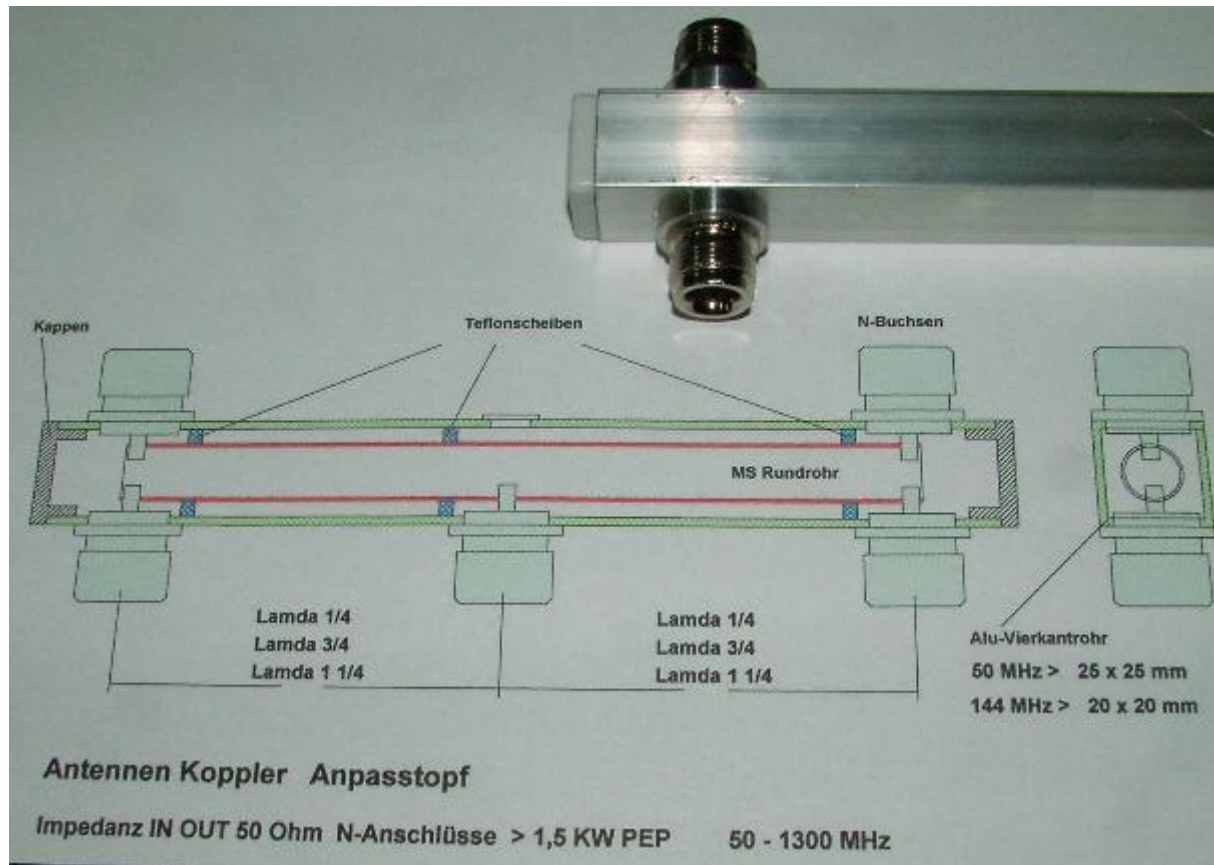
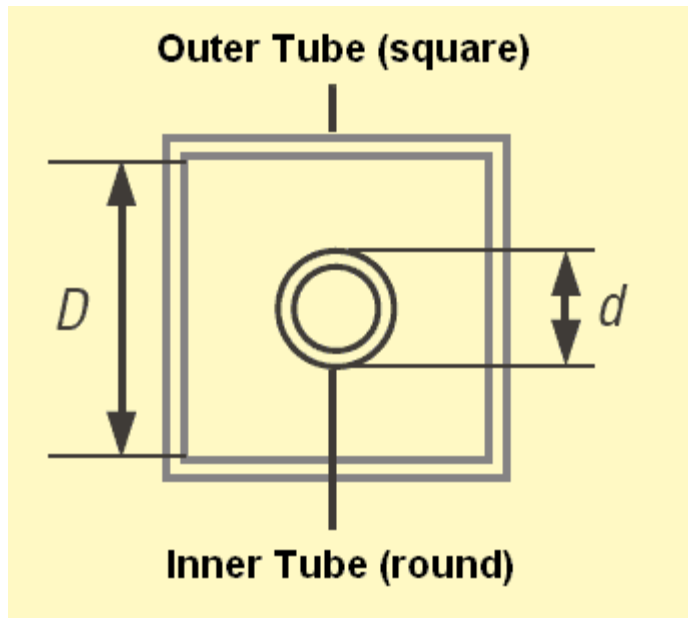


Stacking with homemade Power Splitters (DK7ZB)





Splitters available by DJ3MF, e-mail: kh-druecker@onlinehome.de



The basis of the power splitters/combiners is a construction of a square tube for the outer conductor and a round tube for the inner conductor. It forms a quarterwave coaxial impedance transformer.

The relation D/d influences the resistance/impedance of the splitter.

As with the stacking by coax-cables the impedance transformation will be made with lengths of $\lambda/4$.

A halvewave-splitter consists of two quarterwave-splitters in parallel.

A very good tool to construct power splitters is the program "AppCad". The program is freeware, download at <http://www.hp.woodshot.com>

AppCAD - [Square Coax] _ □ ×

File Calculate Select Parameters Options Help Main Menu [F8]

Square Coax

Dielectric: $\epsilon_r =$

Frequency:

Length Units:

Z0 = Ω

Elect Length = λ

Elect Length =

1.0 Wavelength = mm

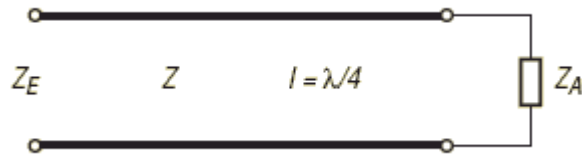
Vp = fraction of c

D1/D2 =

Normal Click for Web: APPLICATION NOTES - MODELS - DESIGN TIPS - DATA SHEETS - S-PARAMETERS

This is a screenshot of "AppCad", you can calculate all parameters for the construction of a power splitter.

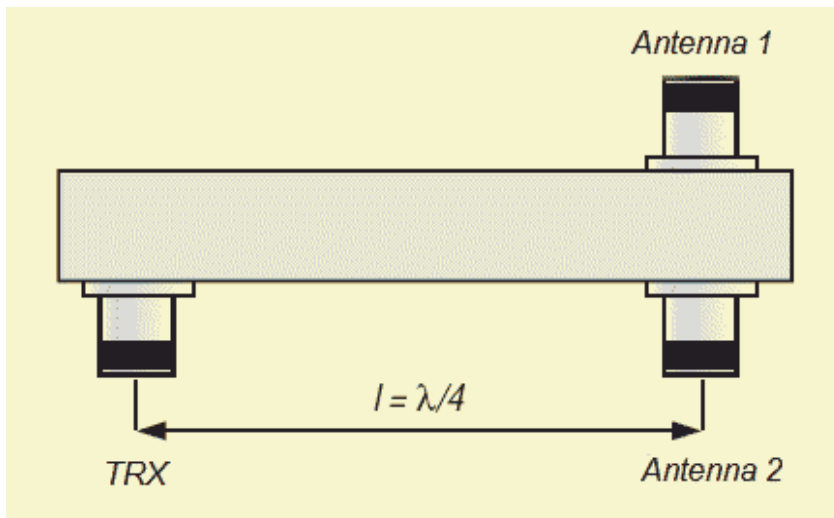




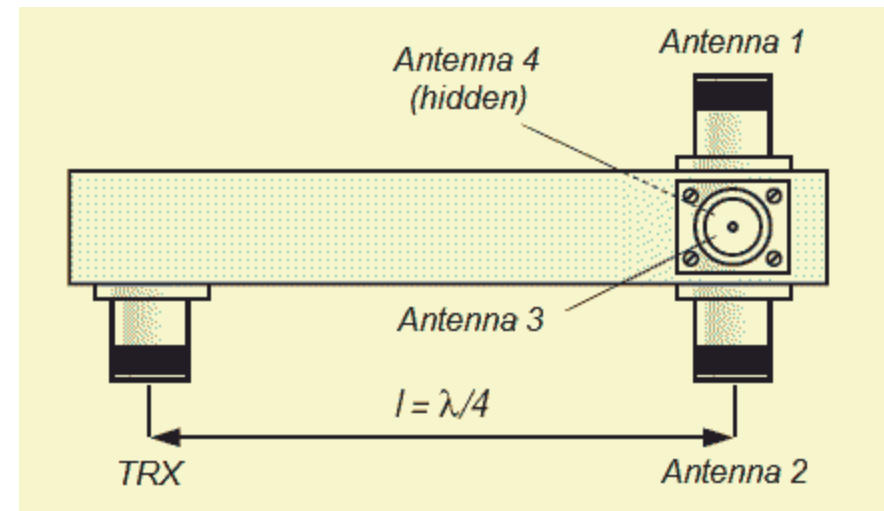
$$Z_E = Z_0^2 / Z_A$$

$Z = Z_0$ (see AppCad)

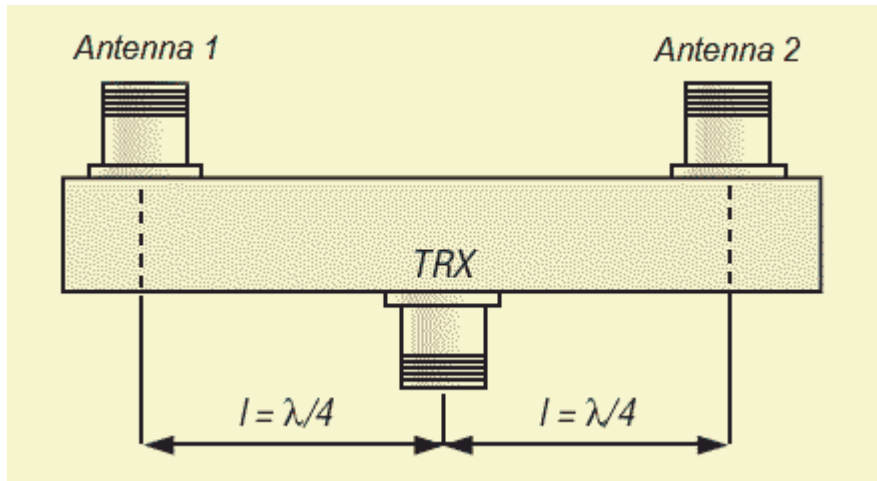
Types of power splitters



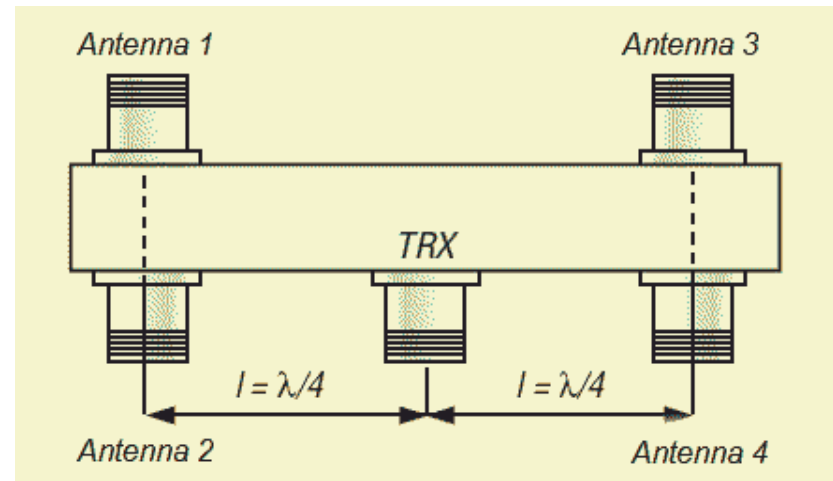
The $\lambda/4$ -power splitter (2-way) = Type 1a



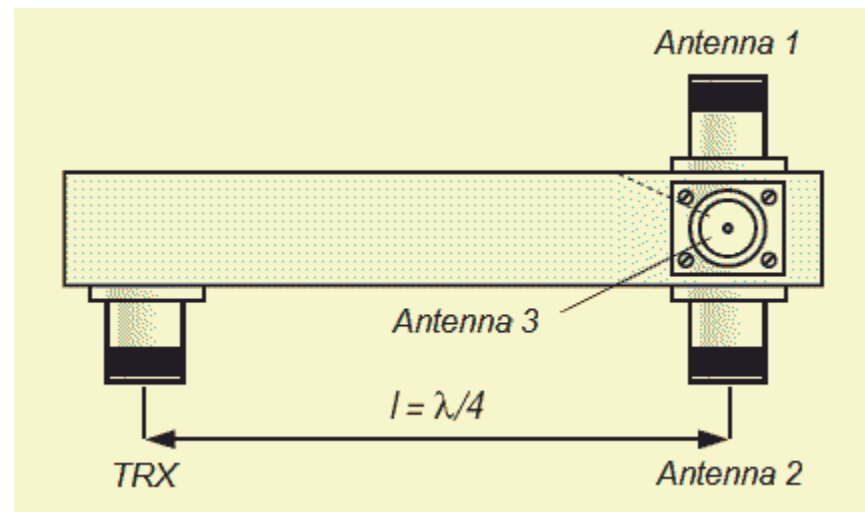
The $\lambda/4$ -power splitter (4-way) = Type 1b



The $\lambda/2$ -powersplitter (2-way) = Type 2a



The $\lambda/2$ -powersplitter (4-way) = Type 2b



The $\lambda/4$ -power splitter (3-way)= Type 1c

Attributes of the Power Splitters

Type	Ways	Length	Z_E	Z_A	Z_0
------	------	--------	-------	-------	-------

1a	2x	$\lambda/4$	25 Ω	50 Ω	35,4 Ω
1b	4x	$\lambda/4$	12,5 Ω	50 Ω	25 Ω
2a	2x	$\lambda/2$	50 Ω	100 Ω	70,7 Ω
2b	4x	$\lambda/2$	25 Ω	100 Ω	50 Ω

Lengths of the inner Tubes (d) for the Bands 2m, 70cm and 23cm

Amateurband	Principle	Length inner tube
2 m	$\lambda/4$	520 mm
70 cm	$\lambda/4$	173 mm
23 cm	$3\lambda/4$	189 mm

What dimensions you use for D and d depends on the sources you have in your country.

Use AppCad to calculate suitable power splitters. For Germany I have some combinations in the tables:

Table 1: $\lambda/4$ -Splitter , 2-way, Type 1a, needed Z=35,4 Ω

Type	Square	Inner (D)	Round Tube (d)	Z
1a	30x2 mm	26 mm	15,5 mm	35,6 Ω
1a	29,5x2,4 mm	24,7 mm	15 mm	34,4 Ω
1a	23,5x1,5 mm	20,5 mm	12 mm	36,6 Ω
1a	19,5x1,5 mm	16,5 mm	10 mm	34,6 Ω
1a	30x2 mm	26 mm	15 mm	37,5

Table 2: $\lambda/4$ -Splitter , 4-way, Type 1b, needed Z=25,0 Ω

Type	Square	Inner (D)	Round Tube (d)	Z
1b	25x2 mm	21 mm	15 mm	24,7 Ω
1b	19,5x1,5 mm	16,5 mm	12 mm	23,7 Ω

Table 3: $\lambda/2$ -Splitter , 2-way, Type 2a, needed Z=70,7 Ω

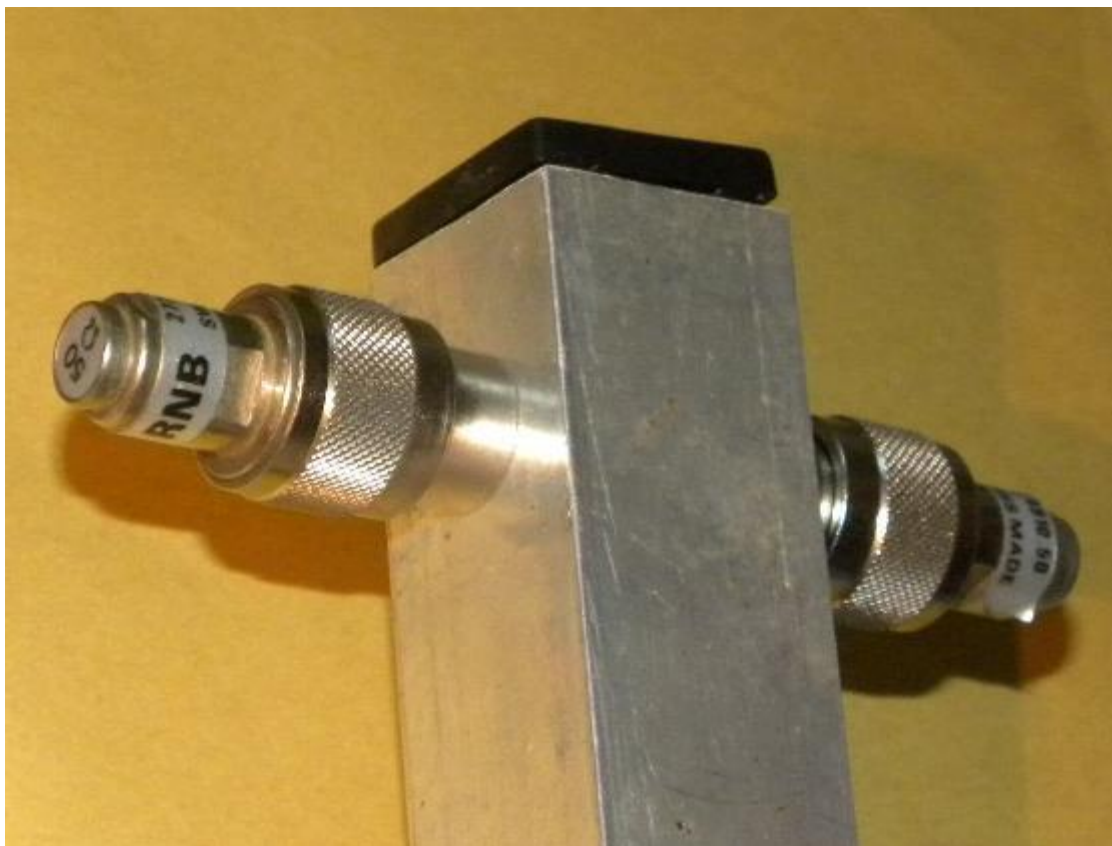
Type	Square	Inner (D)	Round Tube (d)	Z
2a	29,5x2,8 mm	24,7 mm	8 mm	72,1 Ω

Table 4: $\lambda/2$ -Splitter , 4-way, Type 2b, needed Z=50 Ω

Type	Square	Inner (D)	Round Tube (d)	Z
2b	30x2 mm	26 mm	12 mm	50,9 Ω
2b	25x2 mm	21 mm	10 mm	49 Ω

Table 5: $\lambda/4$ -Splitter , 3-way, Type 1c, needed Z=28,9 Ω

Type	Square	Inner (D)	Round Tube (d)	Z
1c	25x2 mm	21 mm	14 mm	28,9 Ω
1c	29,5x2,4 mm	24,7 mm	16 mm	30,6 Ω



Marker 1		Marker 2	
Frequenz:	144,002 MHz	Frequenz:	144,289 MHz
Reell:	50,5	Reell:	50,6
Blind:	-0,1	Blind:	0,0
Phase:	-0,1	Phase:	0,0
SWR:	1,01	SWR:	1,01

Marker 3		Marker 4	
Frequenz:	145,000 MHz	Frequenz:	146,001 MHz
Reell:	50,9	Reell:	51,3
Blind:	0,1	Blind:	0,1
Phase:	0,1	Phase:	0,2
SWR:	1,02	SWR:	1,03

The 2-m-splitter Type 1a with two precision resistors 50 Ohm by R&S shows a SWR of 1,01 at 144,3 MHz and 50,6 +/- j0 Ohm (see Marker 2).

Built with 30x2 mm and 15,5 mm

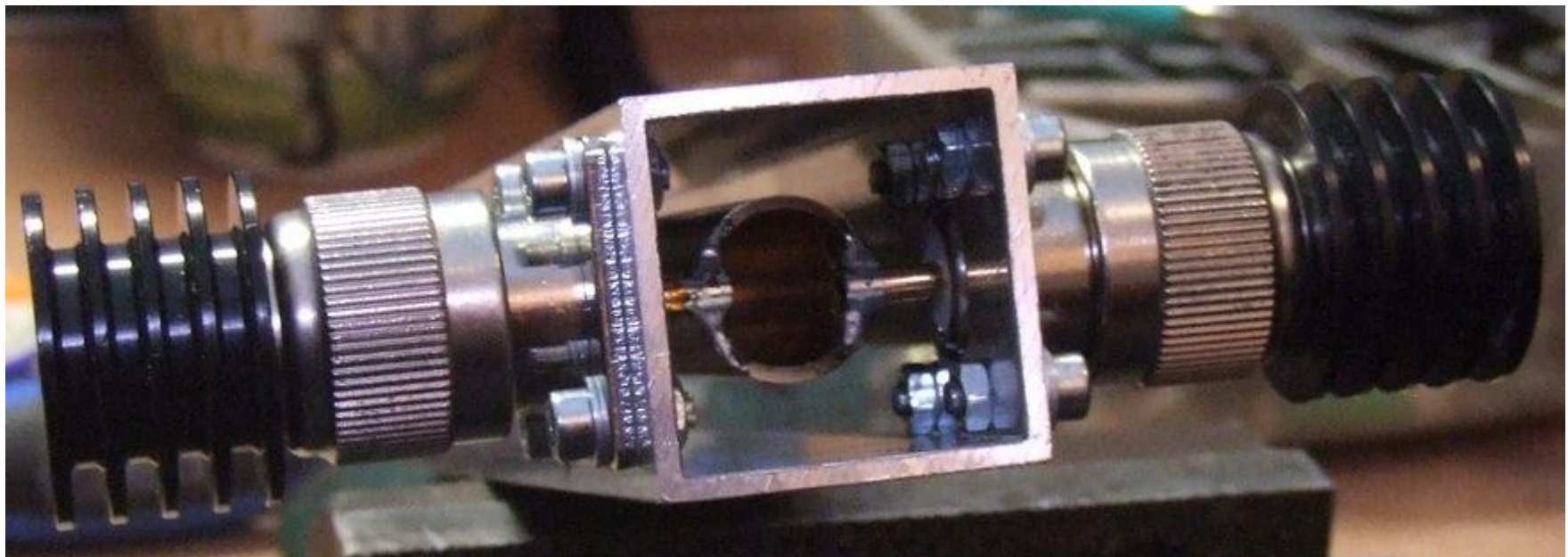
Practical Construction

It is not easy to connect the inner tube to the coax-sockets. The best way for all materials (you cannot solder aluminium!) is shown in the pictures below:





Splitters built by Piotr, SP5MG



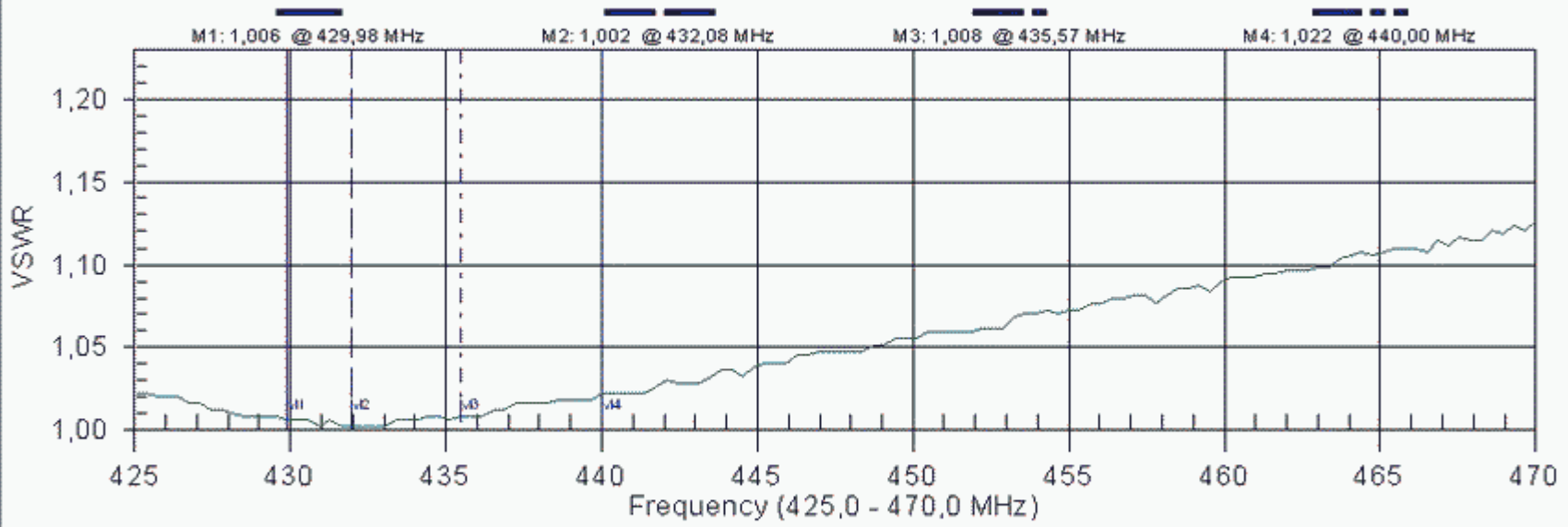
The measured data of the splitters by **Piotr, SP5MG**



70cm



VSWR



Resolution: 130
Date:
Model: S331A

CAL: ON(COAX)
Time:
Serial #: 00000000

CW: OFF
Smoothing: 0