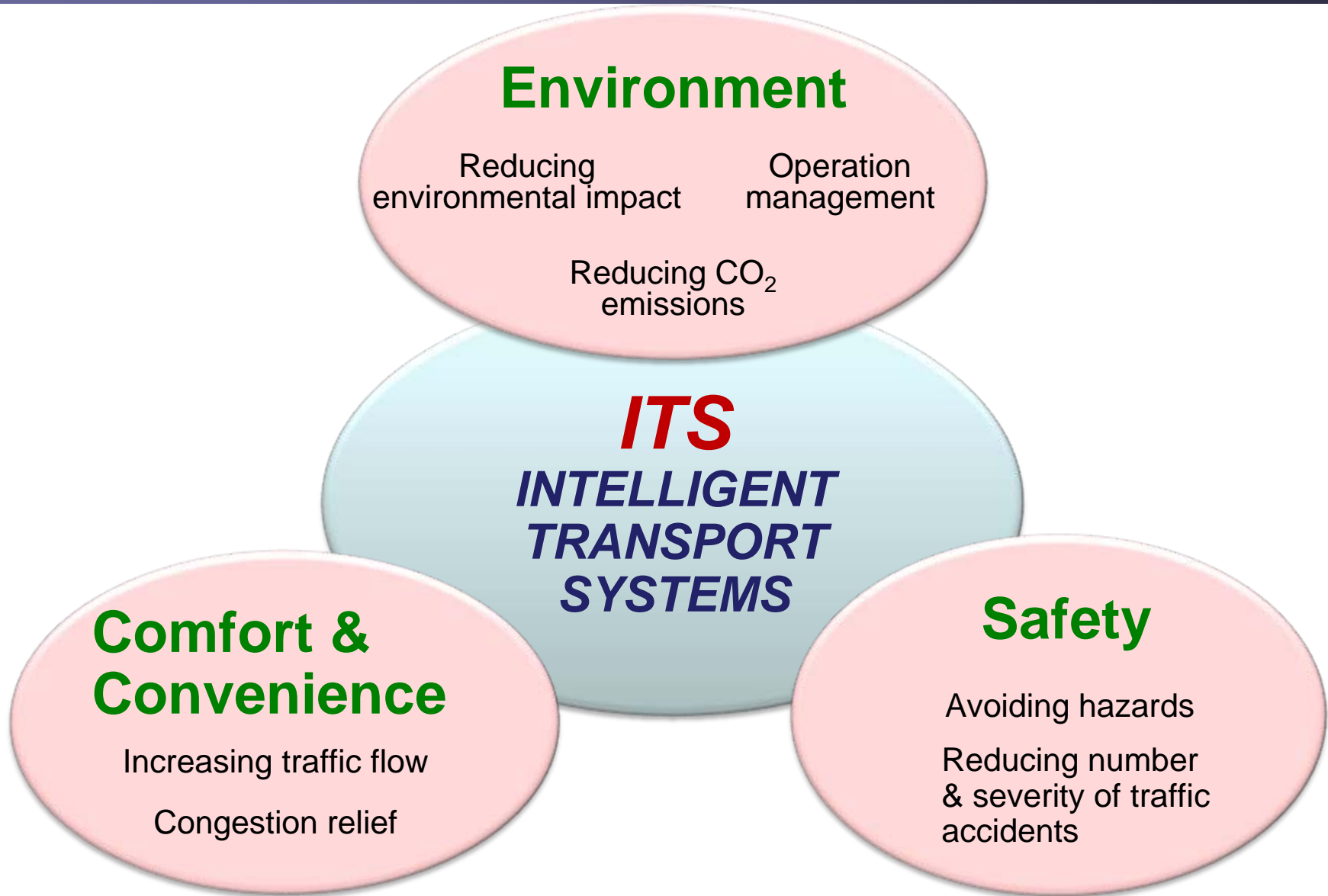


**WP5A-WP5B-WP5C Discussion  
on the  
Preparations for WRC-15**

**Automotive Short-Range High  
Resolution Radar –  
Technical and Spectrum  
Requirements  
(AI 1.18)**

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U.S. Dept. of State    ARIB

# What is ITS?



# Examples of ITS Applications (in Japan)

## VICS



VICS: Vehicle Information and Communication System

## ETC

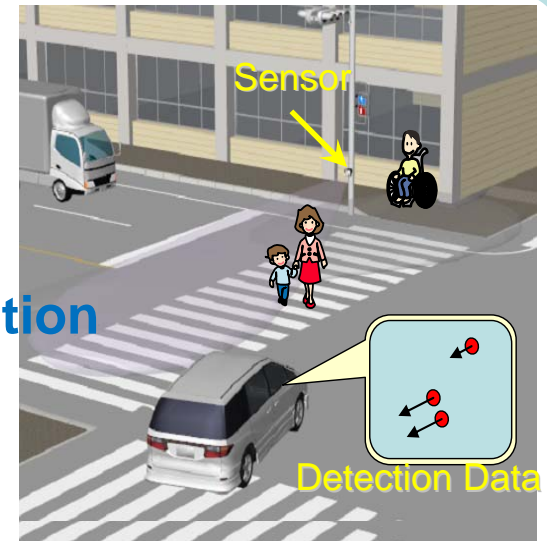


DSSS: Driving Safety Support Systems



FOT in Toyota City  
(2008)

## 79GHz High-Resolution Radar



ITS applications: VICS, ETC, DSSS and High-Resolution Radar

# ITS Radiocommunication Systems (in Japan)

	Spectrum	Service	Technological Requirements
<b>VICS</b> — <i>Vehicle Information and Communications System</i>	76-90MHz (FM multiplex broadcasting)  2.5GHz (Radio beacon)	<ul style="list-style-type: none"> <li>• Traffic information</li> </ul>	Enacted in 1994
<b>ETC</b> -- <i>Electronic Toll Collection</i>		<ul style="list-style-type: none"> <li>• Collect highway toll (Communication)</li> </ul>	Enacted in 1997
<b>DSRC</b> -- <i>Dedicated Short Range Communication</i>	5.8GHz	<ul style="list-style-type: none"> <li>• Collect highway toll</li> <li>• Provide various information (Communication, Broadcast)</li> </ul>	Enacted in 2001 (Revised 2007)
<b>Sub-millimeter, Millimeter wave system</b>	24/26GHz	<ul style="list-style-type: none"> <li>• Detect obstacles (Sensor)</li> </ul>	Enacted in 2009
	60/76GHz		Enacted in 1997
	<b>79GHz</b>		<b>In review</b>
<b>Vehicle-to-Vehicle communications system</b>	5.8GHz	<ul style="list-style-type: none"> <li>• Safety information (Communications)</li> </ul>	Guidelines for field experiment in 2007
	<b>700MHz</b>		Enacted in 2011

**Title** of the Agenda Item at the ITU World Radiocommunication Conference (WRC-2015):

1.18 to consider a primary allocation to the radiolocation service for automotive applications in the 77.5-78.0 GHz frequency band in accordance with Resolution **654 [COM6/23] (WRC 12)**

**Objective:**

❖ To fill a 500 MHz band in the 77.5 to 78 GHz band, in order to achieve global harmonization for ITS Collision Avoidance Radar operating in the 77 to 81 GHz band

❖ To study other ITS safety-related applications that may benefit from global or regional harmonization

# Background and Motivation

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- ❖ Distracted Driving epidemic
- ❖ UN Road Safety Collaboration
- ❖ ITU Council Resolution 1318 (Council 2010) on the role of ITS and ICTs in improving road safety
- ❖ European Commission Directive: [Directive 2010/40/EU on ITS](#)
- ❖ Manufacturing and private sector interest to benefit from economies of scale with global harmonization
- ❖ Parts of the band (including 76 – 77 GHz) are already allocated for collision avoidance radar; and products are available in this band

# Some Facts and Numbers (in the U.S.)

	<b>Fatalities</b>	<b>Registered Vehicles (in Millions)</b>
2000	41,945	217.028
2001	42,196	221.230
2002	43,005	225.685
2003	42,884	230.633
2004	42,836	237.949
2005	43,510	245.628
2006	42,708	251.415
2007	41,259	257.472
2008	37,423	259.360
2009	33,808	258.958
2010	32,885	
2011	32,310	

Compared to a large aircraft with  
350 passengers and crew on-board:  
**~ 90 airplanes per year**

Fatalities are declining due to:

- Technology
- Safer vehicles
- Regulation
- Road improvements

**Source:** Fatality Analysis Reporting System (FARS) of the National Highway Traffic Safety Administration [www.nhtsa.gov/FARS](http://www.nhtsa.gov/FARS)

# Some Facts and Numbers (Globally)

## UN Road Safety Collaboration

- Issued a “Decade of Action for Road Safety 2011-2020”
- Decade’s goal: Save 5 million lives, and prevent 50 million injuries
- Commemorates “World Day of Remembrance for Road Traffic Victims”
  - Third Sunday of November

About 1.3 million people die each year on the world's roads and between 20 and 50 million sustain non-fatal injuries. Road traffic injuries are the leading cause of death among young people, aged between 15 and 29.

3,500 people die on the road every day

~10 airplanes per DAY!!!

**Source:** *Global status report on road safety*, [www.who.int/roadsafety/en/](http://www.who.int/roadsafety/en/)



# ITU-R Regulatory Issues/Concerns

- ❖ To the extent possible, ITS applications have been operating in “unlicensed” environments (or under Industrial, Scientific and Medical (ISM) rules) wherever such bands are available
- ❖ Is “road safety” a radiocommunication safety application, as provided by the regulatory provisions of “safety service”
- ❖ Is it a “radar” or is it an integrated radar/communications device (i.e. is V-V radar or communications)
- ❖ The band 77 – 81 GHz is allocated to the “Radiolocation Service” on a Primary basis
  - There is no Mobile allocations in the band
  - The device must operate/ behave as a Radar
  - Wherever applicable, the device must be licensed under the Radar rules
  - It cannot operate as an unlicensed short-range device
- ❖ The device cannot be used for non-ITS or non-Automotive applications

ITU-R Technical Studies required for completion prior to WRC-15:

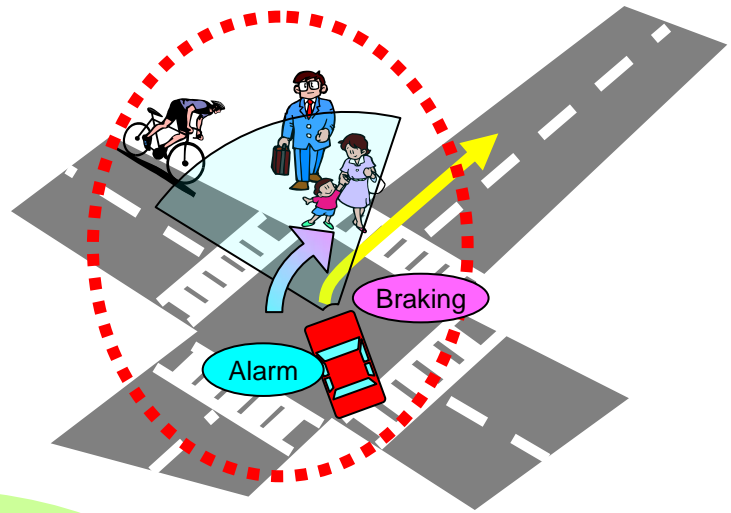
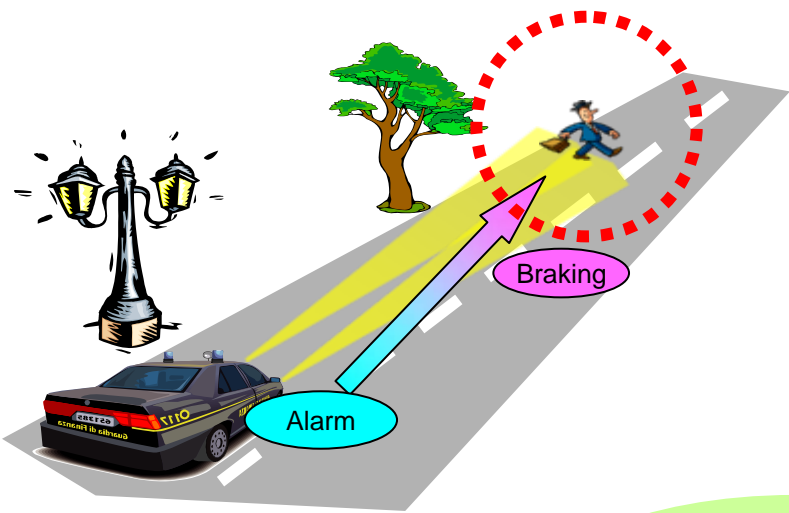
❖ Mainly sharing and compatibility studies with the incumbent services and existing uses of the band:

- Radioastronomy
- Space Sciences
- Radio Amateur
- Any other operating radar in the band

❖ Even if technical studies are complete, must overcome national/regional policy issues/hurdles regarding spectrum allocations, in general

➤ The need and cost/benefit must be justified

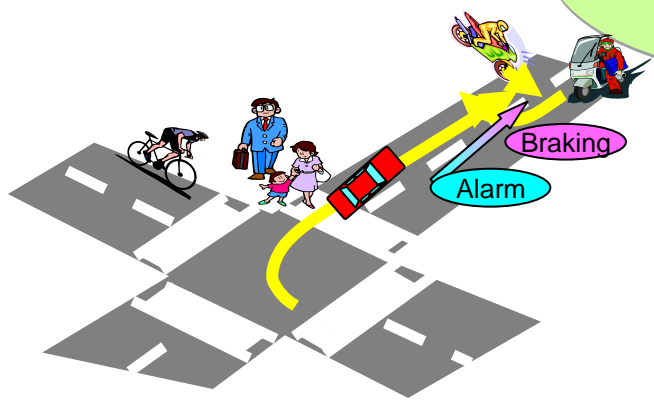
# Use case: 79GHz high-resolution radar



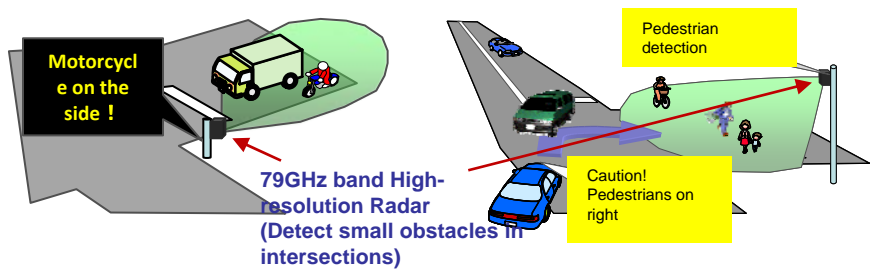
(1) Pedestrian detection at high-speed driving

(2) Pedestrians detection - turn right

Use Case  
79GHz High-Resolution Radar



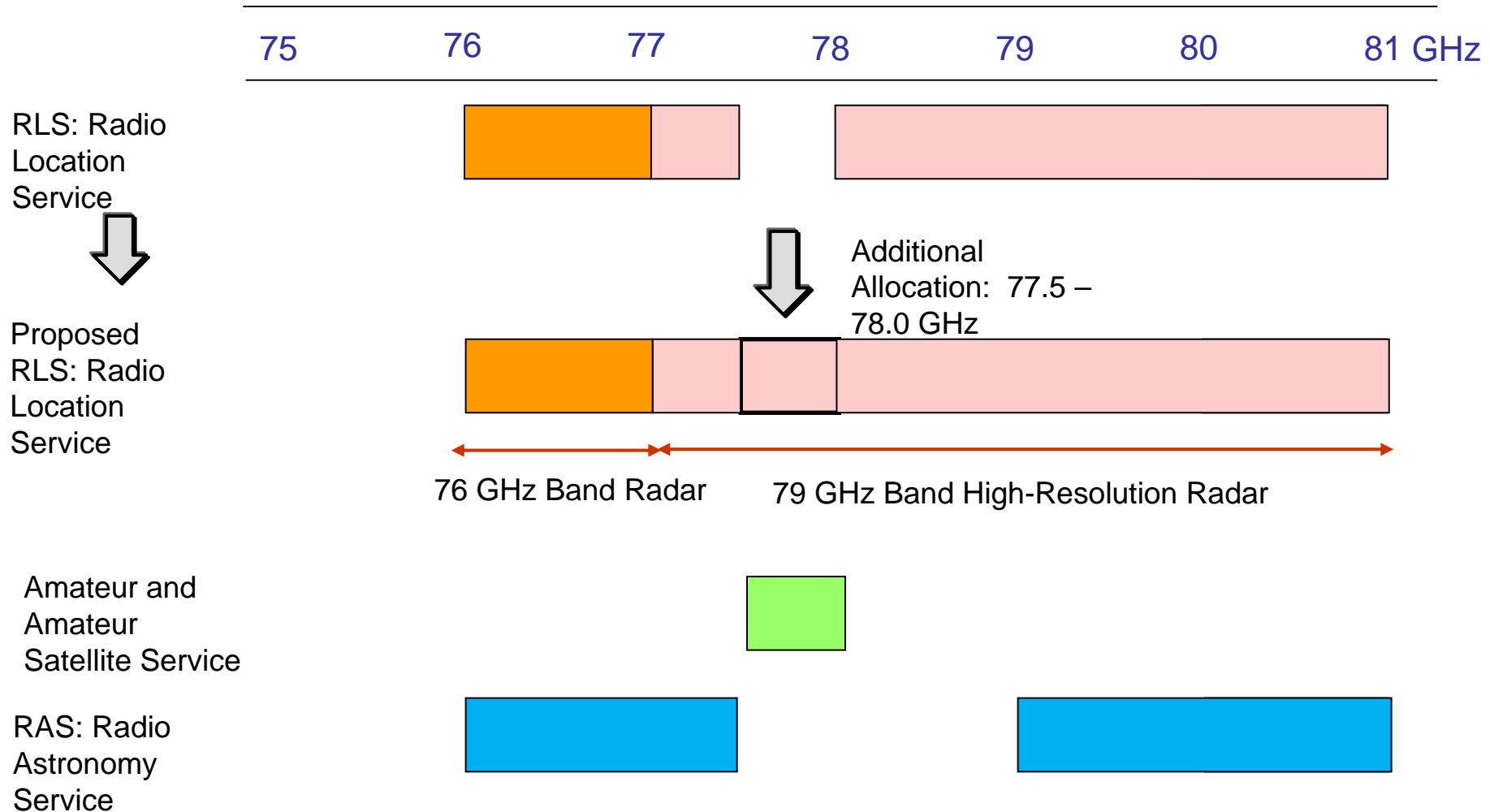
(3) Detection of motorcycle driving at high-speed



(4) Pedestrians detection by Road Side Equipment

# 77-81 GHz Spectrum Allocation

As of May, 2012



# 79 GHz band High-Resolution Radar

## Characteristics

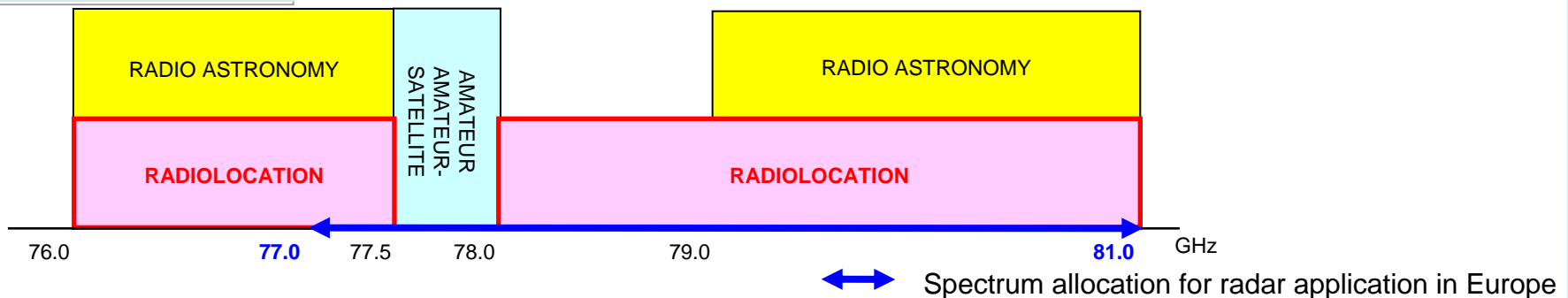
### ◆ Longer Distance, Higher Resolution

79GHz radar can detect/identify multiple obstacles in a closer & further range.

### 【Radar Standards in Japan】

Type of Radar	Frequency	Bandwidth (Max)	Output Power	Antenna Gain	Resolution	Measurement Distance	Operation Permitted
UWB	22–29 GHz	4750 MHz	-41.3 dBm/MHz	—	3 cm (Accuracy)	30 m	22 – 24.25 GHz: Until 2016
76 GHz	76–77 GHz	500 MHz	10 mW	40 dBi	> 100 cm	200 m	No time limit
79 GHz	[77–81] GHz	4 GHz	10 mW	35 dBi	<20 cm <100 cm	25 m 70 m	No time limit

## Spectrum Allocations



New high-resolution radar uses 4 GHz bandwidth at 77 – 81 GHz.

# Other Resources

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<http://79ghz.com/>

International automotive 79 GHz frequency harmonisation initiative and worldwide operating vehicular radar frequency standardisation platform.

CSA 79 GHz project funded by EC

# ITU-R Assignment of Work

- ❖ ITU-R Working Party 5B (Radiolocation Service)
  - To conduct specific technical sharing studies with in-band and out-of-band users
  - To develop a regulatory regime for the operation of ITS collision avoidance radar under the Radiolocation Service
  
- ❖ ITU-R Working Party 5A (Land Mobile)
  - All other ITU-R related ITS
  
- ❖ Assignment based on *invites ITU-R* of Resolution **654 (WRC 12)**

# What is needed from External Organizations

**What is needed from ISO/TC204 (WG 14), or the ITU's Collaboration on Communication Standards, or any other External Organization (including ETSI, ARIB, SAE, etc.):**

- ❖ Any standard/report that provides technical, operational and systems characteristics of ITS collision avoidance radar in the 76 – 77 GHz band
- ❖ Any HMI standard/report between driver and automotive radar
- ❖ Any deployment/projected numbers (i.e. total number of deployed systems, or projections..)
- ❖ Any benefits studies (i.e. contributions of ITS toward road safety, etc.)
- ❖ Identification of other ITS safety-related applications that may benefit from global/regional harmonization



# Conclusion

- ❖ A significant accomplishment for the ITS industry to place an Agenda Item at the level of a WRC
  - Noting that WRC-15 is a major conference to allocate spectrum for Mobile Broadband on a global level (i.e. identification of spectrum for “5G”)
  - Previous attempts to add a WRC Agenda Item were not successful, as the need for global harmonization did not materialize
- ❖ ITU-R cannot perform the identified tasks independently
  - This is a perfect task (or example) for the involvement of the Collaboration on ITS Communication Standards, in general; and ISO/TC204 or ETSI TC ITS in particular

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