



Belgisch **Wegen**congres
Congrès belge de la **Route**

LEUVEN • 4-7.04.2022

TSD and RAPTOR – high speed deflection and prospects in asset management



Historical devices



Deflectograph Flash

Benkelman beam



FWD

Curviameter



07/04/2022

Focus on TSD (GREENWOOD 1/2)

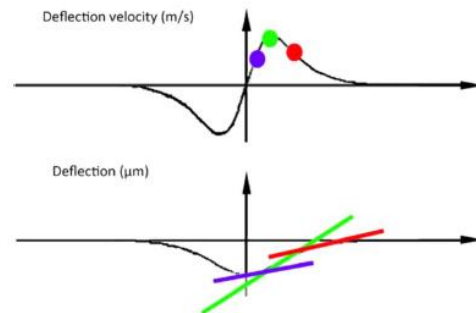
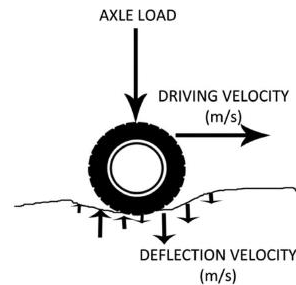
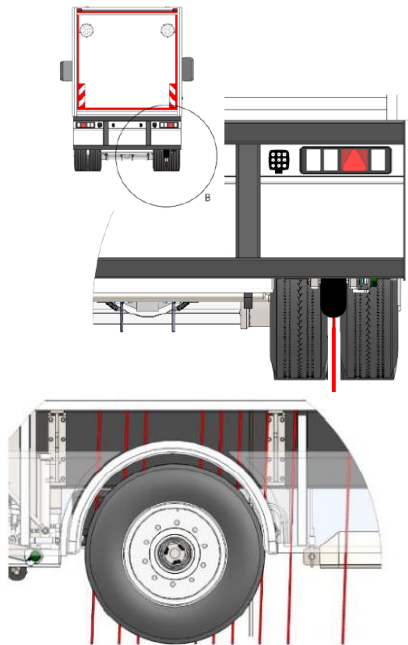


Overall dimensions : 14,95 (14,40) x 2,55 m
Up to 10 tons load – single axle with dual wheels
Based on Doppler velocimetry
Measures the vertical acceleration of the pavement under the load



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Focus on TSD (GREENWOOD 2/2)



TSDs on a global scale



The TSD family



TSD 1: Danish Road Directorate
Denmark



TSD 2: Highways Agencies
United Kingdom



TSD 3: ANAS
Italy



TSD 4: IBDIM
Poland



TSD 5: SANRAL
South Africa



TSD 6: RIOH
China



TSD 7: Greenwood Engineering
Denmark



TSD 8: ARRB
Australia



TSD 9: ARRB
United States of America



TSD 10: VNA
South Africa



TSD 11: Shanghai Municipality
China



TSD 12: ARRB
Australia



TSD 14: BAST
Germany



TSD 15: Wuppertal
Germany



TSD 16: Highways England
United Kingdom

Focus on RAPTOR (Dynatest/Ramboll 1/2)



Overall dimensions : 13 x 2,50 m

Up to 10 tons load– single axle with supersingle wheel

Based on interferometry and image recognition

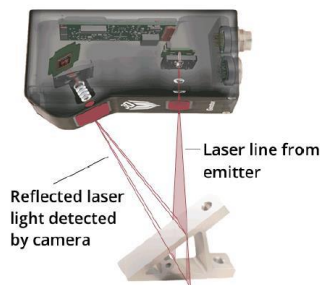
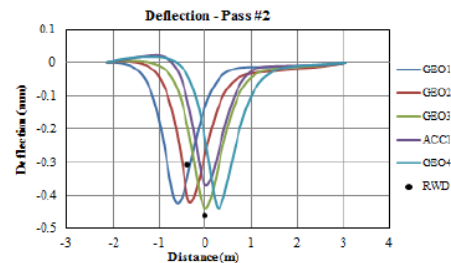
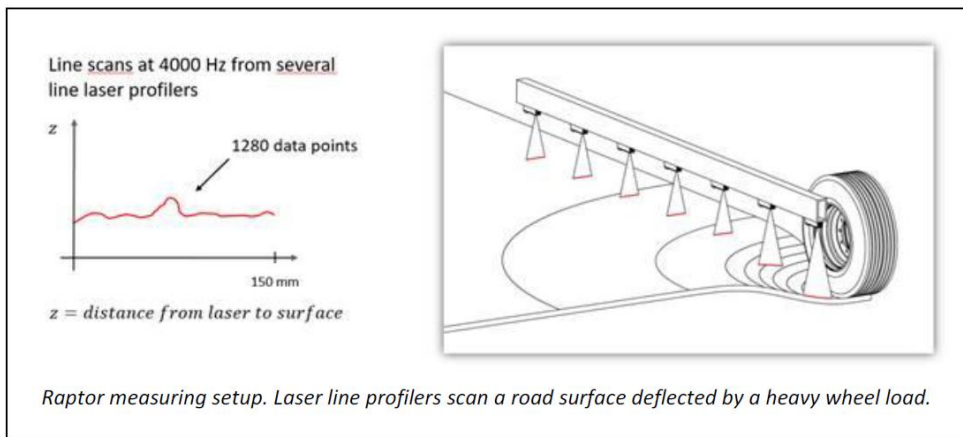
Measures the deformation under the load



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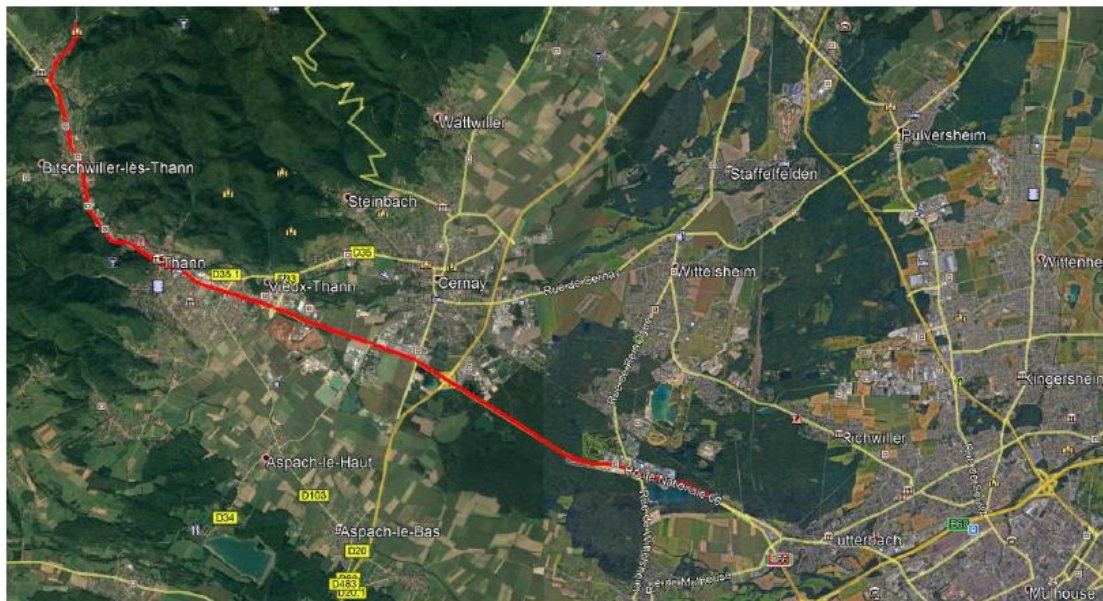
Focus on RAPTOR

(Dynatest/Ramboll 2/2)





Test section – RN66



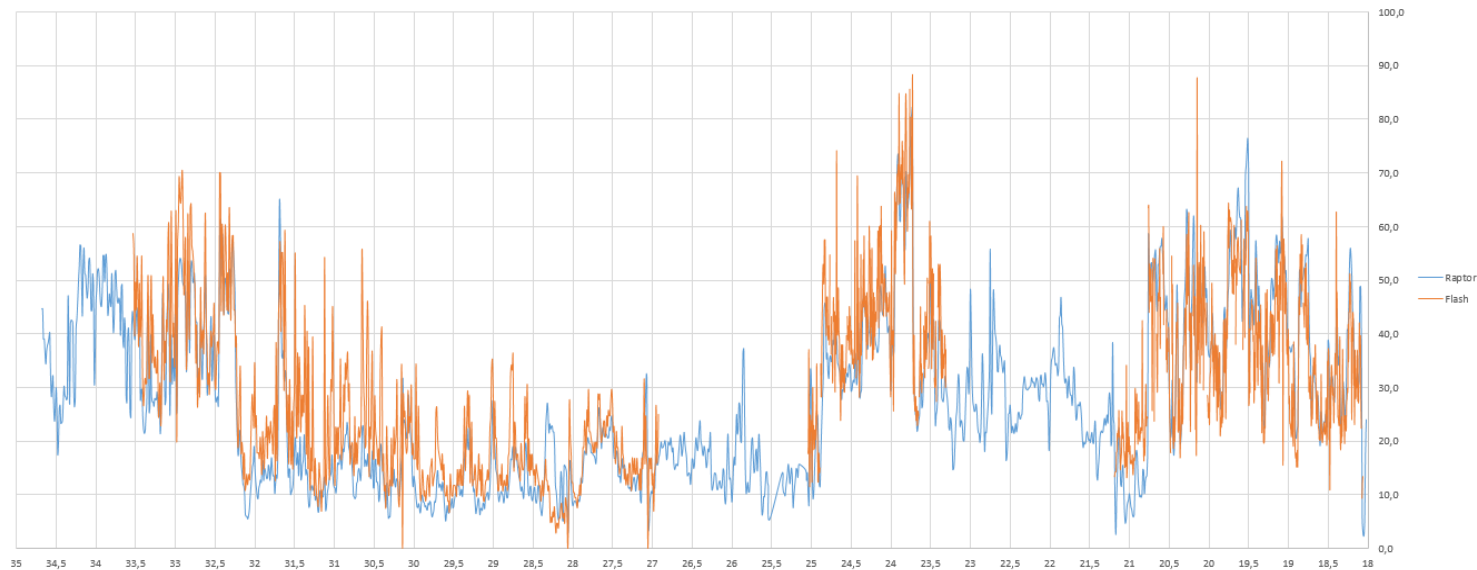
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Measurements



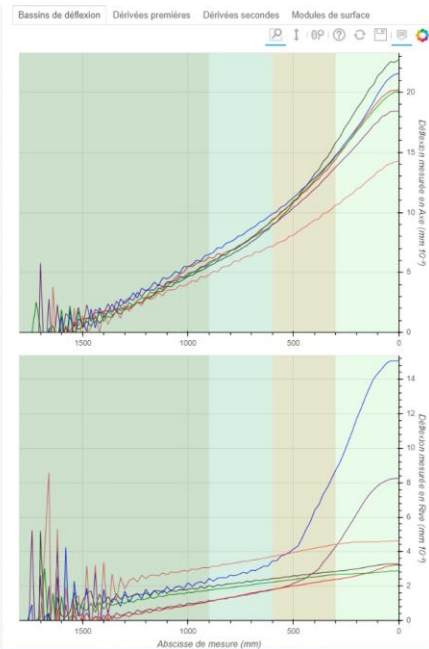
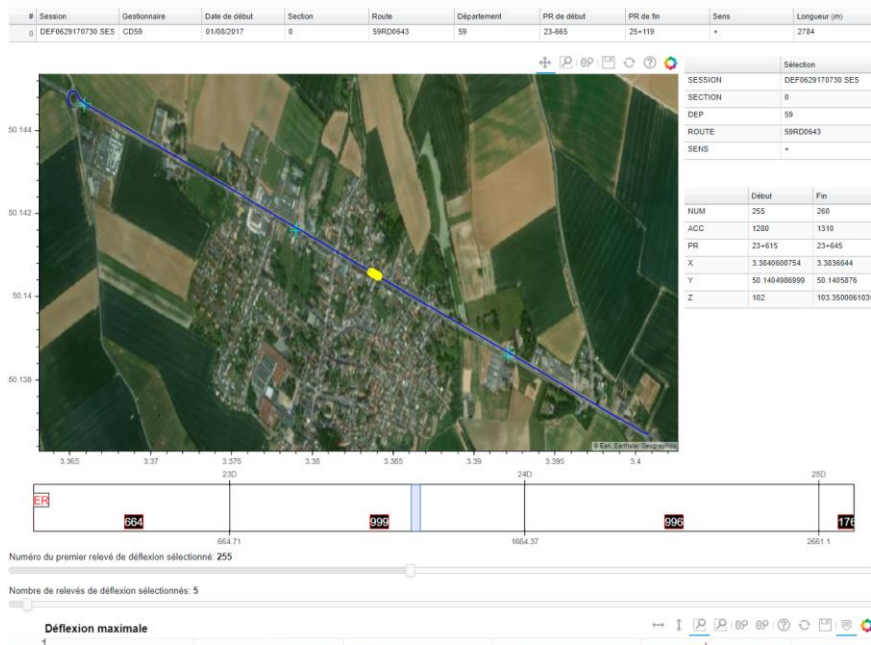
Comparison Raptor-Flash
complete



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Definx Website (internal POC)



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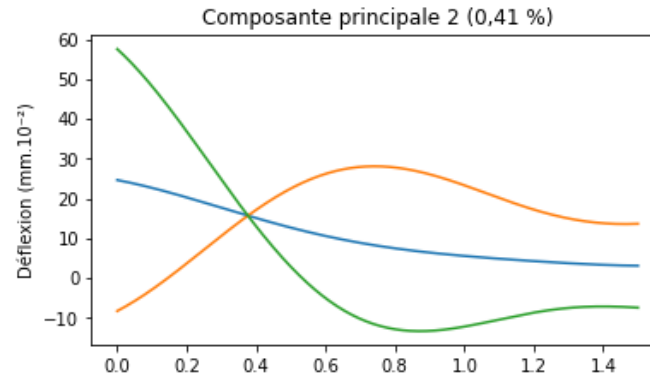
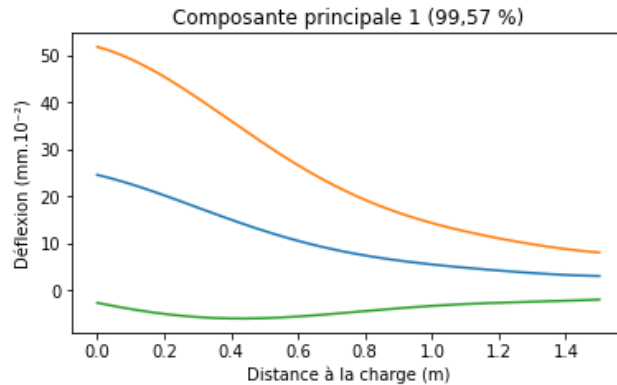


Possible methodological openings



Principal component analysis (PCA) of the deflection bowls

- Deflection bowls characterised by 2 or 3 components
- Keeps more than 99% of the information (99% of the explained variance)

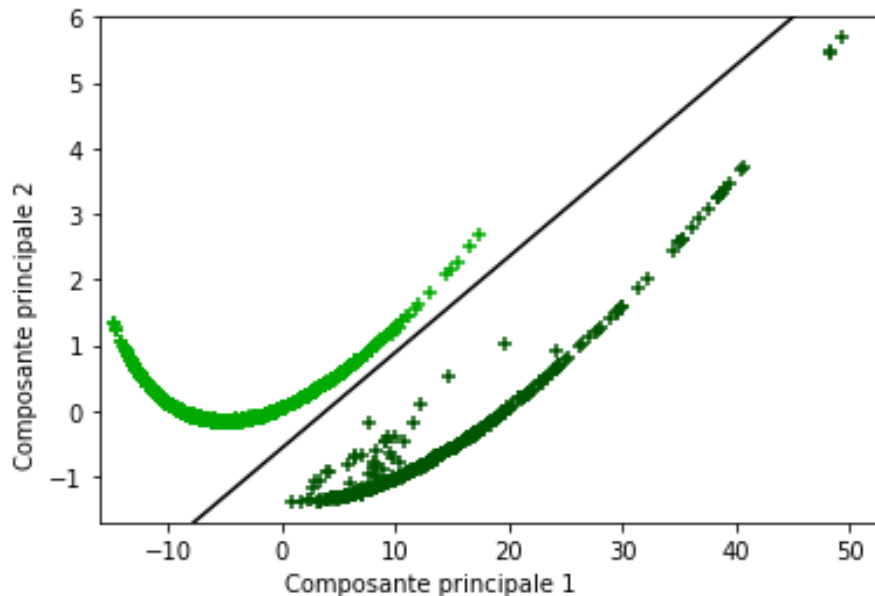




Possible methodological openings



Principal component analysis (PCA) of the deflection bowls

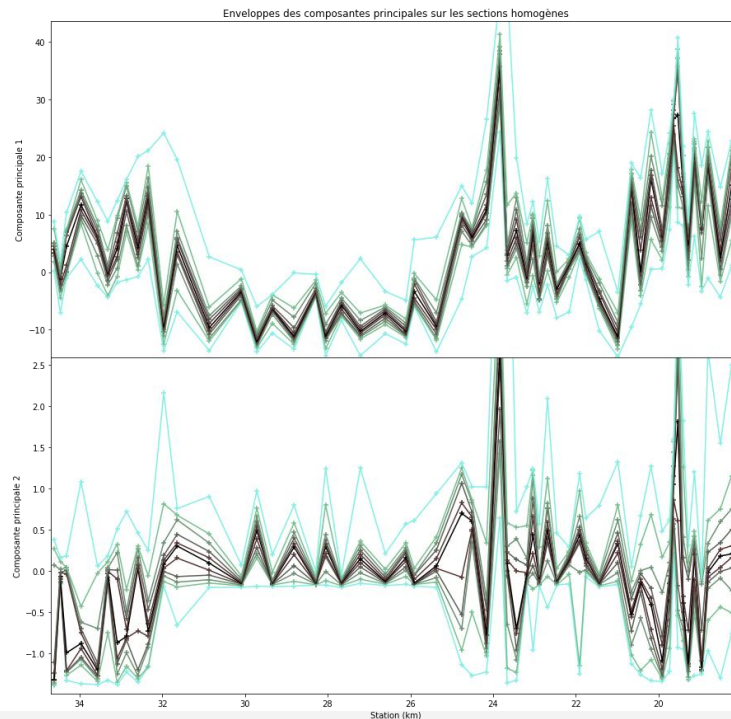
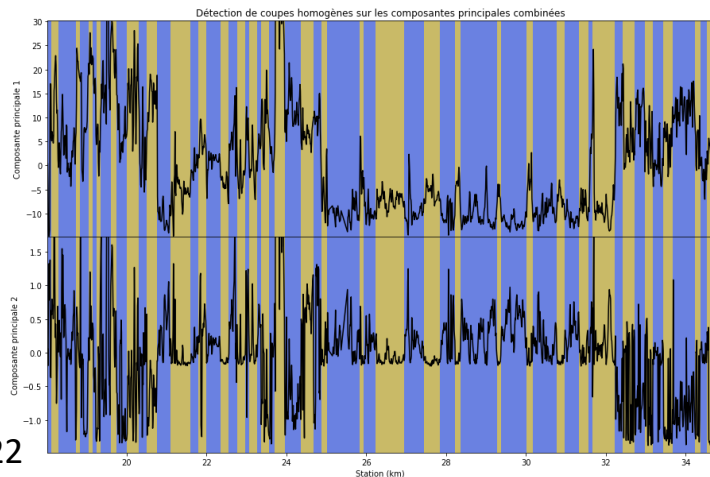


Possible methodological openings



Synthesis of homogenous sections

- **PCA on some of the statistics of the sections (quartiles, ...)**

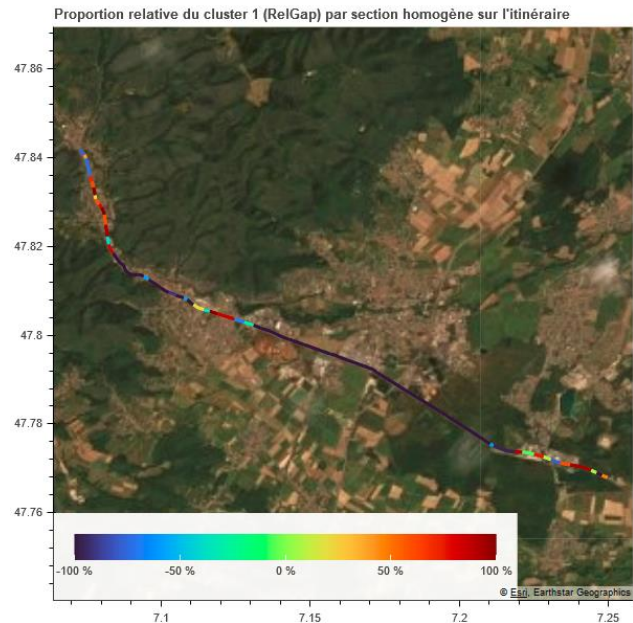
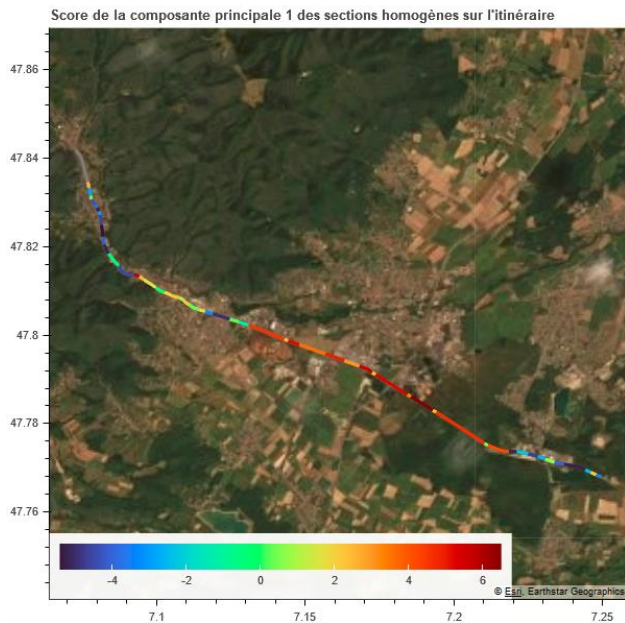


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Possible methodological openings



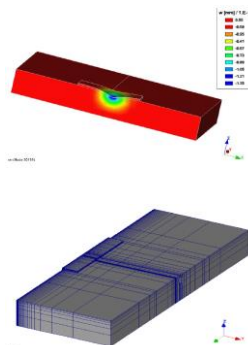
Visual representation of some results



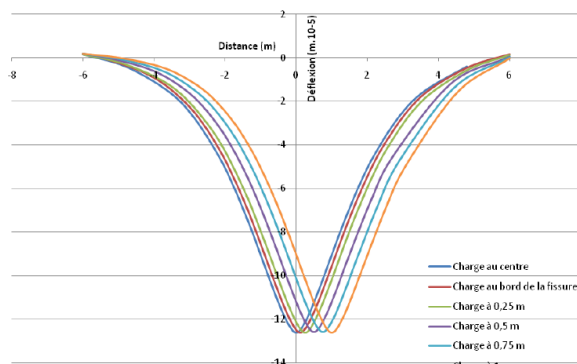
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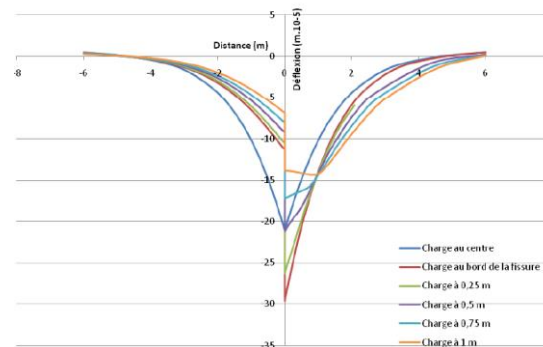
Cross-validation with indexes produced by other measurement devices
 Evolutions regarding common practices in road monitoring and asset management systems



Chaussée Semi Rigide Mono Couche_Interface
 Collée_Couches non fissurées_Déplacement Charge



Chaussée Semi Rigide Mono Couche_Interface
 collée_Couches 1-2 fissurées_Déplacement Charge



Global prospects



CereMap3D

- Surveys the road and its environment
- Continuous 3D point cloud



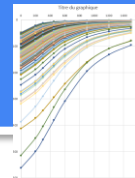
Aigle 3D

- Monitors the visible deformations and degradations on the surface of the road
- « At rest » state
- Representation of the condition of the road
- Continuous 3D point cloud



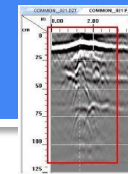
Défectographe

- Structural condition of the road
- « Pulse » response
- Representation of the condition of the road
- Deflection bowls



Radar

- Interface detection
- Continuous monitoring
- Depths of layers





High Speed Deflection



Thank you for your attention !

UNE ORGANISATION



ABR

Association
Belge de la Route



AGENTSCHAP
WEGEN & VERKEER

AVEC LE SOUTIEN DE



Centre de
recherches routières



BRUXELLES MOBILITÉ
SERVICE PUBLIC RÉGIONAL DE BRUXELLES



FBEV
Fédération Belge des Entrepreneurs de Travaux de Voirie asbl



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