ADASE
Advanced driver
assistance systems in Europe

Road to Vehicle Communications via DSRC : the AIDA system

AIDA / MARTA : a success story

- **AIDA : a 4 years technological research project**
  - partners : COFIROUTE, RENAULT, PSA, CSSI
  - support of Ministry of Industry
  - 100 km of network equipped, 30 vehicles
  - 2 awards winner : PREDIT "Innovation for NTIC" 2001
    IBTTA "Toll innovation and Excellence" 2001
- **MARTA : a 3 years harmonisation project**
  - 9 partners, 5 countries, support of European Commission
  - interoperability tests in Wales
 - Project Conference in Cardiff (25/10/01)

The characteristics of DSRC

- **Two-way short range communication from vehicle to infrastructure (in Europe at 5,8 GHz)**
- **Communication standard dedicated to any road telematics application (CEN TC 278, ISO TC204)**
- **First application available:**
  - **Electronic Toll Collection (ETC)**
- **Future value added services:**
  - **Traffic and Travel Information, Emergency Warning, Incident and Traffic data collection, Intelligent Speed Adaptation, Electronic clearance, etc.**

Information, safety, data collection

AIDA antennas

RALENTIR
BOUCHON
SUR 10 km
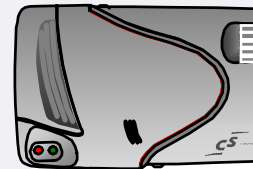
- **Road information**
- **Safety messages**
- **Traffic and weather data collection**
- **Incidents detection**

AIDA : principles of data transmission

Data processing and transmission to the vehicles

Communication with the vehicles

The AIDA services

AIDA : an on-board system providing real time information dedicated to safe and comfortable highway driving

Traffic conditions
- accidents
- perturbances
- road works
- traffic jams

Road information
- sorties conseillées
- distance to next exits
- estimated time of arrival
- relief routes

Weather conditions
- fog
- low temperature
- heavy rain

Personalised traffic information
- tourist information
- petrol stations with brand and price
- service and rest areas

Interactive services
- incidents signalling

Traffic data collection, incident detection

- **Travel times on motorway between 2 beacons**
  - **anonymously = without identification of the driver**
- **Statistic traffic data : origin / destination matrix**
- **Weather events : fog and hard rain**
  - **automatically = switch of the wind screen wipers or fog lights**
- **Slowing down (--> traffic jams)**
  - **measurement of a strong deceleration**
- **Interactive service : incident detection**
  - **accident, stopped vehicle, item on the road, bad weather**

Improving safety : alert functions

- **Automatic processing and transmission to the upstream beacons (in both directions) of the warning information collected by the vehicles**

- **On-board unit with screen :**
  - **spontaneous display of the safety messages on the screen + activation of the buzzer (or synthesised voice)**
  - **nature of the event and location**

- **ETC transponder :**
  - **activation of the buzzer and/or LED : immediate danger ahead**

Display examples : safety services

Alert message corresponding to a traffic incident

Checking the list of incidents (here weather incident)

An "interactive" safety service

The interactive service…

… gives the possibility to inform the Traffic Information Centre of an incident that was seen on the motorway

Display examples : comfort services

Distances to the exits, travel times, traffic conditions
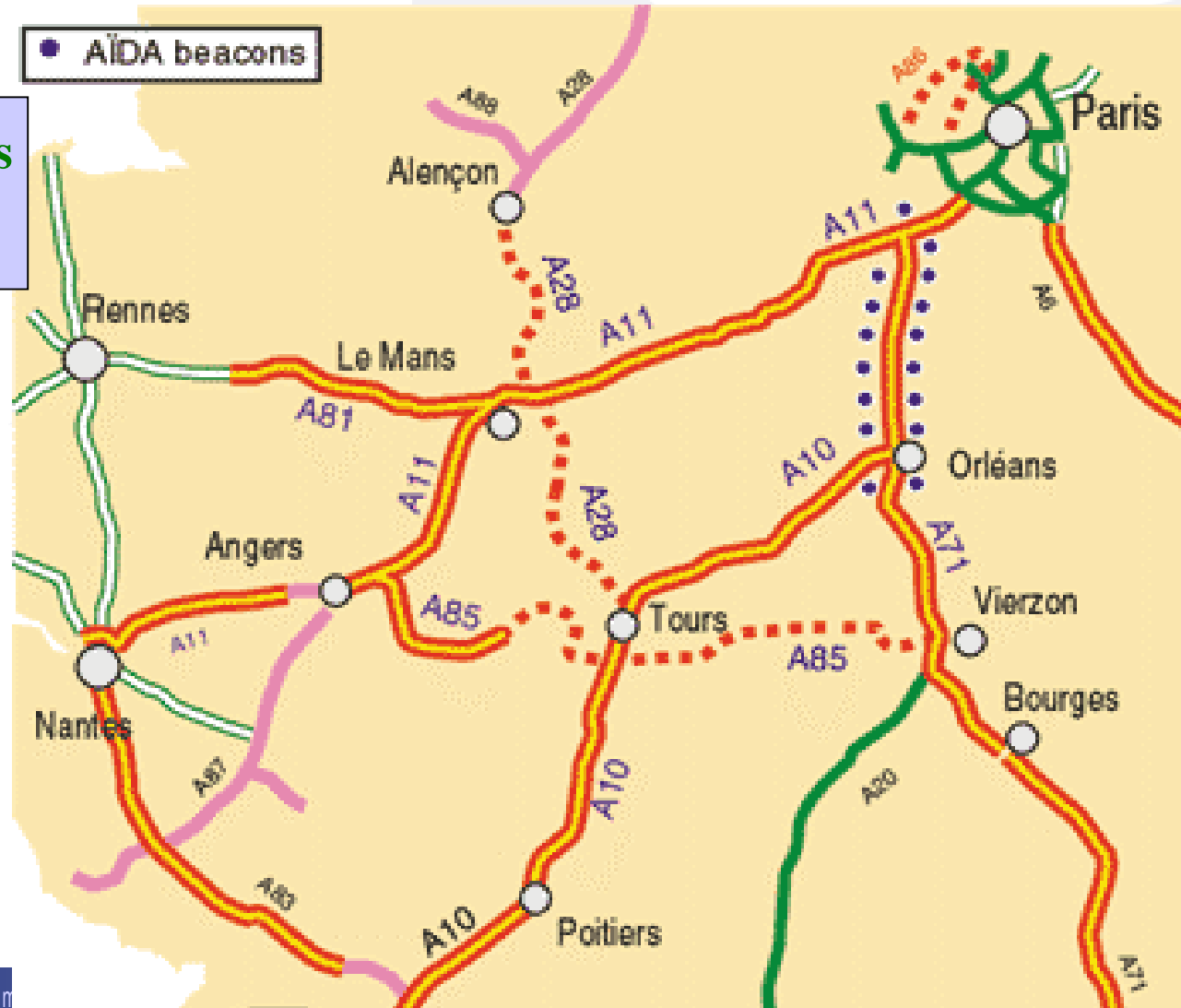
Information on rest and service areas

Cofiroute test site : 100 km / A10

Existing beacons
Phase 1 = 18
Phase 2 = 27

Types of evaluation

- **Man-Machine Interface and driver behaviour aspects carried out by INRETS in 1998**
  - **legibility of text and icons displayed,**
  - **no interference with the driving task**

- **Assessment of some AIDA functions by simulation**
  - **traffic simulation + individual driver behaviour + AIDA model**

- **Field trials in real traffic conditions**
  - **qualitative evaluation through questionnaires and enquiries**
  - **quantitative evaluation through data records in the TIC and in the on-board units (smart card)**

Field Trials

- **Duration : from May to July 2001**
- **Location : a section of 100 km (A10 motorway of COFIROUTE network between Paris and Orléans)**
- **30 vehicles fitted with AIDA devices**
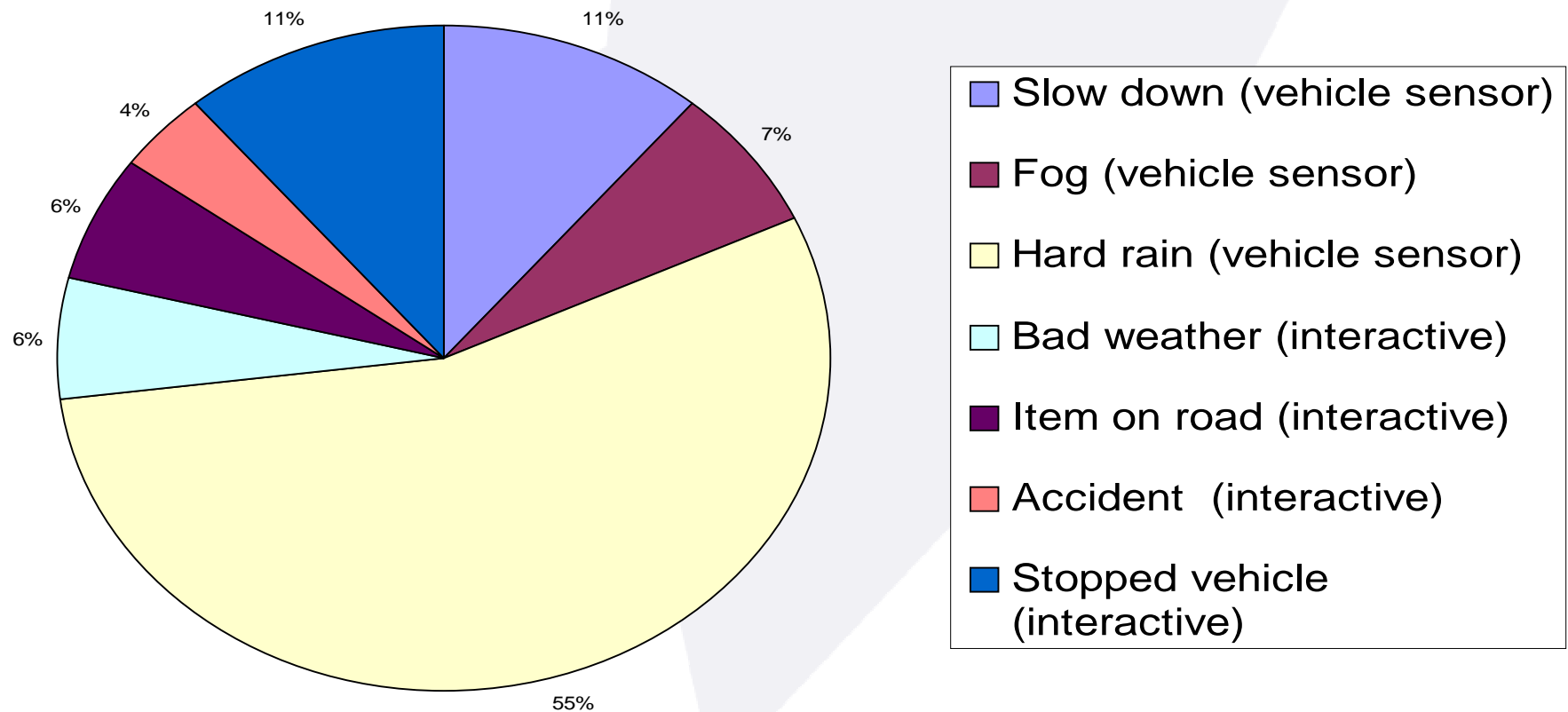- **Several thousands of vehicles equipped with ETC tags**

First results of qualitative evaluation

- **Safety services are considered the most important**
- **The driver becomes an actor in the improvement of road safety through incident signalling (as a witness)**
- **Accurate and local information received**
- **Complementary media with motorway advisory radio (107,7 MHz)**
- **Liability of the system to be improved**
- **Integration of On-board unit in the vehicle expected**

Transmission of events

Breakdown of the events transmitted by the AIDA vehicles

Pie chart segments: 11%, 11%, 7%, 4%, 6%, 6%, 55%

Legend:
- ☐ Slow down (vehicle sensor)
- ☐ Fog (vehicle sensor)
- ☐ Hard rain (vehicle sensor)
- ☐ Bad weather (interactive)
- ☐ Item on road (interactive)
- ☐ Accident (interactive)
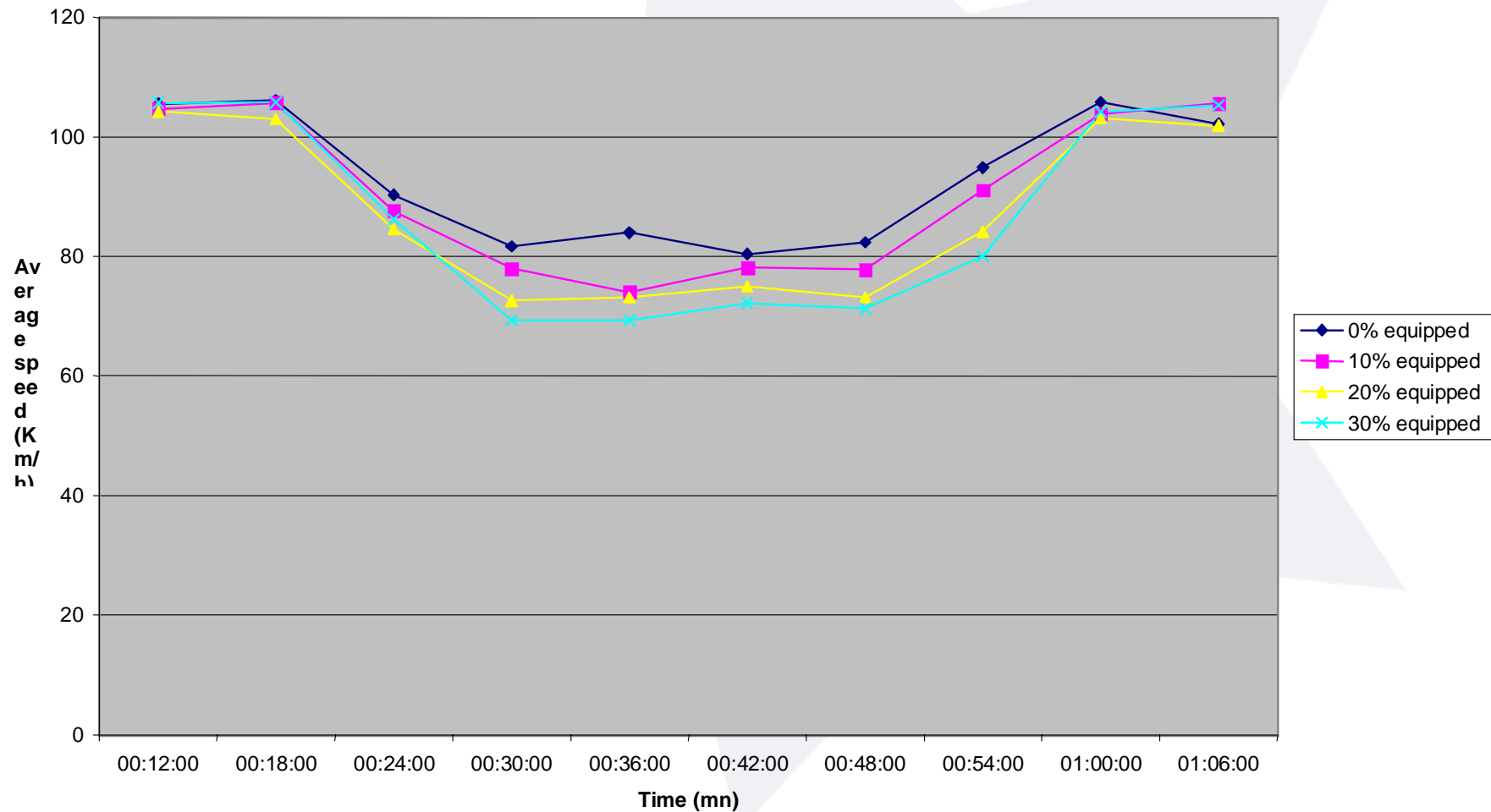- ☐ Stopped vehicle (interactive)

Traffic simulations (1)

Case 1 : Average speed against time ; 1 km before incident (flow of 1275 veh/h)
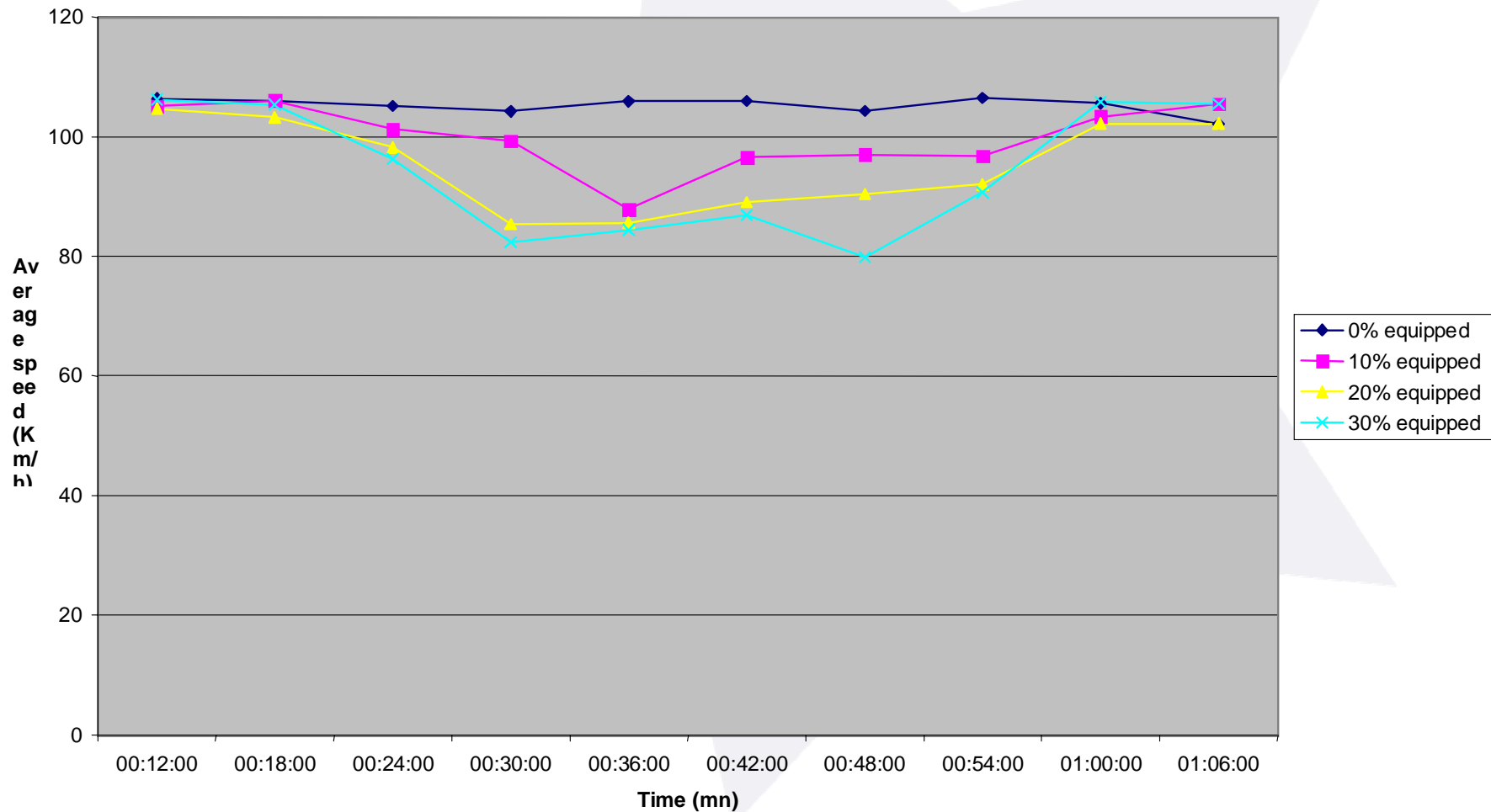
Traffic simulations (2)

Case 2 : Average speed against time ; 300 m before incident (flow of 1275 veh/h)

Lessons learned from evaluations

- **Accuracy of probe-measured travel times within motorway traffic management and control**

- **Impact of AIDA equipment rate on average speed of the whole traffic (avoid pile-up accidents)**

- **Potential reduction of detection time to improve the incident management chain**

The MARTA project

- **Co-ordination between the test sites (AIDA, RTA), from a point of view of functional specifications and test methods**
- **Definition of common applications on the test sites in the framework of traffic and travel information and specification of guidelines of common use**
- **Development of a European draft standard in the framework of the CEN TC278 - WG 4, WG9**
- **Demonstration of interoperability between the AIDA and RTA systems**
- **Ensure that the existing standards are taken into account and contribution to standardisation work within the TC278 WG4.2**

The DELTA project

- **Integration of the DSRC tag in the vehicles, at the factory**

- **A European project of the FP5 (DG INFSO)**

- **An answer to the non compatibility between the ETC systems and the metallised windshields (attenuation of 7 dB)**

- **Development of a standardised interface between the DSRC tag and the other vehicle equipment**

- **Determination of the optimum location of the tag antenna in the vehicle**

DELTA = integration in the vehicle

Objective : Integration of the DSRC as standard equipment in the vehicle
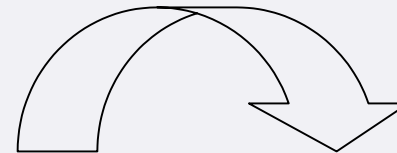
The TRAVIATA project

- ## An attempt to perform a vehicle to vehicle communication using the same DSRC systems
  - emergency warnings between vehicles

- ## Results did not meet the expected level
  - good communication at 20 m
  - probability of good communication at 50 m if messages repeated 100 times
  - communication not possible at more than 100 m

- ## Vehicle equipment will remain too expensive for large market introduction

IVHW

IVHW
Inter-Vehicle Hazard Warning
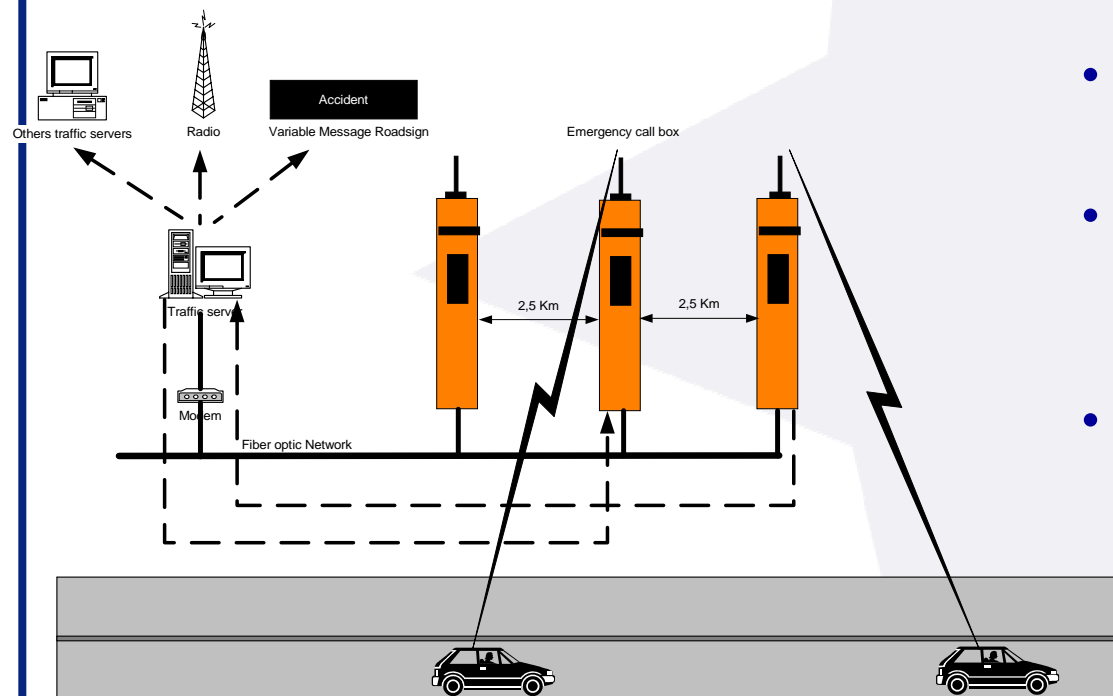
- **Transmission of alerts between vehicles**
- **Communication : up to 1 km**
- **System activated manually or automatically in case of airbag release**
- **Alerts can be transmitted to / from the road operator, thanks to IVHW systems installed in the emergency call boxes**