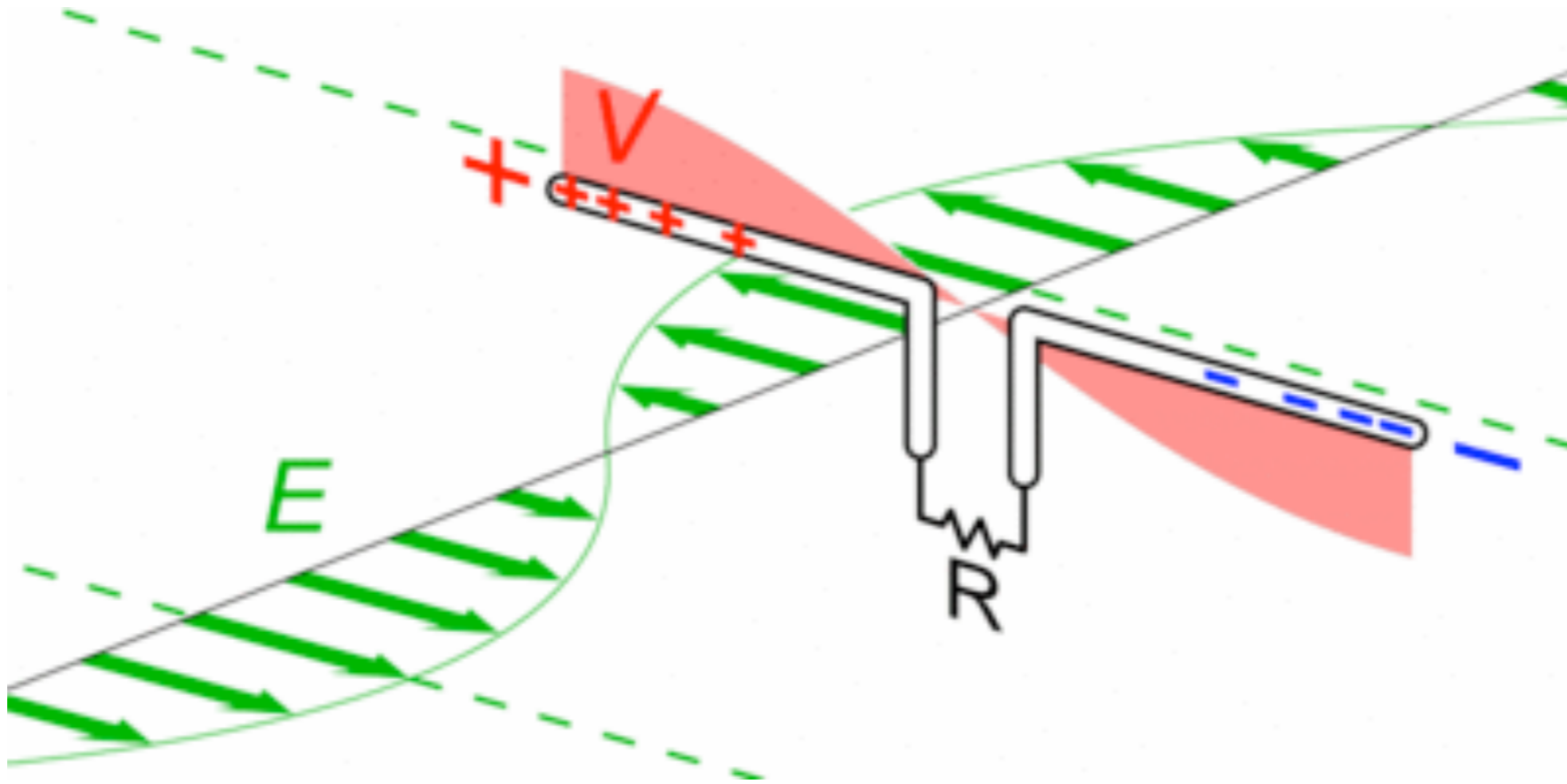


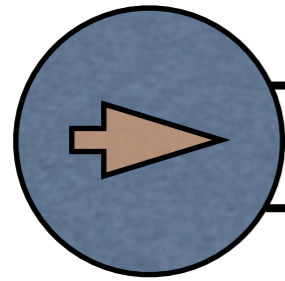
S W R (VSWR)

OUTLINE

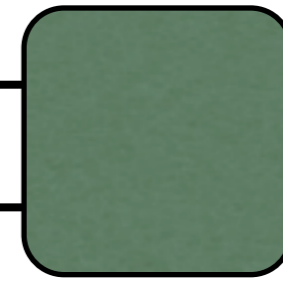
- * ANTENNA AS A LOAD, RESONANCE AND NON-RESONANCE IMPEDANCE
- * DEFINING S W R
- * HOW DOES POOR SWR AFFECT THE ANTENNA PERFORMANCE
- * HOW CAN WE MEASURE SWR
- * MATCHING A NOT-PERFECT ANTENNA USING A “tuner”
- * WHAT A “tuner” does
- * Tuner EXMPLES



Antenna presents a resistive load only at “Resonance”

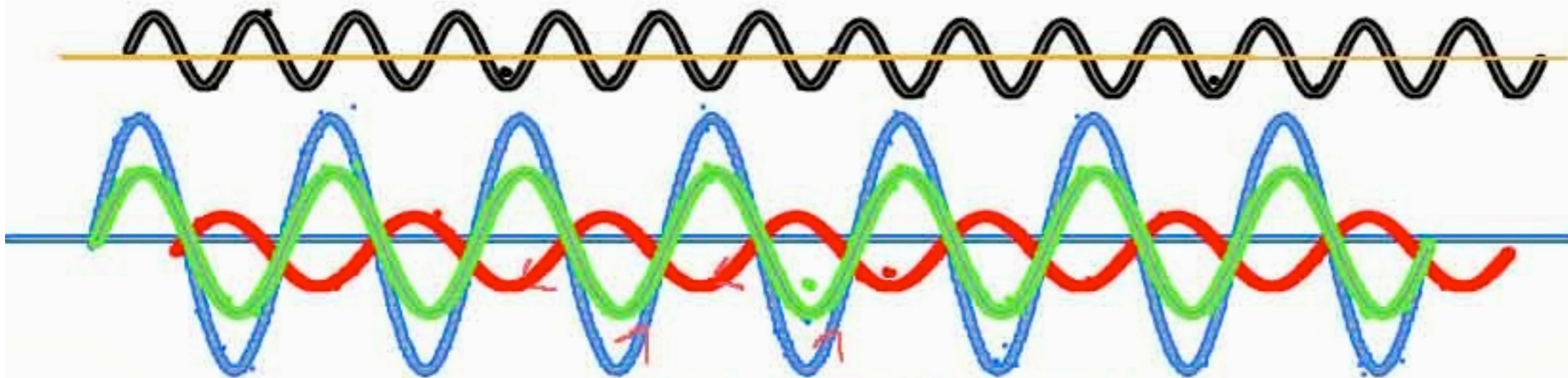


Source
Generator



Load
Antenna

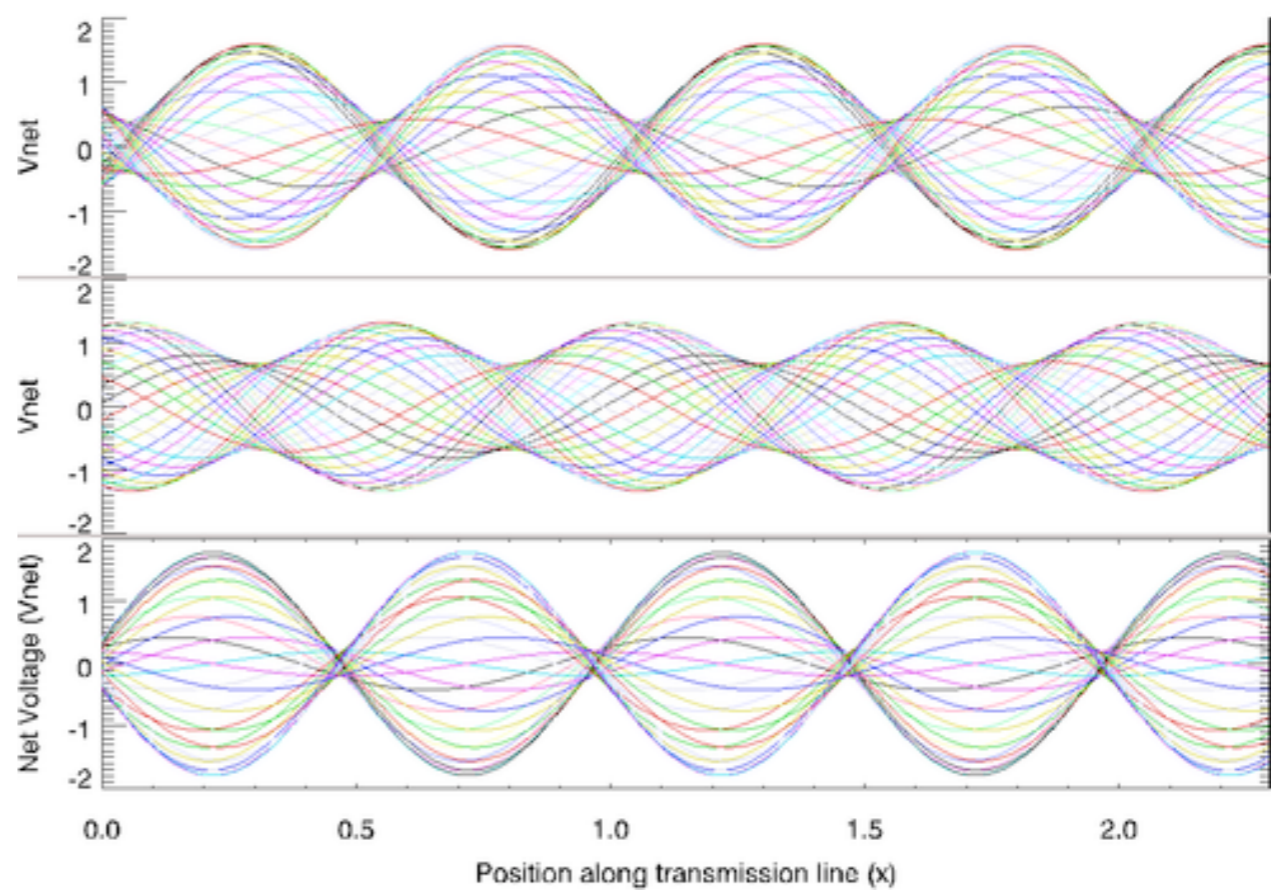
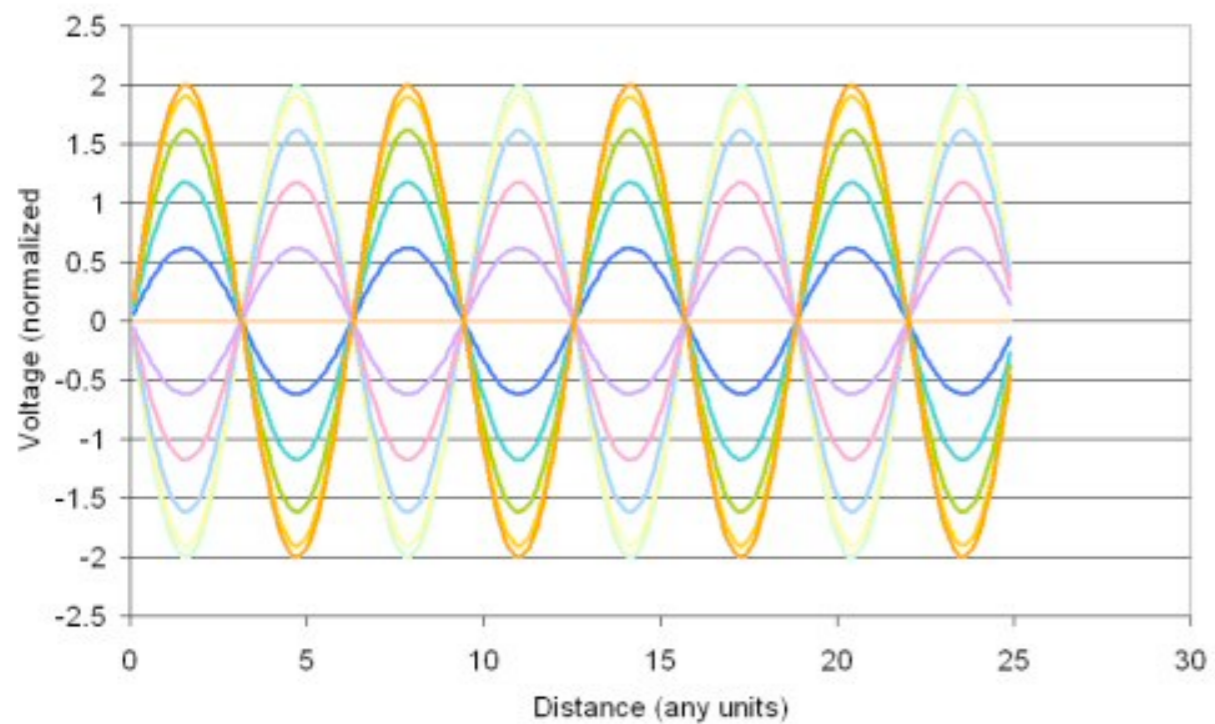
Understanding of VSWR



Blue: Forward wave
Red: Reflected wave
Green: composite wave
Black: Standing wave

By online-telecom-exhibition.blogspot.com

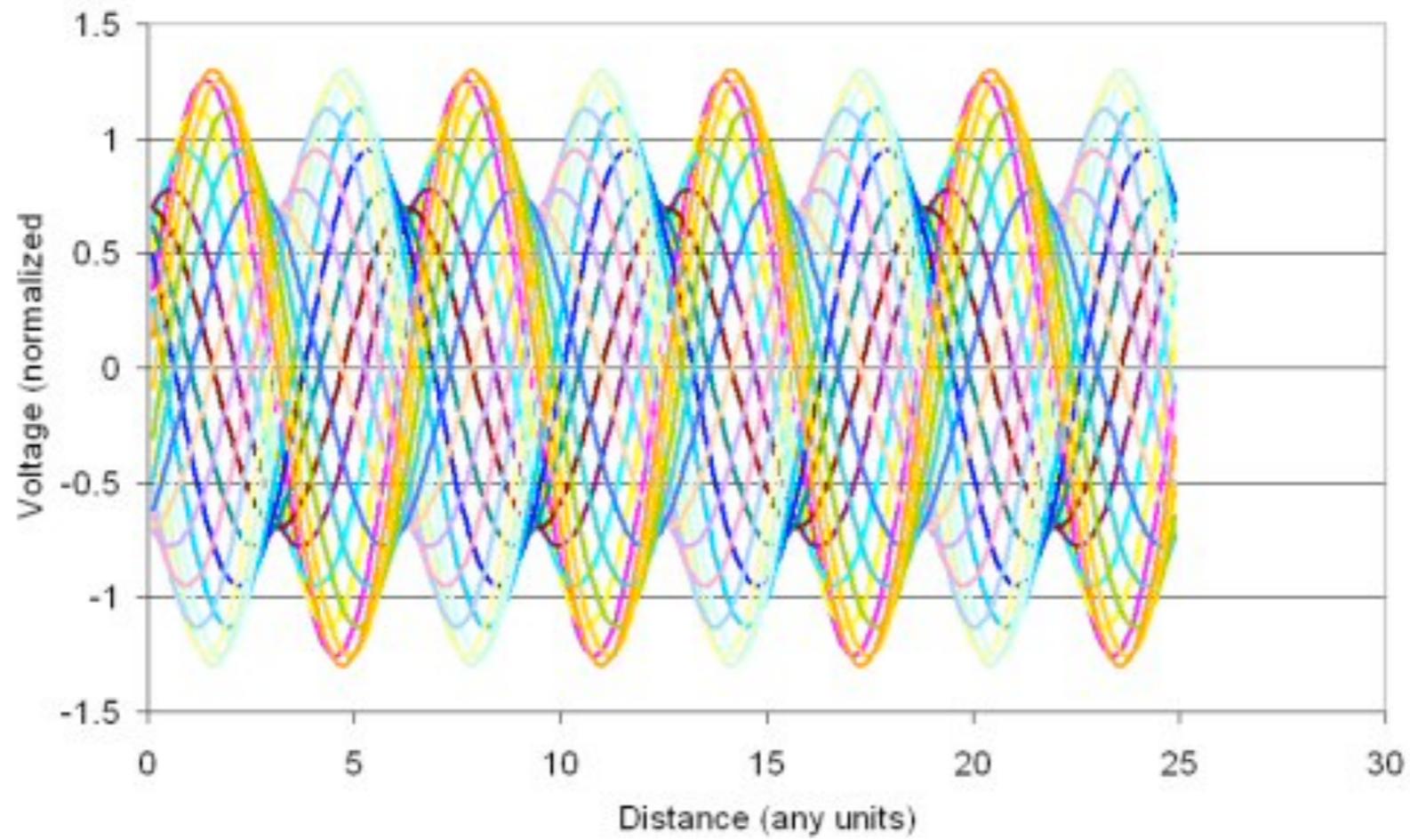
Composite voltage at different times



Affect of SWR on the signals

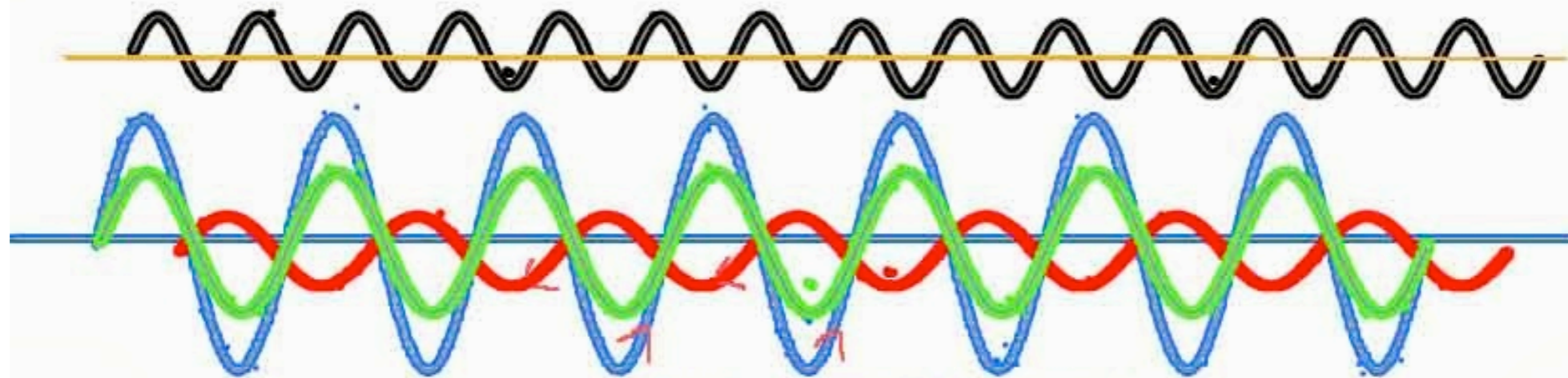
VSWR	Return Loss (dB)	Reflected Power (%)
1:1	∞	0
1.1:1	26.44	0.228
1.2:1	20.83	0.816
1.3:1	17.69	1.71
1.4:1	15.56	2.78
1.5:1	13.98	4
1.6:1	12.74	5.5
1.7:1	11.73	6.8
1.8:1	10.88	8.2
1.9:1	10.16	9.6
2.0:1	9.54	11
3.0:1	6.02	24.9
4.0:1	4.44	36
5.0:1	3.52	44.4
6.0:1	2.92	50.8
∞:1	0	100

Composite voltage at different times



BUT HOW CAN WE MEASURE THIS???

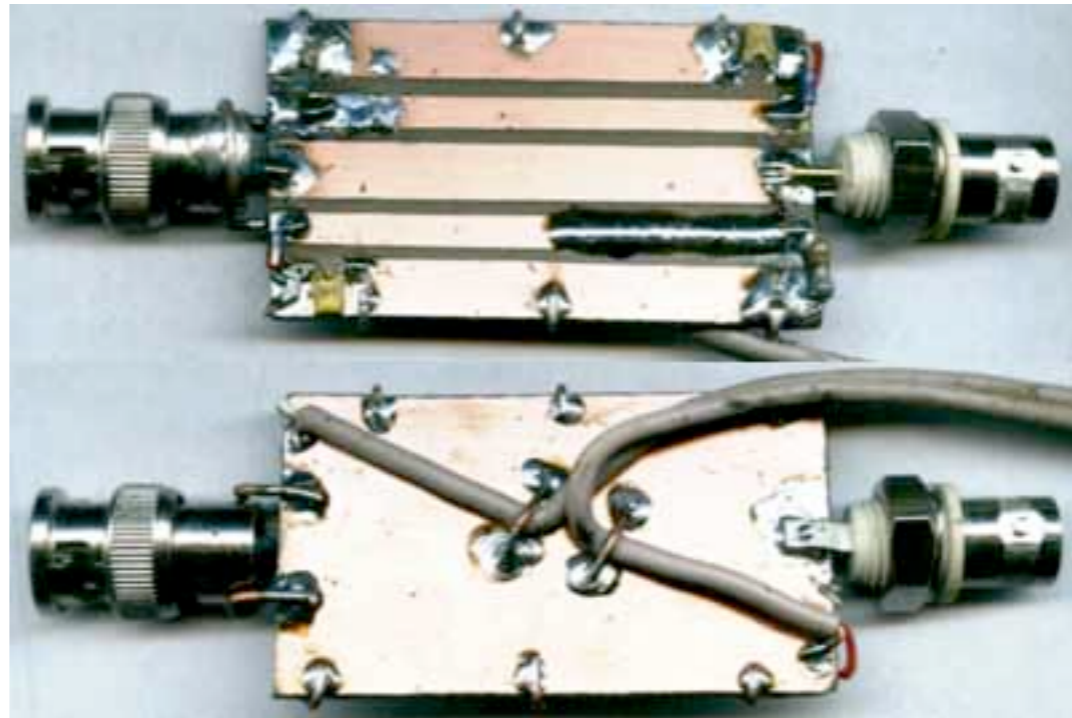
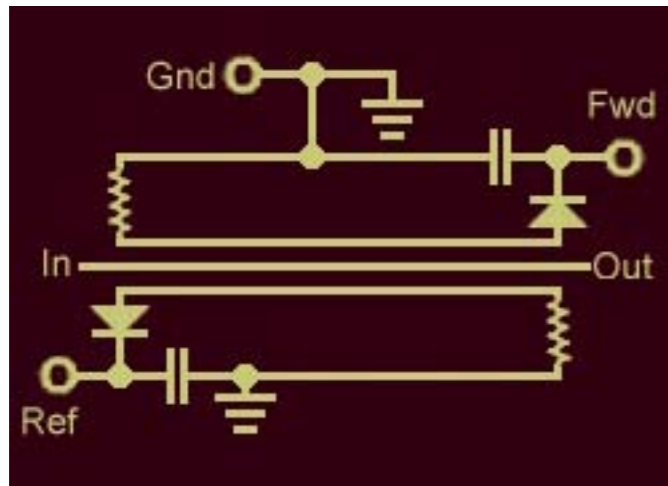
Understanding of VSWR

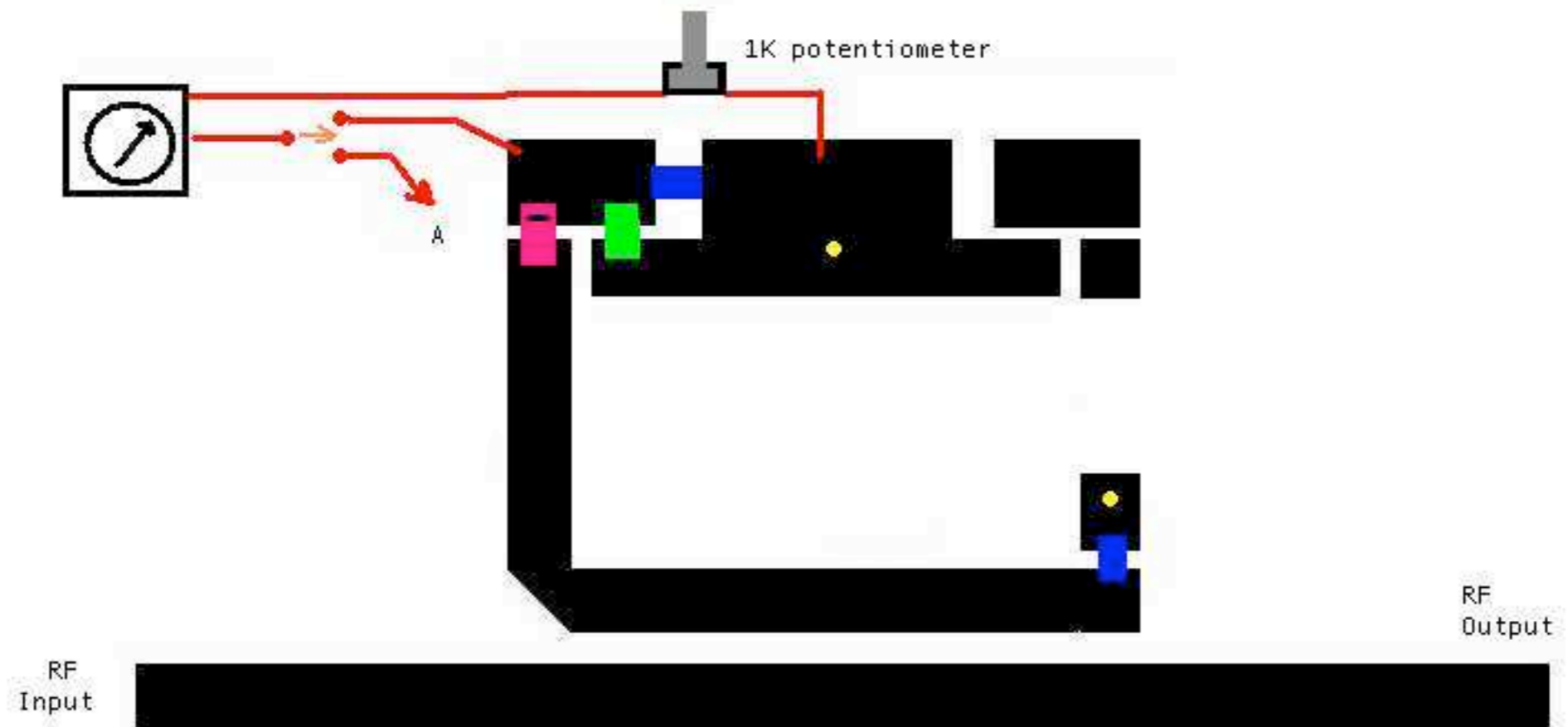


Blue: Forward wave
Red: Reflected wave
Green: composite wave
Black: Standing wave

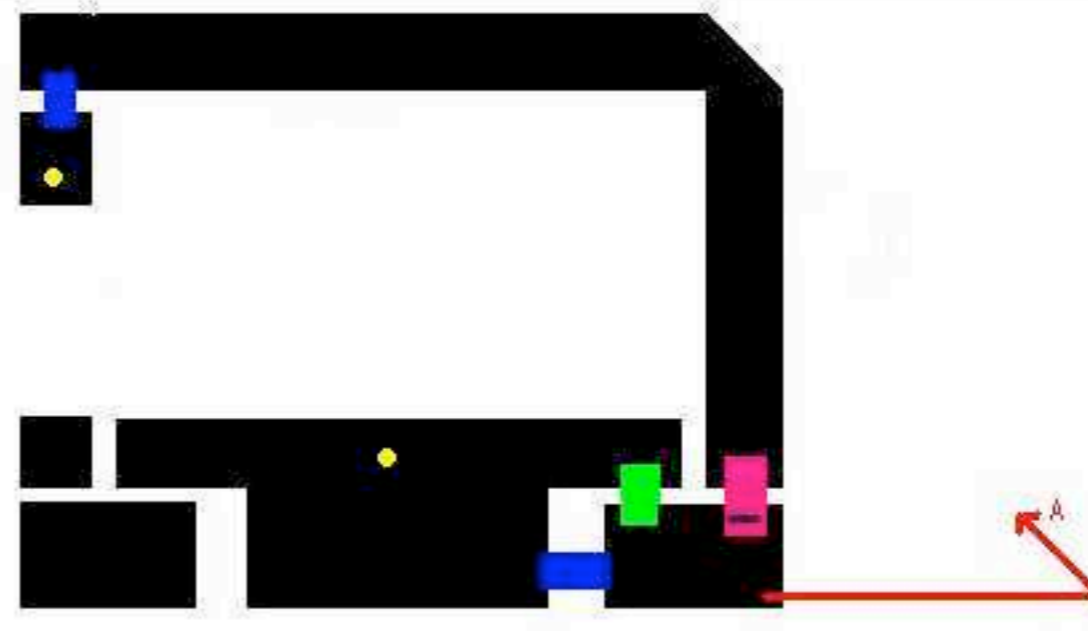
By online-telecom-exhibition.blogspot.com

$$VSWR = \frac{1 + \sqrt{\frac{P_{wr} \text{ Reflected}}{P_{wr} \text{ Forward}}}}{1 - \sqrt{\frac{P_{wr} \text{ Reflected}}{P_{wr} \text{ Forward}}}}$$





-  Diode
-  Resistors
-  Capacitors
-  Earth hole

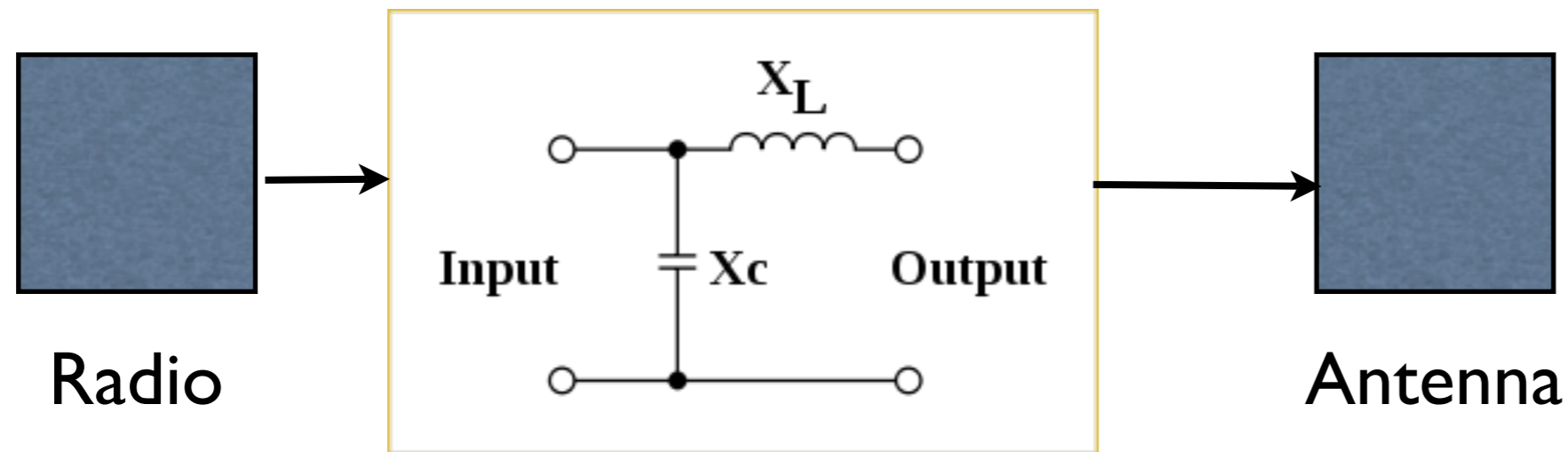


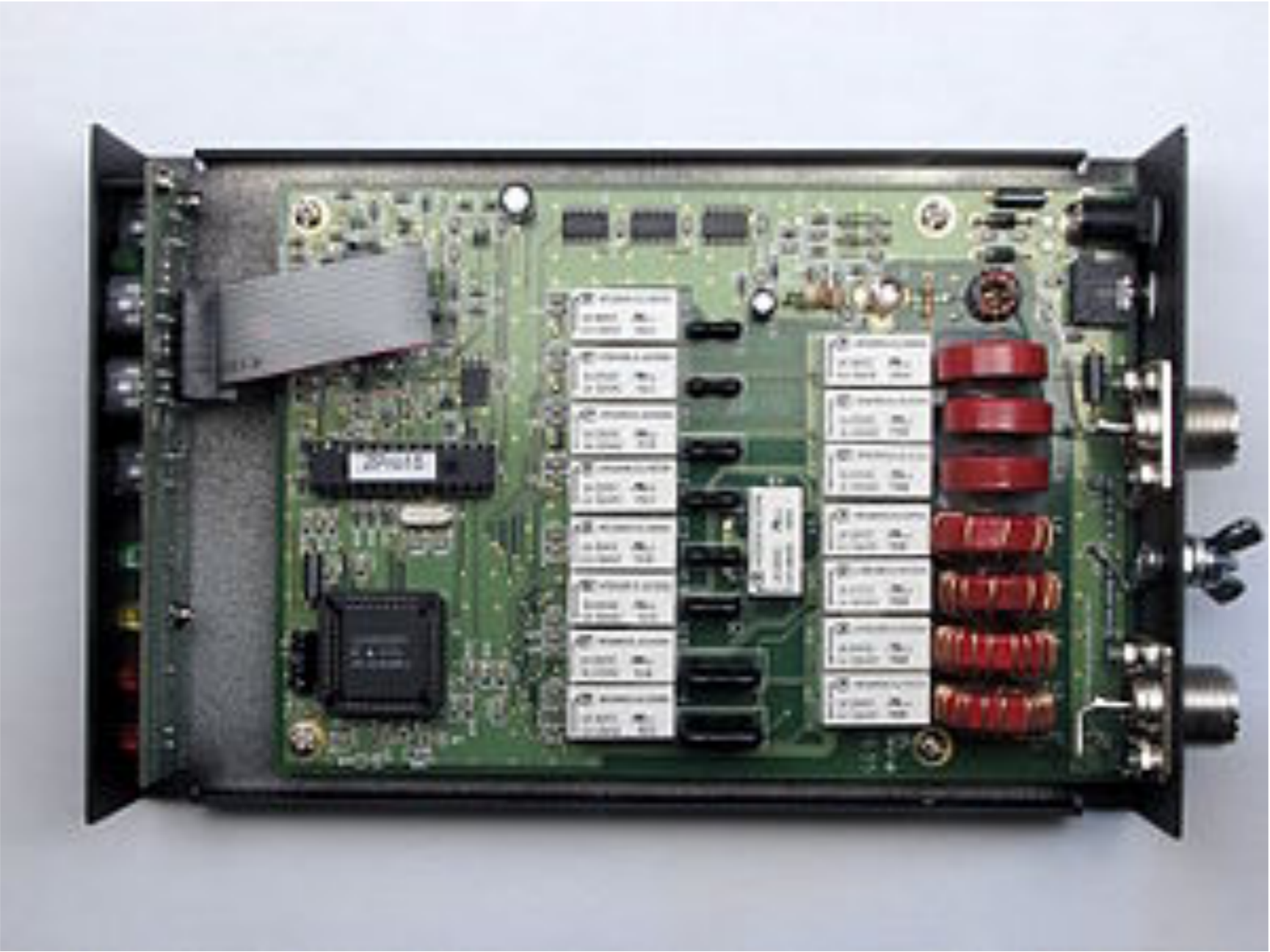




Matching Device

- * The antenna is not changed by the “tuner”.
- * The antenna is what it is.
- * The “tuner” is an impedance converter.
- * The “tuner” inserts C and/or L to show the radio 50 Ohms.





SWR references

<http://vk5ajl.com/projects/SWRMeter.php>

https://en.wikipedia.org/wiki/Standing_wave_ratio

https://en.wikipedia.org/wiki/Dipole_antenna

http://web.mit.edu/6.013_book/www/chapter14/14.6.html

https://en.wikipedia.org/wiki/Antenna_tuner

Search “define SWR”