Stealth Antenna Farm - 2024



Preliminary Considerations

- Why stealth ? Restrictive neighborhood covenants !
- Attic performance factors
 - Location /ground elevation
 - Attic size and height
 - Reflective clutter: furnace/AC/ducting
 - Roof insulation (reflective or not)
 - Feedline routing plan

Improvements

- Plywood flooring
- 120 V AC power
- Overhead lights
- CAT-5

Keys to Performance

• HF

- Balanced antennas: large loops or dipoles eliminates problems with grounding/counterpoise
- Lots of copper for efficiency I use copper tubing for my HF loop
- A good balun with plenty of reserve power rating I use a 10KW, 4:1

• VHF-UHF-μWave

- Stacked Yagi antennas closely spaced
- Line loss management is key to performance at higher frequency bands
 - Remote LNA establishes system NF at antenna –
 - LNA preselector filter is a MUST below 440 MHz
 - Remote PA provides 'free' boost to transmit power
- Omni antennas are useful for local QSO's
- LAN IP control of remote power supplies for:
 - LNA/PA
 - 13cm and 3cm transverters
 - Remote power telemetry
 - 6m antenna switching
 - 10 GHz dish control
 - Attic camera
- Filters are needed with co-located transmitters / repeaters
 - Receiver desense
 - Reverse IMD
- Crossband couplers reduce the number feedlines

Yagi Antennas



Omni H-Polarized Antennas



6m Phase Steerable Array



Balun Feed for HF Loop



10 GHz Dish



Vertical Omni Antennas



Repeater and Link Vertical Omni's

- 900 MHz FM repeater
- 900 MHz P25 repeater
- 900 MHz transceiver
- UHF FM/P25/DMR repeater
- Link for 900 MHz repeaters
- Auxiliary node
- VHF remote base
- VHF-UHF transceiver

SCALA OGB 6-900 DB PRODUCTS DB-589 DIAMOND BC-920 STATIONMASTER-II DIAMOND X50 DIAMOND X50 DIAMOND X50

More Than Just Antennas !



Loss of LMR-400

(100 ft, with connectors)



Sensitivity vs NF



Remote PA and LNA – Huge Benefit

- 100' LMR400 or 9913 is 5.5 dB loss at 1296 MHz
- A preamp at the antenna will be able to hear a 5 dB weaker signal !
- A PA at the antenna instead of in the shack will give 3.5 times the ERP. A 100W PA will sound like a 350W PA in the shack.
- VHF and UHF preamps need input filters to prevent overload and IMD from broadcast FM and TV.
- Microwave transverter RF line losses are higher; so, remote operation is beneficial .

10 GHz Remote Transverter



10 GHz Transverter Interior



2304 MHz Remote Transverter (50W)



902 and 1296 MHz Remote PA & LNA



902 Bandpass Filters



- 902.1 MHz filters to reject co-located 927 MHz repeater signals
- Filters are inline with 902 Yagi and circular collinear omni
- 0.6 dB insertion loss at 902.1 MHz
- > 100 dB rejection of 927 MHz

902 and 1296 MHz Switching



VHF-UHF Remote PA and LNAs



VHF-UHF PA-LNA Interior



Helical BPF



LNA Preselector Response



More Helical BPFs



RF Sampler Detectors



RF Sampler Detector Interior



Remote Telemetry Transmitter





Remote Telemetry Transmitter - Interior



Telemetry Receiver - Interior



Telemetry Receiver (in shack)





Remote Power Display



6m Phase Steerable Array



Phase Steerable Gain Direction



Azimuth Pattern

TWO DRIVEN ELEMENTS 90° PHASE SHIFT **EQUAL DRIVE**



Azimuth Plot Elevation Angle Outer Ring

0.0 deg. 4.71 dBi

Slice Max Gain 4.71 dBi @ Az Angle = 0.0 deg 19.6 dB Front/Back Beamwidth 84.4 deg.; -3dB @ 317.8, 42.2 deg. Sidelobe Gain -11.41 dBi @ Az Angle = 117.0 deg. 16.12 dB Front/Sidelobe

6m Antenna Control



RF Phase Control Circuit





6m Lumped Wilkinson Splitter







6m Ethernet Control Interface

	Danu Acuvity							RX Frequency	
UTC dB DT Freq	Message			UTC	dB	DT	Freq	Message	
181730 -15 0.3 1943 ~	W5BN WA0VPJ R+00)	^	160515	Тx		800 -	W9AKS K5TRA H	RR73
181800 -6 0.3 1944 ~	W5BN WA0VPJ 73			160530	-5	0.2	1518 -	K5TRA W9AKS	73
181800 -			×	160549	Тх		800 -	CQ K5TRA EM10	0
181830 - 🔤 DIVI Antenna Control - KSTRA			160615	Тх		800 -	CQ K5TRA EM10	0	
182100 -				160645	Тх		800 -	CQ K5TRA EM10	0
182200 -				160630	-9	0.1	1804 -	N90Q WX9M ENS	54
184430 -				160647	Тх		800 -	WX9M K5TRA EN	M10
185145 -	N			160630	-9	0.2	2464 -	CQ AA9RR EN62	2
185615				160648	Тх		800 -	AA9RR K5TRA H	EM10
185645 -				160700	-14	0.2	2464 -	K5TRA AA9RR -	-01
185715 - NW		NE		160715	Тх		800 -	AA9RR K5TRA H	R-14
185745	-18	S		160730	-14	0.2	2463 -	K5TRA AA9RR H	RR73
185815	1 Contractor			160745	Тх		800 -	AA9RR K5TRA	73
185845				160800	-15	0.2	2464 -	CQ AA9RR EN62	2
185915	w	Е		160830	-9	0.2	2464 -	NJ1H AA9RR +(02
185945 W			E	162245	-9	0.2	2470 -	VE1AAV AA9RR	73
190015			_	171100	-9	0.1	2469 -	CQ NOPSJ DM78	8
190045				171130	-12	0.1	2469 -	CQ NOPSJ DM78	8
190945 -				171200	-12	0.1	2469 -	CQ NOPSJ DM/8	8
191015	1			171230	-16	0.1	2469 *	CQ NUPSJ DM/8	3
191045 - SW		SE		171530	-19	0.1	2468 1	WOVG NOPSJ -2	20
191145 -				100045	-10	0.1	410	CO DX XE2CO I	20 DM1 2
191215	8			191100	Tv	0.2	800	VE2CO KETRA E	EM10
191215	Ŭ			191130	Tv		800 4	VE2CO KSTRA I	EMIO
191445				191145	-14	0.0	1079 -	CO W6DF DM13	
191515	at E	Evit		191200	Tx	0.0	800	W6DF K5TRA EN	M10
191545 Conne		Exit		191215	1	0.0	1079 -	K5TRA W6DF -1	12
191645 -				191230	Tx		800 -	W6DF K5TRA R4	+01
192115 -	2115 - Connected			191245	-1	0.0	1079 -	K5TRA W6DF R	R73
192600	of Hoompe puto			191300	Тх		800 -	W6DF K5TRA 73	3

Link Radios Share Feedline and Antenna



Crossband Couplers

(BAND SPLIT DIPLEXERS)











LAN Control

On/Off power supply control

- LNA-PA (144, 222, 432, 902, 1296)
- 13cm and 3cm transverters
- Attic camera



Additional remote control and telemetry

- 3cm dish azimuth-elevation control
- 6m antenna switching
- Remote power telemetry

LAN Control



Summary

- Location, location, location ! (elevation, elevation, ...)
- Plan before you begin
- Key to performance:

 - Remote PA 🛛 ← Reduced line loss is free ERP !
 - Filters needed for co-located links and repeaters
 - Crossband couplers for efficient use of coax runs
 - Link radios can share feed and antenna through cavity duplexer
- No rain, lightning or UV deterioration
- Easy maintenance