

## INTRODUCTION

- Focus of this research is in relation to the design and evaluation of intelligent radio transceivers for highly mobile heterogeneous networks, which are intended for public transit scenarios.
- A key aspect to consider is the interoperability of existing cellular networks with the introduction of new technologies such as LTE-Advanced and cognitive radio in vehicular environments (e.g. high-speed trains, tramways and metro systems).
- These technologies would keep up with the demand of high data and voice subscriber services and in turn, improve user experiences [1].
- An additional use-case would also be the provision of highly-reliable surveillance and monitoring services in order to aid public transit operators.
- Low powered nodes such as micro, pico and femtocells or even relay nodes, can be distributed in a public vehicular setting within an existing macro-cell resulting in heterogeneous networks with better throughput and coverage for passengers.

## ENVISIONED APPLICATIONS

### TRAMWAYS, BUSES AND BOATS

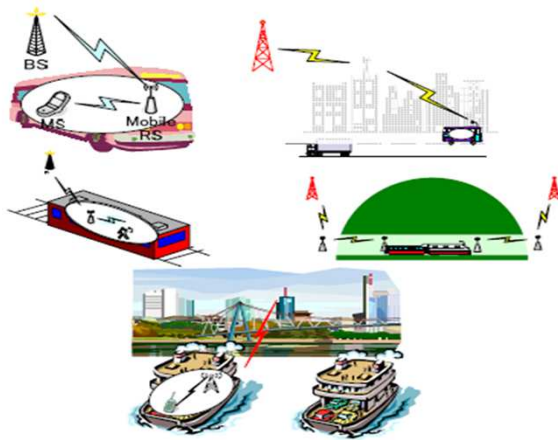


Figure 1: Typical public transit scenarios

### HIGH-SPEED TRAINS

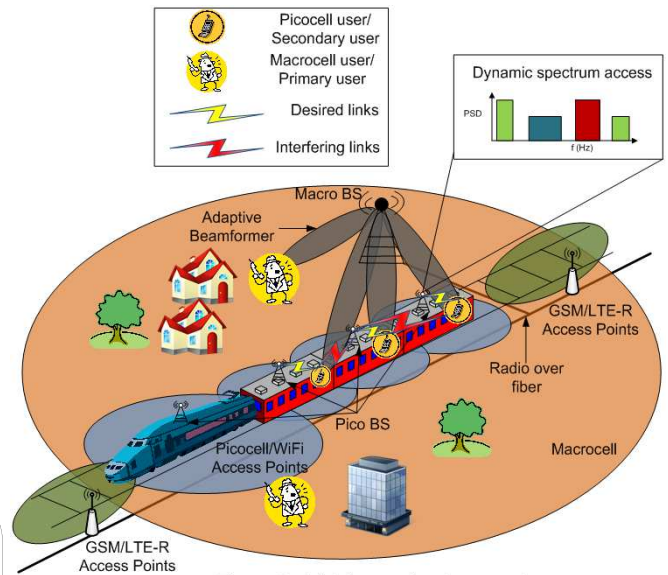


Figure 2: A high-speed train scenario

## RELATED RESEARCH PROJECTS

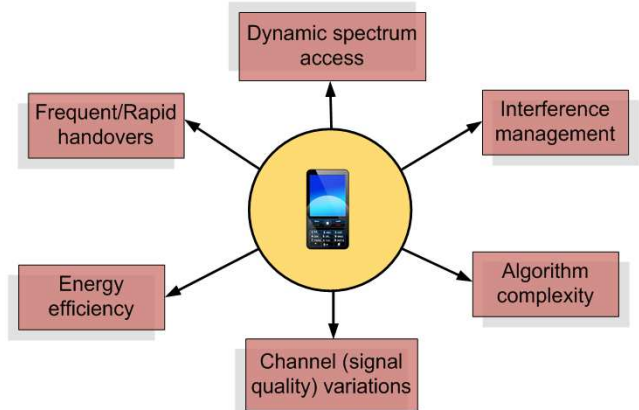


**CORRIDOR** (Cognitive Radio for Railway through Dynamic and Opportunistic Spectrum Reuse) revolves around the design and development of cognitive radio to increase quality, safety, security and reliability of high-speed rail systems.



**SYSTUF** (telecom SYStems for Future Urban Transport) project which aims to provide broadband access to trams and metro trains by exploiting next generation wireless technologies such as LTE.

## RECEIVER DESIGN CHALLENGES



## RELEVANT CONTRIBUTIONS

- High-speed robust links to base stations (possible with higher-order distributed MIMO for the pico base stations, which could be possibly situated on the roof of the carriage). Corresponding interference aware receivers can manage cross-tier and intratier interference with the potential for diversity against shadowing and spatial-multiplexing in fast-fading channel environments.
- Dynamic spectrum access techniques for intelligent mobile terminals, has potential for opportunistic spectrum reuse within the train and in a more broader context, sparsely populated (rural) areas [2].

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## REFERENCES

- [1] – O.B. Karimi and J. Liu and C. Wang, “Seamless Wireless Connectivity for Multimedia Services in High Speed Trains”, *IEEE J. Sel. Areas Commun.*, vol. 30, no. 4, pp. 729-739, May 2012.
- [2] – B. Han, Y. Liang, Z. Xie, X. Zhang and D. Yang, “An anti-interference approach in high-speed railway scenario based on dynamic spectrum adjustment”, *19th ICT 2012*, pp. 1-6, 2012.