A 10 GHz repeater from junk box components

Gary Lauterbach AD6FP
Acknowledgements

- Jeffrey – WA6KBL
  - Monument Peak site arrangements
- John – N6PLR
  - Kapton tape
- Lars – AA6IW
  - 10’ of WR–75
  - 10.7 MHz crystal filter
Goals

- Promote 10 GHz activity by providing a common line-of-site point between club members
- Put it together quickly with parts on hand
Construction History

- Started out as non-translating, single conversion
  - Couldn’t get a wide BW 118 MHz crystal filter working
  - Switched to double conversion non-translating
  - Switched to translating with 600 KHz split
LO Scheme

- Crystals on-hand dictated odd LO frequencies
- 118 MHz first IF allows good image and LO rejection
- 10.7 MHz IF allows common filters
- Input: 10369.000 +/- 22 KHz
- Output: 10369.600 +/- 22 KHz
- Beacon: 10369.567
System Gain

- Noise in 44 KHz BW:
  - $1.7 \times 10^{-16}$ watt, 3db NF
  - $-127$ dbm
- Repeater gain set to 3 dbm noise output: 130 db gain
- System gain with antennas 150 db
Block Diagram
Beacon / ID

- 10 KHz below bottom of passband
- Set to 17 dbm output level, 10db below maximum output
- CW ID: call and grid square every 90 seconds
- Two active parts:
  - PIC 16F84 and NE602
Antennas

- Two waveguide slot antennas:
  - 11’ vertical distance between xmit & rcv antennas
  - 16 slots, 10 db gain
- W1GHZ spreadsheet used to calculate slot spacing/offset
  - Taylor amplitude distribution
- “Wings” for more uniform pattern
Long Path Calculation

- K7NOM to repeater:
  - 111Km: 157 db path loss
  - −113 dbm for full output
  - $157 - 113 = 44$ dbm erp (20 mw and 18” dish)

- Repeater to K7NOM:
  - 37 dbm erp − 157 = −120 dbm
  - 2.4 KHz BW, 3 db NF = −140 dbm
  - 20 db s/n with isotropic antenna
Short Path Calculation

- **AD6FP to repeater:**
  - 142 db path loss
  - $142 - 113 = 29$ dbm erp (100 mw and 16 slot omni)

- **Repeater to AD6FP:**
  - $37$ dbm $- 142 = -105$ dbm
  - $2.4$ KHz, $3$ db NF $= -140$ dbm
  - $35$ db s/n with isotropic antenna
Radio Mobile Coverage Plot
Next Steps

- Fabricate tower mounting hardware
- Install at W6YX for one month burn–in
- After burn–in relocate to Monument Peak
- Use it !!
  - Weekly microwave net ?