



Positioning Leadership



NovAtel Inc.

Overview



ISO 9001:2000

FM 92323

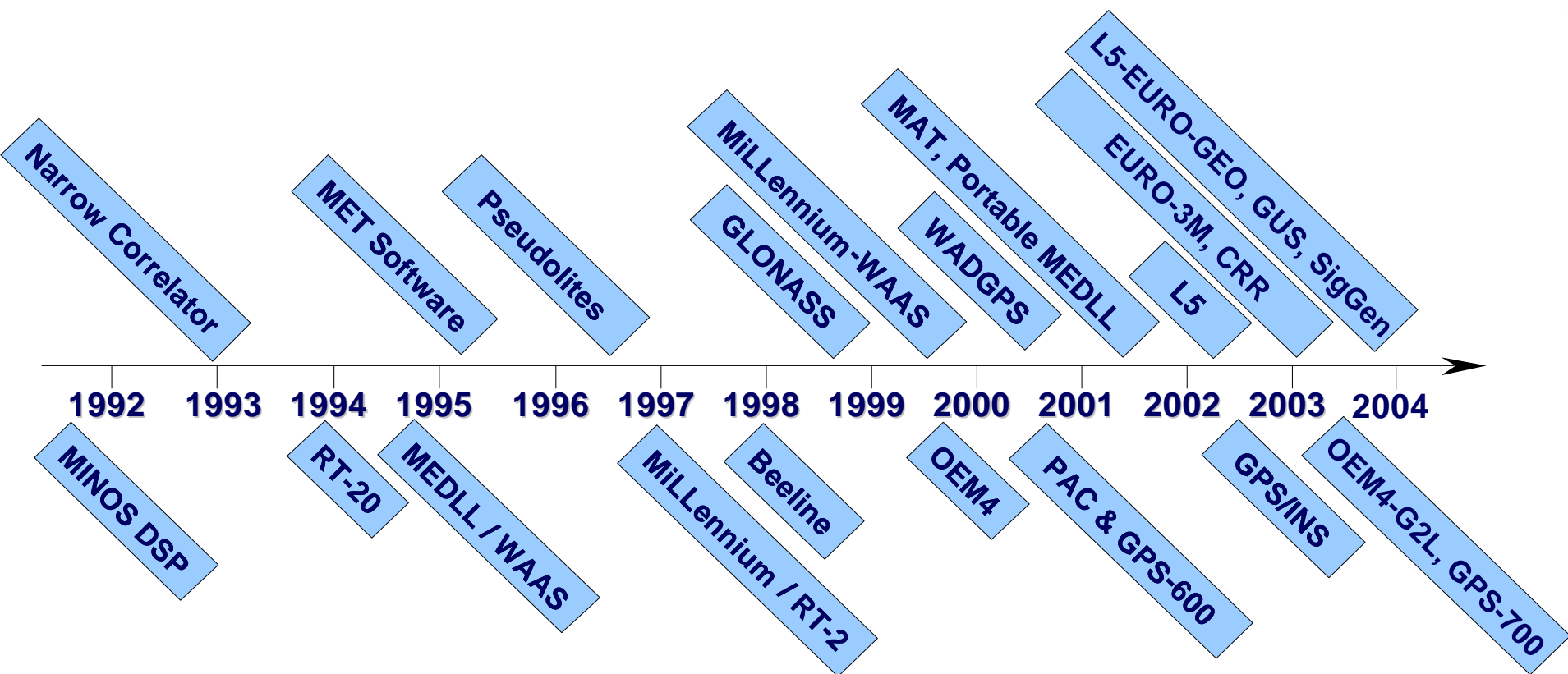
Our Organization



- Canadian corporation headquartered in Calgary, Alberta, Canada
- Established in 1983 - Initially in Telecommunications, now 100% GPS/Precise Positioning
- Initial public offering in 1997 (NASDAQ: NGPS)
- 2004 Revenues \$53.9m Cnd
- 180 employees



Our Technological Innovations



Strategic Partners & Customers

Aviation/Ground Market



Empowered by Innovation





National Augmentation Systems

WAAS Components

courtesy FAA website



2 Wide-area Master Station



25 Wide-area Reference Station



3 Ground Earth Station



2 O&M Console



24 GPS Satellite

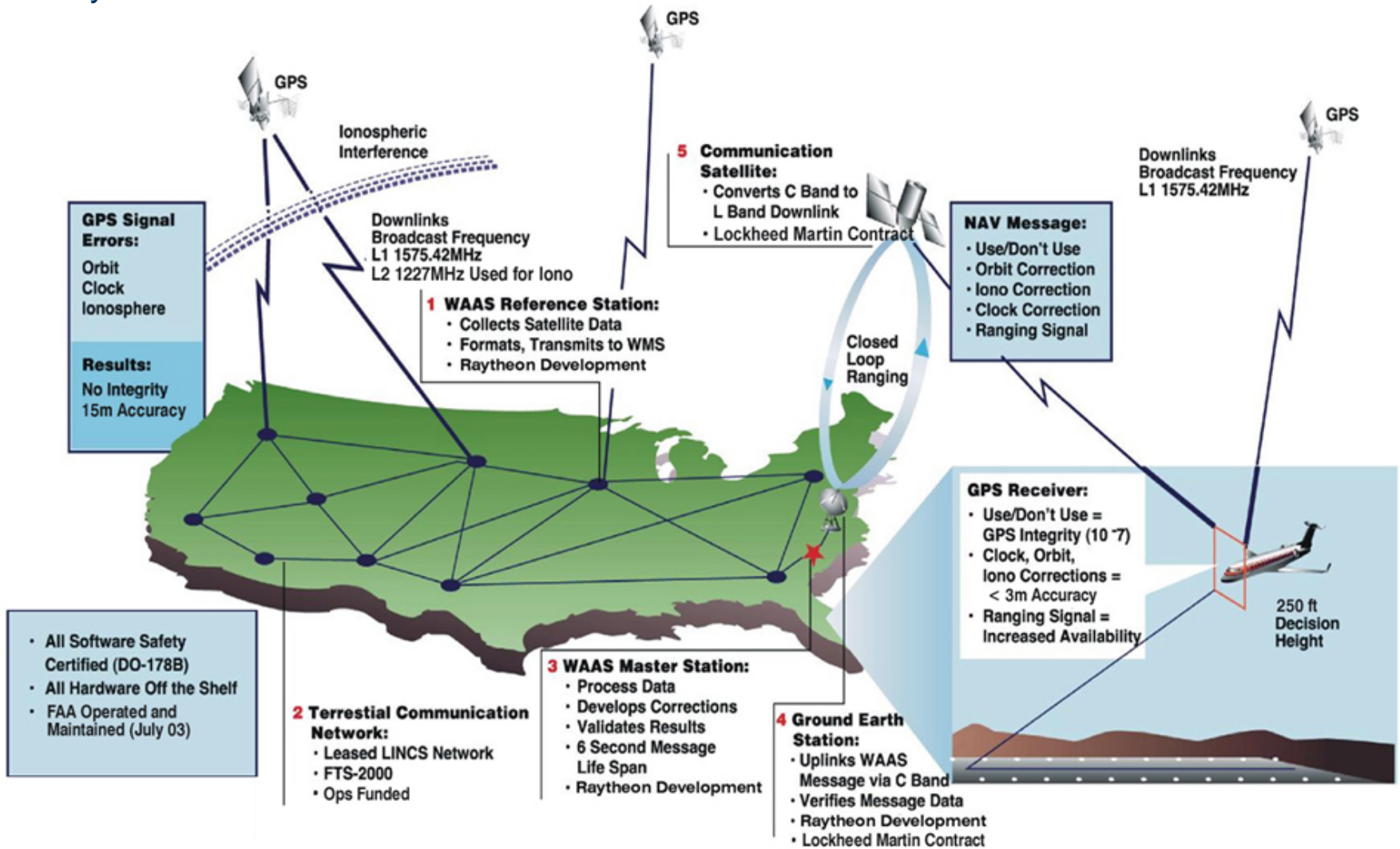


2 GEO Satellite



Wide Area Augmentation System (WAAS) Architecture

courtesy FAA website



SBAS & NovAtel Worldwide



EGNOS:

Europe (2001-2002)

- 22 RIMS-C receivers (Integrity Channel)

SNAS

China (2000-2002)

- 73 WAAS WRS receivers

MSAS:

Japan (1998-2003)

- 47 MSAS WRS receivers
- 6 NLES GUS receivers
- 4 UPC receivers

GAGAN:

India (2005)

- 18 WAAS-G2 receivers
- 3 L1/L5 GUS receivers
- 3 L1/L5 Signal Generators

WAAS:

USA (1996-1999) 1st Generation

- 148 WRS receivers
- 21 GUS receivers

WAAS G-II Receivers

Technology Refresh (2004 2005)

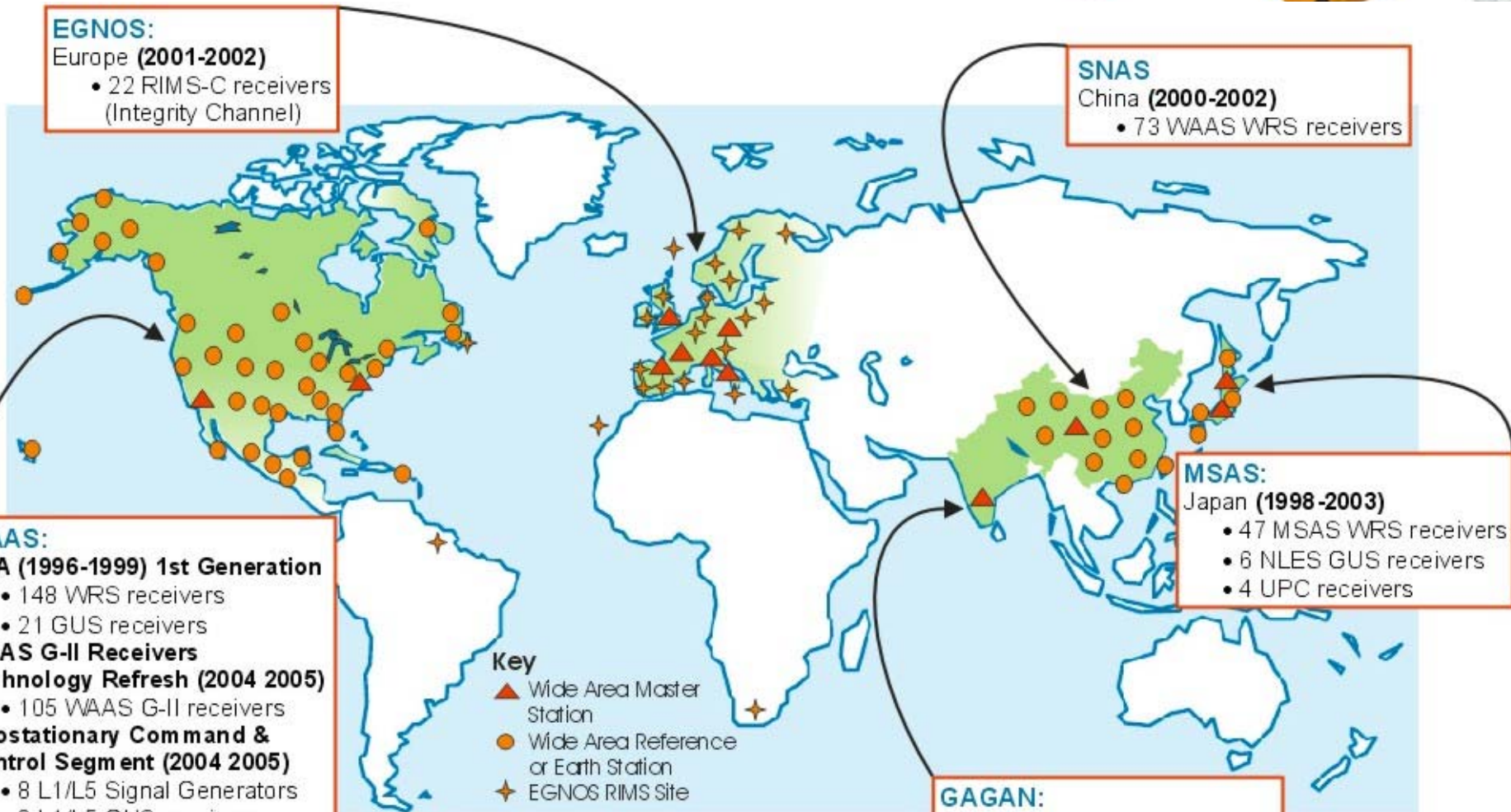
- 105 WAAS G-II receivers

Geostationary Command & Control Segment (2004 2005)

- 8 L1/L5 Signal Generators
- 8 L1/L5 GUS receivers

Key

- ▲ Wide Area Master Station
- Wide Area Reference or Earth Station
- ✦ EGNOS RIMS Site





Augmentation System Products

WAAS Reference Receiver G-II



- 14 GPS + 4 GEO tracking
- L1 enhanced MEDLL multipath mitigation
- L2 C/A tracking
- L2 Digital Pulse Blanking
- WAAS RFI improvements
- SQM measurements for satellite failure detection
- SafeTrak™ cross correlation check
- LCD status screen for improved status indications
- Command and log interface with 32-bit CRC
- Expansion capability for new signals (L5)



Production Units Delivered Spring 2004

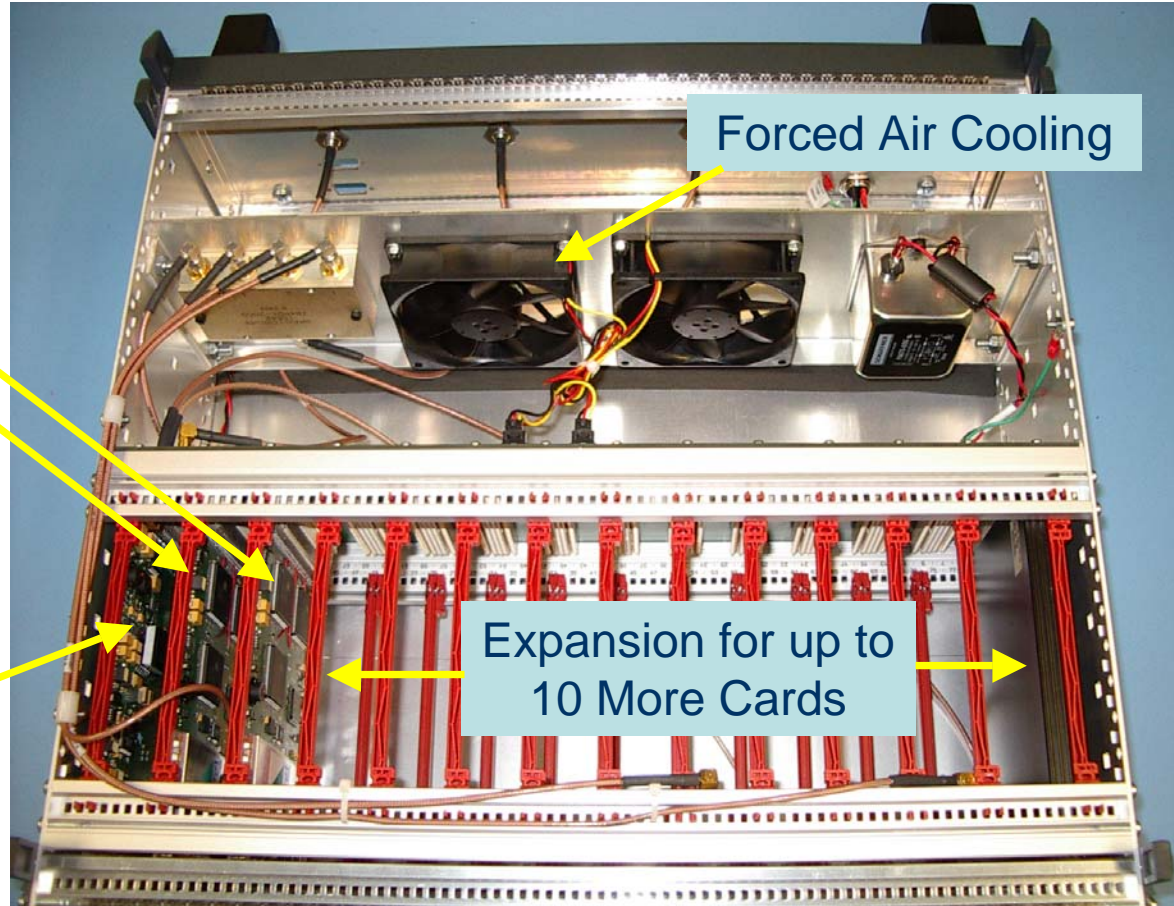
WAAS G-II Build-Up



Euro-3M Receiver Card



Active Clock/Status Card



Forced Air Cooling

Expansion for up to
10 More Cards

GEO Communications Control Segment (GCCS)



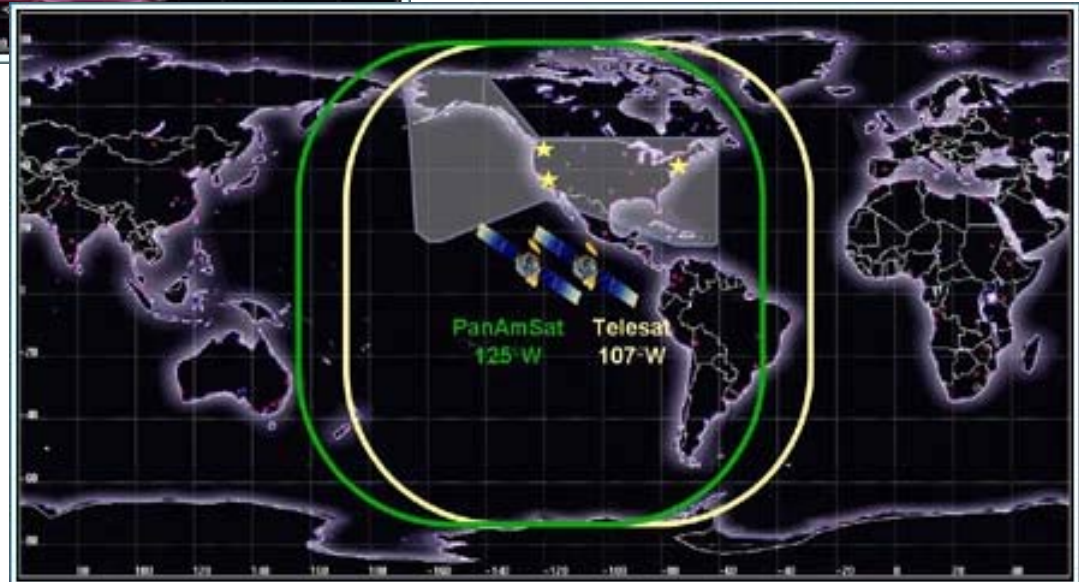
- New WAAS GEOs – improved coverage
- Lockheed Martin is prime, Boeing & Raytheon subs
- Raytheon developing new Ground Uplink System known as the GCCS
- NovAtel developing new GUS Receiver and new Signal Generator for the GCCS

GEO Locations

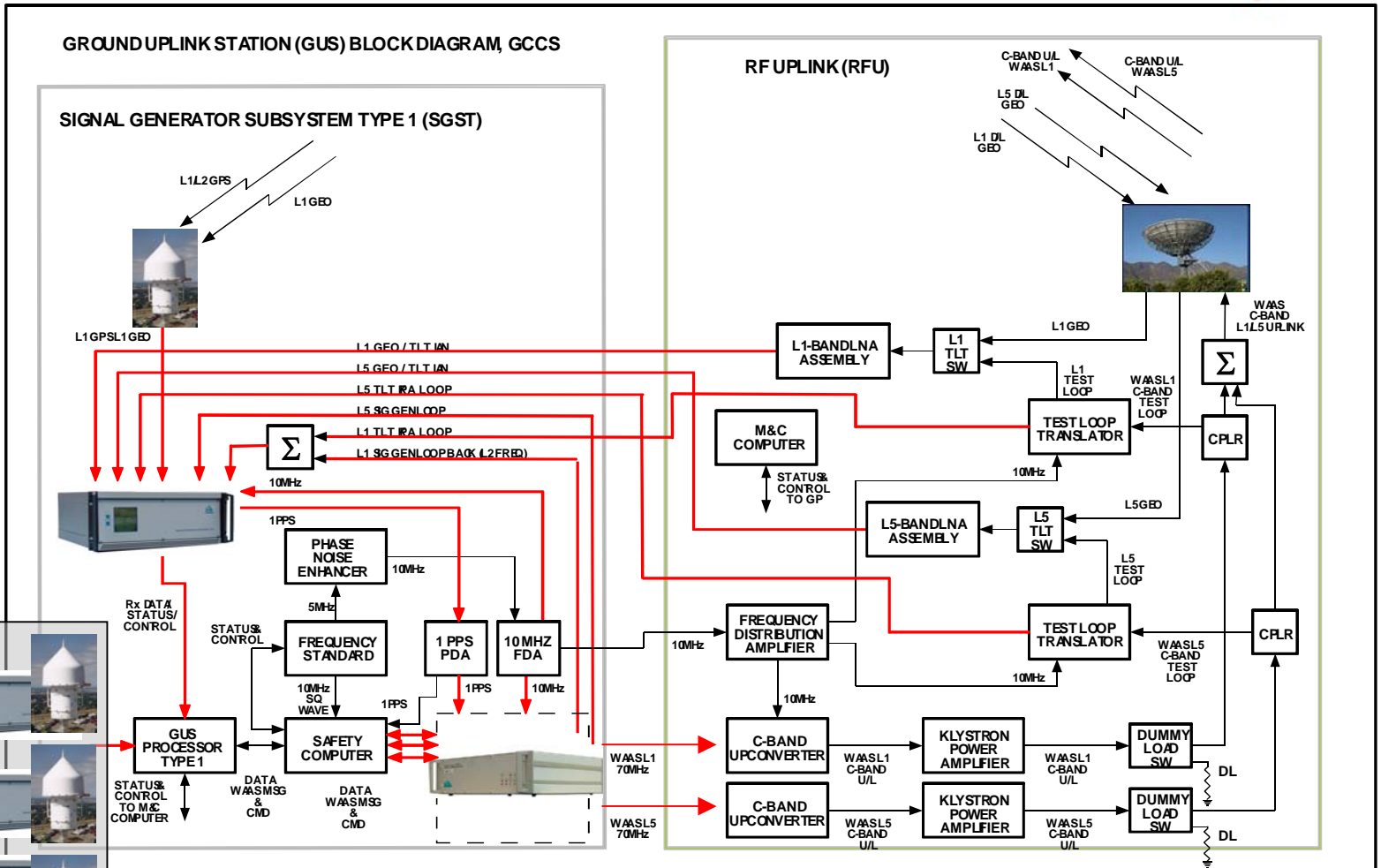


Current GEO Configuration

Future GEO Configuration



GEO Communications Control Segment (GCCS)



L5 Ground Uplink System Receiver



- WAAS G-II expanded for GUS application
- Tracking features:
 - 14 GPS + 4 GEO
 - 4 Channel L5 GEO Card
 - L2 P(Y) or C/A Tracking
 - L2 and L5 Digital Pulse Blanking
 - WAAS RFI Improvements
 - SafeTrak™ Cross Correlation Check
 - 3 Euro4-G2's + 3 L5-Euro's
- New rear panel with additional RF connections



GUS Receiver Build-Up



Euro-3M Receiver Card



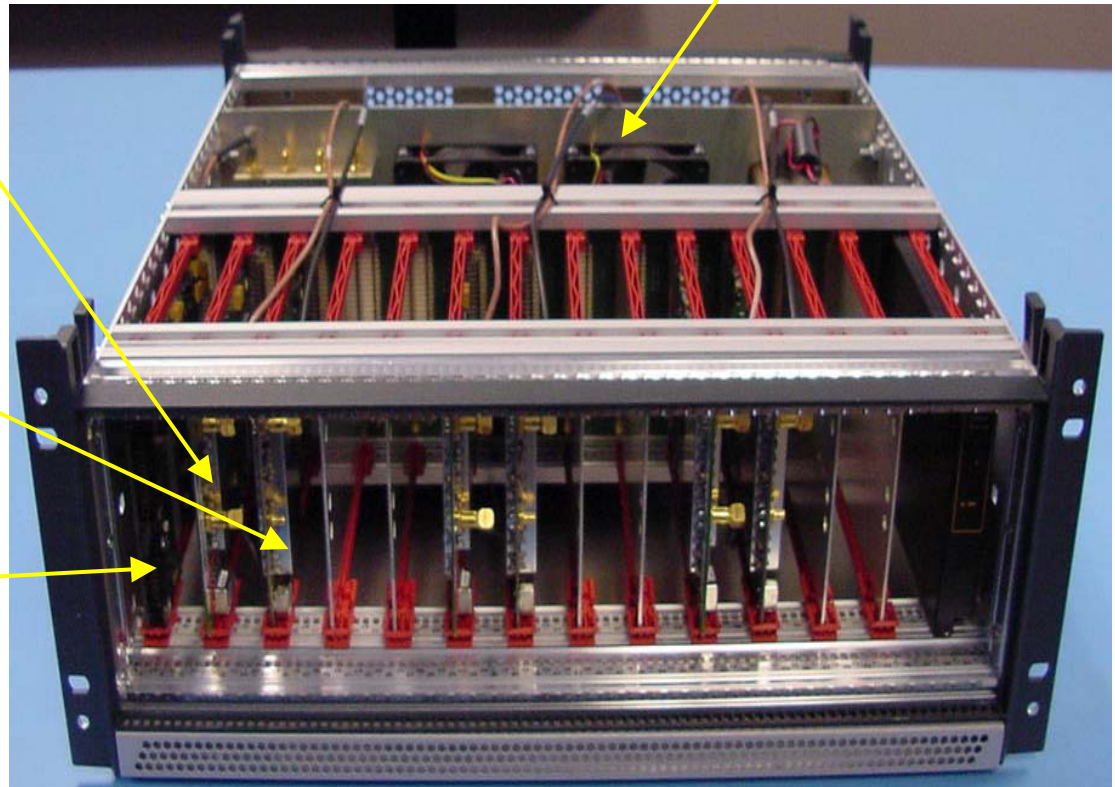
Euro-L5 Receiver Card



Active Clock/Status Card



Forced Air Cooling



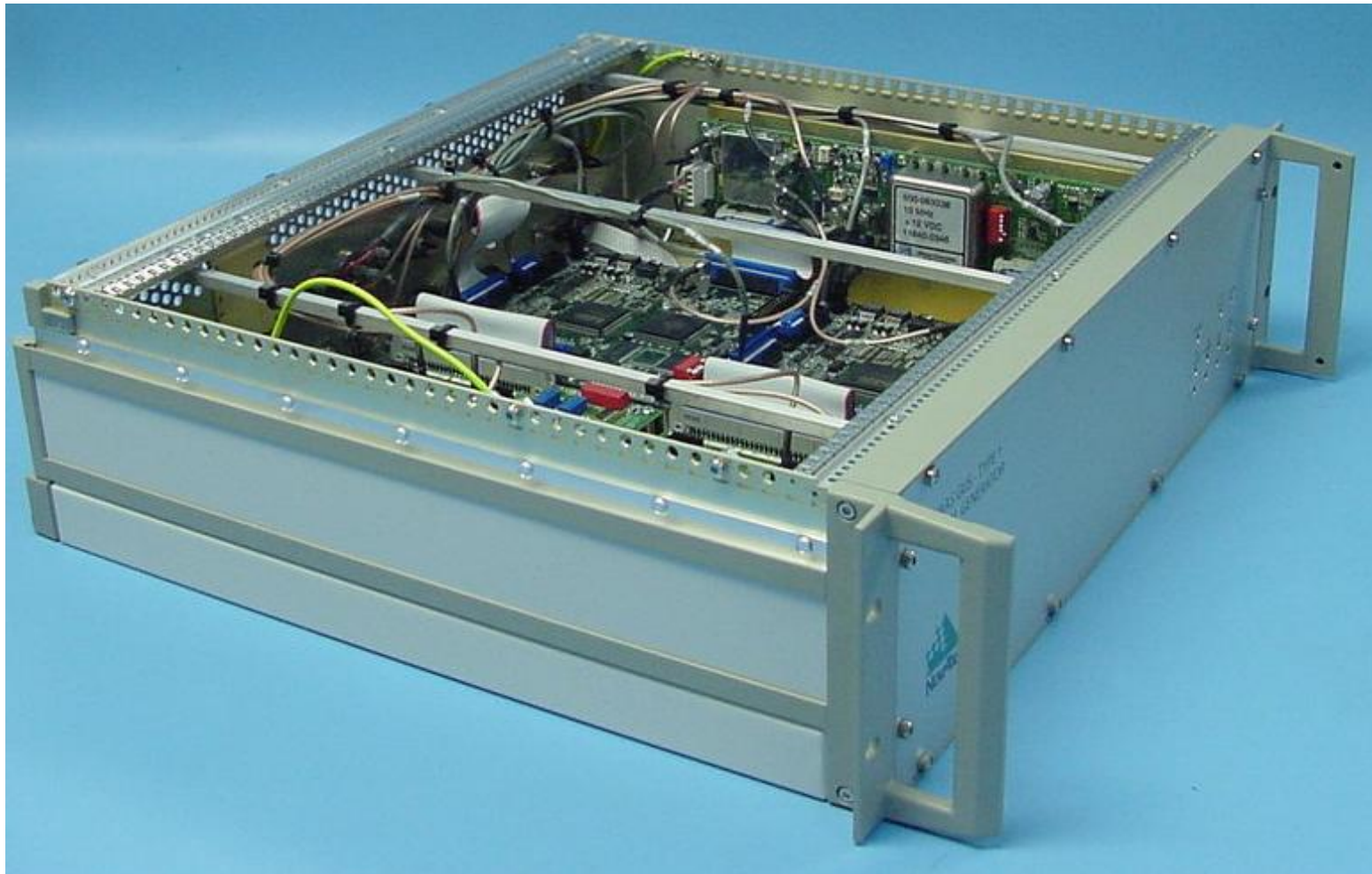
L1/L5 GUS Signal Generator



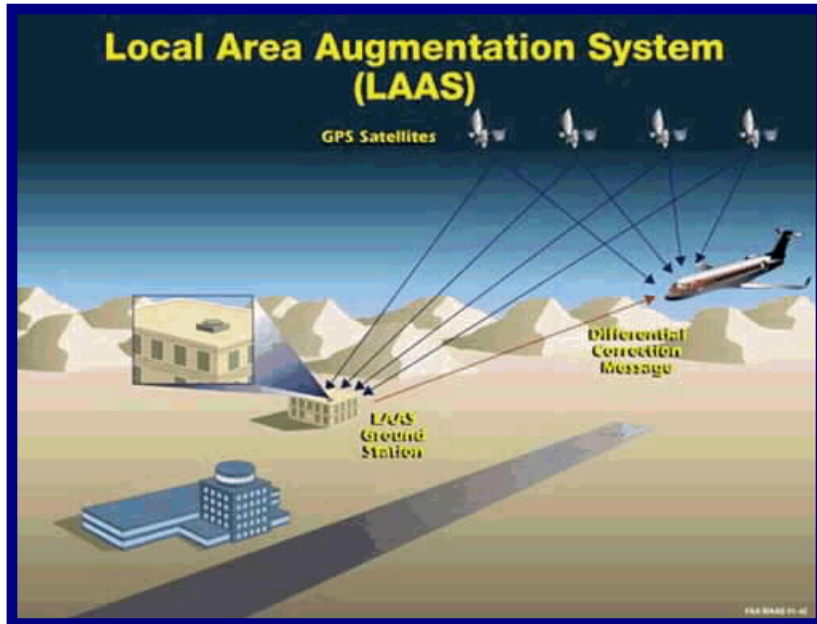
- New signal generator for L1 and L5 GEO uplink (mid-continent GEO)
- Support new L5 signal structure development activities
 - Higher data rates; I & Q signals
- Signal generators at L1 & L5
- Code & carrier control commands from WAAS message processor
- Separate navigation messages for L1 & L5
- Suitable for use at current WAAS GUS (L1 Only)
- NovAtel to commercialize GSV Design



L1/L5 GUS Signal Generator



LAAS: Ground Facility Receiver



CMC/Honeywell
(GNSSA)



Raytheon
(LGF4)

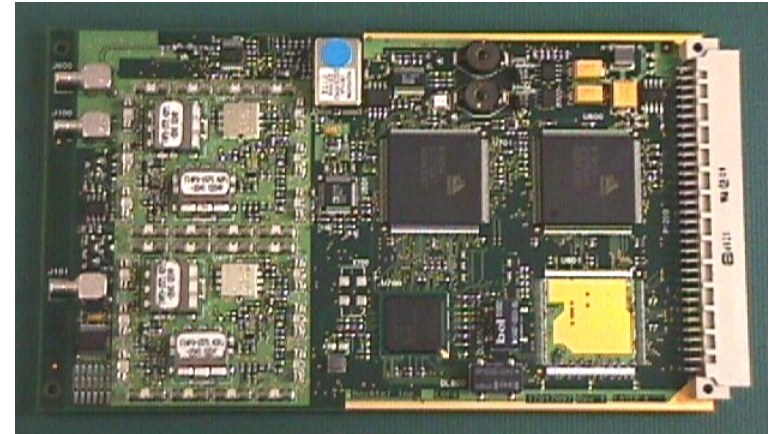


Thales
(LGF4)

LAAS: LGF4



- Dual L1/L1 input ,Two MINOS4 ASIC chips
- Tracks 19 GPS satellites and 4 GEOs
- Utilizes SQM measurement for integrity
- Features SafeTrak™
cross-correlation verification algorithm &
ultra-narrow correlator tracking
- Includes RFI enhancements developed with
the FAA on the WAAS program



NOTE: The LGF4 receiver has yet to be qualified. This receiver is considered beta quality and is sold for test purposes only.

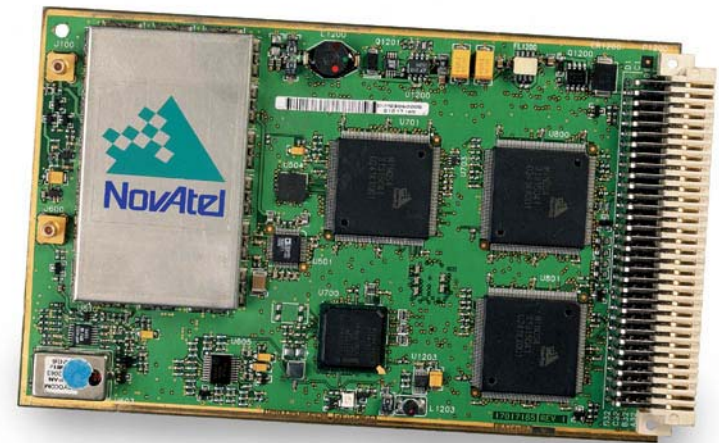


Other Aviation Products

Euro-3M



- Available standalone card or in EuroPak enclosure
- L1/L2 Tracking (14 GPS +4 GEO)
- Enhanced MEDLL (8 GPS + 1 GEO)
- SQM Measurements (I and Q)
- L2 C/A Tracking
- L2 Digital Pulse Blanking
- 3-MINOS4 ASICs
- WAAS RFI Improvements
- SafeTrak™ Cross Correlation Algorithm
- Command and log interface with 32-bit CRC



Euro-L5



- Tracks up to four L5 WAAS GEO signals and decodes the L5 WAAS navigation message
- Includes four channel L5 GPS signal tracking
- Features digital pulse blanking for pulsed RF interference mitigation
- Compliant with RTCA/DO-261 NAVSTAR GPS L5 Signal Specification, December 14, 2000
- Used in GUS Receivers
- Available in standalone EuroPak enclosure

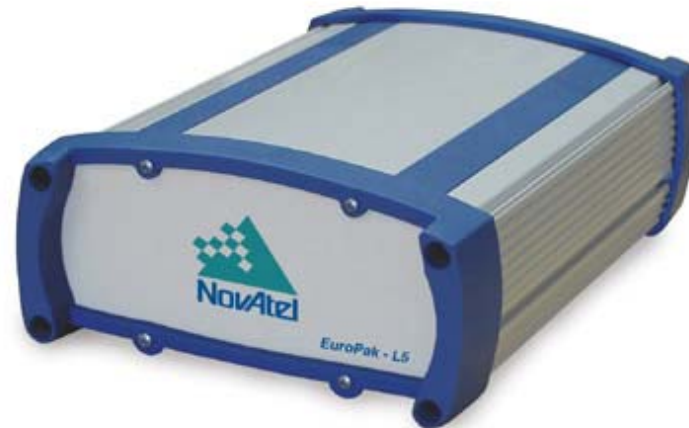


NOTE: The L5 GPS portion of the Euro-L5/EuroPak-L5 receiver has yet to be qualified. This receiver is considered beta quality and is sold for test purposes only.

EuroPak-3M and EuroPak-L5



- Rugged enclosures for the Euro-3M and Euro-L5 receiver cards, respectively
- EuroPak-3MT available with optional 10MHz internal oscillator





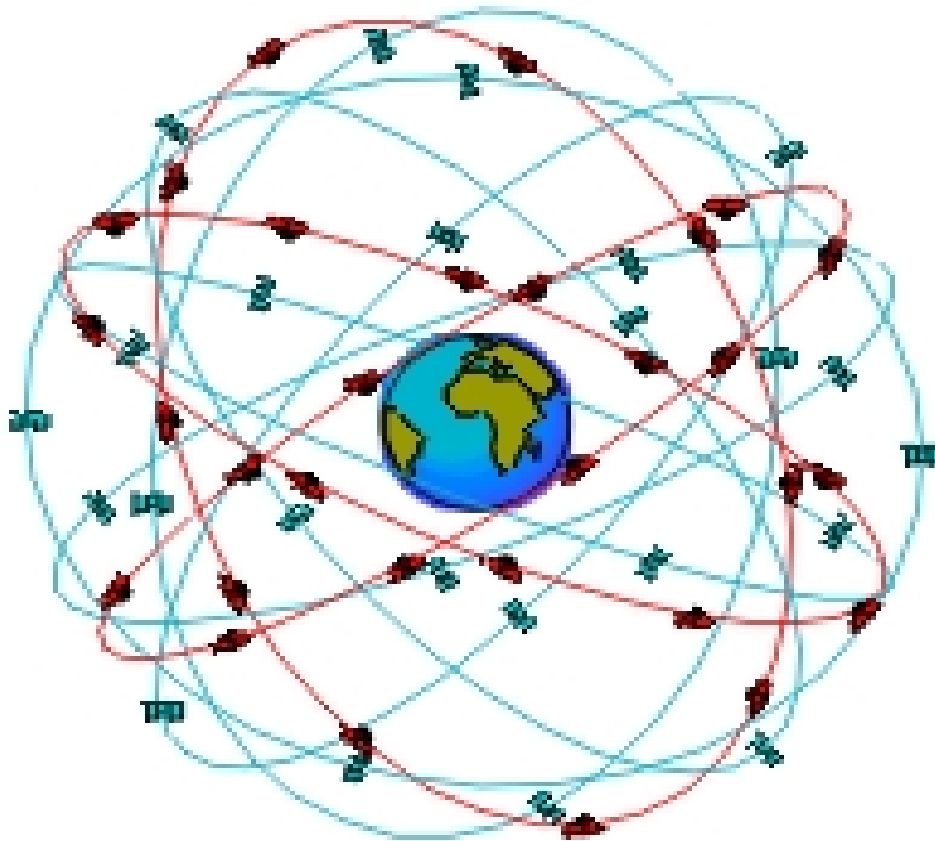
Galileo

Galileo Overview



- When Galileo is operational (2008-2010), ***most precision receivers will have dual-system GPS+Galileo capability***
- Canada is a participating member of the European Space Agency (ESA) & has committed funding to join in the Galileo program
- NovAtel is ***the*** leading receiver participant within Canada's Galileo program
- NovAtel can provide the bridge in North America for Galileo receiver technology

Galileo & GPS Combined

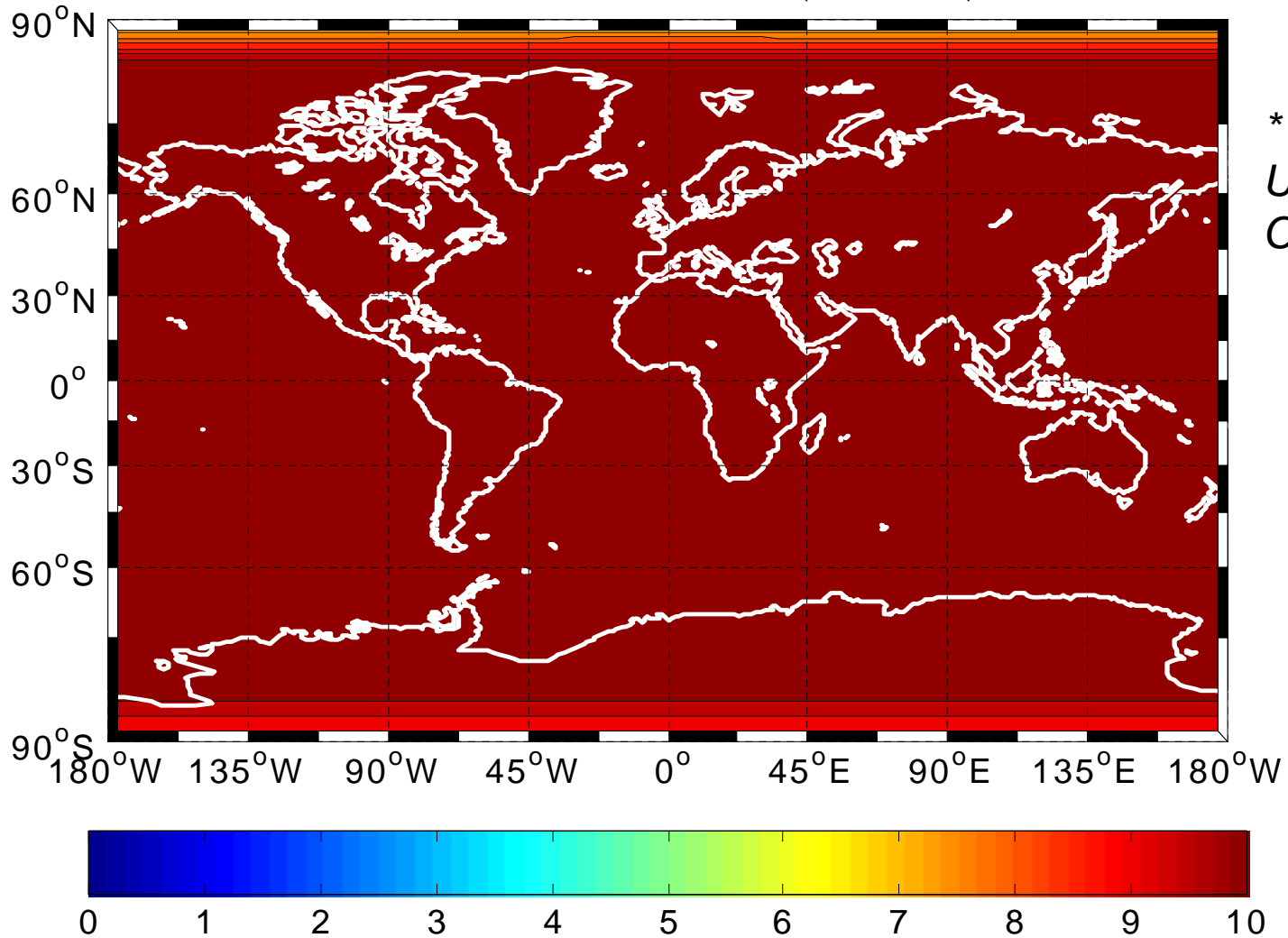


Dramatic improvements in coverage & reliability

GPS Alone



GPS HDOP 95% for Mask 30 (Standalone)

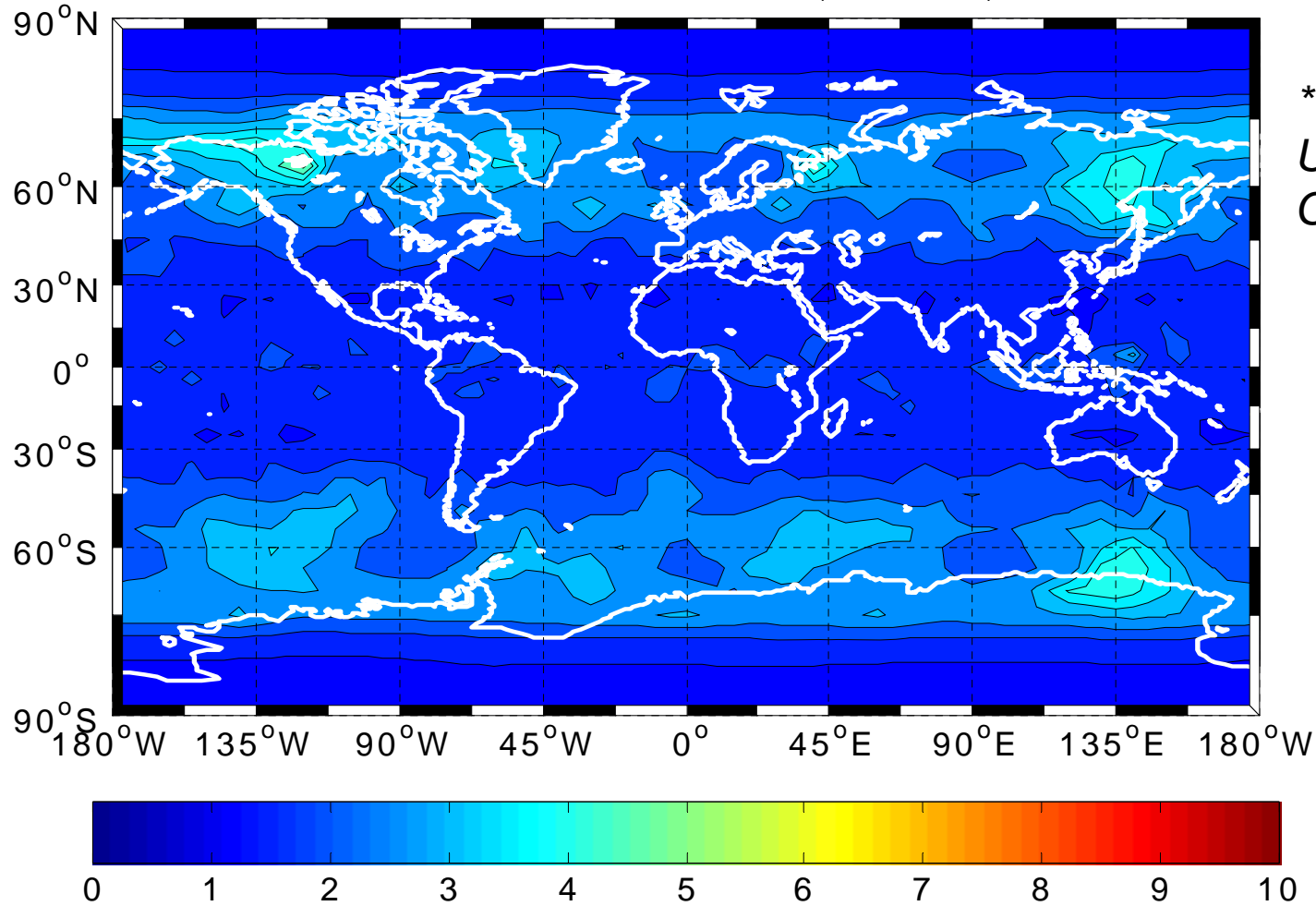


** Courtesy
University of
Calgary*

Galileo & GPS



GG HDOP 95% for Mask 30 (Standalone)



** Courtesy
University of
Calgary*

Advantages of GPS & Galileo



- When Galileo is operational (2008-2010), most precision receivers will have dual-system GPS+Galileo capability
- Typical advantages of two systems:
 - Twice as many satellites, twice the probability of receiving good signals from good parts of the sky
 - Cars in cities will have more signals, more often
 - Surveyors will be able to make higher accuracy measurements more consistently
 - Difficult inshore navigation on rivers and canals will be safer and more reliable
 - Aircraft final approach and landing will have far greater signal redundancy, which could well result in improved decision heights and safety margins

NovAtel's Galileo Programs



- NovAtel has been actively participating in Galileo receiver definition work for over four years
- Programs include:
 - Signal Validation (European Space Agency (ESA))
 - User Receiver Requirements (Thales Avionics)
 - Ground Reference Receiver (GRR) Requirements (Thales)
 - GPS/Galileo Interoperability (Canadian Space Agency(CSA))
 - GRR specification, architecture & modelling (ESA)
 - Two prototype receiver & transmitter development programs (CSA)
- Objective:
 - Reference receivers for the Galileo ground control network
 - GPS/Galileo receivers for NovAtel's existing OEM markets
 - Participation in airborne certified receiver development

Galileo Ground Reference Receiver



- Contracted directly with ESA
- GRR pre-development activities:
 - Specification
 - Architecture
 - Software model of GRR
 - Verification of performance parameters
- Specification & receiver models delivered to ESA

Prototype Receiver Development

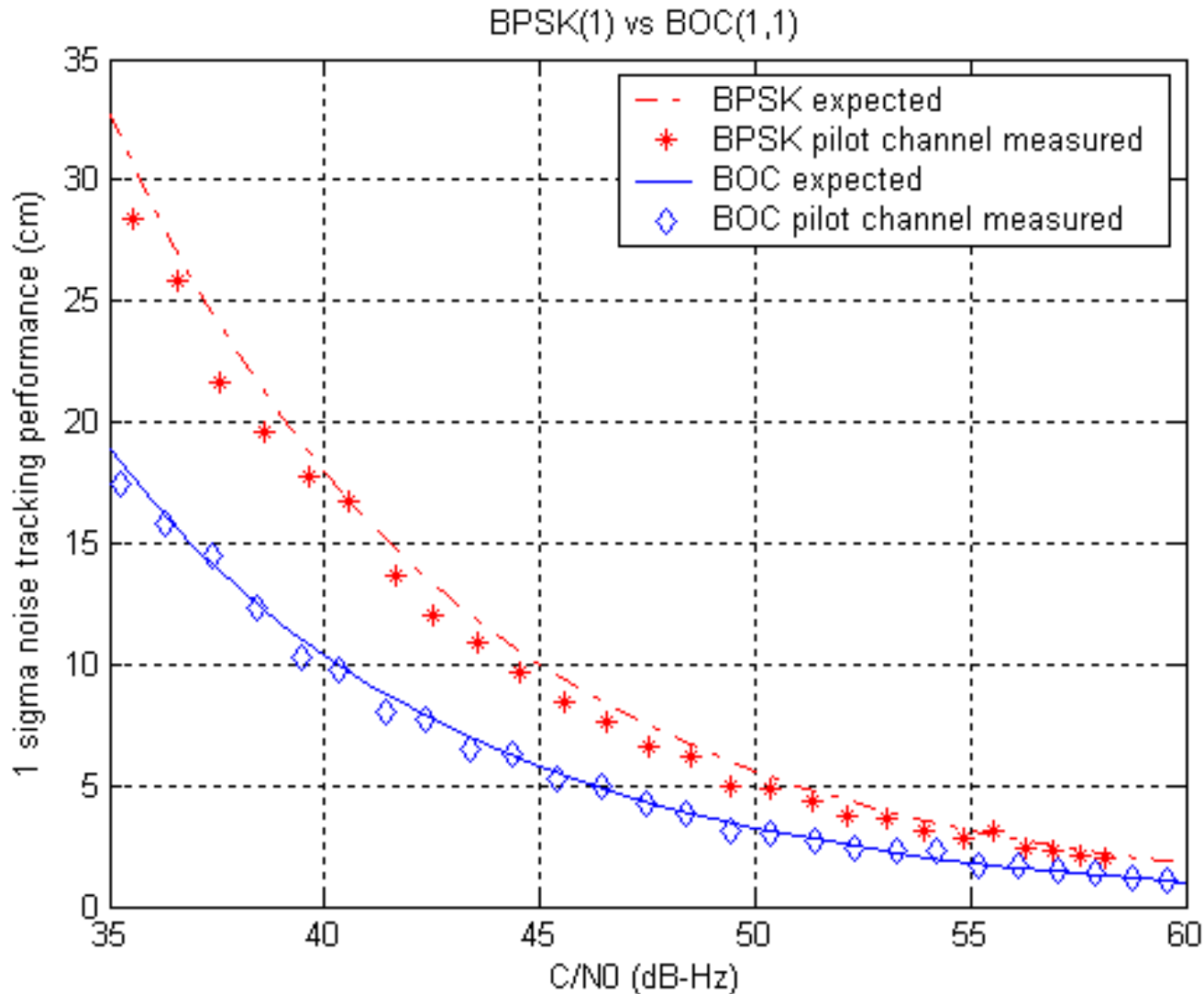


- Contracted directly by Canadian Space Agency
- Used existing L5 receiver hardware
- Field Programmable Gate Array modified to process Galileo BOC(1,1) open signal
- L5 transmitter modified to output BOC(1,1) signal
- Demonstrated and completed in July 2004

Galileo Prototype Receiver Test Setup



Galileo Prototype Receiver Tracking Results



Engineering Model L1/E5a Receiver Development



- Space Technologies Development Program (STDP) awarded by Canadian Space Agency Oct 2004
- \$1.6m Cnd project funded 60/40 by CSA/NovAtel
 - 16 month project
 - Incorporates prototype receiver IP into new L1/E5a receiver in GUS receiver enclosure
- GPS L1/L5 Signal Generator modified to output Galileo L1/E5a signals
- Provides significant IP for incorporation in Galn/ESA C/D phase program

Galileo/GPS L1/E5a Dual Mode Receiver



- 16 channel dual frequency receiver,
- Tracks both Galileo L1/E5a & GPS L1/L5
- Operational demonstration May 2005



Other Programs



- Galileo C/D phase bid for Ground Reception Chain (GRC)
 - Joint bid by Thales/NovAtel & Laben Sept 31, 2004
 - Revised non-PRS receiver only bid by NovAtel & Laben Feb 2005
- Galileo FP6 – Safely of Life receiver
 - Joint CMC/NovAtel proposal to CSA
 - Part of consortium bid by Laben to GJU
- Galileo FP6 – Professional Receiver, multi-frequency RTK
 - NovAtel awarded Canadian IRAP funding Dec 04
 - Part of consortium bid by Space Engineering to GJU



www.novatel.com