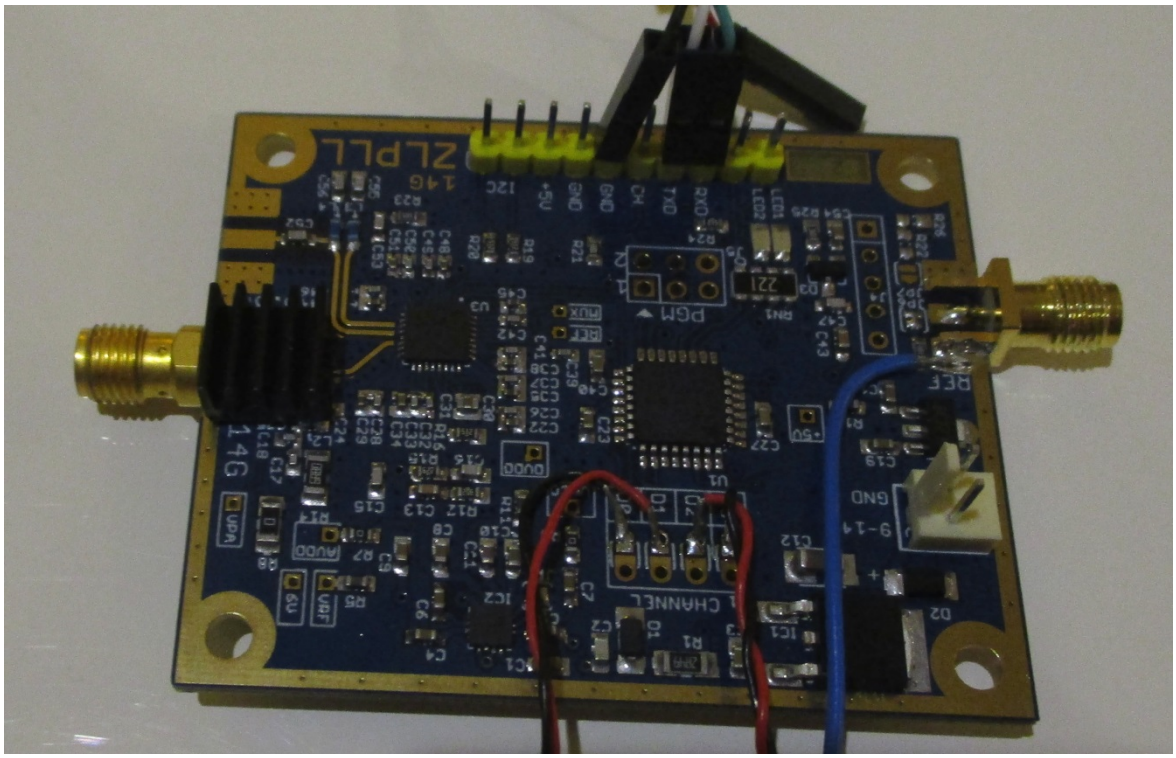
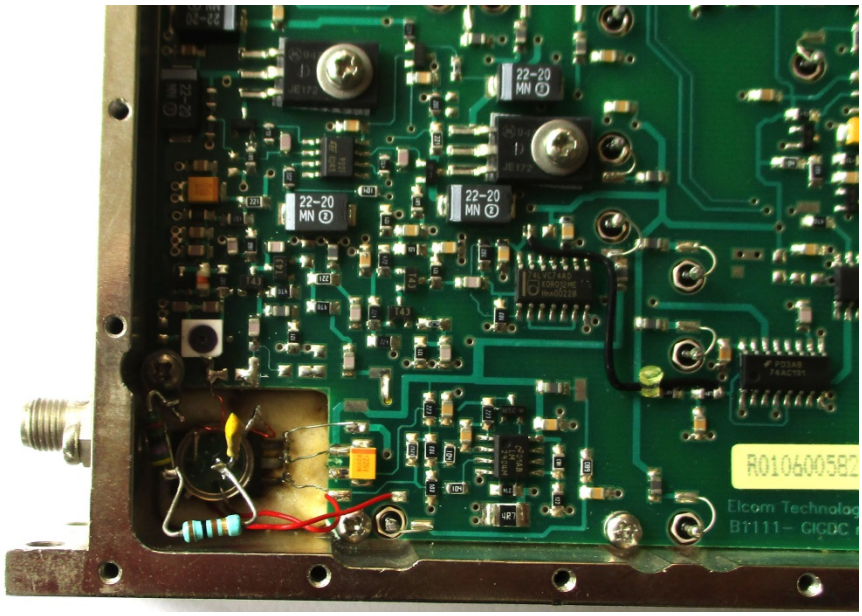
A look at the phase noise performance of a range of synthesisers and references

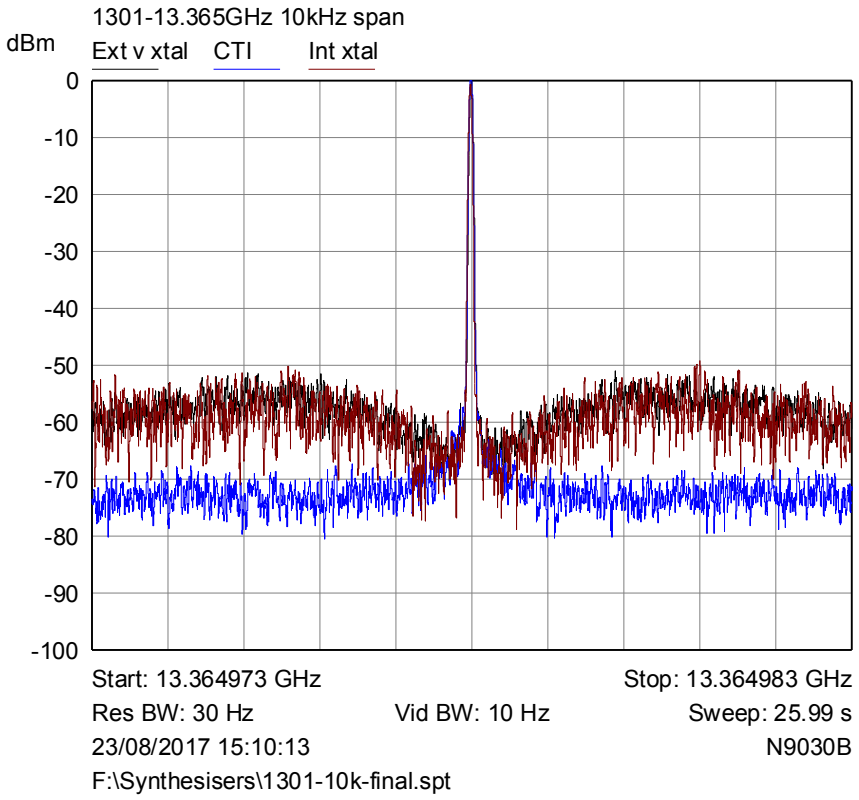
Part 2. Roger Ray G8CUB



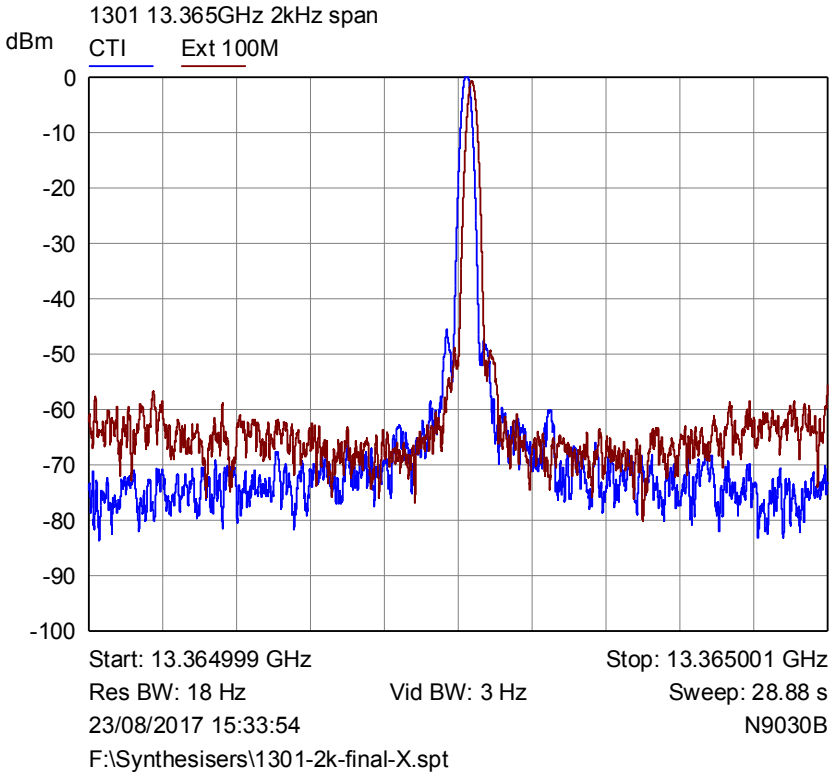
Following on from the first part of the article in November Scatterpoint. I wanted to do a few comparison plots between the different synthesisers. It has been possible to measure them all at the same frequency, or even with the same setup. So where differences in the measurement has been made, this is indicated in the caption.
As a starting point, I looked at the Elcom DFS1301 type synthesisers. These use a 100MHz crystal with heater. Both the stability an accuracy are somewhat poorer than the later CDFSL series that use a 10MHz TCXO.



The modification of the DFS1301, was to add an SMA connector, connected to a 47 ohm load resistor. The SMA centre pin is then connected via a 100R and 1n0 capacitor to one end of the 100MHz crystal, removed from the collector of the oscillator.

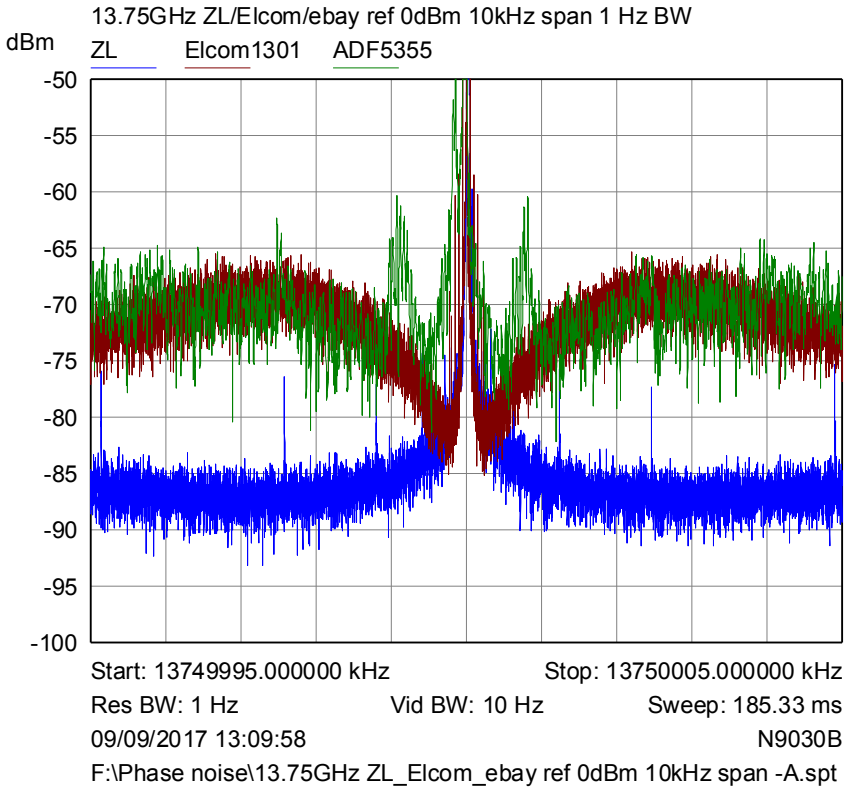


Elcom DFS1301 Internal/External 100MHz, compared to CTI Herley PLL DRO



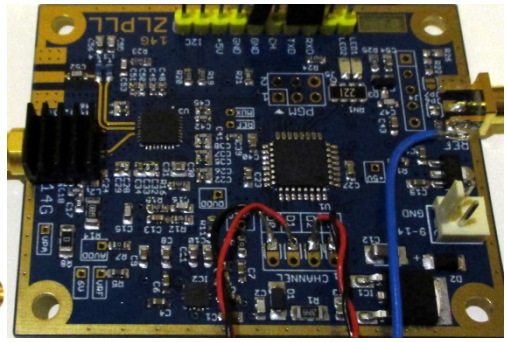
Comparison with +/- 1kHz span 18Hz BW

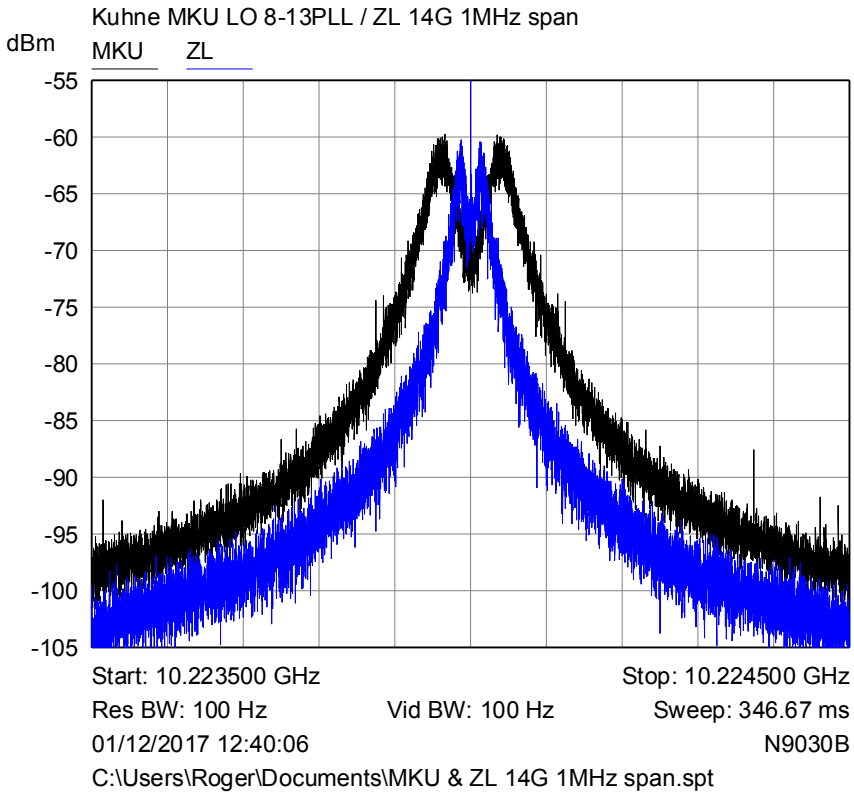
The blue trace is the CTI Herley @ 13.2GHz locked to a 100MHz reference. The Elcom noise was no better on the external reference (most likely limited by noise on the control line), than the internal – however it was now on frequency!



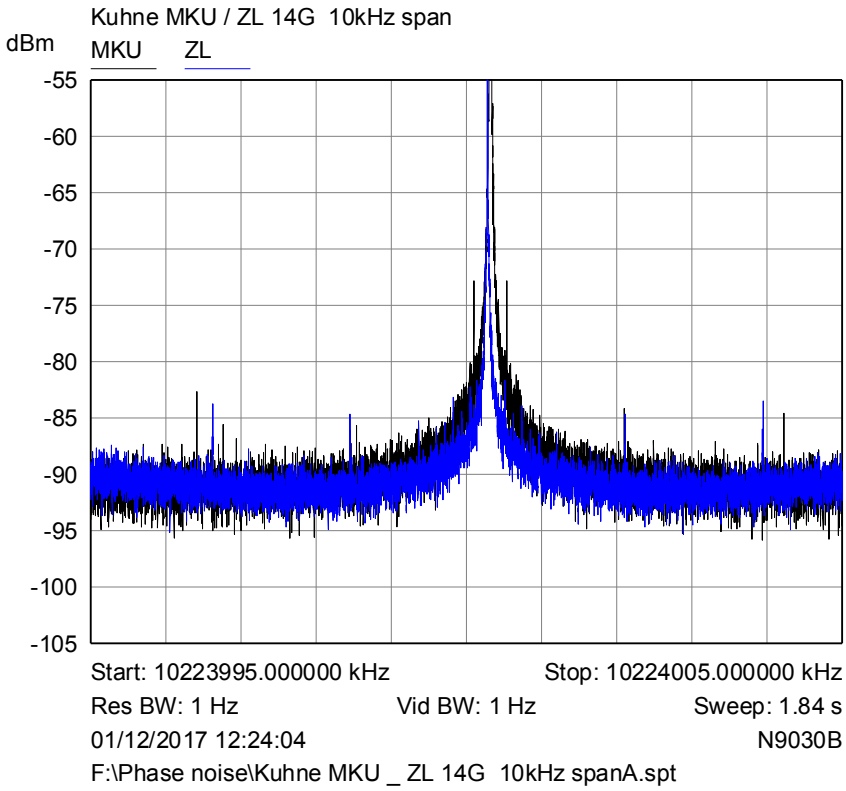
Comparison of ebay ADF5355 board with Elcom 1301 and ZL 14G synthesisers

Measurements are on the Kuhne Electronics MKU LO 8-13G PLL, and the ZL 14G synthesiser. Also included is one of the low cost ebay boards. The ebay board is shown without some of the excellent ideas of improvement by Brian Flynn and others, which mainly target the noise from the voltage regulators.





Comparison of Kuhne MKU & ZL 14G +/-500 kHz span.



Comparison of Kuhne MKU & ZL 14G +/-10kHz span

So for a performance synthesiser, the choice is between a modified green or black ebay ADF4355, a ZL 14G, or a MKU LO. I am still waiting for the crowd funded 15GHz ERA synthesiser. Although that is in the 'reasonably priced' performance signal generator category.
My personal favourite is the ZL 14G from ZL2BKC, being reasonably priced at $190, and including 16 programmed frequencies. Switching between frequencies can be by hex switch, or on board jumper. The programmed frequencies can easily be changed using a USB to TTL RS232 lead (a standard USB/RS232 does not work). A cheap £3.90 ebay lead worked fine. The reference input can be changed from 10 to 100MHz (or anything between), which is a bonus. There is even an on-board keyer, which allows the synthesiser to be used as a beacon.
That's not to say I don't like the Kuhne MKU, especially when used with a touch sensitive LCD controller. It is just that, even with swopping synthesisers between transverters, I need a quite a few units.