

5G포럼 교통융합위원회 백서 워크샵

**C-V2X 시험인증 및 측정시스템 현황**

한국정보통신기술협회  
정준시



2019.04.03



I

# Test & Certification

# Standard, Test & Certification



Baltimore 1904, 출처: 구글

# Standard, Test & Certification

## Why have a Certification Program?

- Safety & Radio Emission Rule

**Regulatory**

- Interoperability Failure

- Damage to Devices / Network

**Voluntary**

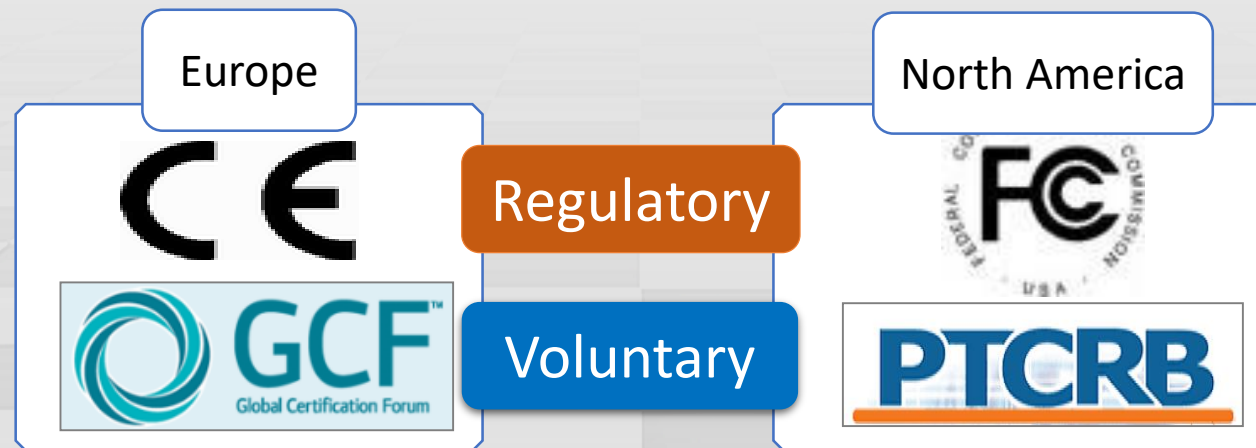


출처: E-Qualus

# Standard, Test & Certification

## Regulatory vs. Voluntary Certification

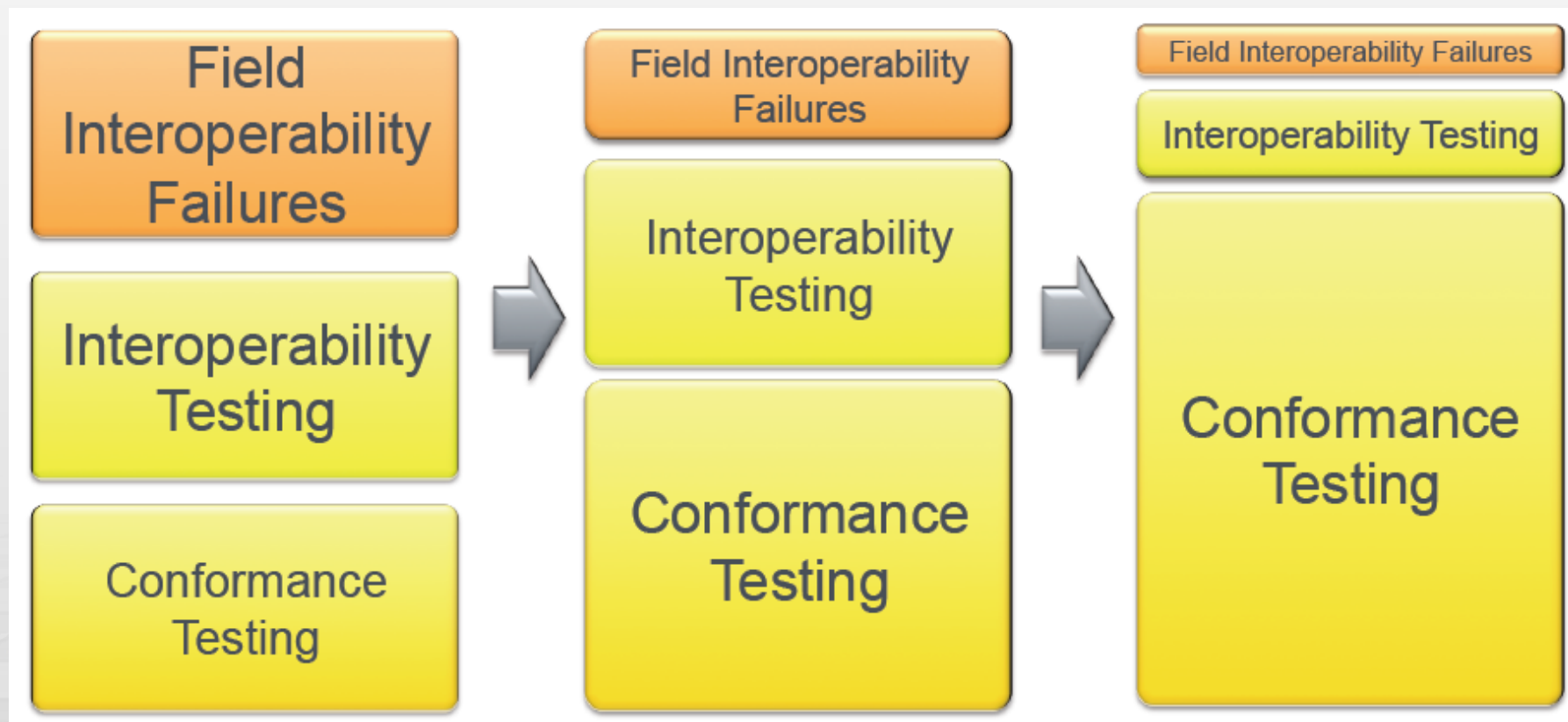
	Regulatory	Voluntary
Purpose	<ul style="list-style-type: none"><li>• Ensure User's safety</li><li>• Protect infrastructures</li><li>• Rule for radio emission</li></ul>	<ul style="list-style-type: none"><li>• Evaluate <b>functions</b> of Spec.</li><li>• Evaluate <b>suitability</b> for markets</li><li>• Provide Certification for use on operators</li></ul>
Control body	Government (Organization, Government)	<b>Forum or Partnership body</b> (Operators, Manufacturers and Labs)
Testing area	Safety, EMI, EMS, Power, Freq.	<b>RF, Protocol, OTA, and App.</b>
Example	FCC(USA), CE(Europe), KC(Korea)	<b>PTCRB(North America)</b> , GCF(Europe)





# Standard, Test & Certification

## Evolution of Test Program



출처: E-Qualus

## II

# C-V2X 시험인증 현황 및 전망



# C-V2X 시험인증 현황 및 전망

## C-V2X Certification Roadmap

구분	2017년	2018년	2019년	2020년
3GPP (기술/시험규격)	Rel.14 LTE-V2X (‘17.6)	Rel.15 5G(LTE)-eV2X (‘18.6)	Rel.16 5G NR-V2X (‘20.3)	
GCF (인증프로그램)		Rel.14 LTE-V2X (‘18.6)	Rel.15 5G(LTE)-eV2X (‘19.4Q)	Rel.16 5G NR-V2X (‘20.4Q)
Launch Test & Certification			Rel.14 LTE-V2X (‘19.2Q)	Rel.15 5G(LTE)-eV2X (‘20.2Q)

*GCF Announces Certification for V2V and V2X Automotive Communications Technologies(06. Jun.18)*

*5GAA and GCF announce collaboration on the certification and testing of C-V2X technologies(08. Mar.19)*

# C-V2X 시험인증 현황 및 전망

## GCF Certification Eco-system

### Standard



### Certification



### Test



----

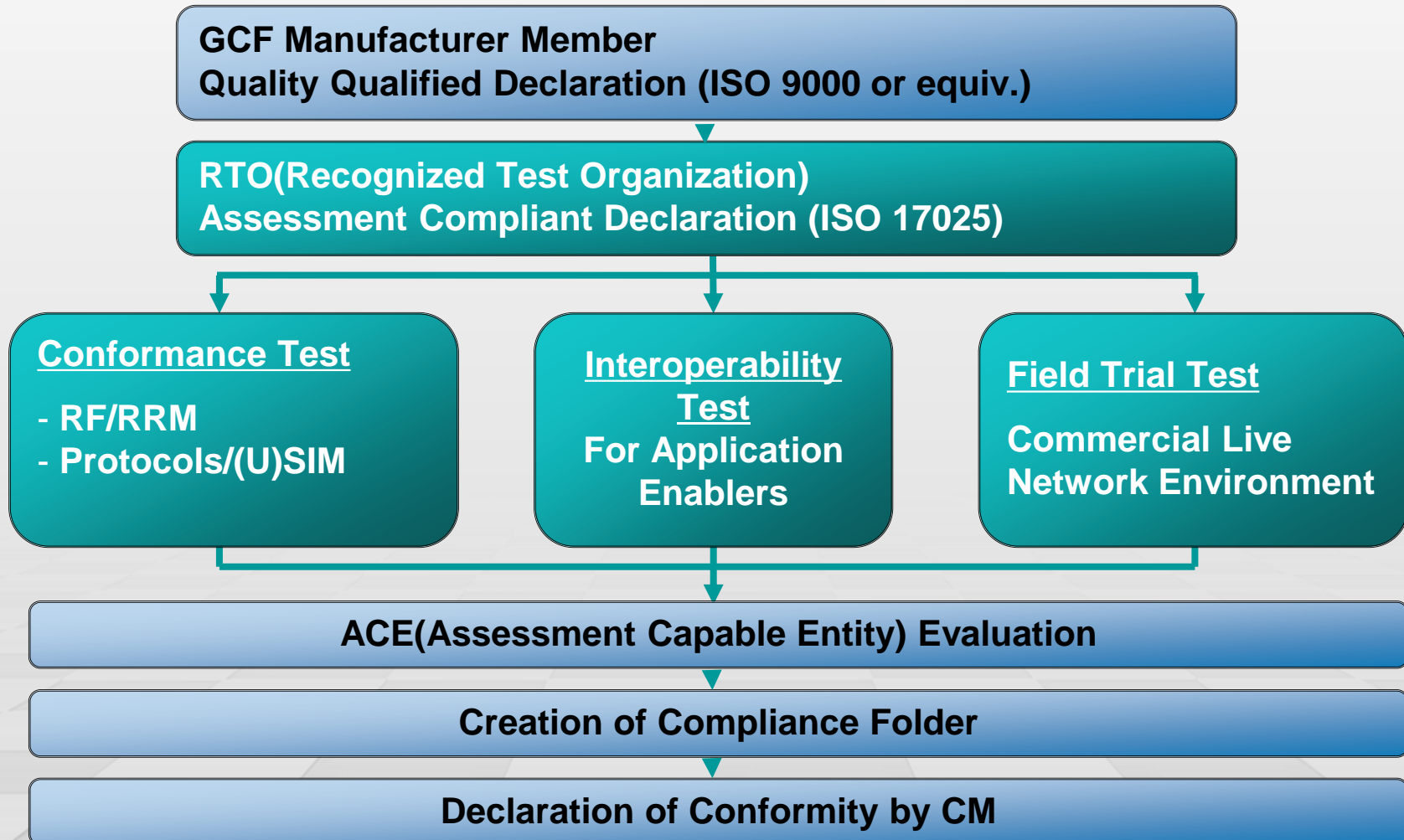
### Test Platform



⋮

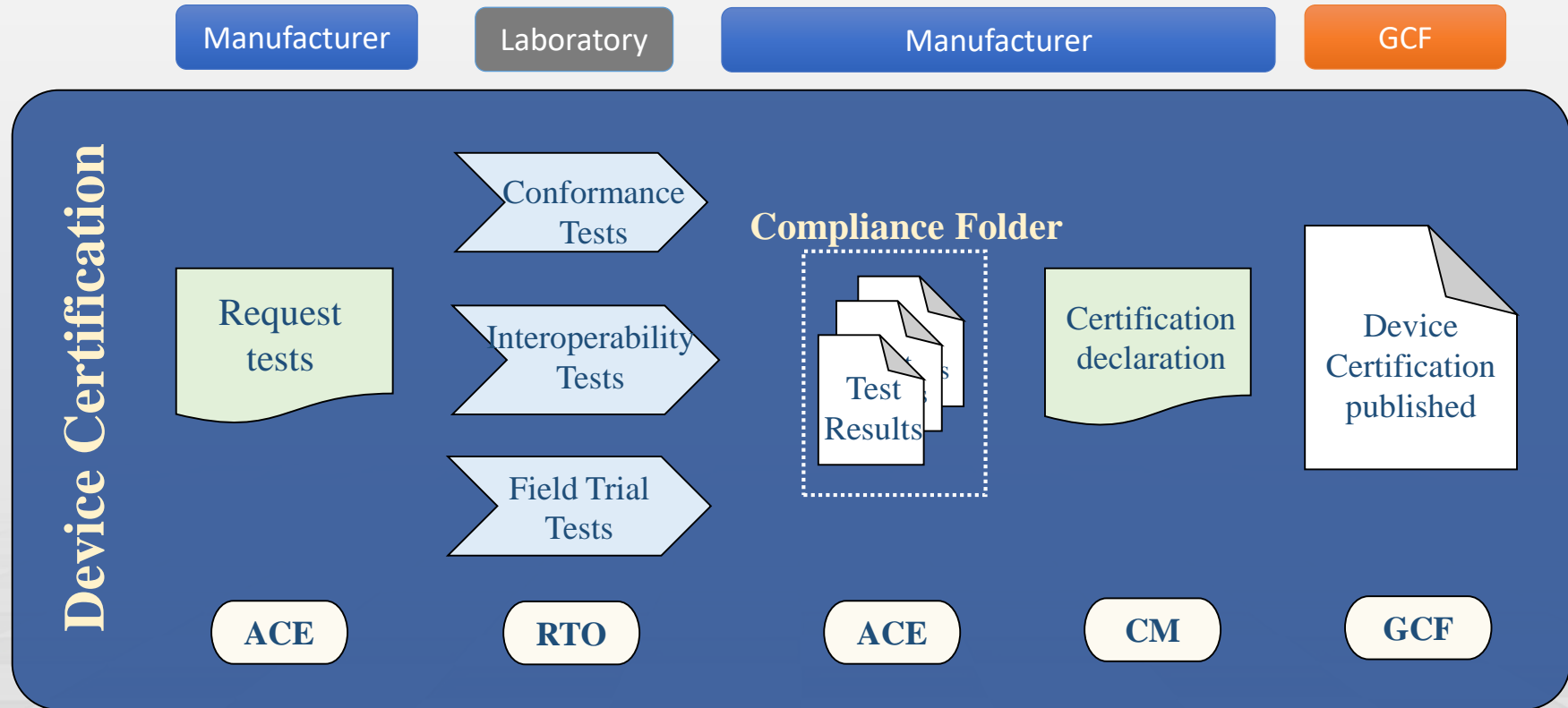
# C-V2X 시험인증 현황 및 전망

## GCF Certification Process



# C-V2X 시험인증 현황 및 전망

## GCF Certification Process



출처: GCF

*Test Once, Use Anywhere*

# C-V2X 시험인증 현황 및 전망

## GCF RTOs in Korea

### Conformance: RF, RRM, Protocol/3GPP

TTA

Cetecom

BV Korea

FIME Korea

LG

KTL

SGS Korea

MTCC

SAMSUNG

### Interoperability: MMS, Browsing/OMA, UICC based NFC/GSMA

TTA

FIME Korea

### Field Trial: Live Cellular Network

TTA

## Field Trial Qualified Operators

Operator	Territory
AT&T Services, Sprint	USA
Bouygues Telecom, Orange SA	France
Deutsche Telekom, Vodafone	Germany
MEO	Portugal
NTT DOCOMO	Japan
Telecom Italia, Vodafone	Italy
Telefonica (O2)	UK

출처: GCF

# C-V2X 시험인증 현황 및 전망

## 3GPP Technical Specifications

- TS 36.521-1 UE Conformance Spec. Radio Transmission and Reception
- TS 36.523-1 UE Conformance Spec. Protocol

## GCF C-V2X Test Cases

- Total: 69/13,660(LTE Single)
  - > RF, RRM: 0/61
  - > Protocol: 3/8
- WI-281: V2V for E-UTRAN Rel.14
- WI-282: V2X for E-UTRAN Rel.14

Conformance Assessment Table

3.73.1\_20190319\_r019

Specification	Test Case	TC Description	TC Comment	Handover TC	WI	Type of Test	Band Applicability	Band	Priority	Category	Validated Test Platform	Validated Test Platforms with Exceptions
36.523-1	24.1.2	V2X Sidelink Communication / Pre-configuration		NO	WI-281-47	Protocol	Single	TDD47	1	B		92
36.523-1	24.1.4	V2X Sidelink Communication / Pre-configuration		NO	WI-281-47	Protocol	Single	TDD47	1	B		92
36.523-1	24.1.16	V2X Sidelink Communication / Pre-configuration		NO	WI-282-47	Protocol	Single	TDD47	1	C		92

## GCF Test Platforms

- Rel.14 RCT: None so far
- Rel.14 PCT: CMW500(Rohde & Schwarz)



# C-V2X 시험인증 현황 및 전망

## 3GPP TS 36.523-1, TC 24.1.2

### V2X Sidelink Communication / Pre-configured authorization / Utilization of the pre-configured resources / Tx

#### Test Purpose (TP)

**with** { UE being authorized for performing V2X sidelink Communication being provisioned with Radio parameters for when the UE is "not served by E-UTRAN" associated with a geographical area, **and**, UE out of coverage on the anchor carrier used for V2X configuration }

#### ensure that {

**when** { UE wants to transmit V2X sidelink Communication, and, UE determines itself as being located in that geographical area }  
**then** { UE is able to transmit V2X sidelink Communication using the preconfigured for "not served by E-UTRAN" resources }  
}

#### Test Procedure

Step	Procedure	Message Sequence		TP	Verdict
		U - S	Message		
1	SS sends AT command +CATM to activate UE test loop mode	<--	AT COMMAND: +CATM	-	-
2	SS sends AT command +CCUTLE to close UE test loop mode E (transmission mode).	<--	AT COMMAND: +CCUTLE	-	-
3	SS configures: GNSS simulator is configured to simulate a location in the centre of area 1 as defined in T S36.508 Table [FFS] that is also pre-configured in the UE.				
4	Wait for 5 sec to allow the UE to start transmission.	-	-	-	-
5	Check: Does the UE transmit V2X sidelink communication data over the PC5 interface in the next 3 transmission periods in accordance with the resources pre-configured in SL-V2X-Preconfiguration-r14 -> v2x-PreconfigFreqList-r14"?	-->	-	1	P



# C-V2X 시험인증 현황 및 전망

## OmniAir Certification Plan

Layers		WAVE	
Messages		SAE 2735/2945	IEEE 1609.2
Protocol	Transport	IEEE 1609.3	
	Network		
MAC		IEEE 1609.4	
		IEEE 802.11p	
PHY		IEEE 802.11p	

'17.10 ~, DSRC-V2X



Layers		C-V2X	
Messages		SAE 3161	IEEE 1609.2
Protocol	Transport	IEEE 1609.3	
	Network		
MAC		3GPP Rel.14 LTE C-V2X	
PHY			

'19.4Q, Cellular-V2X



## OMNIAIR QUÉBEC PLUGFEST – TEST STATIONS

Keysight	Test Station	V2X and OBU	Bench	CV2X, DSRC PHY, 1609, 2945
OmniAir		Surveillance	Bench/Field	C-V2X Sniffer & C-V2X Interoperability
Penta Security	Test Station	SCMS	Bench	SCMS - Multi-root, SCMS cert provisioning
Rohde & Schwarz	Test Station	V2X	Bench	CV2X, DSRC PHY testing
SGS	Test Station	V2X & OBU	Bench	Spirent 2945 and Keysight 802.11p
Siemens	Test Station	RSU - Interoperability	Driving	CV Pilot Interop, TIM/RSA, SPAT, MAP
Spirent	Test Station	V2X and OBU	Bench	CV2X, DSRC, 1609, 2945

출처: OmniAir

### What's New?

- Enhanced V2X Interoperability Testing
- SwRI GNSS Field Testing
- C-V2X Technology Testing

**감사합니다.**

# 질의응답