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# Experimental evaluation of the interface fracture energy for composite pavements

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Poster No. 103

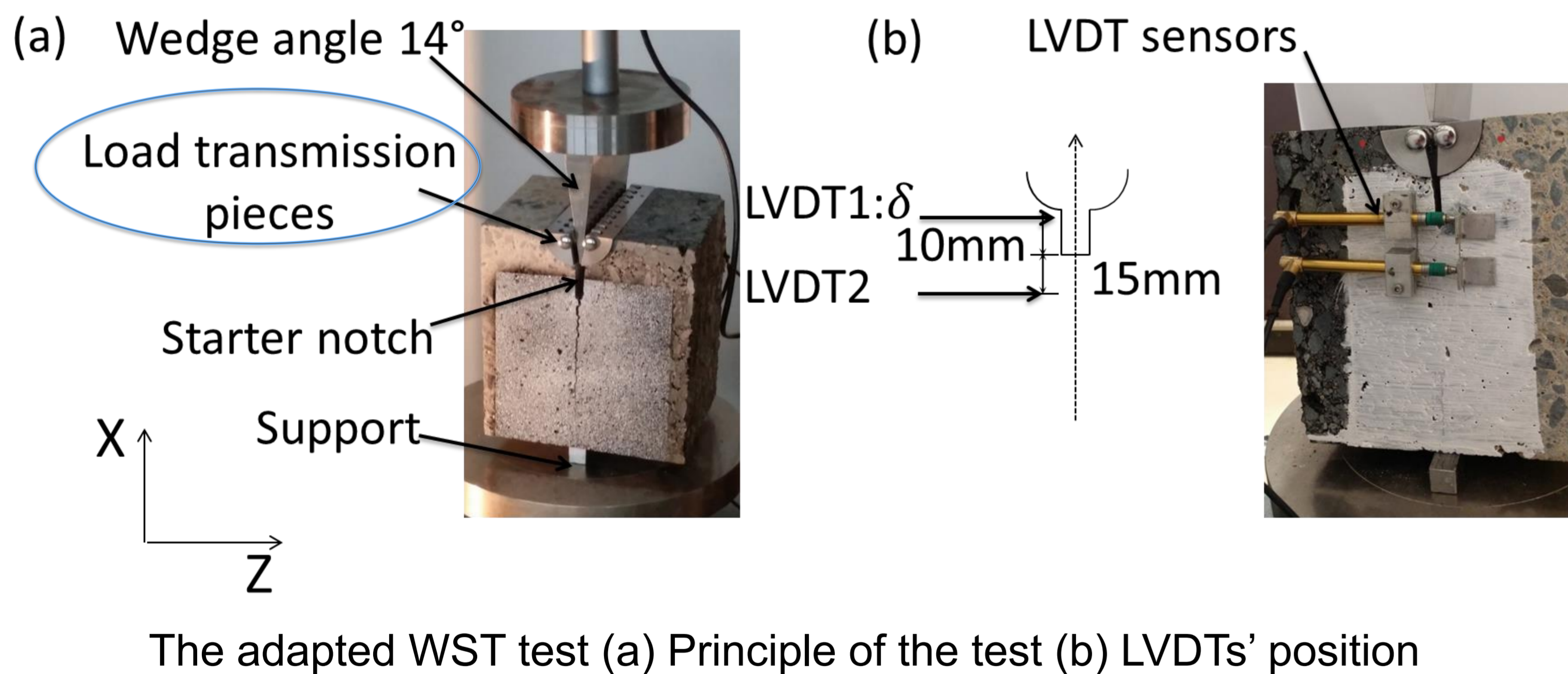


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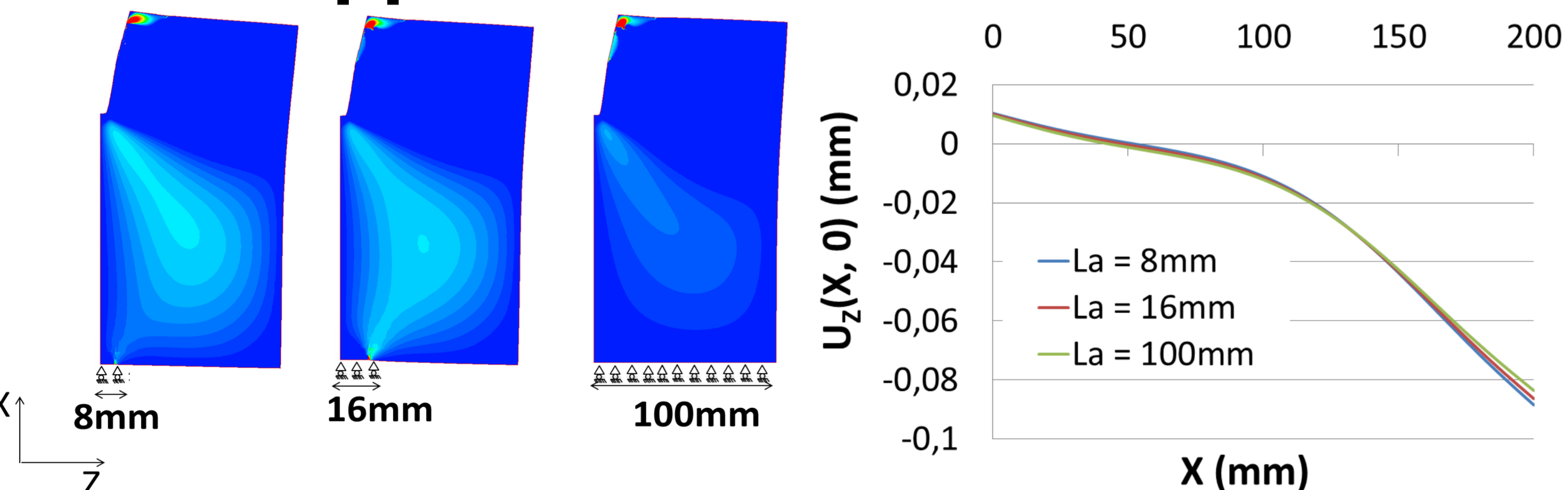
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## Introduction

Performance of pavements depends obviously on a good bonding at the interface between layers. In order to evaluate the bond properties and crack resistance of interfaces of large bi-layer specimens coming from the field, the Wedge Splitting Test (WST) (Tschegg, 1986) is adapted. The interface fracture Mode I tests are made for Ultra-Thin Whitetopping (UTW) specimens used in some French urban roads.



## WST support width variation



Shear stress variation with the variation of support width

Vertical displacement variation with the variation of support width

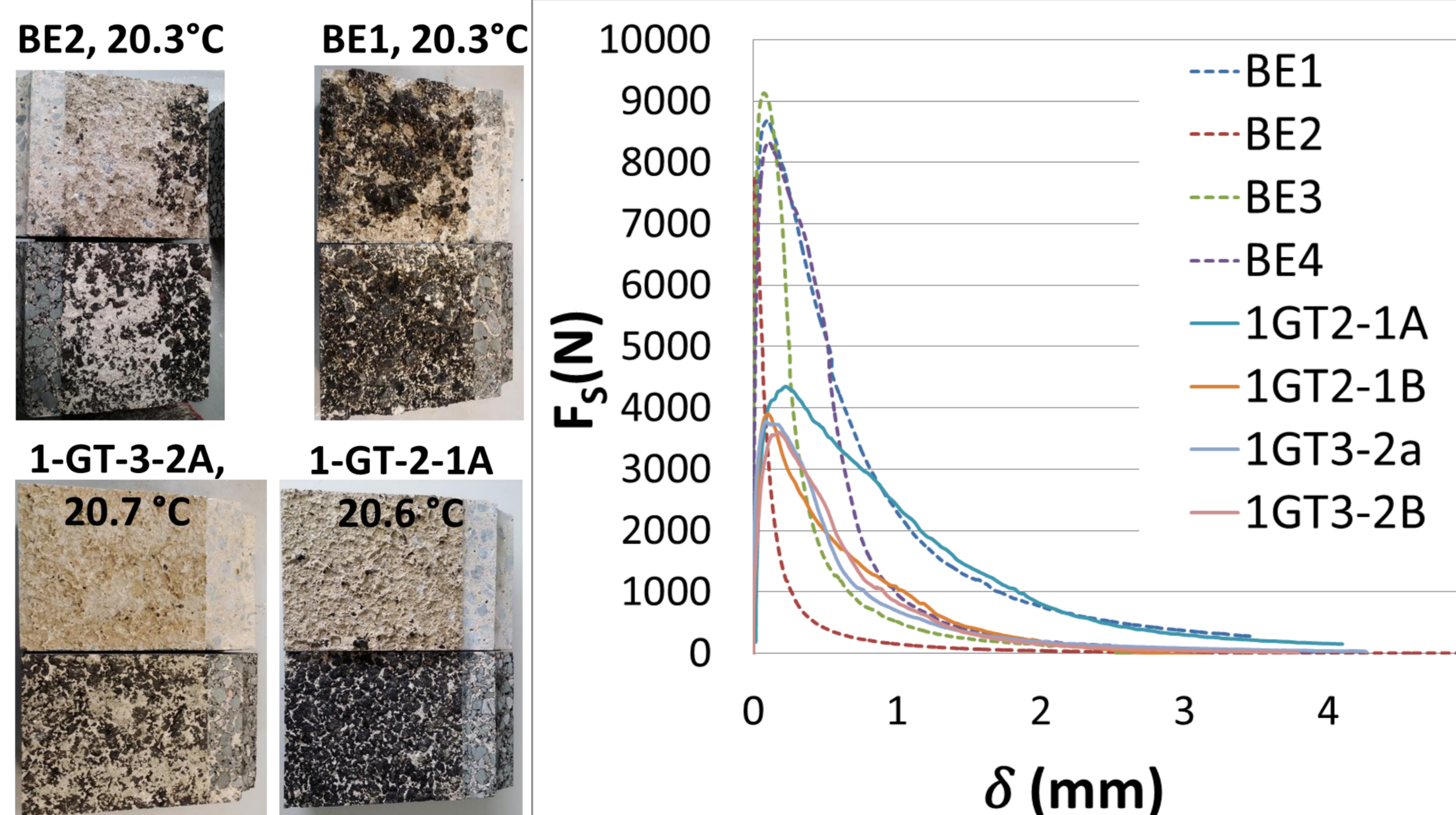
- A slight impact is noted in the maximum flexion of the specimen,
- No significant effect is detected near the starter notch in terms of the shear stress distribution in the half part of the specimen,
- In this study, all experimental tests are performed with a total length support of 16 mm ( $L_a=8\text{mm}$ ).

## Materials

Two types of bonding techniques are tested: i) The BE specimens are coming from a full-scale test section with a shot blasted treatment of the interface (Pouteau et al., 2004) ; ii) The 1GT specimens are made in the lab with a cement concrete layer casted directly onto the bituminous slab only previously washed (Hun et al., 2012).

Specimens	Bituminous aggregates size (mm)	Concrete aggregates size (mm)	Concrete air content (%)	Bituminous air content (%)	W/C
BE	0/14	0/14	4.80	7.0	0.61
1GT	0/10	0/11	2.33	9.6	0.68

## Experimental Results



Fracture debonding area

Load – Displacement (LVDT1) curves (0.7 mm/min,  $T \approx 20^\circ \text{C}$ )

## References

- Tschegg, E. K. (1986). Equipment and appropriate specimen shapes for tests to measure fracture values, AT No. 390328, Austrian Patent Office, Vienna, Austria.
- Pouteau et al., (2004). Fatigue test and mechanical study of adhesion between concrete and asphalt. 9th Int. Symposium on Concrete Roads Istanbul, Turkey
- Hun et al., (2012). A four-point bending test for the bonding evaluation of composite pavement. RILEM Bookseries, 4, 51–60.

The main test observations are :

- A total delamination at the interface is observed for all tested specimens,
- The debonding areas show that asphalt concrete granular still are on the cement concrete fracture surface

Specimens	T (°C)	$S_F$ (m <sup>2</sup> )	$F_{Smax}$ (N)	$S_A$ (N.m)	$G_F$ (J/m <sup>2</sup> )
1GT-3-2A	20.6		3779	2.65	125
1GT-3-2B	20.7		3601	2.69	126
1GT-2-1A	20.6	0.018	4346	5.59	263
1GT-2-1B	20.6		3901	2.74	128
					$G_{Faverage} = 160$
BE1	20.3		8687	7.23	343
BE2	20.3		7753	1.24	58
BE3	21.0	0.021	9131	3.39	159
BE4	21.3		8321	5.25	246
					$G_{Faverage} = 201$

## Conclusions

- The small support width does not disturb the interface shear stress distribution & the global bending of specimens,
- The WST is successfully adapted for testing specimens extracted from real roads
- Shot basted treatments of the UTW interface seem to play a role much more important on the initiation delamination state than during the all propagation process of debonding.
- The  $G_F$  values obtained are in the range of those from the literature.
- Fracture energy results confirms the necessary for testing more than 4 specimens per configuration.