Qualcomm

Qualcomm® Automotive Positioning Solutions

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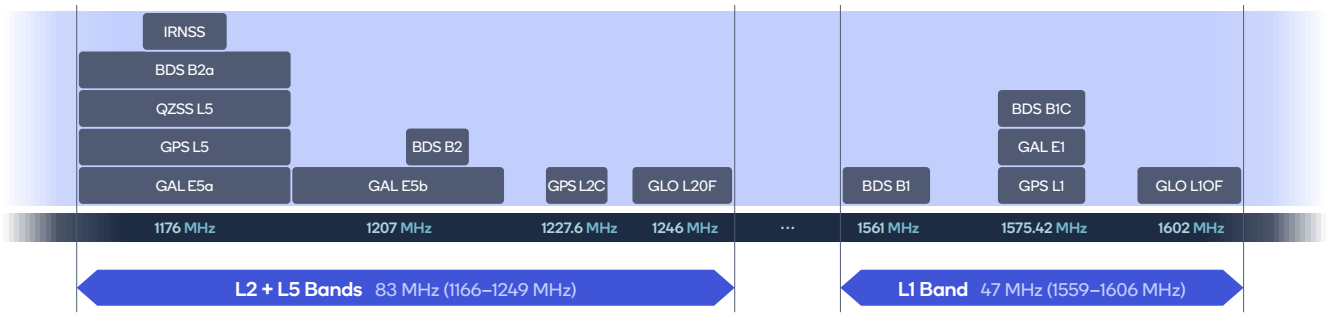
Precise, high-performance positioning solutions

Connectivity, advanced safety systems, autonomous driving, vehicle-to-everything (V2X) communications and enhanced in-car experiences are driving the need for accurate, high-performance positioning solutions. Qualcomm® Snapdragon™ 4G and 5G Automotive platforms feature integrated multi-band, multi-frequency and multi-constellation high-precision GNSS technology, and support all major global and regional GNSS satellite constellations and geographic markets:

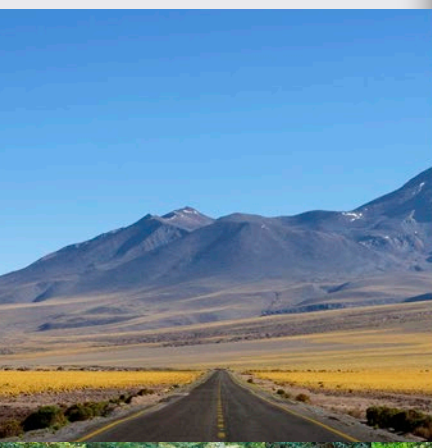
Benefits of multi-frequency

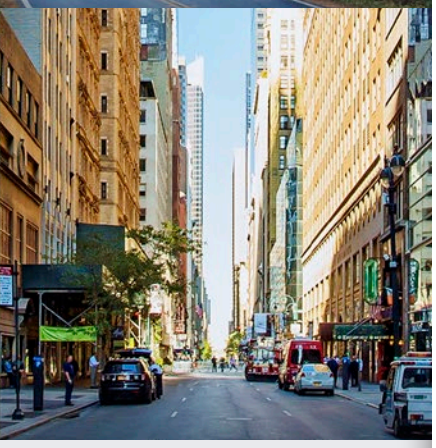
Our multi-frequency GNSS-enabled platforms support concurrent multi-constellation operations on the L1, L2 and L5 frequency bands. To facilitate provisioning of RTK/PPP (Precise Point Positioning) services & SW enabling centimeter-decimeter level of accuracy, we developed the Qualcomm® Automotive Precise Positioning Framework to support OEM customers with the precise positioning solution of their choice. This framework ensures consistency in access and use of all of the core GNSS information required for third party Precise Positioning Engines (PPE) hosted on the Qualcomm Technologies platform.



Tight integration of GNSS functionality in conjunction with the modem reception of the corrections allows for minimum latencies and optimal performance of the precise-positioning solution hosted on the Qualcomm® Telematics platform. The core functionality and capabilities of the integrated GNSS receiver, along with our Precise Positioning Framework, can provide automakers with a global platform to meet both regional and global location requirements for next-generation vehicles.

Qualcomm Telematics platform is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.





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Qualcomm® Dead Reckoning Software (DR2, DR3)

Qualcomm Dead Reckoning uses vehicle information and inertial sensors in addition to GNSS to extend coverage and improve performance in GNSS-denied or compromised environments, including open sky, light urban, dense urban, tunnels and garages.

Qualcomm® Vision Enhanced Precise Positioning (VEPP)

Qualcomm VEPP adds camera and GNSS corrections to Qualcomm GNSS and DR sensor set to provide lane level accurate positioning in the global frame in virtually all environments using Snapdragon platforms.

Qualcomm® GNSS Assistance Service (Extended Orbit Services)

Cloud-based service for providing extended GNSS orbits and associated information to accelerate position fix and integrity, including:

- Faster Time to First Fix (TTFF) for telematics, infotainment and C-V2X use cases
- Faster Time to First Time (TTFT) for C-V2X use cases
- Improved positioning availability and time availability in GNSS-challenged environments

Multi-frequency GNSS platforms

Snapdragon Automotive 4G Platform

The Snapdragon Automotive 4G Platform is our 6th generation multimode LTE modem for automotive applications. Designed to support up to five aggregated LTE carriers, the Snapdragon Automotive 4G Platform uses spectrum deployed by global carriers and features integrated C-V2X direct communications to provide superior support for rich in-vehicle experiences; multi-gigabit cloud connectivity, vehicle-to-vehicle (V2V) and vehicle-to-roadside infrastructure (V2I) communications for safety, high-bandwidth/low-latency teleoperations support, and concurrent multi-frequency GNSS—including GPS, Galileo, Glonass, BDS and QZSS, and precise positioning support for lane level navigation accuracy. The Snapdragon Automotive 4G Platform also supports Qualcomm Dead Reckoning 3 technology and Qualcomm Vision Enhanced Precise Positioning technology, optimized to provide highly accurate location positioning with a comprehensive virtually anytime/anywhere 3D navigation solution.

Snapdragon Automotive 5G Platform

The Snapdragon Automotive 5G Platform is our first automotive-grade 5G platform. It is 3GPP Release 15-compliant, engineered to support FDD and TDD networks, as well as standalone (SA) and non-standalone (NSA) modes of operation. The Snapdragon Automotive 5G platform is optimized to support concurrent multi-frequency, multi-constellation GNSS, including GPS, Galileo, Glonass, BDS and QZSS. The Snapdragon Automotive 5G Platform also supports Qualcomm Dead Reckoning 3 technology and Qualcomm Vision Enhanced Precise Positioning technology, optimized to provide highly accurate location positioning with a comprehensive virtually anytime/anywhere 3D navigation solution.

Single-frequency GNSS platforms

Qualcomm® 9150 C-V2X ASIC

The Qualcomm 9150 C-V2X ASIC is compatible with 5G and complements other Advanced Driver Assistance Systems (ADAS) sensors. It is a part of the Qualcomm 9150 C-V2X ASIC platform. The Qualcomm 9150 C-V2X ASIC includes C-V2X direct communication mode, which is designed to offer vehicles and roadside equipment low latency communications for vehicle-to-infrastructure (V2I), vehicle-to-vehicle (V2V) and vehicle-to-pedestrian (V2P) driving with or without the involvement of a cellular network. Designed to operate at the 5.9 GHz ITS spectrum, C-V2X provides a range, reliability and performance advantage when compared to other similar radio technology. The Qualcomm 9150 C-V2X ASIC Platform also supports Qualcomm Dead Reckoning 3 technology for 3D.

Product Comparison Guide

Features	Qualcomm® MDM9150	Qualcomm® SA415M	Qualcomm® SA515M
GNSS Engine	Gen9v1	Gen9v2	Gen9v4
GNSS Frequencies	L1	L1, L2, L5	
GNSS Constellations	GPS, GLO, GAL, BDS, QZSS	GPS, GLO, GAL, BDS, QZSS, IRNSS	
SBAS Supported*	WAAS, EGNOS, SDCM, GAGAN, MSAS		
Qualcomm Dead Reckoning	L1 multi-constellation	L1 + L5 multi-constellation	
Qualcomm Precise Positioning Framework		•	•
Qualcomm VEPP GNSS Support**		•	•

*Satellite Based Augmentation Systems – Provides DGPS Corrections & Satellite Integrity monitoring

**Vision Enhanced Precise Positioning supported on select external Snapdragon Processors using Qualcomm® Multi Frequency GNSS, Vehicle & IMU Sensor information, and access to either a front- or rear-facing camera feed.

Qualcomm Automotive Positioning Solutions & GNSS advantages

Innovation

Industry Leadership

Broad Solutions

Ecosystem Adoption

- Long history of automotive innovation
- Over 150 million vehicles using Qualcomm Automotive solutions
- #1 in telematics and Bluetooth for Automotive
- #1 in premium, next-gen infotainment design wins for production vehicles starting 2020
- 20 automakers have selected the Snapdragon Automotive Cockpit platform
- Foundational technology leadership, differentiation and scale in mobile (3G, 4G LTE and 5G)

www.qualcomm.com/products/automotive/positioning-solutions

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