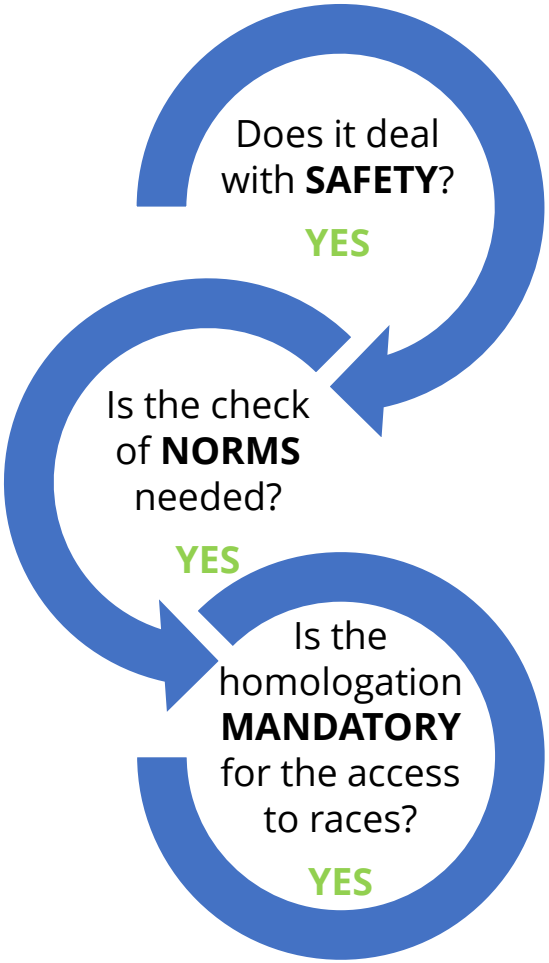
The International Motorcycling Federation sets a new standard for riders' safety through the FIM Racing Homologation Programme for helmets

Erica Manfredi[1] (presenter), Mario Maza[2], Oscar Juste[2]

[1] Fédération Internationale de Motocyclisme (FIM), Mies, Switzerland
[2] Laboratorio del Impacto, I3A, University of Zaragoza, Spain

FÉDÉRATION INTERNATIONALE DE MOTOCYCLISME

FRHP



Application

frhp@fim.ch

↓

Check of norms

↓

FIM test

↓

Issue of labels for identification and visibility

↓

Controls

↓

Admission to competitions

FIM RACING HOMOLOGATION PROGRAMME

Product Discipline

Homologation manual
Ex. FHRPhe-01

FRHP for helmets

FIM RACING HOMOLOGATION PROGRAMME

Helmets
Circuit Racing Disciplines

Homologation manual
Ex. FHRPhe-01

FIM World Championships and Prize events

- FIM Grand Prix World Championship
- FIM Superbike World Championship
- FIM Supersport World Championship
- FIM Sidecar World Championship
- Red Bull FIM MotoGP Rookies Cup
- FIM Supersport 300 World Championship
- FIM CEV Repsol Moto3 Junior World Championship
- FIM World Record Attempts
- FIM Drag Bike World Cup
- FIM Endurance World Championship
- FIM Endurance World Cup

Extract available on **fim.live.com**

FIM TECHNICAL

FIM-UNIZA collaboration

FÉDÉRATION INTERNATIONALE DE MOTOCYCLISME

Impact Laboratory
Aragon Institute of Engineering Research
University of Zaragoza

Universidad Zaragoza
1542

FIM TECHNICAL

Sampling

ELIGIBLE HELMETS

- UNECE 22.05 Type P
- Snell M 2015
- JIS T8133 2015 Type 2 Full face
- Protective lower face cover: not detachable, not moveable and made of the same material of the shell
- One-piece shell
- Retention system with strap and double D-ring

10 SAMPLES

- Samples #1, #2 and #3:
  Conditioning, Weight, Linear impact tests
- Samples #4 and #5:
  Conditioning, Weight, Oblique impact tests
- Sample #6:
  Conditioning, Weight, Penetration tests
- Sample #7: Storage
- Sample #8, #9 and #10:
  Conditioning, Weight, Extra tests if needed

Helmet stability

- The helmets are homologated per **Size** and per declared **Combination of accessories** (e.g. aerodynamic devices).
- The Applicant **undertakes not to modify**
  - trademark(s)
  - commercial name(s)
  - design
  - materials and dimensions of
    - shell
    - protective padding
    - accessories (including spoilers).
- The Applicant **can modify**
  - cover paint
  - comfort padding
  - visor.

Headforms

- Dimensions, mass, inertia matrix*, COG and resonance frequency according to EN960:2006
- Head Positioning Index (HPI): according to UNECE 22.05
- Roughness:
  as per manufactured, except oblique testing (see later)
- Wireless data acquisition:
  1 tri-axial accelerometer + 3 angular rate sensors (+D cone)

***Reference values for Cadex inertia matrix (as measured by Resonic K):**

Headform denomination	Circumference [mm]	Mass [Kg]	Ixx [Kg cm^2] (± 5%)	Iyy [Kg cm^2] (± 5%)	Izz [Kg cm^2] (± 5%)
A	495*	3.1 (± 0.10)	142.2	166.6	95.0
C	515*	3.6 (± 0.10)	172.6	203.3	113.2
E	535*	4.1 (± 0.12)	202.9	238.6	141.3
J	575*	4.7 (± 0.14)	264.0	318.3	193.1
M	605*	5.6 (± 0.16)	337.4	402.7	252.7
O	625*	6.1 (± 0.18)	383.6	461.1	293.5

Headforms

CORRESPONDENCE HEADFORM-SIZE

Smallest Size Specified (cm) \ Largest Size specified (cm)	50	51	52	53	54	55	56	57	58	59	60	61	62
50	A	A	C										
51		C	C	C									
52			C	C	E								
53				E	E	E							
54					E	E	E						
55						E	E	J					
56							J	J	J				
57								J	J	J			
58									J	J	M		
59										J	M	M	
60											M	M	M
61												M	O
62													O

Table 2: Correspondence between test headforms and Helmet Sizes.

Headform denomination	Circumference [mm]	Mass [Kg]
A	495*	3.1 (± 0.10)
C	515*	3.6 (± 0.10)
E	535*	4.1 (± 0.12)
J	575*	4.7 (± 0.14)
M	605*	5.6 (± 0.16)
O	625*	6.1 (± 0.18)

Preparation

CONDITIONING

- Solvent conditioning (as defined in UNECE 22.05 7.2.1)
- >24h, (22±5)ºC, (55±5)% RH

POSITIONING

- HPI: as declared by the Applicant and checked according to UNECE 22.05 requirements (annex 5)
- chinstrap tension: the retention system shall be adjusted under the chin of the headform and tightened to a tension of 75 ± 5 N (over strap friction) with a deflection angle of 45 ± 5°.

Impact testing

LINEAR IMPACT TEST

THRESHOLDS

- PLA ≤ 275g for all impact points
- HIC ≤ 2880 for all impact points

HIGH SPEED ECE POINTS

As defined in UNECE 22.05 (Impact-absorption test), with flat anvil only:

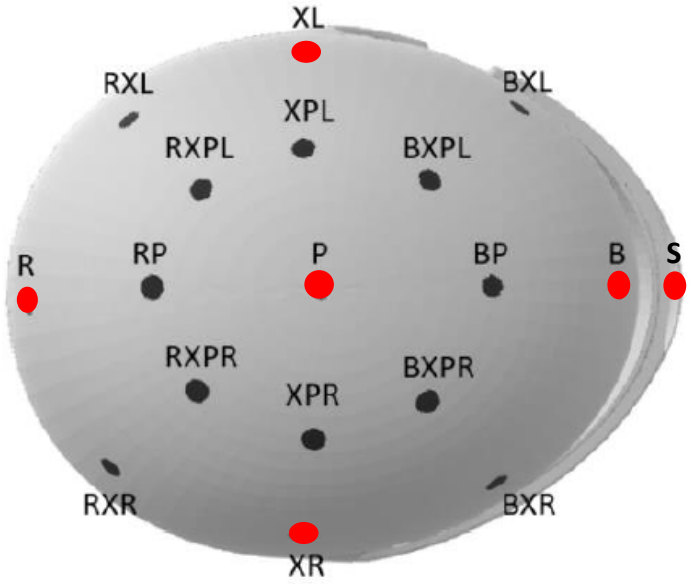
Helmet sample #1

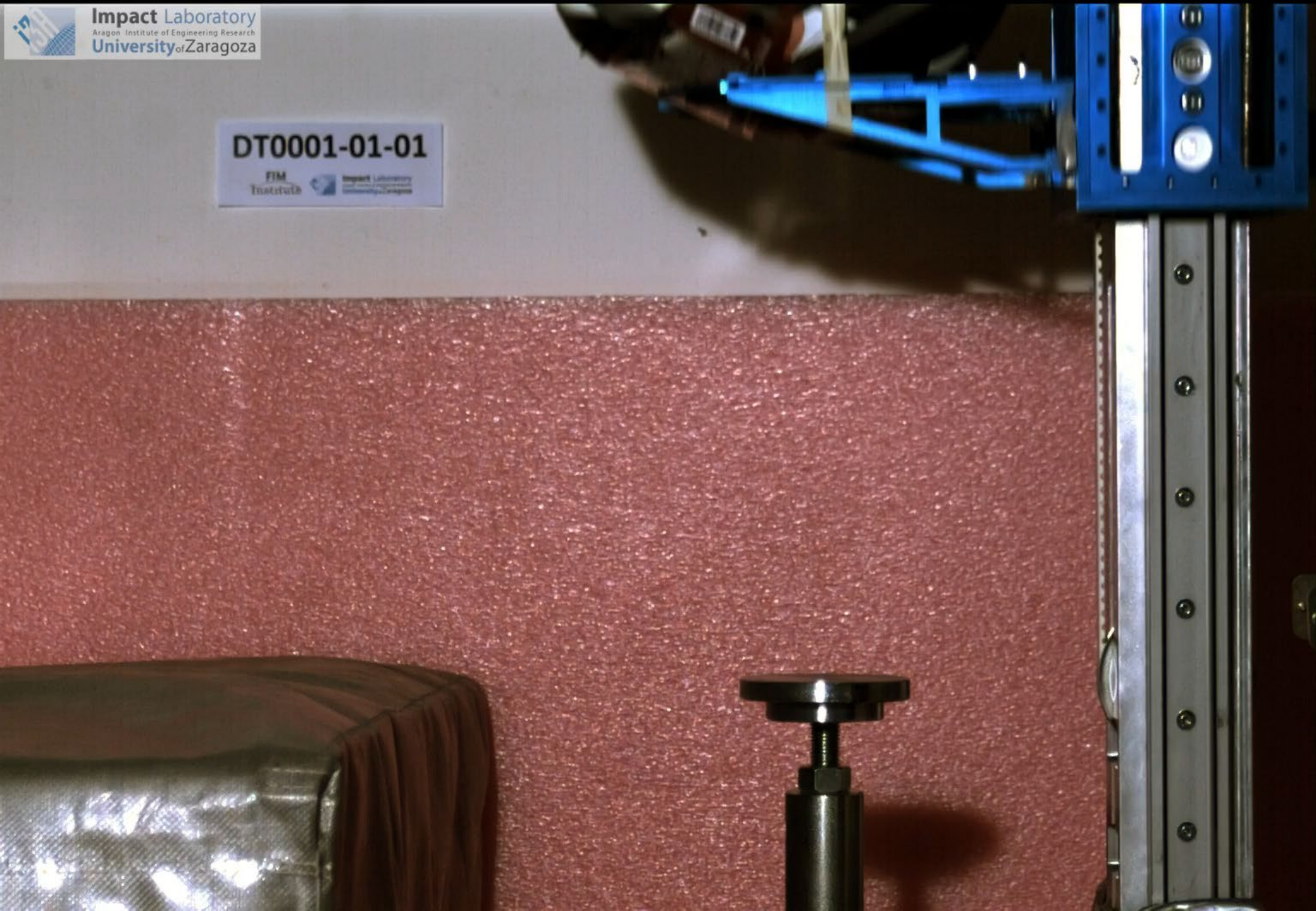
- UNECE points B, X, P, R:

  8.2 (+0.15, -0.0) **m/s**

- UNECE point S:

  6.0 (+0.15, -0.0) **m/s**




Impact Laboratory
Aragon Institute of Engineering Research
University of Zaragoza
DT0001-01-01
FIM
Institute

Impact testing

LINEAR IMPACT TEST

THRESHOLDS

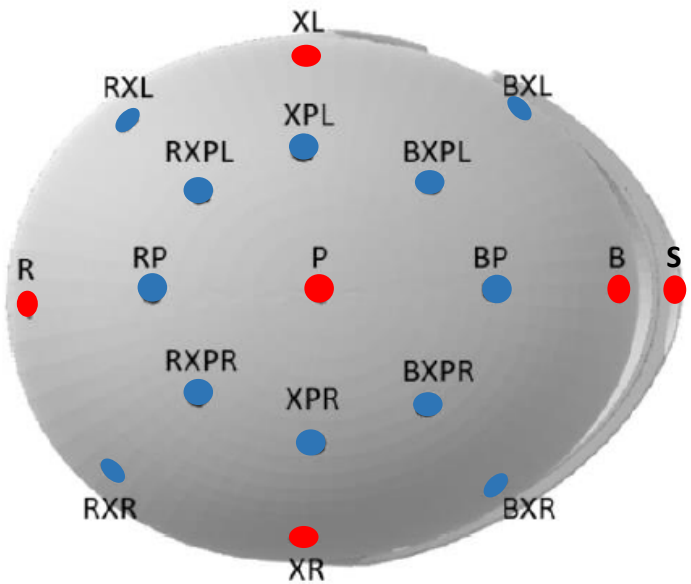
- PLA ≤ 275g for all impact points
- HIC ≤ 2880 for all impact points

HIGH SPEED EXTRA POINTS

Helmet sample #2

- 3 “extra” points (selected among 12 pre-defined points):

  8.2 (+0.15, -0.0) **m/s**



Impact testing

OBLIQUE IMPACT TEST

As defined in UNECE 22.05 (Impact-absorption test), with:

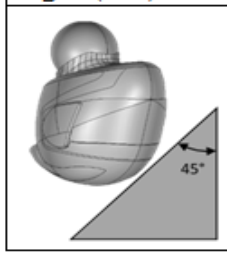
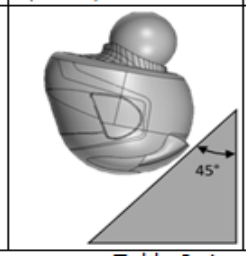
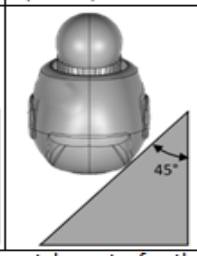
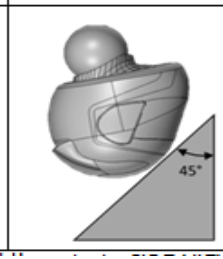
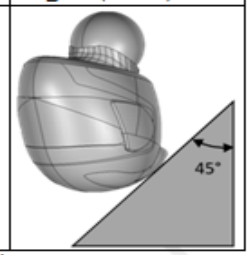
- platinum cure silicone coated headform (μ = 0.78)
- “oblique anvil”: 45º plane, abrasive paper to be substituted after significant damage
- impact velocity 8.00 (+0.15, -0.00) m/s

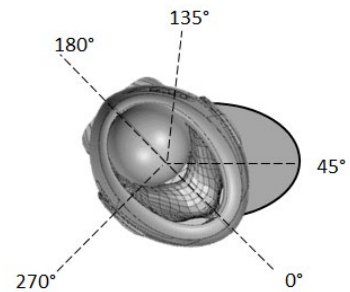
Helmet sample #4: points 45, 180 and 270 degrees

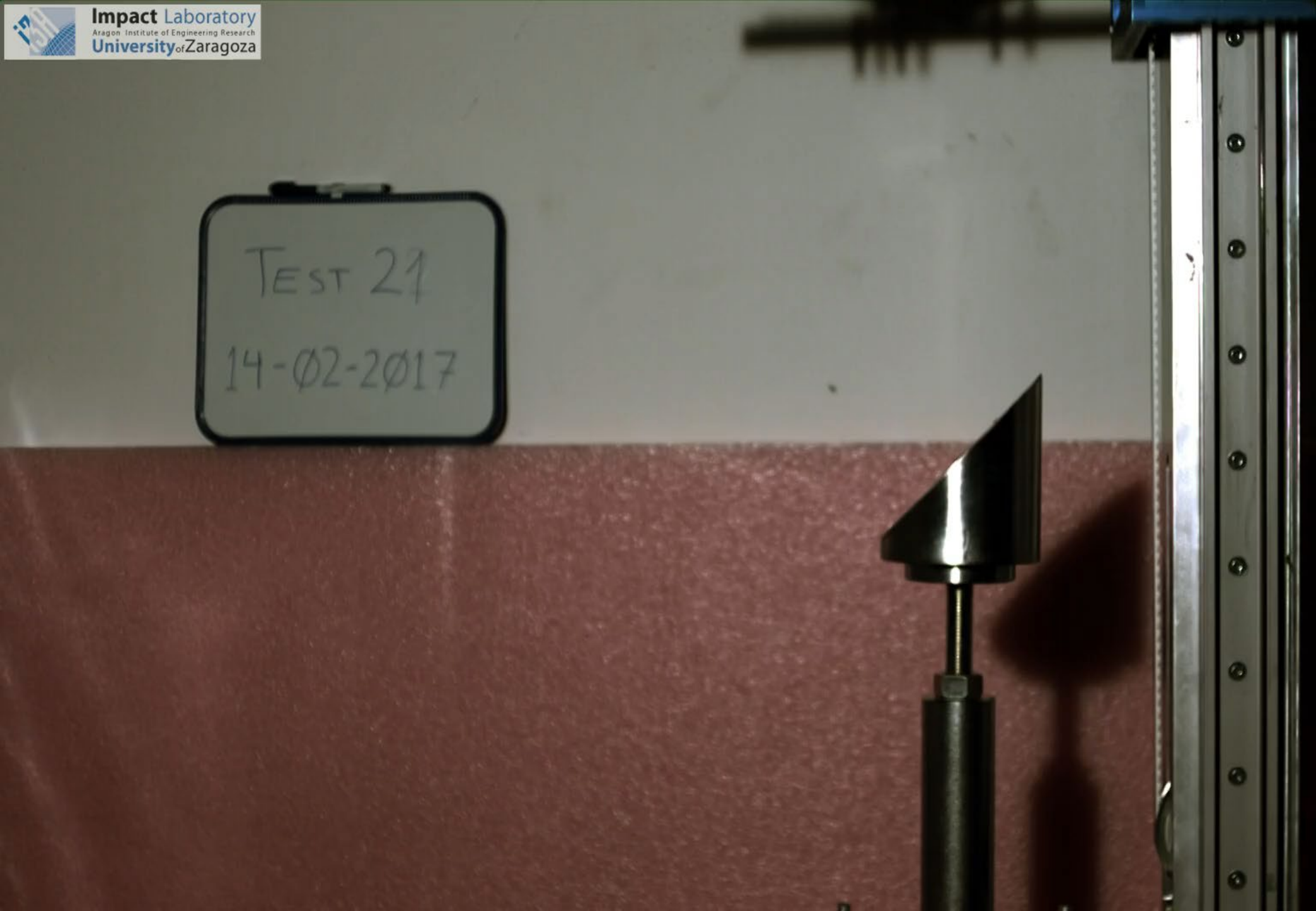
Helmet sample #5: points 0 and 135 degrees
NOTE: neck upward

THRESHOLDS

- PLA ≤ 208g for all impact points
- HIC ≤ 1300 for all impact points
- PRA ≤ 10400 rad/s^2 for all impact points
- BrIC ≤ 0.78 for all impact points

Front-lateral right (45°)	Rear (180°)	Lateral left (270°)	Front (0°)	Rear-lateral right (135°)
				




Impact Laboratory
Aragon Institute of Engineering Research
University of Zaragoza
TEST 21
14-02-2017

Penetration testing

PENETRATION TEST

- As defined in JIS T8133: 2007 5.2 and 7.5 (Type 2), with:
- spherical support
- dropping height: 2m
- 2 penetration sites, above the Snell “test line”, at least 75 mm separated

THRESHOLDS

- No contact between the striker tip and the spherical support surface

Penetration testing

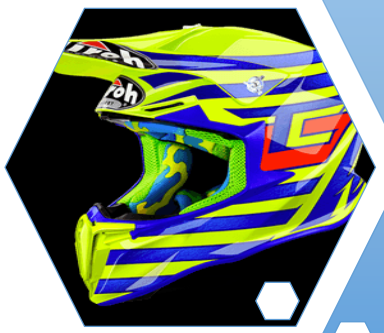
Evolution of the thresholds

FRHPhe-01	
Samples #1 and #2	- $PLA \leq 275$ g - $HIC \leq 2880$
Sample #3	- $PLA \leq 208$ g - $HIC \leq 1300$
Samples #4 and #5	- $PLA \leq 208$ g - $HIC \leq 1300$ - $PRA \leq 10400$ rad/s^2 - $BrIC \leq 0.78$
Sample #6	No contact between striker tip and the support surface.

FRHPhe-02*	
Samples #1 and #2	- $PLA \leq 275$ g - $HIC \leq 2400$
Sample #3	- $PLA \leq 160$ g - $HIC \leq 1000$
Samples #4 and #5	- $PLA \leq 160$ g - $HIC \leq 1000$ - $PRA \leq 8000$ rad/s^2 - $BrIC \leq 0.6$
Sample #6	No contact between striker tip and the support surface.

***The aforementioned timeline and the thresholds may be adjusted by FIM if changes notably in headforms and/or the international standards of reference and/or other important features of the FIM Helmet Standard FRHP-02 are implemented.**

Further evolutions

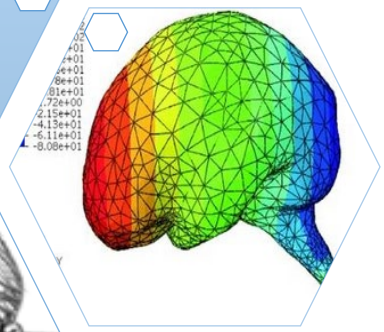


Headform inertia

OFFROAD HELMETS

Headform surface

Impact simulations with FE model



Intermot 2018

WE,THE RIDERS

FIM RIDE GREEN

HALL 7

BOOTH N. 079/068

FIM RACING HOMOLOGATION PROGRAMME

FIM TECHNICAL

Thank you

FÉDÉRATION INTERNATIONALE
DE MOTOCYCLISME