

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

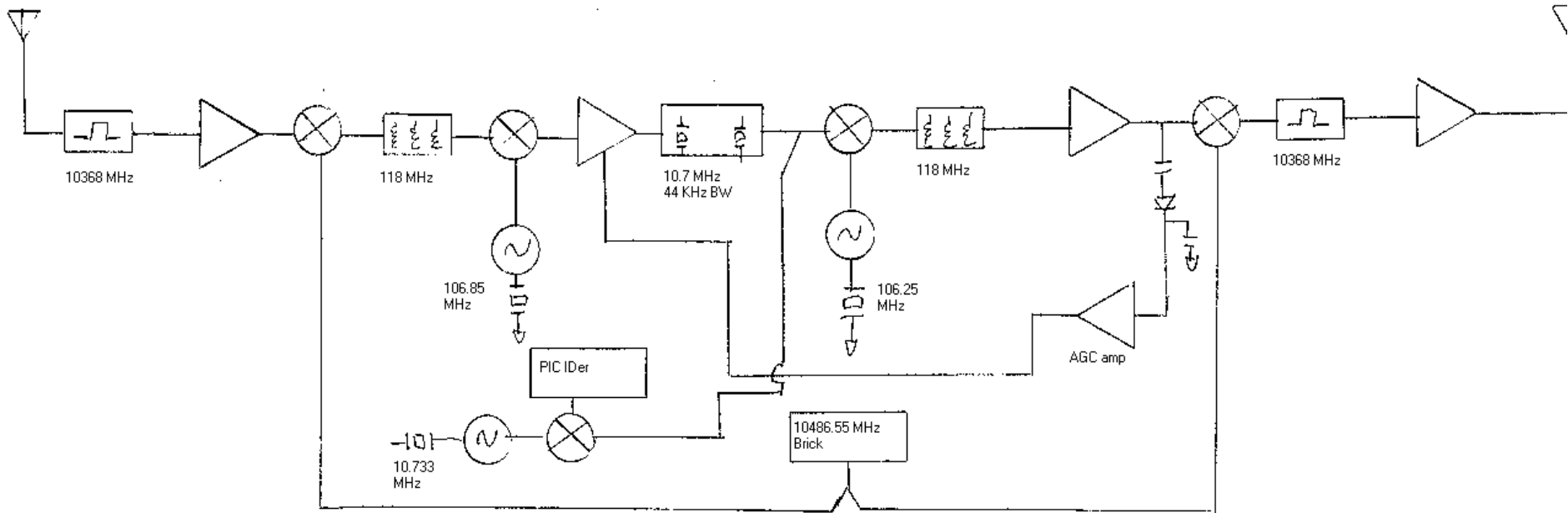
Goals

- 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

Block Diagram



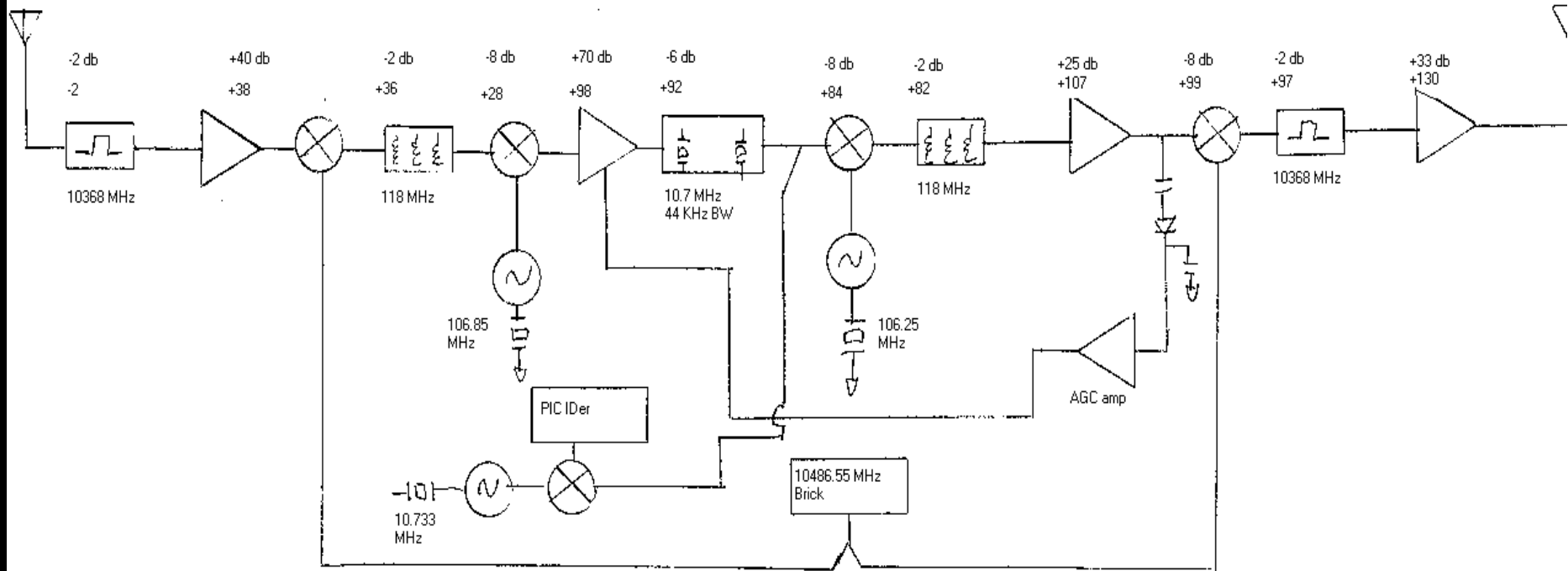
LO Scheme

- 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:
 - ◆ 1.7×10^{-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

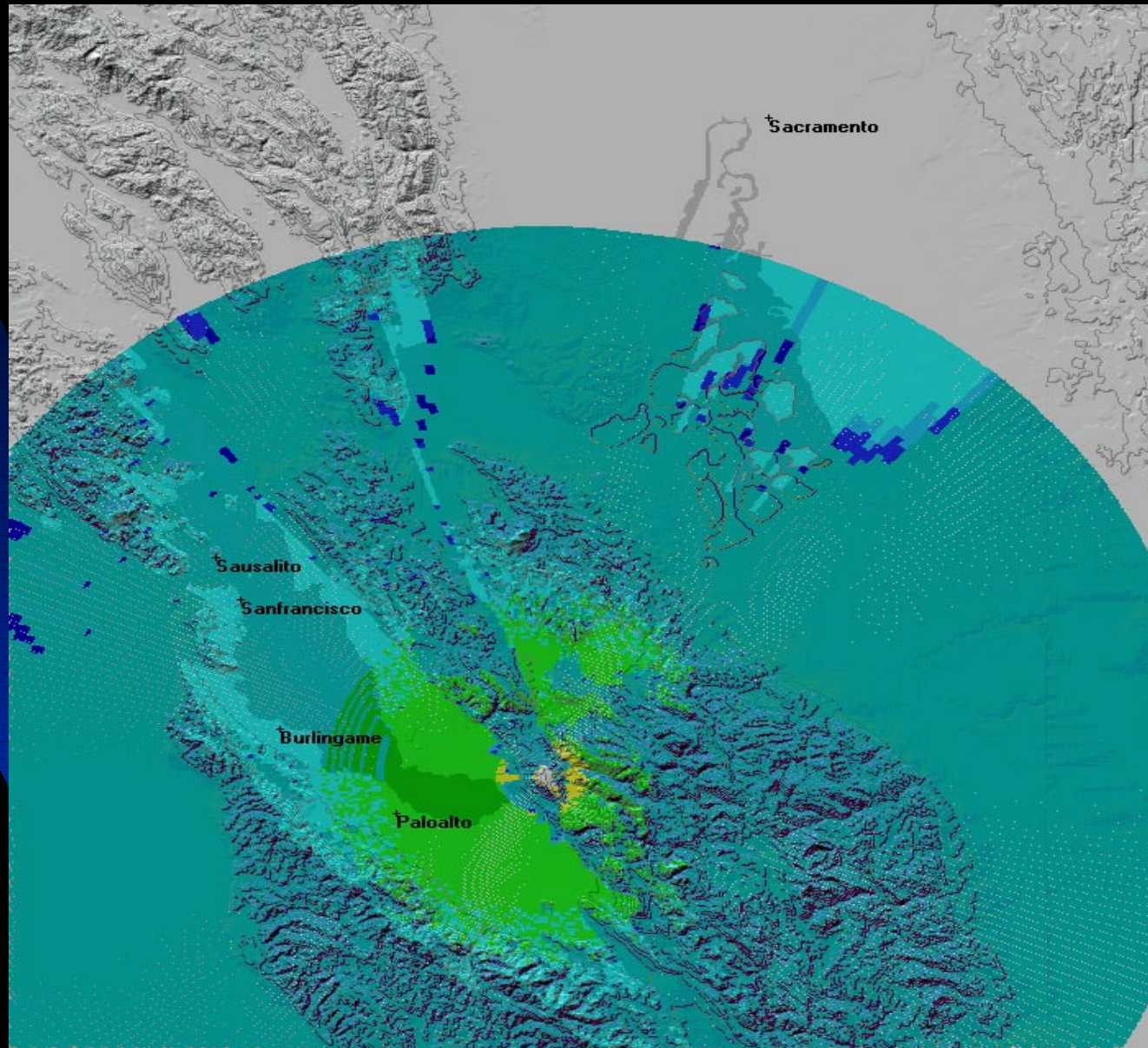
Long Path Calculation

- 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



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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 ?