

PP Gruppe 8

28. Januar 2014

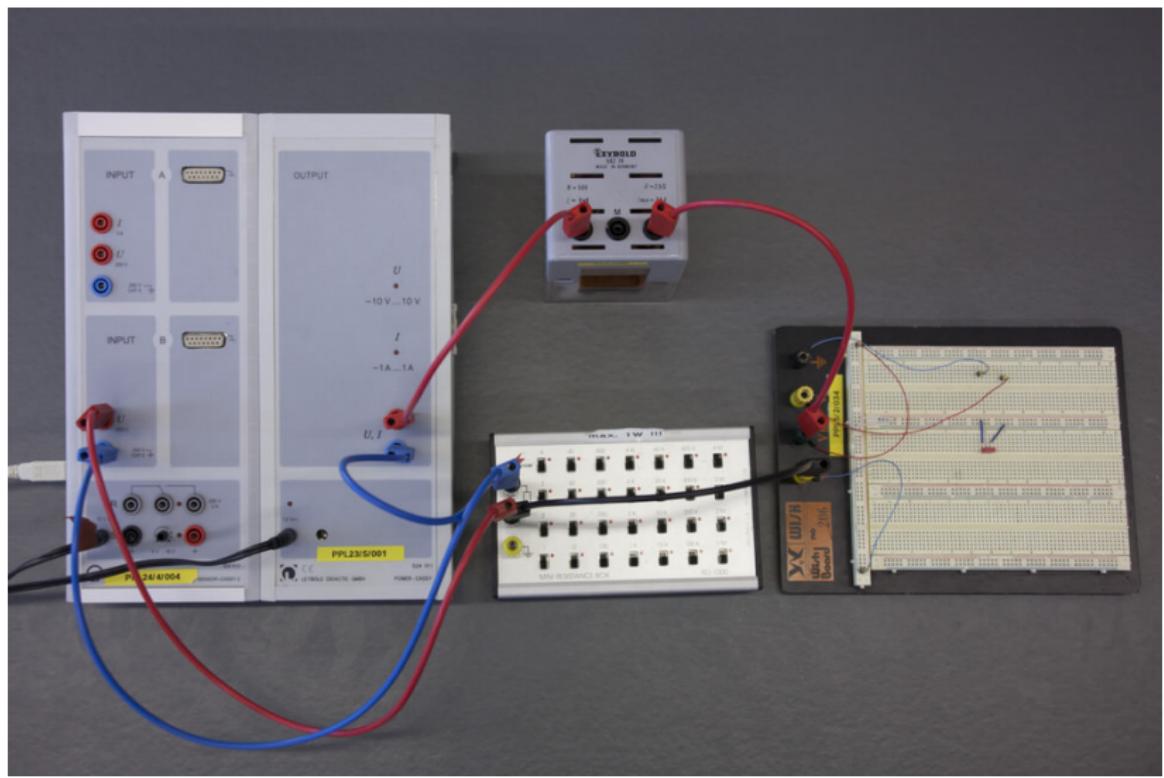
1 Frequenzfilter

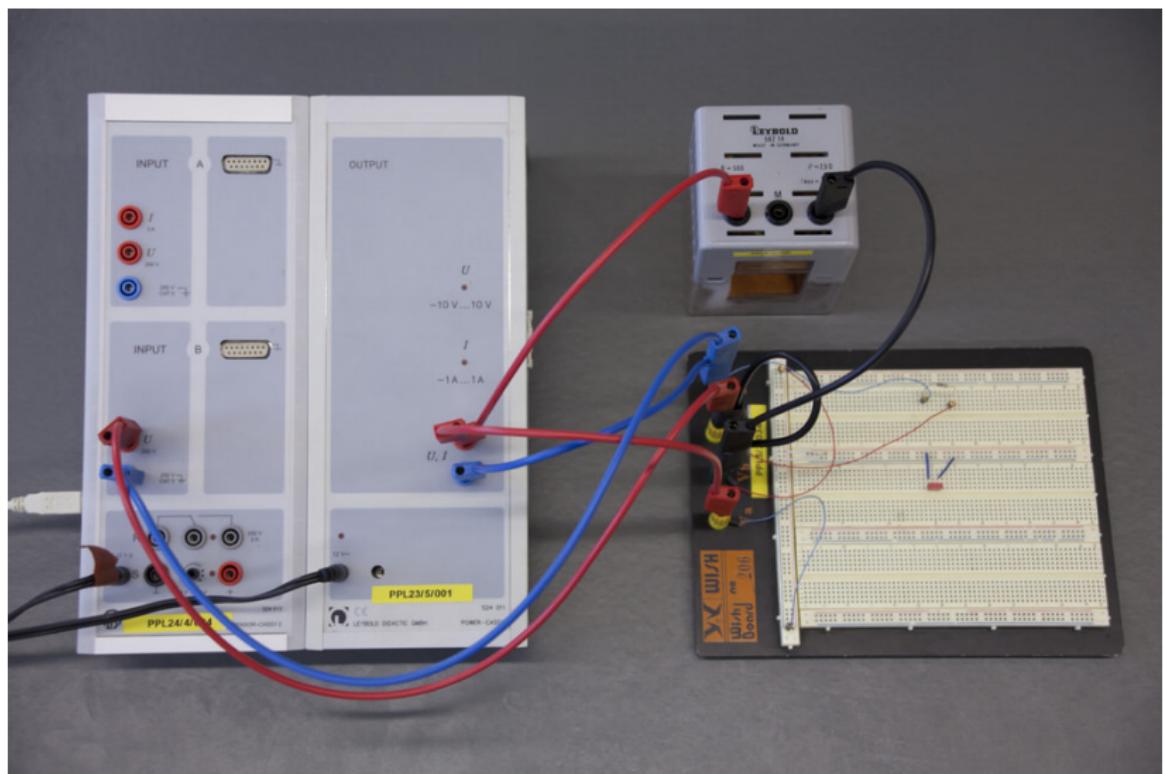
2 Michelson-Interferometer

3 Pitot

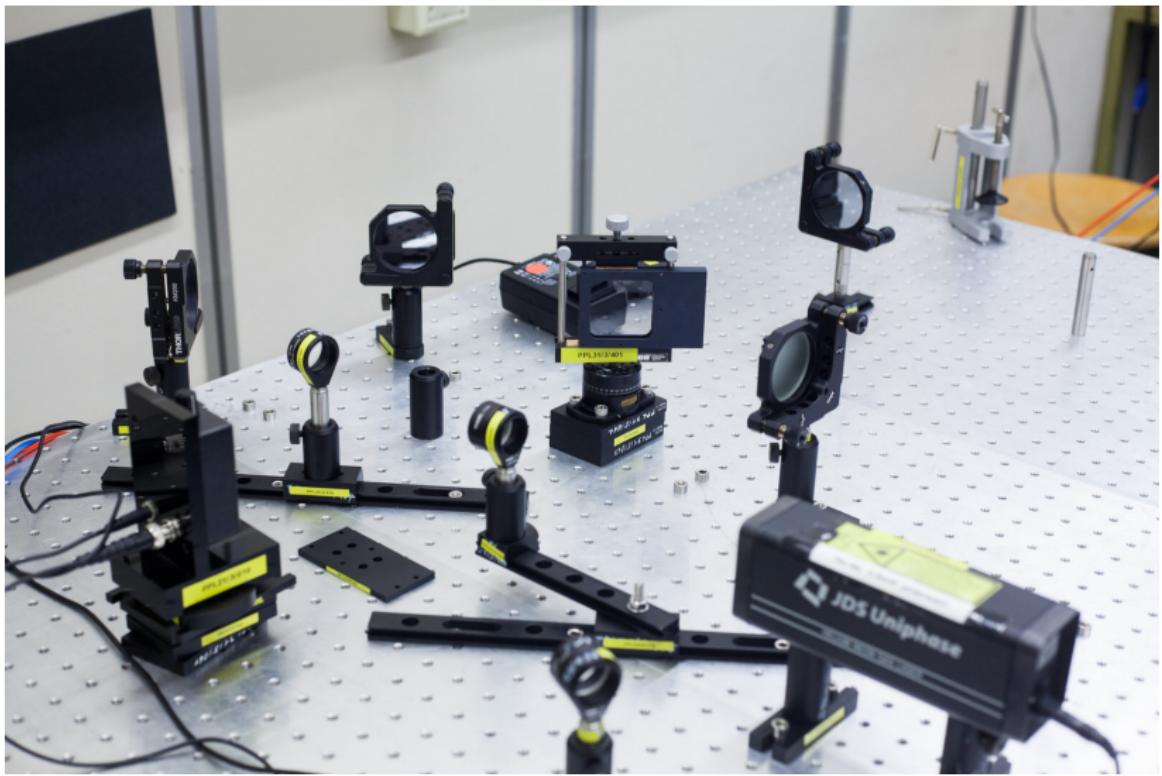
4 Doppelpendel

- Theorie
- Versuchsdurchführung
- Auswertung





Versuchsaufbau



Michelson-Interferometer

Pitot
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Doppelpendel
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Abkühlen des Stabs



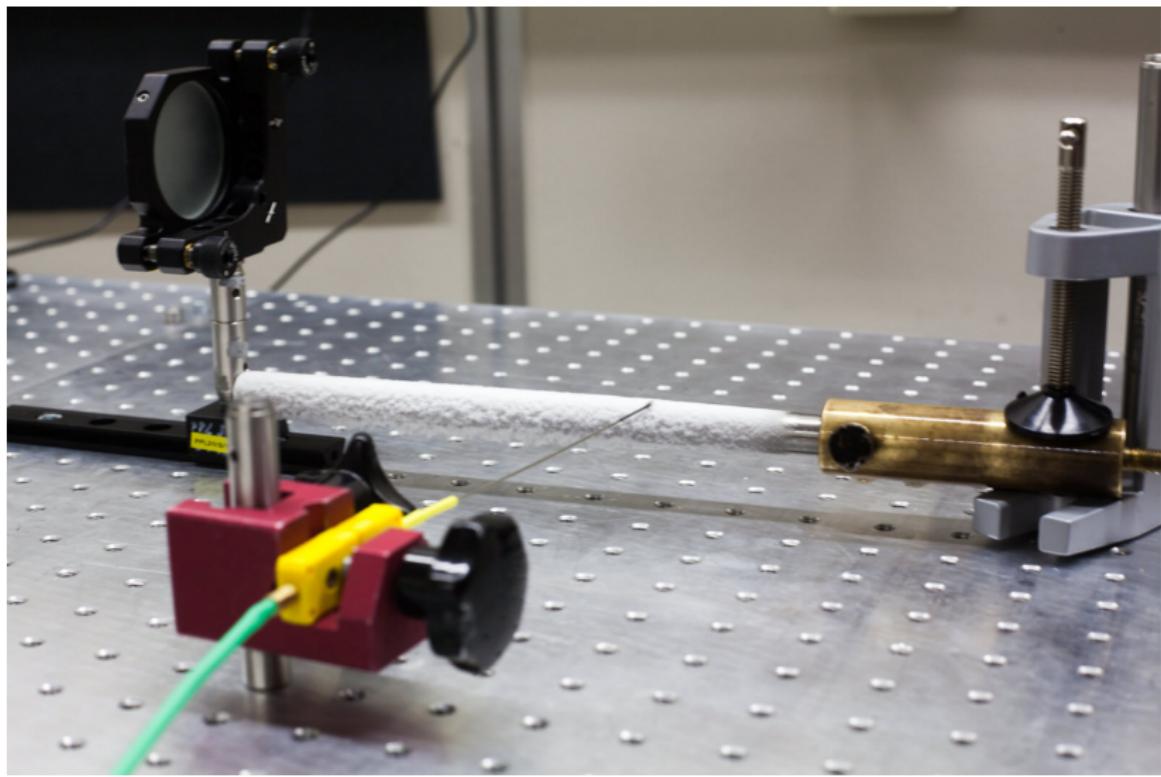
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Temperaturmessung



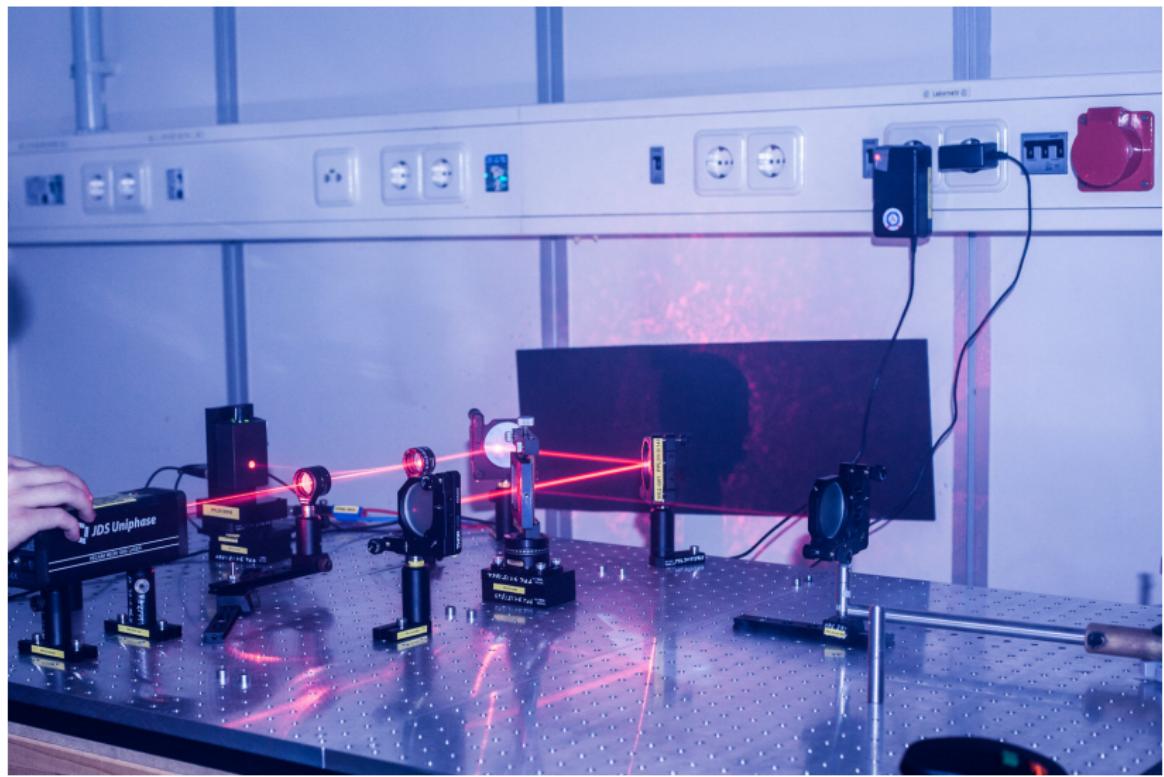
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Strahlführung



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Befestigung der Messrohre auf dem Dach



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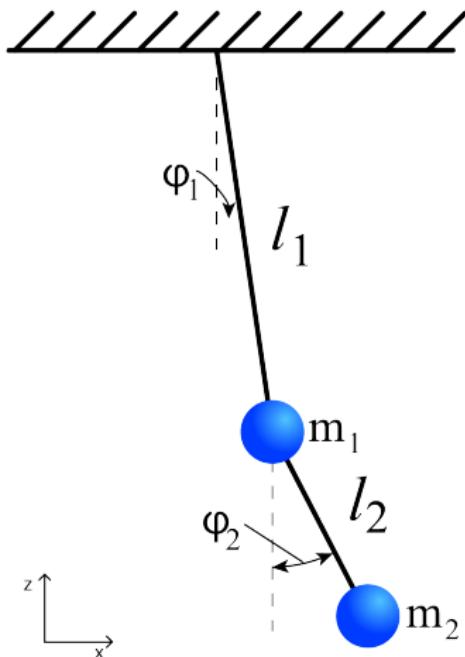
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Aufbau von Manometer, Computer und Kamera im Fahrzeuginnenraum



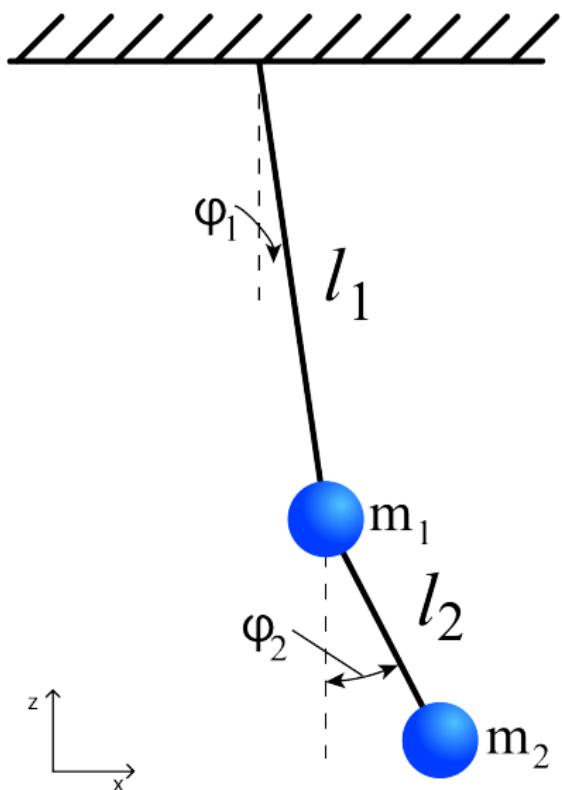
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Bestimmung der Bewegungsgleichungen mit Hilfe des Lagrangeformalismus

$$\frac{d}{dt} \frac{\partial L}{\partial \dot{q}_i} - \frac{\partial L}{\partial q_i} = 0 \quad (1)$$

$$L = \sum_i E_{kin,i} - V_i = \sum_i \frac{m_i}{2} \cdot \dot{\vec{x}_i}^2 - m_i \cdot g \cdot z_i \quad (2)$$



$$\vec{x}_1 = l_1 \cdot \begin{pmatrix} \sin \varphi_1 \\ -\cos \varphi_1 \end{pmatrix} \quad (3)$$

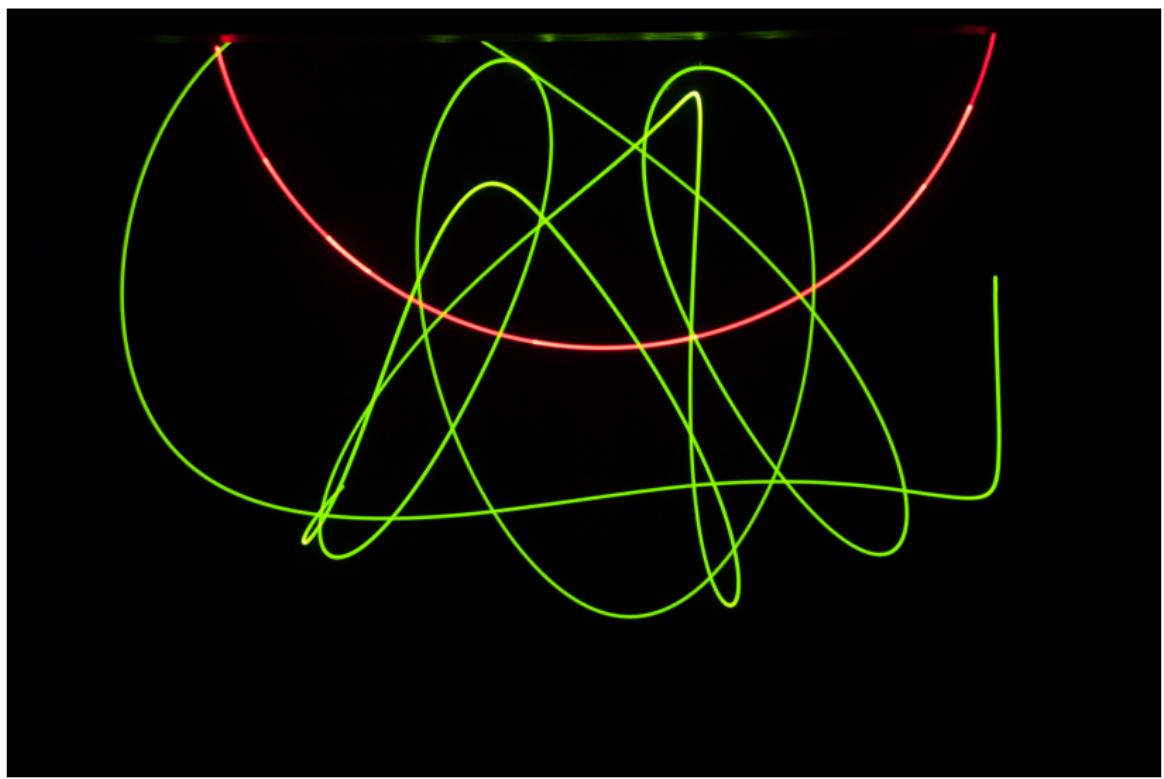
$$\begin{aligned}\vec{x}_2 &= \vec{x}_1 + l_2 \cdot \begin{pmatrix} \sin \varphi_2 \\ -\cos \varphi_2 \end{pmatrix} \quad (4) \\ &= \left(\begin{array}{c} l_1 \cdot \sin \varphi_1 + l_2 \cdot \sin \varphi_2 \\ -l_1 \cdot \cos \varphi_1 - l_2 \cdot \cos \varphi_2 \end{array} \right)\end{aligned}$$

Anwenden des Lagrange-Formalismus ergibt:

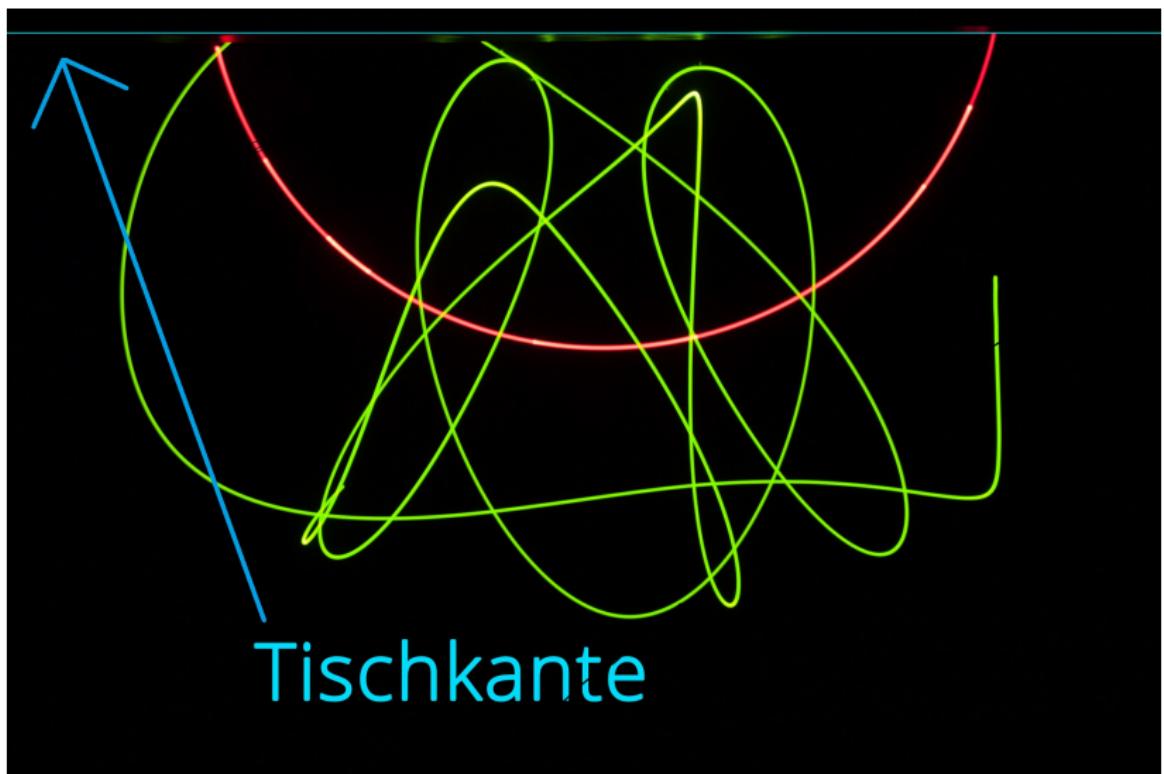
$$(m_1 + m_2)l_1\ddot{\varphi}_1 + m_2l_2\ddot{\varphi}_2 \cos(\varphi_1 - \varphi_2) + m_2l_2\dot{\varphi}_2^2 \sin(\varphi_1 - \varphi_2) + (m_1 + m_2)g \sin \varphi_1 = 0 \quad (5)$$

$$m_2l_2\ddot{\varphi}_2 + m_2l_1(\ddot{\varphi}_1 \cos(\varphi_1 - \varphi_2) - \dot{\varphi}_1^2 \sin(\varphi_1 - \varphi_2)) + m_2g \sin \varphi_2 = 0 \quad (6)$$

Versuchsdurchführung



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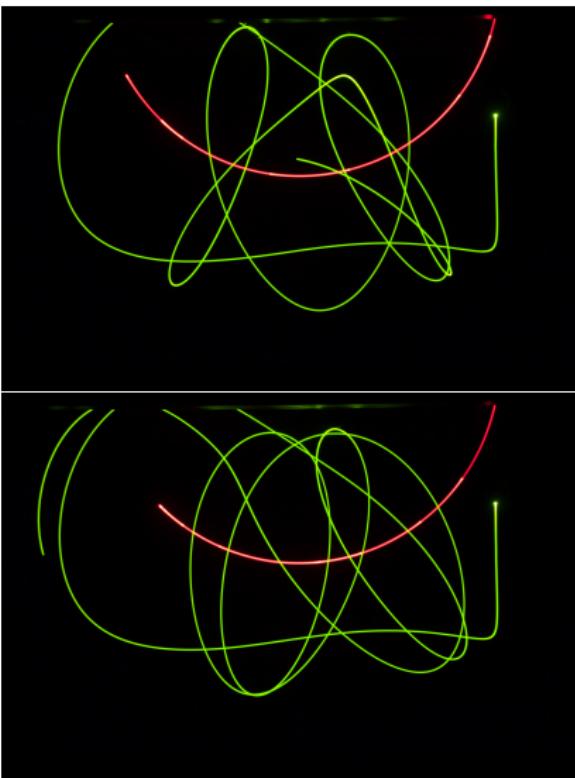
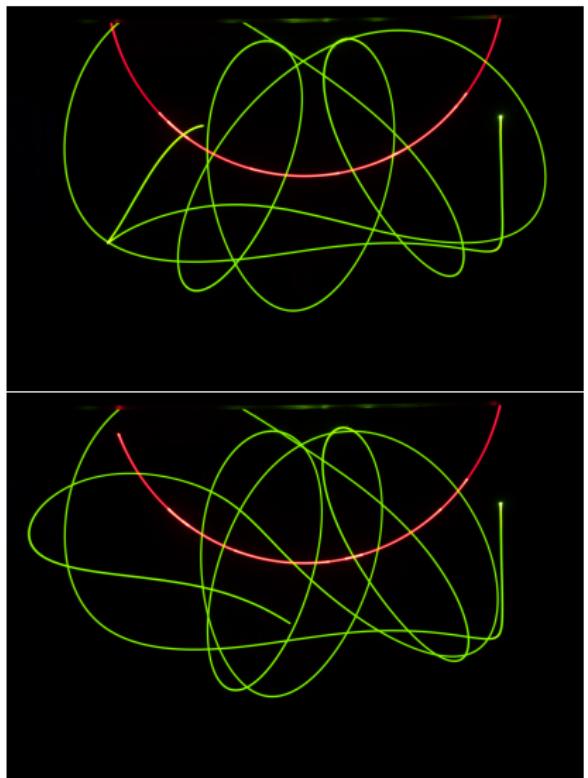
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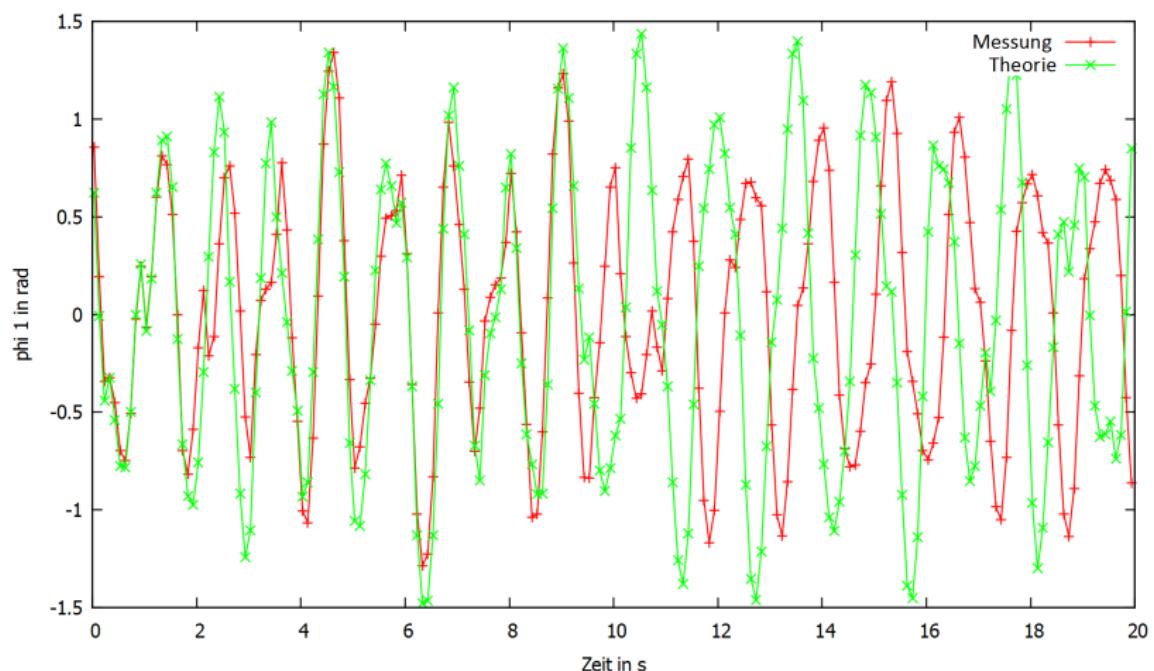
Michelson-Interferometer

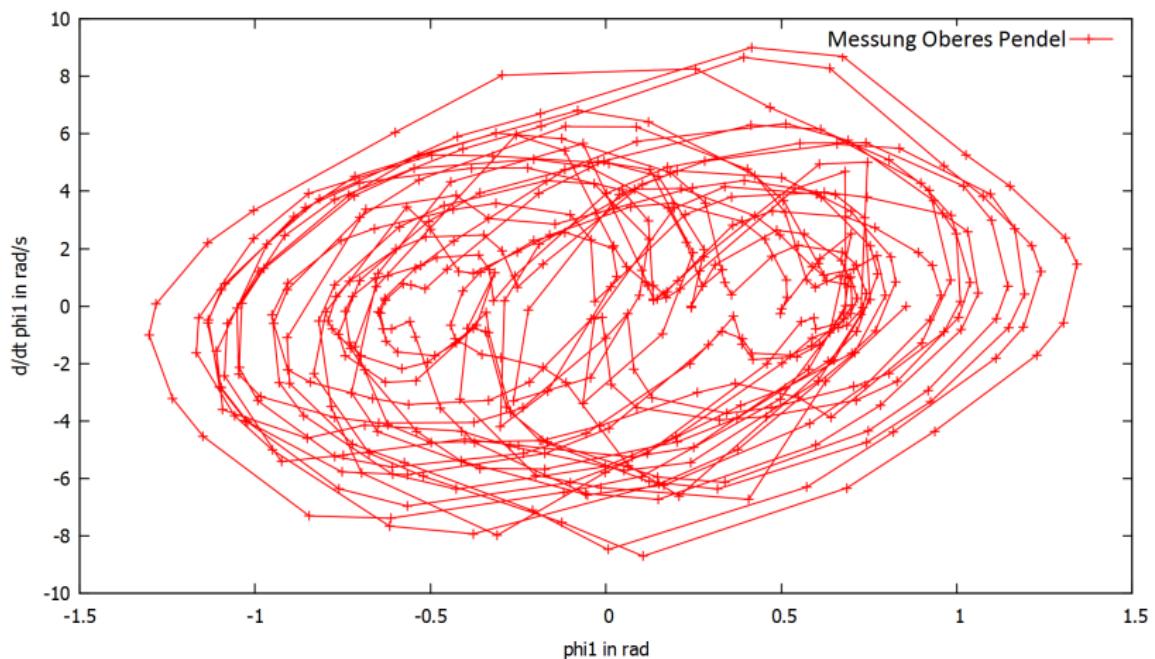
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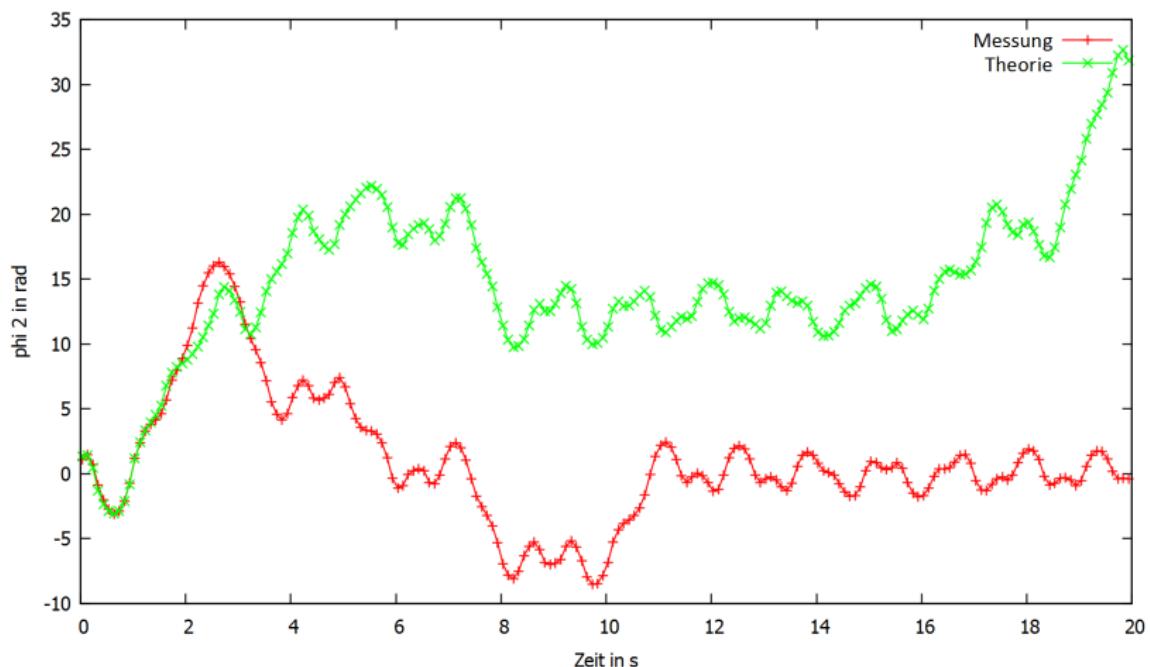
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Auswertung



Masse m_1 – Messung und Simulation

Masse m_1 – Phasenraumdiagramm

Masze m_2 – Messung und Simulation

Masse m_2 – Phasenraumdiagramm