# Lattice codes and sphere decoding

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# Contents

# Symbols and abbreviations

## Symbols

| | |
|---|---|
| **B** | magnetic flux density |
| $c$ | speed of light in vacuum $\approx 3 \times 10^8$ [m/s] |
| $\omega_{\mathrm{D}}$ | Debye frequency |
| $\omega_{\mathrm{latt}}$ | average phonon frequency of lattice |
| $\uparrow$ | electron spin direction up |
| $\downarrow$ | electron spin direction down |

## Operators

| | |
|---|---|
| $\nabla \times \mathbf{A}$ | curl of vectorin **A** |
| $\dfrac{\mathrm{d}}{\mathrm{d}t}$ | derivative with respect to variable $t$ |
| $\dfrac{\partial}{\partial t}$ | partial derivative with respect to variable $t$ |
| $\sum_i$ | sum over index $i$ |
| $\mathbf{A} \cdot \mathbf{B}$ | dot product of vectors **A** and **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