

# Railway interoperability. Academic perspective

**Ernesto García Vadillo (Prof)**  
**Department of Mechanical Engineering**  
**University of The Basque Country (UPV/EHU)**  
**Bilbao**

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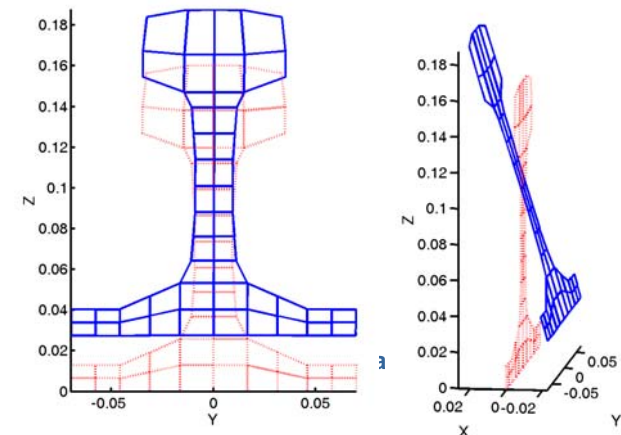
# 1. Directive – Industry – Infrast Managers

- It will be a clear benefit for the manufacturers
- And protects the Infrastructure managers: “Where a Member State finds that a component (...) covered by the ‘EC’ declaration of conformity (...) is unlikely (...) to meet the essential requirements, it shall take all necessary steps to restrict its field of application, prohibit its use or withdraw it from the market.” (Art. 11.1)



## 2. Professional qualifications

- Art. 29. 1: ‘The personnel responsible for the conformity assessment and verification procedures will have (...) a good technical and professional preparation to undertake all the evaluation activities for which they have been notified’
- Not just general Civil Eng, Mech Eng, Electrical Eng. Specific railway technology Knowledge.  
E.g.: Railway Dynamics
- European Union vs USA



### 3. Interoperability and Techn Spec for Interop

#### Transversal TSIs

- Operation and traffic management - OPE TSI
- Control command and signalling subsystems - CCS TSI
- Telematic applications for passenger service - TAP TSI
- Persons with reduced mobility - PRM TSI
- Safety in railway tunnels - SRT TSI

#### HS TSIs (High speed railway)

- Maintenance Subsystem
- Infrastructure Subsystem - HS INF TSI
- Energy Subsystem - HS ENE TSI
- Rolling Stock Subsystem - HS RST TSI.
- Operation and traffic management - HS OPE TSI

#### CR TSIs (conventional railway)

- Rolling stock - freight wagons - CR WAG TSI ←
- Operation and traffic management - CR OPE TSI
- Locomotives and passenger rolling stock subsystem - CR LOC and PAS TSI ←
- Infrastructure Subsystem - CR INF TSI ←
- Energy Subsystem - CR ENE TSI
- Noise - CR NOI TSI.
- Telematic applications for freight service - CR TAF TSI



## 4. Open points and Academia I

Infrastructure Subsystem - CR INF TSI:

- 4.2.5.5.2. Requirements for controlling equivalent conicity in service
- 4.2.5.8. Requirements for track stiffness as a complete system are an open point.
- 4.2.11.2. Noise and vibration limits and mitigation measures are an open point.
- 4.2.11.5. Requirements for mitigating the effect of crosswinds are an open point.



## 4. Open points and Academia II

Rolling stock - freight wagons - CR WAG TSI :

- 4.2.3.4. Axle bearing condition monitoring: (...) The specifications of the design and the conformity assessment of on-board equipment is an open point in this TSI.
- 4.2.3.6.6. Variable gauge wheelsets: (...) The conformity assessment of the requirements specified in this point is an open point.
- 6.2.2.3. Running dynamic behaviour. On-track tests. (...). The required test conditions for on-track tests, as set out in EN 14363:2005, are not always fully achievable concerning track geometric quality, and combinations of speed, curvature, cant deficiency. In cases this is not fully achievable the demonstration of conformity is an open point.





## 4. Open points and Academia III



**Locomotives and passenger rolling stock subsystem:**

**General open points that relate to a complete network**

- 1.2. Specific requirements for CR RST to operate safely on the HS network

**Open points that relate to technical compatibility between the vehicle and the network**

- 4.2.3.5.2.1. Axle bearing condition monitoring. Range of working temperature for trackside equipment
- 4.2.3.4.2. Running dynamic behaviour. Reference track for tests (track geometric quality)
- 4.2.3.4.3.2. Wheelsets equivalent conicity. In-service value of wheelset equivalent conicity
- 4.2.4.8.3. Braking system independent of adhesion conditions. Eddy current track brake

**Open points that do not relate to technical compatibility between the vehicle and the network**

- 4.2.1. Safety related functions: Safety level not specified in clauses:
- 4.2.3.4 (dynamic behaviour; design option with software)
- 4.2.3.3.2. Axle bearing condition monitoring. Option onboard equipment
- 4.2.3.5.2.3. Variable gauge wheelsets. Conformity assessment.
- 4.2.6.2.1. Slipstream effect on passengers on platform (for speed higher than 160 km/h): Train formation for assessment of the single unit not defined
- 4.2.6.2.5. Cross wind. Cross wind effect for all CR rolling stock: harmonised characteristics of wind to be considered and assessment method



## 4. Open points and Academia IV

### An example of consequences:



Track shift after a test run with an older diesel engine. From Pollach O. "Influence of Wheel/Rail contact geometry of the behaviour of a railway vehicle at stability limit, ENOC 2005, Eindhoven, The Netherlands, 2005

## 4. Open points and Academia V

**Another example of consequences:**



Inadequate wheel profile: head shelling and checking, Rolling contact fatigue

## 4. Open points and Academia VI



### SHIFT²RAIL research priorities



**IP1: Energy & Mass Efficient Technologies for High Capacity Trains**



**IP2: Advanced Traffic Management & Control Systems**



**IP5: Technologies for Sustainable & Attractive European Freight**



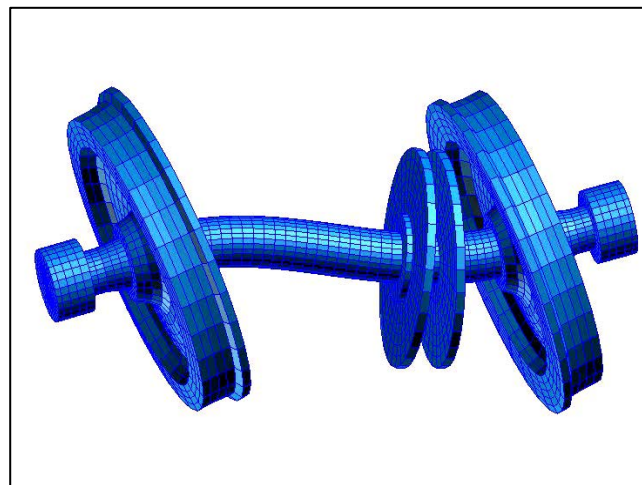
**IP4: IT Solutions for a Seamless Attractive Railway**



**IP3: Cost Efficient High Capacity Infrastructure**

## 5. Integrating TSI and National Standards

- National standards and TSIs
- National Agencies and ERA
- This will take a number of years
- Universities in each Member state, neutral and independent bodies to help towards this integration and unification







## 6. Conclusions

- Draft Directive benefits manufacturers and considers how to protect Infrastructure managers
- A significant number of European Universities very active in specific railway technology education and ready to provide qualified personnel
- Shift<sup>2</sup>Rail (Horizon 2020) to help in open points of TSIs. This needs active support from the Commission and from Research and Transport Committees of the European Parliament
- Universities in each Member state, neutral and independent bodies ready to help in integration of TSIs and National Standards.



# Thank you for your attention