

9:1 VOLTAGE BALUN

9:1 Voltage balun. Install November 2016.

Requiring a balun to feed a balanced antenna from an un-balanced load with an impedance step up from 50ohms to 450ohms, a 1:9 Voltage balun design using an L15 ferrite toroid cores was selected.

Construction

The 1:9 voltage balun has 5 turns wound evenly spaced around the L15 ferrite toroid core with the five individual windings wound close together. The toroidal core was wrapped in an overlapping layer pink heavy duty Teflon plumbers tape to protect the enamelled copper wire from insulation puncture from abrasion with the toroid core.

As this Balun will be used out in the weather a weatherproof plastic enclosure is used. See photos 1,2 and 3. The entry holes for the SO-239 connector and the binding post have small bead of rubberised silicon sealant to achieve full waterproofing of the Balun. Photo 2 shows the perfect application of the rubberised silicon sealant spread uniformly from under the binding post, which will also give additional grip if the post were over tightened.

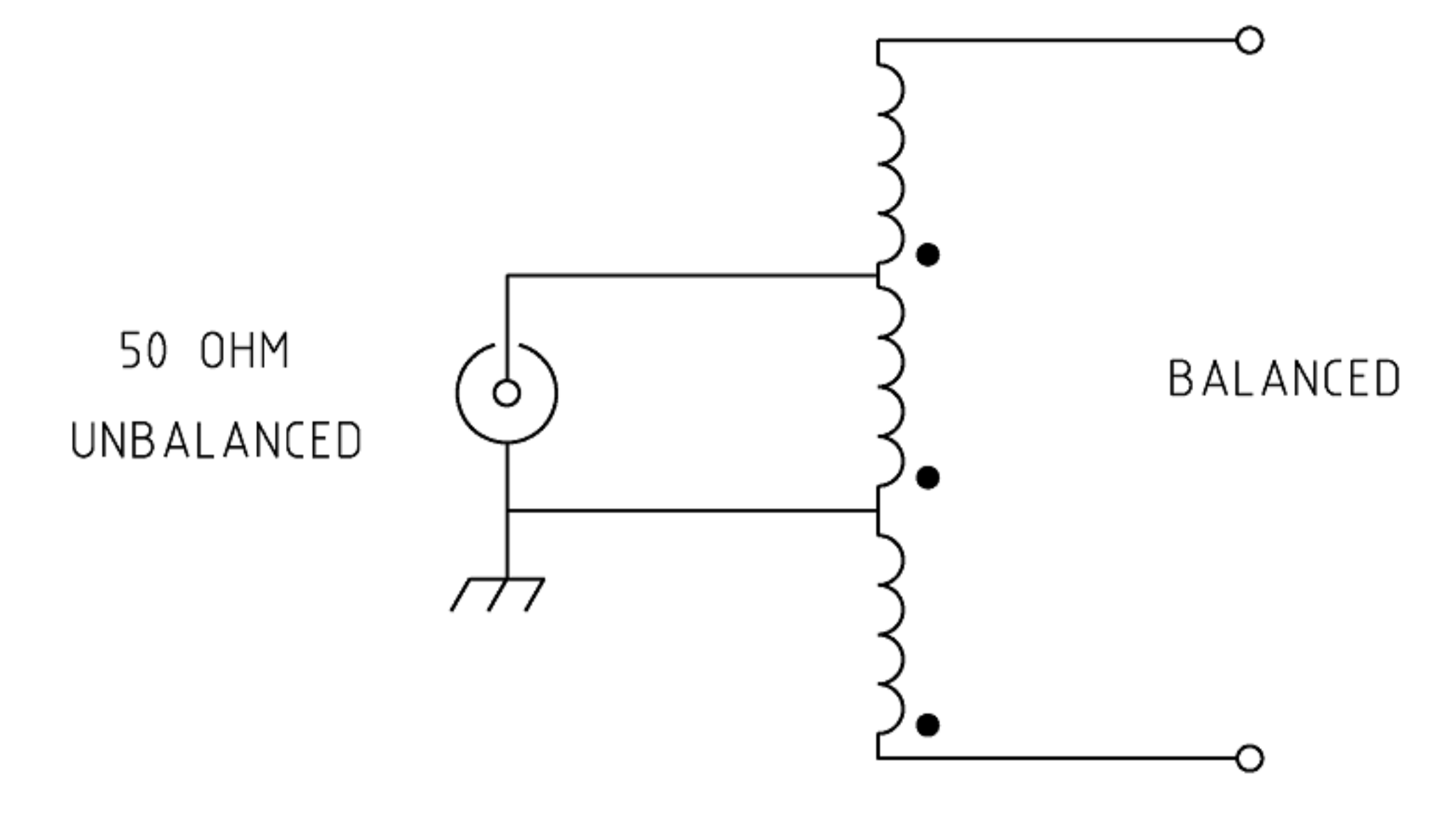


Figure 1 Schematic of the 1:9 Voltage balun

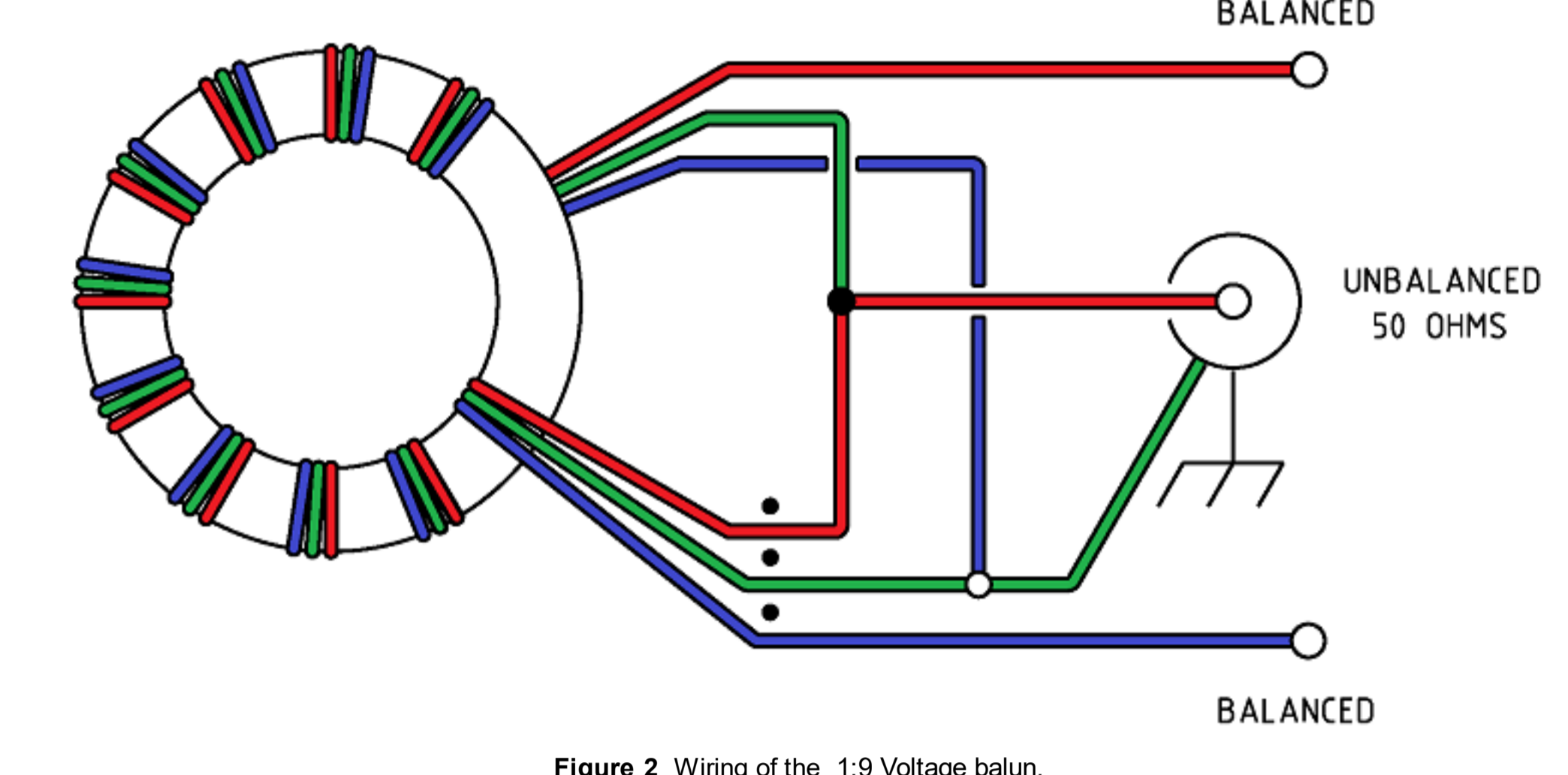


Figure 2 Wiring of the 1:9 Voltage balun. Note this drawing shows winding connections and not the number of turns required. See article for details.

Parts list

- 1.25mm Enamelled copper wire.
- L15 ferrite toroid core, Jaycar Cat. No. LO-1238
- Pink heavy duty Teflon plumbers tape.
- About 3 x 500mm of 1.25mm Enamelled copper wire.
- Two Gold Banana Socket Binding Post - Black, Jaycar Cat. No. PT-0431
- SO-239 UHF chassis mount connector
- Sealed Polycarbonate Enclosures 82 x 80 x 55mm from Jaycar Cat. No. HB-6230

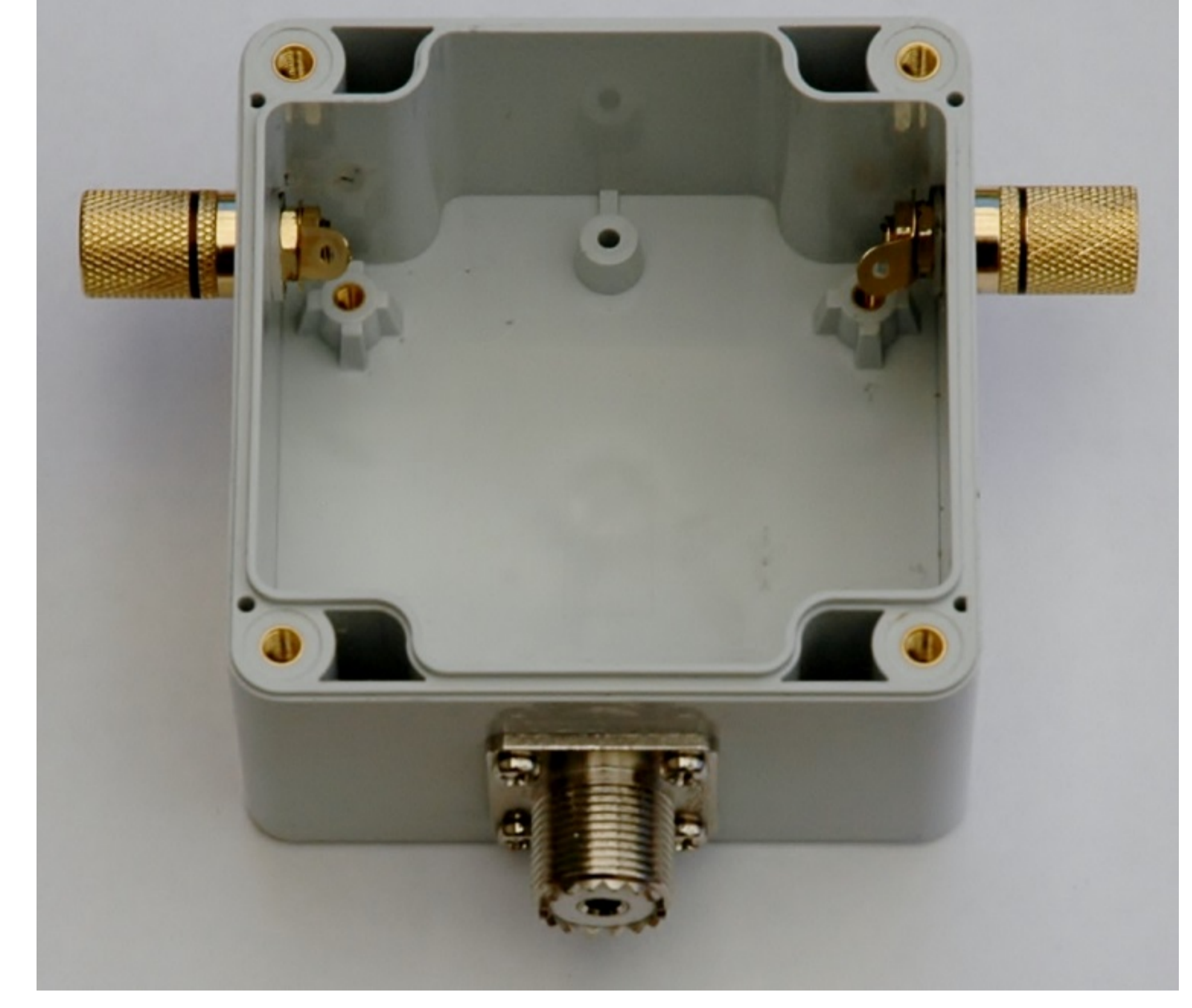


Photo 1 1:9 Voltage balun enclosure assembled.

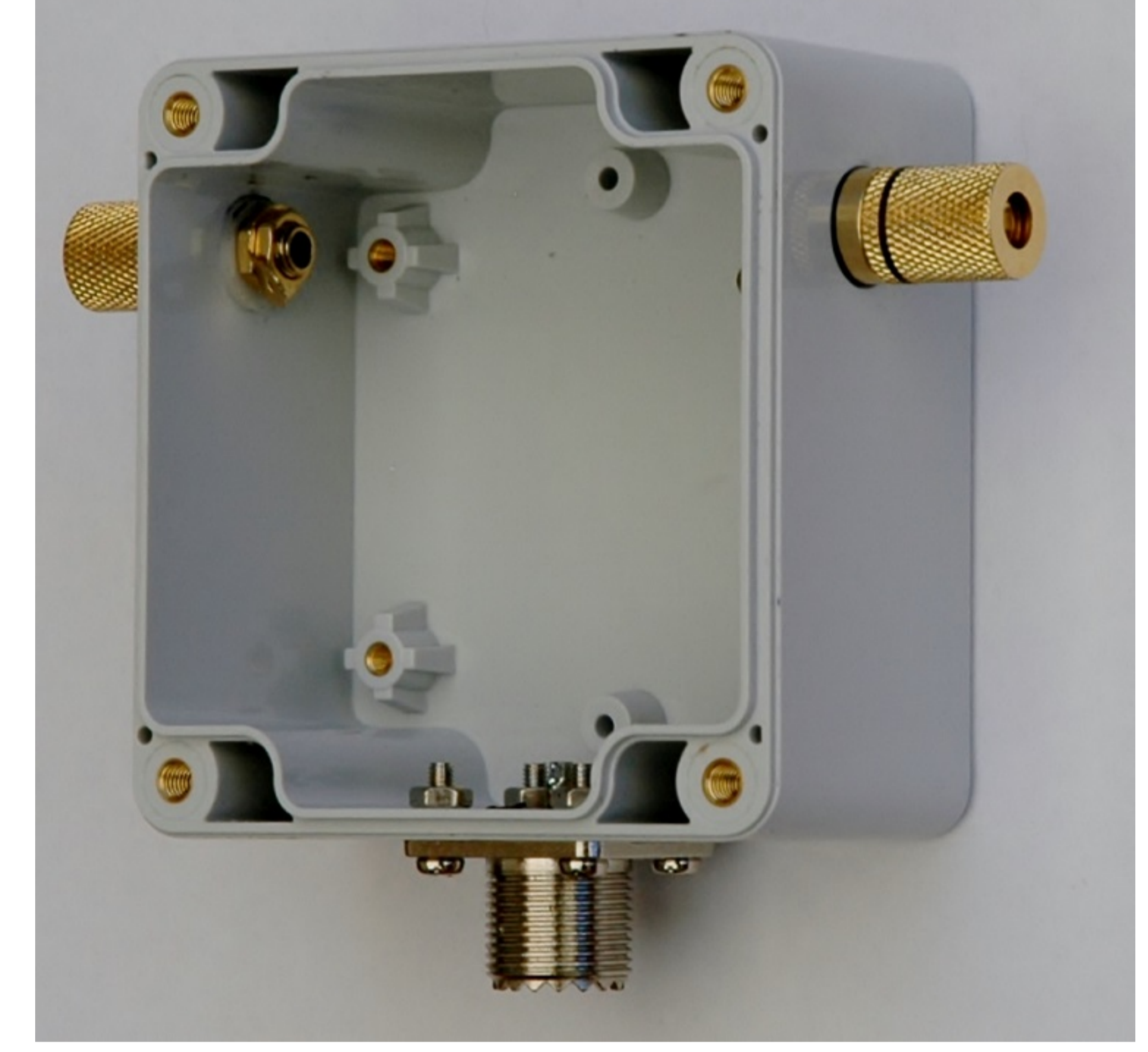


Photo 2 1:9 Voltage balun enclosure assembled.

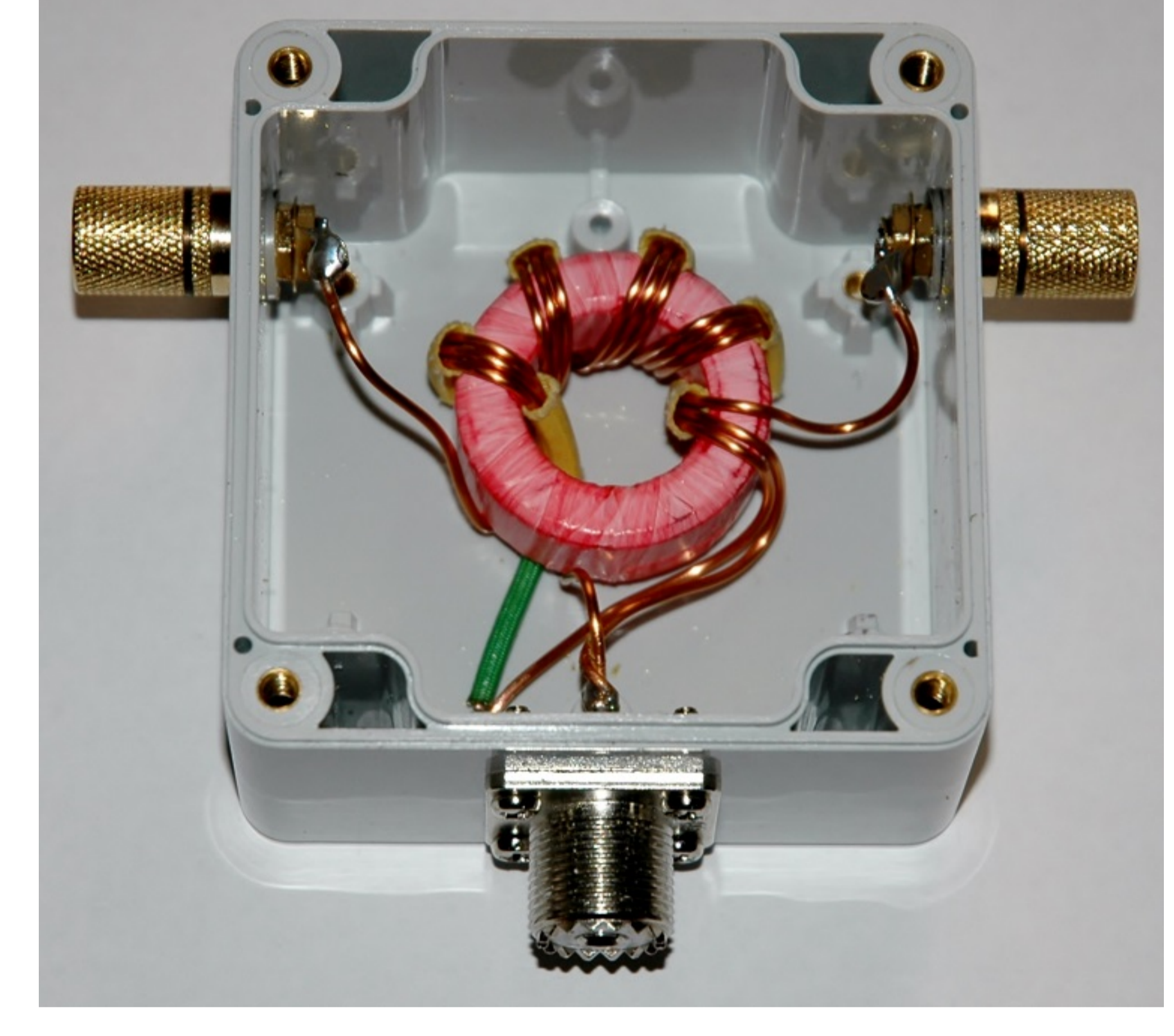


Photo 3 1:9 Voltage balun assembled in weatherproof enclosure.

The evaluation of the efficiency of the balun over the desired bandwidth (1.0 - 30MHz) was carried out by testing the impedance that could be seen from unbalanced side to a resistive load applied to the balanced side using an antenna analyser. The below antenna analyser plot views a 450ohm resistive load attached to the balanced side of the balun and measured at a nominal impedance of 50ohms presented as anticipated an approximate 50ohm load to the analyser and produced about a 1:1 SWR.

The performance of the balun from 1.0MHz to about 30MHz is good and shows little reactance, there is however a gradual rise in reactance above 30MHz along with a gradual rise in the SWR. Despite this rise in reactance and SWR the balun should still perform well up into the 50MHz amateur band.

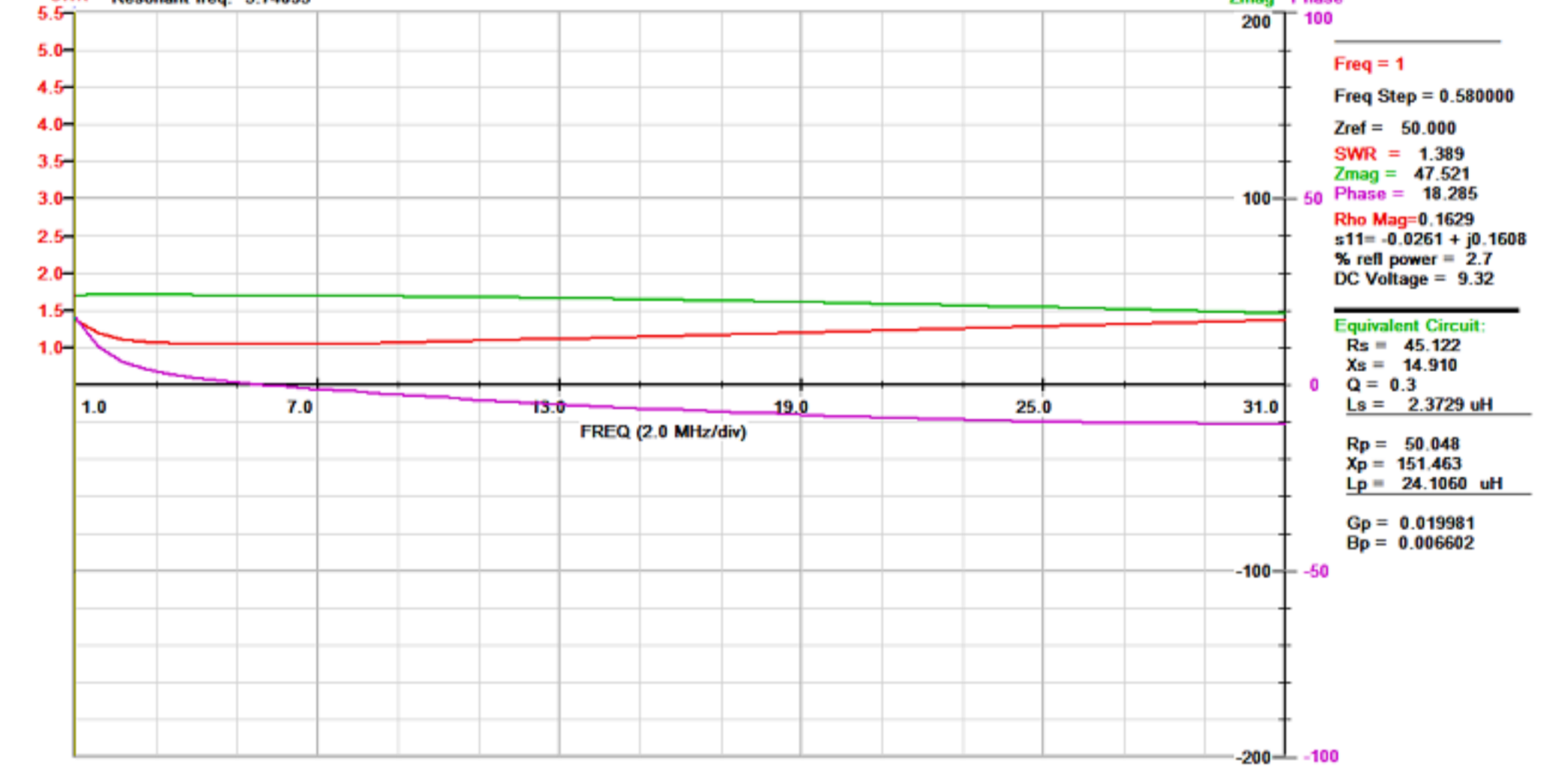


Figure 3 AIM 4170C antenna analyser plot viewing a 450ohm resistive load through the voltage balun. Note the 450ohm resistor appears as 50ohms due to the 9:1 balun ratio resulting in an ideal SWR of 1:1.

AIM 4170C antenna analyser explanation:

SWR	Standing Wave Ratio.
Zmag	Total Impedance.
Theta	Phase angle between voltage and current.

Also see other baluns and ununs:

- [BALUN 1:1 CHOKE & 1:4 BALUN](#) HF ladder feed-line to coaxial cable combination choke and 1:4 balun. (0.1MHz - 30MHz).
- [BALUN 1:1 CHOKING](#) Choking balun for lower HF and MF bands. (200kHz - 10MHz).
- [CHOKING 1:1 BALUN - HF BANDS](#) Reinsert choking balun. (1.0MHz - 30MHz). FT240-43 Ferrite Toroid Core.
- [CHOKING 1:1 BALUN - HF BANDS](#) Reinsert choking balun. (1.5MHz - 30MHz). FT140-43 Ferrite Toroid Core.
- [CHOKING 1:1 BALUN - LOW VHF BAND](#) Choking balun. (10MHz - 60MHz). FT140-43 Ferrite Toroid Core.
- [BALUN 1:1 CURRENT](#) 1:1 Guanella Current balun using a L15 ferrite core (1.8 - 30MHz).
- [BALUN 1:4 CURRENT](#) 1:4 Guanella Current balun using a L15 ferrite core (1.8 - 30MHz).
- [BALUN 1:4 SINGLE CORE CURRENT](#) 1:4 Guanella Current Balun, single FT240-43 ferrite toroid cores. (0.3MHz - 30MHz).
- [BALUN 1:1 VOLTAGE](#) 1:1 Ruthroff voltage balun using a T-200-2 powdered iron toroid core (1.8 - 30MHz).
- [BALUN 4:1 VOLTAGE](#) 4:1 Ruthroff voltage balun using a T-200-2 powdered iron toroid core (1.8 - 30MHz).
- [BALUN 6:1 VOLTAGE - VERSION 1](#) 6:1 Voltage balun using a FT140-43 Ferrite Toroid Core (1.8 - 30MHz).
- [BALUN 6:1 VOLTAGE - VERSION 2](#) 6:1 Voltage balun using a FT140-43 Ferrite Toroid Core (1.8 - 30MHz).
- [BALUN 9:1 VOLTAGE - VERSION 1](#) 9:1 Voltage balun using a L15 ferrite toroid core (1.8 - 30MHz).
- [BALUN 9:1 VOLTAGE - VERSION 2](#) 9:1 Voltage balun using a L15 ferrite toroid core (1.8 - 30MHz).
- [UNUN 9:1 VOLTAGE](#) 9:1 voltage unun using a T-200-2 powdered iron toroid core (1.8 - 30MHz).
- [UNUN 9:1 VOLTAGE VERSION 2](#) 9:1 voltage unun using a L15 ferrite core (1.8 - 30MHz).
- [UNUN 9:1 VOLTAGE VERSION 3](#) 9:1 voltage unun using a FT140-43 ferrite core (0.5 - 60MHz).

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