Motorcycles in connected traffic - a contribution to safety
Intelligent Transportation Systems (ITS) current status without Power Two Wheelers
“…The ACEM manufacturing members agree to initiate deployment of safety-relevant cooperative ITS on PTWs in Europe and agree to have at least one of their models available for sale with a cooperative ITS, either as standard equipment or as optional equipment, by 2020.”

Conclusion: Connectivity technology like ITS will become a major part of future mobility.
Manufacturers already involved

Overall coordination of PTW activities

Several unlinked projects – no cooperation within PTW
CMC – Overview

**VISION**

*Enhance Riding safety* by jointly promoting, researching and developing C-ITS for Powered Two-Wheelers

**OBJECTIVES**

- **Integrating** PTW as an accepted and recognized partner into global future ITS strategies
- **Joining** our forces to create a common approach on ITS for PTW
- **Achieving** a successful implementation and deployment of PTW ITS functions

**PROMOTING & EXTERNAL RELATIONS**

**UNIFICATION & INTEROPERABILITY**

**FEASIBILITY & PROTOTYPING**
PTW is integral part of motorized traffic means

The focus on ITS for PTW:

• Safety features
• Traffic information
• Comfort features
PTW fatality rate decrease in Europe – but numbers still high

Accident analysis - Cause:

• Motorcycles do not have a safety cage
• Motorcycles are often not seen by others
PTW accidents have clear reasons

- Other vehicle driver causes accident 51%
- Motorcycle rider makes wrong decision 37%

Source: MAIDS final report 2.0 (April 2009)
Safety is “to be seen”

PTW often not noticed – “Sorry mate, I did not see you”

Speed / distance often misjudged

Perception failure by other driver is main cause of accidents

- Perception 70%
- Decision 20%
- Comprehension 3%
- Reaction 0.5%
- Other 8%
PTW is regarded Vulnerable Road User
We are “Special Case”

Rider is Vulnerable Road User
Motorcycle is a vehicle
Ready for ITS deployment

- Share same road with cars, trucks, etc.
- Moving with similar speed like cars
- Power supply (12V) on board
- C-ITS equipment on board
Motorcycle Applications Roadmap

Day 1 Applications
- Slow or Stationary Vehicle Warning
- Traffic Jam Ahead Warning
- Road Works Warning
- Weather Hazard Warning
- Emergency Brake Light
- Emergency Vehicle Warning
- Speed Limit Information
- Traffic Light Optimal Speed Advisory

Day 1.5 Applications

Day 2 Applications

Basic Systems

Advanced Systems

Simplified implementation

MAI-Motorcycle Approach Indication ‘BEACONING’
- Basic requirements
- Lower market penetration rate

- Intersection Violation Warning*
- Green Light Optimal Speed Advisory (GLOSA)
- Left Turn Assistant*
- Others....

*motorcycle safety relevant
Phase 1 & 2: Define applications suitable for PTW

Phase 3: How far can PTW cope?

Phase 4: How to cope with PTW?
Car solutions will not work on Motorcycles

**Design**
- Limited space
- High vibrations
- Limitation on sensing parameters

**No cabin**
- Antenna positioning
- Exposed to elements (*rain, humidity, etc.*)

**Dynamics**
- Leaning in corners
- Steering by inertia
- High influence of rider

**Positioning**
- PTW under 1 meter width
- Vehicle movement
- Higher positioning accuracy needed
Antenna challenge for PTW C-ITS

In case of car

- Easy to install antenna on the roof
- Good antenna performance

In case of scooter

- Attenuation by rider body
- Scattering by metal frame

*Big difference in antenna performance*

*Measurement with Honda FORZA 1scale = 10dB*
Motorcycles communicate differently than cars

**Use case: Stationary Vehicle Warning**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Car</th>
<th>Motorcycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard light on</td>
<td>✓</td>
<td>✓ (✓)</td>
</tr>
<tr>
<td>Parking break</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Door open</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Trunk open</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>Drivers seat not occupied</td>
<td>✓</td>
<td>X</td>
</tr>
</tbody>
</table>
Motorcycles move different than cars

Use case: Traffic Jam

Requirement:
...indicate a velocity less than or equal to 30 km/h of at least five other vehicles in at most 100 m distance and the same driving direction...
Motorcycles messages need careful consideration

Use case: Traffic Jam

PTW can ride through traffic jam
Sends „wrong“ trigger conditions – cancel traffic jam
Each trigger condition has issues for PTW

<table>
<thead>
<tr>
<th>Trigger Condition</th>
<th>Remarks concerning PTW (Powered Two-Wheels)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal on CAN</td>
<td></td>
</tr>
<tr>
<td>Tokens</td>
<td></td>
</tr>
<tr>
<td>Pelvic area</td>
<td></td>
</tr>
<tr>
<td>Fren CT</td>
<td></td>
</tr>
<tr>
<td>Trigger</td>
<td></td>
</tr>
<tr>
<td>Yellow markups show DAY 1 use case issues for PTW triggering conditions</td>
<td></td>
</tr>
</tbody>
</table>

If possible, PTW can be implemented into new motorcycles
Yellow markups show DAY 1 use case issues for PTW

03.10.2016
Ifz Conference
Statistics show use cases

15% Intersection collision

18% Left Turn collision

Source: MAIDS final Report 2.0 (April 2009)

C2C CC – Roadmap:
**Intersection Violation Warning & Left Turn Assistant** addressing this scenarios
Motorcycle Approach Indication (MAI) – Day 1.5

Information Function
• Basic Beaconing
• Pre-Information for driver
Motorcycle Approach Warning (MAW) – Day 2

Sophisticated safety Function
• Higher requirements
• Warnings only in critical situation
## Motorcycle Approach Warning (MAW) – Day 2

### Car Functions (Day 2)

<table>
<thead>
<tr>
<th>Intersection Violation Warning</th>
<th>Left Turn Assistant</th>
</tr>
</thead>
<tbody>
<tr>
<td>→ Contain only car requirements</td>
<td></td>
</tr>
</tbody>
</table>

- MAW as umbrella function with PTW requirements (e.g. riding behaviour)
- MAW has to be implemented in the receiving vehicles (cooperation with car industry)
- MAW is a real safety function with only warning in critical situation
- CMC will define requirements and provide this standards to other PTW and car OEMs
- MAW huge impact on motorcycle safety but it is a DAY 2 function
Motorcycle Approach Implementation

Requirements provided to car industry

MAI
Day 1.5
Requirements

MAW
Day 2
Requirements
ITS Landscape – many stakeholders need to act together

- **ETSI**
  - Standardisation

- **Connected Motorcycle Consortium**
  - ITS WG

- **CAR 2 CAR Communication Consortium**
  - ITS WG

- **European Commission**
  - ITS platform

- **CEN**
  - CEN 278 WG 15 eCall standardization

- **iCERO**
  - Harmonised eCall European Deployment

- **ITS cloud...**
C-ITS requires cooperation

- PTW OEMs
- Car OEMs
- Truck OEMs
- Suppliers
- Telecoms
- Road operators
- Ministries of transport
- European Commission
- NHTSA (US)
- ITS Japan
- Various national authorities
Thank you for your attention