PEDESTRIAN CRASH AVOIDANCE RESEARCH PROGRAM UPDATE

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Previous G&I Sessions (2014)

NHTSA's PCAM Testing and Dummy Development

- Test Maneuvers (Scenarios)
- Test Mannequin Development
- Test Apparatus (Motion Control)
- Test Results (CAMP and Production Vehicles)

This Session

- Discuss UPDATED PCAM performance results from testing production level vehicles and engineering prototypes.

NHTSA Initiated PCAM Research in 2011

Volpe –

- Crash analyses and assess the potential safety benefits of PCAM technology
- Completed
- Final Report – DOT HS 811 998 (April 2014)

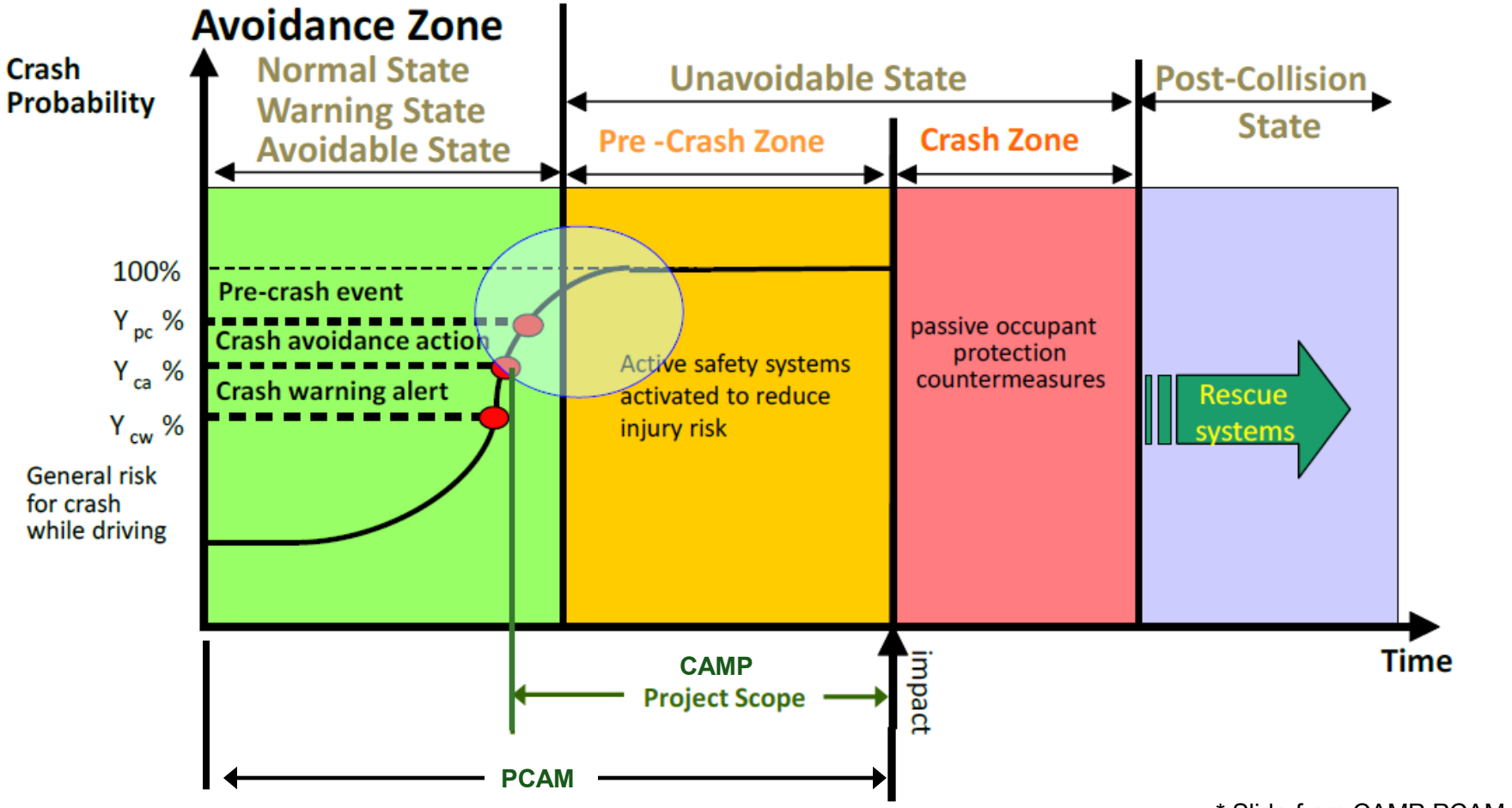
CAMP – GM, Ford, Mercedes-Benz, Continental, and Delphi

- Develop preliminary test methods (Scenarios, Mannequins, Motion Control, etc.)
- Completed
- Final Report - DOT HS 812 040 (June 2014)

NHTSA Internal Research – (ongoing)

- Further Refinement of Test Scenarios, Mannequins, Motion Control, etc.
- Development of Objective Test Procedures and Metrics

What is Pedestrian Crash Avoidance/Mitigation?



* Slide from CAMP PCAM

4,743 Pedestrian Fatalities (14% of total fatalities)

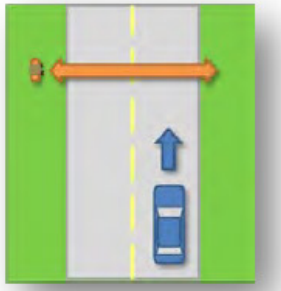
Pedestrians Killed	2011 (% Killed)	2012 (% Killed)
Rural	26%	27%
Urban	**73%**	**73%**
Intersection	20%	20%
Non-Intersection	**68%**	**70%**
Other	10%	10%
Daytime	30%	30%
Nighttime	**69%**	**70%**
Clear/Cloudy	**88%**	**88%**
Rain	8%	8%
Snow	1%	1%
Fog	1%	1%

Test Scenarios
Volpe Analysis – (2005–2009 GES Data)

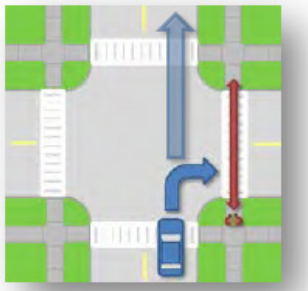
Top 20 pre-crash scenarios by functional years lost (FYL) can be grouped into 4 general scenarios (N = 139,000 Crashes)

Scenario	Cases	% Total FYL	Fatalities	%Fatalities ** (67% of the top 20 scenarios)
S1	115,000	84%	7,000	88%
S2	2,000	1%	16	<1%
S3	9,000	1%	0	0%
S4	13,000	10%	1,000	12%

S1

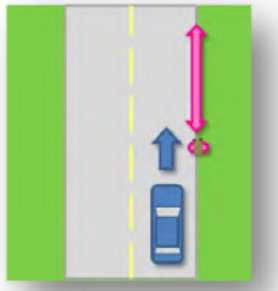


S2



S3

S4

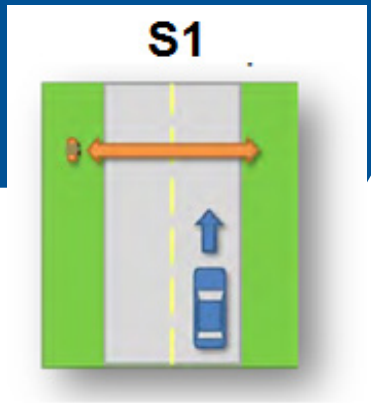


** Note: Top 20 Scenarios represent 67% of estimated pedestrian fatalities

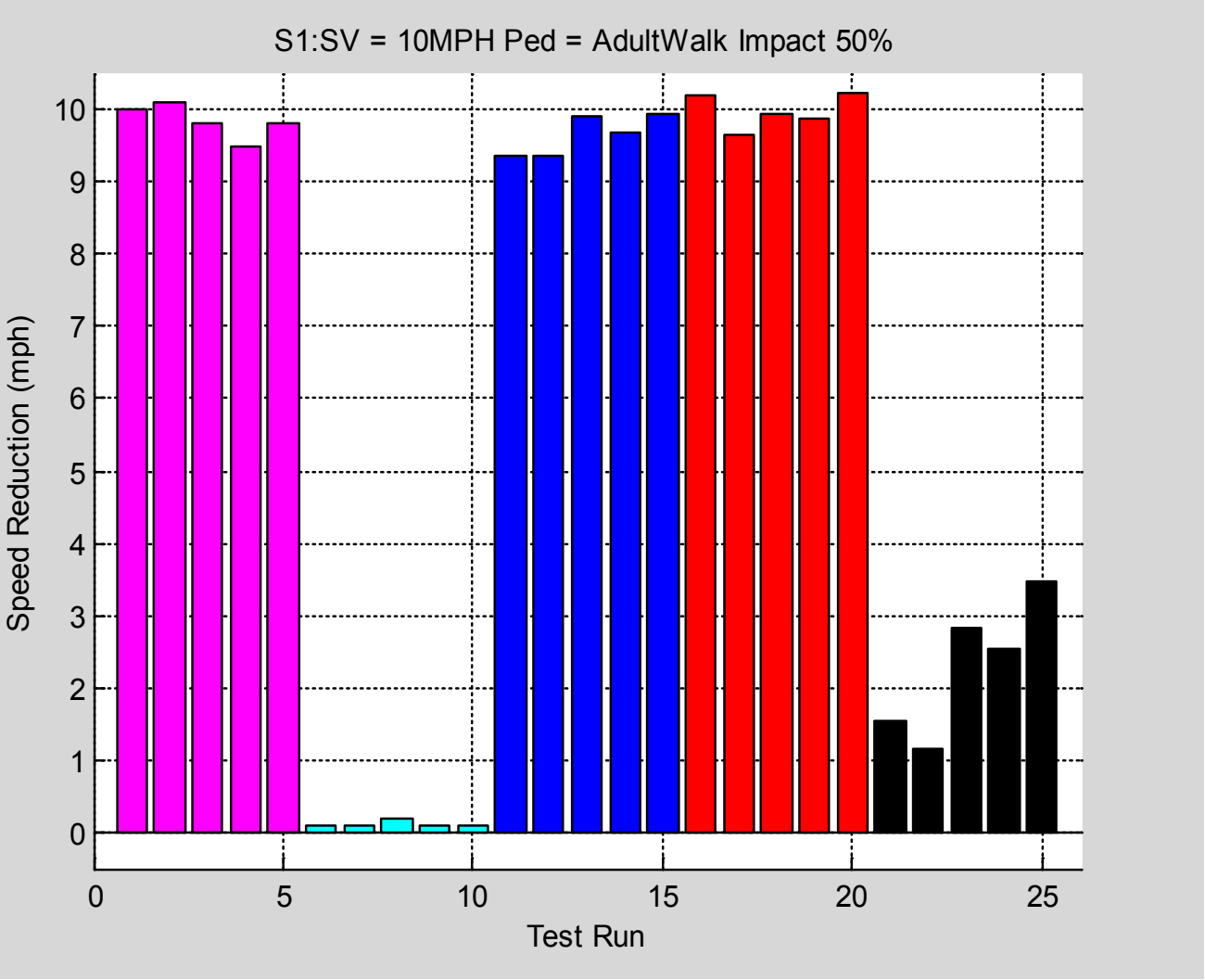
Test Vehicles

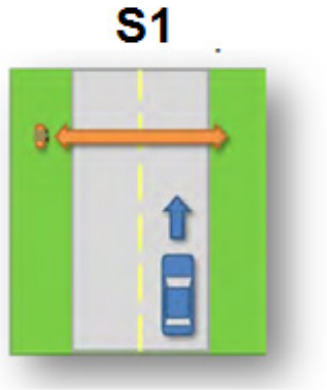
Vehicle	Production	Sensor Technology	CIB/AEB
Vehicle 1	Y	RADAR, LIDAR, and Mono Camera	Up to Full Braking
Vehicle 2	Y	Stereo Camera	Up to Full Braking
Vehicle 3	Y	Stereo Camera	Up to Full Braking
Vehicle 4	Y	RADAR and Stereo Camera	Up to Full Braking
Vehicle 5	Y	RADAR(s) and Mono Camera	Up to Full Braking

S1 - Scenario

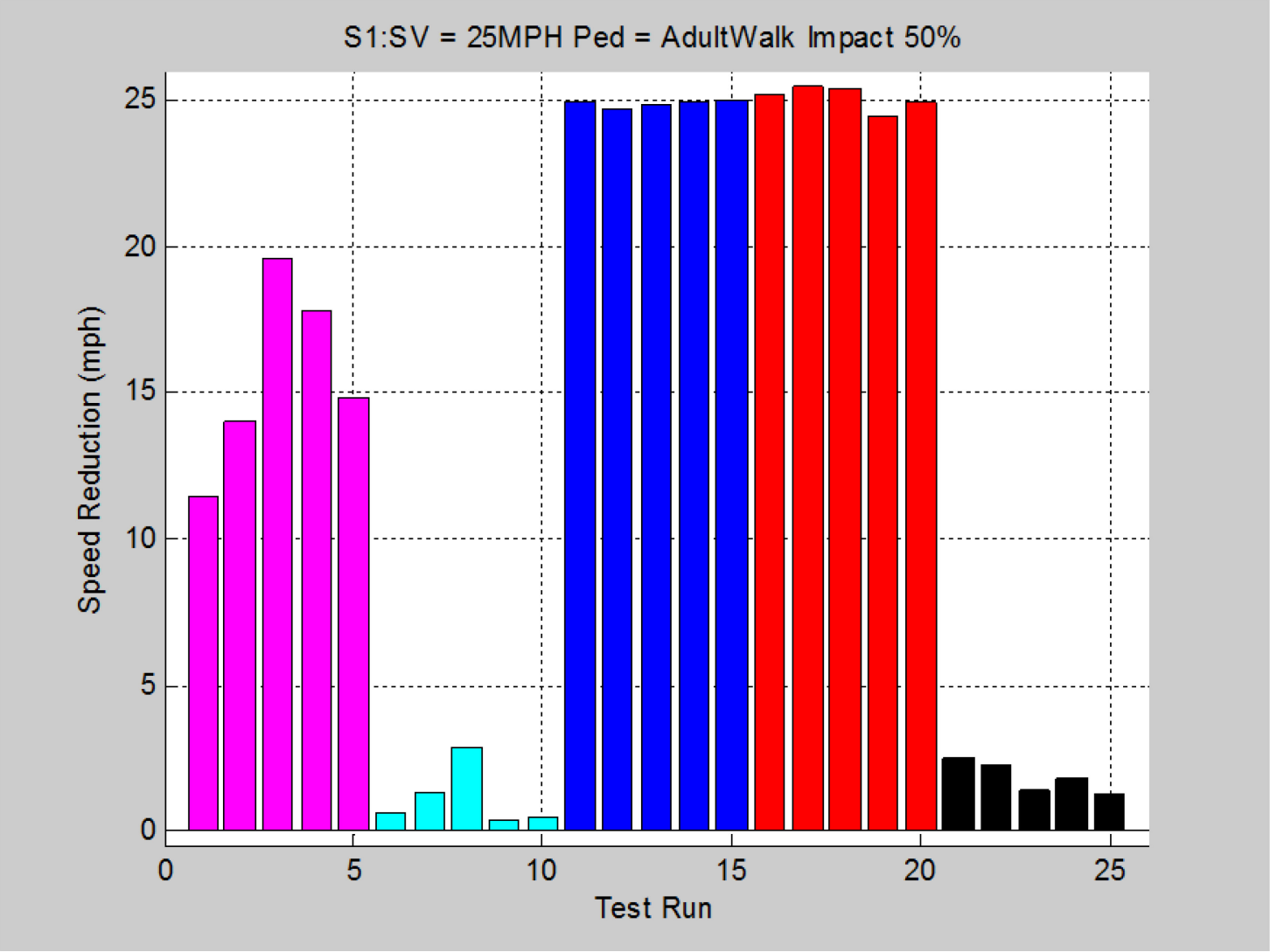


S1 – 10 MPH – Adult – Walking – 50 % Overlap

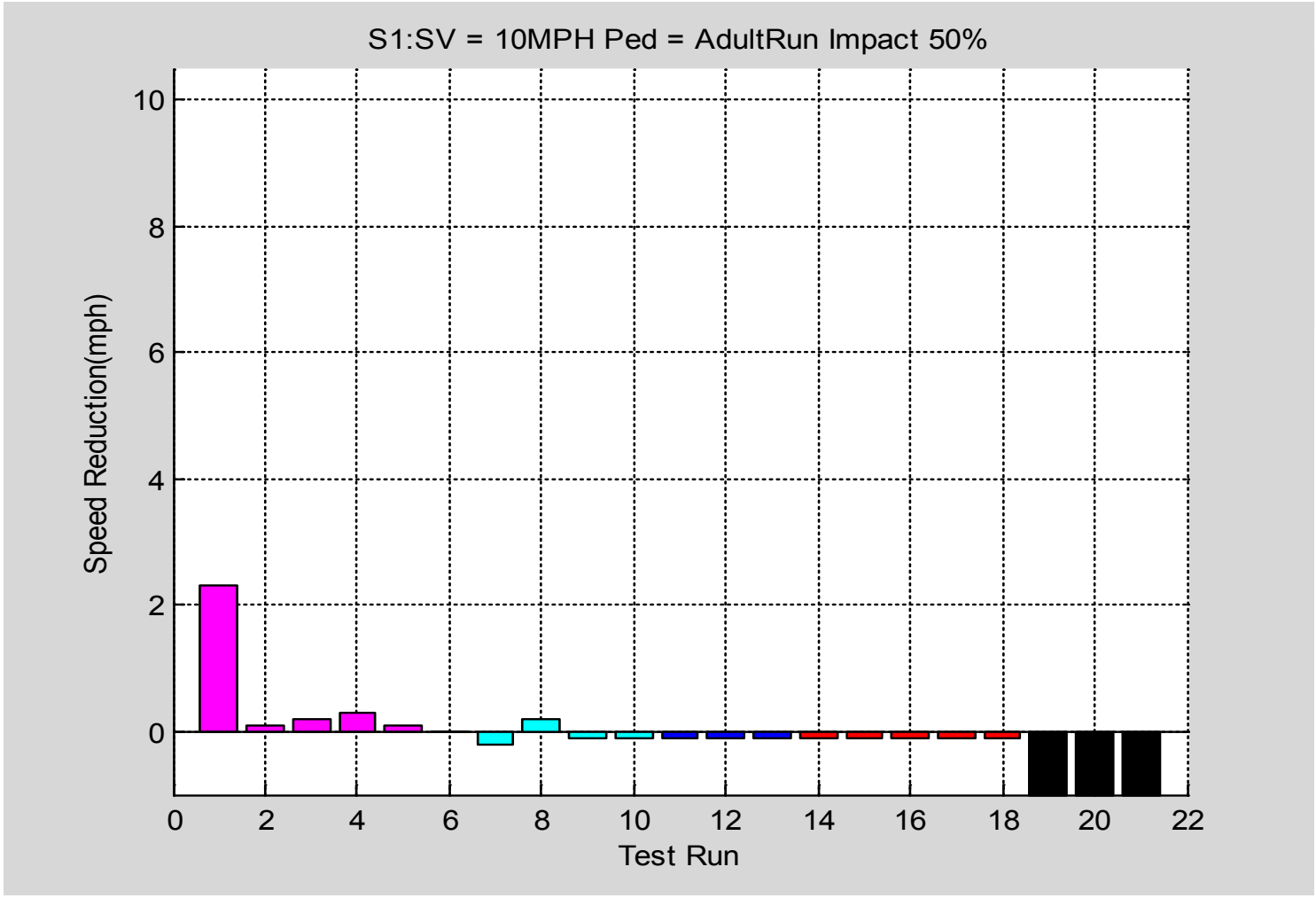




S1 – 25 MPH – Adult – Walking – 50 % Overlap



S1 – 10 MPH – Adult – Running – 50 % Overlap



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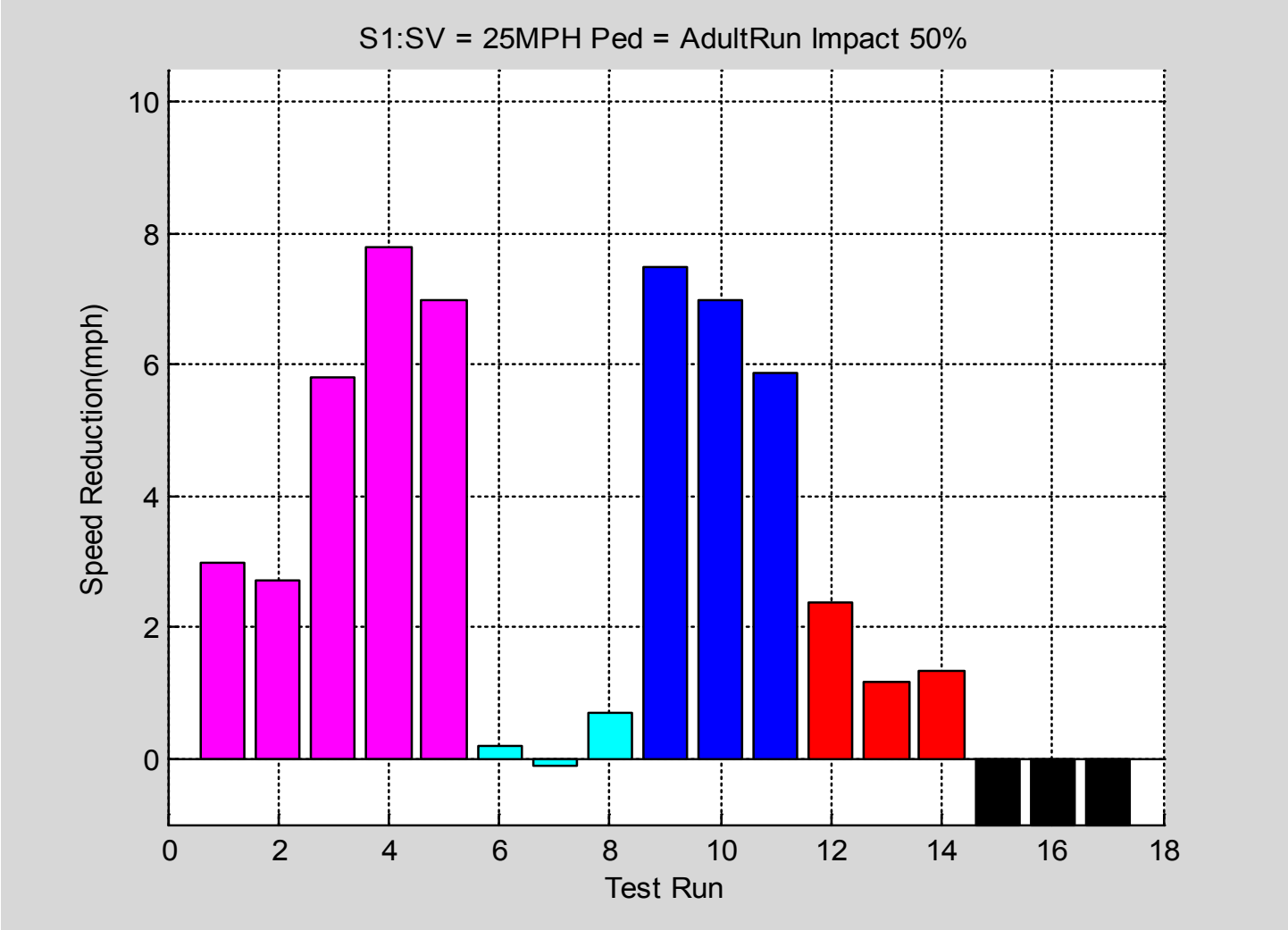
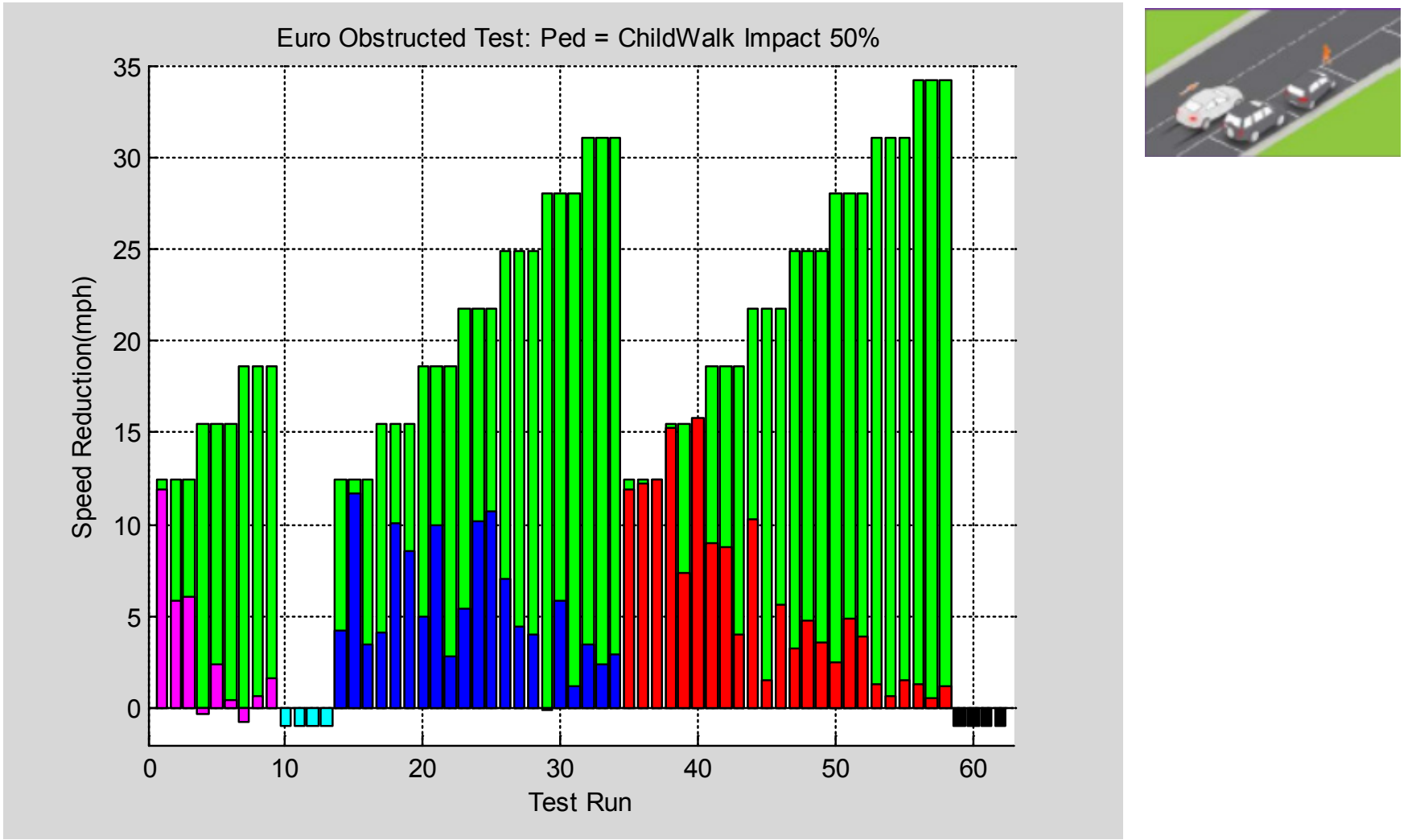
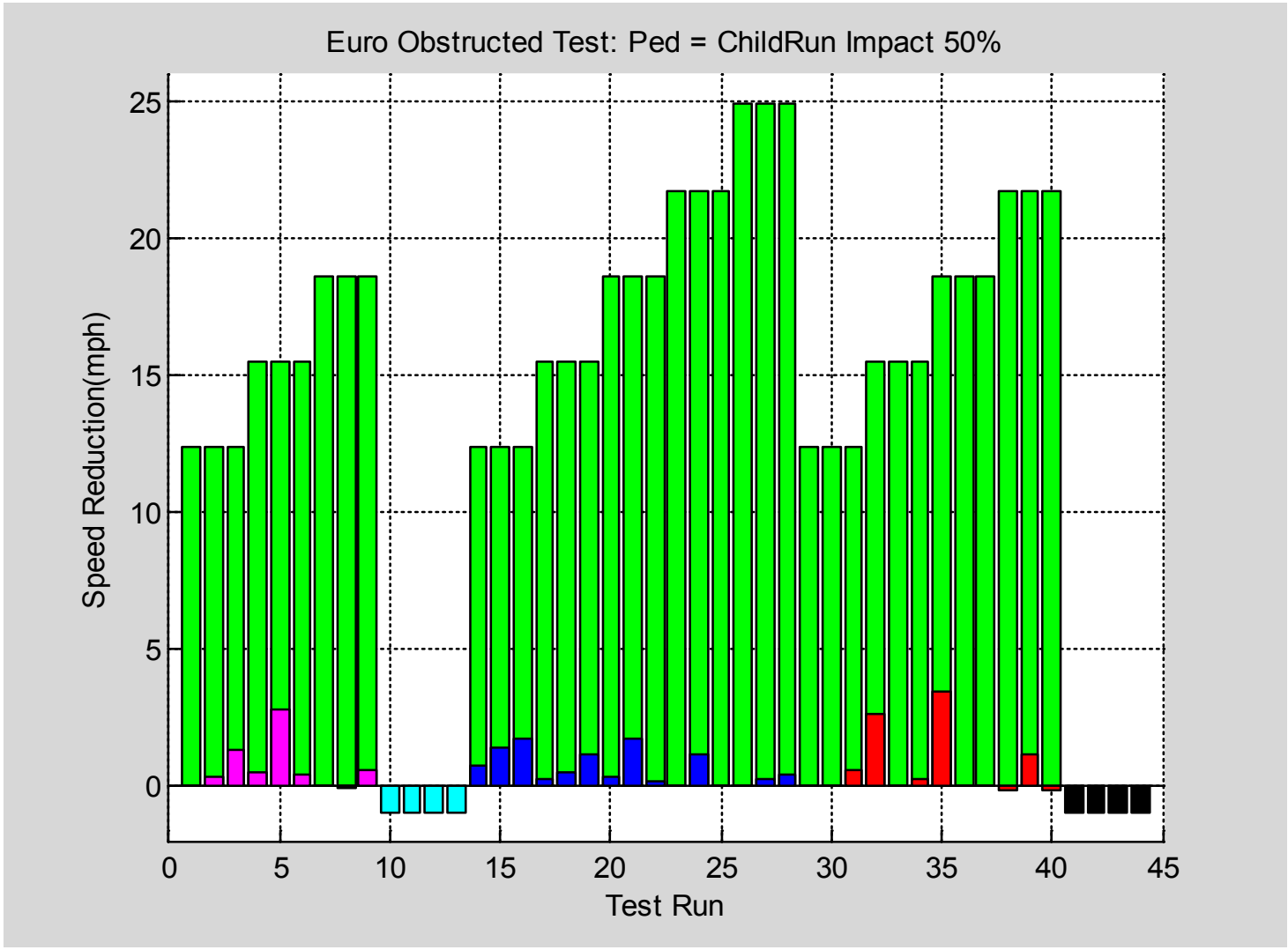


S1 – Obstructed Testing

Euro NCAP Obstructed Child Test - Walking

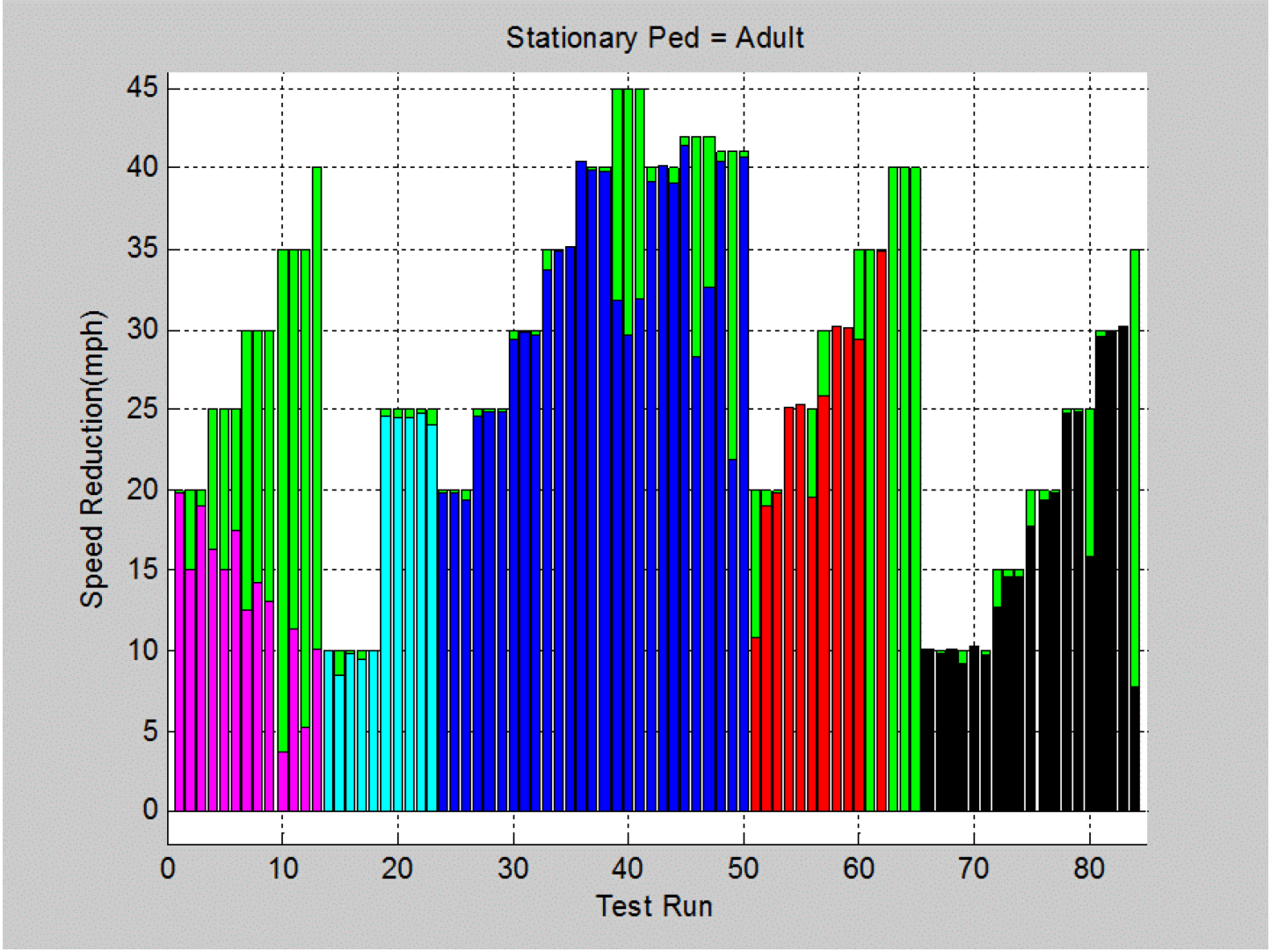


Euro NCAP Obstructed Child Test - Running



Stationary Pedestrian

Stationary Pedestrian – Increasing Speed



Observations

Test data supports:

- PCAM can avoid and mitigate common pedestrian crashes.
  - Data suggests technology is improving.
- PCAM data shows better performance for slower moving pedestrians
  - “Running” Pedestrian scenarios remain challenging for the PCAM systems tested.
- Obstructed pedestrian tests still challenging for PCAM systems.
  - Pedestrian speed a major factor.
- Performance differences can be observed using the objective test conditions described in this presentation.

Planned Research

- Continue testing production vehicles with PCAM. (Sept 2015)
- Refine a PCAM target population to assess system effectiveness and benefit estimates (Dec 2015).
- Refine and further investigate false positive tests. (Oct 2015)
- Complete development adult and child mannequin designs. (May 2015)
  - Select a standard design for objective testing.
- Complete objective test development and procedure (Dec 2015).

Animated Pedestrian

Night Testing

QUESTIONS?

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