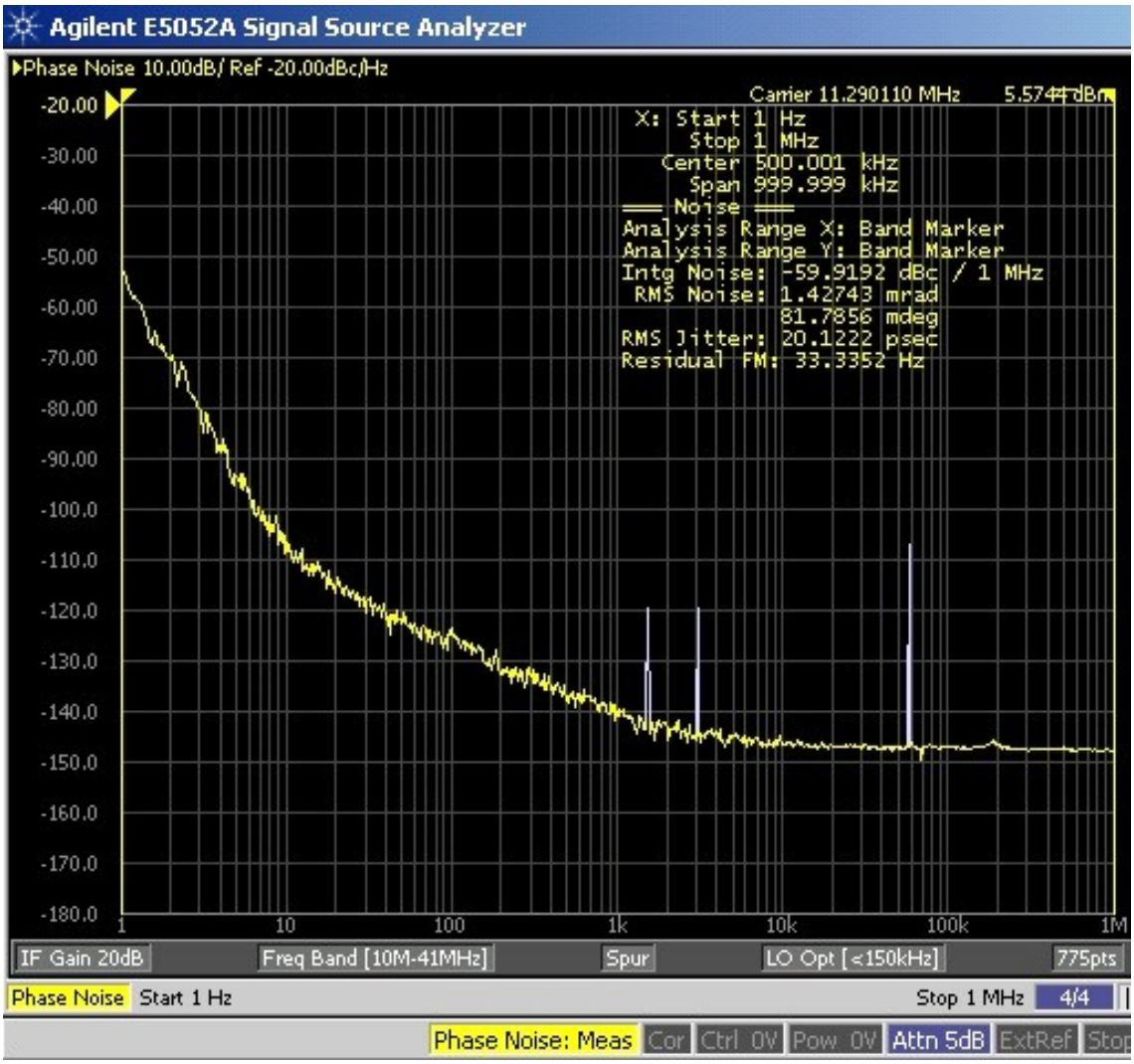
Low Jitter rutgerS'Clock at diyaudio.com

Andrea Mori (Italy) had found my oscillator:

The first circuit I have built is the Clapp oscillator, a variant of the Colpitts.
The circuit was designed by a smart dutch guy, using only a few components.
The oscillator include one jfet as the active device, and a few capacitors, resistors and **a schottky diode**.
Then a simple '04 inverter was used to square the sine waveform coming from the oscillator.
The circuit is intended for use with fundamental mode crystal, from 5 MHz to 25 MHz.
The dutch guy measured also the oscillator with Laptech crystal (I sent him 1 piece) with his DC receiver.
He said about the Laptech crystal "...one of the best Xtals I measured before! Moreover its microphonics is very low which makes it very suitable for a transport in the same room as the loudspeakers"



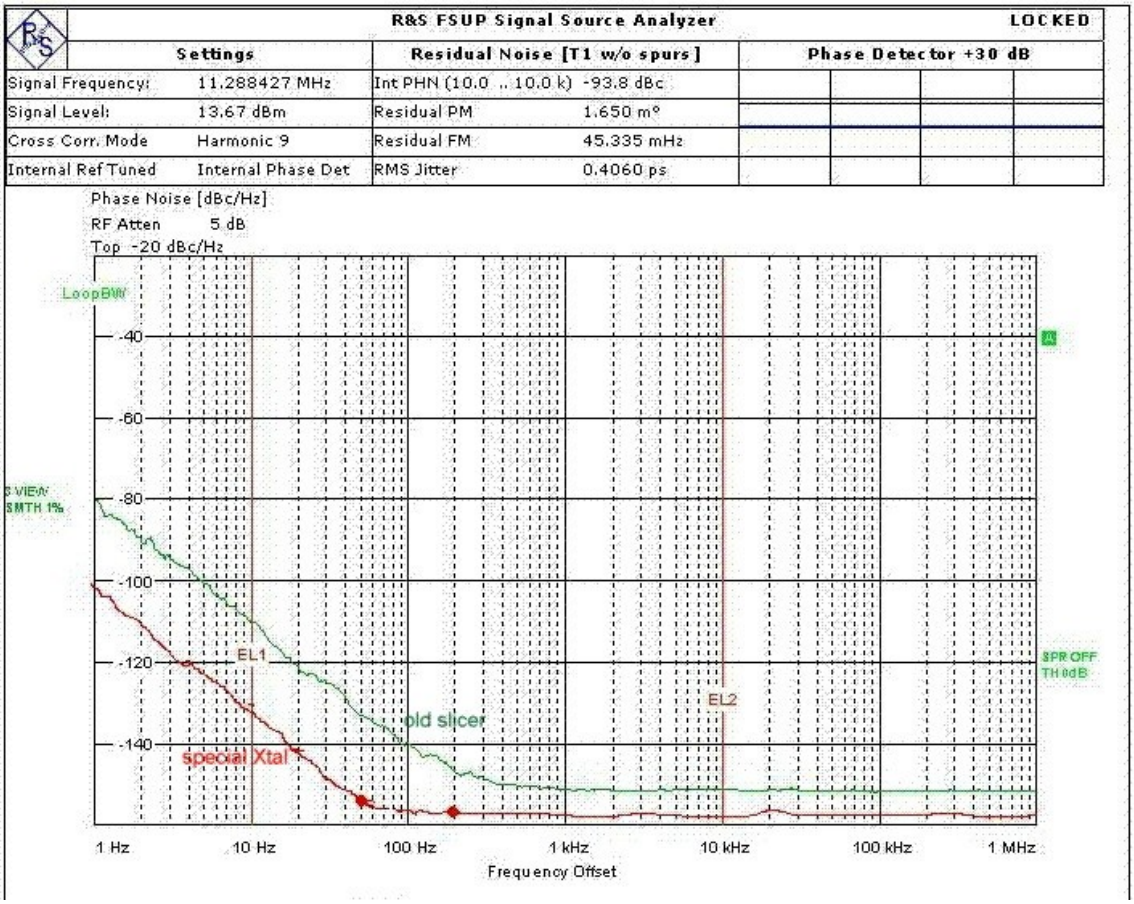
Andrea Mori at diyaudio.com

My oscillator had been measured with a R&S FSUP system.
As you can see in the attached plot the performance is much more impressive:
-132 dBc at 10 Hz from the carrier and -101 dBc at 1 Hz RMS jitter below 1 ps (0.4060).
One of the best AT crystal oscillator I have ever seen, not far from an state of the art OCXO.

Note that the oscillator performs much better using a 74HC04 for the squarer, rather than using a comparator such as the LT1016.

The DC receiver cannot measure the phase noise very close to the carrier. The result was:
at 200 Hz the noise is at the bottom of the DC-receiver: -157dBc/Hz@200 Hz
at 50 Hz the noise is -155dBc/Hz@50Hz.
The crystal used comes from the gerrman QT Quarztechnik GmbH.
It's a HC-49U resistance welded package, 15 ohm ESR, laser engraving strongly polished crystal. Very similar to the Laptech, that on the paper should be a little bit better, since it shows a lower ESR and comes in a cold welded package.

My better measurements with Catena:



Two things should be clear: The noise flour of my oscillator is much lower than that of the oscillator of Mori. More over: ***the noise does not enhance at frequencies nearer than 10 Hz from the carrier!!*** Mind that we talk about <u>two the same circuit diagrams</u>!

It took me quite a long time before I got an idea for what could be the reason. In the begin April 2019 I picked up a TentLabs XO at 33.8688 MHz. This is a prefabbed block as shown at the left. You could find this picture at:

http://tentlabs.com/Components/XO/index.html

At the same page you will find the noise diagram of this 33 MHz oscillator (left below). Of course the absolute values of the noise are worse than those of my oscillator at 11.289427 MHz, **but** the <u>slope</u> of the diagram closer than 500 Hz to the carrier <u>is constant</u>. There is no bent near 10 Hz or so as in the diagram of mr. Andrea Mori.

What could be the reason? Well, Guido and I use the TentLabs **shunt** regulator as shown here to the right and at the and of page:

https://by-rutgers.nl/PDFiles/rutgerS-Clock.pdf

I am convinced of the importance of a very low noise power supply for an oscillator and the buffer behind it that squares the signal.