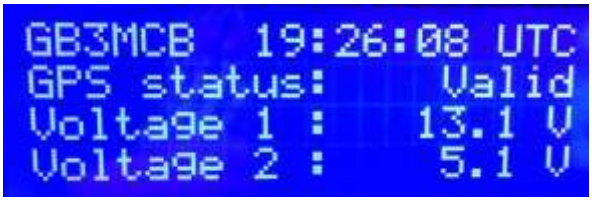
The new GB3MCB "Next Generation" 50MHz Beacon

Peter Taylor G8BCG



Operated by the Mid Cornwall Beacon and Repeater Group (MCBARG) – [Ref 1], the GM3MCB beacon cluster has provide a reliable service on 6m, 4m, 2m, 70cm & 23cm for many years. On 50MHz the beacon has proved to be an excellent propagation indicator for Tropo, Sporadic E and more esoteric propagation modes and is frequently spotted throughout Europe and further afield.

Much of the beacon hardware is now very old and quite inefficient. So, when UKSMG became involved, initially to help fund the ever increasing energy costs, the prospect of a replacement 50MHz beacon came under discussion. The UKSMG Committee decided to fund a new beacon and to move towards a "next generation" approach so as to increase the value of GB3MCB for propagation studies and hopefully also reduce operating costs.

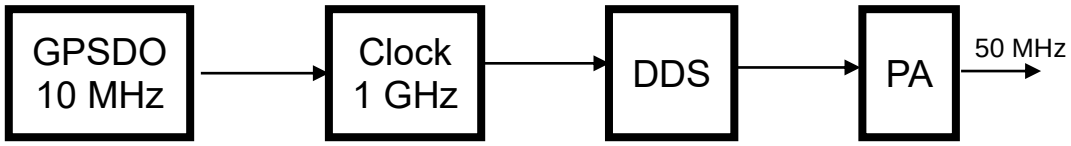
A key objective was to make the NextGen beacon user friendly for both traditional (CW) and digital (MGM) reception. It soon became clear that the OZ7IGY Next Generation Beacon Team [Ref 2] provided an ideal solution with purpose designed beacon hardware and software available at a reasonable cost.

In January 2016 a "short kit" was purchased comprising 5 modules:

1. GPS derived time source and 10MHz frequency standard*
2. 1GHz VCO – PLL controlled by the frequency standard*
3. DDS module to generate the final modulated 50Mhz beacon signal from the 1GHz clock freq and the GPS time standard.

4. 25W PA module to amplify and filter the +17dBm output from the DDS
5. Management display module.

* these can be shared with future NextGen Beacons on site.



Construction and Testing

A 19" desk cabinet was donated by MCBARG and a suitable 19" shelf/ case and a large heatsink were found on Ebay. The case has 2 integral low-noise 6.5v SMPSUs configured in series to give a 13v supply. Other supplies are derived from the 13v line.

All low level modules were mounted in tinplate screened boxes with additional supply filtering. The large heatsink was mounted on the rear of the case and the PA attached directly to it.

The beacon modules were found to be very sensitive to supply noise and so the 13v source from the SMPSUs is fed via a balanced commercial LP line filter plus additional filtering.

The GPS time/frequency reference is fed from an external active antenna. Under GPS fail conditions the beacon continues but with CW ident only.

On Air

The beacon delivers 12W via a commercial 50MHz BPF. Close-in noise is low and in-band spurii (from SMPS) are around -140dBc.

The beacon is line of sight about 20km west of here - with my 4 x 8ele it is quite loud – so I wanted it to be clean;-). The 2nd and 3rd

harmonics are the only significant out of band signals and these are >-90dBc.

Receiving GB3MCB

Please spot GB3MCB/B whenever you hear it (or hear it at above normal levels). There are people active on all VHF/UHF bands in IO70 and spots will bring them on the bands.

The beacon can be received and identified as normal by its CW ident callsign / locator. The beacon "carrier" is on 50.043.0 so tune to 50.042.2 USB for an 800Hz tone. This is also the frequency to tune to for correct decoding of PI4. The CW / PI4 sequence repeats every 60 seconds.

For weak signal work and propagation studies the PI4 encoded data can be decoded by downloading and running the free PI-RX software [Ref 3]

Final Remarks

The beacon went live on 27th July 2016 and has been running faultlessly 24/7 since then.

I am indebted to Bo OZ2M and Steen OZ5N. As with any new project there were issues to be resolved and, without their assistance and early morning / late night conference calls, progress would have been much slower.

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References:

1 MCBARG www.gb3nc.org.uk
2 OZ7IGY www.rudius.net/oz2m/ngnb/
3 PI-RX software rudius.net/oz2m/software/pi-rx/