Vehicle-to-Vehicle Safety Communication Systems in JAPAN
- Current Status and JAMA’s Role -

Masaki KAKIHARA
ITS Technical Subcommittee
Japan Automobile Manufacturers Association (JAMA)
JAMA Committee Organization

**Committee**
- Technical Administration

**Safety & Environmental Technology**
- Environment
- Traffic Affairs
- Distribution
- Taxation
- Purchasing
- International Affairs
- Electronic Information Exchange
- Human Resources

**Subcommittee**
- Safety
- Emissions & Fuel Efficiency
- Noise
- Fuel & Lubricants
- Electronics
- Electric Vehicle
- Heavy Vehicle

**Expert Group**
- ITS Technical
- Human Machine Interface
- Mobile Communication
- Smart System

**JAMA Committee Organization**

V-to-V Safety Communication Systems in JAPAN

ITS Technical SC
Masaki KAKIHARA

ITS-WC London VSC SS
October 11, 2006
Up to 2005: Feasibility Study of 5.8GHz Band for V-to-V Communication

5.8GHz band already allocated for ITS (Road-Vehicle Communication)

- Being applied to ETC (ARIB STD-T55)
- Studying V-to-V Communication based on DSRC (ARIB STD-T-75)

Up to 2005:

- Feasibility Study of 5.8GHz Band for V-to-V Communication
- 5.8GHz band already allocated for ITS (Road-Vehicle Communication)
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### Frequency Allocation and Use of the 5.8GHz Band

**5.8GHz band already allocated for ITS (for Road-Vehicle communication systems)**
- 2 up/down channels in service for ETC (ARIB STD-T55)
- Under study of Road-Vehicle communication services by DSRC (ARIB STD-T75)

<table>
<thead>
<tr>
<th>Frequency band width</th>
<th>4.4MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulation scheme</td>
<td>ASK (ETC) , QPSK</td>
</tr>
<tr>
<td>Bit rate</td>
<td>1Mbps /ASK , 4Mbps / QPSK</td>
</tr>
<tr>
<td>Maximum radiation power</td>
<td>Road side unit</td>
</tr>
<tr>
<td></td>
<td>300mW</td>
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**Frequency allocation**

(Source: Home Page of Ministry of Internal Affairs & Communications)

<table>
<thead>
<tr>
<th>Downlink</th>
<th>Uplink</th>
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<tbody>
<tr>
<td>5.770</td>
<td>5.775</td>
</tr>
<tr>
<td>5.780</td>
<td>5.785</td>
</tr>
<tr>
<td>5.790</td>
<td>5.795</td>
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<tr>
<td>5.800</td>
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<tr>
<td>5.815</td>
<td>5.820</td>
</tr>
<tr>
<td>5.825</td>
<td>5.830</td>
</tr>
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<td>5.835</td>
<td>5.840</td>
</tr>
<tr>
<td>5.845</td>
<td>5.850</td>
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- **Source:** Home Page of Ministry of Internal Affairs & Communications
V-to-V systems prevent roughly 30% of ca. 9,000 traffic fatalities a year

**Targeted accident types**
- Collisions when making a right turn
- Collisions at intersection corners
- Collisions with pedestrians
- Head-on collisions
- Rear-end collisions
- Collisions when making a left turn
- Collisions when changing lanes

**Requirements for communication specifications**
- Required communication zone: Shown on the right
- Vehicles present in the communication zone: 1,780 (max.)
- Required transmission speed: 20Mbps (band width 10MHz)

**Verification test in Tomakomai (July to October 2005)**
- Confirmed efficiently help preventing accidents (on the assumption that communication can be done)
- Need to develop suitable communication media (these was no media to cover the zone in the test)
  (5.8GHz/10mW with repeaters was utilized as the surrogate method of V-to-V direct communication)

(Source: ASV Report)
**IVC Study on V-to-V Safety Communication Systems**

**Purpose**
- Standardization of V-to-V communication technologies on the basis of R&D trends in the world

**Task**
- Feasibility study of 5.8GHz band V-to-V communication systems based on the ARIB STD-T75

**Current status**
- Difficult to satisfy the ASV requirements due to T75 restrictions and large corner loss of 5.8GHz
- Studies on V-to-V direct com. (reduced application) and with repeaters (V-R-V com.) are underway

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**Reduced Application**

100m

5m

Prevent accidents caused by careless safety check after stopping at a intersection

**with Repeaters (V-R-V communication)**

200m

25m

Repeater

Use of repeaters to cover the ASV communication zone

(Source: IVC Report)
### 2005/5: JAMA Proposal on the Suitable Frequency for V-to-V Communication

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- 700MHz - 6GHz suitable for V-to-V safety communication

- JAMA proposal to WBB-SG

- 5.8GHz band already allocated for ITS (Road-Vehicle Communication)
Radio Policy Vision” (July 2003 Telecommunication Council Report)

Guideline for Spectrum Reallocation” (October 2003 MIC)

Urgent need to specify details of concrete measures to promote wireless broadband

Study of developments in both domestic and international wireless broadband services

Identification of future wireless broadband usage and market

Study Group for Wireless Broadband Promotion

(November 2004)

JAMA Proposal

700MHz - 6GHz for V-to-V safety communication systems

Identification of challenges in wireless Broadband promotion

Examination of promotion measures

Final Report (December 2005)

Proposed frequency band for V-to-V safety communication systems: VHF/UHF band

(source: WBB-SG Report)
**Results of ASV Study**

- **Suitable frequency band**: 200MHz - 2GHz
  - Required communication zone as shown in yellow
    - 410m forward, 410m rearward
    - 200m (line of sight) + 25m (non line of sight)
  - Radiation power less than 1W

**Notes by JAMA**

- 200-700MHz omitted due to limitations in antenna composition
- 5.8GHz included as it is already allocated for Road-to-Vehicle communication

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**JAMA’s Role:**
- Developing usable frequency bands
- Forming public consensus
- Supporting standardization
- International harmonization
Safety Communication Systems in JAPAN

October 11, 2006

ITS Technical SC
Masaki KAKIHARA

Proposal for Frequency Allocation of VHF/UHF band

Committee for Effective Radio Wave Use

Study for use of VHF/UHF bands after termination of ground analog TV broadcast
90-108MHz, 170-222MHz, 710-770MHz

Working Group for Effective Use of VHF/UHF Bands

(August 2006)

JAMA Proposal
710 - 770 MHz
for V-to-V safety communication systems

164 Proposals
(11 Proposals for ITS)

Final Report to the Committee for Effective Radio Wave Use (June 2007)

Proposal for Frequency Allocation of VHF/UHF band

(Source: Documents of VHF/UHF-WG)
### JAMA Proposal on the Suitable Frequency in VHF/UHF Band for V-to-V

#### Suitable frequency for V-to-V Communication in VHF/UHF band: 710 – 770MHz

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<th>halloween icon</th>
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#### Frequency bands opened for use
- Use of VHF/UHF bands after termination of ground analog TV broadcast (July 2011)
- Publicly offered frequency bands: 90-108MHz, 170-222MHz, 710-770MHz

#### Reasons for JAMA proposal
- Proposed to the WBB-SG the use of a 700MHz-6GHz band for V-to-V communication
- Of the three offered bands, 710-770MHz is included in the JAMA proposal to the WBB-SG
**JAMA Role in Vehicle to Vehicle Safety Communication System Promotion**

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### 2005-5
- **700MHz - 6GHz suitable for V-to-V safety communication**
  - JAMA proposal to WBB-SG

### 2006-4
- **710 – 770MHz suitable for V-to-V in VHF/UHF band**
  - JAMA proposal to VHF/UHF-WG

### 2008
- Large scale field trial
- Feasibility study

### After 2010
- Implementation

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**JAMA’s role: Develop environment**
- Getting usable frequency band
- Forming a public consensus
- Support for standardization
- International harmonization

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**JAMA**

**ITS Technical SC**

**Masaki KAKIHARA**

**V-to-V Safety Communication Systems in JAPAN**

**ITS-WC London VSC SS**

**October 11, 2006**
Toward to the Implementation of Vehicle to Vehicle Safety Communication Systems

**ASV**
- Review of ASV requirements
- System evaluation
- System development

**IVC**
- Feasibility study of 5.8GHz
- Feasibility study of 700MHz
- Standardization

**MLIT**
- Getting usable frequency band
- Forming public consensus
- International harmonization

**MIC**
- Getting usable frequency band
- Forming public consensus
- International harmonization

**NPA**
- Getting usable frequency band
- Forming public consensus
- International harmonization

MIC: Ministry of Internal Affairs & Communications
MLIT: Ministry of Land, Infrastructure & Transport
NPA: National Police Agency
ASV: Advanced Safety Vehicle
IVC: Inter-Vehicular Com. System Expert Group

**JAMA**
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