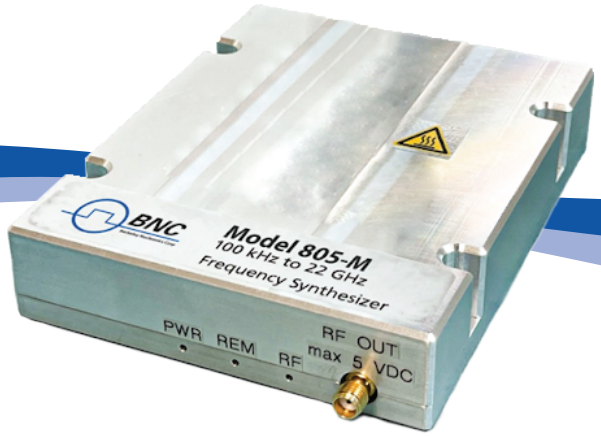
Product Launch | February 8, 2023

22GHz Compact Multi-Channel Phase-Coherent Frequency Synthesizer



Massive Performance in Compact Size

Berkeley Nucleonics (BNC) presents a new compact frequency synthesizer, the Model 805-M, that delivers precise and stable frequencies from 100 kHz to 22 GHz. One of its standout features is the ability to link multiple units for phase coherence and multi-channel capabilities in various applications. The Model 805-M is user-friendly and its compact design makes it suitable for integration into various forms and layouts of RF/microwave systems.

Single Channel Performance

The Model 805-M frequency synthesizer covers a range of 100 kHz to 22 GHz with a resolution of 10 mHz using graphical control software and higher resolution with SCPI commands. It has a fast-switching time of just 5 µs and a calibrated frequency accuracy of ±30 ppb with ±0.5 ppm aging in the first year thanks to its precise OCXO. The adjustable output power ranges from -40 to +25 dBm with an accuracy of ±1.5 dB and a resolution of 0.5 dB. The phase can be adjusted from 0 to 360 degrees with a resolution of 0.1 degree. Its phase noise at a 20 kHz offset from a 1 GHz carrier is -132 dBc/Hz and -110 dBc/Hz at 100 Hz offset. Subharmonics and spurious signals are below -55 dBc. **Figure 1** shows a comparison of measured single-sideband (SSB) phase noise at 1 and 10 GHz.

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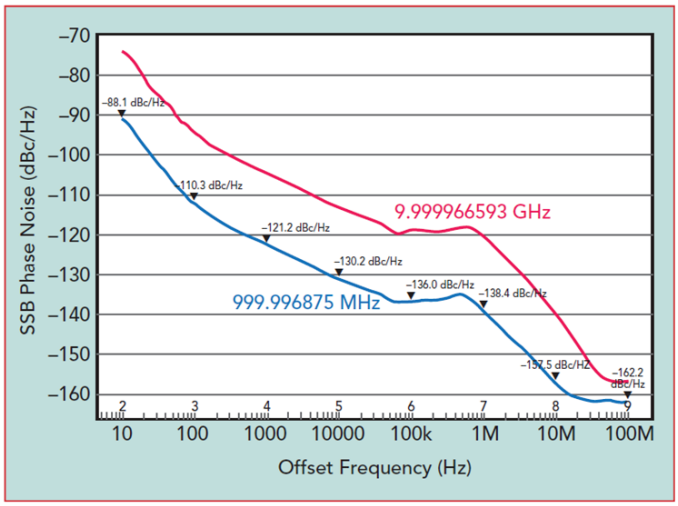

Fig. 1 SSB phase noise measurement.

In addition to providing a CW signal, the Model 805-M supports pulse modulation, which is either internally programmable or externally triggerable. The maximum modulation rate is 10 MHz and the narrowest pulse width is 30 ns. A high speed triggered parameter sweeping function with flexible sweeping profiles is available with the shortest step time of 5 µs. The synthesizer is well-shielded in a compact flange-mountable module measuring 134 × 95 × 25 mm. It weighs under 0.5 kg and consumes only 17 W, which enables it to use passive heat sinking, with easy and flexible mounting to a heat sink. Internal temperature monitoring is available to prevent the synthesizer from exceeding the recommended operating temperature range; if that occurs, the RF output stage will turn off.

The synthesizer has a standard Ethernet port for connecting to a PC and controlling the unit with BNC's graphical interface software or using SCPI commands.

Multichannel & Phase Coherent

The Model 805-M frequency synthesizer supports external references of 100 MHz and 1 GHz with a frequency lock range of ±10 ppm. It also offers a 1 GHz reference output, allowing multiple units to be connected for phase-coherent sources. The first unit acts as the reference, with its 1 GHz frequency being looped through the other units. To lower costs, Model 805-M modules can be ordered without the internal OCXO when used with other Model 805-M modules or an external reference. Phase coherence can be determined by the relative phase difference variation between channels set to the same frequency, as shown in **Figure 2** where two daisy-chained Model 805-M modules in a phase-coherent configuration were measured at 5 GHz. The relative phase difference variation was ±0.5 degree over 10 hours in a non-air conditioned

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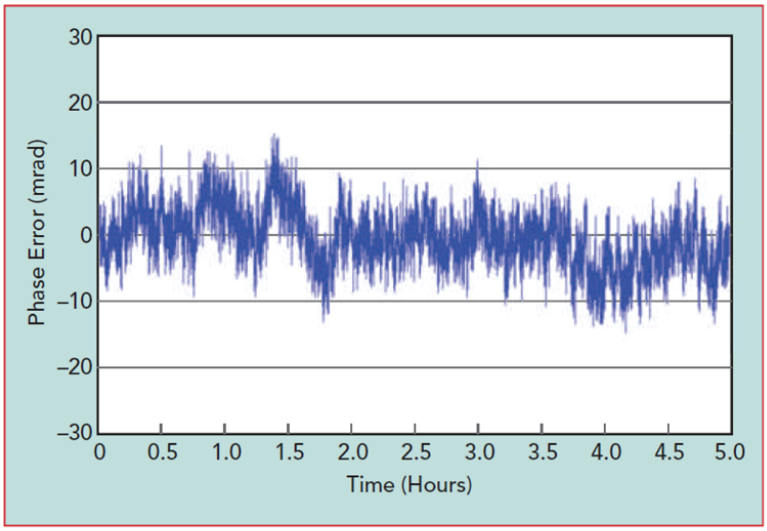

Fig. 2 Time stability of channel-to-channel phase difference, with both channels set to 5 GHz.

room. The synthesizer utilizes a low-noise amplifier between the 1 GHz reference input and output, which has low additive phase noise, enabling the configuration of up to 16 phase-coherent channels.

Applications

The Model 805-M frequency synthesizer has multiple applications. It serves as a suitable clock for RF/microwave systems, especially when multi-channel and phase-coherent local oscillators are required. Its ability to adjust individual channel phase provides precise timing alignment. Its phase-coherent, multi-channel configuration is ideal for designing and testing of radar receivers, phased array beamforming networks, I/Q modulators in quantum computing instrumentation, MIMO receivers, and heterodyne spectroscopic systems. Its phase-coherence and fast switching capabilities also support fast frequency hopping in agile electronic warfare systems.

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