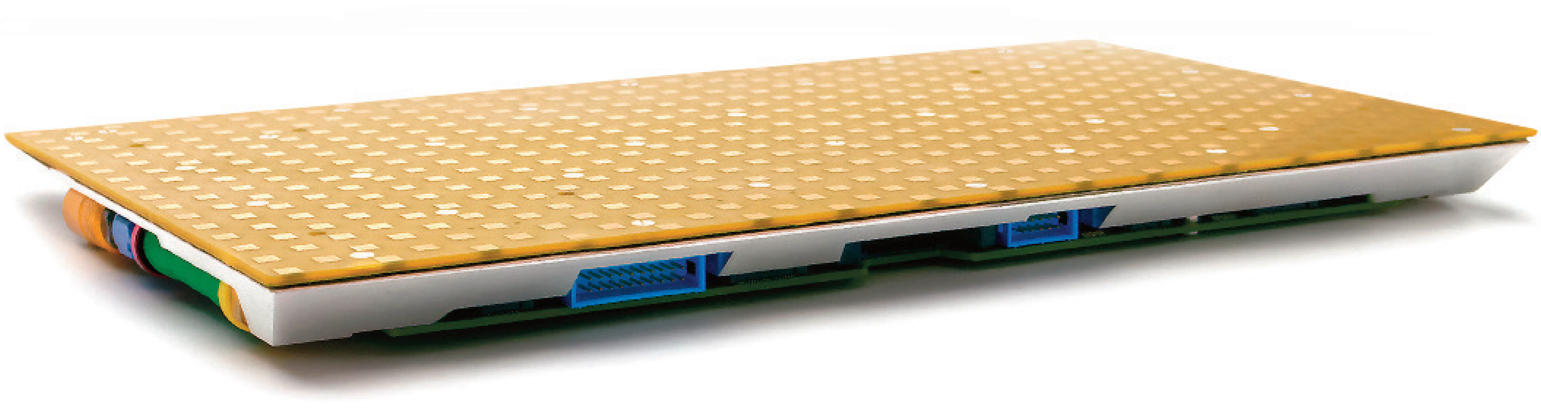
Re-Shaping the Future of Rail Connectivity

For connectivity on-the-move, nothing can rival satellite.

Unconstrained by terrestrial infrastructures' limited reach and congestion, satellite delivers complementary broadband access to virtually anywhere in the world. Today, the satellite industry is experiencing a revolution that will transform it forever. These changes will dramatically affect the reach, affordability and accessibility of "over-the-horizon", or satellite-based broadband wireless connectivity - a paradigm shift that will completely transform communications on the rails.

Let's take a closer look at these changes, and why Phasor's break-through electronically steerable antenna (ESA) technology holds the key to unlocking the potential. Communications satellites operate in three types of orbits: Geosynchronous Orbit (GEO), Medium Earth Orbit (MEO) and Low Earth Orbit (LEO). Traditionally, GEO satellites have been the mainstay of the industry and these large communications spacecraft, located over 37,500km above our heads, travel at the same speed as the Earths' rotation, and therefore appear to be "fixed" in one location in the sky. These satellites, though extremely capable as broadband communications relays, suffer from latency, which can affect certain types of communications such as real-time voice & video communication, due to the time - interval for a signal to reach and return from the satellite. Additionally, GEOs reach is limited in coverage in the extreme Northern and Southern Hemispheres where the "look angle" from an antenna to the equatorial satellite is extremely low, which impairs communications links. Alternatively, there are other types of satellites called "Non Geosynchronous Satellites", (NGSOs), which travel in multiple orbital planes around the Earth, at dramatically closer orbits. These MEOs and LEOs were traditionally reserved for scientific, weather, government/defense and narrowband communications missions. The important and notable change that is now rapidly sweeping the industry is the use of smaller satellites in the MEO and LEO orbits for "wideband" (Ku and Ka frequency) broadband



communications. Due to their much closer proximity to the Earth, latency is no longer an issue, and the multiple orbital planes (other than at the equator) ensure coverage literally everywhere on Earth, including the Poles.

The planned MEO and LEO constellations will consist of many – in some cases thousands – of smaller satellites that will orbit the Earth much faster than GEO satellites. This means that the ground terminals (antennas) that receive the signals must be able to track these moving communications satellites (as apposed to the apparently "fixed" satellites in GEO). In addition, it is required that the ground terminal must track two LEOs/MEOs simultaneously - as one comes into view and transits across the sky, the second must be tracked and engaged to ensure the network remains connected seamlessly.

These new developments within the satellite industry have the potential to create huge benefits for land mobile communicators. If GEO, MEO and LEO satellites, with all the individual and complementary benefits they bring, can be used interoperably, rail operators and communicators will be able to realize a connected experience that is unprecedented– the ability to truly connect EVERYWHERE in broadband, independent of location or which type of satellite asset (GEO/MEO/LEO) is being accessed. As most rail operators will opt for terrestrial wireless networks initially, this new and ubiquitous satellite broadband coverage will complement, and in most cases supplement 3G, 4G and 5G- based networks, allowing a seamless operating environment for all rail broadband service providers.

This powerful combination is being built and launched today, but will only work with a new breed of enabling technology – the electronically steerable antenna, (ESA). The right kind of access technology – agile, reconfigurable, high-performance - unlocks the potential of the new space segment infrastructure in development. Without it, these ambitious constellations and their plethora of services and new applications they empower, literally cannot be realised. The ESA is the gateway technology that will enable these transformative communications. Phasor Inc. was founded four years ago to solve this problem, initially focused on solutions for the rail industry. During the development process of its' ESA technology, the team at Phasor focused upon the evolving nature of enterprise broadband connectivity in land mobile markets, and on satellite industry trends. Phasor is now preparing to take its ESA through beta test, and then to bring to market a very low profile, flat panel solution that is future proof, enterprise grade and that offers unrivalled performance, scalability and reliability. The ESA is solid-state (no moving parts or motors), stands at just 2 inches high and will conform to the deck or superstructure of any vessel. This kind of advanced antenna simply does not exist anywhere else today, and it is set to disrupt the mobility and enterprise broadband communications markets.

The demand for broadband mobility is on a growth trajectory that will continue for the foreseeable future, accelerated by the advent of new and more powerful satellite communications fleets. The introduction of a truly high performance, flat panel antenna with the ability to track multiple satellites from a single aperture simultaneously, is the critical piece that will complete the broadband mobility jigsaw.
In the near future, Phasor will offer its unrivalled ESA technology to the passenger rail market and help define a new era of connectivity on land, at sea and in the air.