



Cavities & Duplexers

w6nbc.com/slides

w6nbc.com/articles/duplexer.pdf

**First, a small point of
theory and terminology**

Duplexer vs Diplexer

BOTH duplexers and diplexers
are often called **DUPL**EXERS
Even by manufacturers

But there is a “soft” distinction

IN HAM PRACTICE

Diplexer

2 of the ***SAME*** type RF devices > 1 out
E.G. a 2m and a 70-cm antenna > 1 jack

Duplexer

2 ***DIFFERENT*** type RF devices > 1 out
E.G. a Repeater: TX & RX > 1 antenna

DIPLEXER

2 antennas

(same RF devices)

HF & 70cm

to one

transceiver jack

Transceiver



**HF
antenna**

**70cm
antenna**

RADIOWORLD

engineering extra

FUTURE

A flared skirt for Voice of Vietnam

In the country's central highlands, Kintronic Labs designed an unusual 400 kW diplexed medium-wave transmission system.



Build a button box
Impress your morning show crew by making them this sound effects gizmo using an Adafruit Audio FX Sound Board.

Thanks, Bob!
We chat with Bob Shotwell as he retires from Spectrum Investigative Services.

**400 kW
Diplexer
for two
AM Broadcast
Stations into
one
Antenna**



DIPLEXER
One antenna to two transmitters

An Efficient 2 Meter Antenna Disguised as a TV Satellite Dish

This vertically polarized horizontal slot antenna, cut into the reflector of a TV dish, might be the ultimate stealth antenna.

John Portune, W6NBC

I've long wondered if it would be practical to hide an efficient 2 meter base-station antenna in a TV satellite dish. My homeowners covenants, conditions, and restrictions (CC&R) didn't force me to take it down. But could all the metal in the TV dish camouflage a 2 meter antenna? Finally, it struck me: don't fight the metal, take advantage of it, by cutting a half-wavelength-long slot into the TV dish reflector.

A slot antenna is a narrow rectangular opening in a large conductive surface, such as a TV satellite dish. Slot antennas are familiar in the commercial radio world. They're common in TV broadcasting, the skin of aircraft, and in radar, microwave, and cell phone applications. This TV dish (see Figure 1) slot is the complement to a dipole. It is also a great way to learn about slot antennas.



Figure 1 — Note the low visibility of the slot in my modified satellite TV dish.

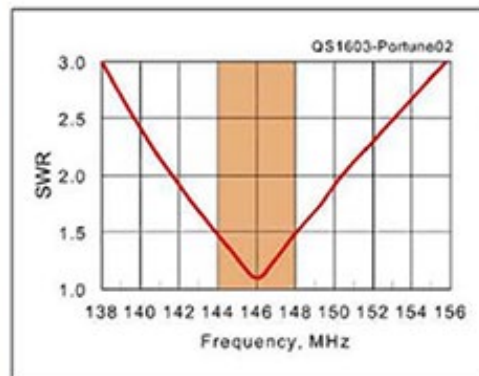
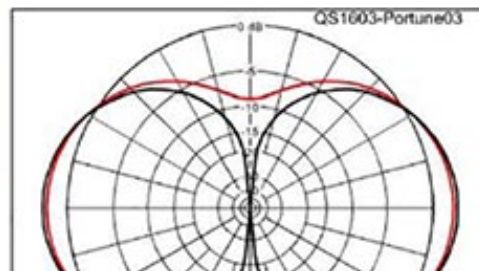


Figure 2 — Bandwidth of a single-saw-blade-cut TV dish slot antenna.



Slot Antennas For Ham Radio



Used a
diplexer to
add 70cm slot

John Portune W6NBC

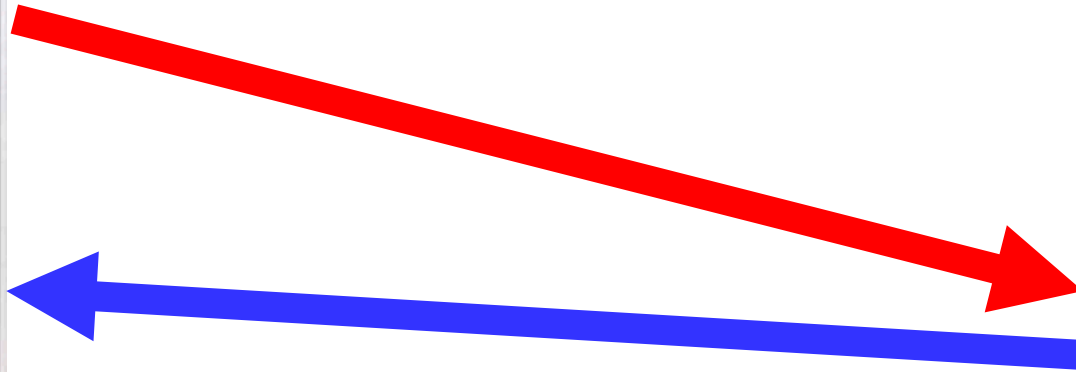
Transmitter



Receiver

DUPLExER

Two different RF devices > one antenna

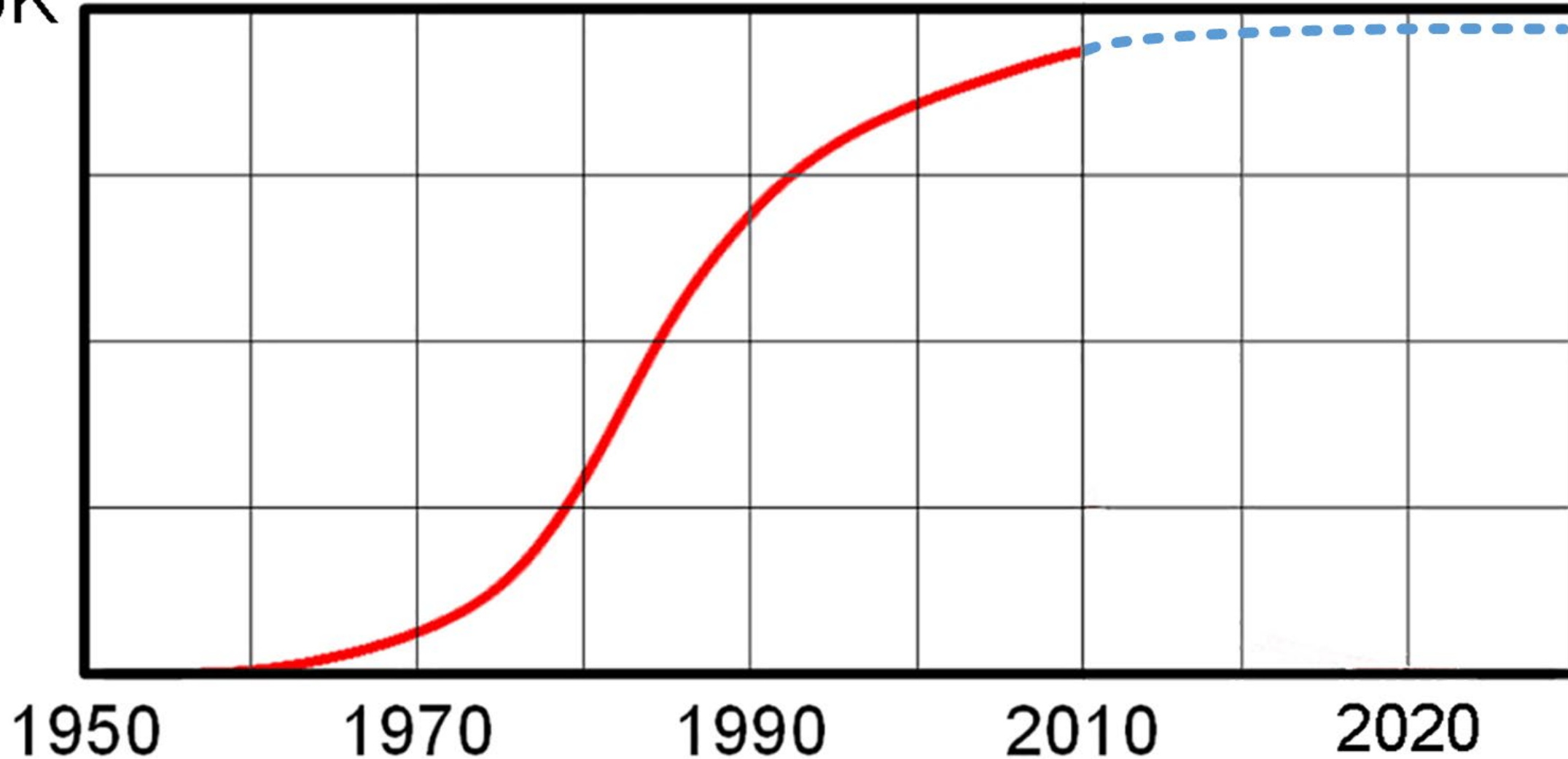




FM Voice Repeaters

US FM Voice Repeaters

35K



Watts	Volts	dBm
0.000000000000000001	0.00000022	-120
0.00000000000000010	0.00000071	-110
0.0000000000000100	0.0000022	-100
0.0000000000001	0.0000071	-90
0.0000000000010	0.000022	-80
0.0000000000100	0.000071	-70
0.000000001	0.00022	-60
0.000000010	0.00071	-50
0.000000100	0.0022	-40
0.000001	0.0071	-30
0.000010	0.022	-20
0.000100	0.071	-10
0.001	0.22	0
0.010	0.71	10
0.100	2.2	20
1	7.1	30
10	22	40
100	71	50

Your Signal in

The Incredible Challenge

dBm reference

Repeater's Signal out

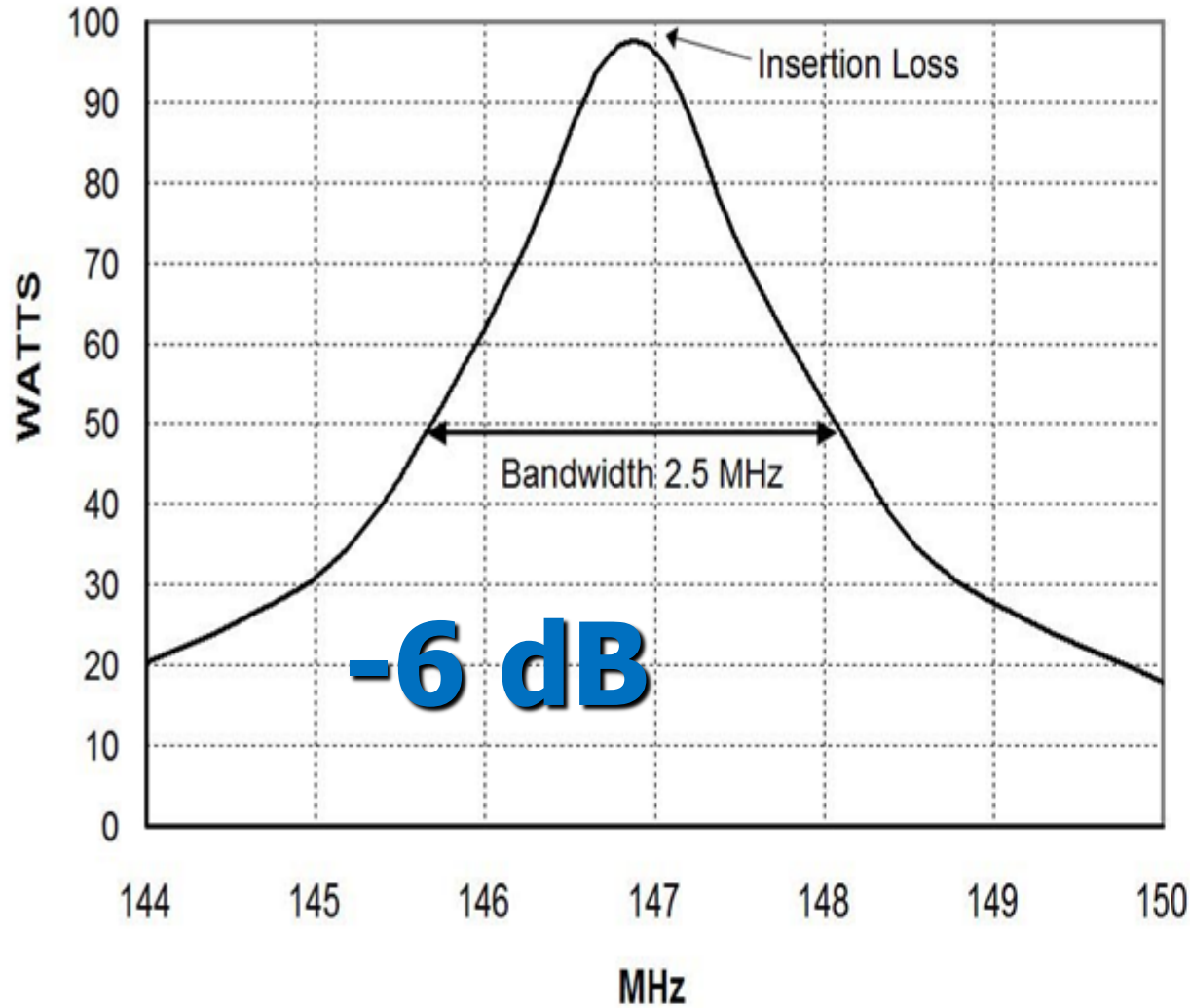
All Done With Filters

Eliminate the
TX > RX "desense"

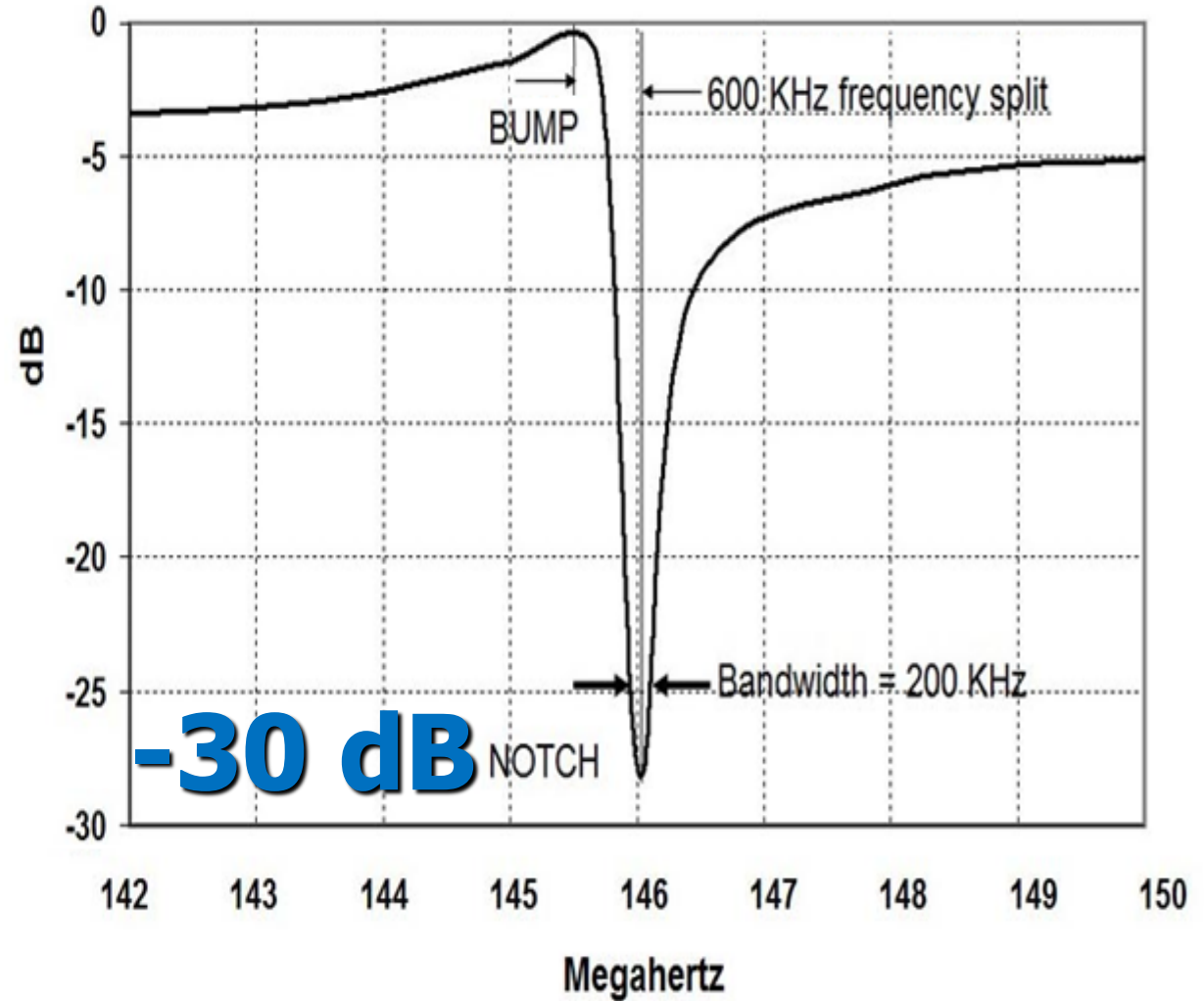
The Duplexer



Bandpass



Notch (suck-out)



Filters

Types and Characteristics



Active



Passive

**Only Passive
Filters can handle
transmitter power**



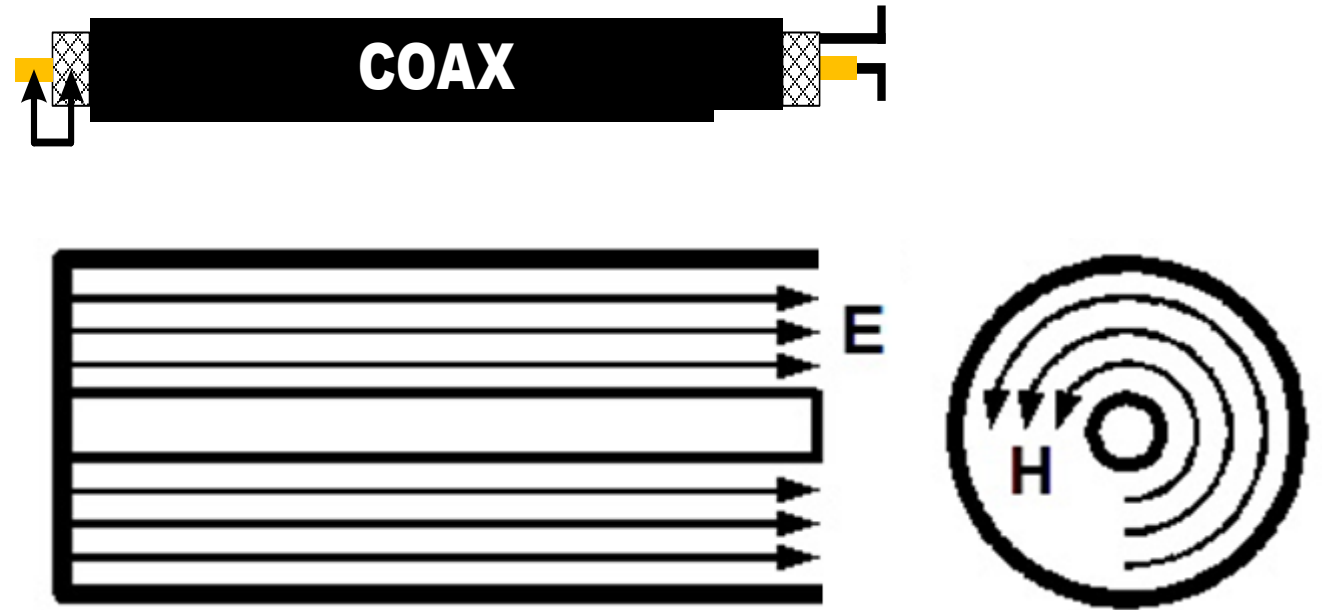
**Light
Power**

**Coils and
Capacitors**

**High Power
Shorted $1/4$
Wavelength Resonant
Cavities**

Resonant Cavities

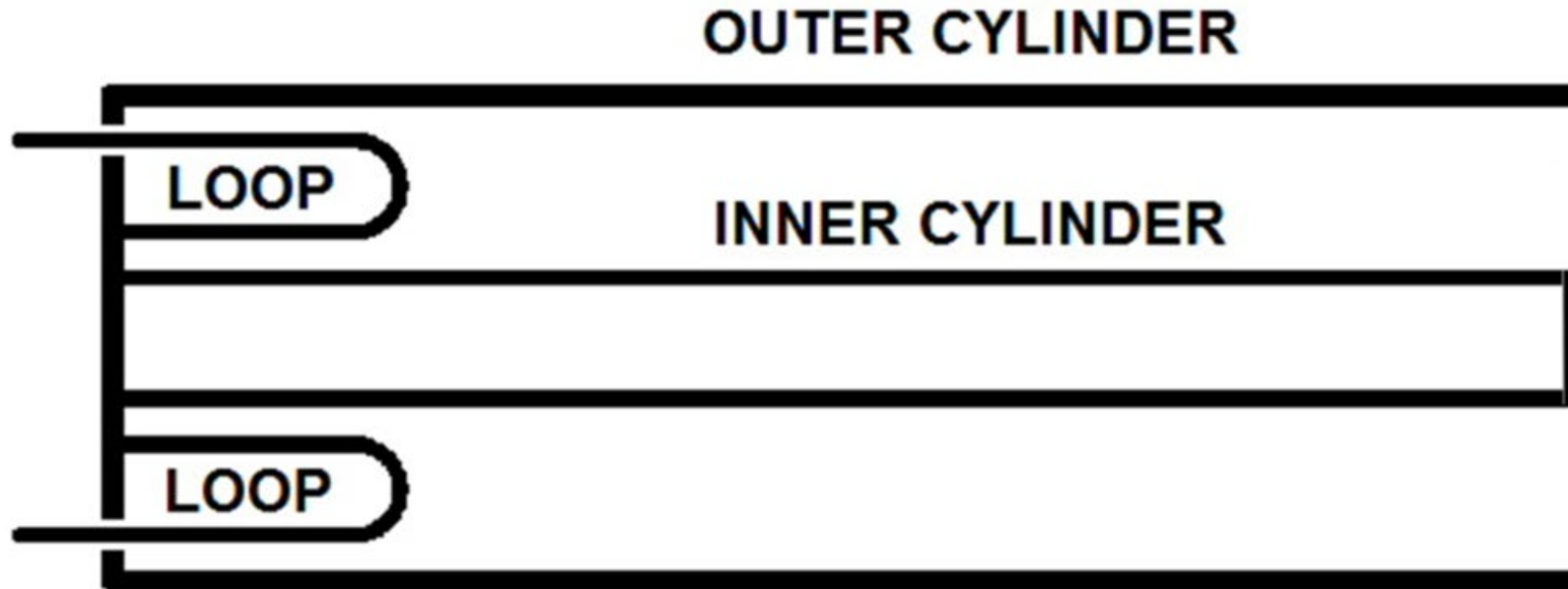
“Bottles
Cans”



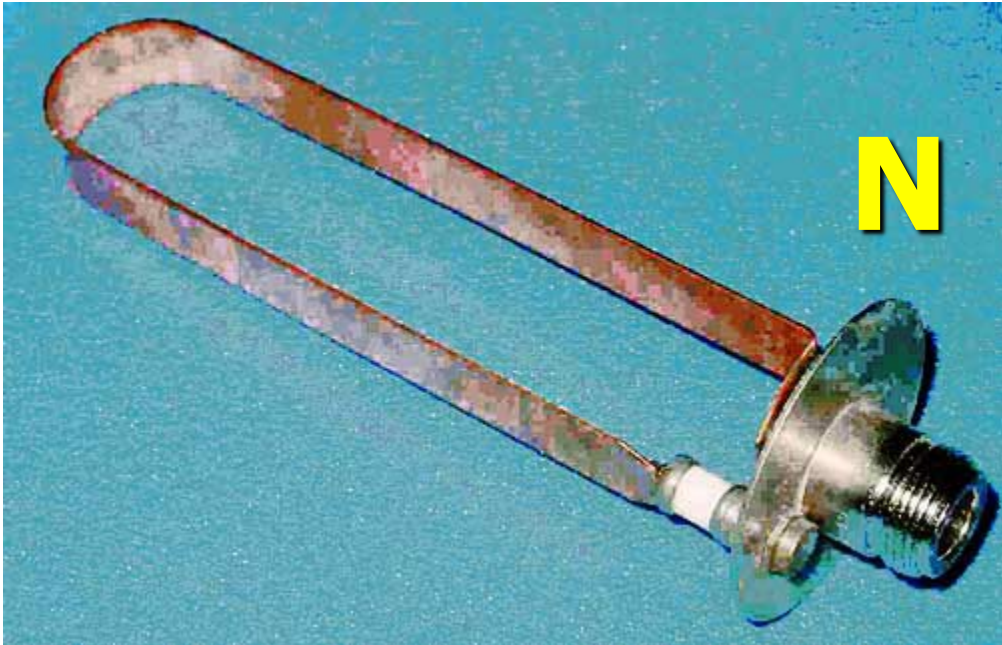
Shorted $\lambda/4$
Coaxial TX Line

Making a Cavity Into a Filter

Series Through Cavity



Magnetic Coupling Loops



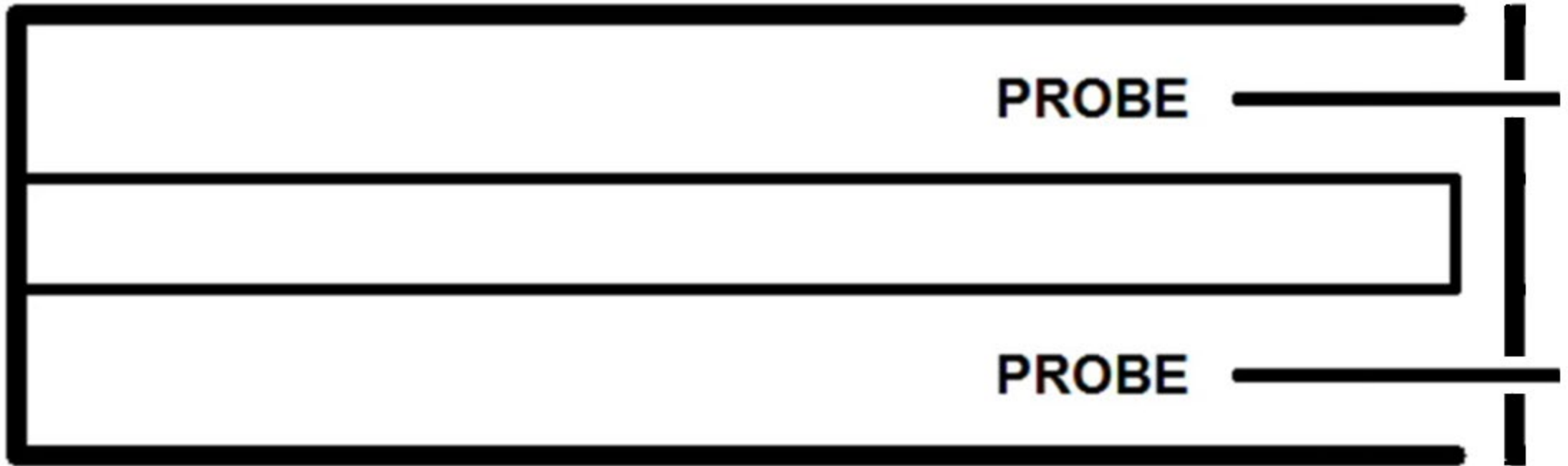
N

BNC

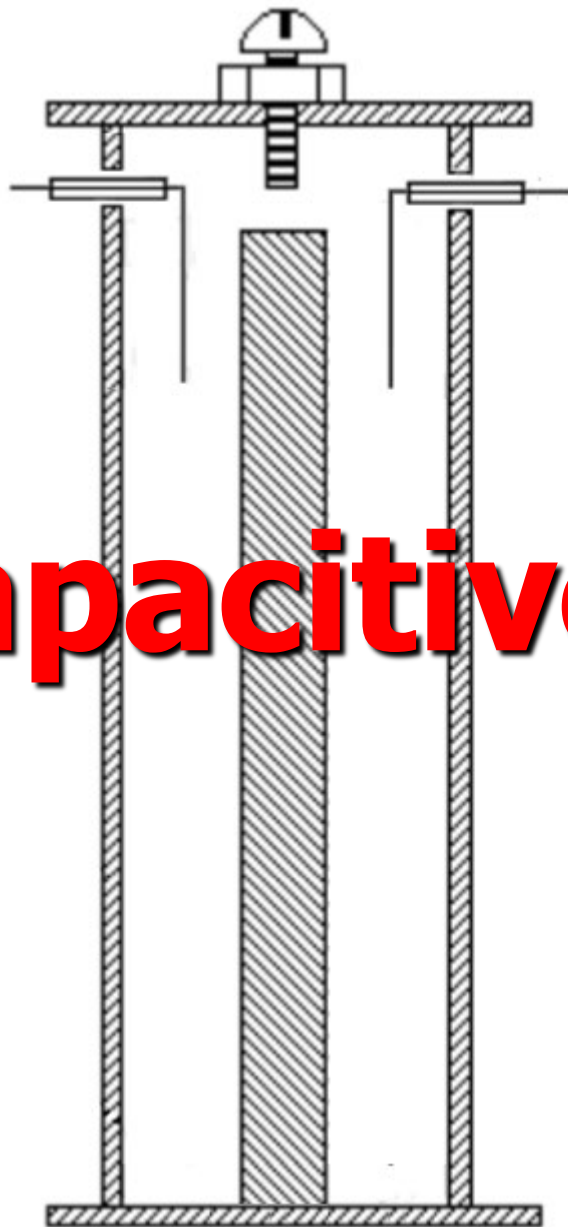


PL239

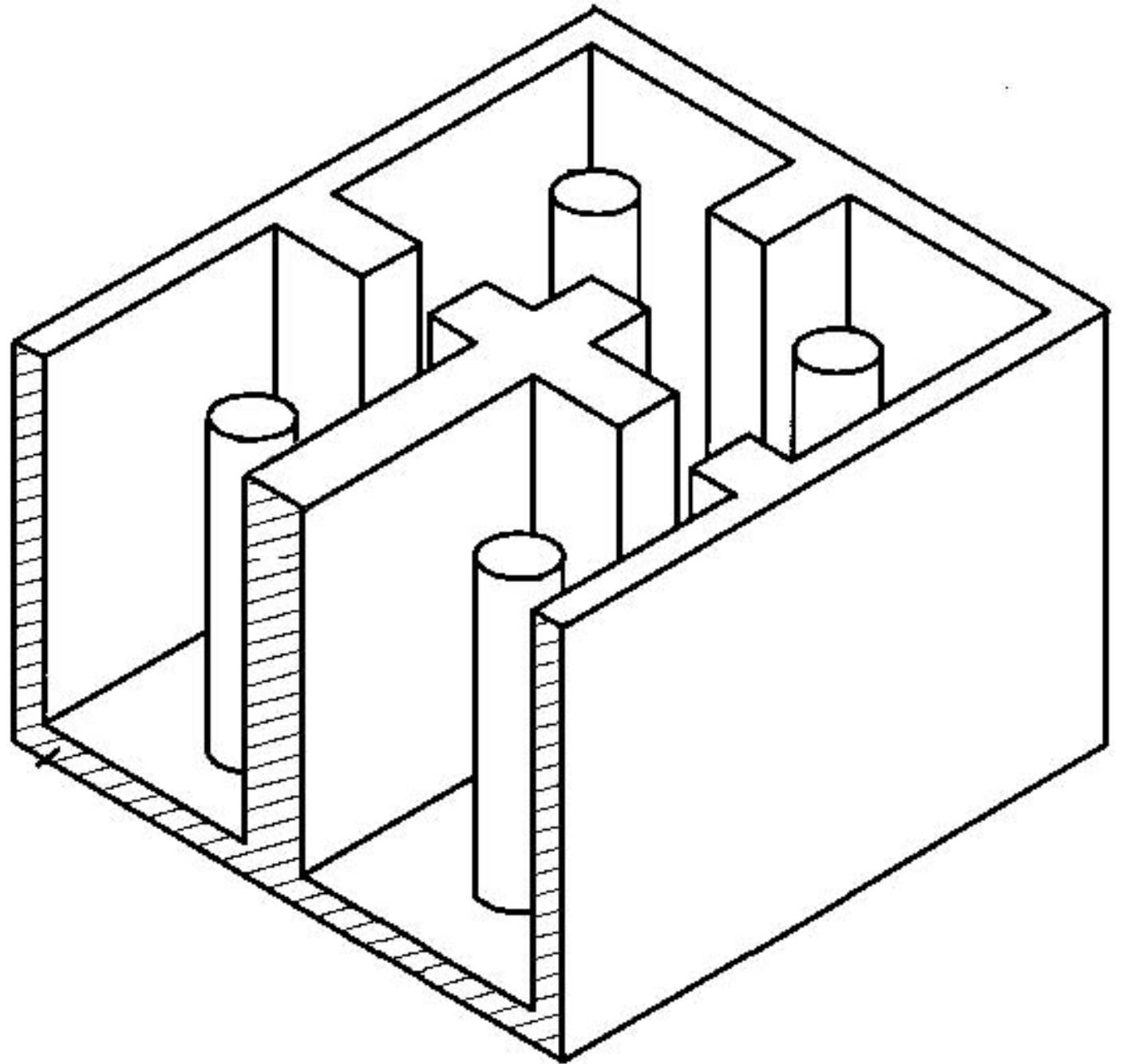
Capacitive Coupling Probes



Capacitive Coupling Probes



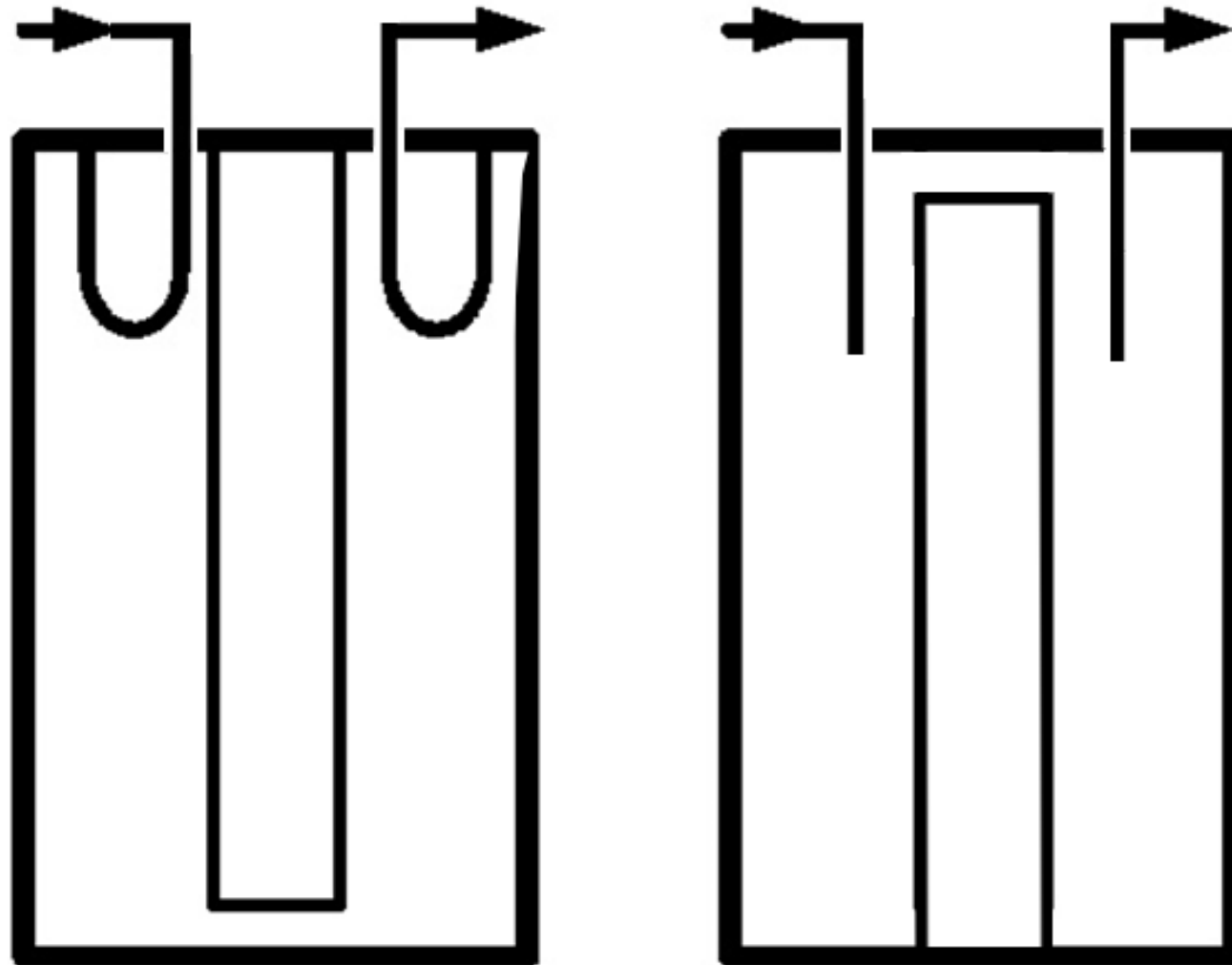
Port Coupling



Making a B_p Cavity

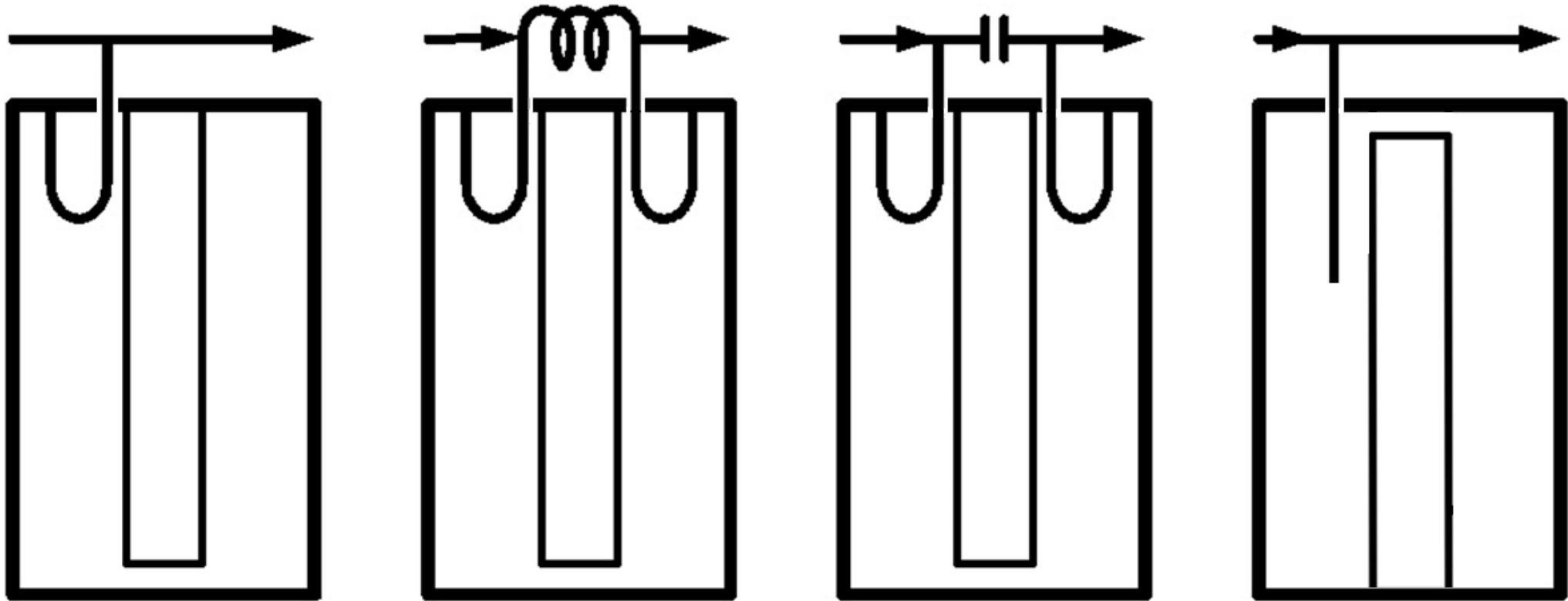
Into a B_R Cavity

Bandpass B_p Series with Line

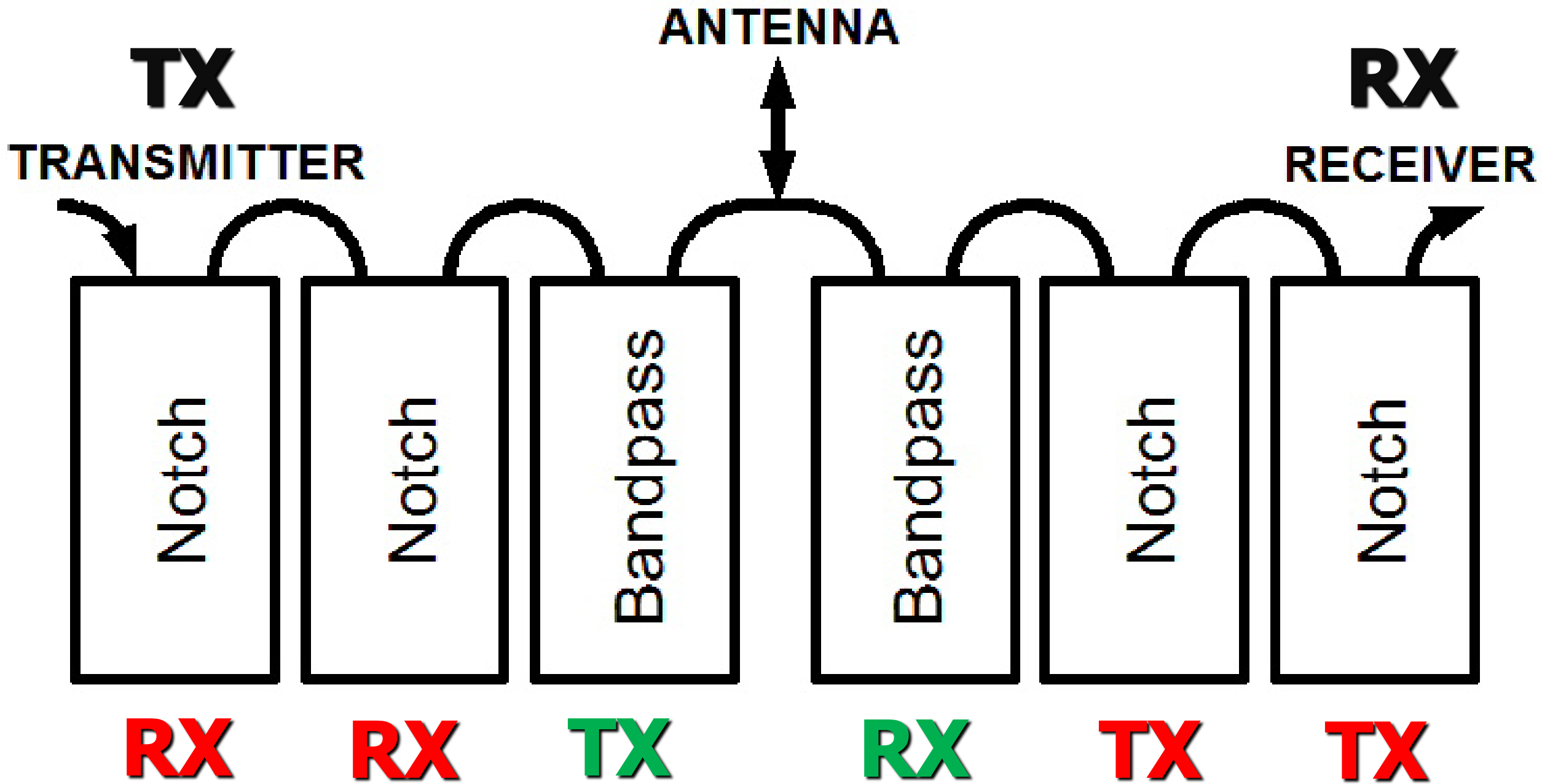


B_R (notch)

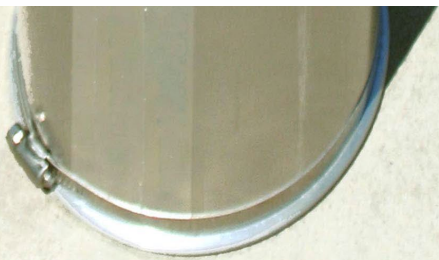
In Parallel with the Line



Cavity Types In a Duplexer

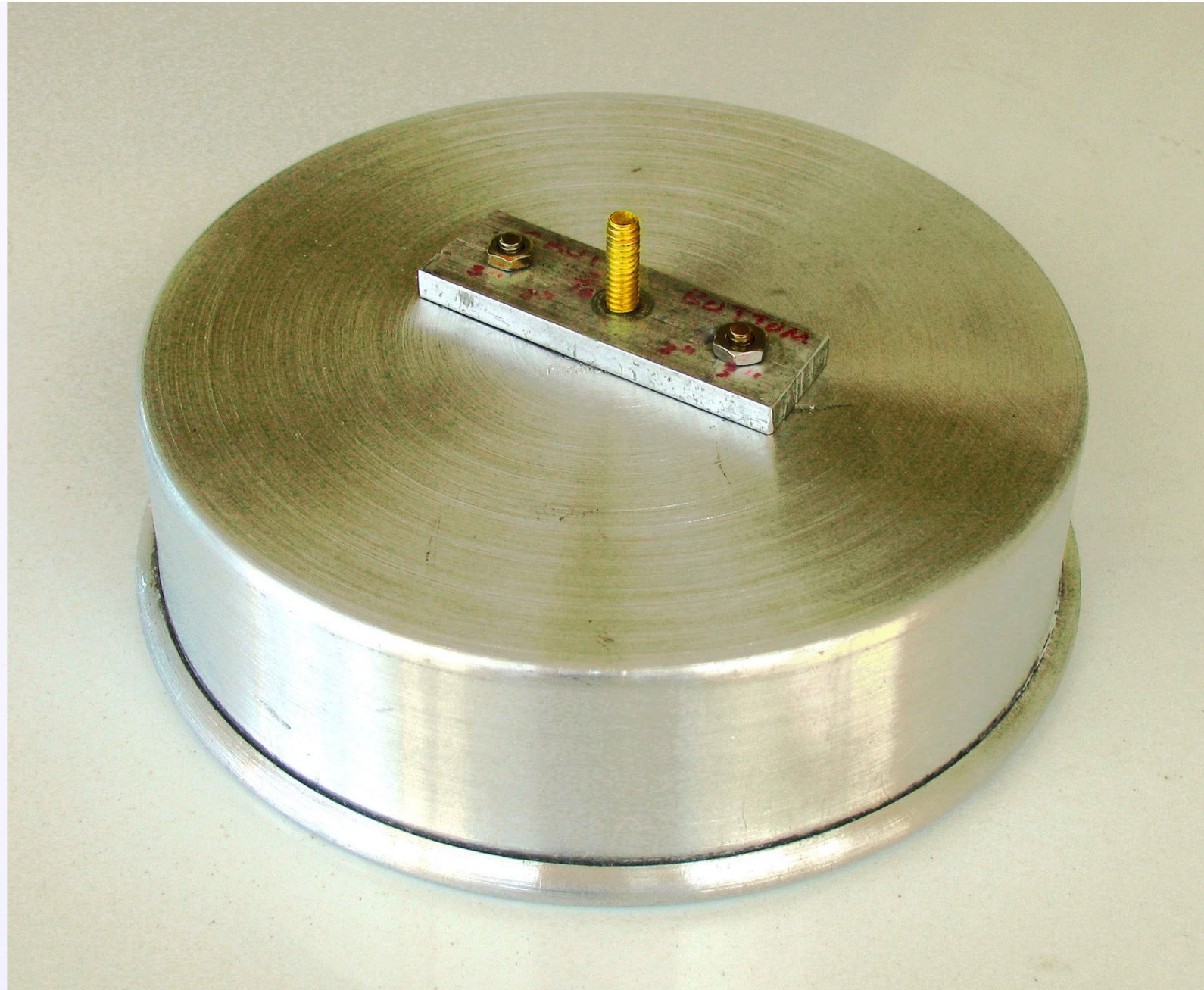
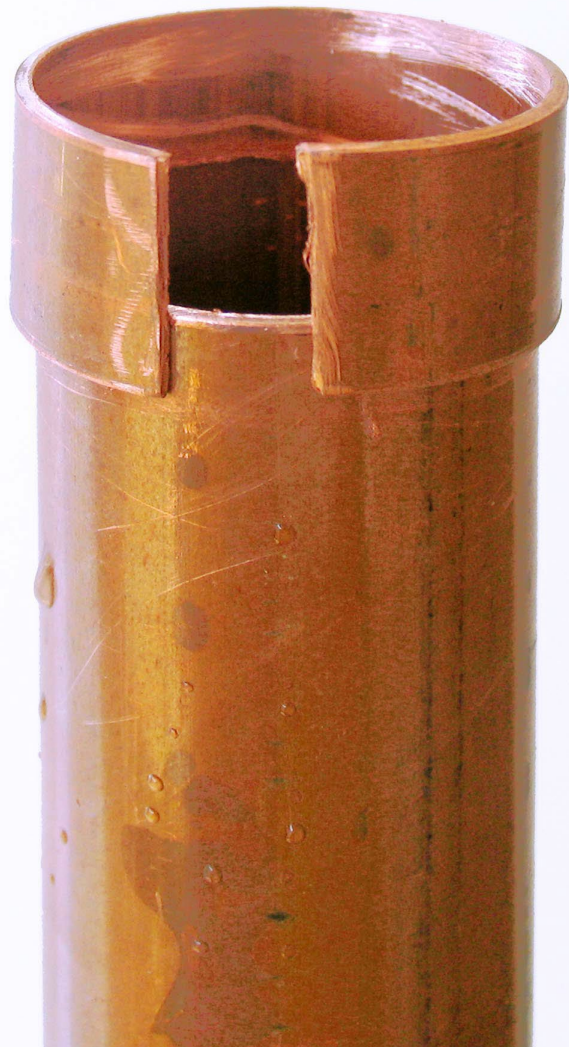


Home-Brew Example



3.6 to 1 ratio







Wilton Performance Pans Aluminum Round Cake Pan, Create Delicious Cakes, Mouthwatering Quiches and More in this Durable, Even-Heating Pan, 6-Inch

[Visit the Wilton Store](#)



2,032 ratings

Amazon's Choice

for "6 inch cake pans"

\$6⁶⁴



AMERIMAX HOME PRODUCTS 66314 14-Inch x 10-Foot Aluminum Flashing

Visit the Amerimax Home Products Store

★★★★★ 124 ratings



for the Amazon Business

with free Prime shipping

minum

s

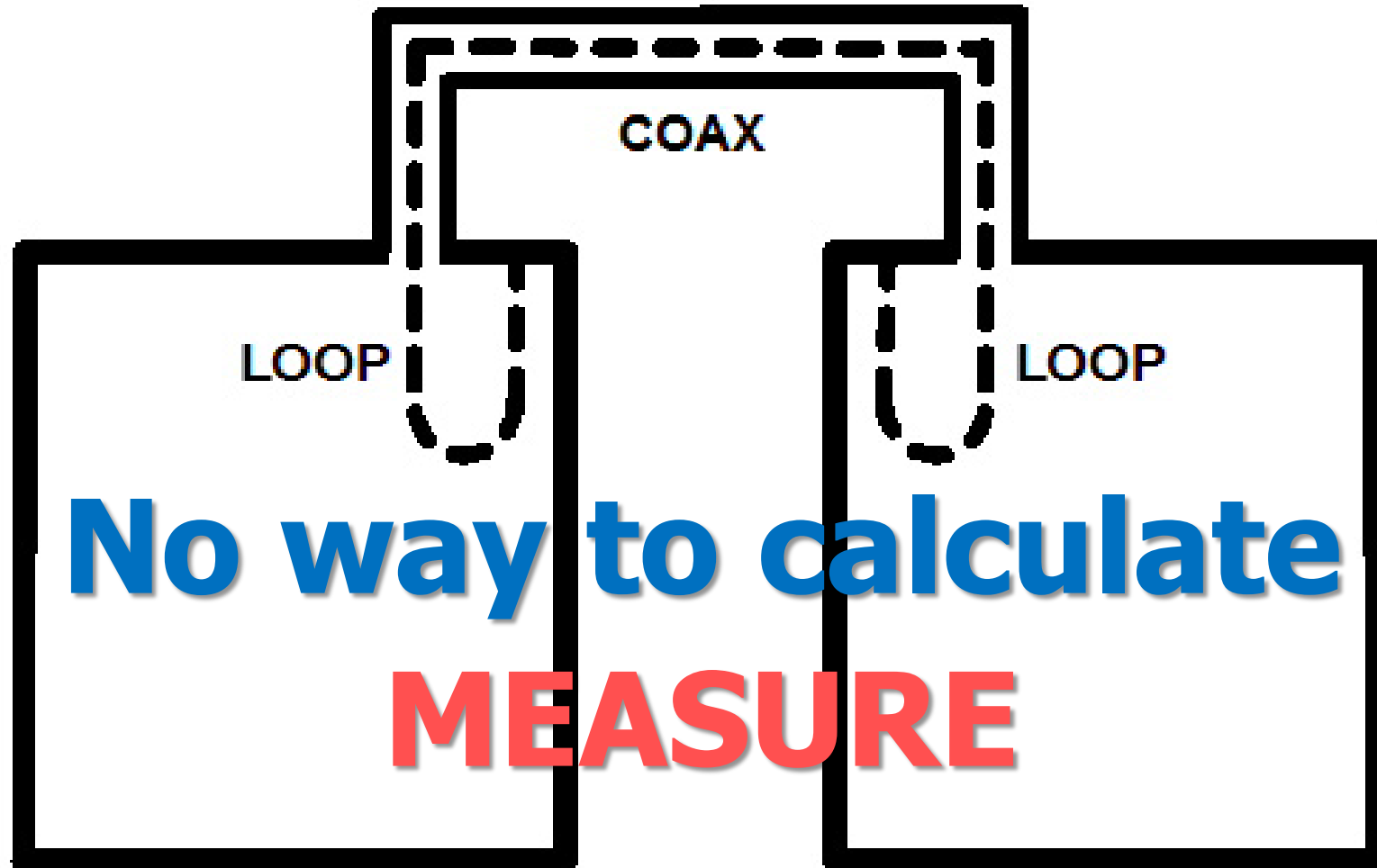
minum

Inter-Cavity

Coax

Retuning Commercial Duplexers

---> Total = Half Wavelength



**No way to calculate
MEASURE**



**Small
Increments
to $\lambda/2$**

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DØGGY

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"That's all Folks!"