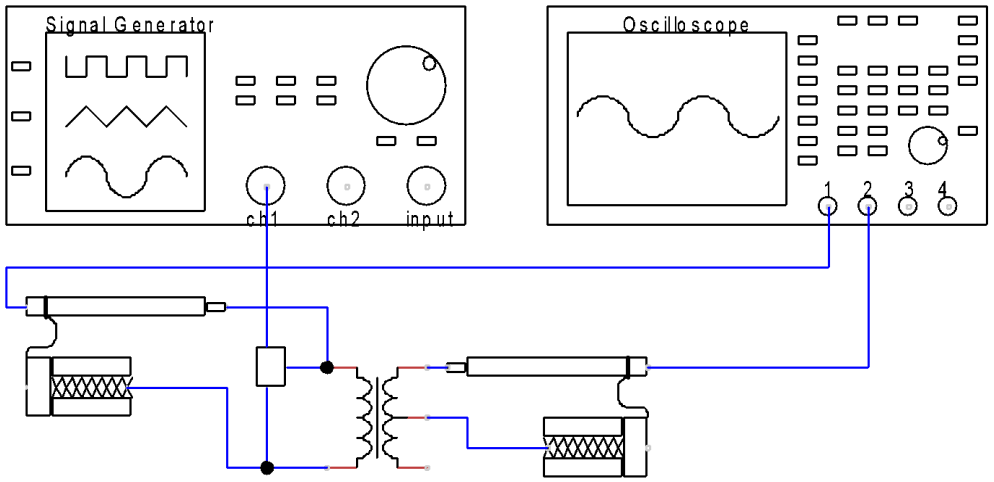
Transformer Magnetisation Cycle

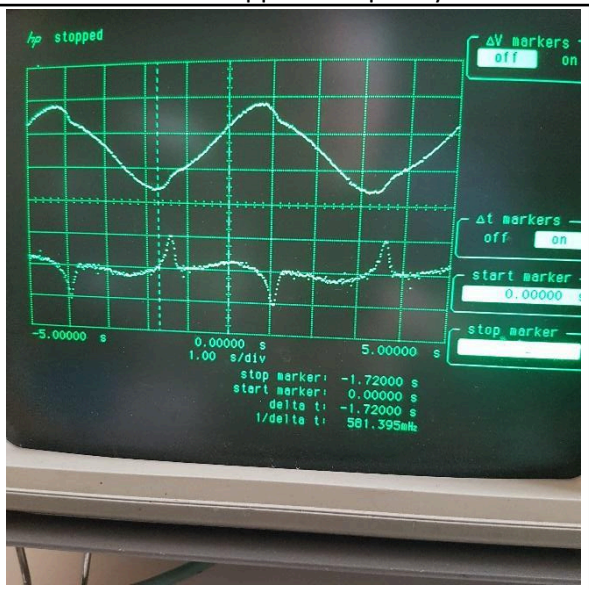
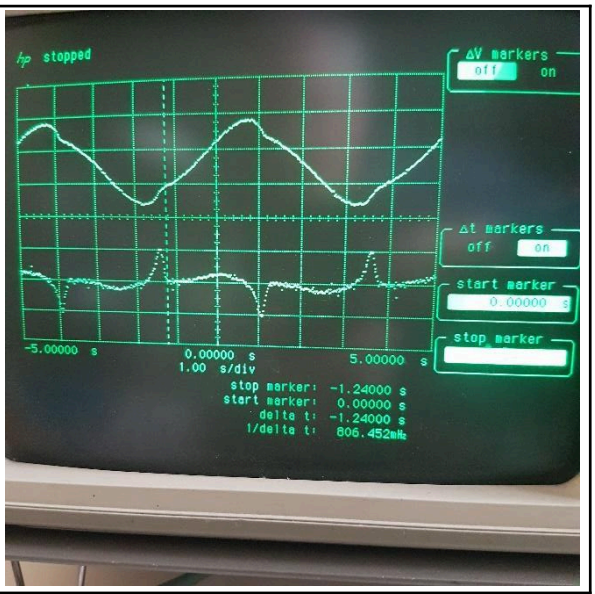
Scope
To examine what happens in a toroidal transformer when a very low frequency sine wave is applied to the primary.

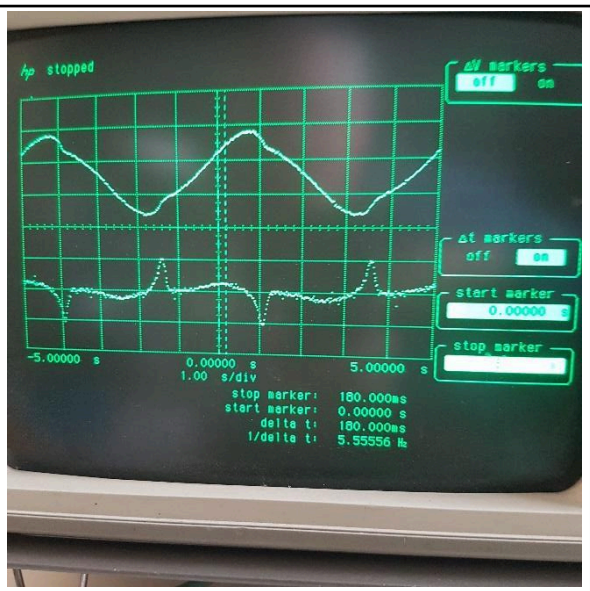
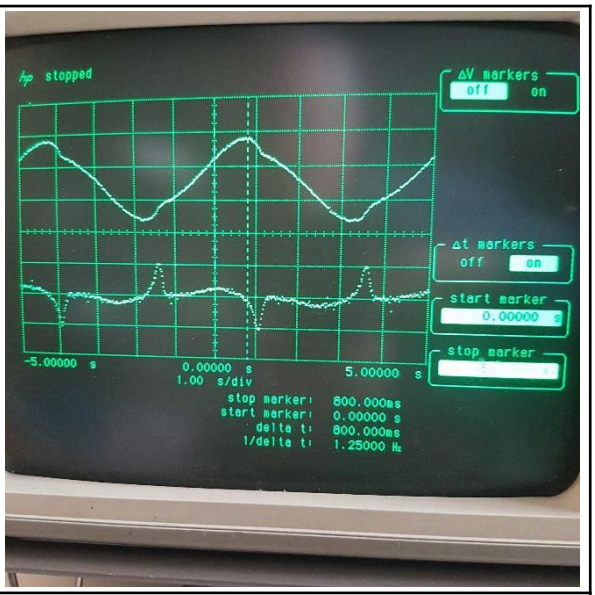
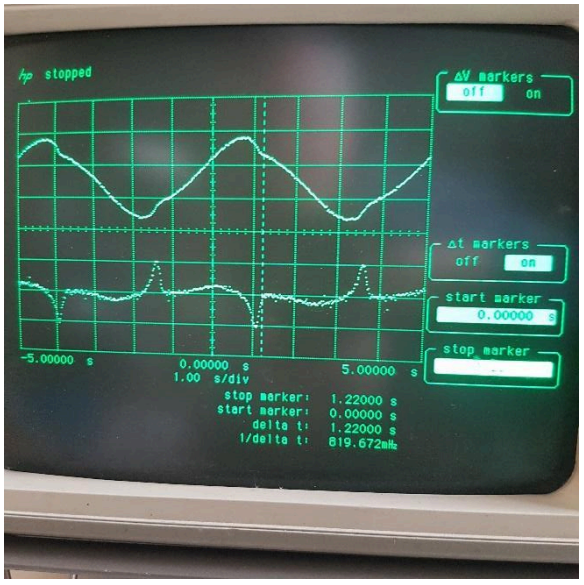
Setup
A signal generator is connected to the primary of a power toroidal transformer. The transformers primary is also connected the oscilloscope channel 1while the secondary is connected to channel 2. Set the generator o/p to sine 5v Freq 10Hz. Set the scope so both traces can be seen, input above output with the sweep quite slow.



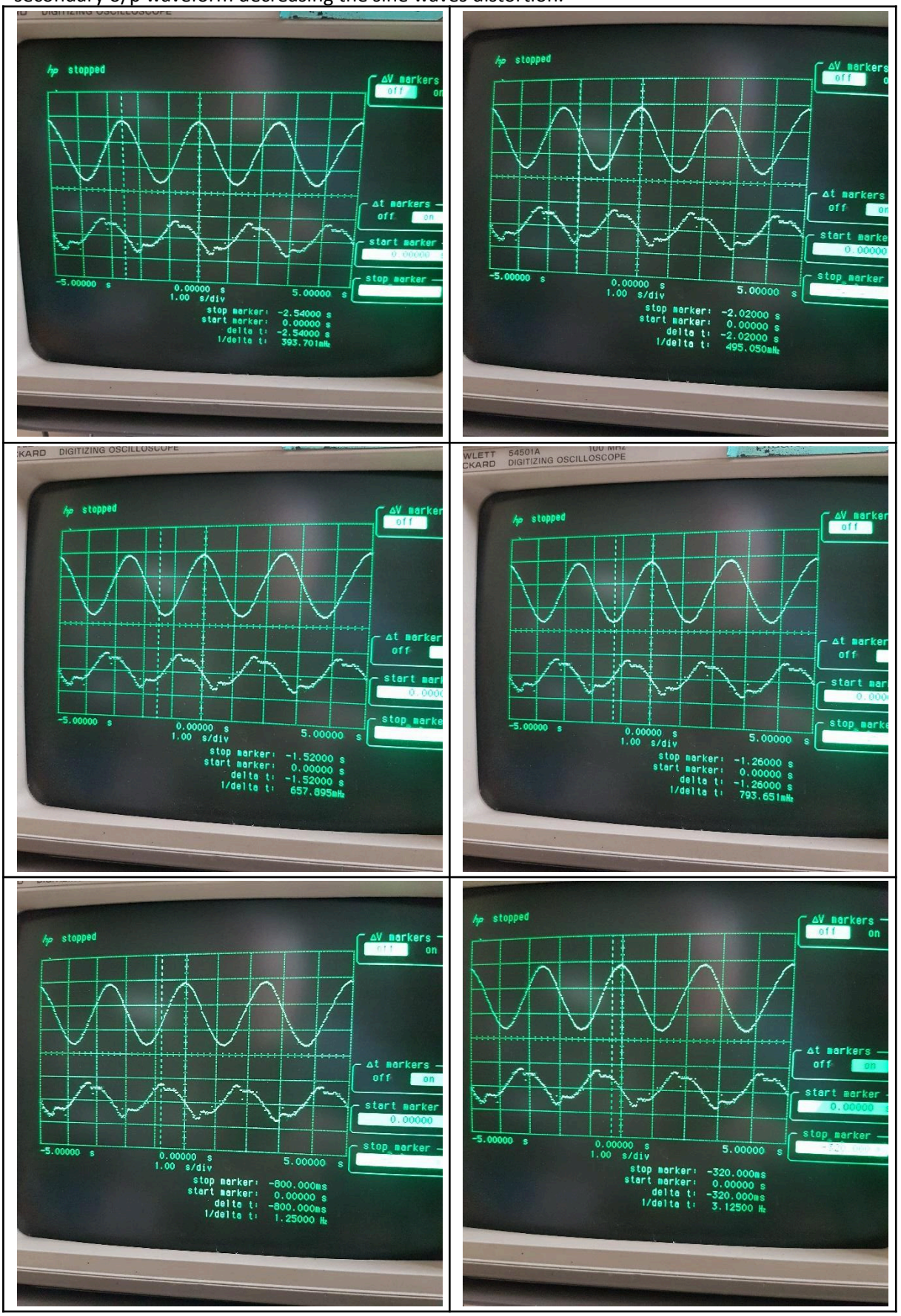
Method
Adjust the generator frequency down, adjusting the scope as necessary. Depending on the transformer, as the frequency drops the o/p sine wave will distort. In this case it was 0.2Hz.

Results
The top trace is the transformer primary and the lower trace is the secondary. Note the position of the vertical cursor. Applied frequency is 0.2Hz

	
Bottom dead centre,core starts to discharge	Core starts to charge positive

	
Core charging starts to slow down	Top dead centre, core starts to discharge
	
Core starts to charge negative	

As seen at a higher frequency of 0.3Hz, note how the core's level of magnetisation changes the secondary o/p waveform decreasing the sine waves distortion.



Conclusion

As can be seen in the second and third quadrant, the transformer core discharges and “fills in” the sine wave where there was insufficient drive to maintain core magnetisation.