HIGH-POWER BALUN TEST LAB
(for under $10)

Use only in a controlled environment. Dangerous RF voltages and radiation need to be respected. RF burns are very painful and slow to heal !

There are a dozen manufacturers of baluns, ununs and isolators and most of them have high-power ratings. Some of the ratings are in the 5 KW to 10 KW range which is very impressive but remember that the rating is for operation into the design load or simply stated, a 1:1 SWR. Some of us are home-brew addicts and there are sources of balun kits, cores, wire and supplies.

Few of us have any means to test and compare these baluns except under use with an antenna. That means putting a powerful signal on the air sometimes and we may not know what impedance the antenna really may be. This is particularly true of antennas operating on multiple bands and non-resonant ones.

It would be nice to have the resources to investigate the following but not spend a fortune on equipment that is rarely used.

1. How to test a balun into the design load impedance of 200 Ohms (1:4 balun) Very common!
2. How to test a balun at 1KW into 200 Ohms (1:4)
3. How to test a balun at 1KW into 100 Ohm mis-match (1:4)
4. How to compare Guanella vs Ruthroff baluns (current vs voltage)
5. What about step down baluns ? (4:1) (12 Ohm balanced load)
6. Is the longitudinal balance good ?
7. Which type of balun winding can handle mismatched loads best?

Most of us have a good 50 Ohm dummy load that will handle all the RF that we can generate. Sometimes I wonder if anyone uses them when we hear all those tune-up heterodynes on any hamband. Our 50 Ohm load is also unbalanced and for coax cable only. Does anyone actually have a genuine balanced load at any impedance ?

When my first transmitter project in the 60s wrecked the budget and I had no dummy load to test it, my Elmer suggested a 100W light-bulb placed in a coffee can for shielding. It worked great because the pi-nets used with tube transmitters would match this load with no problem. Anyone who does much work with baluns will also have a matching network (antenna tuner) which does a much better job than the limited pi-net did. Most of these are "Tee" network matching boxes with 2 variable capacitors and a variable or switched inductor but the output is unbalanced unless you use the internal balun, usually a 1:4, to provide a balanced output. Most of these boxes also have forward and reverse power indicators and will provide the heart of my testing lab along with a budget dummy load. While this matching box is not absolutely essential for testing baluns it does provide more control and instrumentation. Modern solid-state transceivers do not like reactive loads but those with built in tuners will be adequate for testing levels to 100 Watts. The pi-net output of tube type power amps will handle a pretty reactive load but solid-state power amps will need a tuner.

My balanced load consists of 4 plastic lamp recepticles because I couldn't find the old porcelean ones anymore. Just screw in a matched set of 4 X 100W light-bulbs. The only matching I've actually done is to use 4 from the same manufacturer. These can be jumpered in different series and parallel combinations to provide from 12.5 Ohms to 200 Ohms for a load. These are ball-park impedances and vary widely but don't seem to be very reactive up to 30 MHz. My primary interest is for the lower bands where things do seem to behave well. Notice the large green LED connected from the midpoint to ground which is the

coax shield of the input to the balun. This LED will give some indication of balance as indicated in the picture with one bulb shorted.

It's necessary to "sneak up" on the correct tuning because the impedance of a lamp varies drastically as the filament heats. Once it achieves a glow the change is less dramatic. DO NOT push the limits of power and burn out a bulb because final tube(s) for linear amplifiers are $$$ EXPENSIVE $$$! Ordinary bulbs may form hot-spots on the filaments and fail even below rated brilliance. Hot-spots are much more likely to occur at higher frequencies and I've never experienced this problem.

This test lab with 4 X 100 Watt bulbs was intended to test 1:4 (50 to 200 Ohm) baluns at a 400W power level for extended periods of time. It does that quite well and it also provides some variation to see how different baluns handle mis-matched loads. I've used it with 4 X 40 W bulbs and 4 X 200 W bulbs also and they provide different impedance and power levels which is an extension of it's usefulness.

It was interesting to note that with 4 fully illuminated 100W bulbs the Ameritron ATR-30 meter only indicated 300 Watts.

This project does provide a means of testing and comparing baluns with high power levels and mismatched load conditions with readily available and cheap components. It also warms hot-dogs and provides a decent reading light.

73s ---- feedback is appreciated…. de Ken, KØKS

4 X 100 W Bulbs for a 200 Ohm RF Load

The Green LED Shows Unbalanced Load Condition with one bulb shorted