CRPA Modeling and Simulation

CAST NAVIGATION

Wavefront Testing of Phased-Array Antenna Systems

System Features

- Provides a precise, coherent, and repeatable RF “wavefront” that is a perfect solution for testing phased array (CRPA) types of antenna systems
- Provides a dynamic solution representing the phase center for each antenna element which are referenced to the phase center of the antenna manifold
- Jamming can be included in the CAST wavefront systems to provide precisely controlled interference signals for each antenna element
- Ideal choice for military or commercial devices, where the ability to stimulate a phased-array or multi-element antenna system is desired

CRPA and Attitude Determination Receiver Testing

The CAST-CRPA simulation systems provide a precise, coherent, and repeatable GNSS RF signal “wavefront”, that is a perfect solution for testing phased array, or “CRPA” antenna systems in a laboratory environment. The system generates a complete set of RF signals for each antenna element, which are referenced to the phase center of the antenna manifold. In addition, the CAST system allows users to add interference and IMU signals that can also stimulate EGI’s and a wide range of modernized navigation devices.

These systems can be applied to a wide range of testing and integration verification applications making them an ideal choice for stimulating military or commercial devices, where phased-array antenna system stimulation is desired. The CAST-CRPA system’s capability to add interference is controlled through proprietary synchronization technology, where interference and GNSS signals are combined and output as a composite signal for each individual element. The GNSS and interference signals for each antenna element are spatially offset and phase coherent with each other, to reflect real life phase differences in the signal reception at the phase center of each antenna element.

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System Specifications

Output Signal Types

GPS: L1, L2, L2C, L5, C/A-Code, P-Code,Y-Code, SAASM, M-Code AES, M-Code MNSA
BeiDou: BDS-B1L, BDS-B1C,
GLONASS: L1, L2
SBAS: WAAS, EGNOS, MSAS, GAGAN

Maximum Dynamics

Velocity:	> 60,000 m/s
Acceleration:	± 150,000 m/s^2
Jerk:	± 150,000 m/s^3

Signal Output Levels (Nominal)

GPS:	-160 dBW
GLONASS:	-161 dBW
Beidou:	-163 dBW
SBAS :	-160 dBW

Signal Level Control

Range:	± 30 dB
Resolution:	0.1 dB

L1/L2 Differential Delay

Range:	± 0.3 m
Resolution:	< 1 mm

Signal Accuracy

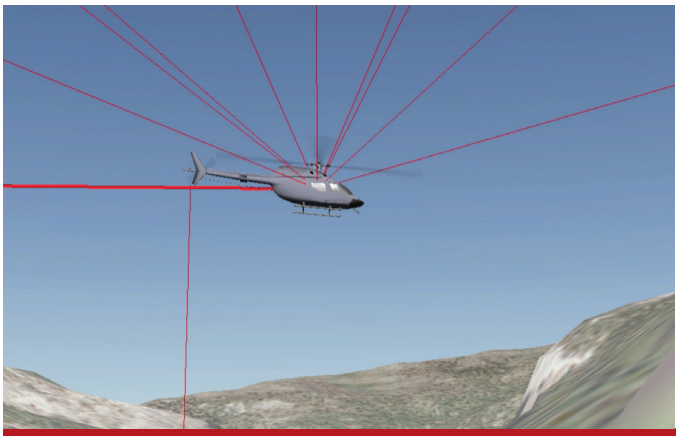
Pseudorange:	1 mm
Pseudorange:	Rate 1 mm/s
Delta Pseudorange:	1 mm
Interchannel Bias:	< 1 mm
Uncontrolled Bias:	< 1 mm
Bias Repeatability (initial):	< 1 mm
Bias Stability (operational):	< 1 mm

Signal Quality

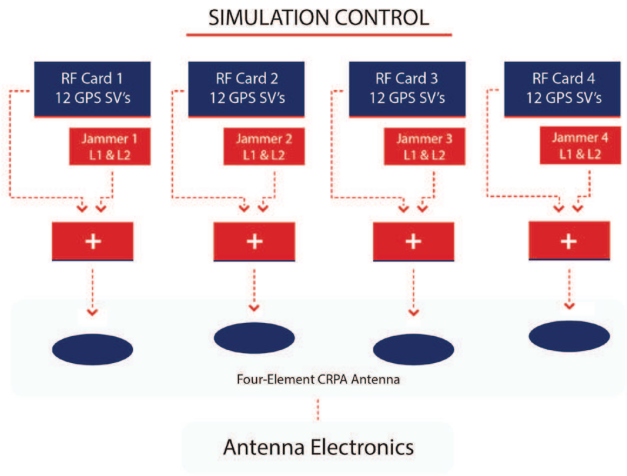
Spurious:	< -45 dBc
Harmonics:	< -50 dBc
Reference Oscillator:	10MHz OCXO
Frequency Stability:	3x10-9 per day

System Options

6-DOF Real Time Interface
Y-Code, SAASM, M-Code MNSA
Coherent Jamming
High Power GNSS Output Option
Inertial Interface
Avionics Interfaces
Remote Control DLL
Up to 8 Element CRPA Testing per Chassis
Multiple Chassis can be Synchronized



3D view of an aircraft flying a simulation.



This configuration illustrates a system that simulates a wavefront of GPS from twelve satellites for a four-element CRPA. This application utilizes jammers for L1 and L2 as well as twelve satellites for each element of the CRPA antenna.

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