PA16 ELECTRONICALLY STEERABLE ARRAY ANTENNAS

- Auto-tracking / 16 high gain beams
- Seamless solid-state switching
- No moving parts
- Integrated control system

The PA16 antenna is an electronically switched array that produces a single, high gain 14dBi beam in one of sixteen directions in azimuth.

An integrated internal control system allows auto-tracking, keeping the beam pointing towards a chosen target site as the helicopter changes its position and heading.

PA16 antenna systems are now in use all over the world, providing TV stations, broadcast video providers, and emergency services with long range, airborne SD and HD digital video transmissions.

The following feedback, after Hi-Def DVB-SH testing in Dallas, TX, is from Ken Pyatt of SKY Helicopters.

“We completed HD range testing using the R44 NewsCopter, a DVB-SH modulator, 8W 2GHz transmitter and the Peak PA16. We tested by flying away from WFAA Cowboy receive site, a fairly broad 20dBi dish mounted 600 AGL. At 120NM we completed several orbits with fine HD pictures. We stopped making pictures at 130NM with no visible RF haystack. We could roll 20-25 deg and pitch 10-15 deg without losing pictures”.

Peak Antennas

www.peakantennas.com

Peak Antennas LLC
200 Main St., Unit 3A
Monroe, CT 06468 USA
Tel/Fax +1 203 268 3688
Email
info@peakantennas.com
MDPeakantennas@aol.com
Antenna System Description.

The PA16 array has a ring of 16 antenna panels, each comprising two tiers of vertical dipoles, driven through PIN diode switching and phasing circuits.

Each of the 16 overlapping azimuth beams is formed by switching in, and phasing up, 4 adjacent panels. This configuration creates a well optimised pattern to cover a 22.5 degree sector. Each beam shares 3 panels with neighboring beams, which makes for a compact design, and ensures smooth transitions with minimal RF amplitude and phase changes as the beams track round. A new feature fills in the amplitude ripple, and mitigates the effect of compass response latency during rapid manoeuvres, whereby as the target direction approaches the cross-over angle, the current beam squints-in towards that direction and then hands off to the next beam also squinting-in. The beam then reverts to its normal shape.

The elevation beamwidth is 35 degrees, which allows adequately for most in-flight manoeuvres.

An integrated circularly polarised downlook antenna allows the system to be used as a relay in a ground to air to ground link.

Beam overlap, showing enhanced hand-off with squint-in feature

Azimuth beam, measurement and simulation

Elevation radiation pattern

An external GPS antenna with inbuilt 20dB gain LNA is provided with the system. The LNA is powered from a DC voltage on the inner of the GPS cable connector.

Installation under Robinson R44

Peak Antennas

www.peakantennas.com
Control System Description.

The internal control system comprises a GPS receiver, electronic compass, microprocessor with embedded system software, I/O comms and diode drivers.

Hand-held Terminals.
User interface is provided by an externally connected handheld keyboard / display terminal. This is used to select the mode of operation, input the lat / long coordinates of target sites and provides various real-time information on the screen. The control system software supports two different terminals. The Trans-Tech Pro-Term is standard, but the Oyster OT-40 is available on request. The pods can also interface with a PC running terminal emulation software.

Control Functions.
A total of 10 target sites can be entered and edited, and this data is held permanently in memory. When Directional or auto-tracking mode is selected the control system uses the current GPS position and compass heading information to keep the beam pointed towards the selected target site, as the helicopter changes its position and heading. Other operational modes are Manual, where the user can select which of the 16 beams is energised, Omni, where all the array panels are energised creating a low gain omnidirectional antenna and Nearest, where the beam will automatically be pointed towards the nearest target site in the memory. When the helicopter is closer than 1.5km from the selected target site in Directional mode, the system automatically changes to Omni mode in order not to risk overloading the receive site.

GPS Receiver.
The integrated GPS receiver provides the current location of the helicopter to the processor (for use in the pointing calculation). It also has a look-up library of magnetic declination values worldwide, and so also provides the local declination value (again for use in the pointing calculation). Additionally it provides NMEA data sentences, available at the control connector in RS232 format at 4800 baud or 1200 baud (with an option for an FSK, Bell modem also). This can be added to the transmission to provide position data to a tracking receive site. The lat/long is displayed on the terminal screen.

Electronic Compass.
A high performance compass module is mounted inside the pod. It features enhanced accuracy and stability, with liquid-filled bubble pitch/roll sensors backed up by mems rate gyros, separate filtering of pitch/roll sensors and magnetometers for output stability in vibrating environments and a sophisticated and proven calibration routine to remove errors caused by permanent magnetic fields generated by the airframe and associated hardware.

Peak Antennas

www.peakantennas.com

Peak Antennas LLC
200 Main St., Unit 3A
Monroe, CT 06468 USA
Tel/Fax +1 203 268 3688
info@peakantennas.com
MDPeakantennas@aol.com
# PA16 ELECTRONICALLY STEERABLE ARRAY ANTENNAS

## Specifications.

<table>
<thead>
<tr>
<th>Specification</th>
<th>PA16-225</th>
<th>PA16-250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>PA16-225</td>
<td>PA16-250</td>
</tr>
<tr>
<td>Frequency</td>
<td>1.98-2.50 GHz</td>
<td>2.3-2.7 GHz</td>
</tr>
<tr>
<td>No. of beams</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Gain</td>
<td>14dBi</td>
<td>14dBi</td>
</tr>
<tr>
<td>Beamwidth</td>
<td>25 degrees azimuth</td>
<td>35 degrees elevation</td>
</tr>
<tr>
<td>Polarization</td>
<td>Vertical</td>
<td>Vertical</td>
</tr>
<tr>
<td>Return loss</td>
<td>14dB</td>
<td>14dB</td>
</tr>
<tr>
<td>Downlook Antenna</td>
<td>5dBi gain, 90deg B/W, RHCP (or LHCP)</td>
<td>5dBi gain, 90deg B/W, RHCP (or LHCP)</td>
</tr>
<tr>
<td>Size</td>
<td>355mm (14 inches) radome diameter</td>
<td>225mm (9 inches) height</td>
</tr>
<tr>
<td>Weight</td>
<td>6.8kg (15 pounds)</td>
<td>6.8kg (15 pounds)</td>
</tr>
<tr>
<td>Voltage supply</td>
<td>7-28 V dc (unregulated)</td>
<td>7-28 V dc (unregulated)</td>
</tr>
<tr>
<td>Current draw</td>
<td>1.0A at 20V</td>
<td>1.0A at 20V</td>
</tr>
<tr>
<td>Connectors</td>
<td>Array N type socket</td>
<td>TNC socket</td>
</tr>
<tr>
<td></td>
<td>GPS (ext. ant.) TNC socket</td>
<td>SMA socket</td>
</tr>
<tr>
<td></td>
<td>Downlook SMA socket</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control 19 pin circular (KPT07A14-19P)</td>
<td></td>
</tr>
<tr>
<td>Hand Terminal</td>
<td>Trans-Tech Pro-Term</td>
<td>Oyster OT-40 (shown below)</td>
</tr>
</tbody>
</table>

![Close-up of top plate connectors](image)

Peak Antennas

www.peakantennas.com

Peak Antennas LLC
200 Main St., Unit 3A
Monroe, CT 06468 USA
Tel/Fax +1 203 268 3688
info@peakantennas.com
MDPeakantennas@aol.com