5G and Satcom – The Perfect Ecosystem

With 5G services poised to take a major bite out of the C-band frequency spectrum, satellite services providers are forced to find new innovative solutions to maintain high levels of service. 5G reject filters and high power amplifier products will play key roles in facilitating the next new normal.

As the FCC will move forward with the redirection of 280 MHz of C-band spectrum (3.7 to 3.98 GHz) to 5G cellular networks, it's inevitable that disruption of satellite services occupying the adjacent block of bandwidth above 3.9 GHz will impact satcom operators around the globe.

The number of deployed ground and space-based C-band assets is significant and the reallocation will restrict the ability of some satellite operators to deliver services, unless steps are taken now to mitigate the resulting interference.

Promises made – that 5G will deliver higher bandwidth and faster access to the mobile masses have created a level of demand that can only be met by making spectrum available to MNOs that have already made major investments in this new technology.

The coexistence of 5G cellular networks and satellite operations is paramount to both group's long-term success. A symbiotic relationship results in a 'win-win' for both parties.

The proliferation of 5G is dependent upon the ubiquity of satellite communications to facilitate international roaming and the needs of mobile customers. Additionally, the enormity of needed backhaul services will benefit teleports worldwide.

Terrestrial and satellite service providers need to ensure that they are taking full advantage of the potential benefits of 5G while mitigating technical risks.

Baylin Technologies Inc., parent to: 1) Galtronics (USA) Inc., a global R&D manufacturer of 5G antenna products, 2) Advantech Wireless Technologies Inc., a market leader in the manufacture of satellite communications products, and 3) Alga Microwave,

a designer and manufacturer of high quality, cost effective active and passive RF/Microwave components, bridges the gap between the two technologies.

The three sister companies are invested in research and development to provide solutions on both sides of the spectrum.

Life after 5G

As 5G services come online, the necessity of spectrum-sharing for 5G and C-band satellite operators will be required to deliver high quality service.

High-power transmitters and beam-forming antennas on the 5G side are bound to cause bleed-over and, as a result, overwhelm sensitive components used in satcom terminal architecture, such as LNAs and LNBs. It will be imperative that specialized filtering be used to maintain RF separation.

Working in conjunction with the C-Band Alliance, a consortium comprised of Intelsat, SES, Eutelsat and Telesat, Alga Microwave has developed a family of 5G interference rejection filters to ensure that C-band frequencies above the designated 5G band will still be usable for satellite links.

The filters provide 60 dB of rejection at 3.98 GHz, while passing satcom signals in the 4.0 - 4.2GHz band. This represents an extremely cost-effective solution for mitigating the interference of 5G traffic with C-band satellite services.

Advantech is already building and shipping thousands of the filters to field deployment teams contracted to retrofit existing terminals worldwide.

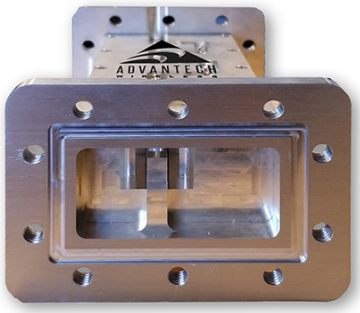
Sharing the bandwidth

Once the C-band spectrum has been divided, there won't be enough bandwidth remaining to facilitate the current C-band satellite services without drastic changes to the way RF spectrum is utilized.

One solution is to increase the number of 'bits per Hz' and increase utilization-efficiency by operating with higher modulation and error correction codes. Advantech has proven that modulation schemes as high as 256 APSK can work well in satellite links if the appropriate RF products are incorporated into the signal path.

Previous tests performed using a 4.5m C-band antenna and a 500W C-band GaN Advantech SSPB demonstrated a spectrum efficiency of 8 bits/Hz that represents ~ 240 Mbps in a 36 MHz transponder. The principal benefits are two-fold; more information is transmitted with less bandwidth (critical for 5G backhauls) and higher efficiency means reduced OPEX for Satcom service providers.

Pushing higher bits per Hz requires additional transmitter power to maintain acceptable C/N ratios



C-Band 5G Interference Reject Filter for Satellite Uplinks

300W / 400W/ 500W C-Band GaN based Solid State Power Amplifier/ BUC

High power is the key

Advancements in solid state amplifier technology have eliminated the difficulty in achieving extremely high levels of RF output power from satcom transmitters.

The Advantech product portfolio includes high-power, standalone amplifiers as well as phase-combined and soft-fail redundant amplifier systems specifically architected for outdoor installations – amplifiers that can be mounted on work platforms of some antennas, greatly reducing insertion losses.

Advantech's solid-state amplifiers, manufactured using Gallium Nitride (GaN) transistor technology, run cooler and reach much higher output power levels and require less mains-power. GaN devices typically operate over wider bandwidths, so more of the C-band (up to 7.025 GHz) can be utilized for satellite transmissions. GaN, considered military-grade technology, was specifically developed to operate in harsh conditions.

Satcom and 5G – The big picture

In the near future, low latency and high throughput needs will prompt military customers to incorporate 5G technology into their next generation networks. Advantech's amplifier portfolio includes the military-centric bands including X and Ka.

With more and more services becoming cloud-based, the advent of LEO constellations will take cloud services access to a whole new level. High-power Ka-band amplifiers and beam-forming antennas will continue to be a major staple in ground station architecture.

The unrivaled ubiquity of satellite-based services will provide high-capacity links that utilize high-order mod/cods and high-power transmitters to connect terrestrial 5G networks wherever they are needed. In areas where the saturation of C-band capacity is an issue, frequency separation between 5G and satellite will be possible with the utilization of special filters.

Satellite services will be a fundamental enabler in the proliferation of 5G services worldwide– two technologies that, if properly implemented, will form the perfect ecosystem.

1000W C-Band GaAs Solid State Power Amplifier/ BUC

NORTH AMERICA

USA
info.usa@advantechwireless.com

CANADA
Info.canada@advantechwireless.com

EUROPE

UNITED KINGDOM
info.uk@advantechwireless.com

RUSSIA & CIS
info.russia@advantechwireless.com

SOUTH AMERICA

info.latam@advantechwireless.com

BRAZIL
info.brazil@advantechwireless.com

ASIA

info.asia@advantechwireless.com

INDIA
info.india@advantechwireless.com