### Lattice codes and sphere decoding

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Bachelor's thesis Espoo 10.7.2017

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Title: Lattice codes and sphere decoding				
Date: 10.7.2017	Language: English	Number of pages: 4+7		
Degree programme: Mathematics and Systems analysis				
Supervisor: Prof. Camilla Hollanti				
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Keywords: sphere decoding, lattice codes, information technology				

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### Symbols and abbreviations

#### **Symbols**

**B** magnetic flux density

c speed of light in vacuum  $\approx 3 \times 10^8 \text{ [m/s]}$ 

 $\omega_{\rm D}$  Debye frequency

 $\omega_{\mathrm{latt}}$  average phonon frequency of lattice

↑ electron spin direction up↓ electron spin direction down

#### **Operators**

 $\nabla \times \mathbf{A}$  curl of vectorin  $\mathbf{A}$ 

 $\frac{\mathrm{d}}{\mathrm{d}t}$  derivative with respect to variable t

 $\partial$ 

 $\frac{\partial}{\partial t}$  partial derivative with respect to variable t

 $\sum_{i}$  sum over index i

 $\mathbf{A} \cdot \mathbf{B}$  dot product of vectors  $\mathbf{A}$  and  $\mathbf{B}$ 

#### Abbreviations

AC alternating current

APLAC an object-oriented analog circuit simulator and design tool

(originally Analysis Program for Linear Active Circuits)

BCS Bardeen-Cooper-Schrieffer

DC direct current

TEM transverse eletromagnetic

# 1 Introduction

- 2 Lattices in communications technology
- 2.1 Closest vector problem

# 3 Sphere decoder

# 4 Simulations and results

# 5 Summary

### References

[1] Mäki, M. Space-time block codes and the complexity of sphere decoding. *Doria*, Referenced 10.7.2017. Available: https://www.doria.fi/bitstream/handle/10024/54404/gradu2008maki-miia.pdf