



Future Development of Vehicle - Infrastructure Cooperation Systems

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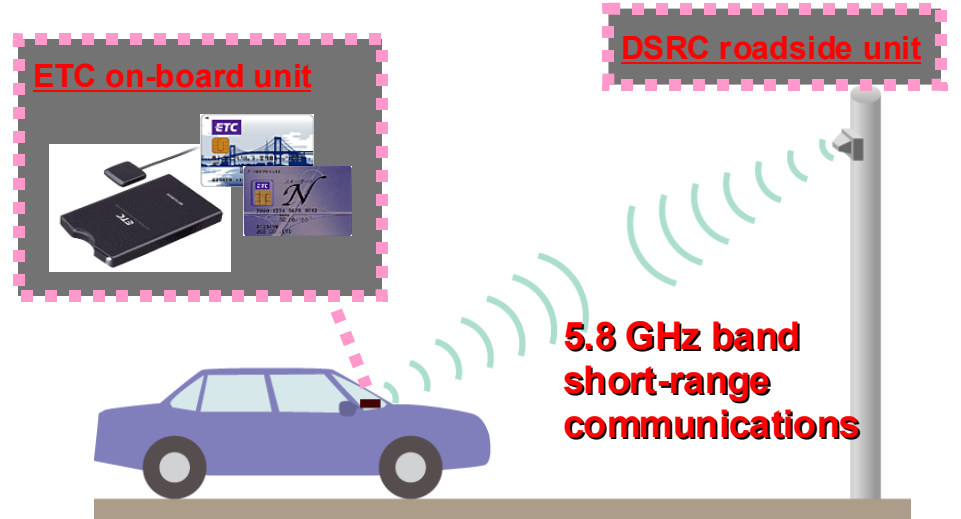
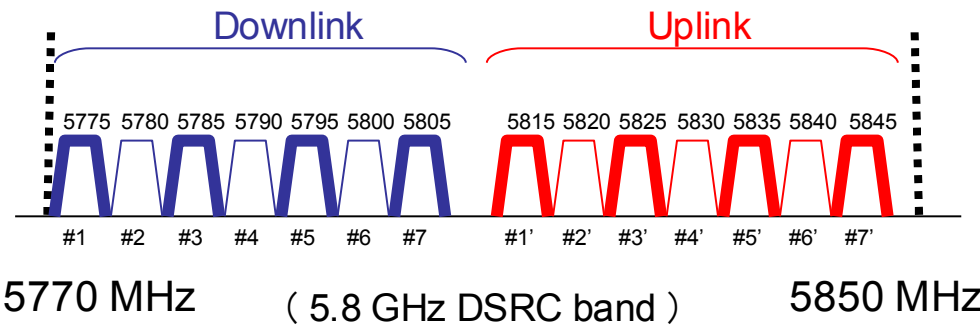
Road Bureau, Ministry of Land, Infrastructure, Transport and Tourism
Government of Japan

Features of Japan's DSRC

< Communications format of the ETC system >

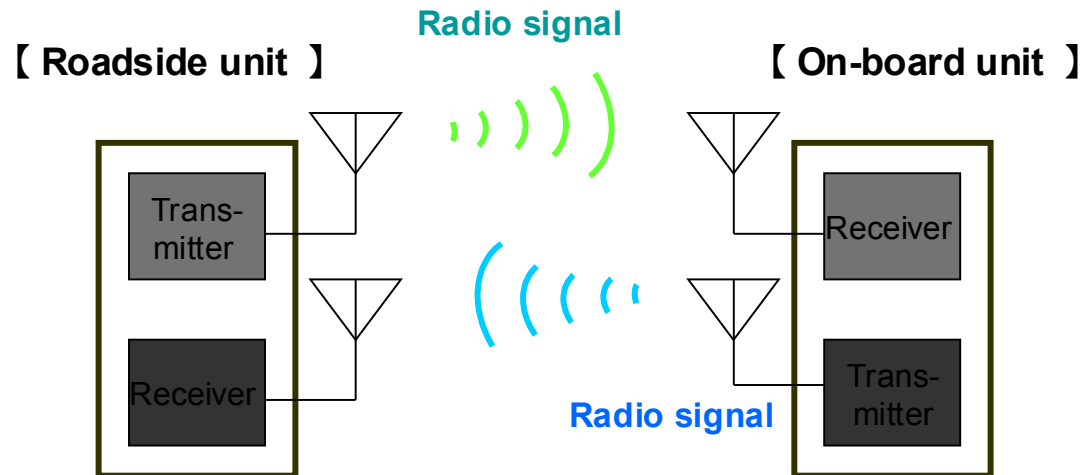
Radio frequency band	5.8GHz band	
System	Active system	
Permitted bandwidth	4.4MHz	
Number of channels (Downlink)	7	
Number of channels (Uplink)	7	
Modulation type	ASK, QPSK (ETC : ASK)	
Transmission speed	1Mbps/ASK, 4Mbps/QPSK (ETC : 1Mbps)	
Radio access type	TDMA/FDD	
Maximum antenna power	Base stations	Mobile land stations
	300mW	10mw

< Radio frequency distribution >



Features of Japan's DSRC

< Active DSRC



Summary:

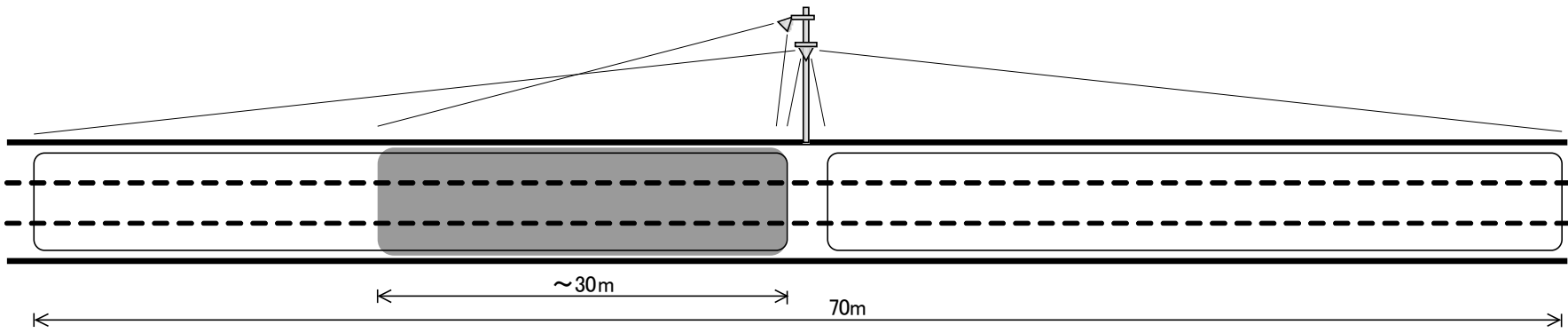
Both the on-board unit and the roadside unit have radio transmitters and can send radio signals to each other.

Features:

- Highly reliable communications
- High-capacity two-way communications
- Communications across multiple lanes

Features of Japan's DSRC

< Spot communications using DSRC >

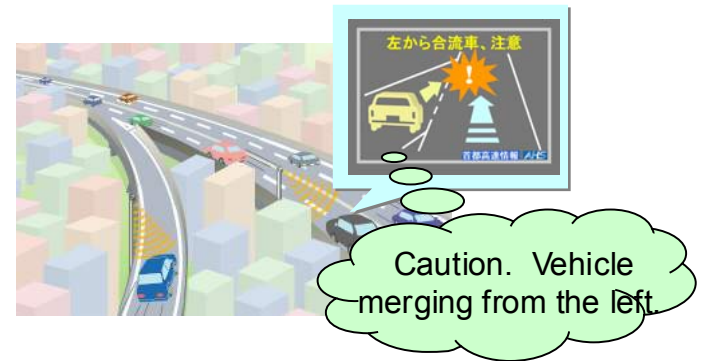


Advanced Cruise Assist Highway Systems (AHS)

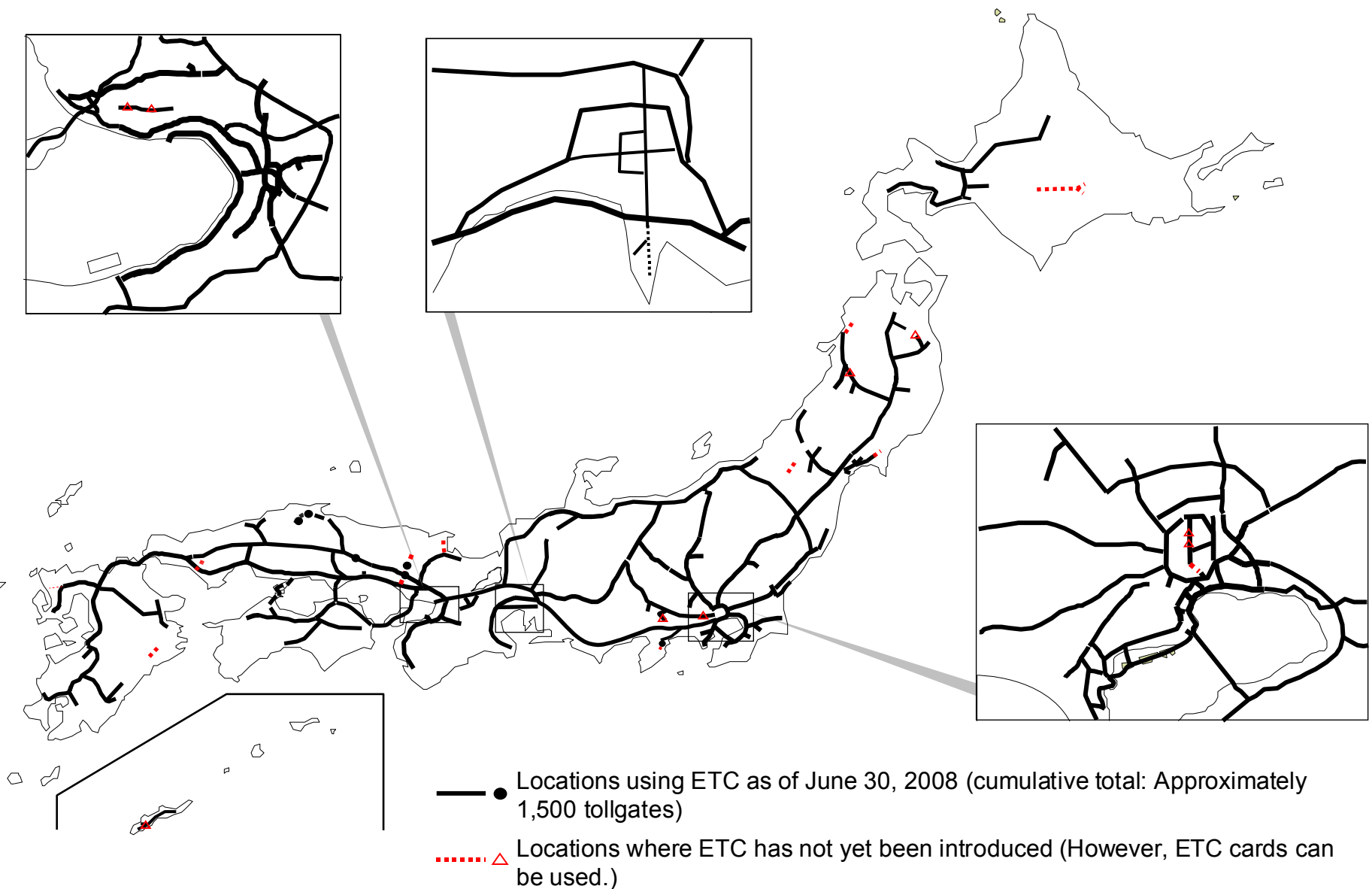
Providing information on obstacles in the road ahead



Providing merging assistance information



Spread of DSRC(ETC)



Spread of DSRC(ETC)

Penetration of ETC on-board units

- About 20.1 million ETC on-board units have been marketed in. (as of October, 2008)
- The nationwide ETC utilization rate is 74.6% (as of October, 2008)

Price of ETC on-board units

30,000 to 50,000 yen prices ranged (at the time of initial introduction)

→ Average price of an ETC on-board unit had declined to about 13,000 yen.

(at the end of fiscal 2007) . Many on-board units are being sold for less than 10,000 yen.

Highway toll payments by ETC on-board unit

- ETC has been used to make highway toll payments totaling two trillion yen.

Expanded DSRC technologies

Diverse media



VICS receiver (2.4 GHz)



+


ETC on-board unit (5.8 GHz DSRC)




ITS on-board unit (5.8 GHz DSRC)



Car navigation system



Car navigation system



VICS (wide-area, detailed road traffic information)




Shinjuku-Dori Ave. near Yotsuya-Mitsuke: Congested for 0.5 km


Fee payment at parking facilities, etc.



In-car Internet access



Driving safety support Systems



この先渋滞、追突注意

首都高速情報 / NHK

Congestion ahead. Take care to avoid a rear-end collision.

V-I Cooperation System (U.S./Japan)

	U.S.	Japan
Communication Media	DSRC(IEEE802.11p) (W-LAN, 3G, WiMAX etc)	DSRC(ARIB STD-T75) (W-LAN, 3G, WiMAX etc)
Method for Location Identification	GPS data	Small communication area by ARIB STD-T75 DSRC GPS data
Application and Data format		Using VICS format
Security	IEEE1609.2	SPF (Security Platform) *already implemented
Evaluation		Collecting data (On-road test on the Metropolitan Expressway since FY2007)
Deployment Strategy		2 types of on-board unit -Navigation-connected type -Simple on-board unit type

V-I Cooperation System (U.S./Japan)

- Applications realized by Vehicle - Infrastructure cooperation system in Japan (e.g; Smartway) are almost as same as VII.
ex; Assisting safe drive by providing obstacles information
- We have a lot of common similar challenges for future deployment.
 - Data format of applications for various applications
 - Method for location identification
 - Ensuring security
 - Cooperation with on-board navigation systems and services by private sector

Collaboration idea

- ◇ How can we exchange and share information?
(Task force, Telephone conference)
- ◇ What do we think about our outputs?
(Common report or guideline)
- ◇ How is the schedule for our activities?

Thank you !
