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OPTIBEAM

optimale Kurzwellen-Antennen

computer-designed / computer-optimiert

entwickelt von Funkamateuren für Funkamateure

optimum short-wave antennas

computer-designed / computer-optimized

developed by hams for hams



OB9-5



9 Element Yagi 20/17/15/12/10
!!! Quality made in Germany !!!

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1. Introduction

The OB9-5 is a high performing Fiveband Antenna for the 14, 18, 21, 24 and 28 MHz amateur radio bands.

OptiBeam shortwave antennas are designed and optimized by support of modern techniques such as computerized antenna simulation and are finally adjusted by extensive tests in practise.

The core of the antenna consists of a direct coupled 5-element-drivercell where the drivers are connected with a phase line of square tubes.

Furthermore there is a separate reflector for each of the 20m, 17m and 15m band and for the 10m band a separate director which works as a director for the 12m band as well.

By this new concept of feeding in combination with a special order of all elements and the exclusive use of full size elements highest efficiency, optimum bandwidth concerning high gain, clear pattern and low SWR together with unlimited power handling are achieved.

In the following table the essential electrical and mechanical data can be seen:

Bands	20m / 17m / 15m / 12m / 10m
Gain (dbd)*	4,3 / 4,5 / 4,7 / 4,5 / 4,5
Gain (dbi)**	11,7 / 12,0 / 12,3 / 12,3 / 12,3
F/B (db)	18 / 20 / 25 / 25 / 25
SWR: 14,00 - 14,19 - 14,35 18.13	1,3 - 1,0 - 1,2 1,1
21,00 - 21,25 - 21,45 24.95	1,6 - 1,1 - 1,6 1,0
28,00 - 28,50 - 29,50	1,6 - 1,2 - 1,5
Impedance (Ohm)	50
Elements	9
Active elements per Band	2 - 3
Max. element length (m)	10,94
Boom length (m)	5,10
Weight (kg)	30

16' 3/4"
66 #

- * = average gain over a dipole in free space
gain of monobanders for comparison: 2-element Yagi: 4 dbd, 3-element Yagi: 5-6 dbd
- ** = average gain at 20m above ground

2. Assembly

The included schematic diagram is needed for the assembly and the following information is given:

- > type of element (R=Reflector, S=Driver, D = Director) and the position on the boom
- > measurements of the element sections (length and diameter)
- > lengths of the element halves
- > distances between the elements.

The lengths are given in m (meters) and the diameters are given in mm (millimeters).

2.1 Sorting the parts

The antenna partly consists of already pre assembled parts.
All parts of the antenna are marked.

needed to sort the parts per band

2.2 Assembly of boom

The square boom consists of three parts which have to be assembled each by two coupling pieces that are already installed at one side of the boom parts.

For each coupling piece 4 screws are needed. The screws have to be tightened finally not before the parts of the boom really **fit** to each other perfectly.

2.3 Construction of the elements

For the element to boom brackets 4-cornered plates are used and the insulation of the elements is done by 2 special plastic tube holders (see picture page).

According to the diameters of the elements there are 2 plates with 30mm (S20 / R20), 2 plates with 25mm (S17 / R17) 2 plates with 20mm (S15 / R15) and 3 plates with 16mm (S12 / S10 / D10) tube holders.

In addition you find the bottom half of a tube holder installed in the middle of the driver element platforms to reinforce the centre of the driven element which is split with the insulator.

The middle sections of the elements have to be fixed **exactly centred** on the plates (orientation = black middle line on parasites / insulator middle piece on driven elements which finally has to sit centred in the pre assembled bottom half of the support tube holder). For that the element middle sections have to be put in to the tube holders (only concerning the driven elements one tube holder has to be opened for this process). Then the screws of the tube holders have to be **tightened solidly**. The screws of the driver middle sections divided with the insulators have to point **straight upwards**.

Next the other element sections have to be assembled. Insert the following sections in the previous sections with their side which has two drill-holes **equal in size**. The tubes have to be put in until the drill-holes of both sections overlap perfectly (concerning the outer 12mm tubes of the driven elements the **middle one** of the three drill-holes has to be chosen).

Then the corresponding screws (30mm tube = longest screw / 25mm tube = second longest screw / 20mm tube = third longest screw / 16mm tube = shortest screw) have to be pushed through **from the side of the enlarged drill-hole** of the previous segment. On the opposite side the washers have to be inserted and the self securing nuts have to be screwed on and **tightened solidly** (hold the screw heads with the included special screw-driver against turning, the screw heads dive into the enlarged drill-hole, see 1st picture page). This method results in an extremely solid mechanical connection and rattle sounds inside the segment overlaps are totally avoided.

By this way of assembling the required lengths of the sections and the element halves are achieved automatically.

While mounting the elements pay attention that all screw heads show **upwards**. Keep in mind that the elements hang below the boom. Therefore the screw heads have to be on the same side of the elements where the plates are located at.

2.4 Attaching the elements to the boom

The elements fixed on the plates have to be mounted on the **underside** of the boom at the marked positions while the connecting screws of the boom should remain horizontal. The square boom makes a straightening of the elements unnecessary.

The plates are attached to the boom by 2 square brackets which embrace the boom from the top and 4 self securing nuts (see 1st picture page). When tightening the square brackets pay attention that all elements are **parallel** to each other.

The driven elements (from the rear S15, S20, S17, S10, S12) should not be tightened before the installation of the phase line is done (see fig. 2.5) as they might have to be moved slightly on the boom.

The plates of the outer elements end directly in line with the tips of the boom.

For convenience in general we recommend to assemble all element middle sections to the boom first as well as the phase line (see fig. 2.5) and the coax socket should be connected to the drivers within this step.

Afterwards the following element sections can be inserted and fixed.

2.5 Installation of the phase lines

The five driven elements are connected with two parallel 20mm square tubes (=phase line) which are broken one time at S17 by a **crossing** that consists of two pieces of flat aluminium.

The phase line is terminated at its beginning and its end by a **stub** (see schematic diagram).

The square tubes have to be in **direct contact** to the elements (put the washers only below the screw heads). First remove the element screws and washers. Then insert the predrilled square tubes (move the elements slightly if needed) by means of the element screws. The 2 slightly **longer** pieces represent the connection from S15 over S20 to S17, the 2 **shorter** pieces build the connection between S10 and S12.

Insert the crossing at S17. One piece of flat aluminium has to be fixed at the **top** and the other at the **bottom** of the phase line (see pictures at 2nd picture page).

Furthermore mount the stubs at the underside of the phase line (=elements are positioned below the boom), one at the beginning of the phase line at S15 and the other at the end of the phase line at S12. The stubs are fixed with insulators to the boom at their other end (see pictures at 2nd picture page).

Likewise insert the coax connector at the bottom of the phase line (=elements below boom) directly with the screws of S10 (see picture at the 1st picture page). Be sure that the screw at the backside of the connector which holds the strap is **tightened solidly**.

Finally the phase line square tubes have to be **tightened really solidly** together with the driven elements (=important electrical contact) and the driven elements have to be mounted below the boom by means of the element plates (see fig. 2.4).

2.6 Installation of the boom to mast clamp

The boom to mast clamp is a completely pre assembled part (see 1st picture page). It has to be attached **between S20 and S15** at the centre point of gravity.

3. Connection of coax cable

The feeding of the antenna is done by 50 Ohm coax cable.

For connection a PL-259 connector is required. The connector should be sealed against water entry.

Close to the feed point the cable should be winded to a choke coil with 5 to 6 turns of about 20 cm of diameter. Hereby the antenna is electrically balanced and unwanted radiation of the cable itself is prevented.

Instead of the choke coil a 1:1 balun can be used as well.

4. Adjustment of the antenna

An adjustment of the antenna is not necessary if the given dimensions are exactly observed.

By some influences of the direct surroundings it may happen that the resonance of the antenna (=point of best SWR) shifts on one or several bands.

By minimum changes of the according driver lengths (=shortening or lengthening of the outer 12mm sections) the resonant frequency of the according band can be shifted to the desired point.

By a slight decrease of the lengths of both element halves (put outer section in to the last drill-hole) the resonant frequency will be shifted upwards, by an increase (pull final section out to the first drill-hole) it will be shifted downwards.

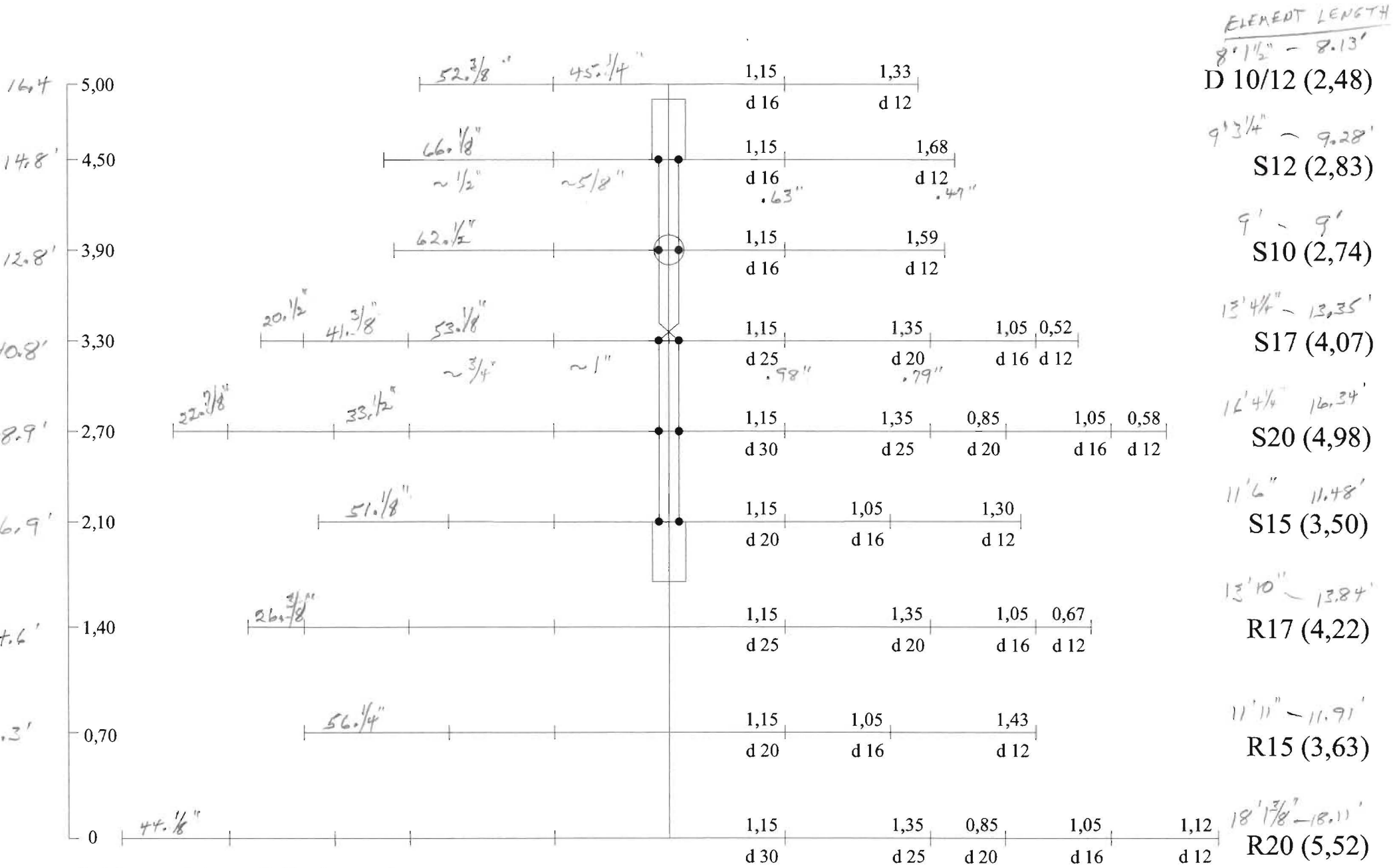
Normally these adjustments don't have to be done as the antenna does not react very sensitive against influences of the surroundings and the SWR curve is flat anyway.

5. Position of the antenna at strong winds

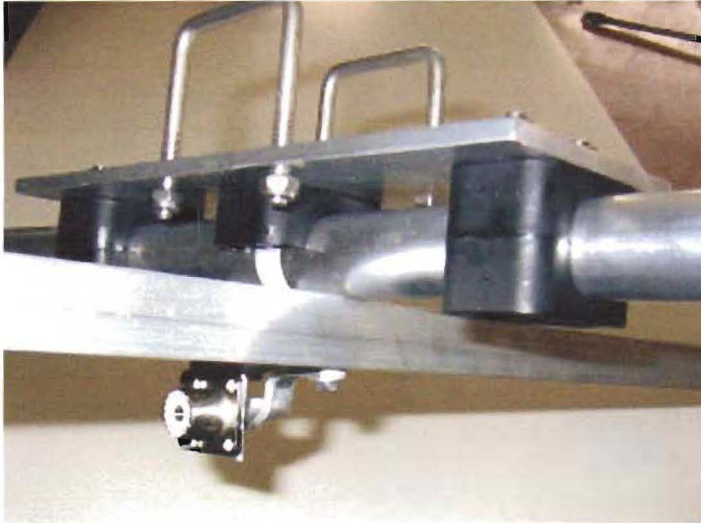
At strong winds the antenna should be placed in a way that the tips of the elements **show straight into the wind** which means that the boom stands broadside to it.

Hereby physical stress to the full size elements is avoided and their duration is enlarged.

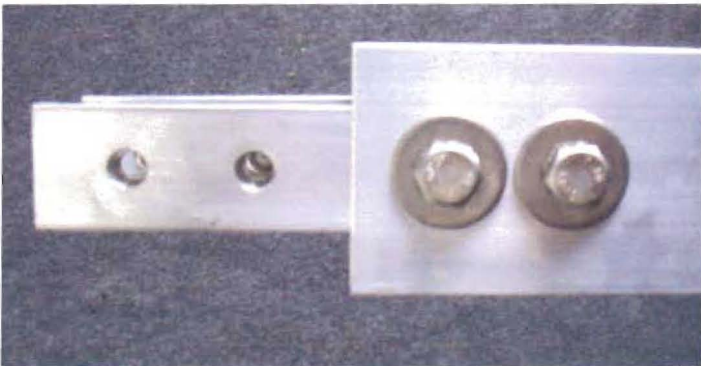
OptiBeam OB9-5 (heavy duty)



alle Längenmaße in m ; alle Durchmesser in mm



Ansicht Element-Plattform Strahlerelement
mit Phasenleitung und Mittenunterstützung /
view element platform driven element with
phaseline and centre support



Ansicht Boomkopplung bei Vierkantboom /
view boom coupler at square boom



Ansicht Koax-Anschlußbuchse SO239 mit Strahler-
element und Phasenleitung /
view coax connector SO239 with driven element and
phaseline



Detailansicht Elementübergänge / close up view element transitions



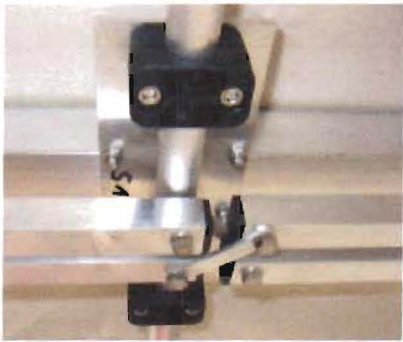
Boom-Masthalterung für kleinere Modelle /
 boom to mast mounting for smaller models



Boom-Masthalterung für mittlere Modelle /
 boom to mast mounting for medium size models



Boom-Masthalterung für große Modelle /
 boom to mast mounting for big models



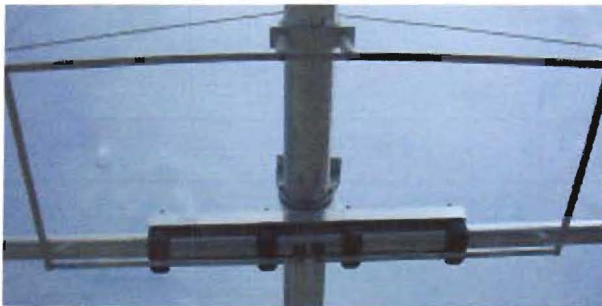
Seitenansicht Überkreuzung Phasenleitung bei Modell 9-5 u. 4-40 /
 side view crossing of phase line at model 9-5 and 4-40



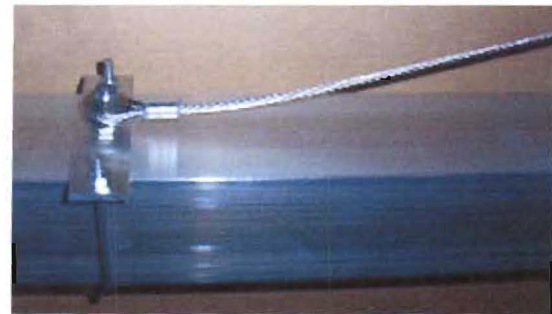
Ansicht zentrale und äußere Boomabspannung für OB11-3 /
 view centre and outer boom truss for OB11-3



Ansicht variable äußere Boomabspannung div. Modelle /
 view variable outer boom truss diverse models



Gesamtansicht Abschlußstub mit Isolatoraufhängung an Boom bei diversen Modellen /
 total view termination stub with insulated fixing to the boom at diverse models



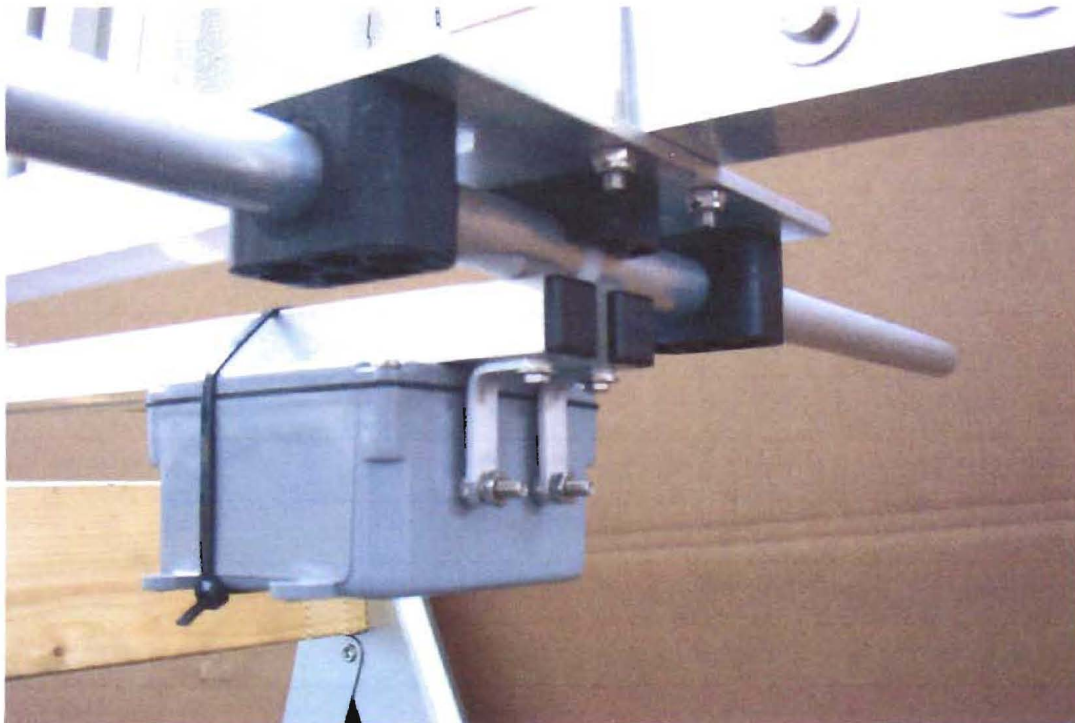
Äußere Seilabspannung für große Modelle, Rundboom dto. /
 outer boom truss for big models, round boom equivalent



Zentrale Seilabspannung für Modelle über 6 Meter Boomlänge /
 centre boom truss for models over 6 meter boom length



Installation des 5 KW Baluns / Installing the 5 KW balun



Durch die Verwendung des beigefügten 50 Ohm 1:1 5 KW Baluns (Design nach WX0B) am Speisepunkt wird die Antenne elektrisch symmetriert und Eigenstrahlung des Koaxkabels wird unterbunden.

Installation

1. Zuerst sind die zwei Schrauben des Strahlerelementes zu entfernen, an dem die Antenne gespeist wird und die auch die Phasenleitungsrohre halten.
2. Der Balun läßt sich aufgrund seiner Flachstruktur gut unter den beiden Phasenleitungsrohren befestigen. Er ist mit seinen beiden Aluminium-Anschlußbügeln und den vorher entfernten Strahlerschrauben am Strahler zu befestigen.
3. Das Einschmieren der Balun-Anschlüsse mit einer Konduktionspaste kann den einwandfreien Kontakt zwischen Balun und Element dauerhaft fördern.
4. Der Balun ist mittels des beiliegenden Kabelbinders an der Unterseite der Phasenleitungsrohre abschließend zu fixieren.
Die Details gehen aus obigem Photo hervor.
5. Das Koaxkabel ist am SO239 Anschluß des Baluns zu befestigen und sollte hier gegen Wassereindringen geschützt werden (z.B. mit selbstverschweißendem Klebeband oder Silikon).

The antenna is electrically balanced and unwanted radiation of the coax cable itself is prevented by the use of the attached high quality 50 Ohm 1:1 5 KW balun (design by WX0B) at the feed point.

Installation

1. Un-screw the two bolts of the driven element where the source is located at and which hold the two square tube transmission lines.
2. Due to the flat structure the balun can easily be mounted below the two square phase line tubes. It has to be connected to the driver by means of the two aluminium straps and the driver screws.
3. You may want to put some anti-oxidant paste such as No-Alox, or Penetrox on the terminal connection before you tighten the bolts.
4. Use the included plastic ty-wrap to finally secure the balun to the transmission line.
The entire installation can be seen on the above added picture.
5. Attach your feedline jumper to the balun's SO239 connector and weather proof this connection to protect it from water.