

# Four Element Vertical Dipole Array

Super Antennas on the Beach

Christian “Chris” Janssen  
DL1MGB / KO2WW



# About Me

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- 42 years old
- Favorite modes: CW, SSB, RTTY
- Contester and DXpeditioner
- Married to Anja DO2WW



# How it all began

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# How it all began



# How it all began

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Joe - DL8WPX / Y21RM

- 5ele VDA for 40m (1988)
- Adopted it for our needs
- But still a secret...



# How it all began



## Antennas Here are Some Verticals on the Beach...

By R. Dean Straw, N6BV  
Senior Assistant Technical Editor, ARRL  
2308 Fabian Street  
San Francisco, CA 94121

**T**he idea was a creative adventure of a lifetime—I began to ask members of the team operating 6Y2AA on the 1998 DXpedition for the CQ World Wide DX CW Contest. My 84-year-old father came along too. Although he's not a ham, he advised 80 years he's a seasoned air doing radio and had helped me put up lots of antennas. On this trip, I had ample opportunity to put up and take down lots and lots of antennas.

### A DXpedition to Jamaica for the CQ World Wide Contest, "Field Day" Style

#### Planning, Planning, Planning

Forbes for myself, the rest of the 6Y2AA team had operated the CQWW CW Contest as 6Y2AA in 1997 from the same location. 6Y2AA had come in second worldwide to

where every European, USA or Japanese QSO was worth three points. Then, just before the contest, we heard that there were some problems in Japan with the band from which 5Y7VA operated last year. This was

followed by K3LR where every European, USA or Japanese QSO was worth three points. Then, just before the contest, we heard that there were some problems in Japan with the band from which 5Y7VA operated last year. This was

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By Juergen A. Weigl, OE3CWL



## Getting the Most from Half-Wave Sloper Arrays

So, you want to put up a real, big 160-meter directional array? Here are some tips.

By Rudy Severns, N5LF

**F**irst, know what you're doing. A half-wave sloper array is a directional antenna that is fed with a balanced feed system.

### Single Support Gain Antennas for 80 and 160 Meters

Introduction

On 80 and 160 meters an antenna system can usually be fed with a balanced feed system. The antenna system is fed with a balanced feed system. The antenna system is fed with a balanced feed system. The antenna system is fed with a balanced feed system.

Many of examples have 3, 4 or 5 elements can usually be fed with a balanced feed system. The antenna system is fed with a balanced feed system. The antenna system is fed with a balanced feed system. The antenna system is fed with a balanced feed system.

By Rudy Severns, N5LF

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Georgetown, MA 01857

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## The 160-Meter Sloper System at K3LR

Sure, doesn't everyone have a 190-foot tower in his backyard? With help from his friends, K3LR made his 160-meter dream come true.

By Al Christian, K3BB Tim Duffy, K3LR  
1105 N. Main St.  
Georgetown, MA 01857

Jim Breaker, WA3PBT  
308 East St.  
Port Matilda, PA 16802

**D**uring the spring of 1992, we began the development work on a 160-meter antenna system using basic wave slopers. This antenna was to be installed on the 190-foot tower belonging to Tim Duffy, K3LR. Our goal was to build an antenna that would provide forward gain in one of several unobstructed compass directions. Good signals of high gain are an important requirement, as well as omnidirectionality. We describe the antenna in a quick review of the theoretical design process, and then discuss the construction, testing and operation of the actual array.

#### Background

Perhaps the best known directional antenna using sloper elements is that of Don Pearce, W4LW. His design utilizes conventional 1/2-wave sloper elements arranged in a main rail and the sloper elements directed toward the main rail at an angle of 60° between elements. All elements are

with equal lengths (slightly over 157' for 160m, 90' or 140', just like the classic "6-Sloper" transmission line antenna). As with all such phased arrays, the challenge is to get the feed currents into each element exactly right, so the full potential of the array can be realized, particularly for forward-back results.

#### Design

The initial design of the K3LR antenna considers some of the best features from both the W4LW and K3LR designs—the mechanical simplicity of the 6-Sloper design, with the straightforward feed system of the Pearce W4LW array. The proposed version of the K3LR system is close to

## An electrically-steerable vertical parasitic array for 10MHz

R C WHELAN, G3PT\*

WITH AN electrically-steerable antenna, the direction of radiation is controlled by changing the electrical relationships between the radiators in an array. No expensive rotators and special cables—just a rotor box, some digital clock and two normally open relays to make a 160-element, four-element 30 beam with excellent directivity and performance. The design could be used to build other arrays for other frequencies.

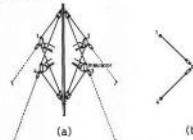


Fig 1. 160 Meter array that steers beam

#### Background

The 160m band is heavily congested—yet an antenna design built with strong electrical isolation—but the propagation characteristics are such that long-distance communication is still possible. However, in order to be able to use the band effectively for a directional antenna with good low-angle characteristics is needed. I have used vertically-pole-dipole loops and a transmission line over the top (with a parasitic antenna). The dimensions of antennas are significantly larger than those at 4MHz and the construction of suitable traps and guards needs to be considered.

Arrays of vertical elements when fed with various of the correct phase and amplitude are capable of producing strongly directional radiation patterns. If any one element is used as a reflector, the array can be steered as a three-element. Two or three with a well chosen element, the beam

The configuration shown in Fig 1 appears to operate best as a parasitic array of the elements are arranged so that elements 2 and 4 are driven in phase in a driven element, direction is used to operate as a director, and element 3 is used to operate as a reflector. The array can be steered as a three-element. Two or three with a well chosen element, the beam

Such an arrangement has been widely used to cover it changed by changing the dimensions. Direction change transmission and reception. Any drive antenna being driven to ensure they were of the



Fig 2. Electrical relationships between the radiators in the array

## SLOPER ANTENNAS

Single- and Multi-Element  
Directive Antennas  
for the Low Bands

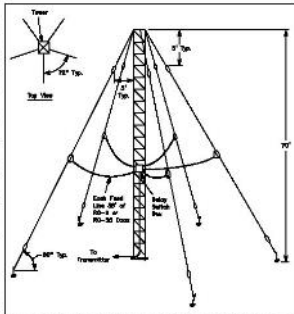


Figure 1—The K3LR Sloper System uses two low-band one-half-wave right sloper elements spaced vertically on a tall mast, back-to-back over an 80-foot length of about 150 elements.

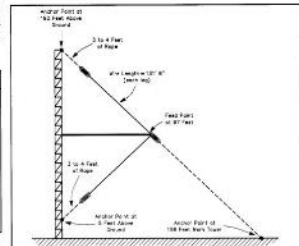
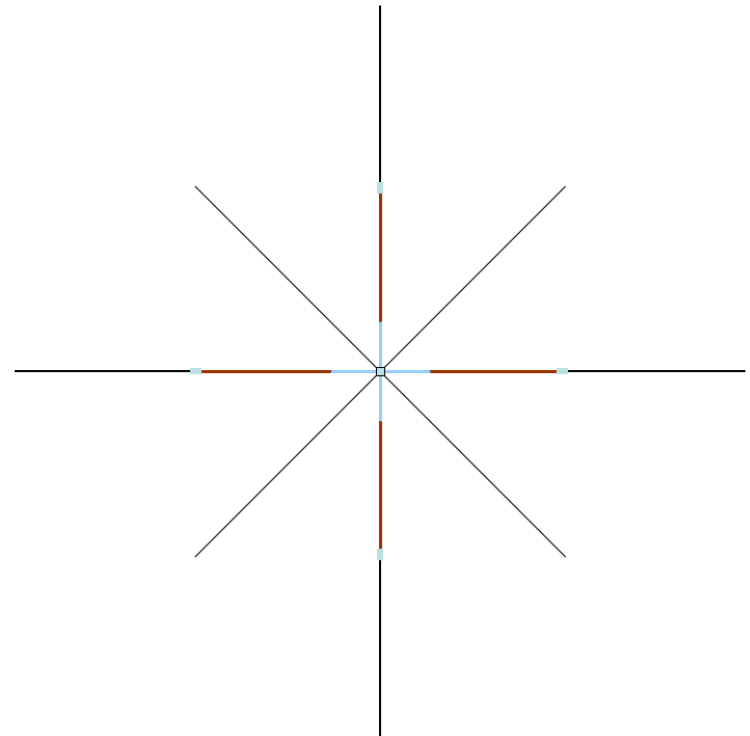
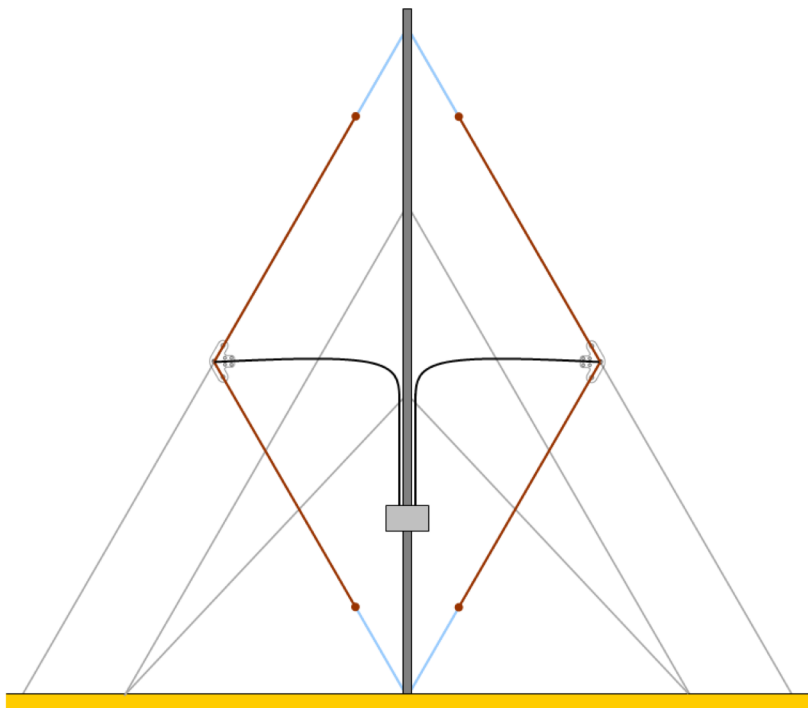
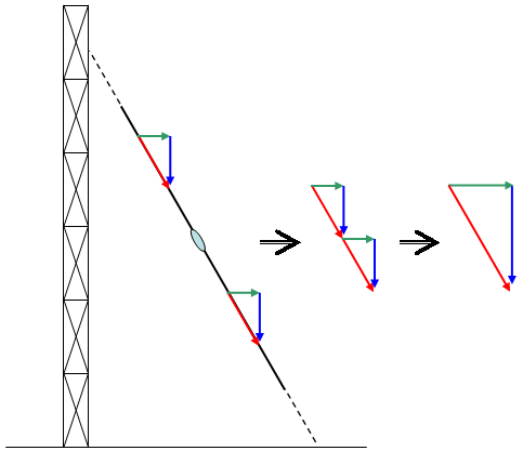


Figure 2—Detail of one element (at least) of the K3LR Sloper System, after having been adjusted to compensate for element-to-element drift.

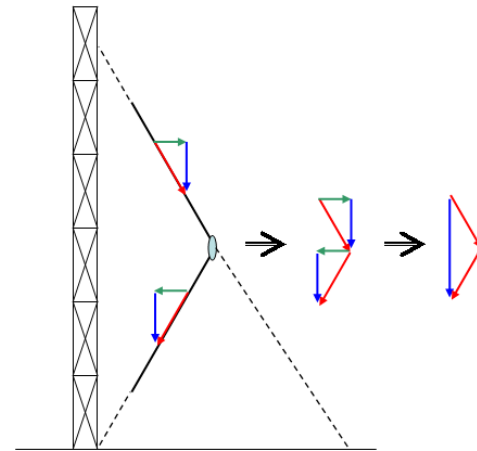
# The Antenna



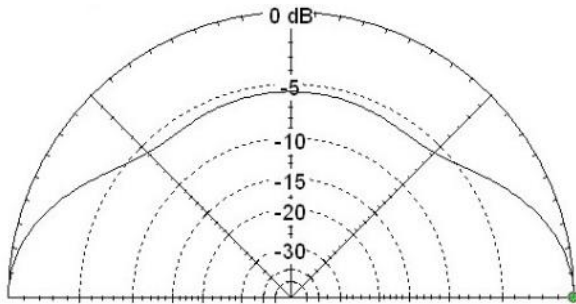
# How does it work? *Ingredient #1*



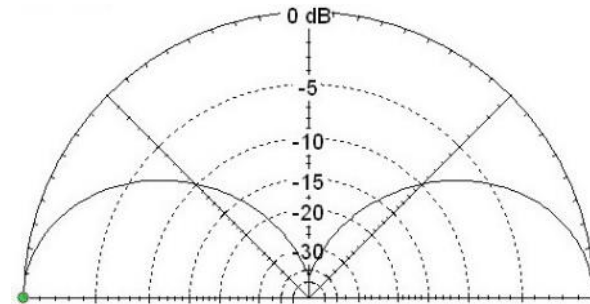
Straight Sloper



Bent Sloper



High-angle radiation



Low-angle radiation



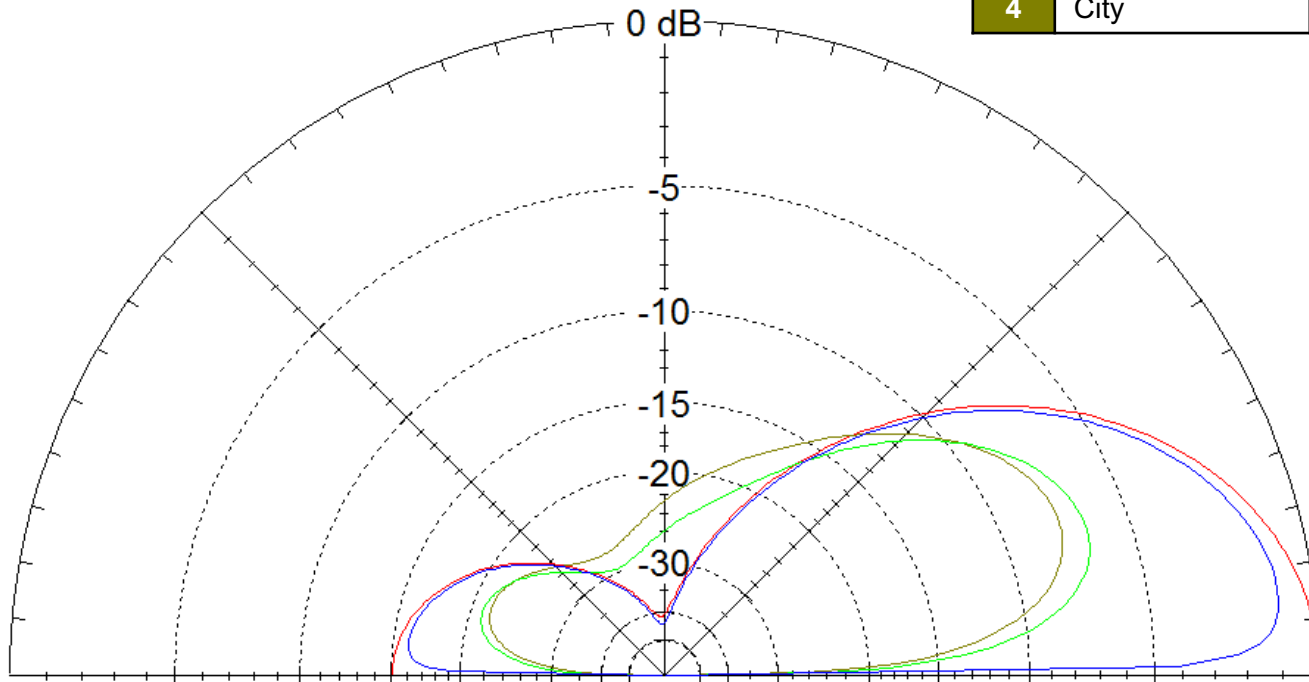
# How does it work? *Ingredient #2*



## 4 Element Vertical Dipole Array

Different ground types

	Description	Ground conductivity	Dielectric constant
1	Perfect ground	n/a	n/a
2	Salt water	5 S/m	80
3	Average ground	0.005 S/m	13
4	City	0.002 S/m	5



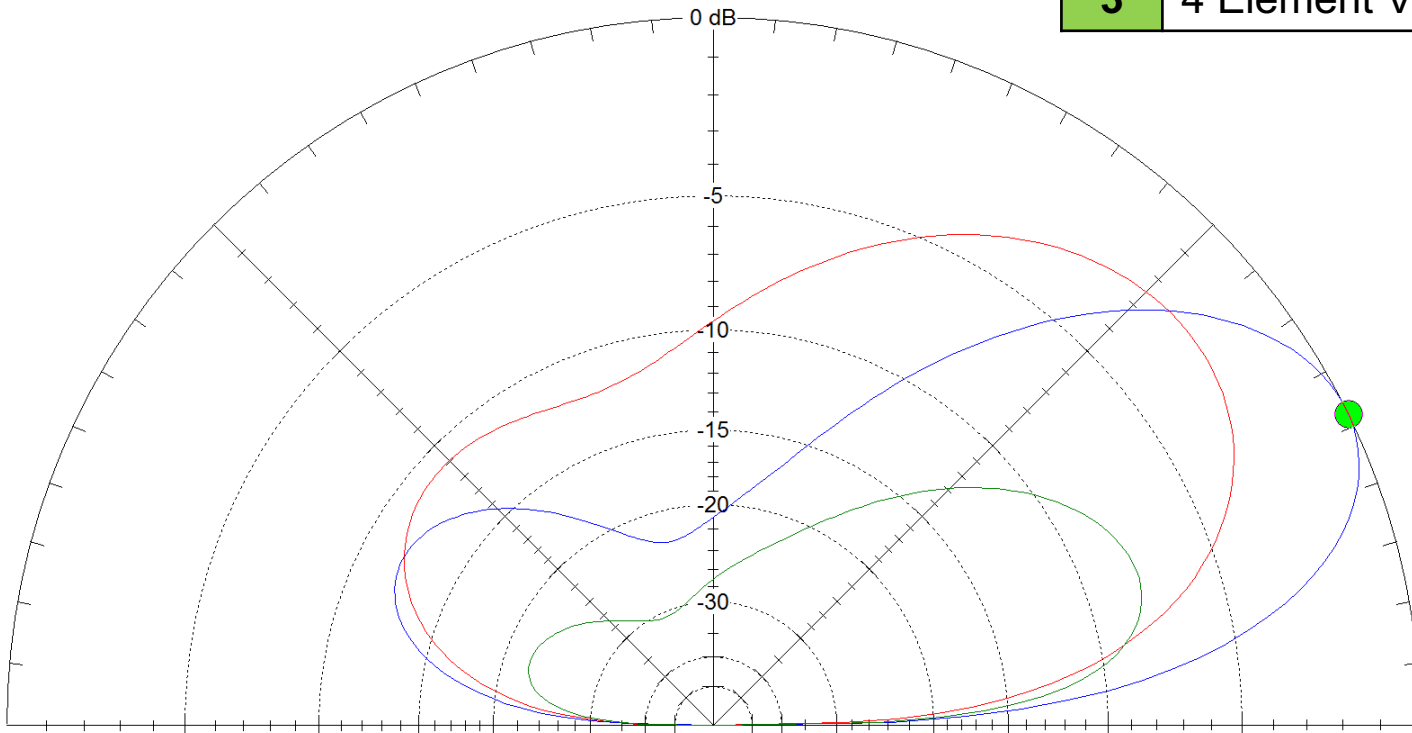
# How does it work? *Ingredient #2*



## Comparison

On average ground

	Description
1	3 Element Yagi @ 5m
2	3 Element Yagi @ 10m
3	4 Element VDA



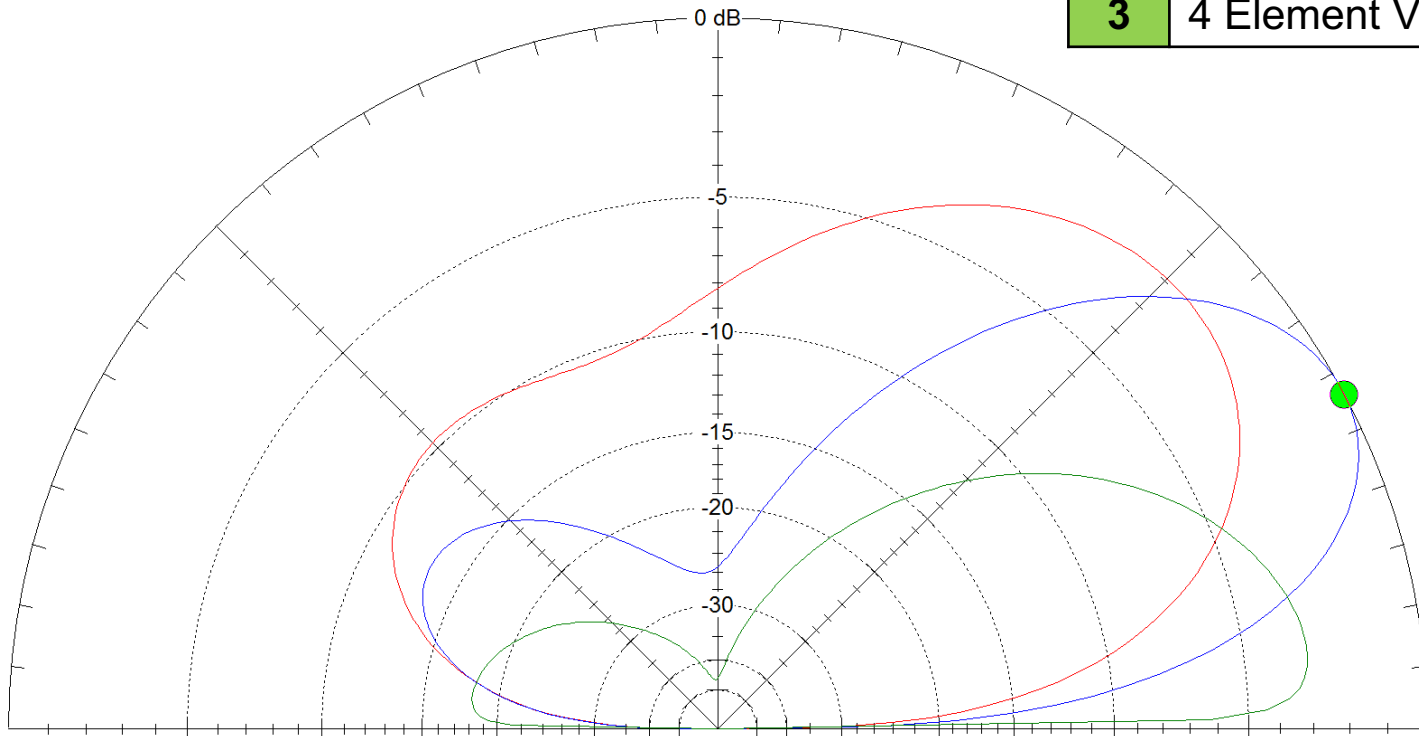
# How does it work? *Ingredient #2*



## Comparison

Very close to salt water

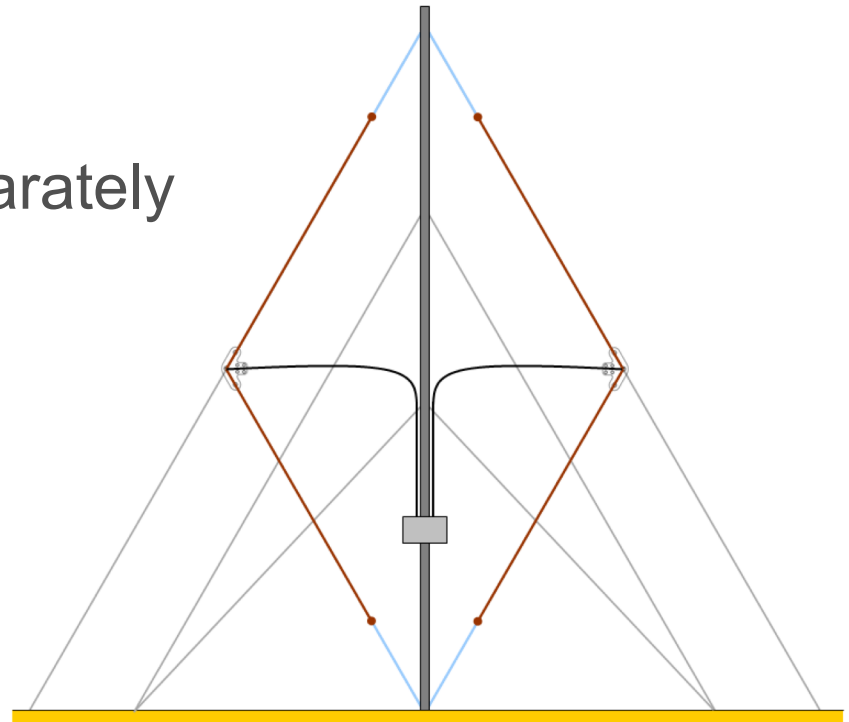
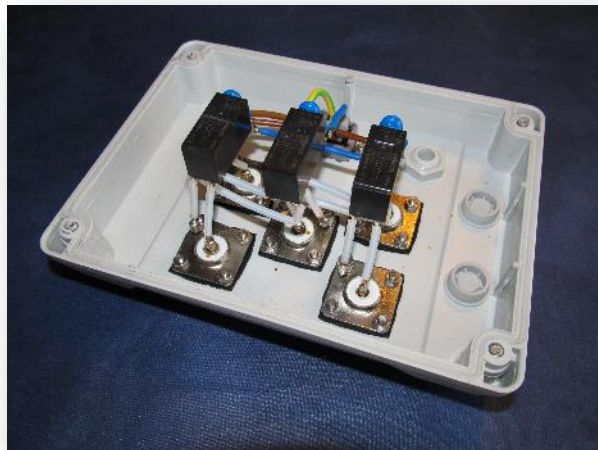
	Description
<b>1</b>	3 Element Yagi @ 5m
<b>2</b>	3 Element Yagi @ 10m
<b>3</b>	4 Element VDA



# How does it work? *Ingredient #3*



- Dual-function of the coax cables
  - Feeder
  - Stub
- Switching Box
  - Insulated
  - Grounds switched separately



# VP6DX – Ducie Island 2008



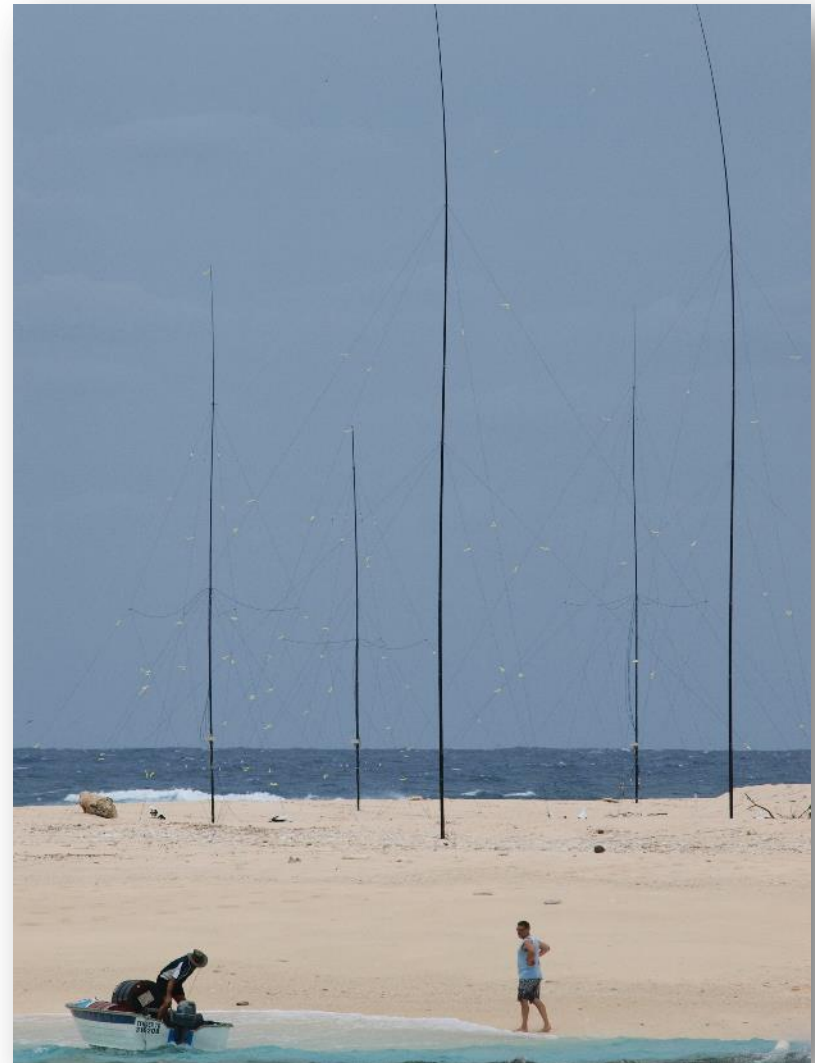
- 2 Element VDAs for 20m to 10m
- Designed by DJ2YA
- New QSO records



# VK9DWX – Willis Island 2008



- Assembly as expected
- Minor length changes
- Loud signals
- Directivity
- Switching appreciated



# ZL8X – Kermadec Island 2010



- Cliff edge – no salt water
- Simulations showed strange results
- No big signals on VDAs
- Decoupling on site



# TX5K – Clipperton Island 2013



- First 30m VDA on 18m mast
- Antenna setup similar to VK9DWX
- Loud signals – despite professional disapproval





# VK9DLX – Lord Howe Island 2014



- First 40m VDA on 26m fiberglass mast
- No Beach :-)
- Decoupling of stations

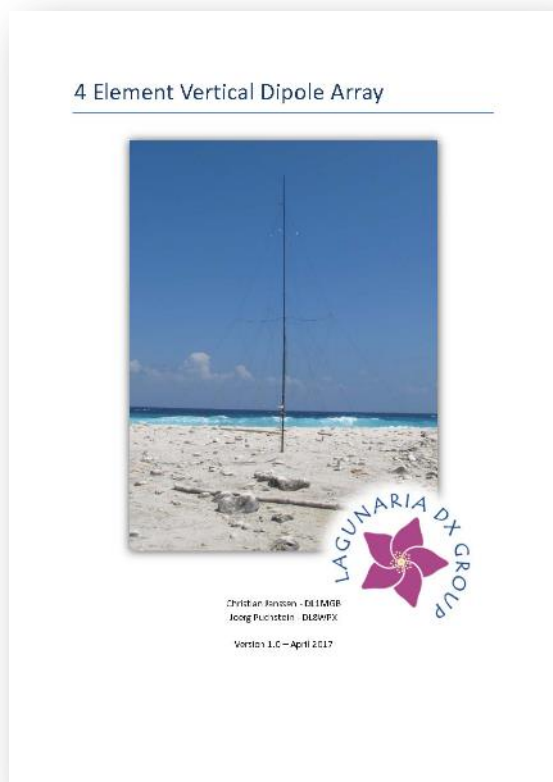


SALT WATER

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VERTICALS

# Book recommendation



- 32 pages in-depth information
- A lot of construction tips
- List of relevant articles and books
- English and German language
- EZNEC files of VDAs
  
- Also on our website
- Information of our DXpeditions
- Pictures
- Statistics
- Presentations
- ... and more to come in the future

[www.lagunaria-dx-group.org](http://www.lagunaria-dx-group.org)

# THANK YOU !



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