



 **IVHW**  
*Inter-Vehicle Hazard Warning*

# ***IVHW : an Inter-Vehicle Hazard Warning system***

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## Project characteristics

- IVHW : a two years DEUFRAKO project - France/Germany co-operation (2001-2002)
- Partners:
  - RENAULT, COFIROUTE, ESTAR, INRETS, ISIS, PSA Peugeot-Citroën
  - BOSCH, DAIMLERCHRYSLER, BAST
- Effort : 154 men x months and €2.7 million
- Sponsored by :





## *Today's opportunities*

- Today's new opportunities:
  - Broad dissemination of GPS
  - Accuracy of GPS (no more scrambling for civil applications)
  - Market penetration of telematics platforms for:
    - navigation, electronic tolling, emergency call
  - Recent authorization of the use of a band in the 869 MHz allowing to reach the needed range of 1 Km

## The concept

- Vehicle-vehicle communication for hazard warning
  - radio « warning flashers »
  - accident
- Also vehicle-infrastructure communication



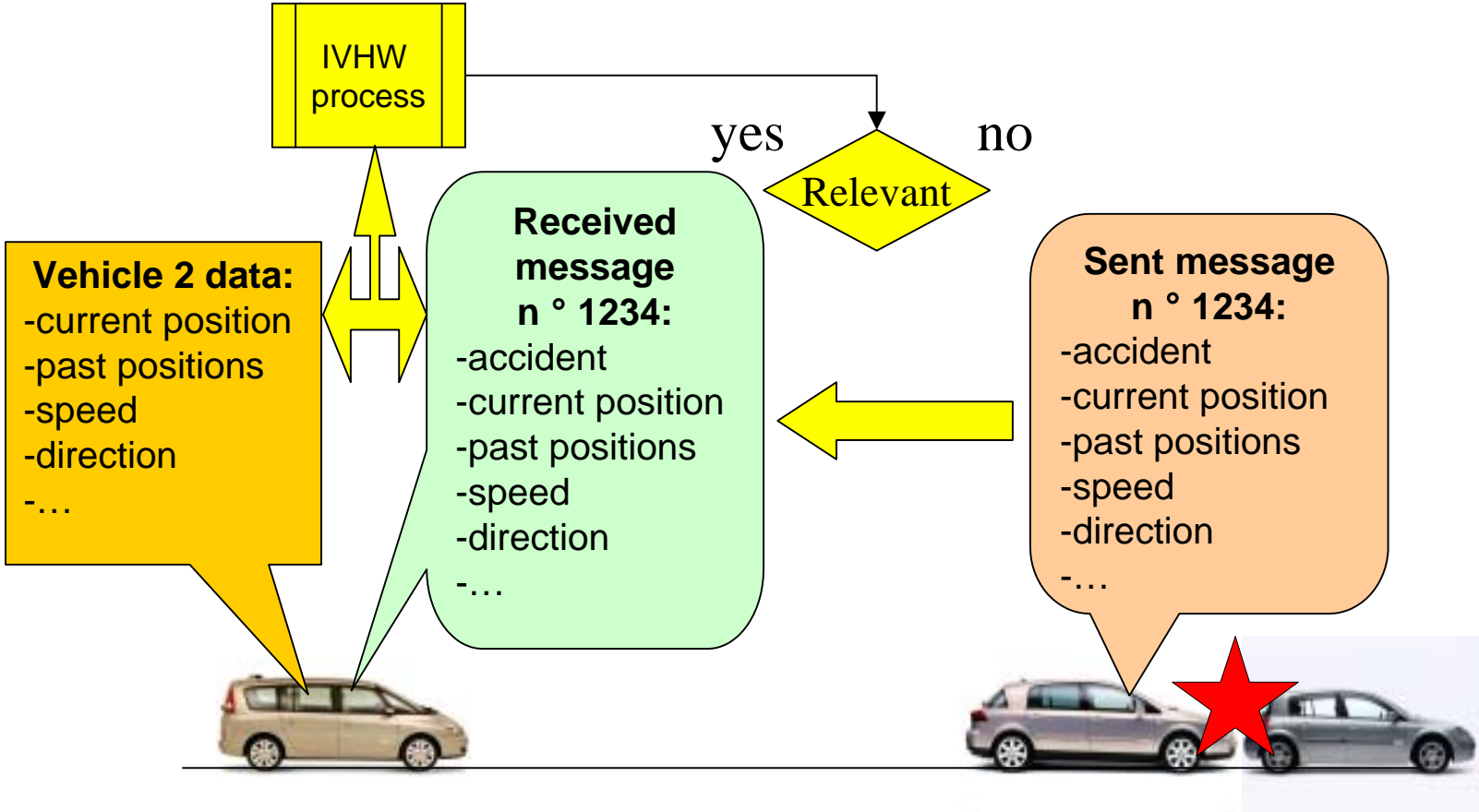


## *Without IVHW*



- Reasons : **bad visibility** or temporary loss of visibility due to obstacles or weather conditions
- Characteristics : pile-up accidents aren't statistically very numerous, but **often very serious** ...
- That **can be avoided** in some situations if a warning message is delivered in time

# With IVHW



*Result message with an example of visual HMI*





## *Typical conditions of use*

Pictures taken during the e-Safety congress of  
September 2002 in Lyon



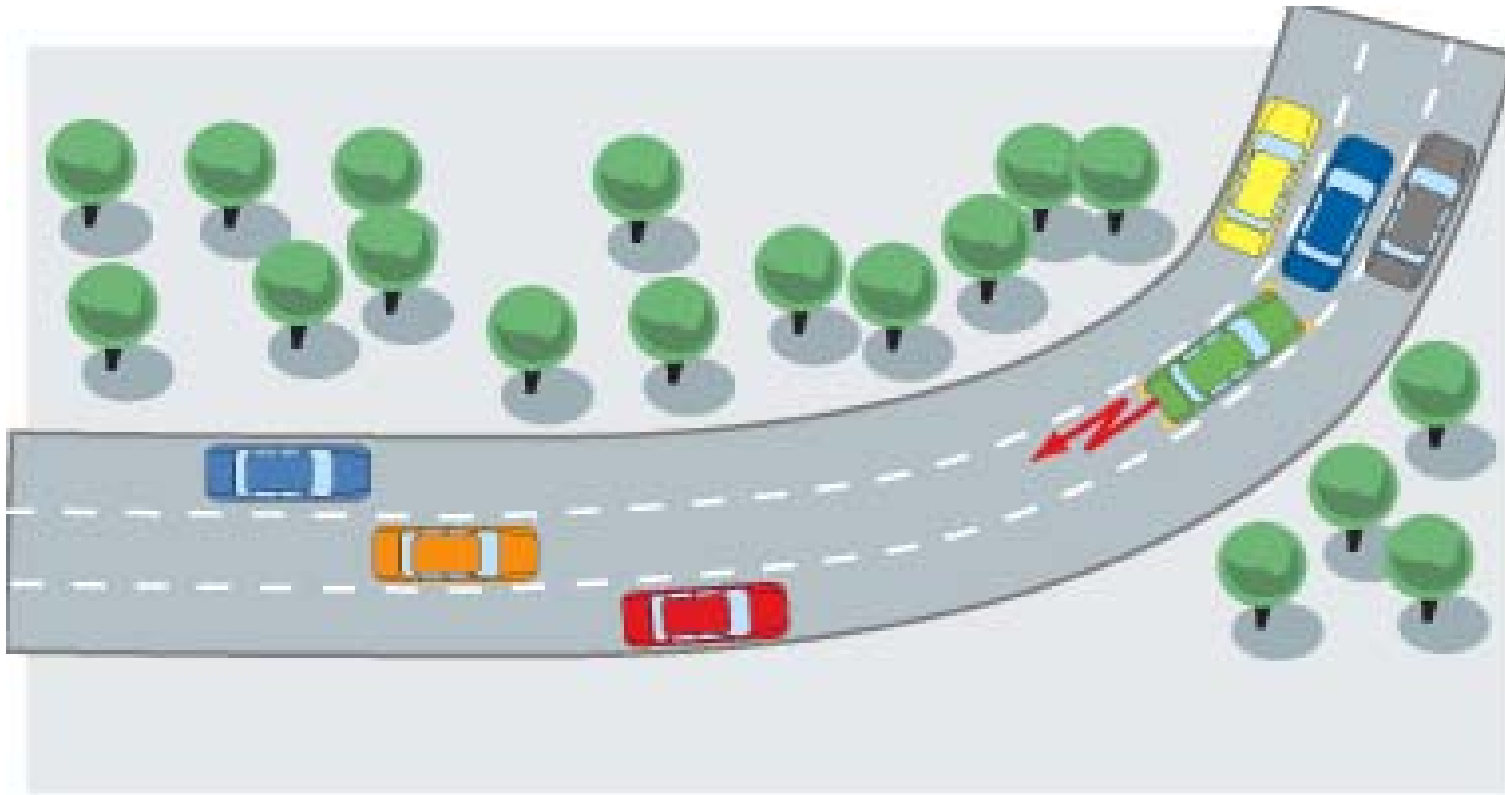
**IVHW**

Inter-Vehicle Hazard Warning





## *Risk of queue end collision*



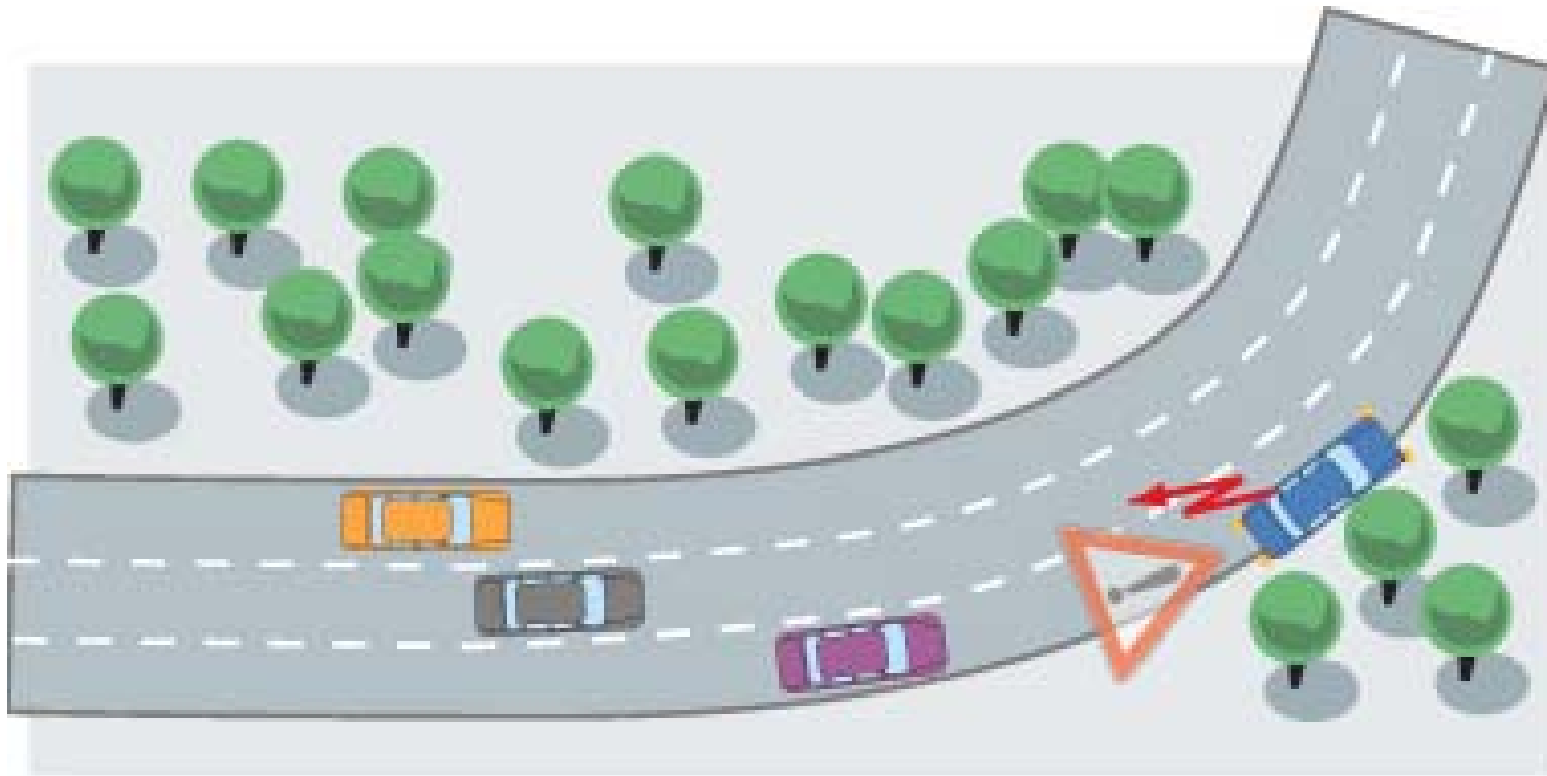


## *Risk of queue end collision*





## *Vehicle breakdown*

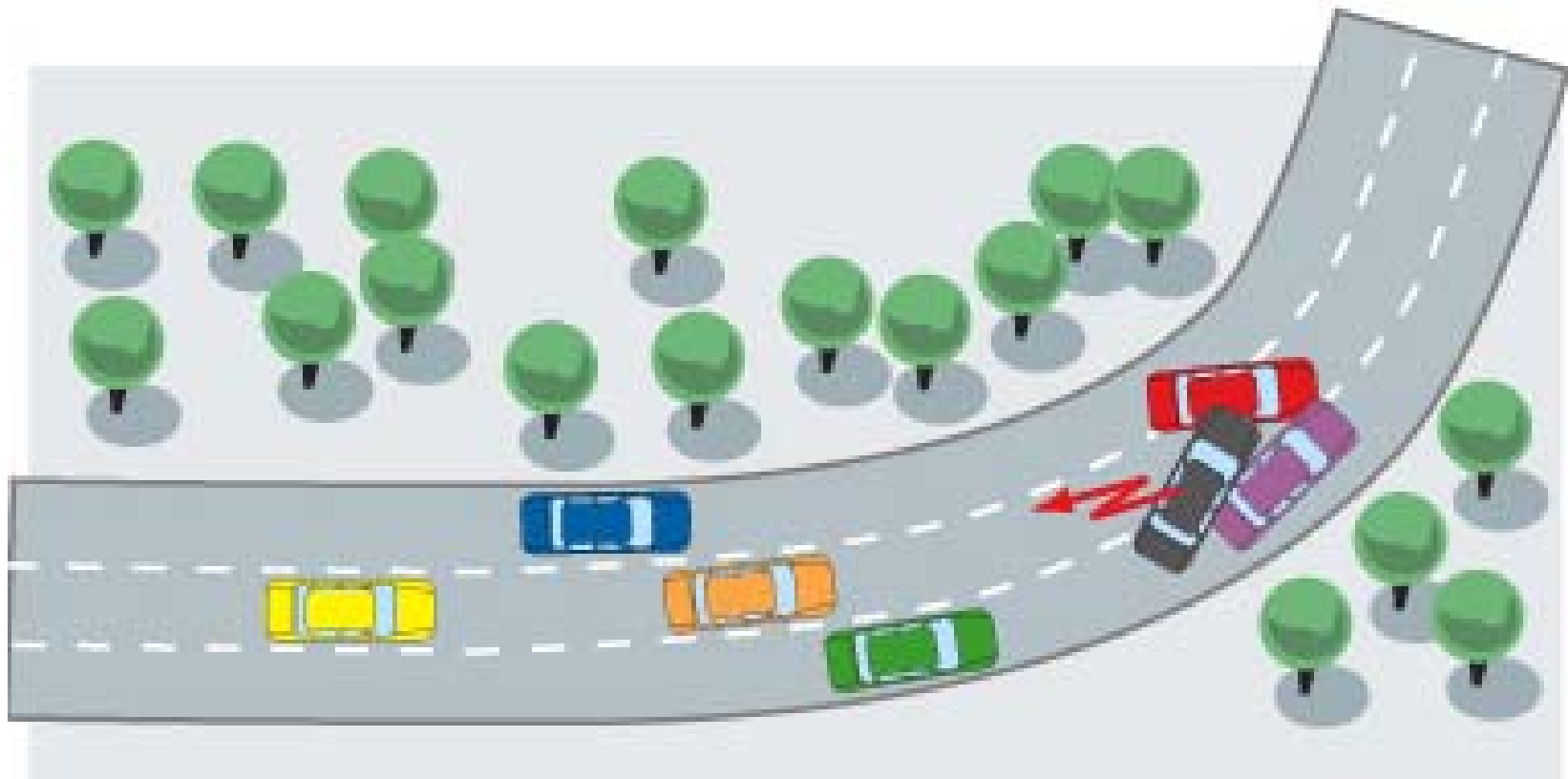


# Vehicle breakdown





# *Airbag triggering*



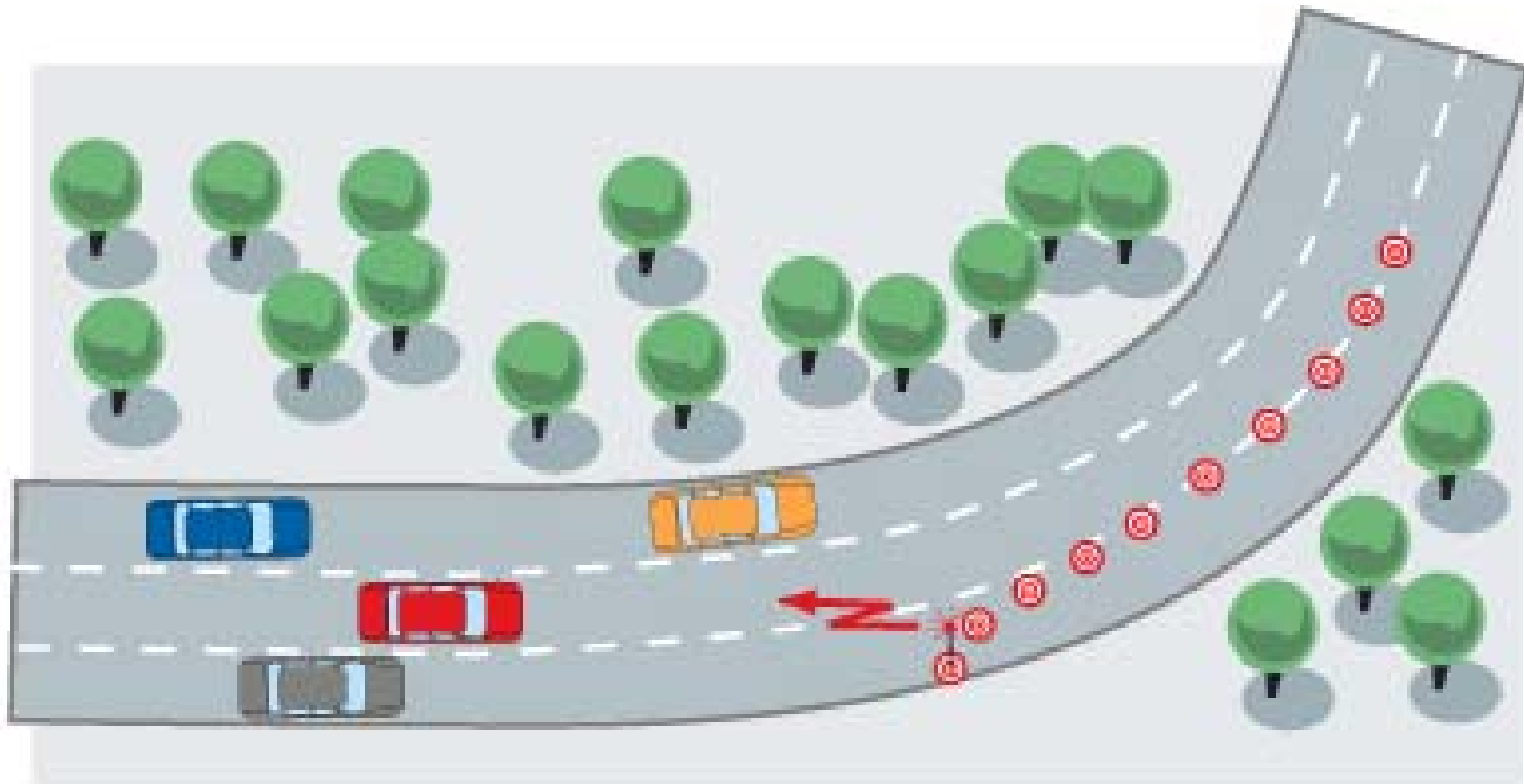


## *Airbag triggering*





## *Warning from infrastructure*





# Warning from infrastructure





## Core proposal synthesis

- A reduced set of messages:
  - from vehicles or infrastructure beacons



- from infrastructure beacons only



## *Extended proposal*

- A proposed extended set of messages (all sent from infrastructure equipment only):



Traffic congestion



Very slippery road



Heavily reduced visibility



Vehicle on the wrong carriageway



# *Technology*



*Inter-Vehicle Hazard Warning*



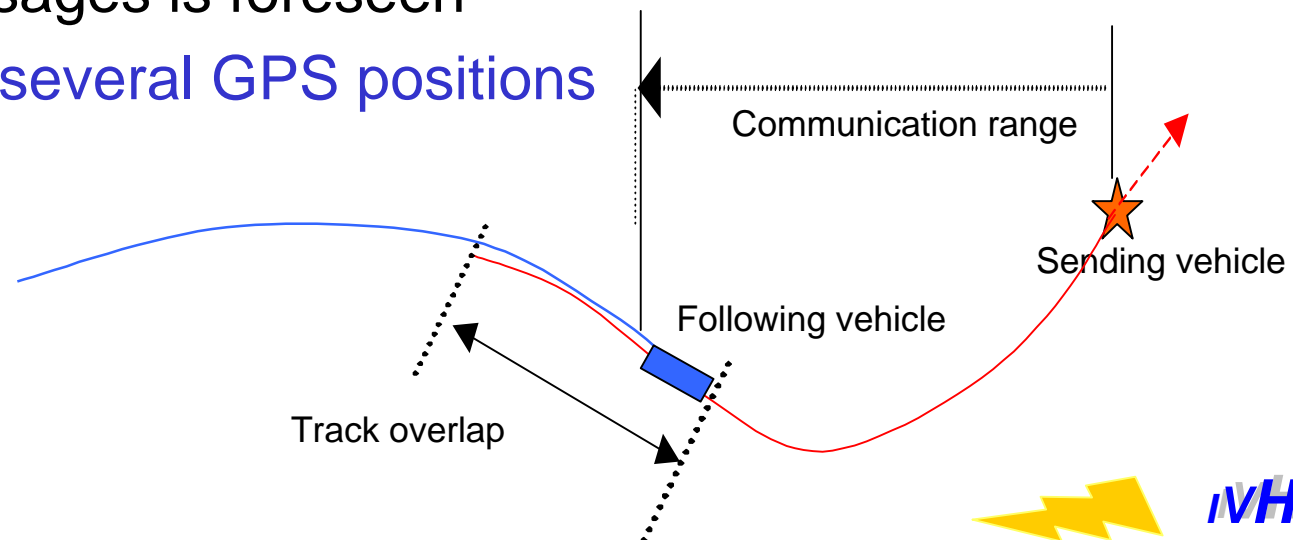
# Message Content

Variable	Size (bit)
Header	8
Random-Message ID	9
Road type	3
Road ID	24
Hazard type	5
Current speed	5
Position and trace data	155
<b>Total message size</b>	<b>209</b>

No  
personal  
data !

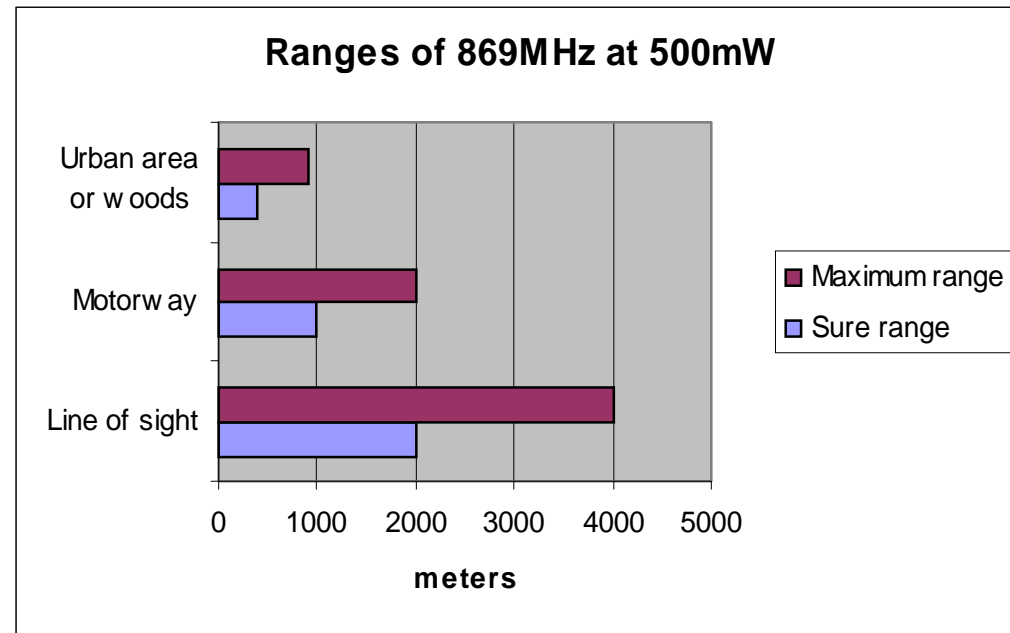
## System characteristics

- **Manual** or **automatic** activation
  - **generic warning**, **stopped vehicle**, **accident**
- IVHW is coupled with the warning flashers
- Manual or automatic deactivation
  - In case of emission of the same message by several vehicles, automatic cancellation of useless messages is foreseen
- **Use of several GPS positions**



## Communication technology

- choice of the 869.4 - 869.65 MHz frequency band
- for 1 Km nominal communication distance
- omni directional broadcast
- relevancy discrimination by the receiver





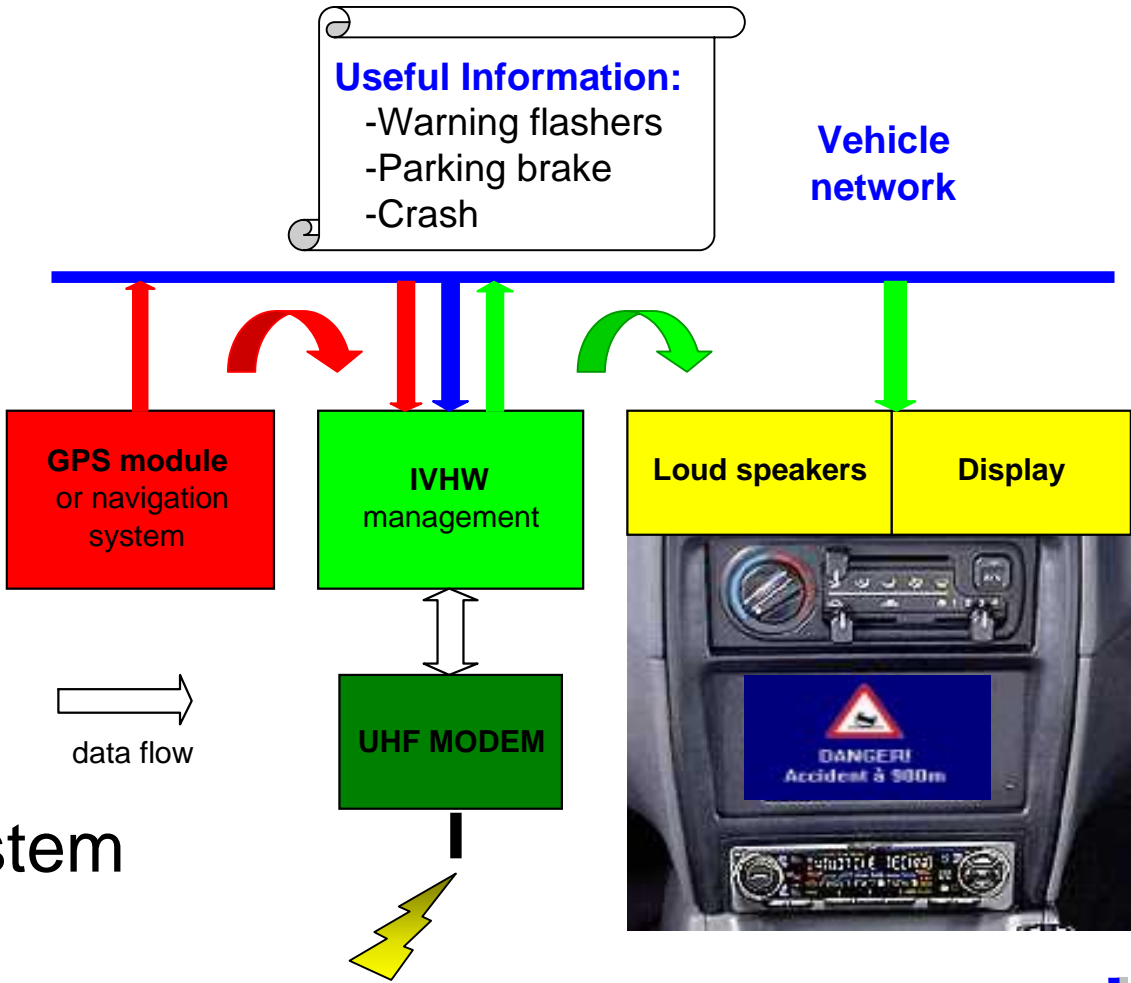
# On-board equipment

## Minimum:

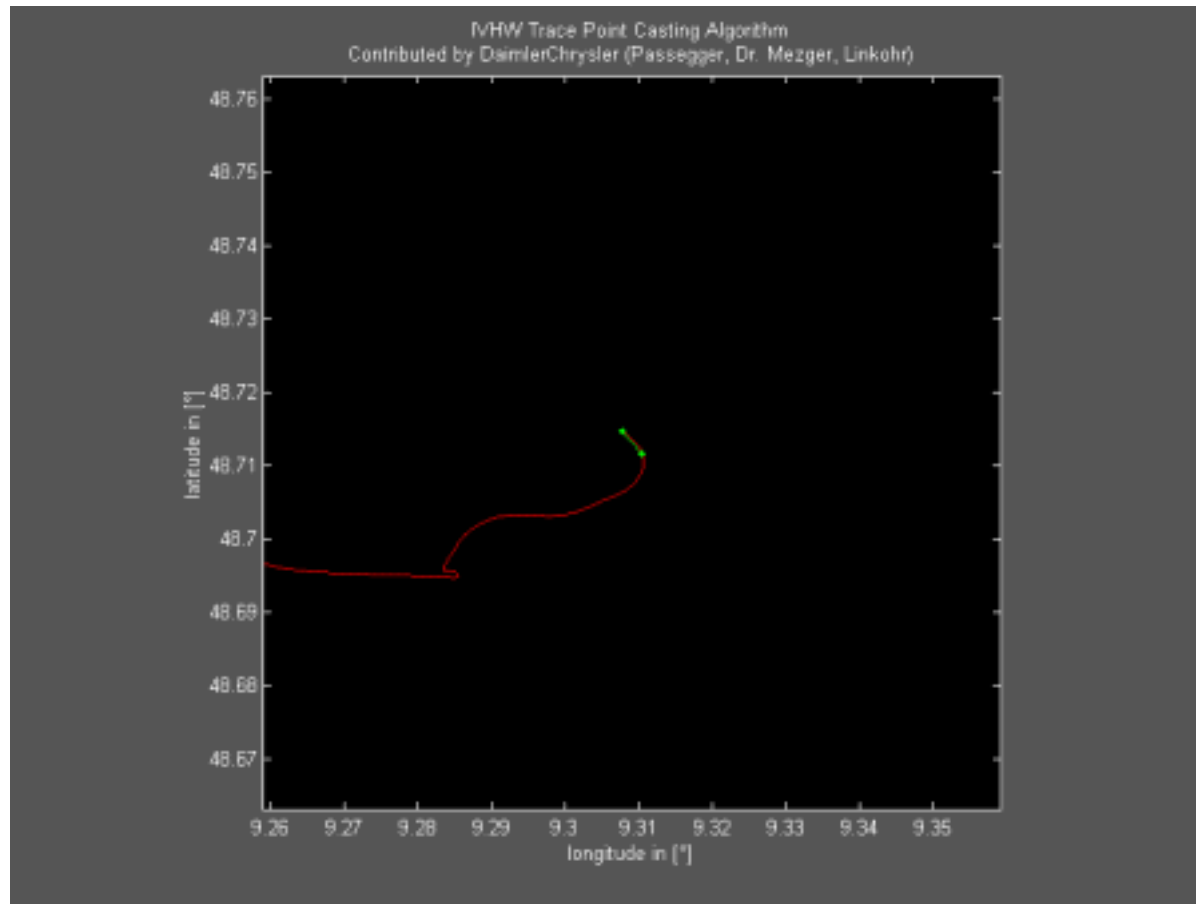
- GPS module
- UHF modem
- HMI interface

## Optional:

- Navigation system

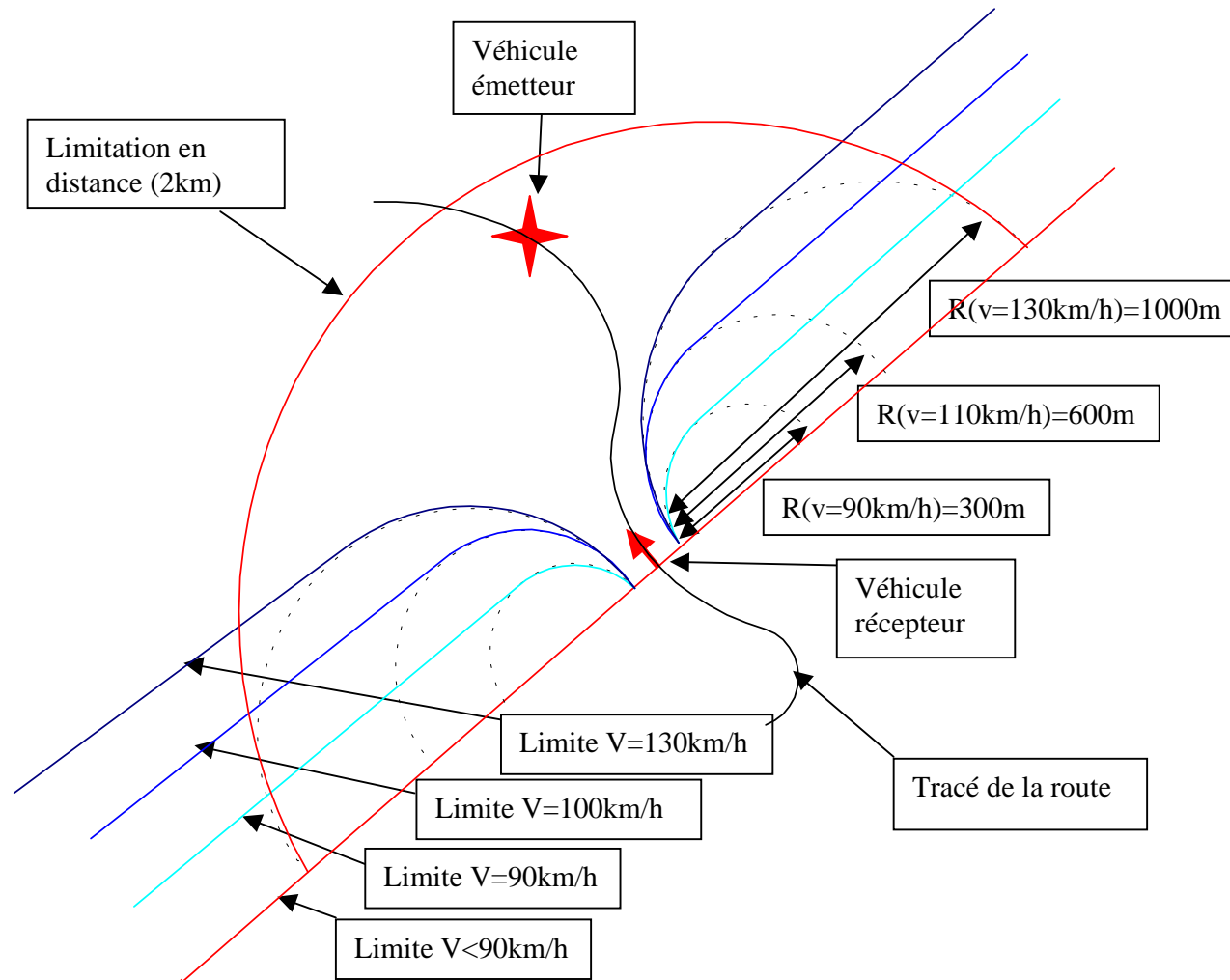


# Optimisation of the chain of GPS positions

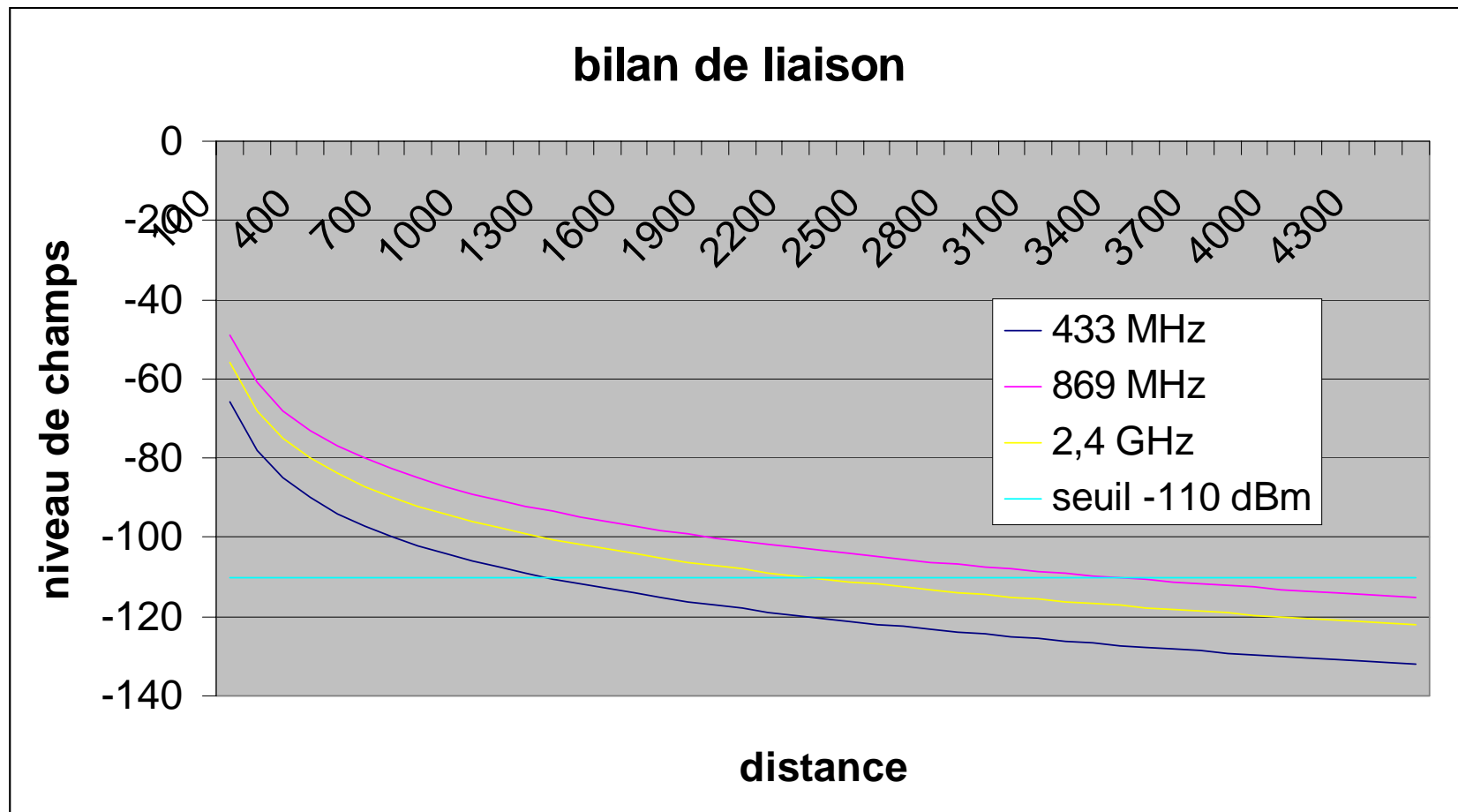




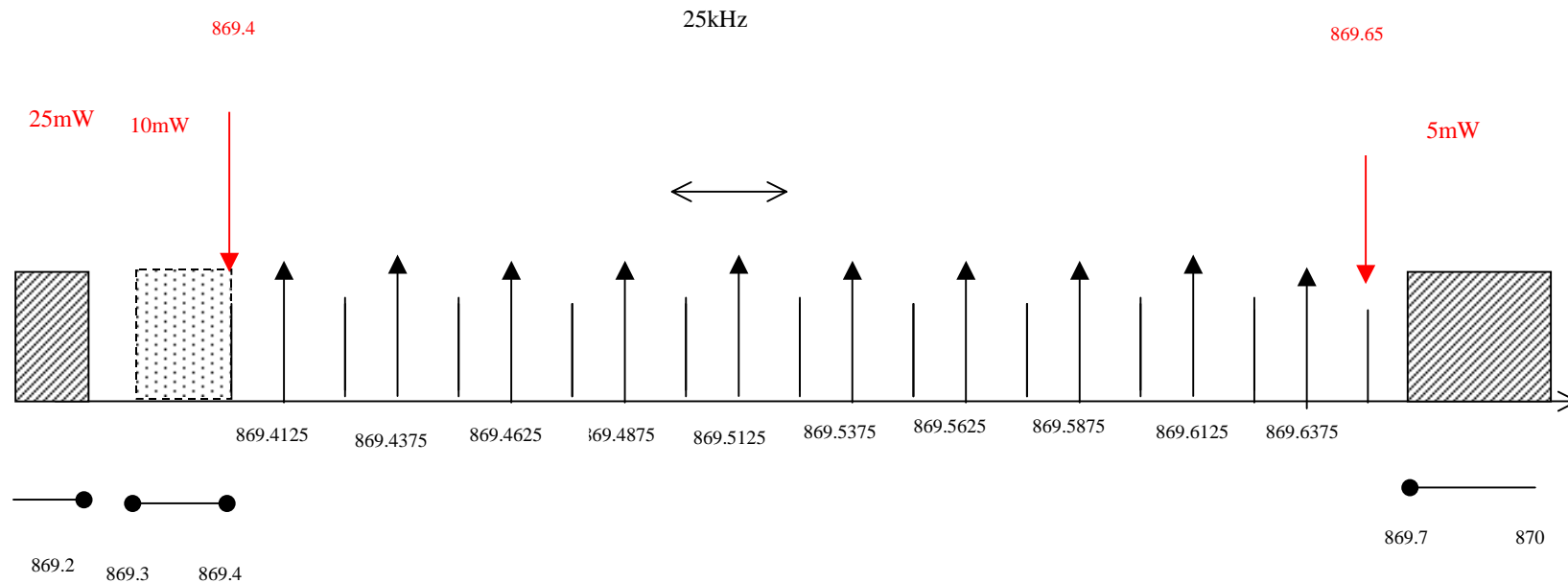
# Example of discrimination algorithm



# Frequency bands



# Frequency legislation



- Channel width to be respected : 25 KHz  
=> Use of GMSK modulation to obtain a minimum data rate of 10 Kbps

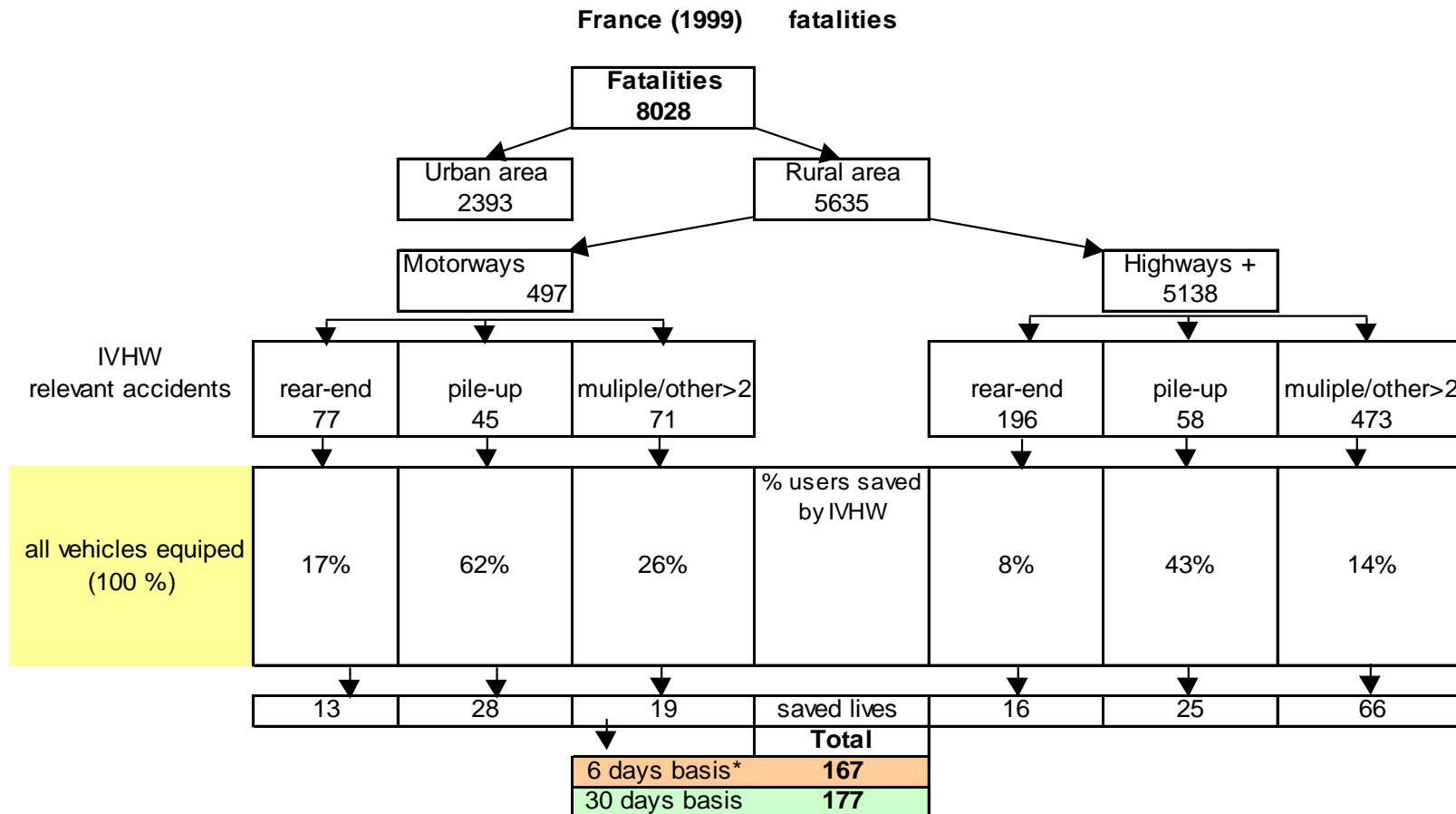


# ***Safety stakes***



***Inter-Vehicle Hazard Warning***

# Accident analysis





## ***Current activities***



**IVHW**

**Inter-Vehicle Hazard Warning**

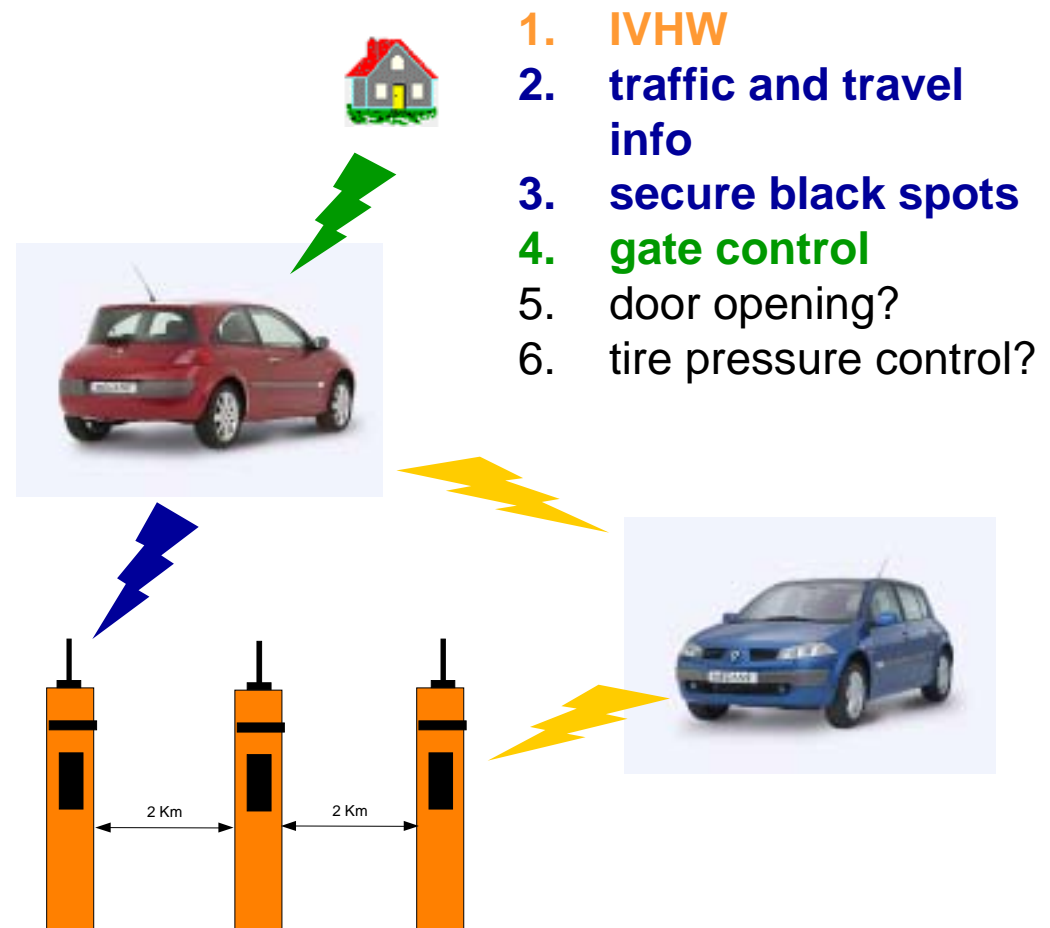


## *Market introduction*

- 1 • **Standardisation: the prerequisite**
  - work within EUCAR, the European manufacturers' research framework in order to achieve consensus among car makers
  - Item to be proposed to TC278
- 2 • **Equipment of rescue and security vehicles**
  - Use of mobile infrastructure beacons
  - Equipment of buses and commercial vehicles
- 3 • **Equipment of passenger cars**

# New developments

- To lower the costs and improve the market penetration, the SAAV project will try to develop a radio communication system allowing several applications to coexist on the same frequency band



1. **IVHW**
2. **traffic and travel info**
3. **secure black spots**
4. **gate control**
5. door opening?
6. tire pressure control?

- .Motorways emergency call boxes
- .Mobile beacons
- .Black spot beacons