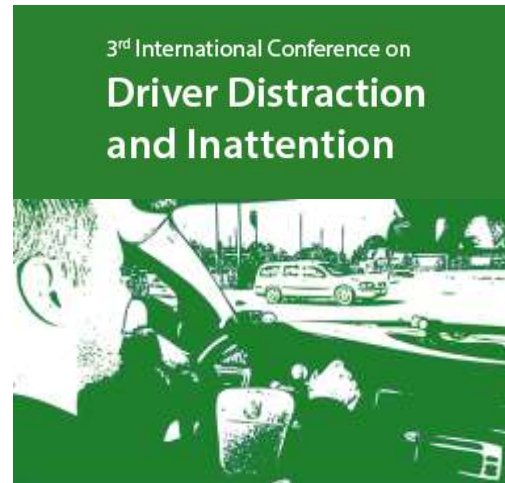


Heart and respiration in-car embedded nonintrusive sensors

H A R K E N ● ● ●

# Using smart materials to monitor physiological signals of driver's inattention



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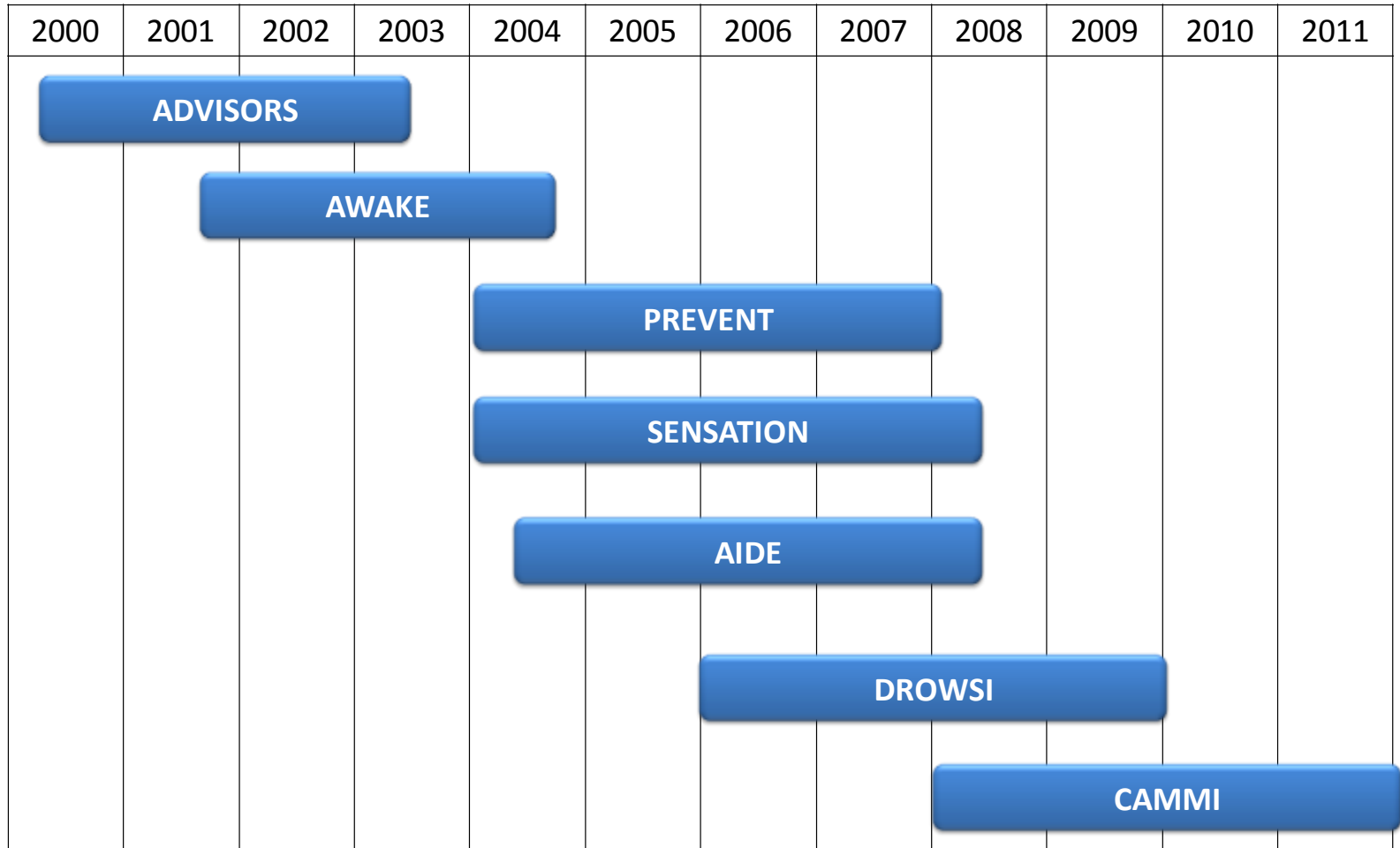


# Driver fatigue countermeasures

- Publicity campaigns
- Infrastructural measures
- Legislation
- In-vehicle systems (HMI)



# European projects about advanced HMI



# Current solutions of driver fatigue monitoring

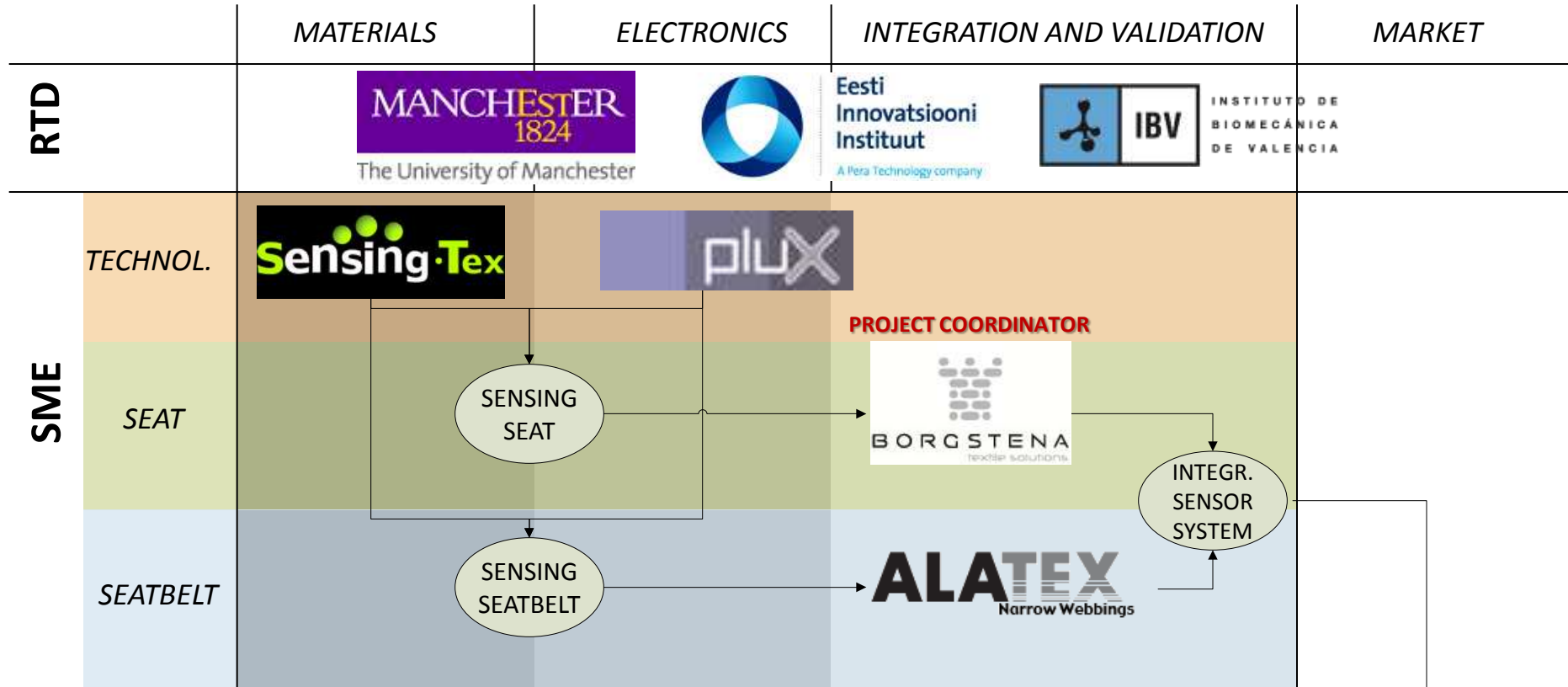
- Control driver behaviour
  - Collision Warnings, Lane Departure Detectors
- Advanced driver behaviour monitoring
  - Mercedes “Attention Assist”: individual patterns
  - Toyota “Driver Monitoring System”: combined with gaze analysis
- Eye-face recognition (many prototypes)
- Wearable physiological monitors



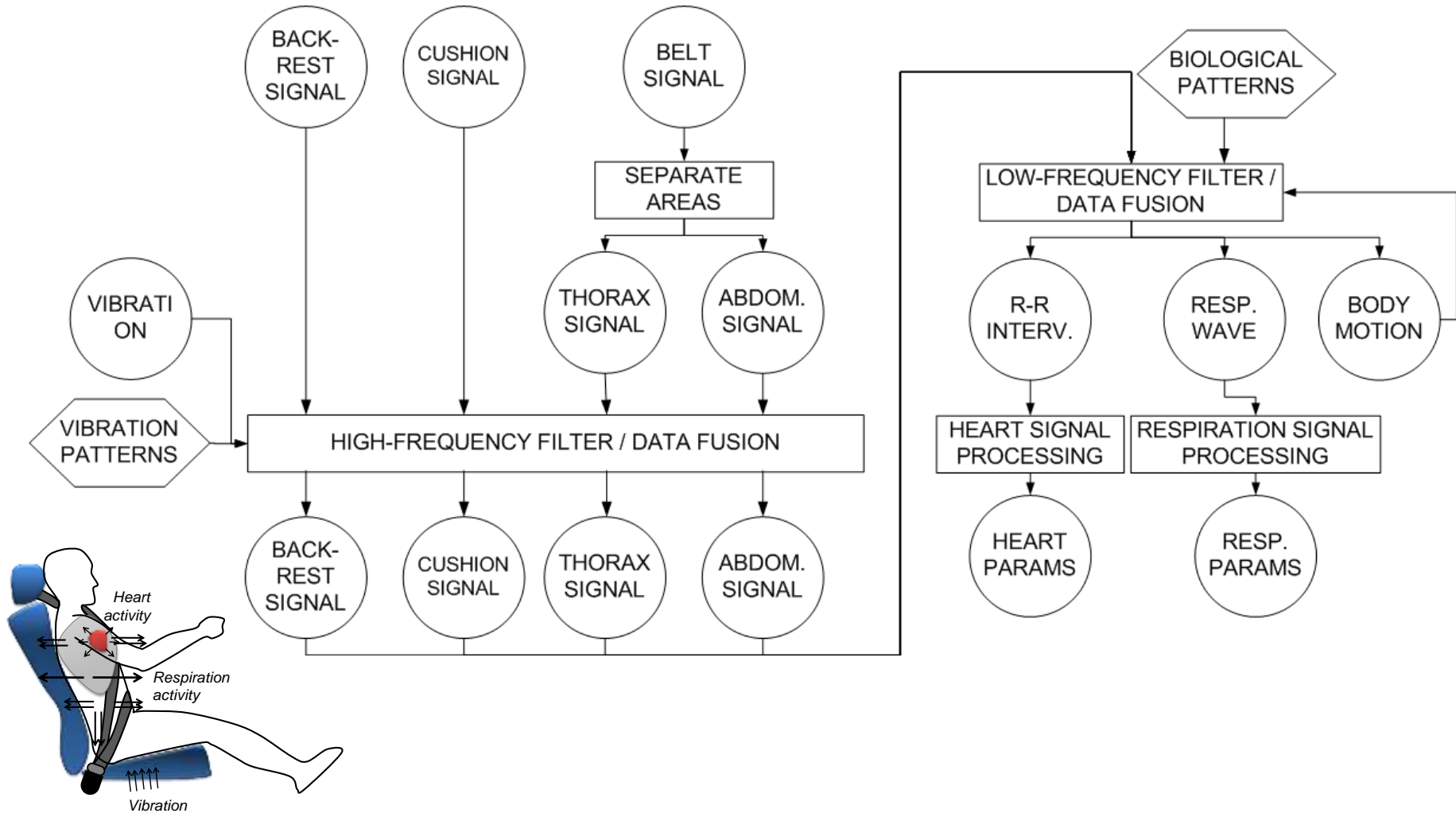
# Challenge!

- Device for measuring physiological signals  
(defined by scientific state of the art, and end user demands)
  - Heart Rate, Heart Rate Variability
  - Respiration rate
- Meet industry requirements:
  - Price
  - Aspect
  - Integration with car components
  - Safety

# HARKEN project



# HARKEN concept



# Current prototypes



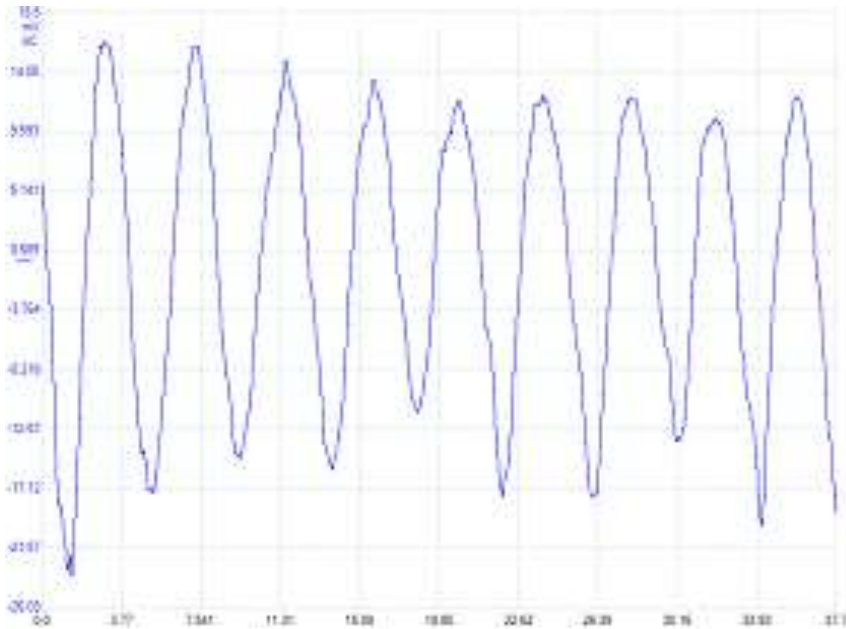
*SEAT SENSORS (NOT EMBEDDED)*



*SEATBELT SENSORS (EMBEDDED)*



# Real measurements from HARKEN sensing materials



**Measured respiration signal**



**Measured BCG**

# Summary of current status

- Sensors created
- First prototypes of seat cover and seatbelt
- Signal processing methods defined and tested with lab. data
- Next steps
  - Adjustment to different anthropometric profiles
  - Check influence of unguided use (clothes, fit of seatbelt...)
  - Test real data – train and adjust filters of signal processing
  - Integration of the different components

Heart and respiration in-car embedded nonintrusive sensors

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THANKS FOR YOUR ATTENTION!

