•**ILCAD – 02 June 2017**

•**Progress Rail**

•**Enrico Vignozzi**

•***(MD Progress Rail Italy)***

•"State of the art radar technology (76GHz) to prevent
•accidents at Level Crossings"

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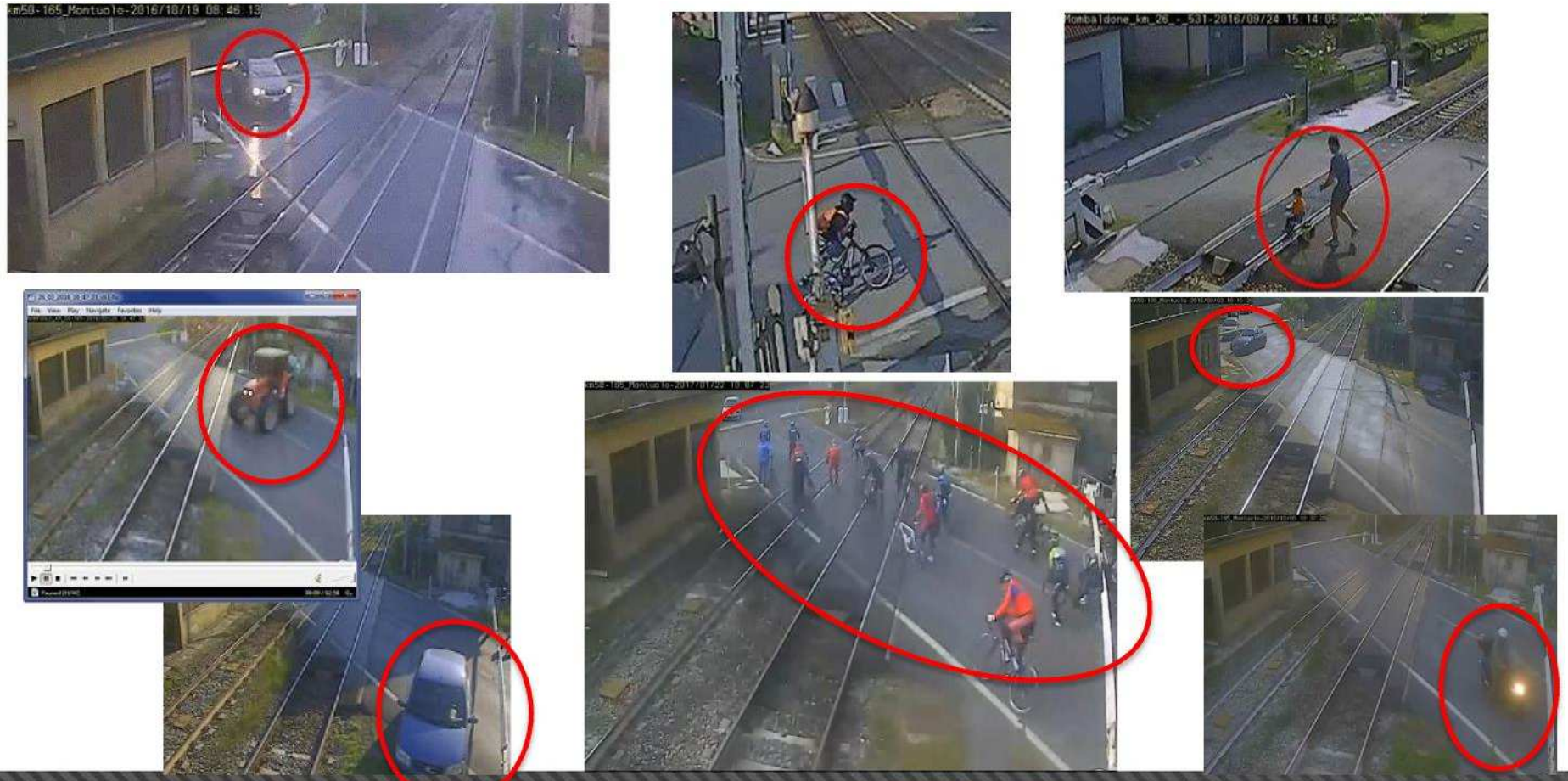
•Agenda

- Accidents Prevention by Use of Obstacle Detection at Level Crossings
- New Evolution – MIRA : use of advanced 76GHz Radar

•Use of Obstacle Detection at level Crossings

•Hazardous behaviour at level crossings....an immediate mitigation would
•be to install traffic lights, signs and barriers system, however this does not
•totally eliminate risks



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•Italy Statistics

•Accidents at LC (RFI)							
YEAR	2010	2011	2012	2013	2014	2015	2016
Injury or Death	15	18	22	17	16	16	9
% of total accidents	15%	18%	20%	18%	17%	19%	10%

•* Source ANSF

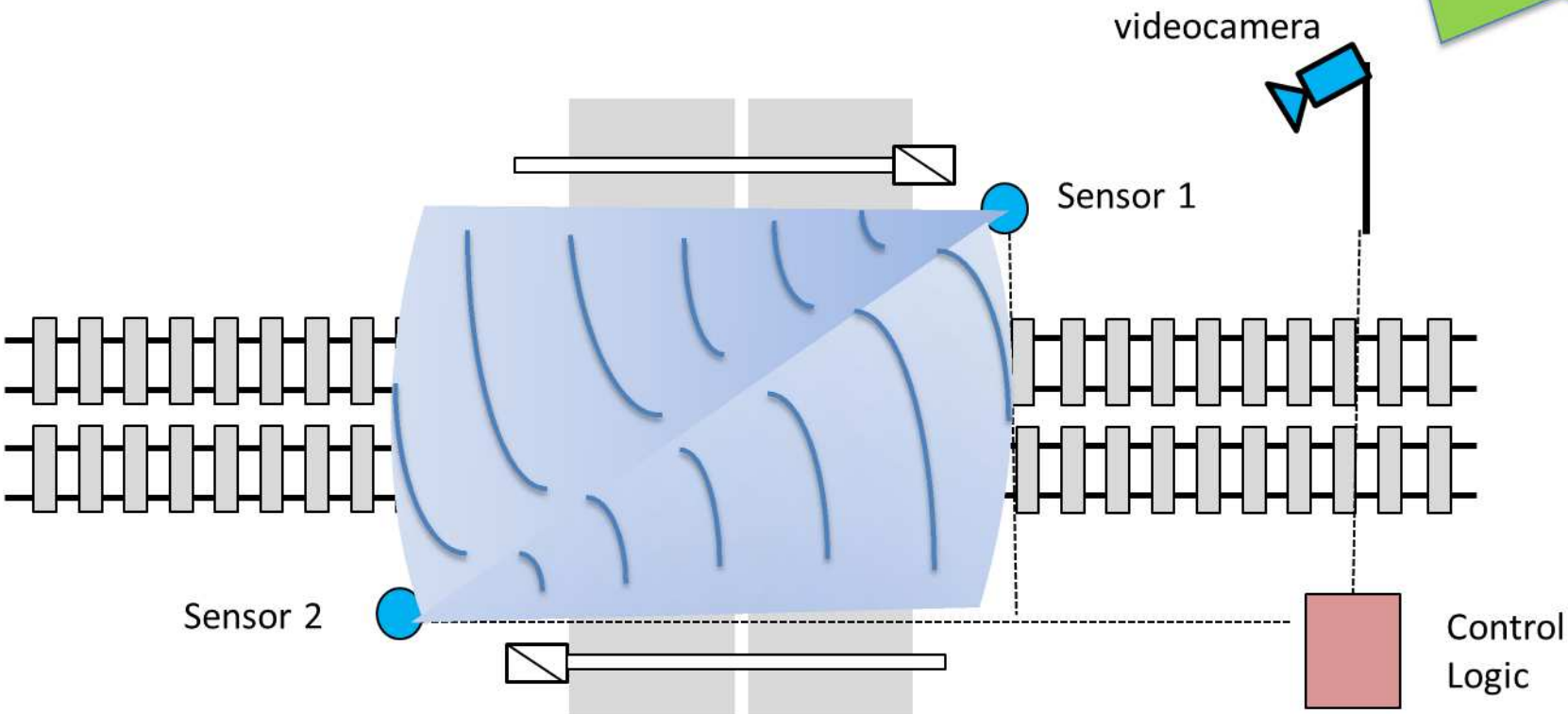
- 10% to 20% of total Railway injuries/deaths at level crossings. Trend is under control, •but still rather stable
- In 2016 we had a significant reduction vs previous years...hopefully this will continue
- Italian Railways has done continuous improvements on Safety. Level Crossings remain •an area of concern.

•One of the actions to achieve accidents reduction was to equip LC with active protection •systems (i.e. **Obstacle Detection Systems**). Based on this input Progress Rail started the •development of MIRA in 2012

•MIRA Architecture

•Component	•Function
•Sensor 1 / Sensor 2	•Radar Antennas **76GHz**
•Control Logic	•Control, Elaboration and Power supply
•Video Camera	•Auxiliary Video Camera

•CENELEC
•SIL 4 Certified
•– Detection of
•Trucks and
•Cars



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•MIRA Obstacle Detection Principles

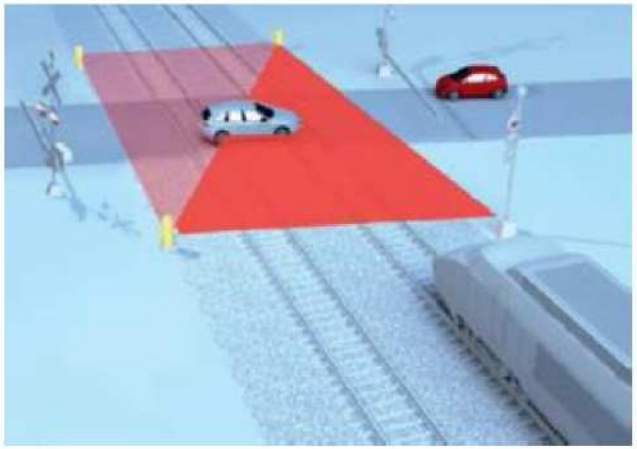
MIRA : **M**ulti **I**nspection **R**adar **A**pplication

1. As soon as gates close, MIRA scans the level crossing area to check the presence of obstacles (Trucks, Cars, Bikes, Pedestrians)

1. The results of the scanning are made available within 5 seconds

1. If the area is free, MIRA communicates to the
•Train or to the signaling system the ok for the
•train to pass at line speed.

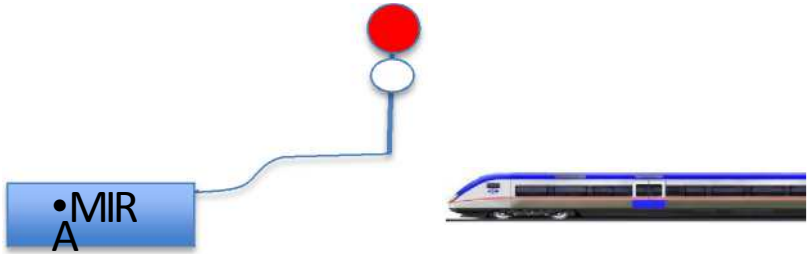
1. If an obstacle is detected, an alarm is
•generated and needs to be managed to avoid
•the accident.



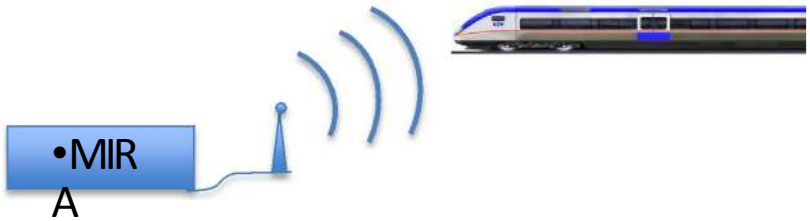
•Alarm management

•In case of alarm (obstacle present on the track area and gates closed), the following
•actions can be taken depending on Railways requirements and signaling architecture:

- **a) <u>SIGNALING ACTIVATION</u>** : Automatic Activation to «red» of the Train Approach Signal. The train will stop at the last Level Crossing entry signal.



- **a) <u>RADIO COMMUNICATION</u>** : Direct Transmission of the Alarm onboard the train through a radio system. The Train Driver will be informed of the presence of an obstacle along the track. He can consequently stop the train.

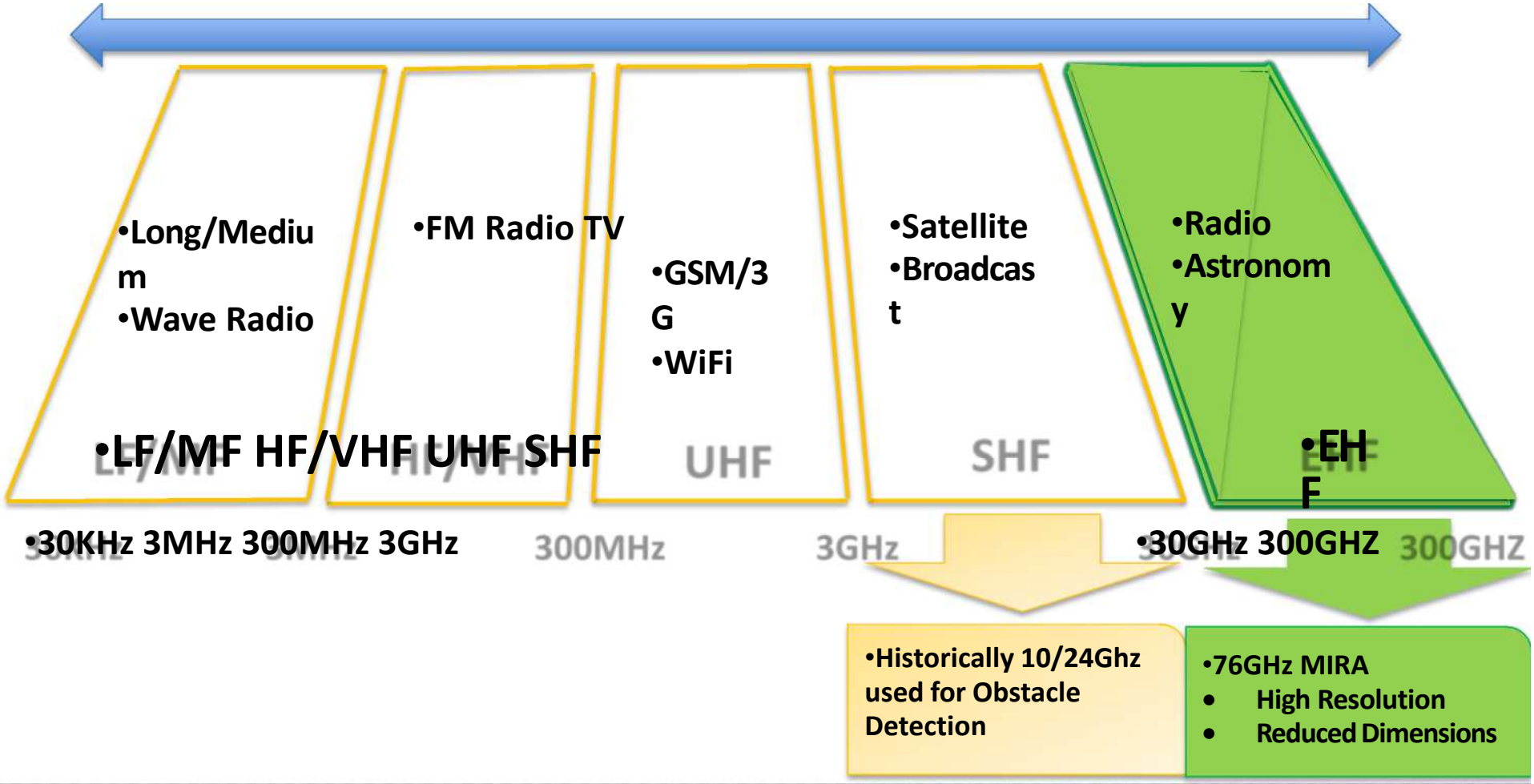


•The Remote Train Dispatcher can check the Level Crossing Area through the auxiliary video camera and consequently :

- send personnel onsite to allow a safe exit of the vehicle
- give prmission to the train to pass the level crossing at sight speed

•Frequency Allocation

•Decreasing bandwith Increasing bandwith



•Key Innovative Points

•Electromagnetic •Immunity (76GHz) • No interference 	• High Power emissions with no risk for Human Health • No need of Licensing (Frequency dedicated to the application)
•Immunity to •Weather Conditions 	• Immunity to snow, fog, rain • 2-D planar detection method provides independency from ground •conditions and its changes over time
•Maintanability •Reliability 	• Located at ground level, easily accessible to maintainers…no •complex interventions (no special equipment/stairs) • Static system…no moving parts, hence high reliability

•Pictures from actual installations

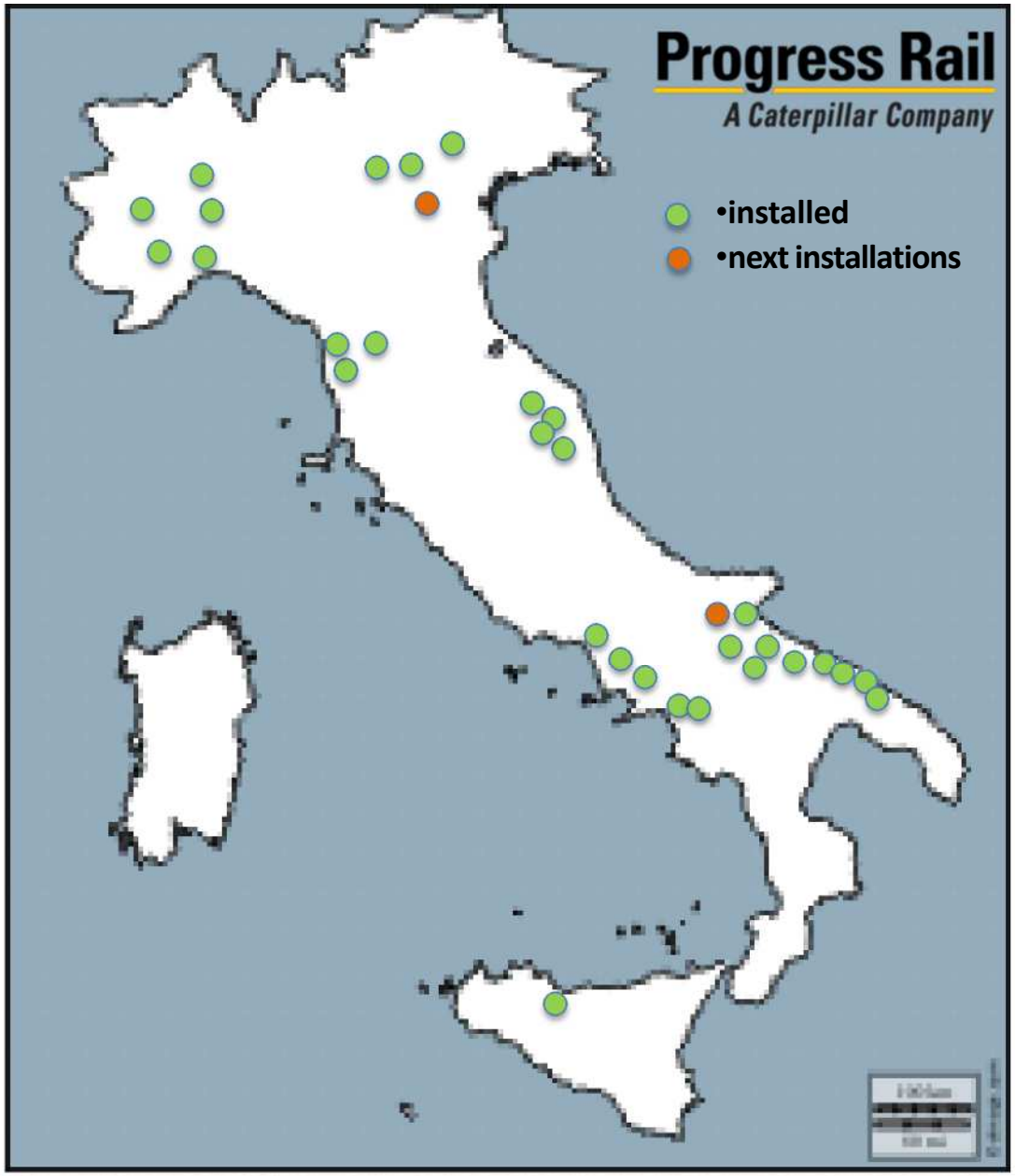
•Montuolo
•(PISA – LUCCA, DTP Firenze)

•Cressa
•(NOVARA – DOMODOSSOLA, DTP Torino)

•Progress Rail :
•Currently 40 obstacle
•Detection systems active
•in Italy

•Mombaldone Momo
•(Alessandria, DTP Torino) (NOVARA – DOMODOSSOLA, DTP Torino

•Italy - Obstacle
•Detection
•Systems by
PRS



•*Questions*
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•*Thank you for your Attention!*