

The "Dual" company has been producing antennas for more than 30 years.

Our focus is on:

- wide bandwidth,
- designs that work equally well in all weather conditions,
- very low SWR and superior G/T, F/B and F/S ratios across the entire frequency band,
- excellent mechanical properties, and
- uncompromised durability.

We do not use amateurish programs like **EZNEC Pro/4**, **4NEC2**, **EZNEC**, **MMANA AO** or **YO**. We perform the design work using **the latest professional full-3D electromagnetic modelling software**. This enables us to accurately include the influence of the boom, insulators, baluns, feed point, connections, etc

Our designs are optimised using the Particle Swarm algorithm, which is considered one of the best global optimization algorithms. We also use the classic Nelder-Mead Simplex algorithm for fine-tuning. Our optimization runs frequently exceed 1 million evaluations.

We rely on solid physics, not on "clever" tinkering with antenna elements or spacings. By paying the greatest attention to all of the important details, we are able to consistently produce top performance designs.

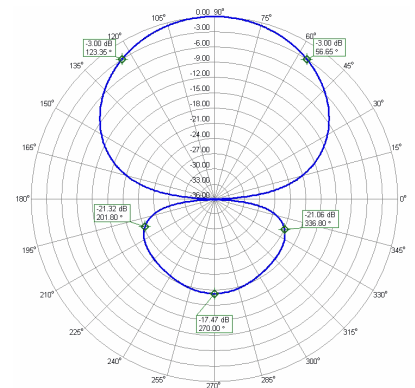
Our antennas are precision physical instruments, they are real **"Precision Antennas" (PA)**.

**Company Dual.** The largest antenna and ham radio equipment manufacturer in Serbia, established 1988.  
Address: Trg puk. D. Gavrilovića 2, 37000 Kruševac, Serbia. <https://www.antennas-amplifiers.com>, [www.dual.rs](http://www.dual.rs)  
Tel. +381 37 3419 100, +381 69 3419 100

# PA144-432-8-09RA

## Electrical Specifications 2 m

Frequency Range:	<b>144 - 146 MHz</b>
Free Space Forward Gain:	<b>6.8 dBi</b>
Front to Back Ratio:	<b>17 dB</b>
3 dB Horizontal Beamwidth:	<b>66.7°</b>
Polarization:	<b>Horizontal</b>
Nominal Input Impedance:	<b>50 Ohms</b>
SWR Across Entire Band:	<b>&lt; 1.2</b>
Maximum Power Input:	<b>100 W</b>
Matching Method:	Direct feed through RG316 common mode balun
Connector:	<b>"N"</b> (Common connector for both bands)



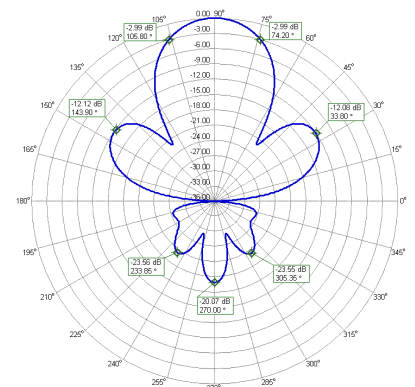
2 m Azimuth Radiation Pattern

## Mechanical Specifications 2 m

Number of elements:	<b>3</b>
Element Diameter:	<b>4 mm</b> Aluminum rod
Dipole Diameter:	<b>8 mm</b> Hard Copper tube.(Common dipole for both bands)
Longest element:	<b>1030 mm</b>
Element Mounting Position:	<b>Below the Boom</b>
Balun and Connector:	<b>Included</b>

## Electrical Specifications 70 cm

Frequency Range:	<b>430 - 440 MHz</b>
Free Space Forward Gain:	<b>11.3 dBi</b>
Front to Back Ratio:	<b>20 dB</b>
3 dB Horizontal Beamwidth:	<b>31.6°</b>
Polarization:	<b>Horizontal</b>
Nominal Input Impedance:	<b>50 Ohms</b>
SWR Across Entire Band:	<b>&lt; 1.2</b>
Maximum Power Input:	<b>50 W</b>
Matching Method:	Direct feed through RG316 common mode balun
Connector:	<b>"N"</b> (Common connector for both bands)



70 cm Azimuth Radiation Pattern

## Mechanical Specifications 70 cm

Number of elements:	<b>8</b>
Element Diameter:	<b>4 mm</b> Aluminum rod
Longest element:	<b>340 mm</b>
Element Mounting Position:	<b>Below the Boom</b>
Balun and Connector:	<b>Included</b>

## Common Mechanical Specifications

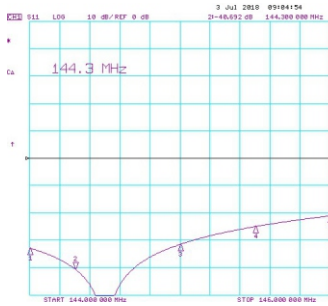
Boom Length:	<b>0.89 m</b>
Boom Size:	<b>20 x 20 mm</b>
Number of Boom Pieces:	<b>1</b>
Guy Rope Support:	<b>Not necessary.</b> Strong boom.
Mounting Mast Diameter:	<b>43 - 70 mm 1-1/4" - 2-3/4"</b>
Survival Wind Speed:	<b>160 km/h</b>
Net Weight:	<b>1.1 kg</b>
Gross Weight:	<b>1.95 kg</b>
Transportation Length:	<b>1.08 m</b>



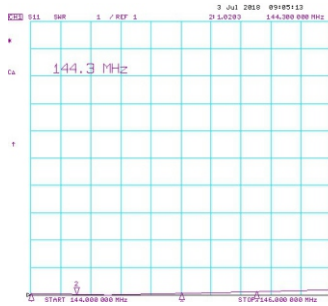
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# PA144-432-8-09RA

## PA144-432-8-09RA Measured characteristics with calibrated HP8753ES Network Analyzer



2 m Measured Return Loss  
at antenna connector



2 m Measured SWR  
at antenna connector



70 cm Measured Return Loss  
at antenna connector



70 cm Measured SWR  
at antenna connector



### Assembly instruction

Attach the antenna mounting bracket.

### Attach the elements (number to number).

Starting with 1, paying special attention on orientation.

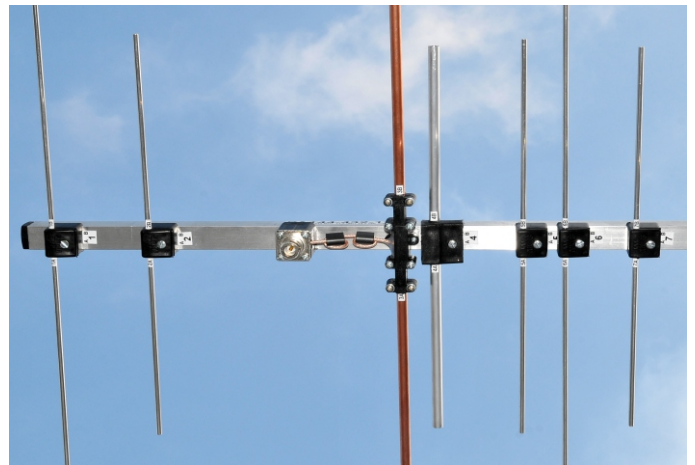
Required torque 2.2 Nm for 8 mm elements. 1.4 Nm for 4 mm elements.

If needed align elements and screw tightly. Elements must stand in one plane.

Before tightening all screws, apply thread lock like Loctite 243 or Permatex Threadlocker BLUE.




Screw connector to connector holder.



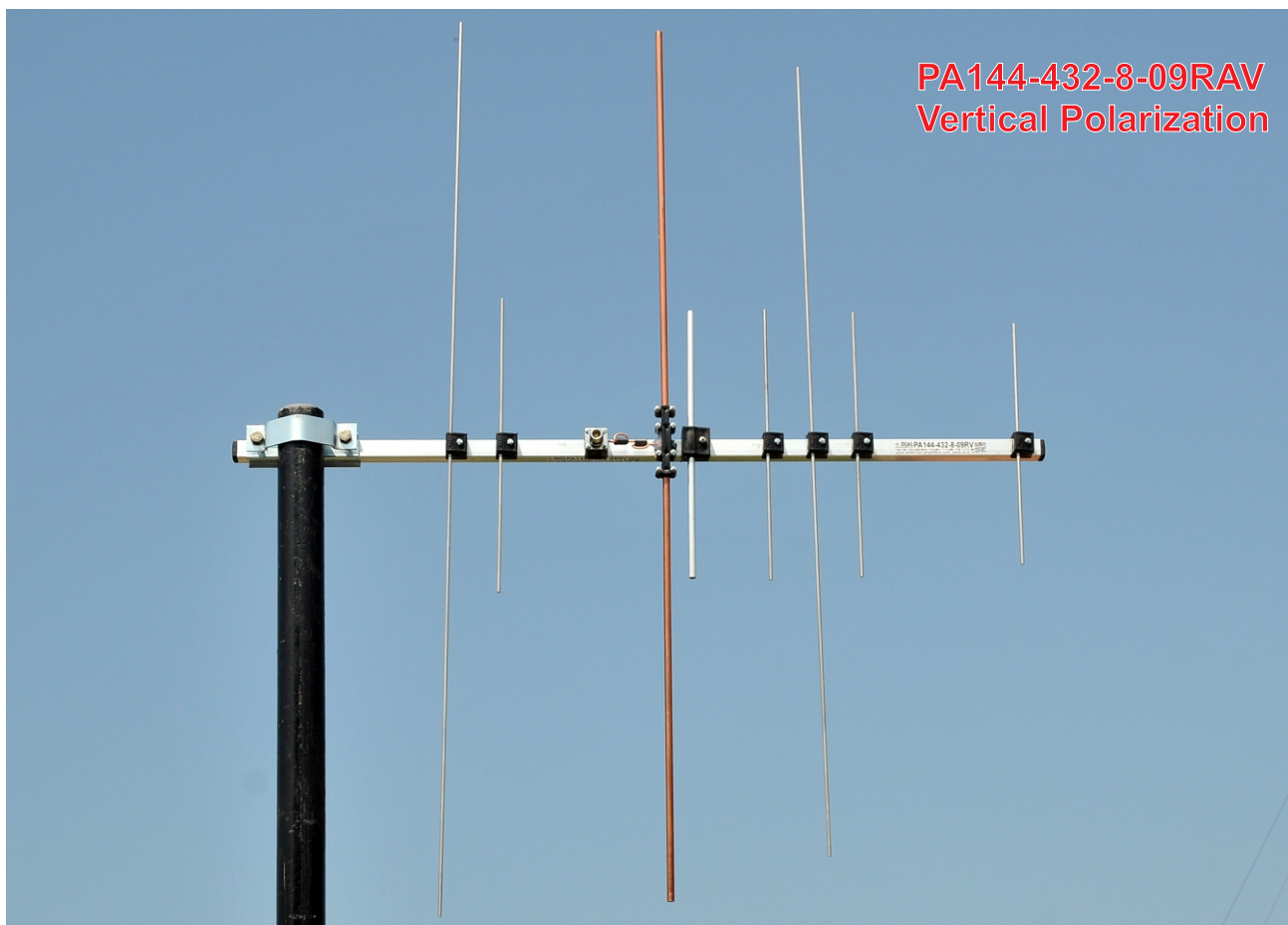
Not all pictures are related to the particular antenna.



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# PA144-432-8-09RA



Raise the antenna. Measure SWR. It must be as predicted or very close on all frequencies. Low SWR is a sign that you assembled everything correctly. Best DX.



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