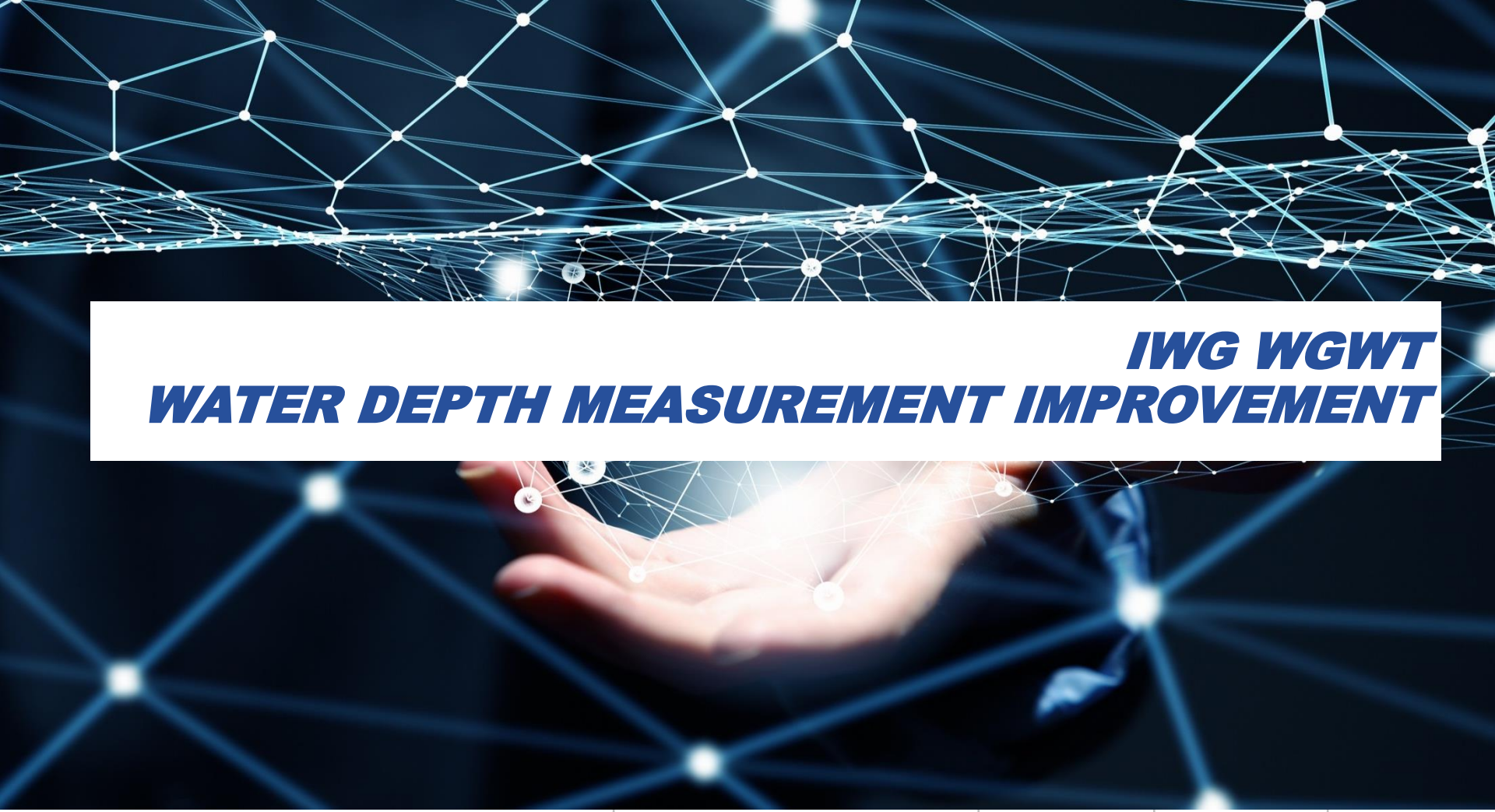


IWG WGWT
WATER DEPTH MEASUREMENT IMPROVEMENT

WATER DEPTH MODEL

- **RECALL – ISO 23671-2021**

5 General test conditions

../..

5.2 Wetting conditions

../.. For both external watering and self watering systems, for the used braking lanes, the water depth shall be between 0,5 mm and 1,5 mm measured from the peaks of the pavement. ../..

../..

7 - Measurement of tyre wet grip index on a trailer or a tyre test vehicle

../..

7.2.2

../.. The quantity of water applied at 65 km/h shall be 18 l·s−1 per meter of width of wetted surface in case of a water depth of 1.0mm ../..

WATER DEPTH MODEL

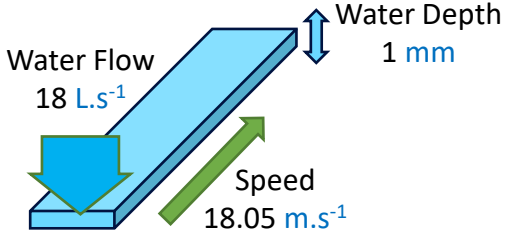
- **WATER DEPTH COMPUTATION**

  - The quantity of water applied at 65 km/h shall be 18 l·s−1 per meter of width of wetted surface

    - Quantity of Water per width = 18 $L.s^{-1}.m^{-1}$
    - Trailer speed = 65 km/h = 18.05 $m.s^{-1}$

    - Water Depth = Quantity of Water per width / speed
      → Water Depth = 18 $L.s^{-1}.m^{-1}$ / 18.05 $m.s^{-1}$ ≈ 1 ($L.s^{-1}.m^{-1}$ / $m.s^{-1}$) = 1 $L.m^{-2}$

    - 1 L = 0.001 m^3
      → Water Depth = 0.001 $m^3.m^{-2}$ = 0.001 m = 1 mm

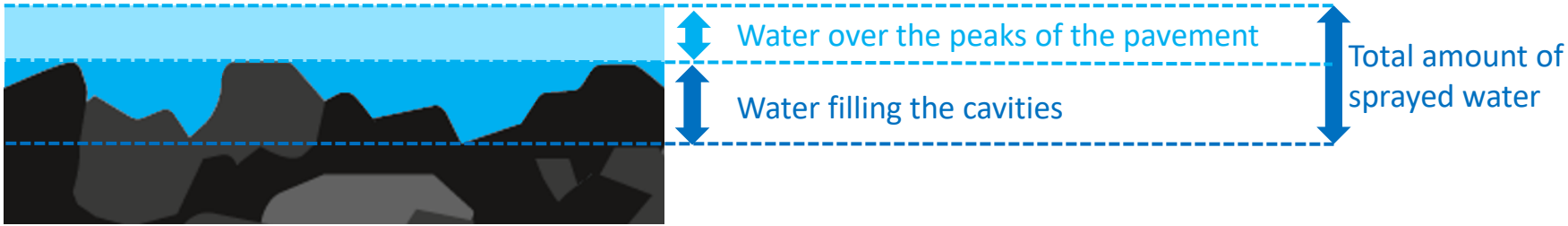


➔ **18 $L.s^{-1}$ per meter of width of wetted surface = 1 mm of water height on a flat ground**

WATER DEPTH MODEL

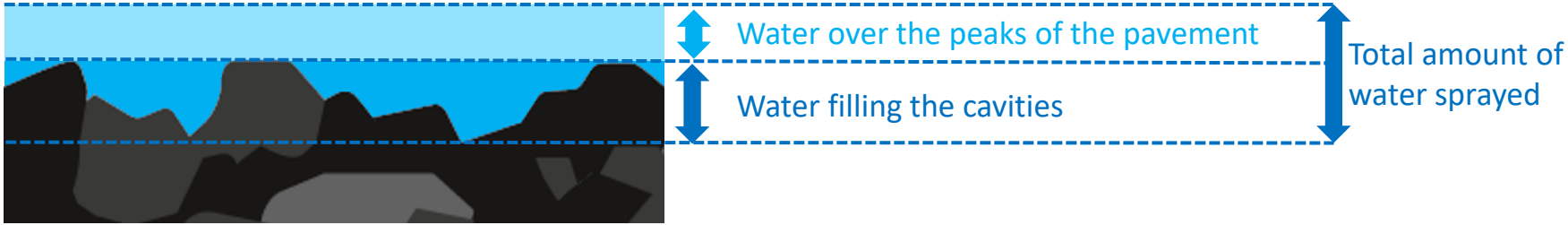
- **CONSIDERING MACRO-TEXTURE**
  - MTD is the mean (macro) texture depth, measured with the sand-patch method (ISO 13473)

  - MTD = M means that for a given surface S, the volume of “void cavities” is equal to MxS
  - Thus, considering a surface S watered to target 1mm of water depth, a part of the sprayed water fills the “cavities” of the textured surface



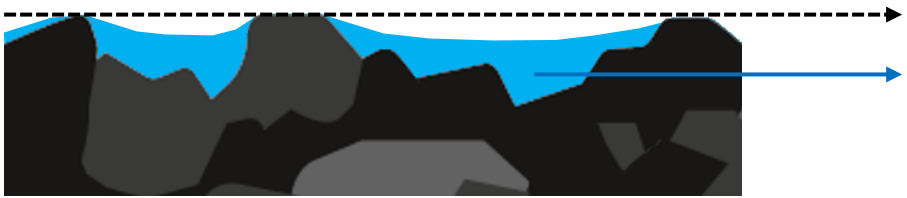
WATER DEPTH MODEL

- **CONSIDERING MACRO-TEXTURE - OBSERVATIONS**



  - From a theoretical point of view, the sprayed water fills all the volume of “void cavities”
    ➔ Water Depth over the peaks of the pavement = Water Depth Flat Ground – MTD

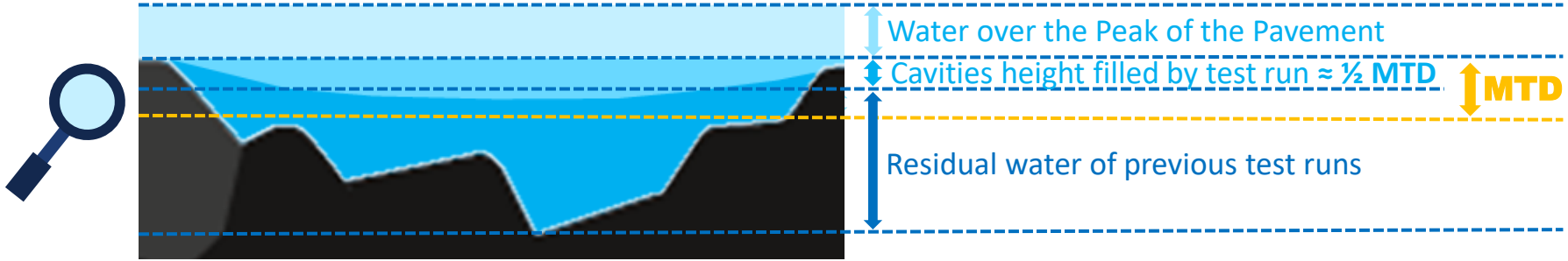
  - In practice, after conditioning the track (see ISO 23671 §7.4.1), and after each test run, one can observe that cavities are partially filled by residual water of previous runs



Question : how much water in the cavities versus MTD ?

WATER DEPTH MODEL

- **CONSIDERING MACRO-TEXTURE – WATER DEPTH MODEL**



- Based upon a large internal DOE plan:
  - Measurement of performance drop of SRTT 16'' at worn state (2mm) vs new state
  - Several tracks with different MTD levels, different µ levels
  - Same trailer, water flow = 18 $L.s^{-1}.m^{-1}$
  - Observation and computation of the influence of the MTD on the hydro mechanism and associated performance drop at worn state
- We built an empirical model representing the actual water depth in function of MTD :

Water Depth over the peaks of the pavement = Water Depth Flat Ground – ½ MTD

WATER DEPTH MODEL

- **WATER DEPTH MODEL INSTANTIATION**

- **RECALL – ISO 23671-2021**

5 General test conditions

../..

5.1 Track characteristics

../.. The macro texture depth MTD shall be measured as specified in ASTM E965-96 using the area of the track to be used for the wet grip test and shall be (0,7 ± 0,3) mm. ../..

Water Depth over the peaks of the pavement = Water Depth Flat Ground – ½ MTD

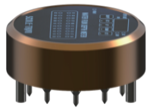
	MTD (mm)				
	0.40	0.55	0.70	0.85	1.00
Water Height (mm)	0.8	0.72	0.65	0.57	0.5

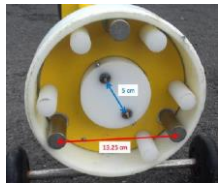
WATER DEPTH MEASUREMENTS

WATER DEPTH MEASUREMENTS

- **WATER DEPTH MEASUREMENT CARTOGRAPHY**

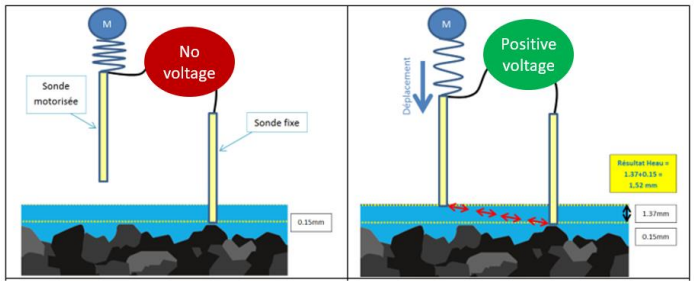
  - **“Contact” devices**
    - Ex: SCALETRON, GIRAPHE, …





    - Principle:
      - Device laid on the peaks of the pavement, thanks to the feet of the devices
      - Measurement = length between reference and top of water film
      - MTD well considered by construction

    - Result: **“real” water depth** over the peaks of the pavement

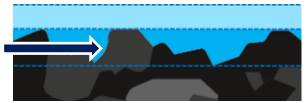


WATER DEPTH MEASUREMENTS

- **WATER DEPTH MEASUREMENT CARTOGRAPHY**

  - **“Contactless” devices**
    - Ex: LUFFT MARWIS
    - Principle: Measures a water volume for a specified surface (infrared measurement)

    - Result:
      - Measured Water Depth = water volume / reference surface
      - **MTD not considered**, the results includes the water filling cavities



    - In reality, real water depth = measured water depth – MTD

		MTD (mm)				
		0.40	0.55	0.70	0.85	1.00
Measured Water Depth (mm)	0.50	0.10	-0.05	-0.20	-0.35	-0.50
	0.75	0.35	0.20	0.05	-0.10	-0.25
	1.00	0.60	0.45	0.30	0.15	0.00
	1.25	0.85	0.70	0.55	0.40	0.25
	1.50	1.10	0.95	0.80	0.65	0.50

NB: Negative WD = no water over the peak of the pavements, only in the cavities

WATER SPRAYING

WATER SPRAYING

- **DIFFERENT TECHNOLOGIES**

Buses LECHLER à jet plat 120° 1/4" BSP

Buses SPRAYING SYSTEMS à jet plat ¼ T 11011

Buses SPRAYING SYSTEMS floodjet ¼ KSS3

Déversoir

Déversoir

Canon PVC 144/160

MICHELIN

UNE MEILLEURE FAÇON D'AVANCER

Merci pour votre attention