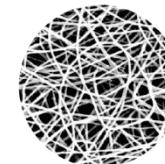
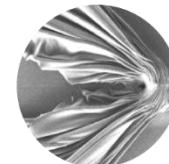
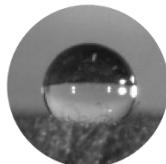


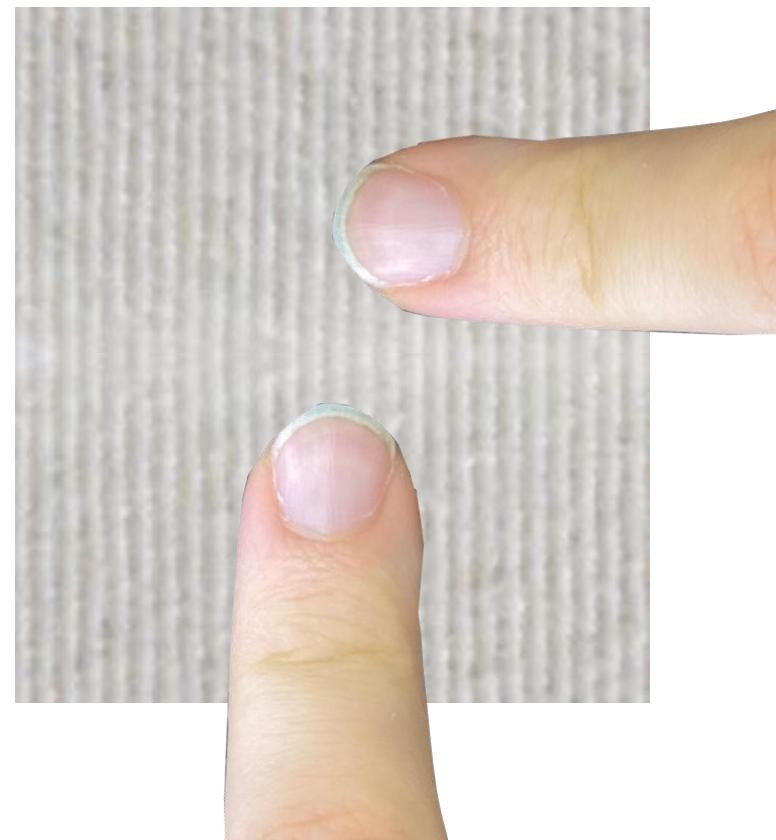
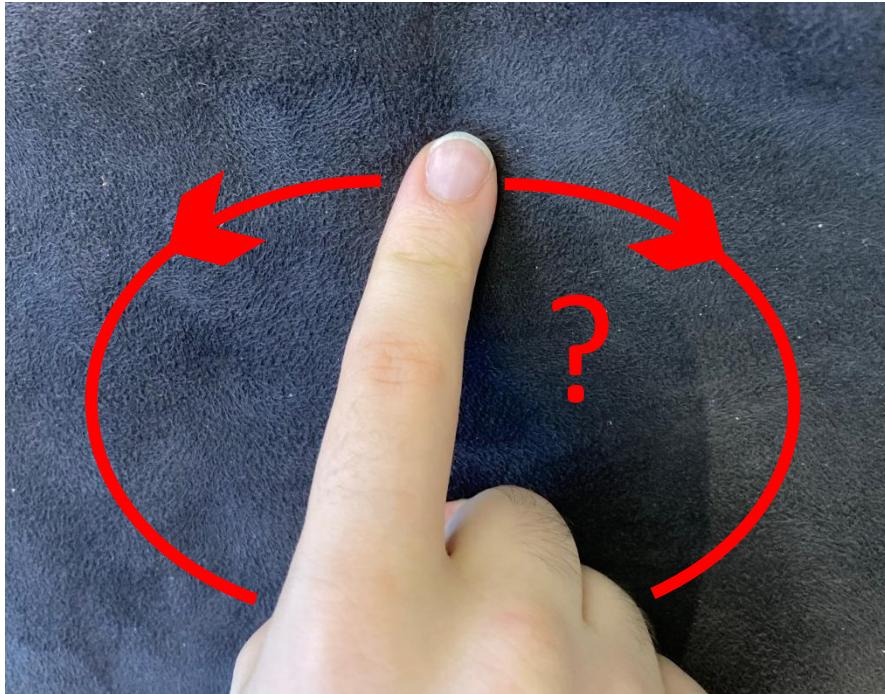
Influence de la direction du mouvement et de l'orientation du doigt sur le frottement et les vibrations induites avec des surfaces textiles

Brigitte CAMILLIERI and Marie-Ange BUENO

LPMT (Laboratoire de Physique et Mécanique Textiles) , ENSISA,
University of Haute Alsace, Mulhouse, France

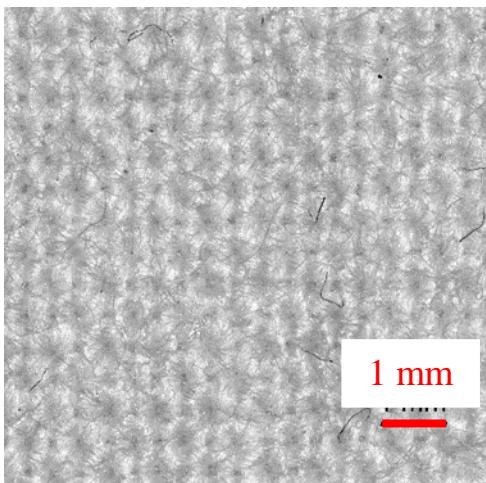


Context



Experiments: textile fabrics

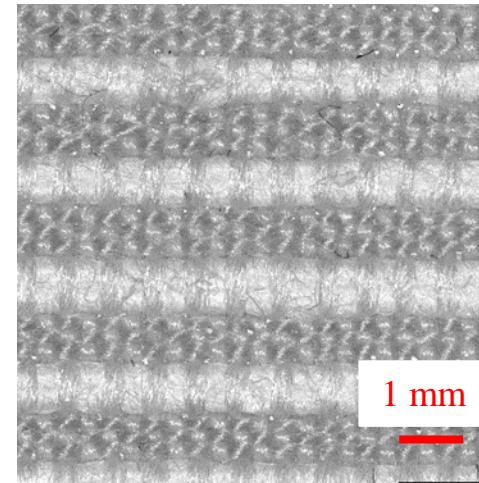
Plain = Toile



Sliding



Pekin

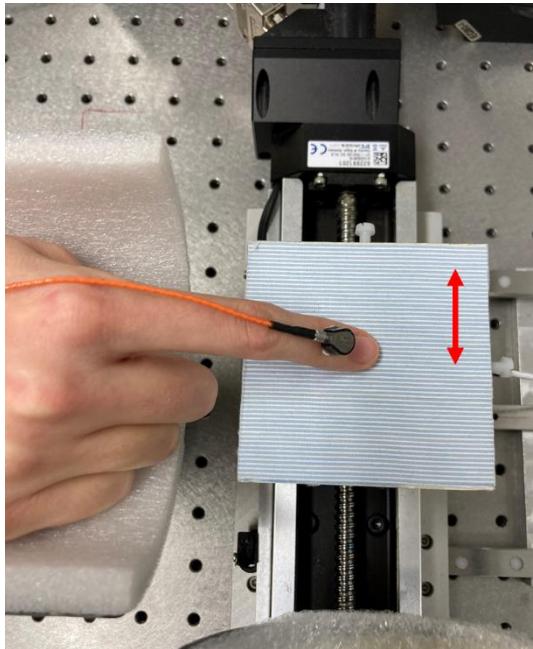


- Spatial period = 0.4 mm (23 yarns/cm)
- Ra = 25 μm

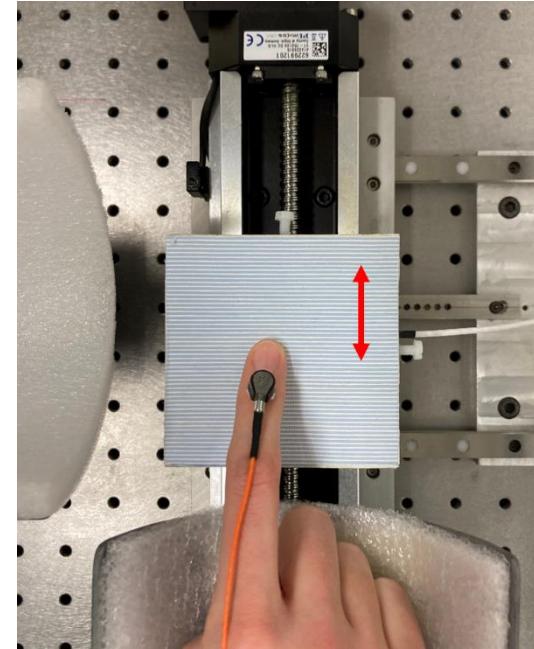
- Spatial period = 1.4 mm (7 bumps/cm)
- Ra = 45 μm

Experiments: measurements

Lateral



Anteroposterior (AP)



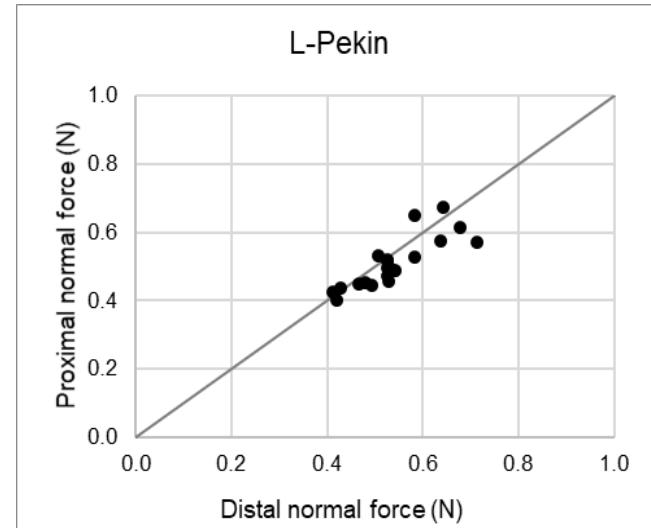
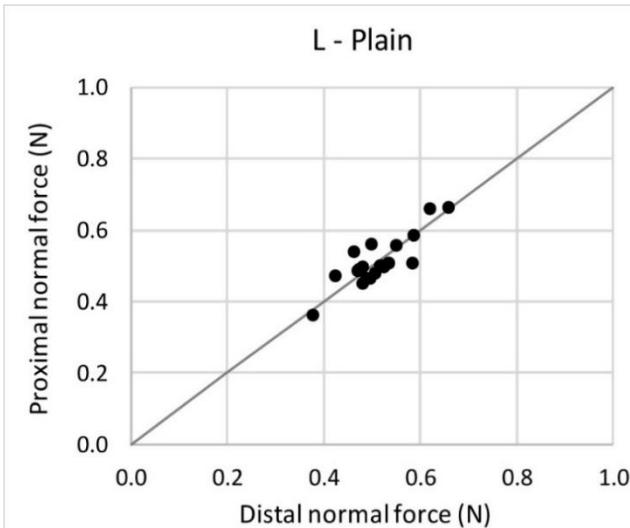
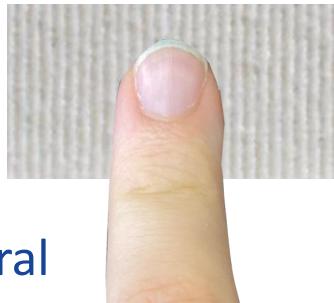
- Alternating movement
- 40 mm/s (passive touch)
- 40 mm sliding distance
- 30° entre doigt et tissu
- ≈ 0.5 N
- 20 volunteers (13 females/7 males,
23–60 years average 36)



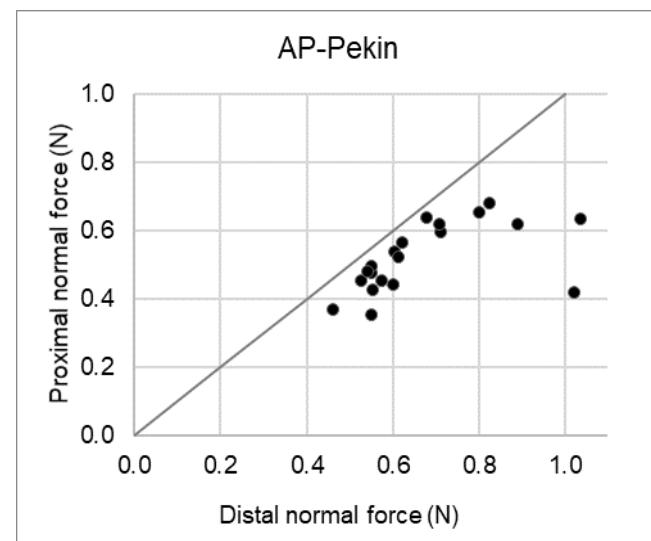
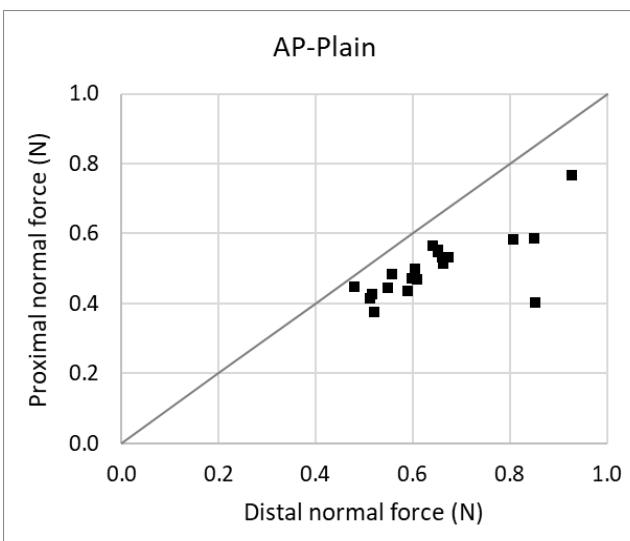
Tangential and normal forces
Finger acceleration
Zones à vitesse constante

Results: normal force

“Proximal”  “distal”



Distal  Proximal

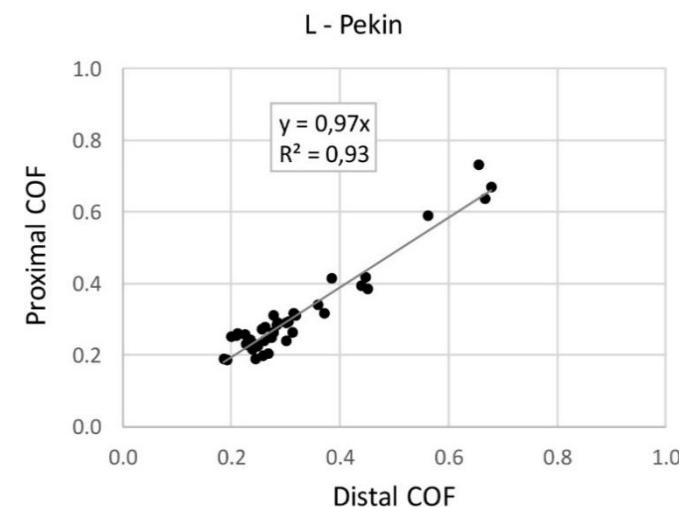
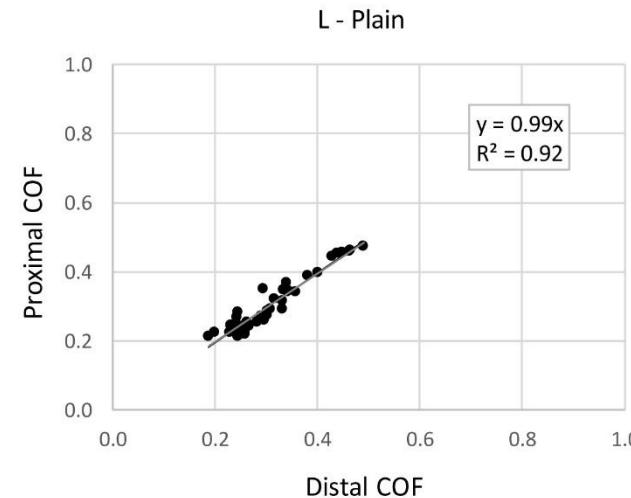


Results: coefficient of friction

“Proximal” ← → “distal”



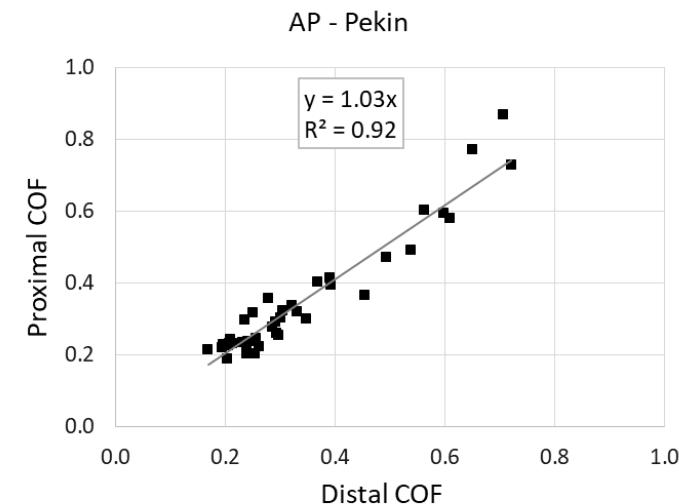
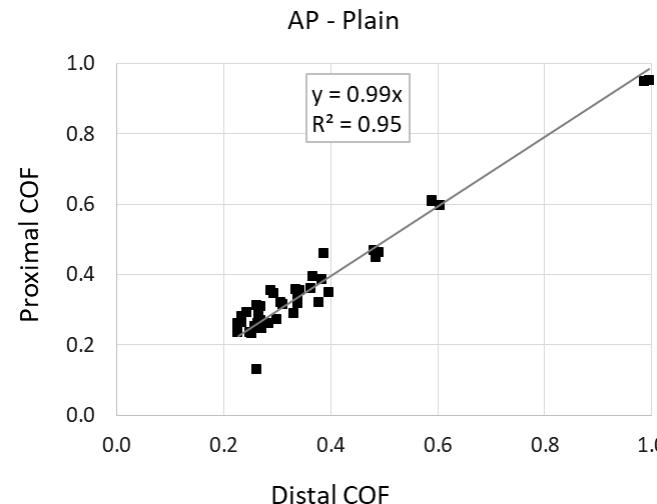
Lateral



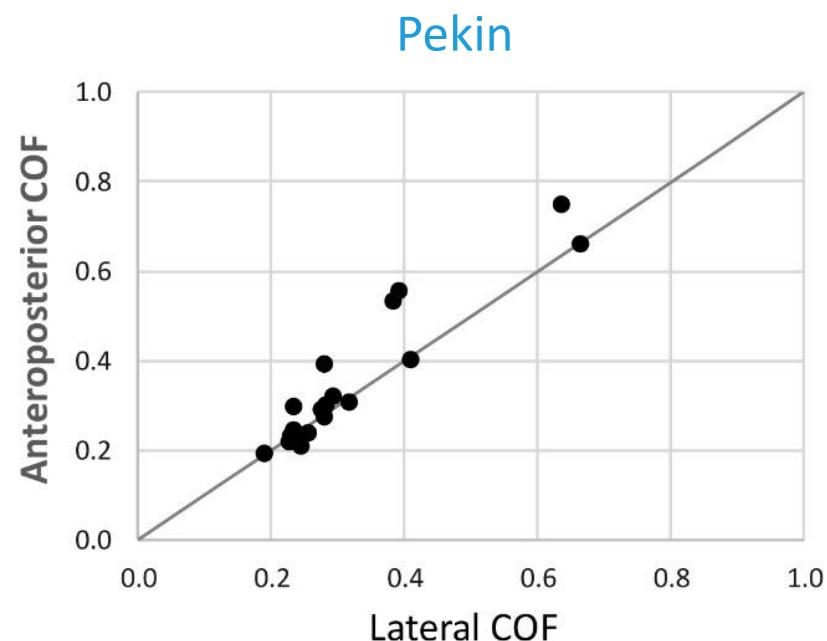
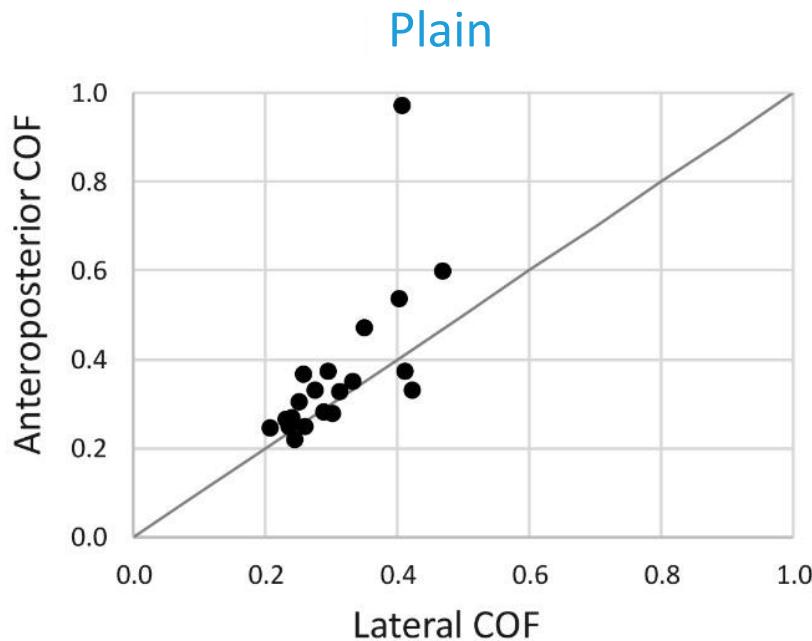
Distal ← → Proximal



Anteroposterior

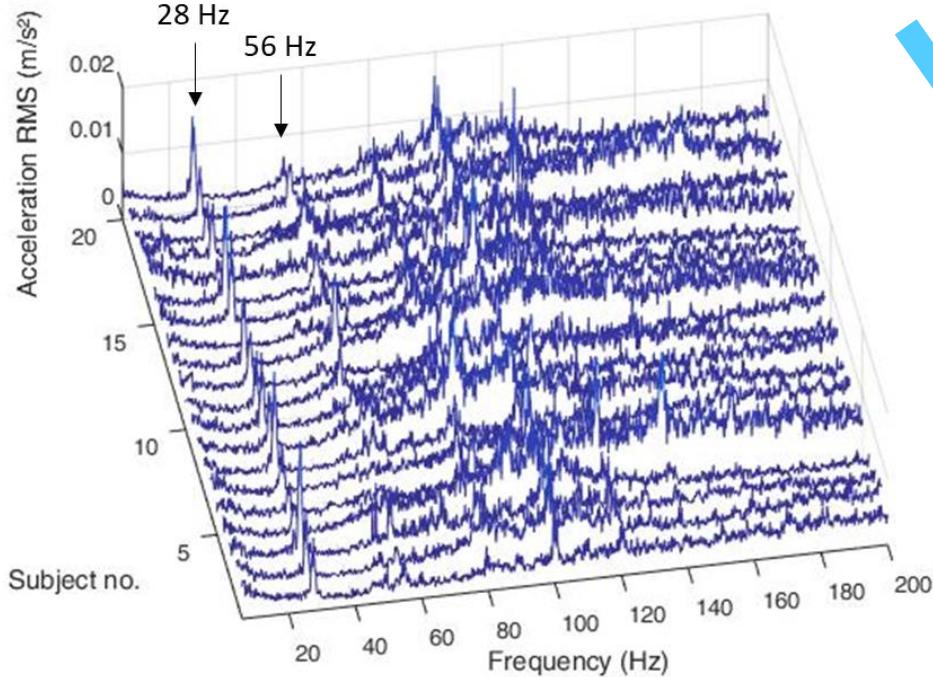


Results: coefficient of friction

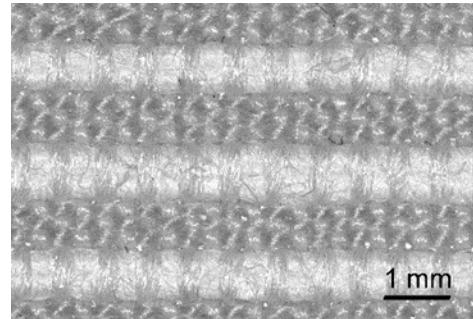


COF slightly higher in AP (no significant for Pekin)

Results: induced vibrations

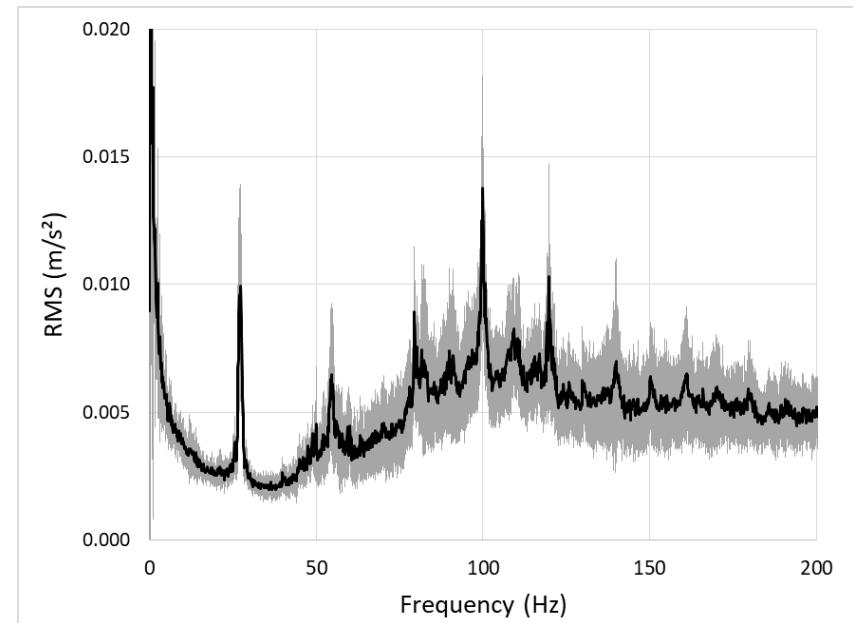


Autospectra for 20 volunteers



Pekin

Mean autospectrum

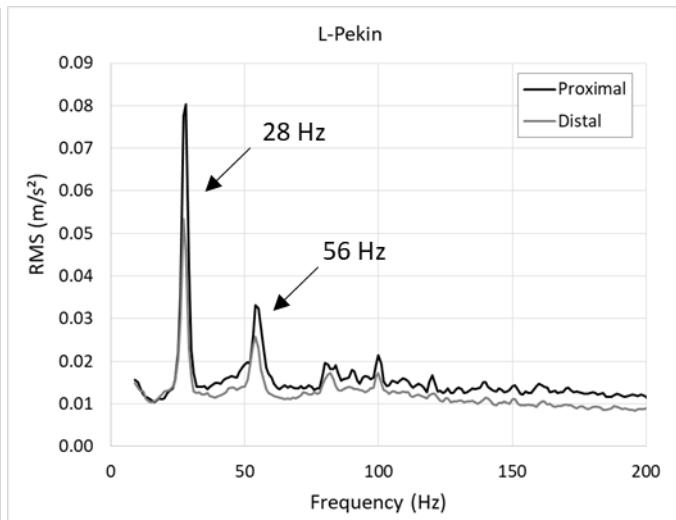
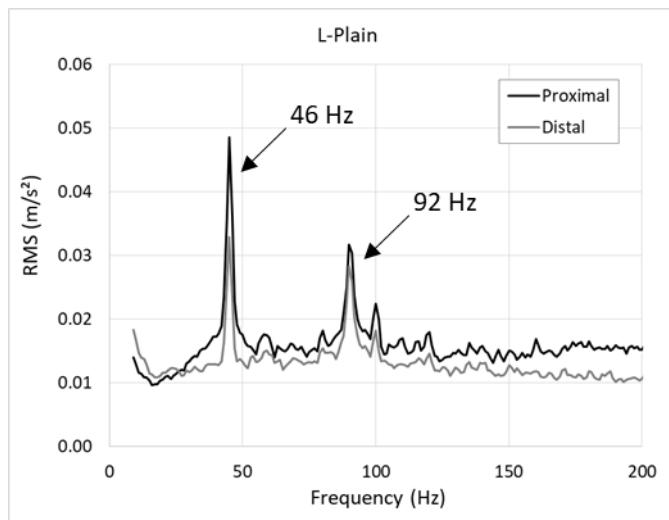


Results: induced vibrations

“Proximal” ← → “distal”



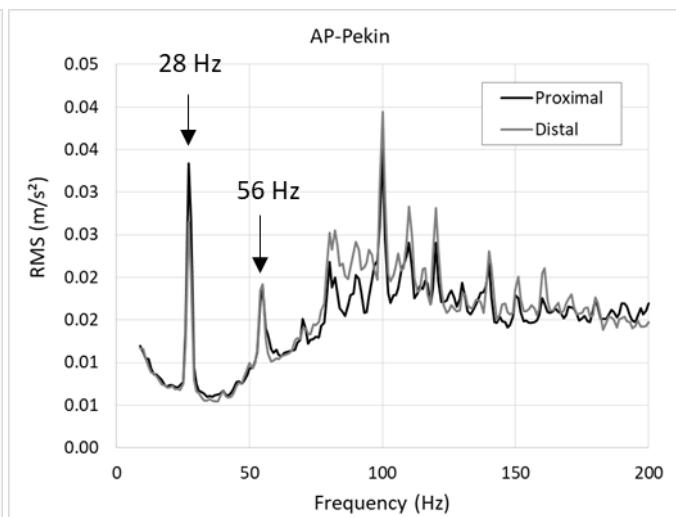
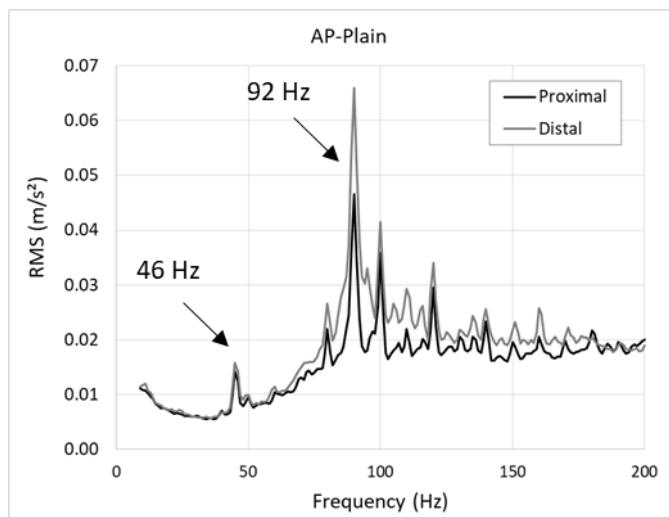
Lateral



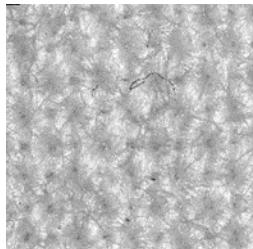
Distal ← → Proximal



Anteroposterior

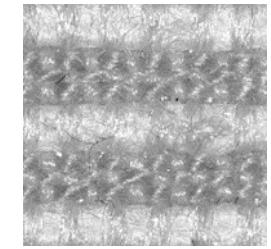
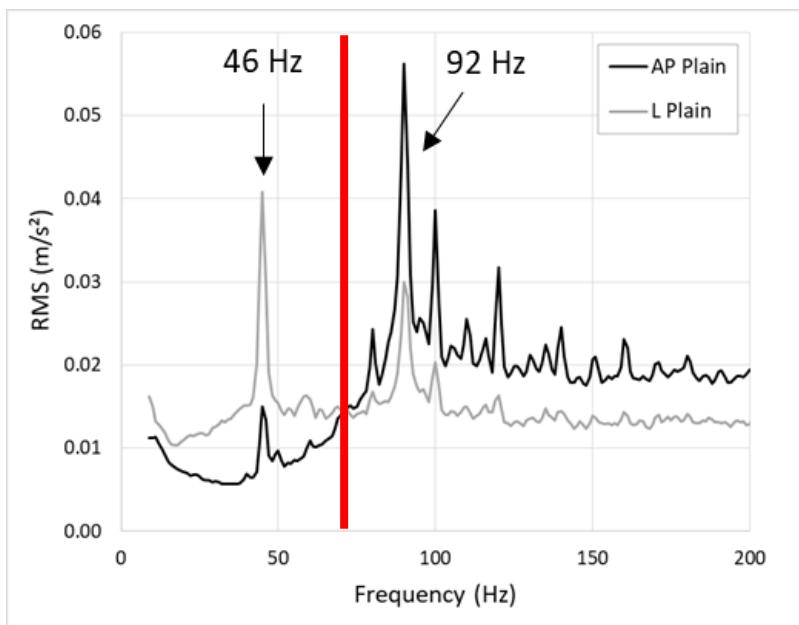


Results: induced vibrations

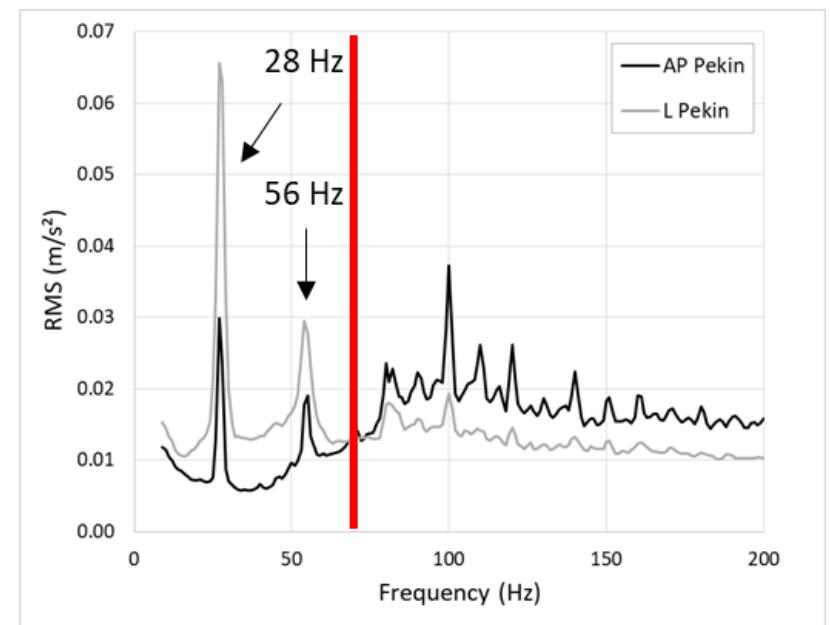


Passive touch (20 volunteers)

Plain



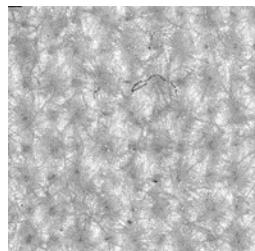
Pekin



Difference of vibration behaviour at ≈ 75 Hz



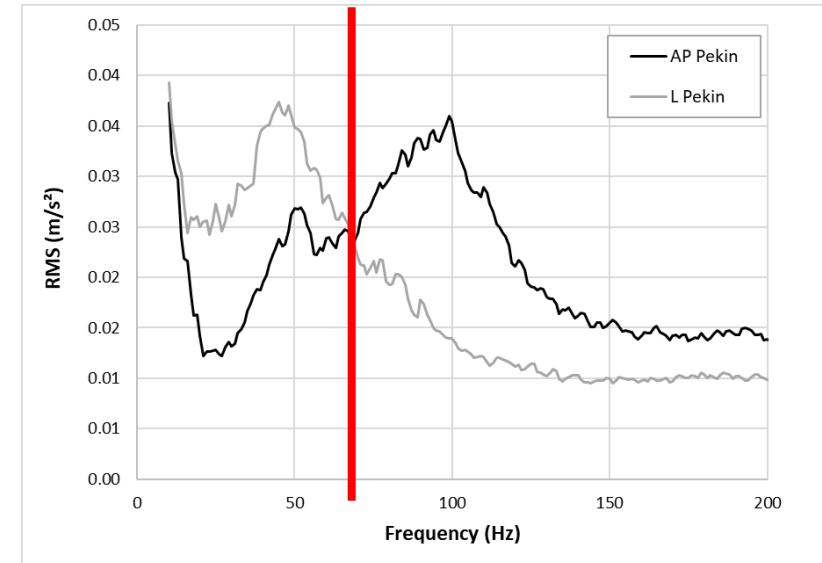
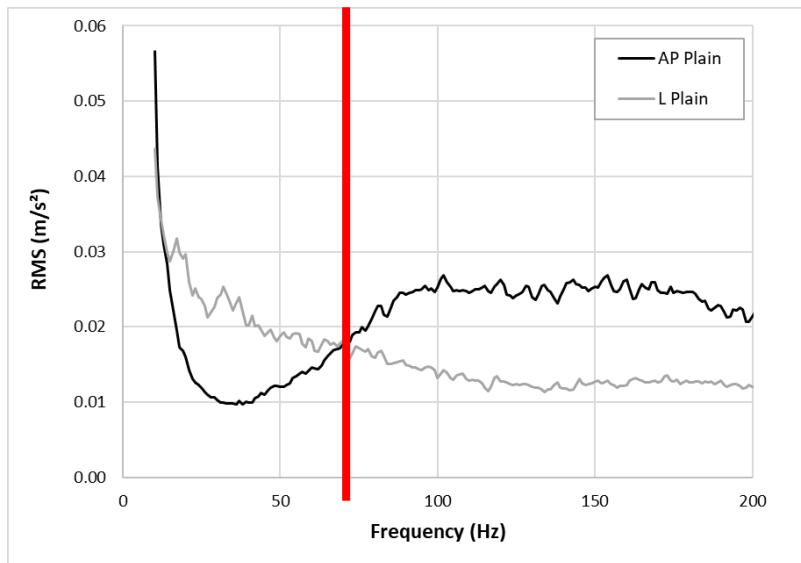
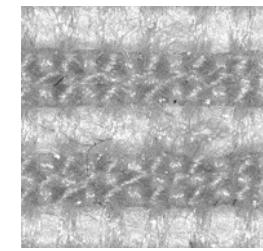
Results: vibrations de la table de translation ?



Plain

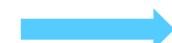
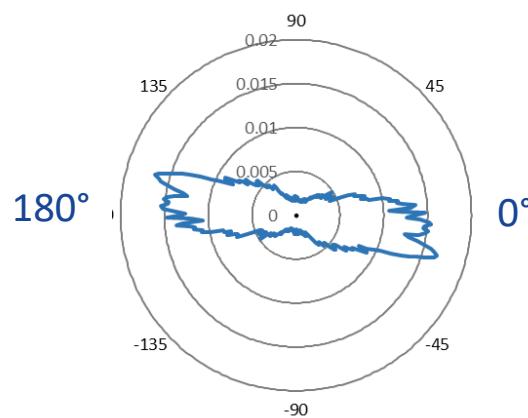
Active touch (5 volunteers)

Pekin

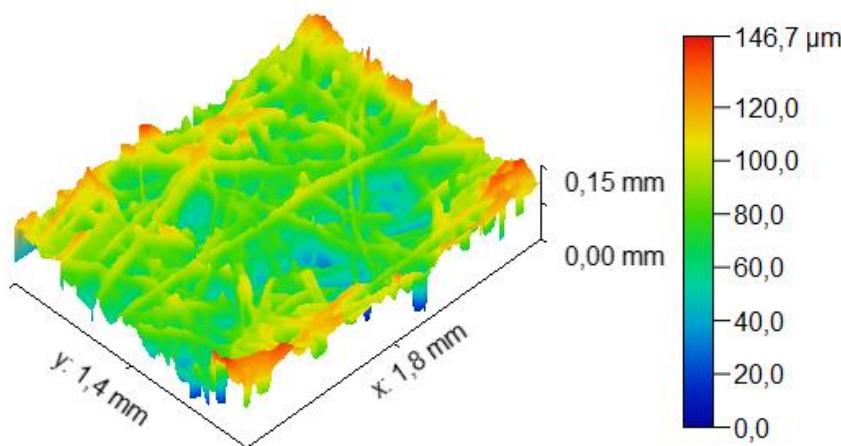


Difference of vibration behaviour at ≈ 75 Hz

Experiments 2: fingerprints orientation ?

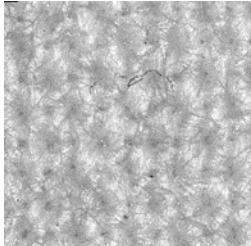


Groove orientation $3^\circ \pm 22^\circ$

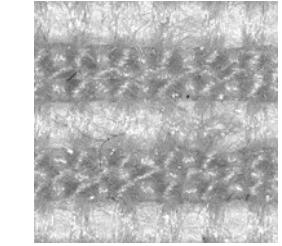
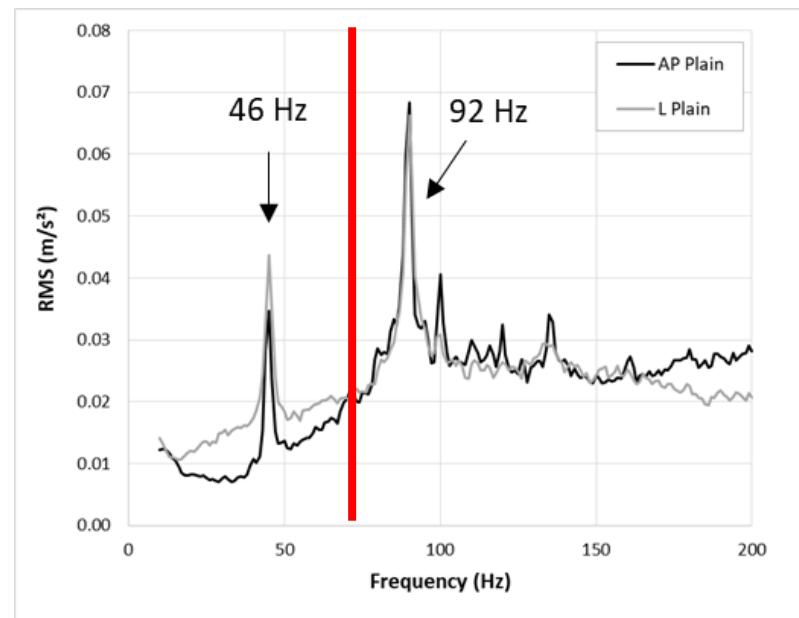


Covered fingers with
a non-oriented membrane

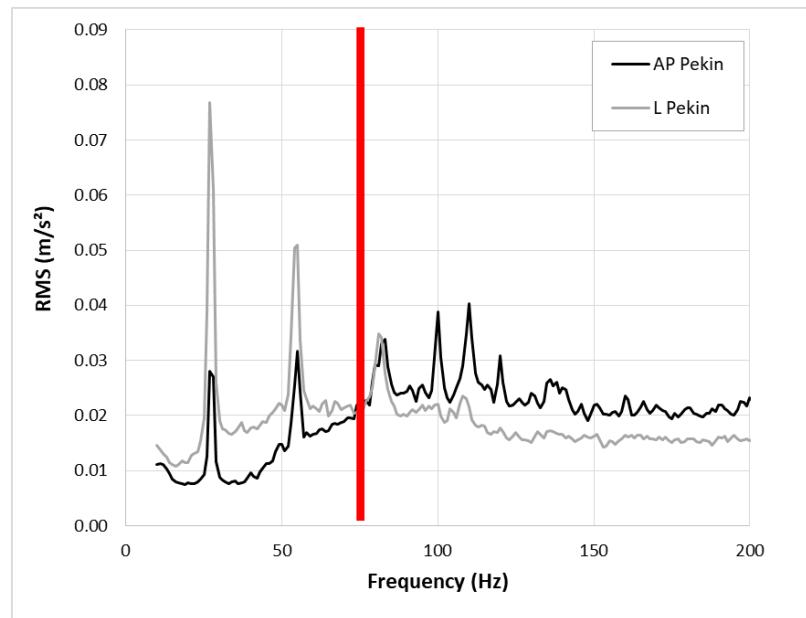
Results experiment 2



Plain



Pekin



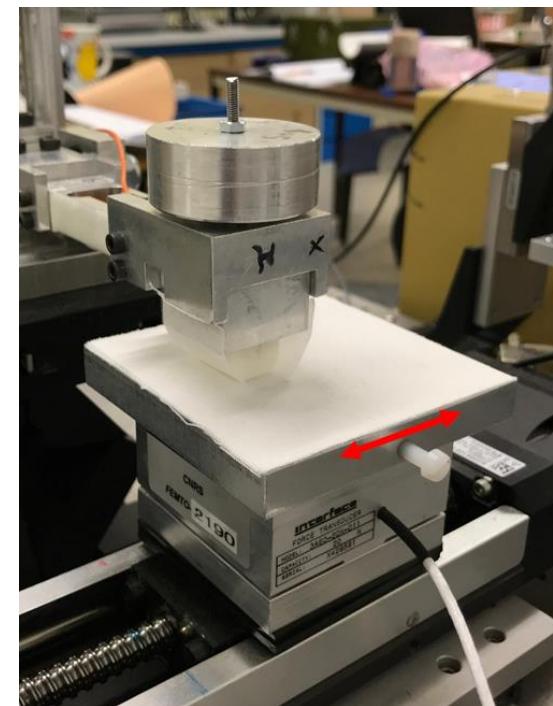
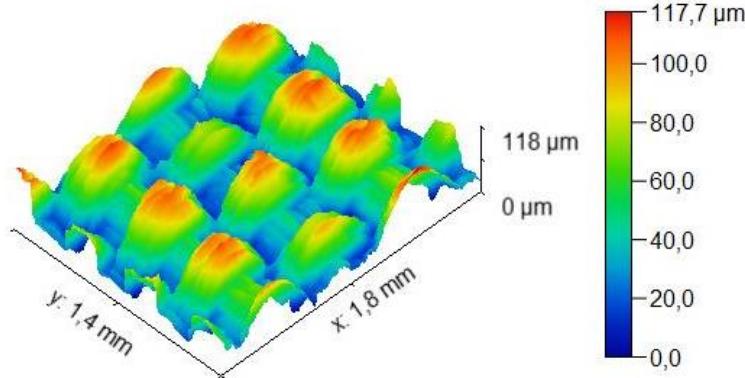
5 volunteers (3 females and 2 males)



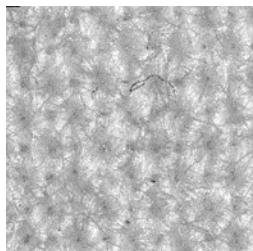
Difference of behaviour remains without fingerprint

Experiments 3: finger biomechanics ?

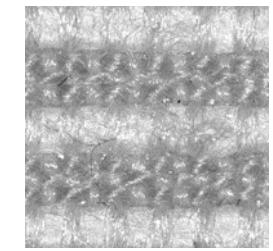
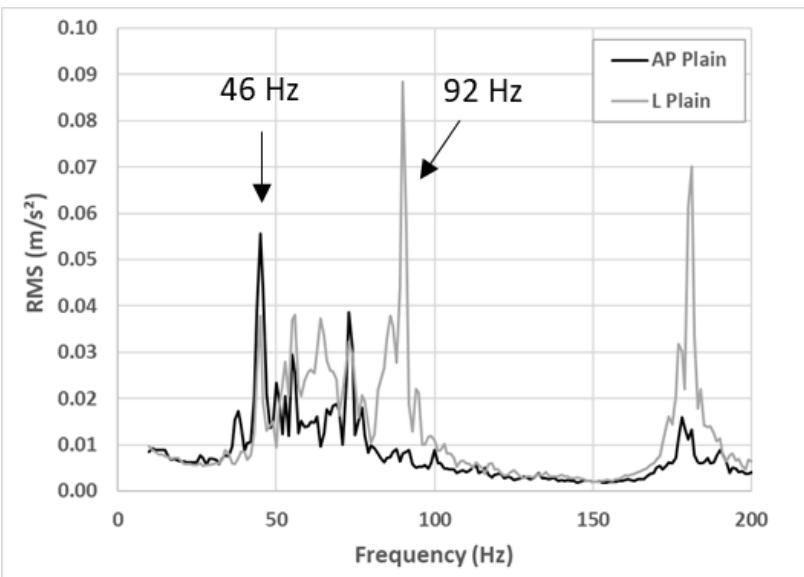
Frotteur avec des caractéristiques proches
du doigt (dureté, revêtement superficiel)



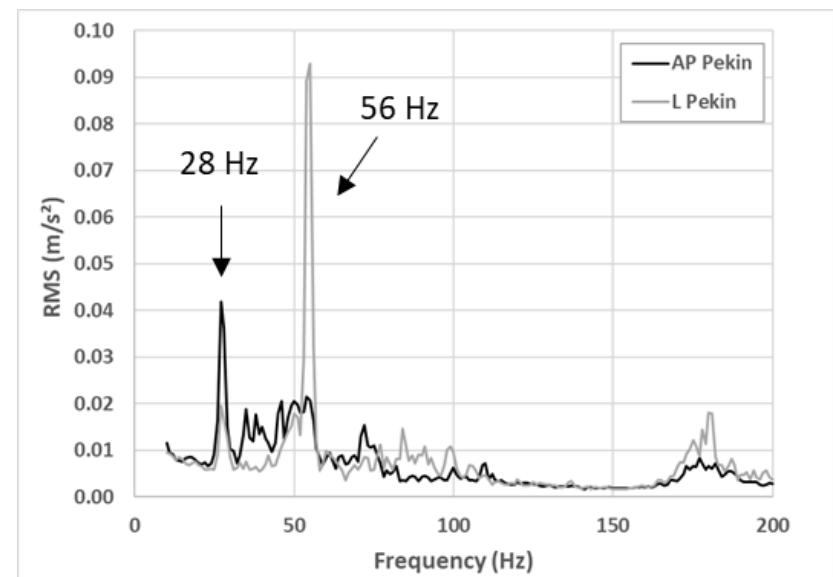
Results experiment 3



Plain



Pekin



No difference of vibration behaviour at 75 Hz

Bilan

- Pas de différences notables sur le COF.
- Différence du comportement en vibration avant et après ≈ 75 Hz selon la direction du mouvement

Hypothèses : mécanique du doigt (articulations, tendons, muscles ...) et/ou de la pulpe du doigt.

Pour plus d'informations :

Camillieri B. et Bueno M.-A., "Influence of Finger Movement Direction and fingerprints Orientation on Friction and Induced Vibrations with Textile Fabrics" - *Tribology Letters*, vol. 69, n°4, p.143, 2021.

Travail futur ...

- Influence de la vitesse de déplacement
 - Influence de l'angle du doigt
 - Etude psychophysique
- 
- Excitation
du doigt

Merci

