E band 80.832 GHz beacon with high performance frequency source.

Compact USB programmable frequency source between 50MHz and 80GHz.
Goran Popovic AD6IW
original design and implementation
50 MHz and up club Beacon project July, 2021
Block Diagram
AD6IW 100MHz reference board
100MHz Ref. PLL Board Features

- 100 MHz locked to 10MHz OCXO
- Higher ref. frequency – better Phase Noise
- 12 bit DAC for fine frequency tuning
- Auxiliary SPI bus for external uW PLL
- Auto switching external reference, power level reading in dBm, overload protection, USB port
- Oven temperature and ready status indicator
- 10 dBm out at 100MHz, low phase noise
100MHz Phase Noise
uW PLL 4 Layers PCB RO4350B
Boards are made by PCB.WAY
Assembled board
CNC enclosure Machining
Finished uW PLL
uW PLL ADF5356 features

- USB port for easy frequency and beacon settings
- Integer and Fractional frequency synthesizer, high resolution 52 bits modulus, milliHertz resolution
- Frequency range 52.125MHz to 13,600MHz
- Adjustable power output in 3dB step’s but useful only at rf port A
- RF output switch pin or toggle bit. 23dB
Bench Testing
Test results Phase Noise
10368.1MHz
Span 1 GHz Center 10368.1 MHz
Span 500M Center 10368.1M

[Graph showing signal levels and parameters]
uW PLL vs DRO PN at 14GHz

Red DRO, Blue uW PLL
10368M RF power and sw. isolation
13.472Ghz RF Power and sw.

isolation
Optional 10GHz AD6IW BPF
10GHz BPF Plots
AD6IW Frequency Multiplier
24 & 47 GHz - AMMP6120
Giga Beam Up-Converter, Modified to work as multiplier

Working as 6 x Multiplier, $13,472 \times 6 = 80,832 \text{MHz}$
Building and testing 80 GHz Beacon by Bob KF6KVG
ADF5356 PLL vs. Chinese PCB
Chinese ADF5355 PLL

- I bought Chinese PLL board for testing purpose, only but it refuse to load firmware - broken 😞
- It is cheap board, but you will not get easily high performance synthesizer out of there
- Unfortunately, poor PN and spurs rich PLL synthesizer, made on 2 side FR-4 PCB Board ?!
- Take a look at Brian GM8BJF, web site for Chinese PLL board review, if you want to play
Bob KF6KVG Beacon Details

- Beacon Frequency 80.832 MHz, A1 Mod. CW
- Possible modes: FSK, PSK and FM modulation
- Call sign CW KF6KVG 20 WPM 2 Minute tone
- Location CM97BL Mt.Umunhum, Northern Cal
- Antenna wide angle Horn 7dB, Direction SV
- RF output Power 15 dBm
Beacon OTA test at 10368.1MHz
Many Thanks to:

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AD6IW July 2021