spiderbeam
high performance lightweight antennas

The spiderbeam was developed as a DXpeditioner's dream antenna. It is a full size lightweight tribander yagi made of fiberglass and wire.

The whole antenna weight is only 6kg (12lbs), making it ideally suited for portable use. It can be carried and installed easily by a single person. A small push-up mast and a TV rotator is sufficient, saving even more weight on the total setup. The transportation length is only 1.20m (4ft).

While the antenna is as light as a mini beam, it maintains the gain and F/B ratio of a typical full size tribander. It can take a maximum power of 2 KW HF continuously.

spiderbeam on 10m aluminium push-up pole

When installing HF antennas a most important point is putting them up as high as possible. An antenna with less gain put up high will produce better signals than a lower one with more gain. Its low weight makes it much easier to put the spiderbeam higher up and choose advantageous locations.

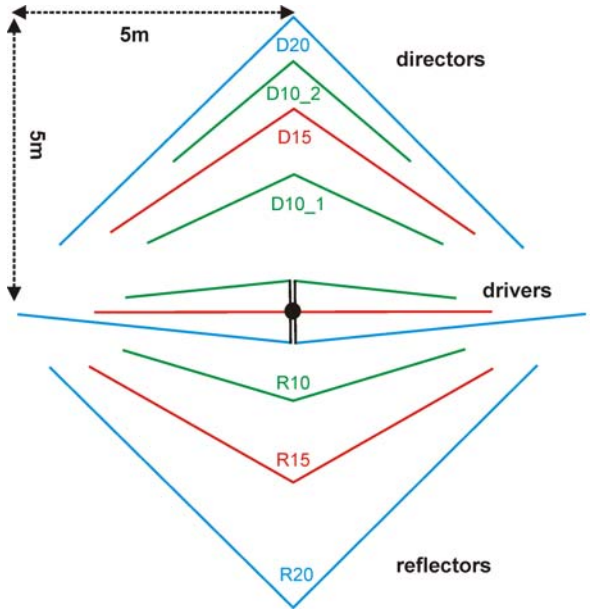
Use it while travelling, activate a nearby mountain, island, castle or lighthouse, put it on the roof for a contest weekend – this antenna goes everywhere you would never drag along a heavy conventional design tribander.

Assembly is straightforward and service-friendly. No complicated parts that can break are involved. No tuning procedure is necessary, making it an ideal newcomer's project. The material cost is quite low. Even more can be saved on the tower and rotator. And if it falls down it does not hurt much ☺

Construction details:
The fiberglass spider holds 3 interlaced wire yagis for 20/15/10m (no traps necessary):

- **3-element yagi for 20m**
- **3-element yagi for 15m**
- **4-element yagi for 10m**

In contrast to regular yagis, the director and reflector elements are bent in V-shape.



The 3 driven elements are 3 separate dipoles that are all tied together in one common feedpoint.
The feed point impedance is 50 Ω, fed through a W1JR type current choke balun, making for a very simple and robust feeding system. No phasing lines or matching devices to worry about.

© df4sa · dipl.-ing cornelius paul · liebigstrasse 2-20 · d-22113 hamburg · info@spiderbeam.net · www.spiderbeam.net

The wire elements are made from stranded copper-clad steel wire (important, to prevent elongation!). Element guy lines are made from high strength PVDF monofilament and Kevlar® material.
The wires are attached to the spreaders with double-sided Velcro® straps, making for fast assembly and disassembly times. All materials are of course UV and weather resistant.

The spider itself is constructed of 4 fiberglass spreaders, 5m long (broken down into 1m long segments for transportation). The center joint is made of aluminium sheet metal and tubes. The vertical antenna mast goes right through the middle of the center joint (the antenna's center of gravity), so weight and turning momentum of the antenna are distributed equally on the mast and rotator. This saves a lot of stress on these parts, and helps a lot when putting the antenna up on light portable masts.
Turning radius is 5m.

Technical Data (3-Band Version):

Band	forward gain (in free space)	forward gain (15m above ground)	F/S ratio	F/B ratio (across band)	SWR
20m	6.7 dBi (4.5 dBd)	11.7 dBi (4.5 dBd)	13 dB	15-20 dB	< 1.5 (14 – 14.4 MHz)
15m	6.9 dBi (4.7 dBd)	12.3 dBi (4.7 dBd)	17 dB	20-25 dB	< 1.5 (21 – 21.5 MHz)
10m	7.1 dBi (4.9 dBd)	12.6 dBi (4.9 dBd)	19 dB	20-25 dB	< 2 (28 – 29.3 MHz)

Thus, the antenna behaves like a typical modern tribander yagi with a 6 or 7m long boom.
The forward lobe is somewhat broader (front-to-side ratio F/S is less than 20dB), which is caused by the bent elements. (At least when contesting, I see this as an advantage because I do not miss people calling from the sides). The F/S ratio stays constant across the whole band.
The front-to-back ratio F/B peaks at band center and drops down to 70% at the band edges.
The forward gain stays nearly constant across the whole band (variation less than ±5%).

For portable contest operation it is of course very easy to use one set of wire elements optimised for CW Contests and another one optimised for SSB Contests, thus squeezing the last dBs out of the design.

Another idea is stacking 2 Spider Beams, which should be very well possible on a regular tower.

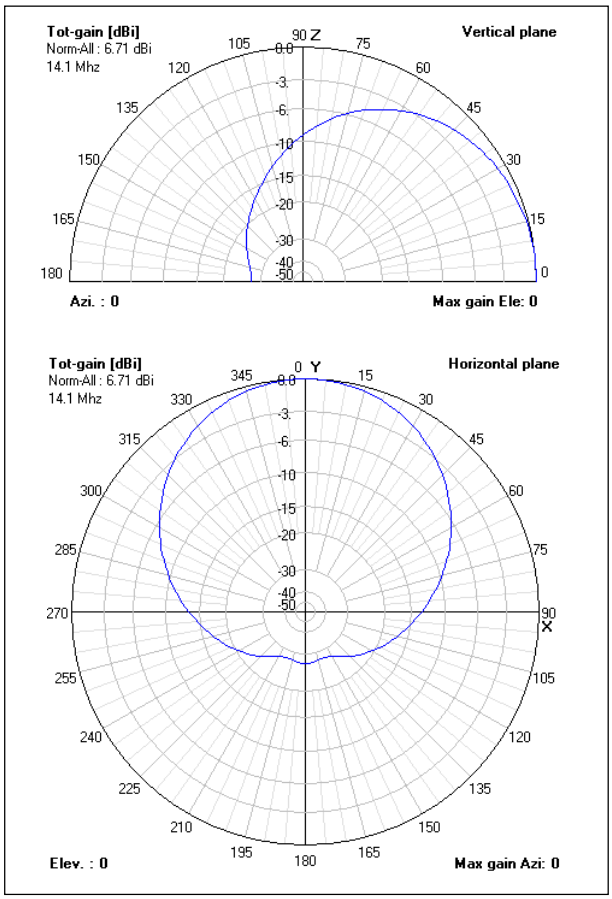
5-Band Version (20-17-15-12-10m)
The antenna can be expanded to cover 5 Bands by adding 2 additional Reflectors and 2 additional Driven Elements for 12m and 17m. Feeding is still possible with only one single coax cable!

Band	forward gain (in free space)	forward gain (15m above ground)	F/S ratio	F/B ratio (across band)	SWR
20m	6.7 dBi (4.5 dBd)	11.7 dBi (4.5 dBd)	13 dB	15-20 dB	< 1.5 (14 – 14.4 MHz)
17m	5.4 dBi (3.2 dBd)	10.5 dBi (3.2 dBd)	15 dB	20-25dB	< 1.5 (18.0 – 18.2 MHz)
15m	6.9 dBi (4.7 dBd)	12.3 dBi (4.7 dBd)	17 dB	20-25 dB	< 2 (21 – 21.5 MHz)
12m	5.2 dBi (3.0 dBd)	10.5 dBi (3.0 dBd)	17 dB	10-12 dB	< 1.5 (24.89 – 25 MHz)
10m	7.1 dBi (4.9 dBd)	12.6 dBi (4.9 dBd)	19 dB	18-22 dB	< 2 (28 – 29.5 MHz)

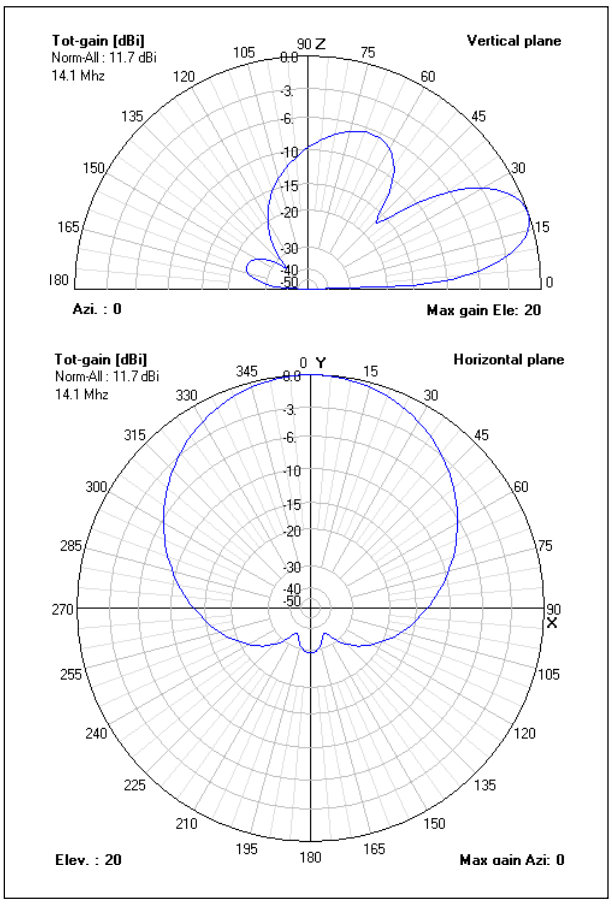
20M Data

(3 elements active on 20m)

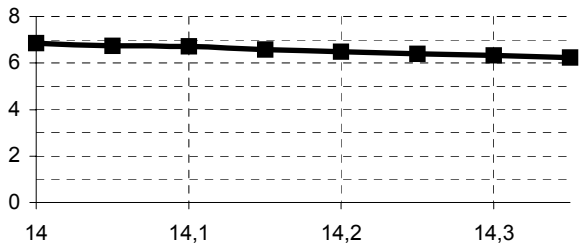
free space



15m (50ft) above ground

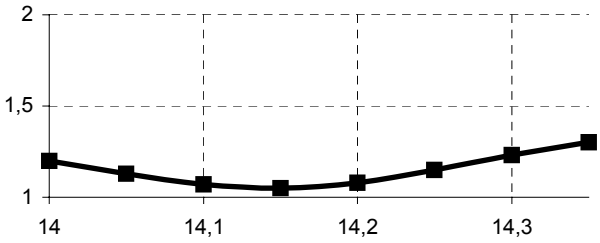


Forward gain [dBi in free space]



Front-to-Back ratio [dB]

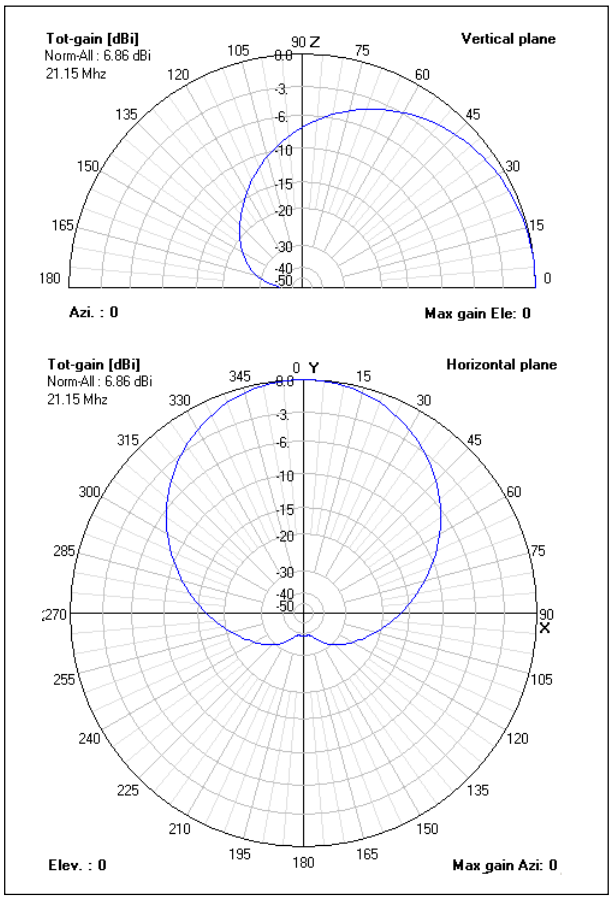
SWR



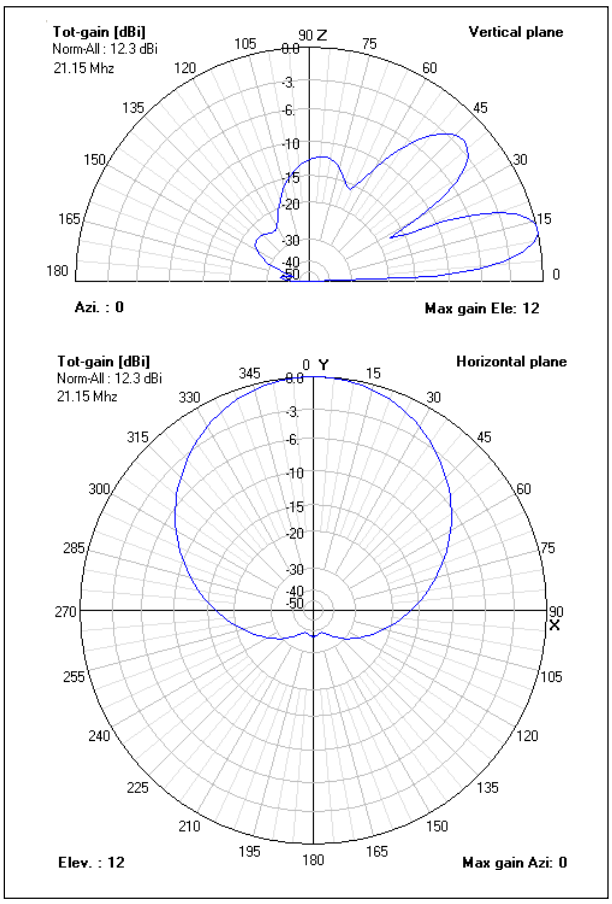
15M Data

(3 elements active on 15m)

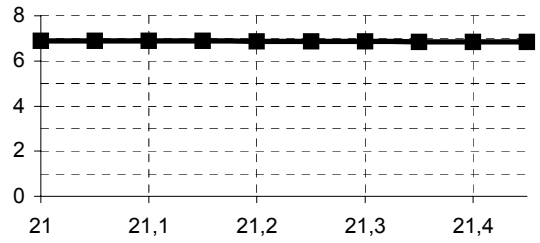
free space



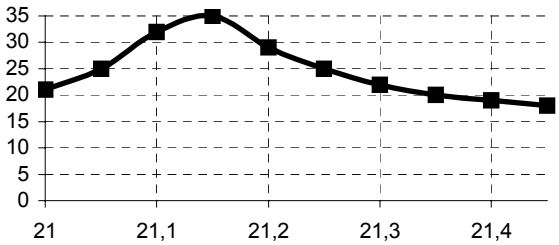
15m (50ft) above ground



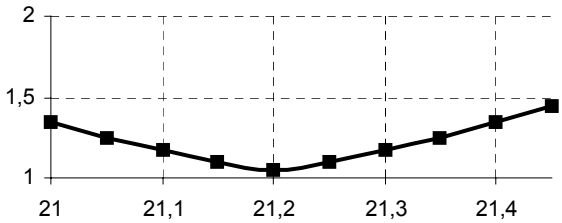
Forward gain [dBi in free space]



Front-to-Back ratio [dB]



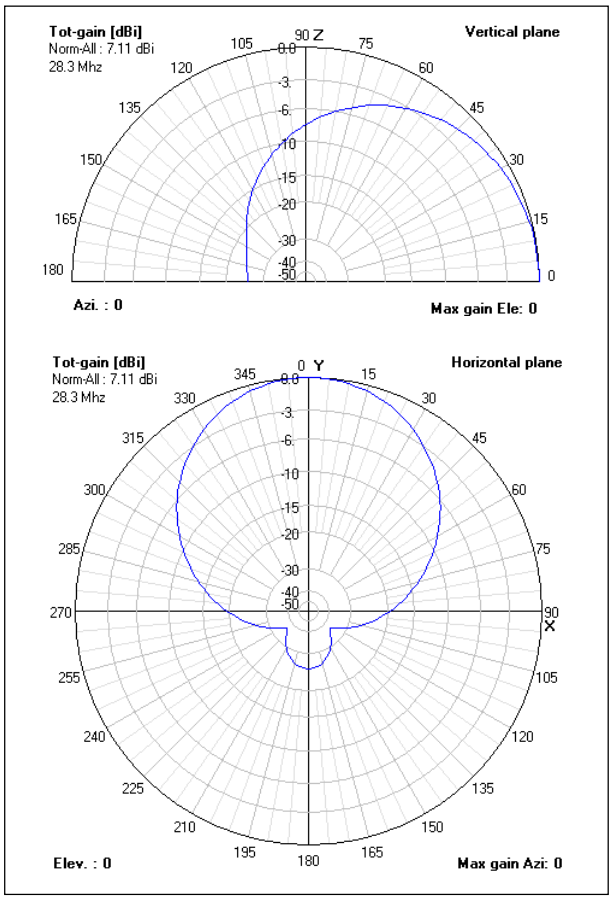
SWR



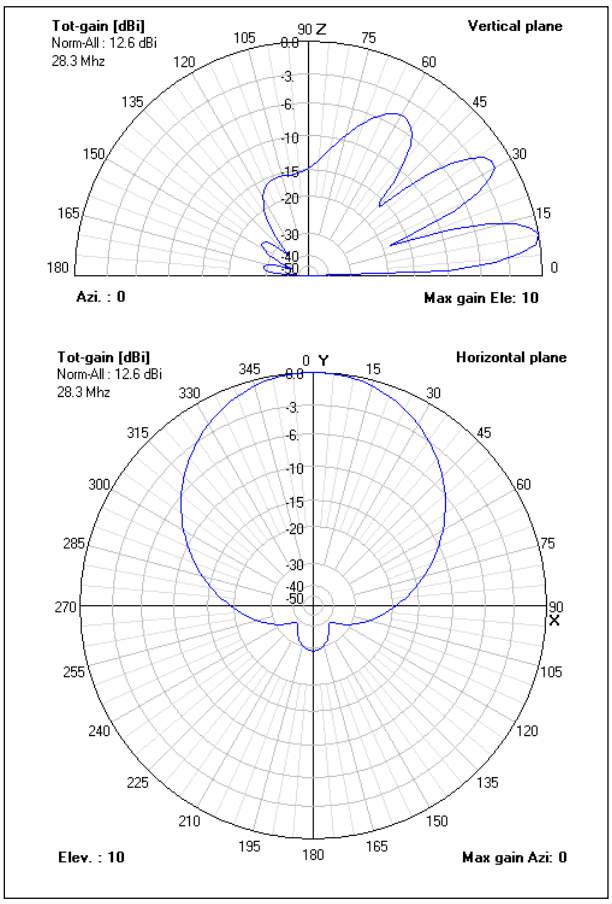
10M Data

(4 elements active on 10m)

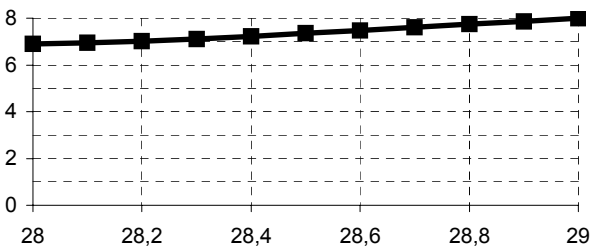
free space



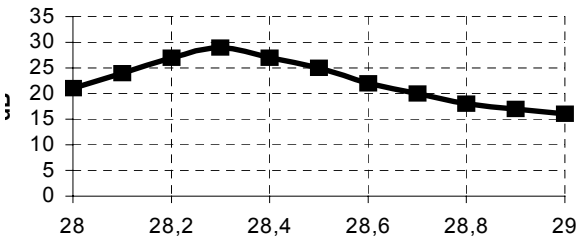
15m (50ft) above ground



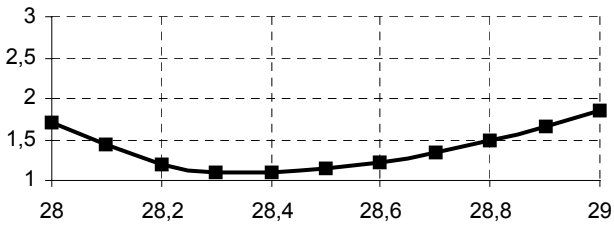
Forward gain [dBi in free space]



Front-to-Back ratio [dB]



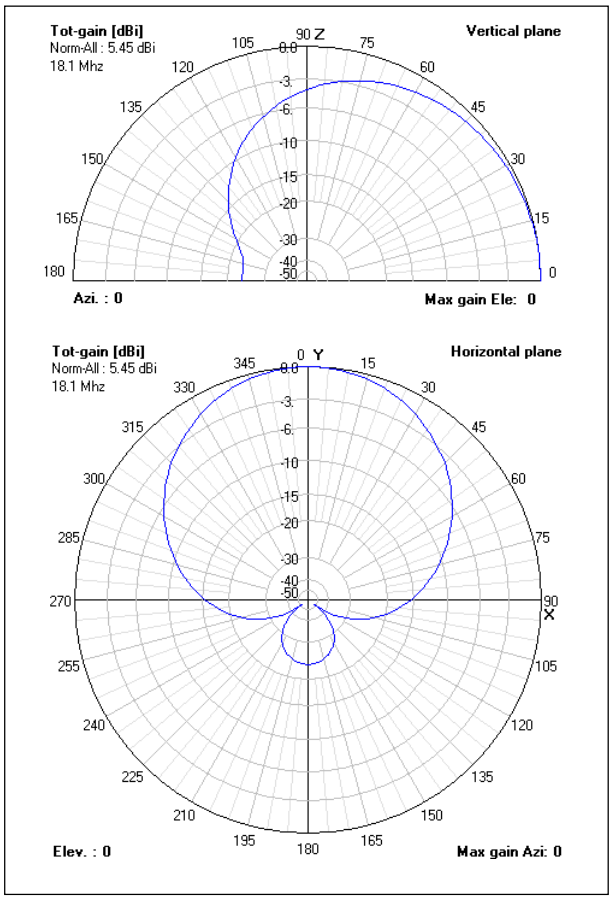
SWR



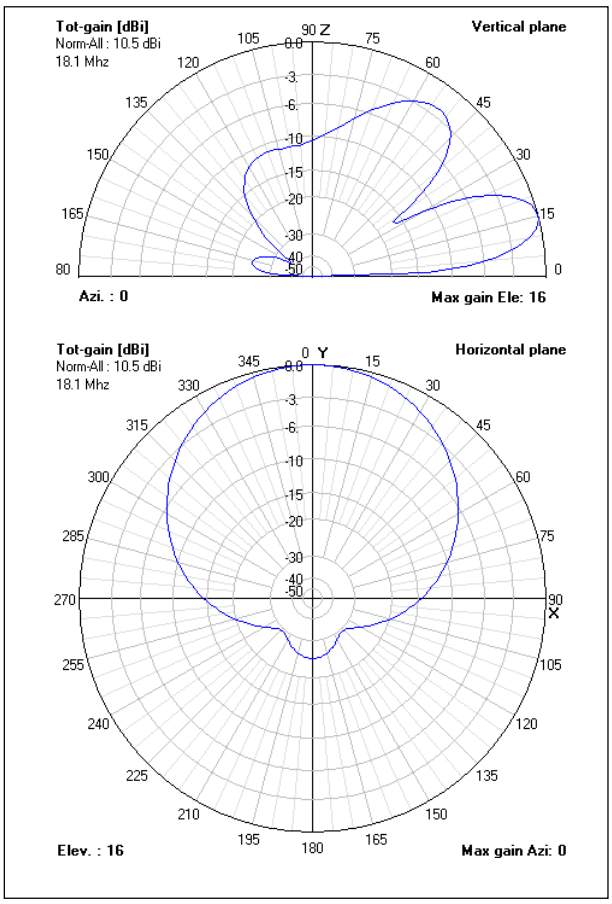
17M Data

(2 elements active on 17m)

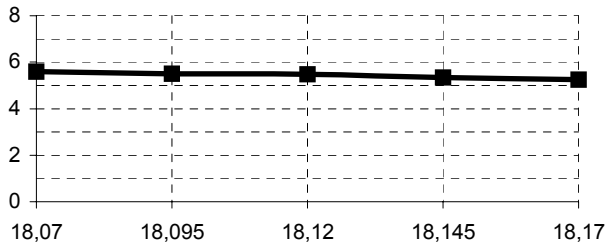
free space



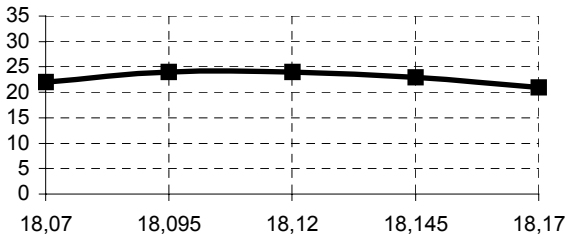
15m (50ft) above ground



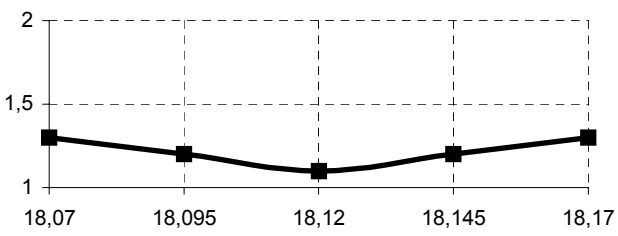
Forward gain [dBi in free space]



Front-to-Back ratio [dB]



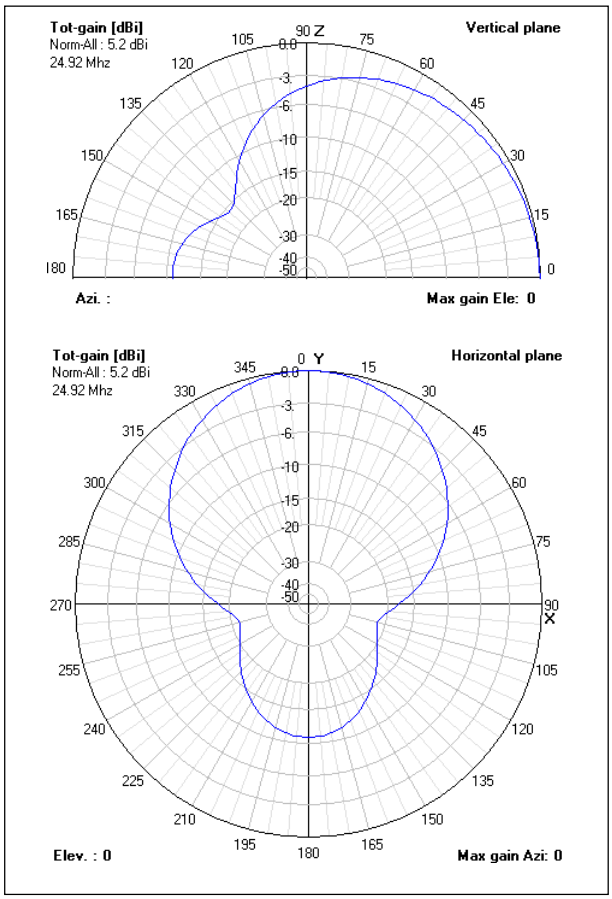
SWR



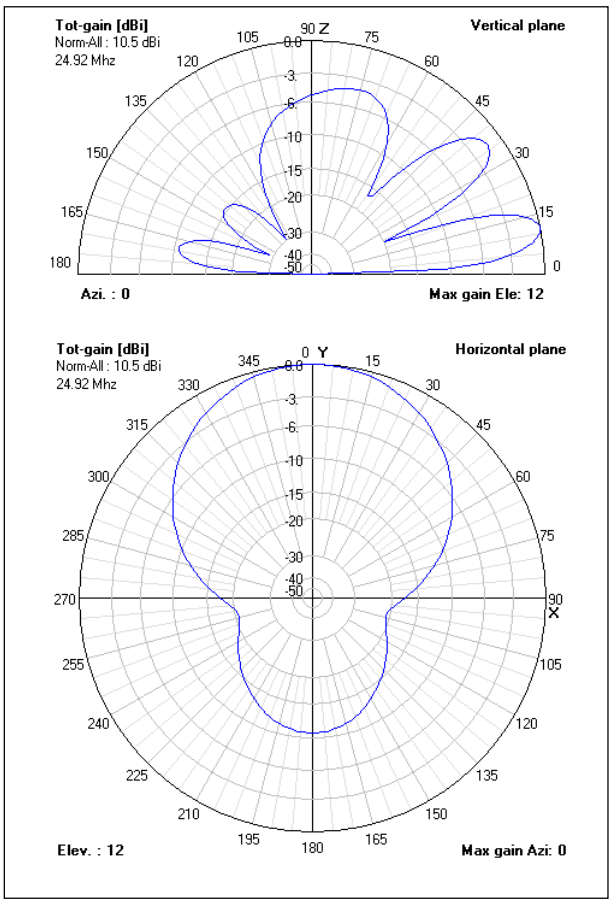
12M Data

(2 elements active on 12m)

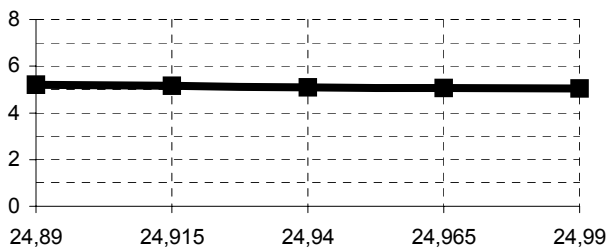
free space



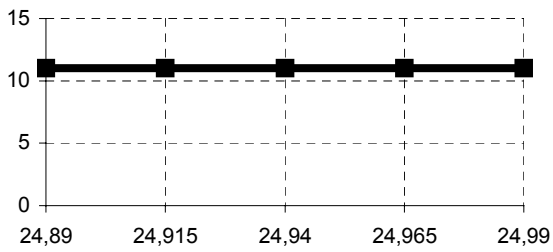
15m (50ft) above ground



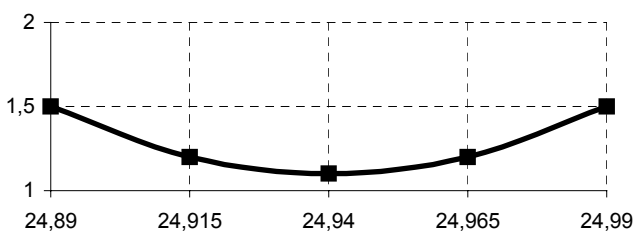
Forward gain [dBi in free space]



Front-to-Back ratio [dB]



SWR



All plotted Data collected from 4NEC2 calculations and real life measurements.