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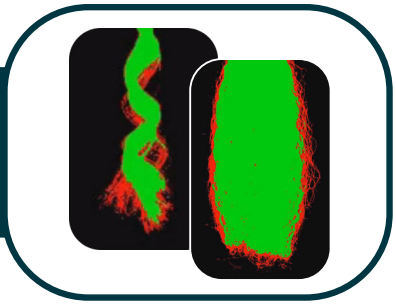
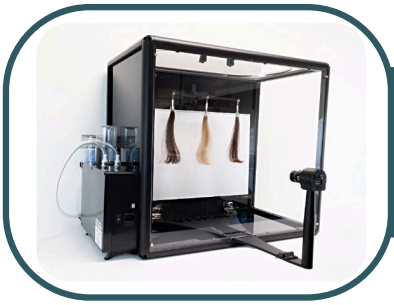
Shuffle

One platform

Multiple instruments

Volume &
Frizz measurements





Humidity Box
integration

Multiple
attachments

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The **Shuffle** is the first ever modular tress-testing platform for your hair care products. Various attachments are easily installed on a light-weigtht frame, allowing the user to test a wide range of visual parameters for your hair swatches with a single instrument. With the multi-tool, expanding your research and testing capabilities has never been so economical.

We currently offer four attachments.

BOLERO WIDE

The **BOLERO Wide** is the basic attachment, already included with the base version of the **SHUFFLE.**

It allows for 2D measurements of volume and frizz on a single swatch. The attachment is specifically designed for wider swatches, which surpass a width of 10 cm.

BOLERO TRIO

The **BOLERO Trio** is identical to the **BOLERO Wide** attachment, but comes with its proprietary image processing tool

This functionality enables simultaneous measurements of 2D volume and frizz on up to 3 swatches at once, with a maximum width of 10 cm for each.

BOLERO 360

The **Bolero 360** is the first optional attachment for the SHUFFLE. Instead of a static fixture holding the hair, the swatch is put on a rotating axis that enables the image acquisition of the hair at different angles.

With the acquisition of 36 different angles, the SHUFFLE software can build a 3D reconstruction of the swatch. This delivers comprehensive measurement results, including the 3D volume of the hair bulk and the frizz area.

The output also includes cross-sections of the hair swatch at any vertical position, which can be tailored for the hair bulk or the full (bulk & frizz) 3D reconstruction.

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While the basic setup of the **SHUFFLE** and the **BOLERO 360** primarily focus on measuring Volume and Frizz, the **HULA** attachment introduces motion as an additional tool for assessing the behavior of your hair swatch..

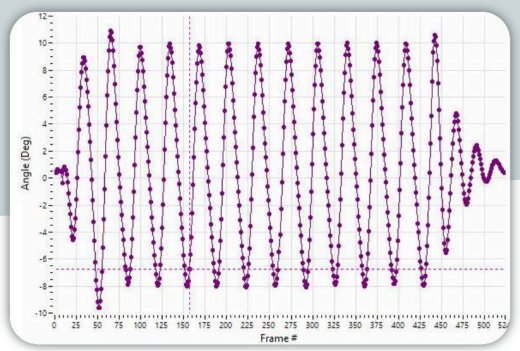
The motion of the hair swatch can be recorded using the **HULA** process. Alternatively, the motion is used as perturbation to disrupt the hair swatch, allowing for a before and after evaluation of your hair care product on the swatch.

HULA

The HULA attachment consists of a motorized translation which can swing the swatch back and forth at a frequency of 1 to 2.5 Hz (60 to 150 swings per minute).

With the HULA process, a 35 fps video of up to 15 seconds is recorded to evaluate the hair swatch property (volume, frizz, geometry) during the motion.

Specific motion parameters (amplitude, reproductibility, shape, dampening effect) can be analyzed depending on the frequency for more in-depth analysis of your product.



HOP

The **HOP** process uses the same attachment as the **HULA,** but instead of recording a video of the motion, the movement is only used to induce perturbation in the hair swatch, and to measure a before / after effect of the perturbation on the visual parameters of the hair.

Users can also use the timelapse option to measure the visual effect of succesive perturbations without having to launch a new measurement for the complete duration of the timelapse

Image before perturbation

Image after perturbation

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While hair color or hair volume has a standardized definition, "styling" doesn't. However, some properties like straightness or alignment - directly related to the shape of hair - may give some insight into how some products - hair blower, dryer, straightener, lotions, etc. - will affect hair styling.

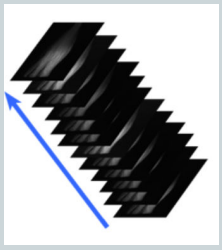
The **RUMBA** was developped to measure all the pysical parameters related to the orientation of hair fibers using polarization analysis and imaging.

RUMBA

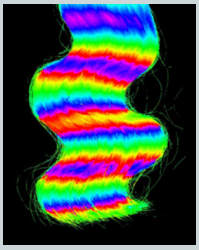
Using its polarization imaging system, the **RUMBA** captures successive images of hair samples illuminated by infrared LEDs. Across multiple polarization states, it enables a comprehensive mapping of the orientation of the hair swatches in a 2D image.

Additional processing gives the user the alignment mapping of any hair sample. From this data, **straightness** and **alignment** properties of your hair sample can be extracted.

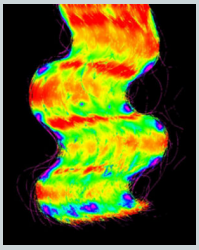
In addition, a spatial analysis allows the user to focus on a specific part of any hair sample - root, middle part, or tip.



Raw Images Acquisition



Orientation Image



Alignment Image

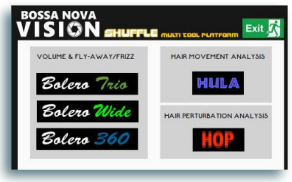
With the **RUMBA** attachment, the **SHUFFLE** is now transformed into an accessorized system that can be used in conjuction with the other attachments.

It allows for a more holistic analysis of your hair swatches, including volume/frizz as well as hair orientation and alignment.

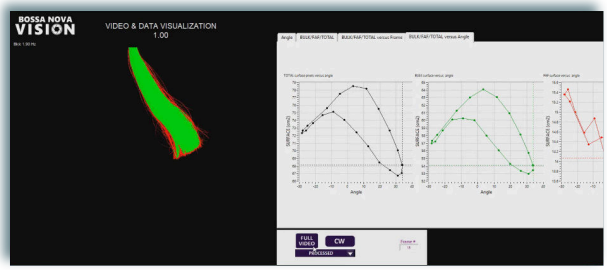
Shuffle SOFTWARE

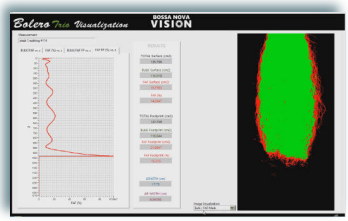
Each attachment has a dedicated program for image capture and processing.

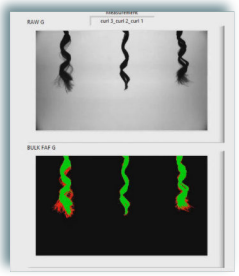
Software and pre-loaded measurements for all three existing attachments are included with the Shuffle*.



** As we continue to develop more attachments and the programs to operate them, we will issue additional software updates*







Using the Shuffle Software, you can easily :

- **Control the settings of your measurement with every attachment**
- **Extensive analysis on the visual properties of your hair samples - including volume, frizz, damping, duration of the effect, etc.**
- **Compare multiple samples**
- **Export all your data including images, graphs and tables**

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SPECIFICATIONS

	TRIO / WIDE	BOLERO 360	HULA / HOP	RUMBA
VISION	Monochrome (B & W) - 8-bits depth - 2250 x 1380 px² resolution - 410 x 245 mm² FOV			
	137 x 245 mm² FOV (individual **BOLERO Trio**)			
	Pixel scaling : 0.1818 mm/pixel (182 µm/pixel)			
			Video @35 fps	
	White Back-light LED Illumination panel			
				Additional red front-light illumination Illumination rotating polarizer Camera rotating polarizer
HAIR SWATCH	Any color - Length from 5 to 20 cm - Typical hair weight = 20 grams			
	No wider than 10 cm (individual **BOLERO Trio**)	Round swatches Dense / Filled swatches		
MEASURENMENT	SHUFFLE 1.6 or higher			
	B&W Single Image (**Wide**) B&W Triple Images (**Trio**)	36 B&W images (1 image every 10 deg.)	B&W Video @ 35 fps (**HULA**) 2 B&W images Before and After (**HOP**)	36 B&W images (pre-processed images)
	Color images / video with bulk and fly-away frizz separation			
				Angles / Alignment images
DATA	Surface / bulk (cm2) Fly-away / Frizz (cm2 and %) Evolution / vertical (z axis) Swatch length (cm)	Volume / bulk (cm3) Fly-away / Frizz (cm3 and %) Evolution / vertical (z axis) Swatch length (cm) 3d point clouds Slice evolution along z axis Individual image processing (similar to TRIO)	**HOP** (Before / after) & **HULA** (on each frame) Surface / bulk (cm2) Fly-away / Frizz (cm2 and %) Evolution / vertical (z axis) Swatch length (cm) **HULA** Vertical angle of swatch Evolution of all parameters along time (frame #) BULK/FAF/TOTAL vs. angle	Surface / bulk (cm2) Fly-away / Frizz (cm2 and %) Evolution / vertical (z axis) Swatch length (cm) Alignment / Angle images Alignment / Angle histograms Evolution of Angle & Alignment along vertical axis (z axis) Alignment score Straightness score
	Export in Excel format			
SYSTEM	SHUFFLE Base system : 24 lbs / 11 kg			
	Trio-Wide / BOLERO 360 / HULA-HOP : < 2 lbs - 1 kg each			RUMBA : 10 lbs - 5kg
	Size : 24" x 24" x 20" (610 mm x 610 mm x 500 mm)			
	110/240 VAC 50/60 Hz			

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