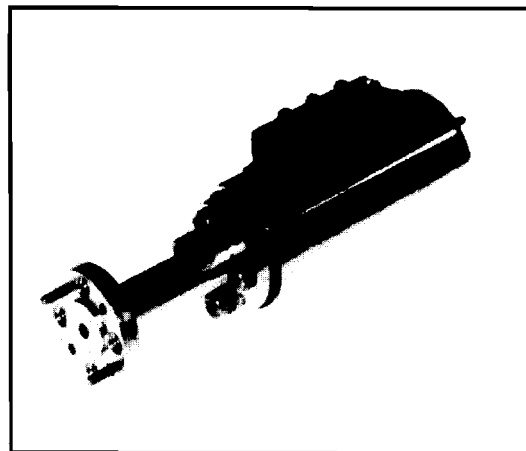


Series 886 Remote Polarization Switch/Diversity Antennas

Features

- ▶ Remote Control of Transmit/Receive Signal Polarization
- ▶ Typical Switching Time of 5 Microseconds
- ▶ Optional Polarizer Driver Allows for Use at Two Separate Frequencies



Description

Fixed and manually switchable circular mode antenna polarization components can be used to provide many polarization options in an antenna, but they are limited to one or two functions at any one time. Some of these polarization functions can also be switched, but, since the switching requires manual control, the switching time is increased.

Alpha's Series 866 remote polarization switch has been designed to make antennas more versatile with polarization selections from a remote position. Each switch consists of a ferrite rotator and a fixed circular polarizer. Considering the device on the transmit end, the signal flow is described as follows:

An incident vertical polarization passes undisturbed through the unexcited ferrite section undisturbed and continues on through the polarizer. The polarizer phaser section (quarter-wave plate) is oriented at right angles to the incident vertically-polarized E-field and allows the field to pass undisturbed. This is the "zero current," unexcited, linear, vertical mode of the remote polarization switch as seen in the upper right section of Figure A. With an applied excitation current, the incident vertical polarization can be rotated 90 degrees to a horizontal position in the ferrite rotator as seen in Figure A. The E-field is then parallel to the polarizer

phaser card and passes undisturbed through the polarizer section in the horizontal plane.

With different excitation current values on the ferrite, the incident electric field can be rotated at different angles. If it is rotated 45 degrees counterclockwise (-45 degrees) then it will result in left-hand circular polarization (LHCP) after passing through the phaser card. Similarly, it will result in RHCP if it is rotated 45 degrees clockwise ($+45^\circ$). Both circular-polarized configurations are shown in Figure A. Some typical operating characteristics of the Series 886 remote polarization switch are shown in Figure A. Over a two percent bandwidth, this unit will have a maximum axial ratio of 1.8 dB with a maximum VSWR of 1.35 and a minimum cross-polarized isolation of 20 dB.

The actual switching of this device occurs in the Faraday rotator, which consists of a small circular ferrite rod which is supported by a Teflon cylinder in a thin-walled stainless steel waveguide. A coil wound around this stainless steel waveguide provides the magnetic excitation in the ferrite. The switching or rotation time of this device is dependent upon its physical structure, materials, and driver. With an Alpha driver, the typical switching time is 5 microseconds. The switching time will vary if a different driver is used.

Another important point of interest with this device, as in all ferrite devices, is hysteresis. Current through the coil induces a magnetic field in the ferrite. When this current is shut off, a residual magnetic field remains in the ferrite which rotates the electric field. This residual magnetic field is called hysteresis and is a function of the ferrite and the magnitude of the induced current just before it is shut off. Caution should be exercised in the sequence of angular rotation so that the operation of the ferrite is confined to one single hysteresis loop. Figure B shows a typical hysteresis loop with a prescribed sequence of 1-2-3-5-5-6.

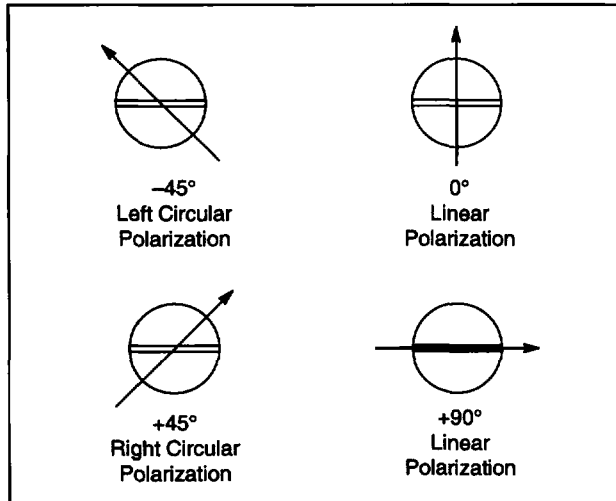


Figure A

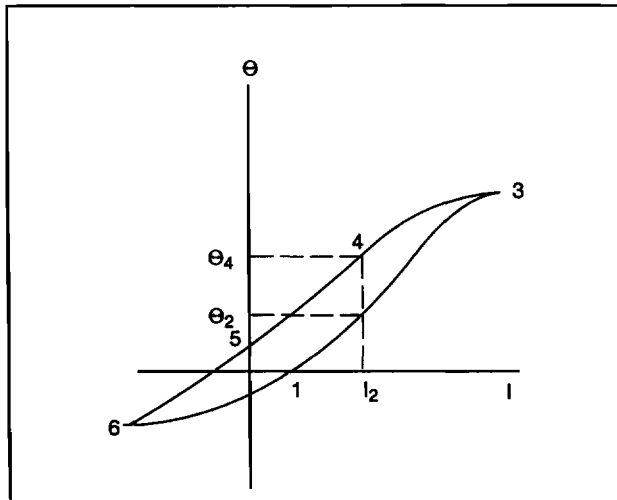


Figure B

A calibration sheet is supplied with each unit giving test data for each of the respective data points 6-1-2-3 as shown in Figure B. Note that 2 is the measured angle on the calibration data sheet corresponding to the

excitation current I_2 (not 4). Any departure from this sequence will result in current and angle values which are different from those given in our calibration table due to hysteresis error. The curve can be recaptured by following the sequence:

1-2-3-4-5-6-1-etc. a few times without any non-sequential steps. The current values should then repeat the calibration curve with small variations due to frequency changes.

Optional Polarizer Driver

A Polarizer driver is available as an option and is highly recommended for operation with the Series 886 remote polarization switch. This driver was designed to excite the ferrite polarizing device with multiple precision currents. The magnitude of current desired is controlled by a set of front panel switches or remotely by connecting digital signal lines to the rear panel connector. Two sets of five current sources are available. The values of these currents are adjustable from the rear panel by screwdriver adjustment of ten multiturn trimming potentiometers. There is also a pair of jacks on the rear panel that accept meter probes to monitor currents.

Usually, one group of five currents is used at one frequency to set the polarization angle to five discrete angles (0, 45, 90, 135, and -45 degrees). The second set of five currents may be used to set the ferrite polarizer to the same set of polarizer angles but at a second frequency. A two-position front panel switch labeled F1/F2 allows the operator to calibrate the ferrite polarizer at these two discrete frequencies. Both this switch and the large rotary switch are inactive when the remote/local switch is in the remote position.

Ferrite hysteresis is eliminated by driving the device with a large negative current each time a new polarizing angle is selected. Both the amplitude and length of time of this reset pulse are adjustable from the rear panel.

The individual currents are preset at the specified frequency during the calibration and tuning of the polarization switch. This data is provided with each polarization switch and an operating manual is provided with each driver.

WARNING: Sensitive ferromagnetic devices are prone to the effects of stray magnetic fields, and the presence of other ferrous components. Care should be exercised to ensure that these switches are located at a minimum distance of 2 inches from any such disturbance-producing units or components.

Ordering Information

To order the Series 886 remote polarization switch, please specify the following parameters: frequency, waveguide, and waveguide flanges.

As with all special antennas, please consult the antenna engineering group at Alpha with specific applications.

Typical Polarization Specifications at 95.0 GHz

Rotation Angle	Current (mA)	Axial Ratio (dB)	VSWR	Polarization
-45	-25	1.1	1.25	LHCP
0	0	30.3	1.28	Linear
+45	+29	1.2	1.28	RHCP
+90	+92	>35	1.30	Linear

Model Number	A		B	
	in	mm	in	mm
886Ku	3.25	82.6	1.75	4.45
886K	3.00	76.2	1.25	31.8
886A	2.50	63.4	1.25	31.8
886B	2.50	63.5	1.25	31.8
886U	2.50	63.5	1.25	31.8
886V	1.69	42.9	0.88	22.3
886E	1.69	42.9	0.88	22.3
886W	1.69	42.9	0.88	22.3

Outline Drawing

