

**Short Overview**

# **ARTIC Industrial Training (AIT)**

**-Advanced Course-**

**07.-11. Sept. 2009**

**EU Joint Research Centre (JRC) Ispra,  
Lago Maggiore, Italy**



**Universität Karlsruhe (TH)**  
Research University • founded 1825

**Institut für Hochfrequenztechnik  
und Elektronik**



# ARTIC Advanced Course Message

## **Antenna Research and Technology for the Intelligent Car**

**The prime intention of the ARTIC Industrial Training (AIT) is the dissemination of information for vehicle communications (C2C, V2V, .....). The course is based on the relevant fundamentals of antennas and propagation channel. The specific mobile to mobile radio channel will be presented. The relevant characteristics of vehicle antennas are evaluated, taking into account their functionalities and design aspects. Combining antennas and the radio channel, the inherent system aspects will be elaborated for Diversity, SIMO and MIMO. The IEEE 802.11p and other DSRC spectrum allocations, especially the lately assigned 5,9 GHz European frequency band will be discussed. One of the goals of the course is to present processes for the optimization of C2C communications systems prior to their hardware development by „Virtual Drive“.**



# Contents – Overview

1. **Motivation, Special Challenges**
2. **Multimedia Systems Air Interface**
3. **Radio Channel, urban, rural, space, C2C**
4. **Antenna Basics, benchmarks**
5. **Automotive Antenna Specialties**
6. **Automotive Antenna Design and Integration**
7. **Diversity and MIMO**
8. **Virtual Drive**
9. **Measurement Techniques**
10. **Measurements at JRC**





# Contents – Present Status of the Lectures -12.2008

ARC 00.1 Teachers_(6).ppt	ARC 06.0 MIMO_Introduction(28).ppt
ARC 00.2 Content_S_V4.ppt	ARC 06.1 MIMO_Techniques(19).ppt
ARC 01.1 BroadC+Com Syst(10).ppt	ARC 06.2 MIMO_Antennas(28).ppt
ARC 01.2 IEEE802.11p.ppt	ARC 06.4 MIMO_System Impl(11).ppt
ARC 02.1 Com_Access_(15).ppt	ARC 07.0 In-Car_Wave_propagation_V1.ppt
ARC 02.2 Analog_versus_Digit(6).ppt	ARC 07.0 SDARS.ppt
ARC 03.0 Radio_Channel_I(50).ppt	ARC 09.2 Tx/Rx_MeasTechn(20).ppt
ARC 03.1 C2X_Com(33).ppt	ARC 09.3 Ant_MeasTechn(25).ppt
ARC 03.2 Verif_Freeway(17).ppt	ARC 09.5 MultiChanMeasTechn(20).ppt
ARC 03.3 Verif_urban(34).ppt	ARC 09.6 Test_in_Production(8).ppt
ARC 03.4 High_v_Train_Com(51).ppt	ARC 10.1 Regulations_(11).ppt
ARC 03.5 Wave_Prop_Tunnel(9).ppt	ARC 11.1 AutomRadarGeneral(30).ppt
ARC 04.1 Antenna basics(39).ppt	ARC 11.2 Autom_ACC2(28).ppt
ARC 04.2 Conv_Car_Ant(18).ppt	ARC 11.3 Autom_Radars(15).ppt
ARC 04.3 Opt_Ant_Positions (8).ppt	ARC 11.4 Autom_Digital_Beamf.ppt
ARC 04.4 El_Small_Ant_V0.ppt	ARC 11.5 RadCom_V7(56).ppt
ARC 05.0 Diversity(49).ppt	ARC 11.6 Virtual-Drive_Rad(46)_V7.ppt
ARC 05.1 Vitual_Drive(32).ppt	
ARC 05.2 IEEE802.11a_LinkMod(8).ppt	



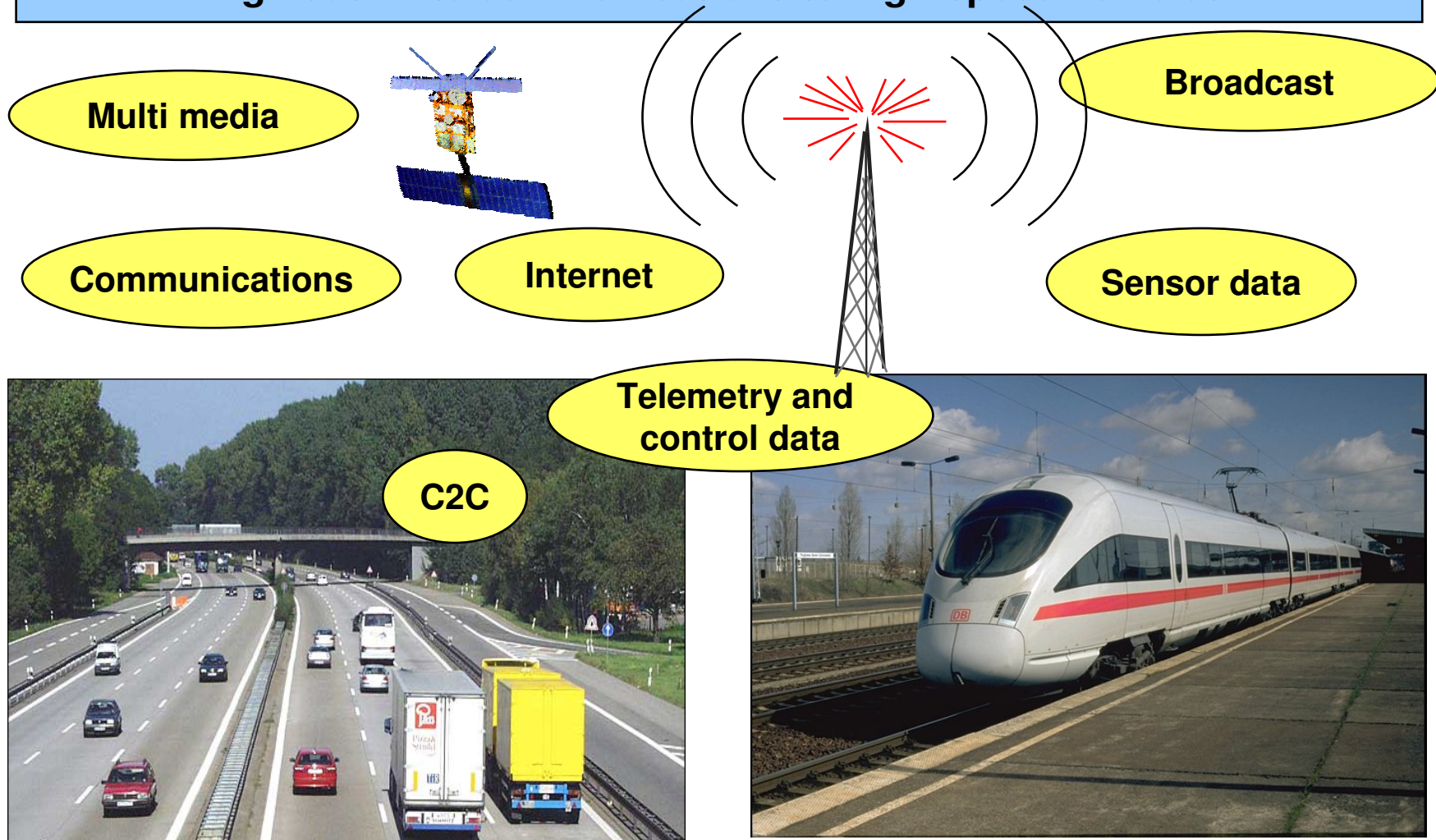
# AIT Timetable Sept. 7. - 11. 2009 - Draft

	Monday 7.9.	Tuesday 8.9.	Wednesday 9.9.	Thursday 10.9.	Friday 11.9.
09:00 10:30	Registration	The Mobile Radio Channel	Automotive Antennas I	Automotive Antenna Integration	Diversity, MIMO
Break					
11:00 12:30	Introduction Motivation	Channel Models and Measurement	Automotive Antennas II Multimode Ant.	Special Automotive Antennas	Virtual Drive
Lunch					
13:30 15:00	Multimedia Air Interface Principles	Antenna Basics,	Ant. Measurement Techniques	Multi-channel Measurement Techniques	Course Summary Discussion
Break					
15:30 16:30	Radio Channel Basics	Channel Tutorial and Exercises	MESL Antenna Measurements	MESL Car Measurements	
Break					
17:00 18:00	Reserve	Reserve	Reserve	Reserve	



# Scenarios: BS to Car, C2C, V2X, Sat to Car .....

High data rate communications to high-speed vehicles

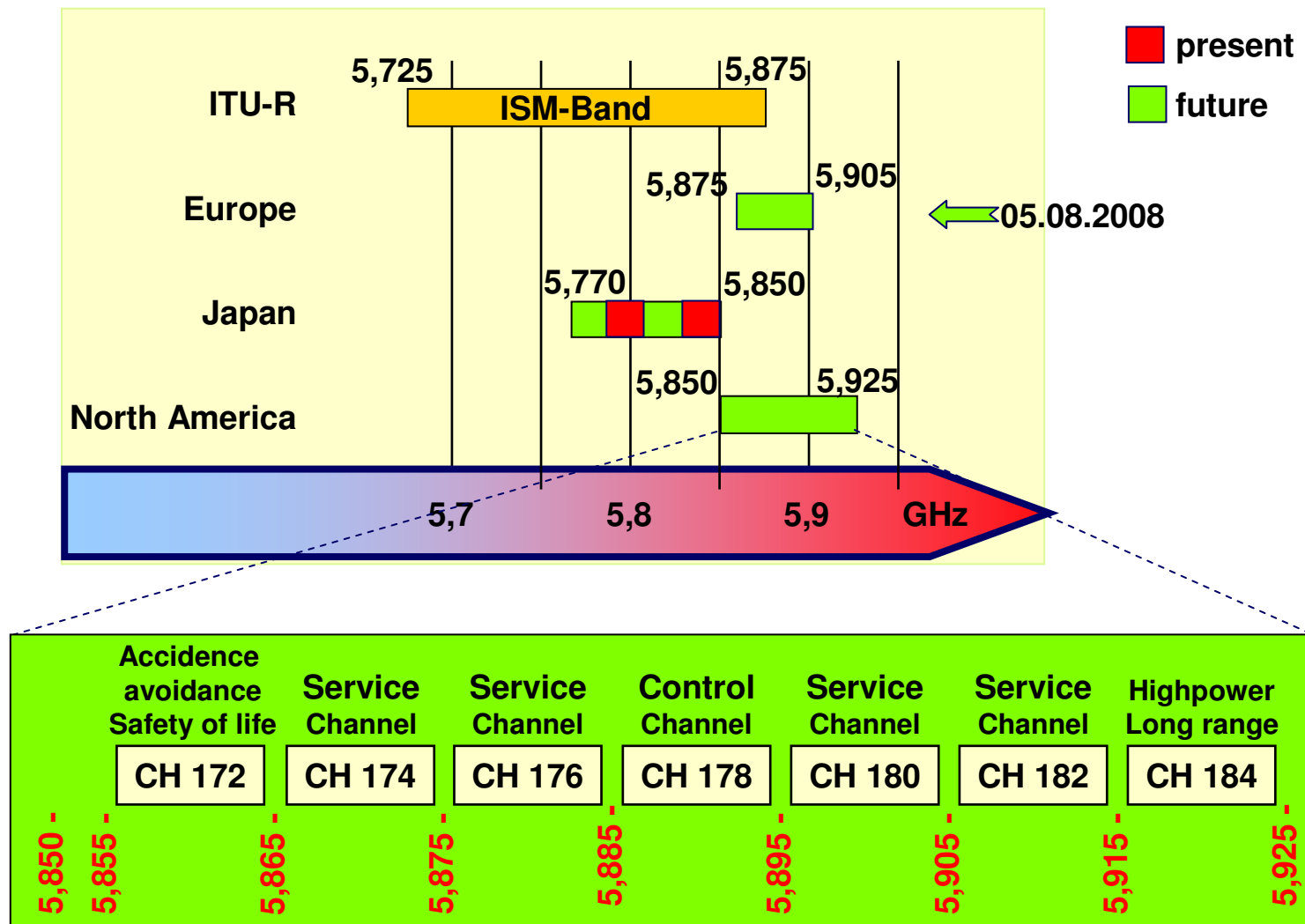


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# IEEE 802.11p and Other DSRC Spectrum Allocations



# Contact-Coordinator

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**Werner Wiesbeck**

Universität Karlsruhe (TH)

Institut für Hochfrequenztechnik und Elektronik

Kaiserstraße 12

D-76131 Karlsruhe

Phone: +49 (0) 721 608 3303

Secr.: +49 (0) 721 608 25 23

Fax: +49 (0) 721 69 18 65

E-Mail: [ihe@ihe.uka.de](mailto:ihe@ihe.uka.de)

[werner.wiesbeck@kit.edu](mailto:werner.wiesbeck@kit.edu)

Web: [www.ihe.uni-karlsruhe.de](http://www.ihe.uni-karlsruhe.de)

**Contributions from industry and academics are welcome**

**will start in April 2009. Registration will start in April 2009. Registration will start in**



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