Presentation Structure

# Outline (1 page)

### Introduction: Large MIMO, GPGPU, CUDA programming principle

### MIMO system Model and Fixed Complexity Sphere Decoder

### GPU Based Acceleration of FCSD

### Performance

### Discussion and Conclusion

# Introduction

### Large MIMO system: text description and figure

### GPGPU: text description and figure (show the data processing power and microarchitecture of GPU)

### CUDA programming: basic description

# MIMO System Model and Fixed Complexity Sphere Decoder

### MIMO system model: discrete time system model (channel, transmitted symbols, noise)

### Fixed Complexity Sphere Decoder: ML detection criterion, Tree searching (full expansion, single expansion, postprocessing SNR, channel ordering, decision feedback), post processing (calculation of Euclidean distance of all possible candidates).

# GPU Based Acceleration of FCSD

### cuBlas Based implementation of preprocessing: Unconstrained estimation of s including matrix multiplication and matrix inverse. Furthermore the channel ordering also involves large amount of matrix operation. Arithmetic operations of matrix has the parallel nature.

### Integrated Parallel Acceleration of Paths Searching: data preparation, thread allocation and integration of post-processing Euclidean distance.

# Performance

### Acceleration table and discussion

### BER-SNR curves

# Discussion and Conclusion

### Minimize data transmission

### Memory access pattern

### Large system and high order QAM modulation

### Conclusion

### Preprocessing process of FCSD includes calculation of unconstrained estimation s hat in (), QR factorization as well as iterative channel ordering.