

Cooperative Agreement

UPM: Prof. Cesar Briso research labs, Radiocommunications Group of EUIT
Telecommunications, Universidad Politécnica de Madrid

BJTU: Prof. Zhong Zhangdui GSM-R research labs, State Key Laboratory of Rail Traffic
Control and Safety, Beijing Jiaotong University

In the framework of the Memorandum of Understanding to promote academic cooperation between Universidad Politécnica de Madrid and Beijing Jiaotong University, we come to a cooperative agreement as following:

1. Exchange students and young teachers

To strengthen the cooperation deeply and efficiently, we plan to exchange students and young teachers for short study and project cooperation according the **Hispano-Chino and Sino Español** programs.

- (1) Exchange graduate student or Ph.D student between UPM and BJTU for nine to ten months study. (from Oct. to July)
- (2) BJTU would like to send young teachers to UPM for one to three months or six to nine months academic exchange.
- (3) BJTU provide the cost of travel and living for exchange of Chinese students and young teachers send to Spain and UPM provide the cost of travel and living for exchange of Spanish students and young teachers, send to China.
- (4) BJTU, State Key Laboratory of Rail Traffic Control and Safety provide additional financial support for the exchange students who work in China and the Radiocommunications Group of UPM provide additional financial support for exchange students who work in Spain. Both sides may offer the study and research conditions for the students and teachers from the other side.

2. Academic Exchange and Project Cooperation

- (1) Fundamental and Applied Fundamental Theory Research (The contents of academic exchange and cooperation can be chosen from the following research points)
 - I. The Development Status of High Speed Railway in Europe and China

- The current status and future trends of high speed railway network in Europe and China.

- The latest status of ETCS, CTCS and CBTC

II. Theory and relevant key techniques for GSM-R in high-speed railway

- Measuring, modeling and simulation of radio wave propagation under high-speed railway environments (including measuring and model construction methods for large and small scale signals; fast-speed and real time simulation methods)

- Anti-interference and relevant techniques for GSM-R system

- Key techniques for safe transmission in high-speed railway (including anti-nonlinear distortion techniques, redundancy techniques, transmission protocol stack for safe data)

- Evaluation system for indexes: (QoS, RAMS, etc.)

III. Future developments and evolutions for GSM-R system

- Feasibility analysis for WCDMA-R (WCDMA for Railway), LTE-R (Long-Term- Evolution for Railway) systems

- Passenger Information Services System under high-speed railway environment

- Adaptability research for key techniques of B3G/4G (OFDM, MIMO, cooperation diversity techniques, applications of Cognitive Radio, Distributed Antennas, heterogeneous network etc. in high-speed railway)

IV. Research on techniques relevant to high-speed railway

- RFID techniques

- Vehicle-to-vehicle communications

- Linearization techniques for RF power amplifier

- WiFi, WLAN etc.

(2) Professor exchange visits and international cooperation

BJTU will invite professors from UPM to visit China once every year for academic exchange. BJTU will provide part of the financial support. BJTU could also help the professors from UPM to visit other universities and research institutes in China. UPM assists BJTU to develop international relationship with other universities and research

institutes in Europe. Both sides can organize international conferences or workshops, publish papers in international journals and conferences together and share research productions.

(3) Joint Project Application

UPM and BJTU could apply for some projects together. For example, the Sino-EU international cooperation project, Sino-Spain international cooperation project; Spanish government funded project, Chinese government funded project, etc.

3. Agency of Products

Both sides could act as an agent for the products of the other side. UPM and BJTU may research and develop new products for railway communications and test tools together and share the production.

*Radiocommunications Group, GRC,
Universidad Politécnica de Madrid*



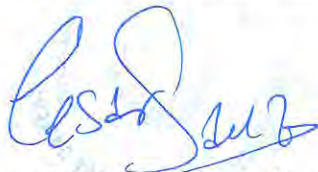
Signatura: Prof. César Briso Rodríguez
Date: 22 July 2009

*State Key Laboratory of Rail Traffic Control
and Safety, Beijing Jiaotong University*




Signature: Prof. Zhong Zhangdui
Date:

*EUIT Telecommunications,
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Signatura: Prof. César Sanz Álvaro, Director
Date: July 22nd 2009

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Signature
Date: