

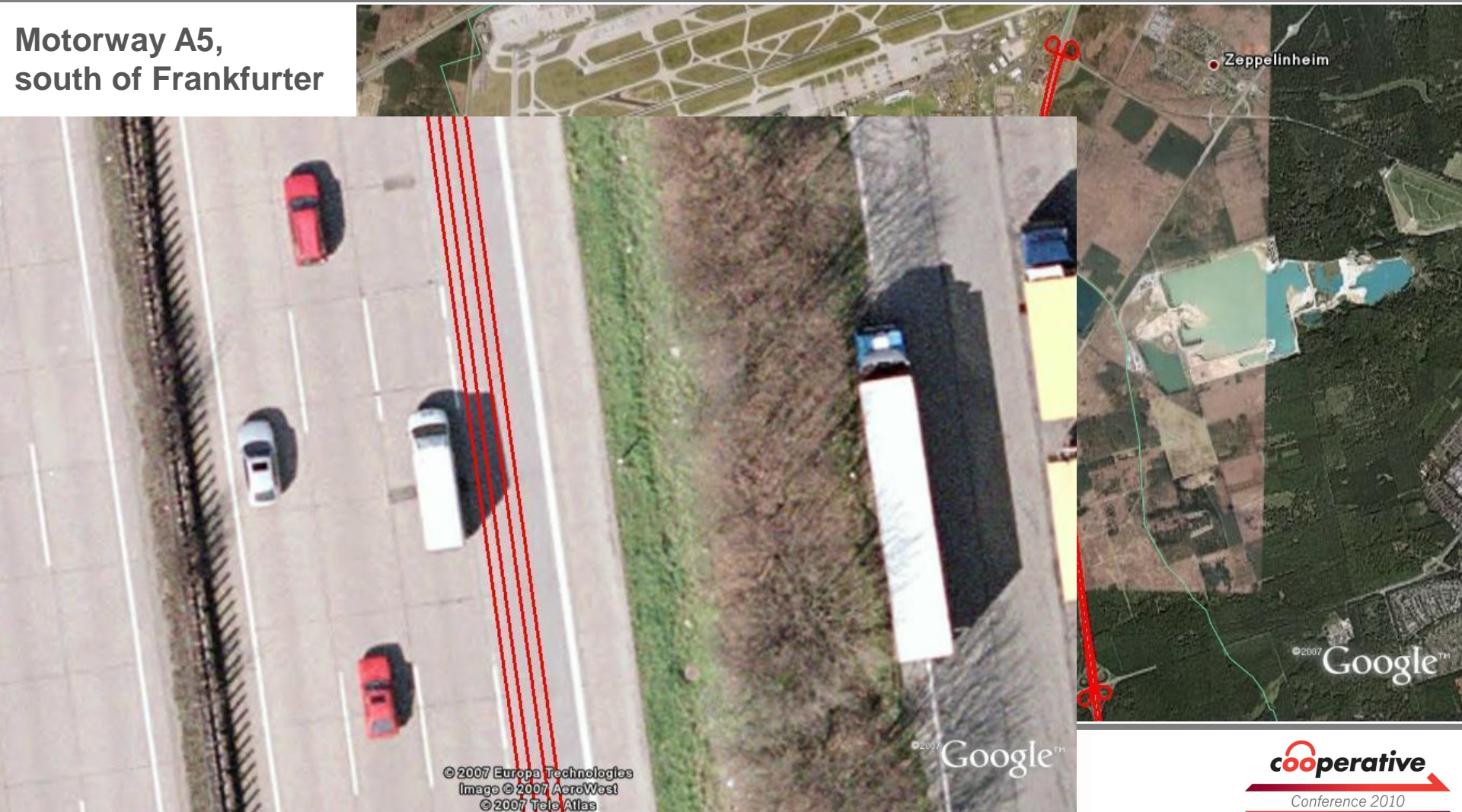


Lane-specific positioning with Galileo

Dr. Jörg Pfister
pwp-systems GmbH

GPS + EGNOS (ideal conditions)

Motorway A5, south of Frankfurter



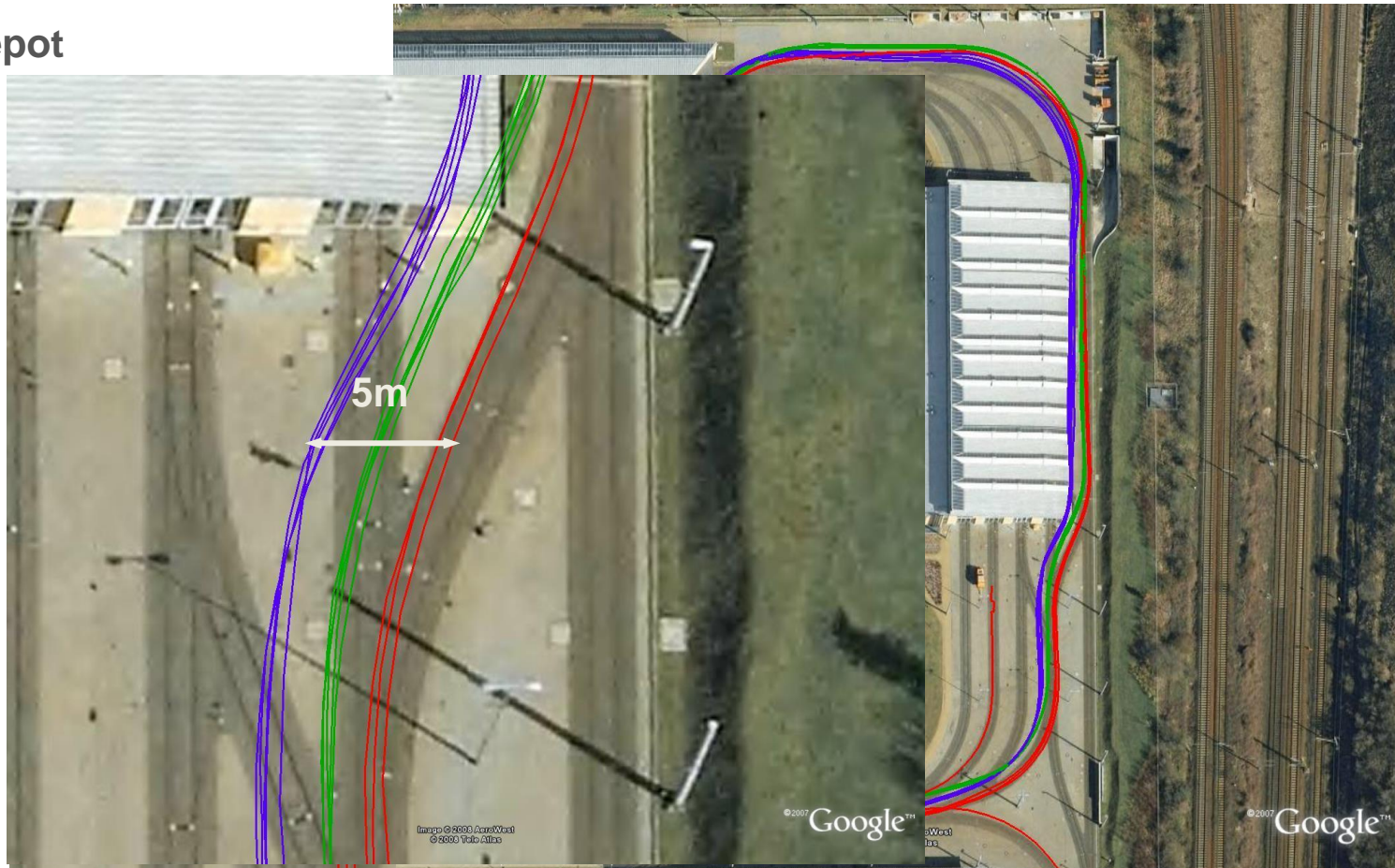
© 2007 Europa Technologies
Image © 2007 AeroWest
© 2007 Tele Atlas

GPS-Repeatability (Guidance on tracks)

Public-Transport-Depot
in Halle (Saale),
Saxony-Anhalt,
Germany

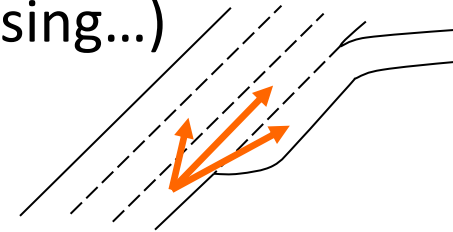
reproducibility
of results
is perfect
because of
guidance on tracks

ideal conditions for
EGNOS experiment



Lane specific information

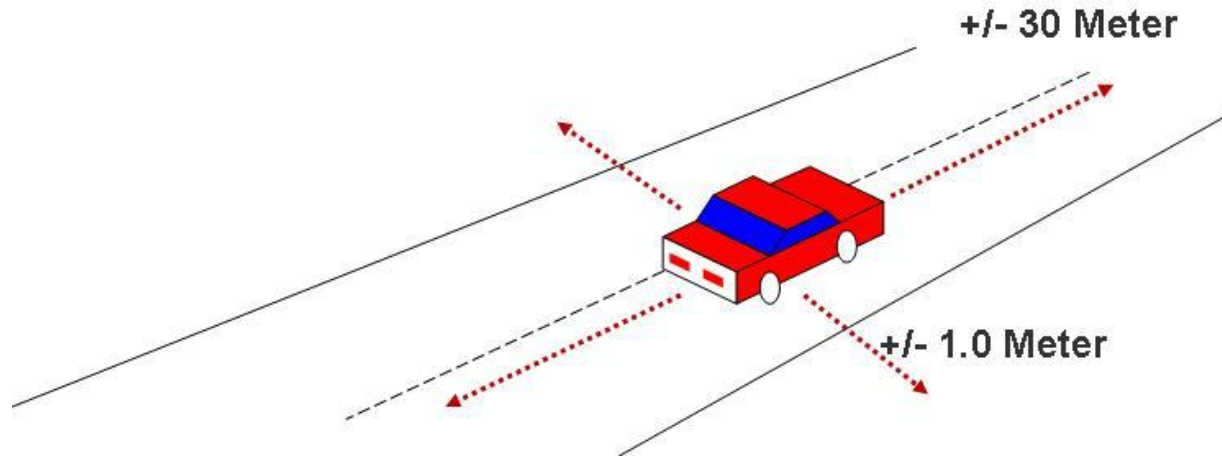
- Intelligent speed limit
- Lane utilisation information
(lane changing, next exit, use hard shoulder, no passing...)



- Precise recommendations and instructions
- Reduce Information load to the driver
- Exclude misinterpretation

**Improve
Road Safety**

Requirements for robust positioning unit (RPU)



- COOPERS has a focus to improve safety for motorways
- 12 services have been developed for the demonstration
- Some services require lane specific positioning capability and robust behaviour with respect to the provided performance
- Therefore the Robust Positioning Unit (RPU) has been developed
- The integration of Galileo signals and the utilization of I2V beacons have proven to achieve lane specific positioning in real life tests

Robust positioning unit (RPU)

Concept-Car



- CGW:**
- GPS
 - CAN
 - CALM-IR



Foto: EFKON

Concept Car with Reference System

NovAtel-L1/L2-Receiver with special antenna



3-Axis-IMU from iMAR



Corrsys

GSSF – Galileo System Simulation Facility

**Static (User)
vs.
Kinematic (Auto)**

Horizontal Navigation System Precision
Galileo, Dual Frequency, 1 day, 5 [deg] Grid

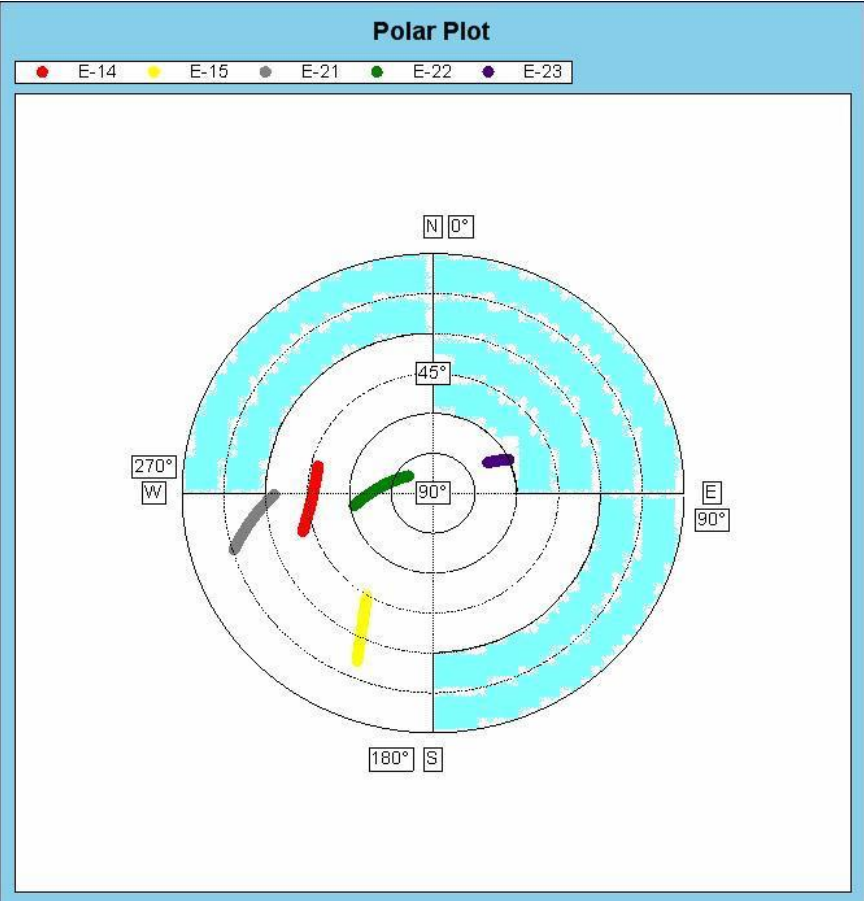
Arithmetic Mean [m]

1.250 1.308 1.366 1.424 1.482 1.541 1.599 1.657 1.715 1.773 1.831

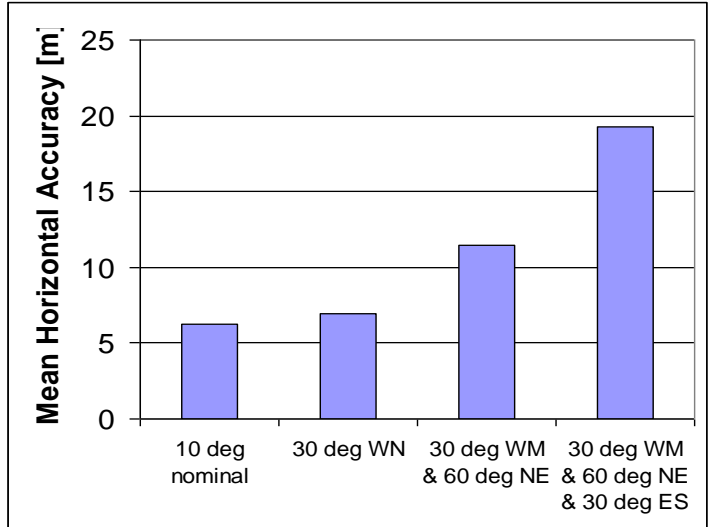
www.gssf.info

SVS (Service Volume Simulation) vs. RDG (Raw Data Generation)

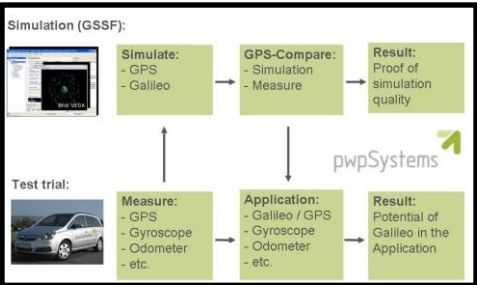
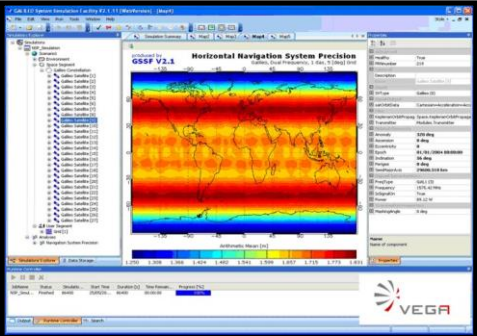
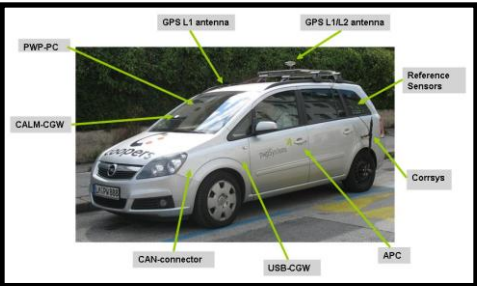
Simulation of signal blocking (environment model)



The variation of the visibility (Masking Angle) for all directions, allows the flexible configuration for the scenario of satellite signal blocking in urban environments.



Approach of “Virtual Galileo”

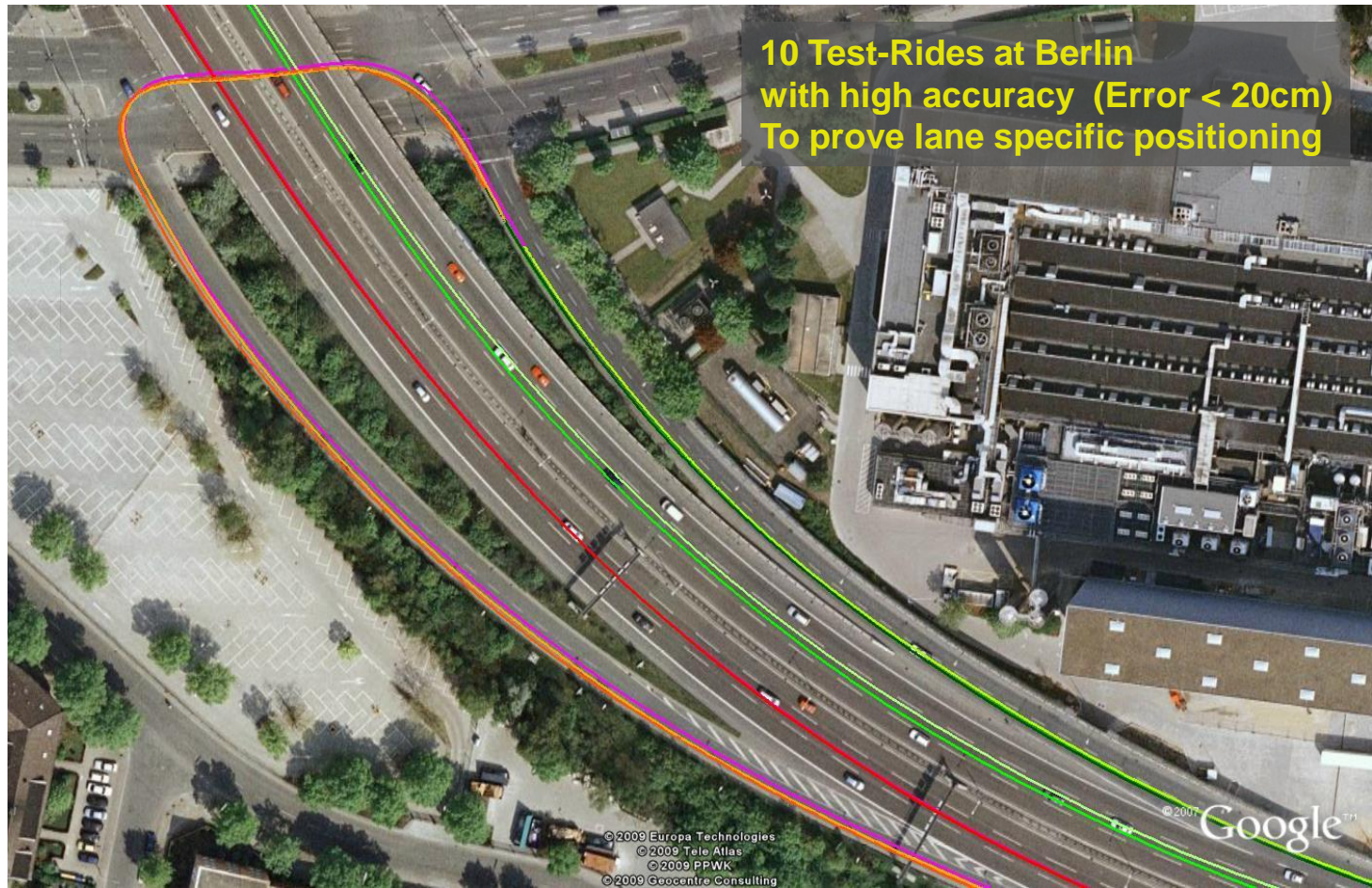


- The RPU combines various sensors (GPS+EGNOS, full CAN access to on board sensors, I2V-communication)
- The concept car contains additional sensors (L1-L2-GPS, INU, etc.) to elaborate a high quality reference trajectory
- The official ESA software “GSSF” has been applied
- Quality check of the simulated GPS signals, by comparing them to the measured GPS data
- New methodology to integrate simulated Galileo signals into real life tests
- Capability to show Galileo benefits in the application, under specific environment and constraints, today
- High Flexibility ⇒ the approach has been proven in Berlin, Innsbruck, Trento and Frankfurt

COOPERS Demonstration at Berlin

“Virtual Galileo”
has been
demonstrated
successfully in:

- Berlin (D)
- Innsbruck (A)
- Trento (I)
- Frankfurt (D)



COOPERS – CVIS - SAFESPOT



- COOPERS, CVIS and SAFESPOT require robust positioning for various eSafety applications
- GPS as stand alone solution can not satisfy these requirements!
- All 3 projects follow a hybrid approach (GNSS + on board + Infrastructure) to develop new positioning technologies
- The task of sensor fusion with sophisticated algorithms become essential to achieve the goal of robust positioning
- Good communication has been established between the projects with respect to the position group, to exchange the gained experience with the different technologies

cooperative

Conference 2010

mobility