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60 GHz for Physical AI

The communications fabric for intelligent machines

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Introduction

AI compute is becoming abundant. The emerging bottleneck is moving multi-gigabit sensor, vision, video and model data among autonomous machines, edge processors and infrastructure. Physical AI brings intelligence into machines that perceive, reason and act in the physical world. Robots, autonomous vehicles, drones and industrial systems increasingly combine cameras, radar, lidar, machine vision, digital twins and edge AI. These systems generate and consume large volumes of data, often under strict latency, reliability and mobility constraints.

The communications challenge is broader than providing high-speed connectivity to the cloud on a best-effort basis. The proliferation of Physical AI demands consistent, high-speed connectivity in highly congested environments, where many intelligent machines must simultaneously exchange sensor streams, video, models and operational data. Conventional Wi-Fi and sub-6 GHz links remain useful for control, coverage and fallback, but shared spectrum can become congested as the number and data demands of these systems increase.

This challenge is better understood as **Data Density**: the aggregate data throughput that a network can sustain within a defined area. Directional 60 GHz mmWave networks combine multi-gigabit links with narrow beams and spatial reuse, allowing many nearby connections to operate concurrently. Such networks have demonstrated the potential to deliver terabits per second per square kilometer—providing the consistent, high-capacity local communications fabric required for dense Physical AI deployments.

Physical AI in the Network

A Physical AI deployment can be viewed as four connected layers:

Sense	Connect	Compute	Act
Cameras, radar, lidar, telemetry	60 GHz data plane plus complementary control links	On-machine, edge and cloud AI	Robots, vehicles, drones and machines

The connect layer must support several traffic classes at once: high-rate sensor transport, time-sensitive machine coordination, model and software distribution, telemetry, and bulk offload of operational data. The ideal architecture separates these needs rather than forcing every flow onto one shared radio technology.

60 GHz provides an ideal solution for the high-capacity local data plane for bandwidth-intensive flows, while retaining the best-fit control, safety and wide-area connectivity technologies for each application.

Why 60 GHz

The 60 GHz band combines wide channel bandwidth with highly directional beamforming. These characteristics are well matched to dense Physical AI environments, where network performance depends not only on the peak speed of an individual link, but on the aggregate Data Density available across the operating area. By spatially isolating nearby links and reusing spectrum, directional 60 GHz networks can support multiple simultaneous multi-gigabit connections without forcing them to compete for the same shared sub-6 GHz capacity.

Attribute	Physical AI value
Multi-gigabit capacity	Moves high-resolution sensor and model data quickly
Low latency link	Supports responsive machine-to-edge communications
Narrow beams	Improves spatial reuse and limits unintended energy
Large unlicensed spectrum	Avoids conventional Wi-Fi congestion
Compact phased arrays	Enables integration into machines and infrastructure
Short wavelength	Supports precise directional links

Applications

AI Model Distribution

Large AI models, maps and software images may need to be delivered to a fleet of robots or vehicles. Multi-gigabit wireless links can reduce update windows and avoid handling physical connectors. A depot, factory cell or charging area can act as a high-speed synchronization point.

- Distribute models and software during planned dwell time
- Stage content at the edge to avoid repeated cloud transfers
- Use signed packages, version control and rollback procedures
- Measure effective application throughput, not only PHY rate

Industrial Robots and Smart Factories

Industrial robots continuously exchange machine-vision data, sensor streams, inference results and digital-twin state. Directional 60 GHz links can create high-capacity cells with strong spatial reuse, especially where cable mobility, rapid reconfiguration or dense radio use is a concern.

Drones, Swarms and Autonomous Systems

Autonomous drones and cooperating unmanned systems may need to transport high-resolution video, share selected sensor data and coordinate local decisions. The narrow-beam characteristics of 60 GHz can reduce energy outside the intended path and support spatial reuse among nearby links. Mobile operation requires fast beam acquisition, tracking, hand-off and careful field-of-view design.



- Air-to-air and air-to-ground high-capacity links
- Local swarm data exchange and cooperative perception
- High-speed mission-data download after landing
- Temporary edge networks for autonomous operations

Autonomous Transportation and Robotaxis

Autonomous vehicles generate large data volumes that can be exchanged locally or offloaded at controlled points. 60 GHz can support vehicle-to-infrastructure links at depots, curbside zones, charging points and service facilities, as well as short-range vehicle-to-vehicle exchange where geometry and regulations permit.

- AI model and map updates
- High-speed sensor and event-data offload
- Vehicle-to-infrastructure perception sharing
- Last-mile delivery fleet synchronization

Peraso Products

Peraso provides 60 GHz chipsets, integrated phased-array modules, firmware, host drivers and application software. The module approach combines baseband, RF, antenna and control software to reduce mmWave integration risk and accelerate system development.

Conclusion

Physical AI depends on more than algorithms and compute. Intelligent machines need a communications layer able to move large sensor, vision and model data sets with low latency and high spatial efficiency. 60 GHz mmWave is well positioned to serve as that high-capacity local data plane in factories, warehouses, autonomous transportation systems and selected drone or tactical environments.

The strongest deployments will use 60 GHz: for flows that benefit from multi-gigabit throughput, directional isolation and rapid transfer, combined with complementary technologies for safety, control, wide-area coverage and fallback. Careful planning for line of sight, blockage, mobility, field of view, security and end-to-end application performance is essential.

60 GHz is not simply a faster wireless link. In Physical AI systems, it can become a scalable communications fabric that connects sensing, edge intelligence and autonomous action.

About Peraso

Peraso Inc. (NASDAQ:PRSO) is a pioneer in high-performance 60 GHz wireless technology, offering chipsets, modules, software, and IP. Peraso supports a variety of applications, including fixed wireless access, drone, defense and tactical communications, immersive video, and factory automation. For additional information, please visit www.perasoinc.com.