Millimeter-Wave Overview

By Mike Lee, Director of Sales and Marketing, dB Control

Recently, a headline popped up on my news feed: "Millimeter Wave Technology Market share will Increase US $2.5 Billion by 2024." My colleagues and I weren't surprised that the millimeter-wave market is on an upward trend. In fact, we've stayed ahead of the curve. There will always be emerging threats in the defense sector that require the innovation that millimeter-wave technology offers. Here's a helpful Q&A primer on millimeter-wave technology – including what dB Control brings to the table:

Which defense applications need millimeter-wave frequency products?

Radar, electronic warfare, airborne datalink, and satellite communications markets are especially in need of millimeter-wave products. Why? Because next-gen tactical networks and electronic warfare are transitioning to higher frequency spectrums to defend against the newly discovered threats. And with innovations like 5G and Satcom backhaul on the rise, connectivity, bandwidth and speed are hugely important in the defense sector.

What are the advantages/challenges of millimeter-wave technology?

Some advantages of millimeter-wave technology include much higher bandwidth, increased connectivity with many more channels and faster exchange of data during tactical communication. Some challenges of millimeter-wave technology include an escalation in costs and complexity as well as operational environmental challenges. Fortunately, the advantages outweigh the disadvantages.

How does dB Control address these challenges?

dB Control has been committed to developing and designing leading edge, sometimes bleeding edge millimeter-wave TWTA and MPM products since early 2006. We've worked closely with TWT original equipment manufacturers (OEMs) to respond to customer requirements and technology forecasts. dB Control also addresses other industry challenges by excelling at producing high-efficiency products. For example, we introduced two high-efficiency, wideband microwave power modules for high-performance radar and SAR systems. Even though these high-efficiency products aren't in the millimeter-wave realm, these TWTAs call attention to dB Control's commitment to producing products that exceed the boundaries of traditional technology. That spirit of innovation is incorporated into everything we design, develop, and manufacture.

What millimeter-wave products does dB Control offer?

dB Control offers several millimeter-wave high-power amplifiers (HPAs), with frequency ranges from 26.5 to 40 GHz. Our millimeter-wave microwave power modules and TWT Amplifiers are in the 26.5 to 40 GHz range. We are also working with sources up to 92 GHz and anywhere in between.

Can you explain the migration from traditional frequencies to higher frequencies?

Traditionally, products with C, X and Ku band frequencies were used in many applications. But as military operations became more sophisticated and congestion increased in those bands, we saw a thirst for more bandwidth. That's why electronic warfare, satcom and datalink applications are moving to millimeter-wave frequencies. As K, Q and V band technology matures, dB Control modifies its designs accordingly. As a result of staying on top of maturing technology, we've consistently produced HPAs that meet the needs of modern military and commercial applications.

What frequency ranges are defense contractors seeking and why?

Defense contractors are seeking frequency ranges from 18-40 GHz. The specific frequency depends on the application. For EW applications, wideband and CW power are required. For datalink and satcom applications, narrow band and CW power are required. For radar applications, narrowband and pulse power are required.

What kind of rugged environments will millimeter-wave HPAs need to endure?

Millimeter-wave HPAs will need to endure very harsh environments with extreme temperatures, excessive vibration, and altitudes about 70 thousand feet above sea level. Fortunately, the millimeter-wave HPAs we manufacture here at dB Control are extensively tested to ensure they remain reliable even on the most rugged missions.

What makes an engineering & assembly team excel at producing millimeter-wave HPAs?

An engineering and assembly team must be equipped to handle next-gen products like millimeter-wave HPAs. Reliability has to be incorporated from the very beginning – during the initial design phase. When you think about the end products, lives are on the line, so a manufacturer must master repeatability and reliability. Defense contractors should look for a manufacturer with a team of experienced design engineers, dedicated test engineers and technicians. People on the manufacturing team should be specifically trained to work with high-voltage electronics. The manufacturer should have a proven track record of production units for airborne, maritime and ground mobile deployments.

What makes dB Control's environmental testing process unique?

Once a product design is established and preproduction runs are complete, full environmental testing and stress screening is required. The extensiveness of the testing minimizes replacement costs and downtime out in the field as well as field infant mortality. dB Control is one of the few facilities with a HALT/HASS machine onsite. We test products in an automated 24-hour test cycle that ensures reliability. Our onsite testing also reduces processing time and labor costs. All the tests we run here are designed to simulate a long mission life in very rugged settings. The environmental chambers can be

programmed for custom combinations of temperature and altitude to match a mission's profile. Our vibration tables are programed for the vibration and shock levels seen on the mission profile as well.

>> Download specs for our most highly requested millimeter-wave HPAs.

>> Learn more about dB Control.

>> Email MLee@dBControl.com for more info.