USDOT Certification Project

The USDOT competitively selected three certification service providers (7Layers, Danlaw, and Southwest Research Institute (OmniAir)) and launched a 2 year project in 2015.

All three work together through the Certification Operating Council (COC) to support certification testing for CV Pilots

Vision is to help the industry to organize and run a self-sustaining certification program supporting deployment of DSRC-based services.

Danlaw provides connected vehicle telematics solutions and embedded electronics to OEMs and the Tier-1 supply chain.

Omniair Certification Services (OCS) is a non-profit organization founded by Omniair to execute independent certification for the intelligent transportation industry.

7Layers is an international group of engineering and test centers having a core competence in wireless technologies.

Certification Goals

Develop and document

Policies **Plans**

Procedures **Tools**

For qualification and certification testing for pilots

Conduct Device Certification to ensure:

Conformance to the message protocols

Ability to transmit & receive messages using specific protocols

Use message security and security credentials

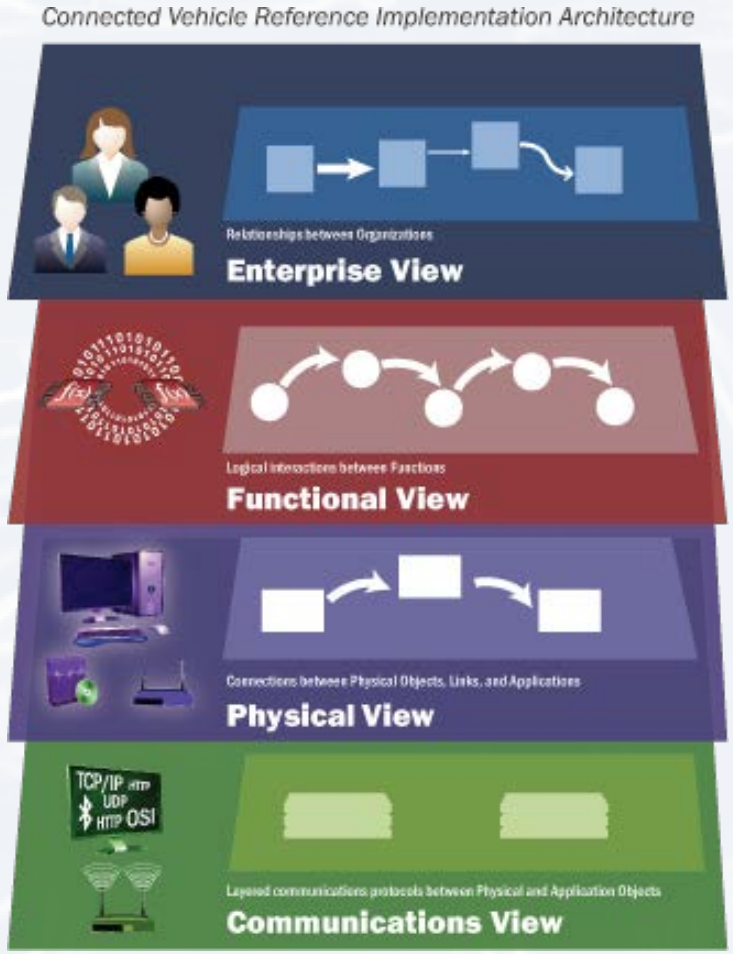
Conformance to performance requirements

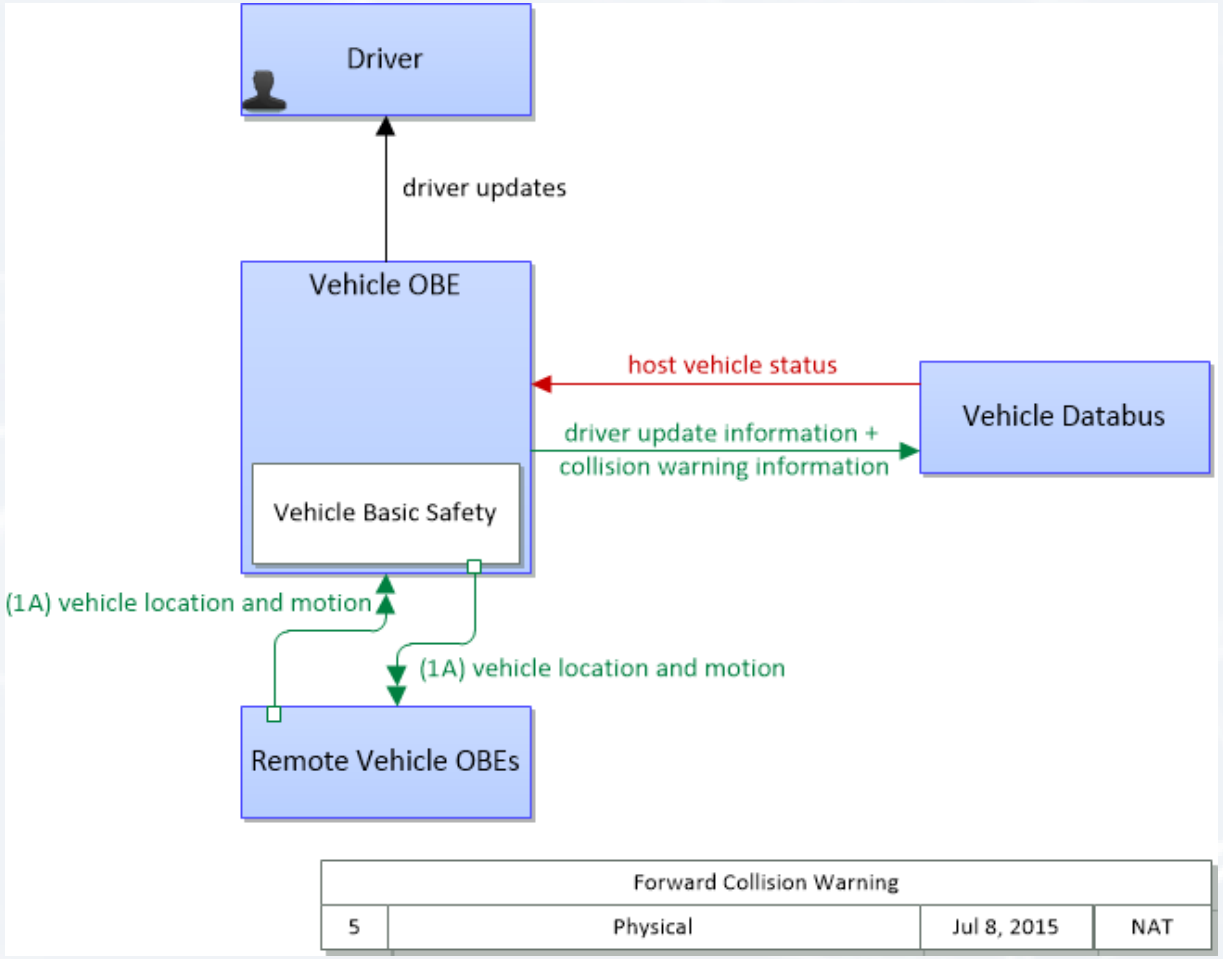
Use position and timing information

Radio behavior characterization

Device interoperability regarding selected information flows

Connected Vehicle Reference Implementation Architecture





Understanding the environment

Certification Scope

<table>
<tr><td colspan="2">4 - Overall Application Abilities</td><td rowspan="2">Applications</td></tr>
<tr><td colspan="2">3 - Interface Abilities</td></tr>
<tr><td>1 - Environmental Abilities</td><td>2 - Communication Protocol Abilities</td><td>Basic Device</td></tr>
</table>

Certification Levels

1. Environmental Abilities including Physical Security
2. **Communication Protocol Abilities**
3. **Interface Abilities (both the syntax and contents of the message payload transmitted over the communications medium)**
4. Overall Application Abilities

Technical Standards

<table>
<tr><td colspan="3">DSRC-WSMP</td></tr>
<tr><td colspan="3">Vehicle location and motion .→</td></tr>
<tr><td colspan="3"></td></tr>
<tr><td>Remote Vehicle OBE</td><td></td><td>Transit Vehicle OBE</td></tr>
<tr><td>ITS Application Information Layer
SAE J2735</td><td rowspan="2">Security Plane
IEEE 1609.2</td><td>ITS Application Information Layer
SAE J2735</td></tr>
<tr><td>Application Layer
Undefined</td><td>Application Layer
Undefined</td></tr>
<tr><td>Presentation Layer
ISO ASN.1</td><td rowspan="6">Security Plane
Undefined</td><td>Presentation Layer
ISO ASN.1</td></tr>
<tr><td>Session Layer
Undefined</td><td>Session Layer
Undefined</td></tr>
<tr><td>Transportation Layer
IEEE 1609.3 WSMP</td><td>Transportation Layer
IEEE 1609.3 WSMP</td></tr>
<tr><td>Network Layer
IEEE 1609.3 WSMP</td><td>Network Layer
IEEE 1609.3 WSMP</td></tr>
<tr><td>Data Link Layer
IEEE 1609.4, 802.11</td><td>Data Link Layer
IEEE 1609.4, 802.11</td></tr>
<tr><td>Physical Layer
IEEE 802.11</td><td>Physical Layer
IEEE 802.11</td></tr>
</table>

Data Messages

SAE J2945/1 Requirements for V2V
Encoding (ISO ASN.1 UPER)
Process Information (SAEJ2735)

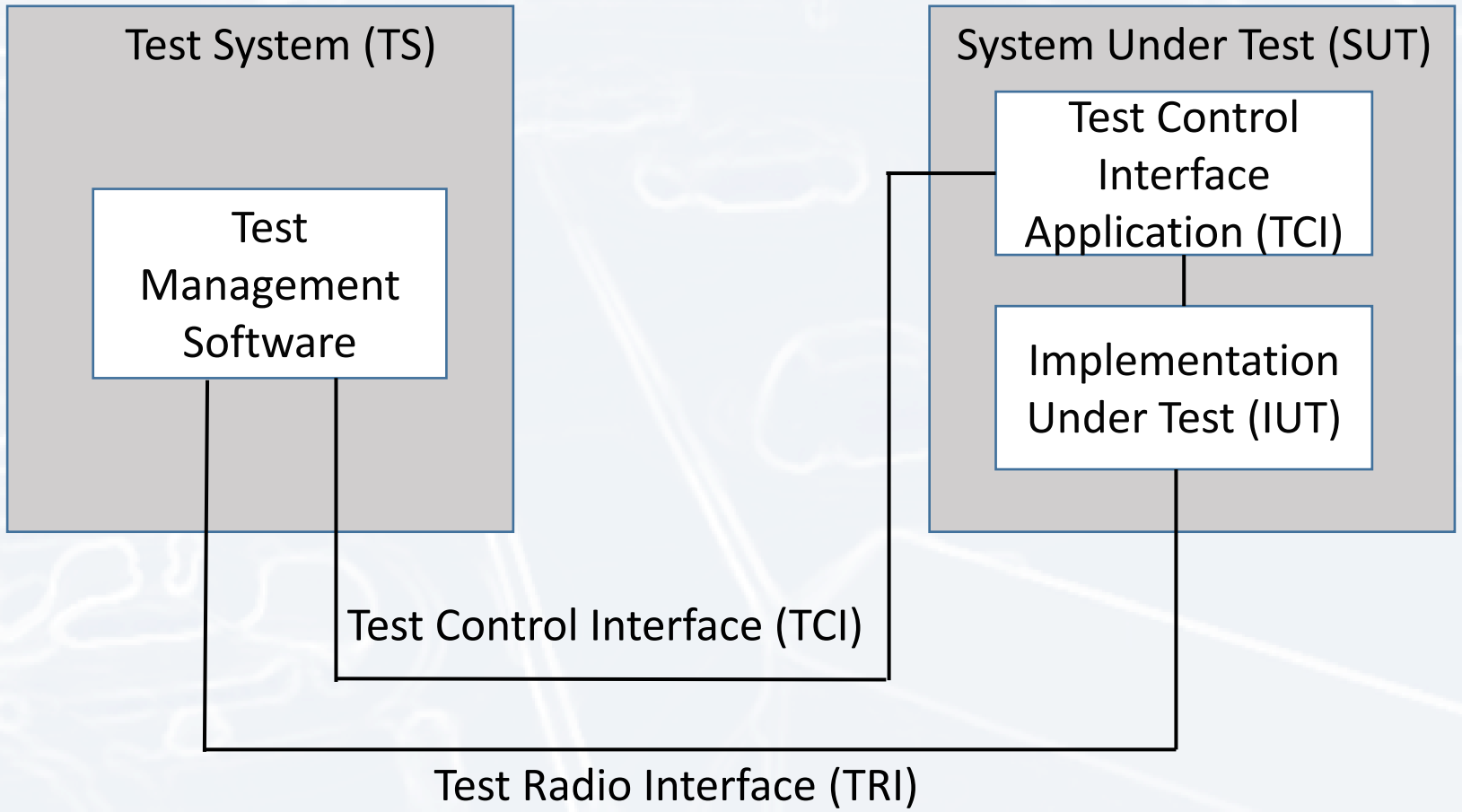
Data Transmission

Transport (IEEE1609.3 WSMP, IPv6)
Security (IEEE 1609.2)
Link (IEEE 1609.4)
Physical (IEEE 802.11)

Device Profiles

V2V per SAE J2945/1
V2V + SCMS per SAE J2945/1
CV Pilot OBU
CV Pilot RSU per USDOT RSU 4.1 spec

Test System Architecture



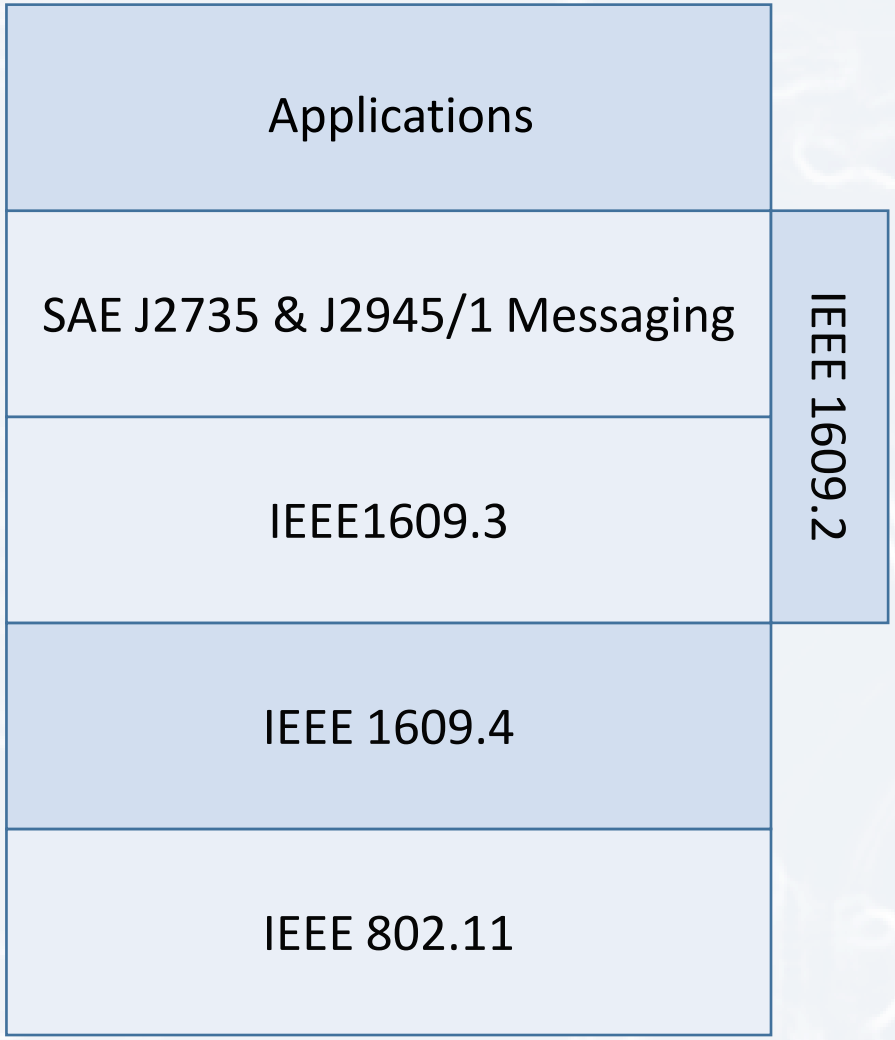
- Built for automation
- Radio testing and protocol conformance
- Devices (IUTs) must implement a TCI application

DANLAW

SPIRENT Communications

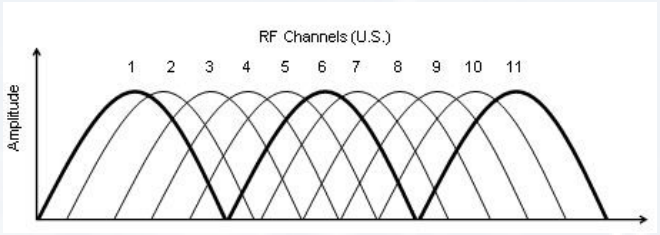
SwRI

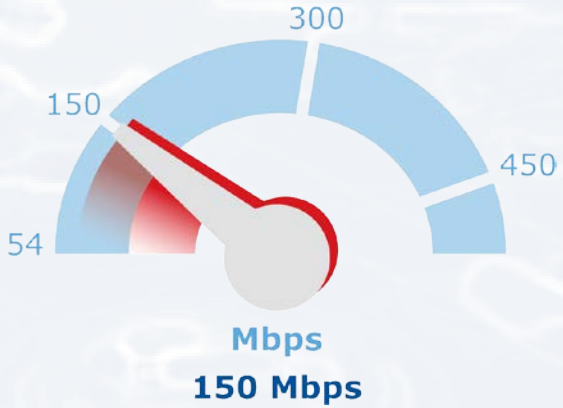
Test Specifications



Test Specification	Title/Scope
Test System Interface	Test Command Interface Protocol Specification
J2945.1-TSS&TP	Test Suite Structure and Test Purposes for SAE J2945/1
WAVESEC-TSS&TP	Test Suite Structure and Test Purposes for Security Services (IEEE 1609.2)
WAVENS-TSS&TP	Test Suite Structure and Test Purposes for Network Services (IEEE 1609.3)
WAVEMCO-TSS&TP	Test Suite Structure and Test Purposes for Multi-Channel Operation (IEEE 1609.4)
WAVE802.11-TSS&TP	Test Suite Structure and Test Purposes for IEEE802.11 (Scope of DSRC)

Device Profile





Example Test Specification

Test Purpose Id	TP-16094-RXT-MDE-BV-01
Summary	Transmit WSMs in continuous channel mode (non-switching) and verify IUT receives the transmitted messages.
Test Configuration	TC1
Reference:	[2] 5.2, 6.3.1, 5.2.1, 5.2.3
PICS Selection	M2, M2.1, M3, M3.1

Pre-test conditions

- The IUT is in initial state as per sec 4.3.1

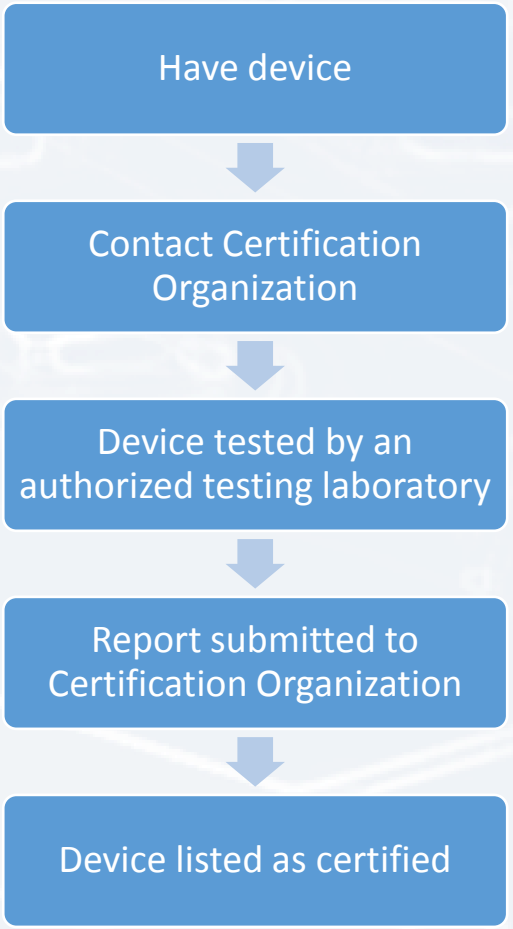
Test Sequence

Step	Type	Description	Verdict
1	Configure	IUT to receive WSM messages in continuous channel mode on ‘vChannel’	
2	Configure	Test Equipment to transmit WSMs in continuous channel mode on ‘vChannel’ with ‘vDataRate’ at ‘vWSMRepeatRate’.	
3	Stimulus	Test Equipment to continuously transmit WSM messages	
4	Verify	IUT receives WSM messages available on ‘vChannel’ at every ‘vWSMRepeatRate’.	PASS / FAIL
5	Procedure	Repeat steps 1-4 for each supported value of ‘vDataRate’ in Table 4-2	
6	Procedure	Repeat steps 1-5 for each supported value of ‘vChannel’ in Table 4-1	
7	Configure	The IUT to initial state	

Reviewed By:

Certification Process

- Certification is similar to other certification schemes
- Certification applies to
  - in-vehicle modules (for OEM integration)
  - roadside devices
  - aftermarket devices
- Device manufacturers pay for certification



Device Certification Progression

Pre-commercial phase (2016-2017)

- Managed by the Certification Operating Council (USDOT project)
- Test specifications available
- 1st USDOT PlugFest for device interoperability in Nov 2016, Novi MI

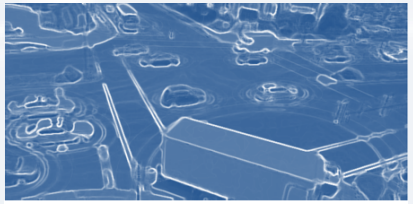
CERTIFIED
Interfaces, Devices for CV Pilots

Commercial certification phase (after 2017)

- Industry certification managed by an industry trade association - OmniAir

OmniAir certified

Common Testing Methodology

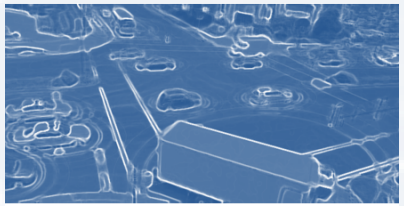


Conformance test specifications for

Wireless Access in Vehicular Environments (WAVE) — Multi-channel Operation

Test Suite Structure and Test Purposes (TSS & TP)

Document Mnemonics:	WAVEMCO-TSS&TP
Revision:	[V0.6.0]
Revision Date:	3/23/2016

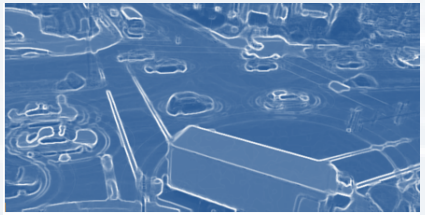


Conformance test specifications for

Wireless Access in Vehicular Environments (WAVE) — Security Services

Test Suite Structure and Test Purposes (TSS & TP)

Document Mnemonics:	WAVE-16092-TSS&TP
Revision:	[V0.6.0]
Revision Date:	2/22/2016

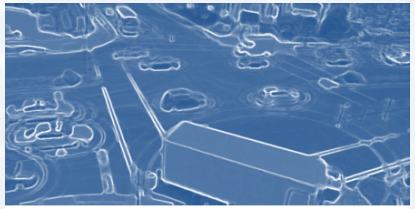


Conformance test specifications for

SAE J2945/1 - On-board System Requirements for V2V Safety Communications

Test Suite Structure and Test Purposes (TSS & TP)

Document Mnemonics:	J2945/1-TSS&TP
Revision:	[V0.3.0]
Revision Date:	2/26/2016

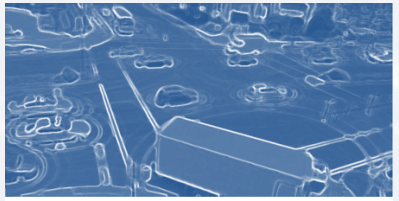


Conformance test specifications for

Wireless Access in Vehicular Environments (WAVE) — 802.11

Test Suite Structure and Test Purposes (TSS & TP)

Document Mnemonics:	WAVE802.11-TSS&TP
Revision:	[V0.5.0]
Revision Date:	2/23/2016



Conformance test specifications for

Wireless Access in Vehicular Environments (WAVE) — Networking Services

Test Suite Structure and Test Purposes (TSS & TP)

Document Mnemonics:	WAVENS-TSS&TP
Revision:	[V0.6.0]
Revision Date:	1/6/2016

DANLAW

OmniAir certified

7layers testing for a smarter world

CERTIFIED Interfaces, Devices for CV Pilots