

Radar & Electronic Warfare Test

Fast-switching, phase-coherent multi-channel sources for radar target simulation, pulse and chirp generation, and dense EW signal environments.



APPLICATION BRIEF · RF & MICROWAVE SIGNAL GENERATORS · dc-62022201

The Mission

Radar and electronic warfare test benches have to recreate the real world before a system ever sees it. That means hopping across bands in microseconds, layering pulsed and chirped emitters, and keeping several channels locked in phase so an angle-of-arrival or multi-emitter scene holds together. Whether the work is threat emulation, receiver stress testing, or jammer development, the signal source limits the switching speed, pulse fidelity and channel count of the scene.

The Challenge

A static CW tone exercises little of what a modern radar or EW receiver does. Engineers need agile frequency switching to walk a frequency-hopping emitter, pulse modulation with clean rise and fall, and wideband chirps for LFM radar. Dense environments add another demand: multiple coherent channels that can play different emitters at once without drifting apart. The faster the switching and the tighter the phase relationship, the closer the bench gets to the field.

Recommended Berkeley Nucleonics Solutions

The Model 875 is the vector flagship for this work. It carries internal I/Q modulation, pulse descriptor word (PDW) playback, real-time PDW streaming over its Fast Control Port, and frequency and amplitude switching in 1 μ s (875-04) or 2 μ s (875-20 and 875-40) with Option UFS, which lets it stand in for agile emitters. Available to 40 GHz with 1, 2, 3, or 4 phase-coherent channels, it builds layered, realistic threat scenes.

When the priority is raw switching agility across many channels, the Model 825-M reaches 5 μ s switching with Option FS and offers up to four phase-coherent outputs in 1U, with chirp and pulse modulation built in. For the widest coverage, the Model 870A spans 10 MHz to 54 GHz (9 kHz with Option 9K) with up to four channels and Option PHS for phase-coherent switching. The Model 855B adds up to +25 dBm of output power (100 MHz to 6 GHz) across up to four phase-coherent channels in 1U, useful for driving long cable runs and multi-emitter angle scenes. For phase-coherent coverage past 50 GHz, the Model 871 reaches 51 GHz with 5 μ s switching (Option FS). Figure 1 sets the five against the IEEE radar bands.

The pulse numbers decide how sharp a scene can be. The 875 pulse modulator has 5 ns rise and fall times, 90 dB on-off ratio with the baseband modulator, and pulses down to 8 ns with Option UFS; the 855B has 10 ns rise and fall, 90 dB typical (80 dB minimum) on-off below 6.5 GHz, and pulses down to 25 ns from its internal pattern generator with 65,536-step patterns and staggered PRF. For a pulse-to-pulse hop, Option PHS on the 855B provides phase-coherent switching with 15 ps phase mismatch between outputs, with phase noise at offsets of 100 Hz and above typically 10 dB higher between 1.1 and 10 GHz.



■ **SCHEMATIC** **Figure 2.** A frequency-agile pulse train, one PDW per pulse setting start, width, frequency, power and phase, with an intra-pulse chirp on the third pulse; illustrative values.



■ **DERIVED** **Figure 1.** Frequency coverage of the recommended sources against the IEEE radar bands, top-of-family versions, from the current datasheets.

Why It Works

These sources share a phase-coherent architecture, so adding channels does not mean giving up the timing relationships an EW scene depends on. Fast-switching options let a single instrument emulate frequency-agile emitters rather than a fixed tone. Pulse modulation is standard on the 855B, 825-M and 870A and optional on the 871 (Option PULSE) and 875 (Option MOD), chirps are standard on the 825-M and 875, and the 875's PDW playback turns a recorded or synthesized threat list into a played-back RF environment. The bench reproduces the frequency, timing and phase relationships of the emitters in the scenario.

Getting Started

Berkeley Nucleonics applications engineers help match the right source, channel count, and options to your test plan. Tell us your frequency span, switching budget, and channel needs, and we will recommend a configuration and arrange a demo.

Contact info@berkeleynucleonics.com or call 800-234-7858. Browse the full family on the RF & Microwave Signal Generators documentation page.

Berkeley Nucleonics Corp.

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Application Brief

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