



IC1301 – WiPE

Wireless power transfer in vehicular applications

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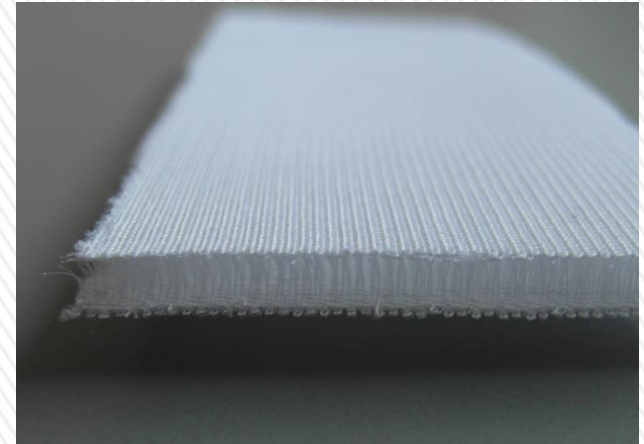
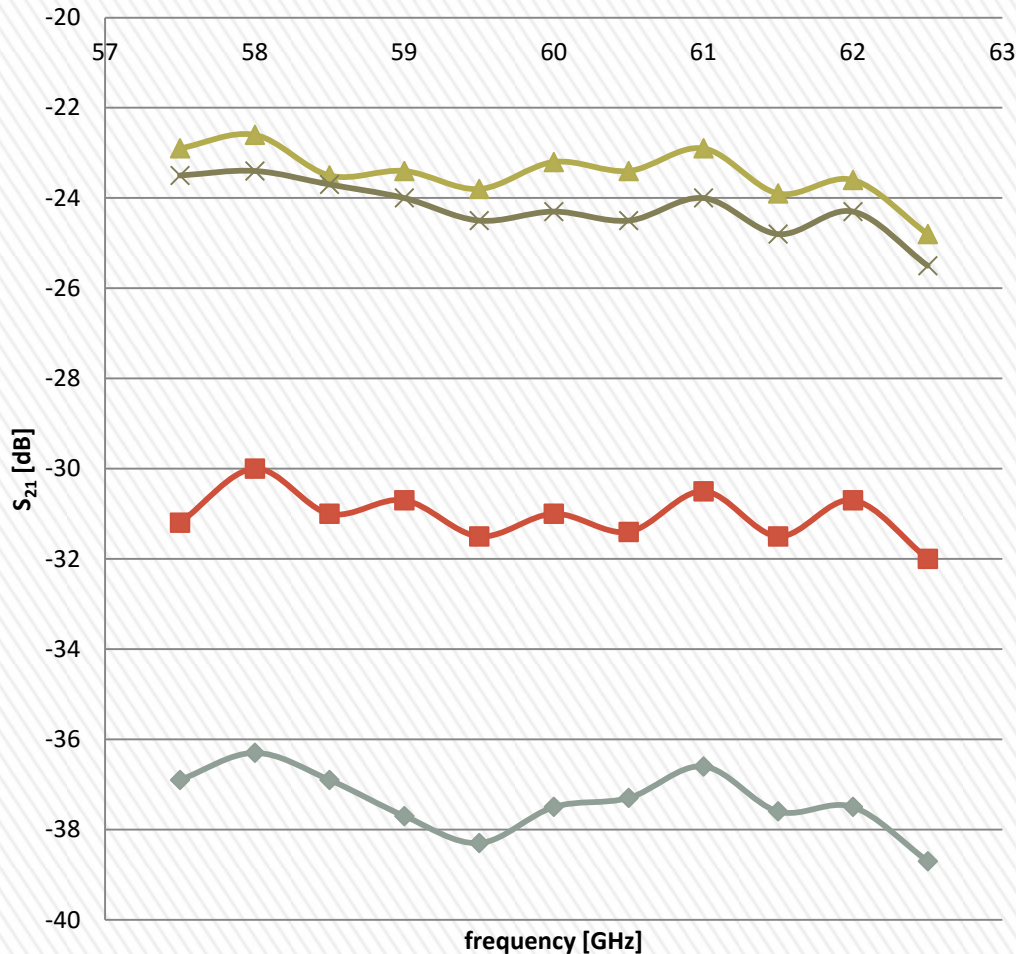
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Recent development (1)

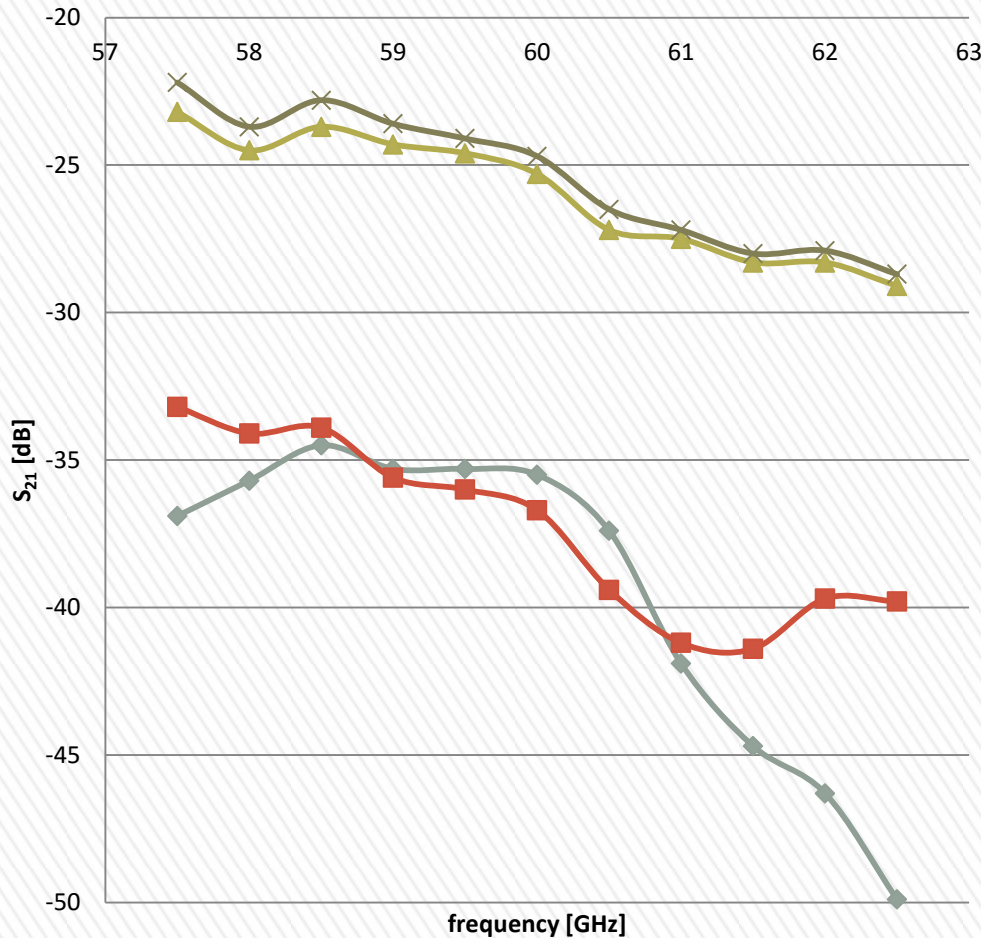
RWG, S_{21} , dist. 180 mm



- ◆ RWG - free space
- RWG - above metal sheet
- ▲ RWG - 3D textile (along)
- × RWG - 3D textile (across)

Recent development (2)

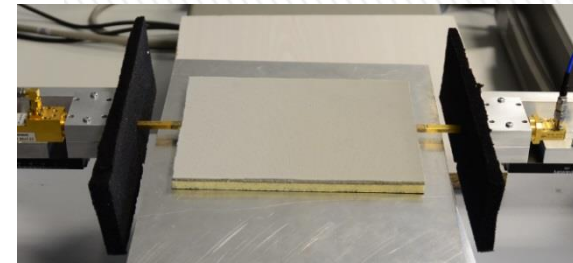
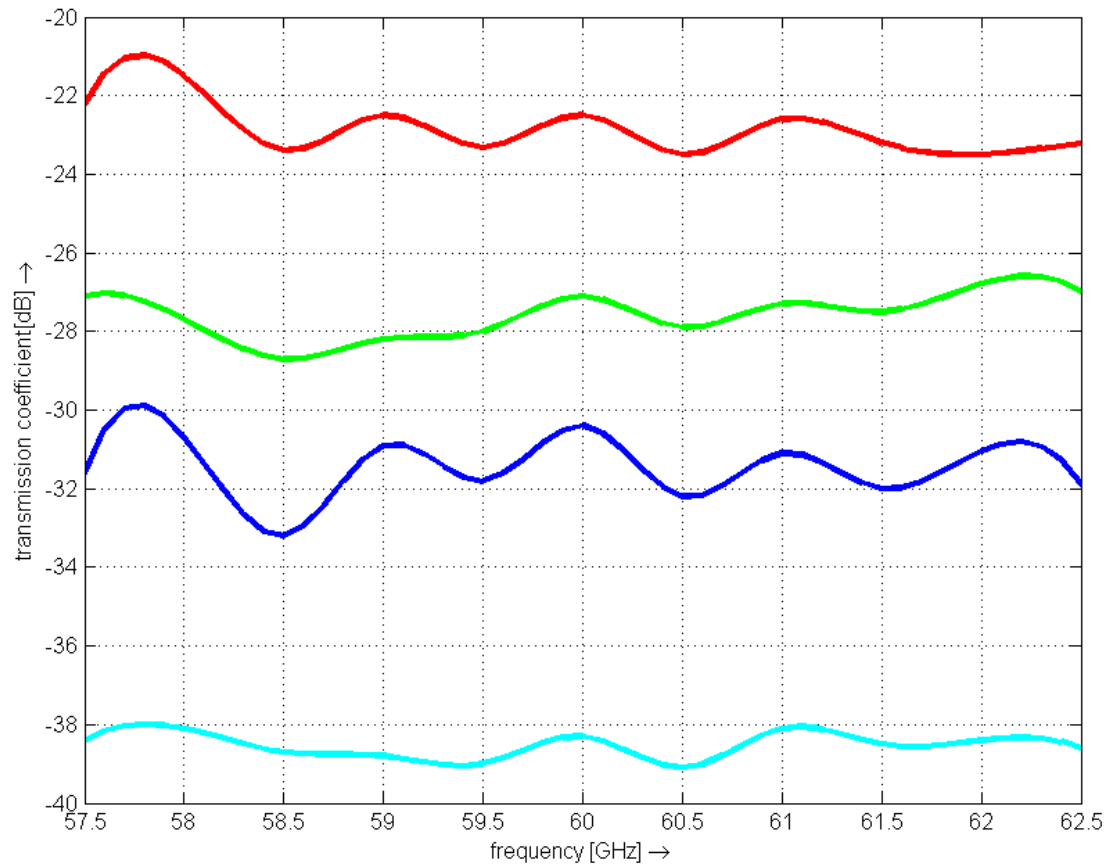
Horn, transmission, dist. 180 mm



- ◆ Horn-free space
- Horn-above metal sheet
- ▲ Horn-3D textile (along)
- × Horn-3D textile (across)

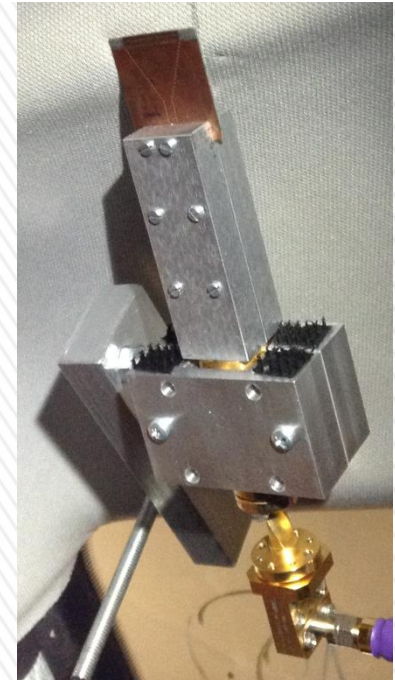
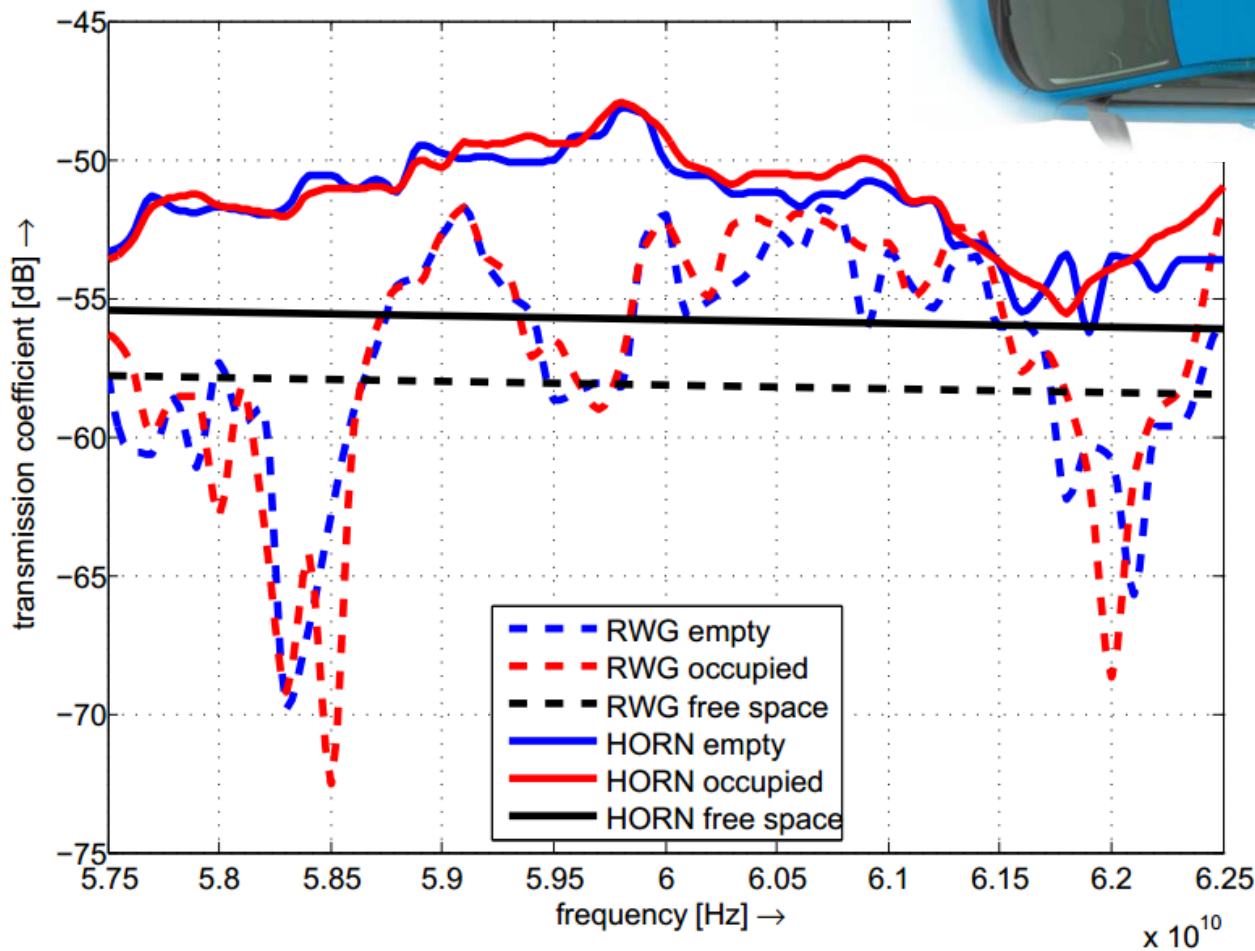
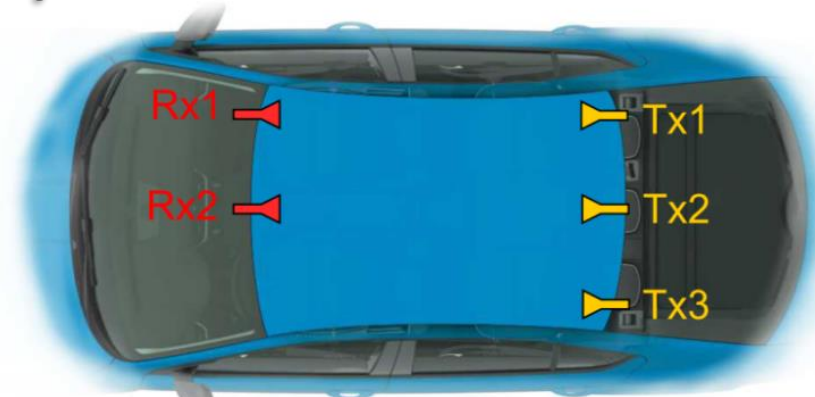
Recent development (3)

Towards in-car transfer



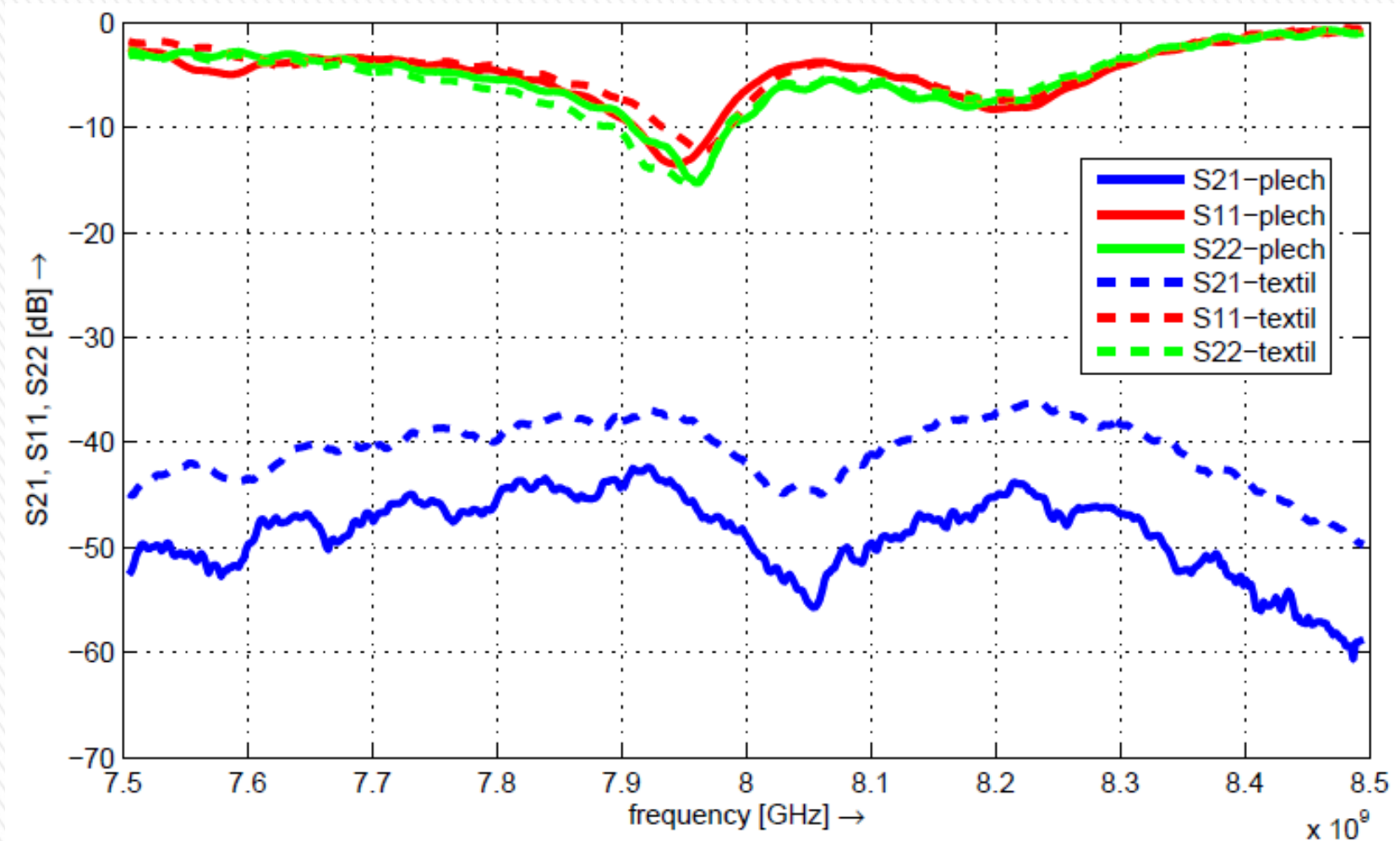
Recent development (4)

In-car along-roof transfer



WPT at lower frequencies

UWB band-group VI \Rightarrow 8 GHz



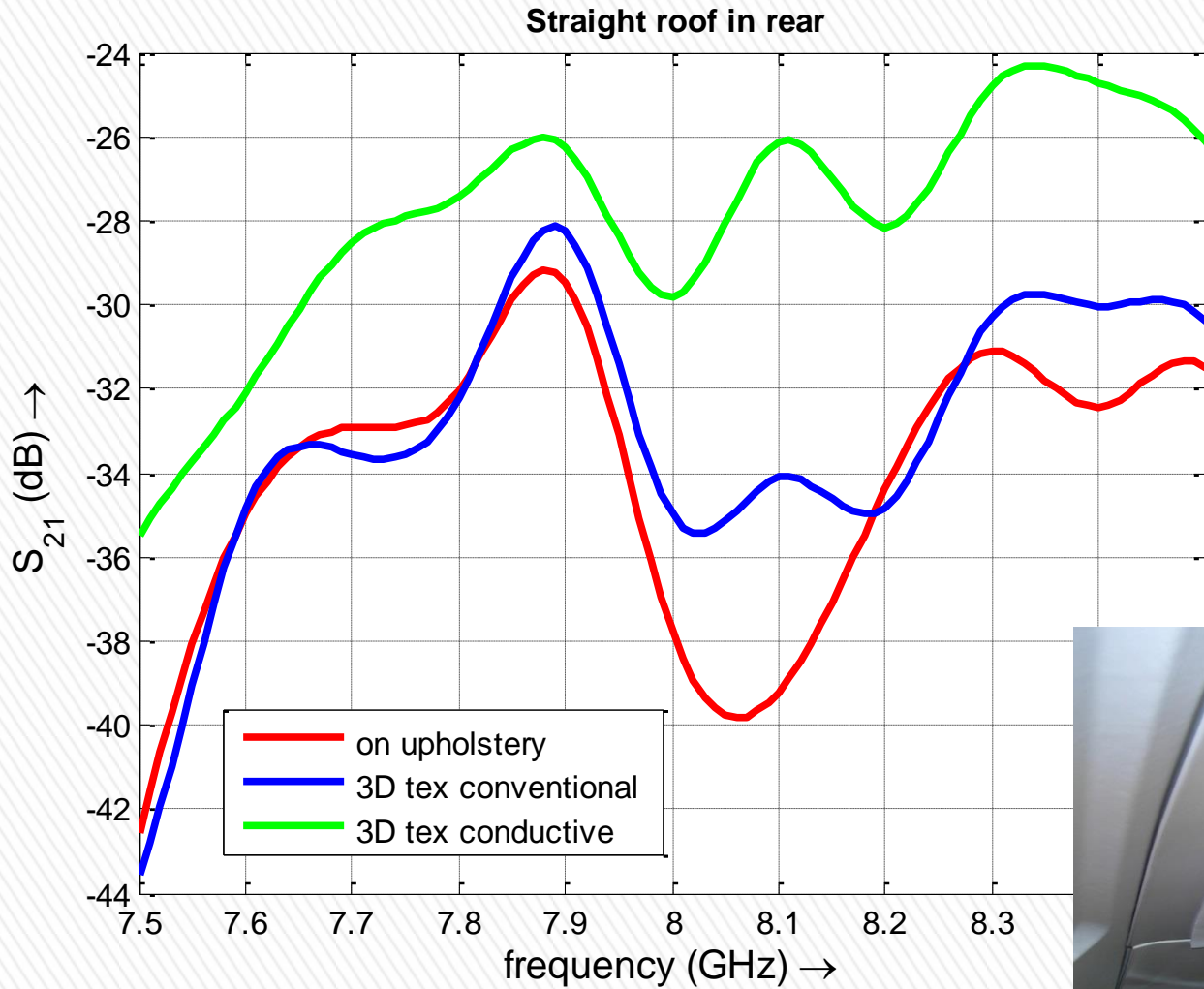
WPT in small airplane (1)

Small airplane = 25 kg of wires

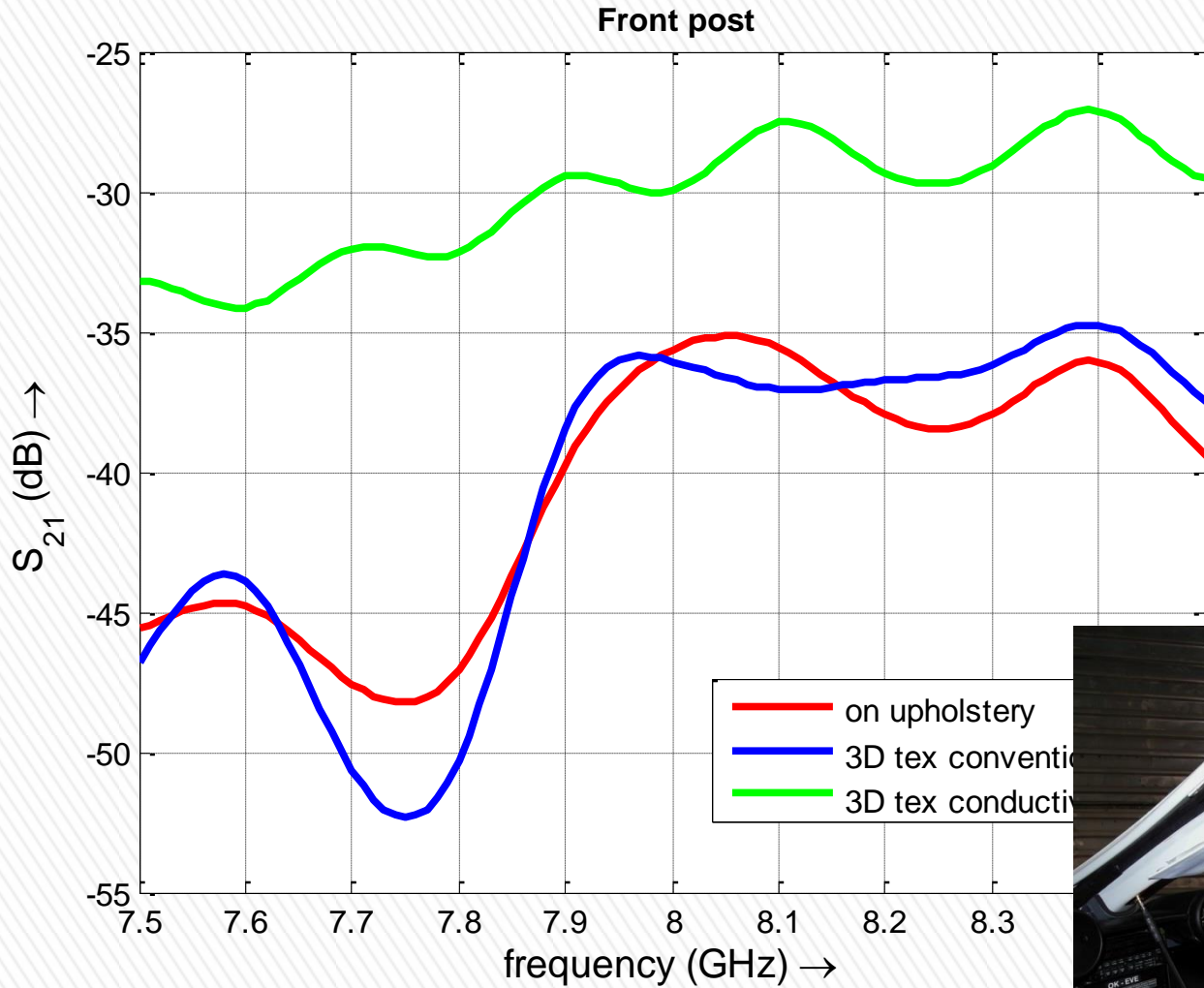
- 10% of cabling removed \rightarrow 2.5×30 tons of fuel saved
- 1 liter of kerosene \rightarrow 2.58 kg of CO₂
- CO₂ reduction: $2.5 \times 30\ 000 \times 2.58$ kg per year



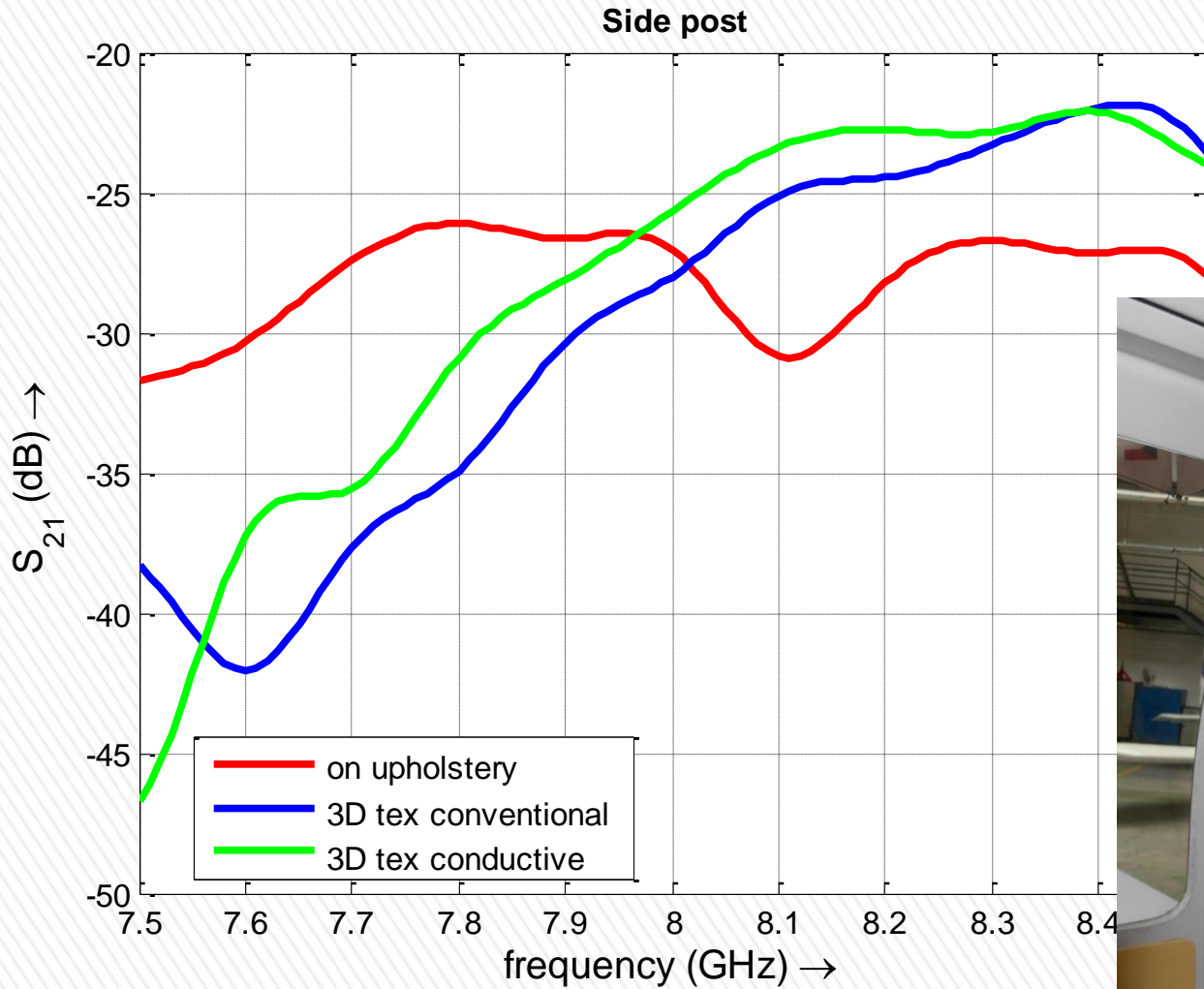
WPT in small airplane (2)



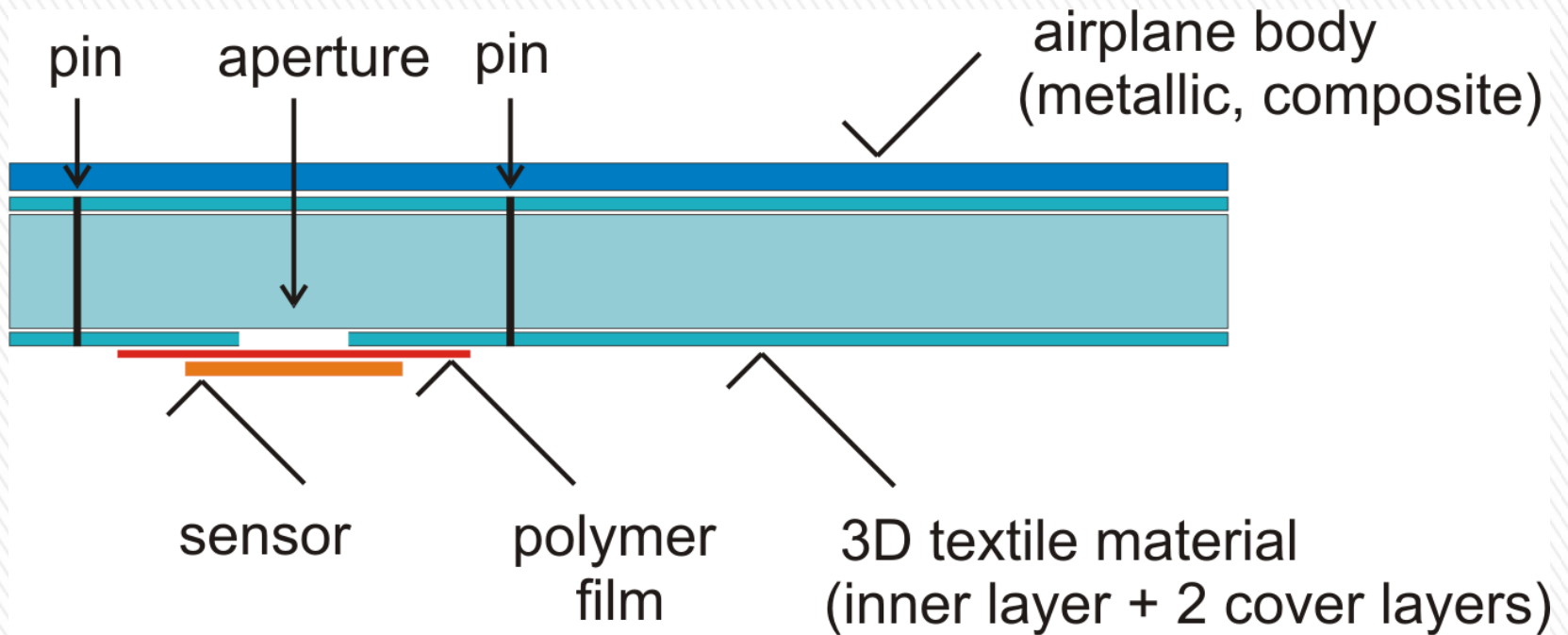
WPT in small airplane (3)



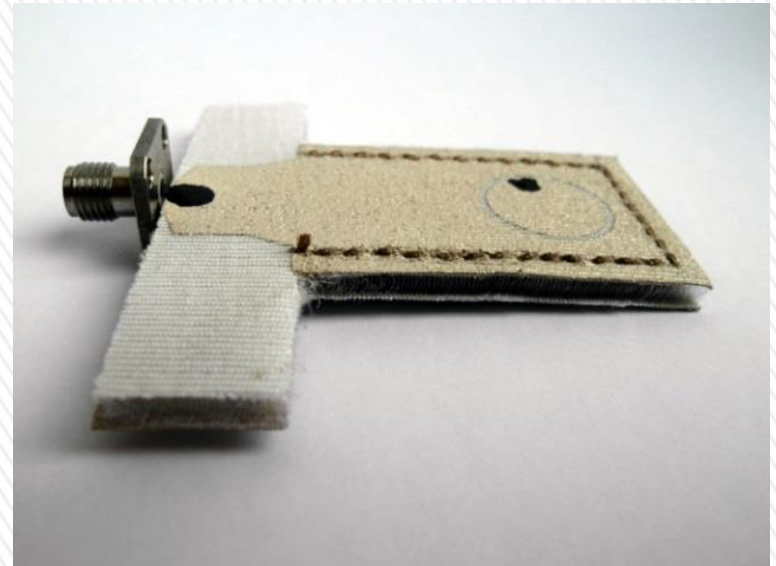
WPT in small airplane (4)



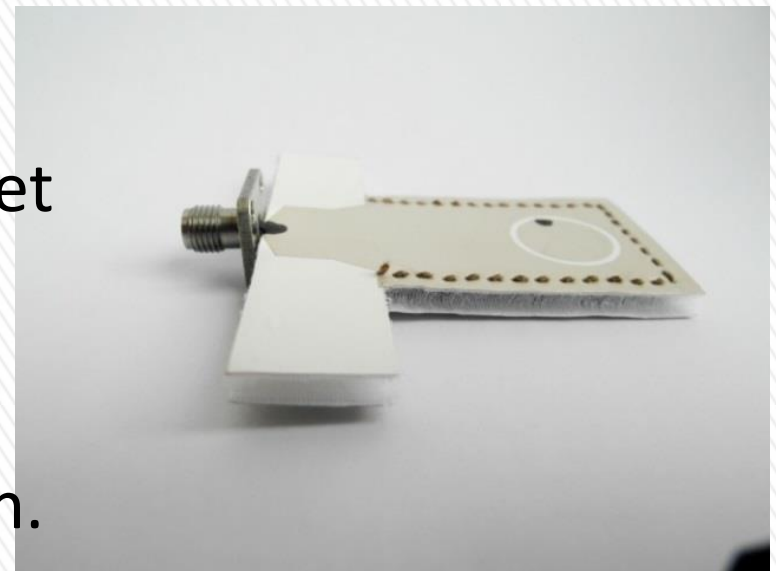
Integrating sensors



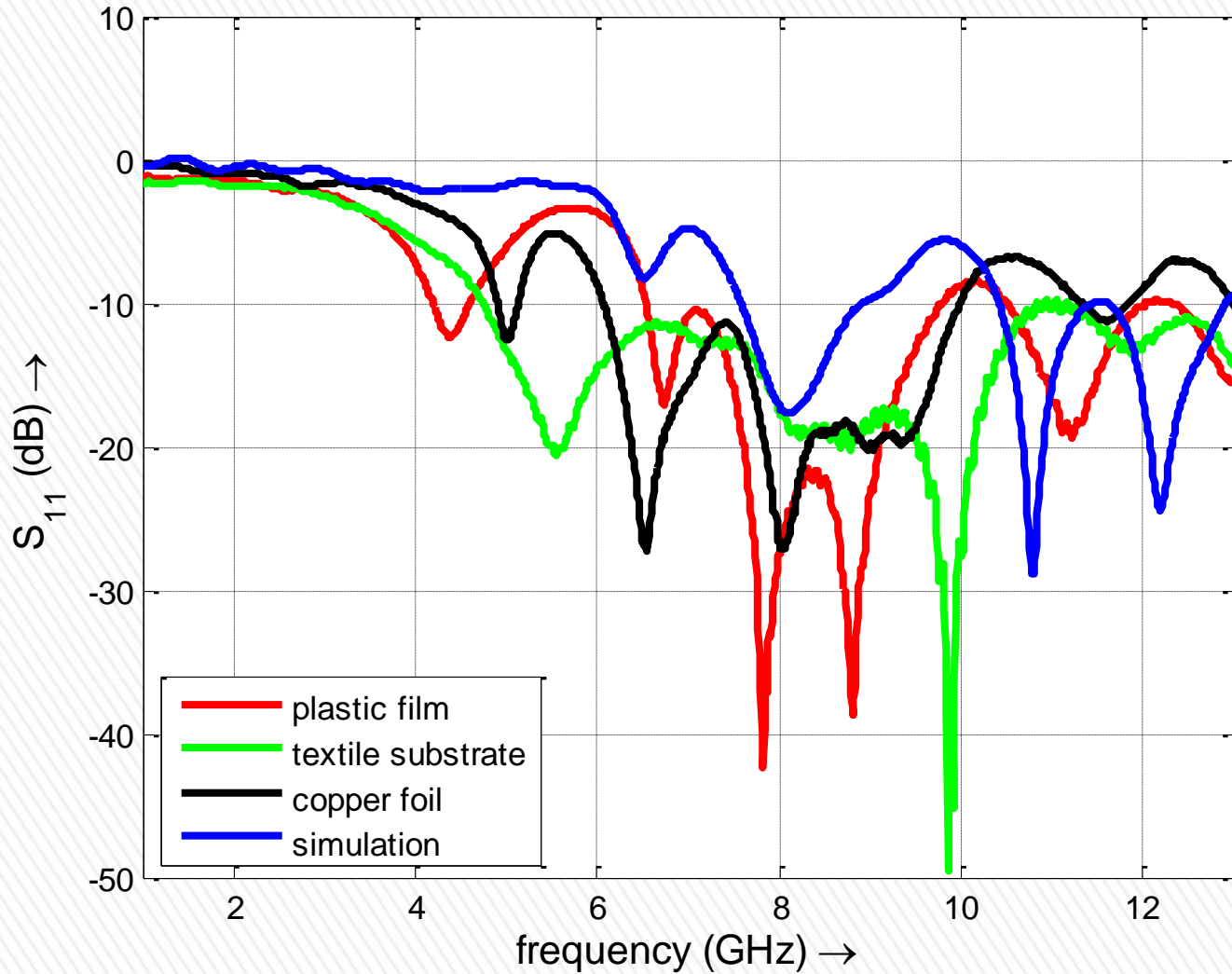
Screen-printed sensors (1)



- Aurel C880 screen printer
- Digiflex-Master foil by Alphaset
- ESL 1901-S polymer silver paste by ESL
- Paste cured at 80°C for 30 min.

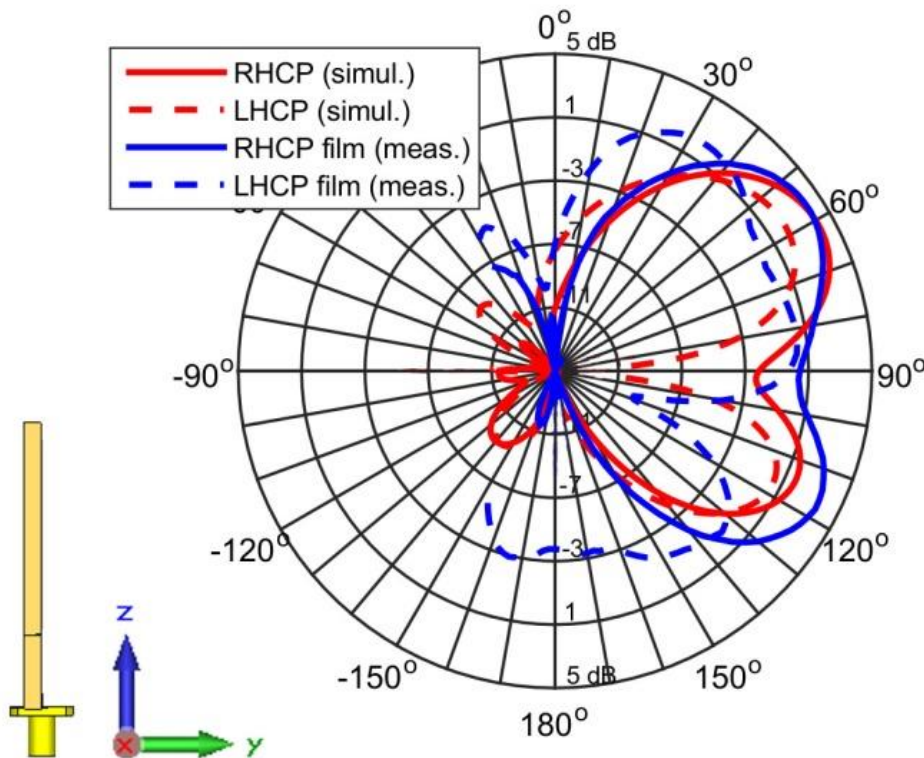


Screen-printed sensors (2)

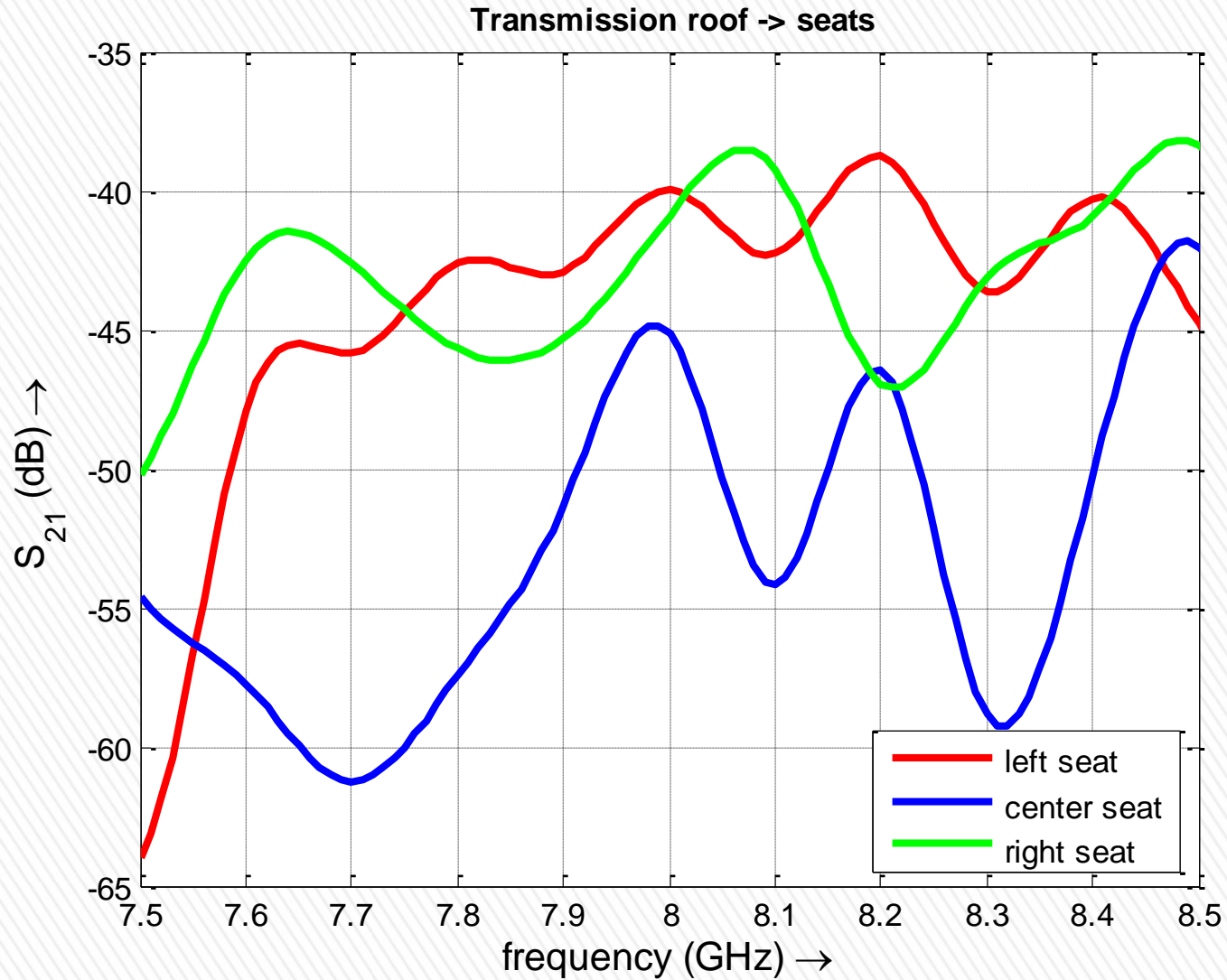


In-plane applications (1)

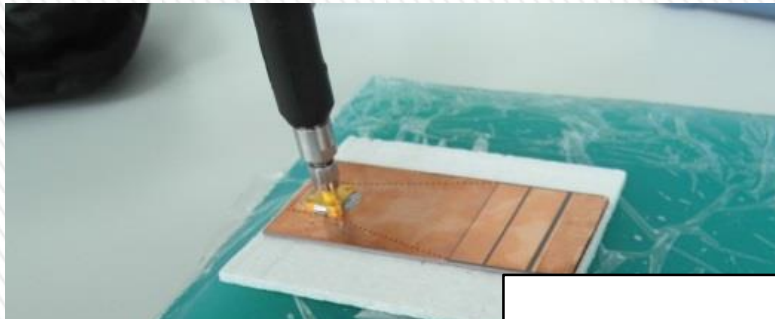
WPT (communication)
to neighboring seats



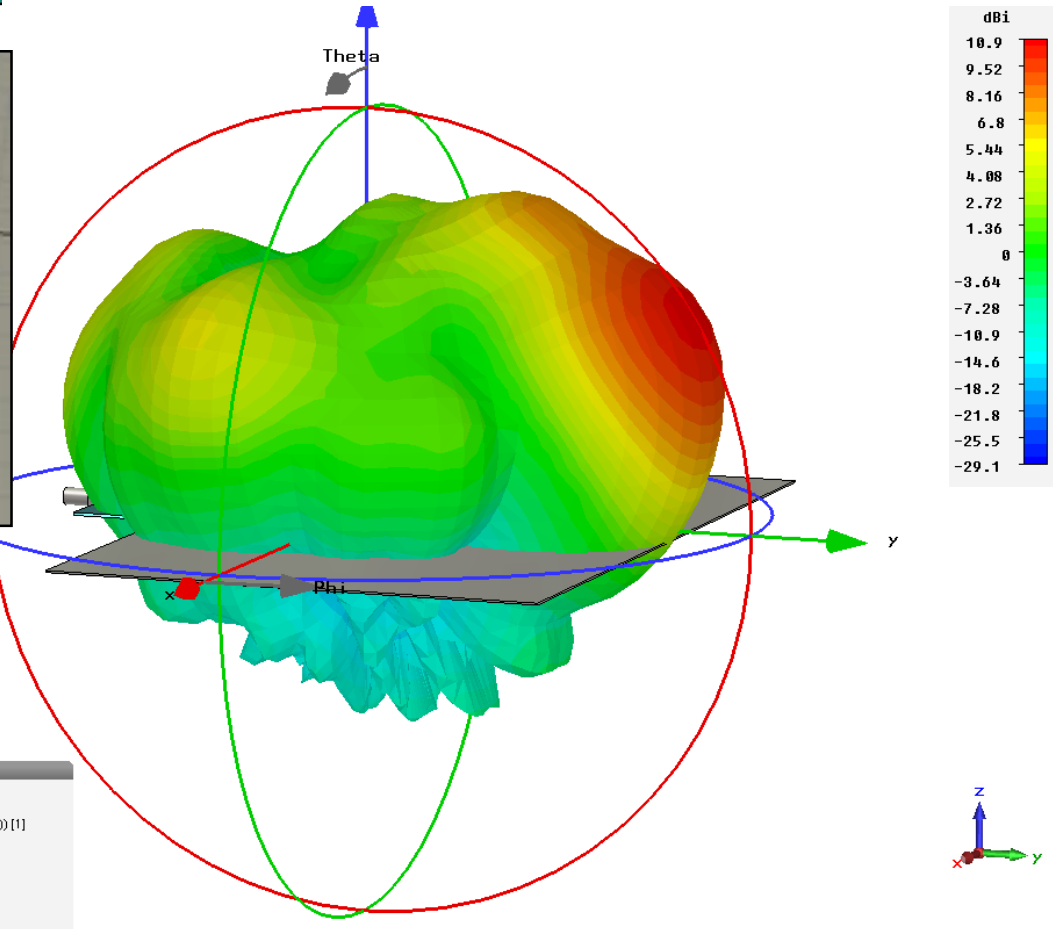
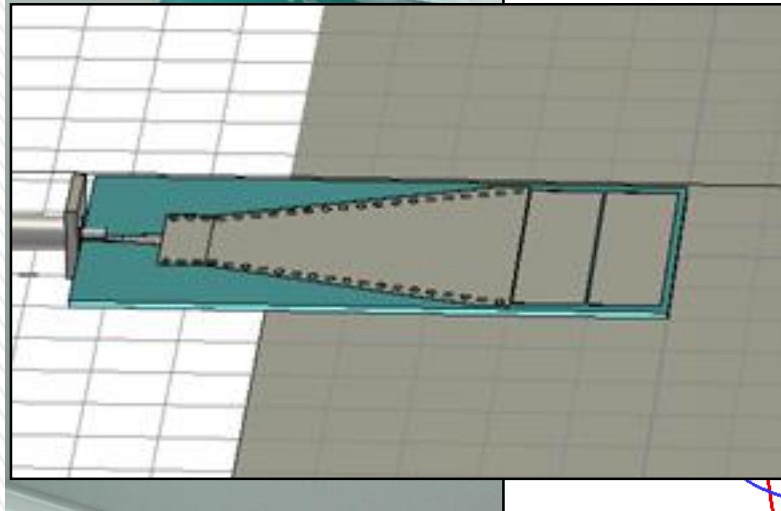
In-plane applications (2)



Feeding 3D textile material (1)

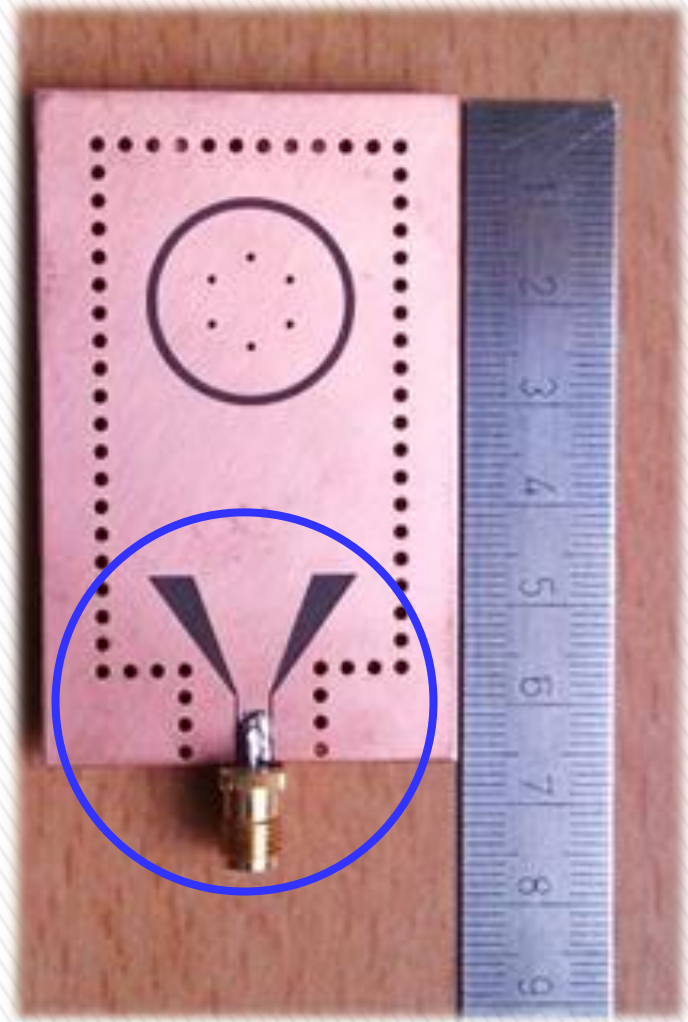
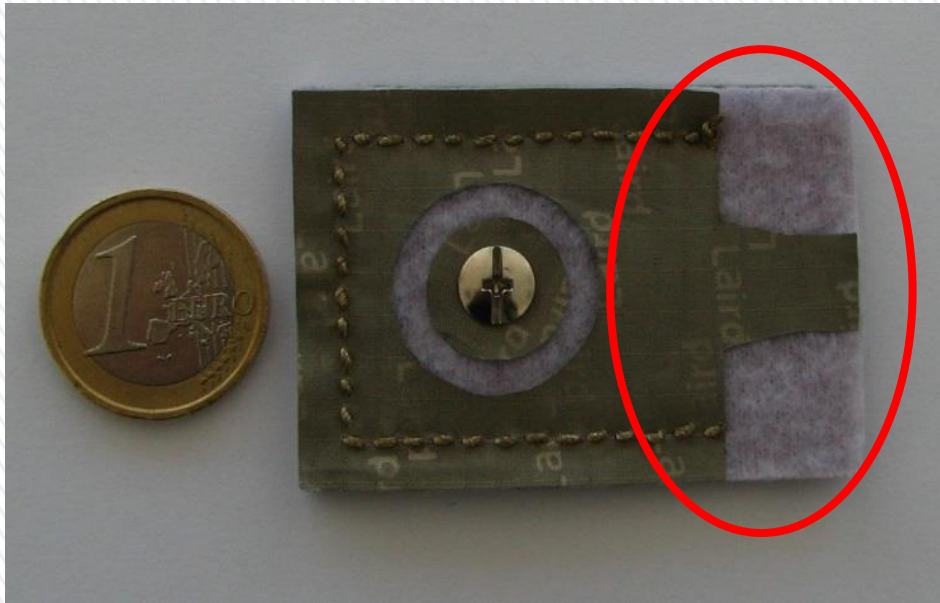


- RWG does not fit the textile
- SIW horn: parasitic elevation



Feeding 3D textile material (2)

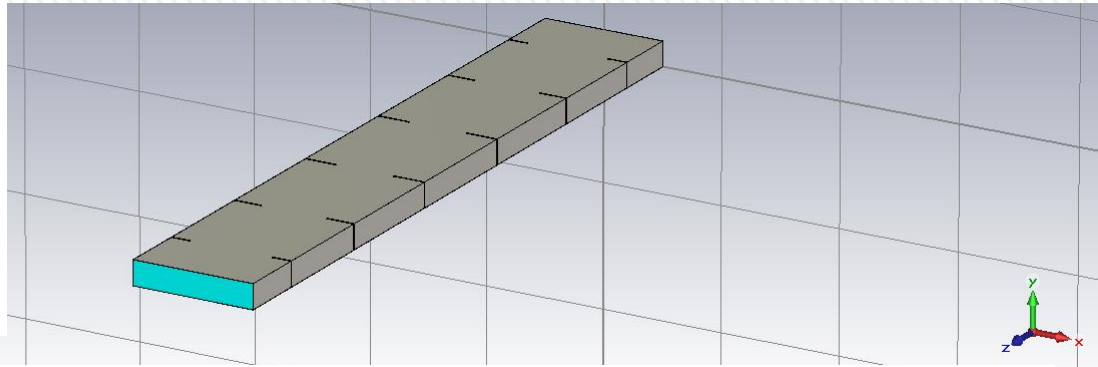
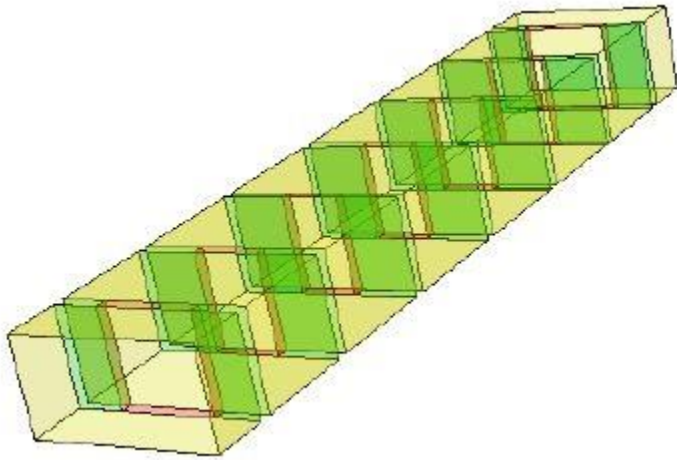
Instead of an antenna,
transmission line → SIW
transition being used



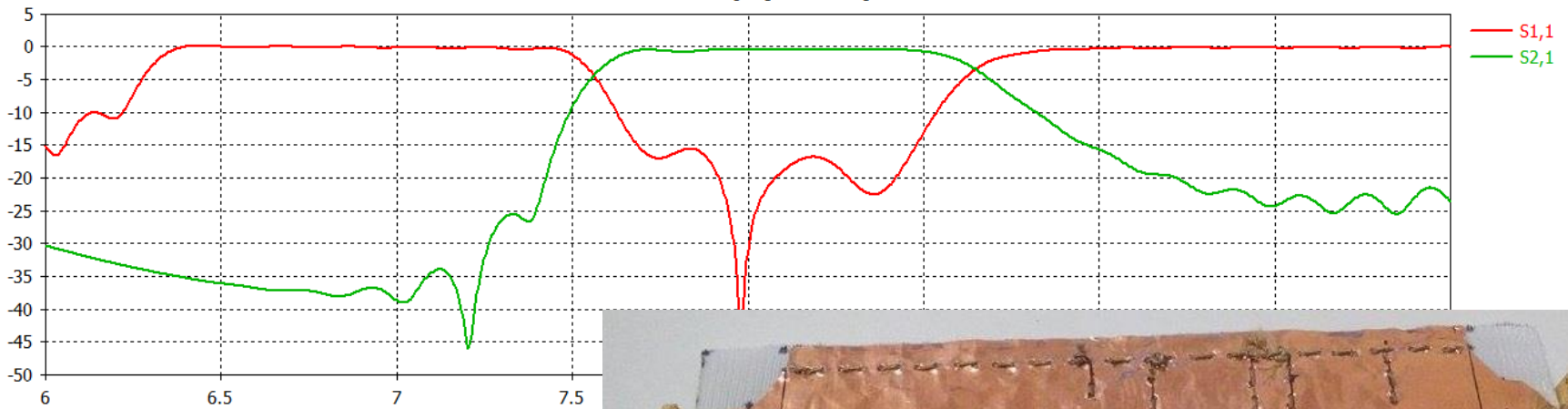
Summary

- 3D textile material → EM energy distribution along the roof of a vehicle
- Screen-printed antennas → delivery of EM energy to seats with passengers
- Future work:
 - Coax-to-SIW transition for feeding 3D textile material
 - Integration of electronics to the textile

Waveguide filter



S-Parameters [Magnitude in dB]



Thank you for your attention

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