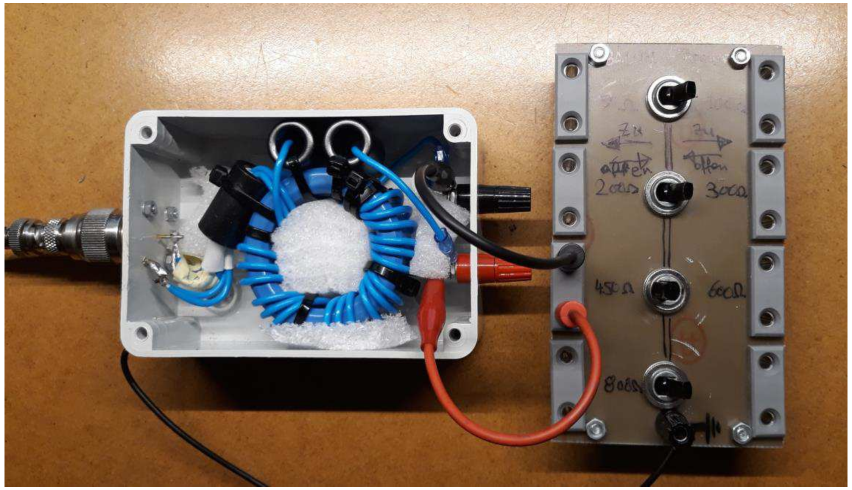
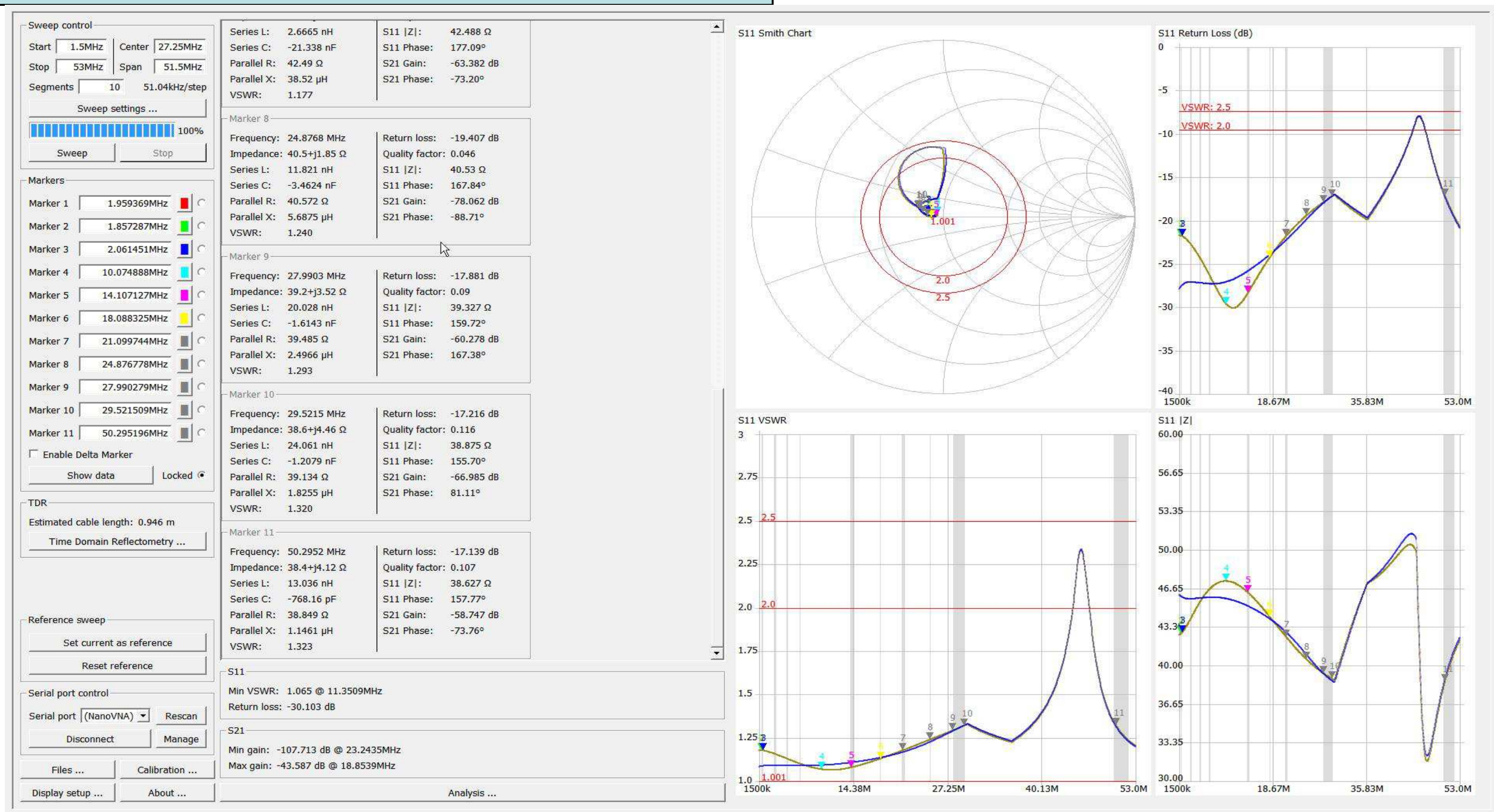
1:9 Balun

nach IZ0UPS

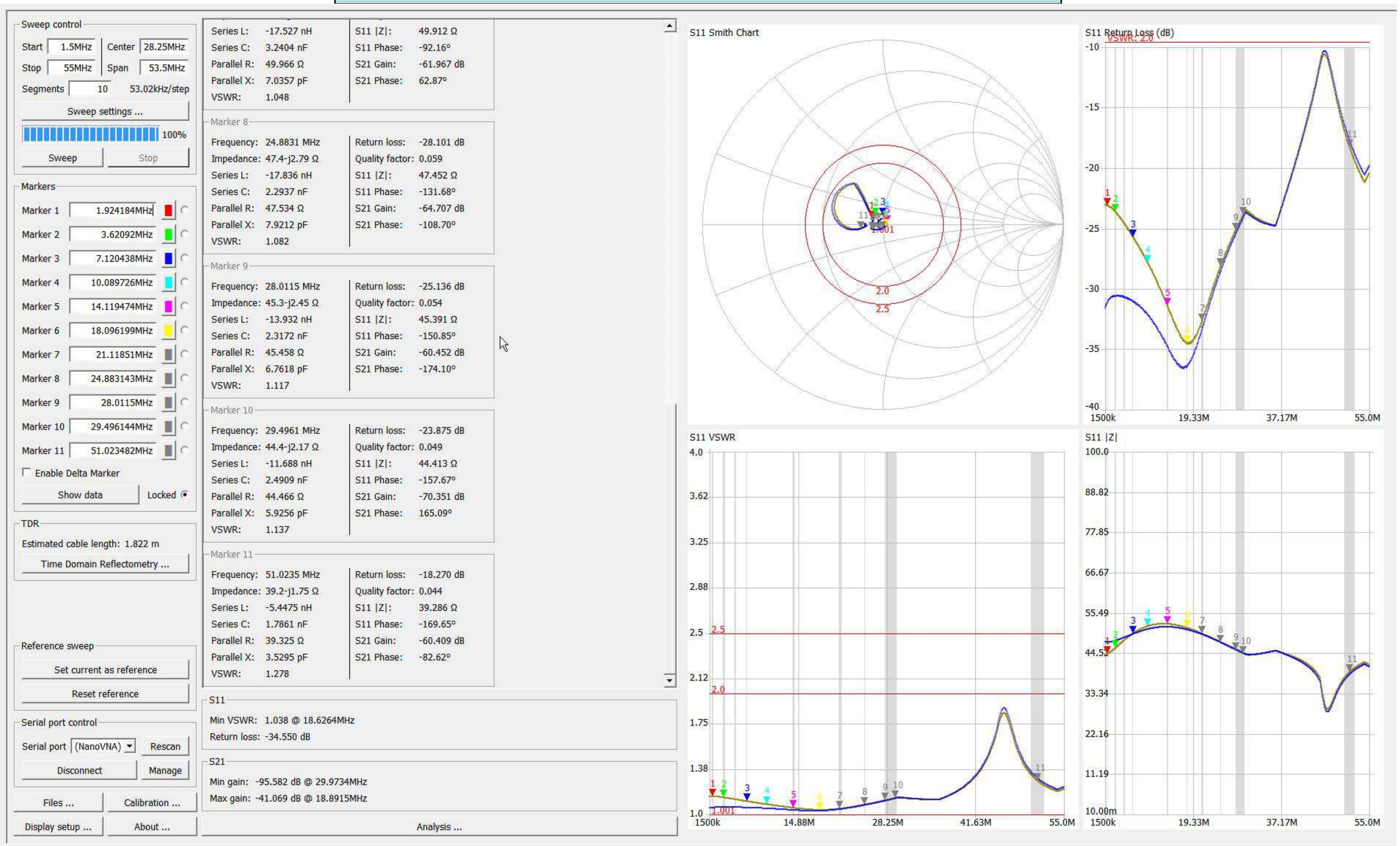
Auch hier wurde versucht, das beste Resultat zu erreichen. Verbesserungen sind immer möglich, aber wie? Höhere Bänder haben ein RL von -17dB. Ab 18MHz und tiefer über -20dB. Schalter bei blau offen, braun zu.





1:9 Balun nach IZ0UPS

Messung nach DL4ZAO, blau offen, braun zu



1:9 Balun

VK5ZVS

Projects 'n' Stuff

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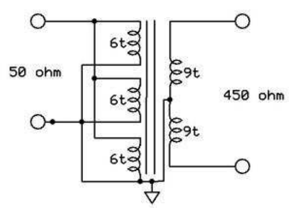
9 to 1 balun.

The completed balun core - wired.

This balun was made with single ferrite core, (Jaycar L01234) wired using single strand Cat 5 UTP wire. The winding ratio is 6 turns to 18 turns. 50 ohm primary is 3 x 6 turns, wired in parallel. The 450 ohm secondary is formed by winding 2 x 9 turns in series, (grounding the centre tap) giving 18 turns overall. This gives a truely balanced to unbalanced impedance transformer. The picture here shows the balun core ready for testing. The two single wires are the 450 ohm secondary. The others are the 50 ohm primary with the larger one being the common ground.

The schematic

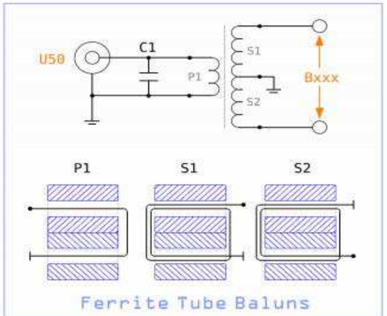


www.korpi.biz/oh1ayr.html

Korpi	Ferrite Tube Baluns		
	For HF 1 to 30 MHz		
	CC-BY OH1AYR	Rev 2.0	Date 29.03.2015

Ferrite Tube Baluns

Here is a short story of magnetic baluns, which we winded using parallel ferrite tubes. These baluns are typically used as impedance transformers with symmetrical, high-impedance HF transmitting antennas, like terminated V-beams, Rhombic's and T2FD's. If you are using some unequally loaded antenna, you may want to use Guanella-type current balun.



This construction is a **magnetic balun** (RF voltage transformer) with two secondary coils **S1** and **S2**, grounded at the center point. Unbalanced primary coil **P1** impedance is 50 Ω. The balanced secondary impedance depends on the turns of secondary coils. Primary turns must be full turns, in this case 1 to 3 turns. Secondary coils must be symmetrical. Secondary turns may be 2 x 1 to 2 x 6 turns, also half turns. While using half turns, you may start winding by grounding the start points at the primary side, so you get the high impedance output wires far from the primary side. With 1:1 and 1:4 baluns we get better results using Guanella-type.

Capacitor **C1** is used to compensate the winding capacitance and smooth the SWR curve. Capacitor values (E12) from 10 pF to 100 pF were selected with 100 pF variable capacitor. The final capacitor was disk ceramic, voltage rating 3 kV and up. Some experimental values follows in examples.

Next table shows turns for some practical impedance ratios:

Ratio	Impedance	P1	S1	S2
1:4	50 Ω to 200 Ω	1	1	1
1:4	50 Ω to 200 Ω	2	2	2
1:9	50 Ω to 450 Ω	1	1½	1½
1:9	50 Ω to 450 Ω	2	3	3
1:12	50 Ω to 612 Ω	2	3½	3½
1:16	50 Ω to 800 Ω	1	2	2
1:16	50 Ω to 800 Ω	2	4	4
1:16	50 Ω to 800 Ω	3	6	6

Ferrite Materials

During these tests we used only two easily available ferrite materials. The material permeability should be between u=125 to u=850, preferring lower values. Ferrite should tolerate hundreds of watts of output power. Iron powder materials have too narrow frequency range for higher impedance ratios, due the much lower permeability.

Ferroxcube TN23/14/7-4C65
Ferrite toroid, OD 23 mm, ID 14 mm, height 7 mm.
Material **4C65**, permeability **u=125** (similar to 61).
Tubes stacked of 5 toroids, each. Tube total length 37 mm.
Better high frequency range. Works here best from 6 to 30 MHz.
Low core loss.

Wurth 74270057
Ferrite tube, OD 19 mm, ID 11,5 mm, length 51 mm.
NiZn, material **4W620**, permeability **u=620** (similar to 43).
Wider frequency range. Works here best from 1 to 30 MHz.
Medium core loss.

Winding Materials

We used coaxial cables center conductor for winding.

RG58 C/U
PE isolation, OD = 2.95 mm, test voltage 5.0 kV.

RG174 U
PE isolation, OD = 1.45 mm, test voltage 3.0 kV.

RG316 U
PTFE isolation, OD = 1.55 mm, test voltage 1.7 kV.

With 1 kW power the output from 1:16 balun is near 1 A 900 V. The OD 1.5 mm conductor might not be enough for 1 kW power. With low ratio baluns the OD 3 mm conductor works well enough; with some high ratio baluns we had to use the OD 1.5 mm PTFE insulated conductor. Anyway, do carefully the wiring.

Structure

Both ferrite tubes were clued parallel on class-fiber circuit board material, on the copper side. This solid copper foil was used as ground plane for all ground connections, including the incoming heavy ground track from BNC coaxial connector. The capacitor C1 was soldered directly into the BNC connector. Details on pictures.

Common Mode Choke (CMC)

This type balun may need an external filter to prevent coaxial mantle radiation, especially with less symmetric antennas. You may want to install a set of ferrite tubes over the coaxial cable near the connector, or use some CMC component.