CAMP

Vehicle Safety Communications 3

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Intelligent Transportation Systems

DSRC PER versus RSS Profiles

Line-of-Sight Vehicle-to-Vehicle Tests

Borrego Springs, CA

September 13, 2013

Purpose & Outline

- Purpose
  - Develop Packet Error Rate (PER) versus Receive Signal Strength (RSS) profiles from vehicle-to-vehicle (V2V) line-of-sight (LOS) tests
  - Use prototype DSRC radios from two radio suppliers

- Outline
  - Test Setup
  - Test Environment
  - PER and RSS Metrics
  - PER versus RSS Scatter Plots

Test Setup

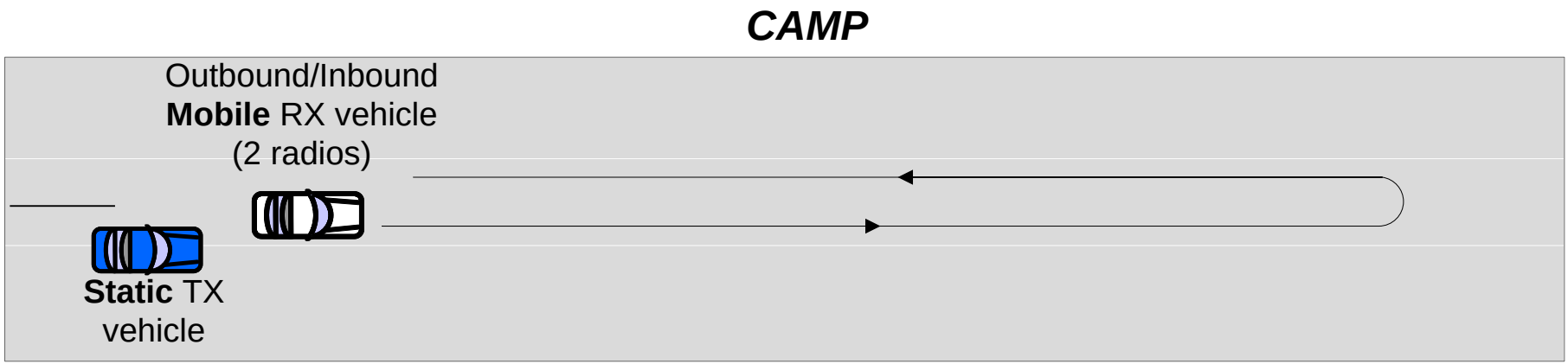
- V2V tests performed on an open road
  - September 13, 2013
  - In Borrego Springs, CA
- 1 mobile receiving (RX) vehicle
  - Supplier 1 receiver
  - Supplier 2 receiver
  - Both receiving on 10 MHz channel 172
- 1 static transmitting (TX) vehicle
  - Reference transmitter
  - Radio from supplier 1
  - 10 MHz Channel 172
- Rooftop antennas
  - 5.9 GHz DSRC band
  - Omnidirectional
  - Magnet-mount

CAMP - Open road test site

ZOOM VIEW: RX CAR

Test Environment

- The RX vehicle
  - Moves outbound & inbound, away from and towards the TX vehicle
  - Travels at speeds approximately 35 to 40 mph
- The environment was line-of-sight throughout drive range
  - No obstructions between the TX and RX vehicles

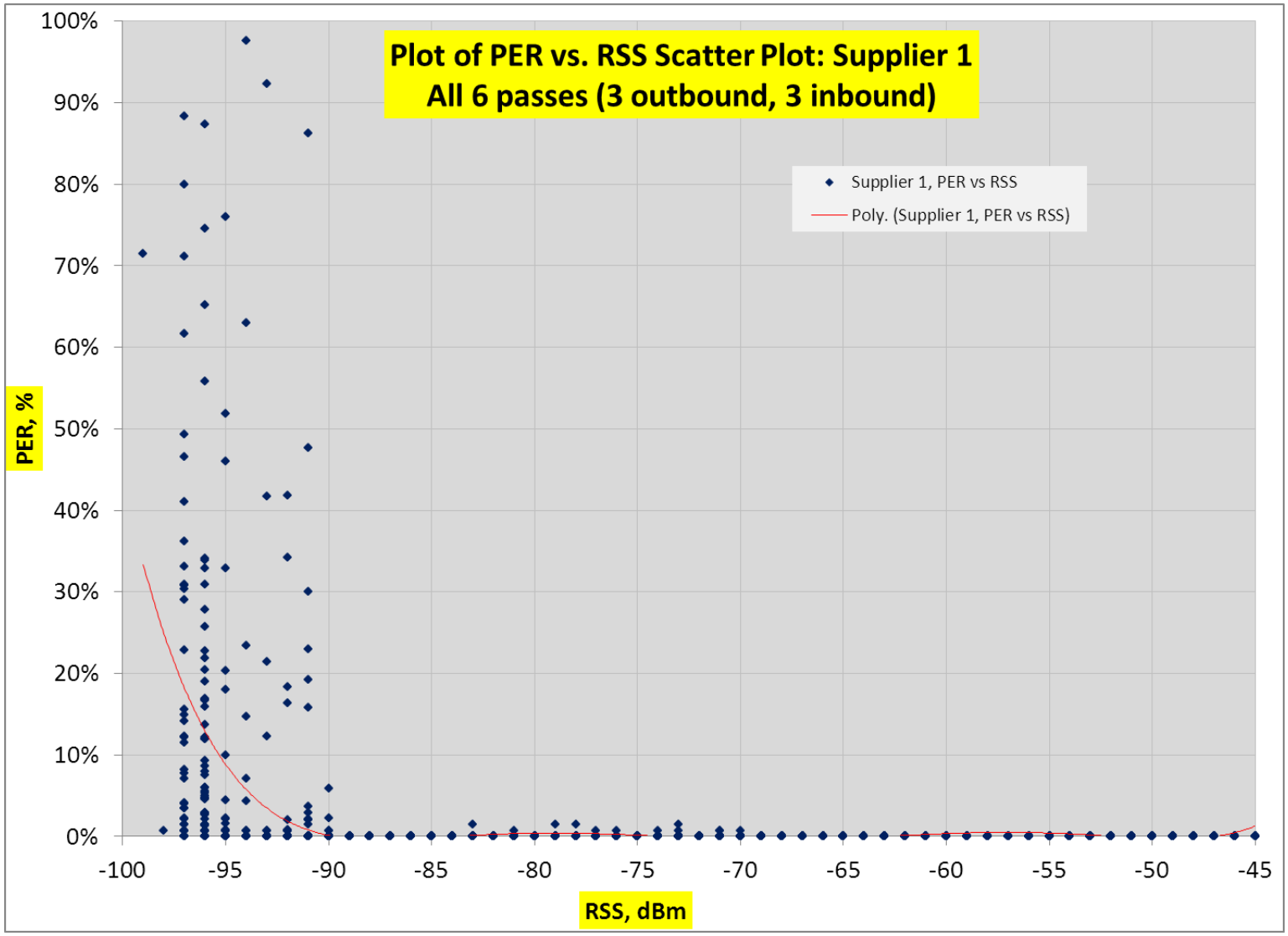


Henderson Canyon Road in Borrego Springs, CA
Number of passes: 6 total (3 outbound, 3 inbound)

PER and RSS Metrics

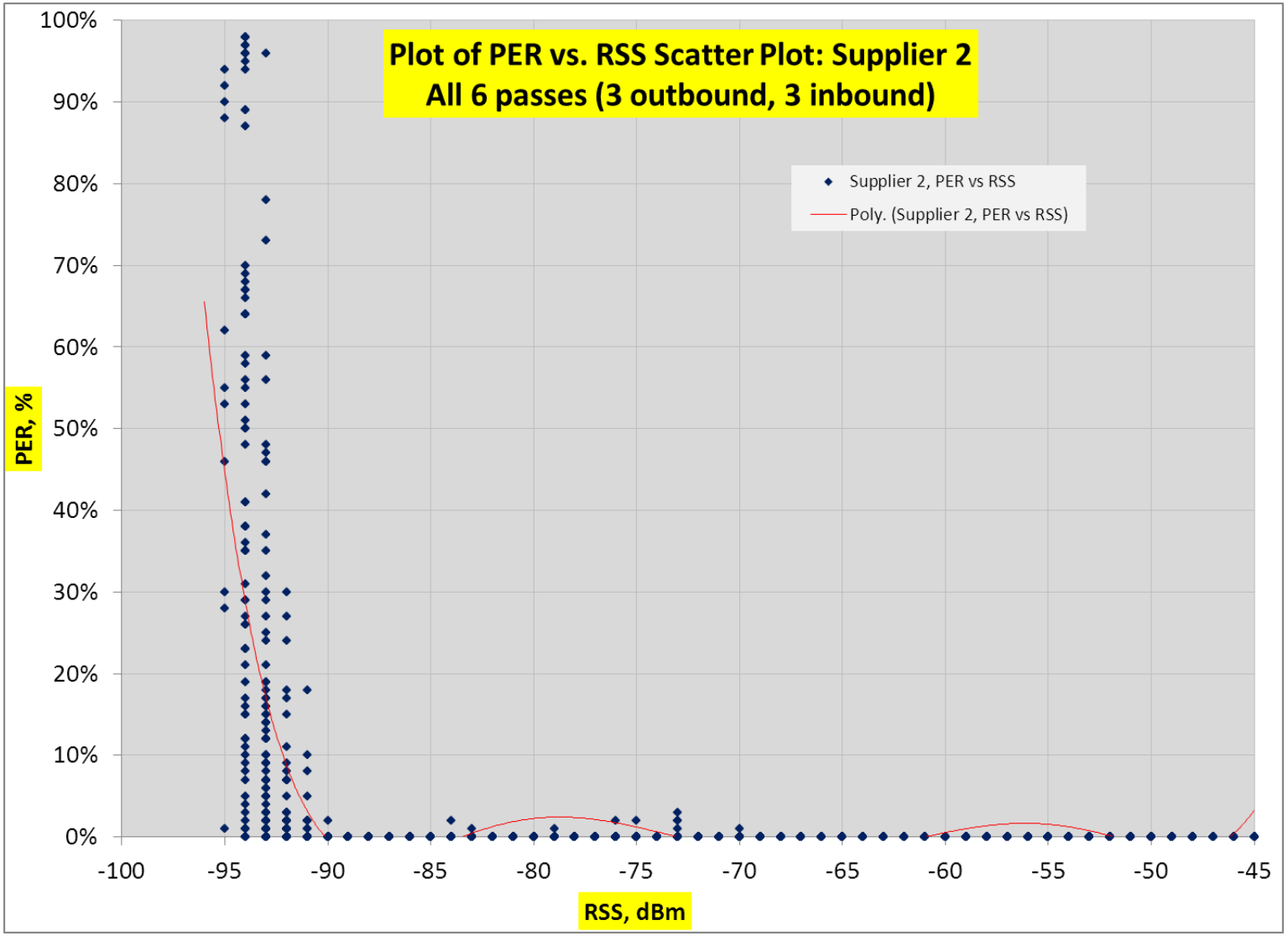
- PER
  - TX vehicle: Broadcasts ~1380 packets per second
    - Each packet includes a sequence number
    - PLCP length ~400 bytes
  - RX vehicle: Calculates PER every 100 ms
    - Calculated over ~138 incoming packets
    - Calculated based solely on the sequence numbers
    - Calculated independently on each supplier's radio
- RSS
  - RX vehicle: RSS is recorded from the last packet received in each 100 ms epoch
- Receive Logs
  - Captured on each supplier's radio hardware
  - Updated every 100 ms
  - Contains: Calculated PER and Recorded RSS

PER versus RSS Scatter Plot: Supplier 1



Scatter plot shows DSRC packet reception below -90dBm

PER versus RSS Scatter Plot: Supplier 2



Scatter plot shows DSRC packet reception below -90dBm