From: Garcia, David <David.Garcia@parsons.com>
Sent: Friday, October 12, 2018 2:48 PM
To: Rick Carlson; Sara Woitel
Subject: NextGen Presentation - Updated
Attachments: NextGen UWB Presentation_181018_r1.pptx

For your review over the weekend

David Garcia
David.Garcia@Parsons.com - M: +1 312.402.8102

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METROM RAIL

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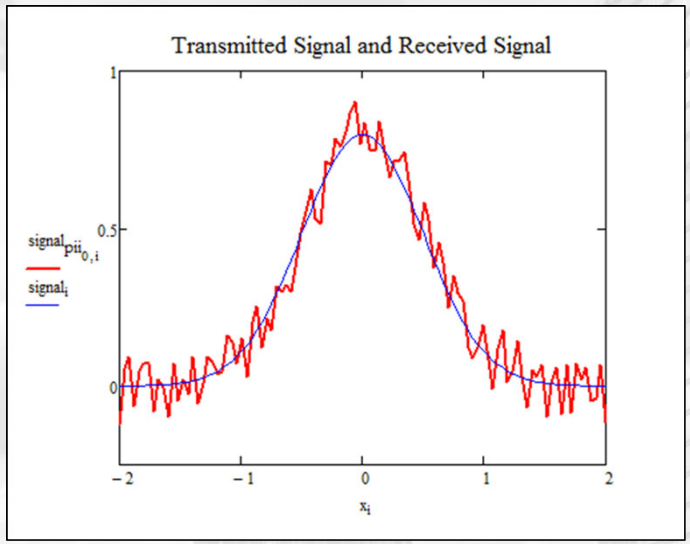
THE AURA SYSTEM:

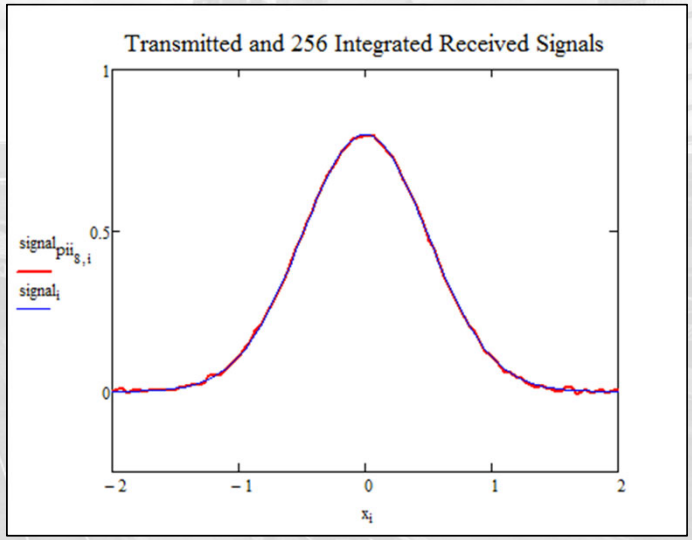
Ultra-Wideband Train Control

GD8

What is **Ultra-Wideband?**

- Ranging between radios w/ 2 cm accuracy
- Multipath resilient
- Developed for secure military communications and radar
- Nearly 10x faster than 802.11b
- The UWB technology used by Metrom Rail prioritizes range accuracy and distance gain
- Coherent signal processing





Slide 2

GD8 FCC Info

Garcia, David, 10/12/2018

Why **UWB Technology?**

- Train-Centric approach allows for a simplified architecture
- Proven technology with over 4000 collision avoidance units in service
- Simplified architecture equals less overall costs
- Modular system
  - Allows for installation and maintenance with minimal service disruption
  - Expandable platform – options include Precision Berthing, Roadway Worker Protection, MoW Vehicles, Platform Intrusion Detection in one integrated solution

	AURA	CBTC
Headway Improvements	Yes	Yes
Moving Block System	Yes	Yes
Train-Centric	Yes	No
Real Time Train Positioning	Yes	No
Integrated Worker Protection	Yes	No
Platform Intrusion Detection	Yes	No
Interoperable w/Non-Revenue Vehicles	Yes	No

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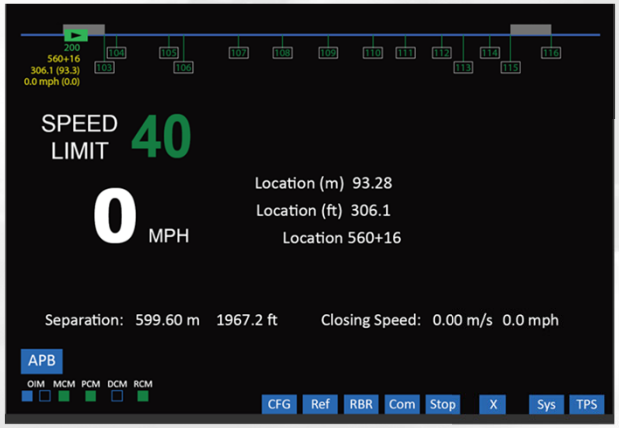
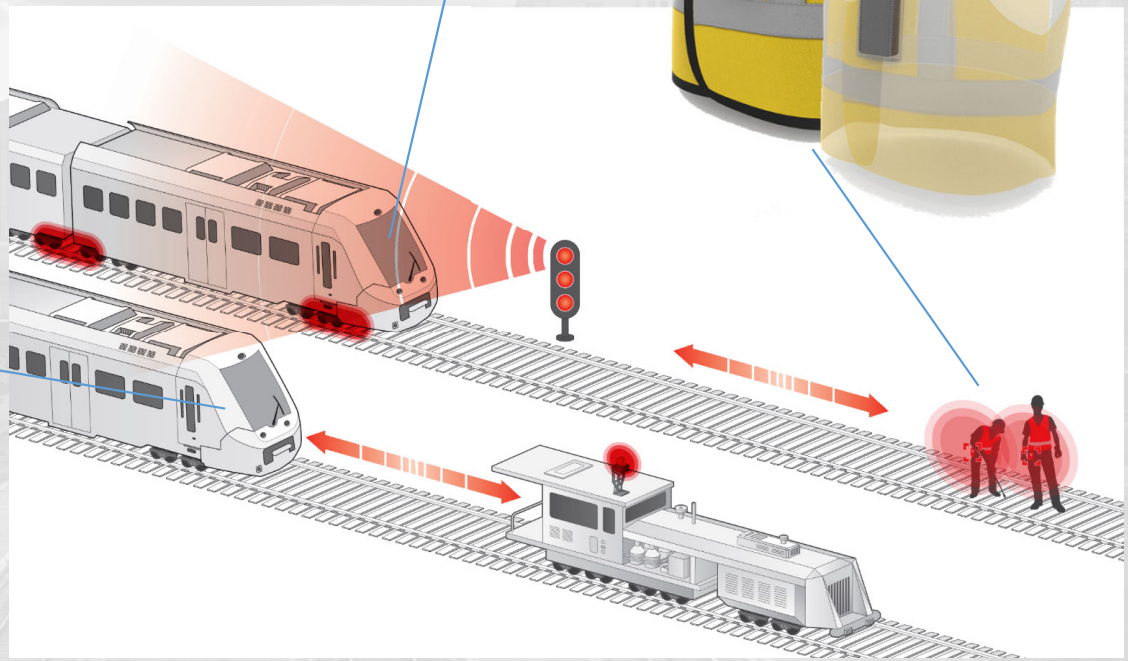
The **AURA System**

Functions:

- Signal Compliance
- Speed Limit Compliance
- Separation Enforcement/Moving Block
- Collision Avoidance – Train, EoL, MoW
- Precision Berthing
- Train Propulsion & Braking Interface
- Worker Protection





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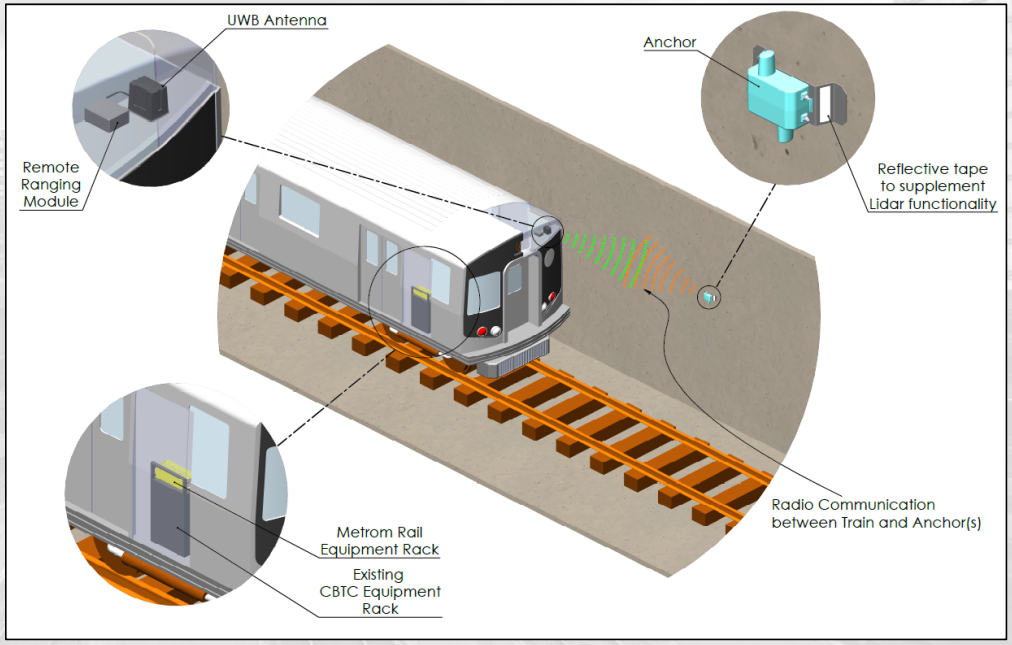
Proving **UWB Works**

- AURA System: Generation 1 – Safety Overlay System
- AURA System: Location Accuracy in a Tunnel
- AURA System: Next Generation Train Control System
- CBTC/AURA: CBTC Integration with UWB for Localization



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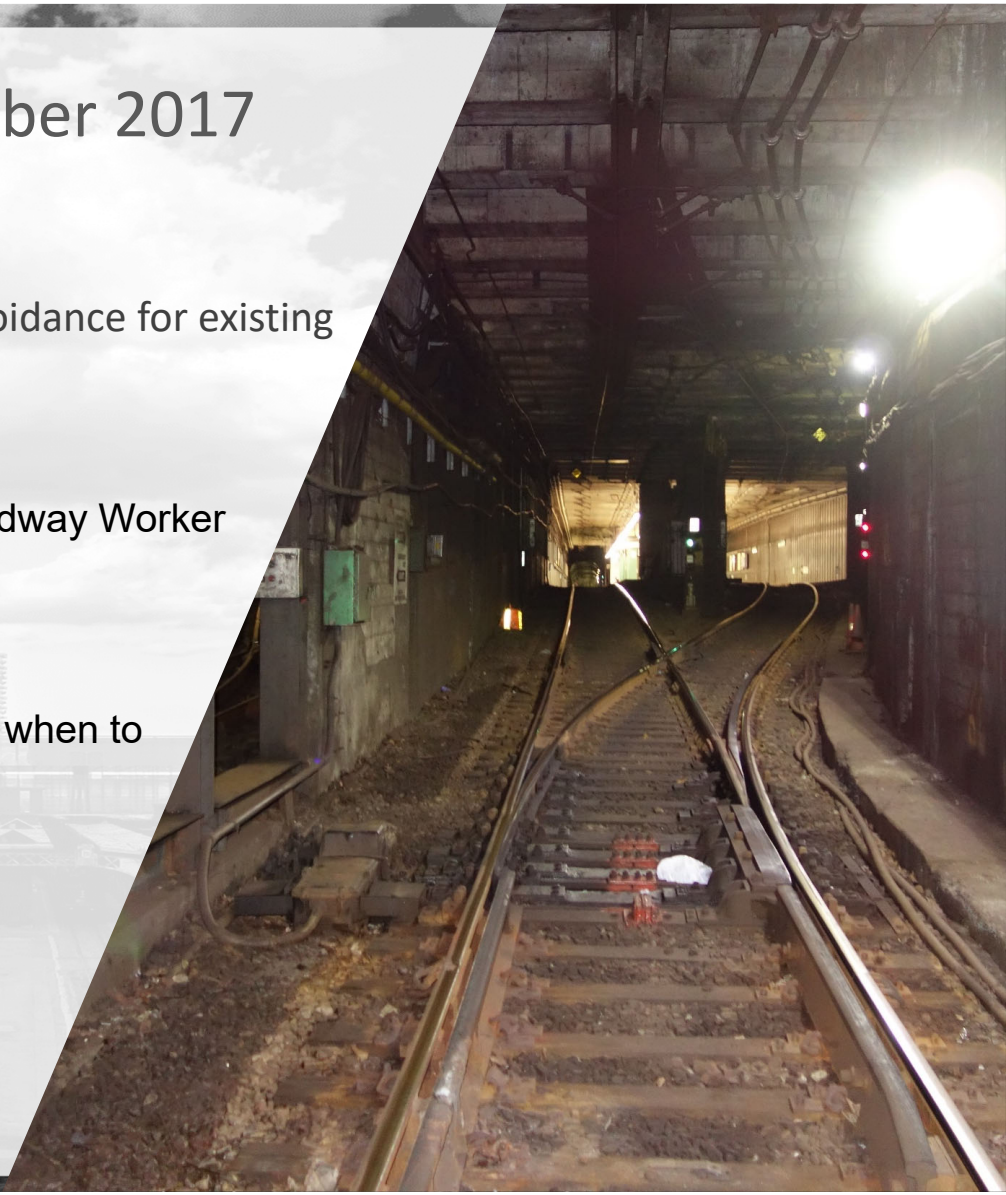
Safety Overlay System: October 2017

AURA System – Generation 1:

Provides Signal Enforcement, Speed Limit, and Collision Avoidance for existing control systems

- Successfully demonstrated 29 test cases over 4 weeks
- Tested Separation Enforcement, Signal Compliance, Roadway Worker Protection, and Overspeed Protection
- Integrated into legacy carborne and signal infrastructure
- Train-centric approach – Onboard subsystem determines when to enforce stops



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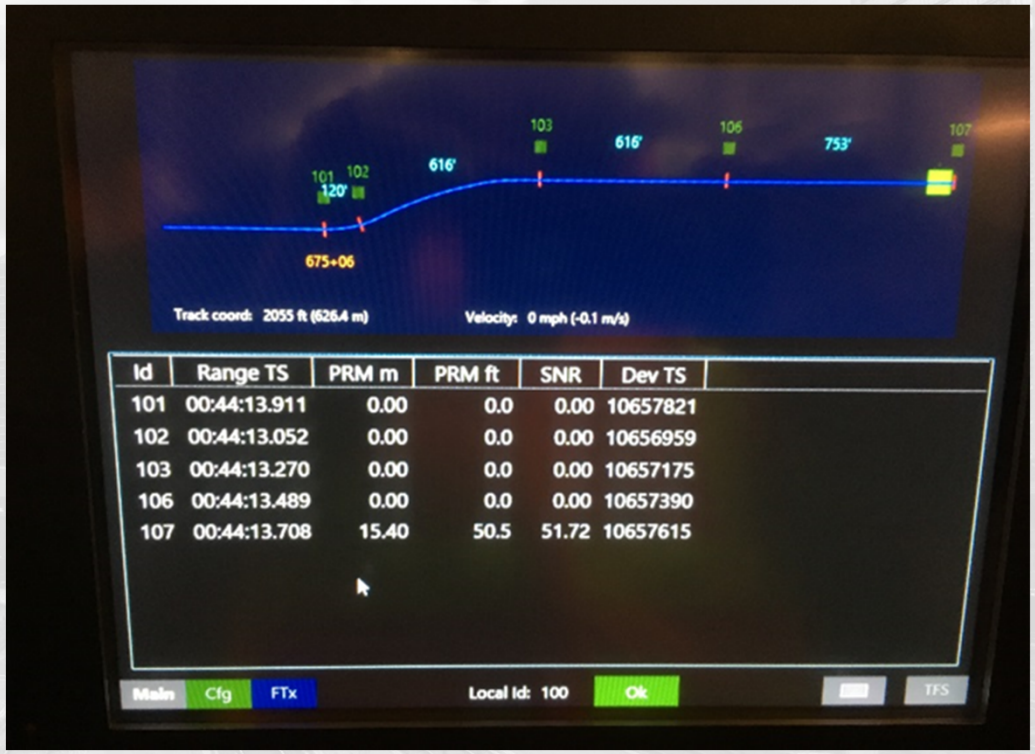
GD7

UWB Accuracy in a Tunnel: December 2017

Location & Ranging Accuracy:

Metrom Rail demonstrated:

- Location accuracy of 1-2 inches when the train is stationary
- Location accuracy of 6 inches when the train is in motion
- UWB Network latency at about 33 ms
- Zero packet drop rate



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Slide 7

GD7 Do the math of 33ms and location accuracy

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Next Generation Train Control: Sept 2018

AURA System – Next Generation:

- Provides Separation Enforcement, Signal Compliance, and Overspeed Protection
- Additional functionality includes Moving Block, Precision Berthing, and Remote Health Status Monitoring of AURA system components
- Successful communication with Solid State Interlocking – including enforcement of track rules dictated by interlocking system
- Enforcement of Virtual Signals and dynamic Temporary Speed Restrictions
- UWB Wayside Anchor Network provides redundant UWB coverage throughout guideway

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AURA & CBTC Integration: December 2018

CBTC Integrated with AURA for UWB Localization:

Integrating UWB into an existing CBTC System

- Allows AURA-derived train position, speed, consist length, and direction to be utilized by a CBTC System
- Lower cost and more accurate than traditional location methods
- Ability to eliminate transponders and tags on the guideway

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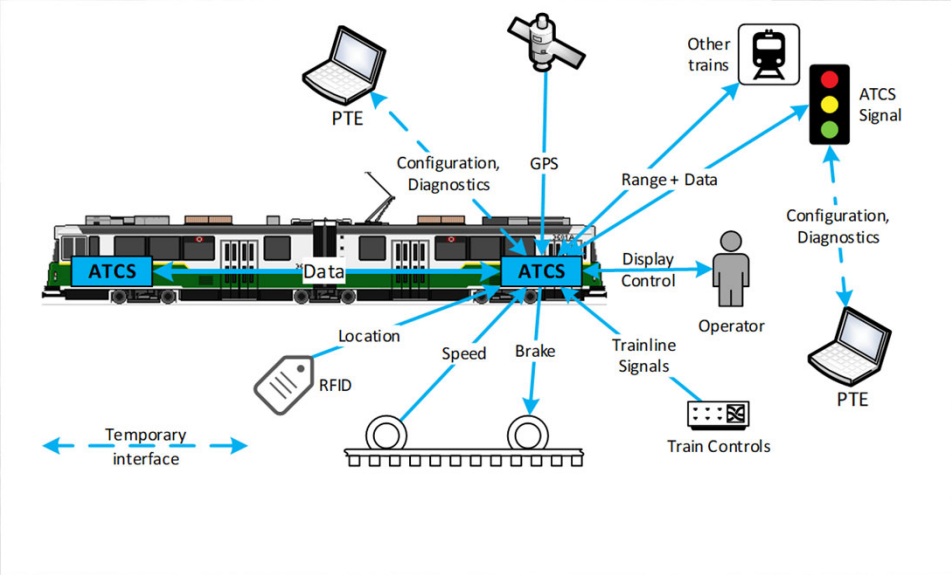
Safety Certification **Approach**

Metrom Rail has been working with an ISA to ensure:

- Compliance as “vital” under AREMA Part 17
- Employing safety assurance concepts as prescribed by IEEE 1483
- Using conditions for safety acceptance from and general equivalency for SIL4 with EN50129
- Software developed against a process compliance with EN50128 for SIL4 software



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Email From	Garcia, David [David.Garcia@parsons.com]
Email To	Rick Carlson [rick.carlson@metrom-rail.com];Sara Woitel [Sara.woitel@metrom-rail.com]
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