

Non invasive measurement theory  
Optical measurements:  
Measurement of Heat Expansion by Triangulation

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Torbjørn Ludvigsen, tolu0022@student.umu.se  
Wenye Liu, wenyeliu1992@gmail.com

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**Abstract**

$\alpha_{alu} = (23.0 \pm 0.1) \cdot 10^{-6} \text{ K}^{-1}$   
 $\alpha_{sst} = (15.8 \pm 0.2) \cdot 10^{-6} \text{ K}^{-1}$ , which is only 1 % off tabulated values  
[1, ?].

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Supervisor: Patrick Ehlers  
Isak Silander  
Amir Khodabakhsh

## 1 Introduction

## 2 Theory

### 2.1 Optics

### 2.2 Circuits

### 2.3 maths

By beginning with the equation

$$v_{max} = Ce^{at} + De^{bt}.$$

By breaking out  $e^{at}$  and taking the logarithm we end up with the equation

$$\ln(v_{max}) = \ln(C + De^{\frac{b}{a}t}) + at$$

For small  $t$  the first term will be nearly constant. A linear fit can be made to find the slope  $a$ . In a similar fashion we can break out  $e^{bt}$

## 3 Experimental Setup

## 4 Procedure

## 5 Error calculations

## 6 Results

## 7 Discussion

## 8 Summary and Conclusions

## References

- [1] Nordling, C., Österman, J. (2006). *Physics Handbook 8<sup>th</sup>*  
Lund, Sweden, Studentlitteratur.