Executive Interview - Dr. Alexander Chenakin VP, Advanced Technologies at Micro Lambda Wireless

November 17, 2016

Microwave Journal

Dr. Alexander Chenakin is the vice president, Advanced Technologies at Micro Lambda Wireless, Inc., Fremont CA, where he oversees the development of advanced signal generator products. Dr. Chenakin previously held a range of technical and executive positions that include serving as Vice President of Phase Matrix, a National Instruments company, and Director of R&D at Anritsu Company. He is well recognized in the field of frequency synthesis and is referred to as the inventor of QuickSyn® technology. In 2009, he received ARMMS RF & Microwave Society's best contribution award for his work on fast-switching frequency synthesizers. We thought it would be a good time to check in with him at his new position to see what new technologies and products he is working on.

What is the business outlook for the major markets for Micro Lambda and what are company's strengths?

Micro Lambda Wireless offers a variety of components (such as YIG oscillators, filters and frequency synthesizers) for complex microwave subsystems and instruments. Established in 1990, no company has done more in the last 25 years to launch new products and revolutionize the field of YIG design. Micro Lambda has built a strong reputation of a reliable supplier of high-quality innovative products. However, the main strength is our people. People are the engines of innovation. The desire to look over the horizon is what drives Micro Lambda's progress.

What are your first priorities as the new Vice President of Advanced Technologies at Micro Lambda?

My immediate priority is to evaluate company's current business and determine the most promising areas where we should invest in for future growth. Then, there will be a routine work to develop a business plan identifying new products we are going to develop, evaluate ROI for these products, form a development team and oversee product development.

You invented new techniques to realize low phase noise, fast switching frequency synthesizers; will that technology be extended at Micro Lambda products?

You probably refer to the QuickSyn synthesizer technology. This was an amazing product recognized by the industry. Furthermore, the technology received the ultimate tribute as newly developed synthesizer designs by various companies were following its design philosophy.

However, time is running. The technology is aging very fast. I introduced the QuickSyn about 10 years ago and now it is essentially a legacy product. Recently, a number of new devices and ICs have become available that bring better performance and functionality. Along with newer, more efficient and sophisticated architectures, this allows building new synthesizers with drastically better characteristics, namely, significantly lower phase noise and faster tuning speed.

What are the main products and technologies that Micro Lambda's will focus on over the next year?

As I mentioned, Micro Lambda actively explores new innovative system-level solutions to deliver the fastest tuning speed and lowest phase noise synthesizers compared to the industry standards. Besides demanding performance characteristics, modern synthesizers are expected to provide extended functionality such as amplitude control or various modulation formats. A very desirable function is the IQ vector modulation. In the past, high-quality, T&M grade IQ signals were only available in high-end bench-top signal generator instruments. Today - due to the rapid development of highly integrated ICs - this function can be brought to the synthesizer module level. A high-performance IQ synthesizer is in the list of Micro Lambda's new developments.

What technologies are you most excited about for future products?

As consumers use up rapidly growing amounts of 4G bandwidth watching streaming videos on their phones, 5G will soon become a necessity. Millimeter waves hold the strongest potential to power the 5G wireless networks. Historically, mm-wave components were built using die devices and chip-and-wire technology. Expensive equipment, tight tolerances, extensive tuning were key words in the mm-wave designer vocabulary. Due to high technology costs and limited integration capabilities, such components have been mostly restricted to special applications. However, the recent demand on low-cost, mass-production devices drastically changes the mm-wave realm. Today, highly-integrated surface-mount ICs are available through high mm-waves that allow building complex components and subsystems using low-cost PCB technologies. A frequency synthesizer - as a part of virtually any microwave or mm-wave subsystem - is a part of the game. Micro Lambda Wireless is focusing on the development of innovative mm-wave synthesizers up to 110 GHz to bring truly high-performance yet affordable alternatives to traditional solutions.

What challenges do you see ahead over the next few years for your industry?

In the past, complex microwave subsystems were often built using individual connectorized modules connected with coaxial cables. The designer could easily isolate and refine individual blocks to make them perfect. These days, such complex assemblies have to be made on a common PCB using tiny surface-mount parts. A great effort is required to minimize interactions between individual components sitting on the same board. Furthermore, many parts are reused to accomplish different functions, which are distributed through the whole assembly. The net result is a significant increase in "design density" meaning both component count and functionality per square inch. All these factors drastically complicate the design process. Nevertheless, this seems to be a "must" approach these days.

What future developments do you see in the area of oscillator and synthesizer technologies – can improvements be made to your revolutionary technologies for synthesizers?

What is a frequency synthesizer? It is a "black box" containing some circuitry that translates one (or more) input frequency - called reference - to a number of output frequencies with desired characteristics. Thus, the input reference oscillator sets the initial frequency quality standard or expectations. Today's commercial OCXOs easily perform -176 dBc/Hz (or better) at 10 kHz offset and 100 MHz output. This can potentially translate to -136 dBc/Hz at 10 GHz assuming the synthesizer circuitry is "ideal." Though nothing is ideal, all current developments are chasing for such an ideality and are quite close. Direct analog and direct digital techniques have a big potential here. Most likely, they will eventually replace traditional PLL designs - even in small form factor modules. However, a major breakthrough is expected operating the reference with other physical principles or materials, for example, using optoelectronic methods or sapphire resonators. The phase noise around -170 dBc/Hz at 10 kHz offset at 10 GHz output (not 100 MHz!) for a sapphire-resonator-based oscillator has been reported. These quality expectations will dramatically change conceptual approaches for building new synthesizers or even the whole way of thinking about this problem. What performance can be eventually achieved? Only the future will tell. A lot of amazing developments are expected next decades.

I am sure we can expect exciting things to come from Alexander – A new synthesizer technology? Perhaps an instrument with complex IQ modulation? 5G solutions? We will keep you up to date on new developments.