AUTOMATIC POLARITY ROTATION

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Contents

- History
 - Evolution of my EME system
 - Original feed mount with polarity rotator versus current
- Geometric Polarity and Faraday Rotation and Manually Compensating
- Automatic Rotator Design
- Results





- First EME RX
- Fixed Horizontal 70cm Array
- Lots of Faraday lock-outs and one-ways

Acquired a Dish - Sept 1999



On the moon - Oct. 2000



Guyed Center Supported Rotatable Feed



Current Feed System (2003)



222 Feed with Polarity Rotator



Geometric (Spatial) Polarity



SkyMoon (by W5UN)

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File EME Dir St	ation2 View Help	About		
HOME: BP51DC				
Thu Mar 18 20:07:20 2021 Quiet Sky Az: 4.7° E				l: 11.4°
	L. L. L. L	waxing		
Moon Az.	Declination	Perigee	Sun Az.	Sky Temp
82.96 deg.	18.44 deg	in 12 days	146.9 deg	362° k
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- ⁿ z		er d	· Rol	222 hz
	2000	53 C.	Saran.	Stn2 Doppler
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70 V	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	್ವಿ ್ರಿ		Stn2 Grid
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105 1	2.	3 MOON (6° ccw
20° ma		5 ~ ~		Stn2 Azim
And I	- T	57	8 30	148.6 deg
ر کړ ک				Stn2 Elev.
V 6		U		62.7 deg
distanting the		ll l		☐ SkyView

Faraday Rotation

In this example the lonosphere causes clockwise Faraday rotation on the transmitted signal

> The reflected signal returning from the moon *continues* clockwise rotation as it passes through the ionosphere

Manually Compensate for Faraday



- Determine Geometric Polarity
 - Sked Enter Grid
 - CQ (random) click map
 - Remember that angle
- Sweep for signal & peak
 - Subtract = difference
- Rotate difference past Geo

Calculated Approach to Compensate for Faraday



Another Example



T = Tx polarity D = Geometric R = Best signal T = 2D - R $T = 2 \times -75 - 45$ T = -195 IF T > 90 THEN T - 180 IF T < -90 THEN T + 180 T = -195 + 180 T = -15

Why Do All This ?

27° polarization error = 1dB loss



To keep the signal losses below 1dB, the polarization error must be less than about $\pm(20-30)^{\circ}$. The good news is that the signal loss within the $\pm 20^{\circ}$ region is very small.

Automatic Polarity Rotation



FEATURES

- 1 Polarity display (2 digits + sign LED (CCW)) +/-99 DEGREES
- 2 0 degree LED (PARK)
- 3 Automatic TX positioning triggered by T/R signal (AUTO)
- 4 Reset (power off-on)
- 5 Geometric position memory (GEO)
- 6 Received polarity memory (RX)
- 7 Manual polarity control via M-O-M Toggle switch
- 8 Automatic park (Hold RX and GEO for 1/2 second)

Operating Procedure



OPERATING PROCEDURE

1. First look up the geometric or spatial offset and rotate the feed to that setting and store that angle. (Press Geo)

2. Then rotate to best signal and store that angle. (Press RX)

3. Then the processor will compute the best angle to TX.

4. The processor will sense when I switch from R to T and rotate automatically to the calculated transmit polarity.

5. When I go back to R it will return to that stored receive polarity.

System Block Diagram



Gear Motor



6 volt to 12v dc motor



Prototype



Rotor Interface



Printed Circuit Board





Overall Flow Diagram



Rack Mounted Control Panel



Results

- Generally effective, not perfect.
- Noise issues due to 150 ft. Cable?
 - Adding caps and ferrites
- Cross over encoder Z pulse resets counter
- Motor slow down and stopping
 - Probably due to voltage drop
 - Doubling up conductors
- VERY CLOSE !!

This presentation, paper, and details at https://kl6m.com/polarity