated with 50Ohm and the common port was used as input respectively the other split port as output port. The input return loss S11 is 18.7dB @2.4GHz.

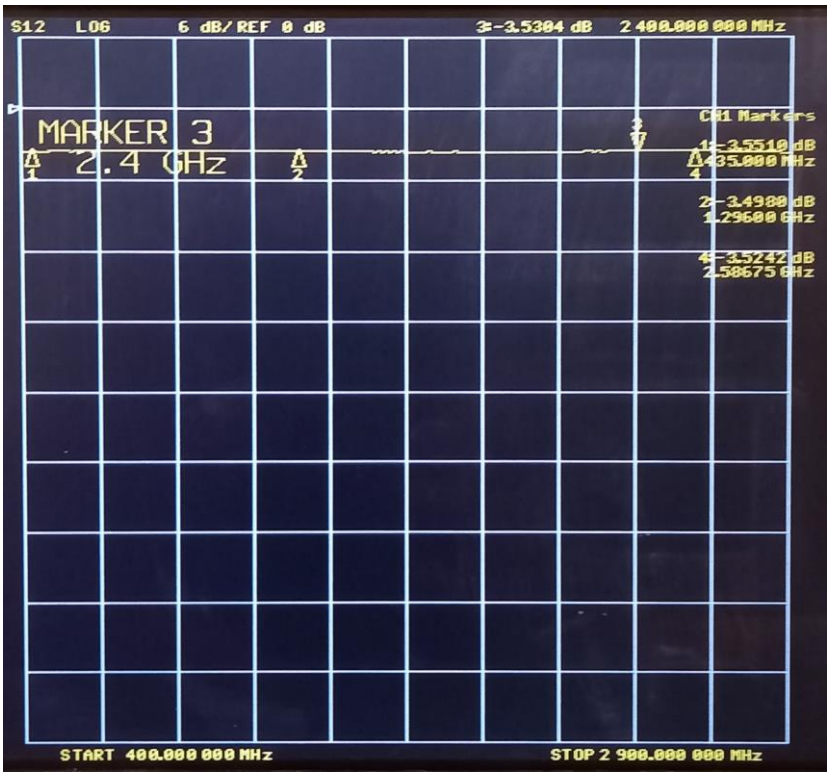




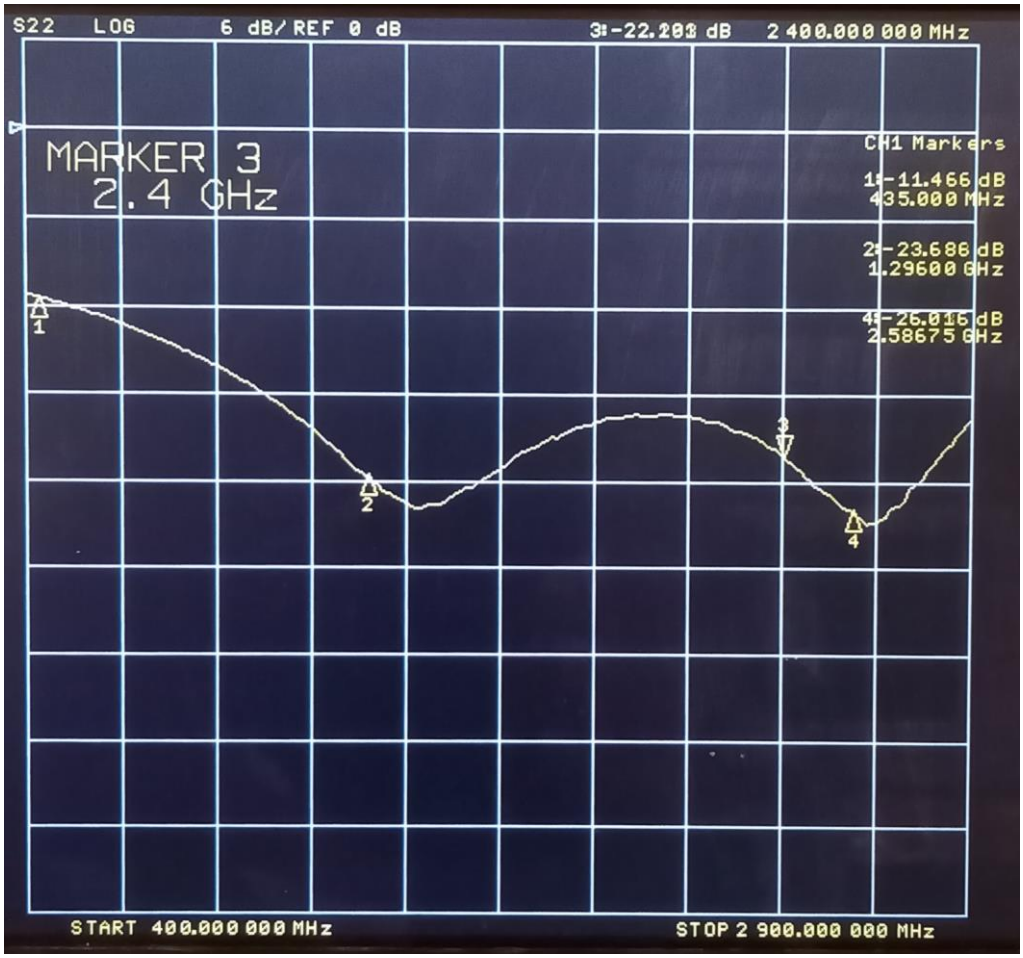
The transmission loss S21 is 3.50dB @2.4GHz, subtracting 3dB which are caused by splitting the signal equally to the 2 split ports the residual insertion loss is 0.5dB.

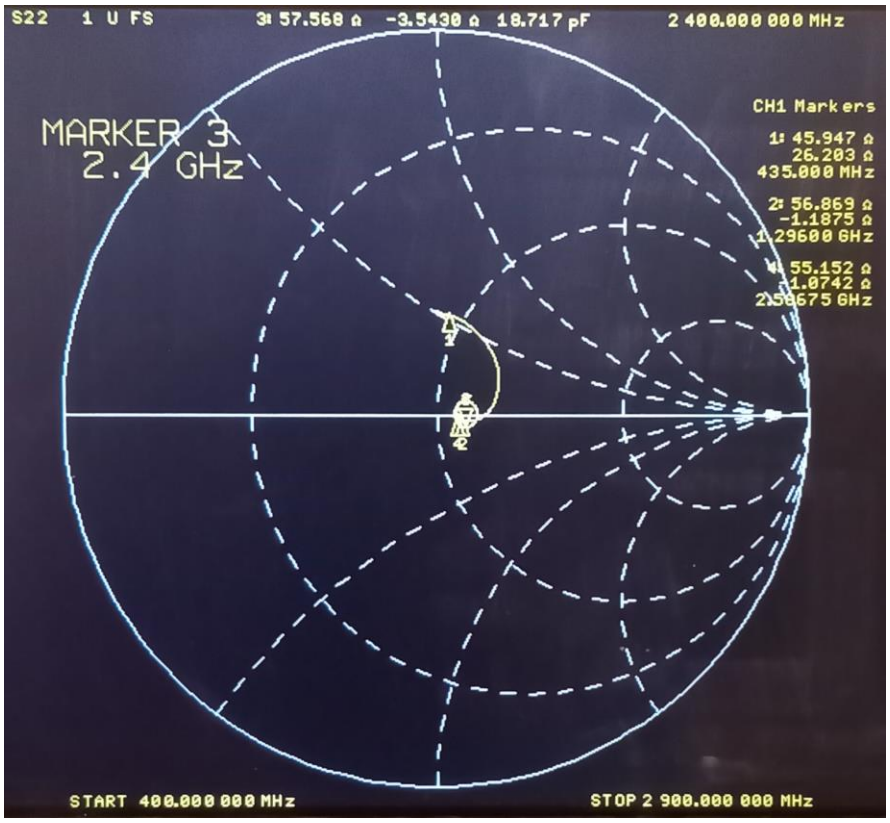


In the reverse direction S12 is almost identical with 3.53dB @2.4GHz respectively an insertion loss of 0.53dB.

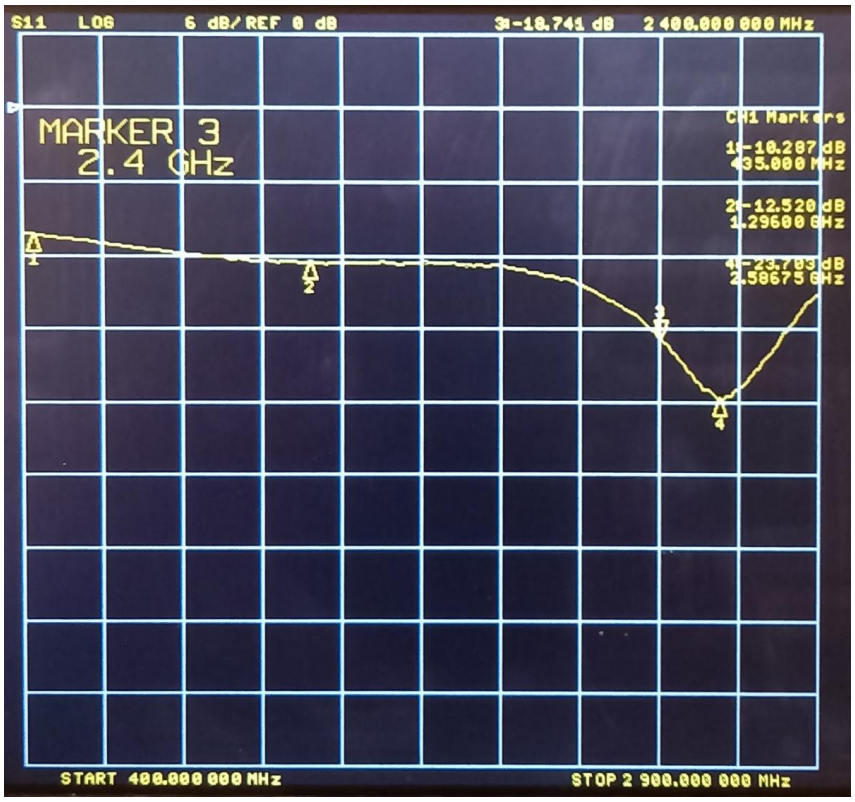


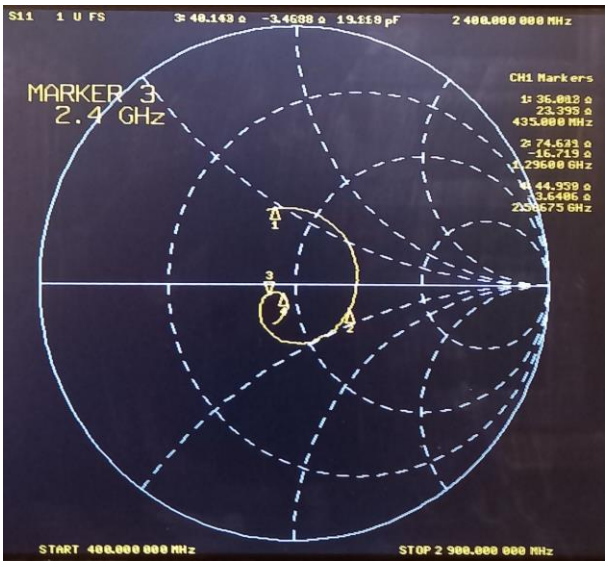
Next, I measured the return loss S22 at the split port output. The return loss is 22.2dB @2.4GHz.



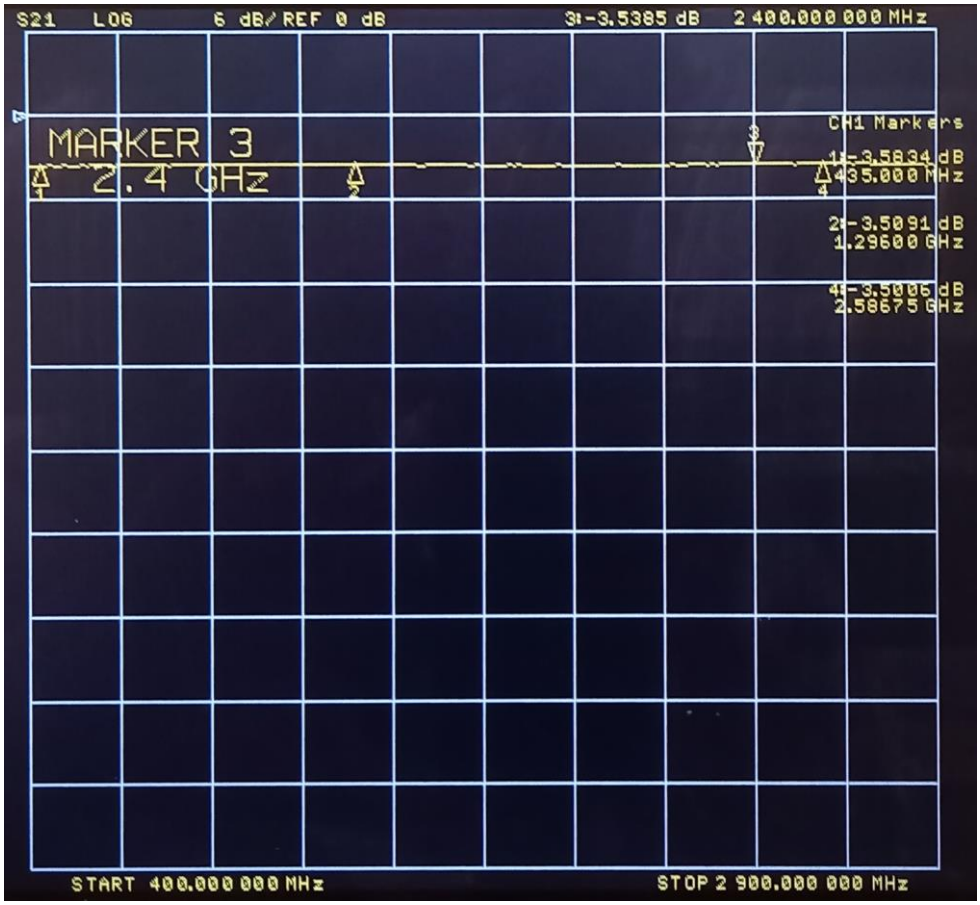


C) Then I repeated the previous measurement after exchanging the 2 split ports. The other split port was terminated with 50Ohm and the common port was used as input respectively the other split port as output port. The input return loss S11 is the same as in the previous measurement: 18.7dB @2.4GHz.

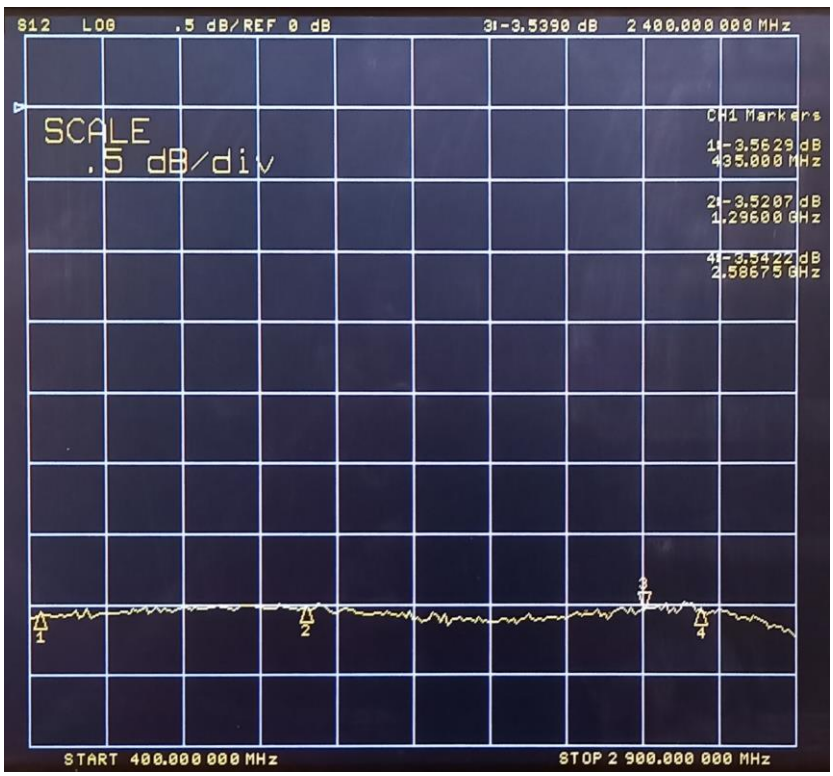




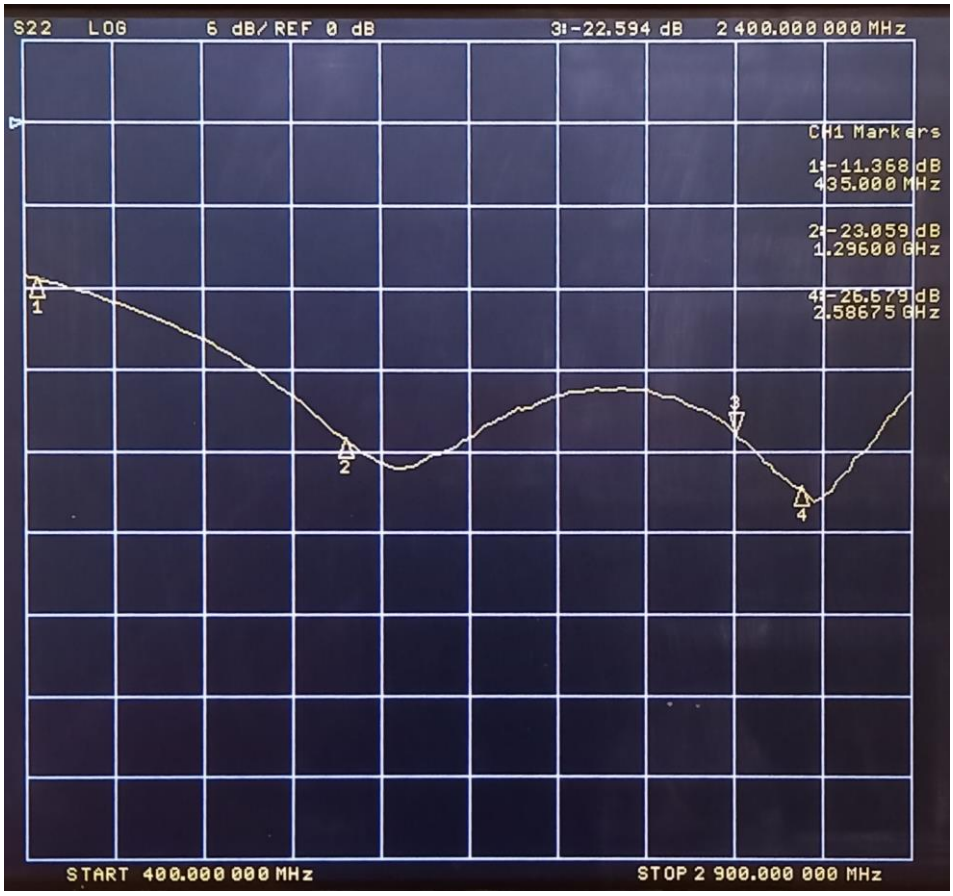
The transmission loss S21 is 3.54dB @2.4GHz, subtracting 3dB which are caused by splitting the signal equally to the 2 split ports the residual insertion loss is 0.54dB.

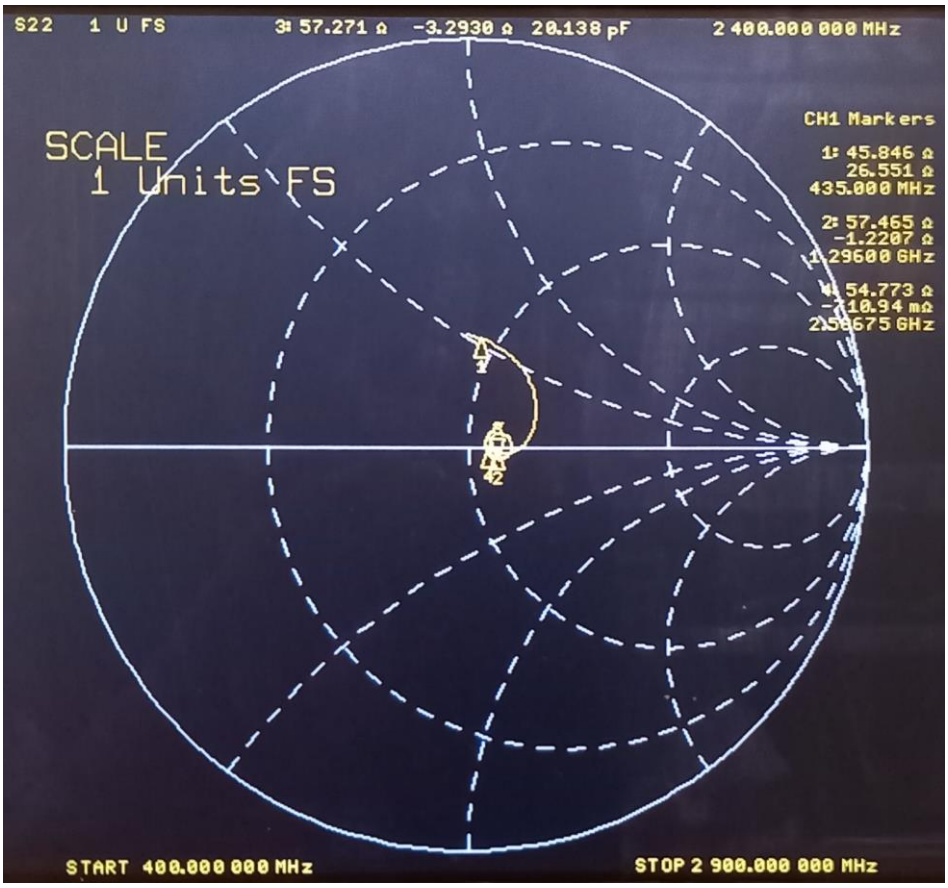


In the reverse direction S12 is identical with 3.54dB @2.4GHz respectively an insertion loss of 0.54dB.

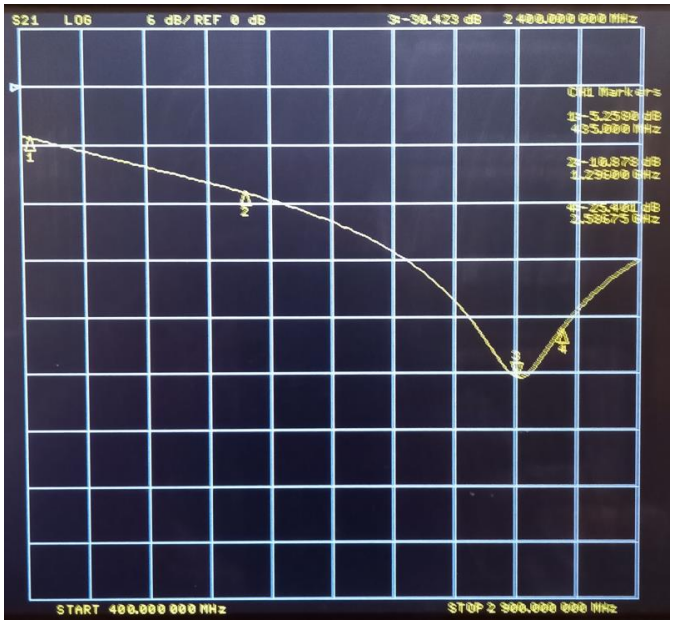


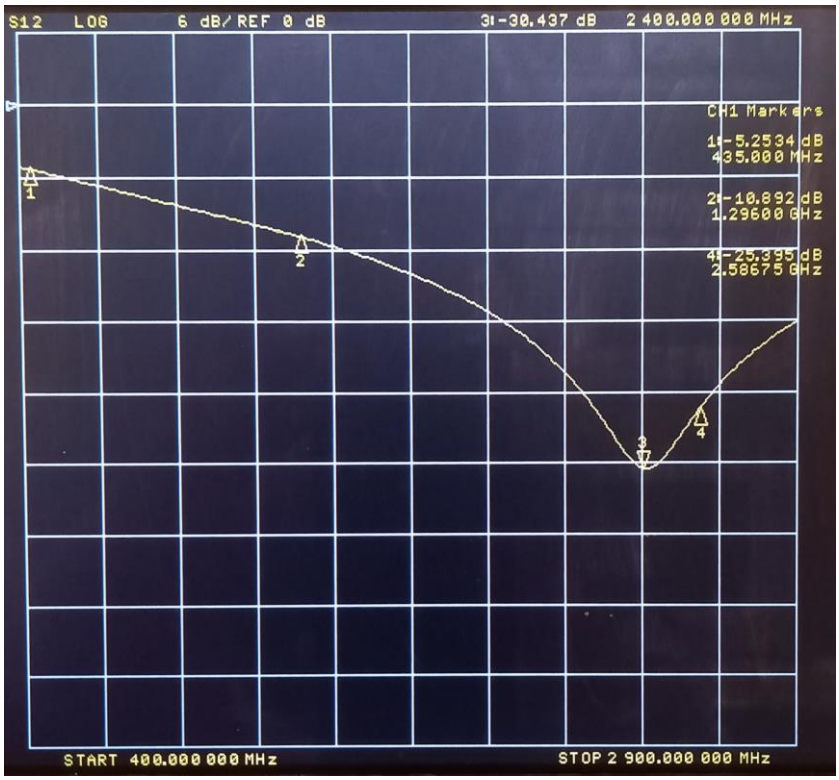
I measured the return loss S22 at the split port output. The return loss is 22.6dB @2.4GHz.





D) Finally, I measured the isolation between the 2 split output ports. During this measurement the common port was terminated with 50Ohm. Both, S21 and S12 show excellent values of 30.4dB.





This is the summary of the key parameters of the Wilkinson power splitter/combiner all measured at 2400 MHz:

Avg. insertion loss	0.52dB (in addition to 3 dB because of splitting the signal)
Amplitude imbalance	0.04dB
Isolation	30.4dB
Return loss com port	18.7dB (VSWR 1.3)
Return loss split ports	22.2dB (VSWR 1.17)

This is an excellent power splitter / combiner for the 13cm ham radio band. Based on the very high isolation between the split ports it is for example very well suited to combine multiple transmit output ports of SDRs and then use a joint power amplifier.

If you have questions or comments, please send them to the Email address given below.

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