

Introduction to the VII Mobile Communications Requirements

Purpose

The purpose of this package is to provide an overview of the requirements that must be met by the mobile communications medium or set of media used in the Vehicle Infrastructure Integration (VII) system.

Definition of VII

VII is an enabling system for networked vehicle safety, mobility, and commercial applications, much like the internet is an enabling system for networked computer applications. VII includes the technology and architecture needed to enable wireless data communications among vehicles and between vehicles and infrastructure-based equipment. VII also requires backroom processes, and systems of governance and operations to support functionality. System reliability, and data privacy and security are foundational principles of any VII system.

VII's primary purpose is to enable safety-of-life applications that can prevent crashes from occurring by warning drivers of imminent dangers, such as a stopped vehicle or braking ahead. Drivers could also receive warnings to stop for a red light or reduce speed for a dangerous curve, and could receive assistance in judging gaps for lane merging and intersection crossing. Mobility applications include those that enhance driving experience, such as provision of traveler information, and others that support roadway maintenance and transportation system management. Examples include information about roadway surface freezing conditions, and information to support balancing of traffic on adjacent facilities. Applications for transit, freight, transportation planning, and electronic payment of tolls and fees are also possible.

The VII research program has focused on Dedicated Short Range Communications (DSRC) as the only currently known, single, non-proprietary technology that can potentially meet *all* of the requirements for safety-of-life applications. However, many wireless technologies are capable of supporting VII mobility applications, and wireless capabilities are expected to continue to improve over time. Therefore, the architecture vision for VII has been broadened to include the possibility that a set of wireless technologies, rather than a single technology, may be the best way to meet the VII mobile communications requirements. The ultimate VII architecture must be flexible to multiple technology solutions and technology changes over time. Standardization is required to support national interoperability for communication and message content. Ultimately the market will determine what technology is deployed.

VII Mobile Communications Requirements

The DSRC spectrum assigned to ITS services by the FCC, and the corresponding DSRC standards (IEEE 802.11p and IEEE 1609) were developed to meet specific needs and requirements that were identified and vetted by a broad array of government and private

sector stakeholders. While the majority of ITS applications can be handled by general purpose communications technologies, numerous studies determined that an important subset of applications, including safety of life crash avoidance applications, have special requirements.

<p style="text-align: center;">Requirements for ITS Vehicle to Vehicle and Vehicle to Infrastructure Safety Applications</p> <ul style="list-style-type: none">• Very low network access times• Low latency• High reliability and availability• Good security and privacy protection• Adequate bandwidth (at least 48 MHz, preferably 75 MHz)• Limited range (1,000's of meters) to allow spectrum reuse and limit interference

Based upon a set of planned applications for VII, the ASTM DSRC standards committee developed a set of requirements for VII mobile communications. At that point in the program, the VII architecture envisioned a single communications medium capable of meeting all requirements, and the only approach meeting all requirements was some form of local, short-range communications utilizing dedicated spectrum.

In order to broaden the range of possibilities to include the potential use of multiple wireless media, depending upon the application, some reorganization and reformatting of these original communications requirements was needed. This has been done in the attached briefing package.

The package documents the requirements for VII mobile communications. Requirements listed as "Overall Requirements" apply to any medium used to support VII applications. Requirements listed as "DSRC-Specific Requirements" would only apply to short-range dedicated communications approaches. However, while these requirements are defined for short-range communications, they derive from the requirements of the applications, and a corresponding, but different set of specific requirements would have to be met by any alternative approach. The last slide lists 3 requirements that would need to be met by any solution that utilizes the 5.9 GHz ITS DSRC spectrum that the FCC has allocated.