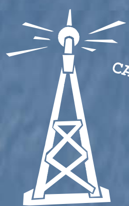
Wireless Roadside Inspection Proof-of-Concept Test



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Background

Safety inspections are performed on commercial vehicles to promote safety on the roadways; over half of all these inspections detect safety violations. The use of a wireless inspection method could dramatically increase the number of safety inspections to at least the number of weight inspections by checking driver licensing, medical card, carrier, and weight information without requiring the driver to stop. Routine inspections could then supplement wireless inspections by further investigating trucks with questionable wireless inspection data and trucks randomly selected for hands-on inspection. The implementation of such a system must be preceded by a proof-of-concept test to determine the feasibility, effectiveness, and limitations of the wireless inspection method.

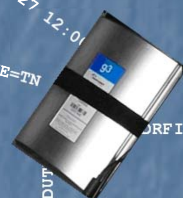

Figure 1: On-Board System

Phase 1A – Generating SDMS

DESCRIPTION

PeopleNet, a producer of current electronic on-board recorder (EOBR) technology, designed a system to produce a Safety Data Message Set (SDMS). Data obtained during a 10-hour test was compared to similar data obtained through an ORNL monitoring system comprised of an eDAQ-lite, VBOX III, Air-Weigh, and custom software.

RESULTS

The majority of the data obtained from the PeopleNet SDMS was accurate. However, the tested system was unable to include the weight and ABS flag components of the SDMS. Also, over an hour was required in some cases for driver status changes to be reflected in the SDMS.

Phase 1B – Testing Wireless Transceivers

DESCRIPTION

STATIC TESTS

The ability to send and receive an SDMS at varying truck orientations (in 45-degree increments), distances (100 ft to 400 ft), and frequencies (5.9 GHz and 2.4 GHz) was tested.

DYNAMIC TESTS

SDMS transmission from the instrumented truck to a roadside unit and mobile enforcement vehicle was tested at various relative speeds. Tests were performed at 2.4 GHz as well as 5.9 GHz, and two different antenna types (dome and stick) were used.

RESULTS

STATIC TESTS

The best reception under static conditions was found to be to either side, slightly ahead of the instrumented truck (Figure 3). Reception was best on the right side, where the antenna was located.

DYNAMIC TESTS

The dome-type antenna had better reception at 2.4 GHz, while the stick antenna performed better at 5.9 GHz. The use of a tripod for the antenna mount increased the effectiveness of both antennas. Files were successfully transferred at various speeds (up to 55 mph).

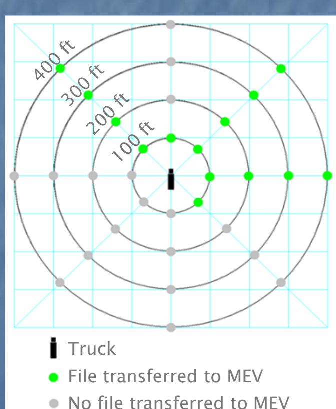

Figure 3: Static test results for 5.9-GHz communication with MEV (dome antenna)

Conclusions

This proof-of-concept test demonstrated the feasibility of a wireless inspection method. It also identified areas in which further testing would be beneficial. Further research should include more extensive testing to determine ideal antenna height, the most appropriate frequency, and optimum mounting location on MEVs.

Future Research

PHASE 2 – PILOT TEST

Testing will continue with further development of the technology and the integration of the system with an actual (rather than simulated) "back-office" infrastructure to assist enforcement.

PHASE 3 – FIELD OPERATIONAL TEST

Further testing will include the integration of transceivers into about 100 trucks using current EOBR technology.

Figure 2: Roadside / Enforcement Vehicle System

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