



# 5G Brings New Improvement to Cellular Based Positioning

Colin Newman – Director of Antenna Business Development

Build a Smarter World





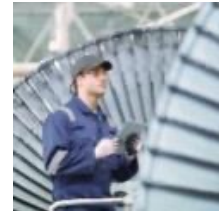
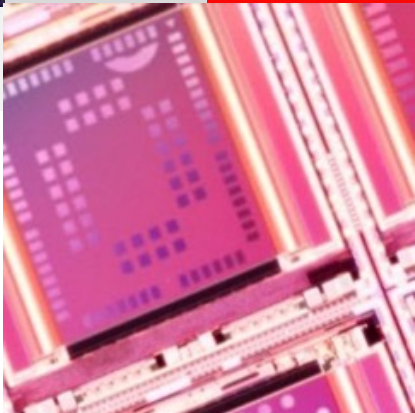
## 5G Brings New Improvement to Cellular Based Positioning

The applications for GNSS technology today range across Drone Delivery, Self-Driving Vehicles, Cargo Logistics, Augmented Reality, Internet of Things, Remote Education, Telemedicine Solutions, Environmental Monitoring, Smart Cities and many more.

With 5G as the backbone, it will deliver high-speed, low-latency broadband connectivity that will open the door to a whole new generation of GNSS applications with enhanced parameters for positioning accuracy down to meter and even centimetre accuracy.

We explore the many benefits this brings to us.

Build a Smarter World



# GPS Yesterday & Today



- 1957 Russia launched Sputnik
- 1983 Reagan authorized the use of Navstar
- 1988 Magellan released - NAV 1000
  - It weighed 0.7 Kg and cost \$3,000
- GPS has 24 satellites controlled by the US (1993)

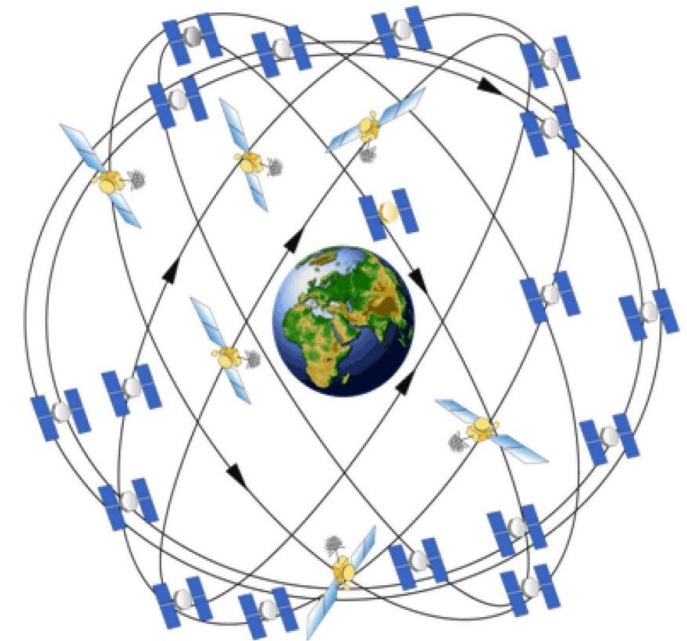


- Today we have GLONASS (Russia), GALILEO (Europe), BeiDou (China), NavIC (India) and QZSS (Japan) – over 100 satellites
- Dual frequency with L1, L5 and L2 bands
- 2022 Receiver chip units approx. 1.8B pcs and expected to reach 2.32B units by 2026
- Receiver chip cost Sub \$2

***If it moves, track it..!!!!***

# GPS Progression

- 1992 Trimble launched the first RTK GPS receiver - 12 channel system, module larger than a match box, excessive power (2 hrs battery) and 4-5 minutes TFFF.
- Today, software enhancements for TFFF.
- 80 - 440 channels is standard – approx. 12 satellites at any one time.
- Without going into detail, channels serve more than one purpose:
  - Speed up satellite acquisition
  - Reduce power consumption
  - Reduce the likelihood of losing a 3D fix even in harsh environments
  - Provide better sensitivity, allowing fixes in places where previously we would struggle
  - Provide better positioning accuracy
- Laws of physics restrict antenna technology from keeping pace with the processor.



# Some Typical GPS/GNSS Applications




**67%**

**WIRELESS IMPLANTABLE MEDICAL DEVICES**


- Deep Brain Neurostimulators
- Cochlear Implants
- Gastric Stimulators
- Cardiac Defibrillators/Pacemakers
- Foot Drop Implants
- Insulin Pumps



**Meter Accuracy**



**Time**



**CM/MM Accuracy**





# Does GNSS Need 5G or Does 5G need GNSS..??



## GNSS:

- It's receiver only.
- 1.8B chipsets (cellular market 5 x Times this).
- All Remote Radio Heads (RRH) must be time synchronized to +/- 1.5 us in their base mode of operation.
  - GNSS-based atomic clocks provide +/- 100 ns Primary Reference Time Clock (PRTC).
- GNSS/5G Combo modules.
- RTK (real time kinematics) calculates your location with 1cm accuracy in real time.

## 5G:

- Faster speed, higher capacity, low-latency and enhanced positioning.
- 5G delivers enhanced parameters for positioning accuracy down to the meter, decimeter, centimeter and even mm..!!
  - Advanced time and angle-based positioning methods.
- Urban canyon or in-door tracking.
  - 5G focus on high-density population and main traffic areas.
- Open RAN (radio-access networks).

**BOTH**

# What's Next...???



## GNSS:

- We've come a long way, but still much further to go
- Demand for high precision only just started
  - Autonomous vehicles, agriculture, drones etc.
- Further developments in RTK (mm accuracy)
- GNSS is vulnerable to cybersecurity attacks such as jamming and spoofing
- 'LEO' – Low Earth Orbit
  - Much stronger signals

## 5G:

- 5G deployment faster than 4G/LTE
- REDCAP (5G NR Light) – 'Reduced Capacity'
  - Power, cost, size
  - 150 Mbps and 50 Mbps in the downlink and uplink
- mmWAVE – shorter range
- 6G - ??



**We are a global IoT solutions provider, backed by outstanding support and services, to deliver a smarter world.**

- Unbeatable choice from the broadest module portfolio in the world
- High quality range of off-the-shelf and customized antennas
- Providing Connectivity-as-a-Service
- Superb support with the largest R&D team in the industry
- Continuous innovation – in 5G, LPWA, CV2X, Smart Modules
- A passionate, dedicated team of “Quectelers” ensure our customers always come first

*Thank You*

**Build a Smarter World**

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: **+86 21 5108 6236** Sales Support: [sales@quectel.com](mailto:sales@quectel.com)

Technical Support: [support@quectel.com](mailto:support@quectel.com) General: [info@quectel.com](mailto:info@quectel.com)