RFI
RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

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EU AGENCY FOR RAILWAYS TRAINING COURSE

Field tests for assessing TSIs basic parameters for placing in service interoperable lines

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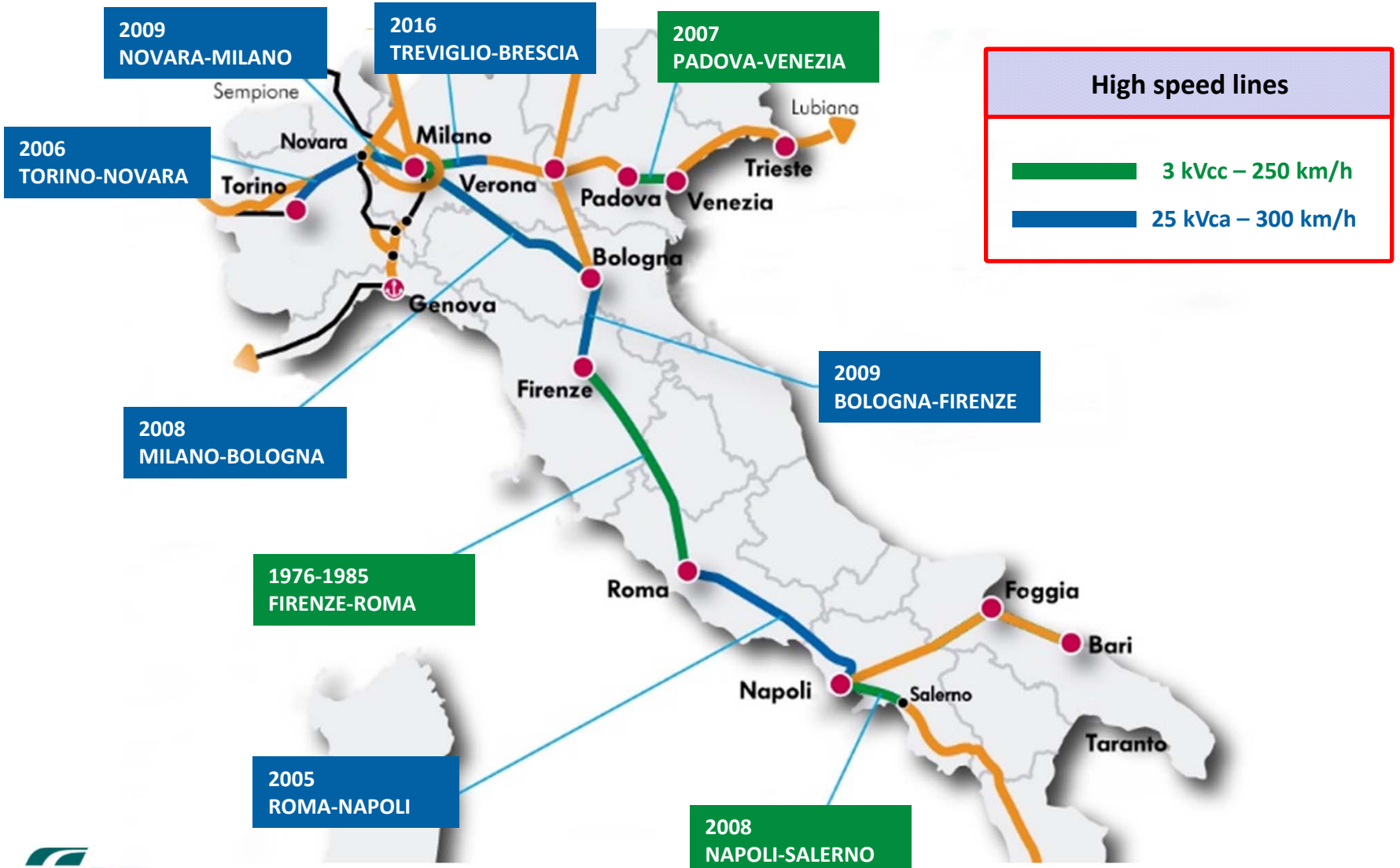
RFI at glance - Introduction to Italian railway network

Railway lines	16,726 km
Double track lines	7,558 km
Single track lines	9,168 km
Electrified lines	11,931 km
Non electrified lines	4,783 km
High Speed	1350 km
Conventional	22,933 km
Station 2,212	2,212

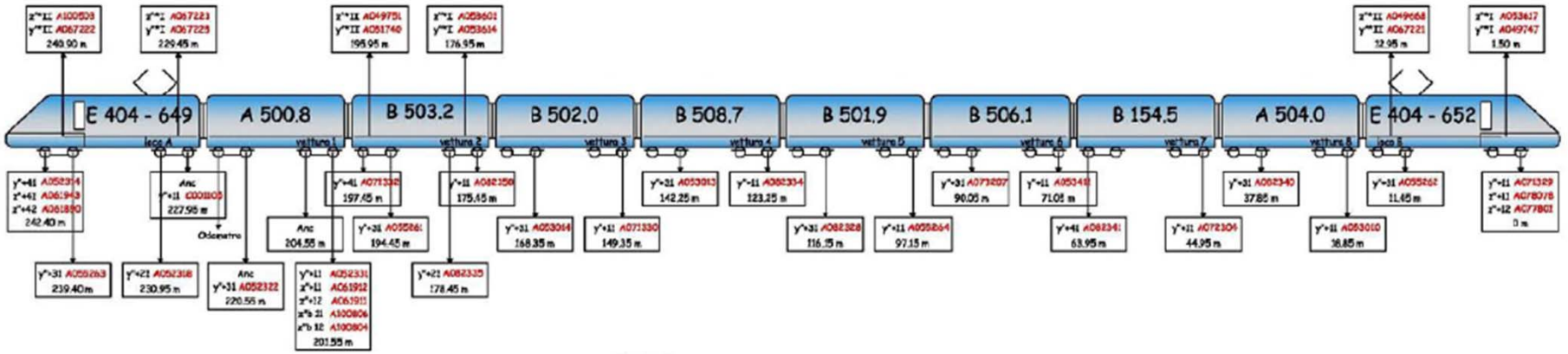
RFI at glance - HS Network at 2017



RFI's test train ETR 500 Y1- Introduction

Train ETR500 Y1 is equipped with measuring system that allows:

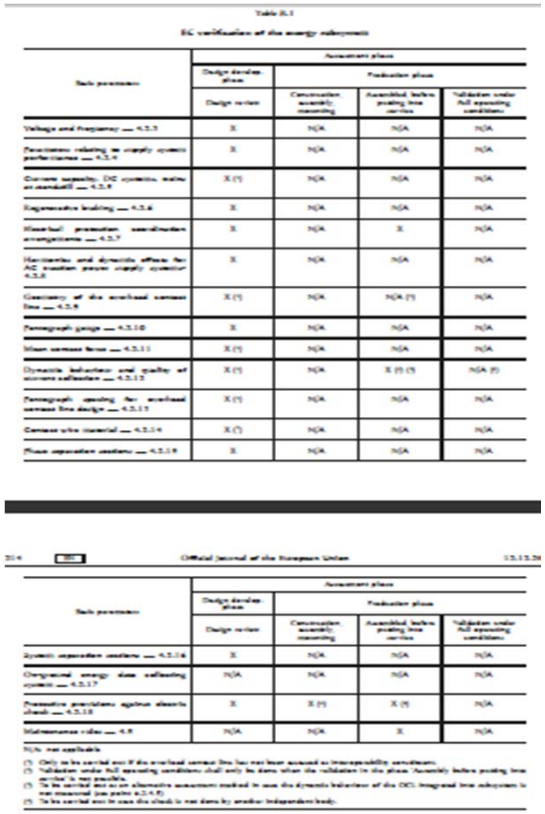
- Evaluation of quality of current collection:
- Catenary diagniosis
- Track diagnosis
- Signalling sistems diagnosis
- Telecommunication systems diagnosis



ENE TSI related tests – Introduction

ENE TSI App.B

EC verification of the energy subsystem



4.2.12 Dynamic behaviour and quality of current collection

6.1.4.1. Assessment of dynamic behaviour and quality of current collection

4.2.12. *Dynamic behaviour and quality of current collection*

(1) Depending on the assessment method, the overhead contact line shall achieve the values of dynamic performance and contact wire uplift (at the design speed) set out in Table 4.2.12.

Table 4.2.12

Requirements for dynamic behaviour and current collection quality

Requirement	v ≥ 250 [km/h]	250 > v > 160 [km/h]	v ≤ 160 [km/h]
Space for steady arm uplift	$2S_0$		
Mean contact force F_m	See 4.2.11		
Standard deviation at maximum line speed σ_{max} [N]	$0,3F_m$		
Percentage of arcing at maximum line speed, NQ [%] (minimum duration of arc 5 ms)	≤ 0,2	≤ 0,1 for AC systems ≤ 0,2 for DC systems	≤ 0,1

(2) S_0 is the calculated, simulated or measured uplift of the contact wire at a steady arm, generated in normal operating conditions with one or more pantographs with the upper limit of F_m at the maximum line speed. When the uplift of the steady arm is physically limited due to the overhead contact line design, it is permissible for the necessary space to be reduced to $1,5S_0$ (refer to EN 50119:2009, clause 5.10.2).

(3) Maximum force (F_{max}) is usually within the range of F_m plus three standard deviations σ_{max}; higher values may occur at particular locations and are given in EN 50119:2009, table 4, clause 5.2.5.2. For rigid components such as section insulators in overhead contact line systems, the contact force can increase up to a maximum of 350 N.

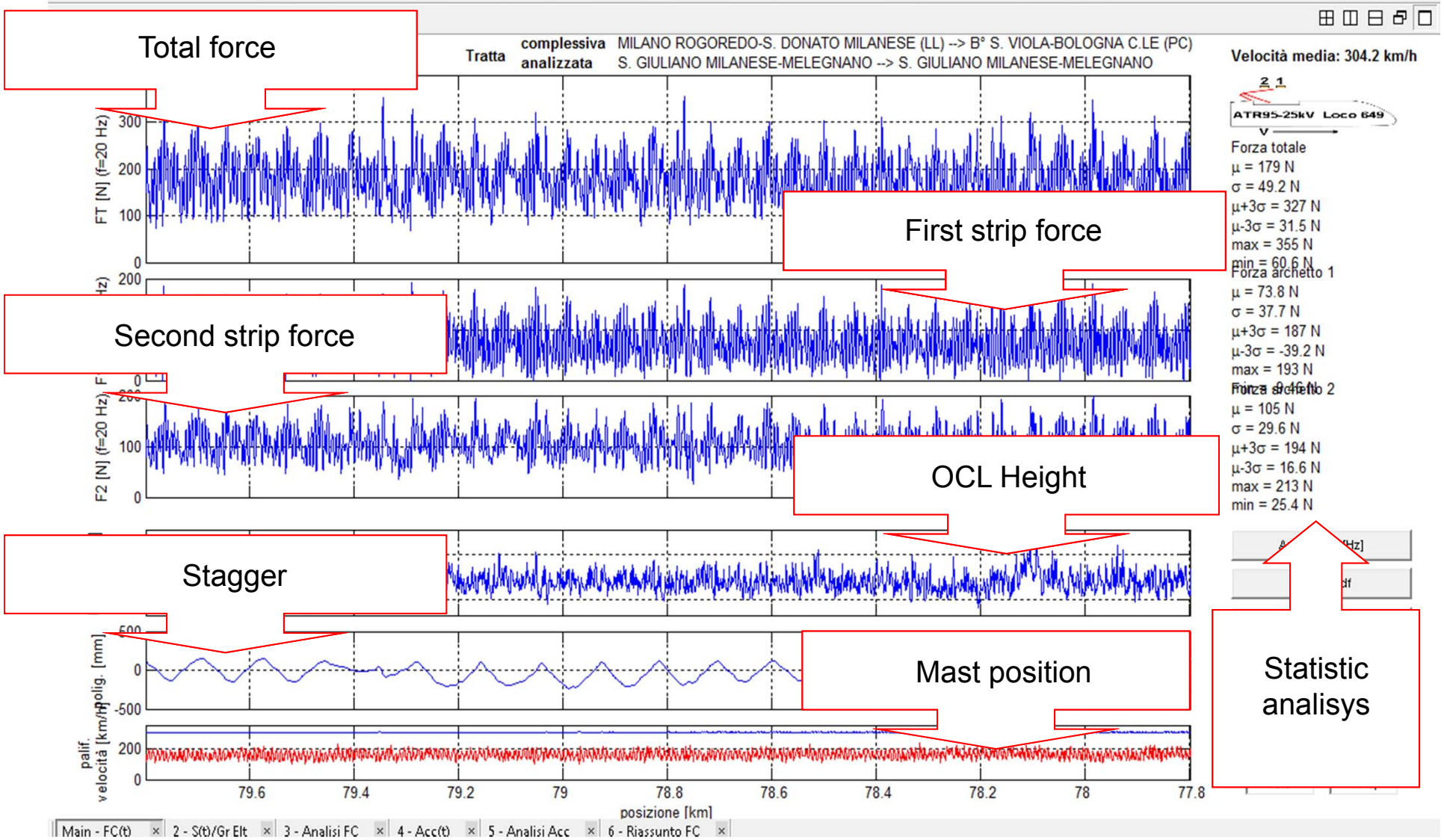
Reference standards

EN 50119

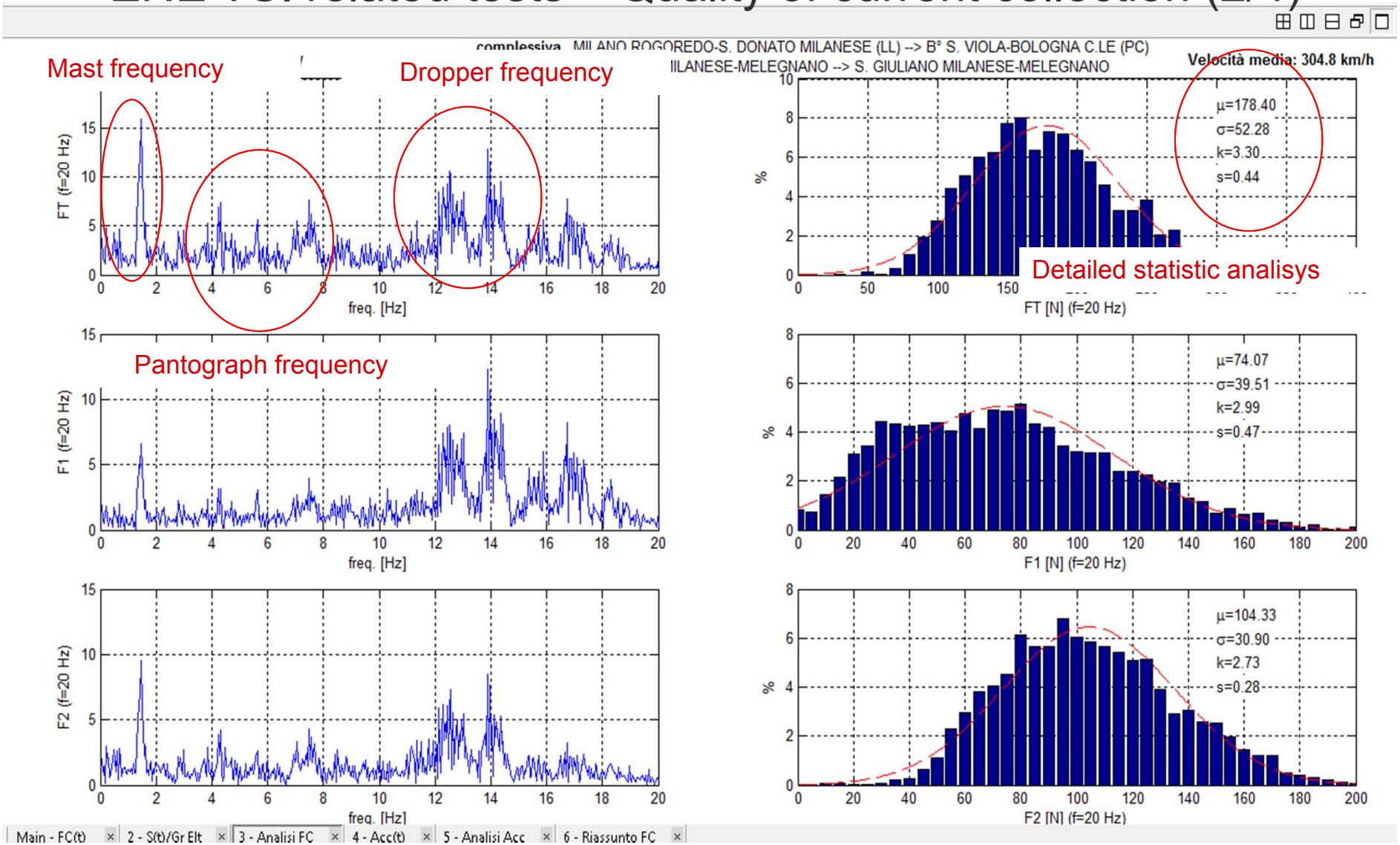
EN 50367

EN50317

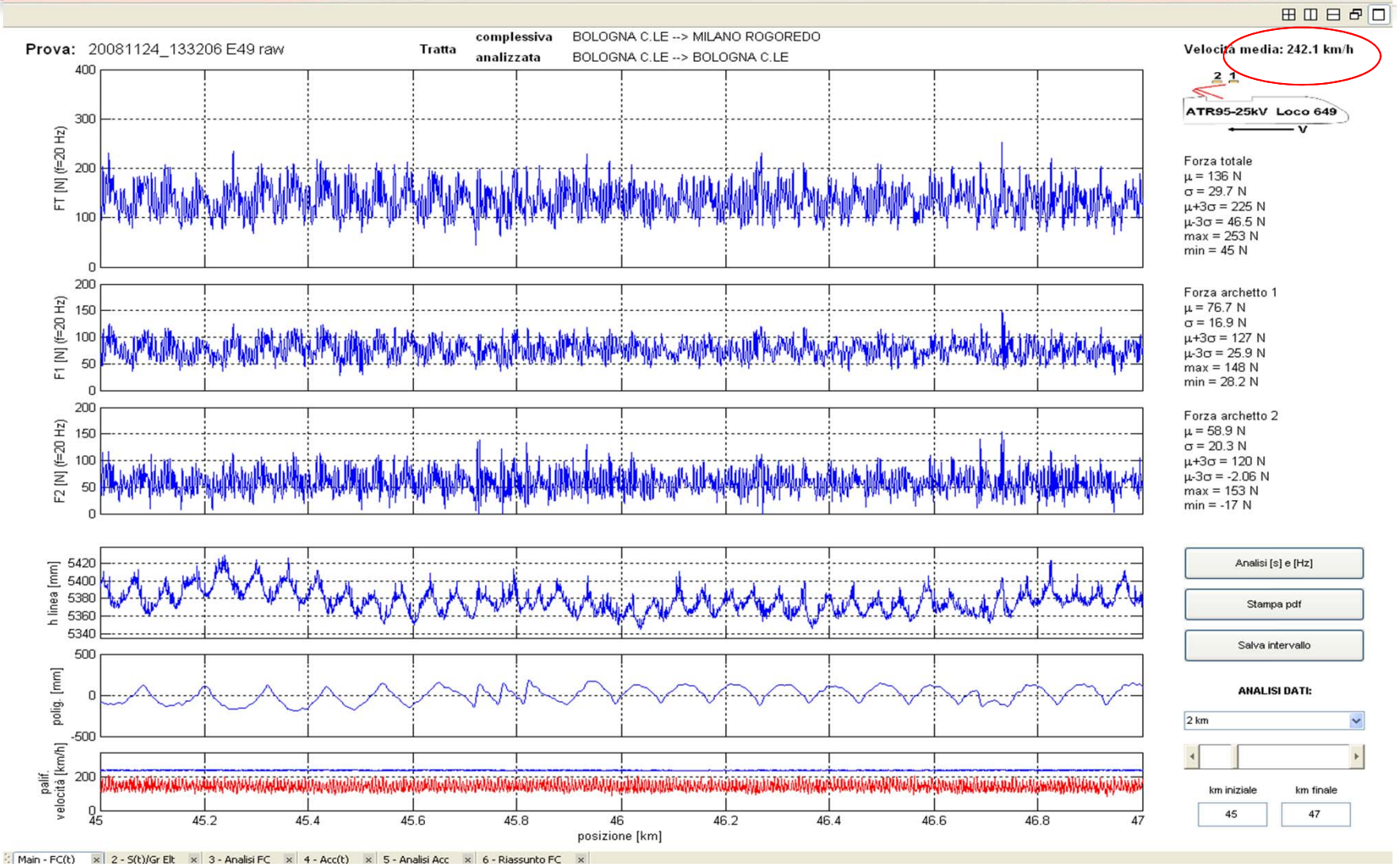
ENE TSI related tests – Quality of current collection (1/4)



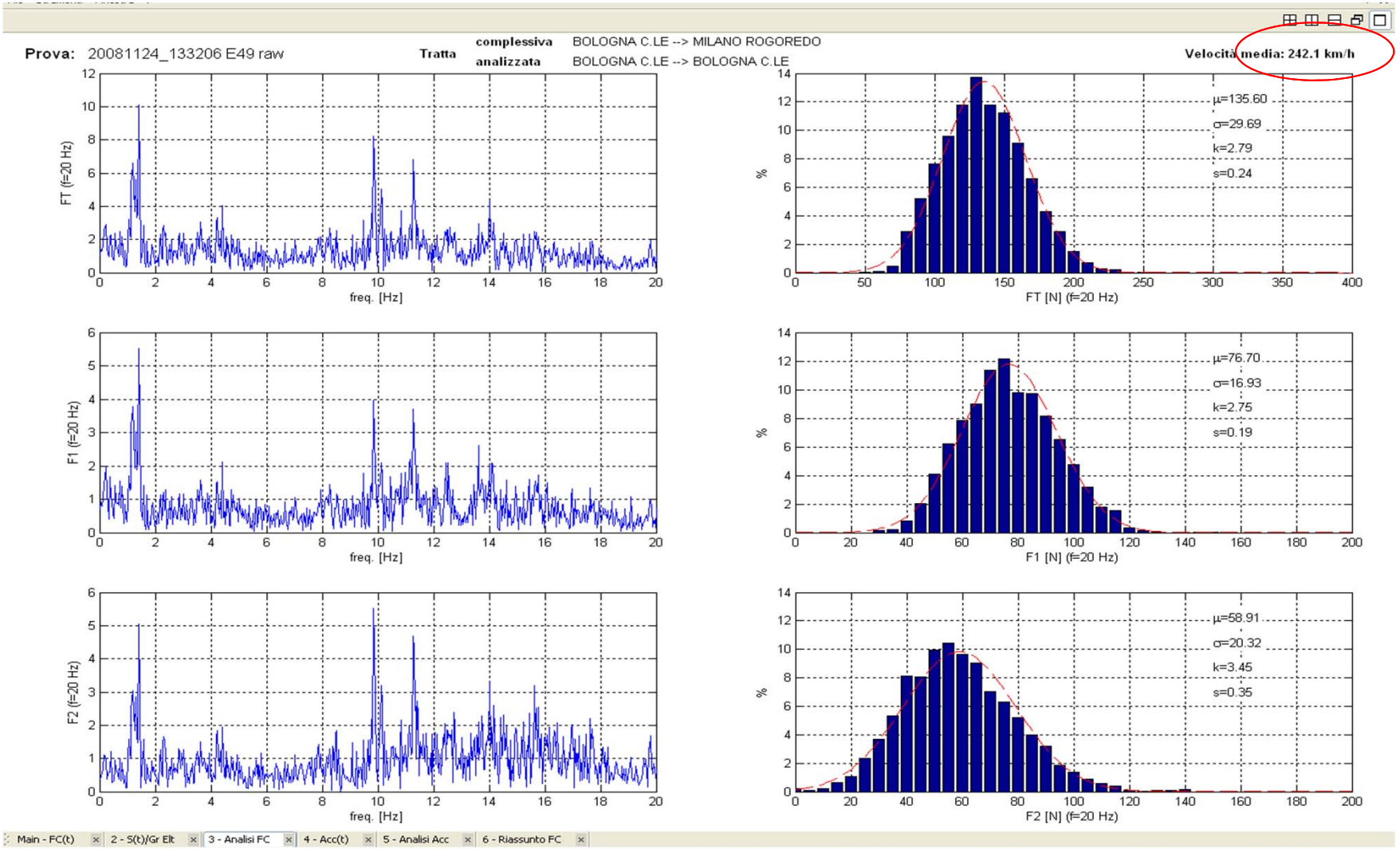
ENE TSI related tests – Quality of current collection (2/4)



ENE TSI related tests – Quality of current collection (3/4)



ENE TSI related tests – Quality of current collection (4/4)



ENE TSI related tests – Uplift

Data	Ora	Treno	Corsa	Senso marcia	Temperatura	Umidità rel	ID misura	Distanza da LDC	Angolazione	Velocità bordo	H_{max}	H_{min}	H_{max}-H_{min}	Velocità terra
					[°C]	[%]		[m]	[°]	[km/h]	[mm]	[mm]	[mm]	[N]
28/06/2016	00:52	1000	1	FI-RM	15,1	>90	161	8,855	1,5	252	36,72	-24,95	61,67	248,40
28/06/2016	01:48	1000	2	RM-FI	14,0	>90	162	8,855	1,5	270	34,65	-19,31	53,96	266,00
28/06/2016	02:37	1000	3	FI-RM	13,2	>90	163	8,855	1,5	257	39,56	-22,52	62,08	248,20
28/06/2016	03:23	1000	4	RM-FI	12,7	>90	164	8,855	1,5	285	40,43	-28,54	68,97	
28/06/2016	04:36	Y1	5	RM-FI	12,6	>90	165	8,855	1,5		25,11	-19,92	45,03	251,90

INF TSI related tests – Introduction

INF TSI App.B Assessment of the infrastructure subsystem

Assessment of the infrastructure subsystem

The characteristics of the subsystem to be assessed in the different phases of design, construction and operation are marked by 'X' in Table 37.

Where no assessment by a notified body is required, this is marked by 'n.a.' in the table. This does not prevent the need for other assessments to be performed in the framework of other phases.

INF TSI related tests – Related standard

Reference standards:

[1] EN 14363, “Railway applications – Testing for the acceptance of running characteristics of railway vehicles – Testing of running behavior and stationary tests”;
[2] EN 13848 -5 “Railway applications – Track – Track geometry quality – Part. 5: Geometric quality levels”.

Related standards:

[3] RFI TCAR ST AR 01 001 D “Standard di Qualità Geometrica del Binario e Parametri di Dinamica di Marcia per Linee con Velocità Fino a 300 km/h”, Emissione per applicazione 31/01/2013.
[4] EN 13231-1 Railway application – Track- acceptance of works – Part 1: works on ballasted track – Plain line
[5] EN 13231-2 Railway application – Track- acceptance of works – Part 2: works on ballasted track – Switches and crossings

INF TSI related tests – Related standard (EN14363)

5.3.2.4 Limit values of ride characteristics

For the assessment of the vehicle's ride characteristics the following accelerations are used:

a) quasistatic accelerations in the vehicle body $\ddot{y}^*_{qst}$

b) maximum accelerations in the vehicle body $\ddot{y}^*_{max}$, $\ddot{z}^*_{max}$

c) root mean square of accelerations in vehicle body $\ddot{y}^*_{rms}$, $\ddot{z}^*_{rms}$

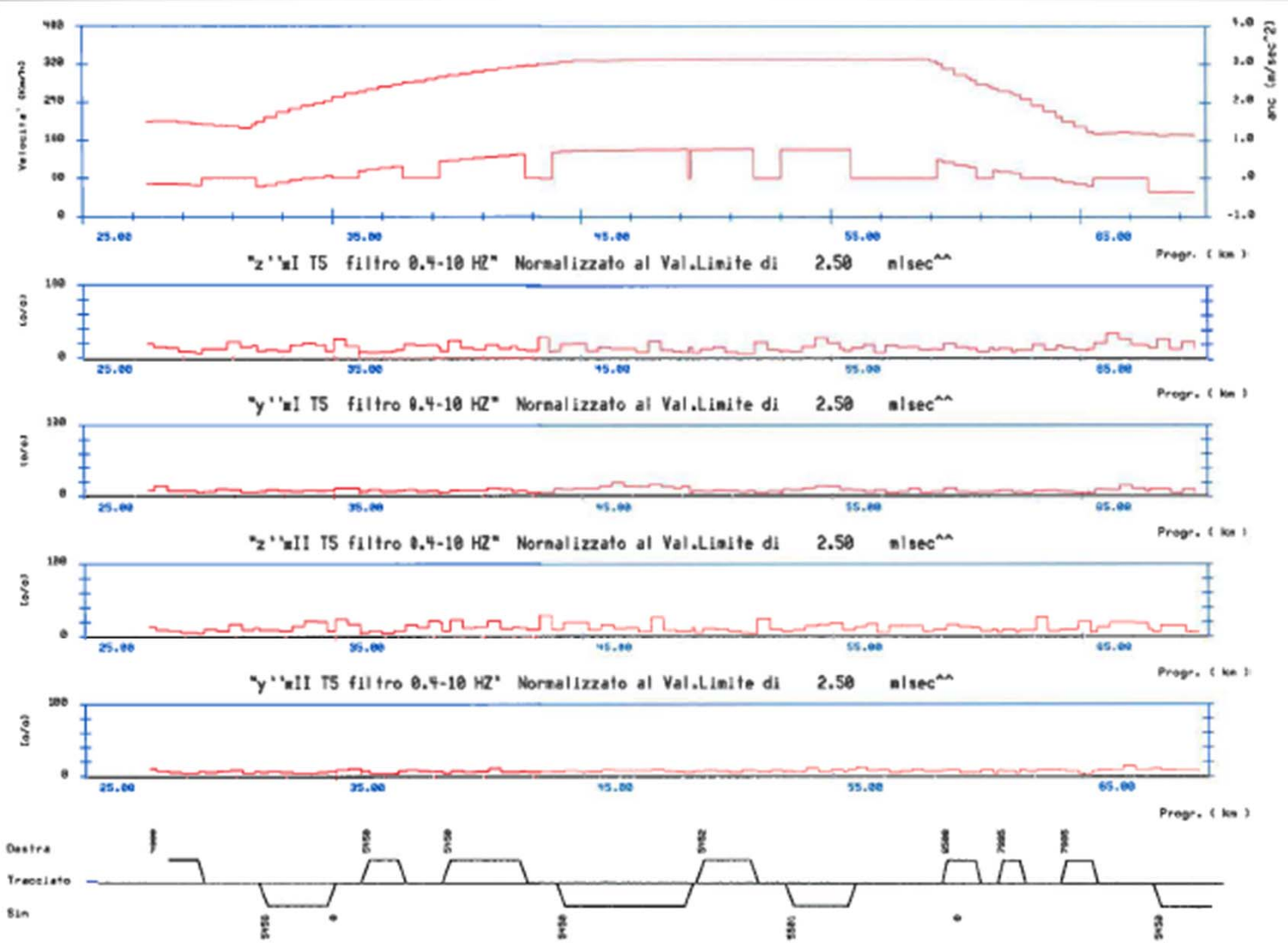
Table 5 shows the values for good ride characteristics. If higher values occur, the influence on passengers or loading safety and the strength of the vehicle and its mounted parts shall be regarded. Number and duration of the incidents as well as the service concept shall be considered.

Table 5 — Limit values for ride characteristics

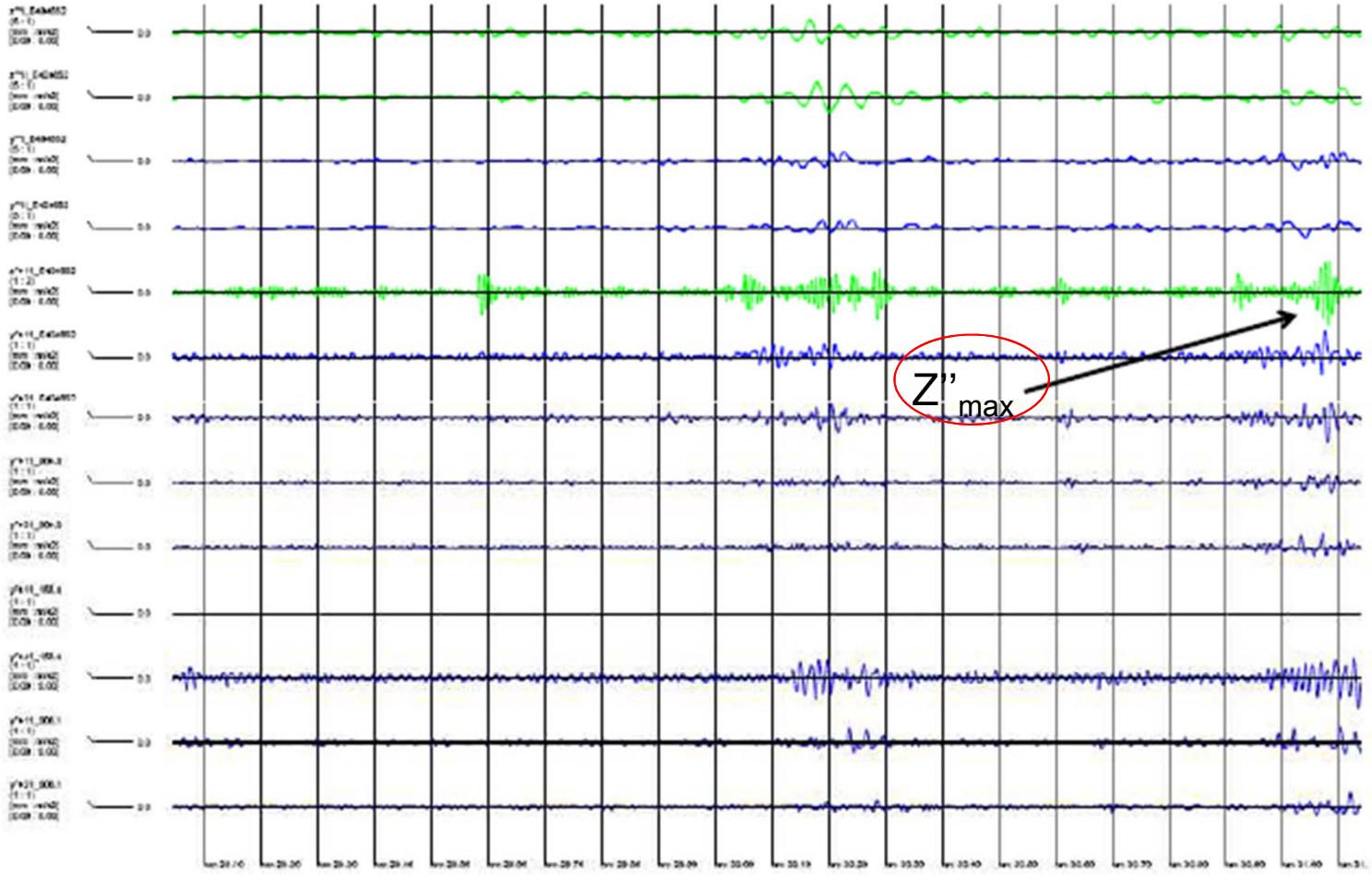
Assessment, vehicle, test conditions	Limit values for accelerations in vehicle body m/s^2				
Ride characteristics	$\ddot{y}^*_{qst,lim}$ [a]	$\ddot{y}^*_{max,lim}$	$\ddot{z}^*_{max,lim}$	$\ddot{y}^*_{rms,lim}$	$\ddot{z}^*_{rms,lim}$
Locomotives, power cars	1,5	2,5	2,5	0,5	1,0
Multiple units, passenger coaches	1,5	2,5	2,5	0,5	0,75
Freight wagons, special vehicles with bogies	1,3	3,0	5,0	1,3	2,0
Freight wagons, special vehicles without bogies	1,3	4,0	5,0	1,5	2,0

[a] Applicable only in test zones 2, 3 and 4 (curves)

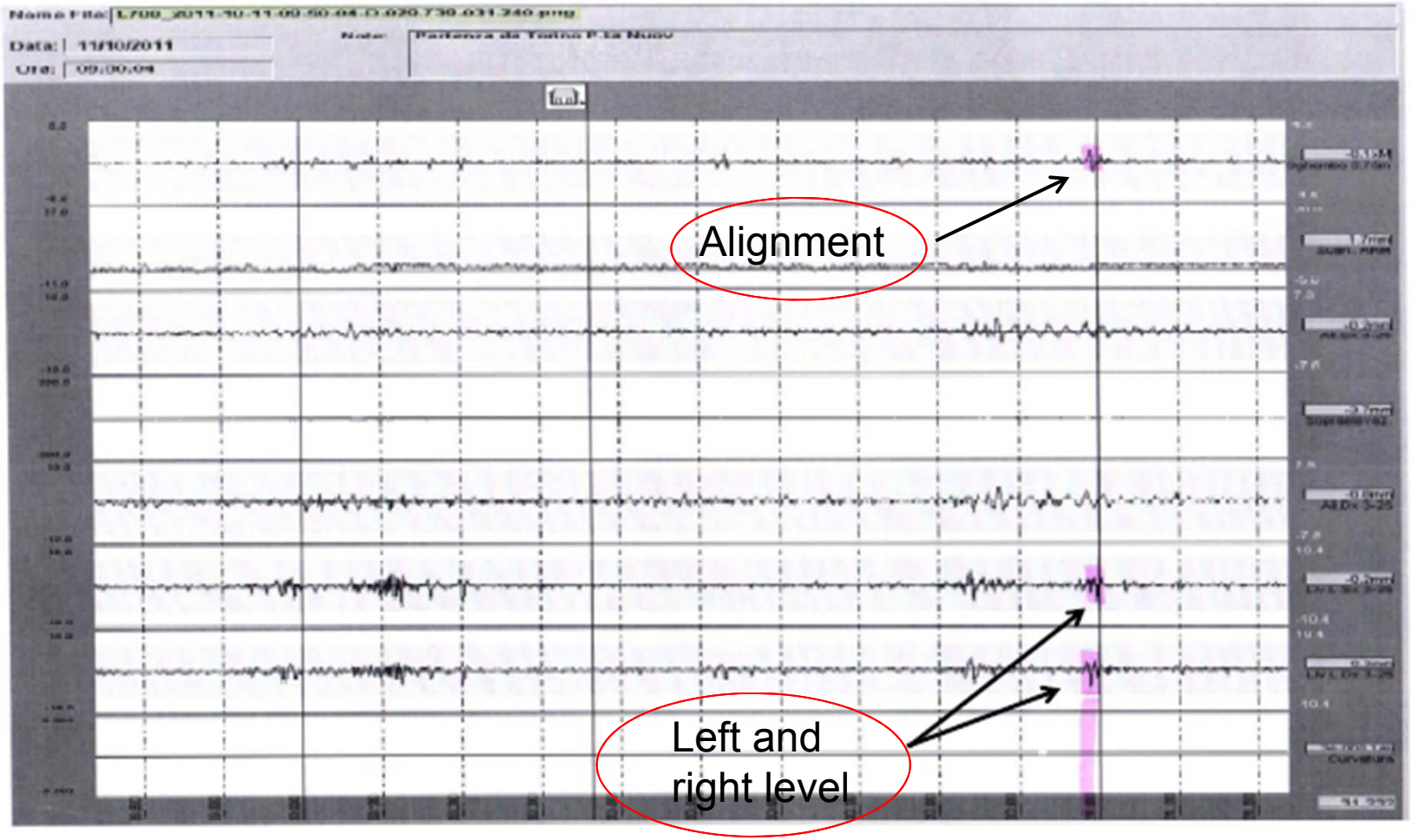
INF TSI related tests – Running behavior (1/3)



INF TSI related tests – Running behavior (2/3)



INF TSI related tests – Running behavior (3/3)



Future perspective (1/2)

Future perspective (2/2)

- RFI has gained experience in test runs up to the highest speed;
- RFI is setting up new testing train;
- Opportunity to offer railway infrastructure diagnostic services (both for maintenance and APIS purposes) on EU market.

Thank you for your kind attention

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