New eLoran Receiver and Antenna Features

by

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ILA 33
October 2004
Tokyo, Japan

Outline

- Features reviewed provide improved performance in marine, aviation, and timing applications
- Three operational modes using ASFs
- Single axis gyroscope (SAG)
- New H-field antenna
- Summary

Operational ASF Modes of SatMate 1030

1. Preprogrammed Locus ASF flashcard or manual entry of known ASFs
2. Automatic generation of ASFs from known position
3. Real time generation of ASFs using GPS

Mode 1: Preprogrammed Locus ASF Flashcard

ASF flashcard mount

Dimensions:
4.88” H (124 mm)
5.74” W (146 mm)
8.14” D (207 mm)

Combined GPS/Loran Prototype with ASF Flashcard

Mode 1: Manual or Batch File Entry of Known ASFs

User enters:	nav asf 8970M -1.22
System responds:	ASF 8970M -1.22us

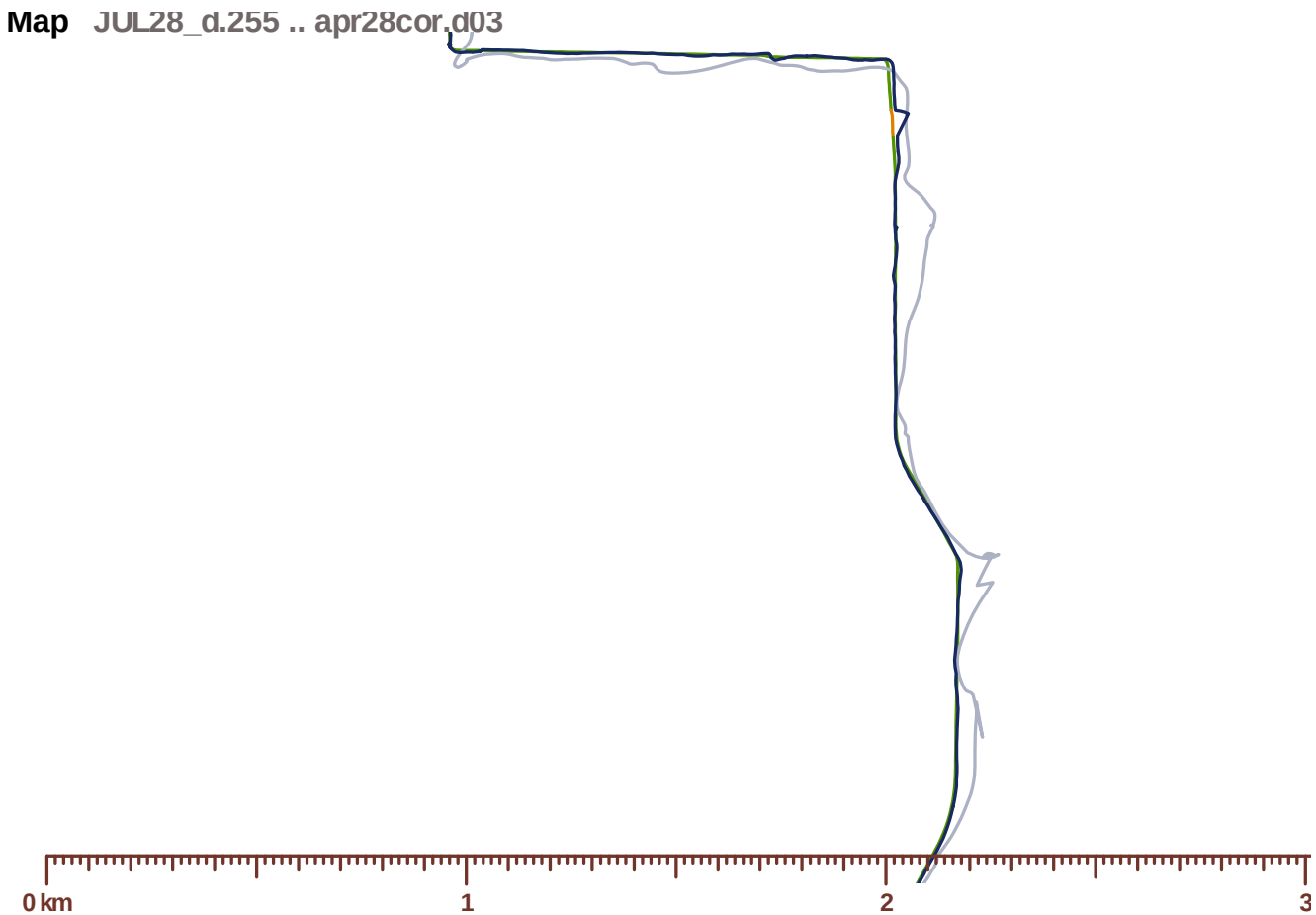
Mode 2: Automatic Generation of ASFs from Known Position

User enters:	nav force datum 43 0.191N 89 25.5581W
System responds:	datum 43 0.1910 N 89 25.5581 W

Mode 3: Real Time Generation of ASFs Using GPS

- GPS receiver outputs NMEA 0183 $GPGGA messages
- SatMate 1030 accepts message over serial port “B”
- SatMate 1030 calculates ASFs in real time and applies to Loran navigation solution
- Last ASF value stored and used until next $GPGGA message received

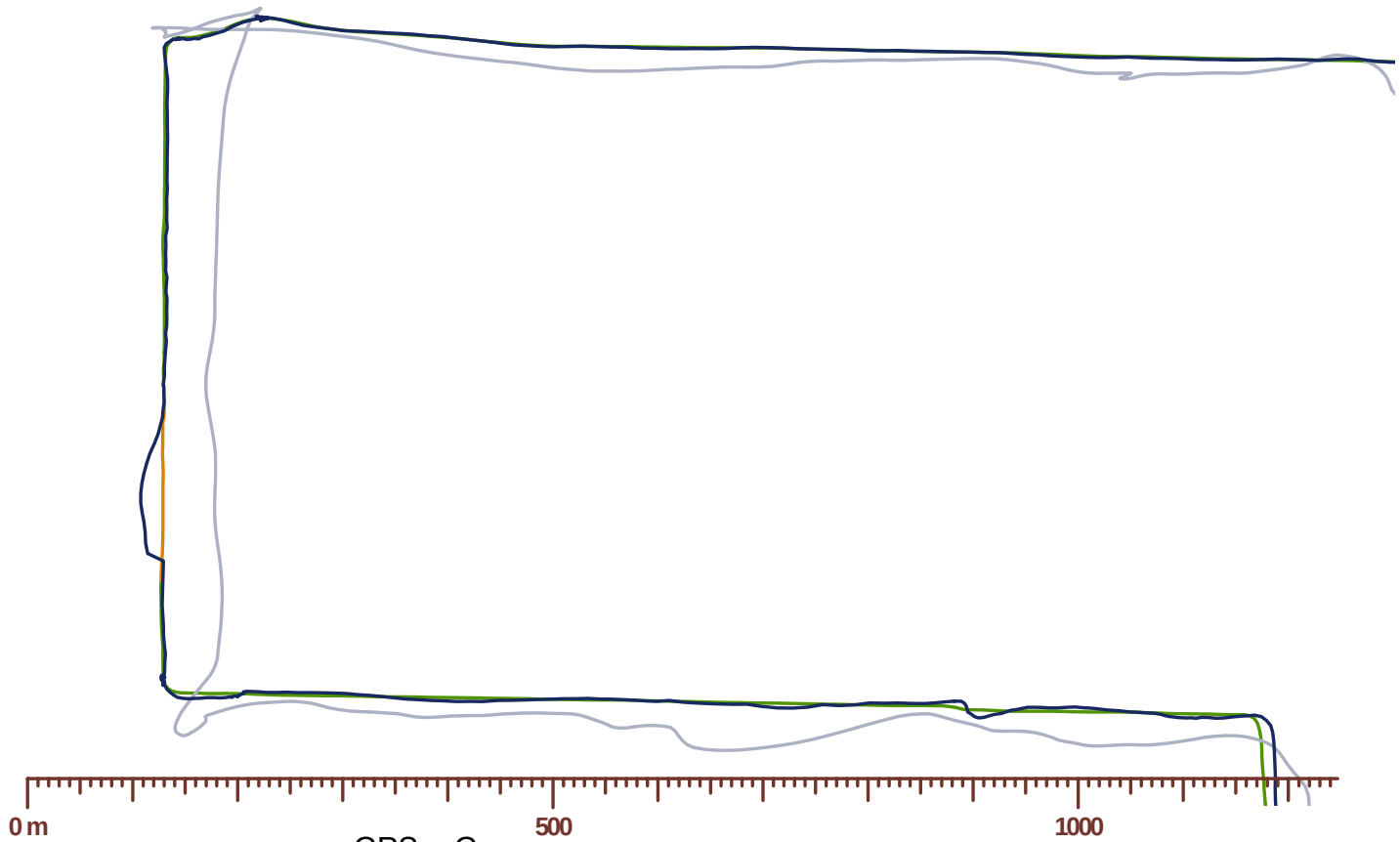
Mobile SatMate 1030 Test - Real-time ASFs vs Single Set of ASFs (here derived ~12 km away)



GPS – Green
SatMate generating real time ASFs – black
SatMate using single set of ASFs - grey

Mobile SatMate 1030 Test - Real-time ASFs vs Single Set of ASFs (here derived ~12 km away)

Map JUL28_d.255 .. apr28cor.d03

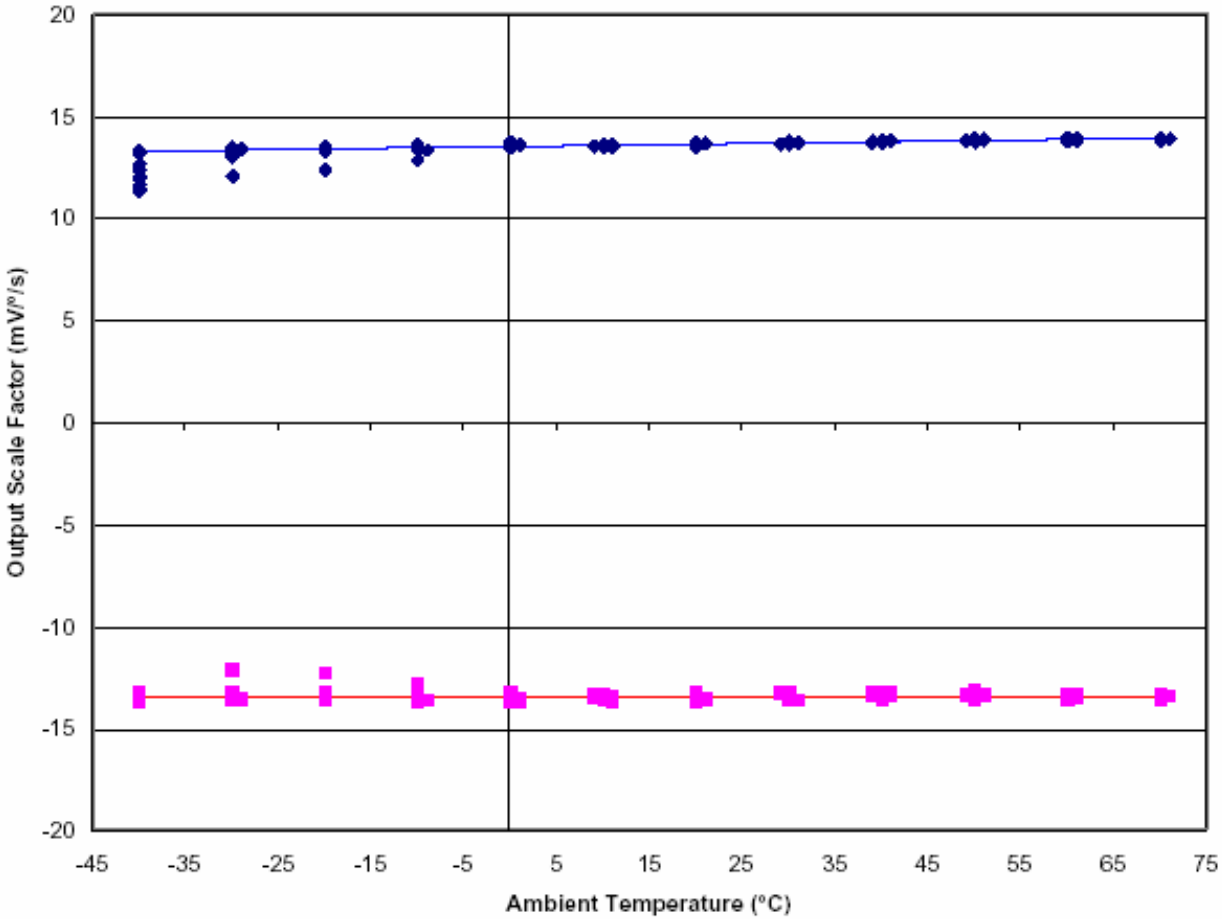


GPS – Green
SatMate generating real time ASFs – black
SatMate using single set of ASFs - grey

SAG Test Fixture

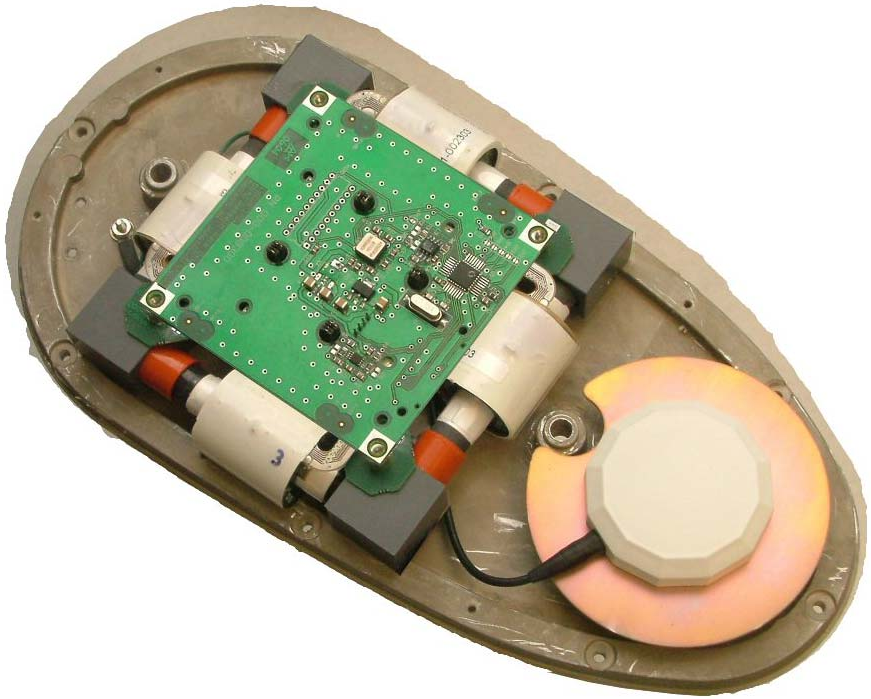
Rotation rates of 0 - 50 rpms
Temperature range - 50° C to + 80° C

SAG Temperature Compensation



Scaling Compensation of Two Single Axis Gyros over Temperature

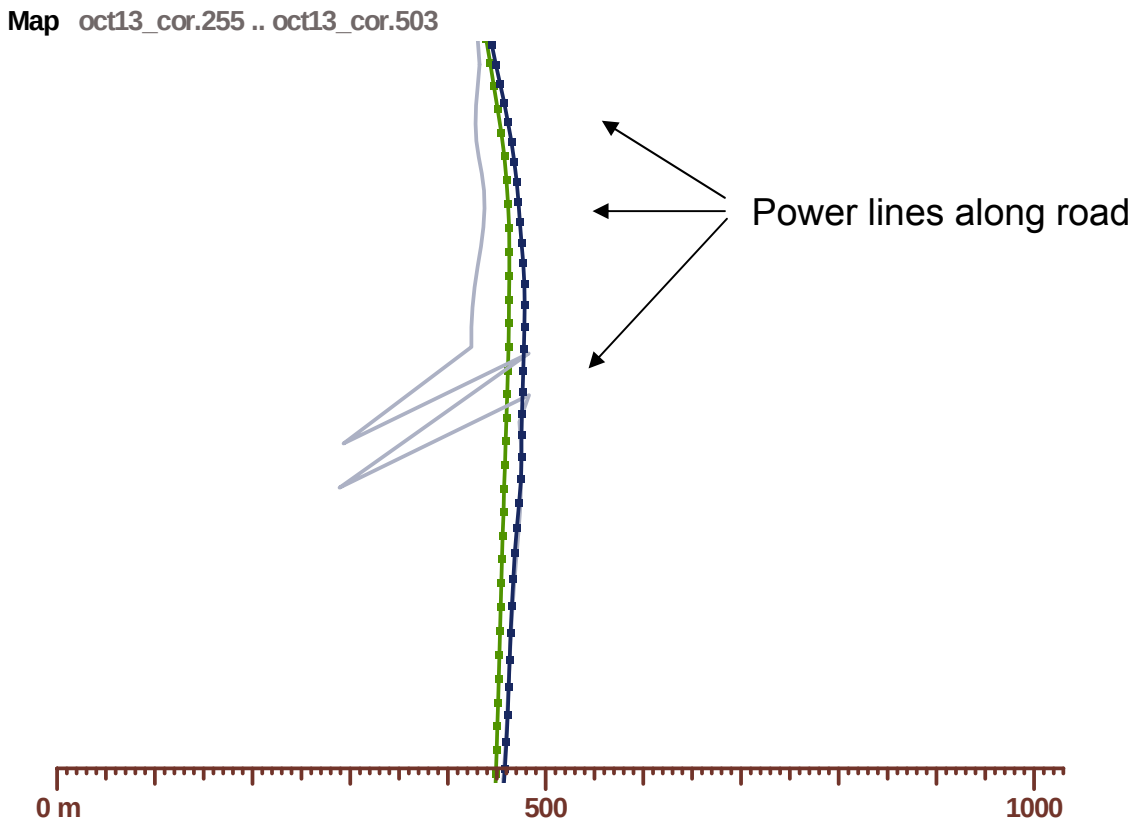
SAG in Combined GPS/Loran Antenna



• No degradation in H-field or GPS function with addition of SAG

Initial Mobile Tests of SAG

October 2004

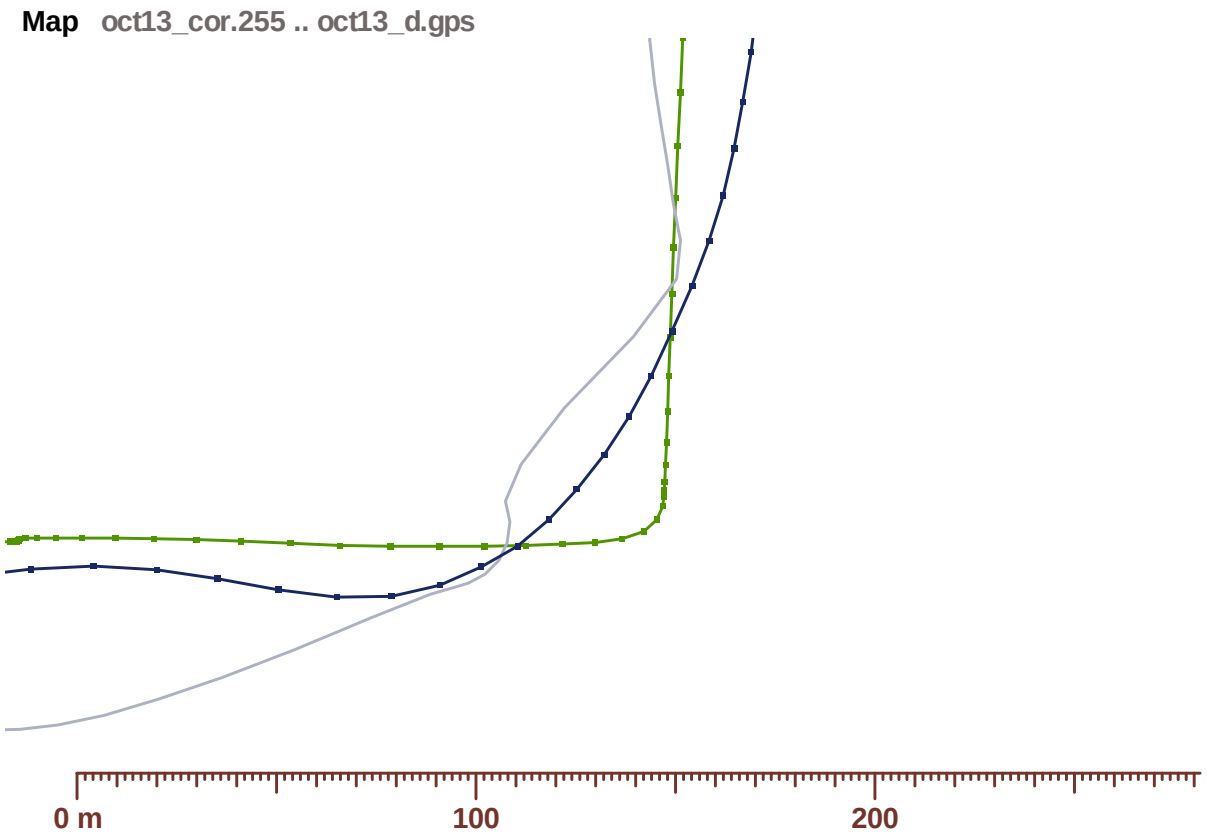


Close to power lines that disrupt H-field,
SAG helps to maintain course during interference

Green – GPS Black – SatMate with SAG Grey – SatMate without SAG

Initial Mobile Tests of SAG

October 2004



SAG helps to maintain course during rapid rotation

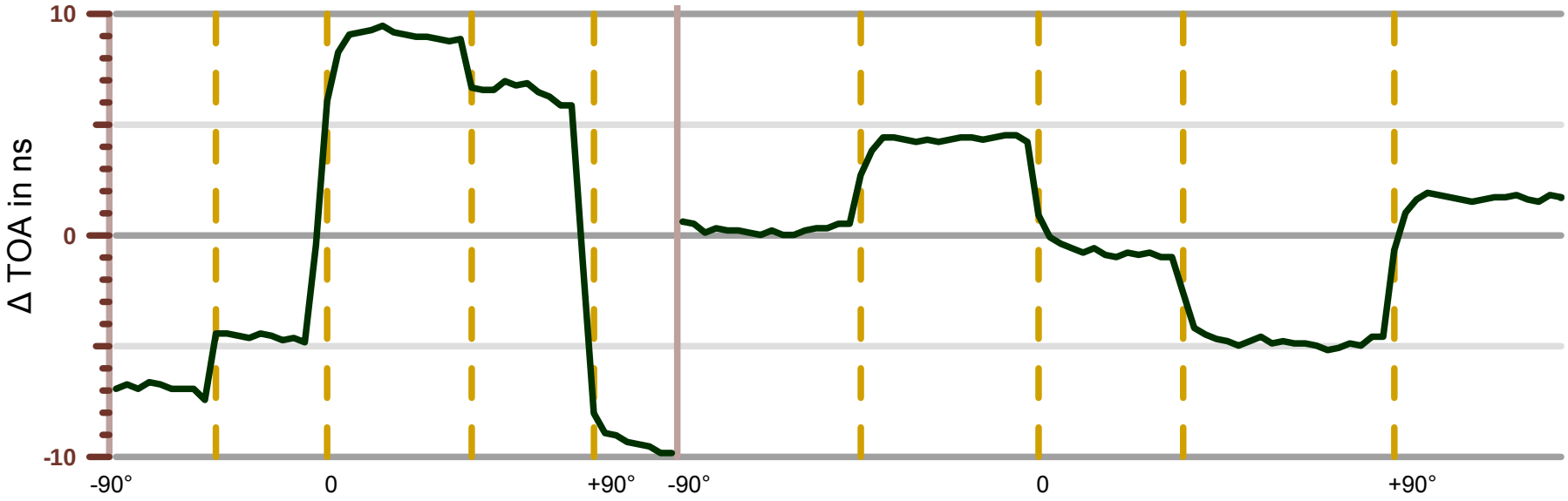
Green – GPS Black – SatMate with SAG Grey – SatMate without SAG

New H-field Antenna

- Redesigned preamplifier
- Much easier and faster assembly
- Much easier and faster tuning
- Much better interchannel balance

H-field Interchannel Balance – Old Design vs New Design

Change in 9960M TOAs as antennas rotated in 45° steps in Helmholtz coil



Old H-field optimized

New H-field not completely optimized, expect < +/- 2.5 ns

New H-field Antenna Preamplifier

Summary and Conclusions

- Locus has developed several new receiver and antenna features that improve eLoran performance in various applications.

- 3 ASF correction modes enable operators to apply ASF corrections in real time for the Loran navigation solution. These modes provide users with the ability to use a specific ASF data set or to have the SatMate calculate ASF values using a datum or GPS input.

- These modes enable and expand the use/study of eLoran and ASFs in regions or areas where no ASF corrections currently exist or where new ASF corrections are necessary.

Summary and Conclusions

- A Single Axis Gyroscope (SAG) has been incorporated within the Locus H-field antenna. Initial tests indicate no degradation in H-field antenna performance and improved dynamic characteristics of the SatMate 1030 system.

- Finally, Locus has developed a new H-field antenna. Improvements include better interchannel balance and much easier manufacture. These improvements will ultimately result in lower costs, more reliability, and better performance for eLoran systems.