

UWB Spectrum Regulatory Position

**Car Connectivity Consortium Digital Key –
The Future of Vehicle Access**



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Executive Summary:

The CCC Digital Key™ belongs to the class of new UWB technology-based applications that contributes to a fast-growing ecosystem. UWB technology enables highly secure and cm-level accuracy ranging. ITU WRC-27 Agenda Item 1.7 covers the range 7.125 – 8.4 GHz or parts thereof – see Figure 1. Furthermore, recent developments out of ITU WRC-23 mean that commonly used UWB channel 5 (6.2 – 6.8 GHz) will soon be rendered useless due to the coexistence of IMT and WiFi in this band. The CCC opposes the identification of 7.75 – 8.4 GHz for IMT, which fully overlaps with its only remaining UWB channel 9 (7.7 - 8.3 GHz). The high-power ubiquitous deployment of IMT would have a drastic interference impact on UWB technology being deployed by CCC members and its already widespread implementation in manifold automotive and consumer use cases.

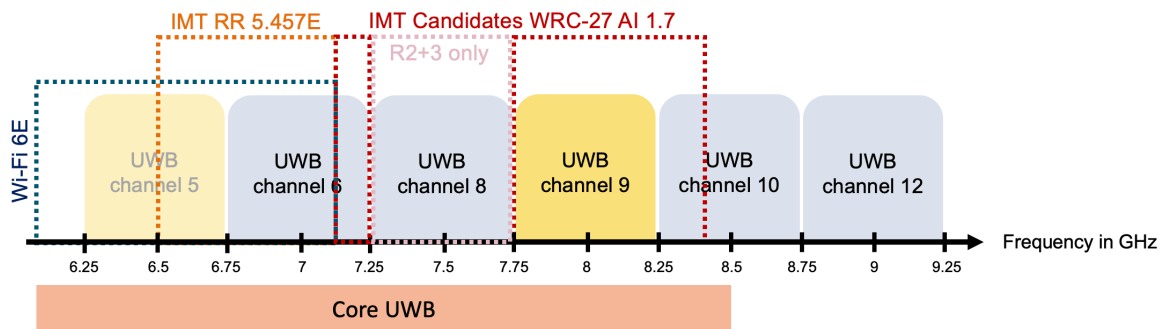


Figure 1 - Overview of UWB channels and ITU regulations established and under discussion.

There is also significant interest and ongoing work around child presence detection systems using UWB in locked cars and an increasing number of UWB-based sensing vehicular applications.

Introducing the Car Connectivity Consortium

The Car Connectivity Consortium® (CCC) is a cross-industry organization advancing global technologies for smartphone-to-car connectivity solutions. CCC has developed the Digital Key Specification and Certification Program, a standard to allow smart consumer electronic devices, such as smartphones, to act as a vehicle key and more. CCC Digital Key securely and conveniently enables the normal lock, unlock and start engine functions by users, but goes further to allow key sharing, offering access to friends or valets, and many more features by using their phones or other smart devices such as watches or fobs.

Now over 300 strong, the CCC's member companies consist of consumer electronics manufacturers and vehicle manufacturers, automotive Tier-1 suppliers, semiconductor manufacturers, security product suppliers, and more. The CCC's Board of Directors includes individuals from charter member companies Apple, BMW, Ford, General Motors, Google, Honda, Hyundai, Mercedes-Benz, NXP, Panasonic Automotive Systems, Samsung, Thales, Volkswagen, and Xiaomi.

CCC Digital Key™

The CCC Digital Key is a standardized ecosystem that enables mobile devices to store, authenticate, and share Digital Keys for vehicles in a secure, privacy-preserving way that

works everywhere, even when the smartphone's battery is low. Since 2019, UWB has been a core element of the CCC Specification for Digital Key and is used in combination with other technologies such as BLE and NFC. It is the UWB technology that delivers the accurate and secure ranging capability, thus securing the access and use of the vehicle.



CCC Digital Key allows consumers to use their mobile devices easily and confidently, regardless of manufacturer or operating system, to access vehicles. Along with robust capability and convenience, it offers enhanced security and privacy protections. CCC Digital Key aims to complement traditional methods, while being robust enough to fully replace them.

CCC Digital Key operates with radio interfaces that ensure safety and convenience, with a state-of-the-art level of security and privacy protections to unify the world of mobile devices and vehicles.

Supported Use Cases include:

- Unlock the Vehicle – smart device in a vehicle's proximity
- Lock the Vehicle – smart device distancing from a vehicle
- Start the Engine – smart device within a vehicle
- User Authentication
- Digital Key Provisioning (typically upon purchase)
- Digital Key Revocation
- Selling the Vehicle
- Digital Key Sharing – remote & Peer-to-Peer
- Digital Key Properties – restricting (shared) key usage



The ability to instantly share a key, from anywhere in the world, across and between, e.g., mobile phone platforms (incl. operating systems) and different vehicle brands is utterly unique to the CCC Digital Key. With the vast majority of the world's smartphone and vehicle manufacturers by volume as members, what was once a vision is now real.

UWB Technology in Digital Key and Beyond

UWB secure ranging is a core technology that enables CCC Digital Key. Based on the IEEE 802.15.4z standard amendment, it defines secure ranging, preventing car theft while preserving full user convenience.

UWB secure ranging works by sending pulses of radio energy, measuring the time to cover the distance between transmitter and receiver. By using strong encryption technology, this distance measurement cannot be hacked by car thieves and the distance can be established quickly, precisely, and securely.

UWB secure ranging consumes very little power and is ultra- accurate – under 10cm in a typical CCC Digital Key application. Unlike many other distance measurement technologies, UWB works in adverse environmental conditions: fog, smoke, rain and in multi-path propagation conditions such as parking garages.

There are also further vehicle applications based on the unique features of UWB-based ranging, such as identifying children left behind in the car - e.g. in extreme Winter or Summer conditions - as well as many more safety and convenience benefits. UWB-based applications that utilize the technology's unique qualities are serving to strongly accelerate market adoption in the primary markets of smart consumer electronic devices and vehicles, but also open opportunities for smaller companies to innovate with tailored solutions. Additionally, it offers many benefits for dedicated consumer groups like people with disabilities, among others.

Rapidly Growing Market Adoption of CCC Digital Key™

Since the completion of the CCC Digital Key Release 2 in April 2020, vehicle and smart device OEMs have started the implementation in their end-user products. With the completion of CCC Digital Key Release 3 in 2021, UWB radios installed in both vehicles and smartphones have been deployed for CCC Digital Key functions by many CCC members.

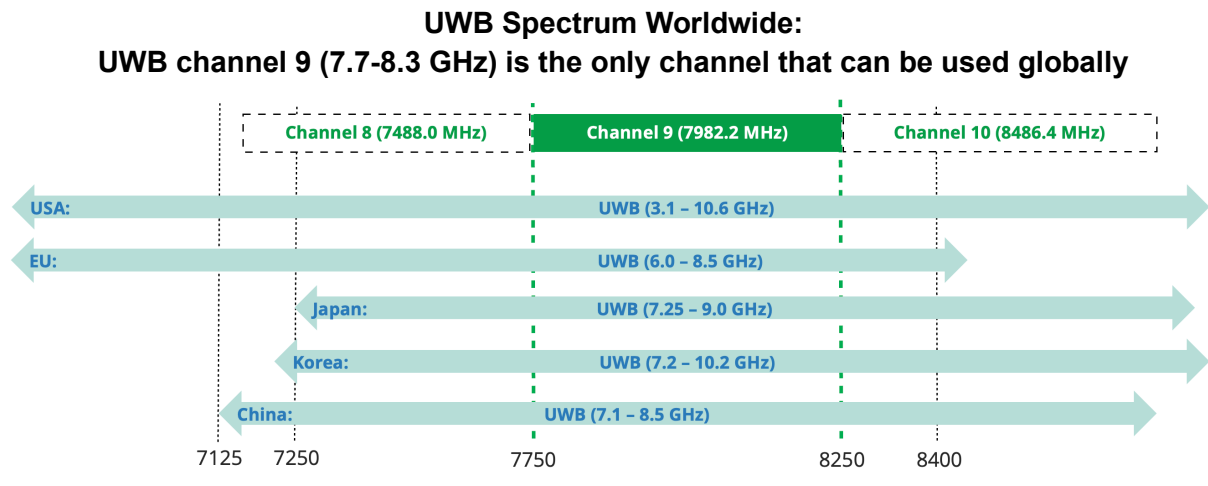
CCC Digital Key™ - Use of Spectrum

UWB technology as employed for the CCC Digital Key does not require dedicated or licensed spectrum. Having a maximum power level of -41dBm /MHz, it simply coexists on a noninterference/non-protection basis in spectrum used by incumbent spectrum users such as satellite systems, scientific applications, fixed links, and radar systems. The CCC Digital Key only selectively uses the UWB secure ranging protocol over time, thus further reducing the spectrum utilization and potential interference with other systems.

Technical Spectrum Facts:

- CCC Digital Key UWB uses IEEE UWB channel 9 (7.7 – 8.3 GHz). IEEE UWB channel 5 (6.2 – 6.8 GHz) used to be an alternate channel until the identification of IMT and addition of Wi-Fi in the band. Now channel 9 remains as the only global channel for UWB (see figure below).
- It handles interference from longer distance narrow-band transmitters very well since the time-domain correlation discrimination in UWB receivers intrinsically filters out such signals.

- However, Digital Key UWB receivers are susceptible to interference from higher power wideband communication transmitters located closely to the UWB receiver. International IMT and Wi-Fi are key examples.
- High power applications in the 7.7 – 8.3 GHz spectrum would overwhelm the sensitive UWB receivers and destroy the growing consumer market.



Conclusion:

ITU WRC-27 Agenda Item 1.7 covers the range 7.125 – 8.4 GHz or parts thereof. The CCC opposes the identification of 7.75 – 8.4 GHz for IMT, which fully overlaps with its only remaining UWB channel 9 (7.7 - 8.3 GHz). The high-power ubiquitous deployment of IMT would have a drastic interference impact on UWB technology being deployed by CCC members and its already widespread implementation in manifold automotive and consumer use cases.