

# Physical Layer Security in Frequency-Domain Fast-Fading TDD Time-Reversal SISO OFDM Communication

Sidney Golstein<sup>\*†</sup>, Trung-Hien Nguyen<sup>\*</sup>, François Rottenberg<sup>\*</sup>, François Horlin<sup>\*</sup>, Philippe De Doncker<sup>\*</sup>, and Julien Sarrazin<sup>†</sup>

<sup>\*</sup>Wireless Communication Group, Université Libre de Bruxelles, 1050 Brussels, Belgium

<sup>†</sup>Sorbonne Université, CNRS, Laboratoire de Génie Electrique et Electronique de Paris, 75252, Paris, France  
Université Paris-Saclay, CentraleSupélec, CNRS, Laboratoire de Génie Electrique et Electronique de Paris, 91192, Gif-sur-Yvette, France

{sigolste,trung-hien,francois.rottenberg,fhorlin,philippe.dedoncker}@ulb.ac.be  
julien.sarrazin@sorbonne-universite.fr

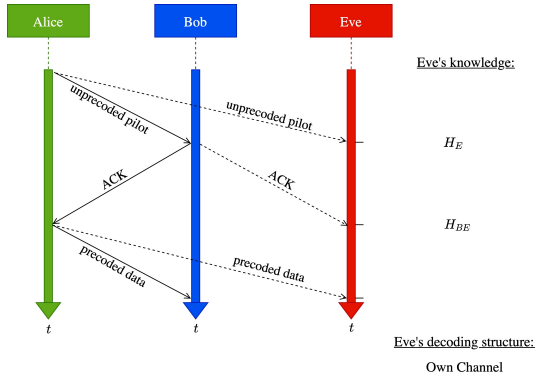


Fig. 1. FF TDD, Alice asks first for communication

**Abstract**—The abstract goes here.

**Index Terms**—Communications Society, IEEE, IEEEtran, journal, LATEX, paper, template.

## I. INTRODUCTION

THIS demo file is intended to serve as a “starter file” for IEEE Communications Society journal papers produced under LATEX using IEEEtran.cls version 1.8b and later. I wish you the best of success.

## II. SYSTEM MODEL

### A. Establishment Protocol

Parler des 3 differents protocol de communication permettant d'établir la comm avec les 3 schemes

### B. Communication Protocol

Schema de communication avec addition d AN

- 1) Received sequence at the intended : p6 rapport
- 2) Received sequence at the unintended: p6 rapport

This work was supported by the ANR GEOHYPE project, grant ANR-16-CE25-0003 of the French Agence Nationale de la Recherche and was also carried out in the framework of COST Action CA15104 IRACON.

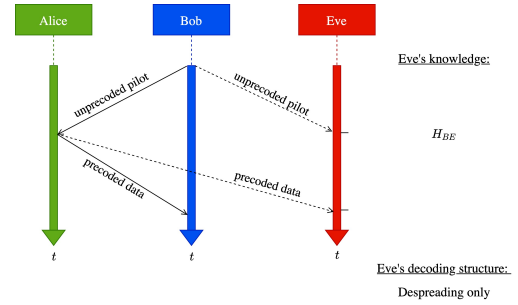


Fig. 2. FF TDD, Bob asks first for communication, no pilot sent

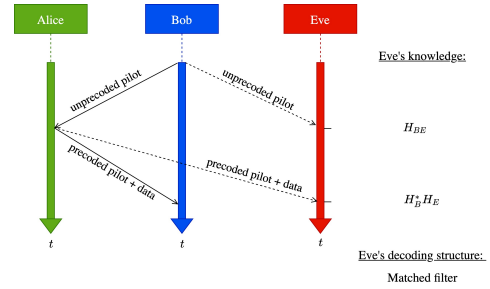


Fig. 3. FF TDD, Bob asks first for communication, pilots sent

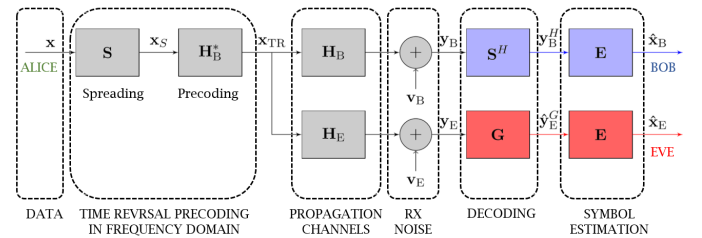


Fig. 4. Communication scheme

### C. Artificial noise Design

p5-6 rapport

### III. PERFORMANCE ASSESSMENTS

Mettre les hypotheses p7 du rapport

#### A. Hypothesis

Mettre les hypotheses p7 du rapport

#### B. SINR determination

- 1) At the intended position:
- 2) At the unintended position:
  - a) Same decoding structure as Bob:
  - b) Matched filtering:
  - c) Own channel knowledge:

#### C. Optimal amount of AN energy to inject

- 1) Same decoding structure as Bob:
- 2) Matched filtering:
- 3) Own channel knowledge:

#### D. Secrecy rate optimization via waterfilling

### IV. SIMULATION RESULTS

#### A. Comparaison between the different models

Equivalent of fig12 p15 rapport

#### B. Comparaison between models and simulations

#### C. Waterfilling optimization

### V. CONCLUSIONS

#### A. Subsection Heading Here

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

1) Subsubsection Heading Here: Lorem ipsum dolor sit amet, consectetur adipiscing elit. Ut purus elit, vestibulum ut, placerat ac, adipiscing vitae, felis. Curabitur dictum gravida mauris. Nam arcu libero, nonummy eget, consectetur id, vulputate a, magna. Donec vehicula augue eu neque. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis egestas. Mauris ut leo. Cras viverra metus rhoncus sem. Nulla et lectus vestibulum urna fringilla ultrices. Phasellus eu tellus sit amet tortor gravida placerat. Integer sapien est, iaculis in, pretium quis, viverra ac, nunc. Praesent eget sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

### APPENDIX A

#### PROOF OF THE FIRST ZONKLAR EQUATION

Appendix one text goes here.

### APPENDIX B

OKAY

Appendix two text goes here.

### ACKNOWLEDGMENT

The authors would like to thank...

### REFERENCES

- [1] H. Kopka and P. W. Daly, *A Guide to L<sup>A</sup>T<sub>E</sub>X*, 3rd ed. Harlow, England: Addison-Wesley, 1999.

**Michael Shell** Biography text here.

PLACE  
PHOTO  
HERE

**John Doe** Biography text here.

**Jane Doe** Biography text here.