

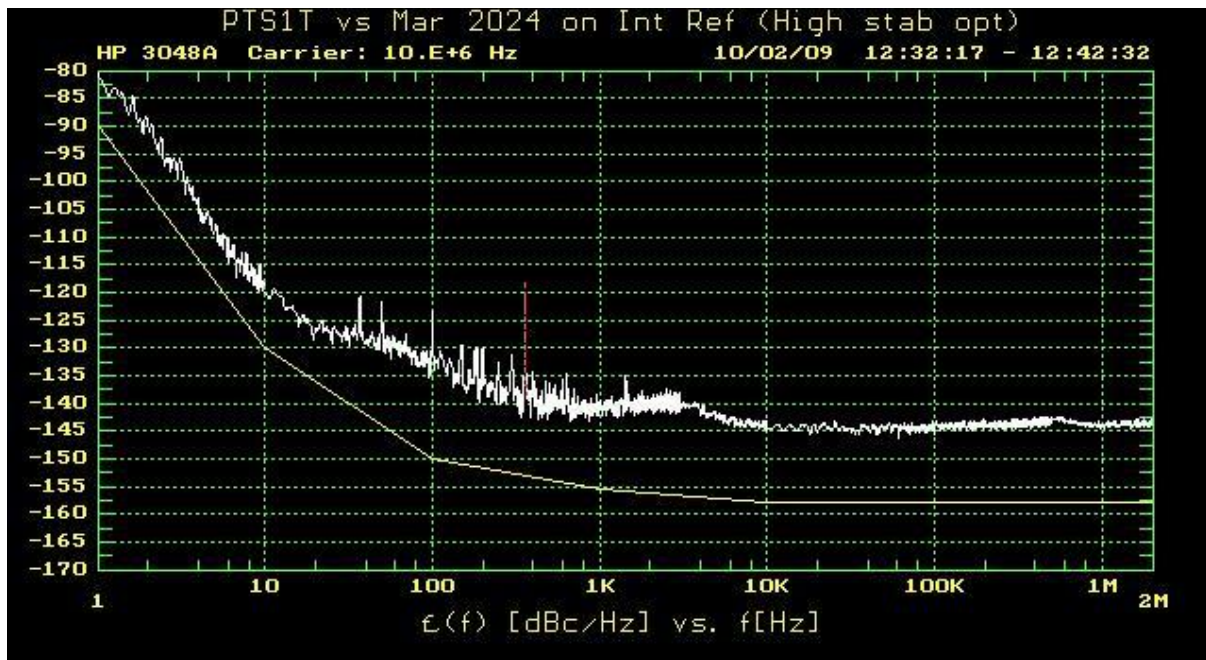
## Phase Noise

Phase noise is often overlooked in a frequency reference but it is a very important parameter.

By using low phase noise references and distribution amplifiers, an improvement to existing test equipment can be made.

### Marconi 2024 Signal Generator - Internal Reference

Refer to the picture below.



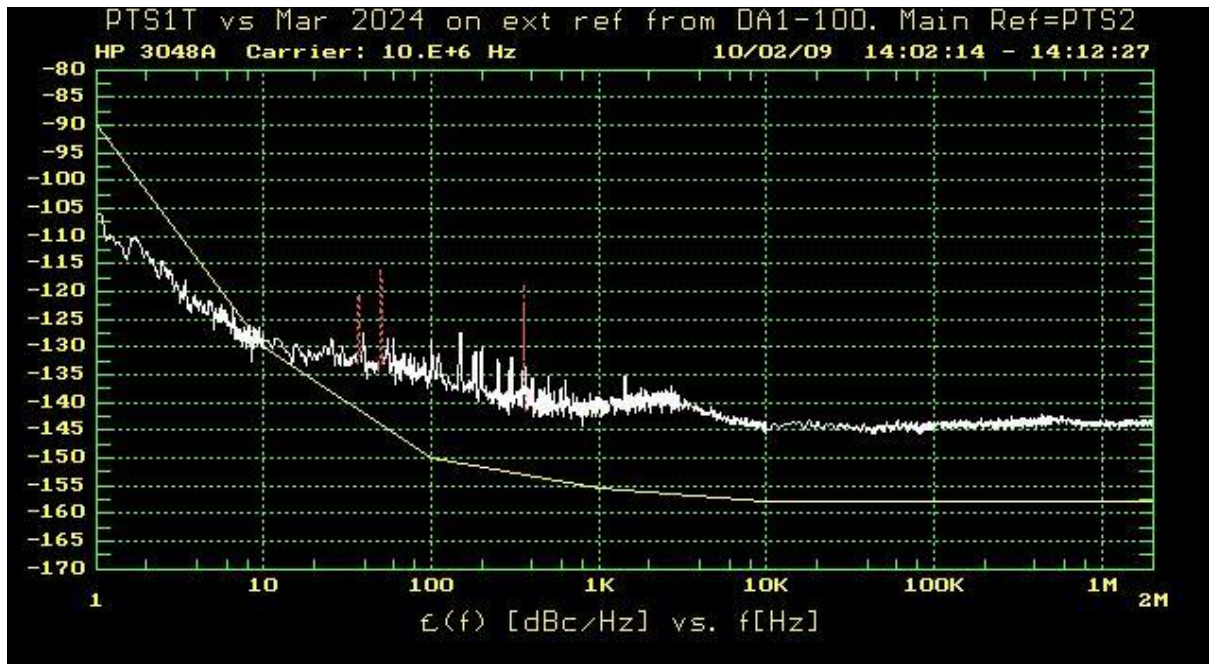
The picture above shows the phase noise of the authors own Marconi 2024 signal generator. The 2024 was set to 10 MHz and its internal reference oscillator was used. This Marconi 2024 has the optional high stability reference installed. The Marconi 2024 was compared with a CFS10B-03, our own ultra low noise 10 MHz reference. The CFS10B-03 has phase noise of -112 dBc/Hz @ 1 Hz offset with a -168 dBc/Hz noise floor. So, as this reference, is much better than the Marconi 2024, it does not influence the results. Thus, the above phase noise plot is the true noise of the Marconi 2024.

The phase noise is typical of this type of equipment. The phase noise was -81 dBc/Hz at a 1 Hz offset with a -145 dBc/Hz noise floor.

### Marconi 2024 Signal Generator - External Reference

The Marconi 2024 was now set to use an external reference. Another CFS10B-03 was used as the external reference.

The phase noise was again measured in exactly the same way as before.



See how the phase noise at 1 Hz offset is 26 dB better and 10 dB better at 10 Hz offset. This amazing improvement is due to the Marconi 2024 now having an ultra-low noise reference. This phase noise will also improve the Marconi 2024's Allan variance.

### Other Test Equipment

The same theory as above applies to other types of test equipment such as spectrum analyzers, tracking generators, or any equipment that accepts an external 10 MHz. For example, the authors own HP8561B 6.5 GHz spectrum analyzer was compared with an internal and external reference. The signal response 10 Hz away from the carrier again should a 10 dB improvement when the external low phase noise reference was used.

### Summary

Using an ultra-low phase noise frequency standard and distribution amplifier system not only synchronizes all of the equipment to a common accurate frequency standard, but the actual test equipment's' performance can be improved using an ultra-low phase noise external reference.

Precision Test systems manufacturers some of the industry's lowest phase noise frequency standards and distribution amplifiers.