Preparing for a Future with Quantum Technologies:
an online approach to accessible Quantum Education

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MAX PLANCK SCHOOL of photonics

Overview

- Motivation
- Online teaching concept
- Delivery model
- Learnings and Summary
- Outlook

Motivation

- Create awareness on quantum science and technologies

- Enabling MPSP students to get first hand exposure
- Focusing on photonics-based quantum technologies
- Providing an online learning platform
- Learning best practices of online lab courses

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Online teaching concept

- 6x short lectures (10-20 min each)
- Negligible or no mathematical derivations
- Explanation of underlying physics
- Facilitate with recorded experiments in 360° (VR)
- Perform the experiments virtually

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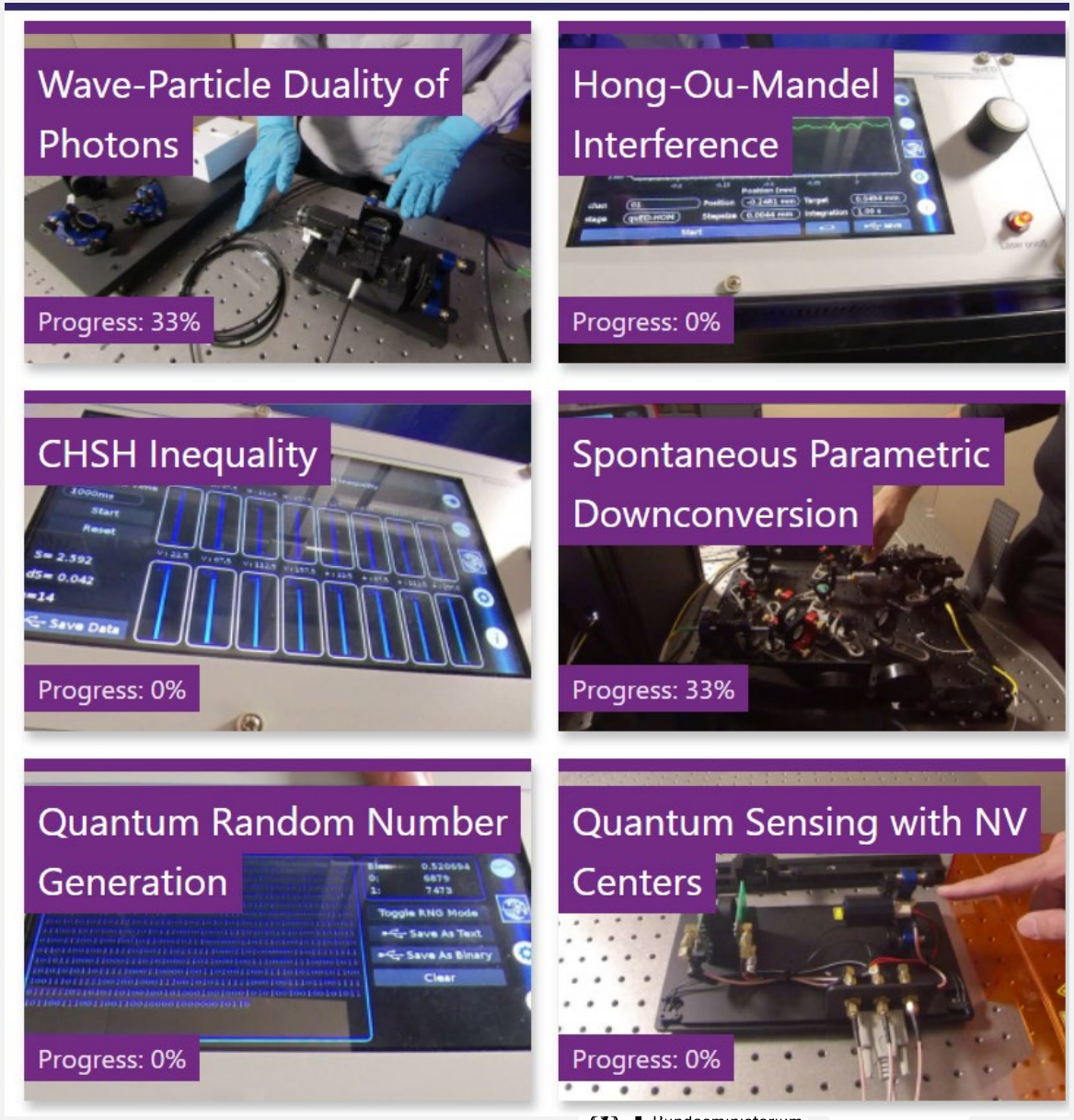
Backend organization

- Prepare the lecture materials
  ~10 slides / topic
- Setting up 360° and 2D recording studio in laboratory
- Record the lectures and experiments

- Advertise this course in different MPSP events



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Course topics

2

Quantum Interferometry

4

Spontaneous Parametric Down Conversion (SPDC)

6

Quantum Sensing

1

Particle nature of light and properties of photons

3

EPR Paradox and Bell's inequality

5

Quantum Random Number Generation

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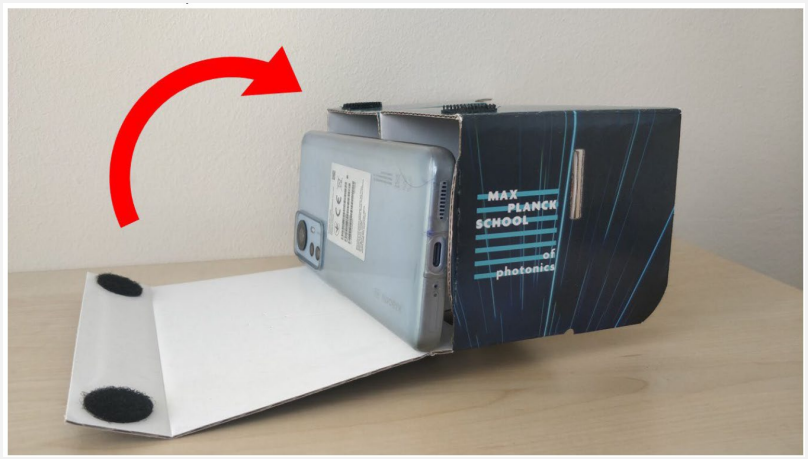
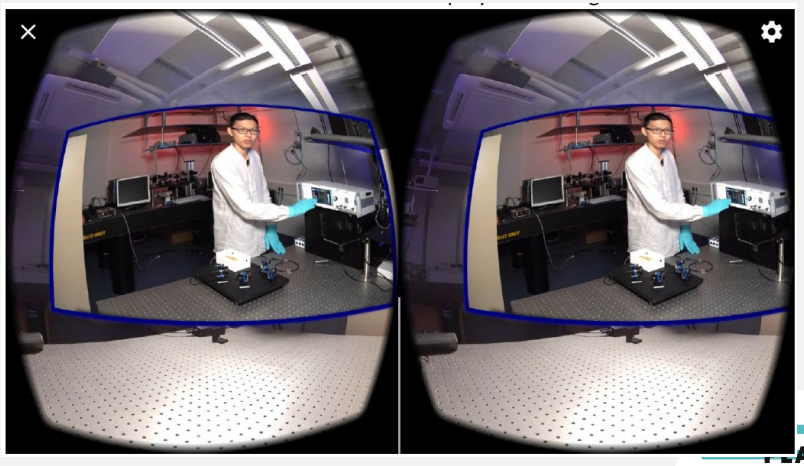
Course delivery

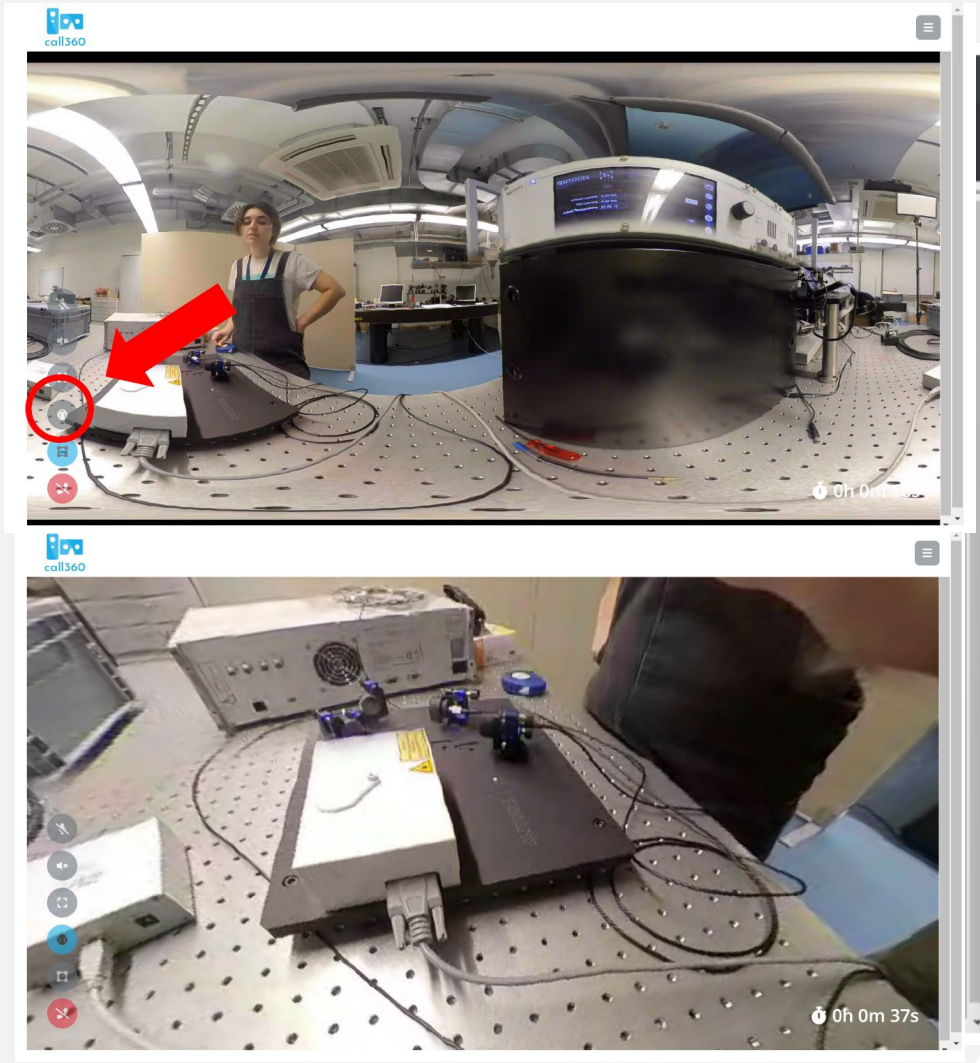
- 1 topic released every 2 weeks
- Participants go through the lecture material
  (and supplementary material)
- Participate in quiz
- Watch the recording of the experiment
- Book a slot for online-lab





Online-lab and lab-buddy

- Live low latency VR VC
- Motorized kits
- Students control the setups using VNC connection
- Students get 360° live feed and the experimental control panel



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of photonics

Assessment and Grades

- Quiz for each topics
- Presentation on any one of the experiments

- PhD students receive 0.5 ECTS by MPSP
- Certificate of participation is issued

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Learnings and Summary

- 100% participation in the course
- Effective training of lab buddies is important
- Troubleshooting and maintaining kits
- Coordination within MPSP and other institutes is critical

Online-lab course needs significant resources and continuous training to make the course future-proof

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Outlook: Applications of Quantum Technologies

1: Characterization of the source: G(2), tomography

2: Quantum Computing: using IBM quantum computer

3: Quantum Computing: using photonic quantum processors

4: Quantum Communications – E91 and quantum dense coding

5: Quantum Imaging: Ghost imaging

6: Quantum Metrology: OCT and QOCT

More talks from MPSP

Wed – 09:45
Send Castle II
The Virtual Reality Cleanroom Training

Wed – 11:15
Seahorse
Augmented Reality in Labwork Training

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Thank you for your attention

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