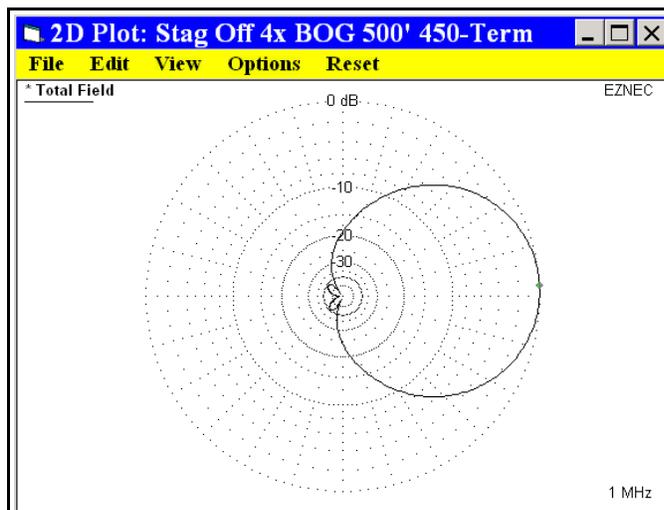


beverage array near Houlton, Maine in 1927 for their first transatlantic telephone system in 1927. Staggered offset beverage arrays are sometimes called echelon beverage arrays. W8JI has a schematic of a dual staggered offset beverage array using coax delay on his web site. My dual SO beverage array above uses LC delay.

If the beverage antenna elements are shortened to 500' and two more staggered offset beverage antennas are added, then EZNEC predicts the pattern at right for a Quad Echelon BOG array. The pattern is not much different from a QDFA.

For no particular reason, I decided to terminate the beverage antenna elements with grounds instead of the traditional 450 ohm (nominal) resistors. To my surprise, EZNEC predicted the pattern below with a narrower beam width. The null of the ground terminated echelon array is not quite as deep as the 450 ohm terminated echelon array, but still very good.

In general, the wider the offset, the more skewed the pattern, and for a narrower beam width the beverage elements should be terminated. Ground terminated echelon arrays have higher impedances than traditional resistor terminated arrays, so high impedance followers at the beverage elements may be required to achieve the pattern predicted by EZNEC.



Wires

Wire Create Edit Other

Coord Entry Mode Preserve Connections

No.	End 1				Conn	End 2		
	X (ft)	Y (ft)	Z (ft)	X (ft)		Y (ft)	Z (ft)	
1	0	0	0.2			500	0	0.2
2	-100	-10	0.2			400	-10	0.2
3	500	0	0.2	W1E2		500	0	0
4	400	-10	0.2	W2E2		400	-10	0
5	-200	-20	0.2			300	-20	0.2
6	-300	-30	0.2			200	-30	0.2
7	300	-20	0.2	W5E2		300	-20	0
8	200	-30	0.2	W6E2		200	-30	0

2D Plot: Stag Off Quad BOG 500' G-Term

File Edit View Options Reset

* Total Field

1 MHz

Azimuth Plot
Elevation Angle 30.0 deg.
Outer Ring -2.89 dBi

Cursor Az 2.0 deg.
Gain -2.89 dBi
0.0 dBmax

Slice Max Gain -2.89 dBi @ Az Angle = 2.0 deg.
Front/Back 57.54 dB
Beamwidth 61.7 deg.; -3dB @ 331.5, 33.2 deg.
Sidelobe Gain -36.89 dBi @ Az Angle = 105.0 deg.
Front/Sidelobe 34.0 dB

EZNEC v. 4.0

File Edit Options Outputs Setups View Utilities Help

Stag Off Quad BOG 500' G-Term

- File: Staggered Offset Quad 500' Beverages G
- Frequency: 1 MHz
- Wavelength: 983.571 ft
- Wires: 8 Wires, 168 segments
- Sources: 4 Sources
- Loads: 0 Loads
- Trans Lines: 0 Lines
- Ground Type: Real/MININEC
- Ground Descrip: 1 Medium (0.005, 13)
- Wire Loss: Copper
- Units: Feet
- Plot Type: Azimuth
- Elevation Angle: 30 Deg.
- Step Size: 1 Deg.
- Ref Level: 0 dBi
- Alt SWR Z0: 450 ohms
- Desc Options

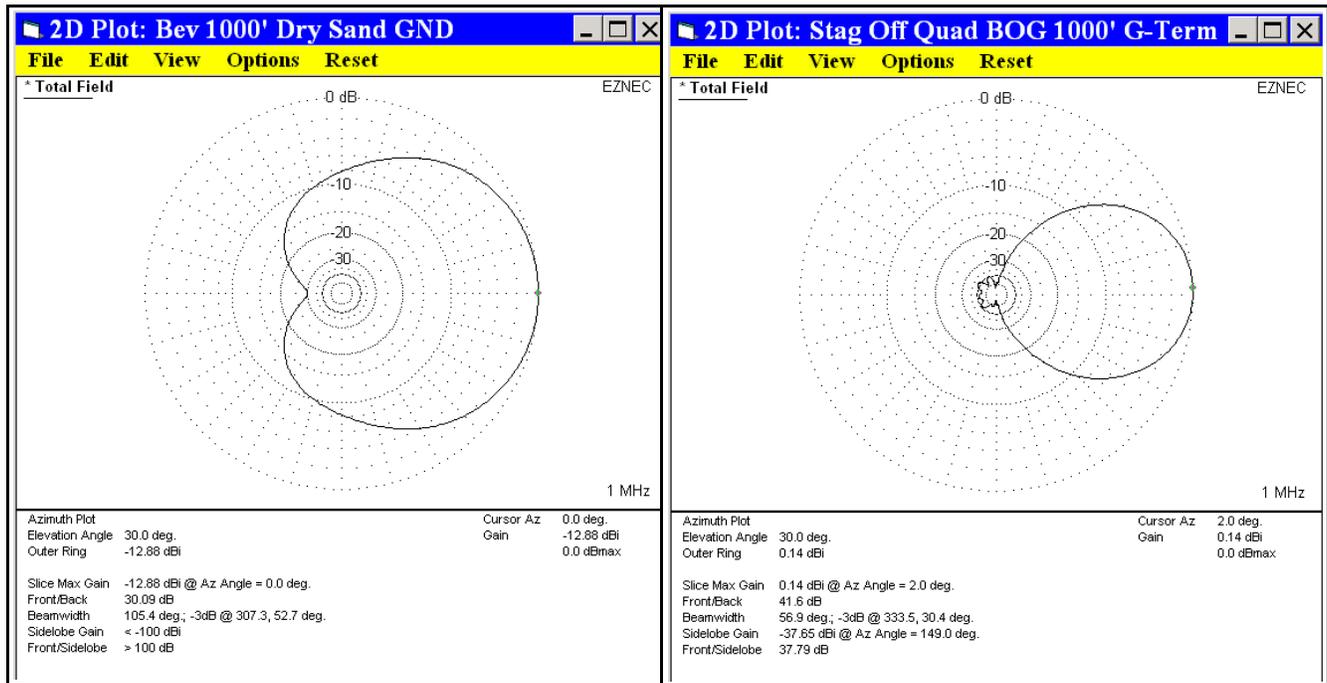
Sources

Source Edit

No.	Wire #	% From E1	% From E1	Seg	(V, A)	[deg.]
1	1	0	1.21951	1	1	0
2	2	0	1.21951	1	1	-212
3	5	0	1.21951	1	1	-212
4	6	0	1.21951	1	1	-424

I am not a big fan of beverages because of the space they require for good MW performance, but this does show what may be feasible with MW echelon beverage arrays in a relatively small space.

MW beverage true believers do not advertise it, but many MW beverages are really not all that great. For example, at Grayland and Kongsfjord the beverages are seldom longer than 1000 feet. Below left is the EZNEC pattern of a 1000' terminated beverage at 1000 kHz over good ground (dry sand). Of course, neither Grayland nor Kongsfjord has a good ground. But never mind. As you can see, the 1000' terminated beverage has pathetic splatter reduction and no better beam width at 1 MHz than a standard QDFA. If you do an EZNEC simulation at 600 kHz, the 1000' beverage pattern is omnidirectional... no splatter reduction at all!!! and 360 degree beam width!!! The pattern of a QDFA at 600 kHz is about the same as at 1000 kHz. No contest. The 1000' beverage is a loser. It does have a somewhat better pattern at 1500 kHz, but not much better.



If the length of a beverage is increased to 2000' (but this much space is not available either at Grayland or at Kongsfjord), then the beam width of the 2000' beverage is about equal to a 1000' quad staggered offset ground terminated BOG array; see above. But the 2000' beverage splatter reduction is still poor. According to EZNEC, to get good splatter reduction together with a narrow beam width from a beverage array, the elements must be staggered, offset, and ground terminated. Staggering and offsetting have been known and used since the 1920's, but ground termination apparently was unknown until I discovered it a few days ago. Ground terminated beverages have very high impedances, so staggered, offset, quad, ground terminated beverage arrays like the one with the pattern above will probably require high intercept, high Z, FET followers at the antenna elements. The only reason I can think of to implement such an array is for its more or less uniformly narrow beam width from one end of the MW band to the other. Of course, there are very few places where such an array could be implemented.