

# SPAN™ Positioning Technology

**GNSS + INS Navigation**

*Enhanced Positioning  
for Challenging Navigation  
Environments*



*Precise Thinking Makes it Possible*

# SPAN Technology



Precise thinking

SPAN (Synchronous Position, Attitude and Navigation) technology combines NovAtel's precision GNSS positioning technology with robust inertial navigation techniques. The tight integration of these complementary technologies in SPAN provides accurate, high-rate position, velocity and attitude output at data rates up to 200 Hz. The system is able to provide stable, accurate positioning through conditions where traditional GNSS receivers fail and can even bridge through brief periods when no GNSS satellites are visible.

Tight integration means that GNSS satellite observations are used directly in the inertial solution to take advantage of all available GNSS data, even when only a few satellites are visible. Tight integration also allows feedback of the inertial solution back into the GPS receiver core to improve GPS performance characteristics such as signal reacquisition and RTK convergence time.

**The results of a tightly-coupled architecture are:**

- More stable positioning, in nearly any GNSS conditions
- Accurate and stable attitude performance
- Improved GNSS signal tracking
- Improved GNSS RTK convergence time

**Which in turn provide SPAN users with:**

- Better accuracy position, velocity and attitude for their applications
- New opportunities by providing an accurate, high-rate, full attitude navigation solution where GNSS-only systems fail
- Improved productivity by preventing re-work often required when operating in difficult GNSS conditions

A complete SPAN system is comprised of a GNSS receiver, IMU and dual-frequency GNSS antenna. Choices of NovAtel IMUs and receivers are shown below:

**Receivers**

Part Number	Board Level	Sealed Enclosure	Tightly-Coupled GPS/INS	AdVance RTK Capable	GPS/GLONASS Capable	L-Band Capable
OEMV-2	✓		✓			
OEMV-3	✓		✓			✓
Propak-V3		✓	✓			✓
OEM-SPAN-SE	✓		✓	✓	✓	✓
SPAN-SE		✓	✓	✓	✓	✓

For more information visit [www.novatel.com/products/span.htm](http://www.novatel.com/products/span.htm)

**IMUs**

Part Number	Manufacturer and Part Number	Export <sup>1</sup> Controls	Embedded GNSS	IMU <sup>3</sup> Grade	Data Rate	Gyro <sup>4</sup> Technology
IMU-H58	Honeywell HG1700 AG58	ITAR	No	Tactical	100 Hz	RLG
IMU-H62	Honeywell HG1700 AG62	ITAR	No	Tactical	100 Hz	RLG
IMU-LN200	Northrop Grumman LN200	ITAR	No	Tactical	200 Hz	FOG
IMU-FSAS-EI	iMAR FSAS	varies <sup>2</sup>	No	Tactical	200 Hz	FOG

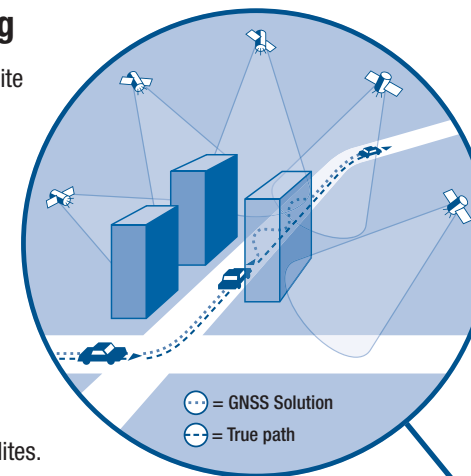
For detailed IMU specifications, please see the full product sheet.  
<sup>1</sup> Tactical Grade – Grade of IMUs with 1 to 10 degree/hour gyro bias error  
<sup>2</sup> Free of restrictions for certain countries and applications

<sup>3</sup> ITAR – Sales outside of the United States require export permits from the U.S. State Department  
<sup>4</sup> RLG = Ring Laser Gyro and FOG = Fiber Optic Gyro

# SPAN Delivers Superior Positioning

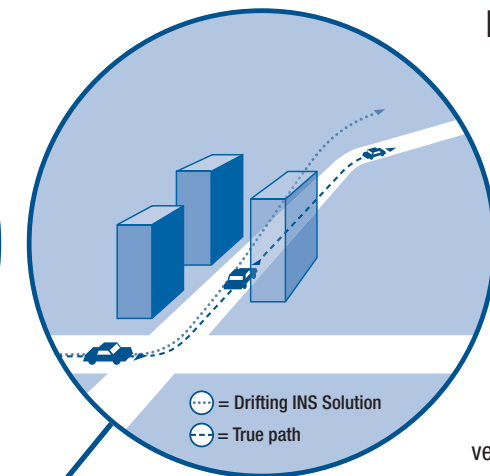
**GNSS Positioning**

A Global Navigation Satellite System (GNSS) such as GPS or GLONASS uses signals received from orbiting satellites to compute position and velocity of a vehicle. GNSS navigation has excellent accuracy provided the antenna has good visibility to the satellites. Accuracy can further be improved by using external corrections such as RTK, Satellite Based Augmentation Systems such as WAAS or EGNOS, or commercial correction services such as Omnistar. When satellites are blocked by obstructions such as trees or buildings, navigation becomes unreliable or impossible.



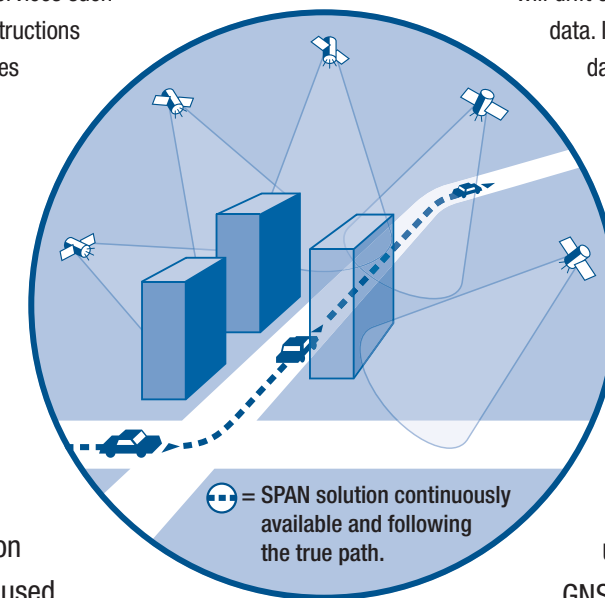
**Inertial Navigation**

Inertial Navigation Systems (INS) use rotations and accelerations measured from an Inertial Measurement Unit (IMU) to compute accurate relative position over time. An INS can also solve the attitude (roll, pitch and heading) of a vehicle and is not reliant on any external measurement in order to compute a solution. However, in the absence of an external reference, the INS solution will drift over time due to accumulating errors in the IMU data. IMU data is typically available at a much higher data rate than GNSS data, so an INS can produce a higher rate solution than a GNSS-only system.



**SPAN GNSS/INS Navigation**

When combined, the two navigation techniques augment and enhance each other to create a very powerful system. The absolute position and velocity accuracy of the GNSS is used



to compensate for the errors in the IMU measurements and the stable relative position of the INS can be used to bridge through times when the GNSS solution is degraded or unavailable.

**SPAN-CPT GPS + INS In One Enclosure**

SPAN-CPT is a complete GPS/INS system built into one enclosure. The product contains the NovAtel OEMV-3 receiver, which provides the user interface for the system, along with an IMU comprised of fibre-optic gyros and MEMS accelerometers. SPAN-CPT is comprised entirely of commercial components, which greatly reduces export restrictions when operating in multiple countries.



# SPAN Components



Precise thinking



Propak-V3



OEMV Receiver



SPAN-SE



IMU-FSAS



IMU-LN200



IMU-HG1700

## NovAtel's precise thinking makes it possible

NovAtel designs, markets and sells high-precision GNSS (Global Navigation Satellite System) receivers, positioning components and subsystems used in a variety of applications within the aviation, geomatics (surveying and mapping), mining, precision agriculture, marine and defense industries.

We put our precise thinking to work by developing products that combine hardware, such as receivers and antennas, with software to enable customers to fully integrate our high-precision GNSS technology into their systems.

NovAtel is also the principal supplier of reference receivers to national aviation ground networks in the US, Japan, Europe, China and India.

To learn more about how NovAtel's precise thinking can benefit you, visit [www.novatel.com](http://www.novatel.com).

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