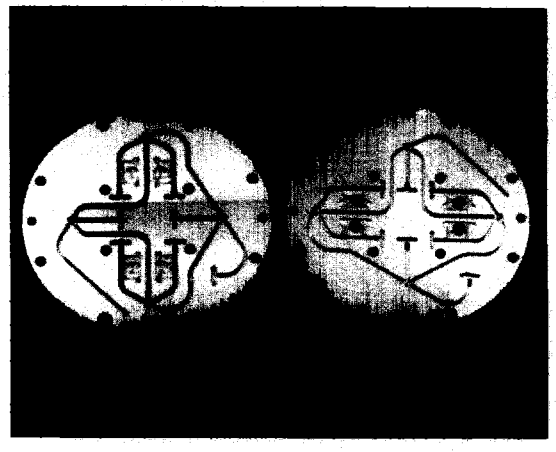
Miniaturized Millimeter Wave Monopulse Comparator Feed Assembly

Features

- Deep Null Depth > 30 dB
- High Efficiency > 55%
- Excellent Performance
- Small Size
- Light Weight
- Planar Waveguide



Description

Alpha's miniaturized millimeter wave monopulse primary feed/comparator network utilizes planar waveguide techniques to offer a more compact package than conventional monopulse waveguide plumbing assemblies. Each comparator is automatically machined by CNC milling machines in an aluminum split-block configuration. The result is excellent electrical performance that helps the system designer achieve significant savings in size and weight.

Full null depths greater than 30 dB, the signals from all ports are matched to within 0.25 dB in amplitude and to within 3 degrees in phase. The four balanced output ports are routed to a small cluster for feed horn excitation where the signals are coupled to a unique multimode scalar feed horn through a resonant cavity. This multimode scalar feed features almost perfect E-plane/H-plane symmetry as opposed to conventional horns that have distinctly different radiation properties in the E-plane and H-plane. The inherent symmetry enables the multimode feed horn to mask the sum and difference modes and bring together the radiation envelope of the two modes.

Refer to the Application Notes for a more detailed review of four-port monopulse theory and operation.

Applications

Alpha's miniaturized millimeter wave monopulse primary feed/comparator network can be easily integrated with various types of antennas, such as lens antennas and parabolic reflectors. In addition, the feed/comparator network can easily be integrated with the receiver front end, including LO and LO distribution network. The available savings in size and weight make this device very effective for use in airborne applications such as tracking and terminal guidance where size and weight are critical factors.

Primary Feed Characteristics

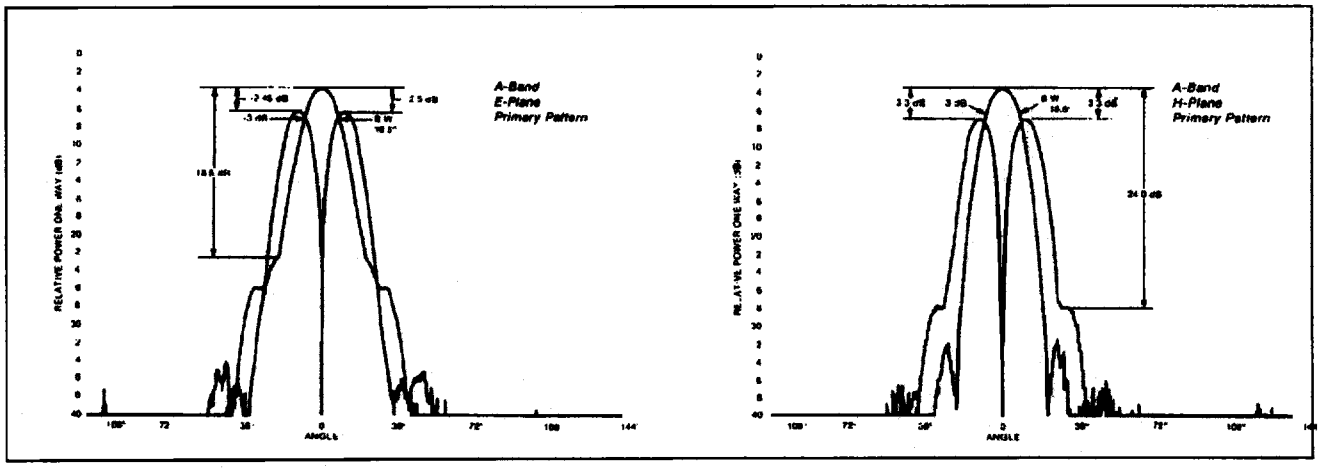
Model Number:	878A	878W
Frequency Range (GHz)[1]	35.0 ± 0.5	94.0 ± 0.5
Sum Port		
3 dB Beamwidth, Nom	16°	16°
10 dB Beamwidth, Nom	30°	30°
Sidelobes, Min (dB)	–20	–20
VSWR, Max	1.5:1	1.7:1
Difference Port		
Sidelobes, Min (dB)	–20	–20
Peak Variation, Max (dB)	+1.0	+1.0
Amplitude Variation , Typ (dB)		
Sum/Difference	4.0	4.0
Null Depth, Min (dB)	30	30
VSWR, Max	1.7:1	1.7:1
Polarization	Single Linear	Single Linear
Isolation, Min (dB)	25	25

Secondary Performance Characteristics

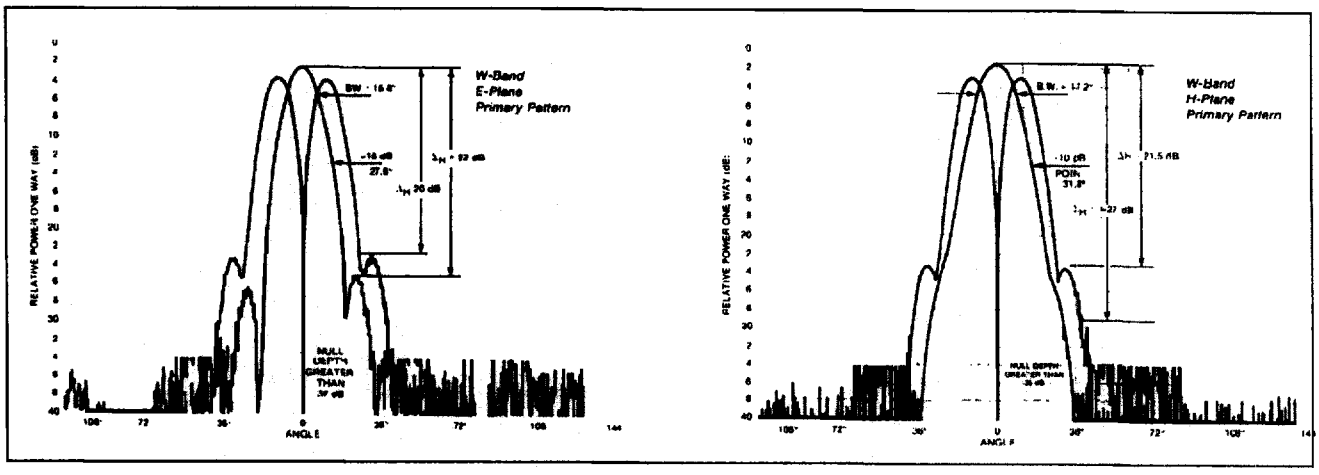
Model Number	–	**879–012W**	**879–024W**	–
Frequency Range (GHz)	94 ± 1.0	94± 0.5	94± 0.5	35 ± 0.5
Antenna Type	Lens	Reflector	Reflector	Reflector
Antenna Diameter (Inches)	4	12	24	15
Polarization[2]	Linear	Linear	Linear	Linear
Sum Port				
3 dB Beamwidth	2.2°	0.73°	0.37°	1.6°
Sidelobes, Nom (dB)	–22	–18	–18	–18
Feed Insertion Loss, Max (dB)	1.0	2.5–3.0	2.5–3.0	1.0
Any Port Net Gain, Min (dB)	37	46	50	39
VSWR, Max	1.7:1	1.7:	1.7:	1.7:1
Difference Port				
3 dB Beamwidth, Nom	48°	1.6°	.8°	3.52°
Sidelobes, Nom	–22	–18	–18	–18
Amplitude, Nom	–5	–4	–4	–4
Peak Variation, Max	±0.5	±0.5	±0.5	±5
Null Depth, Min (dB)	–30	–30	–30	–30
VSWR, Max	1.7:1	1.7:1	1.7:1	1.7:1
Isolation (dB)	–25	–25	–25	–25

1. Broader bandwidths can be supplied on request.
2. Circular polarization is available on request.
3. The W–band 12–inch assembly can be ordered as model number 879–012W. The other assemblies described on this page are custom–engineered models. Alpha Industries will quote on any custom–engineering monopulse comparator/feed assembly.

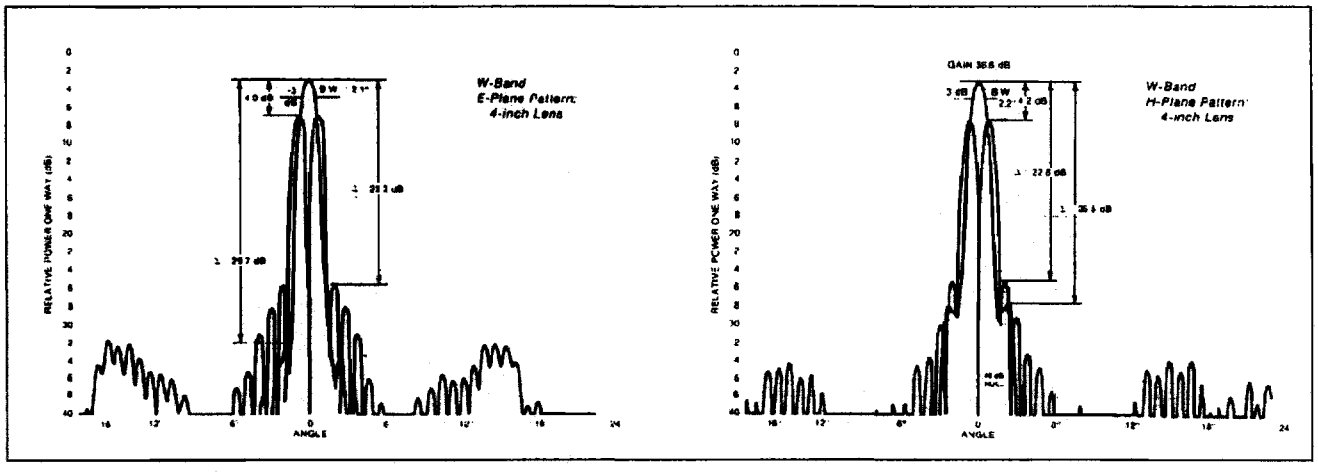
A-Band E and H-Plane Primary Patterns



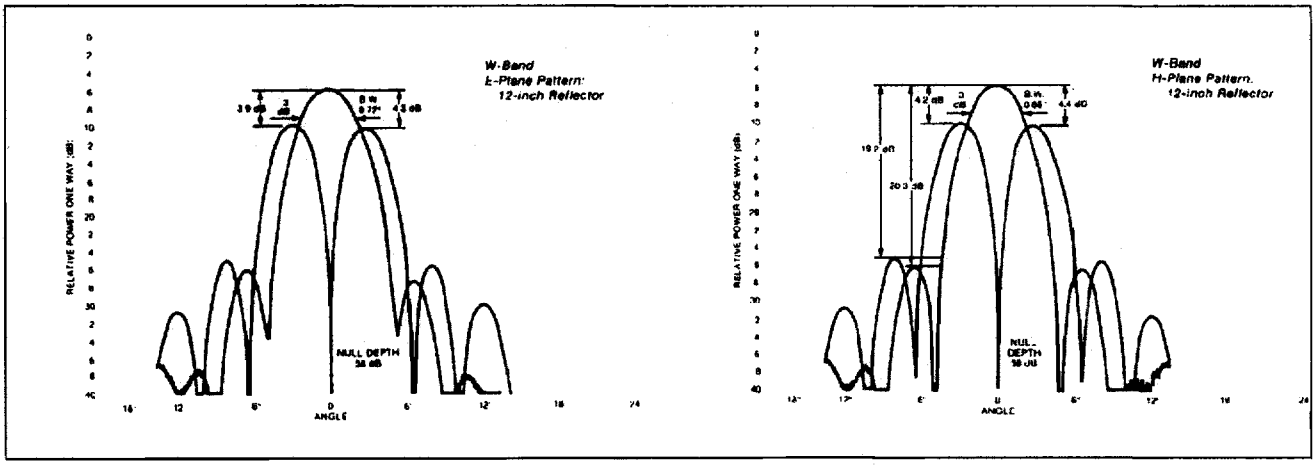
W-Band E and H-Plane Primary Patterns



W-Band E and H-Plane Secondary Patterns: 4-inch Lens



W-Band E and H-Plane Secondary Patterns: 12-inch Reflector



A-Band E and H-Plane Secondary Patterns: 15-inch Reflector