

Automotive Radar Stimulator Development

at the Institute of Microwave and Photonics
Engineering

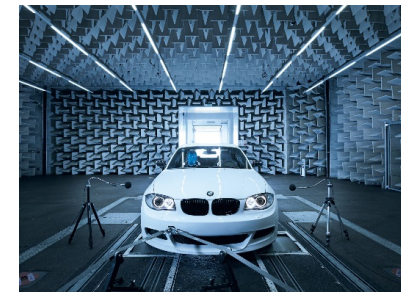
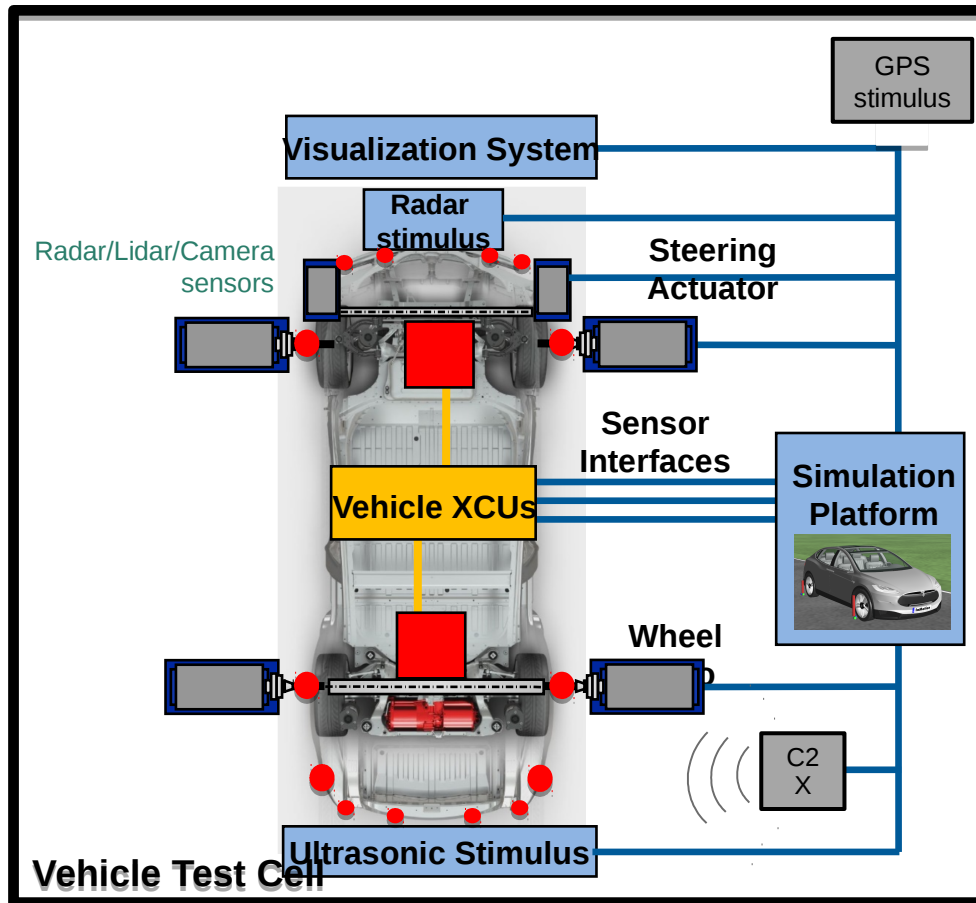
together with:



Why Automotive Radar Target Stimulation ?

- Testing autonomous driving in real world is quite a challenge
- As much testing as possible by simulation and on a testbed :
 - Faster
 - Cheaper
 - Better repeatability
- On a testbed the sensors of the cars have to be stimulated

The Testbed



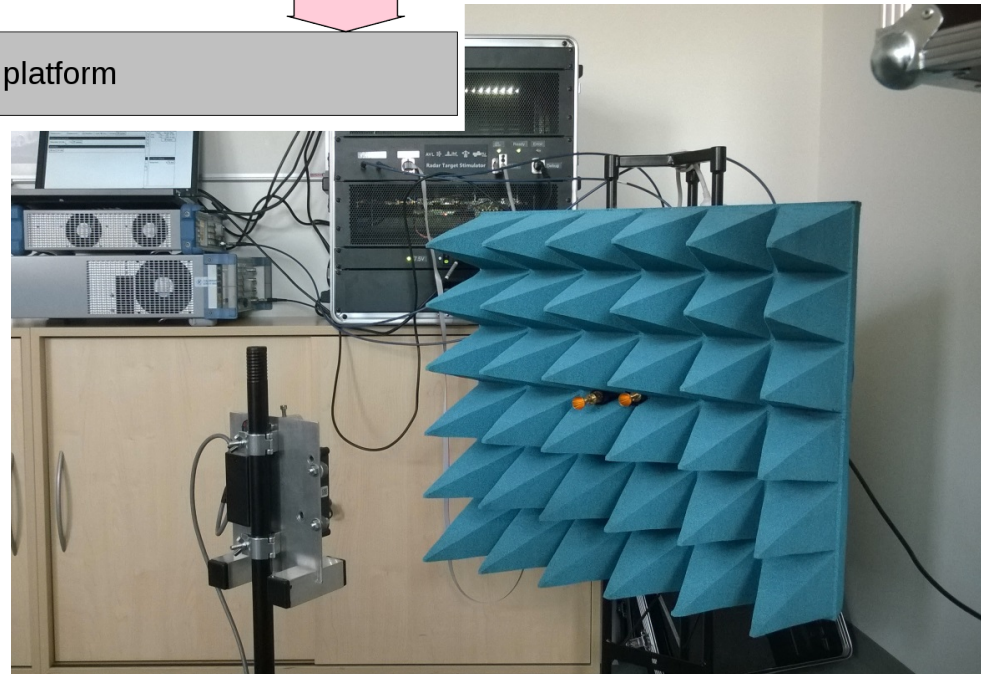
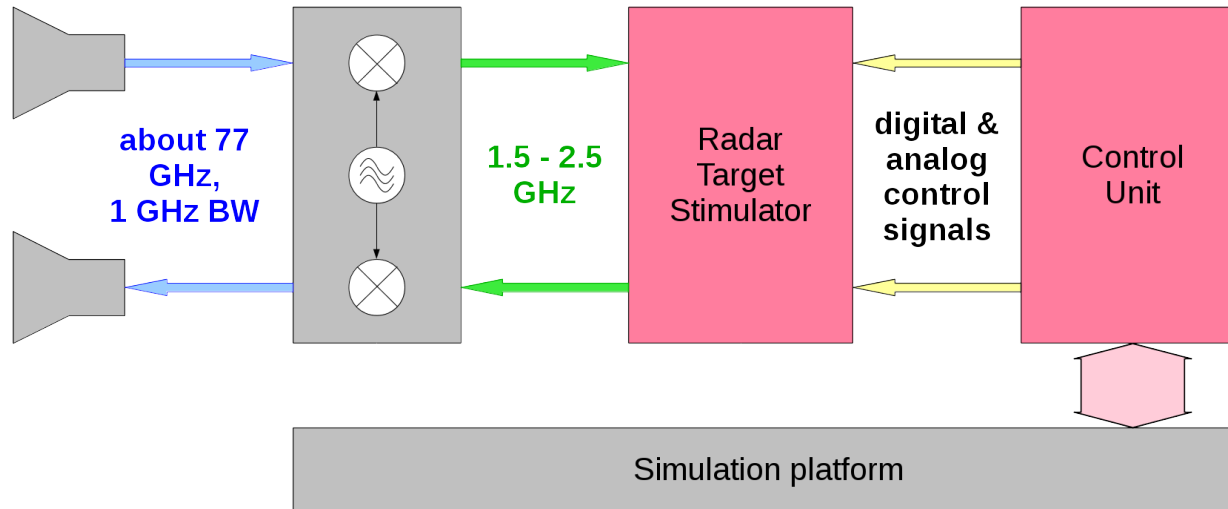
Challenges for Target Stimulation

- Complicated real world scenarios:
 - Multiple targets
 - Multiple azimuth channels
 - Moving and stationary targets (clutter at the testbed)
- High processing bandwidth (up to 1 GHz and more)
- Large variation in distance (a few meters to hundreds of meters)
 - High dynamic range
- Fast response time (5 m correspond to 33 ns)

How to Stimulate a Radar Target

- The radar target stimulator has to create for each target
 - the correct distance by delaying the radar echo
 - the correct velocity by shifting the echo frequency
 - the correct target RCS by changing the signal amplitude
 - the correct angle

Structure of the Radar Target Stimulator - 1/2



Structure of the Radar Target Stimulator - 2/2

- Highly scalable
 - in distance
 - in # of targets
- Switching without discontinuities in the signal's phase
- Flexible connection between delay module & target emulation module
- Does not depend on the radar's transmit signal form

Ongoing & future work



- Extending the stimulator to targets in multiple azimuth directions – allowing azimuthal movement
- Covering possible multipath propagation & possible interference by other radars
- Range extension by digital stimulation
 - Analog system with delay lines not feasible for longer ranges and many targets
- Integration in a test rig
- Simulation of clutter

