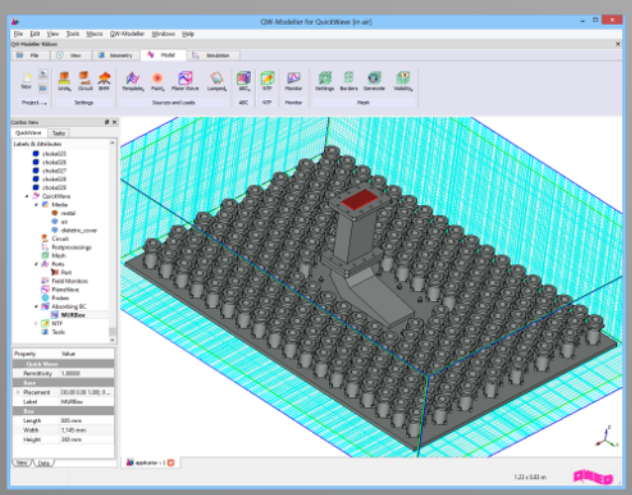
Instytut Badawczy Dróg i Mostów

QWED

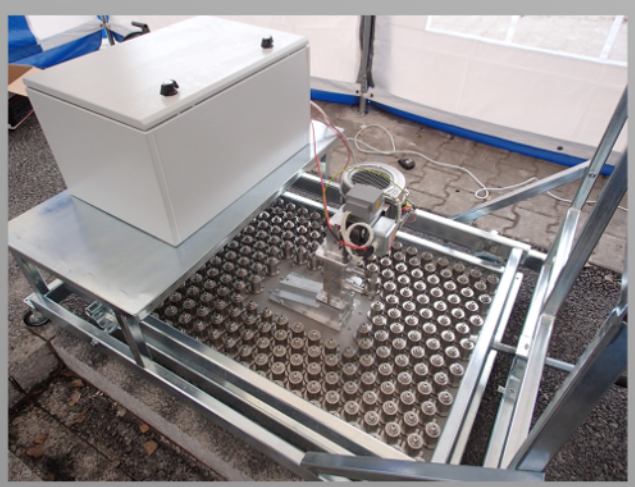
An Applicator for Microwave-Assisted Bituminous Surface Thermal Bonding

This work presents an alternative approach to eliminating longitudinal cracks occurring in bituminous surfaces, inherent to standard road processing cycles. The disadvantages of typical bonding process performed with the aid of gas-jet are mitigated by adopting microwave processing in the near vicinity of the technological gap. For that purpose an applicator for microwave-assisted bituminous surfaces thermal bonding is designed.

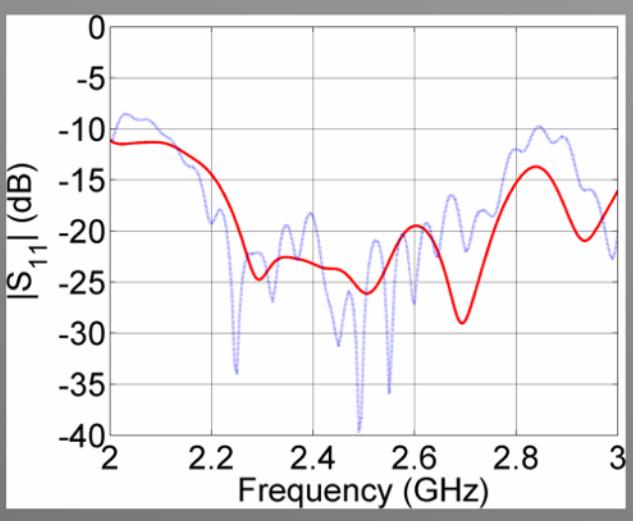
The applicator is equipped with a waveguide nozzle and a hexagonal lattice of cylindrical metallic chokes preventing microwave leakage. The design is performed with the aid of electromagnetic simulations, based on a finite-difference time domain method implemented in commercial QuickWave software for electromagnetic design and simulations. Simulation results are initially validated with experiments and a good agreement is achieved.



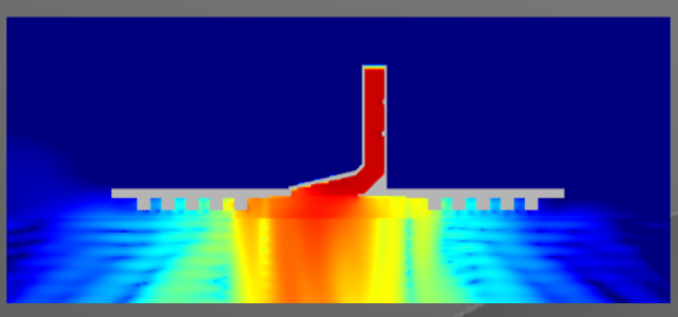
Computational scenario of the applicator, view in QW-Modeller.



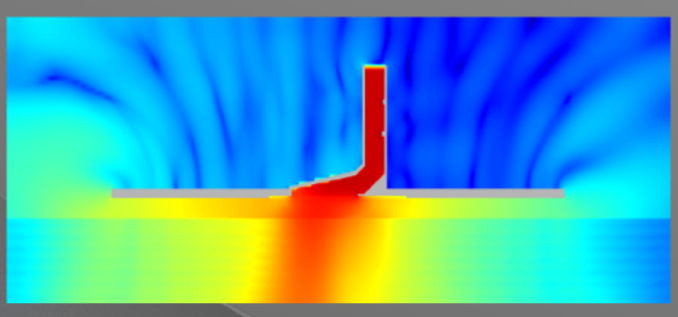
Photograph of an early prototype of the applicator.



Magnitude of a reflection coefficient simulated in QuickWave (red line) and measured for the applicator placed 2 cm above the road surface.



Averaged power density (W/mm2) distribution at the cross-section of the applicator with cylindrical chokes.



Averaged power density (W/mm2) distribution at the cross-section of the applicator without cylindrical chokes.

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