Sensors I

RadaScan: A local reference, high resolution radar, dynamic positioning sensor

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Introduction

RadaScan: a high resolution radar local DP reference system

Signal Processing
- Target Properties
- DSP Hardware
- Signal Processing
- Performance
- Summary
Introduction

RadaScan: a high resolution radar local DP reference sensor
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RadaScan: a high resolution radar local DP reference sensor

Microwave FMCW radar (patented)

All weather operation
High accuracy

Continuously rotating (180 rpm)

Multi-target tracking
3Hz data refresh rate

High elevation coverage

Close working arrangements

Coded retro-reflective transponders (patented)

Clutter Rejection / No false reflections
Description

RadaScan: a high resolution radar local DP reference sensor
Description

RadaScan: a high resolution radar local DP reference sensor
Antenna Properties

RadaScan: a high resolution radar local DP reference sensor

Tight azimuth beam pattern (H-plane)  Wide elevation beam pattern (E-plane)
Target Properties

RadaScan: a high resolution radar local DP reference sensor

True retro-reflector (no transmit energy)

No external power source required
Target Properties

RadaScan: a high resolution radar local DP reference sensor

Broad azimuth response for wide incidence angle

Azimuth ±45° @-3dB

Elevation ±20° @-3dB
Target Properties

RadaScan: a high resolution radar local DP reference sensor

Broad azimuth response for wide incidence angle

Clutter rejection by modulated ID and polarization

<table>
<thead>
<tr>
<th>Range</th>
<th>50m</th>
<th>100m</th>
<th>500m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angle</td>
<td>170°</td>
<td>120°</td>
<td>90°</td>
</tr>
</tbody>
</table>
DSP Hardware

RadaScan: a high resolution radar local DP reference sensor

One single highly integrated board provides:

- 4 ADC channels
- 1500K Gate FPGA
- 1.2 GFLOPS DSP processor cluster
- Embedded PC
- All external IO to DP system
Signal Processing

RadaScan: a high resolution radar local DP reference sensor

FPGA Front End Digital Signal Processing:

- Target Triggers
- Marker & Interrupts
- High Speed Link Ports

Legend:
- Sigma T1
- Delta T1
- Sigma T2
- Delta T2

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Signal Processing

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Down Stream Digital Signal Processing:

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From FPGA

Freq

Range, R

Detection Decision

Bearing, φ

Hardware Control

R

φ
Sensor Performance

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Measurement Accuracy: Bearing

Normalised bearing measurement accuracy distribution plot for a target @ 180m, 13000 measurements

2 Sigma = 0.5mrad

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Summary

RadaScan: a high resolution radar local DP reference sensor

Range Accuracy: Typically 0.1% of range.
Operating Range: 20 to 750m
Angular repeatability:
  STD 0.03° @ 200m
  STD 0.06° @ 500m
Elevation Beam Shape: ± 12 degrees @ -10dB
Close-Up Elevation: +35 degrees @ 25m.

High-accuracy all-weather radar position
and heading dynamic positioning sensor

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