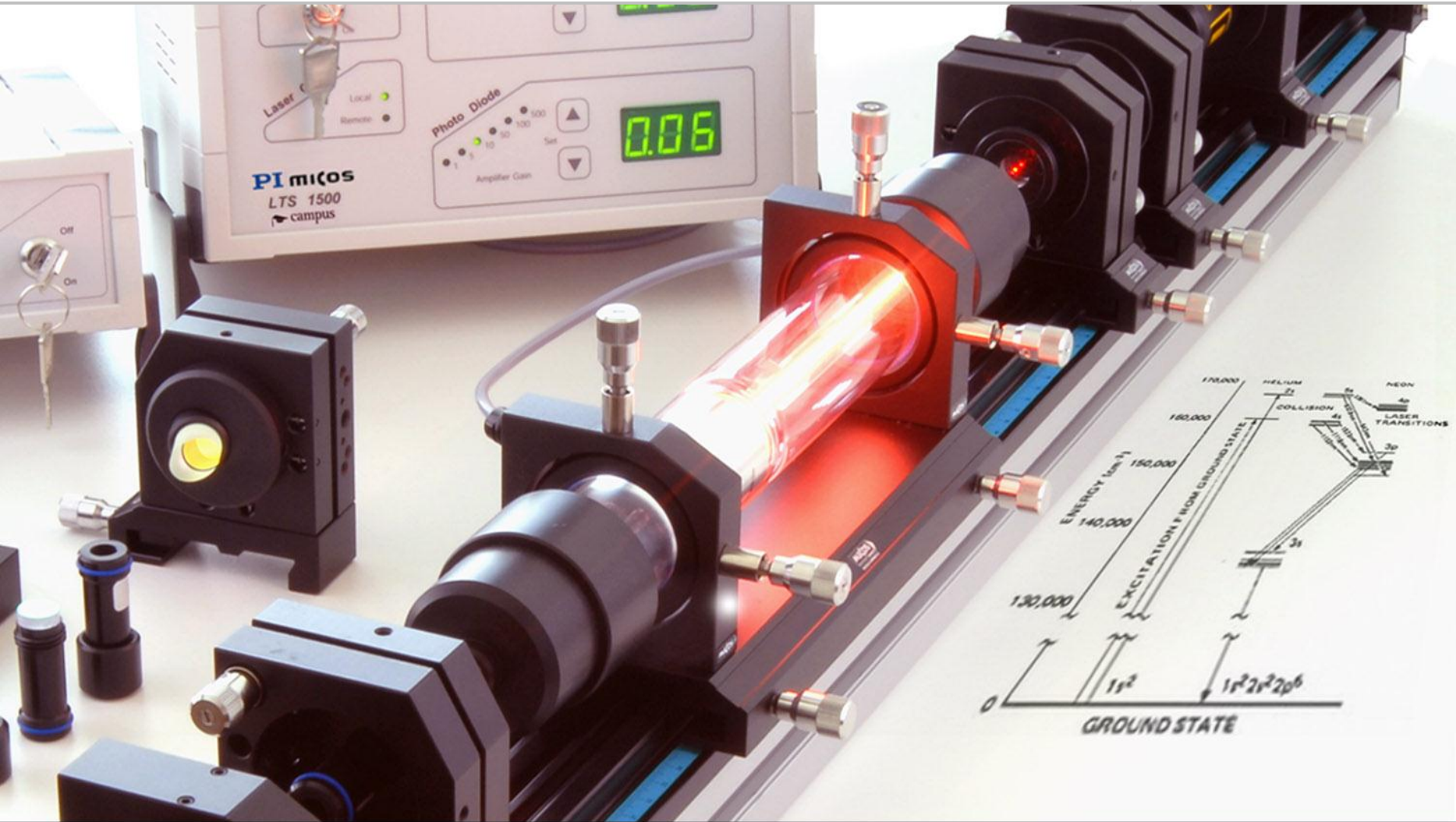


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PI **micos**



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EDUCATIONAL LASER AND PHYSICS SYSTEMS

Innovative Lehrmittel 2014 in Berlin // Referent: Dr. Jürgen Gallus

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PI miCos

Die PI miCos und ihre Produkte

Versuch „Magnetisches Moment“

Versuch „Lichtgeschwindigkeit“

campus



EDUCATIONAL LASER AND PHYSICS SYSTEMS

Innovative Lehrmittel 2014 in Berlin // Referent: Dr. Jürgen Gallus

Das Unternehmen PI miCos GmbH

- Firmengründung der miCos GmbH 1990 von Lucius Amelung
- Seit 2011 Tochter der Physik-Instrumente (PI)
- Sitz des Unternehmens in Eschbach bei Freiburg, > 70 Mitarbeiter



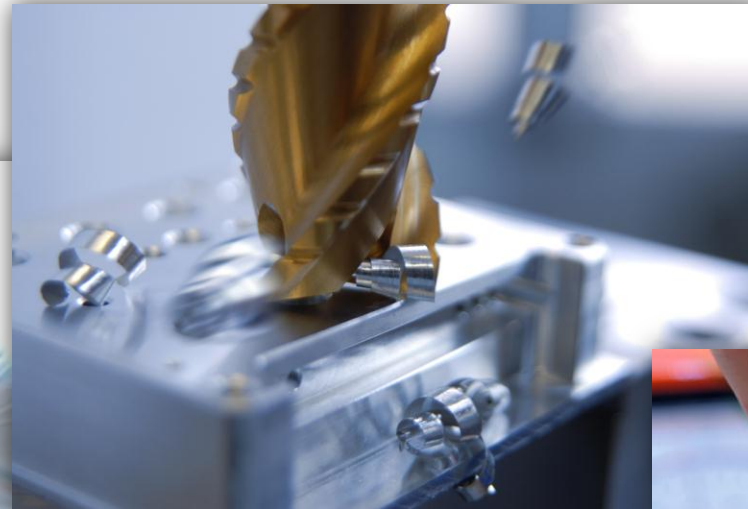
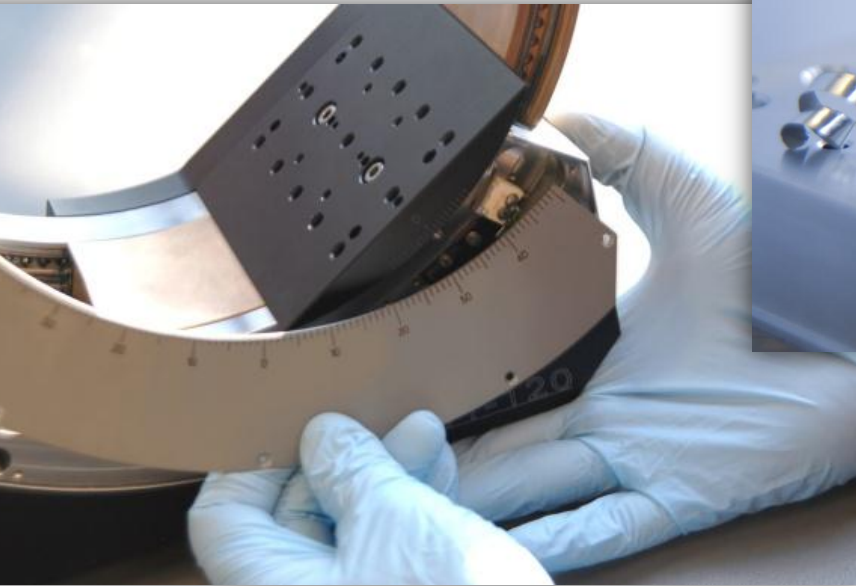
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Design / Entwicklung

Produktion

Montage / QM

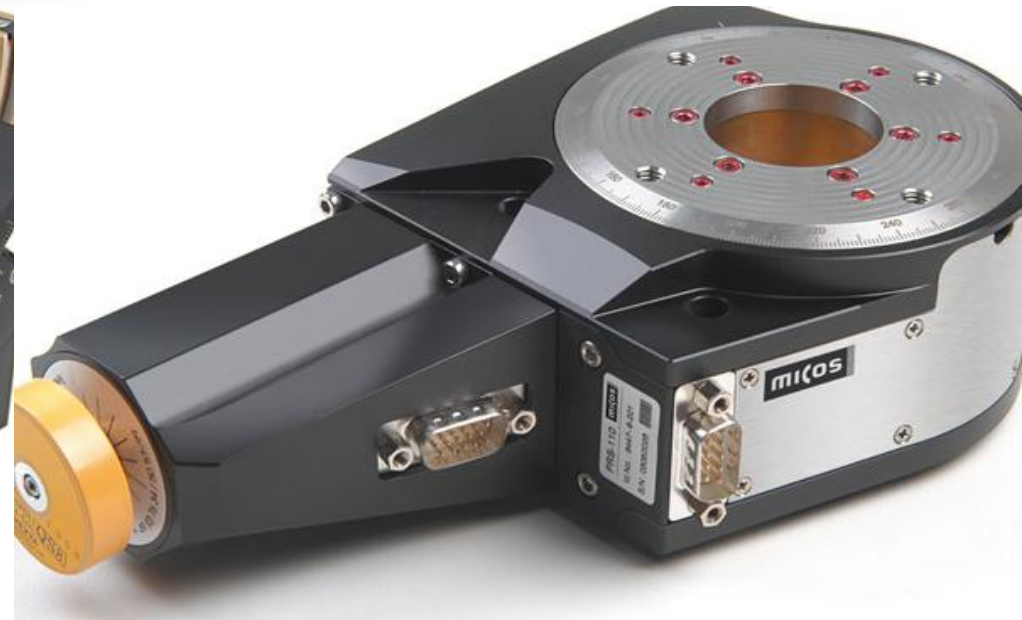
Vermarktung



motionControl

Standard-Produkte

- Linearachsen
- Drehtische
- Goniometertische



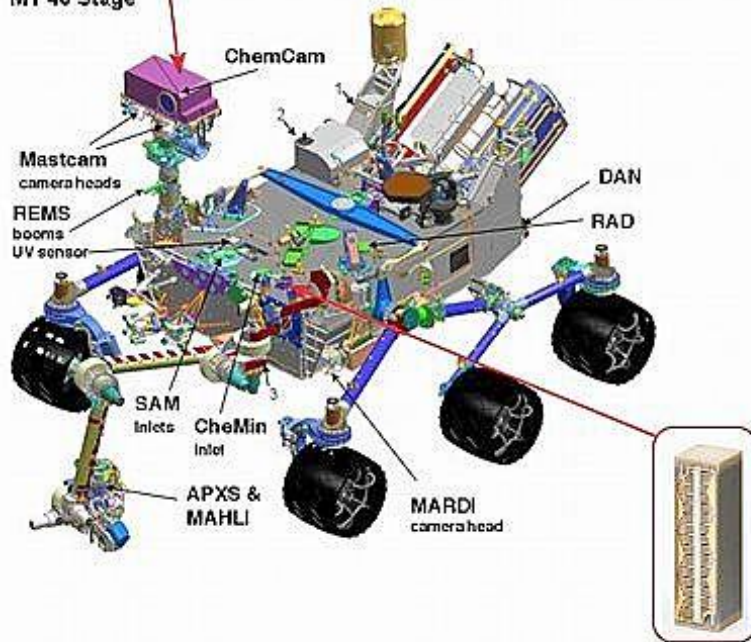
motionControl

Kundenspezifische Produkte

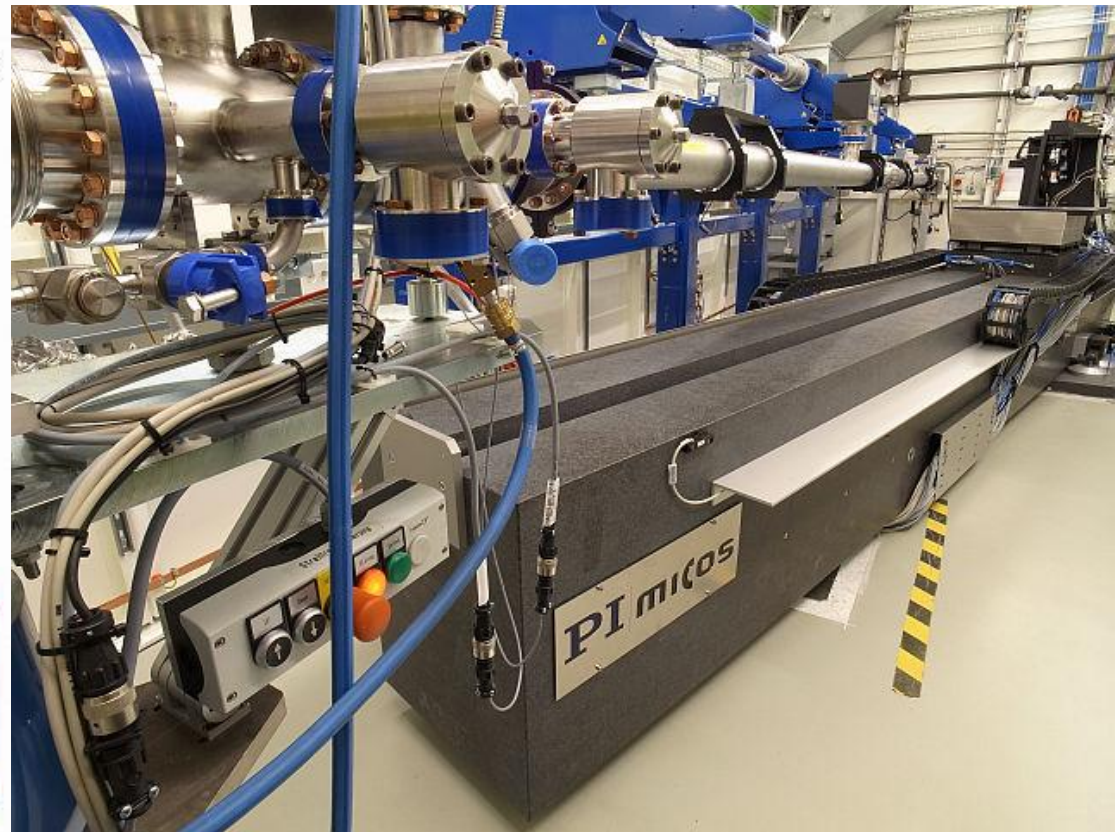


MT 40 Stage

PI and PI miCos equipment
on the Mars rover's science lab



PICMA Piezo Actuator

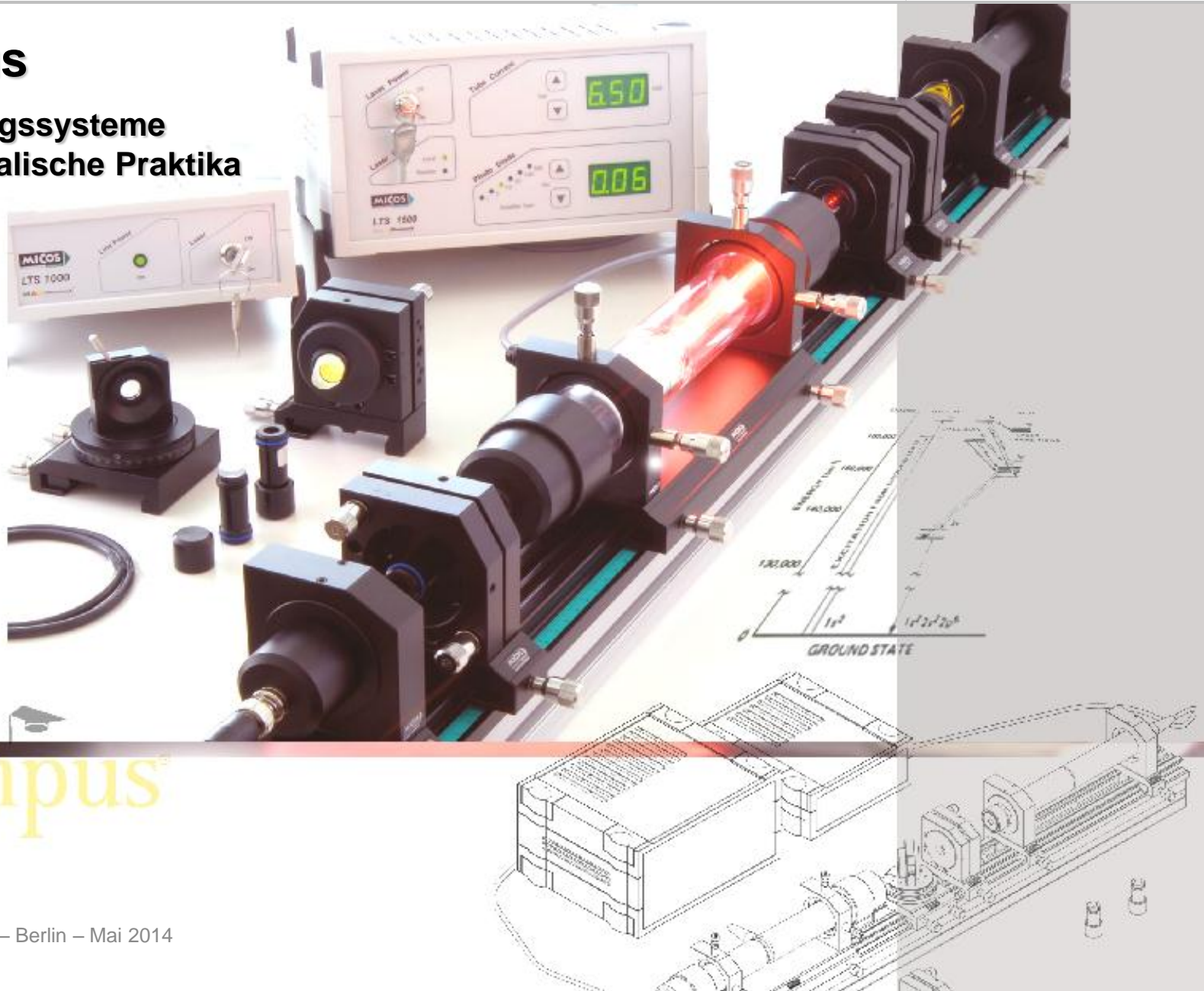


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Ausbildungssysteme
für physikalische Praktika



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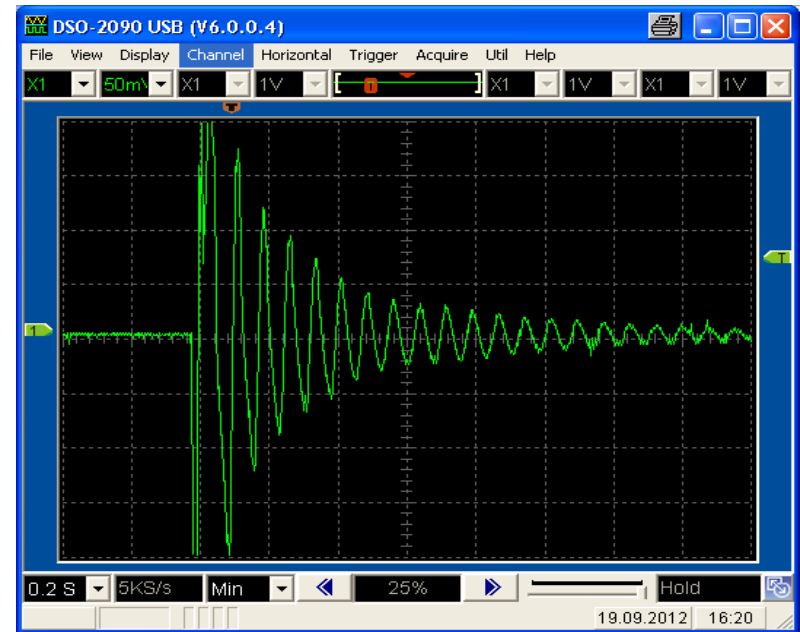
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PImicos



Lorentzkraft-getriebene
schwingende Saite

Bestimmung des Adiabatenexponenten eines Gases

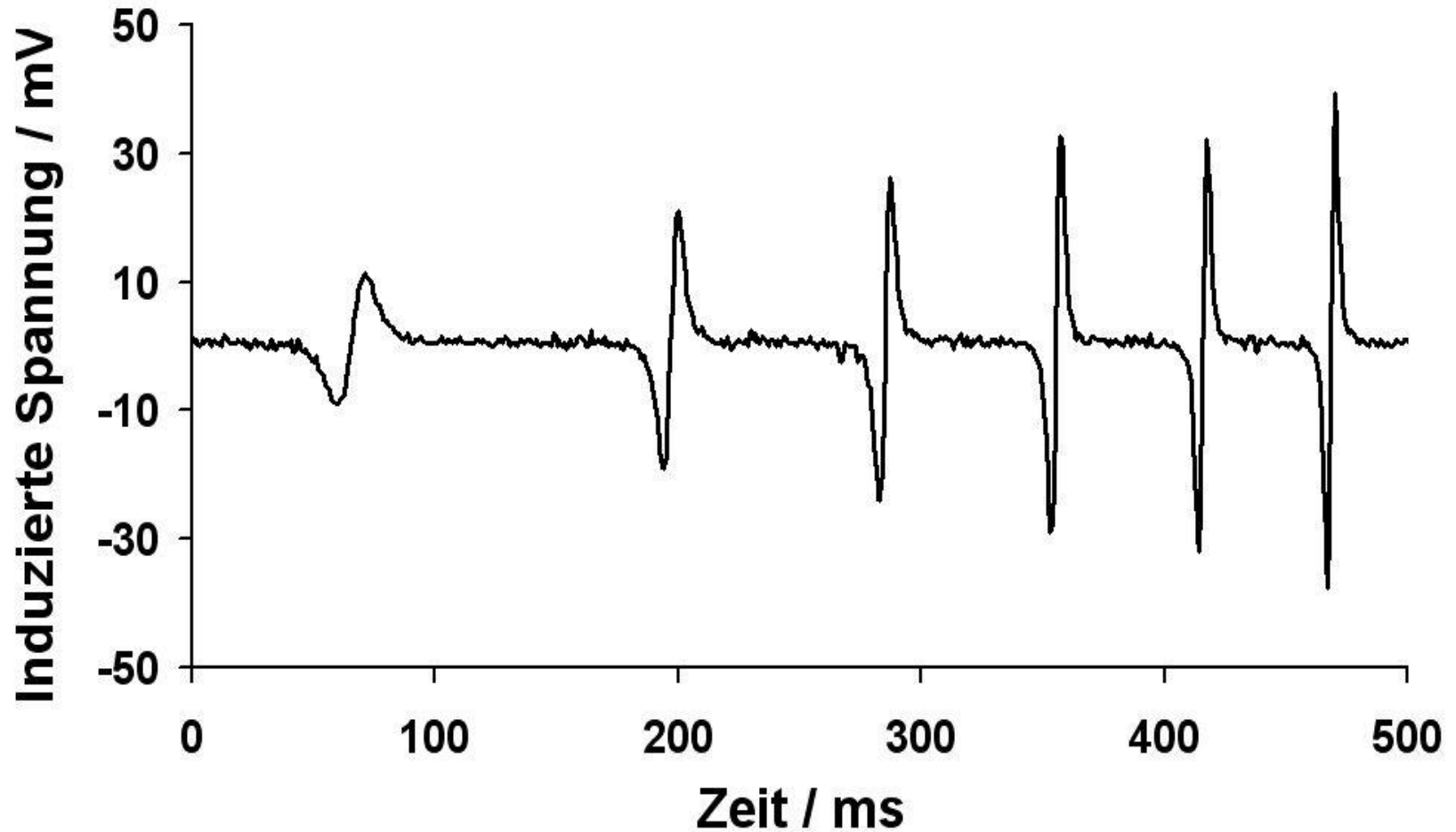


- Gedämpfte Oszillation
- Freiheitsgrade von Gasen
- Adiabatenexponent
- Wärmekapazitäten

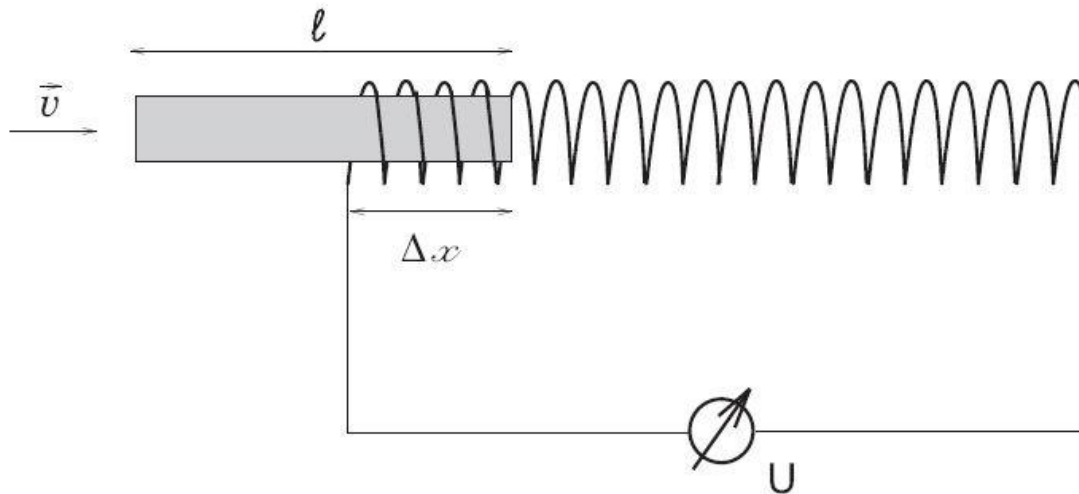


Bestimmung des magnetischen Moments eines Magneten

Messung mit einem Magneten



Spannungsinduktion



Magnet in Spule mit Windungszahl N :

$$U_{\text{ind}} = -\frac{d}{dt}(N\Phi)$$

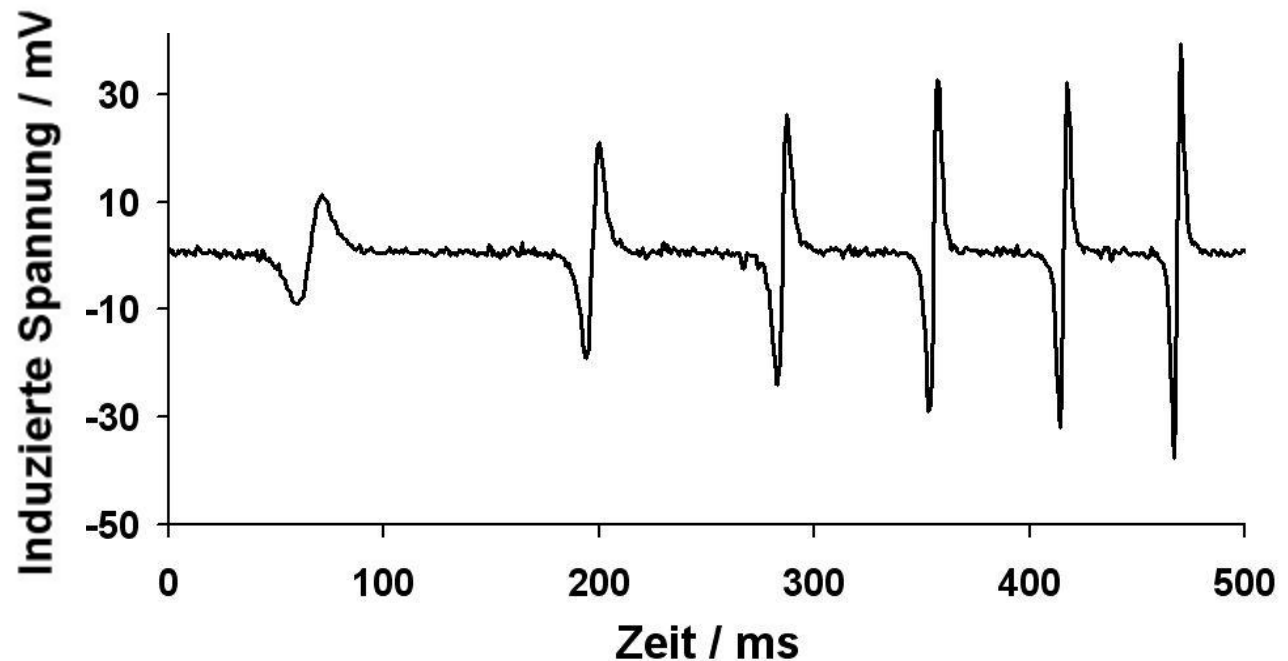
Annahmen:

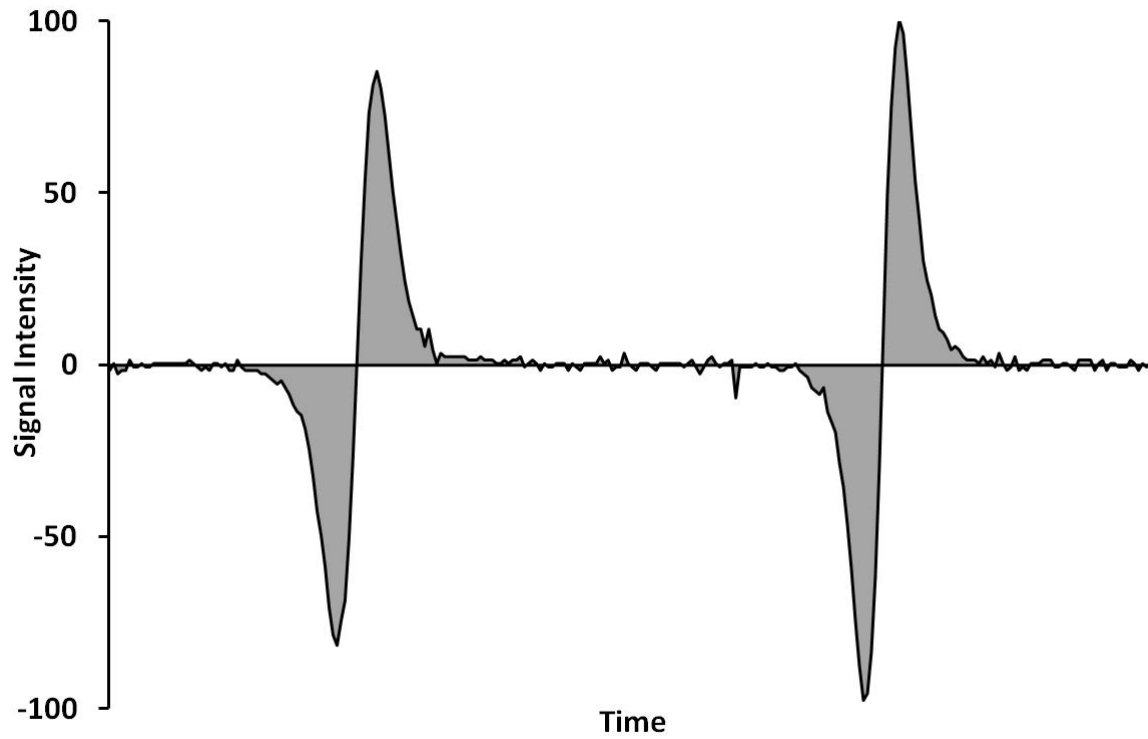
homogenes Magnetfeld

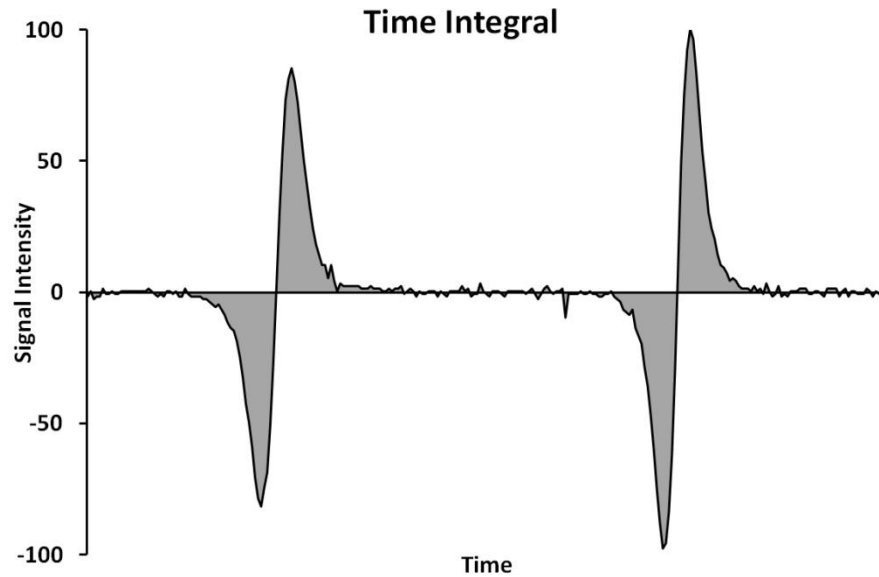
ebene Fläche des Magneten

$$\frac{d}{dt} (N(t)\Phi) = \frac{dN}{dt} \Phi = \frac{dN}{dx} \frac{dx}{dt} \Phi = \rho_N v \vec{B} \cdot \vec{A}$$

$U_{\text{ind}} =$







$$\int_{t_1}^{t_2} U_{\text{ind}} dt = - \int_{t_1}^{t_2} \frac{d}{dt} (N\Phi) dt$$

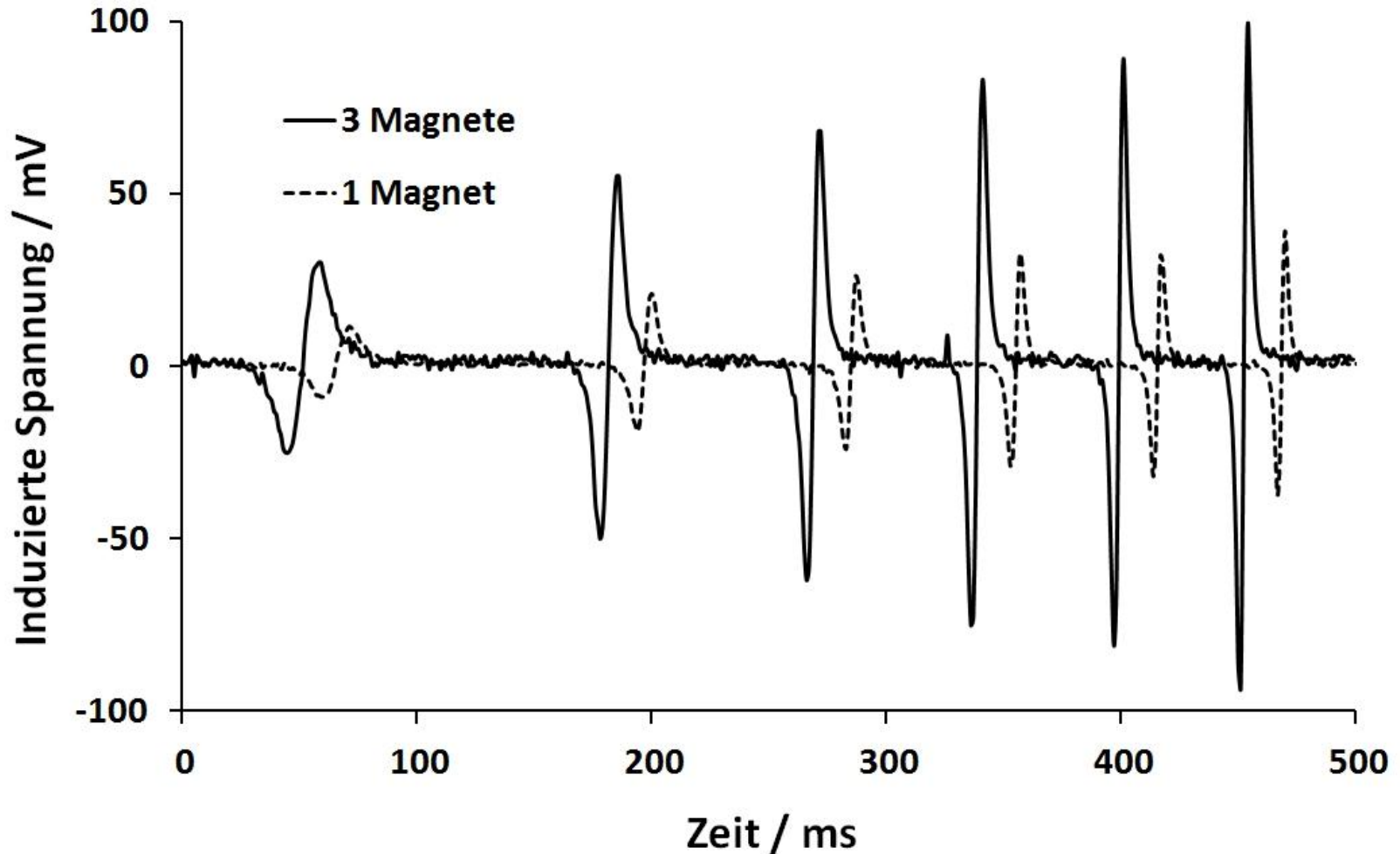
$$= -\rho_N \vec{B} \cdot \vec{A} \int_{t_1}^{t_2} v dt = -\rho_N \vec{B} \cdot \vec{A} \cdot \ell$$

Magnetisches Moment

$$\vec{B} = \mu_0 \frac{\vec{m}}{V} = \frac{\mu_0}{A\ell} \vec{m}$$

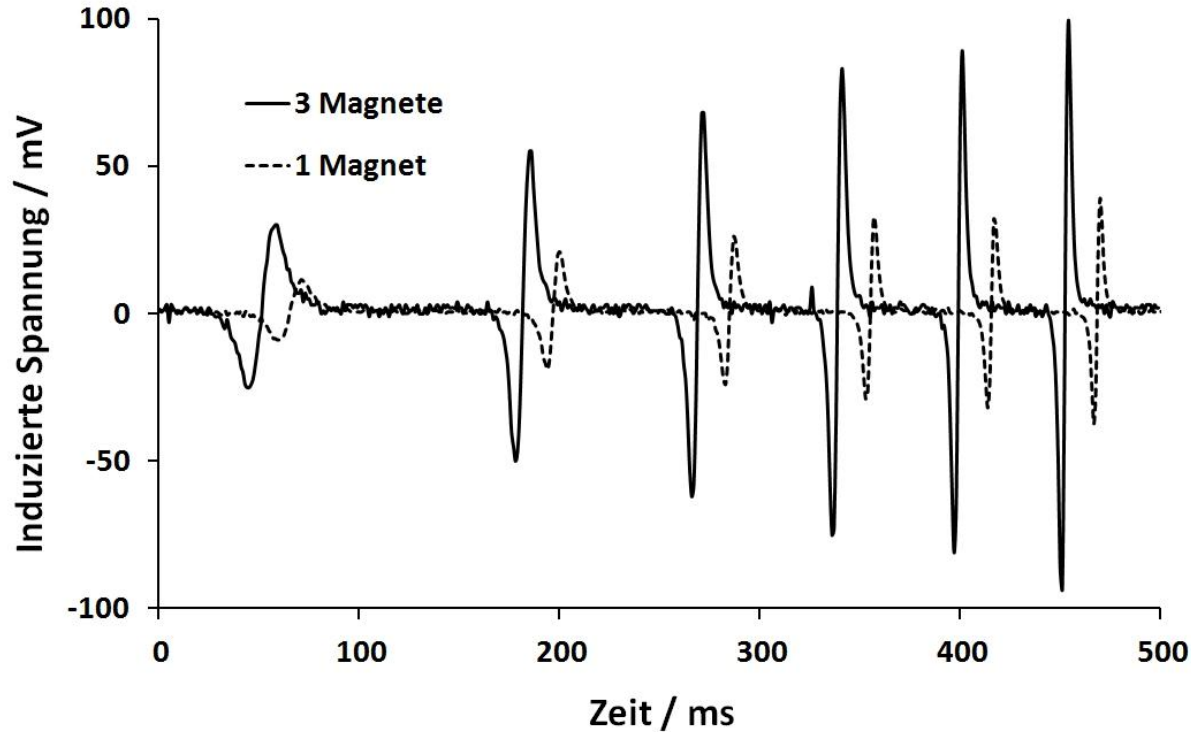
$$\left| \int_{t_1}^{t_2} U_{\text{ind}} dt \right| = \mu_0 \rho_N |\vec{m}|$$

Messung mit mehreren Magneten



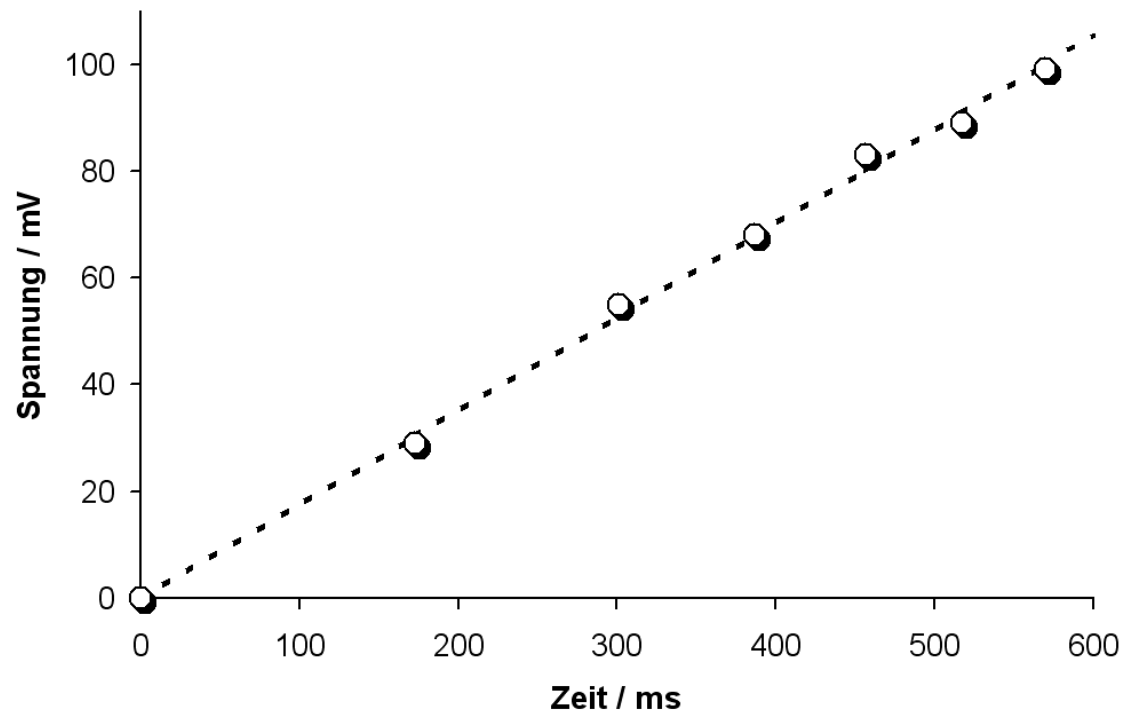
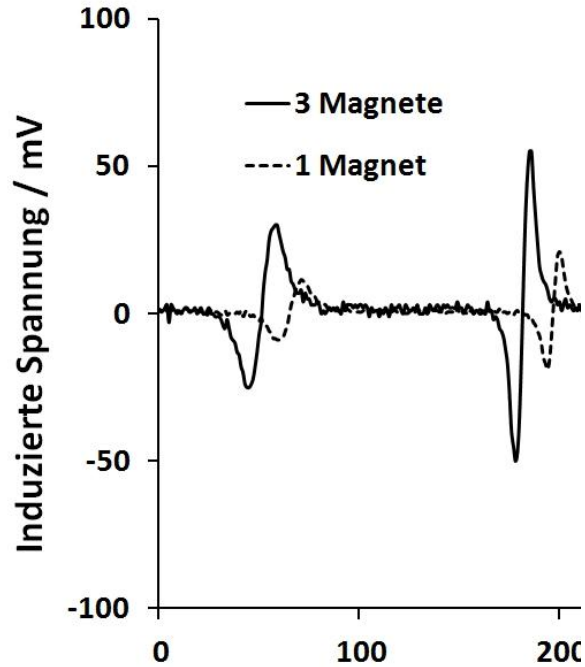
Erdbeschleunigung

$$U_{\text{ind}} = \rho_N v \vec{B} \cdot \vec{A}$$



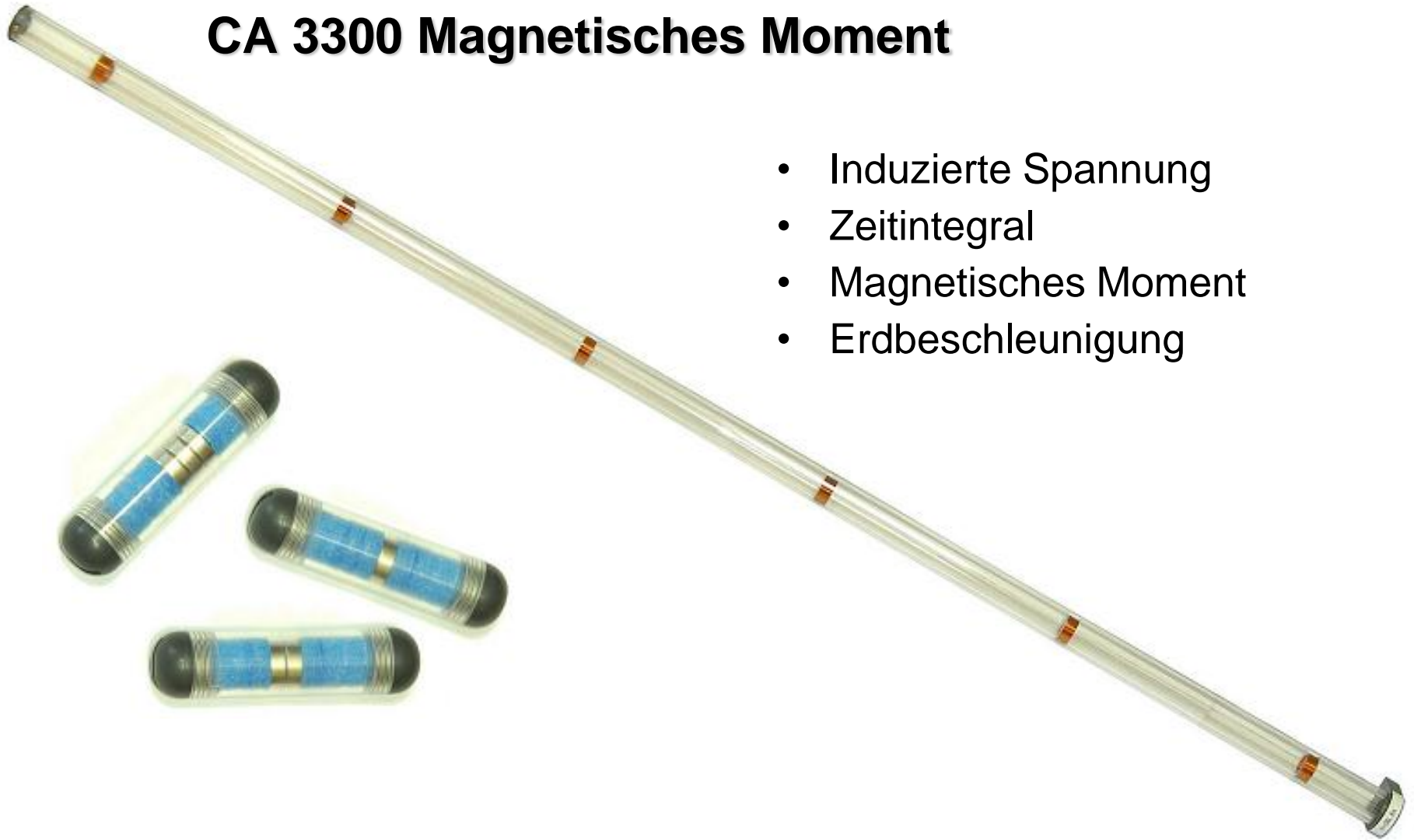
Erdbeschleunigung

$$U_{\text{ind}} = \rho_N v \vec{B} \cdot \vec{A}$$

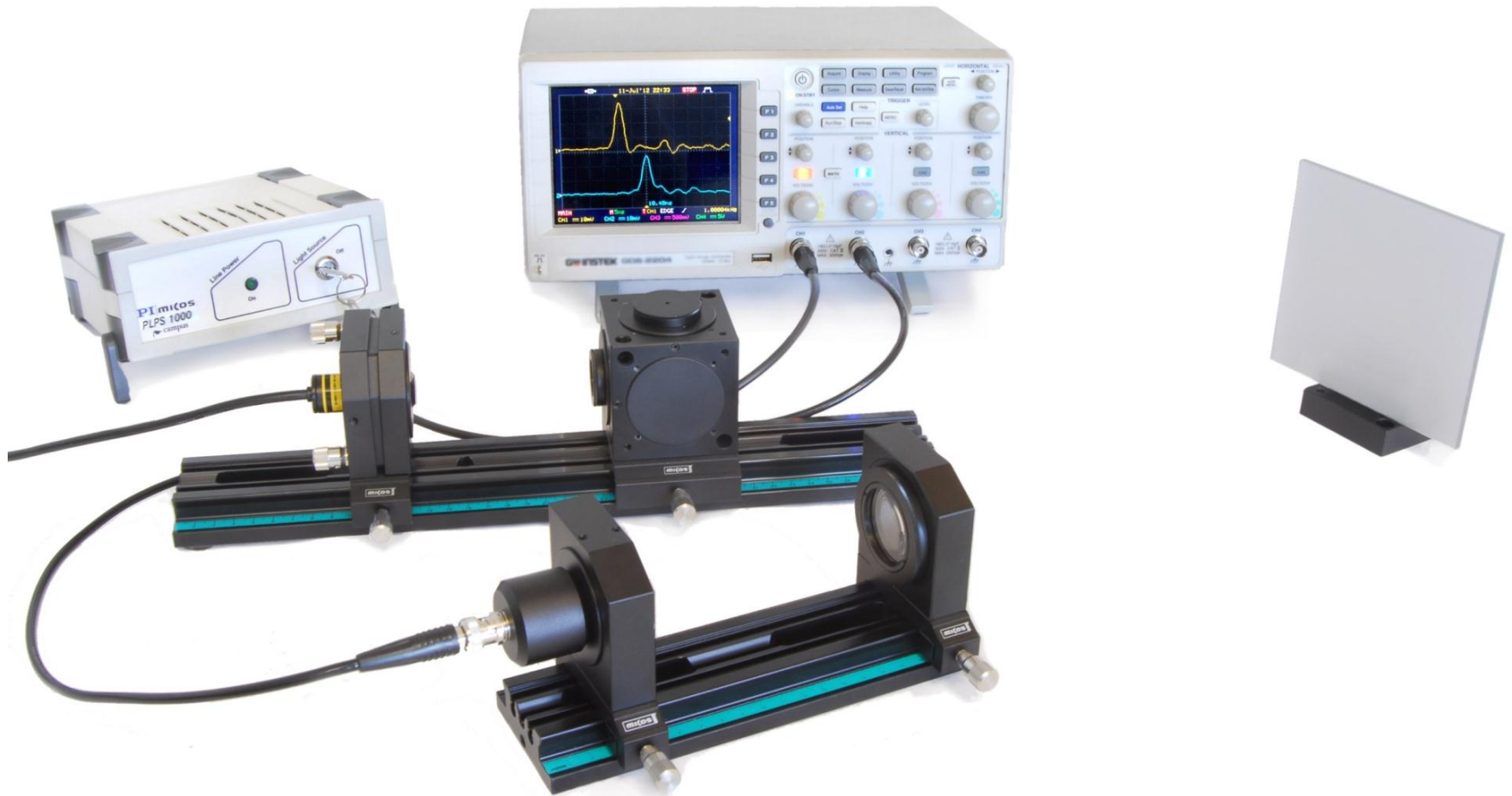


CA 3300 Magnetisches Moment

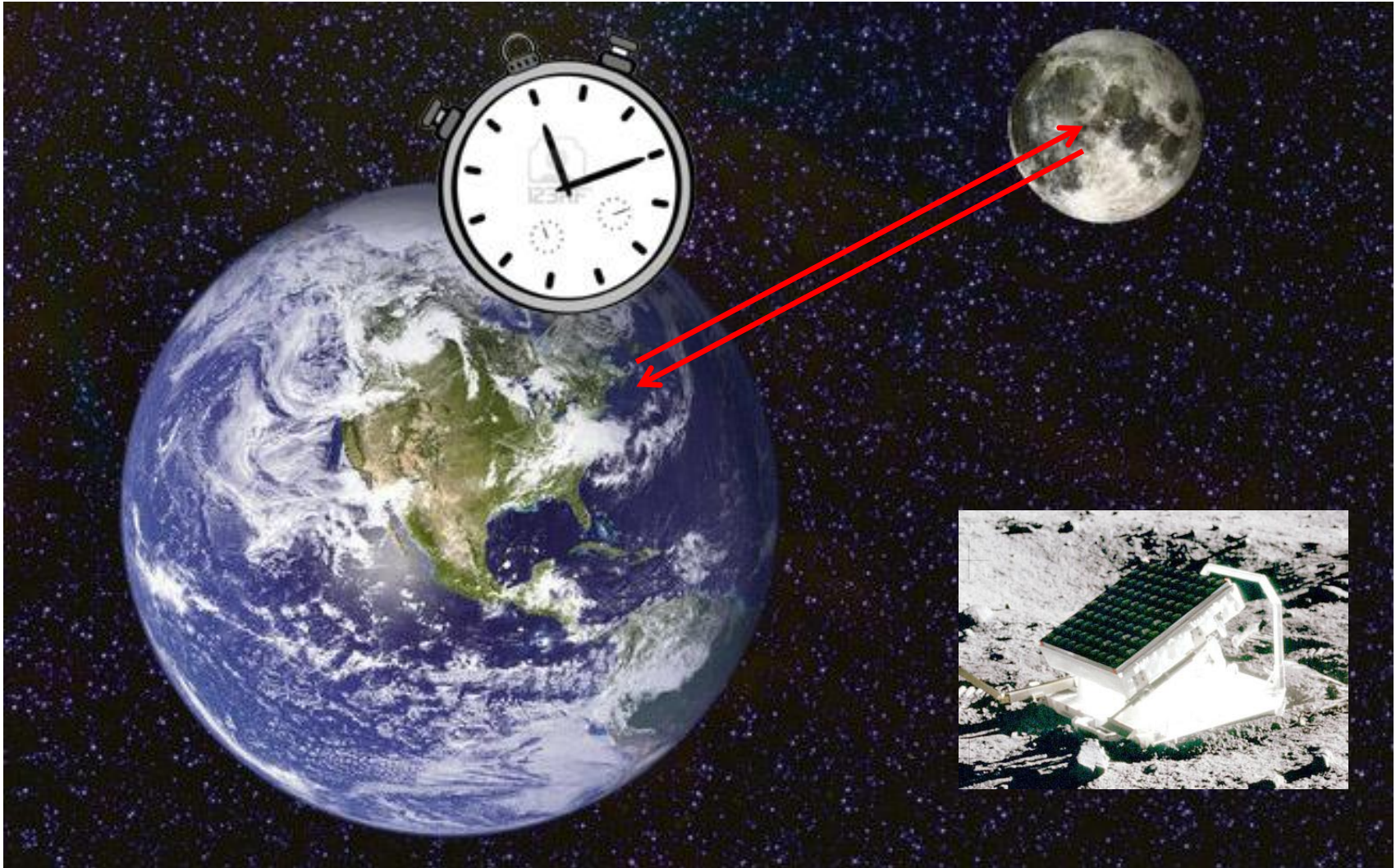
- Induzierte Spannung
- Zeitintegral
- Magnetisches Moment
- Erdbeschleunigung



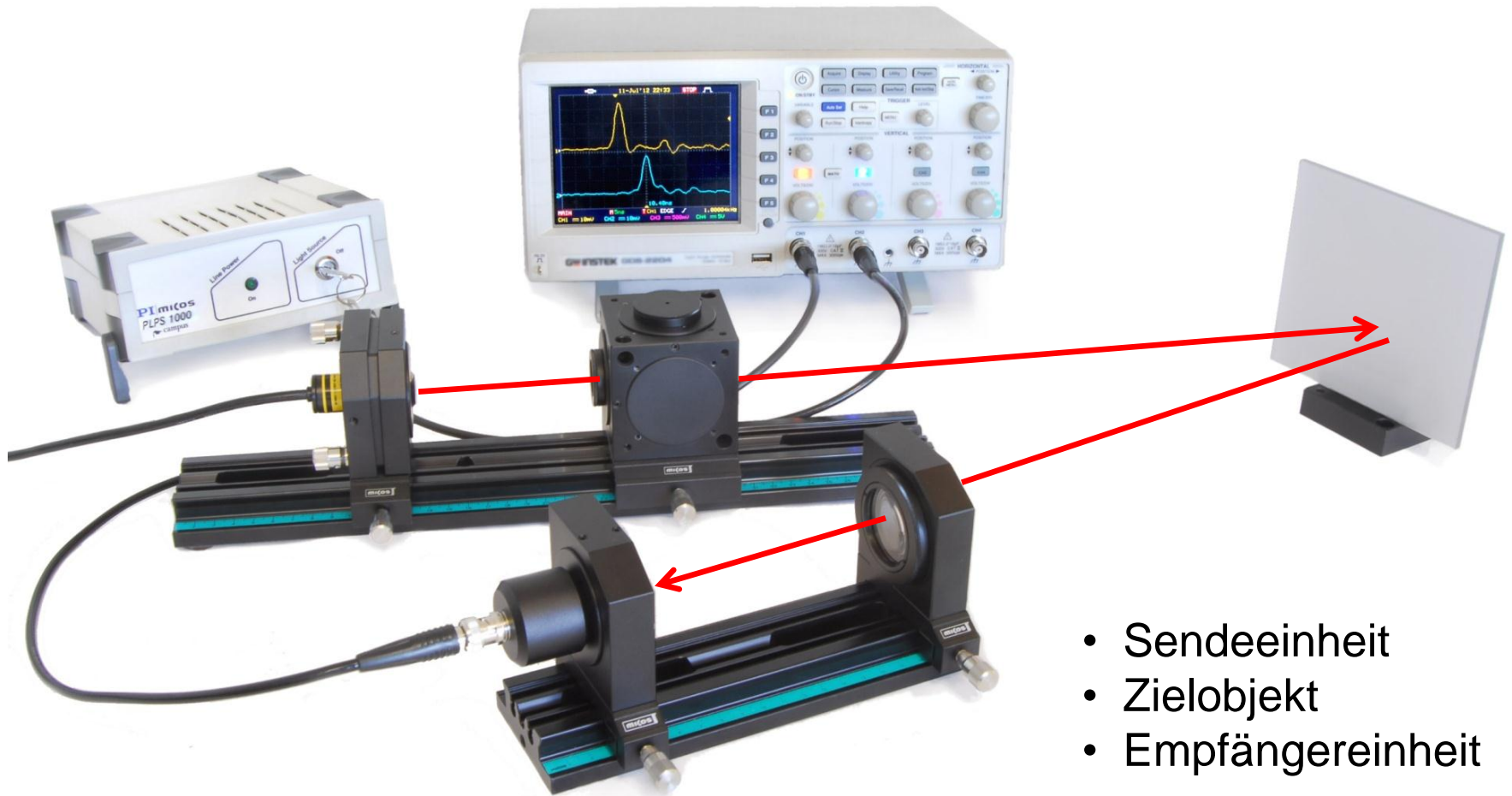
Lichtgeschwindigkeit und Laser-Radar



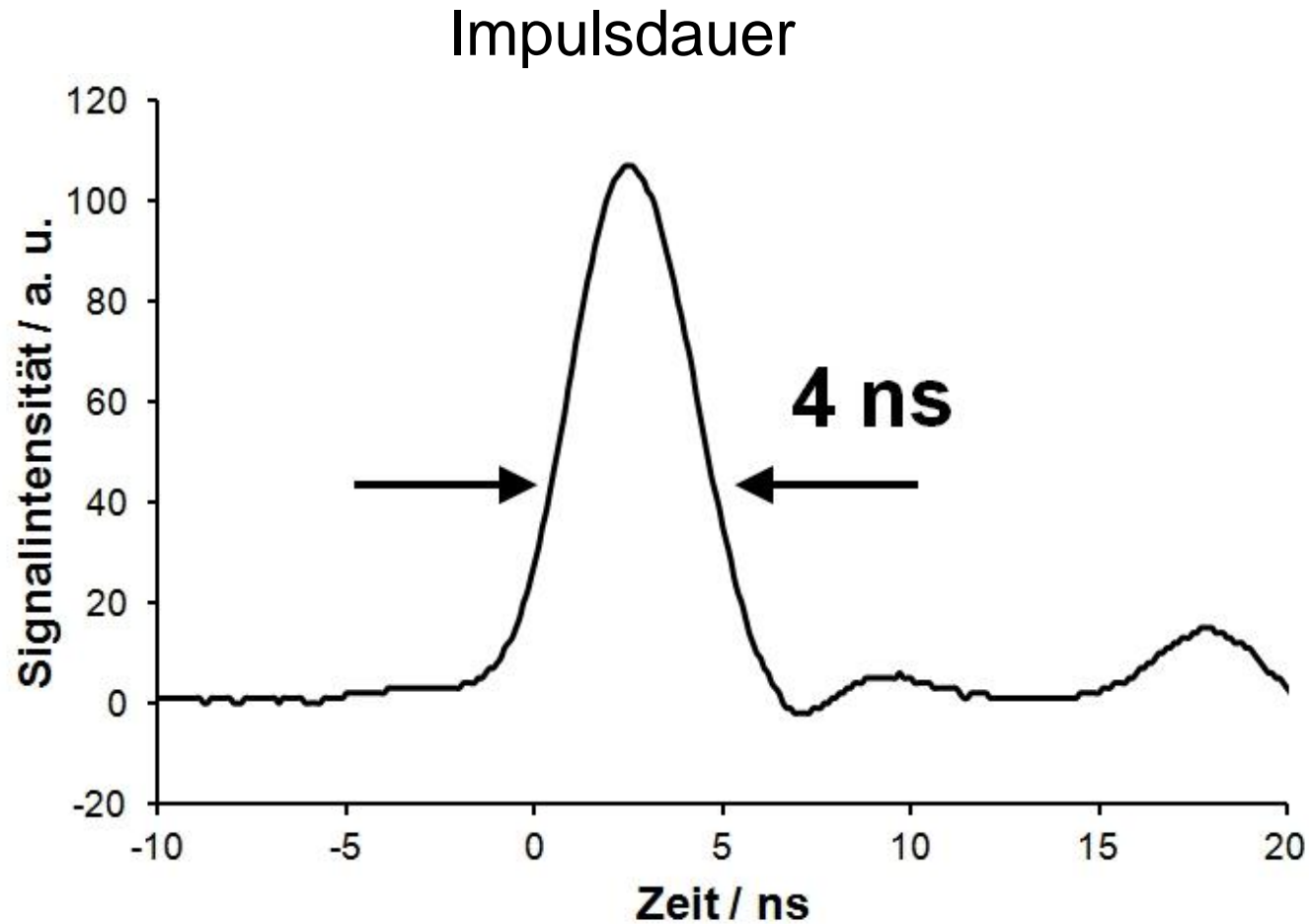
Das Prinzip



Der Aufbau

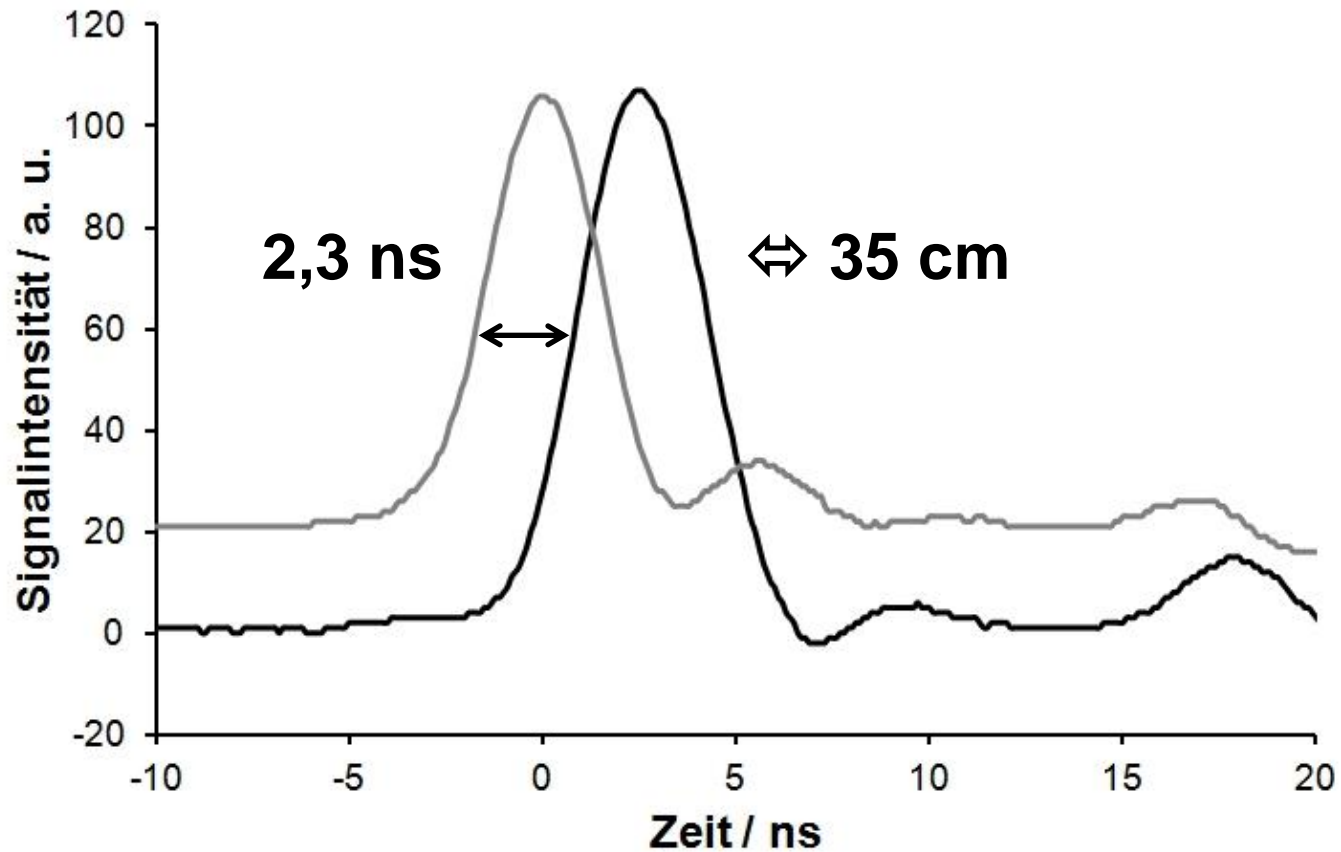


Die Messungen



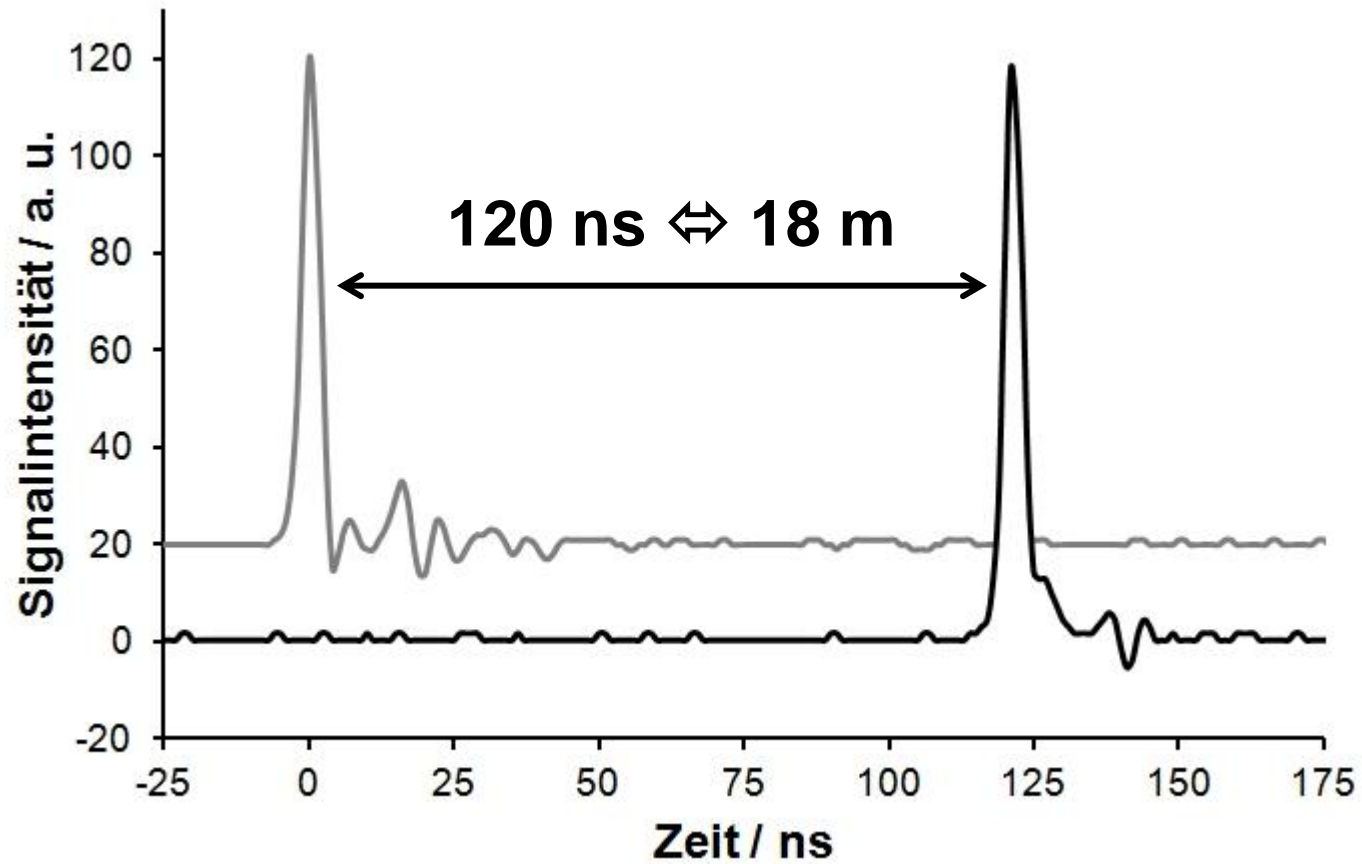
Die Messungen

Zeitliche Auflösung

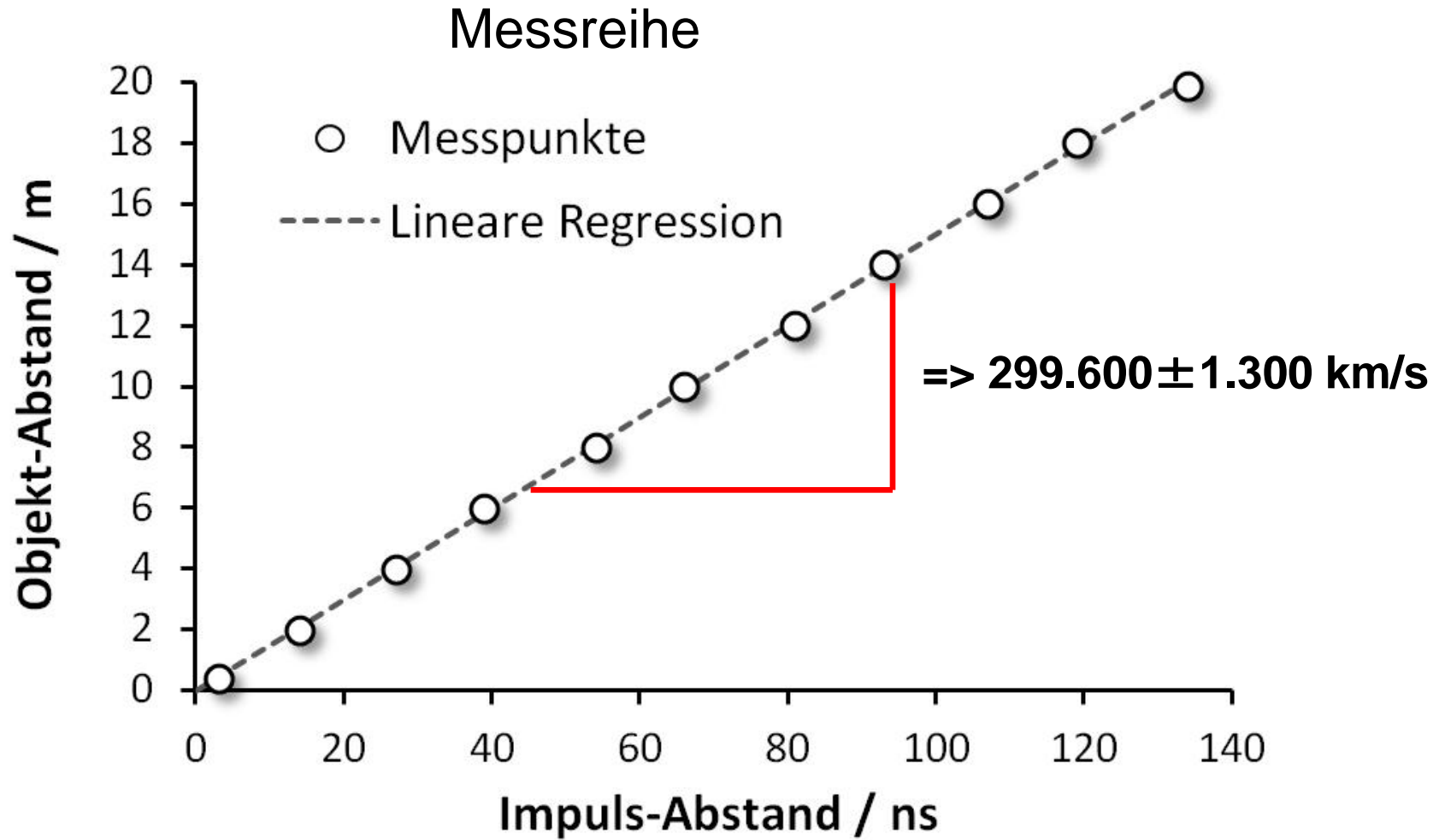


Die Messungen

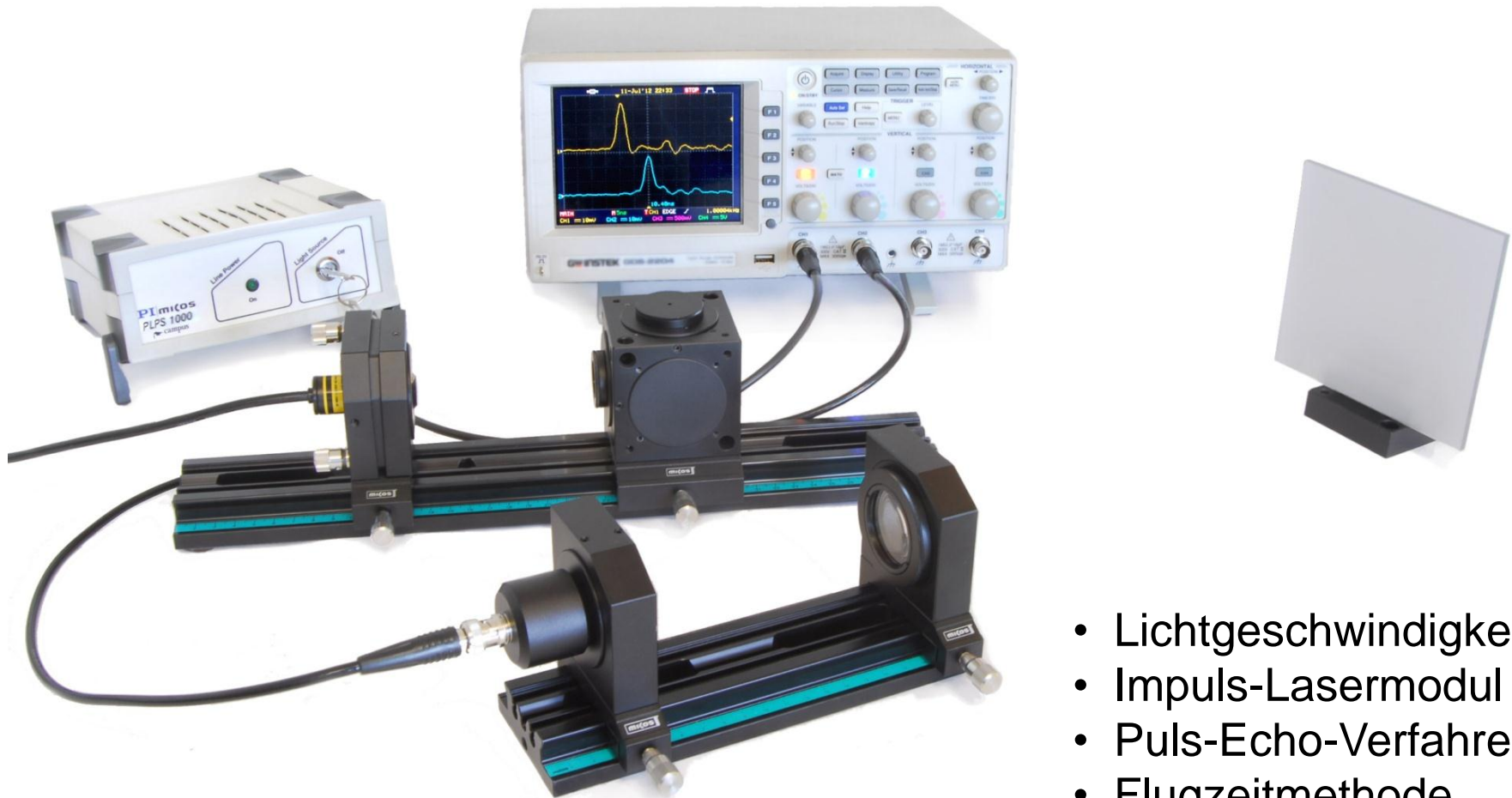
Fernbereich



Die Messungen

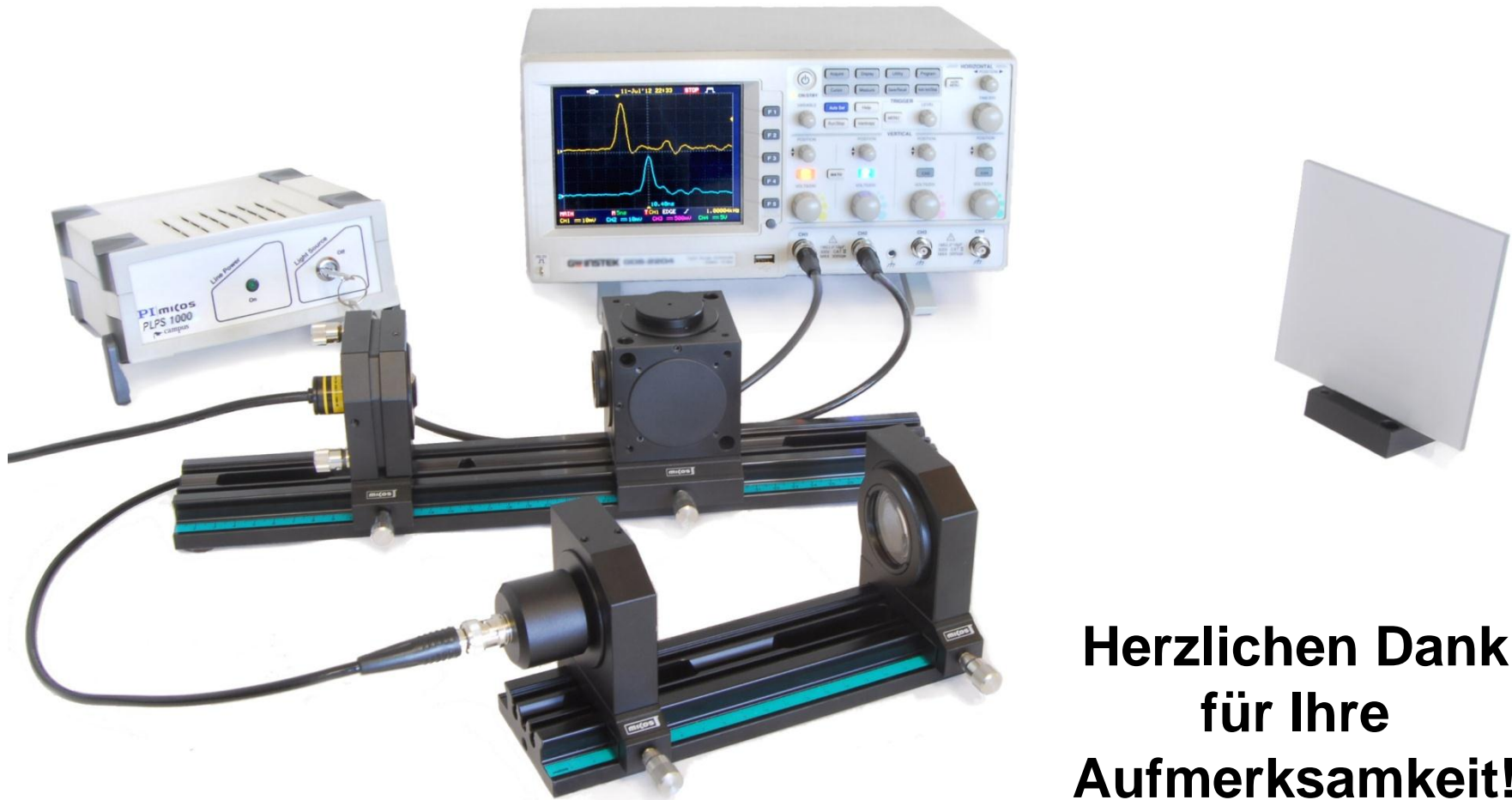


CA 1345 Lichtgeschwindigkeit und Laser-Radar



- Lichtgeschwindigkeit
- Impuls-Lasermodule
- Puls-Echo-Verfahren
- Flugzeitmethode

CA 1345 Lichtgeschwindigkeit und Laser-Radar



**Herzlichen Dank
für Ihre
Aufmerksamkeit!**