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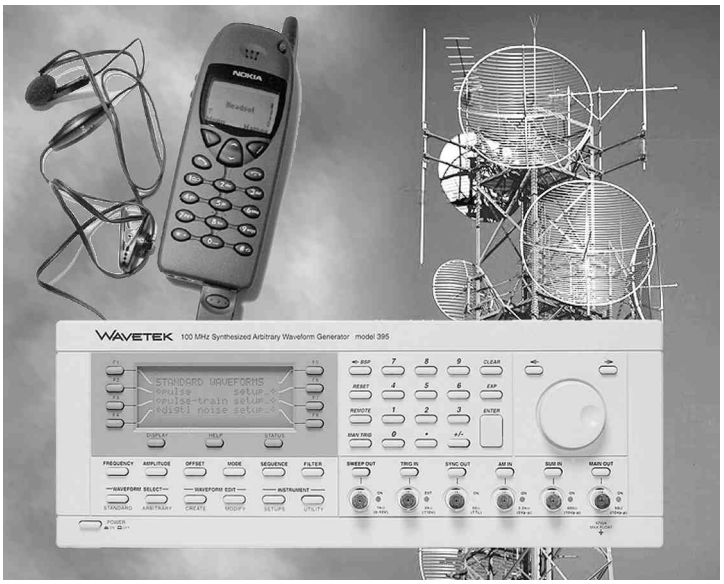
The Use of Arbs in CDMA Signal Simulation

Application Data



Overview

Noise is used for testing circuits in many types of instrumentation, including those in the growing wireless digital communications industry. One example of noise being used as a test signal is the simulation of Code Division Multiple Access (CDMA).

CDMA is a modulation technique used for signal transmission in a number of digital cellular telephones. Using CDMA, a caller's voice is first digitized, then the data is summed with a pseudo-random bit sequence that spreads the information over a specified frequency bandwidth. Many callers can share the same frequency spectrum simultaneously by using a distinctive bit sequence for each caller. The transmitter circuit in a cellular telephone must be tested for inter-modulation distortion and noise. Rather than generate an actual CDMA signal to test the circuits, a band of noise can be used to simulate the desired properties of the signal. This signal is input to the transmitter, and inter-modulation distortion between the transmitter's input and output is measured.

Theory of Operation

The simulated base band CDMA waveform is a band of noise between 2 kHz and 500 kHz with extremely sharp frequency cut-off and a low noise floor. Obtaining a CDMA test signal is a challenge using an ordinary noise generator, since it is not readily able to provide those characteristics. An arbitrary waveform generator (arb), however, can easily simulate CDMA noise by using a signal that is created mathematically and generated using a digital-to-analog converter.

CDMA testing also requires intermediate frequency (IF) signals to be mixed with the base band. If signals are created by modulating the base band signal between 4.5 and 5.5 MHz, usually double the base band frequency.

There are many advantages to using arbs to generate band width limited noise such as CDMA signals. A 100 MHz arb can generate noise with very narrow-to-moderate bandwidths (mHz to tens of MHz). Arbs can also provide repeatable noise (often a problem with conventional noise sources), Gaussian amplitude distribution, and multiple channels generated with tightly correlated characteristics.

The model 395 arb has several built-in noise functions that allow the selection of the start and stop frequencies and the noise sequence length. An internal algorithm generates the waveform and adjusts the playback sample rate to obtain the programmed. bandwidth. The sequence length is programmable from 63 to 131,071 points, and the bandwidth is programmable from 10 mHz to 10 MHz. There is also a signal-plus-noise function that allows any of the standard functions (sine, square, and pulse) and any user-defined function created or uploaded from a digital storage oscilloscope to be added to bandwidth-limited noise.

Summary

The advent of wireless communications has placed great demands on the use of the frequency spectrum. The arb's ability to simulate signals provides an effective tool to help design and test engineers meet these demands. An arb with powerful built-in functions such as noise can be used as a universal signal source offering versatility for today's expanding signal requirements.

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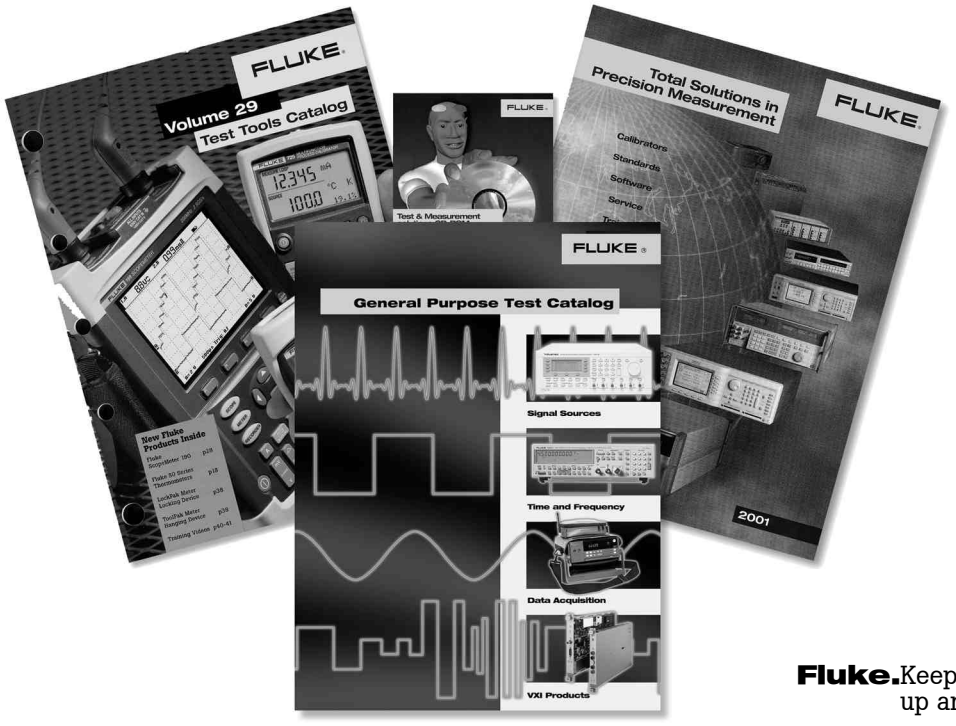

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Web access: http://www.fluke.com/

Printed in UK 9/2001 1638084 A-ENG-N Rev A, DS260

Printed on recycled paper.