



# Tanulmányi kirándulás a Max Planck Kvantumoptikai Intézetbe

Gärching-München, 2017 májusa







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





7

WZTES 66

M S 3353









UNIVERSITAS -  
LUDOVIC MAXIM -  
MONA -  
CENSIS









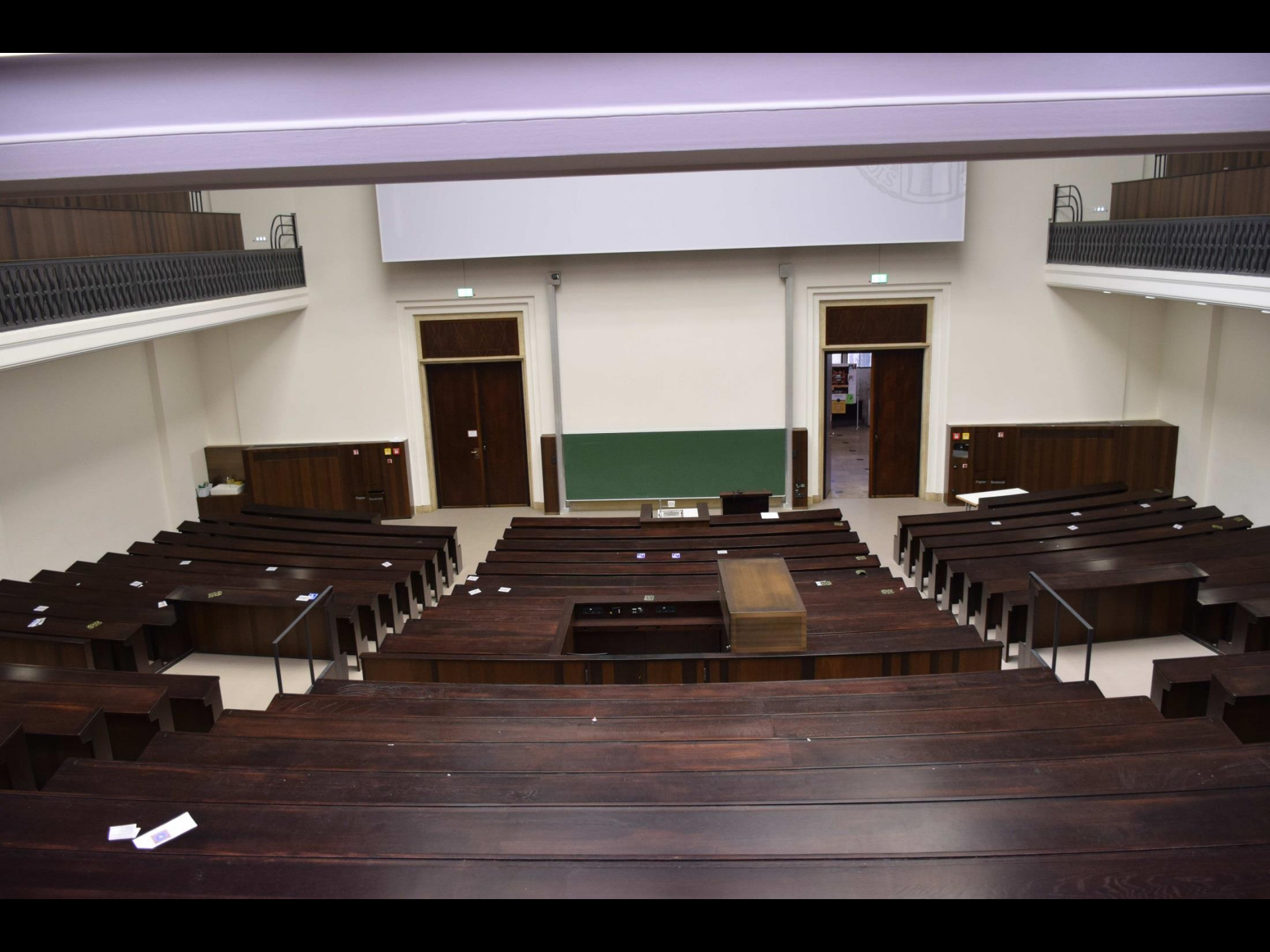
















SIRIUS

ORION

RIGEL

CASSIOPEIA

PLE-JADEN

SATURNUS

JUPITER

URANUS

NETTUNUS

URSUS MINOR

URSUS MAJOR

DELPHIN













**Marienplatz**

hUQ8









Information



Marktplatz

16-01

Stadler

MARKT

3









PROBAT  
BAULEITUNG

Häcker-Pschorr

Häcker-Pschorr

Häcker-Pschorr

Häcker-Pschorr

Häcker-Pschorr













ANNO 1589







PASTA & PIZZA

GALLETTES

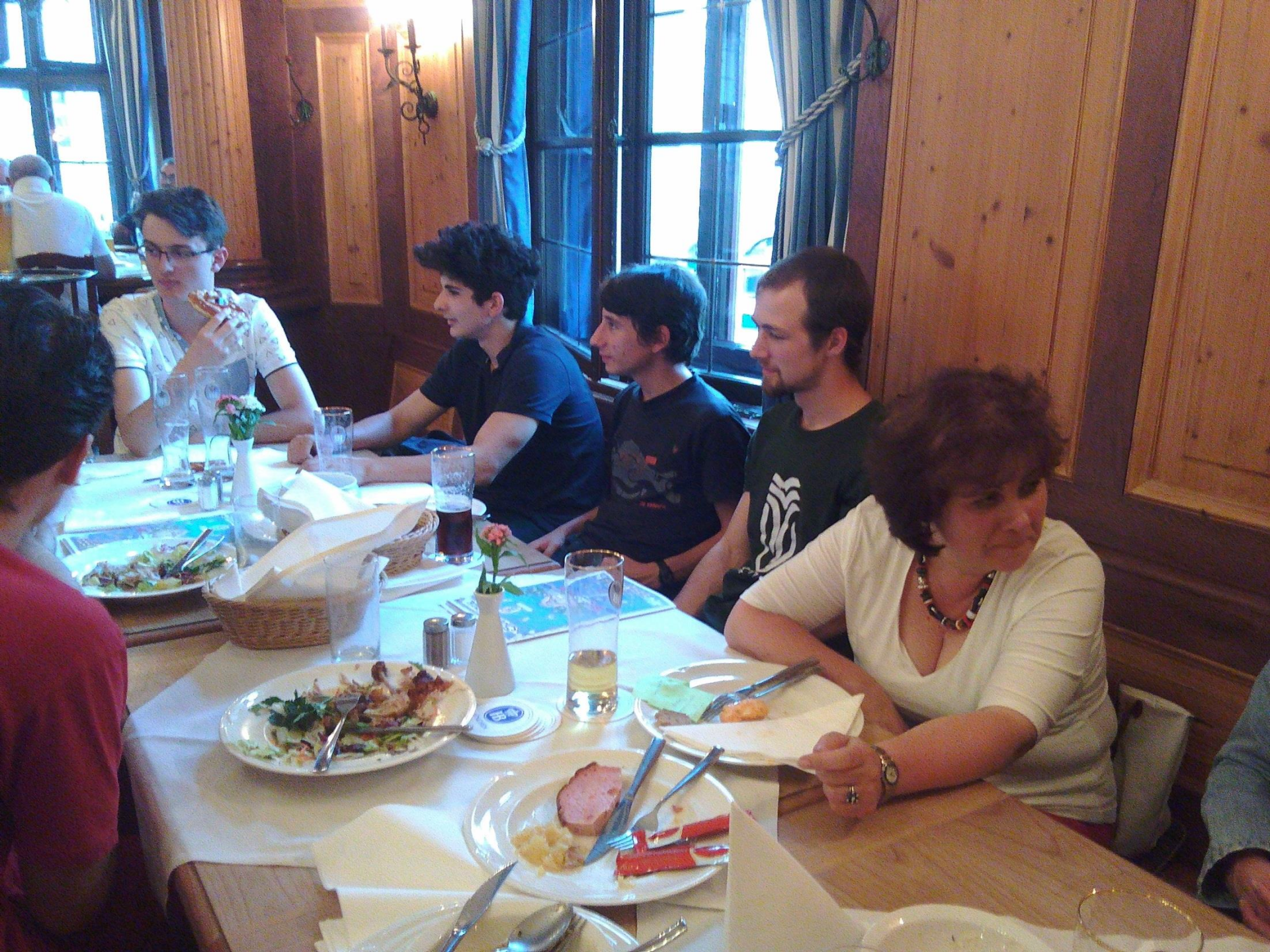
6

PASTA & PIZZA

SCHOKOLA  
TEE

www.schaback.de

















60  
FAHRE

HB  
MÜNCHEN

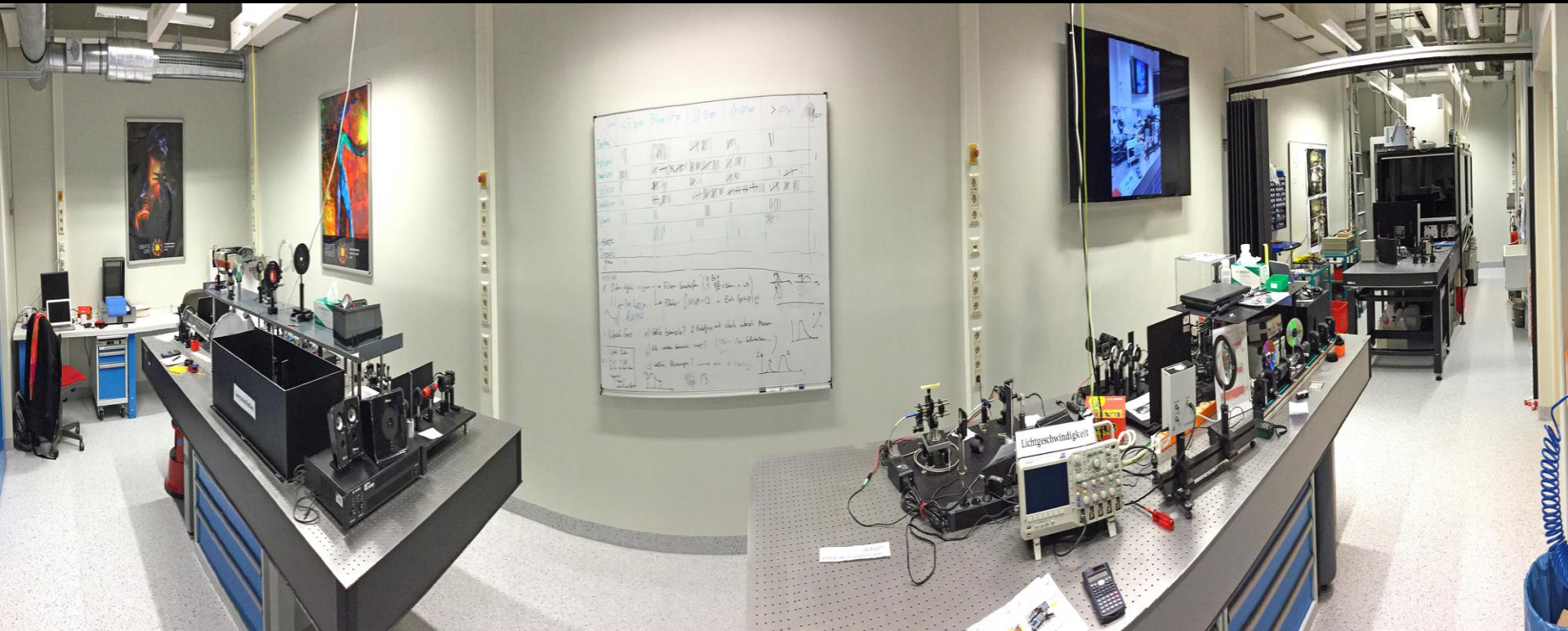












PhotonLab - lézertudományi laboratórium iskolásoknak

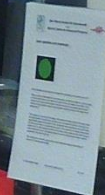








Haardicke messen







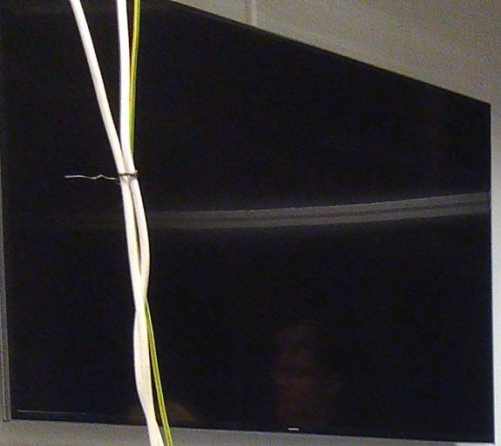
Quantenradierer

20 Holographie

21

Newport Scientific Series High Performance Sealed Hole Table Top





20

# Holographic

**Mini-Phasor-Inverter for Class**  
 Maritah Centre for Education

**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...



The experimental setup includes a black metal frame with a glass pyramid on top. Below the pyramid is a silver perforated metal table. On the table, there is an oscilloscope, a magnifying glass, a green box, and other electronic components. A man in a pink shirt is leaning over the table, looking at a piece of paper. A woman in a patterned jacket is standing behind him, gesturing with her hand. Two other men are standing nearby, one in a white shirt and one in a dark shirt. The background shows a laboratory setting with various equipment and a large window.





8

# Interferometer

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

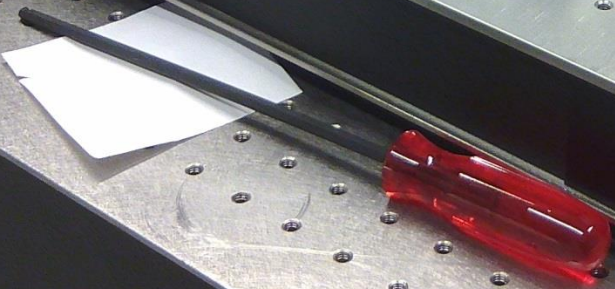
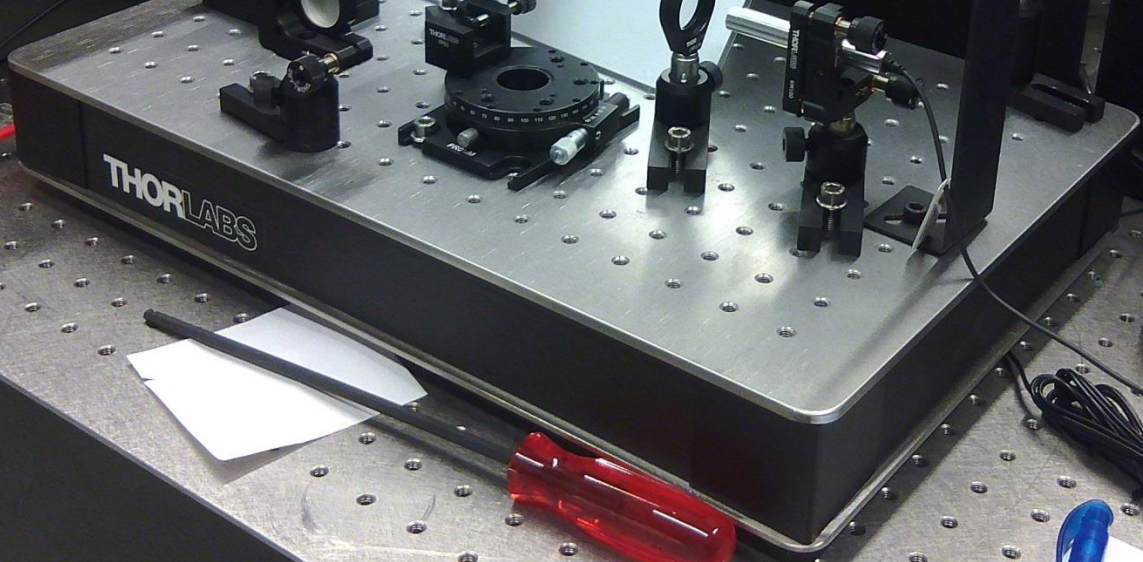
**Light + Light = darkness!**  
In order to measure the wavelength of laserlight  
1. Experimental arrangement



**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





increased the  
ring and recor-  
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to the energy in-  
two same... So

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output trace star-  
and the initial de-

as born!

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?**  
Experimentally measure the thickness of your hair by a hair.  
Please Note: The white piece below your hair is for laser safety.  
There are hair in front of the light path of the setup. Do not touch the hair and do not cover the eye with your hand.  
The laser beam is dangerous only the hair.  
Use the red box to hold the hair and the yellow box to hold the hair.  
Use the yellow box to hold the hair and the red box to hold the hair.

**Max-Planck-Institut für Quantenoptik**  
**Maxwell Center for Advanced Photonics**  
Measure the thickness of a hair between the order of the diffraction pattern. The order of the diffraction pattern is the number of the order of the diffraction pattern. The order of the diffraction pattern is the number of the order of the diffraction pattern.





H<sub>2</sub>O des

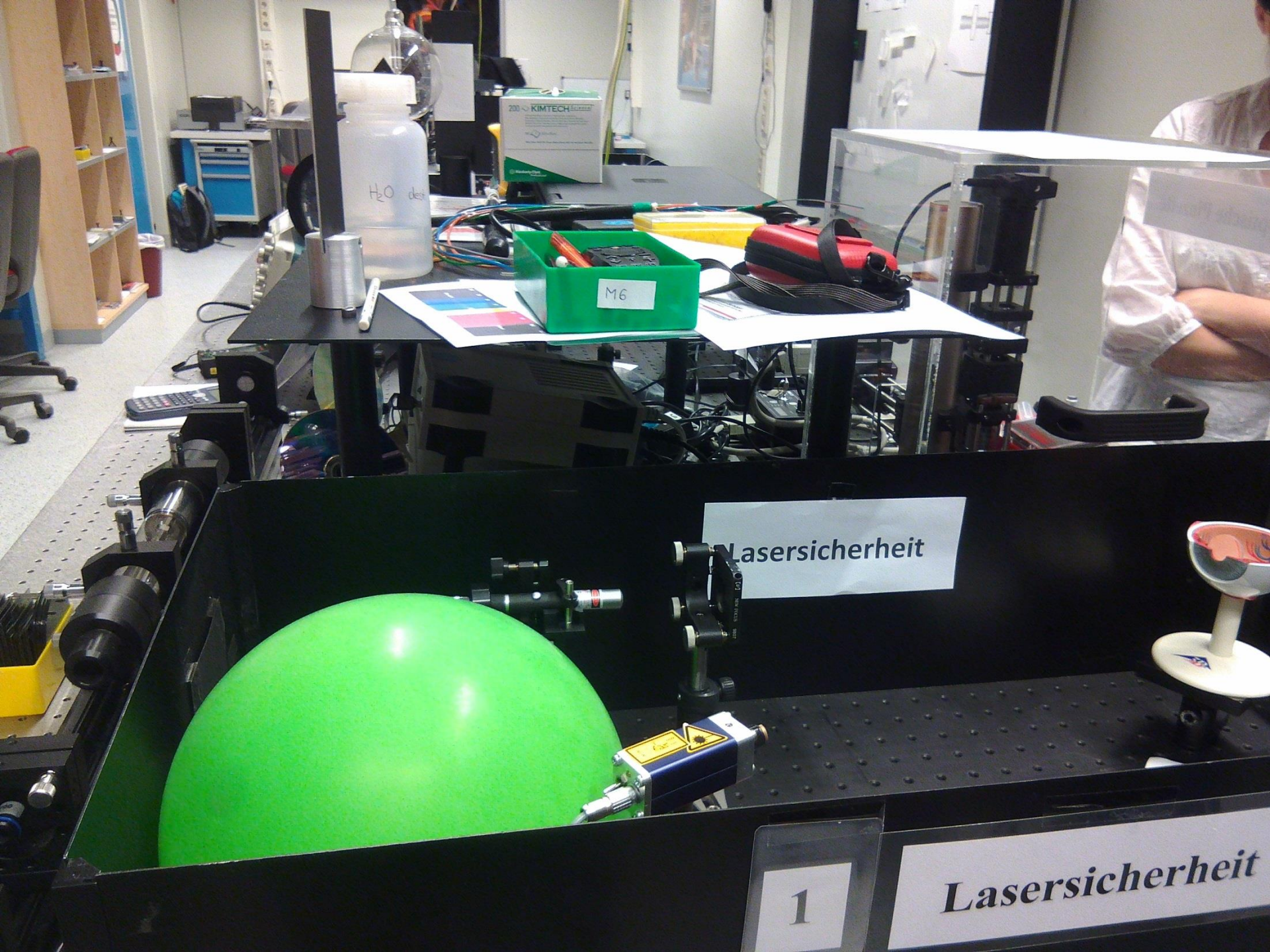
200 KIMTECH

M6

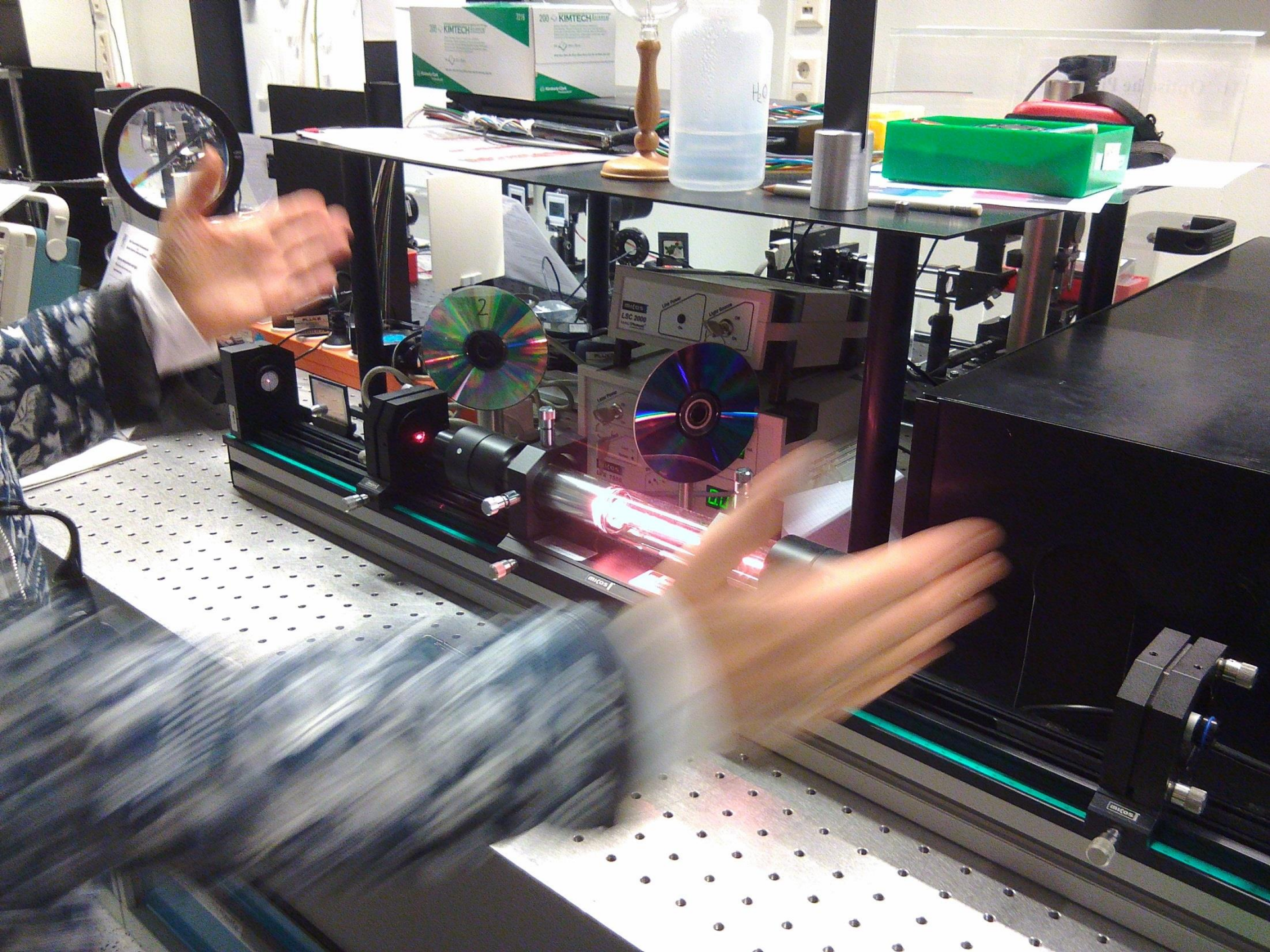
Lasersicherheit

1

Lasersicherheit







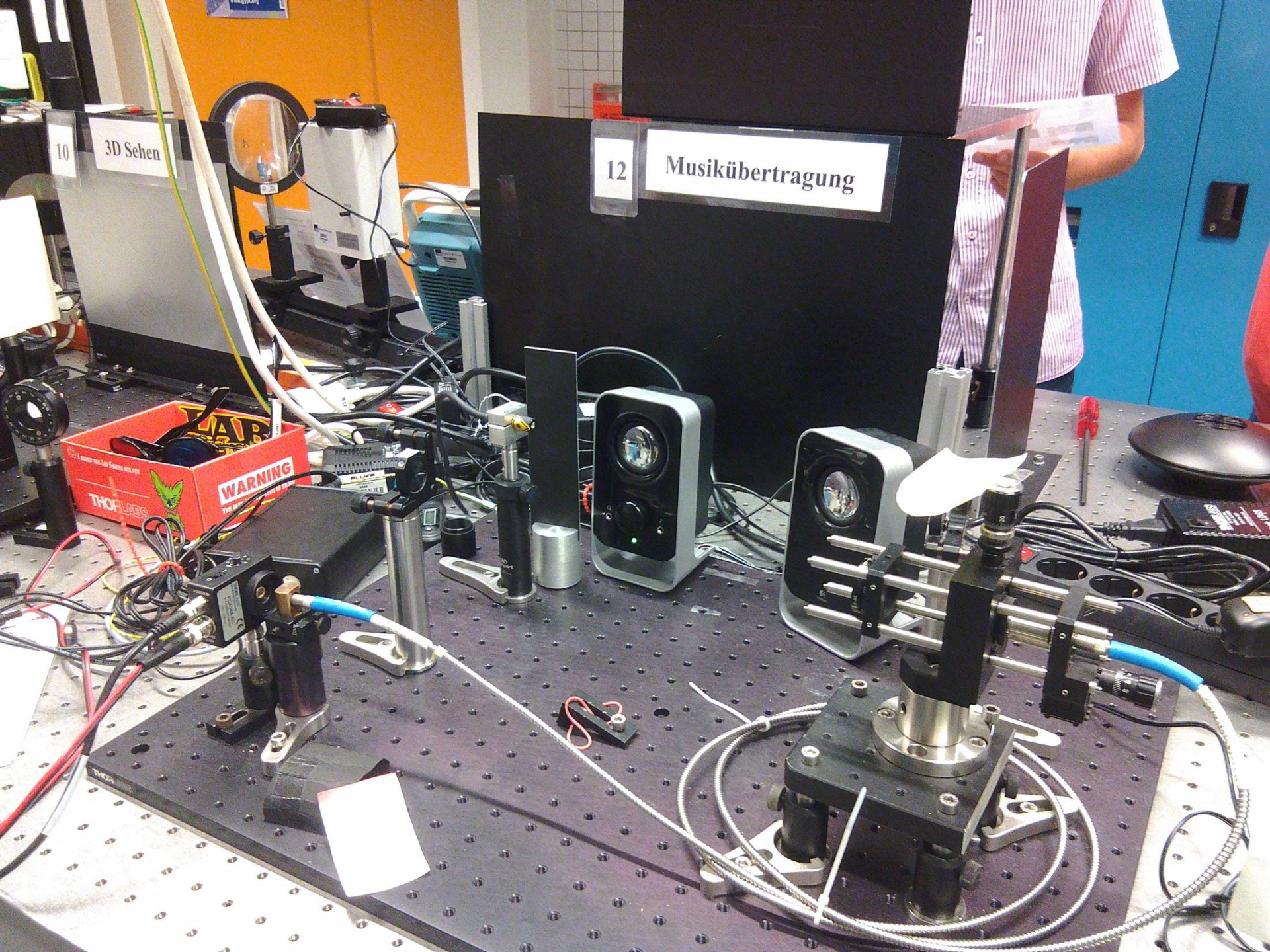


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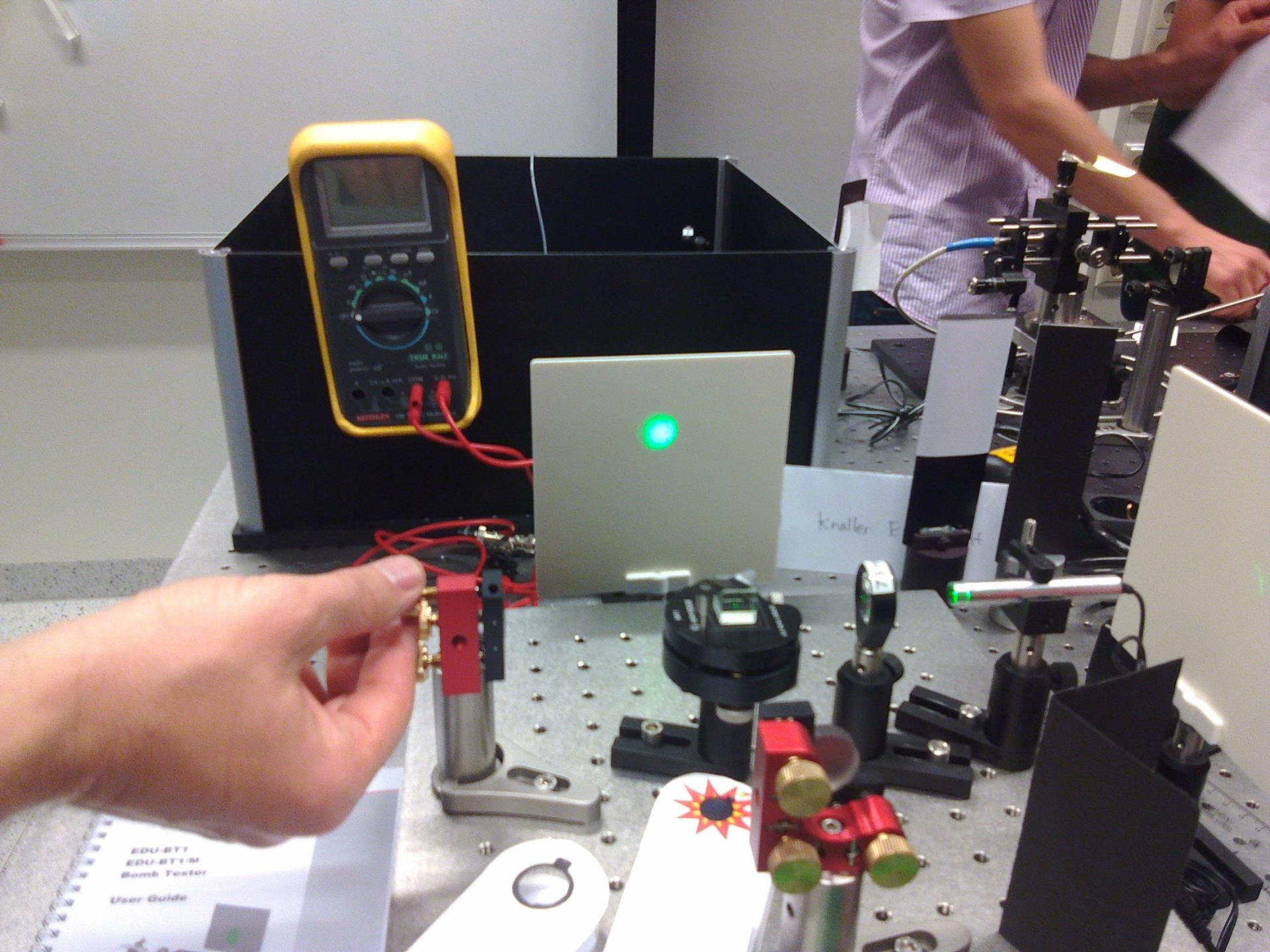
3D Sehen

12

Musikübertragung







Knaller E

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

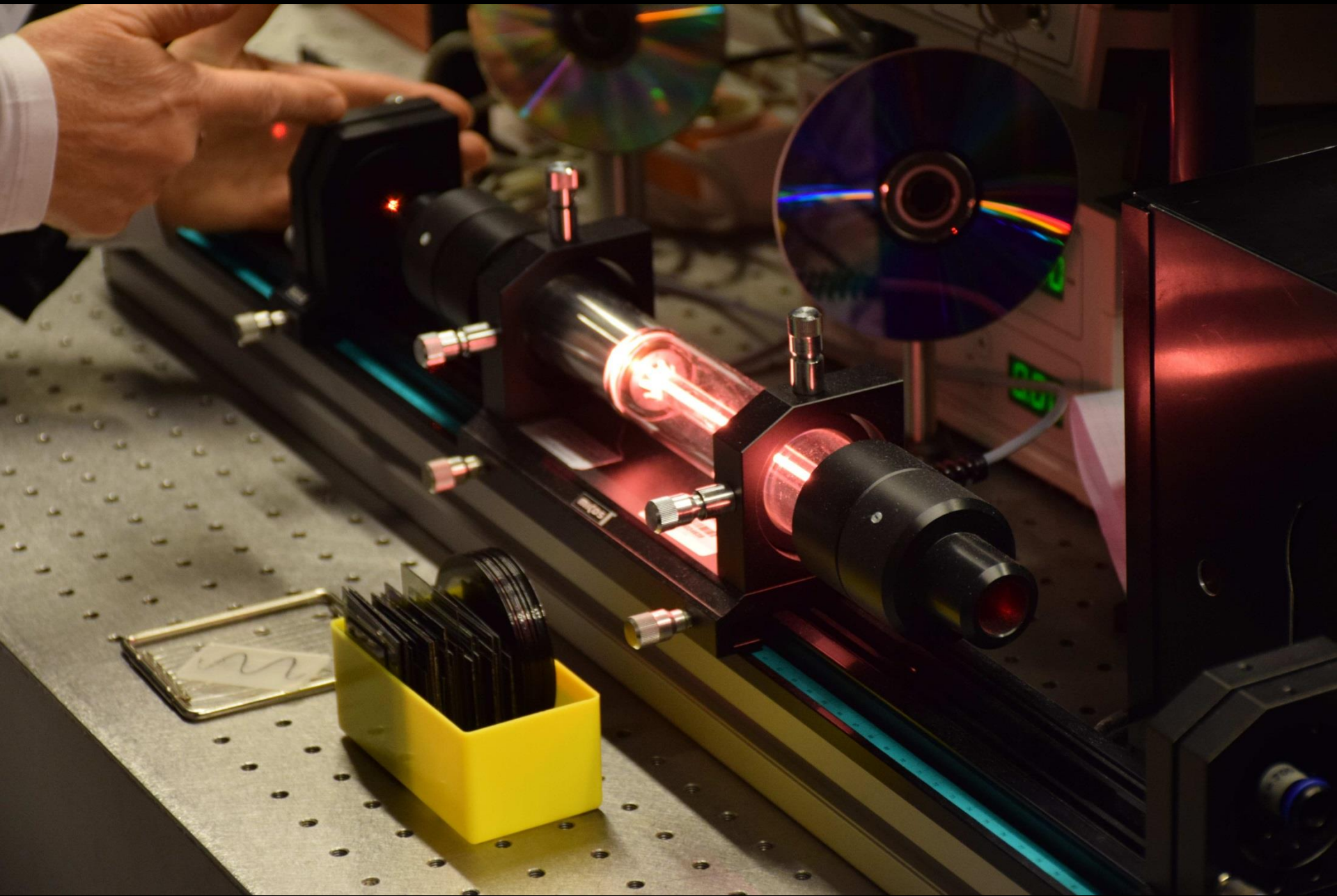




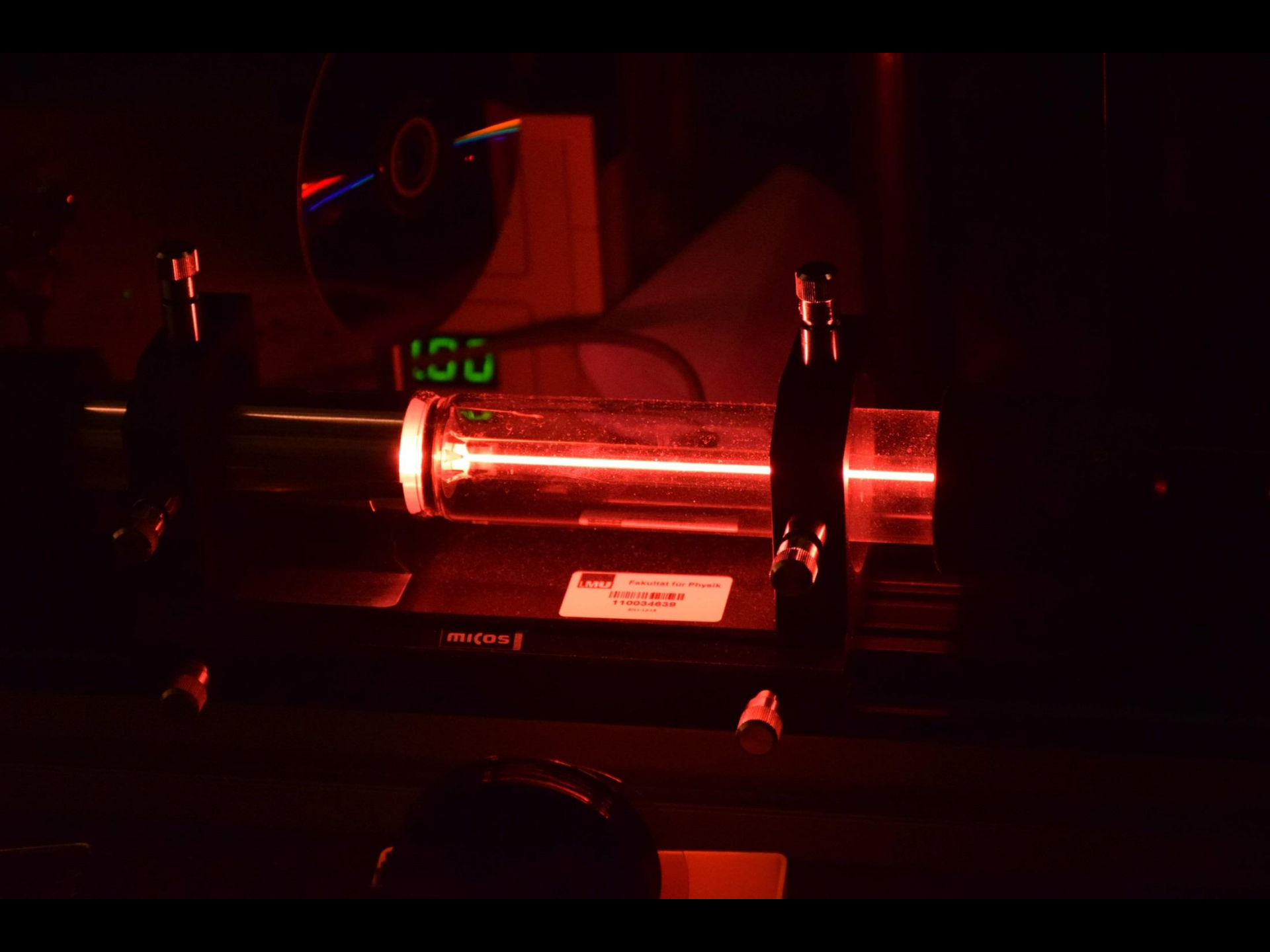


Knaller Exp







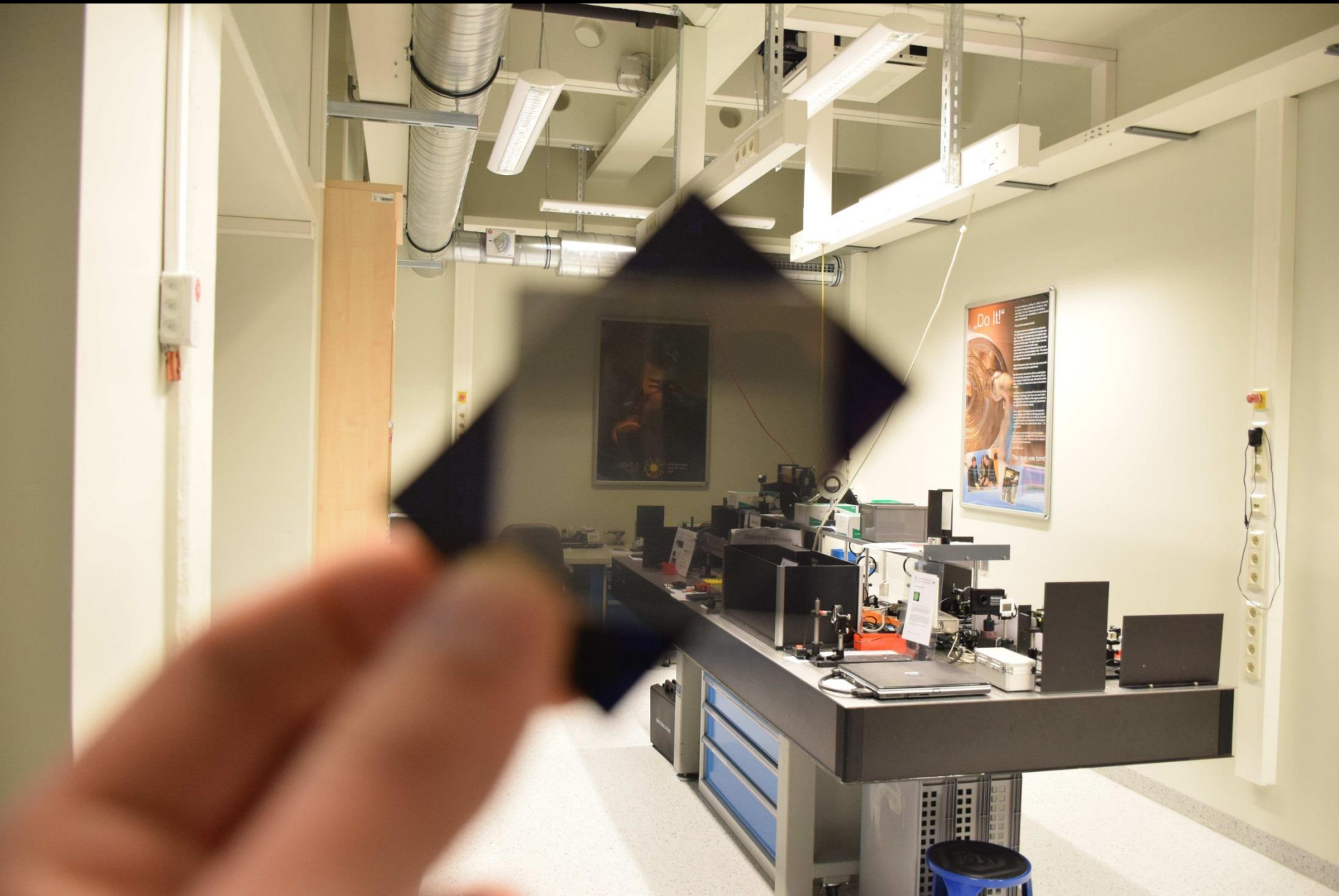


1.50

IME Fakultät für Physik  
110034639

micos









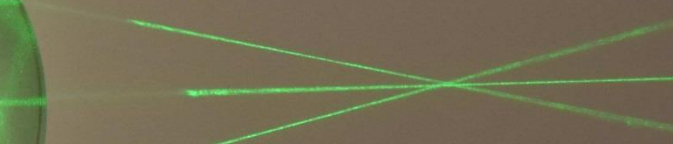




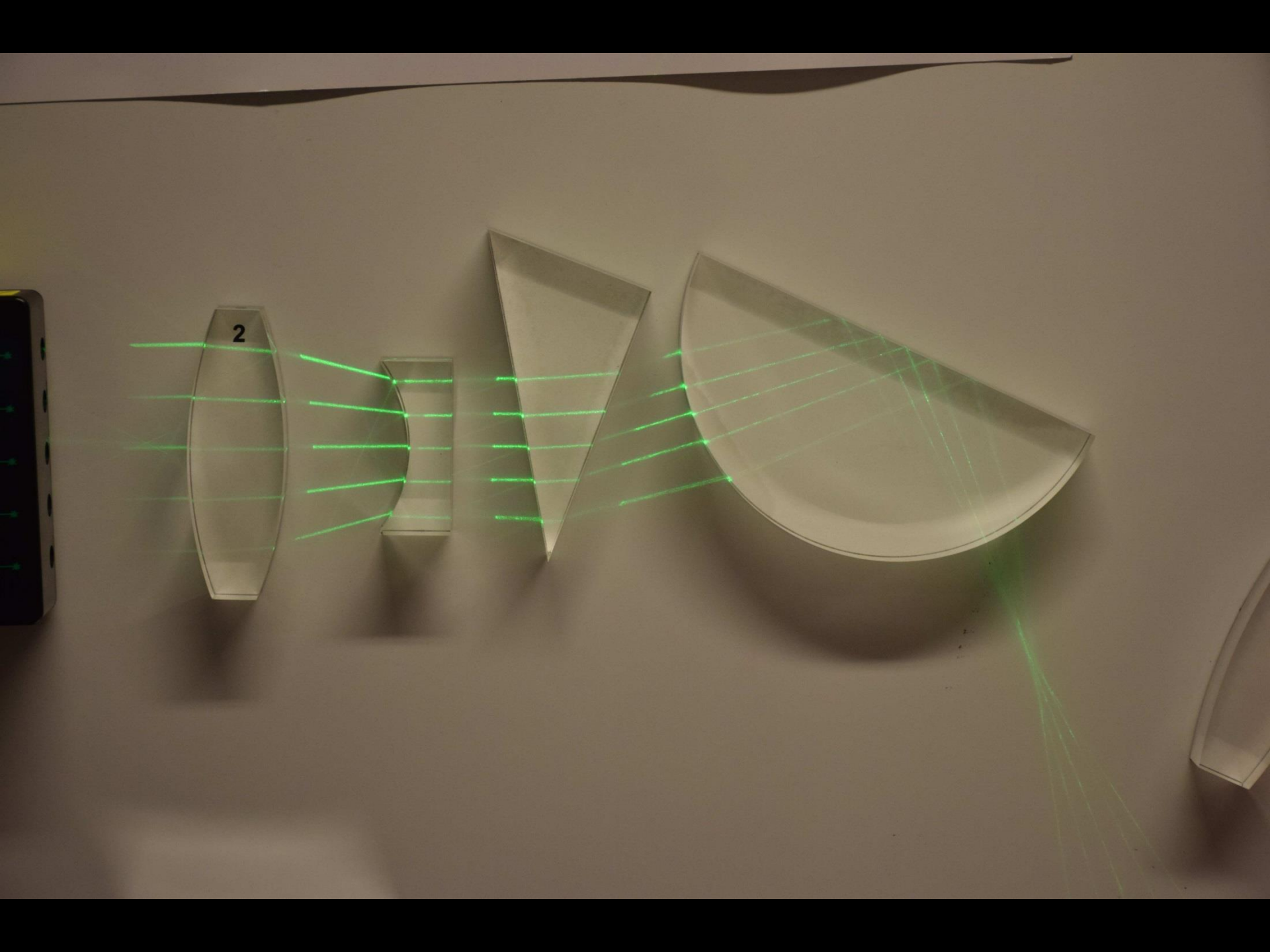




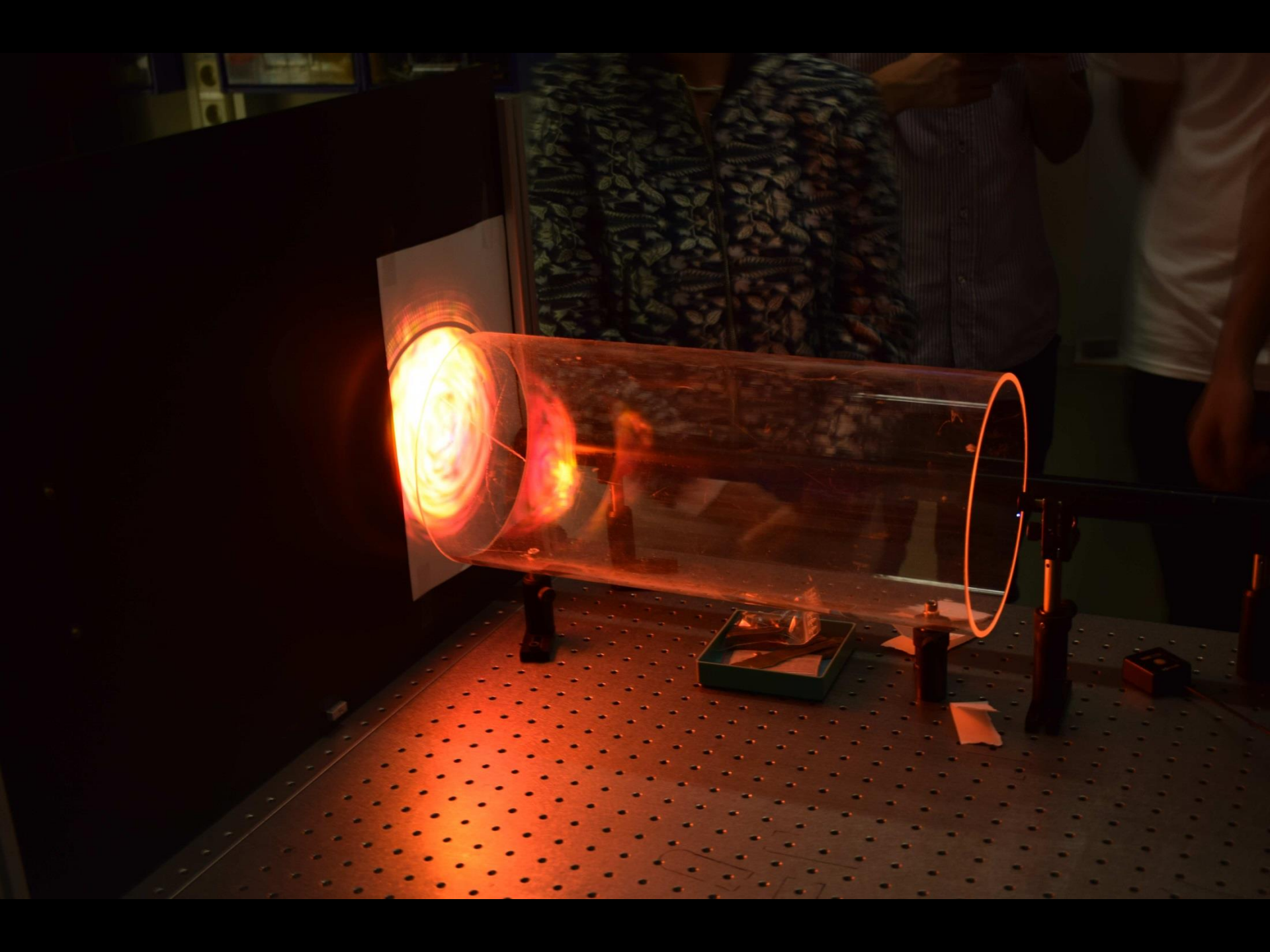












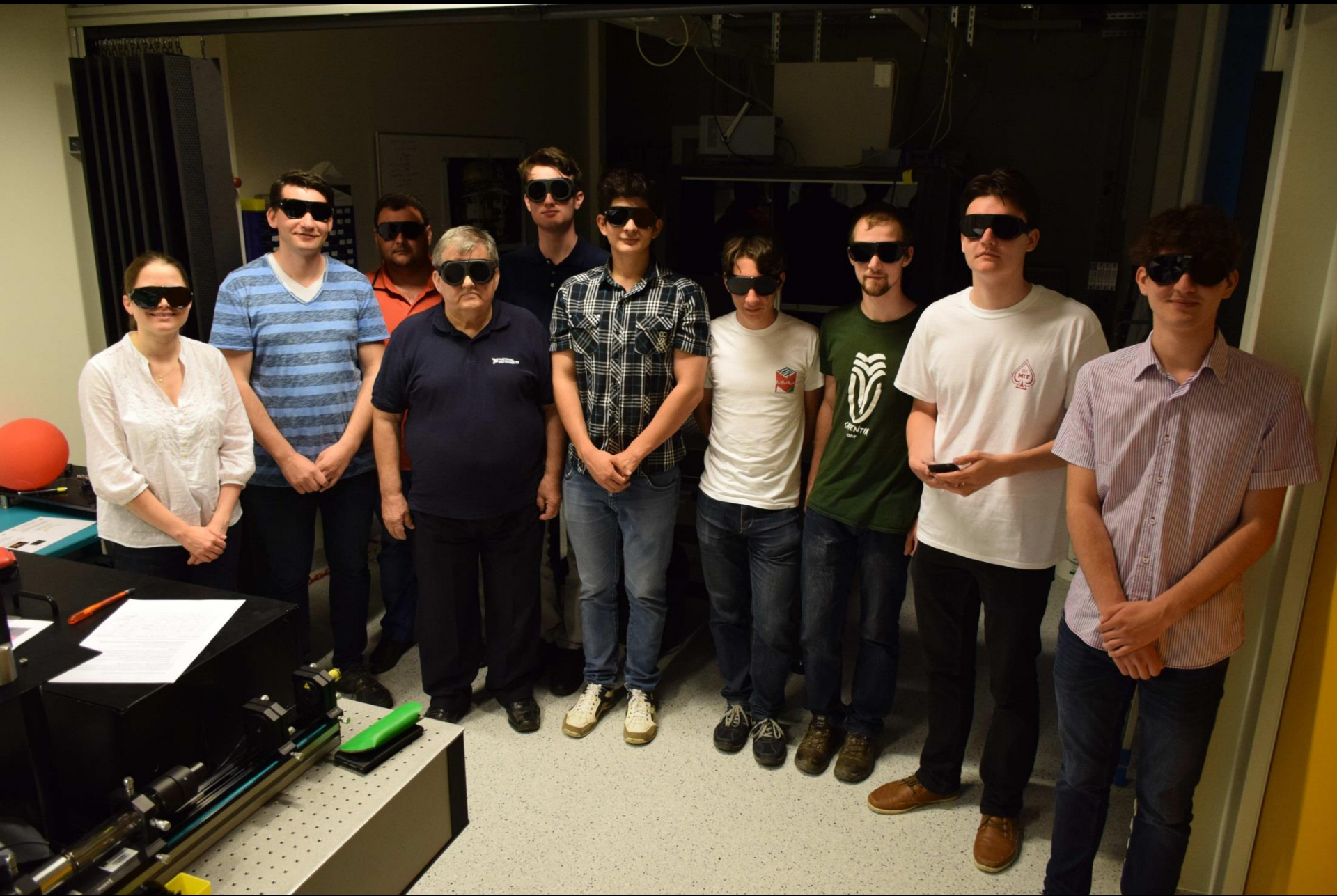




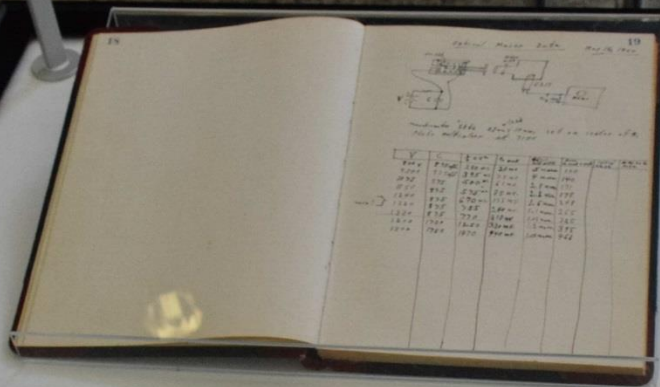


**Fehér folt.** A kép úgy készült, hogy egy körülbelül 50 fs-os lézer impulzusnyalábot egy lencsével a levegőben fókuszáltunk. A néhány száz  $\mu\text{J}$  energia, az impulzus rövideksége és a fókuszpont kis mérete miatt a fókuszban olyan nagy az intenzitás, hogy a levegőt ionizálja, azaz plazma keletkezik. Ez a plazma a cső bemeneténél egy kis fehér pontként látszik. Ilyen nagy intenzitásoknál már nemlineáris effektusok lépnek fel. A plazmában a törésmutató arányos lesz az intenzitással (harmadrendű nemlineáris effektus), ezért, mivel a fókuszban térben és időben nem állandó az intenzitáseloszlás, a plazma egyrészt lencseként hat, másrészt meg időben egymáshoz képest eltolja az impulzus különböző intenzitású részeit. Ezt ön-fázismodulációnak hívják, aminek folytán új frekvencia-komponensek keletkeznek, ezért látunk egy fehér foltot, annak ellenére, hogy vörös fénnel dolgoztunk.









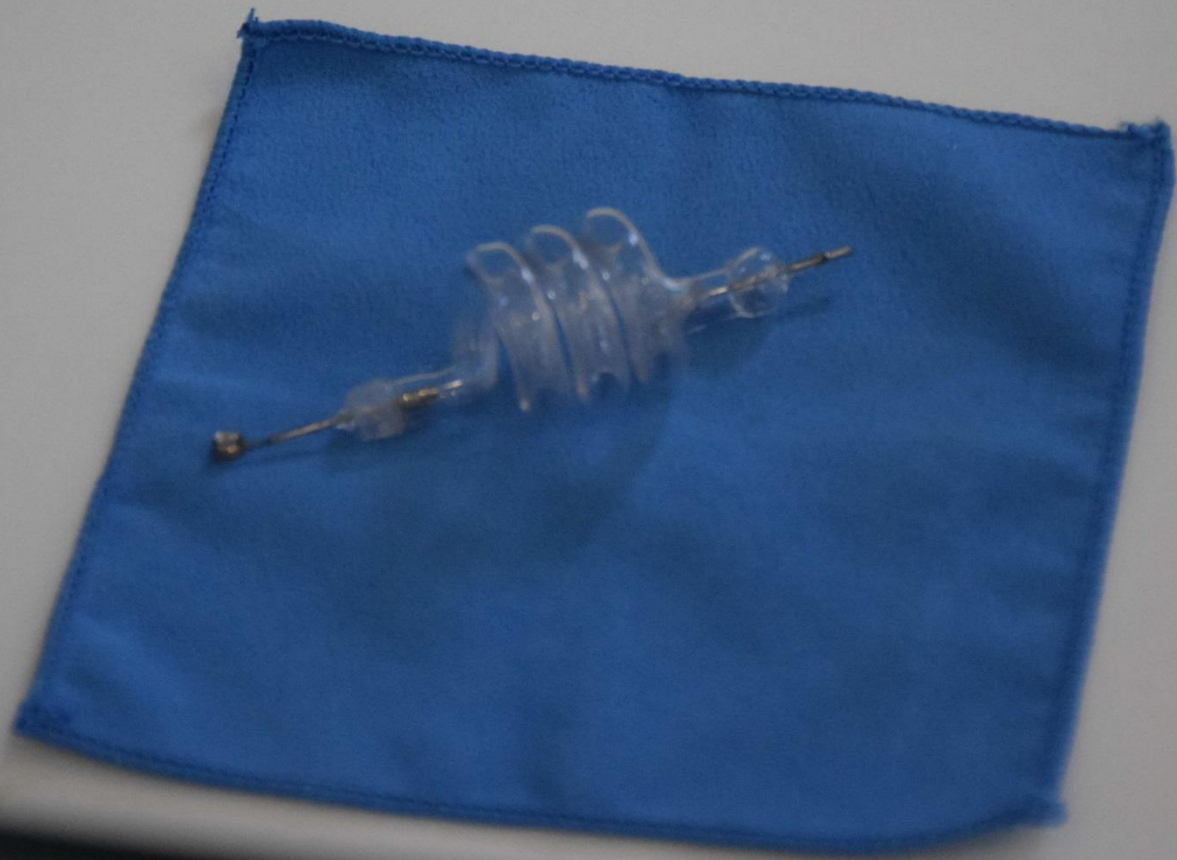
Laboratory notebook of Theodore Maiman  
July 1960 - October 1960  
The right page shows the laboratory notes  
of Theodore Maiman on May 16th 1960.  
The first laser was built that day and successful  
demonstrated.



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.



















Ebéd a TUM diákmenzájának kertjében

























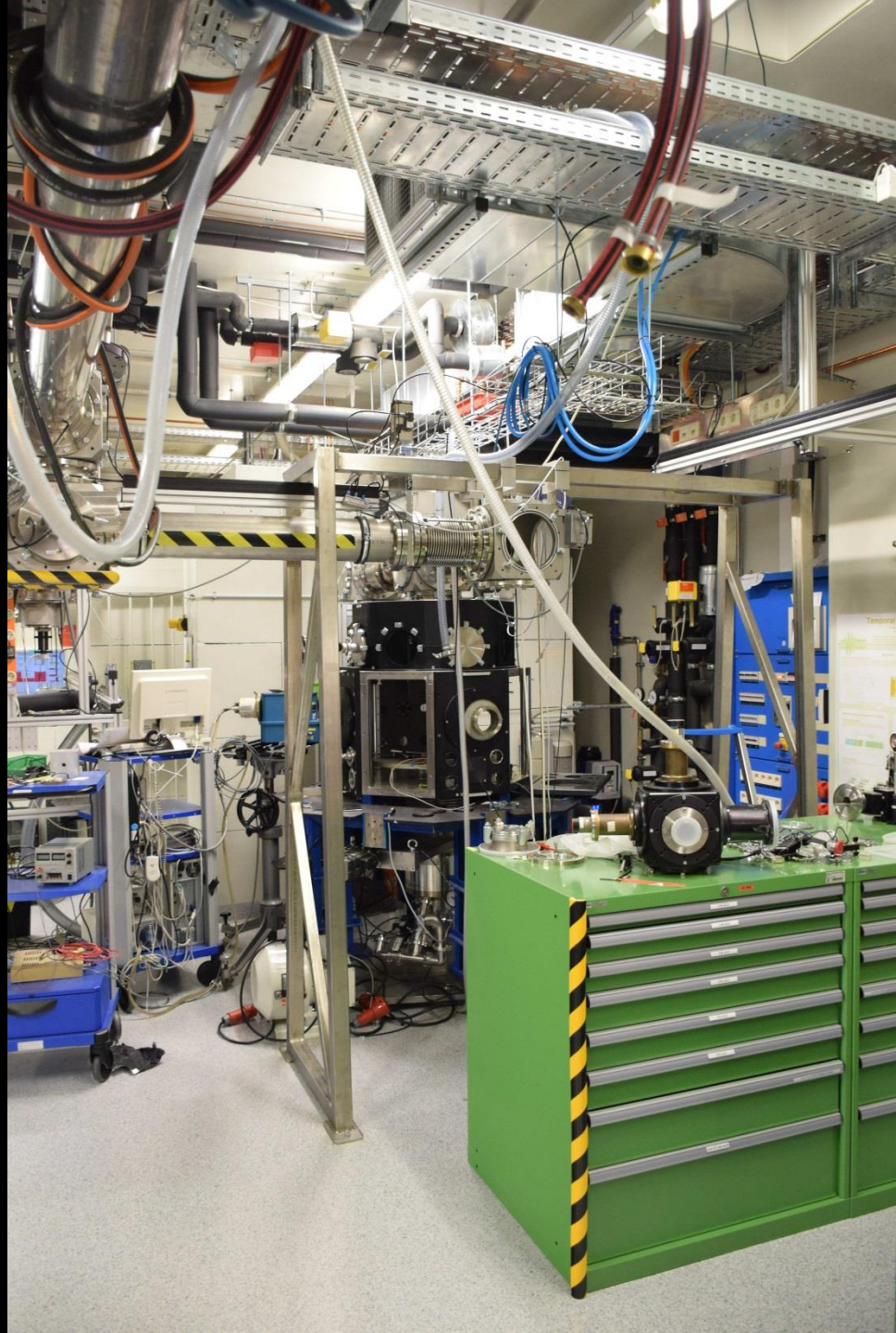




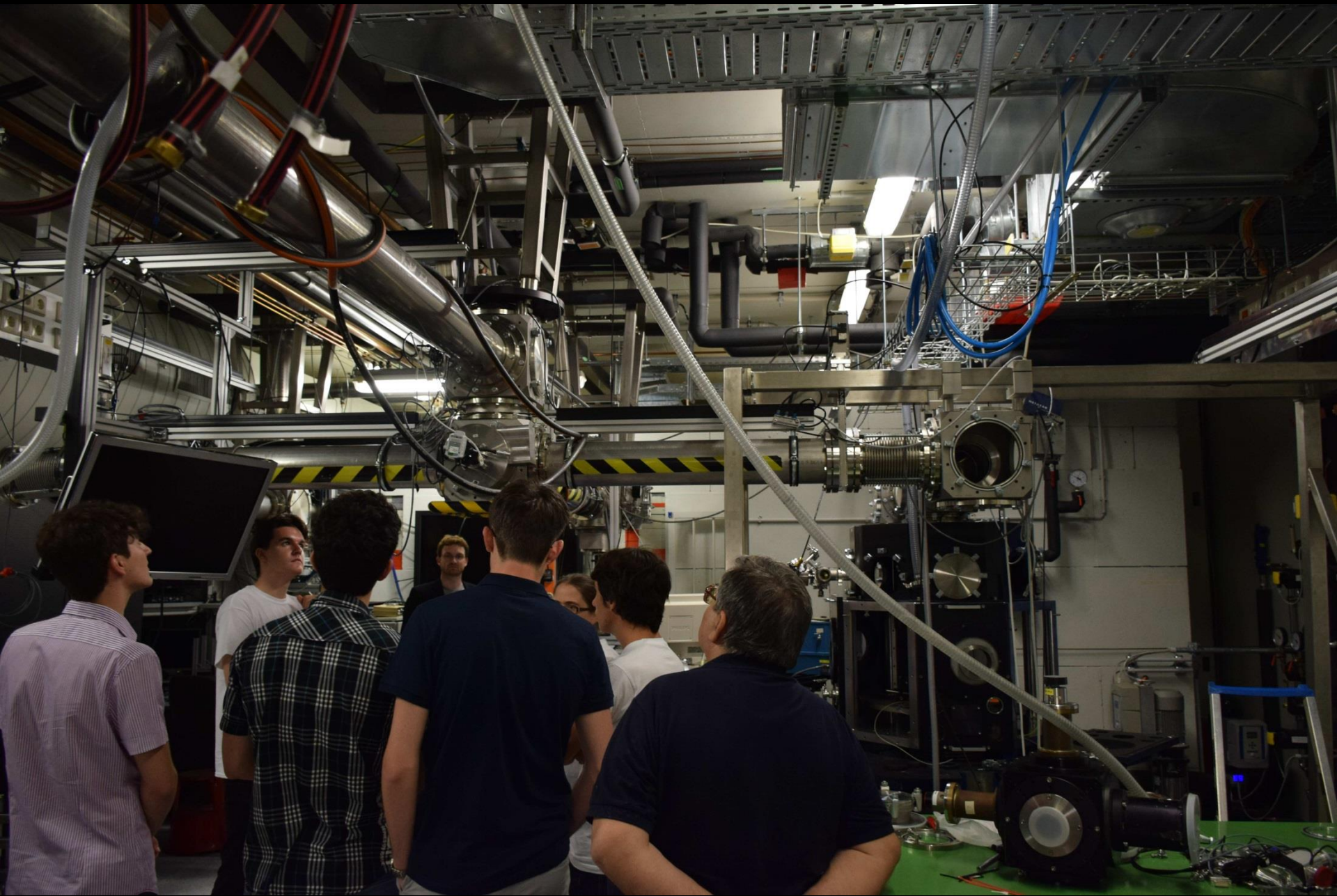
MAX PLANCK INSTITUTE  
OF QUANTUM OPTICS



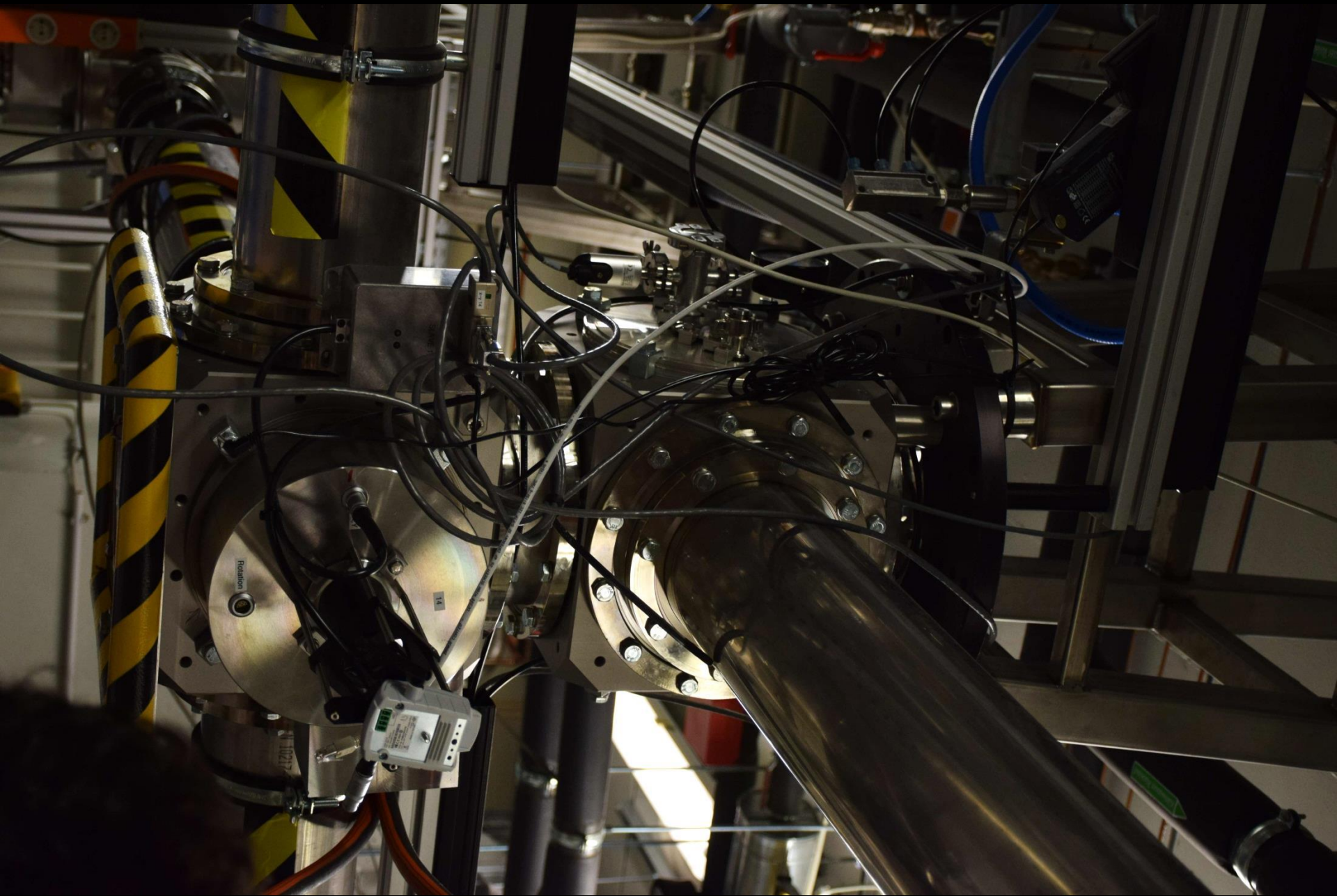








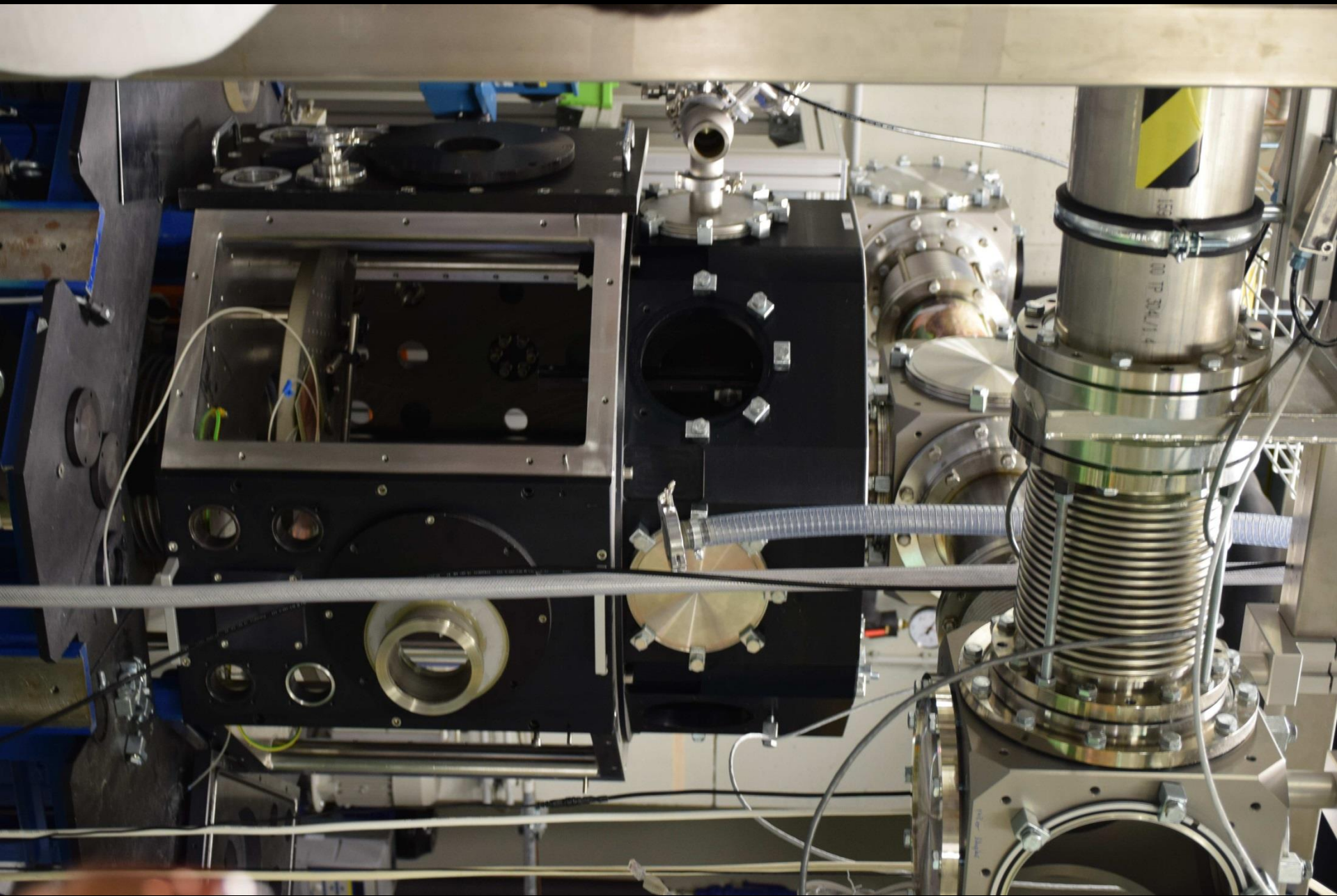




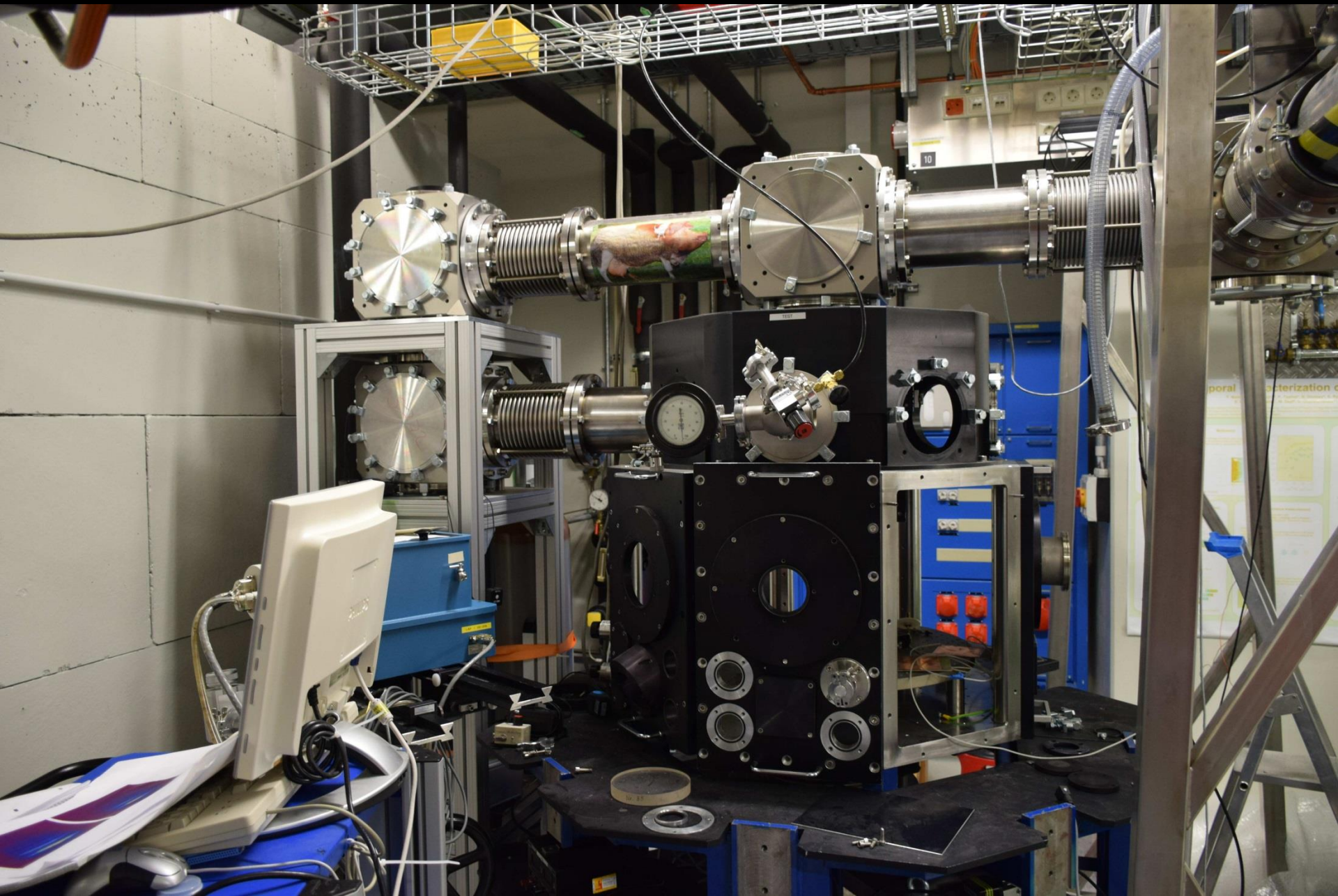




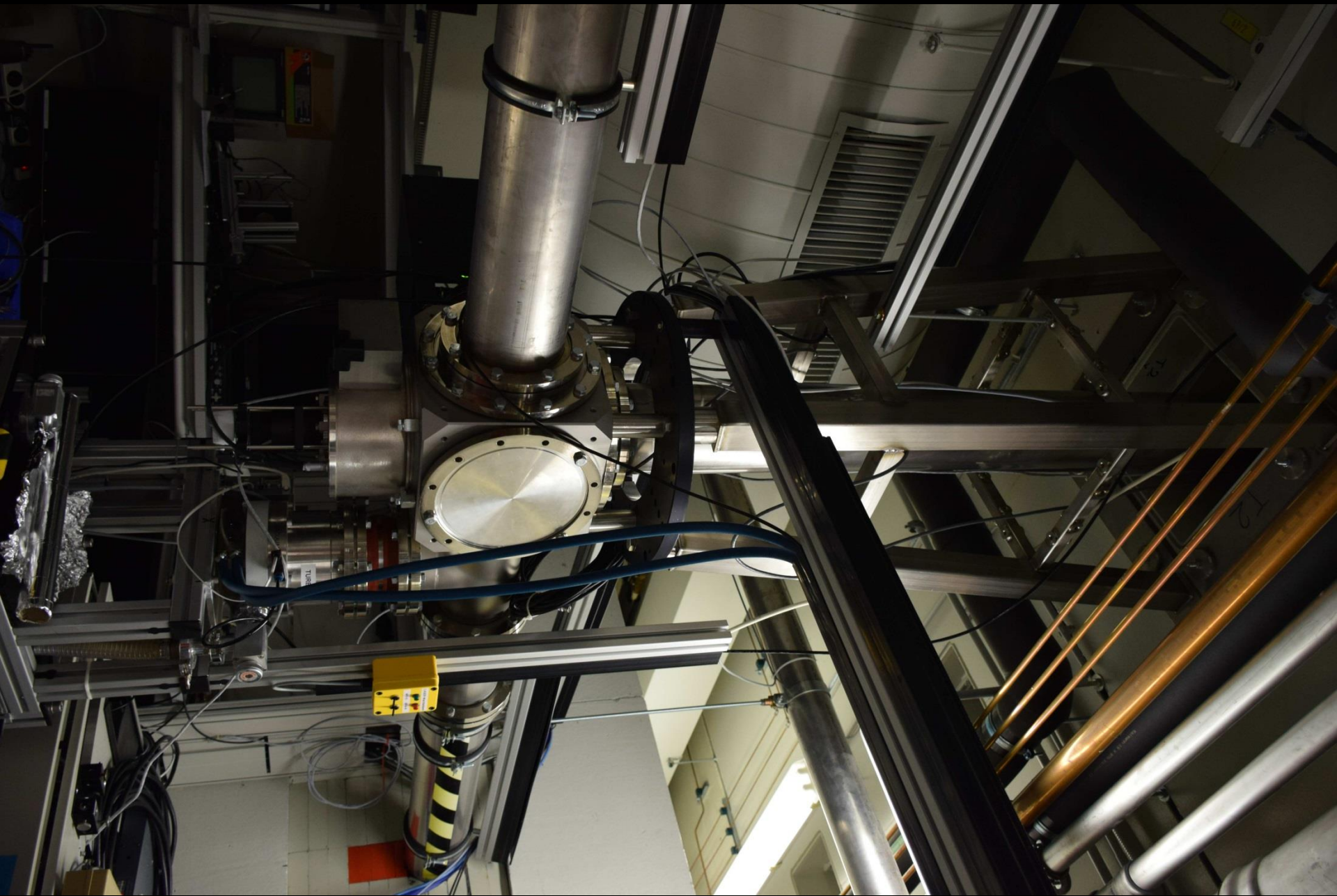




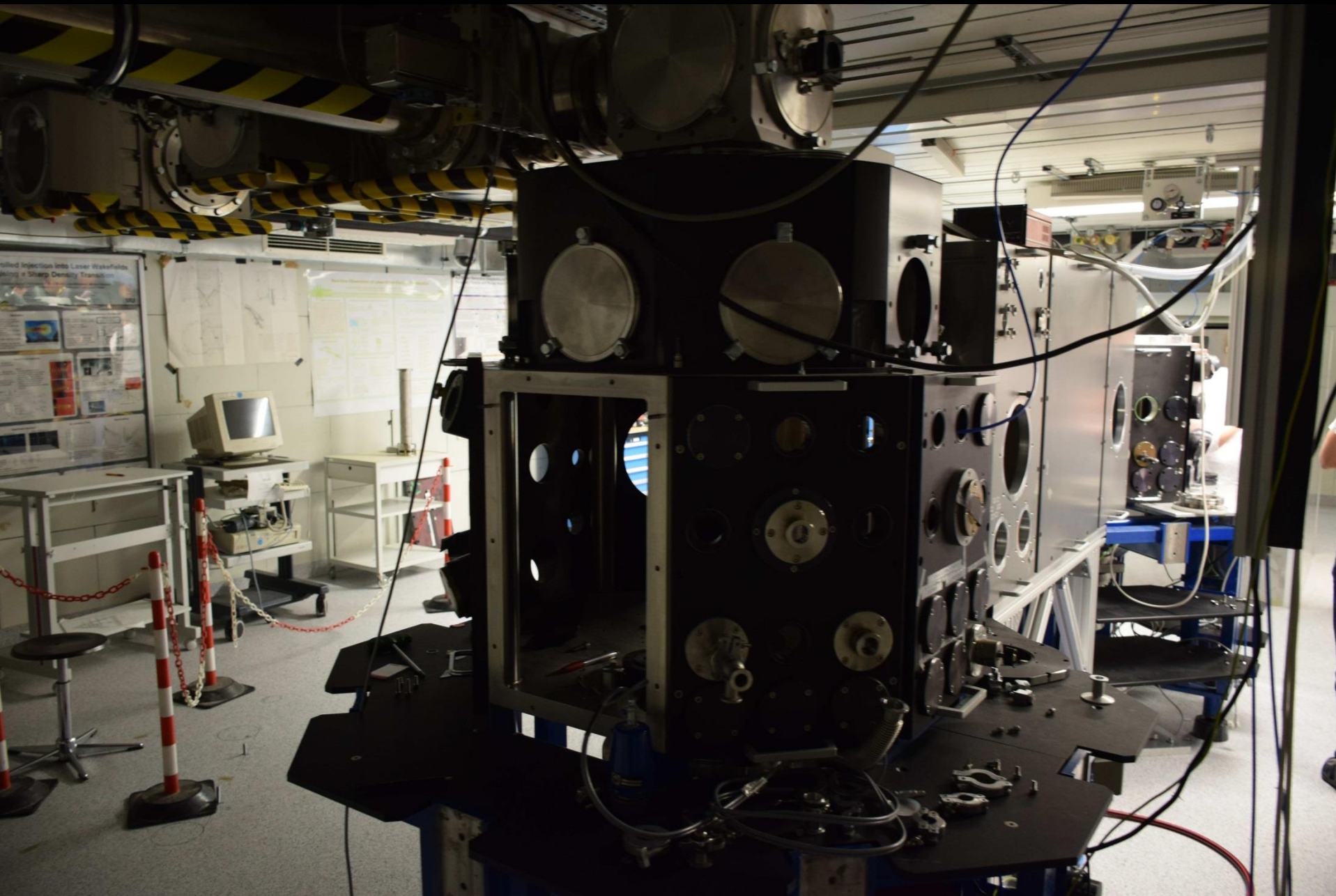




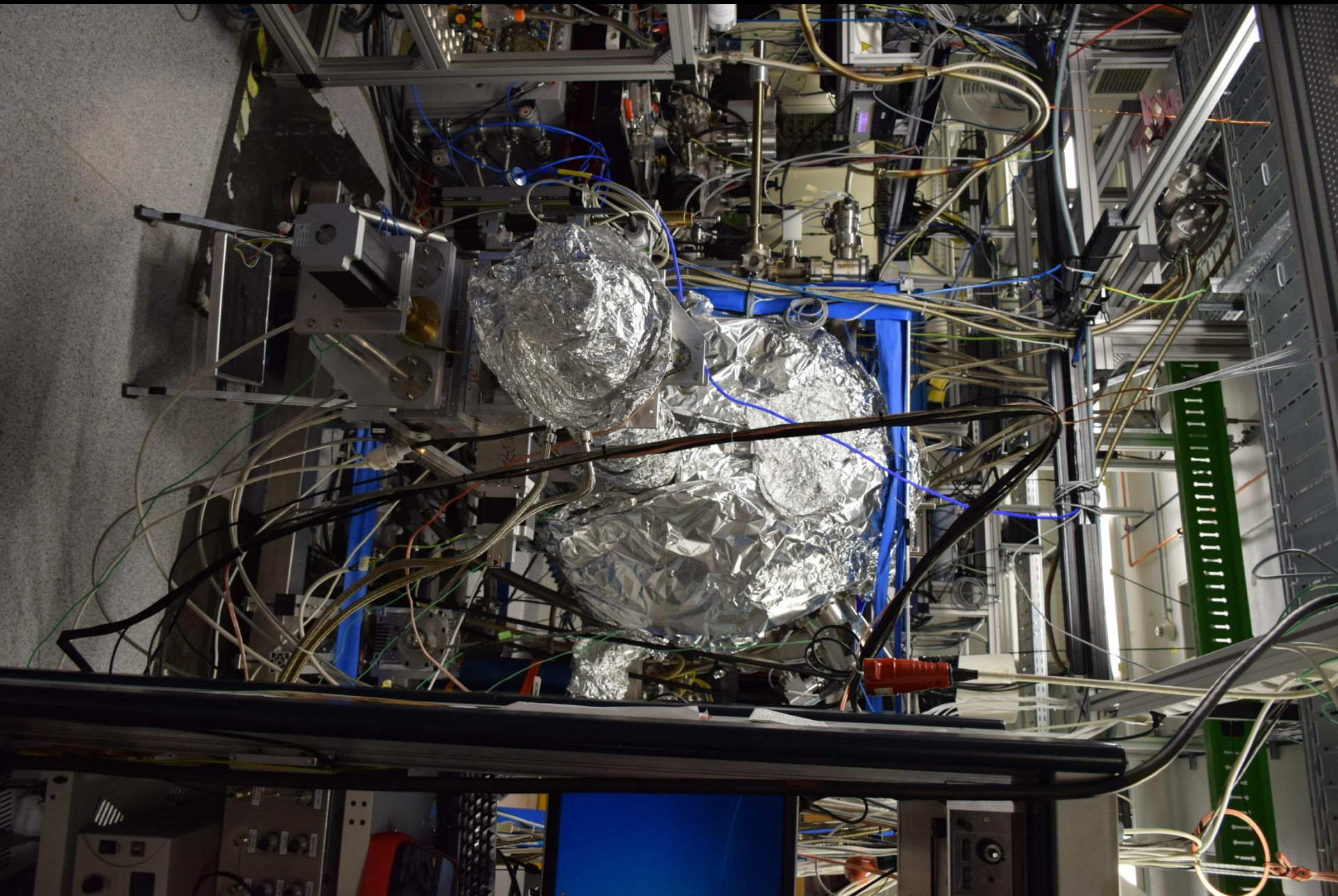




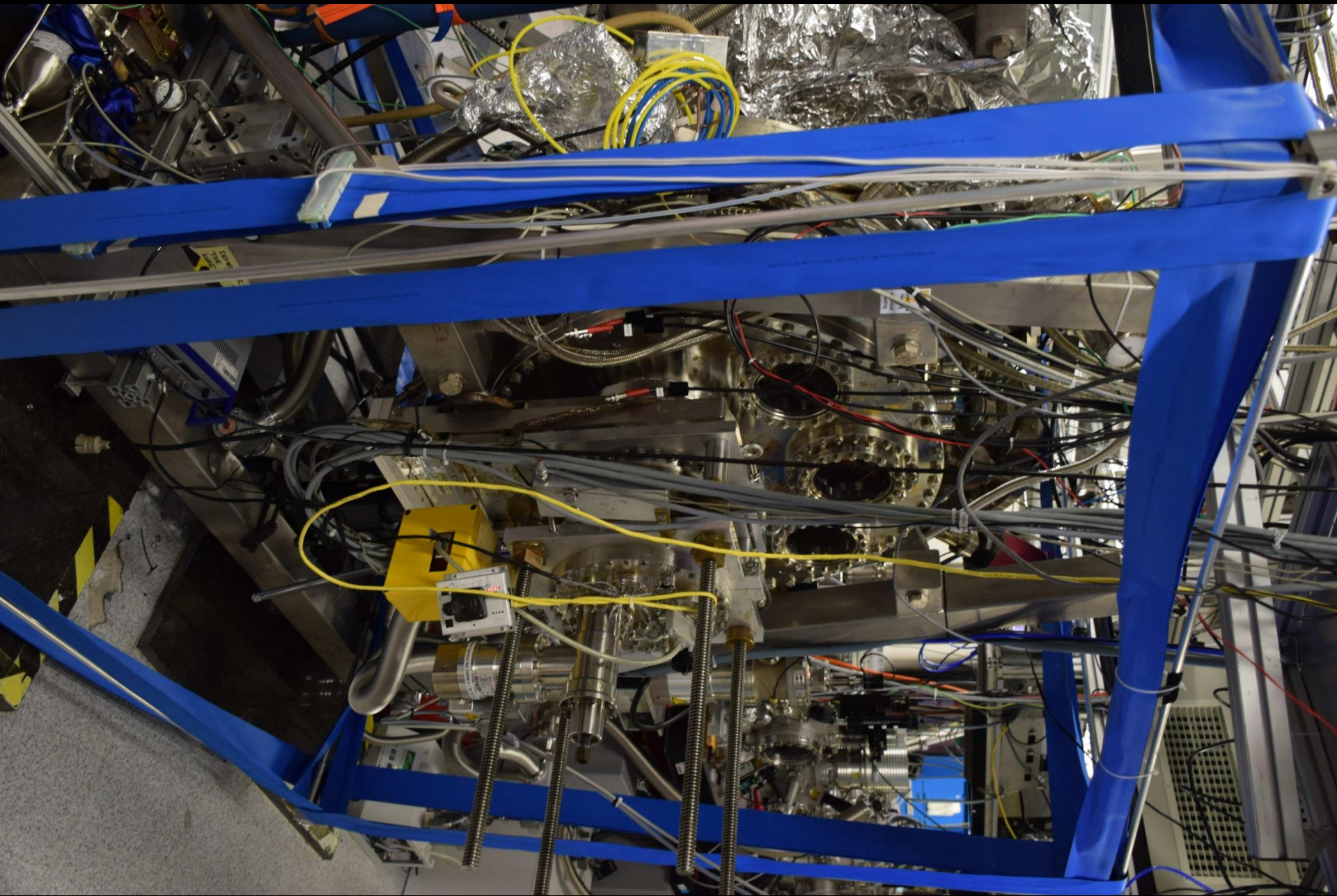




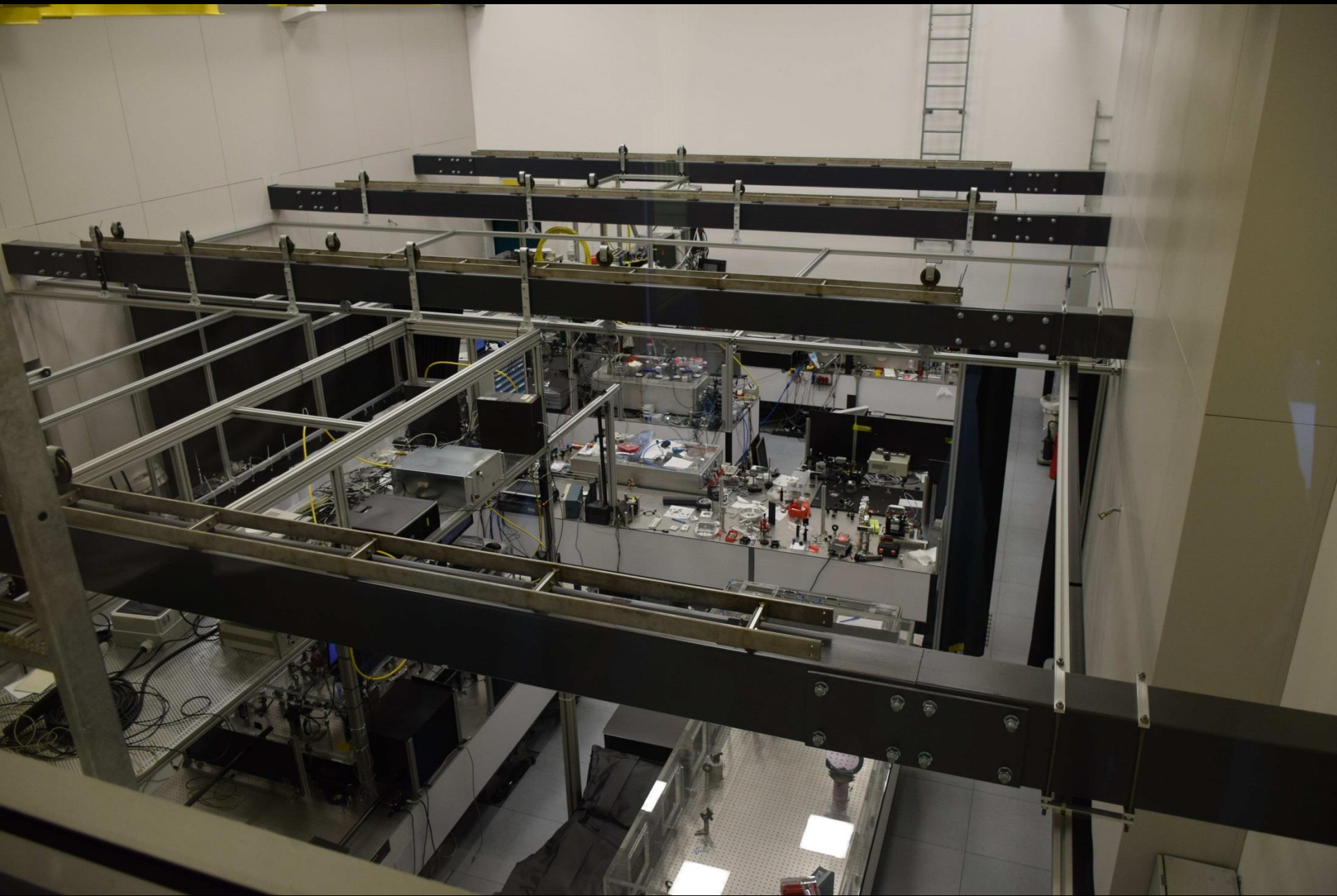














LASER  CO<sub>2</sub>-ALARM



















































DEM SIEG GEWEIHT VOM KRIEG ZERSTÖRT ZUM FRIEDEN MAHNEND

N CITY





5035

HKL  
18000 - 44 800 44

HKL MIETPAR

LAND-ROVER  
IDEONSPLATZ 2

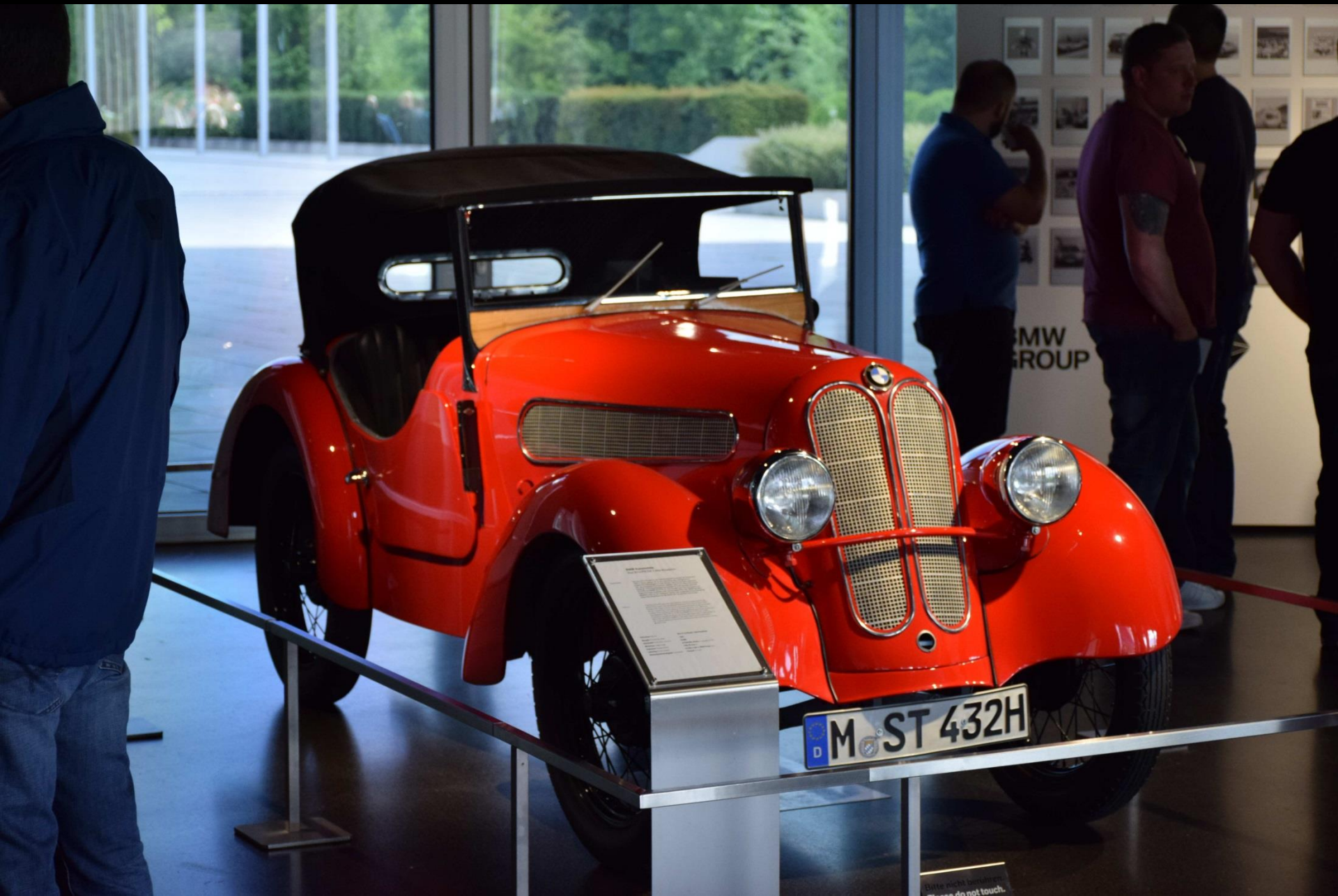












Informational text on a display stand in front of the car.

D M-ST 432H

Bitte nicht berühren  
do not touch.





1968  
BMW 3.3 Li



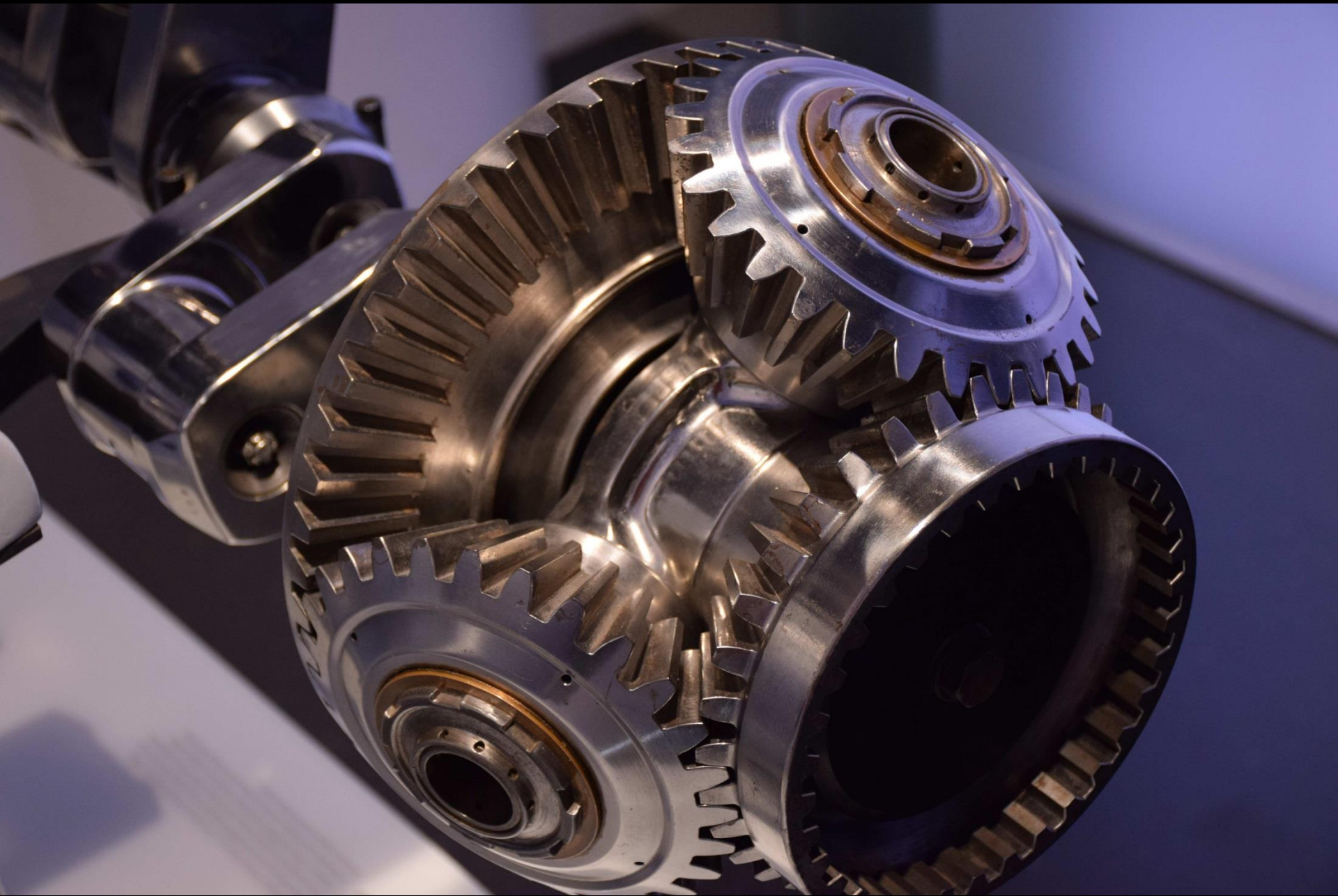




1990  
BMW P75

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

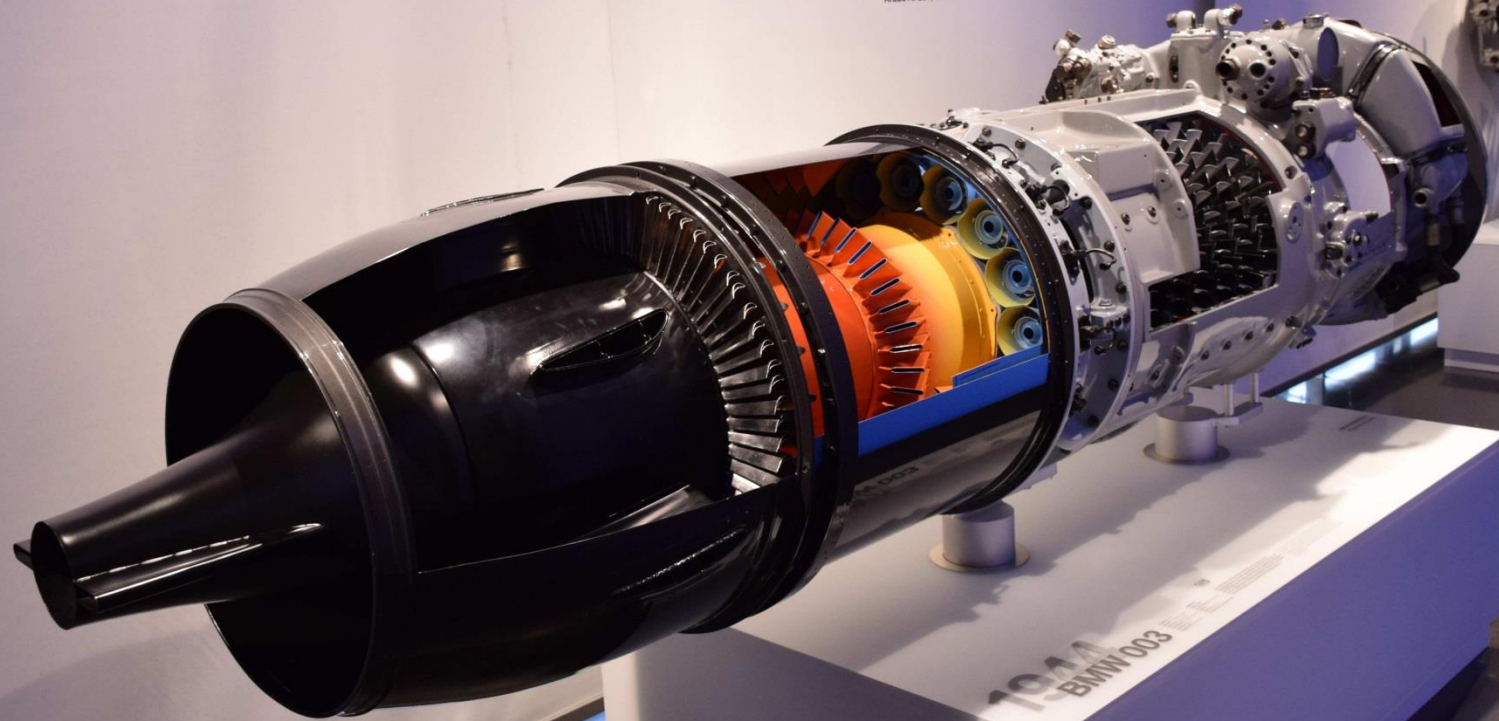
1933  
BMW 132



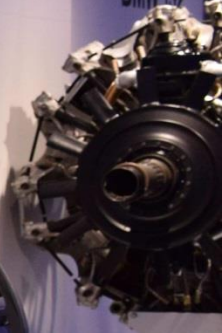
Arado Ar 234, 1944.



BMW 801



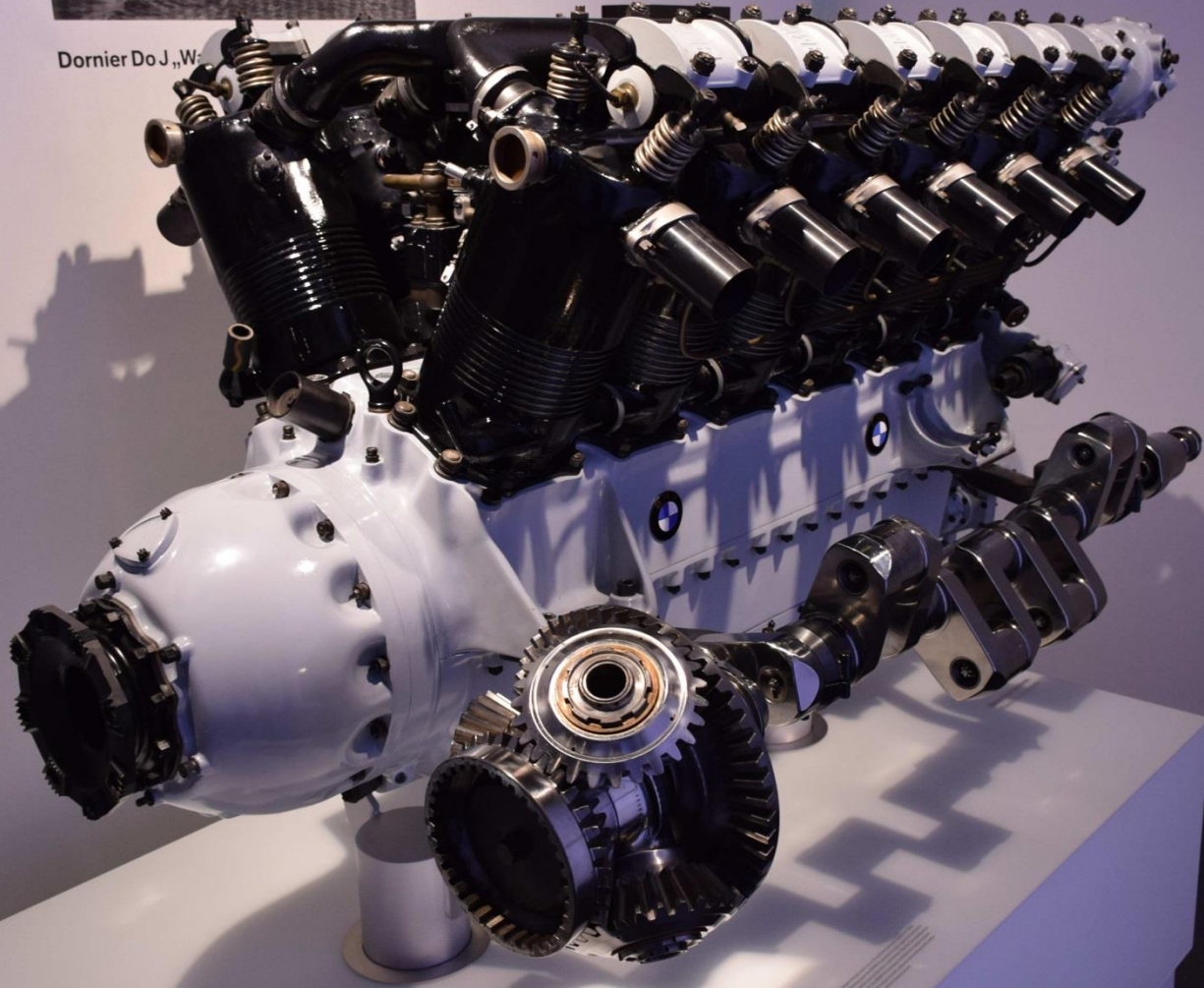
1944  
BMW 003







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 1983 gab BMW sein erstes Formel-1-Rennen. Das erste Mal, nachdem BMW im Jahr 1982 sein erstes Formel-1-Rennen mit der BMW M12 absolviert hatte. Die BMW M12 war das erste Formel-1-Rennen, das BMW absolvierte. Die BMW M12 war das erste Formel-1-Rennen, das BMW absolvierte. Die BMW M12 war das erste Formel-1-Rennen, das BMW absolvierte.





1977

BMW 745i



1976

BMW 330



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.

Innovative Technik.  
Innovative technology.





rive.

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

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

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

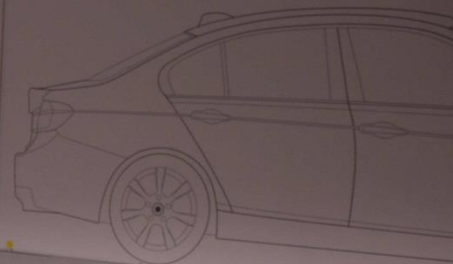
**Innovativer Vorreiter.**  
Innovative pioneer.



1996  
BMW 325i



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









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DRIVING PLEASURE.

PERFORMANCE

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YOUR PERSONAL MOBILITY COMPANION.



BMW 1 Series Hatch 5-door





ing you do  
Sir Henry Royce



Power in reserve  
Space in abundance

ATHLETE  
BUSINESS











ENERGY  
17:42

500 m, A N

304

Ludwigsfeld

Fasaher

Dachauer Str.

OPT







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



















Köszönjük az MPQ szíves vendéglátását  
és a szponzoraink támogatását