

# **RESEARCH FOR ON-BOARD MONITORING TECHNOLOGY** FOR WIND SPEED AND DIRECTION AND ITS **APPLICATION ON EMU**

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## **INTRODUCTION**

The practical services and test data show that the lateral stability of EMU would be significant affected by lateral wind and it may be cause derailment or overturn. The change of flow field makes the effect of environmental wind more outstanding and complex in the case of bridge, embankment, hilly and some other special section, and which lead to the bigger risk coefficient of derailment or overturn. At present, the existing wind measuring equipment was set in a certain distance range according to the characteristic of environment. From point of macroscopic view, the results from the measuring points on the ground can give the wind speed and direction in large range, thus, the EMU could be derived based on this results. Although this rule plays an active role to some extent, it can't give the actual wind acting on the EMU. It shows from the test data that wind data from the measuring points on the ground was different from which acting on EMU, and then the correlation between wind data and dynamic response is not very strong which cause the instructiveness for the operation safety of EMU is not very perfect. Therefore, it is necessary to make a deep study on the on-board monitoring technology for wind speed and direction from the perspective of economy and function.

Thus, the detection system was developed, and by which we can compute the

## **TEST AND VERIFICATION**

- **1. Prototype and Wind Tunnel Test**
- (1) To validate the rationality of shape.
- (2) To correct the models.
- (3) To certificate the algorithm.





■ The results show that the errors meet with the request to precision.

#### 2. On-board Test (Car and EMU)





natural wind speed, direction and lateral wind speed of environment from the atmospheric, static pressure, pressure difference, temperature and running speed.









## **TECHNICAL PRINCIPLE**

**Test data**: Differential Pressure, Atmospheric Pressure, Temperature, Speed

**Calculation Results**: Wind Speed, Wind Direction, Lateral Wind Speed



The pressure vector anemography technology using silicon piezoresistive sensors, the wind pressure vector and gust pressure parameters were measured by this technology, by which the asynchrony of wind speed and direction between time and space could be eliminated. Moreover, there is no rotating parts, it can work reliably in various harsh environments.

It can be seen that the wind speed measured by the ultrasonic and that measured by the product have a certain deviation from the vehicle speed, but the deviation of the product is slightly smaller and closer to the speed of the vehicle.





- It shown from the on-board test that the monitoring technology and its production are correct and can be used as field applications.
- 3. Other Test

Air tightness, Low temperature, High temperature, Vibration

## **APPLICATION**

Based on the data of comprehensive wind test, we made a coupled analysis of measured wind speed and direction and aerodynamics test in order to demonstrate the practicability and accuracy of the monitoring system.











### **CONCLUSIONS**

- The innovative research on EMU on-board wind speed and direction monitoring technology based on the actual demand was made, and also developed the corresponding test equipment.
- A series of tests show that the developed real-time monitoring system can measure the wind speed and direction effecting on the EMU, thus the measurement precision can meet the requirements.



