olks,

I've been following this very interesting thread and have just tested a capacitive divider using a 5.6 pF cap with a 2700 pF cap to gnd. The junction goes through a 100R resistor to the PS input on my modified (older PA board) 100D. Works just as well and is as flat from 160 to10M as my torroidal current transformer pickup, the forward output from a home brew directional coupler. PS auto attenuate is the same within 1 dB for the same power from 160 to 10M. I'm running a homebrew 8877 amp in the PS loop.

One thing I was looking for was perhaps an improvement in IMD with PS since all magnetic coupling devices have some degree of non linear response. This would theoretically add inaccurate feedback to PS. This is why a good magnetic design stays far away from core saturation which can occur on 160M with some commercial directional coupler designs!

I didn't see any difference with either coupler and suspect that the internal coupling that still exists in my 100D might be covering up any improvement. I currently get -56dB 3rd order IMD consistently. It would be interesting to have someone with a 7000 or 8000 try the same thing since I've heard the internal coupling has been significantly reduced. I'm ready to go for a 7000 myself but not until next year.

Comments?

Chuck K1KW

Mike

How much of a circuit diagram is needed to show two capacitors in series with the input across both and the output between the centre connection and ground?

The capacitive tap I have described and measured today sits across the output of my RF2K+ LPF. As has been pointed out the capacitance at the output of the LPF and hence across the two series capacitors varies by band but this is not important. What is important is the RMS voltage at this controlled impedance point is the same for 1000W at 1.8MHz as it is for 1000W at 52MHz. Extra capacitance added by the load will affect divider ratio but do so equally across a broad range of frequencies, so long as the extra capacitance is free from added inductance. If this capacitance is significant it should be accounted for in calculating Xc ratios.

1000W in a 50R circuit produces 223.6V.
1000W is 60dBm
A 0dBm tap requires 223.6/1000V output therefore Xc_C1 needs be 1000 x Xc_C2 where C2 provides the sample output. If C1 is 10pF then C2 would be 10,000pF
A 10dBm tap requires 223.6/316.2V output and appropriate ratio C1 to C2. If C1 were 10pF then C2 would be 3162pF. Not a preferred value but 3300pF would be close enough.

Remember that the key to success is the avoidance of stray inductive reactance.

73 Bob, 5B4AGN

Scott

The implementation which I measured yesterday sits on the LPF PCB in my RF2K+ so a photograph of this will be of little use to you.

Use of 1kV rated capacitors makes sense. ESR is not much of an issue in this application as there is no meaningful current involved so disipation is not a concern and ESR will anyway be small compared to Xc. Aside from ratio based calculation there are other factors to keep in mind.

1. The combined capacitance of C1/C2 in series should not be significant when compared to the optimised capacitance at the output of your LPF.

2. The value of Xc C2 should swamp Xc load.

Fortunately these objectives are easy to meet.

I would perhaps not choose the values in your example as their combined value may be significant at 6m. If we look at the 60dB example I would perhaps choose 2.2pF and 2200pF. The combined capacitance of the series combination at <2.2pF should be small enough not to influence LPF tuning even at 6m while 2200pF at C2 should hopefully swamp Xc load. If it doesn't either account for the value of Xc load in your calculation or if you can do so without detuning the output filtering on the highest band increase the value of both caps while maintaining their value ratio.

It makes sense to use NP0 or C0G rated dielectric in the interests of temperature stability. A quick look at Mouser suggests the following devices to be suitable but there are plenty of others.

2200pF Mouser 77-VJ1812A222KXGAT

2.2pF Mouser 77-VJ1111D2R2BLGQJ

As already mentioned stray inductance effects are to be avoided as much as possible. Small SMT ceramics will themselves not be the source of problems in this area but wiring may be. Were I to build such a tap enclosed in its own box I would choose a box just big enough to mount 2 x SO239 and one BNC. I would mount the two SO239 connectors as close together as possible preferably on opposing sides of a very small metal case. The centre conductors of the two connectors would be linked together directly. I would use a small piece of PCB on which I would mount the caps. The sliver of PCB at the free end of C1 would be soldered directly to the centre pin of one of the SO239 connectors while the sliver at the earthy end of C2 would be soldered directly to a suitably located ground tag. The divider would hence be free of connecting wires. A small piece of light coax maybe RG174 could be used to connect between the divider (across C2) and the BNC sample connector which maybe mounted in any convenient position on the metal box. A similar approach might be used if locating such a divider inside existing equipment.

73 Bob, 5B4AGN

Yes, all well and good, Bob. I could go out and buy some low ESR, SMT, 1KV cap's, say a 5000pF and a 50pF, and get approx. a 40dB coupling factor, which I would pad down further with a handy rotary attenuator so I could fine tune it. BUT...one example is worth a thousand analyses. A photo and some representative part numbers are worth having, just to know that one is not putting something together that has too much ESR, or too low of a voltage, or too much inductance, etc.

73,

Scott