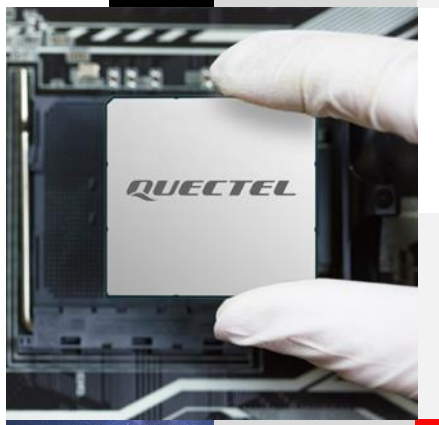
Quectel Automotive Module

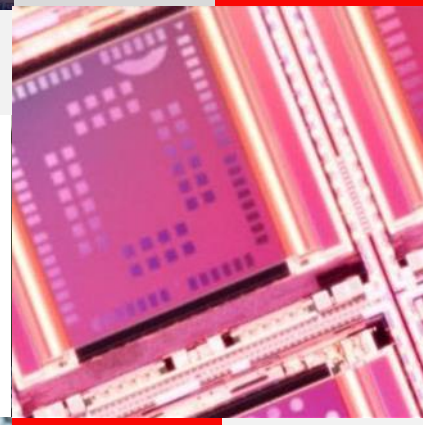
Product Overview

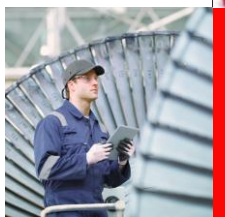
Build a Smarter World

Duty of Confidentiality

The Receiving Party shall keep confidential all documentation and information provided by Quectel, except when the specific permission has been granted by Quectel. The Receiving Party shall not access or use Quectel’s documentation and information for any purpose except as expressly provided herein. Furthermore, the Receiving Party shall not disclose any of the Quectel's documentation and information to any third party without the prior written consent by Quectel. For any noncompliance to the above requirements, unauthorized use, or other illegal or malicious use of the documentation and information, Quectel will reserve the right to take legal action.

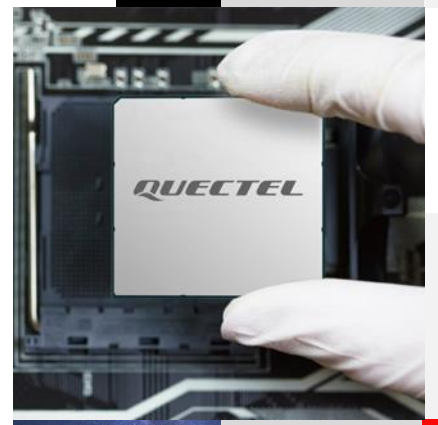


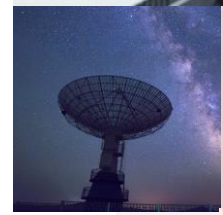


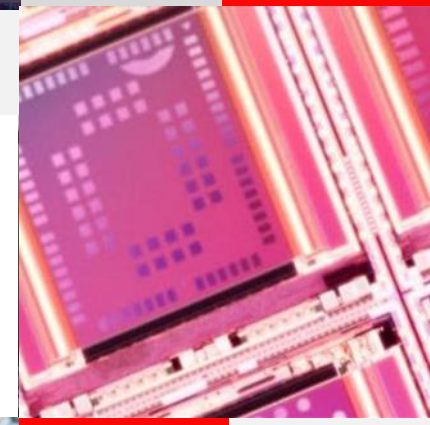


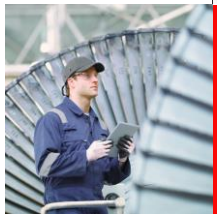
Roadmap

Product Overview
Support Package
Enhanced Technologies
Applications









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Automotive Modules Roadmap

5G

SA515M

AG551Q Series
-CN/ -EU/
-NA/ -JP ①

5G

AG550Q Series
-CN/ -EU/
-NA/ -JP ①

5G
C-V2X

AG552Q Series
-CN ① / -EU ① /
-NA ① / -JP ①

5G
DSDA

AG553Q Series
-CN ① / -EU/
-NA ① / -JP ①

5G
C-V2X
DSDA

MT2735x

Q4/21

AG568N Series
-CN* / -EU* /
-NA ① / -ROW ①

5G
DSDS

Q4/21

AG569N Series
-CN* / -EU ① /
-NA ① / -JP ①

5G
DSDS
C-V2X

Cat 6/12

SA415M

AG520R Series
-CN/ -EU/ -NA/
-JP/ -LA ①

LTE-A
C-V2X

AG521R Series
-CN/ -EU/ -NA/
-JP ① / -LA ①

LTE-A

AG529R-CN

LTE-A

MT2731R

AG509M Series
-EU*/ -NA ① /
-JP ①/ -CN ①

LTE-A

AG519M Series
-EU*/ -NA ① /
-JP ①/ -CN ①

LTE-A

Cat 4

MDM9628

AG35 Series
-CE/ -E/ -NA/ -LA/ -J

C-V2X

MDM9150

AG15

C-V2X AP

SA2150P

AG215S

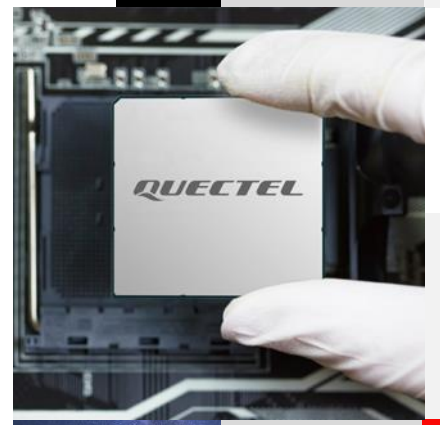
** means under development*
① means under planning

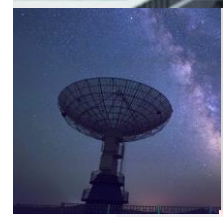
Qx/YY *Estimated Engineering Sample Time*

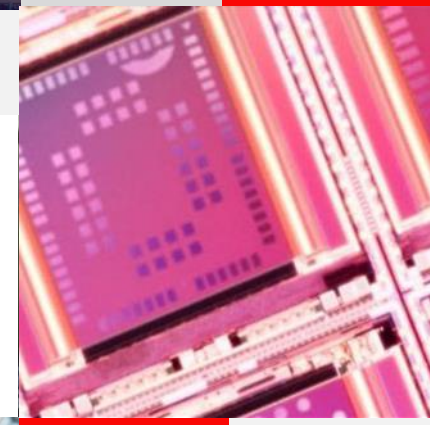
Roadmap

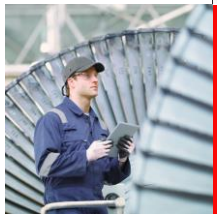
Product Overview

Support Package
Enhanced Technologies
Applications





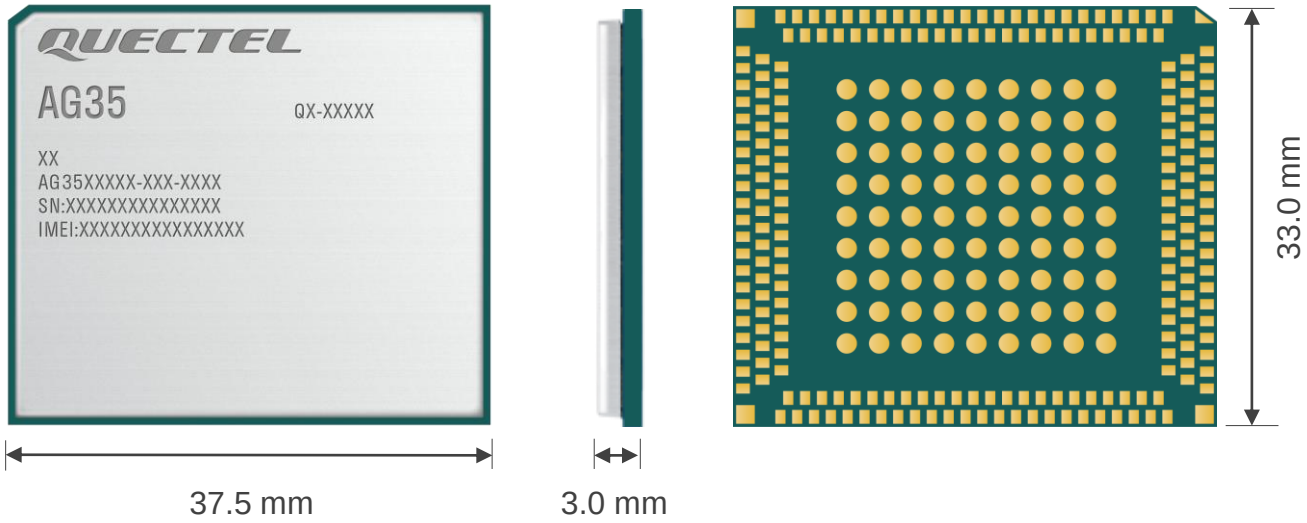




Build a Smarter World

Automotive Module AG35 Series Highlights

Multi-Mode LTE Cat 4 Module (MDM9628)



33.0 mm × 37.5 mm × 3.0 mm

- Qualcomm MDM9628 chipset solution dedicated for automotive applications
- Ideal for automotive applications with IATF 16949 requirement
- Wide operation temperature range (-40 °C to +85 °C) and support eCall under +95 °C NOTE
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-constellation GNSS receiver available for applications requiring fast and accurate fixes in any environment

NOTE: +95 °C eCall application is supported through proper customers' system designs, and it may lead to shortened module lifetime.

AG35 Series Specifications

Multi-Mode LTE Cat 4 Module

33.0 mm × 37.5 mm × 3.0 mm
150 Mbps DL/ 50 Mbps UL

Variant		AG35-CE	AG35-E	AG35-NA	AG35-LA	AG35-J
LTE	LTE-FDD	B1/B3/B5/B8	B1/B3/B5/B7/B8/B20/B28	B2/B4/B5/B7/B12(B17)/B13	B1/B2/B3/B4/B5/B7/B8/ B28	B1/B3/B5/B8/B9/B19/ B21/B28
	LTE-TDD	B34/B38/B39/B40/B41	B38/B40	-	-	B41
UMTS	WCDMA	B1/B8	B1/B5/B8	B2/B4/B5	B1/B2/B3/B4/B5/B8	B1/B3/B5/B6/B8/B19
	TD-SCDMA	B34/B39	-	-	-	-
EVDO/CDMA		BC0①	-	-	-	-
GSM		900/1800 MHz	900/1800 MHz	850/1900 MHz	850/900/1800/1900 MHz	-
Embedded GNSS		Y	Y	Y	Y	Y
Dead Reckoning		Optional	Optional	Optional	Optional	Optional
PPE (RTK)		Optional	-	-	-	-
Wi-Fi/BT Interface		Y	Y	Y	Y	Y
Region		China	EMEA, Korea, Australia, India, Southeast Asia	North America	Latin America	Japan
Certification		**Regulatory:** SRRC/ NAL/ CCC	**Carrier:** KT/ SKT* **Regulatory:** GCF/ CE/ FCC/ KC/ RCM	**Carrier:** Verizon/ AT&T/ T-Mobile/ Rogers **Regulatory:** GCF/ FCC/ PTCRB/ IC	**Regulatory:** CE/ FCC/ Anatel/ RCM	**Carrier:** NTT DOCOMO **Regulatory:** JATE/ TELEC

"Y" means supported. ** means under development.* *① means the band is optional.*

AG35 Series Key Features

Item	Description		
Chipset	Enhanced processes compliant with the key testing items required by AEC-Q100		
	Application processor - ARM Cortex A7 up to 1.2 GHz with 256 kB L2 cache - ARM Cortex A7 - primary boot processor Modem processor - QDSP6 processor at up to 691 MHz (Turbo) RPM processor - ARM Cortex M3 up to 100 MHz		
Memory	Embedded Nand+DDRAM - NAND: 512 MB - DDRAM: 256 MB Available for customers - NAND: > 120 MB - DDRAM: > 100 MB		
Interfaces	USB 2.0, HSIC, UART, I2C, PCM, SGMII, SDIO, (U)SIM, ADC, SPI, GPIOs		
Enhanced Features	Wi-Fi + BT* eCall, QuecOpen® (Open Linux), Multi-APN ERA-GLONASS* Secure Boot, TrustZone/TPM*, Code/user data backup for higher security Temperature management Embedded codec (*Optional*) ESD/ EMI protection through internal specific circuits and components		
Data Speed	**LTE:**	LTE-FDD: Max. 150 Mbps (DL), Max. 50 Mbps (UL)	LTE-TDD: Max. 130 Mbps (DL), Max. 30 Mbps (UL)
	UMTS:	DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps	WCDMA: Max. 384 kbps (DL/UL)
	TD-SCDMA:	Max. 4.2 Mbps (DL), Max. 2.2 Mbps (UL)	
	CDMA2000:	EVDO: Max. 3.1 Mbps (DL), Max. 1.8 Mbps (UL)	1X Advanced: Max. 307.2 kbps (DL/UL)
	GSM:	EDGE: Max. 296 kbps (DL), Max. 236.8 kbps (UL)	GPRS: Max. 107 kbps (DL), Max. 85.6 kbps (UL)

** means under development*

AG35 Series Certification Timeline

2021

Project Stage

AG35-CE/ AG35-E/ AG35-NA/ AG35-J/ AG35-LA — SOP

Carrier Certification

AG35-E	**KT**	**Completed**
	SKT	**TBD**
AG35-NA	**Verizon① / AT&T/ T-Mobile/ Rogers**	**Completed**
AG35-J	**NTT DOCOMO**	**Completed**

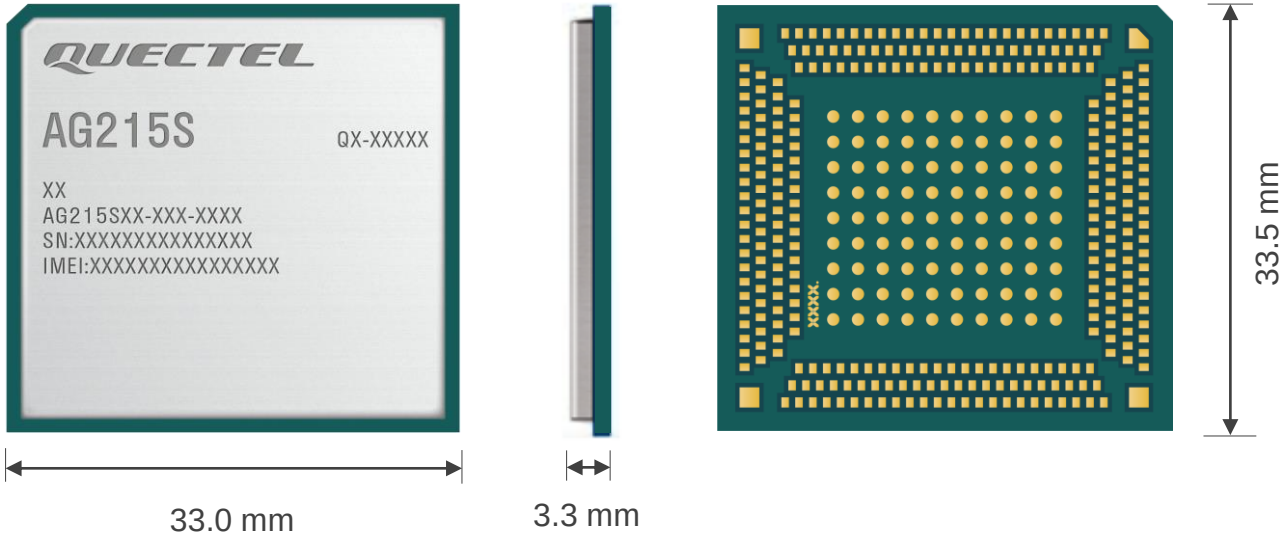
Regulatory Certification

AG35-CE	**SRRC/ NAL/ CCC**	**Completed**
AG35-E	**GCF/ CE/ FCC/ KC/ RCM**	**Completed**
AG35-NA	**GCF/ FCC/ PTCRB/ IC**	**Completed**
AG35-J	**JATE/ TELEC**	**Completed**
AG35-LA	**CE/ FCC/ Anatel/ RCM**	**Completed**

① Conditional Waiver NS07.

Automotive EAP Module AG215S Highlights

AP Module for C-V2X and Telematics (SA2150P)



33.5 mm × 33.0 mm × 3.3 mm

- Qualcomm SA2150P chipset for the C-V2X and Telematics Application Processor
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- IATF 16949 compliant Application Processor to host ITS stack, C-V2X and Telematics applications
- Optimized communication performance with Quectel AG520R/AG550Q/AG553Q
- Embedded hardware engine fulfills powerful ECDSA verification capability
- Support global and China national security algorithms
- Additional HSM/SE integrated, and optional ITS stack integrated
- Wide operation temperature range (-40 °C to +85 °C)
- Extremely high reliability thanks to automotive grade testing standard

EAP: External Application Processor

AG215S Specifications

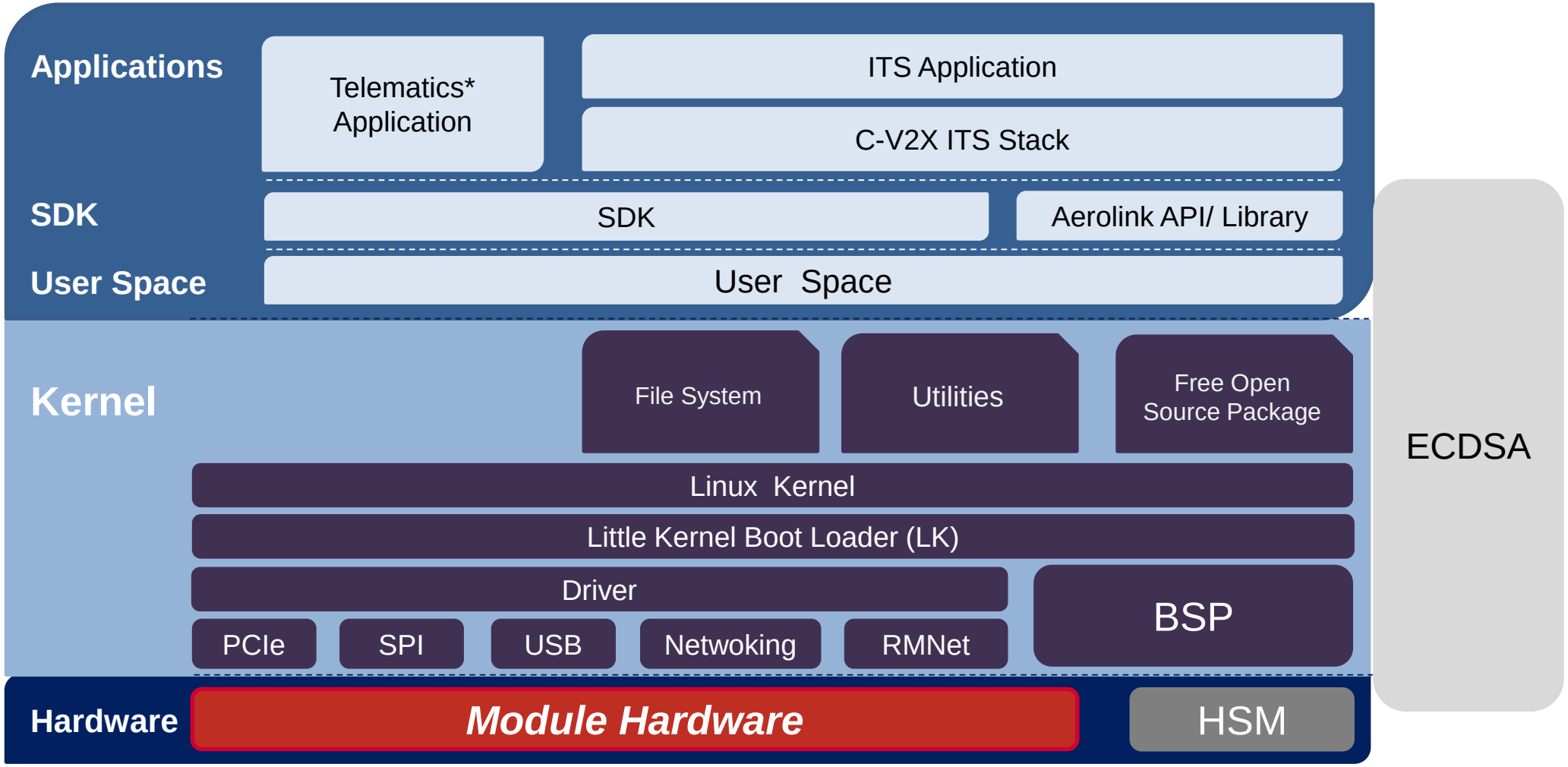
Automotive Grade C-V2X and Telematics Application Processor Module

33.5 mm × 33.0 mm × 3.3 mm

Features	AG215S
Processors	• 64-bit ARM Cortex-A53 Microprocessor Cores • 1.4 GHz Quad-Core Processor
Interfaces	SDIO, PCIe Gen 2*, USB 3.0/2.0, RGMII 1 Gbps, UART, SPI, I2C, 1PPS (Input), ADC
Embedded ECDSA Hardware Engine	Support NIST p-384, NIST p-256, Brainpool p-384, Brainpool p-256, SM2 256 bit Curves
Scalable ECDSA Capability	Up to 2500TPS through embedded engine and CPU (based on NIST p-256 and SM2)
Hardware Crypto Engine Embedded	• Secret key generation and storage, and digital signature and verification • Additional 2000TPS ECSDA capability (based on NIST p-256 and SM2)
Region	Global
Certification	TBD

** means under development*

AG215S Software Architecture

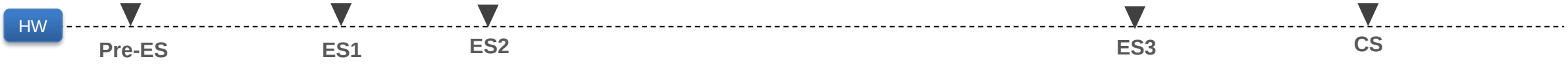


** Telematics under planning. Telematics Application is not needed if using QuecOpen® SDK.*

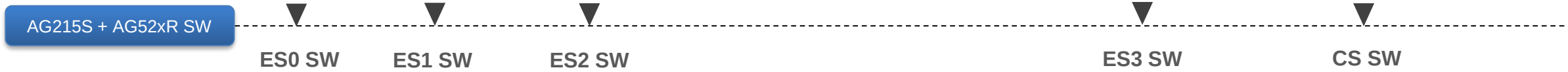
AG215S EAP Module Timeline

2020									2021											
Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



- ***Pre-ES HW:*** *Used for demonstration and customers' software designs, etc.*
- ***ES1 HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
- ***ES2 HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***ES3 HW:*** *HW is in test.*
- ***CS HW:*** *Hardware design ready for SOP.*

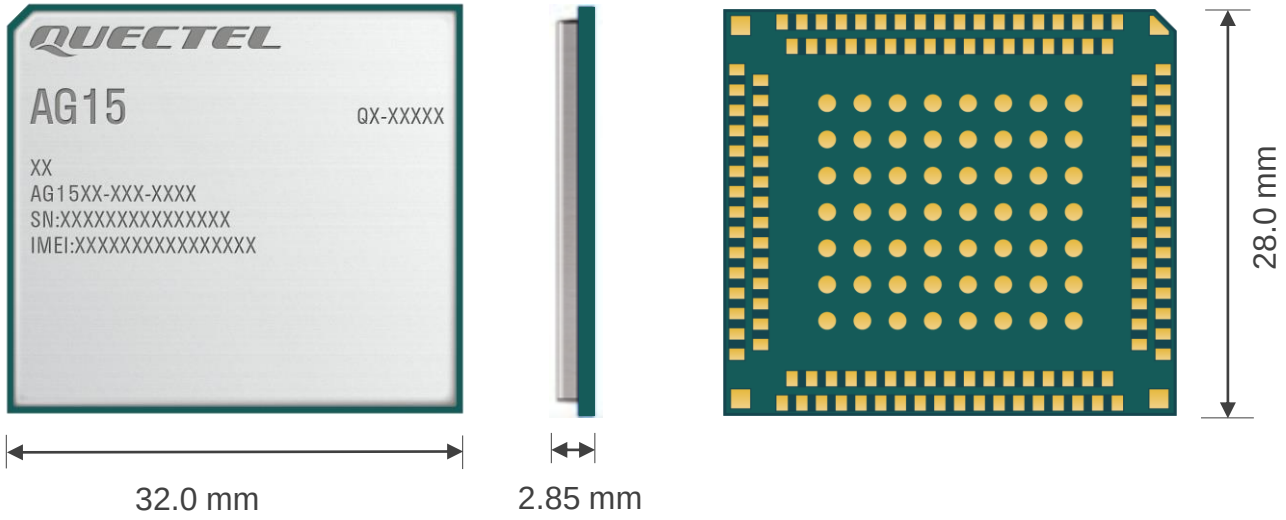


AG215S + AG55xQ SW **Planning**

- ***ES0 SW:*** *Basic functions ready.*
- ***ES1 SW:*** *C-V2X SDK, ITS stack and security function ready.*
- ***ES2 SW:*** *Most of the functions ready.*
- ***ES3 SW:*** *functions completed.*
- ***CS SW:*** *Bug fix and SW stability improved.*

Automotive C-V2X Module AG15 Highlights

Support C-V2X PC5 Direct Communications (MDM9150)



28.0 mm × 32.0 mm × 2.85 mm

- Qualcomm MDM9150 chipset solution dedicated for C-V2X (V2V, V2I, V2P) applications
- Designed to meet IATF 16949 requirements
- Wide operation temperature range (-40 °C to +85 °C)
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Extremely high reliability thanks to automotive grade testing standard
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-constellation GNSS receiver available for applications requiring fast and accurate fixes in any environment

C-V2X Module AG15 Specifications

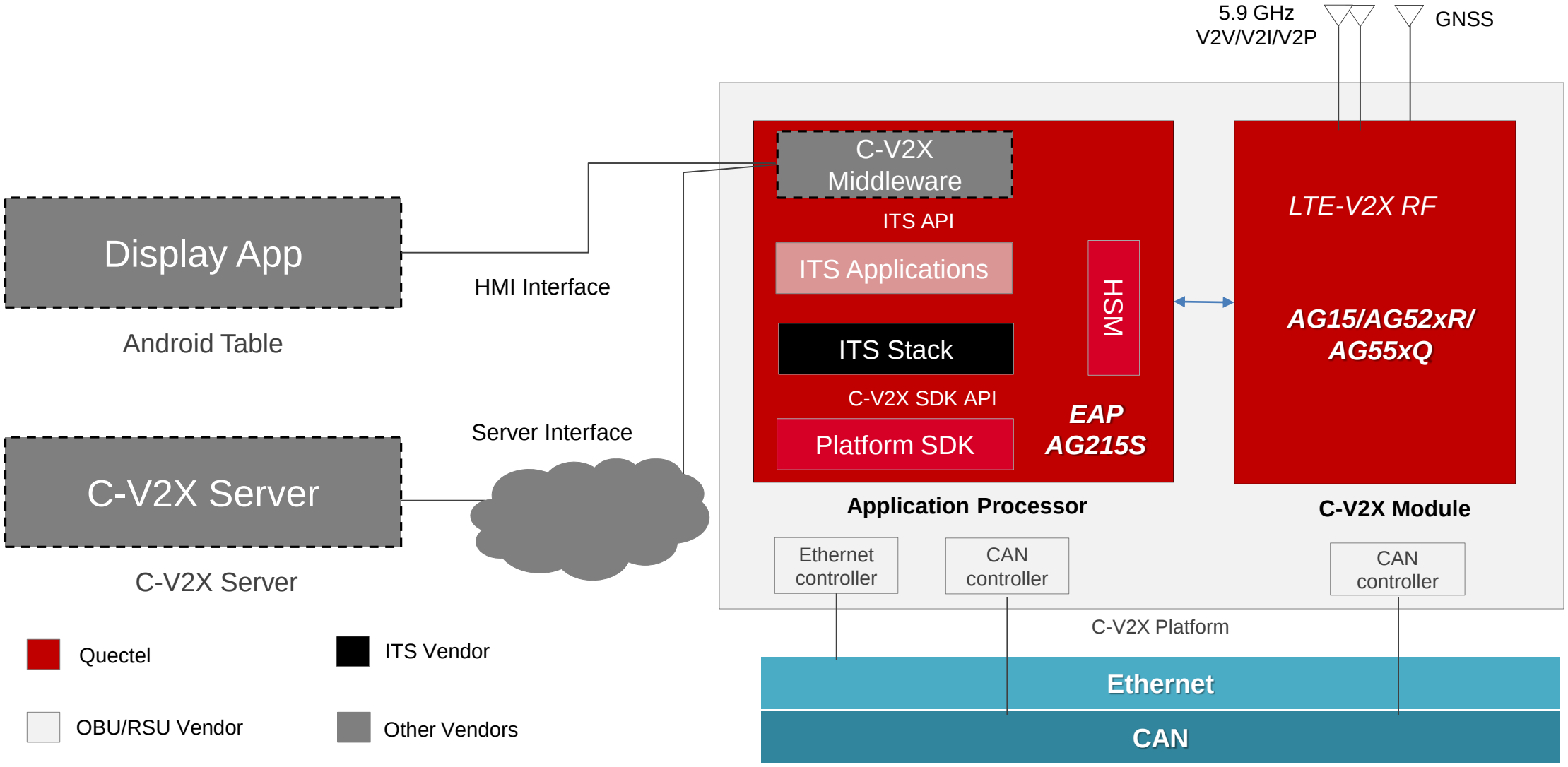
Qualcomm MDM9150 C-V2X Chipset solution based on 3GPP Rel-14 for PC5-based direct communications

28.0 mm × 32.0 mm × 2.85 mm

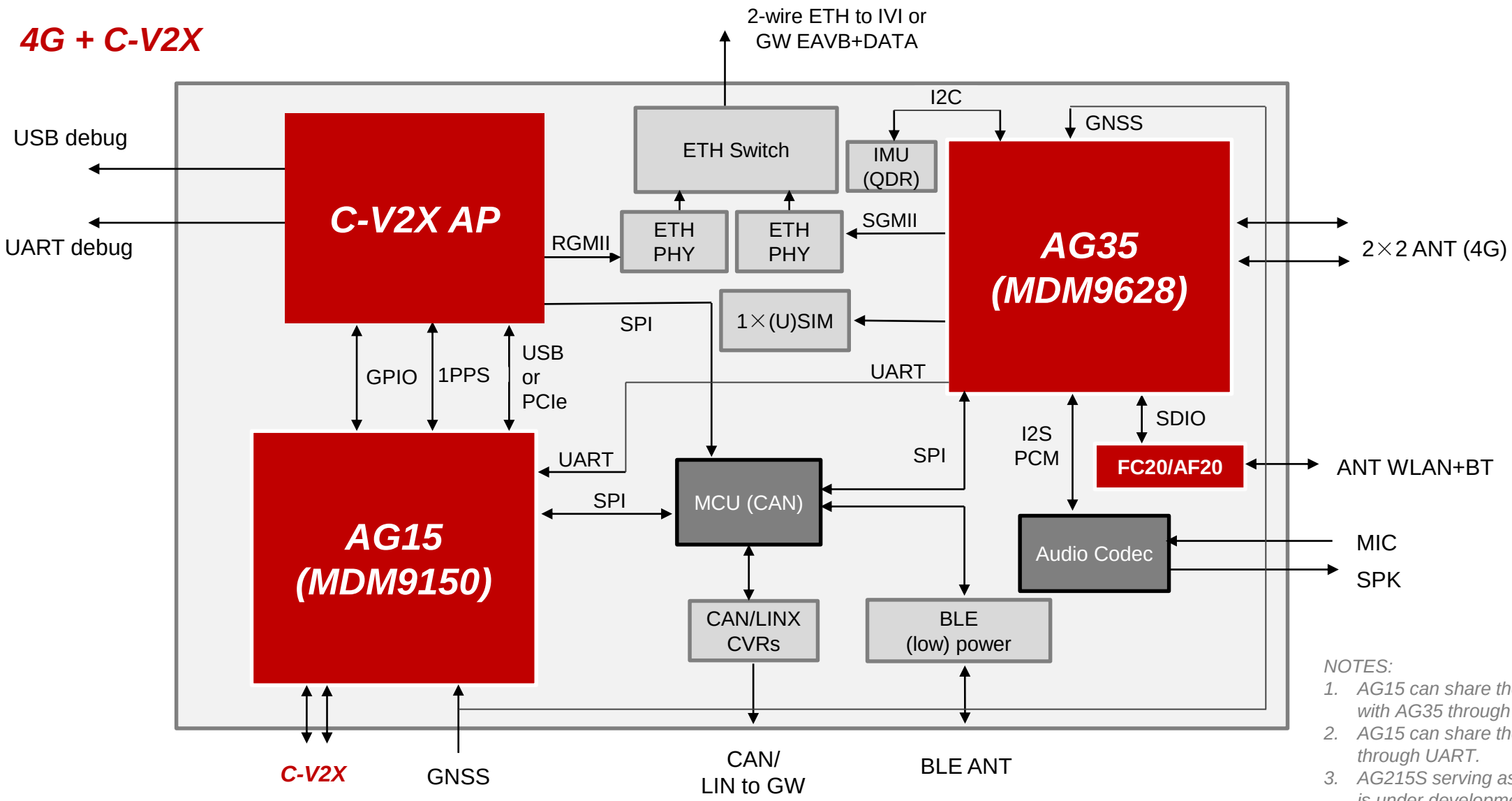
Features	AG15
Frequency	5.8 GHz & 5.9 GHz
Embedded GNSS*	GPS/ GLONASS/ BeiDou/ Galileo/ QZSS
Interfaces	PCIe, USB 3.0/2.0, SPI, I2C, UART, GPIO, ADC, DR_SYNC
Dead Reckoning*	QDR3 (Share the same IMU with MDM9628)
Enhanced Features	PACE (Position Assisted Clock Estimator), TUNC (Time Uncertainty Constraint)
Region	Global
Certification	TBD

** means under development*

C-V2X System Architecture



AG15 + AG35 (with IMU) + EAP TCU Hardware Architecture

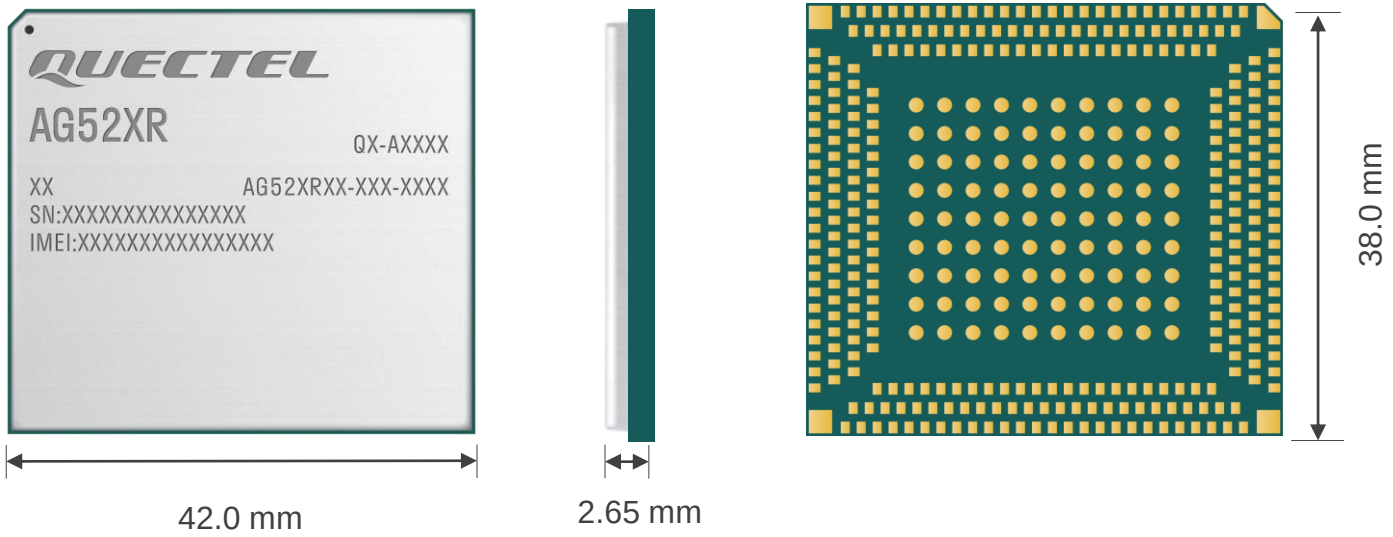


NOTES:

1. *AG15 can share the GNSS antenna with AG35 through a power splitter.*
2. *AG15 can share the IMU with AG35 through UART.*
3. *AG215S serving as C-V2X AP module is under development.*

Automotive Module AG52xR Series Highlights

Multi-Mode Automotive Module up to LTE Cat 12 + Optional C-V2X (SA415M)



38.0 mm × 42.0 mm × 2.65 mm

- AEC-Q100 qualified Qualcomm SA415M chipset solution dedicated for automotive and optional C-V2X applications
- Ideal for automotive applications with IATF 16949 requirement
- Wide operation temperature range (-40 °C to +85 °C) and support eCall under +95 °C
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-frequency GNSS receiver available for applications requiring fast and accurate fixes in any environment

AG52xR Series Specifications

Multi-Mode LTE up to Cat 12 + Optional C-V2X

Variant		AG52xR-CN	AG52xR-EU	AG52xR-NA	AG52xR-JP	AG52xR-LA (Planning)
LTE	LTE-FDD	B1/B3/B5/B7/B8	B1/B3/B5/B7/B8/B20/ B28/B32①	B2/B4/B5/B7/B12/B13/B14/ B25/B26/B29①/B30*①/B66/B71	B1/B3/B5/B8/B9/B11/ B18/B19/B21/B28	B1/B2/B3/B4/B5/ B7/B8/B20/B28
	LTE-TDD	B34/B38/B39/ B40/B41	B38/B40/B41	-	B41	B38/B40/B41
UMTS	WCDMA	B1/B8	B1/B3/B5/B8	-	B1/B3/B5/B8/B9/B19	B1/B2/B3/B5/B8
GSM		900/1800 MHz	900/1800 MHz	-	-	850/900/1800/1900 MHz
C-V2X		AG520R	AG520R	AG520R	TBD	AG520R
MF-GNSS Optional		L1 + L5	L1 + L5	L1 + L5	L1 + L5	L1 + L5
Dead Reckoning Optional		QDR 3.0	QDR 3.0	QDR 3.0	QDR 3.0	QDR 3.0
PPE (RTK)		Optional	Planning	Planning	TBD	-
Ethernet Optional		RGMII	RGMII	RGMII	RGMII	RGMII
Wi-Fi/BT Interface		Y	Y	Y	Y	Y
Region		China	EMEA/ Korea/ Brazil/ India/ Australia	North America	Japan	Latin America *(excl. Brazil)*
Certification		**Regulatory:** SRRC/ NAL/ CCC	**AG521R-EU:** Carrier: TBD Regulatory: CE **AG520R-EU:** TBD	**AG521R-NA:** Carrier: AT&T/ T-Mobile/ Verizon* Regulatory: GCF/ PTCRB/ FCC/ IC **AG520R-NA:** TBD	TBD	TBD

"Y" means supported.
** means under development/ongoing.*
① LTE-FDD B29, B30 and B32 support Rx only

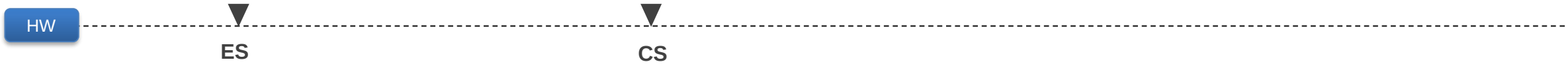
AG52xR Series Key Features

Item	Description
4G Category	Default Configuration: Cat 12, 2×2 MIMO *Optional Configuration: Cat 16,* 4 ×4 MIMO *(Based on customized firmware and certifications)*
Apps Processor	ARM Cortex A7 at 1.5 GHz; 256 KB L2
C-V2X (AG520R)	PC5 Mode 4 (direct communication), Uu mode
Embedded GNSS Optional	• GPS/ GLONASS/ BeiDou/ Galileo • Enhanced Automotive MF-GNSS (L1 + L5)
QDR Optional	QDR3 (external IMU is required)
Interface	PCIe, USB 2.0/3.0, RGMII, SDIO, SPI, I2C, I2S, PCM, UARTs, GPIOs, 1PPS, Wi-Fi interface, BT interface
Antenna Interfaces	• 2 × cellular antenna interfaces for 2×2 MIMO *(4 cellular antenna interfaces for 4×4 MIMO available as an option)* • 2 × C-V2X antenna interfaces • 1 × GNSS antenna interface
Peak Data Rate	**AG521R Series** **LTE:** LTE Cat 16: LTE-FDD: Max. 1.0 Gbps (DL)/ 150 Mbps (UL) LTE-TDD: Max. 716 Mbps (DL)/ 90 Mbps (UL) LTE Cat 12: LTE-FDD: Max. 600 Mbps (DL)/ 150 Mbps (UL) LTE-TDD: Max. 410 Mbps (DL)/ 90 Mbps (UL) LTE Cat 6: LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD: Max. 226 Mbps (DL)/ 28 Mbps (UL) **AG520R Series** **LTE:** LTE Cat 16: LTE-FDD: Max. 1 Gbps (DL)/ 75 Mbps (UL) LTE-TDD: Max. 716 Mbps (DL)/ 45 Mbps (UL) LTE Cat 12: LTE-FDD: Max. 600 Mbps (DL)/ 75 Mbps (UL) LTE-TDD: Max. 410 Mbps (DL)/ 45 Mbps (UL) LTE Cat 6: LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD: Max. 226 Mbps (DL)/ 28 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 296 kbps (DL), Max. 236.8 kbps (UL) GPRS: Max. 107 kbps (DL), Max. 85.6 kbps (UL)
	C-V2X: Max. 30 Mbps (Tx/Rx)

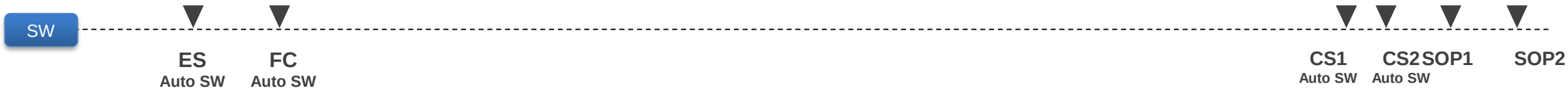
AG52xR-CN Development Schedule

2020												2021											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



- ***ES HW:*** *Mainly used for customers' software designs, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*



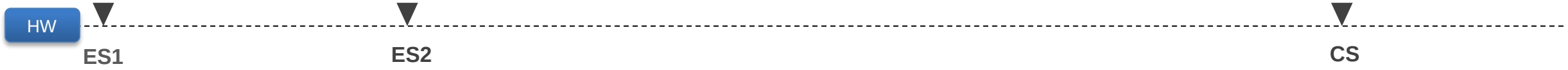
- ***ES Auto SW:*** *SDK/Data architecture ph1(USB) without QCMAP ready. SDK APIs for C-V2X and C-V2X+L/3G(USB) ready. BT/ Wi-Fi/ Low Power/ Backup& Restore/ DFOTA/ MF-GNSS/ eCall/ ERA-GLONASS ready.*
- ***FC Auto SW:*** *Function completed. SecBoot/ DM-Verity/ SELinux/ Trustzone/ eAVB ready. CS quality for LTE-A Only variant.*
- ***CS1 Auto SW (AG521R-CN):*** *Telematics ready. The firmware is quite stable and can be upgraded..*
- ***CS2 Auto SW (AG520R-CN):*** *QDR/ PPE/ C-V2X + Telematics ready. The firmware is quite stable and can be upgraded..*
- ***SOP1 SW (AG521R-CN):*** *Firmware design ready for SOP. Ready for mass production.*
- ***SOP2 SW (AG520R-CN):*** *Firmware design ready for SOP. Ready for mass production.*

The timeline is estimated based on Qualcomm release schedule.

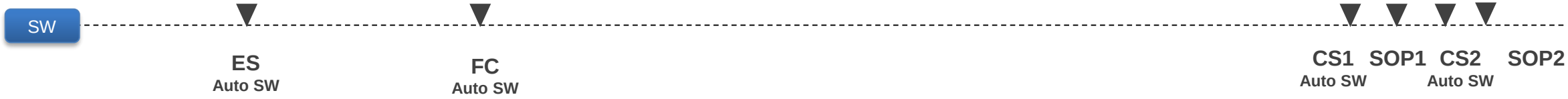
AG52xR-NA Development Schedule

2020												2021											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



- ***ES1 HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
- ***ES2 HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*



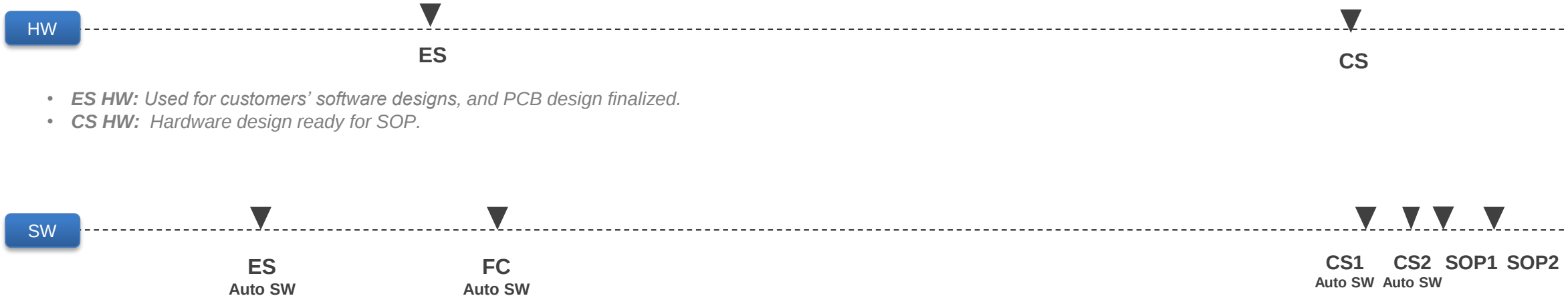
- ***ES Auto SW:*** *SDK APIs for C-V2X and C-V2X+L/3G(USB) ready. Low Power/ Backup& Restore/ DFOTA / MF-GNSS/ eCall/ ERA-GLONASS ready.*
- ***FC Auto SW:*** *Function completed. SecBoot/ DM-Verity/ SELinux/ Trustzone/ eAVB ready. CS quality for LTE-A Only variant.*
- ***CS1 Auto SW (AG521R-NA):*** *Telematics ready. The firmware is quite stable and can be upgraded..*
- ***CS2 Auto SW (AG520R-NA):*** *QDR/ PPE/ C-V2X + Telematics ready. The firmware is quite stable and can be upgraded..*
- ***SOP1 SW (AG521R-NA):*** *Firmware design ready for SOP. Ready for mass production.*
- ***SOP2 SW (AG520R-NA):*** *Firmware design ready for SOP. Ready for mass production.*

The timeline is estimated based on Qualcomm release schedule.

AG52xR-EU Development Schedule

2020												2021											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



- ***ES HW:*** *Used for customers' software designs, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

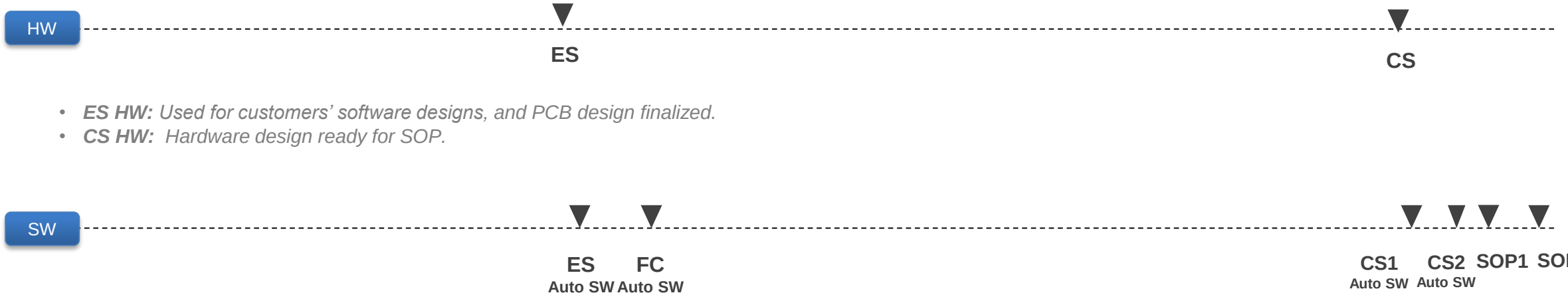
- ***ES Auto SW:*** *SDK/Data architecture ph1(USB) without QCMAP ready. SDK APIs for C-V2X and C-V2X+L/3G(USB) ready. BT/ Wi-Fi/ Low Power/ Backup& Restore/ DFOTA/ MF-GNSS/ eCall/ ERA-GLONASS ready.*
- ***FC Auto SW:*** *Function completed. SecBoot/ DM-Verity/ SELinux/ Trustzone/ eAVB ready. CS quality for LTE-A Only variant.*
- ***CS1 Auto SW (AG521R-EU):*** *Telematics ready. The firmware is quite stable and can be upgraded..*
- ***CS2 Auto SW (AG520R-EU):*** *QDR/ PPE/ C-V2X + Telematics ready. The firmware is quite stable and can be upgraded..*
- ***SOP1 SW (AG521R-EU):*** *Firmware design ready for SOP. Ready for mass production.*
- ***SOP2 SW (AG520R-EU):*** *Firmware design ready for SOP. Ready for mass production.*

The timeline is estimated based on Qualcomm release schedule.

AG52xR-JP Development Schedule

2020												2021											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Project Schedule



- ***ES HW:*** *Used for customers' software designs, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

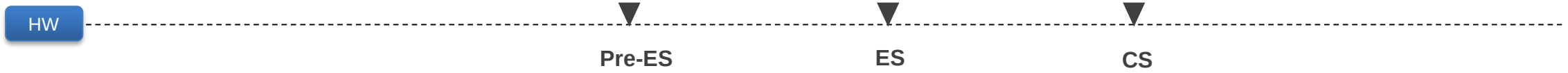
- ***ES Auto SW:*** *SDK/Data architecture ph1(USB) without QCMAP ready. SDK APIs for C-V2X and C-V2X+L/3G(USB) ready. BT/ Wi-Fi/ Low Power/ Backup& Restore/ DFOTA/ MF-GNSS/ eCall/ ERA-GLONASS ready.*
- ***FC Auto SW:*** *Function completed. SecBoot/ DM-Verity/ SELinux/ Trustzone/ eAVB ready. CS quality for LTE-A Only variant.*
- ***CS1 Auto SW (AG521R-JP ①):*** *Telematics ready. The firmware is quite stable and can be upgraded..*
- ***CS2 Auto SW (AG520R-JP):*** *QDR/ PPE/ C-V2X + Telematics ready. The firmware is quite stable and can be upgraded..*
- ***SOP1 SW (AG521R-JP ①):*** *Firmware design ready for SOP. Ready for mass production.*
- ***SOP2 SW (AG520R-JP):*** *Firmware design ready for SOP. Ready for mass production.*

① AG521R-JP is under planning.
The timeline is estimated based on Qualcomm release schedule.

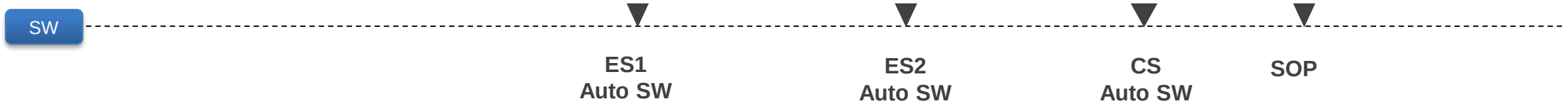
AG52xR-LA Development Schedule (Preliminary)

2021				2022			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4

Project Schedule



- ***Pre-ES HW:*** *Used for demonstration and customers' software designs, etc.*
- ***ES HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
- ***CS HW:*** *Hardware design ready for SOP.*



- ***ES1 Auto SW:*** *SDK/Data architecture ph1(USB) without QCMAP ready. SDK APIs for C-V2X, C-V2X+L/3G(USB) and DFOTA ready.*
- ***ES2 Auto SW:*** *BT/ Wi-Fi/ QDR/ MF-GNSS/ eCall/ SecBoot ready.*
- ***CS Auto SW:*** *C-V2X + Telematics ready. The firmware is quite stable and can be upgraded..*
- ***SOP SW:*** *Firmware design ready for SOP. Ready for mass production.*

AG52xR-LA is under planning.
The timeline is estimated based on Qualcomm release schedule.

AG52xR Series Certification Timeline

2020				2021											
Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Carrier Certification

AG521R-NA

AT&T/T-Mobile — **Completed**

Verizon

Regulatory Certification

AG521R-NA

GCF/ PTCRB/ FCC/ IC — **Completed**

AG521R-EU

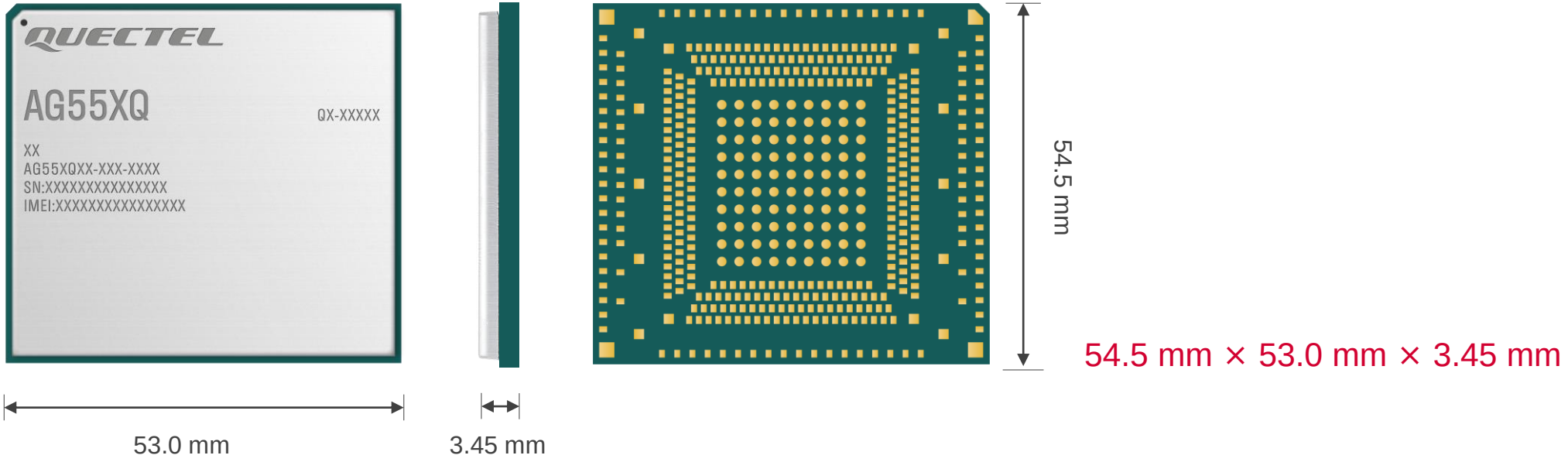
CE — **Completed**

AG52xR-CN

SRRC/ NAL/ CCC — **Completed**

Automotive Module AG55xQ Series Highlights

Automotive Grade 5G Module + Optional C-V2X/ DSDA (SA515M)



54.5 mm × 53.0 mm × 3.45 mm

- AEC-Q100 qualified Qualcomm SA515M chipset solution dedicated for automotive 5G NR and optional C-V2X/DSDA applications
- Ideal for automotive applications with IATF 16949 requirement
- Wide operation temperature range (-40 °C to +85 °C) and support eCall under +95 °C
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-frequency GNSS receiver available for applications requiring fast and accurate fixes in any environment

AG55xQ Series Specifications

Automotive Grade 5G Module + Optional C-V2X/DSDA

54.5 mm × 53.0 mm × 3.45 mm

Variant		AG55xQ-CN	AG55xQ-EU	AG55xQ-NA	AG55xQ-JP (Planning)
5G NR	5G FDD	n1①/n3①/n28①	n1/n3/n8/n20/n28	n2/n5/n25/n66/n71	n1/n3
	5G TDD	n41/n78/n79	n41/n78	n41/n78	n77/n78/n79
LTE	LTE-FDD	B1/B3/B5/B7/B8	B1/B2/B3/B4/B5/B7/B8/B20/B28/B32②	B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B28/B29②/B30②/B66/B71	B1/B3/B5/B7/B8/B9/B11/B19/B21/B28
	LTE-TDD	B34/B38/B39/B40/B41	B38/B40/B41/B42	B41/B48	B41
UMTS	WCDMA	B1/B8	B1/B3/B5/B6/B8	B2/B4/B5	B1/B3/B5/B8/B9/B19
	TD-SCDMA	-	-	-	-
GSM		900/1800 MHz	900/1800/850/1900 MHz	1900 MHz	-
C-V2X B47		AG550Q/AG553Q	AG550Q/AG553Q	AG550Q/AG553Q	AG550Q/AG553Q
DSDA (SIM2 for 2G/4G only)		AG552Q/AG553Q	AG552Q/AG553Q	AG552Q/AG553Q	AG552Q/AG553Q
MF-GNSS Optional		L1 + L5	L1 + L5	L1 + L5	L1 + L5
Dead Reckoning Optional		QDR 3.0	QDR 3.0	QDR 3.0	QDR 3.0
PPE (RTK)		Optional	Planning	Planning	Planning
Ethernet Optional		RGMII	RGMII	RGMII	RGMII
Wi-Fi/BT Interface		Y	Y	Y	Y
Region		China	EMEA/ Korea/ Australia/ India/ Southeast Asia/ Latin America	North America/ Mexico	Japan
Certification		Regulatory: SRRC/ NAL/ CCC	**AG551Q-EU:** Regulatory: CE/ RCM	TBD	TBD

① n1/n3/n28 for AG55xQ-CN supports SA only
② LTE-FDD B29, B30 and B32 support Rx only

"Y" means supported.
** means ongoing.*

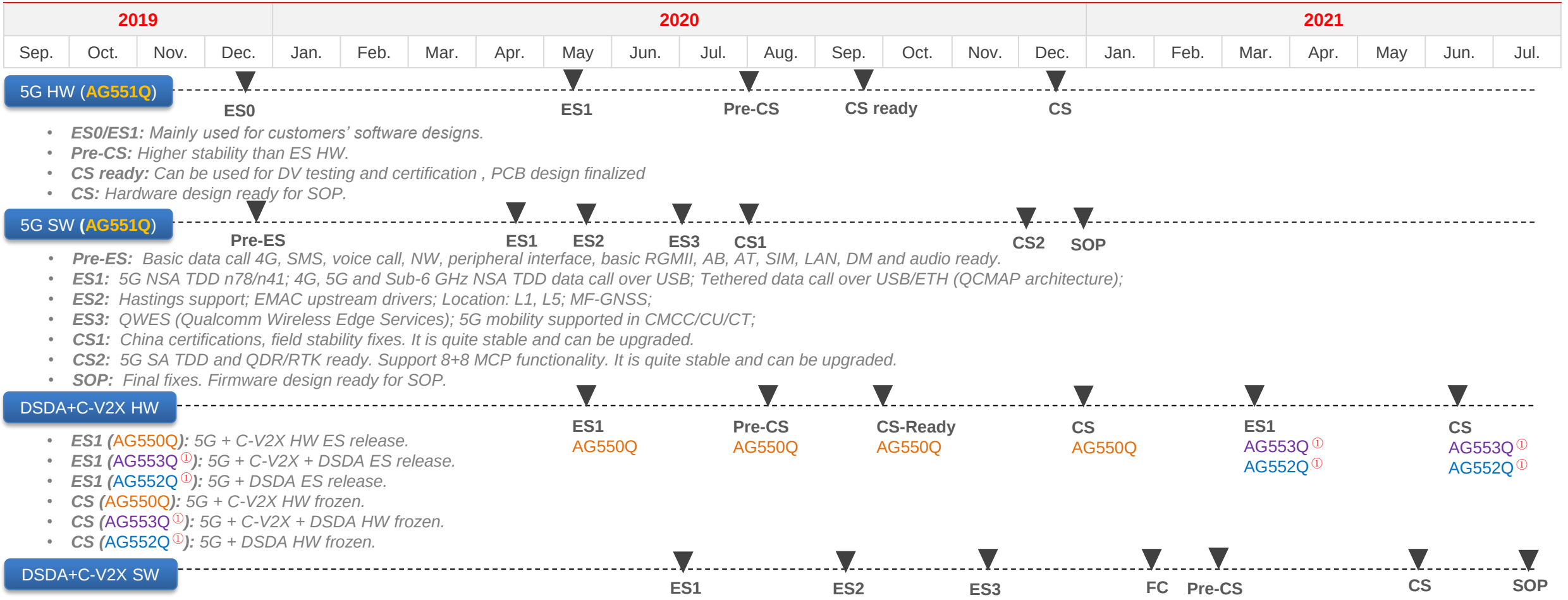
AG55xQ Series Key Features

Features	Description
5G NR	3GPP Release 15 NSA/SA operation, Sub-6 GHz
4G Category	LTE Cat 19, 3G/2G fallback
Apps Processor	Cortex A7 at 1.5 GHz; 256 KB L2
C-V2X (AG550Q/AG553Q)	PC5 Mode 4 (direct communication), Uu mode
DSDA (AG552Q/AG553Q)	Dual SIM Dual Activation
Embedded GNSS Optional	GPS/ GLONASS/ BeiDou/ Galileo Enhanced Automotive MF-GNSS (L1 + L5)
QDR Optional	QDR3 (external IMU required)
Interface	PCIe 3.0, USB 2.0/3.1, RGMII, SDIO, SPI, I2C, I2S, UART, PCM, ADC, (U)SIM, 1PPS, GPIOs
Antenna Interfaces	• 4 × 5G/4G antenna interfaces (4×4 MIMO) • 2 × antenna interfaces for DSDA (2×2 MIMO) • 2 × C-V2X antenna interfaces (2×2 MIMO) • 1 × GNSS antenna interface
Peak Data Rate	**5G SA:** Max. 2.0 Gbps (DL)/ 450 Mbps (UL)
	5G NSA: Max. 2.4 Gbps (DL)/ 550 Mbps (UL)
	LTE: LTE-FDD: Max. 1.6 Gbps (DL)/ 200 Mbps (UL) LTE-TDD: Max. 1.4 Gbps (DL)/ 120 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 296 kbps (DL)/ 236.8 kbps (UL) GPRS: Max. 107 kbps (DL)/ 85.6 kbps (UL)
	C-V2X: Max. 48 Mbps (Tx/Rx)

AG55xQ Series Memory Information

Item	Total Memory	Available Memory	Remark
AG551Q Series	4+4 MCP (512 MB + 512 MB)	RAM 127 MB	• Not including the memory necessary for QDR/PPE/Wi-Fi • QDR + PPE: 30 MB; Wi-Fi 6: 60 MB • Recommended minimum remaining RAM: 35 MB
		Flash 67 MB	• Recommended space redundancy: 20%
	8+8 MCP (1 GB + 1 GB)	RAM 623 MB	• Not including the memory necessary for QDR/PPE/Wi-Fi • QDR + PPE: 30 MB; Wi-Fi 6: 60 MB • Recommended minimum remaining RAM: 35 MB
		Flash 529 MB	• Recommended space redundancy: 20%
AG550Q Series	4+4 MCP (512 MB + 512 MB)	RAM 117 MB	• Not including the memory necessary for QDR/PPE/Wi-Fi • QDR + PPE: 30 MB; Wi-Fi 6: 60 MB • Recommended minimum remaining RAM: 35 MB
		Flash 67 MB	• Recommended space redundancy: 20%
	8+8 MCP (1 GB + 1 GB)	RAM 608 MB	• Not including the memory necessary for QDR/PPE/Wi-Fi • QDR + PPE: 30 MB; Wi-Fi 6: 60 MB • Recommended minimum remaining RAM: 35 MB
		Flash 529 MB	• Recommended space redundancy: 20%

AG55xQ-CN Timeline (8+8 MCP)



- ***ES0/ES1:*** *Mainly used for customers' software designs.*
- ***Pre-CS:*** *Higher stability than ES HW.*
- ***CS ready:*** *Can be used for DV testing and certification , PCB design finalized*
- ***CS:*** *Hardware design ready for SOP.*

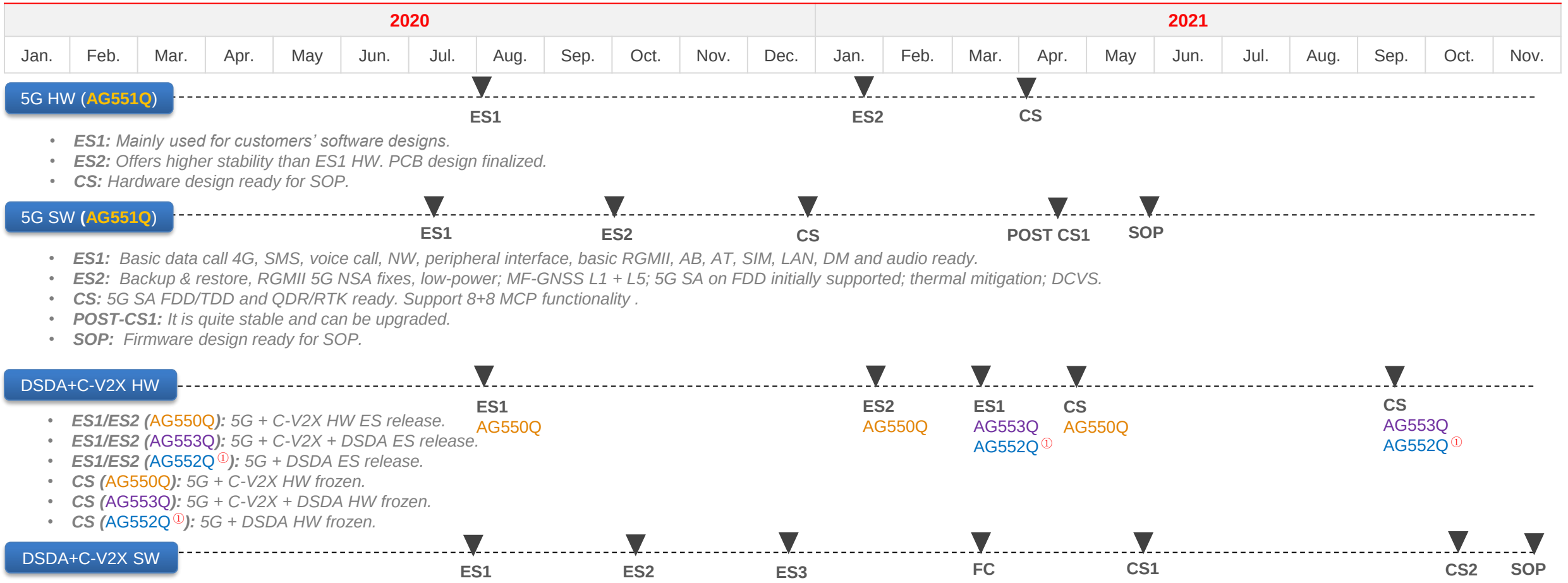
- ***Pre-ES:*** *Basic data call 4G, SMS, voice call, NW, peripheral interface, basic RGMII, AB, AT, SIM, LAN, DM and audio ready.*
- ***ES1:*** *5G NSA TDD n78/n41; 4G, 5G and Sub-6 GHz NSA TDD data call over USB; Tethered data call over USB/ETH (QCMAP architecture);*
- ***ES2:*** *Hastings support; EMAC upstream drivers; Location: L1, L5; MF-GNSS;*
- ***ES3:*** *QWES (Qualcomm Wireless Edge Services); 5G mobility supported in CMCC/CU/CT;*
- ***CS1:*** *China certifications, field stability fixes. It is quite stable and can be upgraded.*
- ***CS2:*** *5G SA TDD and QDR/RTK ready. Support 8+8 MCP functionality. It is quite stable and can be upgraded.*
- ***SOP:*** *Final fixes. Firmware design ready for SOP.*

- ***ES1 (AG550Q):*** *5G + C-V2X HW ES release.*
- ***ES1 (AG553Q①):*** *5G + C-V2X + DSDA ES release.*
- ***ES1 (AG552Q①):*** *5G + DSDA ES release.*
- ***CS (AG550Q):*** *5G + C-V2X HW frozen.*
- ***CS (AG553Q①):*** *5G + C-V2X + DSDA HW frozen.*
- ***CS (AG552Q①):*** *5G + DSDA HW frozen.*

- ***ES1:*** *Low-power ; 5G SA on FDD initially supported; thermal mitigation; DCVS; FTM and RF calibration for C-V2X.*
- ***ES2:*** *Standalone C-V2X; C-V2X TelSDK supported on SA2150P; MF-GNSS L1 + L5 ;PACE/TUNC initially supported; DSDA L+G (No C-V2X).*
- ***ES3:*** *C-V2X with concurrent WWAN on SA515M (Single SIM); DSDA L+L / W+L / 5G+L / 5G+G; QDR/RTK ready； support 8+8 MCP functionality .*
- ***FC (Function Complete):*** *5G NSA/SA; C-V2X fixes; DSDA 5G+L / 5G+G / L+L; commercialization fixes*
- ***Pre-CS:*** *5G+CV2X commercialization, DSDA bug fixes*
- ***CS:*** *C-V2X and DSDA ready. It is quite stable and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

① AG552Q-CN and AG553Q-CN are under planning.
The timeline is estimated based on Qualcomm release schedule.

AG55xQ-EU Timeline (8+8 MCP)



- ***ES1:*** *Mainly used for customers' software designs.*
- ***ES2:*** *Offers higher stability than ES1 HW. PCB design finalized.*
- ***CS:*** *Hardware design ready for SOP.*

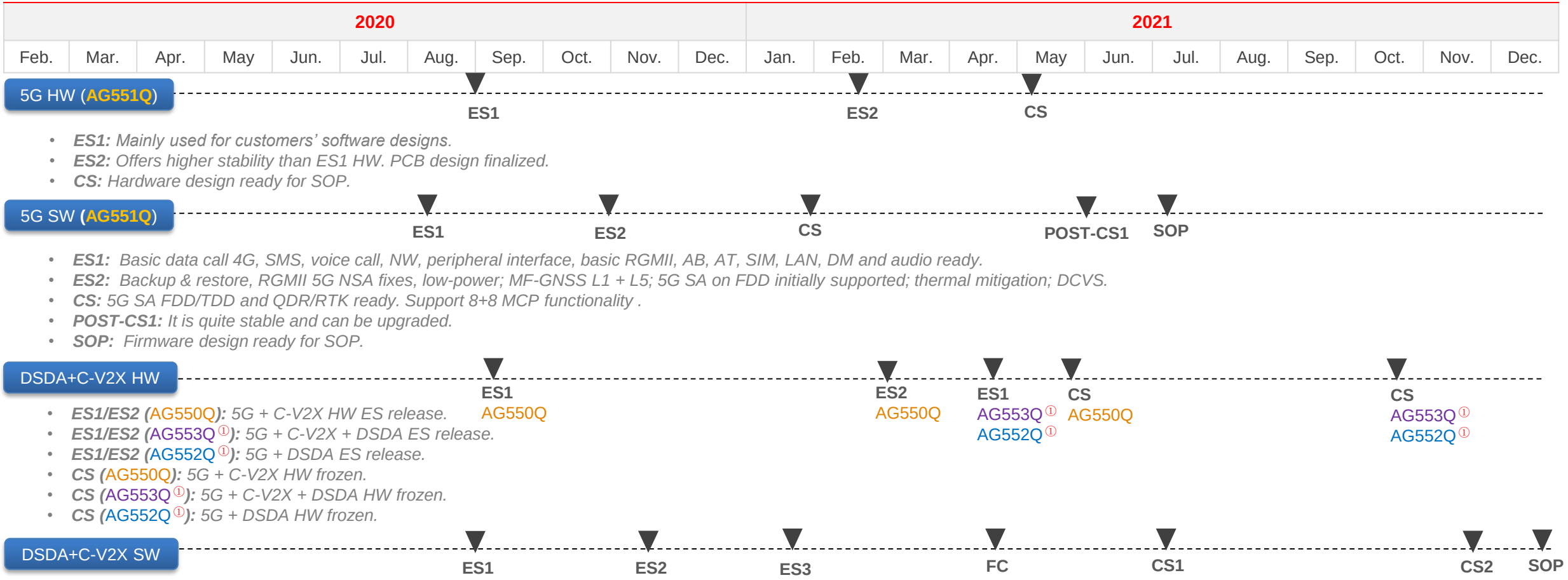
- ***ES1:*** *Basic data call 4G, SMS, voice call, NW, peripheral interface, basic RGMII, AB, AT, SIM, LAN, DM and audio ready.*
- ***ES2:*** *Backup & restore, RGMII 5G NSA fixes, low-power; MF-GNSS L1 + L5; 5G SA on FDD initially supported; thermal mitigation; DCVS.*
- ***CS:*** *5G SA FDD/TDD and QDR/RTK ready. Support 8+8 MCP functionality .*
- ***POST-CS1:*** *It is quite stable and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

- ***ES1/ES2 (AG550Q):*** *5G + C-V2X HW ES release.*
- ***ES1/ES2 (AG553Q):*** *5G + C-V2X + DSDA ES release.*
- ***ES1/ES2 (AG552Q①):*** *5G + DSDA ES release.*
- ***CS (AG550Q):*** *5G + C-V2X HW frozen.*
- ***CS (AG553Q):*** *5G + C-V2X + DSDA HW frozen.*
- ***CS (AG552Q①):*** *5G + DSDA HW frozen.*

- ***ES1:*** *Low-power ; 5G SA on FDD initially supported; thermal mitigation; DCVS; FTM and RF calibration for C-V2X.*
- ***ES2:*** *Standalone C-V2X; C-V2X TelSDK supported on SA2150P; MF-GNSS L1 + L5 ;PACE/TUNC initially supported; DSDA L+G (No C-V2X).*
- ***ES3:*** *C-V2X with concurrent WWAN on SA515M (Single SIM); DSDA L+L / W+L / 5G+L / 5G+G; QDR/RTK ready; support 8+8 MCP functionality .*
- ***FC (Function Complete):*** *5G NSA/SA; C-V2X fixes; DSDA 5G+L / 5G+G / L+L; commercialization fixes*
- ***CS1:*** *C-V2X ready. It is quite stable for AG550Q and can be upgraded.*
- ***CS2****: DSDA ready. It is quite stable for AG553Q/AG552Q and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

① AG552Q-EU is under planning.
The timeline is estimated based on Qualcomm release schedule.

AG55xQ-NA Timeline (8+8 MCP)



- ***ES1:*** *Mainly used for customers' software designs.*
- ***ES2:*** *Offers higher stability than ES1 HW. PCB design finalized.*
- ***CS:*** *Hardware design ready for SOP.*

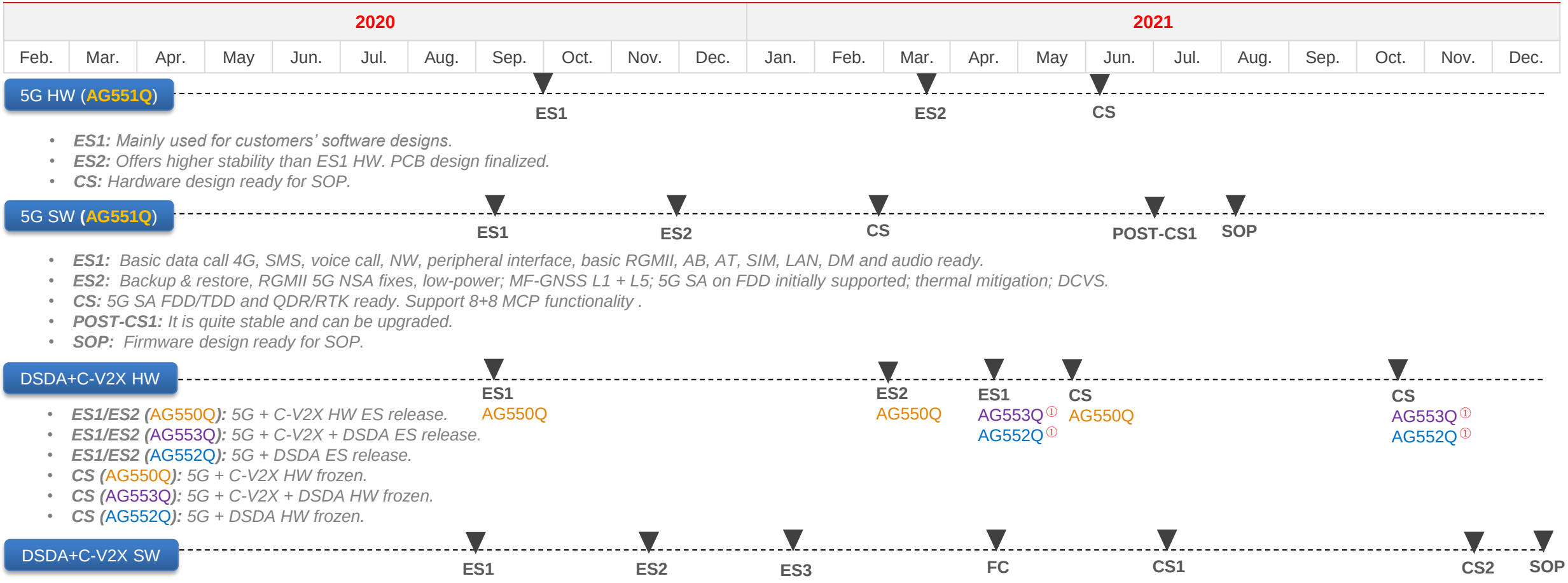
- ***ES1:*** *Basic data call 4G, SMS, voice call, NW, peripheral interface, basic RGMII, AB, AT, SIM, LAN, DM and audio ready.*
- ***ES2:*** *Backup & restore, RGMII 5G NSA fixes, low-power; MF-GNSS L1 + L5; 5G SA on FDD initially supported; thermal mitigation; DCVS.*
- ***CS:*** *5G SA FDD/TDD and QDR/RTK ready. Support 8+8 MCP functionality .*
- ***POST-CS1:*** *It is quite stable and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

- ***ES1/ES2 (AG550Q):*** *5G + C-V2X HW ES release.*
- ***ES1/ES2 (AG553Q①):*** *5G + C-V2X + DSDA ES release.*
- ***ES1/ES2 (AG552Q①):*** *5G + DSDA ES release.*
- ***CS (AG550Q):*** *5G + C-V2X HW frozen.*
- ***CS (AG553Q①):*** *5G + C-V2X + DSDA HW frozen.*
- ***CS (AG552Q①):*** *5G + DSDA HW frozen.*

- ***ES1:*** *Low-power ; 5G SA on FDD initially supported; thermal mitigation; DCVS; FTM and RF calibration for C-V2X.*
- ***ES2:*** *Standalone C-V2X; C-V2X TelSDK supported on SA2150P; MF-GNSS L1 + L5 ;PACE/TUNC initially supported; DSDA L+G (No C-V2X).*
- ***ES3:*** *C-V2X with concurrent WWAN on SA515M (Single SIM); DSDA L+L / W+L / 5G+L / 5G+G; QDR/RTK ready； support 8+8 MCP functionality .*
- ***FC (Function Complete):*** *5G NSA/SA; C-V2X fixes; DSDA 5G+L / 5G+G / L+L; commercialization fixes*
- ***CS1:*** *C-V2X ready. It is quite stable for AG550Q and can be upgraded.*
- ***CS2****: DSDA ready. It is quite stable for AG553Q/AG552Q and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

① AG552Q-NA and AG553Q-NA are under planning.
The timeline is estimated based on Qualcomm release schedule.

AG55xQ-JP Timeline (Planning)



- ***ES1:*** *Mainly used for customers' software designs.*
- ***ES2:*** *Offers higher stability than ES1 HW. PCB design finalized.*
- ***CS:*** *Hardware design ready for SOP.*

- ***ES1:*** *Basic data call 4G, SMS, voice call, NW, peripheral interface, basic RGMII, AB, AT, SIM, LAN, DM and audio ready.*
- ***ES2:*** *Backup & restore, RGMII 5G NSA fixes, low-power; MF-GNSS L1 + L5; 5G SA on FDD initially supported; thermal mitigation; DCVS.*
- ***CS:*** *5G SA FDD/TDD and QDR/RTK ready. Support 8+8 MCP functionality .*
- ***POST-CS1:*** *It is quite stable and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

- ***ES1/ES2 (AG550Q):*** *5G + C-V2X HW ES release.*
- ***ES1/ES2 (AG553Q):*** *5G + C-V2X + DSDA ES release.*
- ***ES1/ES2 (AG552Q):*** *5G + DSDA ES release.*
- ***CS (AG550Q):*** *5G + C-V2X HW frozen.*
- ***CS (AG553Q):*** *5G + C-V2X + DSDA HW frozen.*
- ***CS (AG552Q):*** *5G + DSDA HW frozen.*

- ***ES1:*** *Low-power ; 5G SA on FDD initially supported; thermal mitigation; DCVS; FTM and RF calibration for C-V2X.*
- ***ES2:*** *Standalone C-V2X; C-V2X TelSDK supported on SA2150P; MF-GNSS L1 + L5 ;PACE/TUNC initially supported; DSDA L+G (No C-V2X).*
- ***ES3:*** *C-V2X with concurrent WWAN on SA515M (Single SIM); DSDA L+L / W+L / 5G+L / 5G+G; QDR/RTK ready；support 8+8 MCP functionality .*
- ***FC (Function Complete):*** *5G NSA/SA; C-V2X fixes; DSDA 5G+L / 5G+G / L+L; commercialization fixes*
- ***CS1:*** *C-V2X ready. It is quite stable for AG550Q and can be upgraded.*
- ***CS2****: DSDA ready. It is quite stable for AG553Q/AG552Q and can be upgraded.*
- ***SOP:*** *Firmware design ready for SOP.*

AG55xQ-JP is under planning.
The timeline is estimated based on Qualcomm release schedule.

AG55xQ Series Certification Timeline

2021											2022										
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.

Regulatory Certification

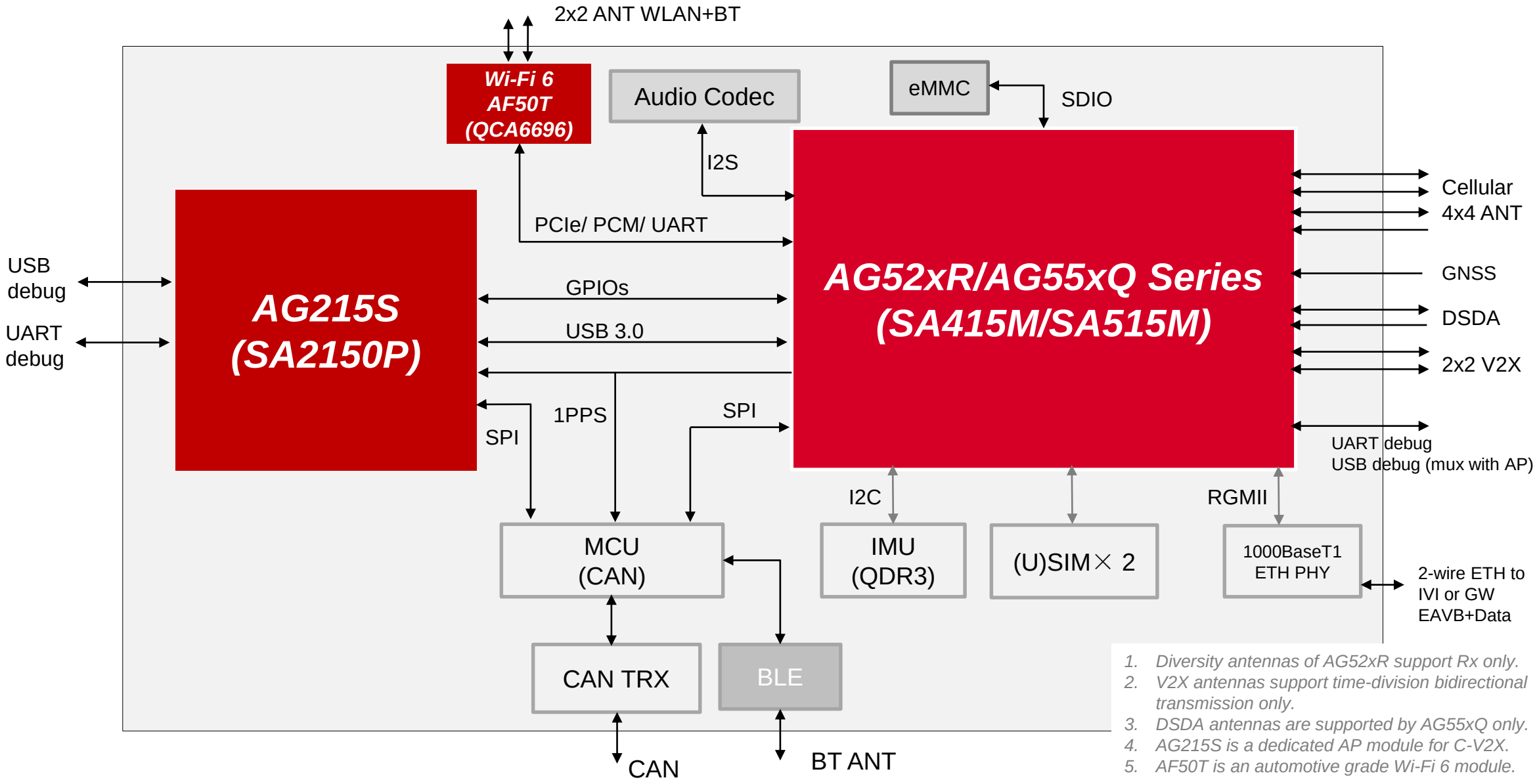
AG551Q-EU

CE/RCM

AG550Q-CN/ AG551Q-CN

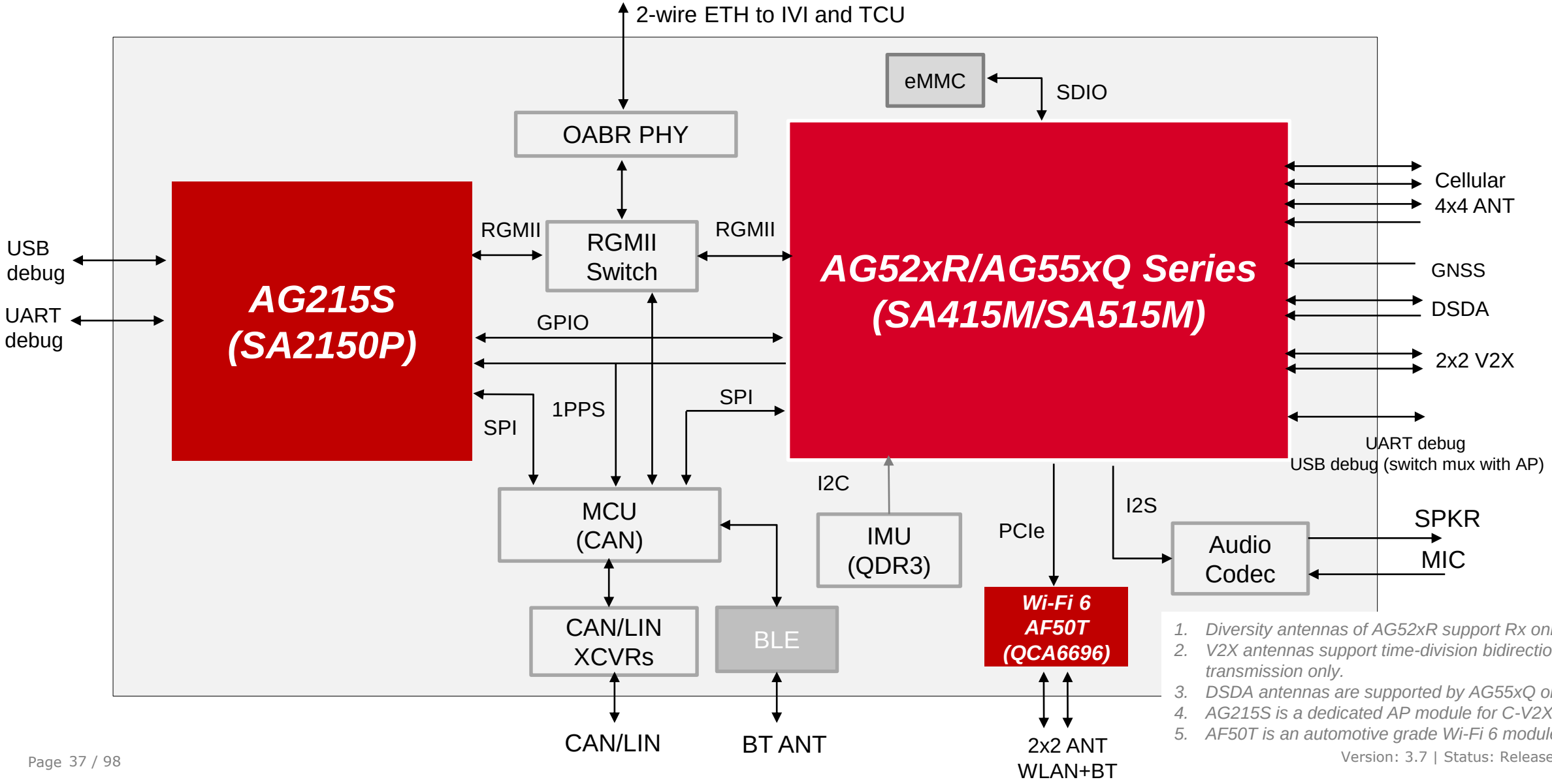
SRRC/ NAL/ CCC

AG52xR/AG55xQ Application Architecture (Default)



1. *Diversity antennas of AG52xR support Rx only.*
2. *V2X antennas support time-division bidirectional transmission only.*
3. *DSDA antennas are supported by AG55xQ only.*
4. *AG215S is a dedicated AP module for C-V2X.*
5. *AF50T is an automotive grade Wi-Fi 6 module.*

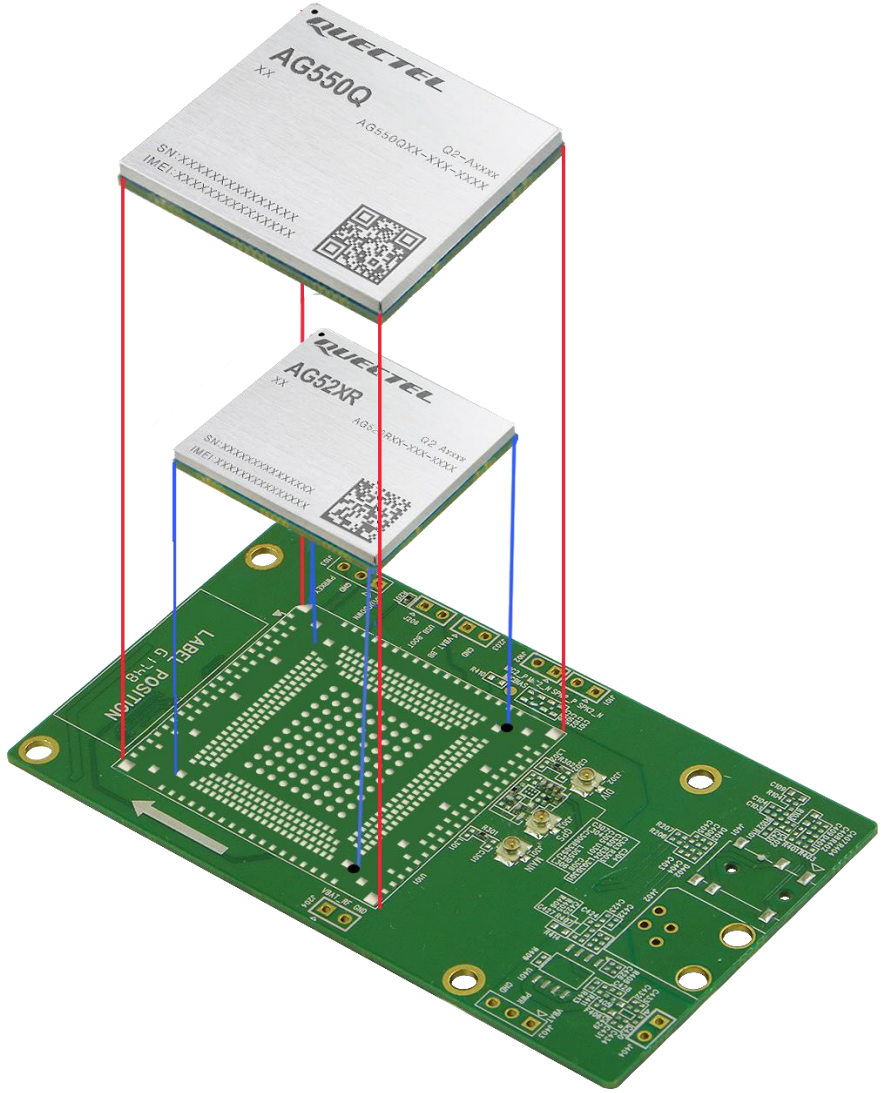
AG52xR/AG55xQ Application Architecture
– Optional Solution for Customization Requirements



1. *Diversity antennas of AG52xR support Rx only.*
2. *V2X antennas support time-division bidirectional transmission only.*
3. *DSDA antennas are supported by AG55xQ only.*
4. *AG215S is a dedicated AP module for C-V2X.*
5. *AF50T is an automotive grade Wi-Fi 6 module.*

AG55xQ/ AG52xR Layout Compatibility

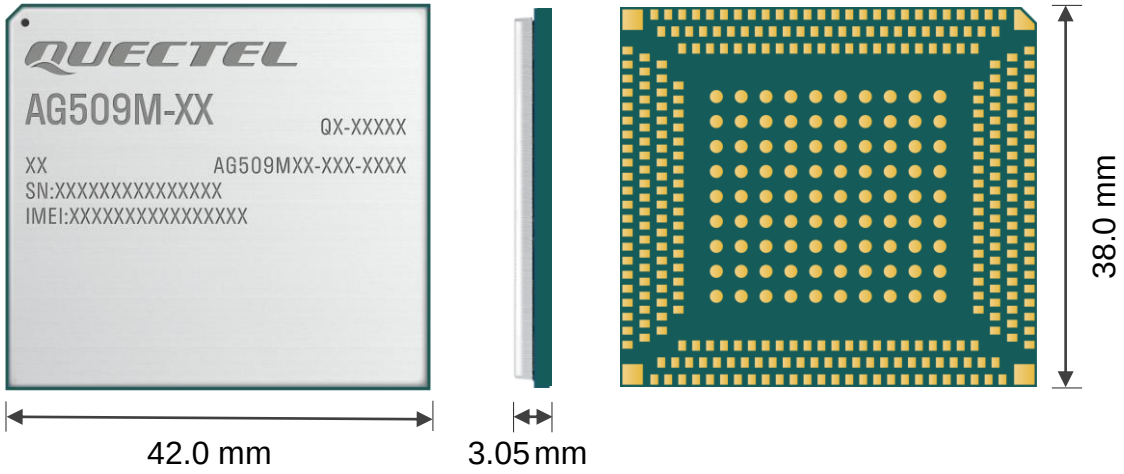
The compatible design accommodates **AG55xQ** and **AG52xR** series modules on the same PCB footprint.



The compatibility diagram shown above is for illustration purpose only.
The actual label design may be different.

Automotive Module AG509M Series Highlights

Multi-Mode LTE Cat 6 Module (MT2731R)



38.0 mm × 42.0 mm × 3.05 mm

- AEC-Q100 qualified MTK MT2731R chipset solution dedicated for automotive applications
- Ideal for automotive applications with IATF 16949: 2016 requirement
- Wide operation temperature range (-40 ℃ to +85 ℃) and support eCall under +95 ℃ NOTE
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- GNSS receiver available for applications requiring fast and accurate fixes in any environment

NOTE: +95℃ eCall application is supported through proper customers' system designs, and it may lead to shortened module lifetime.

AG509M Series Specifications

38.0 mm × 42.0 mm × 3.05 mm

Multi-Mode LTE Cat 6

Variant		AG509M-EU*	AG509M-NA (Planning)	AG509M-JP (Planning)	AG509M-CN (Planning)
LTE	LTE-FDD	B1/B3/B5/B7/B8/B20/B28/B32①	B2/B4/B5/B7/B12/B13/B17/B28/ B29①/B30①/B66/B71	B1/B3/B5/B7/B8/B9/B11/B19/B21/ B28	B1/B3/B5/B7/B8
	LTE-TDD	B38/B40/B41	-	B41	B34/B38/B39/B40/B41
UMTS	WCDMA	B1/B3/B5/B8	B2/B4/B5	B1/B3/B5/B8/B9/B19	B1/B8
GSM		B2/B3/B5/B8	B2/B5	-	B3/B8
CA Combination		B1+3, B1+5, B1+7, B1+8, B1+20, B1+28, B3+3, B3+5, B3+7, B3+8, B3+20, B3+28, B5+7, B7+7, B7+8, B7+20, B7+28, B20+32,B20+38, B1C, 3C, 7C, 38C	B2+2, B2+4, B2+13, B2+29, B25+66, B25+5, B25+12, B25+25, B25+71, B5+66, B12+66, B13+66, B29+66, B66+71, B2C, 5B, 66C, B2+28, B2+30, B4+28, B66+30, B5+7, B5+30, B7+12, B7+28, B12+30	B1+3, B1+8, B1+18, B1+19, B1+5, B1+28B, B1+41, B3+8, B3+19, B41+41, B41C, B11+28, B1+1, 1C, B21+28, B28+41, B3+28, B3+3, B3+41, B3+5, B3+8, 3C, B8+41	B1+3, B1+5, B1+8, B3C, B3+5, B3+8, B39+41, B39C, B40C, B41C
GNSS		L1	L1	L1	L1
Ethernet Optional		RGMII/eAVB	RGMII/eAVB	RGMII/eAVB	RGMII/eAVB
Dead Reckoning Optional		ADR	ADR	ADR	ADR
Wi-Fi/Bluetooth Interface		Y	Y	Y	Y
Region		EMEA/Korea/Australia/ Southeast Asia/ Brazil	North America/Mexico/ Latin America	Japan	China/India
Certification		**Regulatory:** CE*	TBD	TBD	**Regulatory (Planning):** SRRC/ NAL/ CCC

① LTE-FDD B29, B30 and B32 support Rx only

"Y" means supported.

** means under development/planning.*

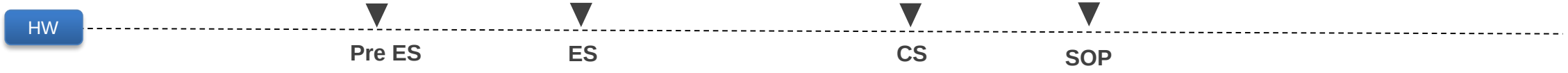
AG509M Series Key Features

Features	Description
4G Category	Cat 6
Apps Processor	Cortex A53 Dual Core
Embedded GNSS	GPS/ GLONASS/ BeiDou/ Galileo
ADR	Optional
Interface	PCIe/USB 3.0, USB 2.0, RGMII, SDIO, SPI, I2C, I2S, PCM, UART, GPIO
Antenna Interfaces	• 2 × cellular antenna interfaces • 1 × GNSS antenna interface
Peak Data Rate	**LTE:** LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD：Max. 240 Mbps (DL)/ 30 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 236.8 kbps (DL)/ 236.8 kbps (UL) GPRS: Max. 85.6 kbps (DL)/ 85.6 kbps (UL)

AG509M-EU Development Schedule (Preliminary)

2021												2022					
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.

Project Schedule



- ***Pre ES HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Bring up BSP function, SquashFS, QuecOpen Voice ready. EVT sample ready.*
- ***ES1 Auto SW:*** *Secure Boot, DM-verity, NV Backup & Recovery, Audio, Radio, Data, Thermal ready.*
- ***ES2 Auto SW:*** *GNSS, AB system, Signature & Certificate (security), SIM/SMS, eCall, TZ/OP-TEE ready.*
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG509M-EU Certification Timeline

2021												2022					
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.

Regulatory Certification

CE

AG509M-NA Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule

- ***Pre ES HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
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- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Bring up BSP function, SquashFS, QuecOpen Voice ready. EVT sample ready.*
- ***ES1 Auto SW:*** *Secure Boot, DM-verity, NV Backup & Recovery, Audio, Radio, Data, Thermal ready.*
- ***ES2 Auto SW:*** *GNSS, AB system, Signature & Certificate (security), SIM/SMS, eCall, TZ/OP-TEE ready.*
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG509M-JP Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule

- ***Pre ES HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
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- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Bring up BSP function, SquashFS, QuecOpen Voice ready. EVT sample ready.*
- ***ES1 Auto SW:*** *Secure Boot, DM-verity, NV Backup & Recovery, Audio, Radio, Data, Thermal ready.*
- ***ES2 Auto SW:*** *GNSS, AB system, Signature & Certificate (security), SIM/SMS, eCall, TZ/OP-TEE ready.*
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG509M-CN Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule

- ***Pre ES HW:*** *Mainly used for customers' software designs, but with higher stability than Pre-ES HW.*
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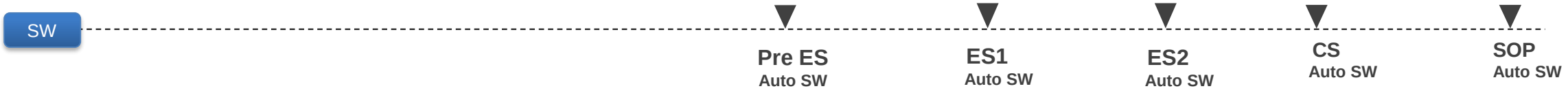
- ***CS HW:*** *Hardware design ready for SOP.*



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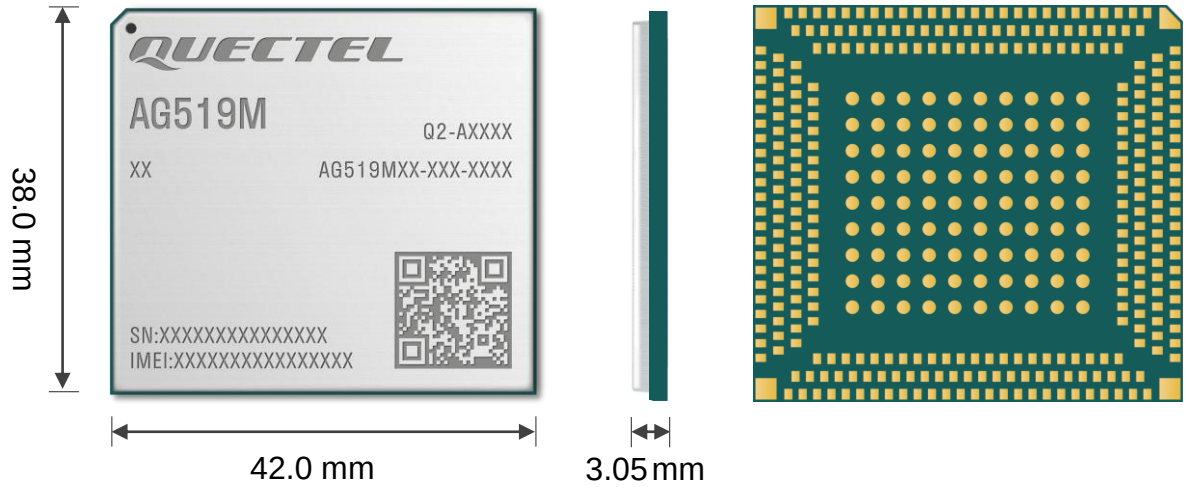
- ***ES1 Auto SW:*** *Secure Boot, DM-verity, NV Backup & Recovery, Audio, Radio, Data, Thermal ready.*
- ***ES2 Auto SW:*** *GNSS, AB system, Signature & Certificate (security), SIM/SMS, eCall, TZ/OP-TEE ready.*
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

Automotive Module AG519M Series Highlights

Multi-Mode LTE Cat 6 Module (MT2731R, Intra Band CA only)



38.0 mm × 42.0 mm × 3.05 mm

- AEC-Q100 qualified MTK MT2731R chipset solution dedicated for automotive applications
- Ideal for automotive applications with IATF 16949: 2016 requirement
- Wide operation temperature range (-40 ℃ to +85 ℃) and support eCall under +95 ℃ NOTE
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- GNSS receiver available for applications requiring fast and accurate fixes in any environment

NOTE: +95℃ eCall application is supported through proper customers' system designs, and it may lead to shortened module lifetime.

AG519M Series Specifications

38.0 mm × 42.0 mm × 3.05 mm

Multi-Mode LTE Cat 6

Variant		AG519M-EU*	AG519M-NA (Planning)	AG519M-JP (Planning)	AG519M-CN (Planning)
LTE	LTE-FDD	B1/B3/B5/B7/B8/B20/B28	B2/B4/B5/B7/B12/B13/B17/B28/ B29①/B30①/B66/B71	B1/B3/B5/B7/B8/B9/B11/B19/B21/ B28	B1/B3/B5/B7/B8
	LTE-TDD	B38	-	B41	B34/B38/B39/B40/B41
UMTS	WCDMA	B1/B5/B8	B2/B4/B5	B1/B3/B5/B8/B9/B19	B1/B8
GSM		B3/B8	B2/B5	-	B3/B8
DL CA (Intra Band CA Only)		CA_1A-1A, CA_1C,CA_3A-3A, CA_3C, CA_5A-5A, CA_5B, CA_7A-7A, CA_7C	CA_2A-2A, CA_2C, CA_4A-4A, CA_5A-5A, CA_5B, CA_7A-7A CA_7C, CA_66A-66A, CA_66B CA_66C	CA_1A-1A, CA_1C, CA_3A-3A CA_3C,CA_5A-5A, CA_5B, CA_7A-7A, CA_7C, A_41A-41A CA_41C	CA_1A-1A, CA_1C, CA_3A-3A CA_3C, CA_5A-5A, CA_5B CA_7A-7A, CA_7C, CA_38C CA_39C,CA_40C, CA_40A-40A CA_41A-41A, CA_41C
UL CA (Intra Band CA Only)		7C	7C	7C ,41A	7C,39C,40C,41C
GNSS Optional		L1 (AGPS)	L1 (AGPS)	L1 (AGPS)	L1 (AGPS)
Ethernet Optional		RGMII/eAVB	RGMII/eAVB	RGMII/eAVB	RGMII/eAVB
Dead Reckoning Optional		ADR	ADR	ADR	ADR
Wi-Fi/Bluetooth Interface		Y	Y	Y	Y
Region		EMEA/Korea/Australia/ Southeast Asia/ Brazil	North America/Mexico/ Latin America	Japan	China/India
Certification		**Regulatory:** CE*	TBD	TBD	**Regulatory (Planning):** SRRC/ NAL/ CCC

① LTE-FDD B29 and B30 support Rx only. *"Y" means supported.* ** means under development/planning.*

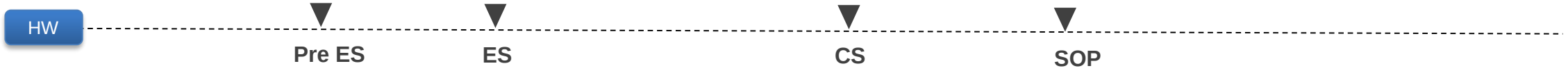
AG519M Series Key Features

Features	Description
4G Category	Cat 6 with Intra Band CA Only
Apps Processor	Cortex A53 Dual Core
Embedded GNSS	GPS/ GLONASS/ BeiDou/ Galileo
ADR	Optional
Interface	PCIe/USB 3.0, USB 2.0, RGMII, SDIO, SPI, I2C, I2S, PCM, UART, GPIO
Antenna Interfaces	• 2 × cellular antenna interfaces • 1 × GNSS antenna interface
Peak Data Rate	**LTE:** LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD：Max. 240 Mbps (DL)/ 30 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 236.8 kbps (DL)/ 236.8 kbps (UL) GPRS: Max. 85.6 kbps (DL)/ 85.6 kbps (UL)

AG519M-EU Development Schedule (Preliminary)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule



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- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG519M-EU Certification Timeline

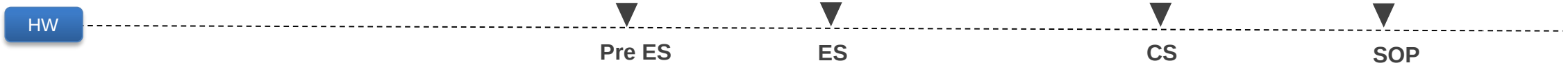
2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Regulatory Certification

AG519M-NA Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule



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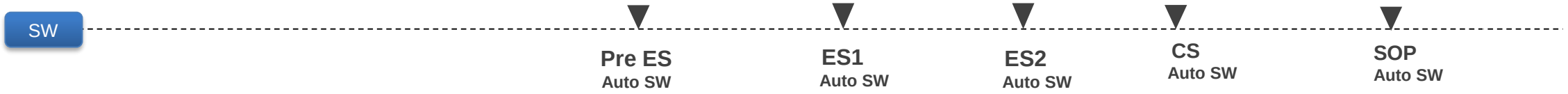
- ***CS HW:*** *Hardware design ready for SOP.*



- ***Pre ES Auto SW:*** *Bring up BSP function, SquashFS, QuecOpen Voice ready. EVT sample ready.*
- ***ES1 Auto SW:*** *Secure Boot, DM-verity, NV Backup & Recovery, Audio, Radio, Data, Thermal ready.*
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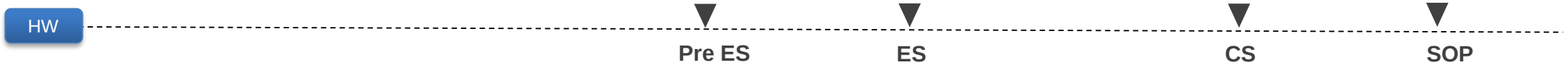
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG519M-JP Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule



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- ***ES2 Auto SW:*** *GNSS, AB system, Signature & Certificate (security), SIM/SMS, eCall, TZ/OP-TEE ready.*
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

AG519M-CN Development Schedule (Planning)

2021								2022									
May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.

Project Schedule

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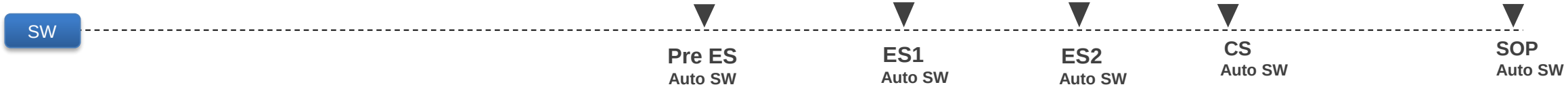

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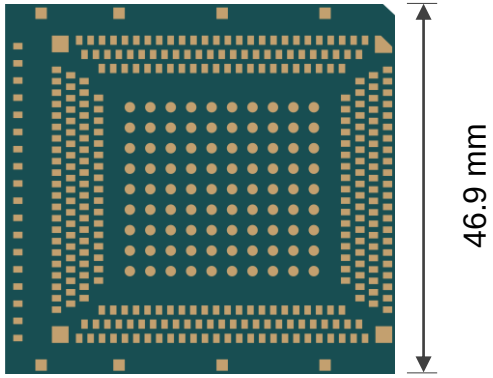
- ***CS Auto SW:*** *Telematics ready. The firmware is quite stable and can be upgraded.*
- ***SOP Auto SW :*** *Firmware design ready for SOP. Ready for mass production.*

Automotive Module AG568N Series Highlights

Automotive Grade 5G Module + DSDS (MT2735M)



45.0 mm × 46.9 mm × 3.25 mm

- AEC-Q100 compliant MediaTek MT2735M chipset solution dedicated for automotive 5G NR and DSDS applications
- Dual-core Cortex-A55 operating up to1.5 GHz
- Ideal for automotive applications with IATF 16949 requirement
- Wide operation temperature range (-40 ℃ to +85 ℃) and support eCall under +95 ℃ NOTE
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-frequency GNSS receiver available for applications requiring fast and accurate fixes in any environment
- Optimized thermal management and low power consumption designs as well as the underfill process ensure higher reliability
- Integrated 2.5 Gbps ETH supports AVB/TSN

NOTE: +95℃ eCall application is supported with limited time through proper customers' system designs, and it may lead to shortened module lifetime.

AG568N Series Specifications (Preliminary)

■ Automotive Grade 5G NR 4x4 MIMO

45.0 mm × 46.9 mm × 3.25 mm

Variant		AG568N-CN*	AG568N-EU*	AG568N-NA (Planning)	AG568N-ROW (Planning)
5G NR	5G FDD	n1/n3/n28A①	n1/n3/n8/n20/n28A①	n2/n5/n12/n14/n25/n66/n71	n1/n3/n28
	5G TDD	n41/n78	n41/n78	n41/n78	n41/n77/n78/n79③
LTE	LTE-FDD	B1/B3/B5/B7/B8	B1/B3/B5/B7/B8/B20/B28A/B32②	B2/B4/B5/B7/B12/B13/B14/B17/B25/ B26/B29②/B30②/B66/B71	B1/B2/B3/B4/B5/B7/B8/B9/B11③/ B18/B19/B21/B26/B28
	LTE-TDD	B34/B38/B39/B40/B41	B38/B40/B41	B38/B41/B48	B38/B40/B41
UMTS	WCDMA	B1/B8	B1/B3/B5/B8	B2/B4/B5	B1/B3/B5/B6/B7/B8/B9/B19
GSM		900/1800 MHz	900/1800/850 MHz	-	900/1800/850/1900 MHz
C-V2X B47		-	-	-	-
MF-GNSS Optional		L1 + L5	L1 + L5	L1 + L5	L1 + L5
Ethernet Optional		SGMII/RGMII	SGMII/RGMII	SGMII/RGMII	SGMII/RGMII
Wi-Fi/BT Interface		Y (PCIe)	Y (PCIe)	Y (PCIe)	Y (PCIe)
Region		China	EMEA/ Korea/ Australia/ India/ Southeast Asia	North America	Japan/ Latin America/ Brazil/ Mexico/ …
Certification		**Regulatory:** SRRC*/ NAL*/ CCC*	TBD	TBD	TBD

① n28A supports Tx at 703–733 MHz and Rx at 758–788 MHz
② LTE-FDD B29, B30 and B32 support Rx only
③ Optional bands. Not supported by default.

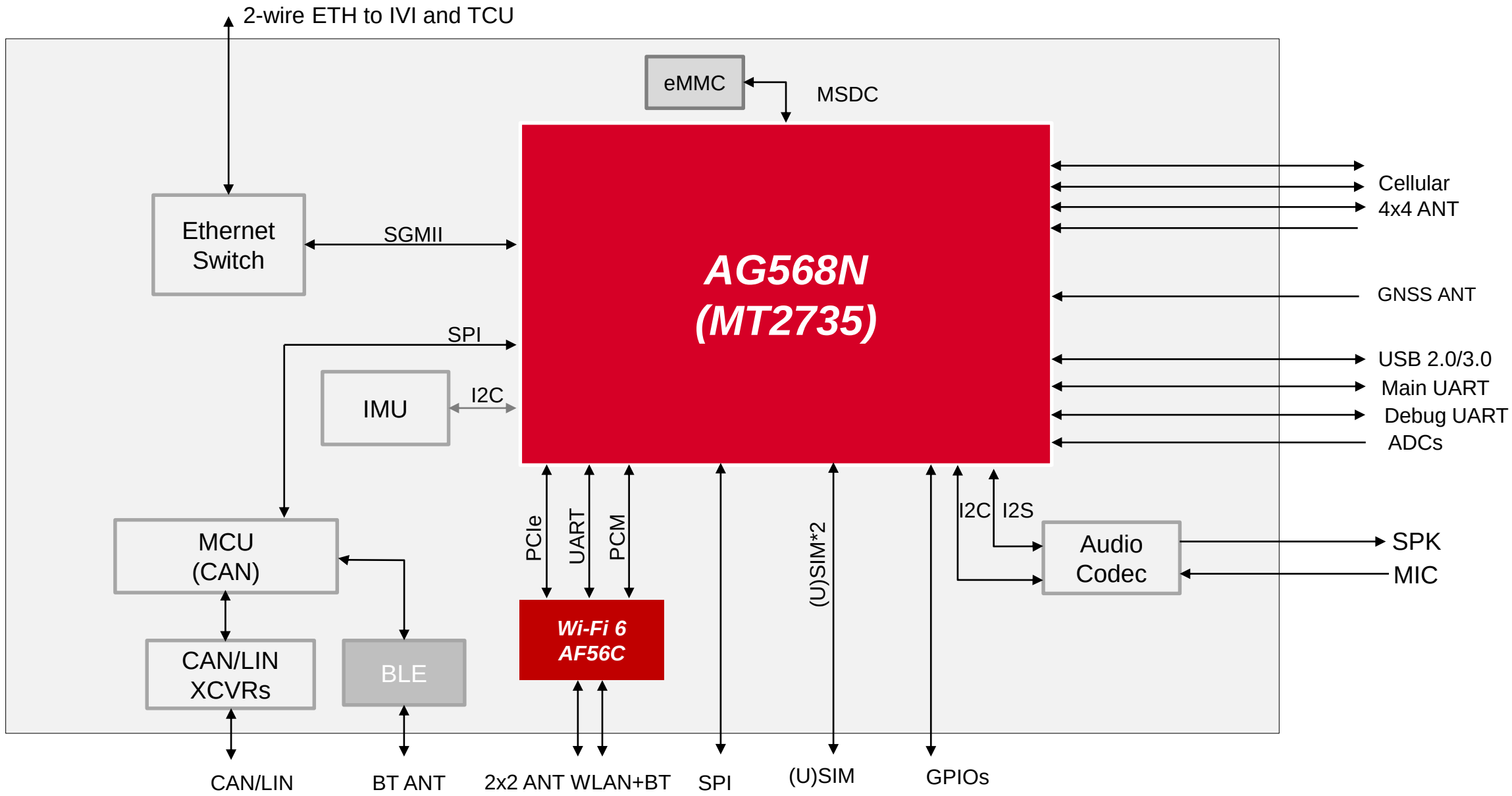
"Y" means supported.
** means under development/ongoing.*

AG568N Series Key Features

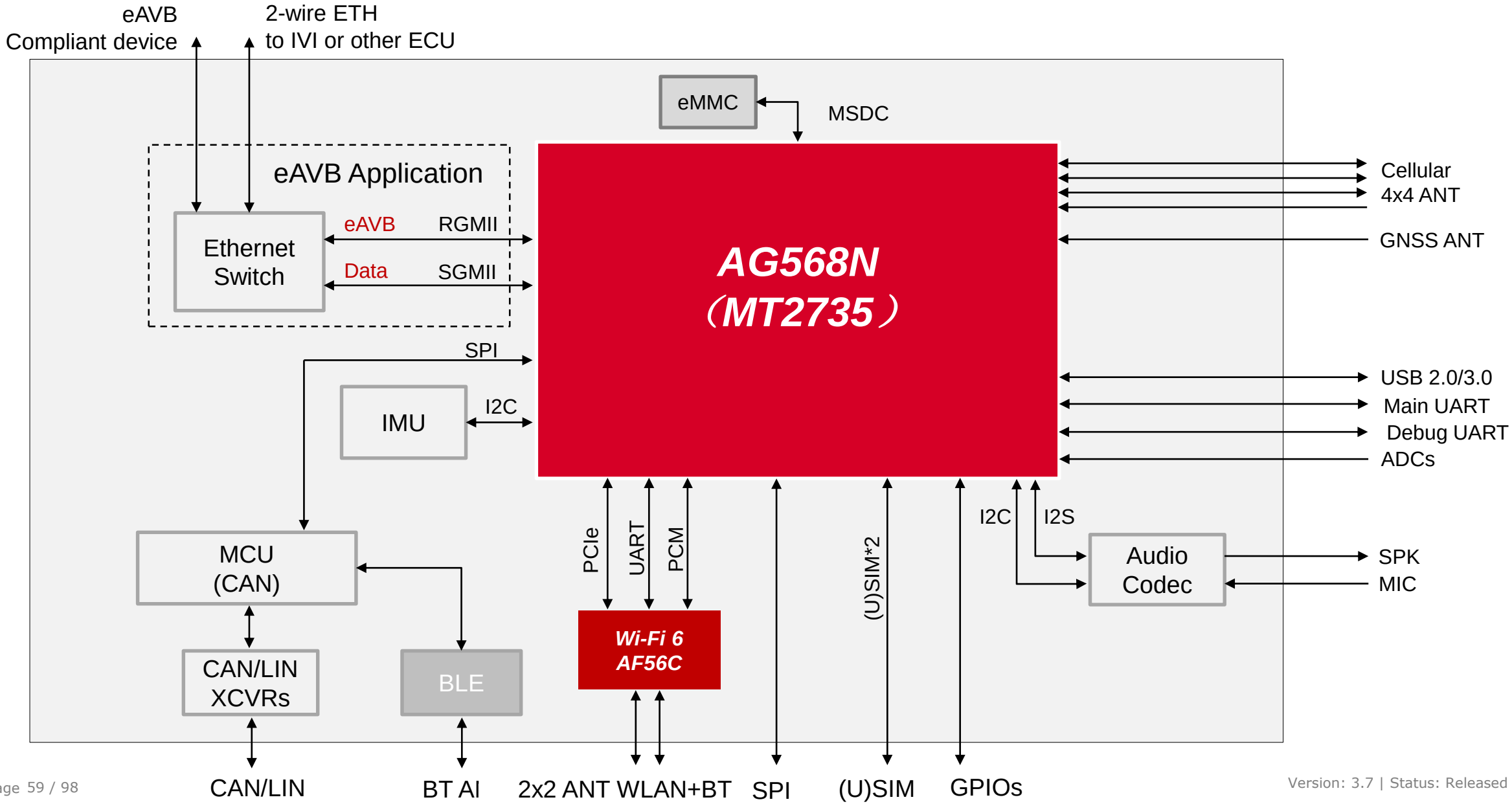
Features	Description
5G NR	3GPP Release 15 NSA/SA operation, Sub-6 GHz
4G Category	LTE Cat 15 (*LTE Cat 6 for AG568N-CN*), 3G/2G fallback
Apps Processor	Cortex A55 1.5 GHz Dual Core
C-V2X	Not supported
DSDS	Dual SIM Dual Standby supported
Embedded GNSS	GPS/ GLONASS/ BeiDou/ Galileo
	Enhanced Automotive MF-GNSS (L1 + L5)
Interface	USB 3.0/ PCIe (Gen3)/ RGMII/ SGMII/ UARTs/ SPI / I2C/ I2S (PCM) / SDIO/ ADCs / GPIOs
Antenna Interfaces	• 4 × 5G/4G antenna interfaces (4×4 MIMO) • 1 × GNSS antenna interface
Peak Data Rate	**5G NR** ① **:** Max. 4.67 Gbps (DL)/ 2.5 Gbps (UL)
	LTE Cat 15: LTE-FDD: Max. 800 Mbps (DL)/ 200 Mbps (UL) LTE-TDD: Max. 600 Mbps (DL)/ 120 Mbps (UL) **LTE Cat 6:** LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD: Max. 300 Mbps (DL)/ 50 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 296 kbps (DL)/ 236.8 kbps (UL) GPRS: Max. 107 kbps (DL)/ 85.6 kbps (UL)

① *Preliminary data. To be tested.*

AG568N Series Hardware Architecture (1)

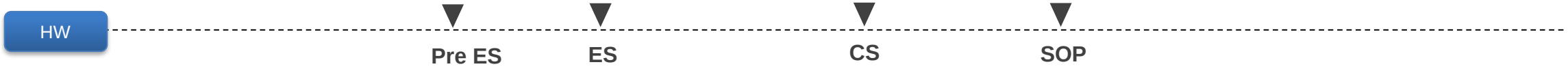


AG568N Series Hardware Architecture (2) (eAVB Application)



AG568N-CN Development Schedule

2021											2022										
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.



- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG568N-CN Certification Timeline

2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

Regulatory Certification

SRRC/NAL/CCC

AG568N-EU Development Schedule

2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG568N-NA Development Schedule (Planning)

2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG568N-ROW Development Schedule (Planning)

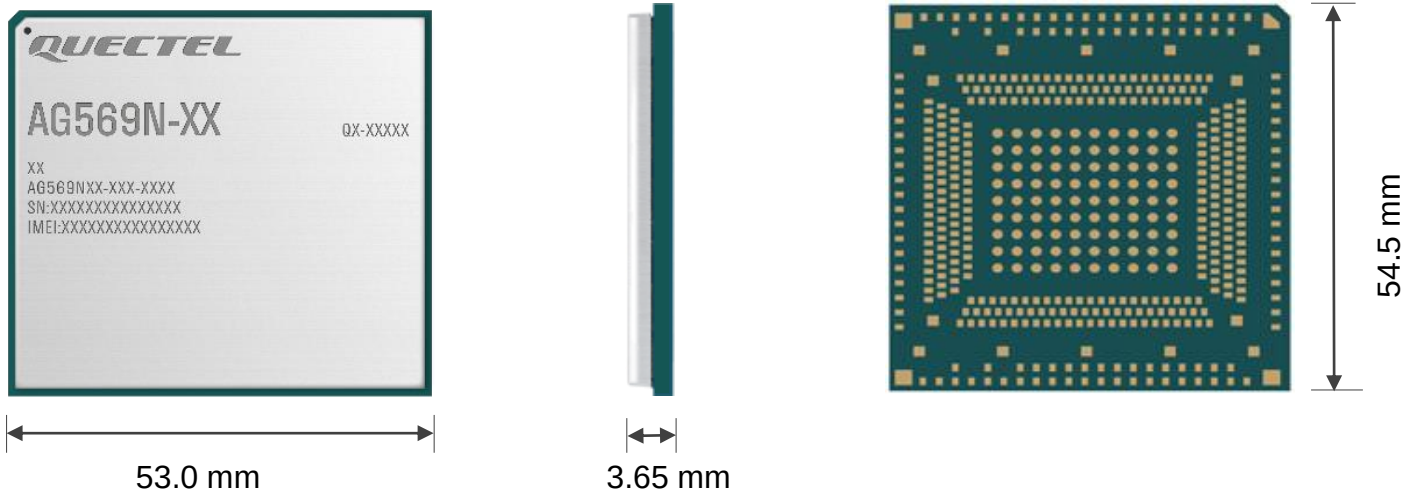
2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

Automotive Module AG569N Series Highlights

Automotive Grade 5G Module + DSDS + C-V2X (MT2735P)



53.0 mm × 54.5 mm × 3.65 mm

- AEC-Q100 compliant MediaTek MT2735P chipset solution dedicated for automotive 5G NR, DSDS and C-V2X applications
- Quad-core Cortex-A55 1.5 GHz supporting 15K DMIPS computing
- Ideal for automotive applications with IATF 16949 requirement
- Wide operation temperature range (-40 ℃ to +85 ℃) and support eCall under +95 ℃ NOTE
- Automotive quality processes (PPAP, 8D report, DFMEA, PFMEA…)
- Excellent EMC/ESD protection ensures great robustness even in harsh environments
- Compact LGA form factor ideal for integration in slim and size-constrained automotive solutions
- Multi-frequency GNSS receiver available for applications requiring fast and accurate fixes in any environment
- Optimized thermal management and low power consumption designs, as well as the underfill process ensure higher reliability
- Integrated audio codec and 2.5 Gbps ETH support AVB/TSN

NOTE: +95℃ eCall application is supported with limited time through proper customers' system designs, and it may lead to shortened module lifetime.

AG569N Series Specifications (Preliminary)

■ Automotive Grade 5G NR 4x4 MIMO + DSDS + C-V2X

53.0 mm × 54.5 mm × 3.65 mm

Variant		AG569N-CN*	AG569N-EU (Planning）	AG569N-NA (Planning）	AG569N-JP (Planning）
5G NR	5G FDD	n1/n3/n28A①	n1/n3/n8/n20/n28	n2/n5/n12/n14/n25/n66/n71	n1/n3
	5G TDD	n41/n78	n41/n78	n41/n78	n41/n78
LTE	LTE-FDD	B1/B3/B5/B7/B8	B1/B3/B5/B7/B8/B20/B28/B32②	B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/ B29②/B30②/B66/B71	B1/B3/B8/B11/B18/B19/ B21/B26/B28
	LTE-TDD	B34/B38/B39/B40/B41	B38/B40/B41	B38/B41/B48	B38/B41
UMTS	WCDMA	B1/B8	B1/B3/B5/B8	B2/B4/B5	B1/B8
GSM		900/1800 MHz	900/1800/850/1900 MHz	-	-
C-V2X B47		Y	Y	Y	Y
MF-GNSS Optional		L1 + L5	L1 + L5	L1 + L5	L1 + L5
Ethernet Optional		SGMII/RGMII	SGMII/RGMII	SGMII/RGMII	SGMII/RGMII
Wi-Fi/BT Interface		Y (PCIe)	Y (PCIe)	Y (PCIe)	Y (PCIe)
Region		China	EMEA/ Korea/ Australia/ India/ Southeast Asia/ Latin America/Brazil/ Mexico	North America	Japan
Certification		**Regulatory:** SRRC*/ NAL*/ CCC*	TBD	TBD	TBD

① n28A supports Tx at 703–733 MHz and Rx at 758–788 MHz
② LTE-FDD B29, B30 and B32 support Rx only

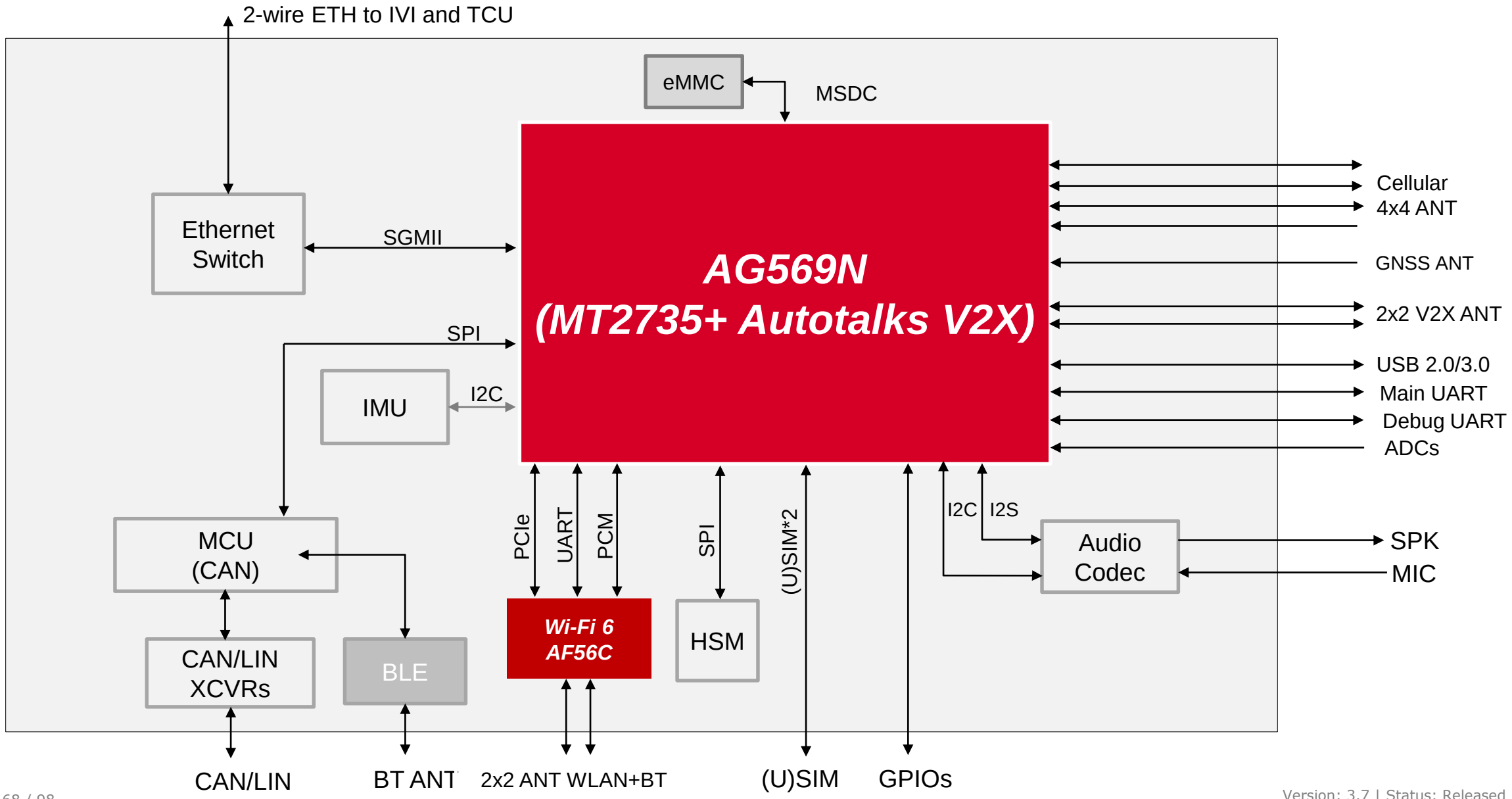
"Y" means supported.
** means under development/ongoing.*

AG569N Series Key Features

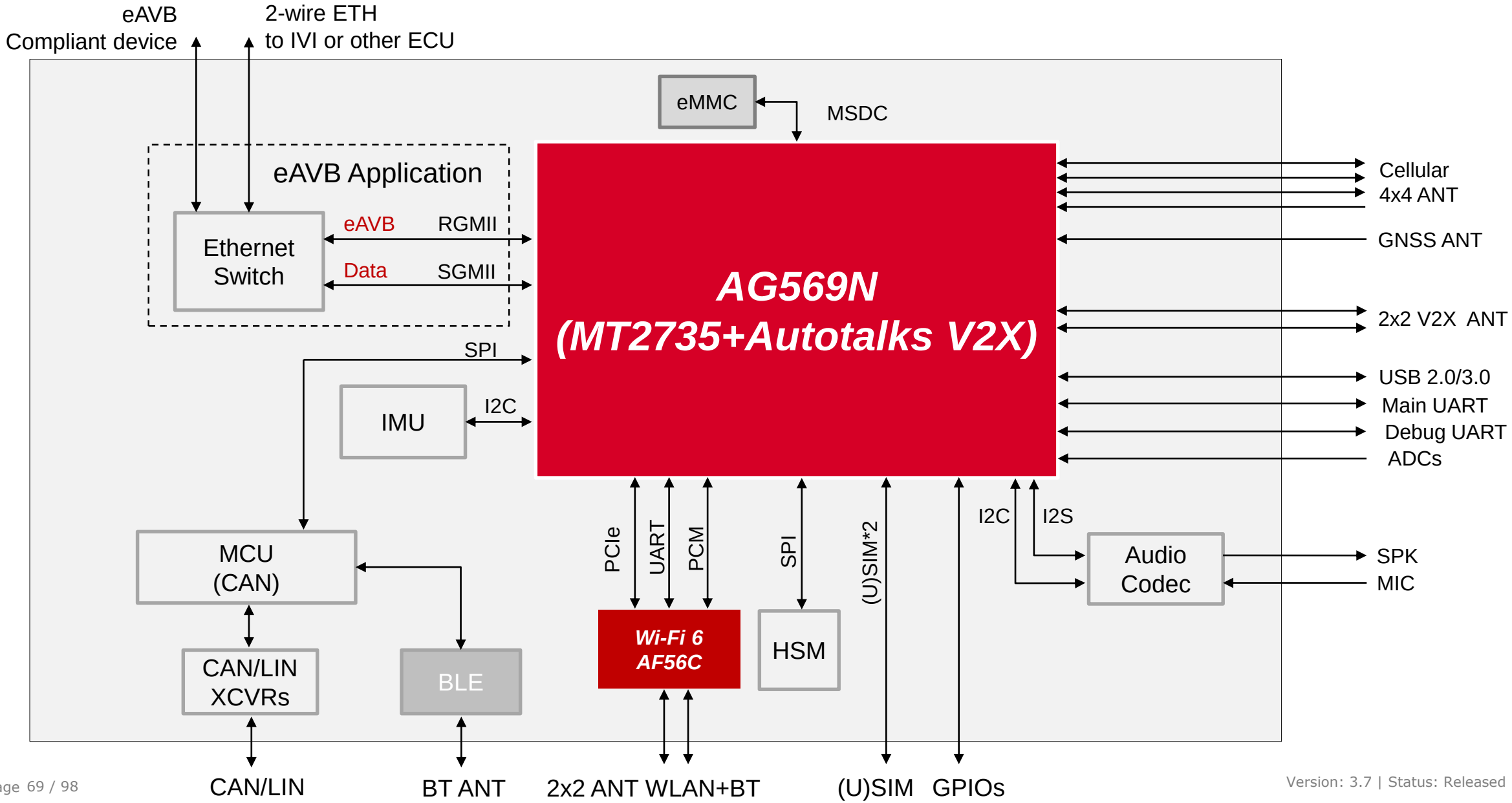
Features	Description
5G NR	3GPP Release 15 NSA/SA operation, Sub-6 GHz
4G Category	LTE Cat 15 (*LTE Cat 6 for AG569N-CN*), 3G/2G fallback
Apps Processor	Cortex A55 1.5 GHz Quad Core
C-V2X	B47 C-V2X
DSDS	Dual SIM Dual Standby supported
Embedded GNSS	GPS/ GLONASS/ BeiDou/ Galileo
	Enhanced Automotive MF-GNSS (L1 + L5)
Interface	USB 3.0/ PCIe (Gen3)/ RGMII/ SGMII/ UARTs/ SPI / I2C / I2S (PCM) / SDIO/ ADCs/ GPIOs
Antenna Interfaces	• 4 × 5G/4G antenna interfaces (4×4 MIMO) • 2 × C-V2X antenna interfaces (2×2 MIMO) • 1 × GNSS antenna interface
Peak Data Rate	**5G NR**①**:** Max. 4.67 Gbps (DL)/ Max. 2.5 Gbps (UL)
	LTE Cat 15: LTE-FDD: Max. 800 Mbps (DL)/ 200 Mbps (UL) LTE-TDD: Max. 600 Mbps (DL)/ 120 Mbps (UL) **LTE Cat 6:** LTE-FDD: Max. 300 Mbps (DL)/ 50 Mbps (UL) LTE-TDD: Max. 300 Mbps (DL)/ 50 Mbps (UL)
	UMTS: DC-HSDPA: Max. 42 Mbps HSUPA: Max. 5.76 Mbps WCDMA: Max. 384 kbps (DL/UL)
	GSM: EDGE: Max. 296 kbps (DL)/ 236.8 kbps (UL) GPRS: Max. 107 kbps (DL)/ 85.6 kbps (UL)

① *Preliminary data. To be tested.*

AG569N Series Hardware Architecture

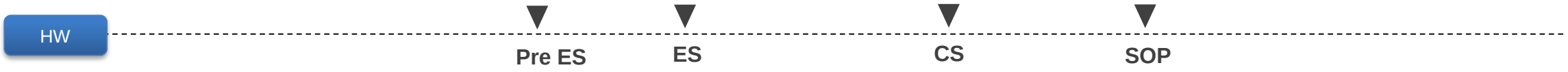


AG569N Series Hardware Architecture (eAVB Application)



AG569N-CN Development Schedule

2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.



- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG569N-CN Certification Timeline

2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

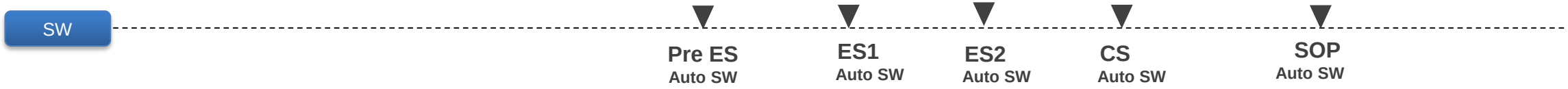
Regulatory Certification

SRRC/NAL/CCC

AG569N-EU Development Schedule (Planning)

2021											2022										
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.* ·



- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG569N-NA Development Schedule (Planning)

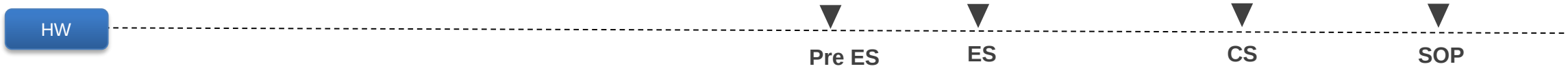
2021											2022											
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.

- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*

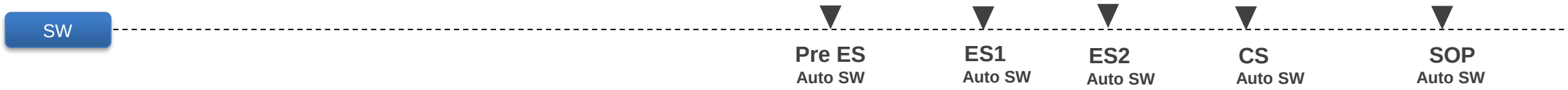
- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG569N-JP Development Schedule (Planning)

2021											2022										
Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.



- ***Pre ES HW:*** *Mainly used for customers' software designs.*
- ***ES HW:*** *Partial modification of non-critical materials, and PCB design finalized.*
- ***CS HW:*** *Hardware design ready for SOP.*



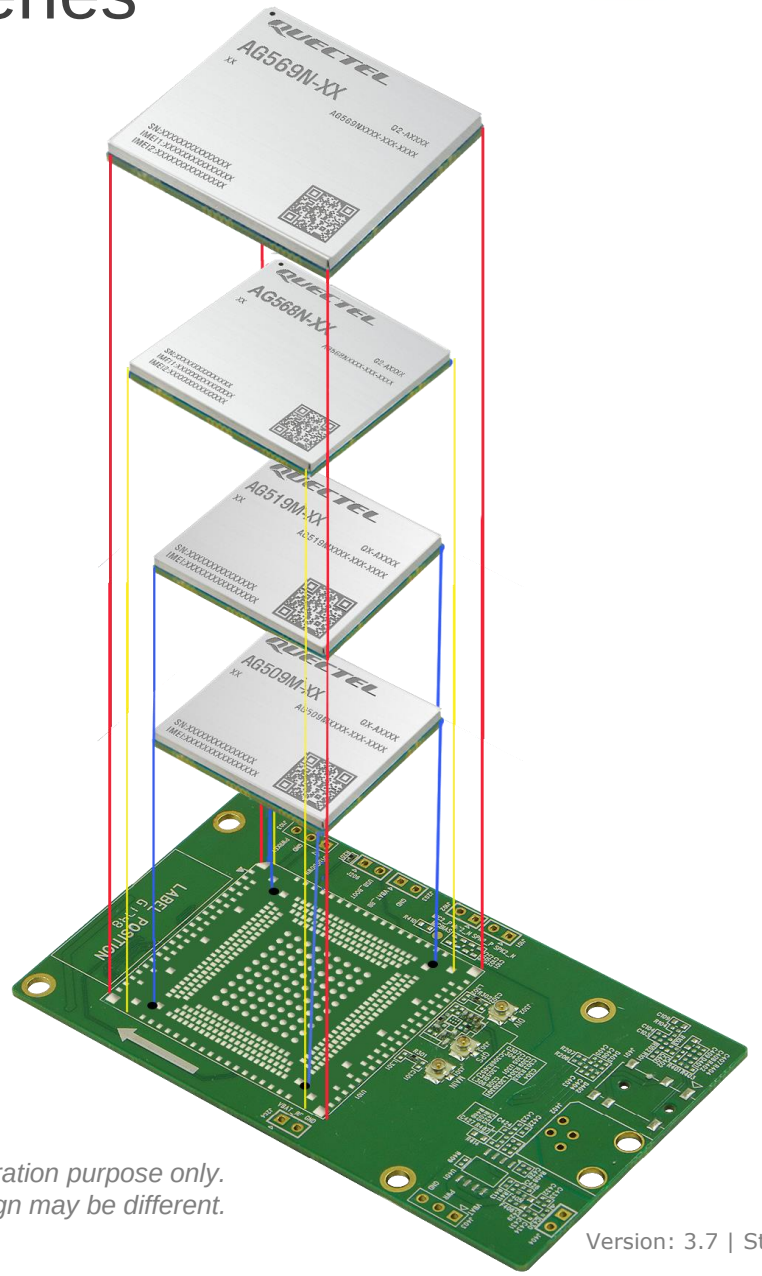
- ***Pre ES Auto SW:*** *Data call, Audio, PMIC driver, Network , Modem, NVRAM, Partition, SMS ready*
- ***ES1 Auto SW:*** *Power Management, Voice, RGMII, AT Command, SIM, Voice call ready*
- ***ES2 Auto SW:*** *Thermal, Low Power, Backup Restore, A/B System, DM-Verity, Secure boot, Trust zone*
- ***CS Auto SW:*** *HWNAT (IPA) ready; Telematics SDK ready. The firmware is quite stable and can be upgraded*
- ***SOP SW :*** *Firmware design ready for SOP. Ready for mass production*

AG509M, AG519M, AG568N & AG569N Series Layout Compatibility

The compatible design accommodates

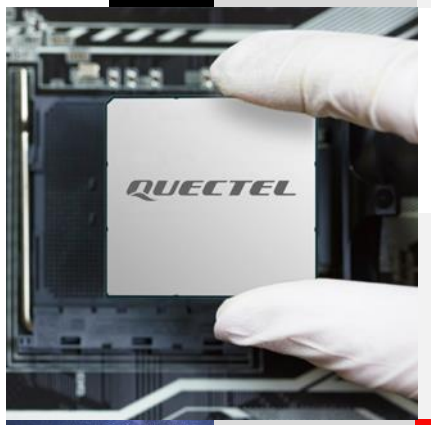
AG509M, AG519M, AG568N and AG569N

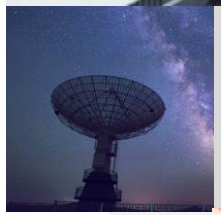
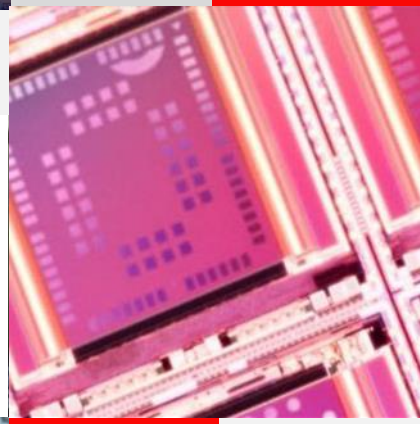
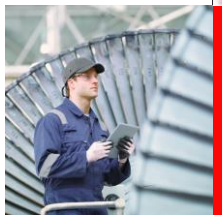
series modules on the same PCB footprint.



The compatibility diagram shown above is for illustration purpose only.
The actual label design may be different.

Roadmap
Product Overview
Support Package
Enhanced Technologies
Applications



Build a Smarter World

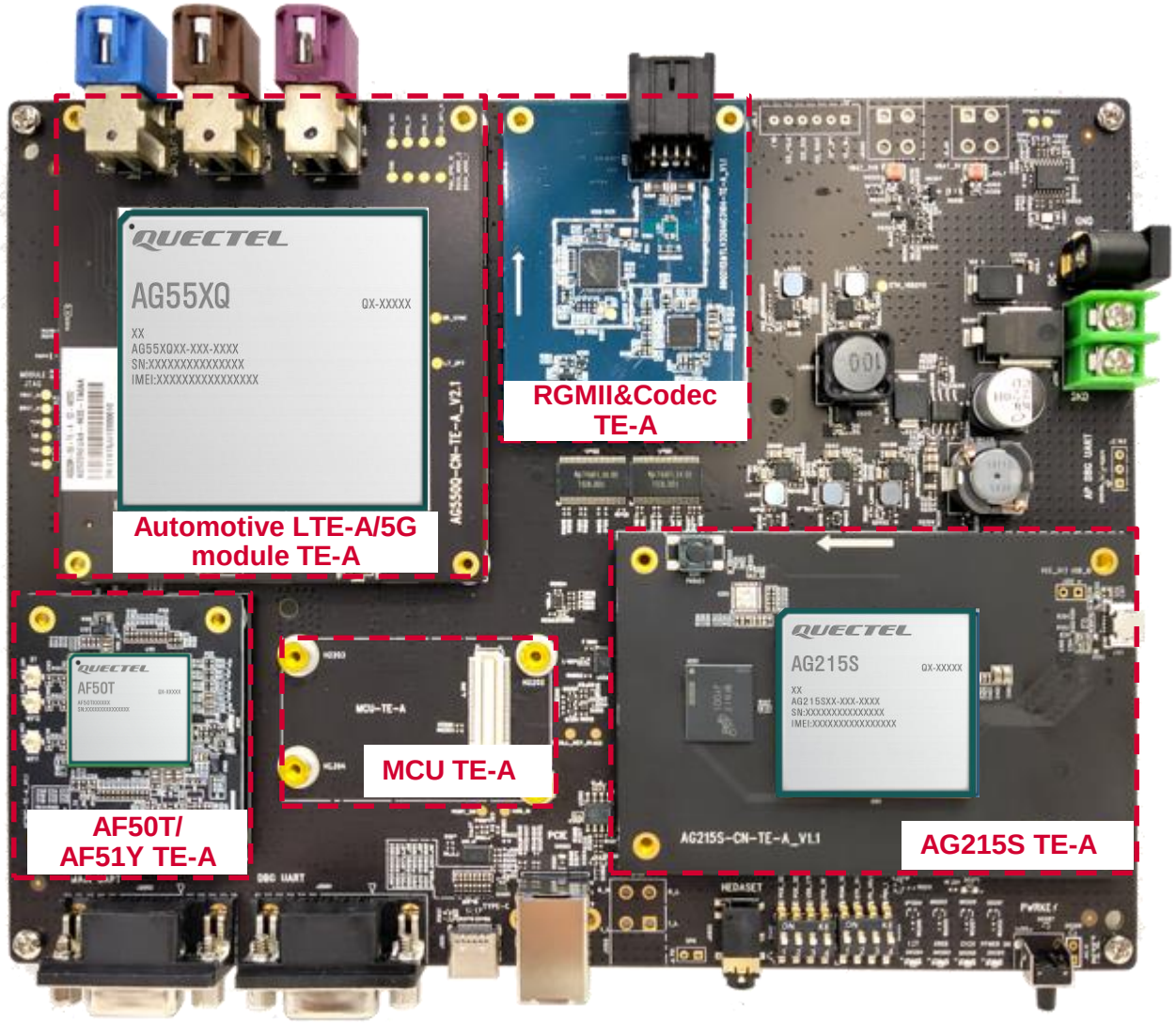
AG55xQ/AG52xR/AG5x9M/AG56xN + AG215S Support Package

Technical Materials Package

- Hardware and software development guides
- Debug tools, download tools, test tools, EVB kit & USB drivers

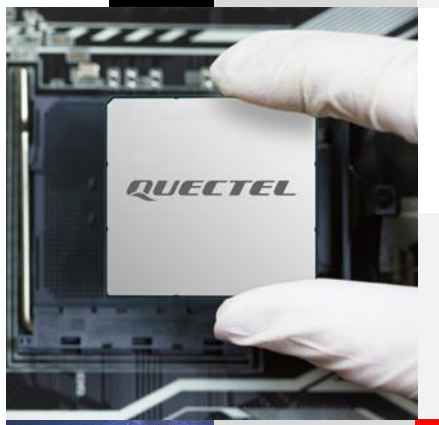
Development Tool (V2X&5G EVB Kit)

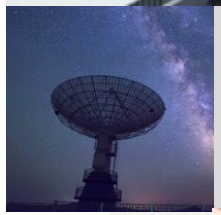
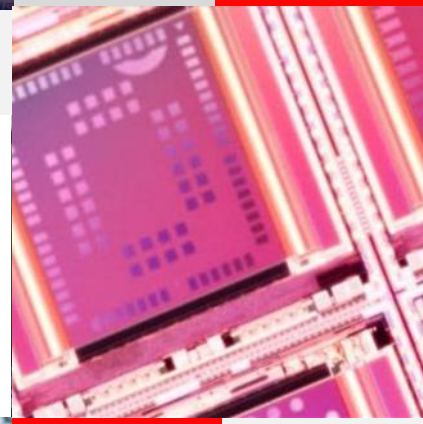
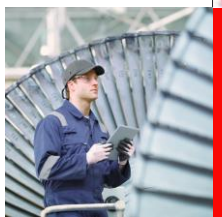
- Interfaces
  - a) *Power supply interface*
  - b) *Ethernet interface*
  - c) *Antenna interfaces*
  - d) *UART interfaces*
  - e) *USB interfaces*
  - f) *(U)SIM interfaces*
  - g) *PCIe interface*
  - h) *Audio interfaces*
  - i) *CAN interface*
- Accessories
  - a) *Antenna box*
  - b) *RGMII&Codec TE-A*
  - c) *Power adapter*
  - d) *Power converters*
  - e) *Earphone*
  - f) *USB Type-C cable*
  - g) *USB to UART converter cable*



Roadmap
Product Overview
Support Package
Enhanced Technologies
Applications

Build a Smarter World



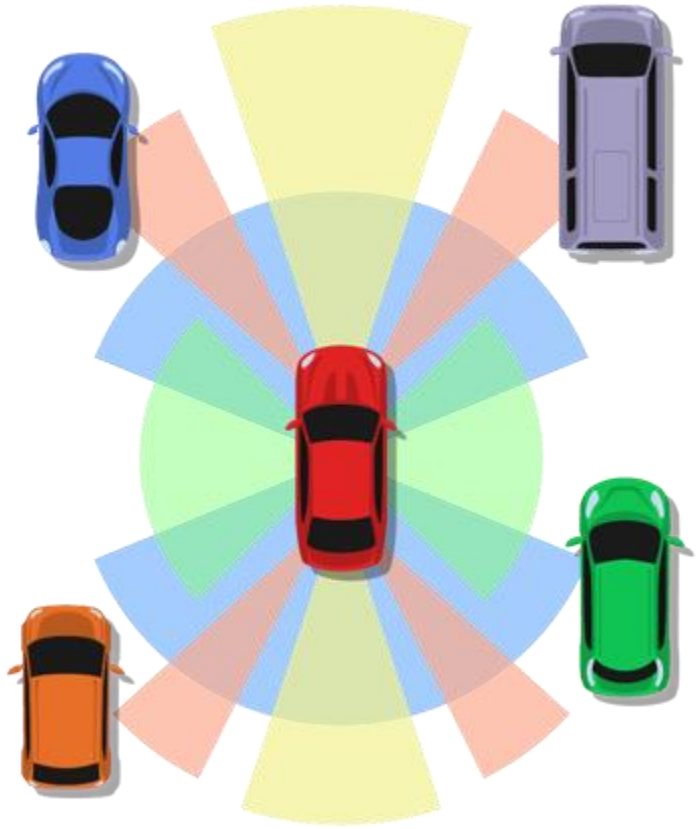




On-board Technical Characteristics

High Security

BT & Wi-Fi

Max 8 APNs



Low Target PPM Rates

Antenna Services

EMI Suppression

eCall

QuecOpen® A/B Partitions

Ultra-low Power in Sleep

Max +95 ℃ eCall Temperature

ESD Protection

Antenna Diagnosis

DFOTA

eAVB

Shorter Boot Time

Long Life Cycle

RTK & DR

AEC-Q104 Compliant

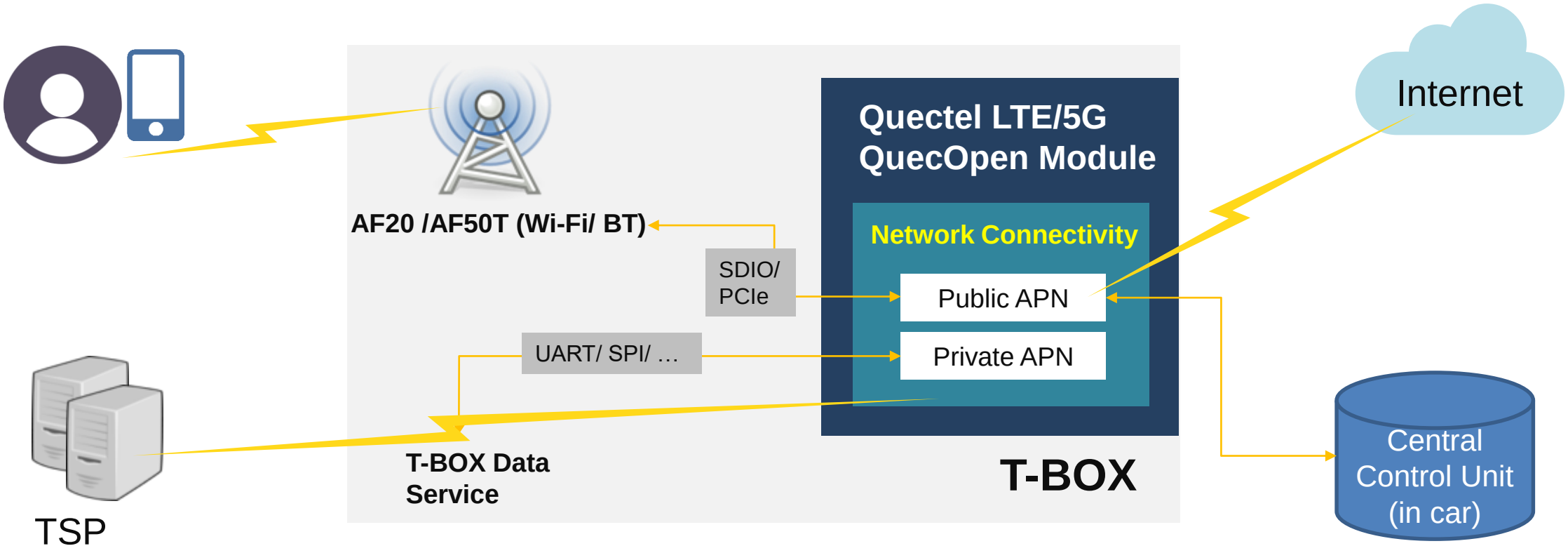
Continuous V2X Technology Evolution

- Careful spectrum planning to support continuous V2X technology evolution shown as below
- Evolution to 5G, while maintaining good backward compatibility

C-V2X is a critical component for safer autonomous driving, communicating intent and sensor data even in challenging real world conditions.

- Non line-of-sight sensing
- Conveying intent
- Situational awareness

Multi-APN Solution



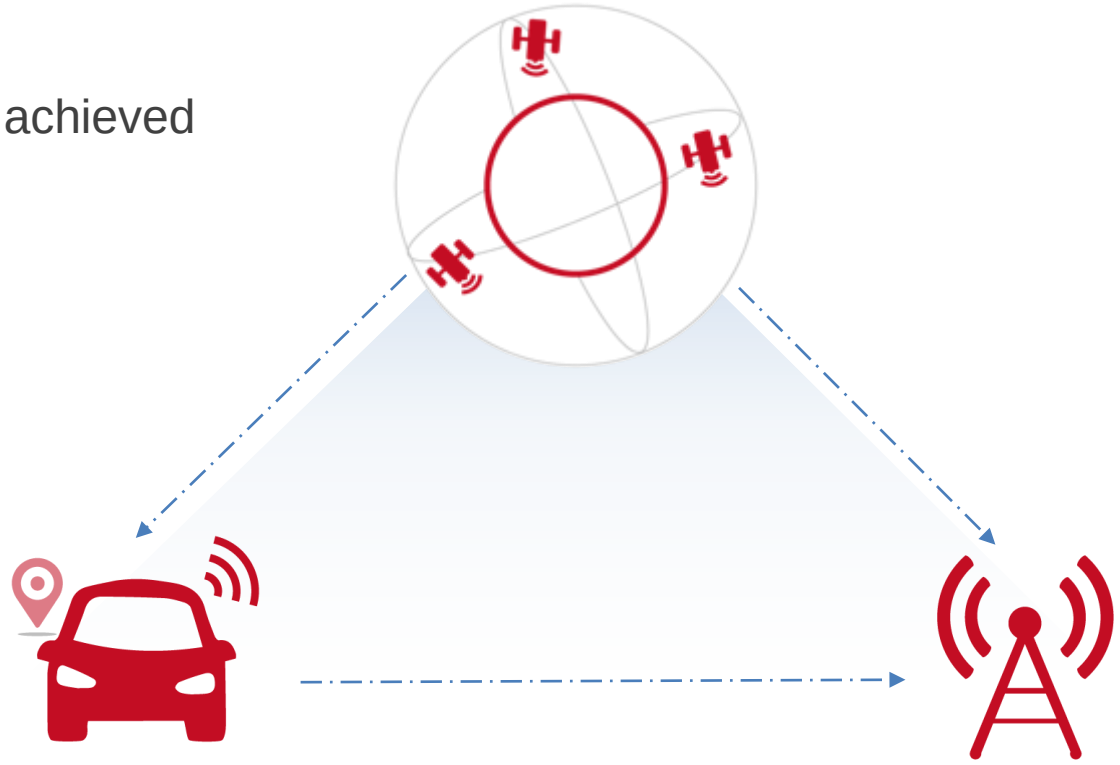
- Users can get in-car infotainment and Wi-Fi access via the public APN.
- TSP is able to communicate with vehicles via the private APN, which can ensure the data that car OEM gets safer and more reliable.
- Maximally 8 APNs are supported now.

Multi-Frequency GNSS

By simultaneously tracking all global navigation satellite systems (GNSS) and receiving **two frequencies** from each satellite system to meet car-level positioning accuracy.

Precise positioning and fast convergence time can be achieved globally.

- Multipath signals L1 + L5
- Higher chipping rate
- Direct measurement of the Ionospheric delay
- Increased robustness
- Integer resolution for PPP

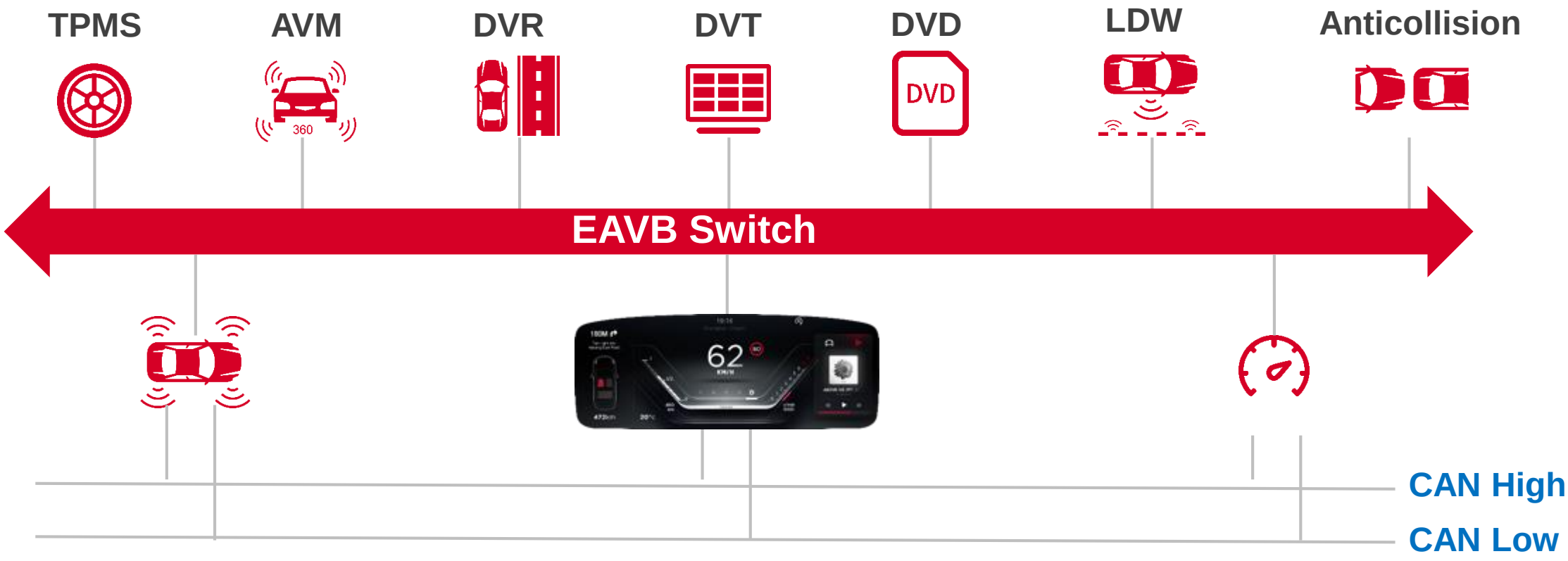


Estimated Multi-Frequency GNSS Performance

SN.	GNSS Performance Metric	L1 GNSS	L1 + L5 GNSS	Remark
1	2D positioning error (50%, 68%, 95%)	< 2 m, < 2.5 m, < 5 m	< 1.2 m, < 1.5 m, < 3 m	Under open sky conditions, standalone
2	Altitude accuracy (50%, 68%, 95%)	< 2.5 m, < 3 m, < 6 m	< 2 m, < 2.5 m, < 5 m	
3	2D positioning error in meters (50%, 68%, 95%)	< 1 m, < 1.5 m, < 3 m	< 0.9 m, < 1.1 m, < 2.2 m	Under open sky conditions, standalone with SBAS
4	Altitude accuracy (50%, 68%, 95%)	< 2 m, < 2.5 m, < 5 m	< 1.6 m, < 2 m, < 4 m	Under open sky conditions, SBAS
5	Speed accuracy (68%, 95%)	0.15 m/s, 0.3 m/s	0.15 m/s, 0.3 m/s	Straight line driving at 30m/s
6	Heading accuracy (68%, 95%)	0.2 deg, 0.5 deg	0.2 deg, 0.5 deg	
7	Vertical speed accuracy (68%, 95%)	0.23 m/s, 0.45 m/s	0.23 m/s, 0.45 m/s	
8	RTK 2D positioning error in centimeters (50%, 68%, 95%)	< 1 cm, < 1.2 cm, < 2.5 cm	< 1 cm, < 1.2 cm, < 2.5 cm	Open sky, static environment. Based on Qualcomm GNSS receiver capabilities assuming < 1 km short base line RTK, choke ring type precision navigation grade antenna in perfect no interference environment.
9	RTK altitude accuracy (50%, 68%, 95%)	< 2 cm, < 2.5 cm, < 5 cm	< 2 cm, < 2.5 cm, < 5 cm	
10	RTK heading accuracy (68%, 95%)	0.05 deg, 0.1 deg	0.05 deg, 0.1 deg	

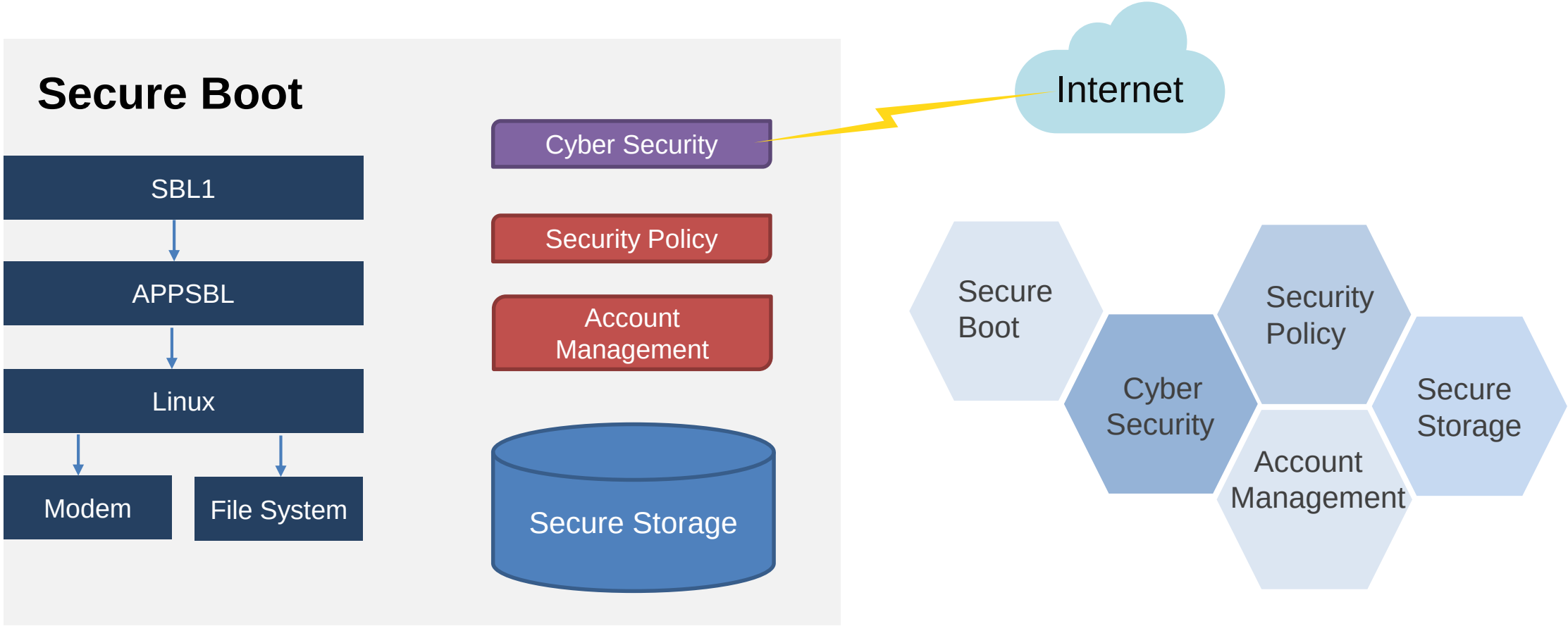
NOTE: The above data is applicable to AG52xR and AG55xQ series modules, and tested based on V2X&5G EVB kit.

Ethernet AVB (Audio Video Bridging)



Ethernet AVB (Ethernet Audio/Video Bridging), based on IEEE 802 standard, provides perfect quality of service through guaranteeing bandwidth, limiting latency and accurate time synchronization on the basis of traditional Ethernet network, so as to support various audio and video network multimedia applications.

Security Solution



QuecOpen® Software Architecture

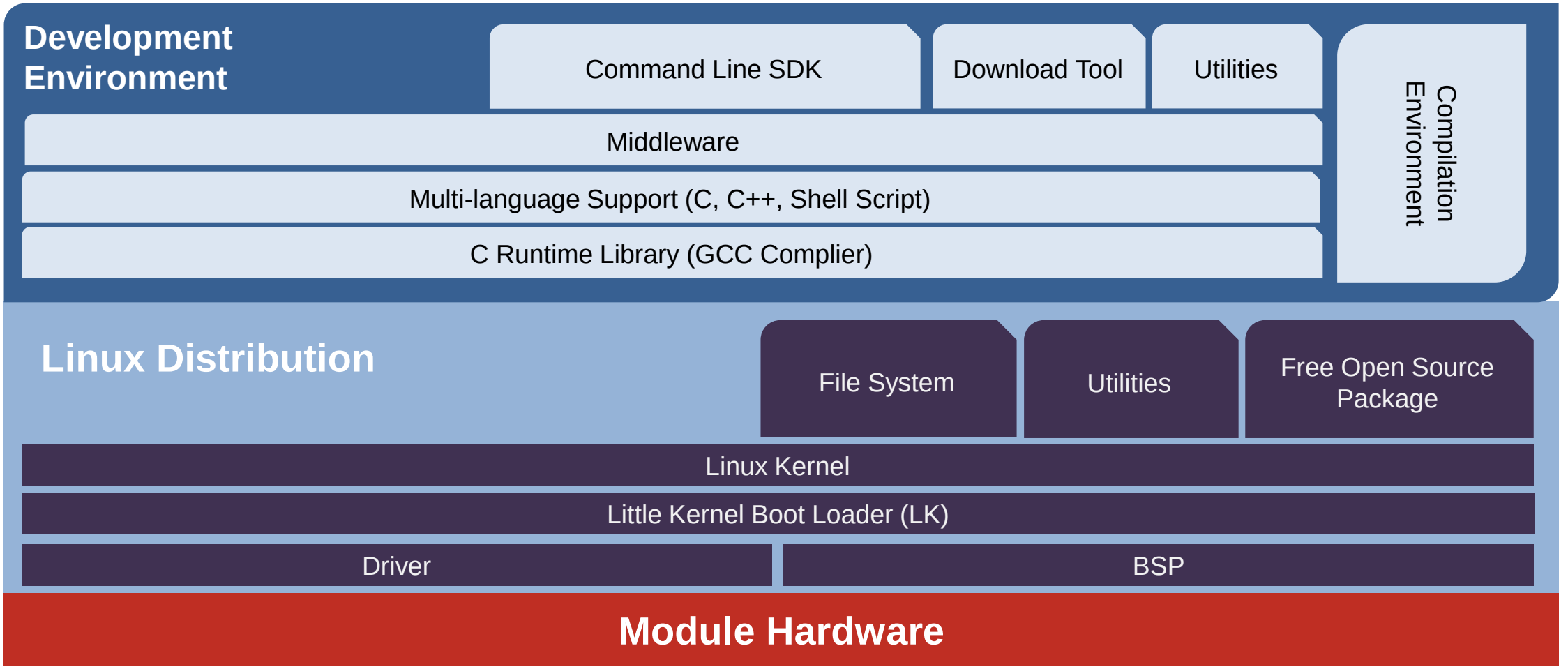
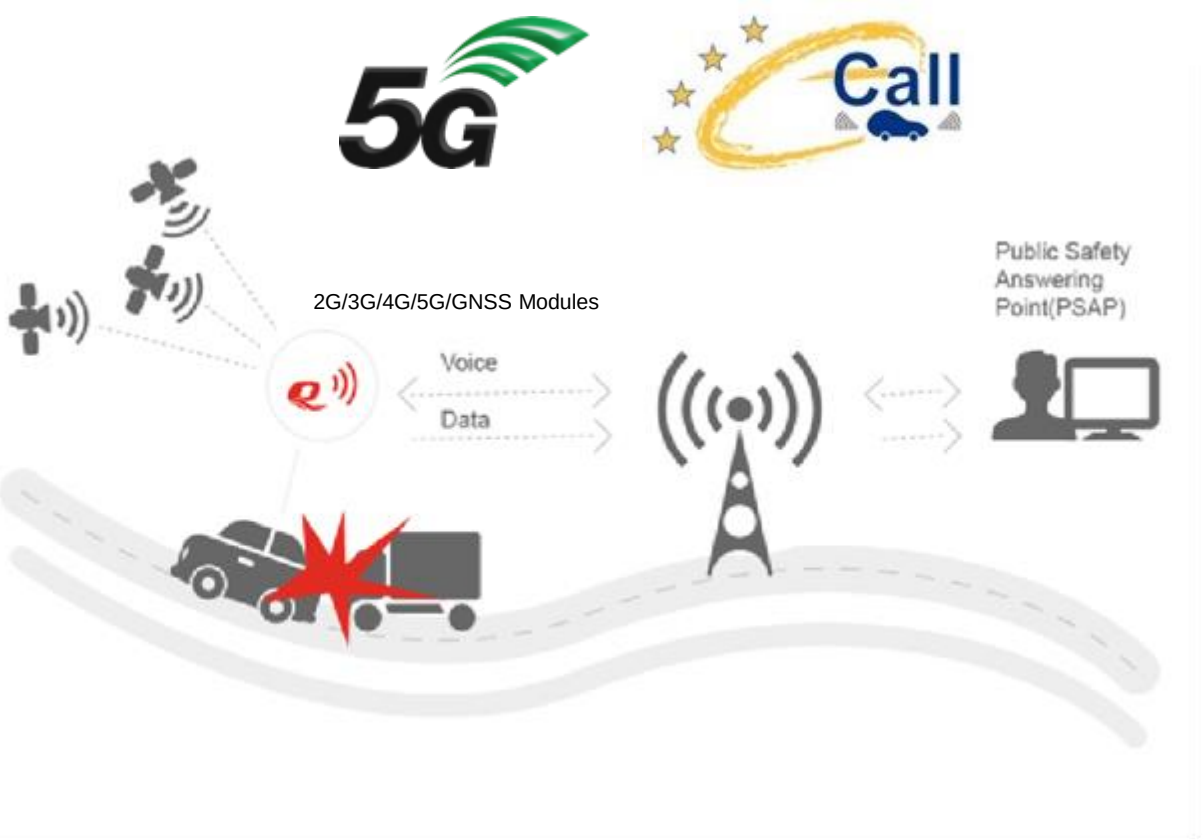


Figure: Framework of QuecOpen®

eCall Function

A car will have an electronic safety system automatically call emergency services in case of a serious accident. Even if the driver is unconscious, the system will inform rescue workers of the crash site's exact whereabouts, and the rescues will be on its way within minutes. The system is named as "**eCall**".



- *Quectel supports eCall in 2G/3G/4G/5G/GNSS modules and has been working on eCall since late 2011.*
- *Quectel has enough development experience on eCall to support and assist customers with eCall application development.*

DR Function

Quectel automotive modules support Qualcomm DR Technology

Support Bosch 6-axis inertial MEMS sensor:

- Industrial sensor: BMI160
- Automotive sensor: SMI130

Support STMicroelectronics 6-axis gyroscope:

- Automotive sensor: ASM330

Support InvenSense 6-axis gyroscope:

- Automotive sensor: IAM-20680

Condition	2D DR Position Drift	
2D DR position drift (straight road tunnel, Minimum 1km length)	2D position error in distance (50%)	~0.6 m @ 1 km
	2D position error in distance (95%)	~1 m @ 1 km
	2D position error in distance as % of distance travelled (50%)	< 0.6%
	2D position error in distance as % of distance travelled (95%)	< 1%

DR: Dead Reckoning

DR Positioning *GNSS Positioning*

Multi-level Building

Underground Parking Lot

RTK Positioning Technology

Integrating Qualcomm DR technology and Qianxun RTK positioning technique

Quectel AG35 series: L1 band GNSS RTK, 1 meter lane level positioning accuracy.
Quectel AG52xR/ AG55xQ series: L1 + L5 GNSS RTK, centimeter level positioning accuracy.

RTK Advantages:

High efficiency

High positioning accuracy and no error accumulation

All-day operation

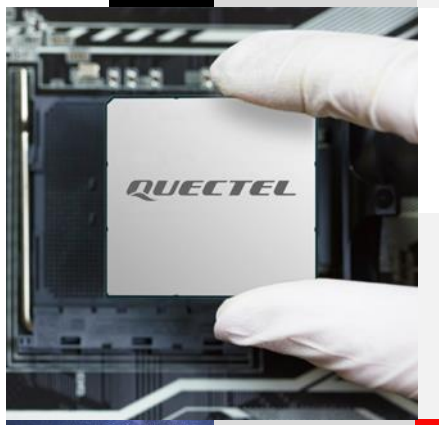
Automation and high integration level

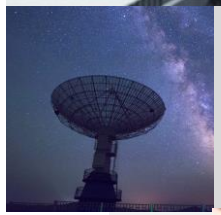
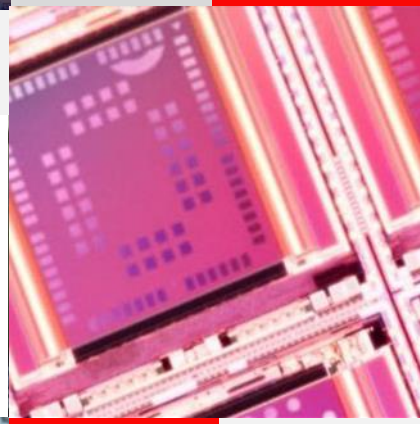
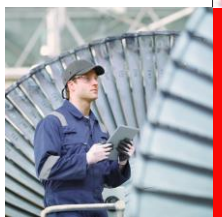
Item	Accuracy	Definition
Fixed Solutions		
Horizontal Positioning Accuracy	< 10 cm	2D position accuracy of ambiguity-fixed solutions (CEP95)
Float Solutions		
Horizontal Positioning Accuracy	< 100 cm	2D position accuracy of ambiguity float solutions (CEP95)

RTK: Real-Time Kinematic

Roadmap
Product Overview
Support Package
Enhanced Technologies
Applications

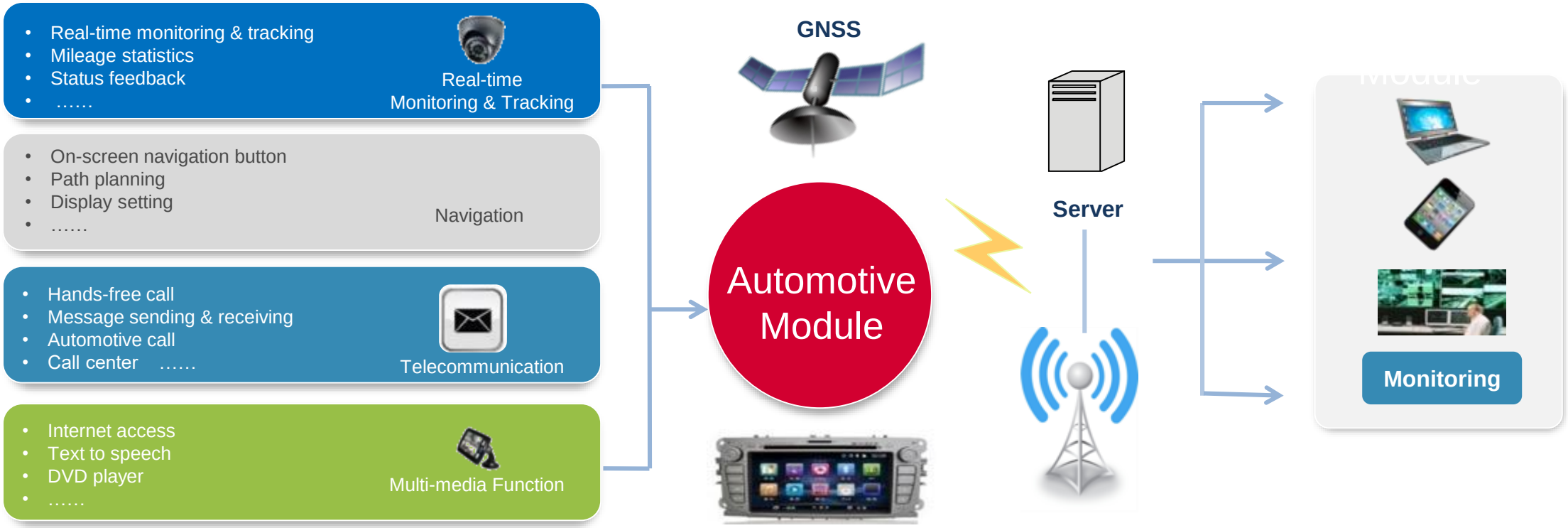
Build a Smarter World



GNSS-based Autonomous Navigation System

- GNSS-based autonomous navigation system + monitoring center + wireless communication + Internet
- Based on M2M module, it combines geographical information system with automotive voice-assisted navigation technology to implement the perfect integration of the on-board wireless communication with autonomous navigation system.



T-BOX

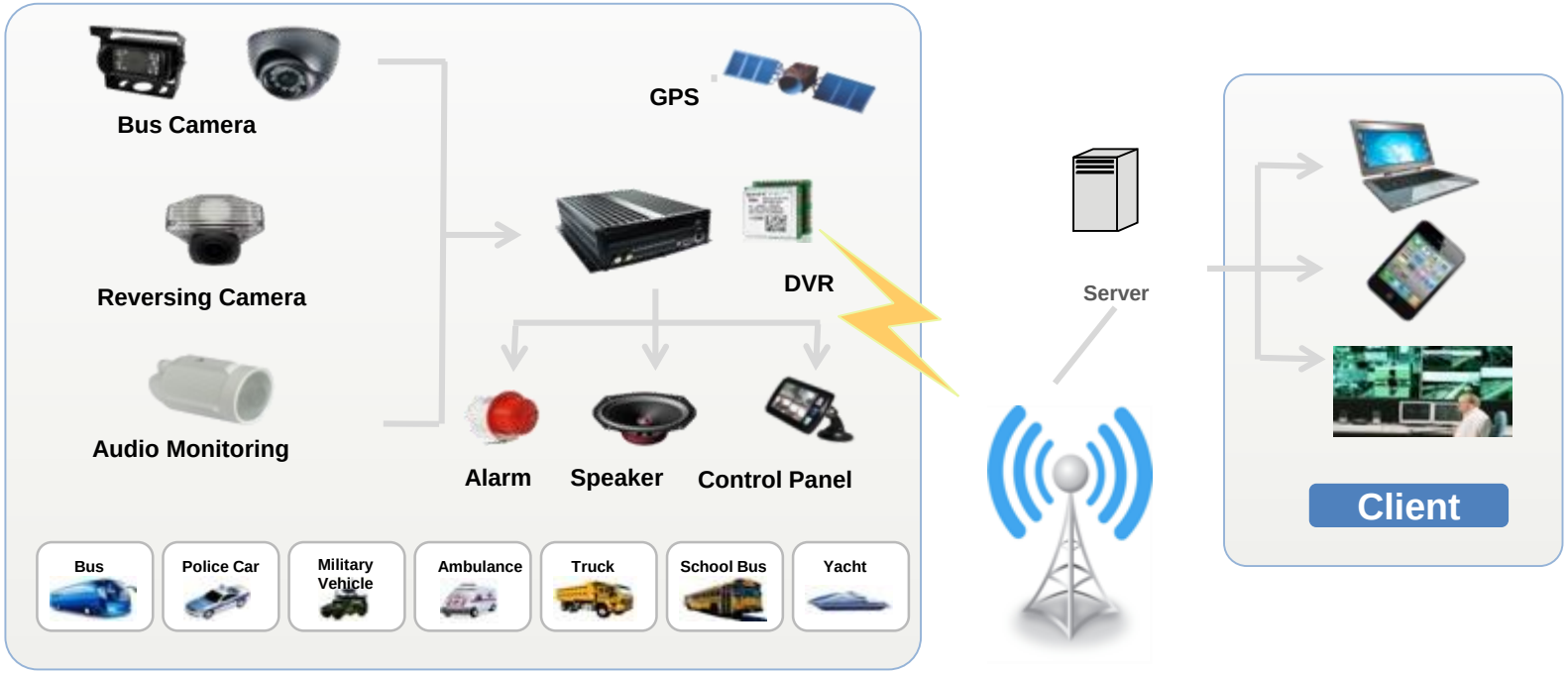
T-Box is a standard terminal for the connected car, providing diversified online applications like vehicle remote monitoring, remote control, safety monitoring and alarming, and remote diagnosis by means of 4G/5G remote wireless communication, GNSS satellite positioning, acceleration sensing and CAN communication functions.

T-BOX transmits the vehicle information and position information to the TSP Center via the built-in module. The TSP Center can track the status of vehicles and provide relevant services accordingly.

- Windows and air conditioner control
- Vehicle health alerts
- Unsafe driving alerts & reports
- Remote automatic vehicle diagnostic

4G DVR

- Real-time video and audio monitoring
- Track and record vehicle movement including speed, position, temperature, brake, reverse, turn, alarm, etc.
- Remote communication with driver by intercom, broadcasting, and text message
- Video playback
- Remote alarm



OBD

On-board diagnostics (OBD) refers to a vehicle's self-diagnostic and reporting capability. OBD systems give the vehicle owner or repair technician access to the status of the various vehicle subsystems.

- Self-diagnostic and reporting features
- Integrated GSM/GPRS and/or Bluetooth, GPS+BeiDou.
- Supports CAN and OBD II protocols
- Data can be stored on remote servers
- Provides real-time data for drivers or maintenance technicians to rapidly identify and remedy malfunctions within vehicles

4G/5G In-car Wi-Fi

In-car Wi-Fi refers to Internet service provided in a car. Internet access can be provided by tethering a mobile phone, or with a mobile hotspot, whether portable or built into the car.

- Stay connected to everything while on the road
- Access your music, apps, social media – everything needed to keep in touch

Fast and reliable connection

Stream movies and TV on the go

4G/5G In-car Wi-Fi

Easy access to multi-media

Real-time data transmission

Intelligent BOX

Intelligent BOX not only provides the functionalities related with telematics, but also C-V2X functionalities including V2V/ V21/ V2P.

Telematics functionalities:

- Windows and air conditioner control
- Obtain real-time traffic, road and pedestrian information
- Vehicle health alerts
- Unsafe driving alerts & reports
- Remote automatic vehicle diagnostic

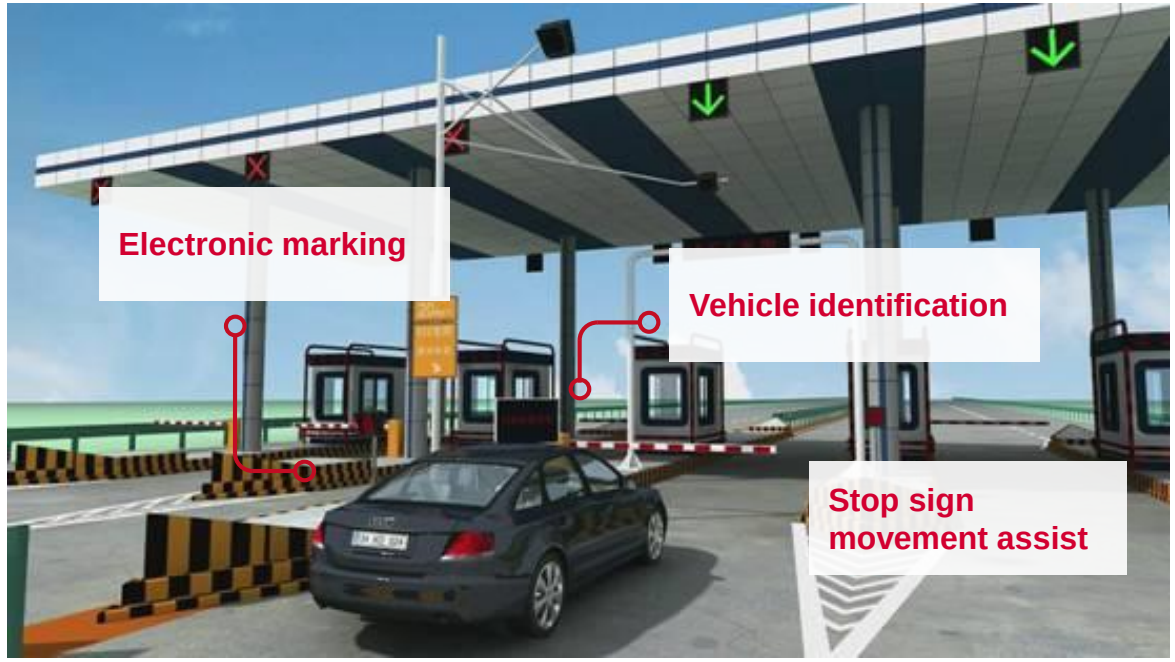
C-V2X functionalities:

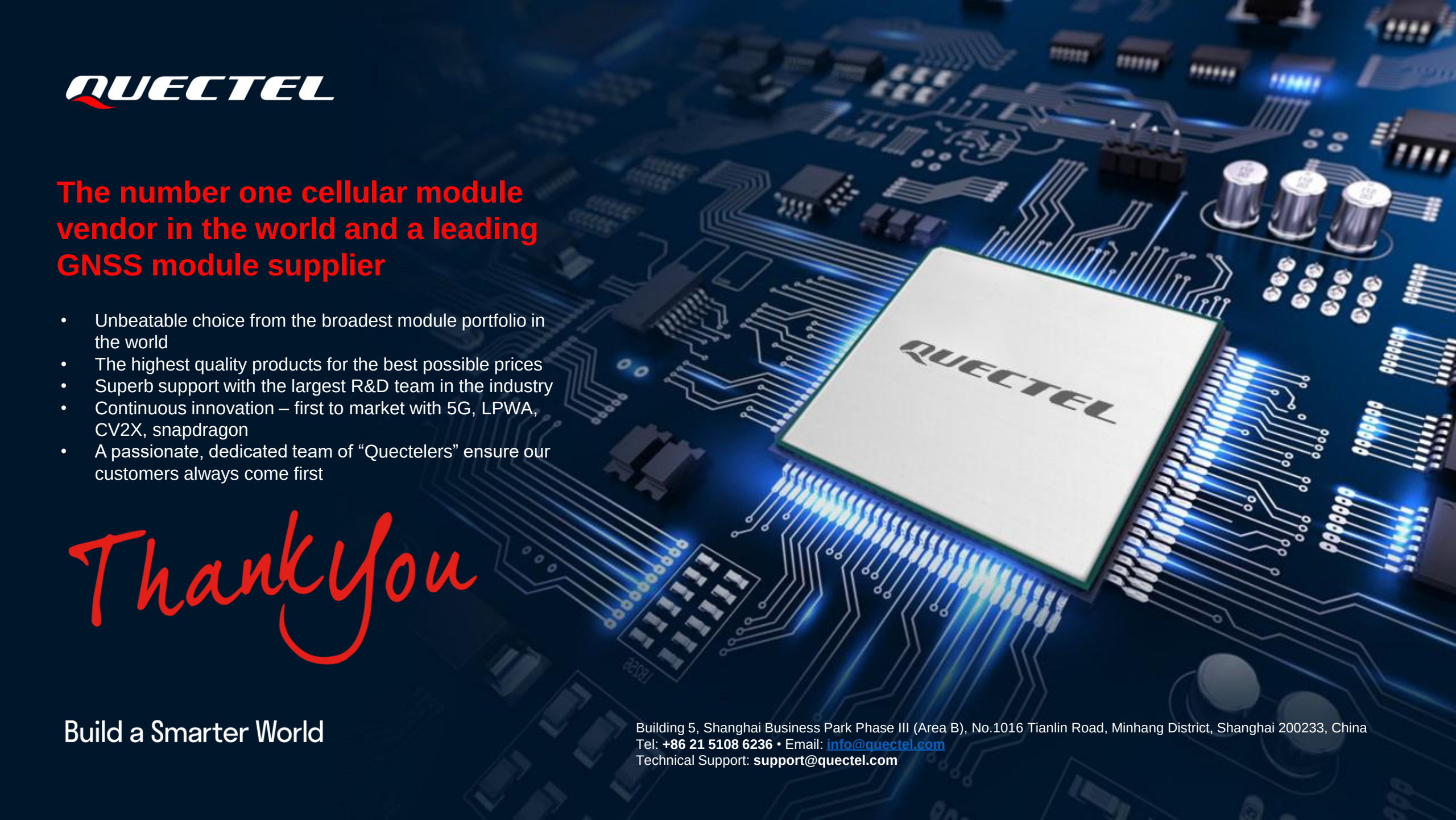
- V2V/ V2I/ V2P

TSP (Telematics Service Provider)

RSU

- RSU, which literally means Road Side Unit, is installed on the Road Side in traffic light system, ETC systems, etc. and it uses **C-V2X** technology to communicate with **OBU (On Board Unit)** inside vehicles.
- When an accident occurs, wireless technologies enable vehicles to share warning messages with other vehicles by using **vehicle to vehicle (V2V)** communications, and with the emergency services by using **vehicle to infrastructure (V2I)** communications. Regarding vehicle to infrastructure communications, RSU acts similarly to wireless LAN access points, and can provide communications with the infrastructure.





The number one cellular module vendor in the world and a leading GNSS module supplier

- Unbeatable choice from the broadest module portfolio in the world
- The highest quality products for the best possible prices
- Superb support with the largest R&D team in the industry
- Continuous innovation – first to market with 5G, LPWA, CV2X, snapdragon
- A passionate, dedicated team of “Quectelers” ensure our customers always come first

Thank You

Build a Smarter World

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