ISO Standard: FVCMS

I received the following explanation from the FVCMS author:

"The intent behind SRB was to potentially draw the driver's attention to hazards ahead of the SV before MB was enacted but in a more active way than CW. Some manufacturers wanted to be able to achieve the same speed reduction (or greater) by starting earlier in the process so as possibly not to have to decelerate as quickly. End result from a minimum requirements standpoint was the same, how an OEM decided to get there was given more flexibility. We are talking about TTCs between 3 and 4 seconds. For light vehicles, MB shall not initiate above 3s and SRB not above 4s. If you look at the permissible system configurations, a type 1 system is SRB and CW (no MB), a type 2 system is MB and CW (no SRB), and a type 3 system is MB, SRB, and CW."

Aims to provide flexibility for the manufacturers when developing their system.

Sensor: LIDAR – fixed beam

- Used primarily for proximity detection

- Shorter range, which may prevent using this technology with a design speed greater than 30km/h.

- Range significantly reduced range in heavy rain, snow, fog.

- Sensor blockage possible by e.g. mud/snow, but self-diagnosed by the sensor. + windscreen swept area

- Detection range depends on IR reflectability (i.e. brightness) of the object surface.

- Able to detect moving and static vehicle targets as well as pedestrians.

Sensor: RADAR

- Used primarily for proximity detection

- Range significantly reduced range in heavy rain, snow, fog. Most robust for adverse weather conditions.

- Sensor blockage possible by e.g. mud/snow, but self-diagnosed by the sensor.

- Detection range depends on radar reflectivity (i.e. RCS)

- Able to detect moving and static vehicle targets, some state of the art systems can also pedestrians (moving legs required).

- Limited by RADAR frequency regulations.

- Can measure relative speed directly. (Doppler effect).

- Unable to measure the width of the object, but good a measuring longitudinal distance. Opposite with mono camera systems).

Sensor: Camera

- Used primarily for target classification. However Stereo camera can be used for proximity detection as well as target classification.

- Maximum detection range can be limited by hardware resolution and/or software capabilities.

- Significantly reduced range in heavy rain, snow, fog, ambient light levels and direction of light (natural/artificial).

- Sensor blockage possible by e.g. mud/snow, but self-diagnosed by the sensor. Wiper area.

- Detection range depends on background contrast and brightness of the object surface

- Able to detect moving and static vehicle targets as well as pedestrians.

Sensor: Choice

In addition to the technical justifications for the VMs choice in sensor:

- Vehicle manufacturers experience and subjective opinion

- Synergies with other technologies LKA.

- Historic link with suppliers, who may specialise in certain sensor technology. (Economical approach.)

- Depending on the scope set by the VM, performance in the same scenario may differ. If suppliers are ask to cover inter urban and city scenarios (+ ACC), then the city performance may be better because RADAR technology is implemented. Compared to a manufacturer who asks for just city environment so a fixed beam LIDAR System is installed and the maximum performance capabilities may be reduced.

Scenario: Low speed manoeuvring

- Limitations based on use cases rather technology.

- False positives in: Parking scenarios / Low speed manoeuvring / Car wash / Car park barriers etc.

- Little benefit for regulating AEB for low speed scenarios. (<10km/h)

Scenario: City 10-50km/h

- Above approx. above 30km/h LPS vs LPB comes into consideration. So manufacturers may not activate. More appropriate for partial overlaps scenarios. Where, when the LPS = LPB is closer to the target.

Scenario: Inter Urban (30-80km/h)

- Higher the speeds, the more dangerous it would be for a false activation.

Scenario: VRU detection

- Situation is very dynamic. Pedestrian may take 1 step and is now in the path of the vehicle within very short period of time. Therefore the system needs to be able to detect, classify and intervene in a very short period of time.

- The lateral offset required by the vehicle to avoid a collision with a pedestrian may be very small e.g. < 30cm. With such low lateral offset required, the velocity at which LPS = LPB becomes significantly lower. So manufacturers may be more reluctant to provide a system that works at higher speeds as it will cause greater possibilities of false activation.

- System needs to be robust and confident.

- Wider FOV for VRU detection require greater processing power from ECU.

- Night scenarios require night vision technology.

NCAP vs Type approval

- Performance determination vs minimum safety standard.

- Designed performance needs to take in account for different conditions in the real world when compared to the test track.

- Design with safety margin to cover variation in results.

- NCAP selection of vehicle is based on the most common variants available on the market, type approval vehicle selection is based on the worst case vehicle.

- Performance based on Ideal conditions e.g. pre prepared brakes (hot.), weather conditions. Level of braking required for type approval should based on UNECE Regulation R13H. (6.4m/s²) for regulatory consistency.

- Consideration should be given to the possibility of false positives: Off road scenarios / Steel trench plates / Parked cars at entry and exit of corner / Motorway Gantries / Railway tracks / Overhead cables / Damaged windscreen before re calibration.