Build an RF Coax Shield Current Probe

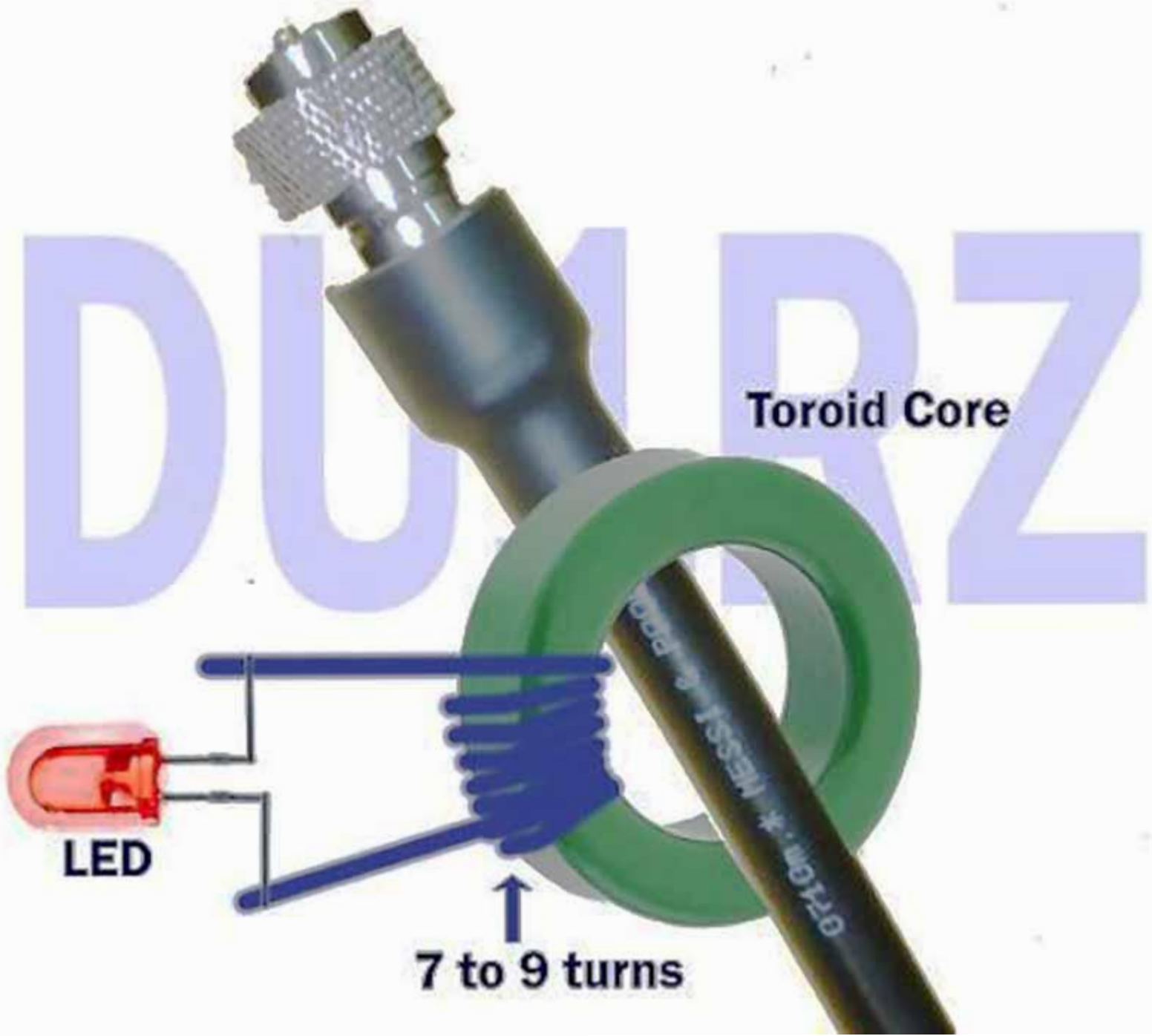
w6nbc.com/slides.html

RF Probe

Stray RF in the radio shack

owenduffy.net

https://owenduffy.net/module/icm/#:~:text=An%20approach%20to%20measurement%20Common%20mode%20current%20can,half%20wave%20detector%20driving%20a%20high%20impedance%20voltmeter.


Toroid Core
LED
7 to 9 turns

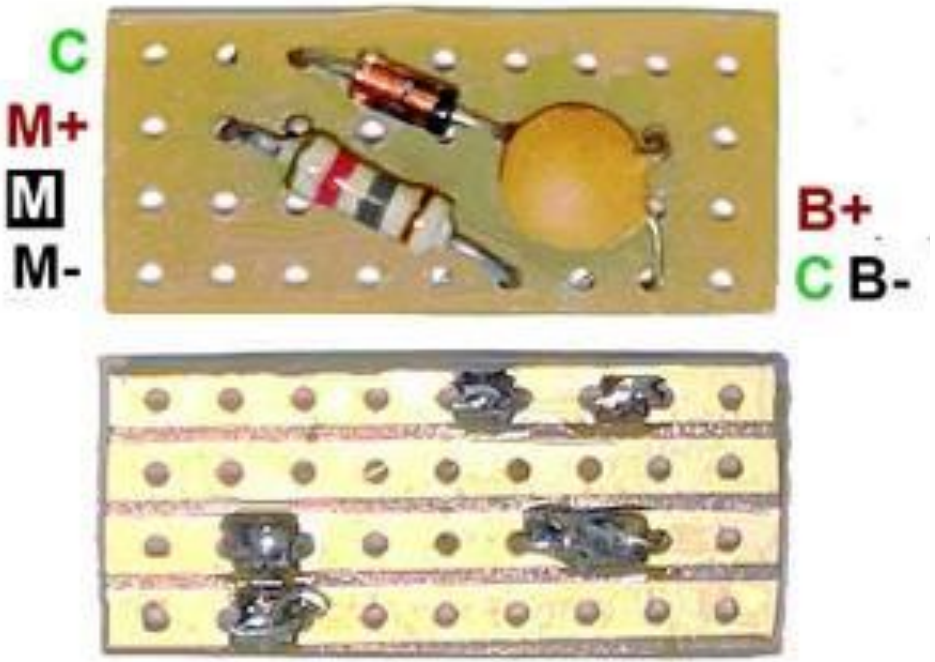
MFJ-853H, CLAMP-ON, MINI RF CURRENT METER, HI-PWR

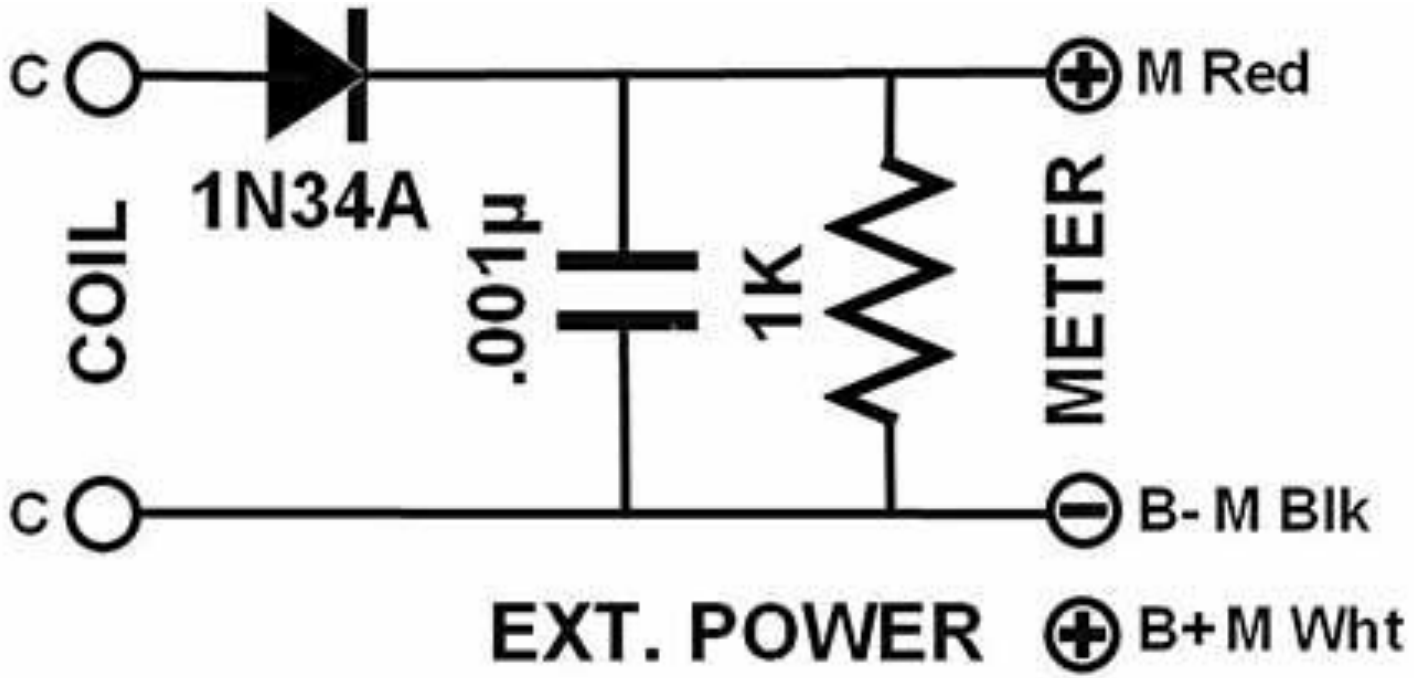
$109.95

Clamp-on ferrite choke with an added pickup coil & meter

The W6OEK Version

With and Without 3D Printed Cover





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Bill of Materials

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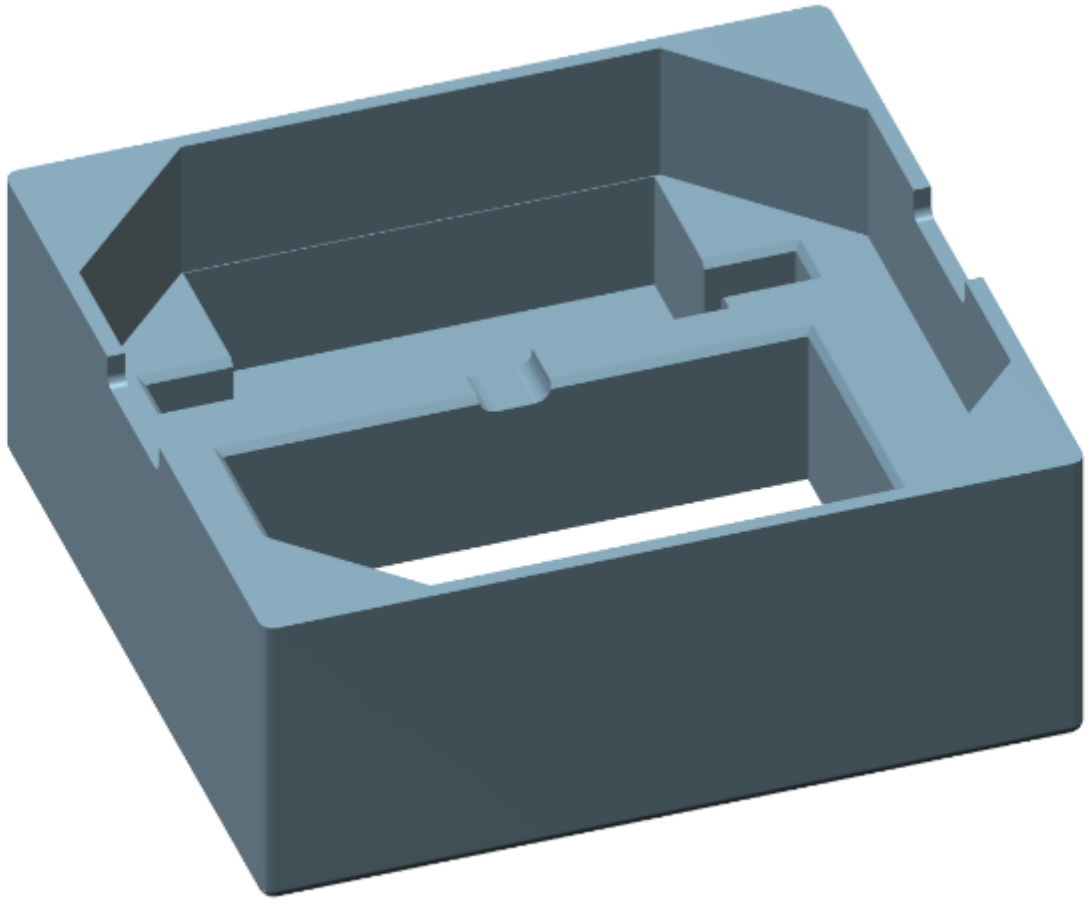
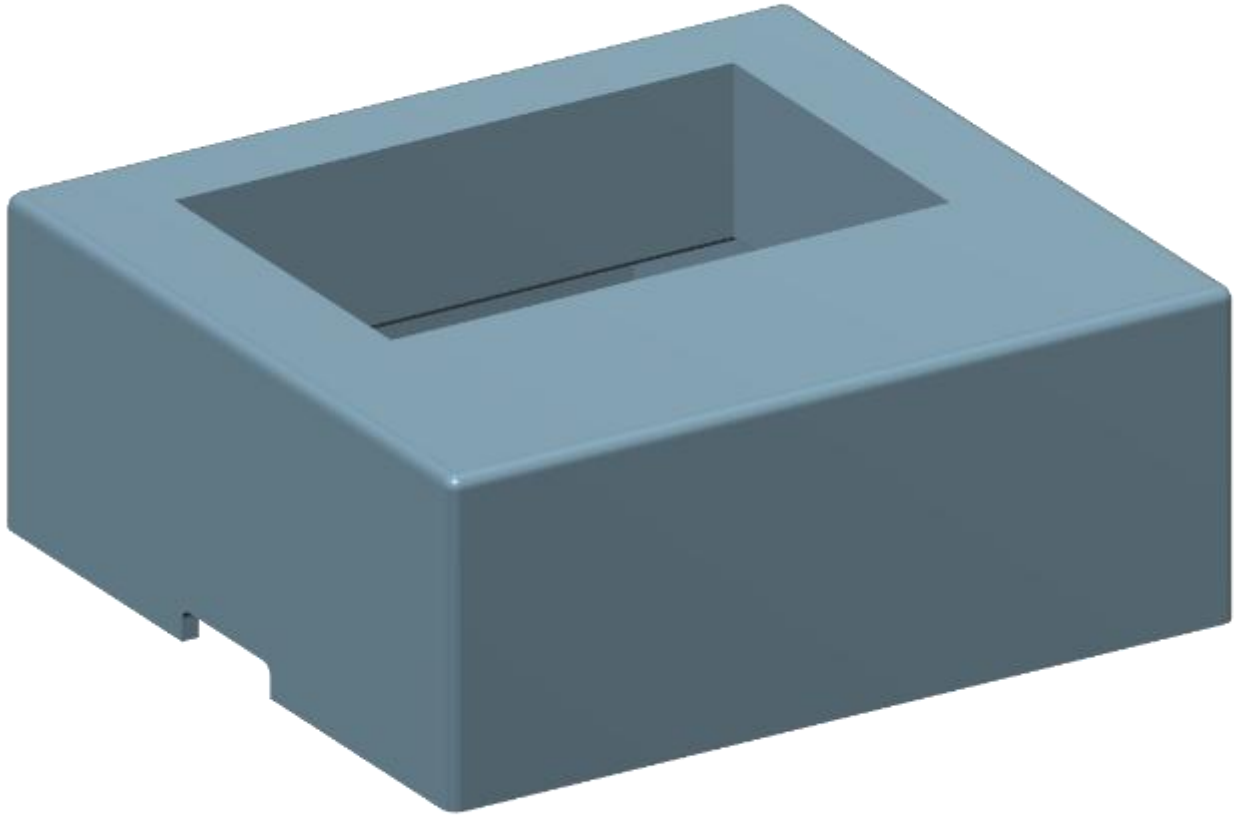
1	Snap-on mix 43 Ferrite choke for RG-8, RG-213 size coax. (0.405 in.)	e.g. Fair-Rite 0443164151 snap-in, Palomar Engineers FSB43-1/2, ID=1/2" or similar
10 turns	Insulated magnet wire, AWG 24 (or smaller)	Electronic parts supplier
1	3-digit digital voltmeter, 3-wire 100V version (see text)	Amazon, EBay, mpja.com, Walmart, surplus electronics dealers
1	1N34 diode	Electronic parts supplier
----	100 mil linear copper strip perfboard	Electronic parts supplier
1	2 cell (6V) 2032 coin cell holder with cells and switch	https://www.amazon.com/dp/B092VFFCR8?psc=1&ref=ppx_yo2ov_dt_b_product_detailsAmazon, EBay
----	3M VHB Double Sided Heavy Duty Outdoor Mounting Tape or sticky squares	Local hardware store, internet
1	3D printed probe cover	.stl 3D printer file: xxxxxx





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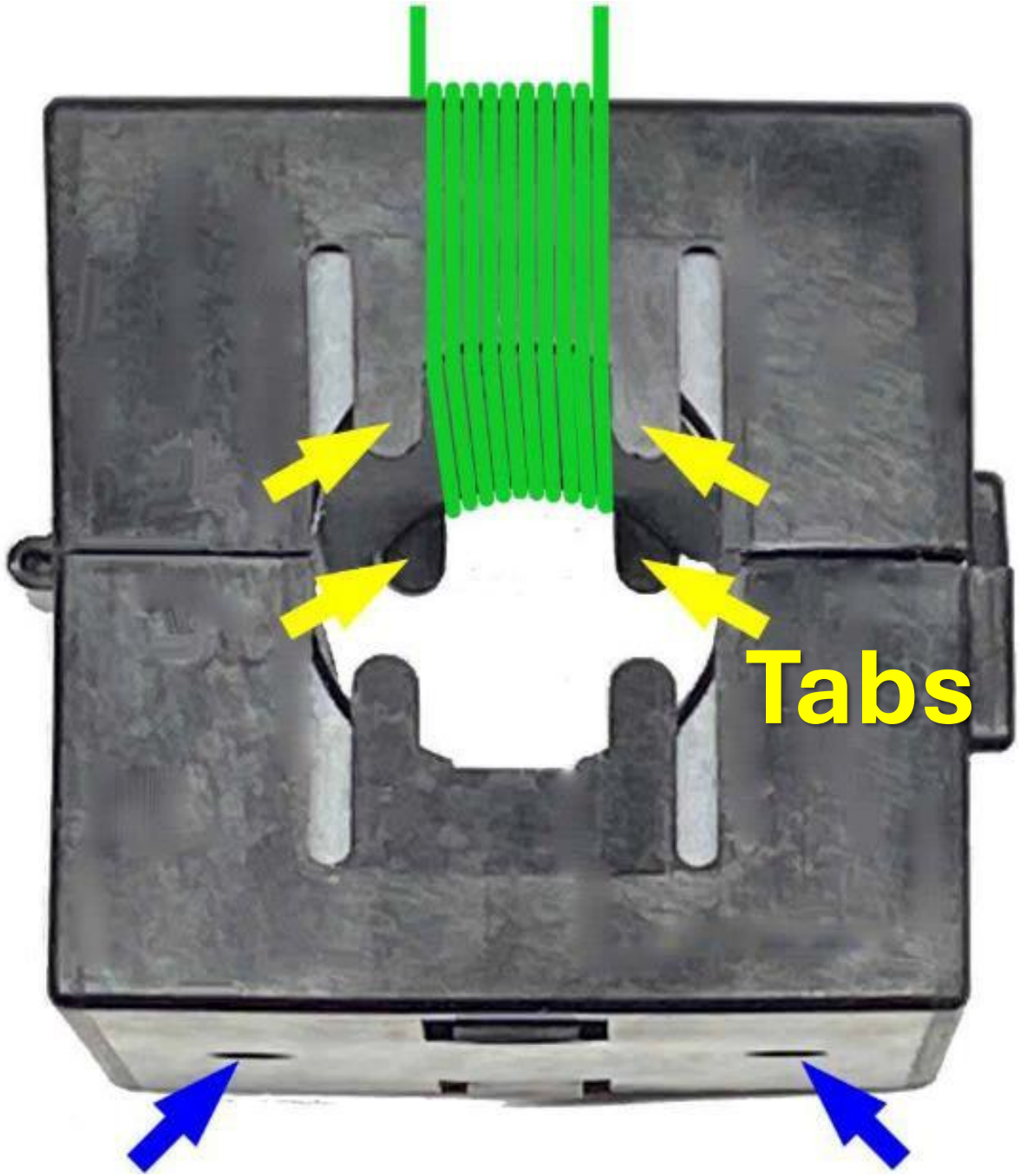


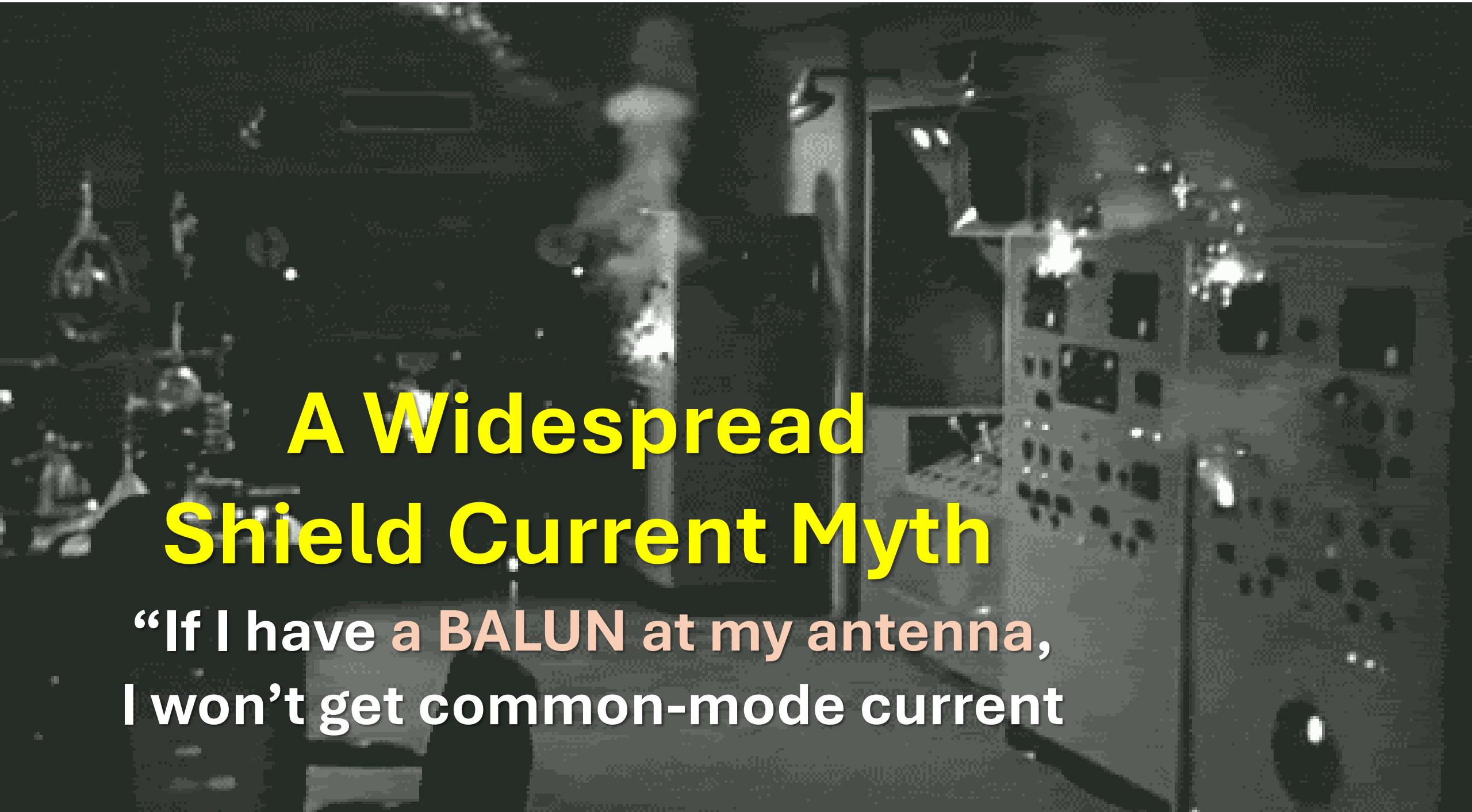
Fair-Rite

0443154151

for ½ in. coax

OK for smaller coax

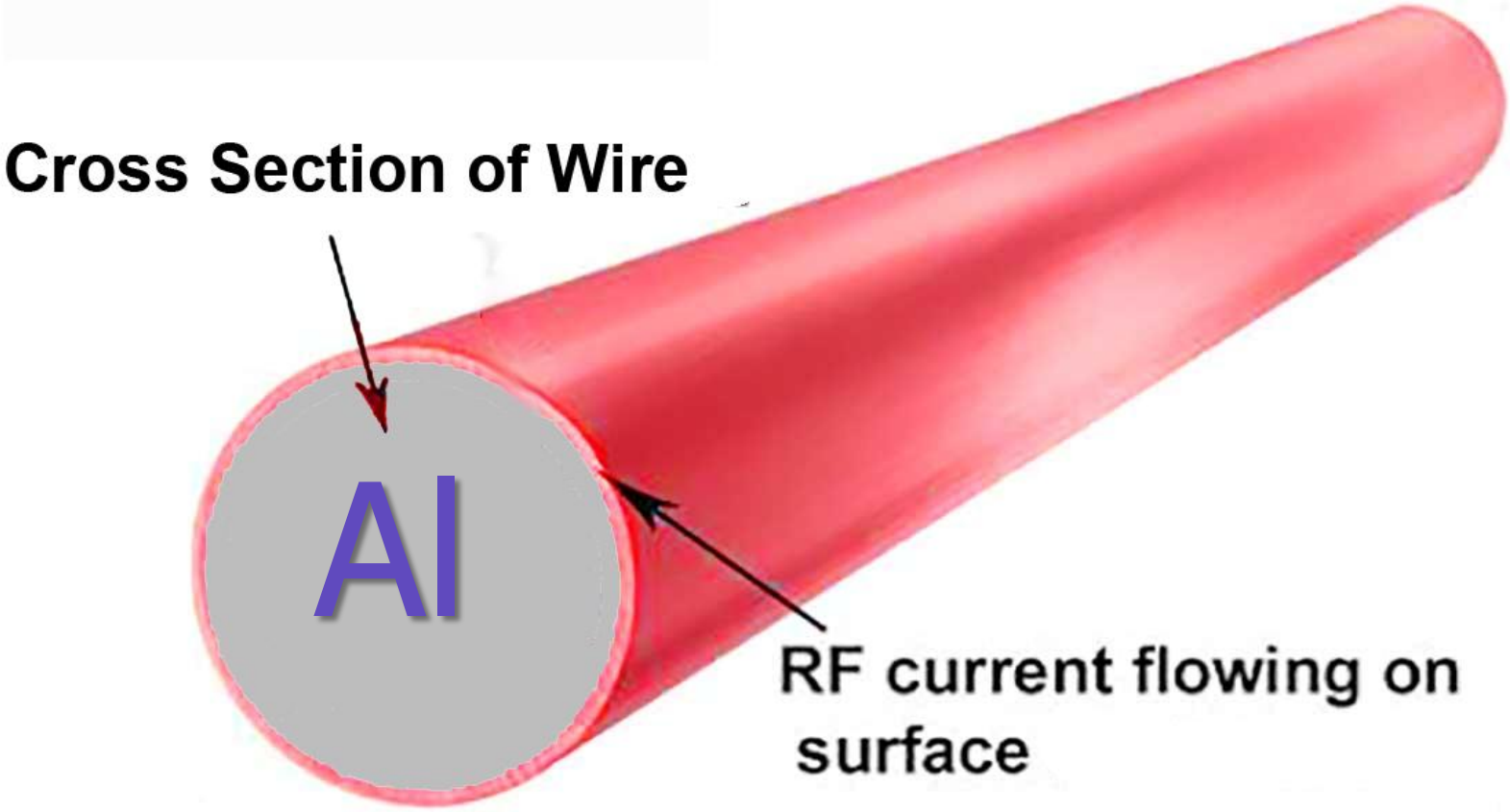
A Better View of Baluns



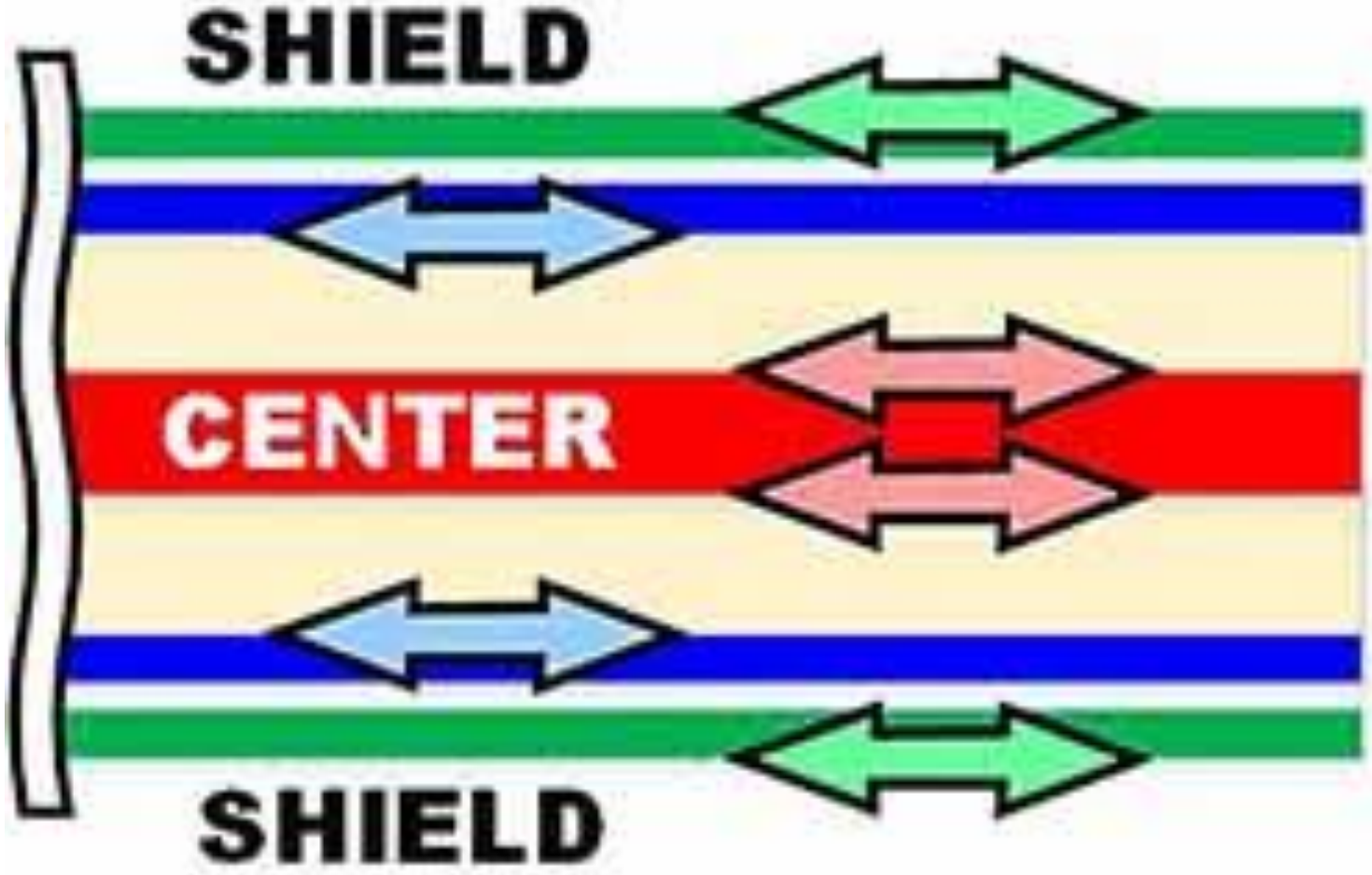
A Widespread Shield Current Myth

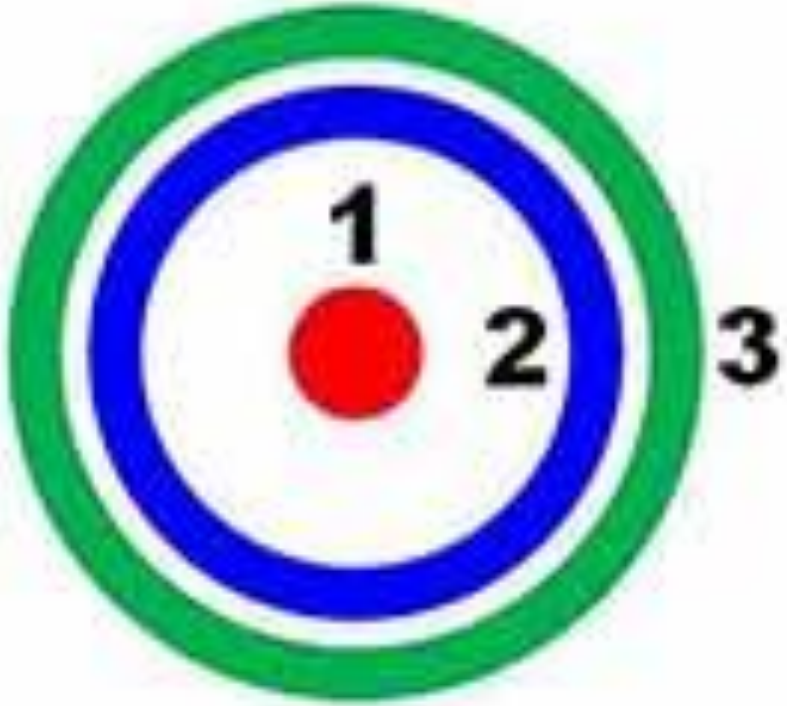
"If I have a BALUN at my antenna,
I won't get common-mode current

The Balun is a Consequence of Skin Effect



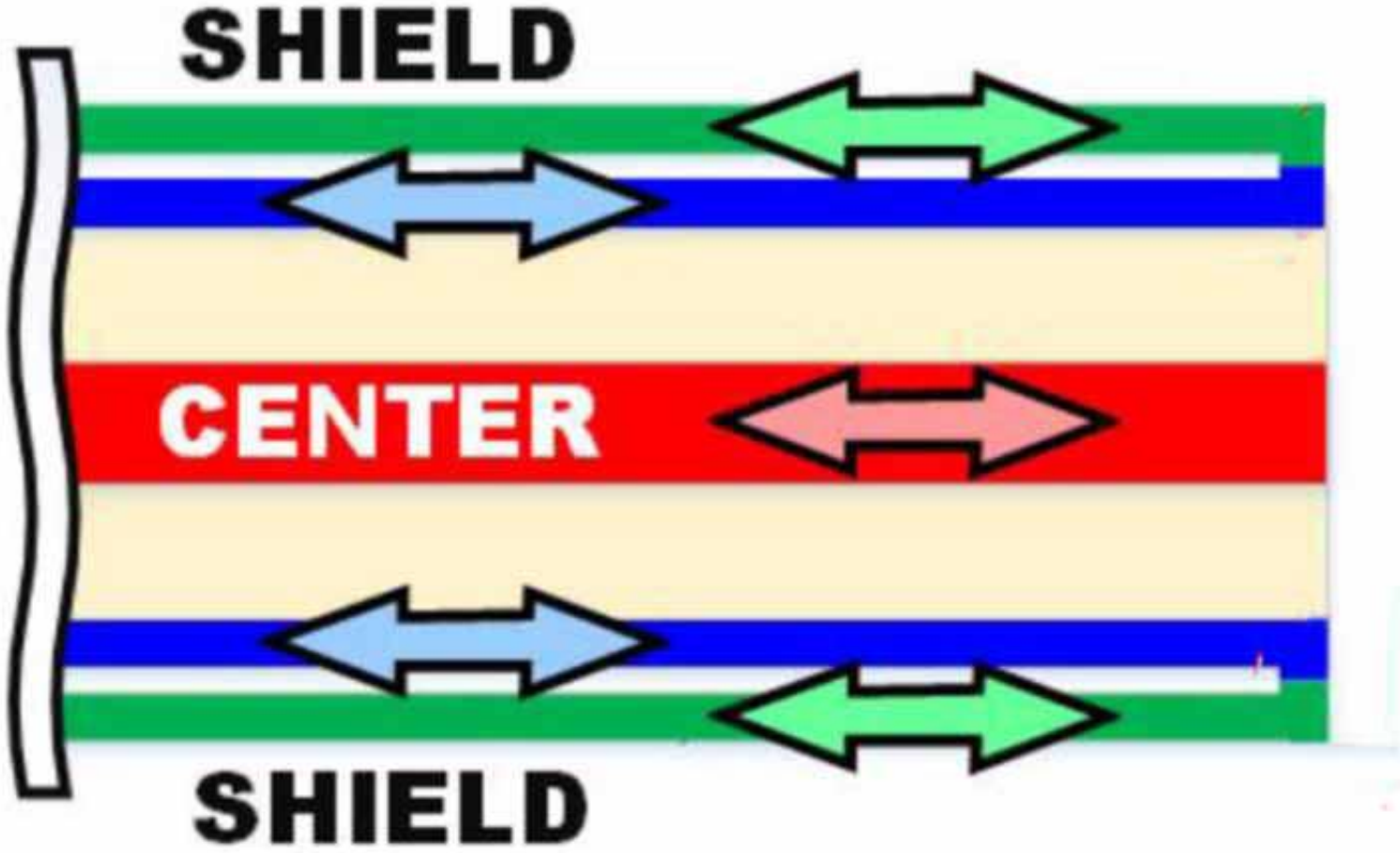
Surprise -- Coax has 3 wires

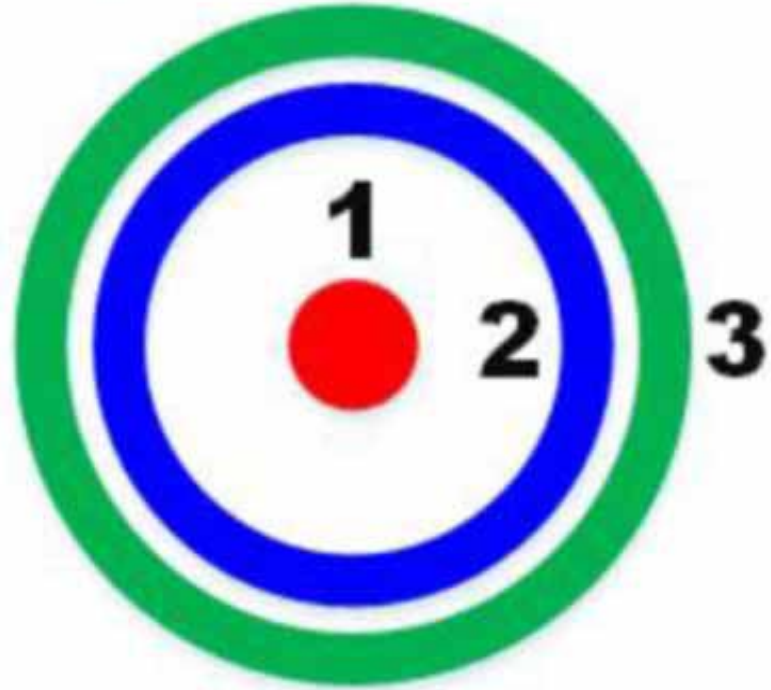




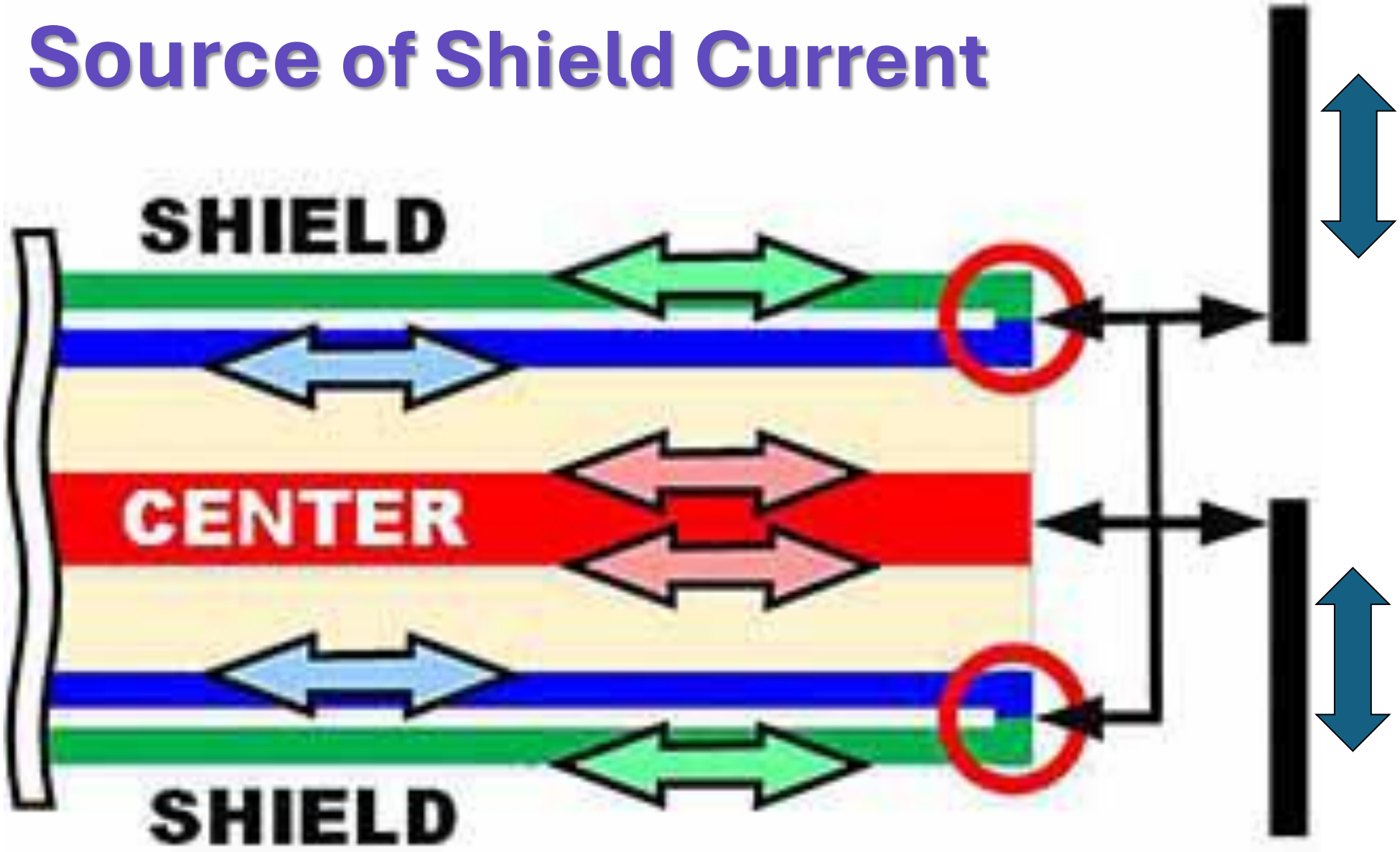
Skin forms at the end
Connects inner to outer

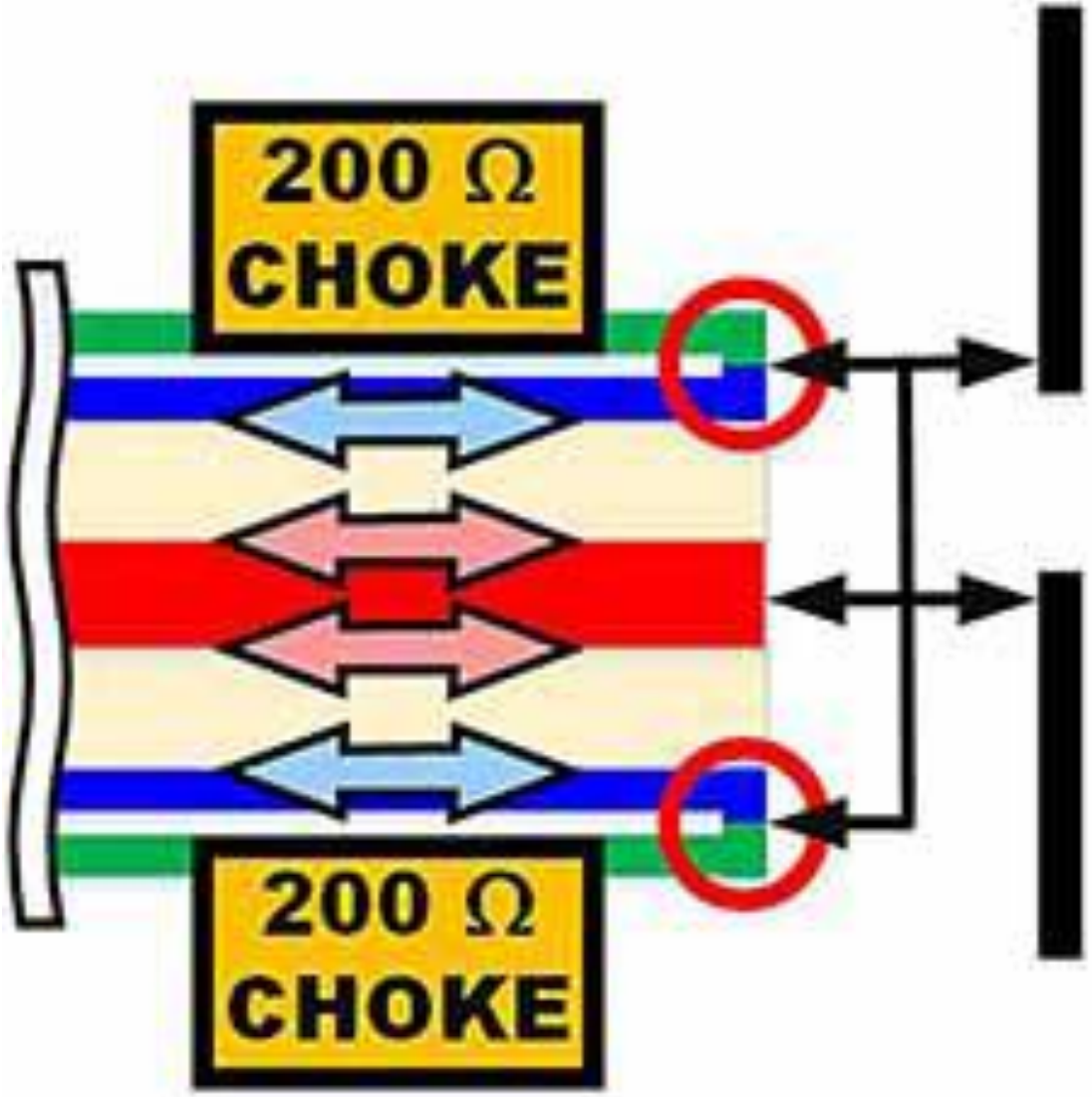
Skins continue





Source of Shield Current





The PRIMARY job of ALL baluns:

to "Choke Off"
to "Isolate"
the Outside Skin

i.e. Balance"
the Inside Skins

“Minimum”choking impedance = 200Ω

4 times

50 Ω system impedance

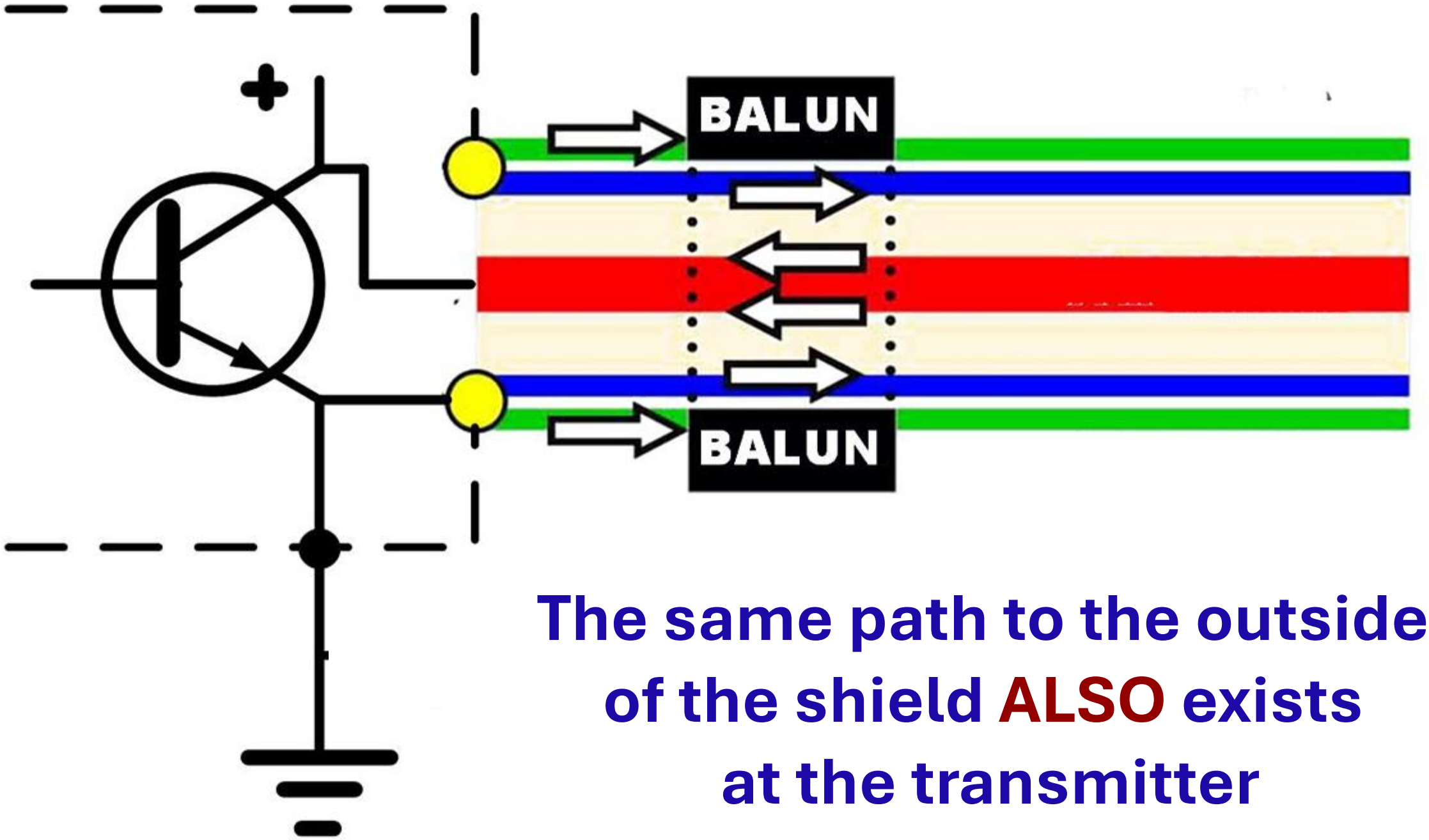
OK to use more

A secondary job

As an impedance transformer

4:1, 9:1

The Big Surprise



The same path to the outside of the shield ALSO exists at the transmitter

AXIOM

1. ANY PLACE coax ends
2. And there's a balanced source of energy

RF can get on the shield

NOT JUST AT THE ANTENNA

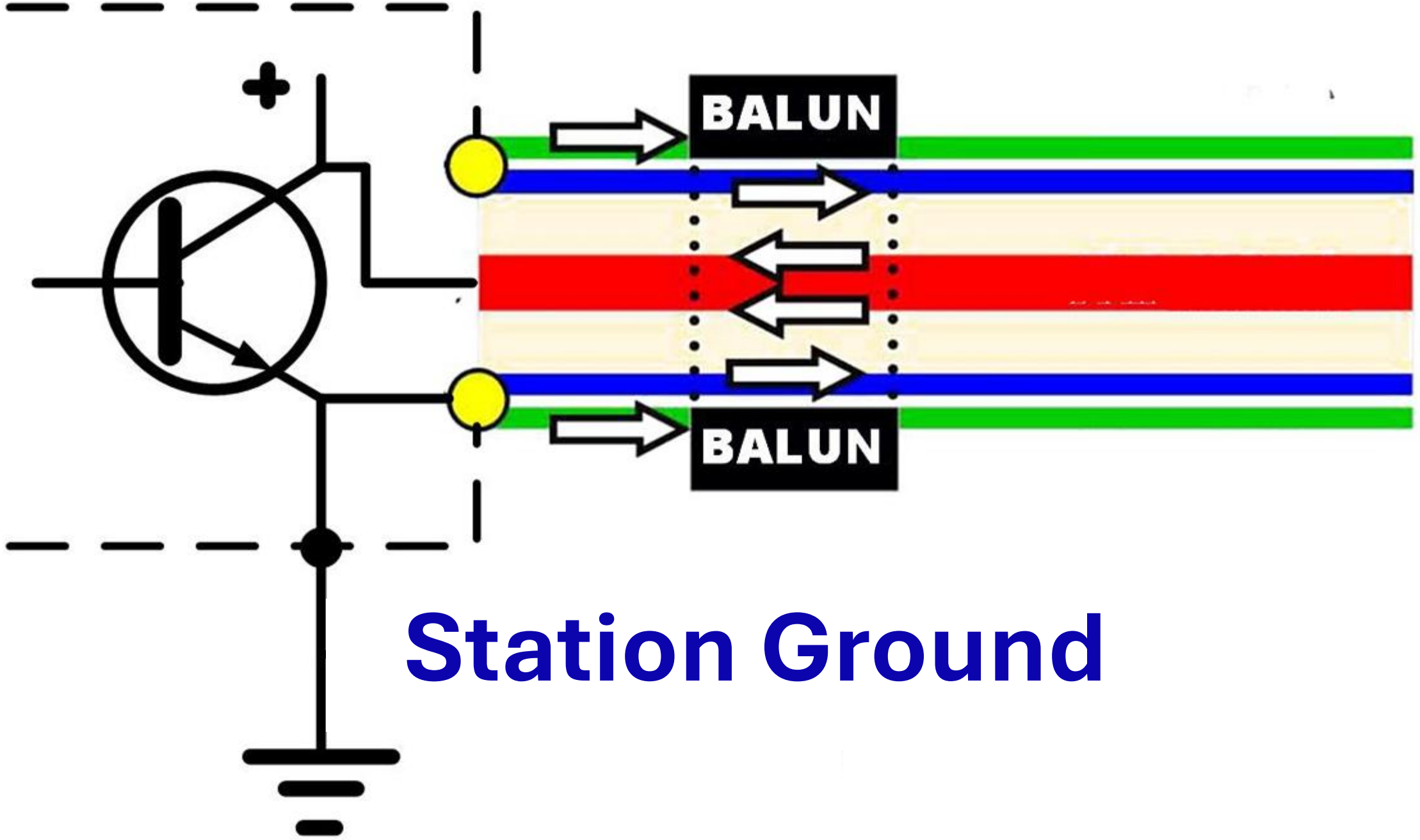
BOTH Antennas & Transmitters

PRIMARY Sources of Energy

NOT → Barrels, Switches

Not Sources of Energy

Why we may have gotten away without choking in the shack?



Station Ground

Hands-On Radio

H. Ward Silver, NØAX, n0ax@arrl.org

Experiment #144

The Myth of the RF Ground

Sooner or later, just about every ham who builds an HF station — whether it's at home, in the car, at Field Day, or for portable operation — experiences the rite of passage called an *RF burn*. Although painful, it rarely creates a physical mark, just a certain wariness on the part of the burn-ee. What's happening here?

You just had an exciting encounter with a high-impedance point on your antenna system. Impedance being the ratio of voltage to current, when power is applied, a high RF voltage will be present at these points. Who says you can't feel RF? "But wait," you exclaim, "the antenna is up in the air and connected to the antenna tuner! I'm not touching my antenna system!"

Oh yes, you are! Unless your station is built inside an RF-tight metal enclosure or is otherwise isolated from the antenna and feed line, every coax shield, every enclosure,

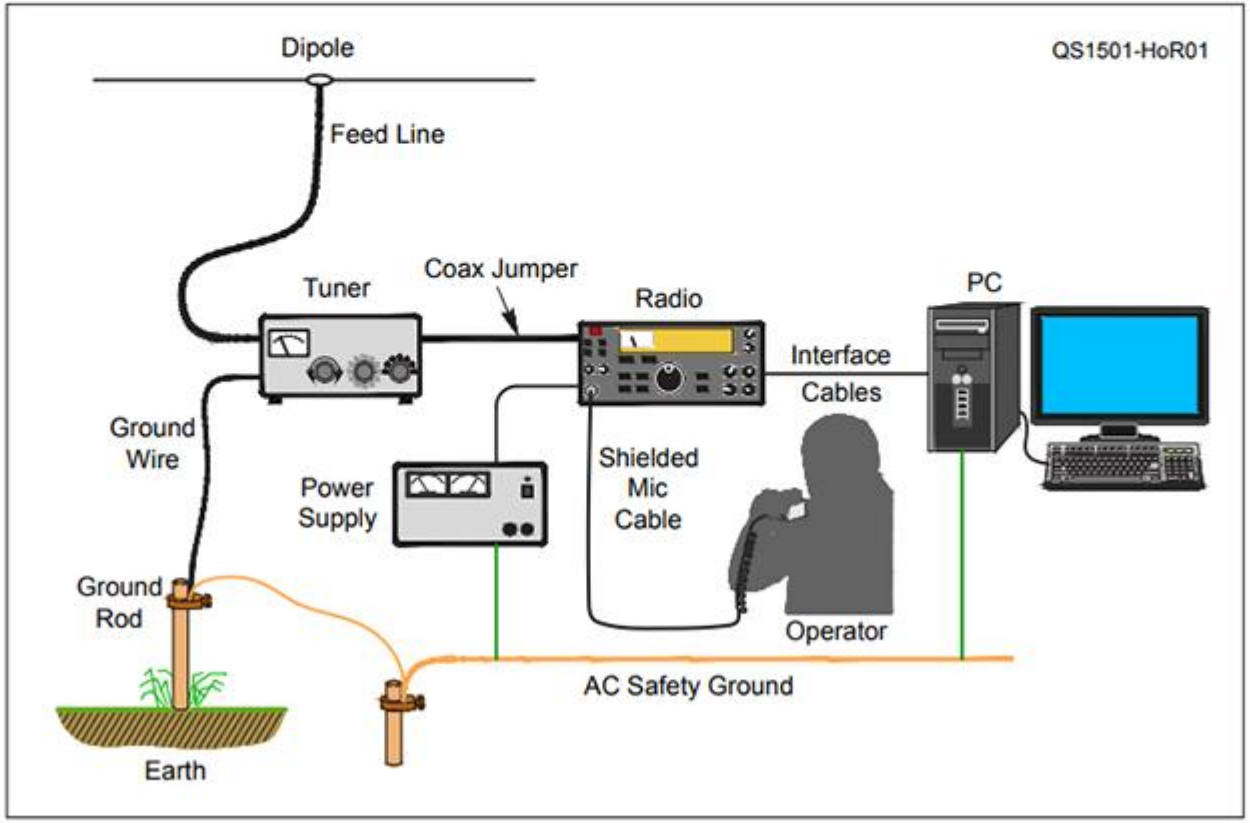
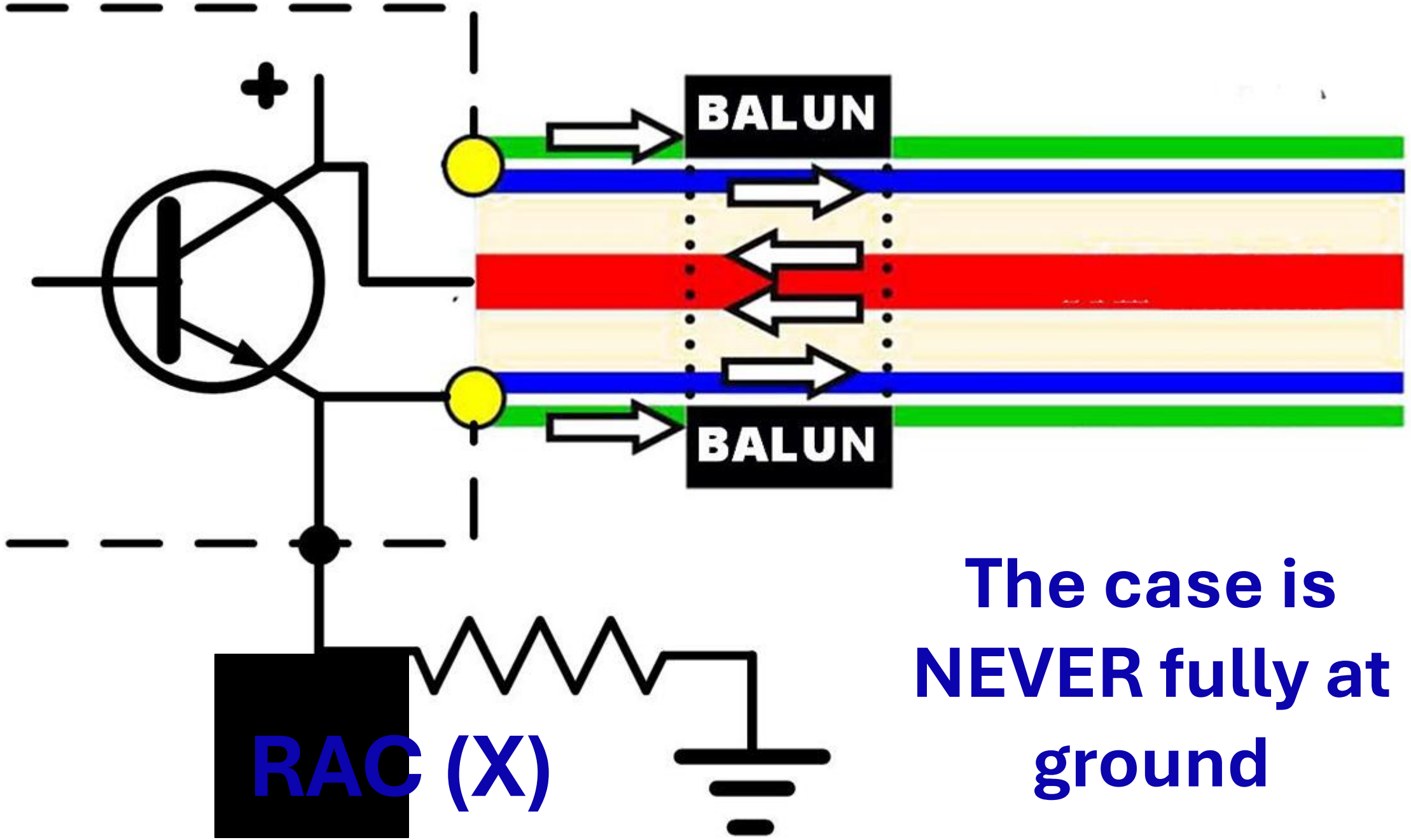


Figure 1 — The complete antenna system for a typical shack. Everything conductive, including the operator holding a microphone, is part of the antenna system.

January 2015 QST
H. Ward Silver

No Such thing as a "Perfect" RF Ground



The case is NEVER fully at ground

Jim W6OEK's experience with an 80-meter dipole with a good balun

Conductive Fabric Didn't Work

Only shield current chokes in the shack did

Ferrite Snap-On's

Mix 43/31 HF, 61 VHF/UHF

1 — 10m, dozen – 160m

Ferrite Sleeves

Ugly/Coax Balun

Toroid Balun

A Non-Double-Choked System is an RF Magnet

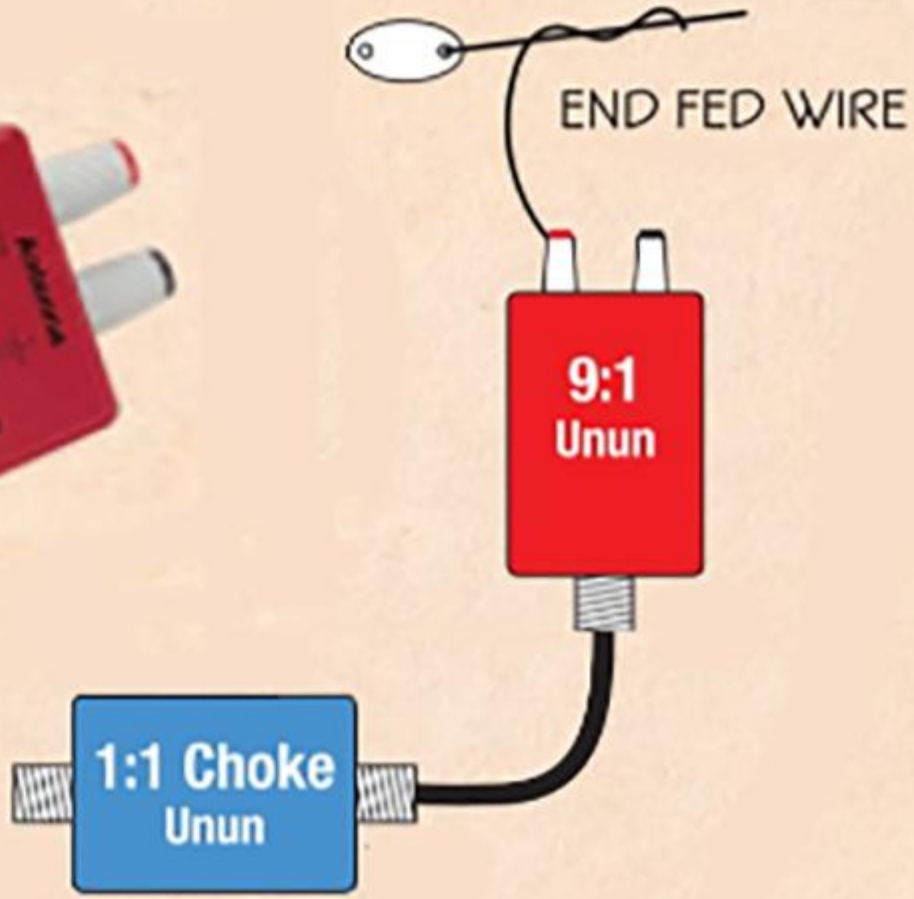
- Your own feedlines not at 90°
- Other transmitters
- Other radio systems
- Atmospherics, QRN

SO
Choke, Choke, Choke

- Transmitters
- Coaxes – TX & Antenna
- More than one balun OKAY

Also with a 4:1 or 9:1

LDG



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