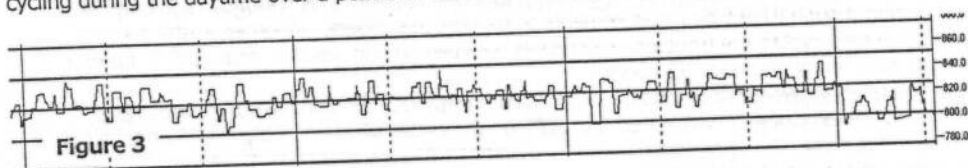
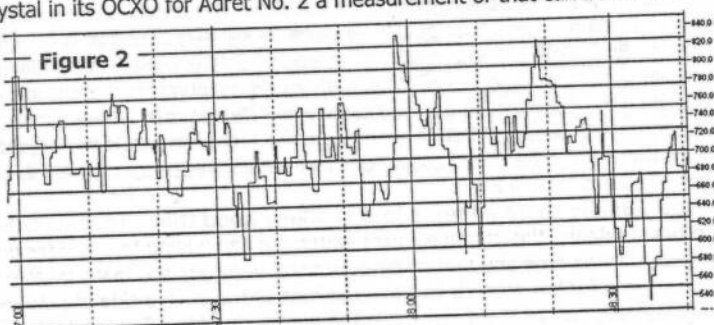


connected to the FT290 Rx and the resulting CW audio note connected to the sound card in the PC and the DL4YHF² Spectrum Lab software. **Figure 1, above**, shows the frequency perturbations of the test set-up. Vertical scale is 10Hz/div. Horizontal divisions are 10 seconds. The amplitude of the jitter is around 10-15Hz pp. This amount sounds perfectly satisfactory on CW.

Substituting the test crystal in its OXCO for Adret No. 2 a measurement of that can be made.

Figure 2 shows the new 100.2 MHz crystal as considerably worse than the test setup. Vertical scale is now 25 Hz/div. The jitter amplitude being as high as 300Hz pp. This is very audible as a nasty wobbly note.

The method of heating and cooling the crystal is rather arduous and was done as time permitted. The crystal being re-measured at intervals for signs of improvement. Temperature cycling during the daytime over a period of around five days gave the result in **Figure 3**. Here the



vertical scale is 20 Hz/div. So it's possible to see around 30Hz pp. jitter and a result about 2:1 worse than that of the Adret but an overall improvement of about 10:1 for this particular crystal. Another crystal, for which a graph is not available, improved to match the Adret result so it's possible that the Adret jitter would be the limiting measurement factor for this case.

The improvement is not necessarily as good for all crystals. If you have the jitter problem then only by doing the temperature stressing will you find how good the crystal is capable of becoming. The sharp frequency transitions shown in Fig. 2 are assumed to be stresses in the bonding wires which presumably are annealed in the temperature cycling process along with some stresses within the crystal resonator. Luis Cupido, CT1DMK, on a recent visit suggested increasing the crystal drive level. This I assume will help accelerate the shedding of any rubbish on the crystal itself.

The design drive level in my OXCO is nominally 750uW to the crystal. By shorting R2, the effect of the amplitude limiter diode D1 is removed and by shorting R8 the crystal drive level is raised to 10mW whilst maintaining around +4dbm output level. A really high power oscillator is possibly needed but there is some evidence that running the OXCO for several days at this higher drive level has some improvement effect. The tests have been done at 24GHz because the writer's portable transverter design allows easy testing. Testing at 10GHz would be possible but the amplitude of the measurements would be around 2.3 times smaller. It is assumed from the crystals evaluated so far that this jitter only manifests itself as an operating problem at 10GHz and higher. Regrettably