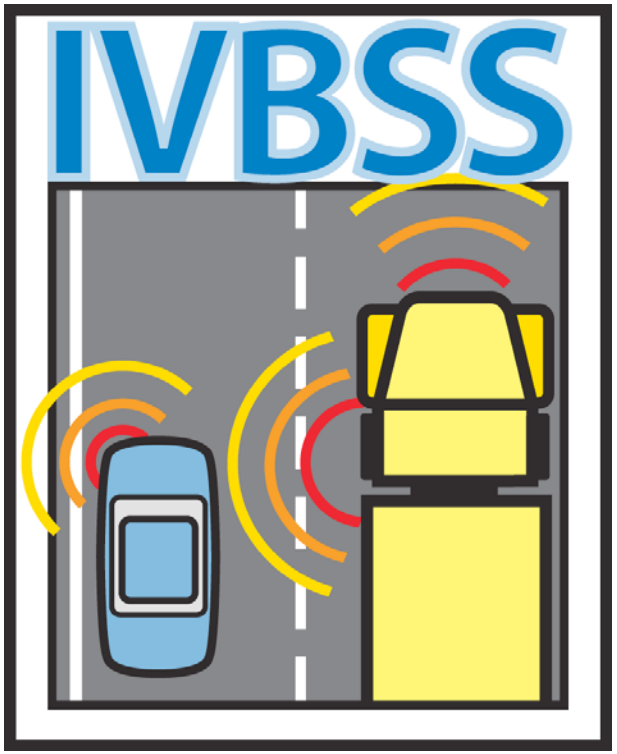

Light Vehicle Extended Pilot Test

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UMTRI

Extended Pilot Test (EPT) Objectives

- Demonstrate FOT readiness through a full dress rehearsal.
  - 12 drivers from the general public
  - 4 FOT vehicles equipped with IVBSS
  - Experimental process exercised
- Success criteria:
  - Is driver acceptance positive?
  - Does IVBSS perform as expected? Is it robust?
  - Is data collection reliable?
  - Is the experimental process ready for the FOT?

Light Vehicle Field Operational Test & Extended Pilot Test

Platform	Test	Drivers / usage period	Travel distance
Light vehicle	FOT	108 drivers @ 6 wks plus 10 drivers @ 6 additional wks Baseline (2 weeks) IVBSS enabled (4 weeks)	272,000 Miles* 436,000 Km
	Extended pilot	12 drivers @ 4 weeks IVBSS enabled only (4 weeks)	12,600 Miles 20,200 Km

Drivers for both tests:

- Evenly split by gender
- Evenly split by age groups (20-30, 40-50, 60-70 years)

** Prediction based on previous FOTs*

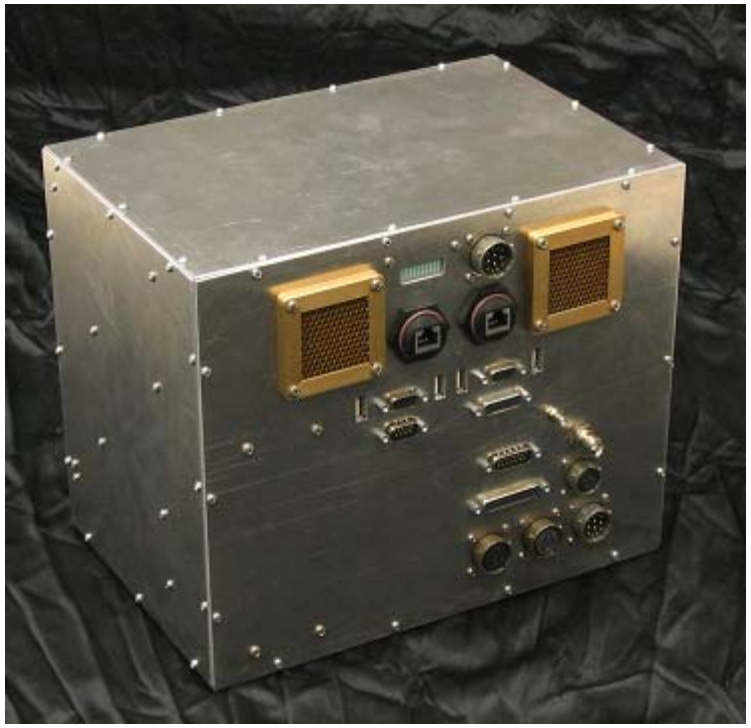
Driver Recruitment & Orientation

- Recruitment with licensing agency database
  - Southeast Michigan resident with 2 yrs driving, no egregious violations, and self-reported mileage at least 75% of average NPTS for the age/gender group.
- Pre-drive information and training:
  - Informed consent form
  - Questionnaires: demographic background,driver behavior questionnaire (DBQ), driver style questionnaire (DSQ)
  - Video overview of IVBSS
  - Hands-on demonstration, including static demo of driver interfaces, and on-road test drive

Post-Drive Instruments

- Written Questionnaire
  - General Impression of IVBSS
  - Combinatorial Effects of the Warnings
  - Forward Crash Warning (FCW)
  - Lateral Drift Warning (LDW)
  - Lane Change/Merge Warning (LCM)
  - Overall IVBSS Warning Acceptance
  - Displays and Controls
  - Training and Ease of Learning
- Verbal questions
- Video-assisted review of the driver's alerts

IVBSS Data Acquisition System



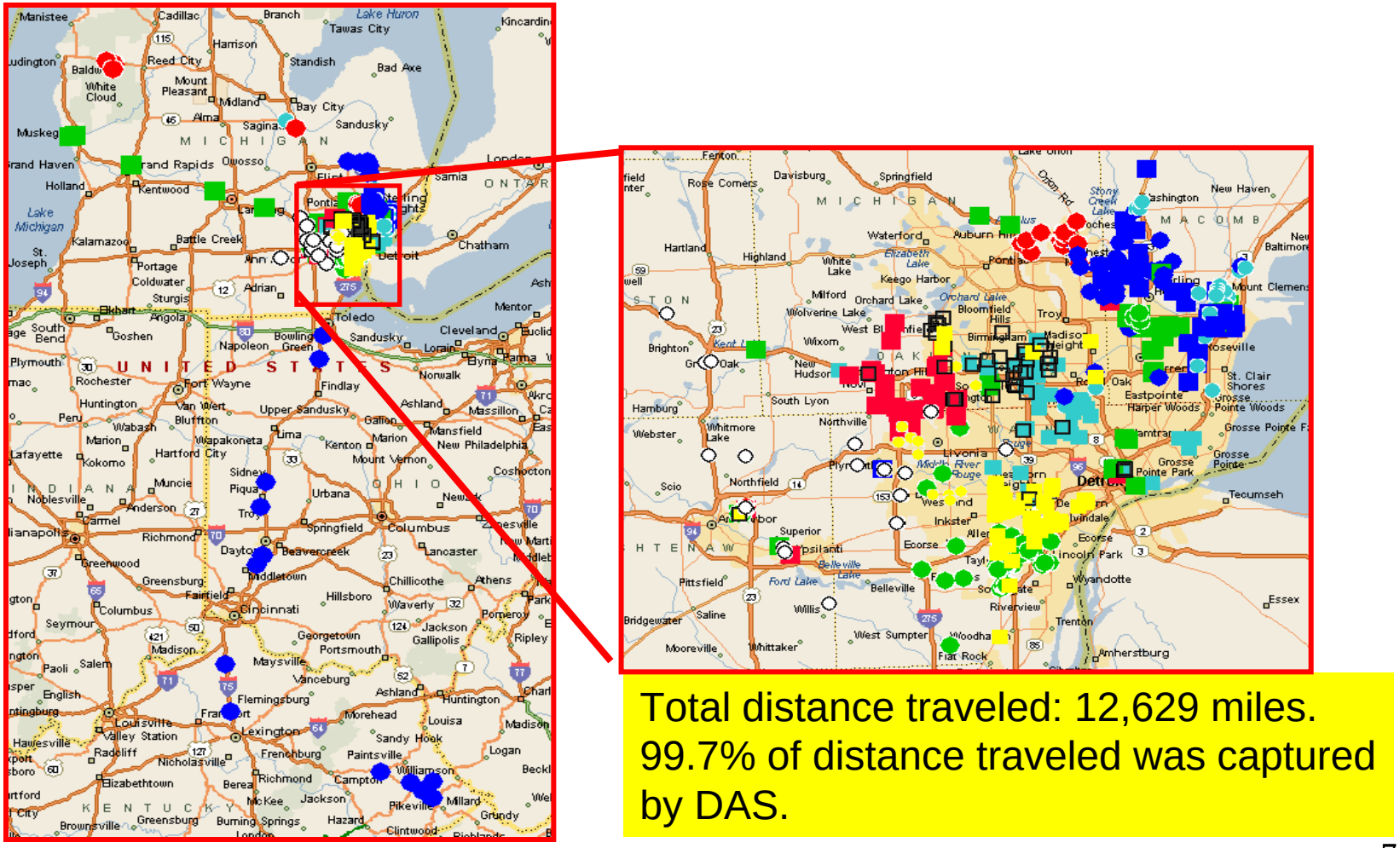
Data sources:

- CAN buses – IVBSS, OEM
- J1939 (heavy truck)
- 5 cameras with video capture & compression
- 6 or 7 radars
- Onboard map match (LV)

UMTRI Data acquisition system:

- Two CPU system
- Automotive-grade hard disks
- Second GPS
- Vehicle motion IMU
- Microphone……ETC!
- GPRS/Edge cellular modem
- DAS power management system

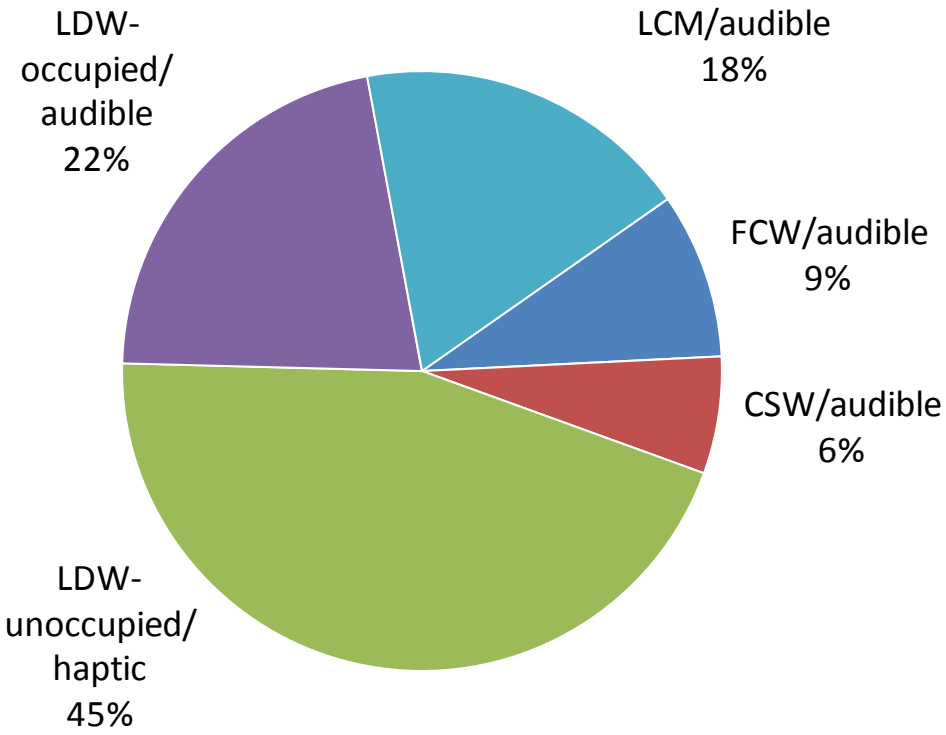
Travel During EPT



Total distance traveled: 12,629 miles.
99.7% of distance traveled was captured by DAS.

Video

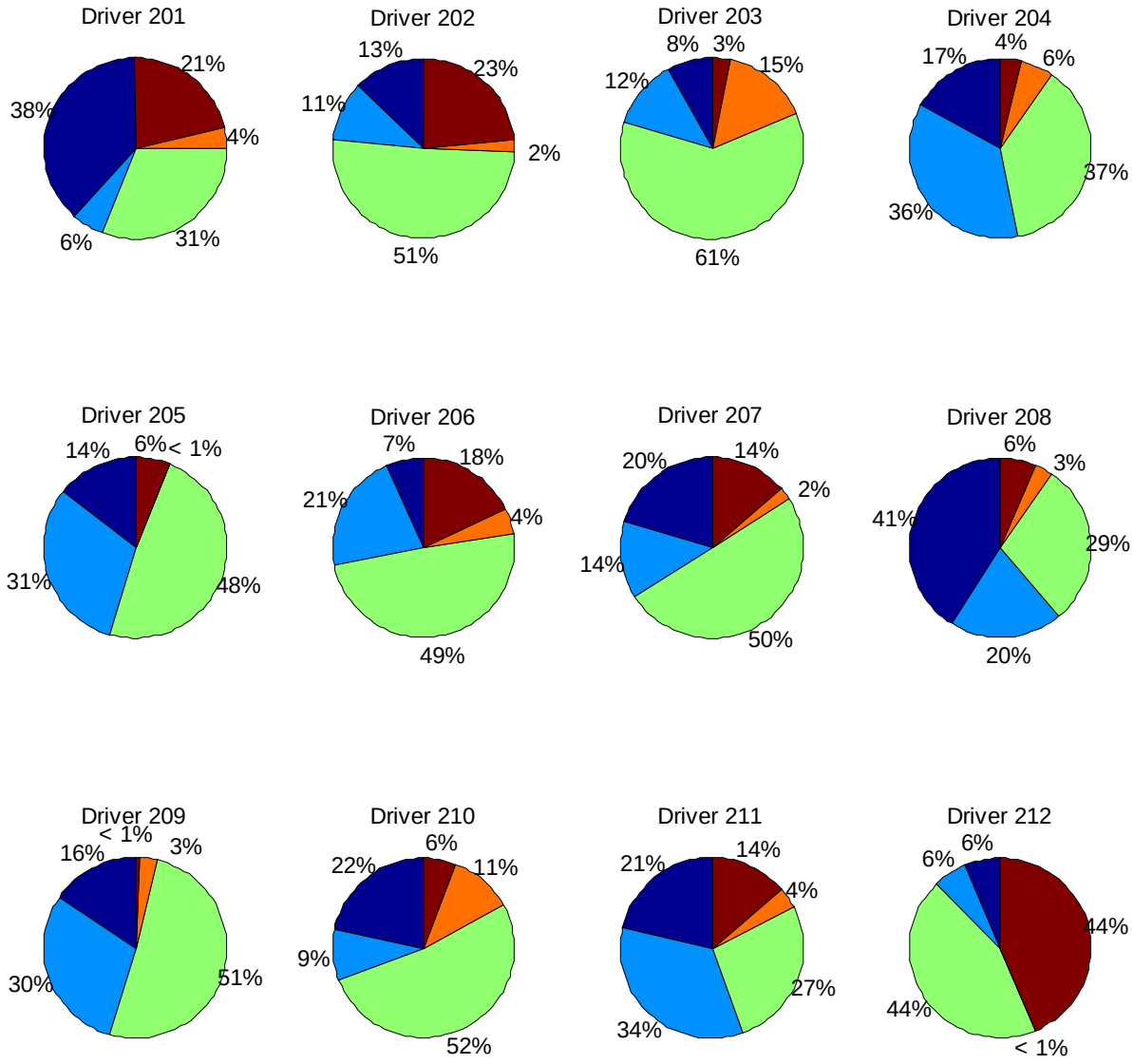
Alerts by Warning Functionality



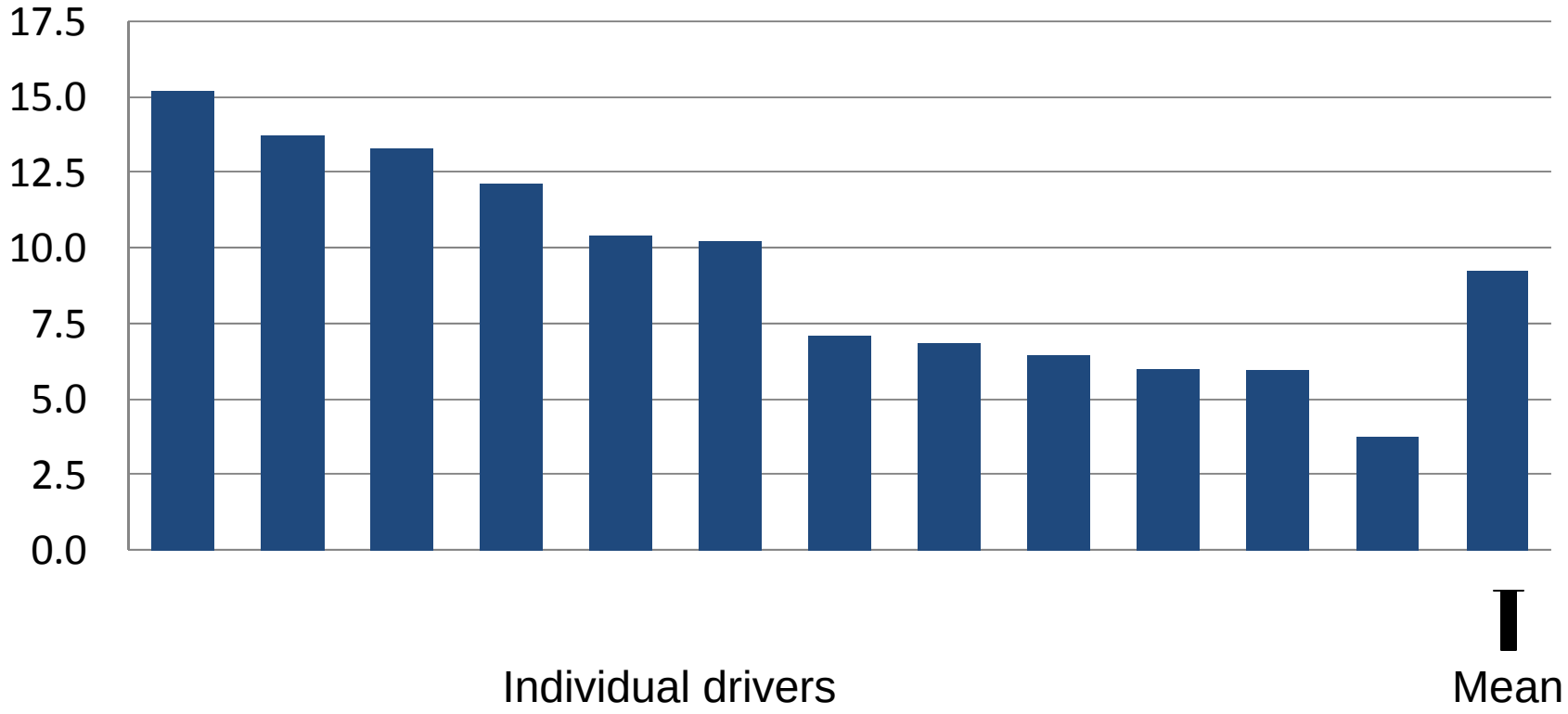
Note: 45% of alerts involve no audible alerts, only haptic seat vibration.

(All alerts are followed by text on the OEM center-stack display.)

Alert Experience Varies by Driver

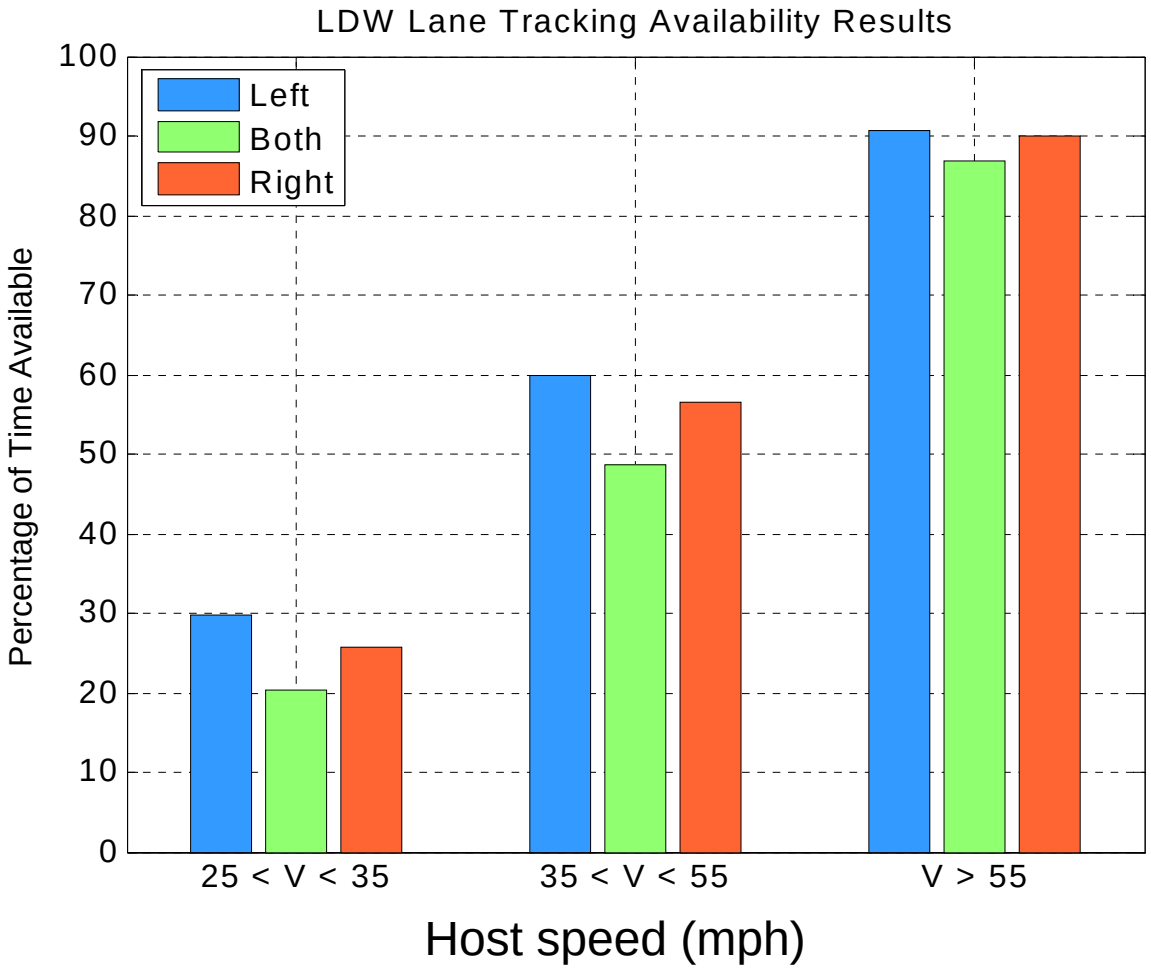


Alerts Per 100 Mi (161 Km)



LDW Availability

Note: Testing in Winter



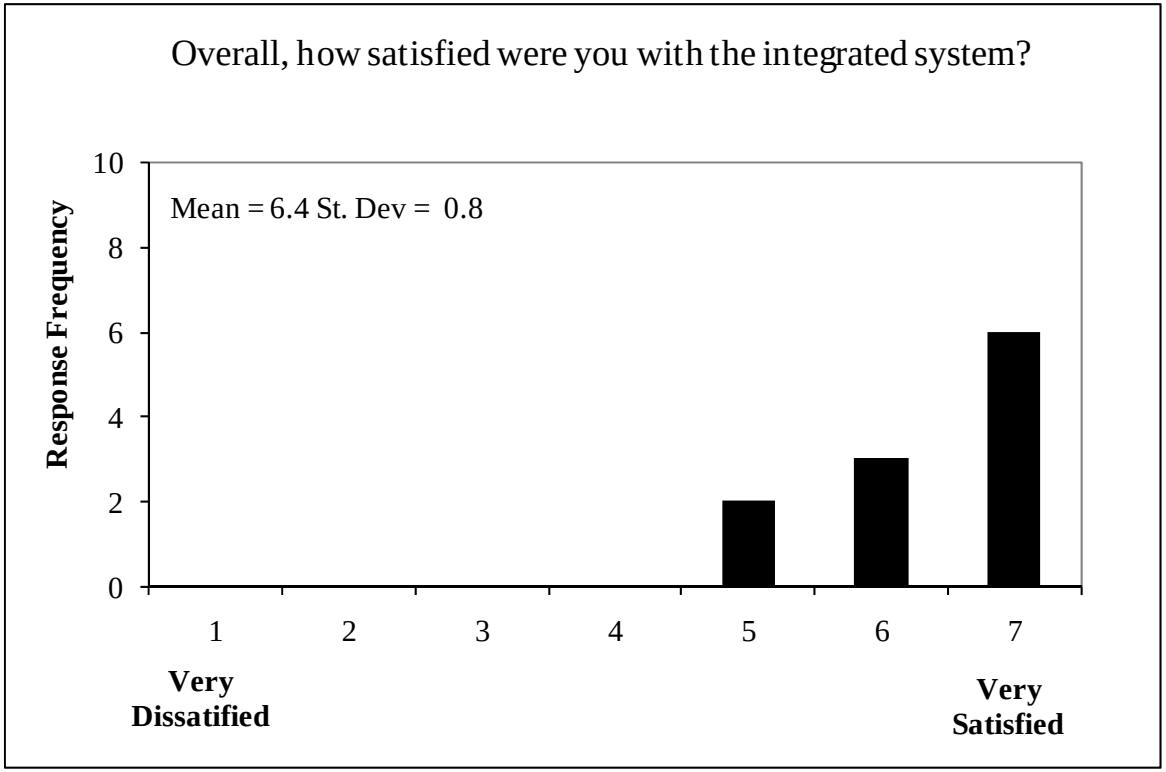
Subjective Results: Overview

Overall, I felt that the Integrated system was predictable and consistent.

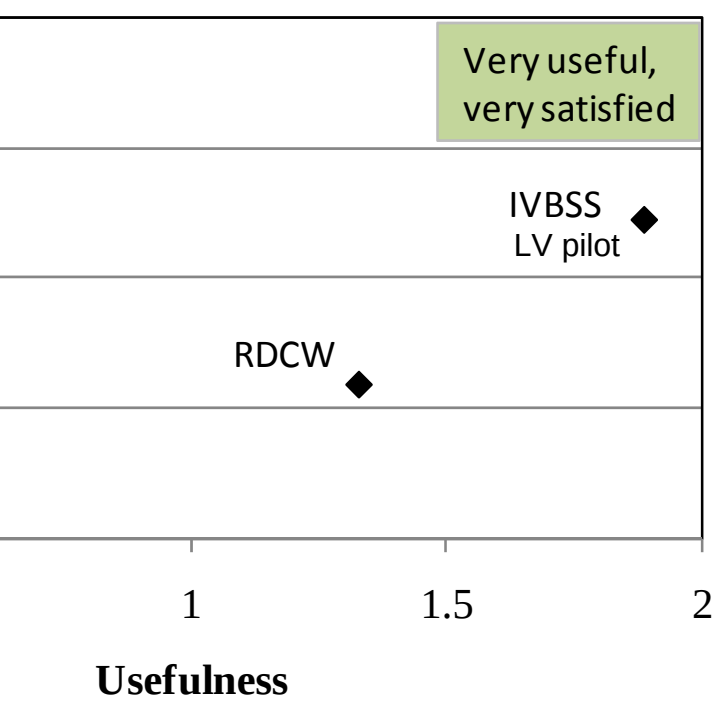
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

Questionnaire topic	Mean
Helpful	6.3
Attention-getting	6.6
Not annoying	6.1
Not distracting	5.7
Will increase driving safety	6.3

Questionnaire: Sample of Response Distribution



Sanity Check:
Comparing IVBSS to RDCW FOT Using Van der Laan Ratings



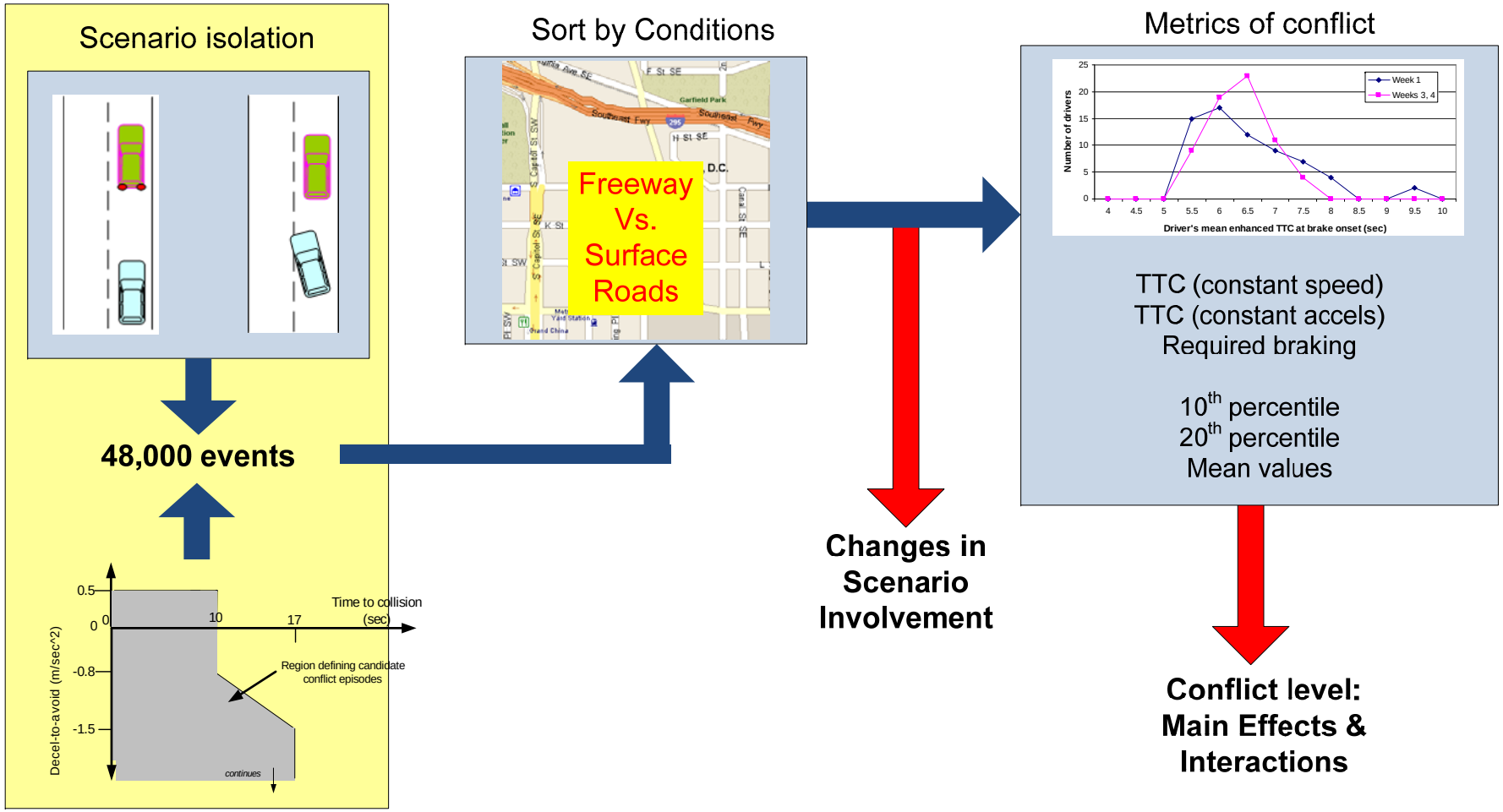
- IVBSS extended pilot test results : 11 subjects feedback.
- RDCW FOT results: 78 drivers.

Safety impacts & driver performance - Examples

- Examine:
  - Driving pattern changes:
    - Involvement in scenarios, e.g., approaches to decelerating lead vehicles
    - Changes in pre-conflict and conflict distributions, e.g., headway times, forward conflict distributions, lane change metrics, curve-taking
  - Driver response to events
  - Unintended consequences
- Estimates of potential safety benefits - Volpe

Example - Forward conflict – analysis steps*

** ACAS FOT [USDOT HS 809 901]*



LV Extended Pilot Test Conclusions

- Driver acceptance of IVBSS is high.
- IVBSS performed well, but modest changes and calibration changes would reduce potential nuisance alerts in specific scenarios.
- IVBSS was robust in the field.
- Data collection & management is ready, with adjustments.
- Recruitment, subject handling, and subjective data instruments is ready, with adjustments.