

HONEYWELL RADAR VELOCITY SYSTEM

Range and Velocity without GNSS

Honeywell Radar Velocity System (HRVS)

Honeywell

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RANGE AND VELOCITY WITHOUT GNSS

The Honeywell Radar Velocity System (HRVS) is a low size, weight and power (SWaP), radar-based navigation aiding system. Combined with INS, it enables safe navigation during continuous GNSS disruptions.



Proven – Robust – Accurate

The Honeywell Radar Velocity System is built upon mmWave sensing technology (60-64GHz or 76-81 GHz) providing the range and velocity of objects. It can provide cm level-range accuracy and is impervious to environmental conditions such as rain, fog, dust and snow.

HRVS is meant to be used as a body velocity aiding source for inertial navigation systems as well as airborne altimeter and depth mapping/ground avoidance sensor pack, ready for application in multiple market segments and use cases.

KEY HONEYWELL ADVANTAGES

- Guaranteed functionality with chosen Honeywell product lines such as Honeywell Compact Inertial Navigation System (HCINS)
- Supports high velocity ranges (theoretical limit ~250m/s)
- Provides precise vertical velocity (e.g., for autoland)
- Range up to 170m above the ground
- Range measurement resolution down to 4cm
- Day/night operations
- Impervious to environmental conditions such as rain, fog, dust and snow
- Enables features:
 - Velocity aid
 - Altitude measurement
 - Depth mapping
 - Ground avoidance

KEY CHARACTERISTICS

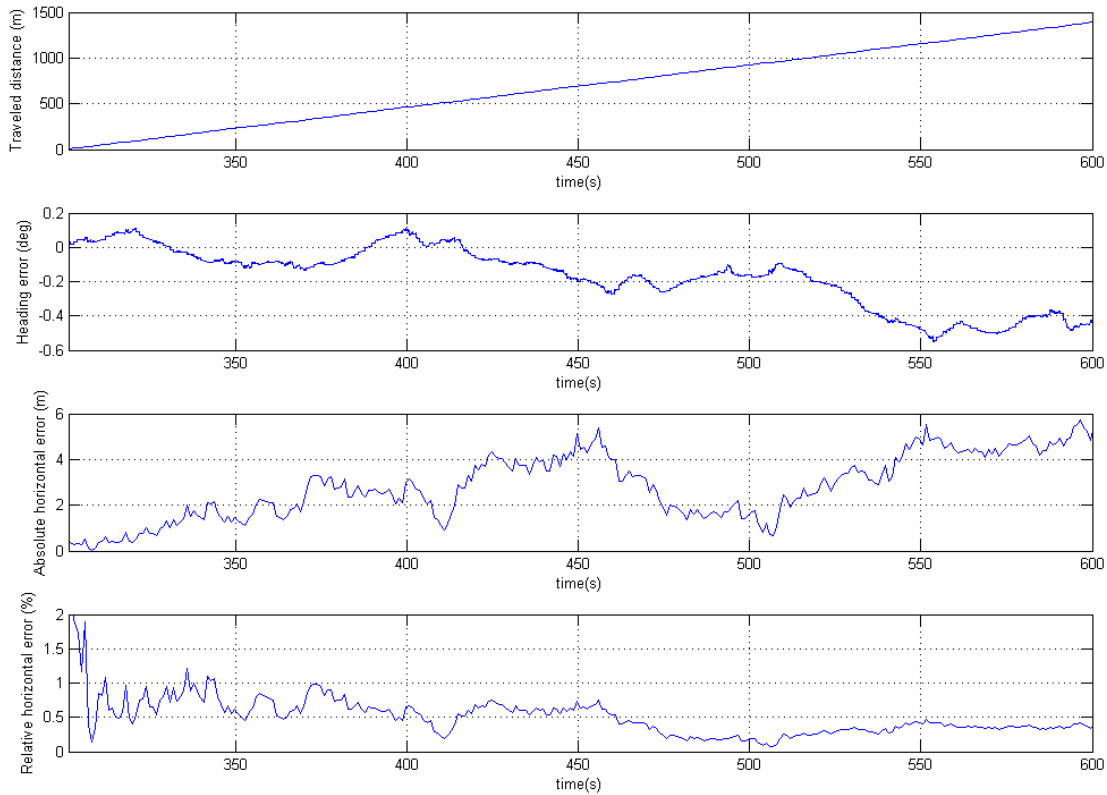
Supply Voltage	+5VDC
Power Consumption	1.7W nominal
Weight	24g (OEM version) 68g (Enclosed version)
Size	113mm x 60mm x 10mm (OEM version) 118mm x 66mm x 13mm (Enclosed version)
Operating Frequency	62.0±0.5GHz
Field of View	5.5° H x 5.5° V (-3dB)
Operating Temperature Range	-40 to +85°C

HRVS (4 BOARDS) PERFORMANCE DATA – AIRBORNE (NO GNSS)

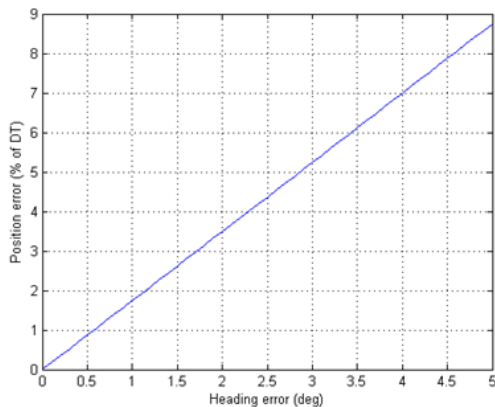
Used INS	HCINS (MEMS based low-cost navigator – tactical grade - gyro bias instability 1 deg/h)	
Typical Performance	*1% of Distance Travelled (Typical Performance)	
2-sigma Performance	*3% of Distance Travelled (2-sigma Performance)	
Maximum Measurement Range	170m	
Key Performance Variables	Heading error, trajectory shape (open vs closed)	
Typical Heading Error with HCINS	5 minutes < 1° (for outages > 15 minutes mag. heading aiding is recommended)	
Tested Surfaces	Asphalt, grass, concrete, forest/trees, greenfield, snow	
Surfaces with Limitations	Lake (i.e. still water)	
Velocity errors X/Y/Z axes 3m/s	0.20/0.20/0.04 RMS	0.02/0.02/0.003 Mean
Velocity errors X/Y/Z axes 6m/s	0.35/0.35/0.07 RMS	0.06/0.02/0.02 Mean
Velocity errors X/Y/Z axes 9m/s	0.45/0.45/0.10 RMS	0.09/0.04/0.03 Mean

*Performance between 1-3% of DT is achievable till the heading error starts to be a dominant error source which is typical for GNSS outages shorter than 10 minutes. For longer outages, it's recommended to use some heading-aiding source if it is possible, like a magnetometer for example.

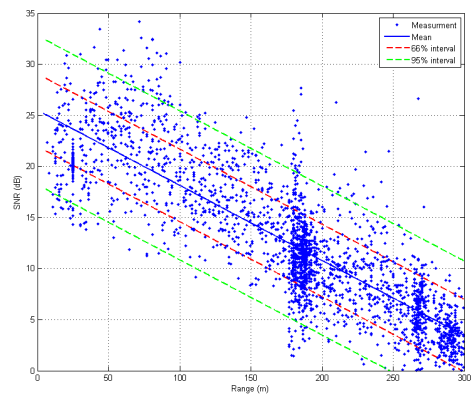
Example of flight test results with the tactical grade INS (HCINS) on closed trajectory



Dependency of position error on heading error in case of straight-line trajectory



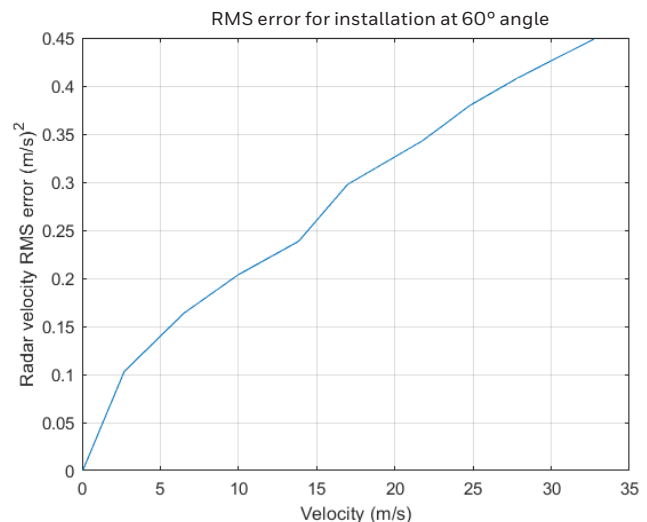
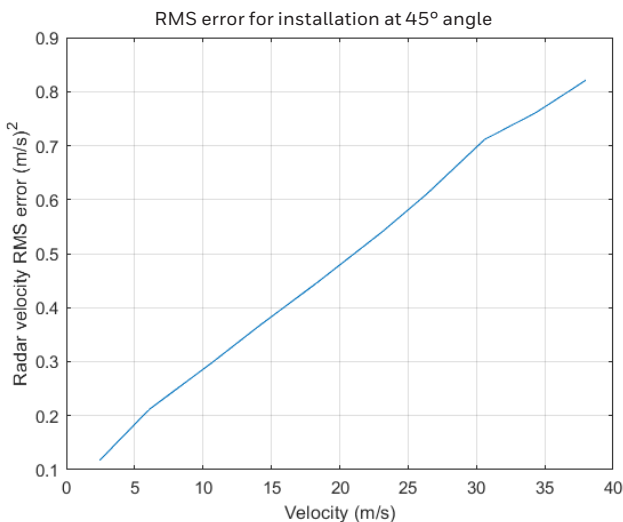
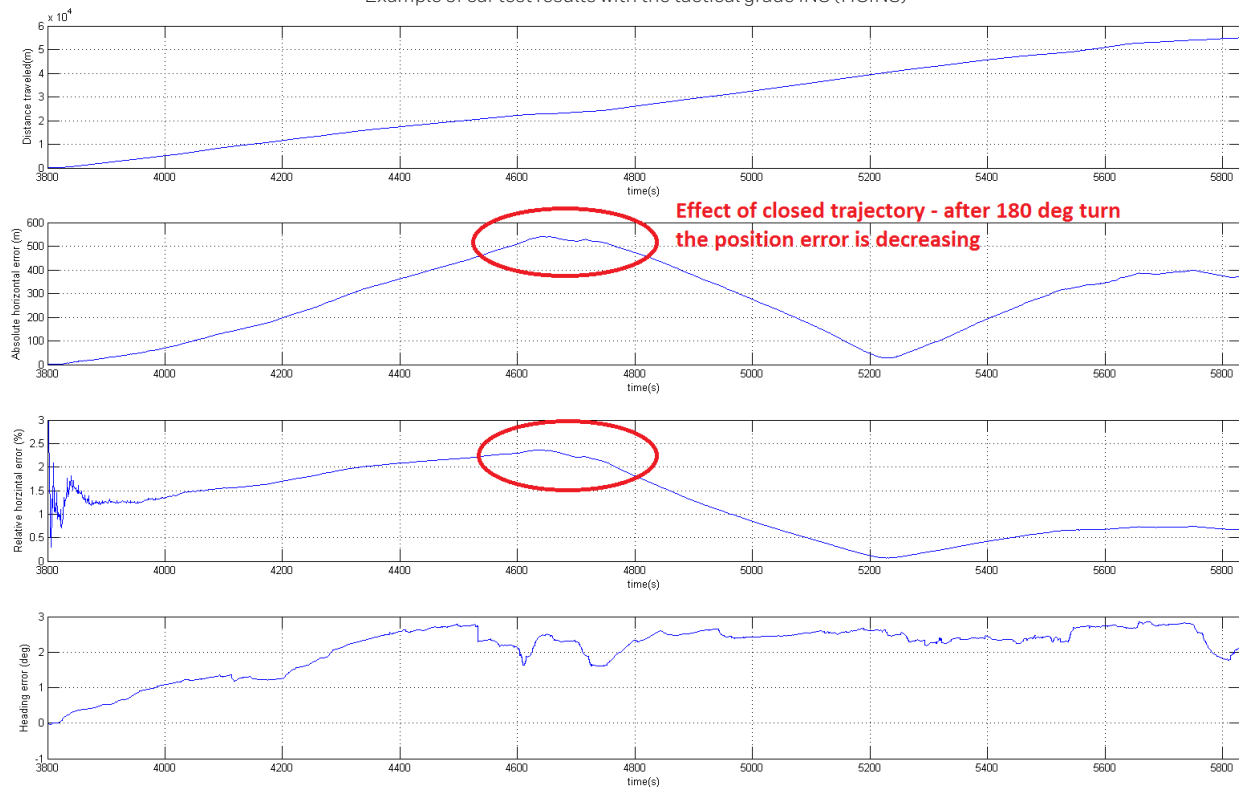
Dependency of signal to noise measurement range



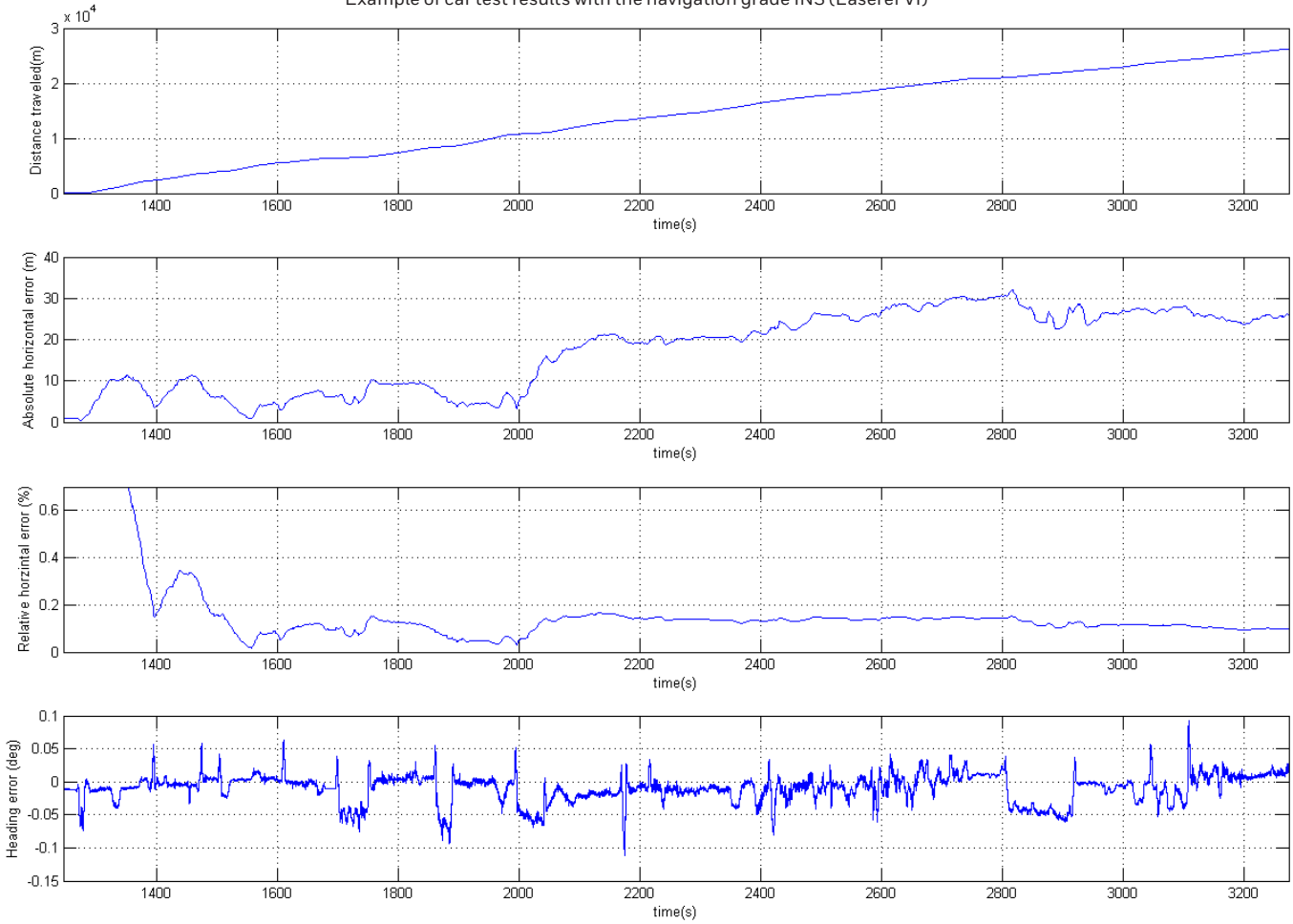
HRVS (1 BOARD) PERFORMANCE DATA – SURFACE (NO GNSS)

Used INS	HCINS (MEMS based low-cost navigator - tactical grade - gyro bias instability 1 deg/h) and Laseref VI (navigation grade)
Performance with tactical grade INS	>0.15% of distance travelled, max error is determined by heading error which is the dominant error source (depends on INS gyro quality) and typically grows in time
Performance with navigation grade INS	~0.1% of distance travelled
Minimum tested installation height	0.6 m
Key Performance Variables	Heading error, trajectory shape (open vs closed)
Typical Heading Error with HCINS	5 minutes < 1° (for outages > 15 minutes mag. heading aiding is recommended)
Tested Surfaces	Asphalt
Velocity error X axis	0.14 RMS 0.02 Mean @ speed 5 m/s and angle 60°
	0.26 RMS 0.02 Mean @ speed 15 m/s and angle 60°
	0.37 RMS 0.02 Mean @ speed 25 m/s and angle 60°

Example of car test results with the tactical grade INS (HCINS)



Example of car test results with the navigation grade INS (Laseref VI)



HRVS APPLICATIONS PER SEGMENT

**Airborne
(UAS)**



Setup: 4 x HRVS board + INS (HCINS, etc.).
Tested Range: Up to 170m.
Features: Velocity aid, altimeter, depth mapping, ground avoidance sensing.

**Surface
(Commercial)**



Setup: 1 x HRVS board (1.5m/0.6m above the ground) + INS (HCINS etc.).
Features: Velocity aid for no GNSS operations.

**Surface
(Defense)**



Setup: 1 x HRVS board (1.5m/0.6m above the ground) + INS (HCINS etc.).
Features: Velocity aid for no GNSS operations.
Emission analysis available upon request.

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**THE
FUTURE
IS
WHAT
WE
MAKE IT**

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