



Gerard Charpentier Vice President,
Business Development ●●●

Today, CPI's scope and global reach is unmatched, having shipped over 50,000 high power amplifiers to uplink stations in over 150 countries. CPI satcom products for satellite uplink and troposcatter applications are available in all standard frequencies from S-band to V-band.

CPI SMP's Satcom Products Group is uniquely equipped to be your one-stop HPA subsystem supplier for standard and emerging satcom applications, whether for GaN-based solid state BUCs and SSPAs, traveling wave tube amplifiers (TWTAs) or klystron power amplifiers.

CPI's Satcom Products Group is also a global leader in the design and manufacture of uplink klystrons and advanced millimeter wave klystron technology, with frequency ranges up to 700 GHz.

World leader in uplink amplifier products

The Satcom & Medical Products Division of Communications & Power Industries (CPI Satcom) is a world leader in uplink amplifier products and systems for satellite communications. The company has played a vital role in the satellite industry since its inception, having supported the first satellite projects, INTELSAT and CONUS. Since then, CPI Satcom has shipped more than 50,000 high power amplifiers (HPAs) to more than 150 countries. Amy Saunders spoke with Gerard Charpentier Vice President, Business Development, CPI SMP satcom products, to learn more about the company's history, current capabilities, and market assessment.

Question: Can you provide an outline of CPI Satcom's history, and its development through to where it stands today?

Gerard Charpentier: Communications & Power Industries began life as Varian Associates in 1948, and the initial business was based primarily on its founders' invention of the klystron. The company soon became involved in all things RF, including the addition of traveling wave tubes in the 1960s and high-power amplifiers in the 1970s, and was involved in some of the early satellite projects. Customers have looked to CPI ever since for innovative products in support of programs such as Iridium's Ka-band LEO system, large

GEO ground stations for operators around the world, as well as the Q and V-band systems targeted for future constellations.

Question: What can you tell us about CPI Satcom's products and capabilities, and how do they compare to others available on the market?

Gerard Charpentier: CPI offers a full range of HPAs, and is the only manufacturer to offer a portfolio containing traveling wave tube amplifiers (TWTAs), solid state amplifiers (SSPAs) along with a complete klystron power amplifier (KPA) line. We have our own TWT and klystron manufacturing facilities, and we make our own GaN-based solid state bricks as well. As a result, CPI's allegiances are unbound by any one or other of these product types. The company is therefore in a unique position to provide customers with the most appropriate solutions for their applications, rather than just a solution we happen to offer.

CPI's solutions represent the state of the art in prime power efficiency, TWT longevity, Ka-band output power and GaN SSPA technology.

Question: Where does CPI Satcom see itself in the market? Which geographical and vertical markets are key to its operations?

Gerard Charpentier: With more than 35 offices and service centres all over



CPI now offers liquid cooling in many of its outdoor TWTAs ●●●



the world, CPI has the largest network of satcom product professionals in the amplifier market.

Our commitment to offering all three commercially viable technologies for amplifiers makes us the best choice for our customers who want a provider willing to offer them the most technically appropriate solution for their applications. Combine that with our strong partnership with CPI's TWT and klystron manufacturing, and with our own SSPA module-suppliers, and it's easy to see why CPI can offer the most technically proficient solutions with the best value for our customers.

Question: Where do you see the most opportunities going forwards?

Gerard Charpentier: Opportunities abound in both traditional and emerging satcom markets. We see areas such as Q/V-band as the future of the satcom industry. We've been very pleased with the growth of the Ka-band markets and our ability to make significant contributions to those efforts. That trend should continue as more applications develop in higher and higher frequencies beyond Ka and V band. In addition, growing needs for connectivity and demand for content around the world are resulting in sustained demand for satcom on the move, in both commercial and military arenas, as well as for larger fixed installations in such traditional markets as direct-to-home television.

Additionally, applications such as in-flight entertainment and connectivity (IFEC) and maritime connectivity continue to show promise, providing CPI with opportunities to push the envelope with products that are lighter and smaller for use on aircraft and ships.

Question: How important are the government and military sectors to CPI Satcom's business, and how are those customer demands met compared with commercial customers?

Gerard Charpentier: Because the various branches of the US military use satellite communications extensively in combat situations, they require extremely reliable products that are as small, lightweight, and efficient as possible. The content they broadcast is very dense (using higher and higher modulation techniques), and they often

require higher power and bandwidth with increasingly linear performance. As the availability of traditional band (X and Ku) GEO satellites can be difficult to obtain, especially on short notice, military systems have been, and continue to be, developed in Ka-band and higher frequencies. This market segment is a strong component of our innovation strategy.

Question: In April 2017, CPI combined its Communications & Medical Products Division with its Satcom Division to form the CPI Satcom & Medical Products Division. What are the benefits of this combination, and how has it affected day-to-day operations?

Gerard Charpentier: The result of the merger is a more consistent, focused effort in product development, manufacturing and customer service. Previously, solid state and VED HPA groups were in different divisions, and now they are together under a single management team. For CPI, that has resulted in a more responsive, cohesive organization.

Technology-wise, it also makes sense to keep the medical products and the satcom products groups together because there are many commonalities in technology, product development and manufacturing between the two groups. This allows us to share common expertise easily while maintaining our focus on our different customer audiences.

Question: The satellite industry is in the middle of a major state of change.

Which innovations do you think have been most disruptive to the industry, and how will they affect CPI Satcom?

Gerard Charpentier: CPI has been involved in the satellite industry since the very beginning, and the one thing we can tell you is that the satellite industry is always in a state of change. The pace of that change has been increasing recently. CPI works to stay in front of industry developments with innovative products, technologies and services, such as:

- Worldwide expertise available for our customers 24/7, no matter their location;
- Evolution of the HPA performance by new characterization of linear performance to address the latest high data rate modulation techniques;
- 700 Watt broadband Ka-band TWTA (highest power available in the market);
- High Power Ka band solid state amplifiers and integrated multiple band BUCs;
- LifeExtender™ patented technology that increases the useful life of TWTs by up to 50 percent;
- SuperLinear® technology that allows efficient use of RF power in multi-carrier applications; and
- User friendly monitoring and control for simple to complex HPA switches and combiners.

And the list goes on and on. By leading these changes, CPI Satcom has often found itself ready to both meet industry challenges and even to help



CPI's 160 W SuperLinear™ Ka-band GaN BUC ●●●

propel demand. The diversification of satellite constellations with the advent of MEO and LEO systems have led to new ground segment architecture.

The other noticeable trend is the race towards more bandwidth and more complex modulation techniques allowing new technology trade-offs in the whole transmission chain.

CPI responds to those new trends by developing closer relationships with our customers, from the system integrators to the end users. By understanding the whole ecosystem, we are able to focus on the key performance areas that are required in a modern HPA.

Different applications require different characteristics. Usually weight, size, linearity and efficiency are key purchasing factors for a customer, but it can also be something as simple as

the amount of total RF power available from a single device, or whether a product is offered with liquid cooling. It all depends on the specific goal of an application, and it is important for CPI to understand exactly what the customer needs and how we can help.

Question: What were CPI Satcom's key achievements in 2017, and how can the company expand on these for 2018?

Gerard Charpentier: CPI Satcom had a very productive year in 2017. We were selected as the HPA supplier for a number of very major satellite networks around the world, which we take as proof of the trust our customers have in us.

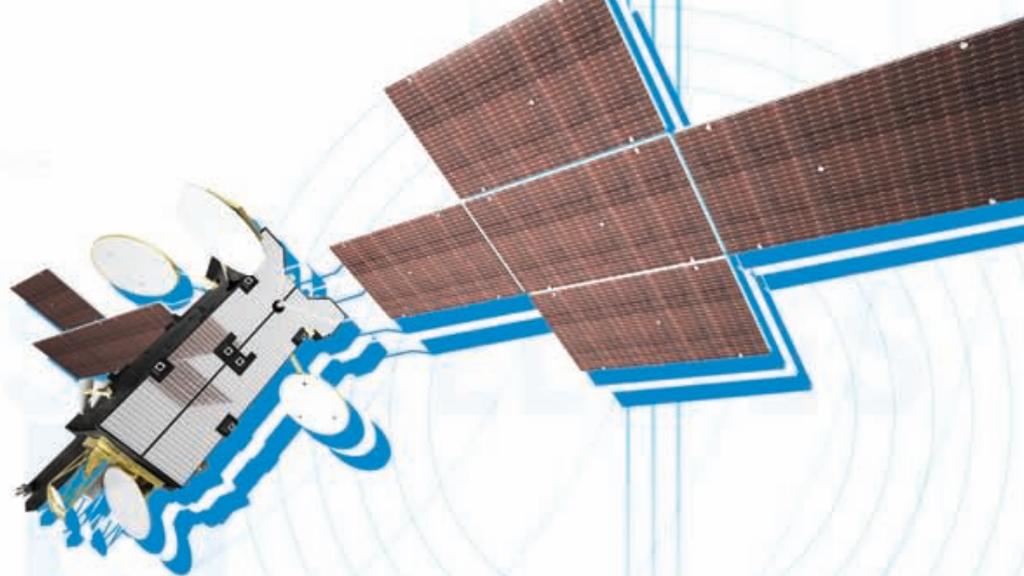
We continued to strengthen our position of leadership in the ground fixed and mobile market. We had an

outstanding year in the military satcom market. We expanded our product line in Ka-band with the 700 W HPA, and continued our engineering work to anticipate the needs of the Q/V applications. Additionally, we renewed our well-established klystron amplifier line with touchscreen interface and other updates. Lastly, we developed and qualified airborne BUCs in Ku and Ka-band and have received orders for these products from significant players in this market.

In 2018, CPI Satcom will continue to innovate and provide state of the art RF amplifier solutions in all our key strategic areas: military and commercial satcom, ground based, mobile and fixed, maritime and airborne. We look forward to working with our customers to help ensure their success in all of these fields.



CPI's new TouchPower GEN IV brings CPI's advanced, user-friendly interface to its KPA product line



YAMAL SATELLITES FLEET

GAZPROM SPACE SYSTEMS

Our Strengths

- four reliable satellites: Yamal-202, Yamal-401, Yamal-402, Yamal-300K
- wide C and Ku bands service zones
- 24/7 customer support
- above 250 company customer base

