



# Study trip to Max Planck Institute of Quantum Optics

Gärching-München, May 2017





Seniorenzentrum

Niels-Bohr-Str.

701

Ortszentrum Rathaus  
Bürgerhaus Postamt

Einsteinstr.

Albert Einstein  
dt. Physiker, geb. 1879, gest. 1955

**Heisenbergstr.**

# Max-Planck-Straße

Max Planck,  
dt. Physiker, geb. 1858, gest. 1947









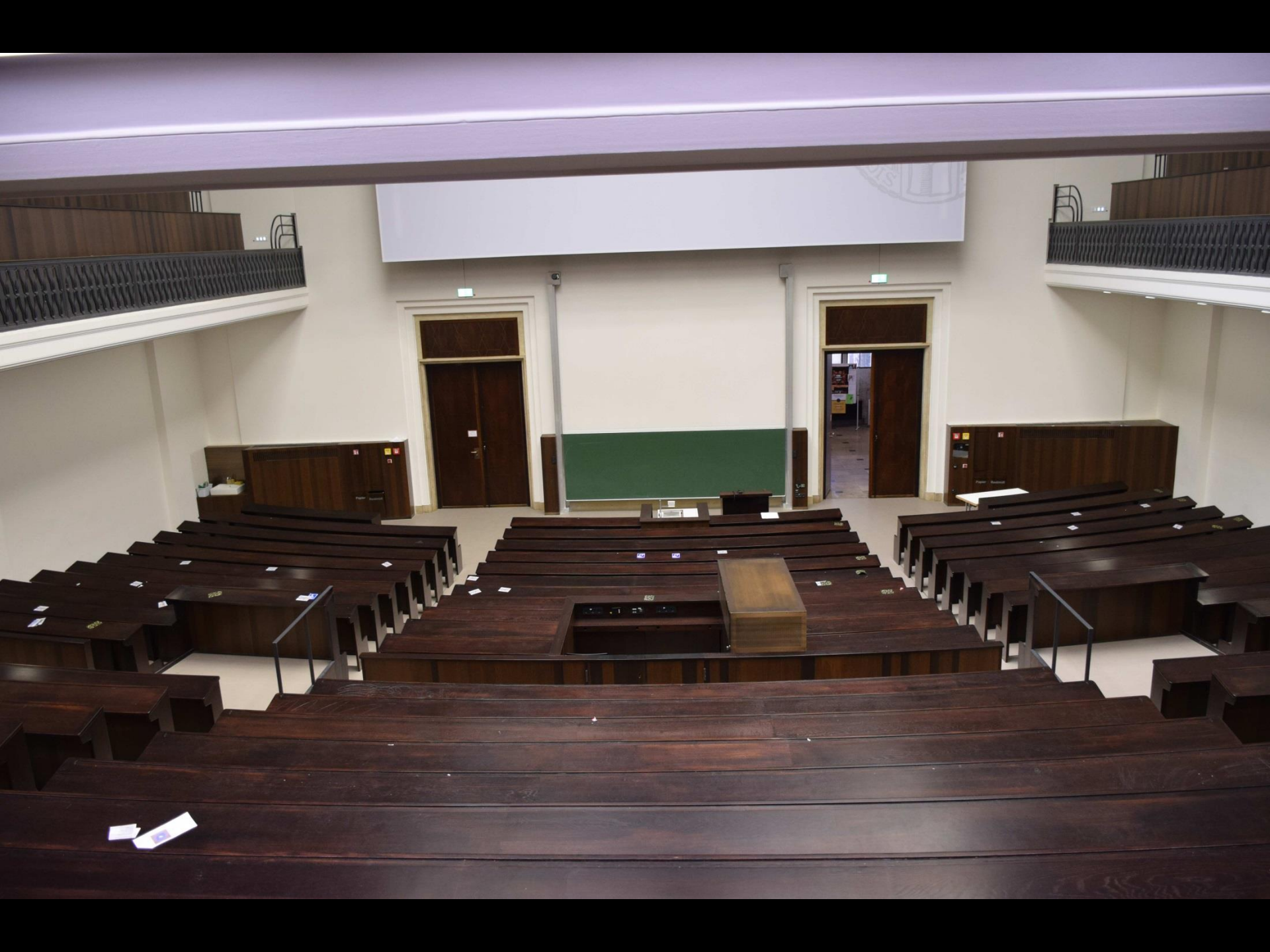
UNIVERSITAS -  
LUDOVIC MAXIM -  
MONA -  
CENSIS



















**Marienplatz**

hUQ8

**Donistl**  
 PILSENER BEER  
 0.5 l € 4.40  
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 Donistl sparkling wine: Darbo elderflower strip, fresh mint, lime / ice 0.2 l € 4.40  
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 our team about our merchandise items.  
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**S**  
**U**

**Marienplatz**

Eingang **A**  
Entrance

**U3 U6 S**

MVG • SWM  
Kundencenter

WC



AVG

| Linie | Ziel                       |
|-------|----------------------------|
| U3    | Friedrichshof West         |
| U6    | Friedrichshof              |
| U6    | Friedrichshof Südost       |
| U6    | Münchener Freiheit         |
| U3    | Olympiastadion             |
| U3    | Friedrichshof West         |
| U6    | Garching-Forschungszentrum |
| U6    | Messe                      |





PROBAT  
BAULEITUNG

Häcker-Pschorr Häcker-Pschorr Häcker-Pschorr Häcker-Pschorr Häcker-Pschorr



Neu denken  
E.ON

MÜNCHEN  
ZIN  
GER

Fräulein  
HAARSCHMUCK

OPTIK  
HÖRTKORN  
Dixons

Hacker-Pschorr  
Hacker-Pschorr  
Hacker-Pschorr





SIGILLUM MUSEI V. EDICTVM A. 1825





ANNO 1589





PASTA & PIZZA

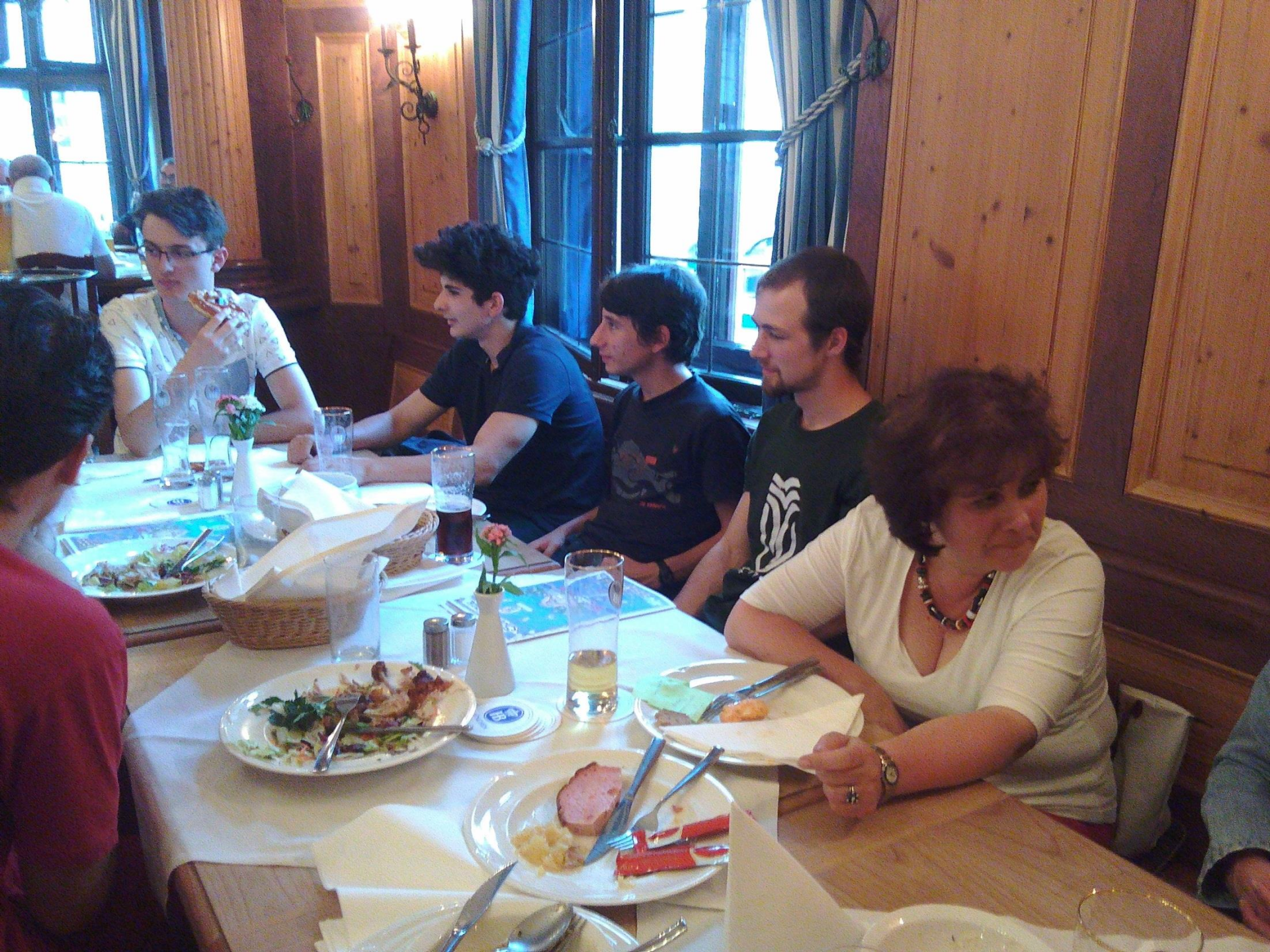
GALLETTES

6

PASTA & PIZZA

SCHOKOLA  
TEE

www.schaback.de





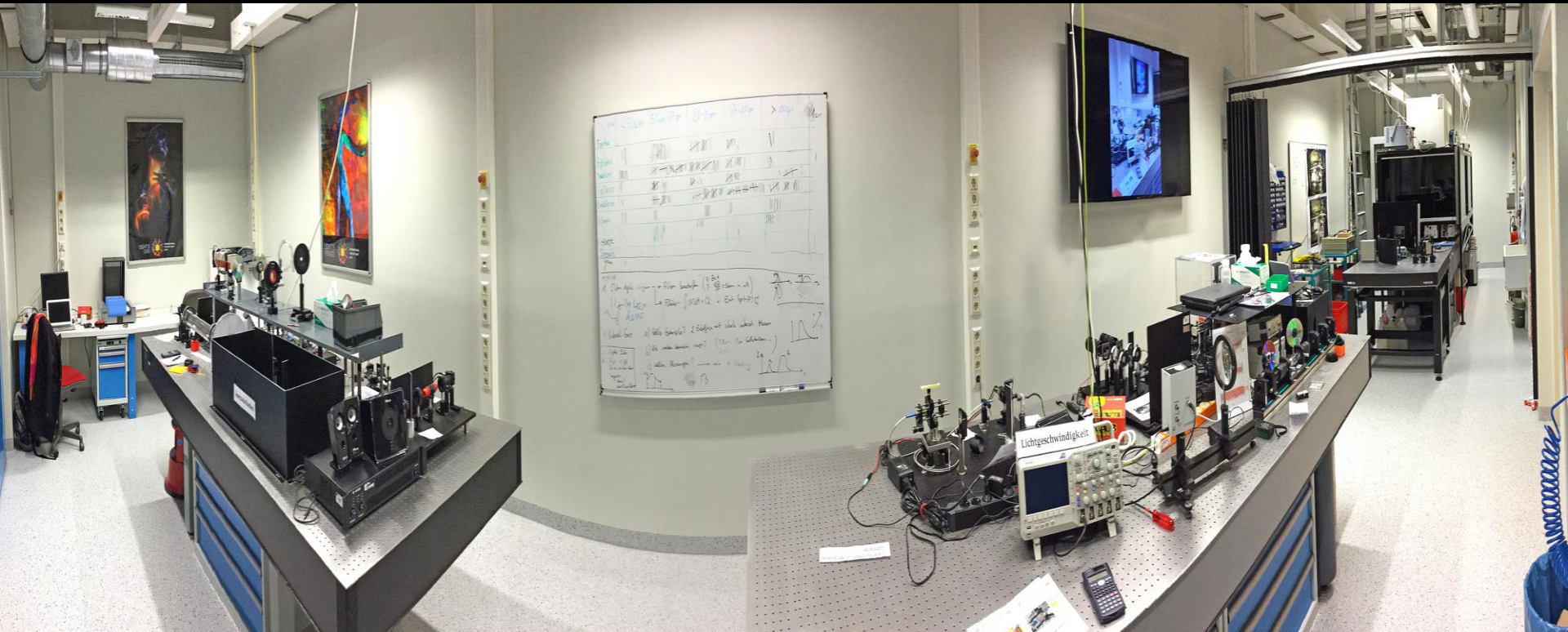






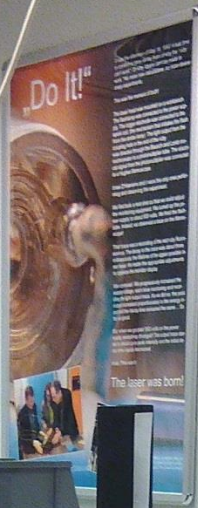






PhotonLab - the laser laboratory for school students





Haardicke messen



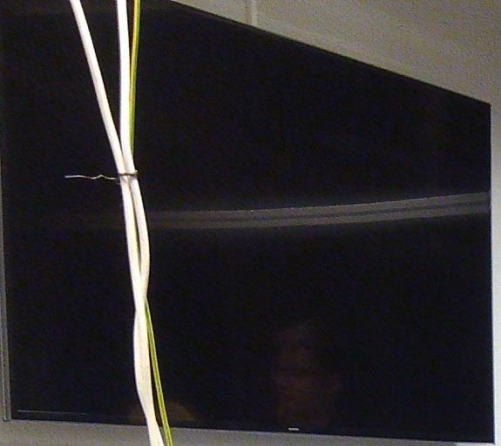


11  
Quantenradierer

20  
Holographie

21

Newport  
Scientific Series  
High Performance Sealed Hole Table Top



20

# Holographic

**Mini-Phasor Oscilloscope for Class**  
 Marlin Centre for Research

**Holography**  
 1. Place the slide on top of the hologram...  
 2. Turn the slide on top of the hologram...  
 3. Place the slide on top of the hologram...  
 4. Turn the slide on top of the hologram...  
 5. Place the slide on top of the hologram...

**What are the characteristics of a hologram?**  
 A hologram is a complex, three-dimensional optical...  
 It is a type of optical illusion that can be used for...  
 It is a type of optical illusion that can be used for...



8

# Interferometer

**Max-Planck-Institut für Quantenoptik  
Munich Centre for Advanced Photonics**

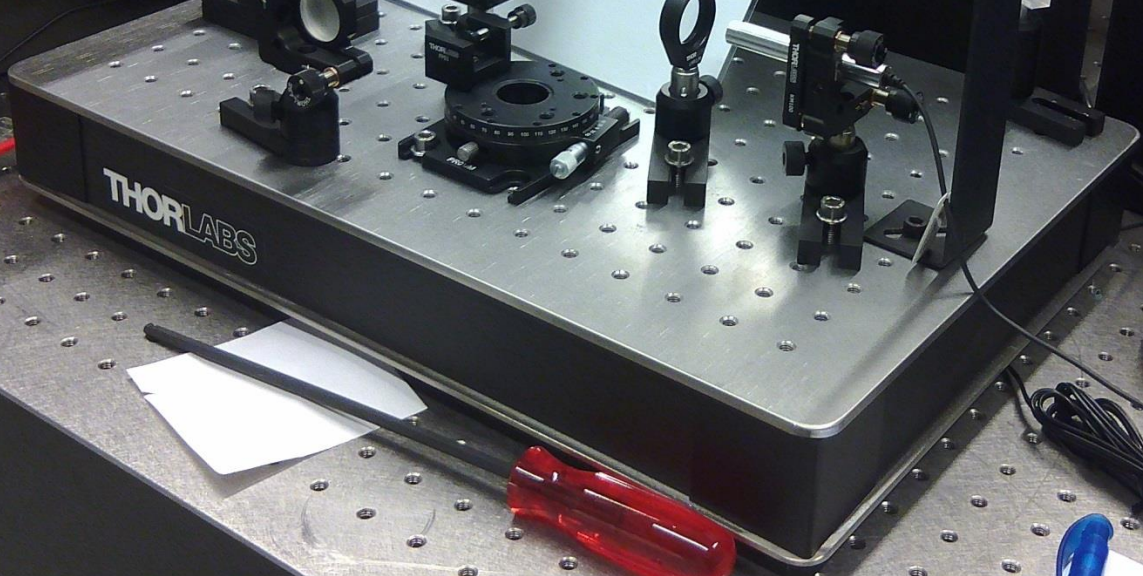
**Light + Light = darkness!**  
In order to measure the wavelength of laserlight  
1. Experimental arrangement



**2. Adjusting the Interferometer:**  
Adjustment: The mirrors can be adjusted with the two screws lying  
opposite to each other at the mirror holder.

**What laser safety glasses and turn  
the laser on!**  
Adjust the two backscattered  
reflected spots to the center of the  
laser beam.

On the screen you will watch two laser reflexes  
that should come to overlap.  
If they overlap exactly, you will see only one  
pattern of several stripes.  
Adjust the interferometer in a way so that you can only see two to



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200 KIMTECH



200 KIMTECH

200 KIMTECH

3

Haardicke

Haardicke messen

**Max-Planck-Institut für Quantenoptik**  
**Maxwell Center for Advanced Photonics**  
**Interference Diffraction of Light**  
**1. What is the thickness of my hair?**  
Experimental setup: Diffraction of laser light by a hair

**Practical Note:** The visible green laser line (532 nm) is very safe!

Place one hair in front of the aperture of the HeNe laser at the top end. Adjust it so that the laser beam just passes through the hair.

Use a red cube to hold the hair in place.

**Max-Planck-Institut für Quantenoptik**  
**Maxwell Center for Advanced Photonics**  
**Interference Diffraction of Light**  
**2. What is the thickness of my hair?**  
Measure the distance  $D$  to the detector plane and the distance  $d$  between the center of the diffraction pattern and the center of the central maximum. Measure the distance  $D$  between the center of the diffraction pattern and the center of the central maximum. Measure the distance  $d$  between the center of the diffraction pattern and the center of the central maximum.

For a hair of thickness  $t$ , the distance  $d$  is given by:  
$$d = \frac{\lambda D}{t}$$
  
where  $\lambda$  is the wavelength of the laser light.  
The thickness of the hair is:  
$$t = \frac{\lambda D}{d}$$
  
What can you conclude about the thickness of the hair? Compare your result with the manufacturer's specification.



Praxis



H<sub>2</sub>O des

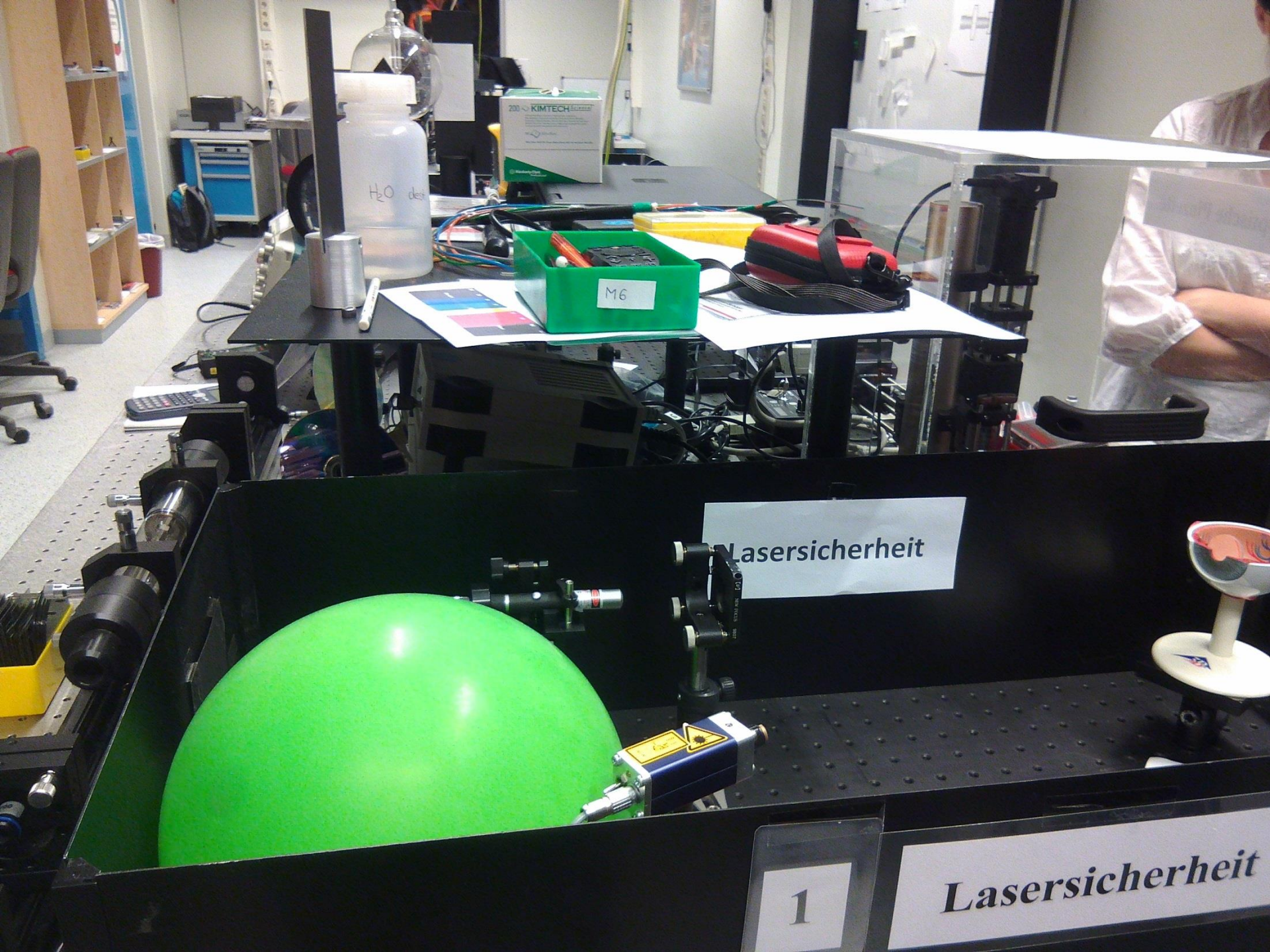
200 KIMTECH

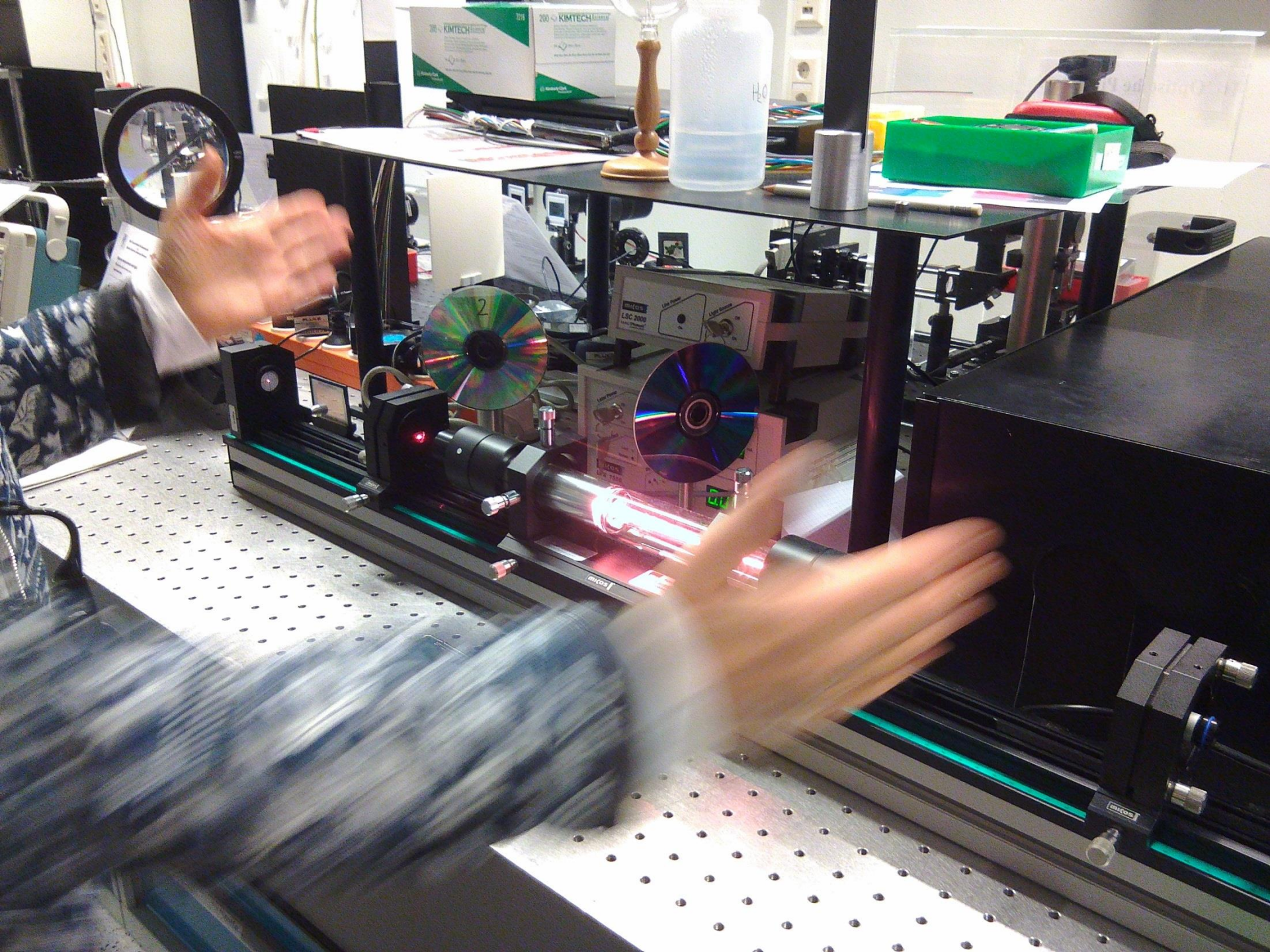
M6

Lasersicherheit

1

Lasersicherheit



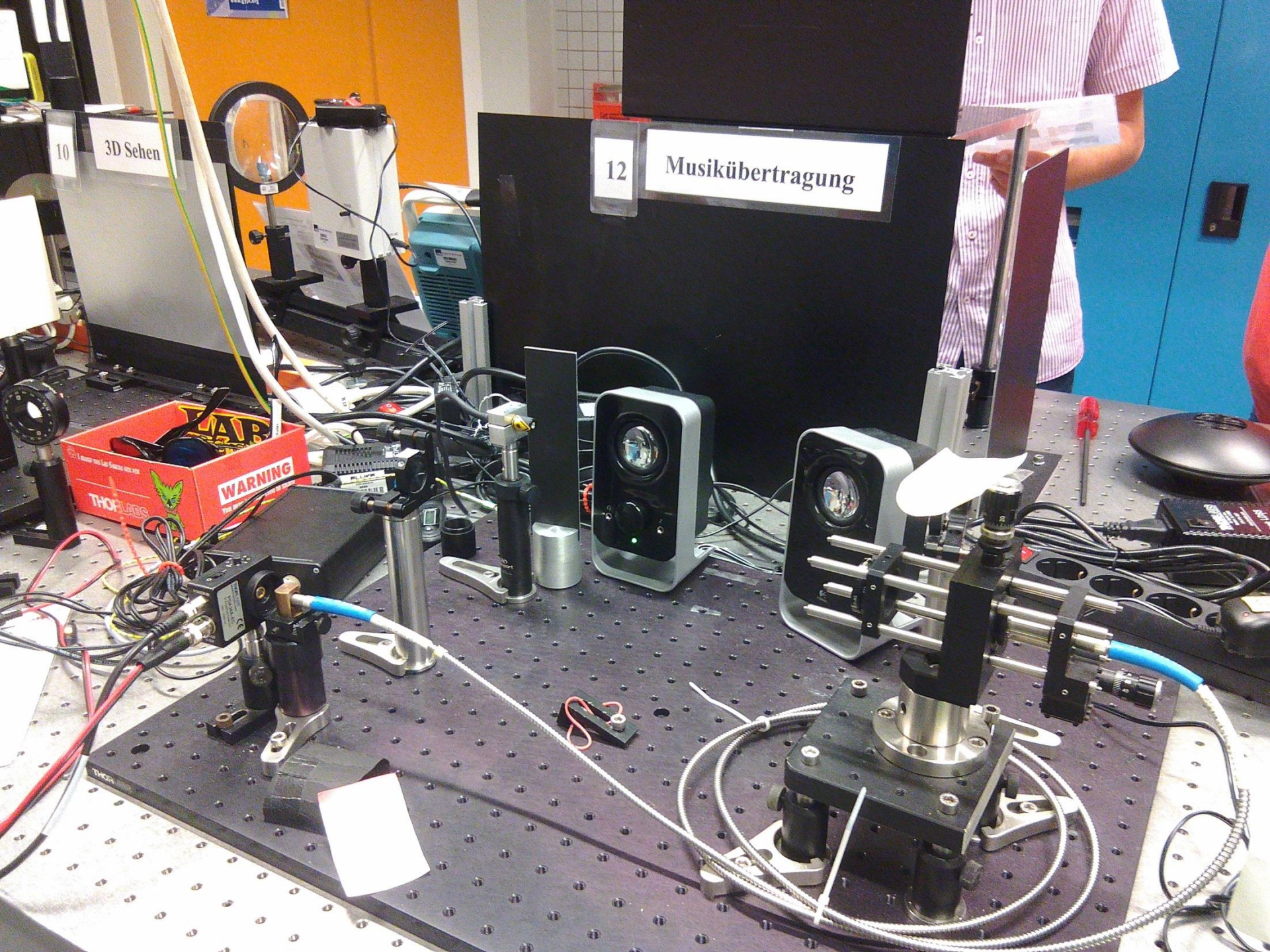


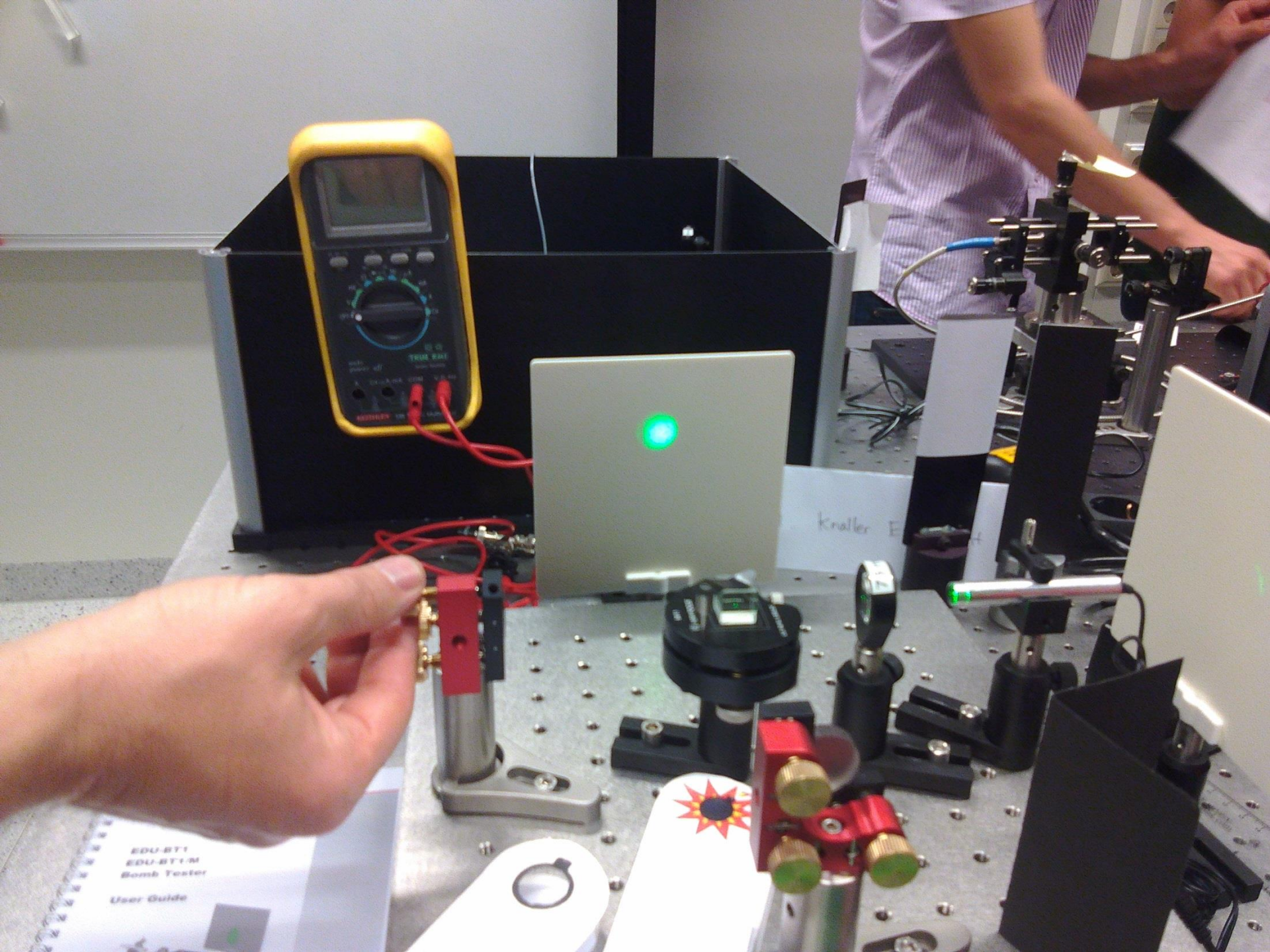
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3D Sehen

12

Musikübertragung





Knaller E

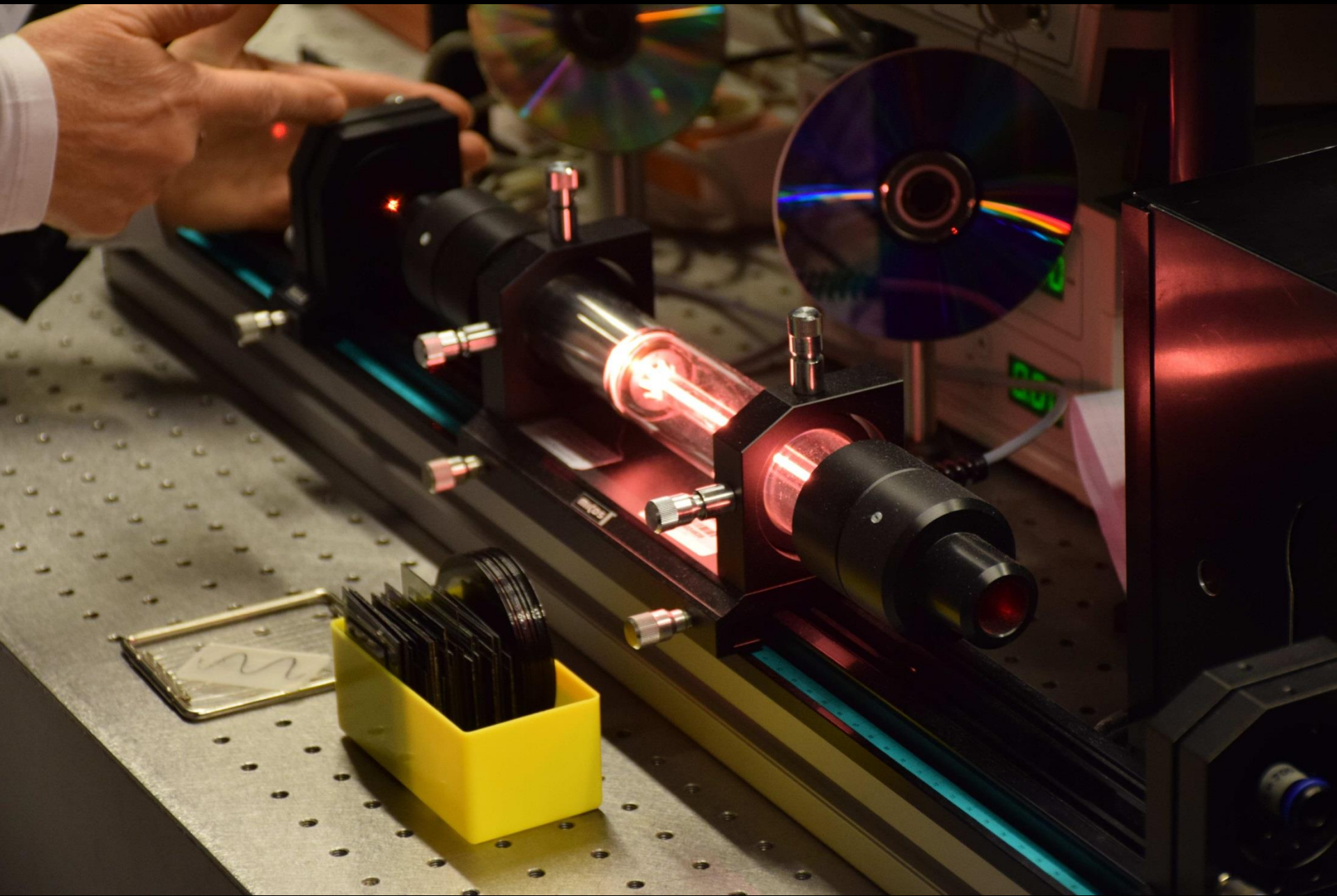


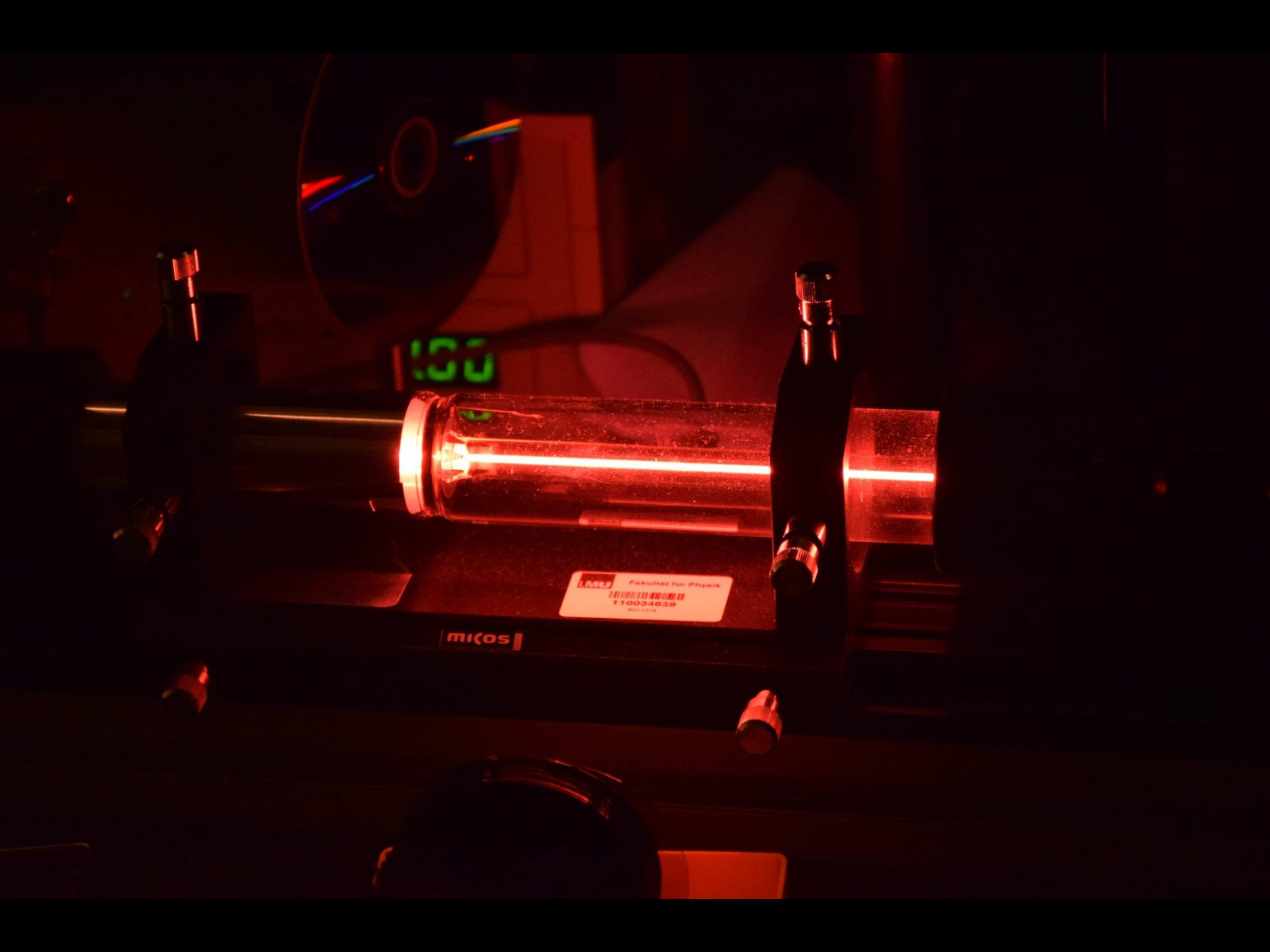
EDU-BT1  
EDU-BT1-M  
Bomb Tester  
User Guide





Knaller Exp

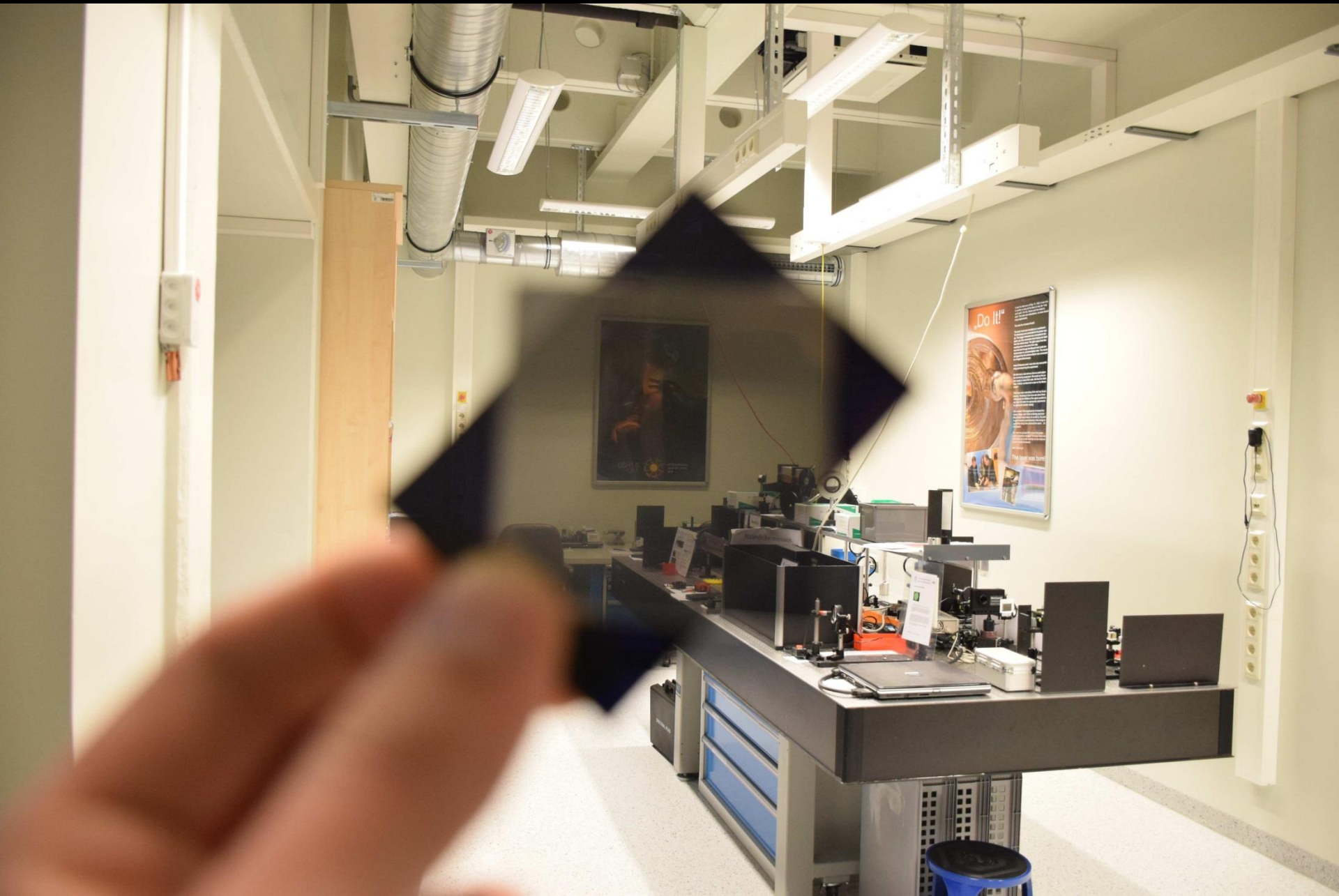




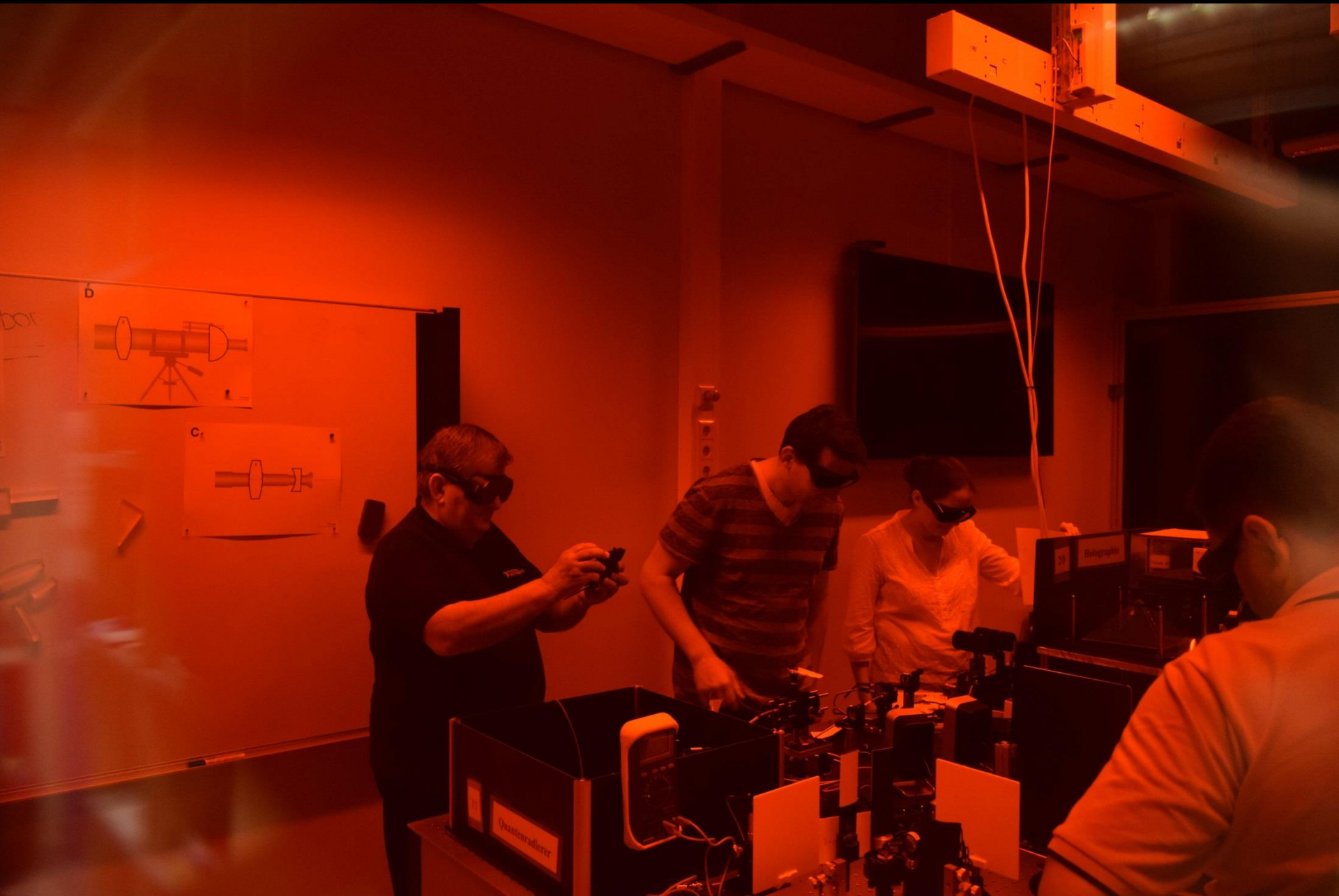
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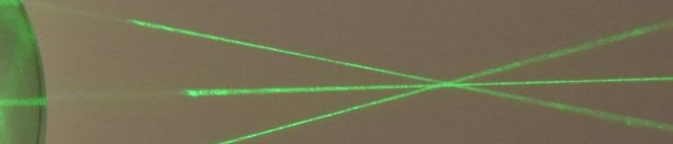


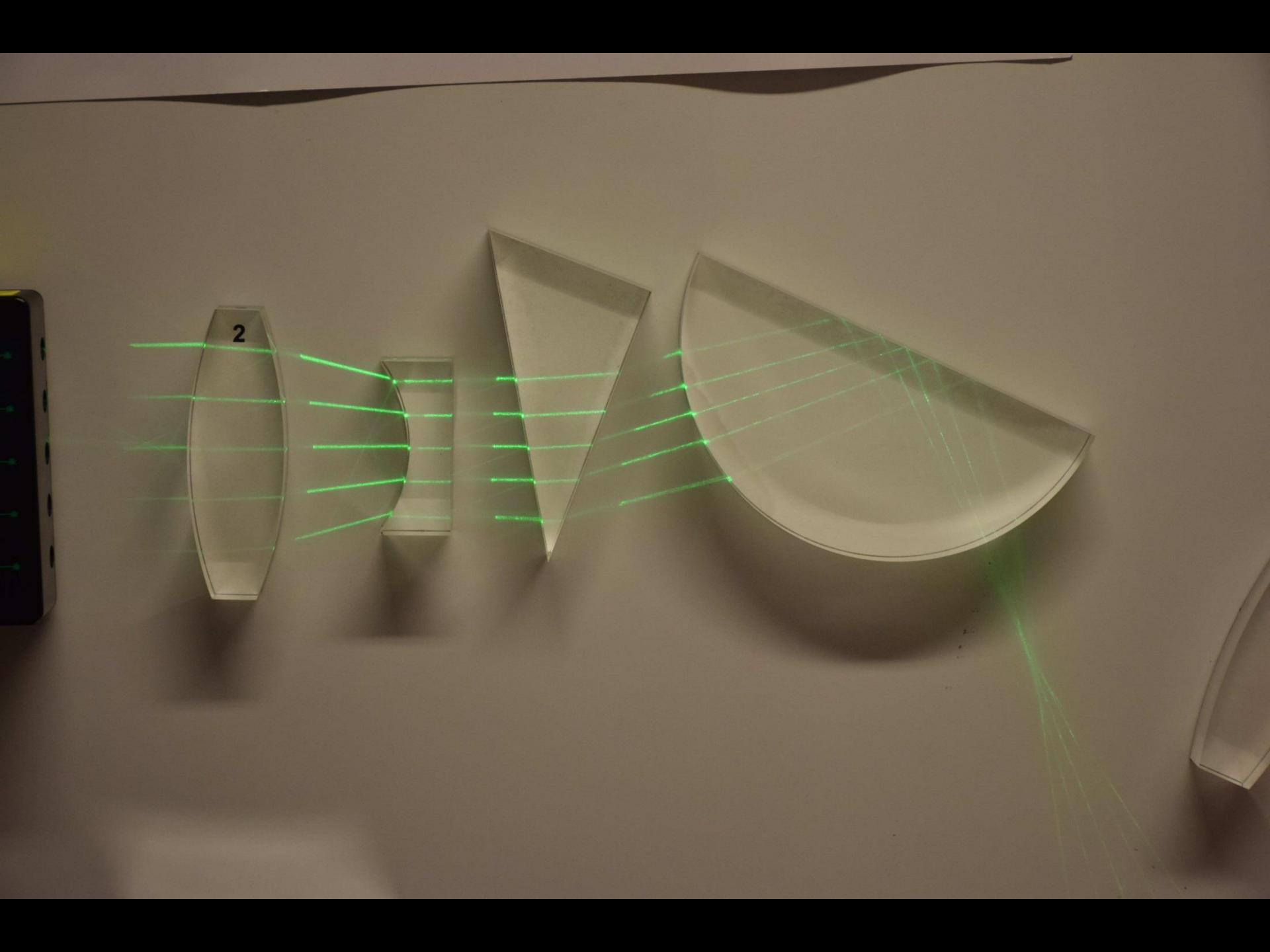


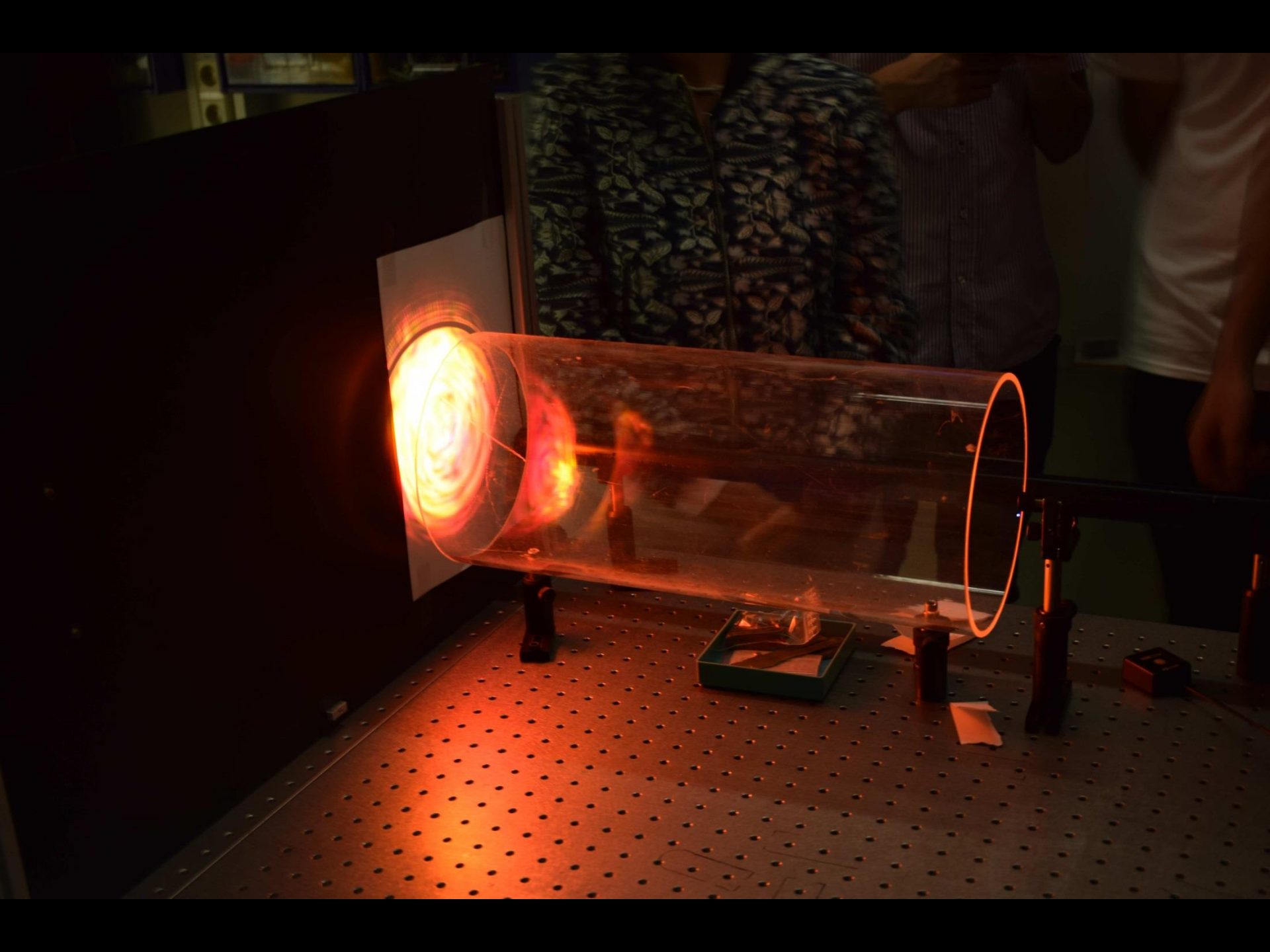




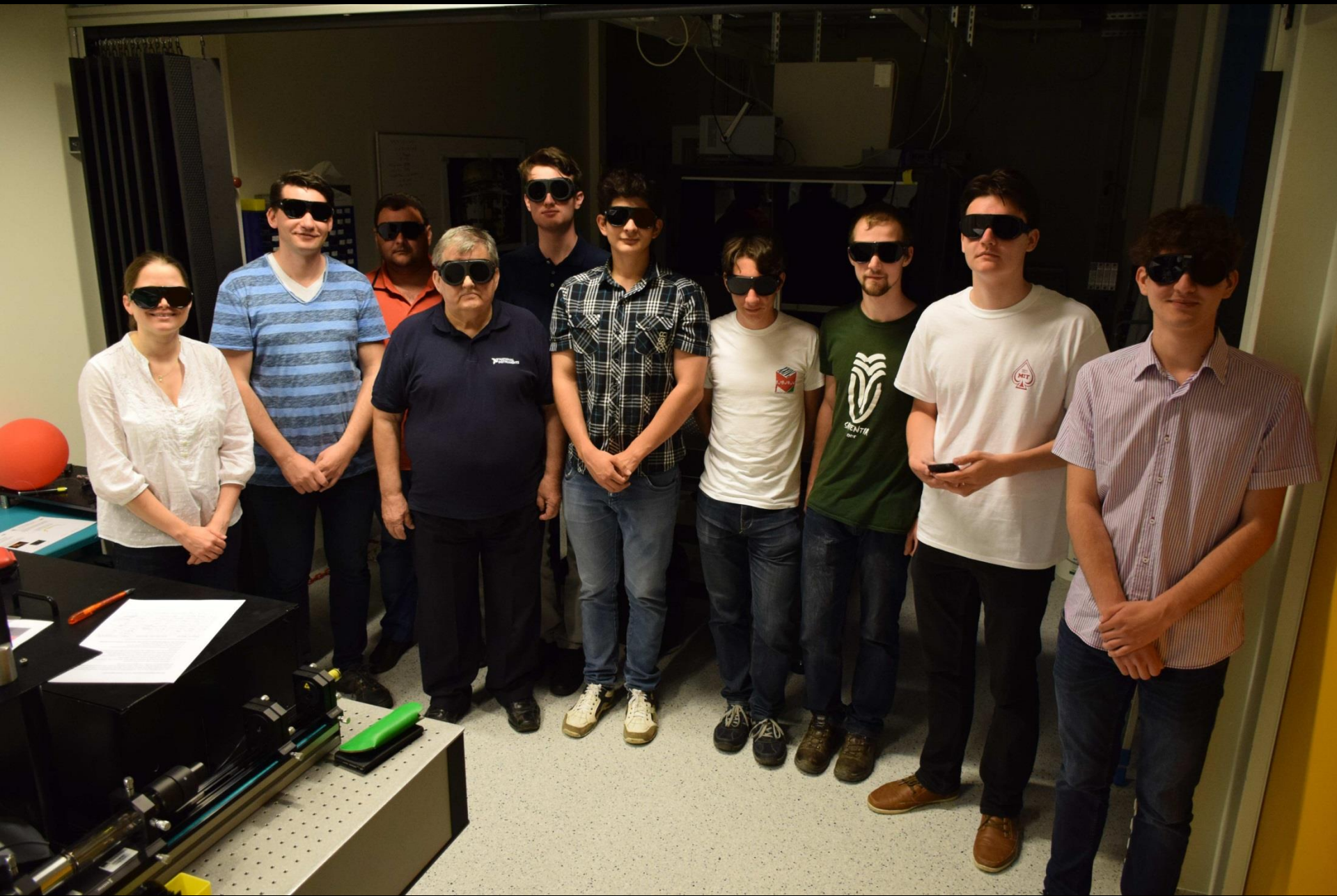




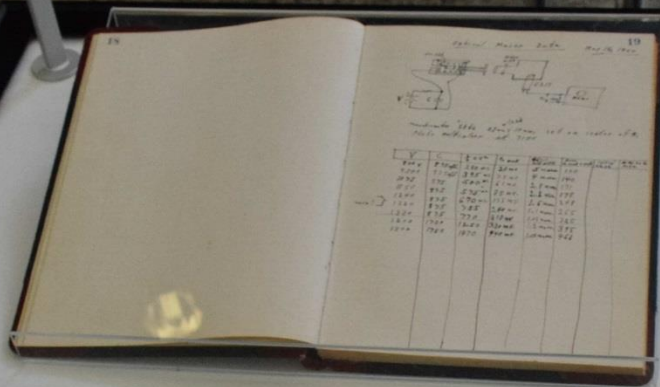










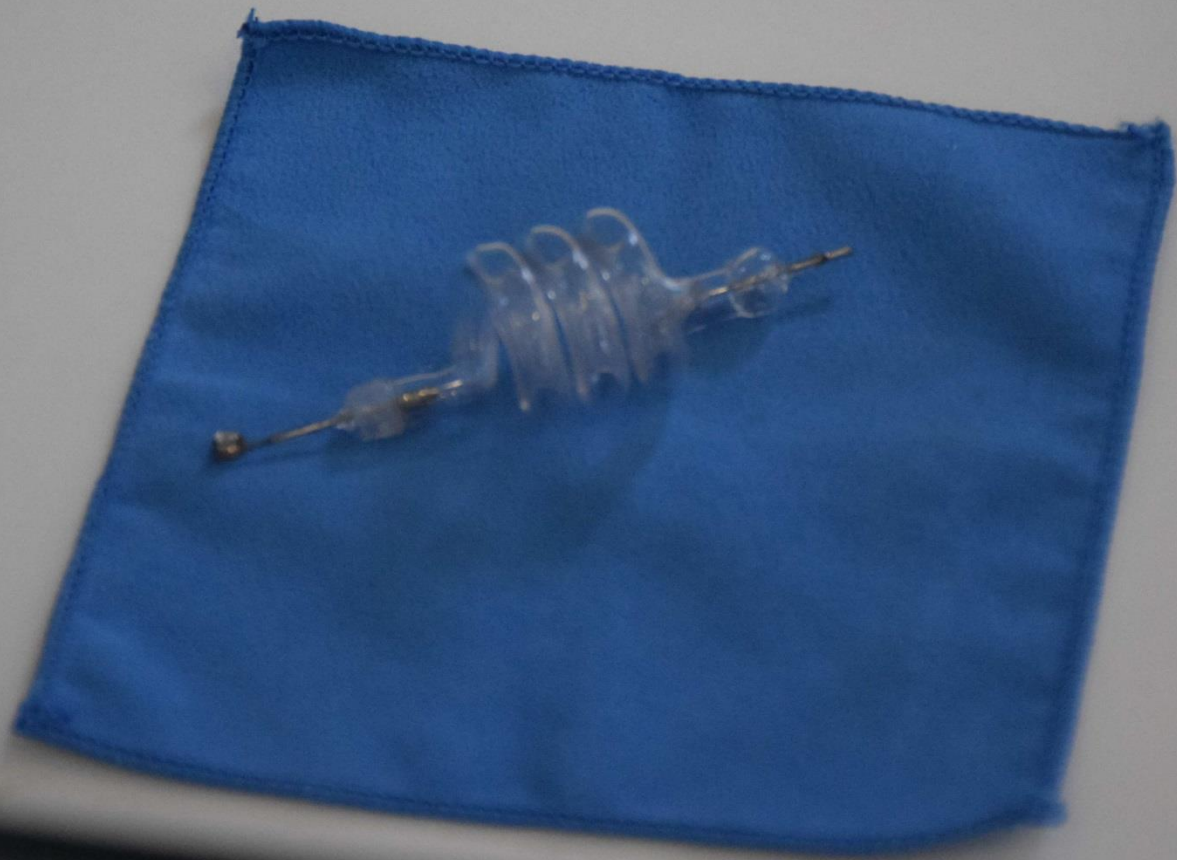


Laboratory notebook of Theodore Maiman  
July 1960 - October 1960  
The right page shows the laboratory notes  
of Theodore Maiman on May 16th 1960.  
The first laser was built that day and successful  
demonstrated.

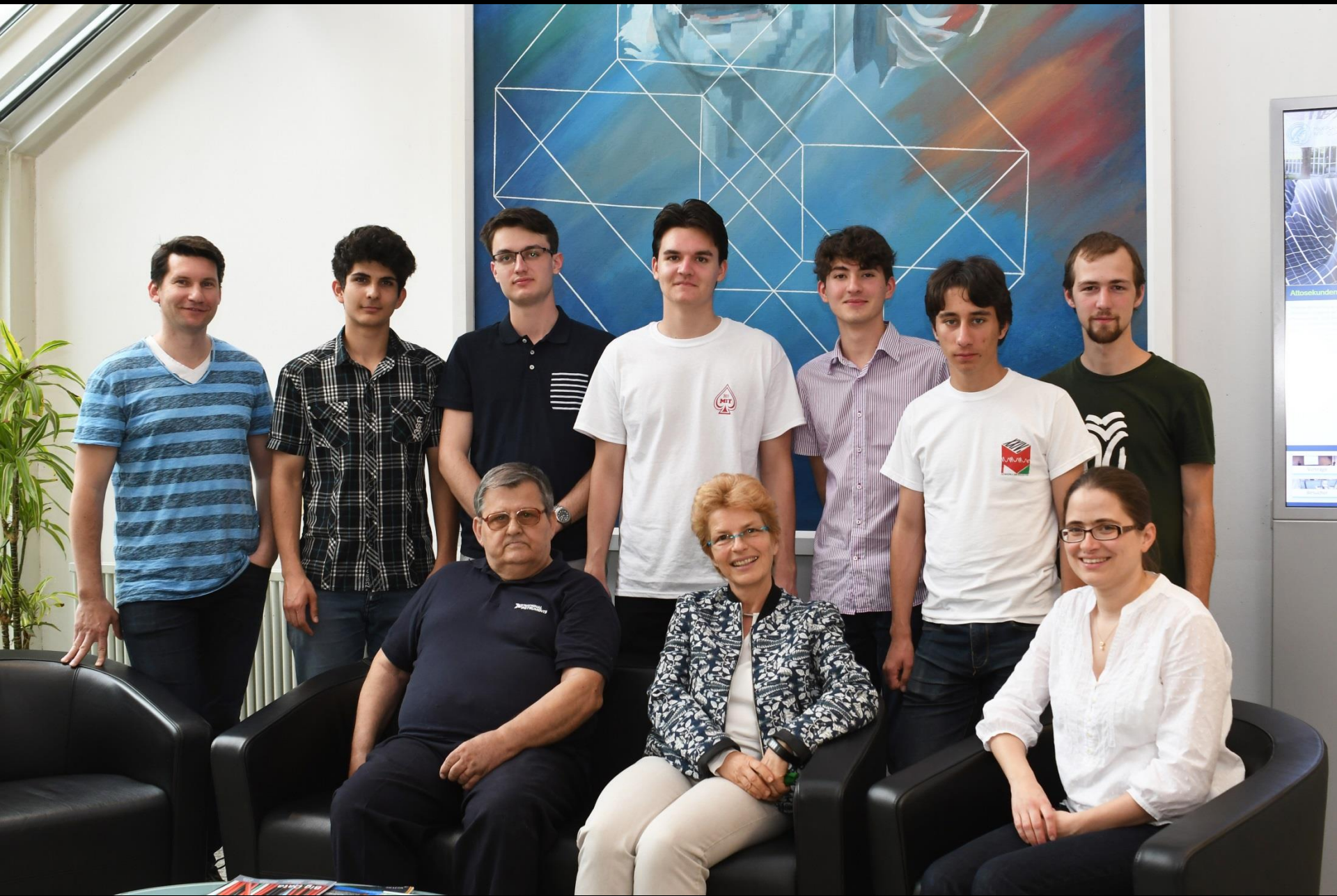


Theodore Maiman's original first laser early 1960. U.S. Patent # 3,353,115  
An aluminum cylinder with flash light and ruby crystal mount.  
A spiral flash light and a ruby crystal with evaporated-silver-mirrored  
ends are enclosed in a hollow aluminum cylinder.











We had lunch in the garden of the TUM











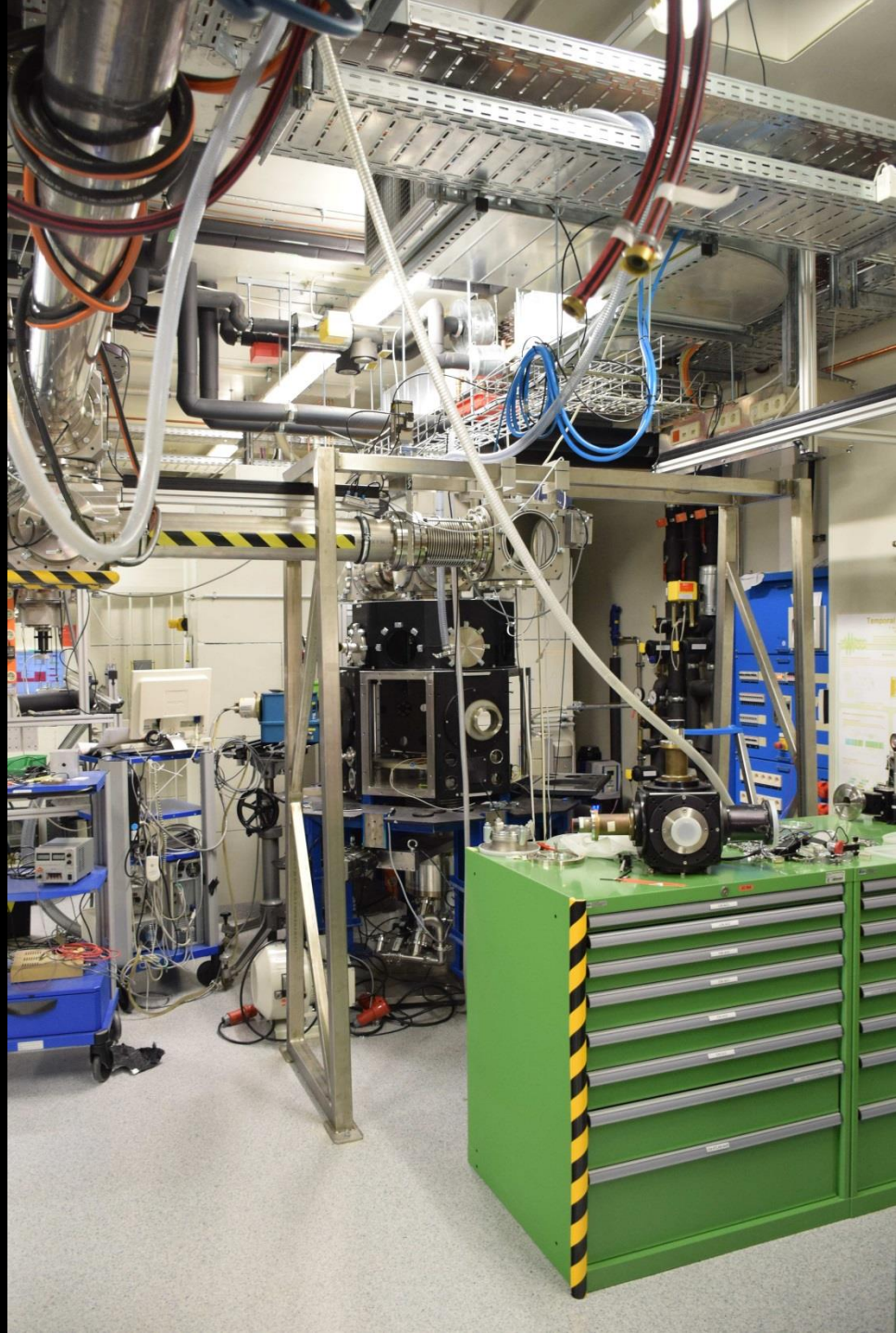


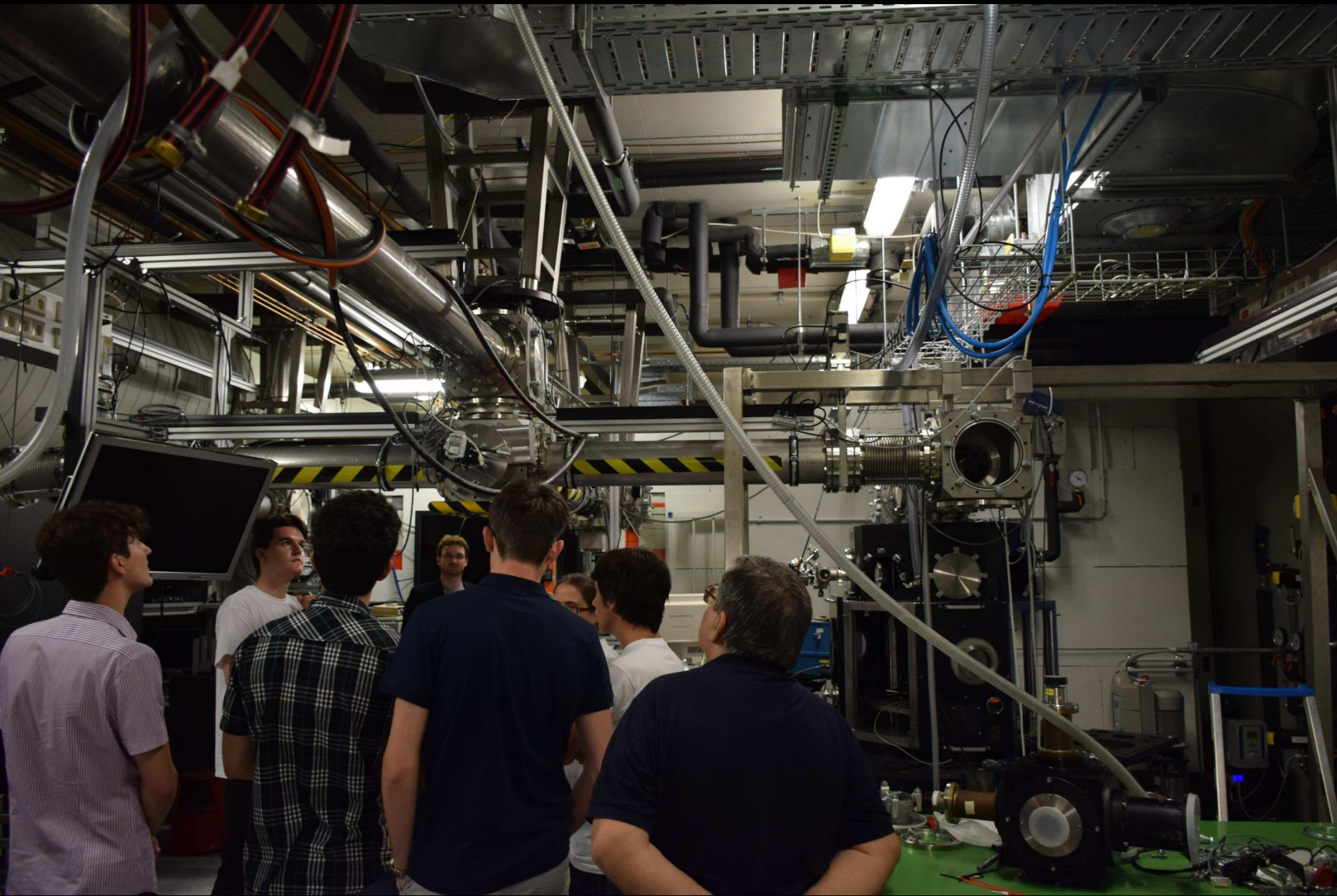


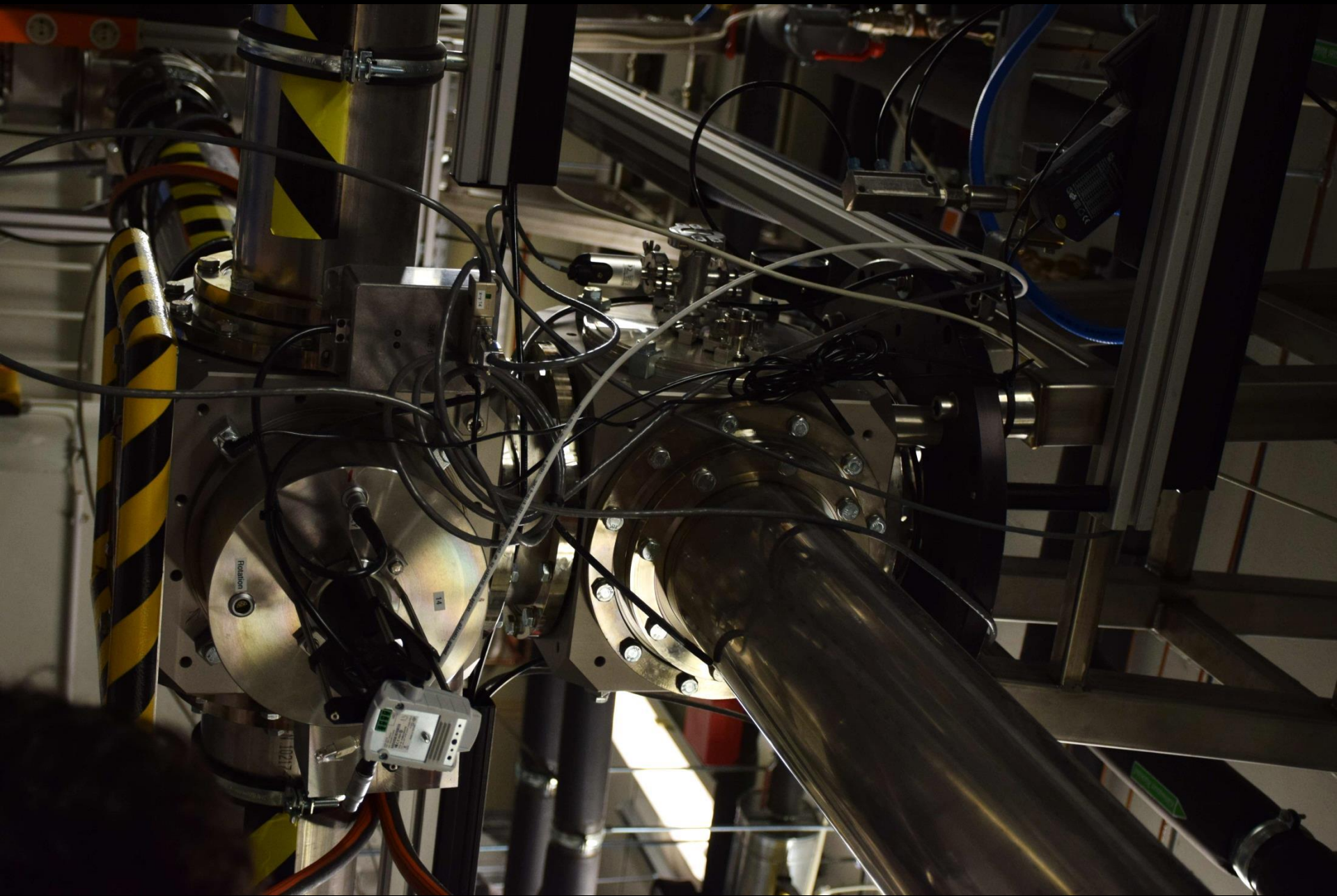


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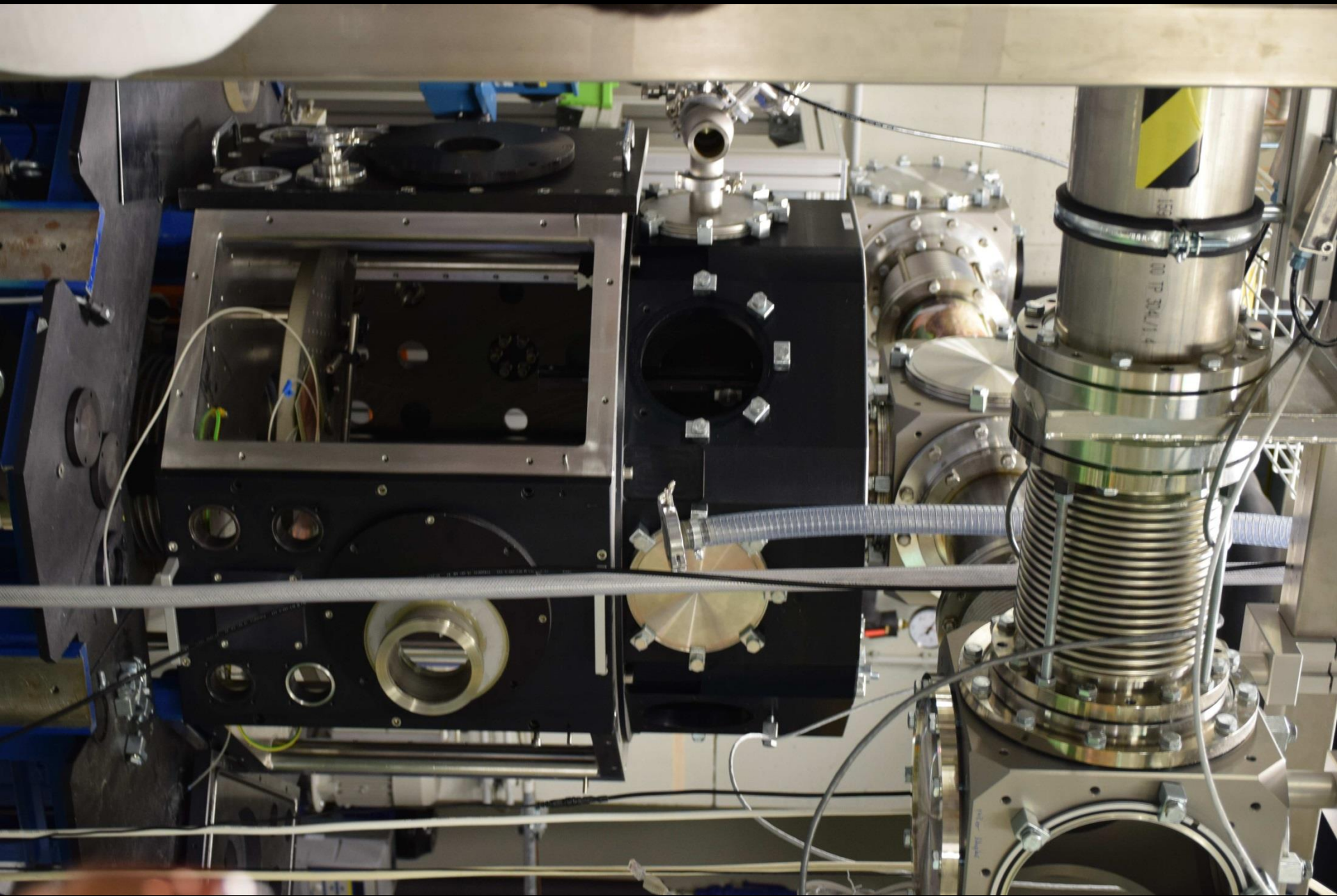


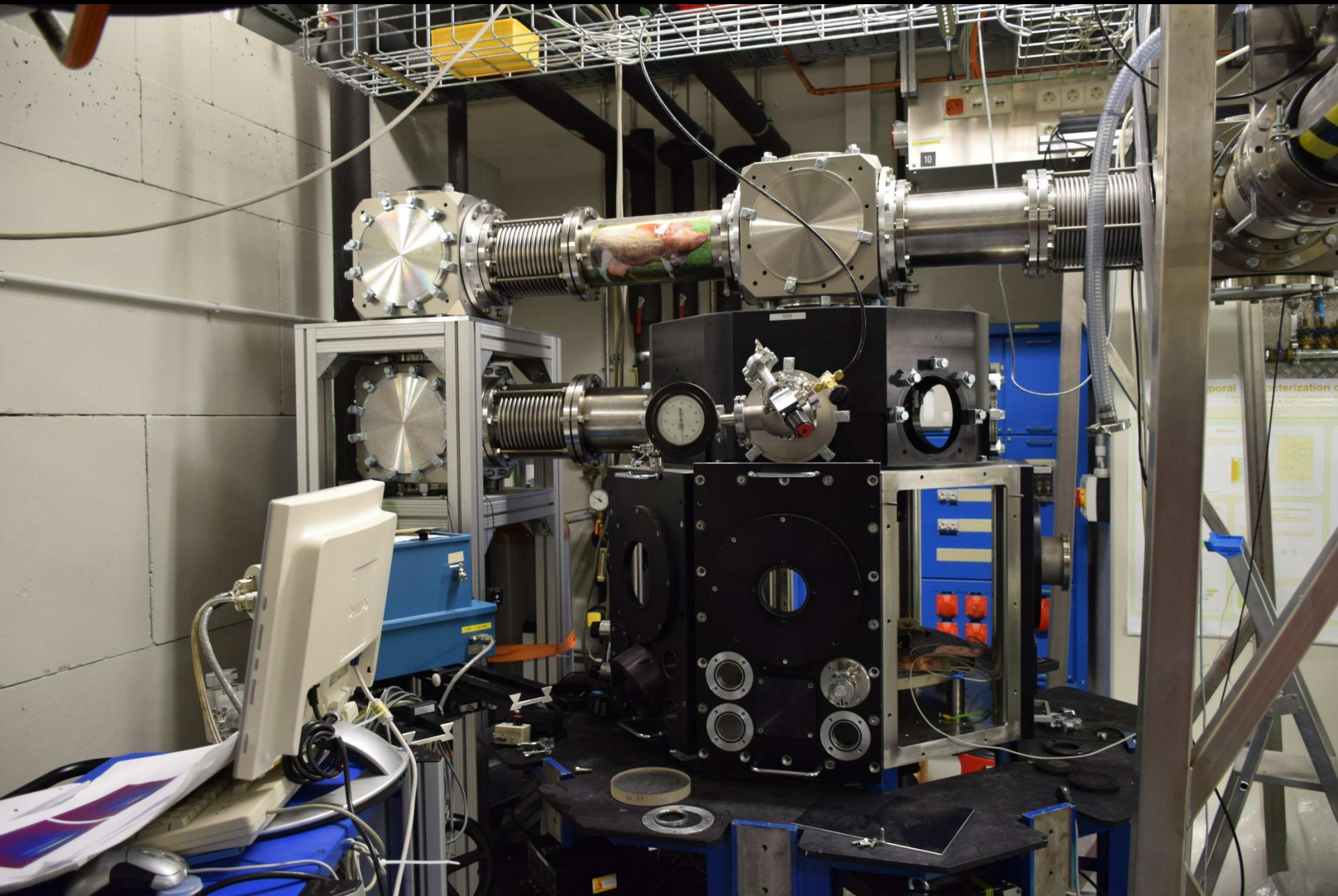




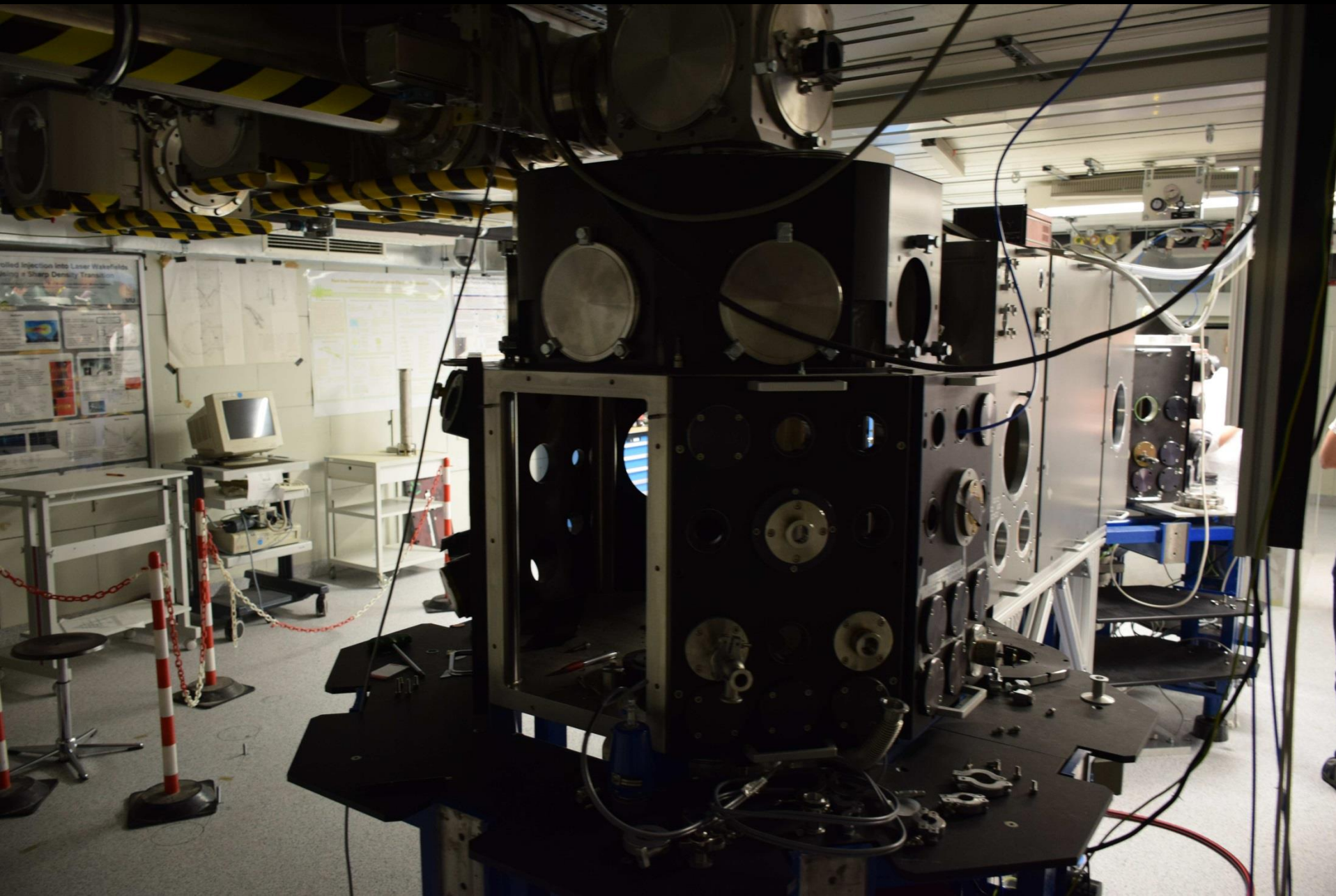


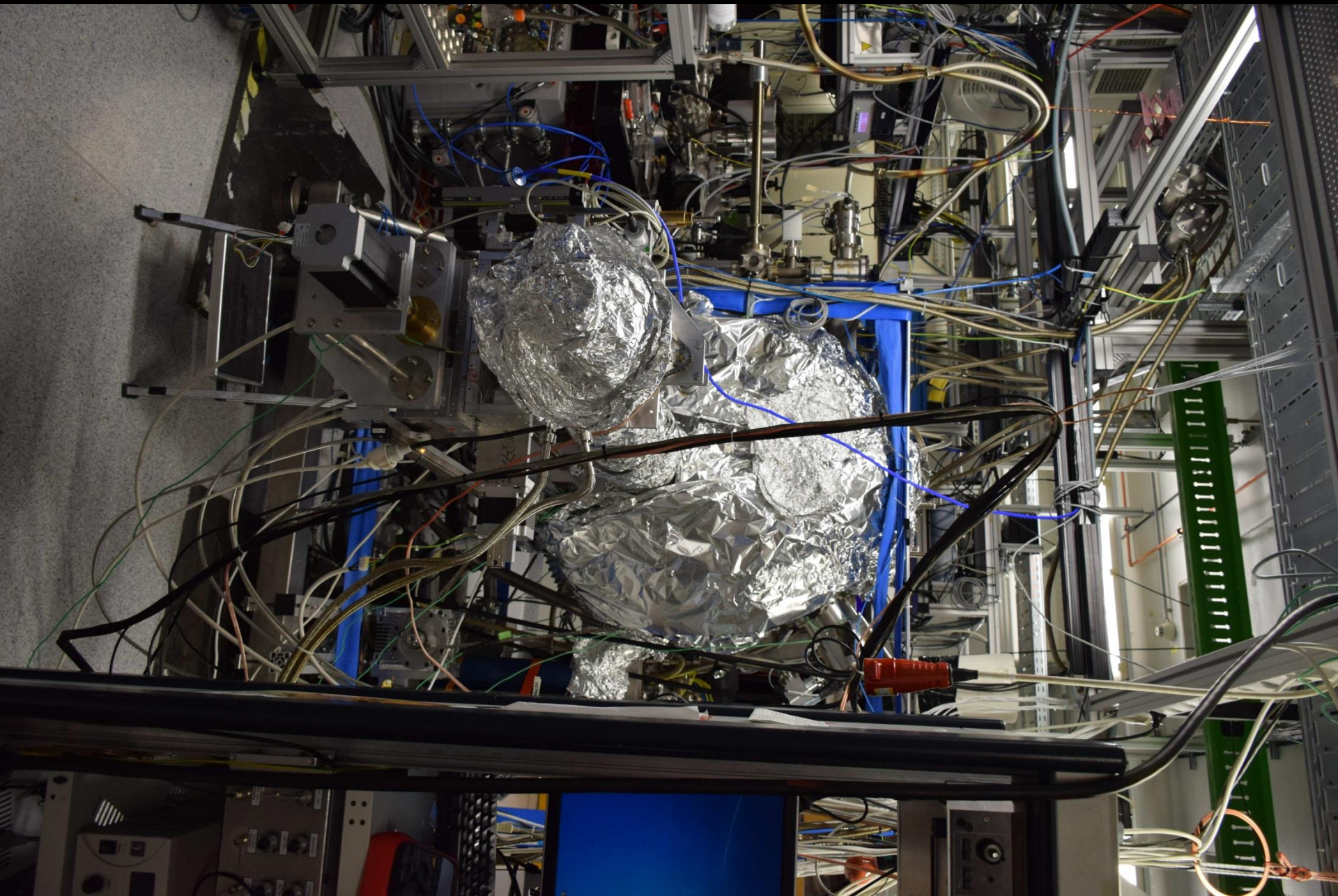


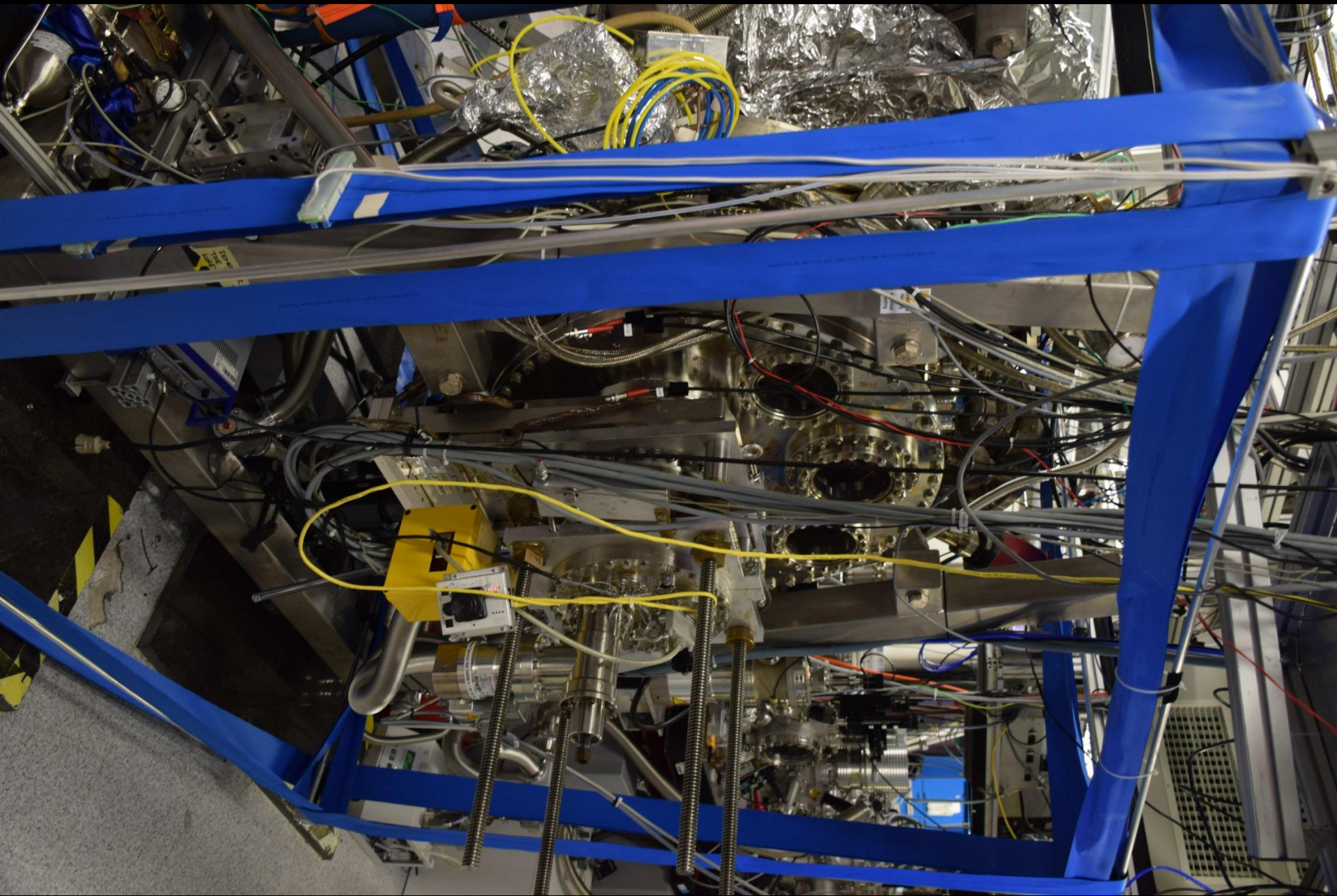


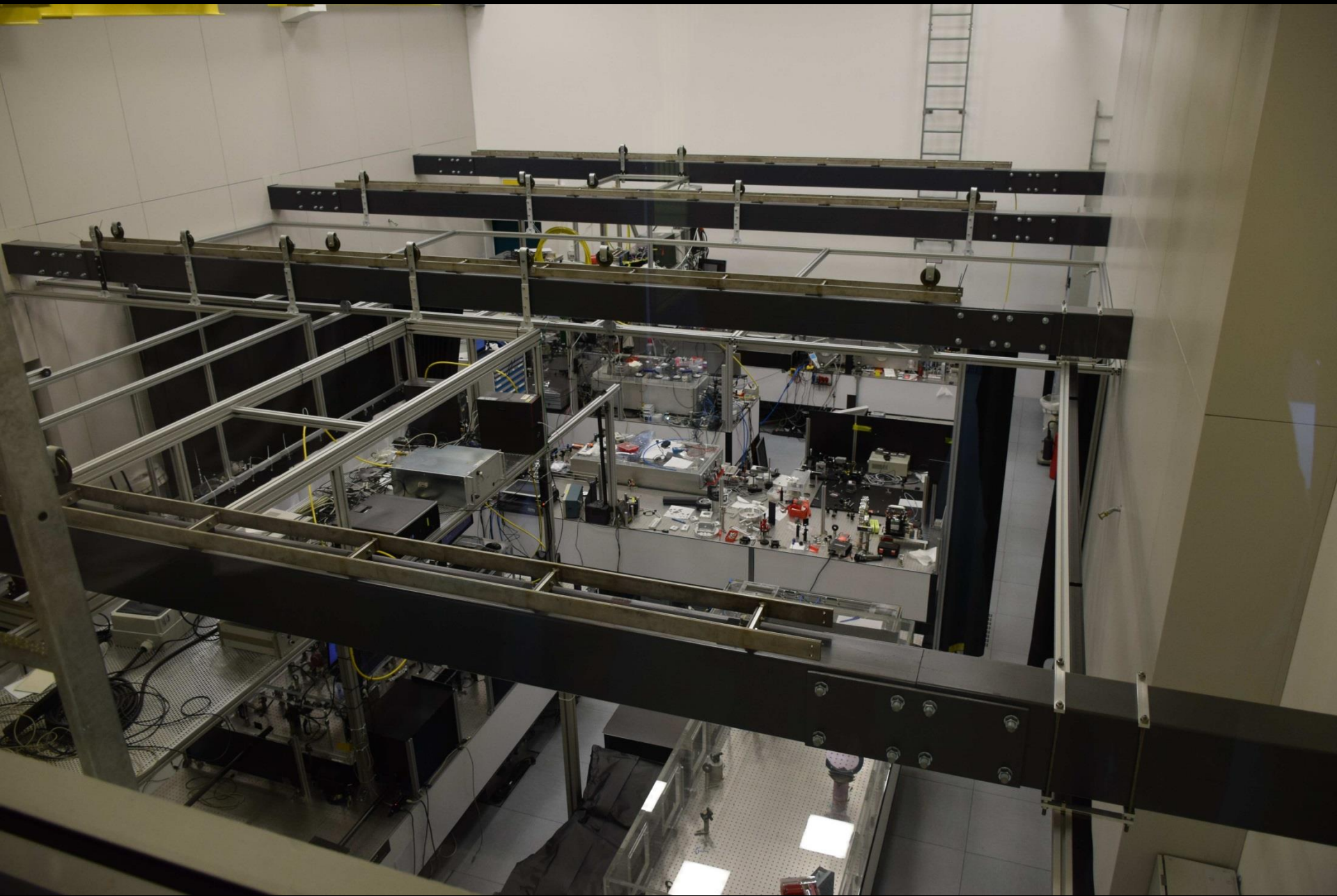












LASER  CO<sub>2</sub>-ALARM































DEM SIEGGEWEIHT VOM KRIEG ZERSTÖRT ZUM FRIEDEN MAHNEND

N CITY



5035

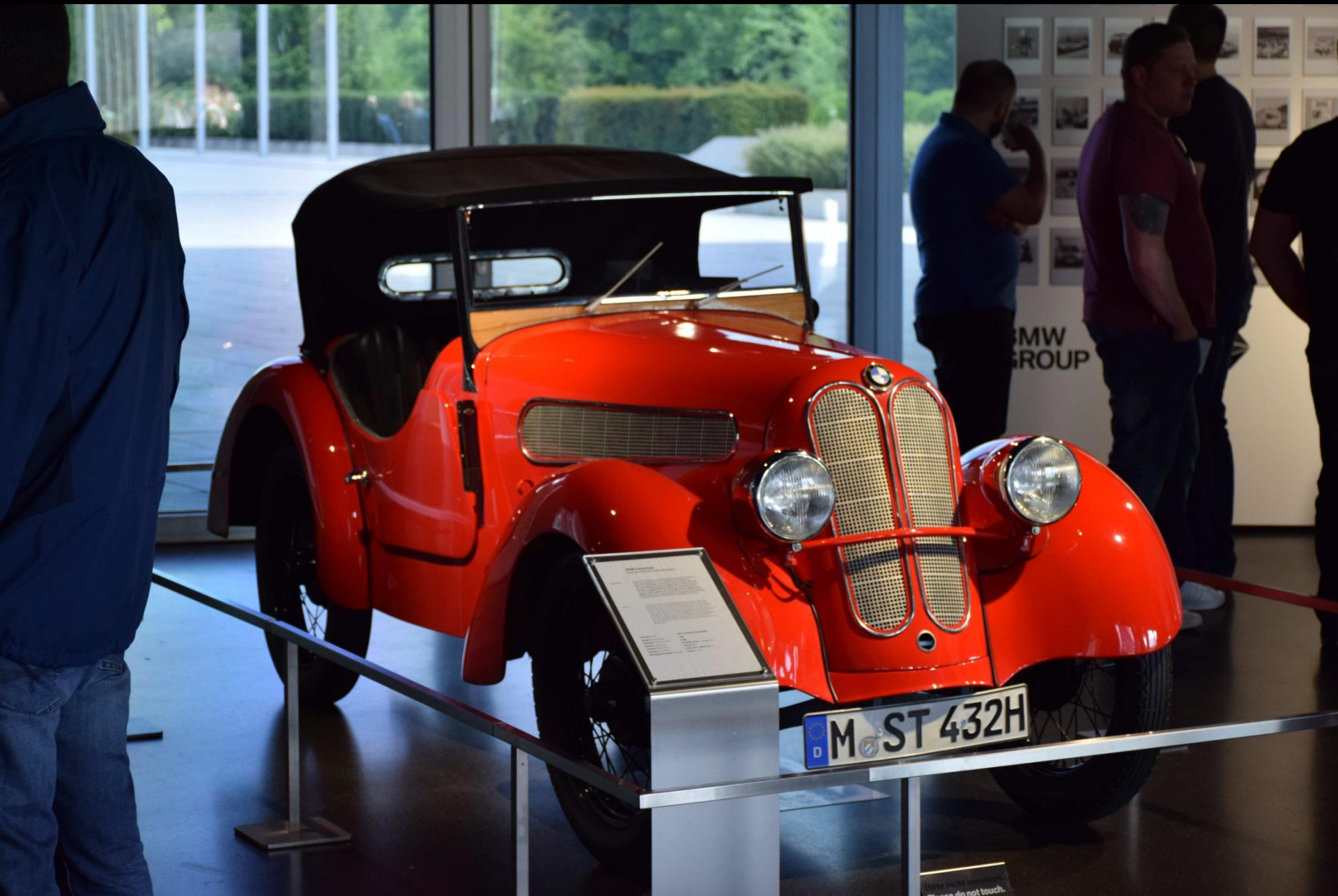
HKL  
18000 - 44 800 44

HKL MIETPAR

LAND-ROVER  
IDEONSPLATZ 2







Informational plaque detailing the car's specifications and history.

D M-ST 432H

BMW GROUP

Bitte nicht berühren  
do not touch.





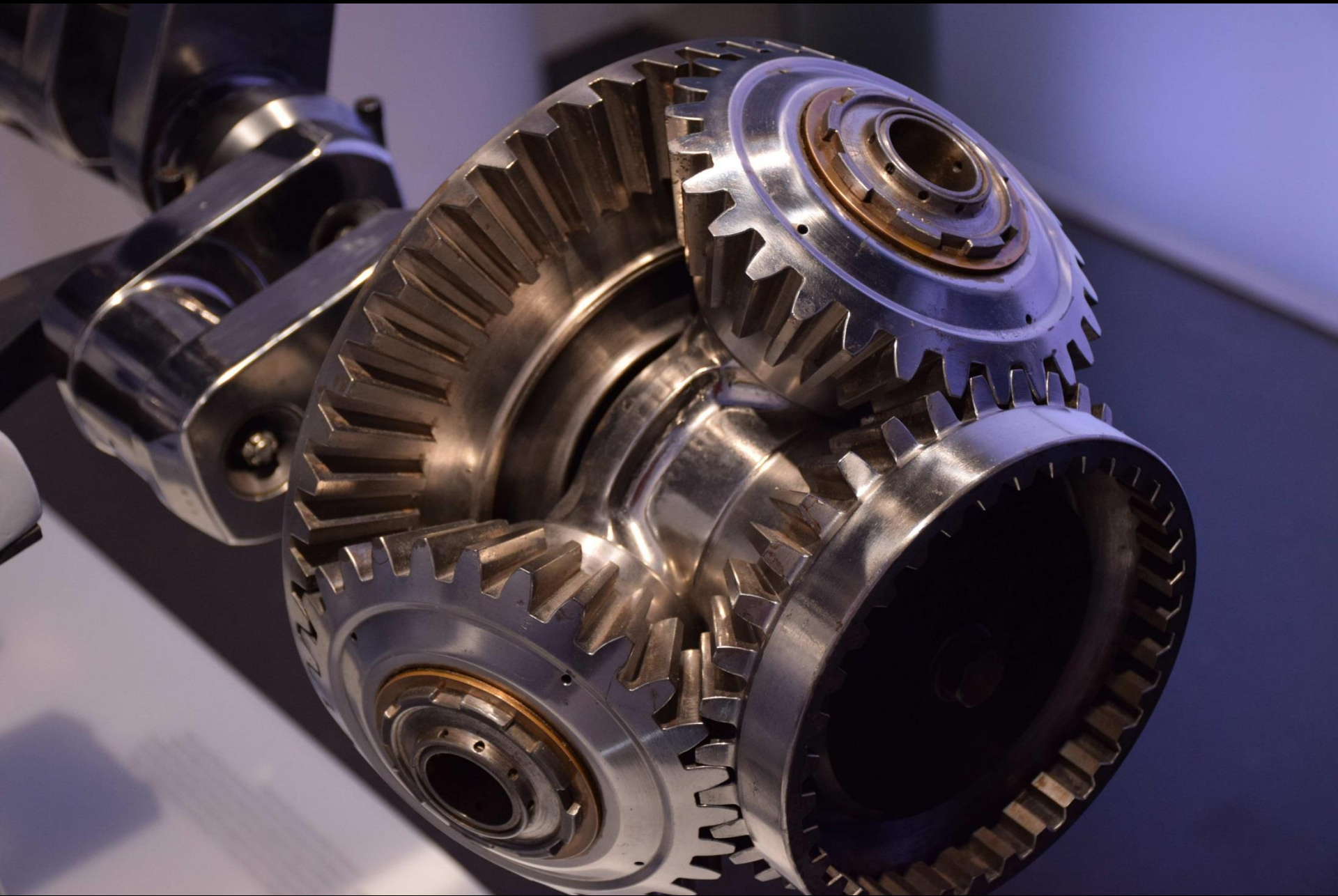
1968  
BMW 3.3 Li





1000  
BMW-P75

Bitte nicht berühren.  
Please do not touch.



...Qualität und wegweisende  
engines during the First World War. The new  
product, the BMW IIIa inline six-cylinder engine.  
...ing civil aviation in Europe. In the following  
...cooled radial engines, and in the 1940s  
...diness. In due course, BMW's engineers and  
...ded for aircraft engine construction to the  
...ressive standards of quality and incorporated

1944  
BMW 003

1944  
BMW 801

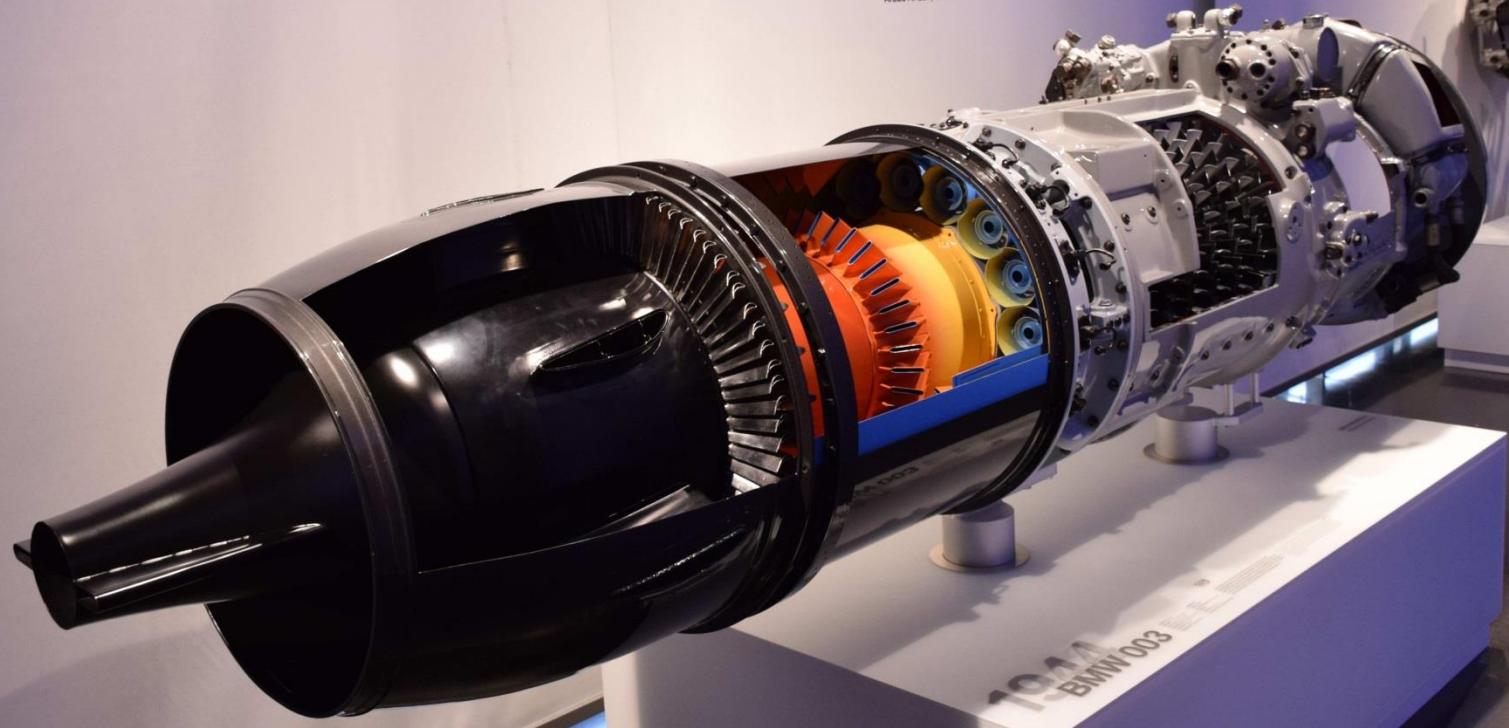
1933  
BMW 132



Arado Ar 234, 1944.



BMW 801

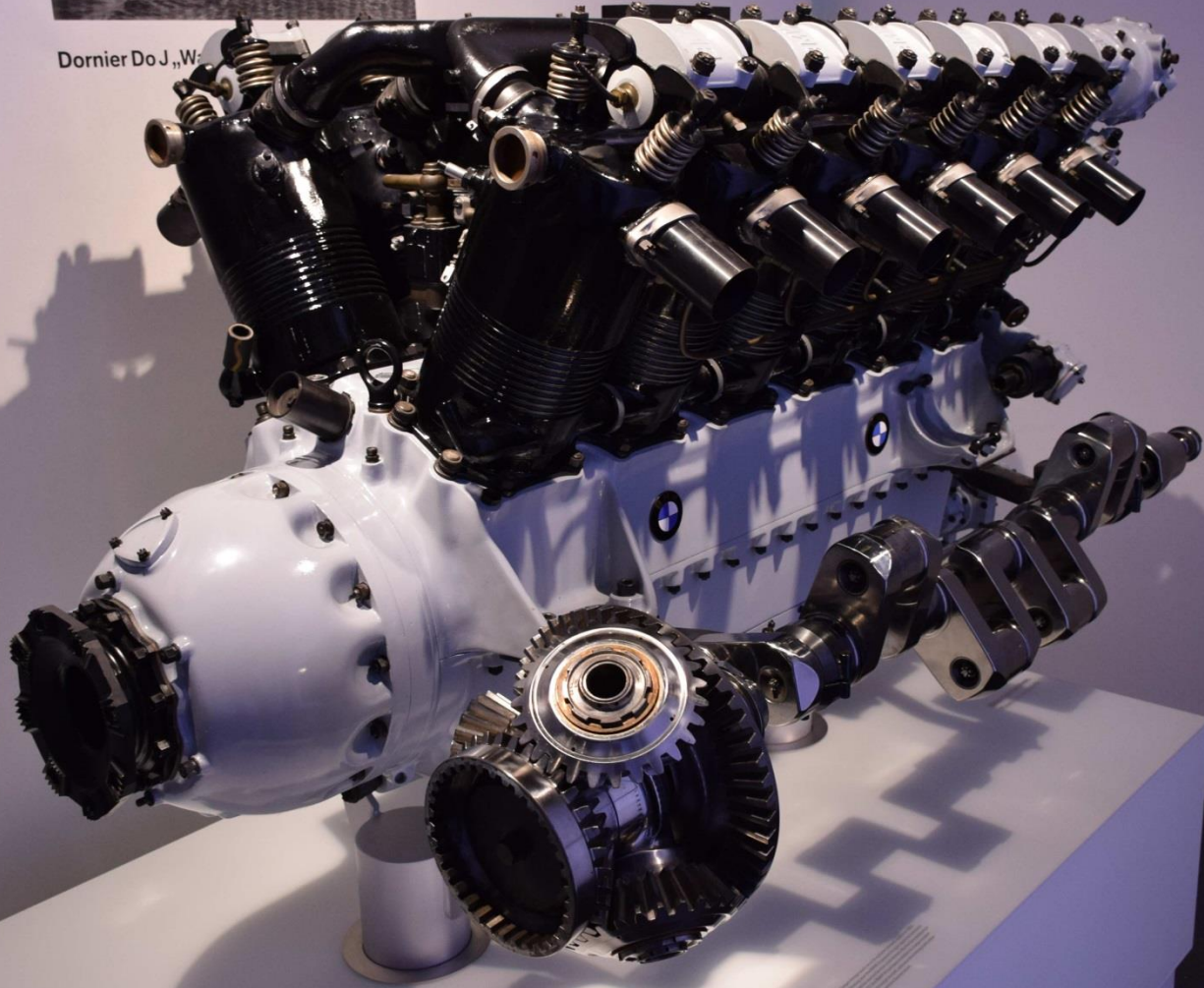


1944  
BMW 003

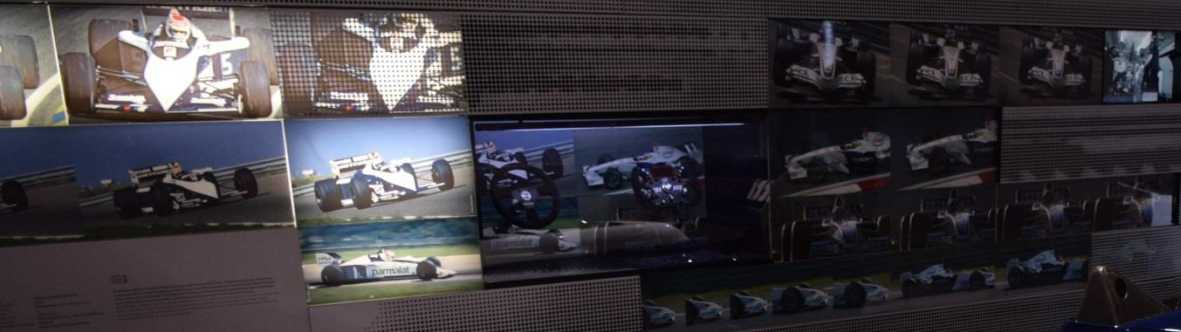




Dornier Do J „W-



... used in racing. Both in motor sport and in series production, BMW was the first manufacturer, in cooperation with the Bosch company as its development partner, to adopt what are still known as 'Digital Motor Electronics'.



57

Am 24. April 1981 gab BMW sein erstes Engagement in der Formel 1 bekannt. Das erste BMW-Rennfahrzeug war das BMW M1200 von Oliver Oros. BMW war Partner von Bernie Ecclestone, der die Rechte an den Formel 1-Weltmeisterschaften für Deutschland an die Daimler-Benz AG übernahm. Im darauffolgenden Jahr wurde BMW zum offiziellen Motorsportpartner der BMW AG ernannt. Die BMW-Motorsport-Abteilung wurde gegründet und wurde von Oliver Oros geleitet. Die BMW-Motorsport-Abteilung wurde im Jahr 1982 als Teil der BMW AG gegründet. Die BMW-Motorsport-Abteilung wurde im Jahr 1982 als Teil der BMW AG gegründet. Die BMW-Motorsport-Abteilung wurde im Jahr 1982 als Teil der BMW AG gegründet.



1977

BMW 745i



1976

BMW 336



1972

BMW 520i



1975

BMW 320i

r.  
sor.

Die erste Generation.  
The first generation.

Das erste 3er Cabrio.  
The first 3 Series  
Convertible.

Raum und Allrad.  
Space and all-wheel drive.

Dynamik und Eleganz.  
Dynamic performance and elegance.

Zeichen der Zeit.  
Sign of the times.

Mehrfach unser Klassik.  
The corner in the class.

Erweiterter Bereich.  
Extended area.





rive.

**Dynamik und Eleganz.**  
Dynamic performance and elegance.

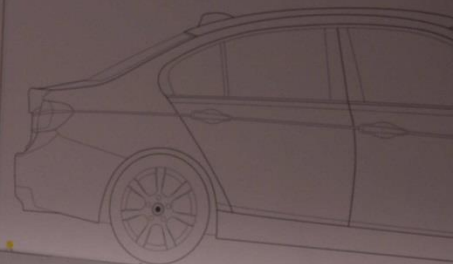
**Zeichen der Zeit.**  
Sign of the times.

**Maßstab seiner Klasse.**  
The standard in its class.

**Innovativer Vorreiter.**  
Innovative pioneer.



**Innovativer Vorreiter.**  
**Innovative pioneer.**





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BMW 1 Series Hatch 5-door

ing you do  
Sir Henry Royce

ROYCE

Power in reserve  
Space in abundance

ATHLETE  
BUSINESS



DAWN





- Navigation icons: a vertical column of icons on the left side of the screen, including a compass, a magnifying glass, a car icon, and a location pin icon.

ENERGY  
17:42

500 m, A N





- 8 Salzburg
- Passau
- 9 Nürnberg  
← München
- Messe / ICM

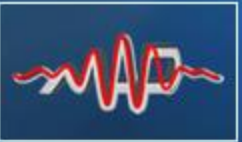












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