Integrated eLoran/GPS Receiver Development Platform
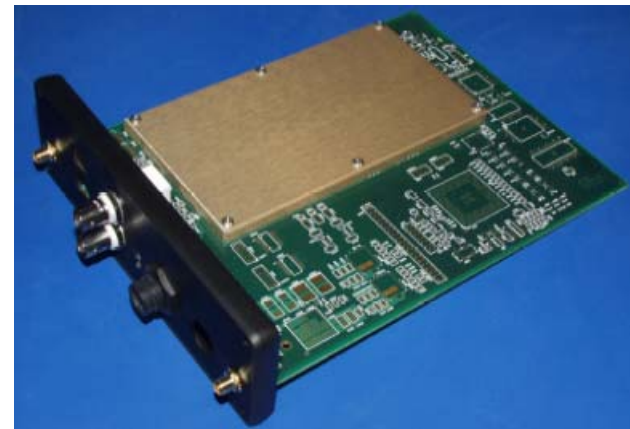

Producing the next generation of Integrated GPS/eLoran Receivers

Presentation for:

ILA

October 16, 2007

Outline

- Project Overview
- Receiver Hardware Specs
- Software Development 'Process'
- Current Status

Project Overview

- Goal: Develop an Integrated eLoran/GPS Development Platform

  - Relatively low cost.

  - User upgradeable.

  - Easily field deployable.

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Team

Hardware Specs

- 4 channel front end
  - Allows for various antenna configurations.
  - Jumper configurable power options to allow a 'phantom' DC power supply up the antenna wire.
  - Jumper configurable 4 stage filter/amp on each channel. Allows up to 8 pole filter with >60db dynamic range.
  - Digitally controllable gain.

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Hardware Specs (cont)

- ADC's
  - δ/Δ
  - 16 bit
  - 1.2Msps

- 4 channels multiplexed into 2 DSP inputs
  - 4 channels can operate simultaneously at up to 600ksps
  - 2 channels can operate simultaneously at up to 1.2Msps

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Hardware Specs (cont)

- Floating Point TI DSP
  - Allows 'non-embedded' developers to more easily generate code

- Memory
  - 16MB SDRAM
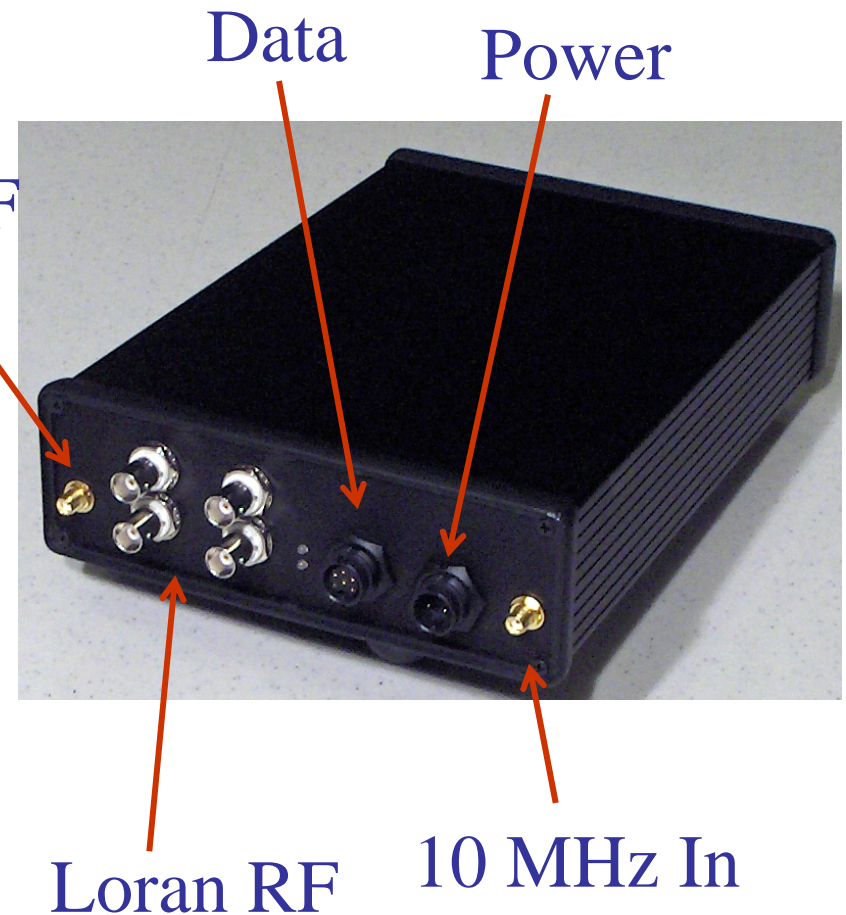 - 1MB Flash

GPS

- uBlox Antaris 4 module
  - LEA-4h
    - 16 channel
    - WASS and DGPS supported
    - 4Hz position update rate
   - Flash EPROM allows for embedded code configuration

I/O

- Loran RF input-4 BNC
- GPS RF-SMA
- External frequency reference-SMA
- 12V power
- 6 pin data
  - 2X RS232 tx & rx
  - GPS 1pps
  - GND

Data

Power

GPS RF

Loran RF

10 MHz In

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Development Goodies

- Data tap pins
  - Post amp/filter
  - Post ADC

- 20 pin HPI connector
  - Allows design of future interface with processor to make DSP slave

- 14 pin JTAG
  - Allows for reprogramming embedded code

Front End Headers

HPI   JTAG

10

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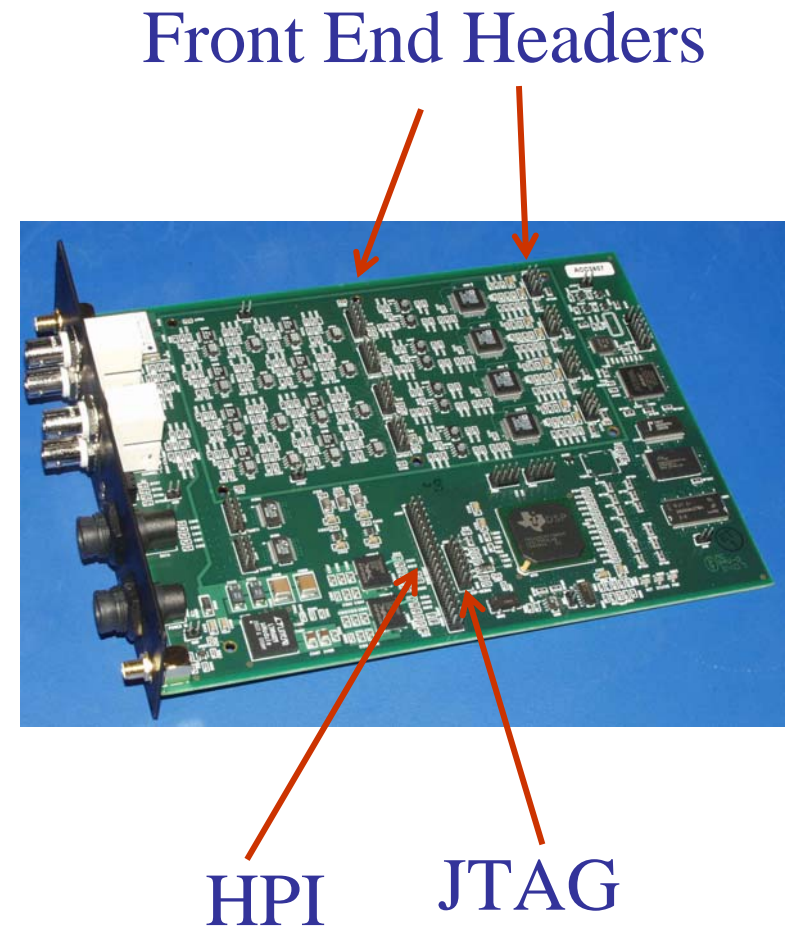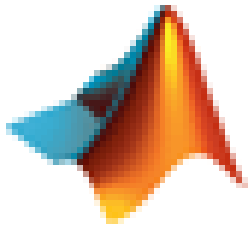
Mathworks Design Flow

- CrossRate part of Mathworks 'partner program'
  - Excellent developer support
- MATLAB->Simulink->RTW->TI Code Composer
  - Allows for 'auto' code generation
  - With all software tools, a change in the Simulink model can be in the form of embedded code on the target boards in minutes.
- Plenty of caveats
  - Need to understand how Simulink generates code in order to make 'right' changes to model
  - RTW doesn't always generate the most efficient code

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Overall Project Status

- Physical Hardware complete and nominally operational

- Receiver code running on DSP

- Hardware Driver Library Still being fleshed out.

- Once drivers are finished a nominal set of receiver algorithms will be loaded and tested.

Acknowledgements

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