SiRF GNSS Technology Overview

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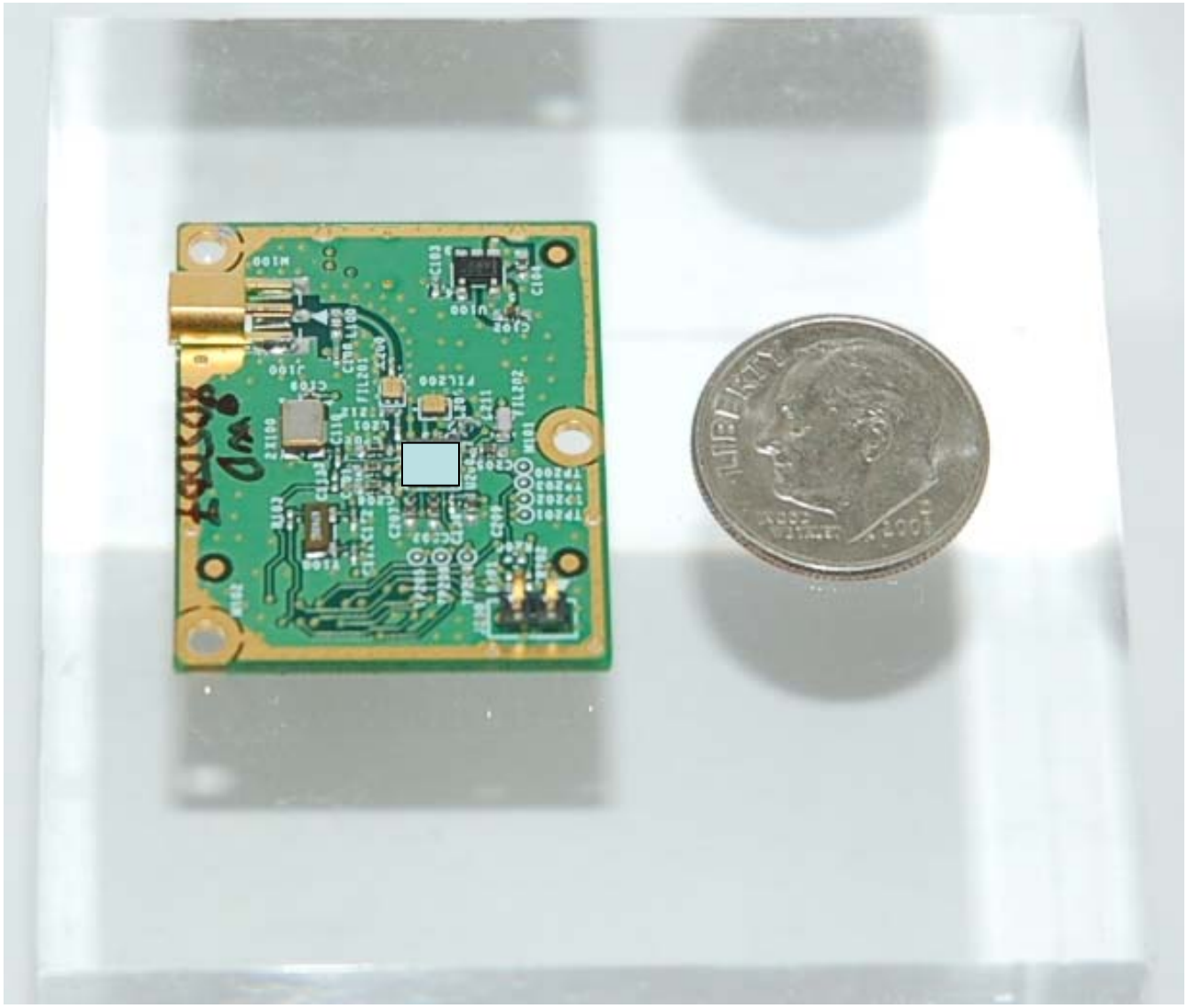
Who is SiRF?

- SiRF was founded in 1995 with a vision to bring GPS to mainstream consumers
  - Market was still focused on professional applications at product and module level
  - Breakthrough performance in sensitivity and time to first fix with a REDUCTION in power and price
- Our products fueled the growth of key consumer markets for car navigation, PC accessories and cell phones
  - Today we are a market leader and our chips can be found in leading PND and cell phone products around the world
- The SiRFstarII chipset was the first to support WAAS and EGNOS for consumer products in 1998
- We were the first company to ship > 1M GPS chipsets in a single month

Key specifications

	SiRFstarI	SiRFstarIII
year introduced	1997	2008
BB Technology	350nm CMOS	90nm CMOS
CPU/Memory	3 chips external	Internal
RF Technology	BiCMOS	Internal
Power (1Hz fix)	< 1W	<50mW
Total BOM	< $100	< $15
Chipset portion	>50%	<40%
Total Footprint	< 7500 mm2	< 20 mm2
Sensitivity	-142 dBm	-159 dBm
TTFF (hot)	12 seconds	<1 second

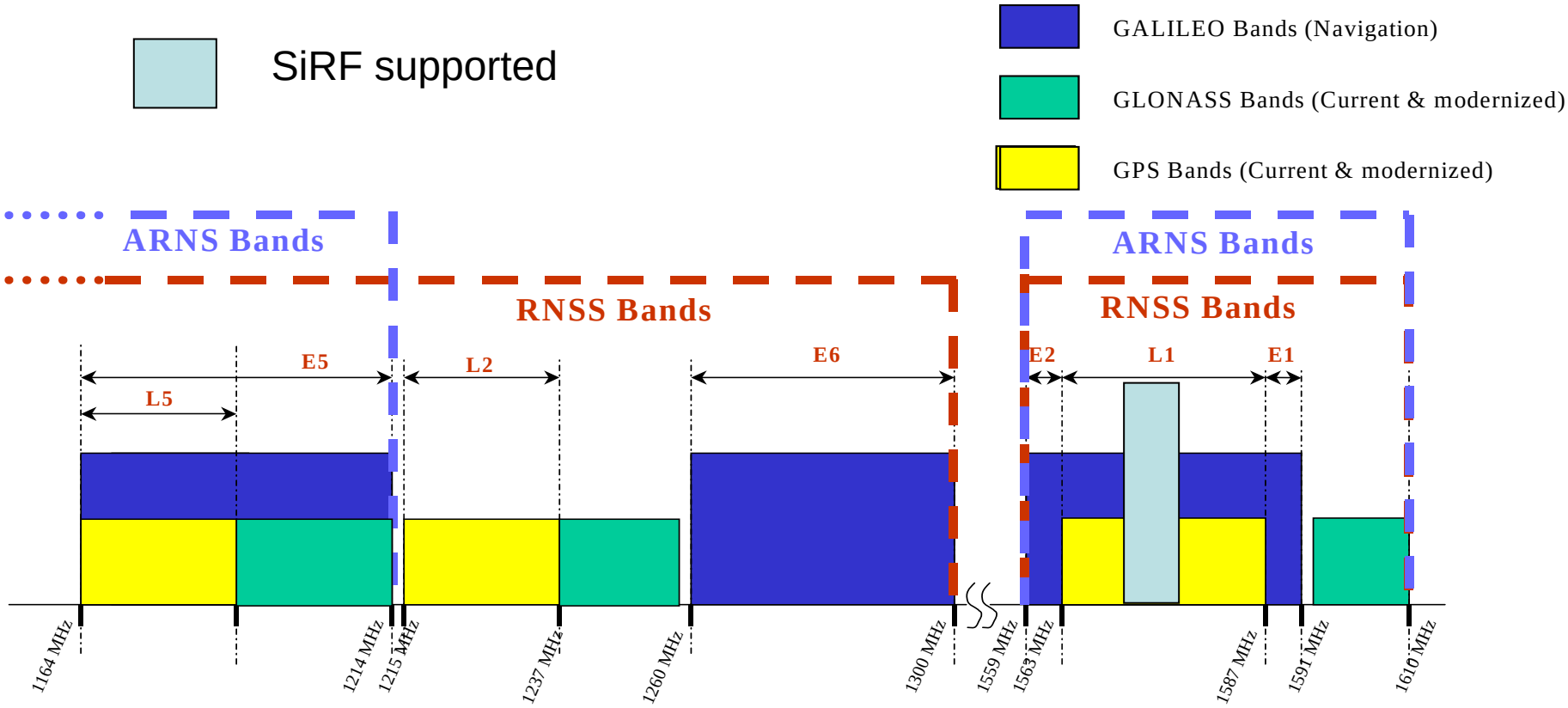
Current SSIII chip on an evaluation board



Future of GNSS for consumer

- Two distinct markets have different characteristics
- Automotive Navigation, Telematics and PND systems
  - GPS penetration is 100%
    - It is the primary radio in the device
  - Many consumer products no longer advertise GPS specifications
    - Many leading brands don't support WAAS or EGNOS
    - Focus is on screen size, map support, even music
  - Manufacturers still have certain requirements
    - Accuracy in high multipath, downtown environments
    - Fast TTFF in autonomous operation
- Cellular and other wireless devices
  - GPS penetration is relatively low (<25%)
  - Product specification is focused on applications
  - Coexistence with other radios is paramount
  - Cost, size and power dictate penetration
  - Performance under aided (AGPS) conditions is focused on availability, not very high accuracy
- KEY NOTE: Neither market considers GNSS a "must have"

GNSS Spectrum chart circa 2006



- SiRF used this chart to support our single frequency preference for L1
- Potential future support for 3 systems at L5

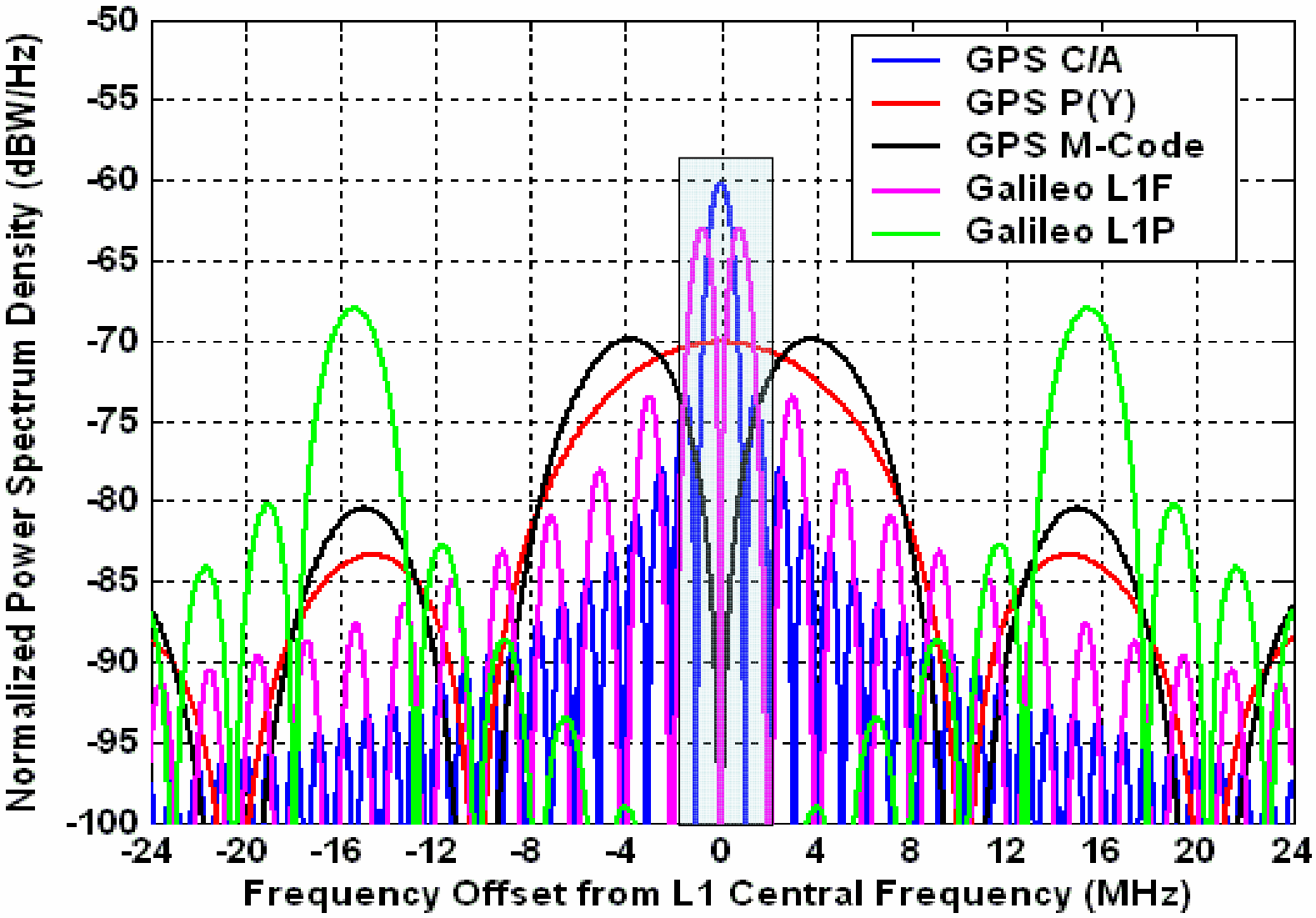
Since then GPS improved significantly

- Satellite constellation now at 31 active vehicles
  - Improvement in TTFF and availability across the board
  - Next ground segment upgrade to support 64 SVs
- Significant navigation improvements
  - 95% Spec is 13m, actual performance is 3-4m
  - Done under the AII initiative
- Satellite upgrades on track
  - Block IIR-M vehicles on orbit and verified
    - L2C interesting but no market impact and not in products
  - First block IIF to go up this year
    - Begin L5 capability to assess market potential
  - Block III contract awarded
    - Sustainment of constellation and L1C interoprability
- Market perception of GPS is rock solid and continuing to improve with no impact on cost!

Along comes Galileo

- Changes in management and schedule have created significant uncertainty
  - Few customers are willing to plan for capability
  - Most will require it once its proven
- Technical benefits are limited to consumers
  - More satellites is better, but only marginally now
  - Codes will provide better accuracy but at cost
    - Memory codes require chip area and potentially licensing?
- SiRF is a Galileo believer
  - Support Galileo hardware at L1 on our SiRFPrima chips today
  - Timeframe for operational support however is dependent on implementation
  - Management and control issues also need to be resolved

GPS & Galileo at L1



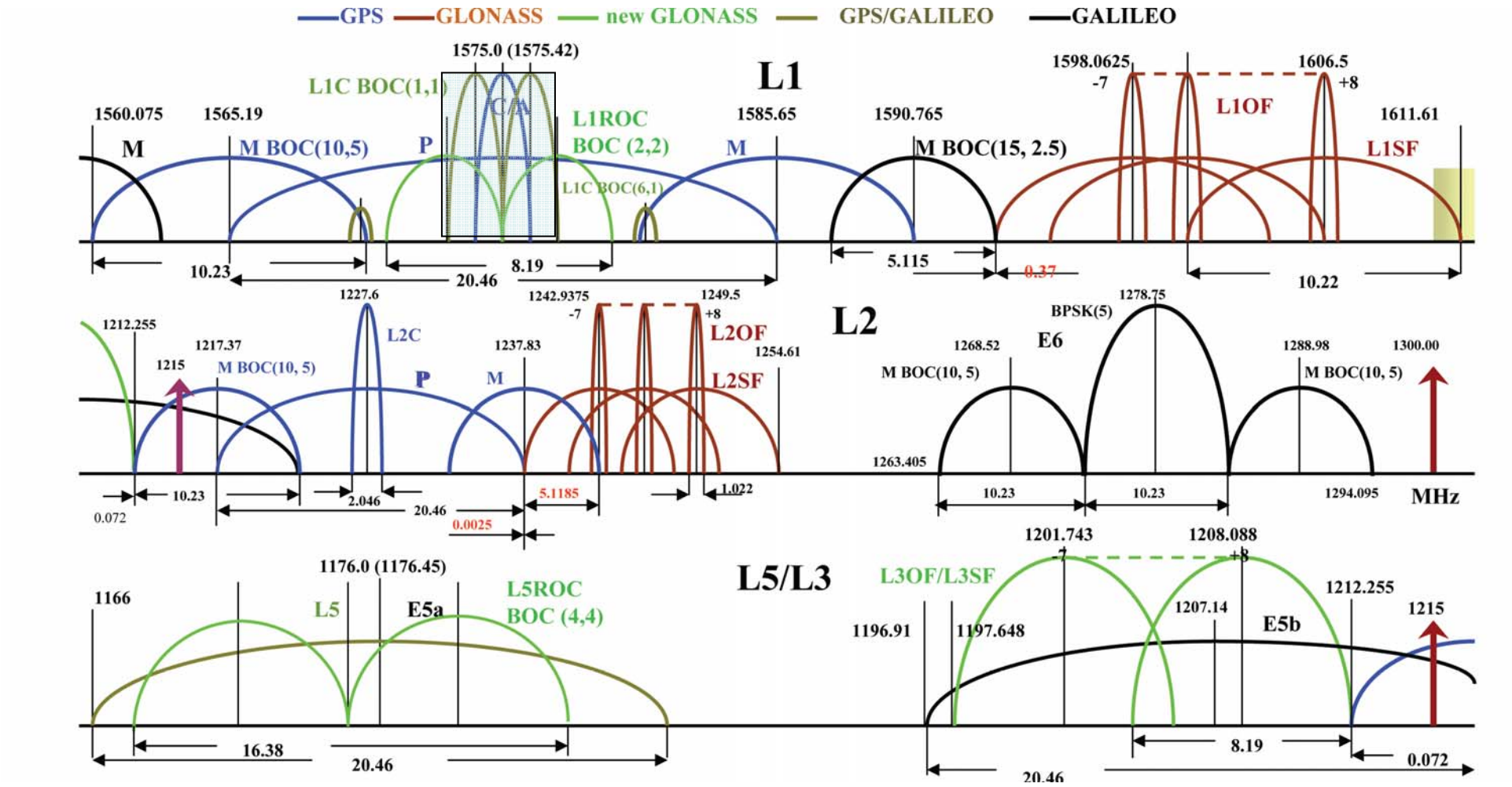
Galileo – Technical Impact at SiRF

- Major change in L1 signal structure for Baseband
  - Code is BOC(1,1) with ~4000 length memory code
    - Impact is extra gates for decimator and codes
  - Different message structure
    - New software for acquisition, tracking loops and navigation
  - These change are all acceptable cost/performance tradeoffs at modern (65nm) geometries
    - Licensing fees would be main open issue
- RF impact on bandwidth potentially more problematic
  - SiRF supports both 6 and 2 MHz bandwidth
    - Many customers prefer 2MHz for improved performance in unintentional interference from other internal sources
      - Transmitters, clocks, memory buses, display drivers, etc.
  - Wider bandwidth (6MHz) needed for full performance
    - Requires development of DSP mitigation methods
  - Some customer may choose narrow single sidelobe over full bandwidth depending on interference

GLONASS Comes back

- Constellation “replenishment” moving to schedule
  - New revision satellites (Glonass-M) have much better performance and on-oribt life than previous ones
- GLONASS gaining market traction
  - Some customers requesting for it, starting to appear in standards
  - Internal Russian market growing
- Significant silicon integration issues on current signals
  - Wide bandwidth and different center frequency at L1
    - Requires two front end paths
  - FDMA methodology and new tracking loops needed
- Longer term future is more code compatible
  - Next generation (Glonass-K) will have CDMA at L1 & L5
  - Similar issues to Galileo baseband
- Main concern is RF due to signal bandwidth
  - 8MHz at L1 is problematic
    - Too many harmonics will fall in band and noise floor will rise
  - 20MHz at L5 would require major redesign

Current 3 system proposal



Other Systems

- Augmentation Systems
  - WAAS system on new birds has positive impact in North America
  - MSAS, EGNOS and Gagan (India) augmentations have similar benefit
  - Japanese QZSS would be most beneficial
- Chinese COMPASS system is evolving in a positive way
  - Proposed MEO constellation is high complimentary
  - Frequency plan looks reasonable for implementation
  - Looking forward to ICDs and business proposals

SiRF Plans

- Support all commercially beneficial GNSS systems
  - All consumer devices likely to remain single frequency (L1) for some time
    - Dual frequency impact on BOM cost and size may not justify consumer benefit
    - Keep front end as narrow bandwidth as possible
- Continue influencing government strategy
  - Working with USGIC and GSA today on ICD issues
  - Pushing for License free access to signals from space
    - IPR development on implementation, not signals
  - Start GLONASS discussions internally and externally
- Technical and market focus in around BANDWIDTH
  - Current GPS customers driving for 2MHz bandwidth to minimize interference
  - All new signals require minimum of 6 MHz bandwidth
    - Looking at DSP methods to use 6 MHz bandwidth and eliminate interference issues
- GNSS based location faces other competition
  - Hybrid radio methods using DTV, cellular, WiFi and many other SoP
  - Sensor integration due to advances in MEMS accelerometers and gyros
- SiRF is now a LOCATION company, no just a GPS or even GNSS company
  - Consumers drive for ubiquitous availability is the key measure