About the T2FD antenna type

T2FD is folded dipole, terminated with a low-inductance 450-1000 ohms resistor. Feed impedance is high, you may feed the antenna with open feed line. Easier method is to use balun 1:9 to 1:16 with normal coaxial feed. The terminating resistor should be of low inductance type; power handling capacity 15 to 50% of transmitter power. The resistor must also be cooled properly.

T2FD is a wide band antenna with rather low SWR over the full designed frequency range: antenna tuner is optional.

Antenna length is not critical: it works well beyond the designed frequency range, with less radiation however while transmitting. Typically total length is 30% to 50% of the wave length of the lowest frequency to be used. With antenna length you may fine-tune the lowest SWR points to some commonly used frequencies.

Free space gain is typically 3-6 dB below fixed frequency half-wave dipole. Radiation pattern is similar to dipole with the similar dimensions. Efficiency varies from 15% to 50%, typically 30%.
Some people say that T2FD is a sophisticated dummy load ...
Yes, T2FD might not be the first choice for QRP operations, especially on the lowest frequencies.

T2FD is a non-resonant, traveling wave antenna, which is rather immune to local wide band noise and statics. T2FD is a extremely quiet RX antenna with high S/N ratio... *worth to try with PSK* ...

T2FD is an ideal construction for wide band reference antennas and for Slow Frequency Hop systems. With digital modes this antenna type works well. It is also used as a high-quality wide band receiving antenna (with low power terminator). Antenna type is widely used by military and commercial services since late 1940s.

Antenna type is mostly used as NVIS short to medium range portable tactical HF wire antennas for 0 to 2000 km range, using frequencies 2 to 15 MHz. With NVIS operations the low inverted-V configuration gives the best results. We try to get the main radiation pattern up... *the cloud burner effect*. The optimal center-point height is around 9 meters. Minimal wire height from ground is near 2 meters, due the high RF voltage on wires. With dry grounds the antenna may need counterpoise wires below the antenna. We tested it; only minor changes were seen on simulations over average ground type.

The antenna works like standard dipole: If you use vertical wire loop and a flat top dipole assembly with high altitude (15-20m) you get direction pattern similar to half wave dipole with low takeoff angle radiation. *However, the T2FD is not the best DX antenna*...

NVIS inverted-V with parallel horizontal wires:

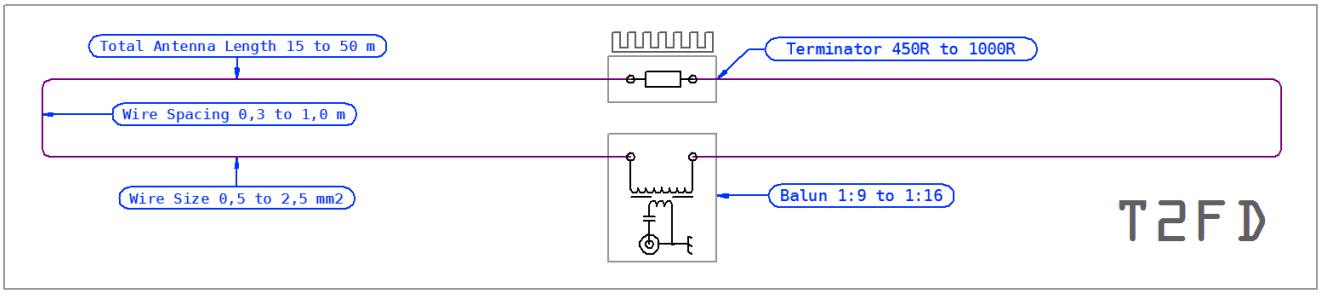
NVIS inverted-V with parallel vertical wires:

Terminator cooling

This antenna type moves about 40 to 90% of the full carrier power into the terminator. This varies by the antenna length and frequency. With CW/SSB the average dissipation is 15 to 30%.
If you use thick-film based resistor, enclosed into a transistor case or similar, it is important to cool the resistor properly. Normally you fit the resistor tight into a heatsink, using heat transfer silicone. Some heatsinks for solid state relays are compact and efficient. Typically the thick-film resistors can handle 20 to 40% of the nominal power at the 125°C device temperature. As an example:

Take BI's MHP140W resistor in TO-245 case. It can handle 30 W with 125°C case temperature. Using 100W transmitter with normally compressed SSB, you dissipate average 30W into the resistor. If you use heatsink of 2K/W, then the heatsink temperature rise is about 60°C, which means about 85°C device temperature at 25°C ambient temperature. It works, but heatsink of 4K/W produces device temperature of 145°C, which is too high.

Heatsink is easiest to fit into the center support pole of the antenna. Air cooled silicone carbide resistors are light and are easier to fit directly into wires without further support.



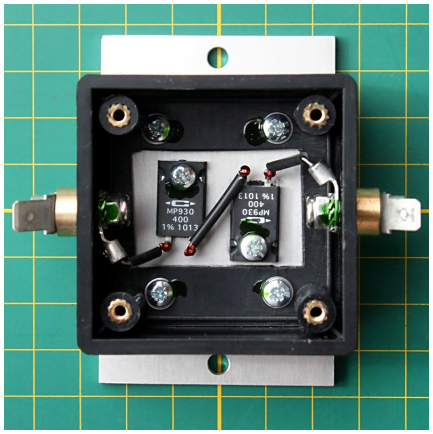
T2FD version 2012

This antenna was assembled as inverted-V at 3/8/3 m height. Input power range is up to 60W/carrier and up to 120W/SSB with the 60W terminator. SWR is from 1.0 to 2.5 full range: designed to use now with automatic antenna tuner.

Antenna total length was fine-tuned to get highest SWR points to meet the most common ham frequencies. The efficiency on T2FD antennas should be highest on high SWR points... now we try this.

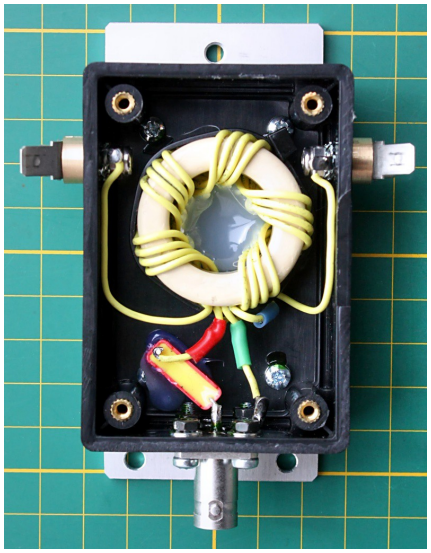
Antenna full length is 38 m for frequencies from 3.5MHz to 30MHz. Antenna's wire spacing was 450 mm. 5/500 mm glass fiber spacers were used between the wires, distance between spacers was about 3 m. Spacers were fitted with gable ties. 1.5 mm^2 PVC insulated stranded equipment copper wire was used as the antenna wire.

Terminator Box



800 Ohms low-inductance resistor is fitted into ABS box.
Resistor type is 2x **MP930-400, 400R 30W**, (Elfa).
Box is fitted into 3mm aluminum sheet and then to profile heatsink.
6.3mm AMP terminals are for connecting the antenna wires. The box was finally potted with beeswax.

Balun Box



Transformer type: 50 ohms to 800 ohms (1:16) balun.
Balun details are on separate document at the web page.
Components were fitted with hot-glue into the ABS box.
6.3mm AMP terminals are for connecting antenna wires.
BNC connector with flange for 50 ohms coaxial feed gable. The box was finally potted with beeswax. In this case we used three ferrite tubes as choke balun. Tubes were assembled over the coaxial.

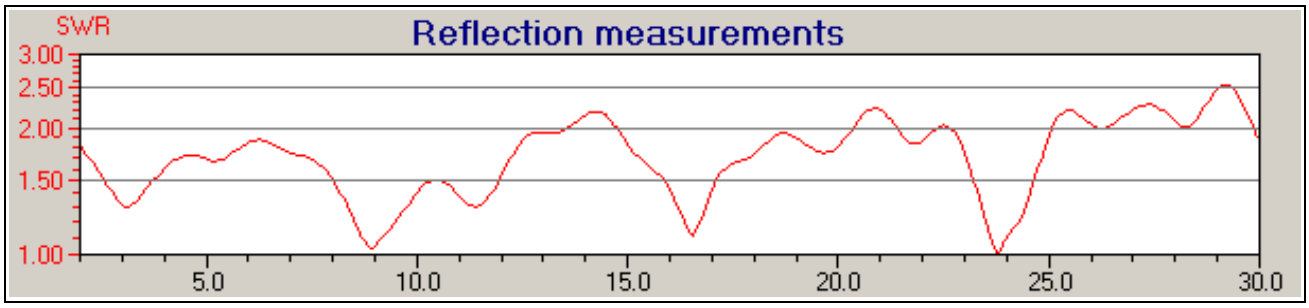
Support bar for horizontal wire loop

Terminal & balun boxes are fitted into heatsink (20x80x450mm). Horizontal wire-spacing is 450 mm. Antenna mast is free-standing 50/38mm steel tube mast, top 8 meters. Mast & antenna survived last winters storm, gusts over 30 m/s.

NEC simulated preferences:

MHz	SWR	Efficiency	Max Gain
3.5	1.25	17.5 %	-4.6 dBi
7	1.92	21.0 %	-0.7 dBi
14	2.40	40.0 %	+1.9 dBi
21	2.40	47,0 %	+3.8 dBi
28	1.80	45,0 %	+4.3 dBi

Measured SWR



Simulated Radiation Patterns

Blue: Vertical, Red: Horizontal