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# MicroWaves & RF

## 50th Anniversary Issue



Often referred to as the “father” of QuickSyn® technology, Chenakin is a pioneer in developing synthesizers that are capable of fast switching speed.



*Phase Matrix's ALEXANDER CHENAKIN is well known on account of his leading role in developing synthesizers capable of fast switching speed.*

THE FIELD OF FREQUENCY SYNTHESIS is still reeling from the jolt of genius delivered by Phase Matrix's “synthesizer guru,” Dr. Alexander Chenakin. After being involved in the industry for a number of years, Chenakin recognized a need for frequency synthesizers capable of fast switching speed. He observed a rapid increase in the data-flow rates of the most current microwave systems and predicted that synthesizers would need to accommodate this increase. Traditionally, however, there had been compromises with regard to frequency coverage, resolution, and spectral purity in order to increase switching speed.

For a microwave system in an application that requires low phase noise, switching speed is a serious tradeoff. Fast tuning using traditional frequency-synthesis technology has typically yielded spurs and high phase noise or resulted in extremely complex designs. This scenario had been the dominating limitation within the field of frequency synthesis...that is, until Chenakin recognized it to be a mere myth. “Why can't we have both spectral purity and fast switching speed?” he asked.

“Does this break any fundamental laws of physics? Should a solution be necessarily super-complex and expensive?”

Through his revolutionary phase-refining technology, which is currently utilized by the increasingly popular QuickSyn® brand of frequency synthesizers, Chenakin has achieved switching speed in the microsecond range—along with low phase noise comparable (or even superior) to the best industry designs. Interestingly, he accomplished this achievement by using low-cost, tiny voltage-controlled oscillators (VCOs) instead of relying on bulky and expensive parts, such as yttrium-iron-garnet (YIG) or electro-mechanical devices.

Most importantly, Chenakin, did not stop asking questions. He observed that the general consensus insisted that the main job of a synthesizer was to deliver continuous-wave (CW) signals—yet only to keep the synthesizer size and cost within “reasonable limits.” However, he asked: “What if the customer needs more functions, such as modulation?” The answer? “Satisfy the customer.”

Chenakin understood that there are always devices inside the synthesizer that can carry various functions. They also can be reused to increase functionality without a significant cost penalty. This approach results in “design density,” which includes consideration of both component count and functionality per square inch. “Though the design process may become drastically complicated,” Chenakin notes, “it is a ‘must’ approach in the current industry.” That's why all QuickSyn® frequency synthesizers are capable of modulation capabilities (for example, AM, FM, phase, and pulse), power leveling and control, frequency and power sweep, list mode, and other functions that are usually found in complex benchtop instruments. Furthermore, QuickSyn® synthesizers are available at a fraction of the size and cost of benchtop instruments.

“When Alexander Chenakin asks questions, we can expect that accomplishments and advances will be made,” says Pete Pragastis, General Manager of Phase Matrix, Inc. Recently, Chenakin turned his attention toward synthetic instrumentation and the PXI platform. During the 2011 Autotestcon show in Baltimore, MD, he presented a paper and—along with his team—demonstrated a 2-to-20-GHz, PXI-based local oscillator (LO) module that employs QuickSyn® technology. As of today, it is the highest-frequency synthesized signal source available in the PXI form factor. “The short time between concept and completion of this PXI module was almost as fast as QuickSyn® switching speed itself,” jokes Suresh Ojha, a member of Chenakin's design team.

As Vice President of Signal Sources at Phase Matrix, Inc., Chenakin leads a team of talented and perseverant engineers who express their appreciation for the opportunity to work with him. “I am especially grateful knowing that frequency-synthesis technology is truly being advanced here at Phase Matrix by Dr. Chenakin and the very team that I am a part of,” says Shyam Nediyanchath. Efforts by Chenakin and his team have contributed to the success of Phase Matrix, which helped to make it exceptionally attractive to industry leader National Instruments (NI). In May of 2011, NI acquired Phase Matrix. In the official press release, NI stated that the “acquisition brings key RF talent, technologies, and manufacturing capabilities to NI and will significantly increase the capability of NI products in high-frequency RF and microwave applications.”

Chenakin, who is often referred to as the father of QuickSyn® technology, is well recognized in the field of frequency synthesis. In 2009 he received ARMMS—The RF & Microwave Society's best contribution award for his work on fast-switching frequency synthesizers. In the same year, the QuickSyn® synthesizer was listed as one of *Microwaves & RF's* top-10 products. Other trade publications within the microwave industry have also duly acknowledged Chenakin for his contributions to microwave technology. Moreover, Chenakin receives the ultimate tribute as newly developed synthesizer designs by various companies within the market are following his thoughts and projections.

Not surprisingly, Chenakin's contributions to the microwave industry are not just technological advancements. He also contributes to the microwave design community by generously sharing knowledge. He has written more than 40 technical articles that have appeared in national and international publications. In addition, Chenakin authored the textbook *Frequency Synthesizers: Concept to Product* (Norwood, MA: Artech House, 2010), which is a comprehensive overview of well-established and recently developed techniques. His book contains a unique collection of block diagrams, clever circuits, design recipes, and other hard-to-find information that is usually treated as “design secrets.” It is considered an invaluable, all-in-one source for new and experienced designers alike.

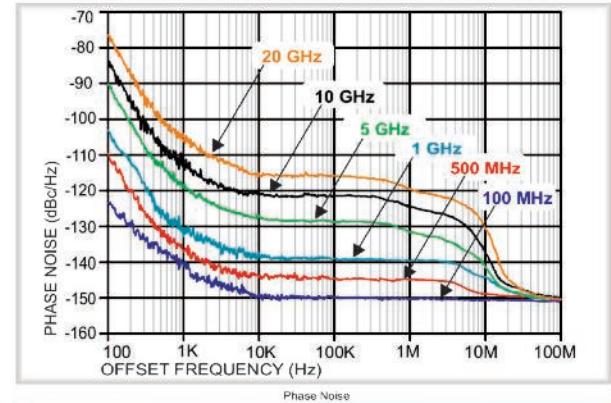
Chenakin earned his degree from Kiev Polytechnic Institute in the former Soviet Union. He has led the development of advanced products at Celeritek, Nextek, Micro Lambda Wireless, General Electronic Devices, and other companies. He is a senior IEEE member and a great contributor to the microwave industry.

# QuickSyn<sup>®</sup> Technology

QuickSyn<sup>®</sup> technology is a radical new approach to frequency synthesis that utilizes tiny VCOs instead of bulky parts such as YIGs or electromechanical devices. Thus, signal-sources that employ QuickSyn<sup>®</sup> technology have significantly reduced footprints. Plus, VCO-based technology enables very fast switching speed, which is crucial for most current microwave systems. Time spent by a synthesizer transitioning between frequencies becomes increasingly valuable since it cannot be used for data processing within the microwave system. Phase noise is another important feature for most signal sources, and QuickSyn<sup>®</sup> technology achieves low phase noise by eliminating the divider from the PLL feedback path.

With small size, excellent spectral purity, and blazing fast switching speed, QuickSyn<sup>®</sup> technology is highly suitable for the PXI platform. In fact, a 2 to 20 GHz PXI-based local oscillator module was demonstrated during the 2011 Autotestcon show. As of today, the demonstration marks the highest frequency achieved for a PXI-based signal source.

QuickSyn<sup>®</sup> technology is available from Phase Matrix, which was founded by former employees of EIP Microwave, a well-established and longtime manufacturer of RF and microwave T&M instruments. As a wholly owned subsidiary of National Instruments, Phase Matrix's commitment to advancing RF and microwave technology is solid.



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