



Superposition Principle

Any (linear) combination of possible states of the system is also a possible state of the system.

$$|0\rangle = \begin{bmatrix} 1 \\ 0 \end{bmatrix} \quad |1\rangle = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$$

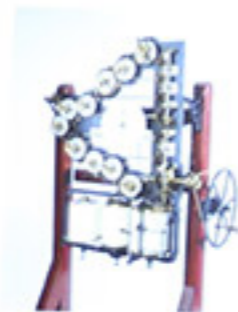
$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle = \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$$

$\alpha, \beta \in \mathbb{C}$

Self-interference of a photon: a purely quantum effect.



The evolution of Computation and Simulation



2022

MASTER

Flip Ch
pa
size: 8

25

BAKI
DÖVLƏT
UNİVERS



BAKI
DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY





Summary

electron's properties can be controlled by changing its shape and size

atom-like atom confined in a nanostructure by considering different types of the linearly shrinking and harmonically

electron's dynamics to the moving wall of average total energy and coordinate and force acting on the electron by

electron is found in case of

nanowire, atom coating, modeling the conditions, associated physics



BAKU STATE UNIVERSITY

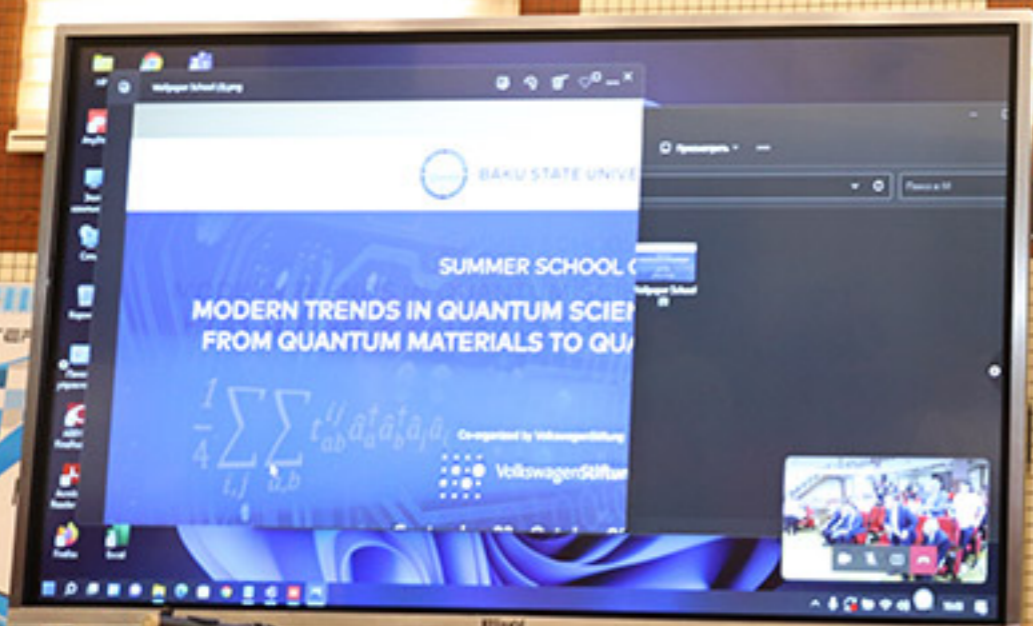
SUMMER SCHOOL ON

MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

Organized by Nanosystem Center
Volkswagen-Stiftung

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN







BAKI
DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY



BAKI DÖVLƏT UNIVERSİTETİ



BAKU STATE UNIVERSITY








Dr. Elchin Safarov
Institute of Physics,
Azerbaijan

"AN EXACT SOLUTION TO THE
NANOSTRUCTURES EXHIBITING

Some years ago I had a
L.A.M. Director in the
Morgan Library in New York
City. He had a book on
Classical - Quantum
Harmonic Oscillators
written by L. Landau and
E. Lifshitz. I had read it
and it was very good.
It would be enough if we
could understand the
electron. I had read it
and it would be enough if
students could understand
the harmonic oscillator.



MASTER



Flip

BAKI
DÖVLƏT
UNİVERSİTETİ





BAKI DÖVLƏT UNIVERSİTETİ





BAKI
DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY

Felix von Oppen













BAKI DÖVLƏT UNIVERSİTETİ



systems state



QPC state

$$|\phi_0\rangle = r|r\rangle + t|t\rangle$$

$$|\phi_1\rangle = (r + \delta r)|r\rangle + (t + \delta t)|t\rangle$$



assume a single e scattering in QPC





Outline

- Preparation Technology;
- Influence thermal annealing on structure and optical properties;
- Influence gamma irradiation to structure and optical properties;
- Conclusion.



BAKI
DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY



Mashrab Akramov
National University of
Uzbekistan, Uzbekistan

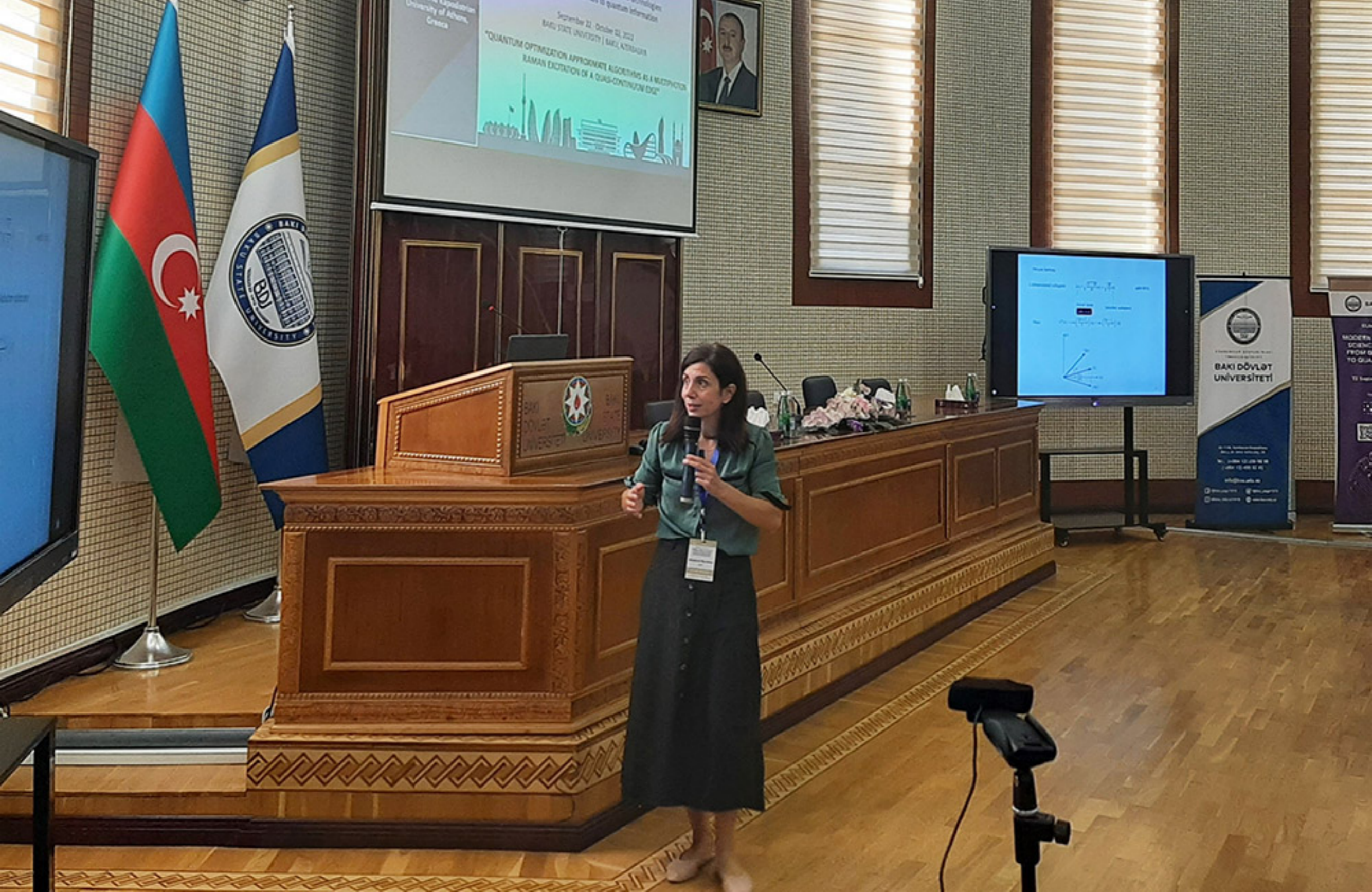


SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"QUANTUM TRANSPORT AND BAND SPECTRA IN BRANCHED DISCRETE
LATTICES"





September 22 - October 22, 2022
BAKI STATE UNIVERSITY | BAKI, AZERBAIJAN

QUANTUM OPTIMIZATION APPROXIMATE ALGORITHMS AS A MIXED-PHASE
RAMAN EXCITATION OF A QUASI-CONTINUUM EDGE

BAKI DÖVLƏT
UNİVERSİTETİ



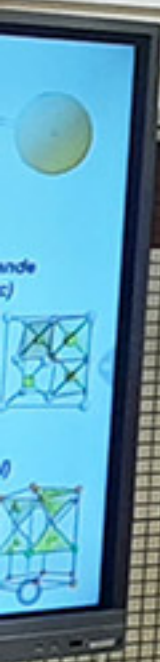
Dr. Lala Gahramanli
Baku State University,
Azerbaijan



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"THE INFLUENCE OF PARAMETERS OF THE ENVIRONMENT ON THE PHYSICAL
PROPERTIES OF NANOMATERIALS"



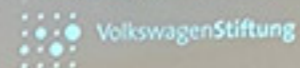


BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^y \hat{a}_a^\dagger \hat{a}_b^\dagger \hat{a}_j \hat{a}_i$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{l,j} \sum_{a,b} c_{ab}^{lj} \hat{a}_a^\dagger \hat{a}_b^\dagger \hat{a}_a \hat{a}_b$$

Co-organized by VolkswagenStiftung
VolkswagenStiftung

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



BAKI DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY



SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^{ij} \hat{a}_a^\dagger \hat{a}_b^\dagger \hat{a}_j \hat{a}_i$$

Co-organized by VolkswagenStiftung
VolkswagenStiftung

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



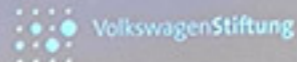


BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{t,j} \sum_{a,b} t_{ab}^{ij} a_a^\dagger a_b^\dagger a_j a_t$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



BAKI
DÖVLƏT
UNİVERSİTETİ



UNİVERSİTETİ



CERTIFICATE

Mr. Deyanir Abdullayeva

Participant

September 22 - October 02, 2022

Baku State University

Co-organized by VolkswagenStiftung

Signature

Date



SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^{ij} a_a^\dagger a_b^\dagger a_j a_i$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

BAKI
DÖVLƏT
UNİVERSİTETİ

UNIVER



SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^i a_0^i a_0^j a_1^i a_1^j$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



BAKI DÖVLƏT
UNİVERSİTETİ





BAKU STATE UNIVERSITY

SUMMER SCHOOL ON

MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} c_{ab}^i a_i^\dagger a_j^\dagger a_j a_i$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN





SUMMER SCHOOL ON

MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{l,j} \sum_{a,b} t_{ab}^{lj} \hat{a}_a^\dagger \hat{a}_b^\dagger \hat{a}_j \hat{a}_l$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\sum_{i,j} \sum_{a,b} t_{ab}^i a_i^\dagger a_j a_b$$

Coorganized by VolkswagenStiftung

VolkswagenStiftung

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



BAKI DÖVLƏT
UNİVERSİTETİ

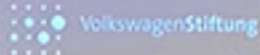


BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^i a_a^\dagger a_b^\dagger a_j$$

Co-organized by VolkswagenStiftung



September 22 - October 02, 2022

BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN





BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^{ij} a_a^\dagger a_b^\dagger a_j a_i$

Co-organized by VolkswagenStiftung
VolkswagenStiftung

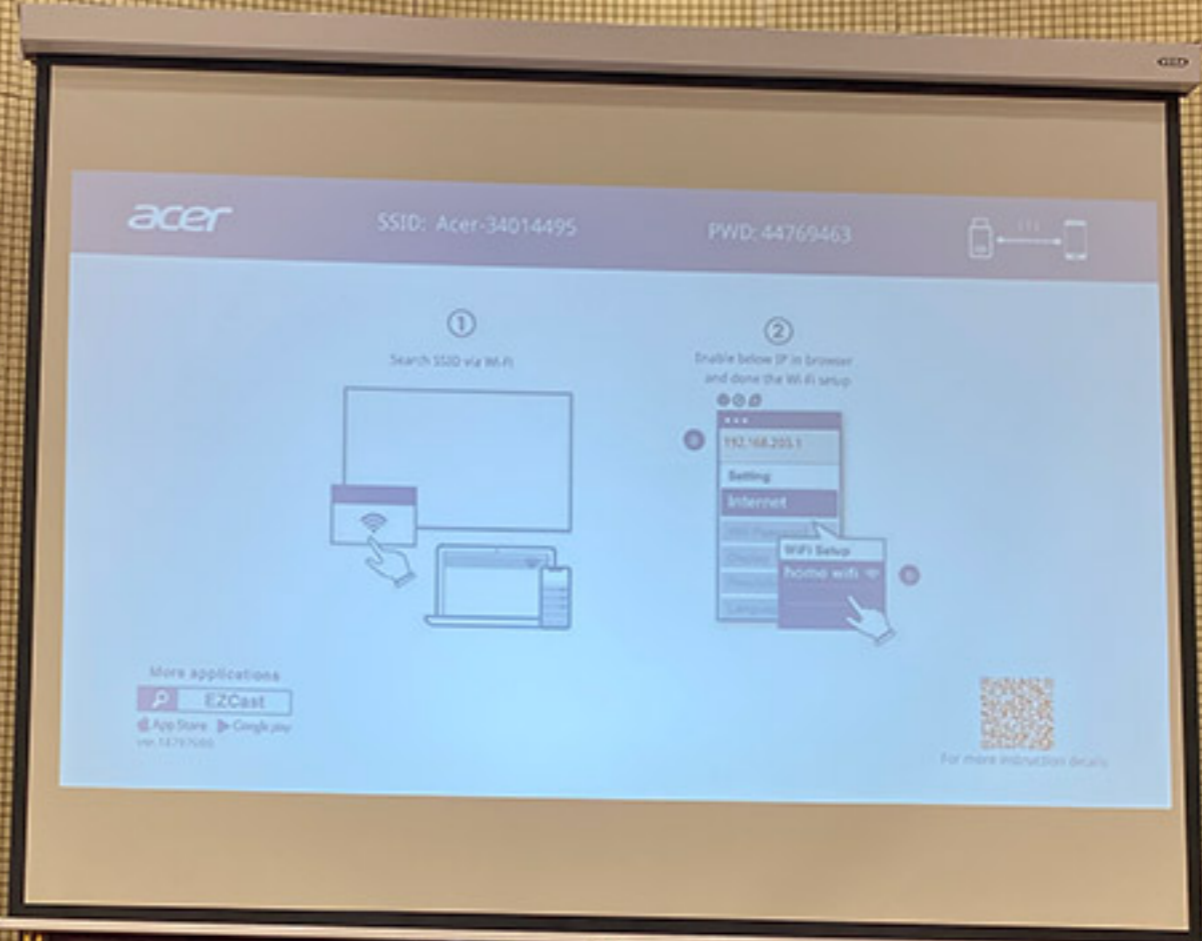
September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

BAKI DÖVLƏT
UNİVERSİTETİ



BAKU
STATE
UNIVERSITY







BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
 MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
 FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

Co-organized by VolkswagenStiftung
 VolkswagenStiftung

September 22 - October 02, 2022
 BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

$$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^y a_a^i a_b^j$$

BAKI DÖVLƏT
 UNIVERSİTETİ



BAKU
 STATE
 UNIVERSITY







BAKI DÖVLƏT UNIVERSITETI
BAKU STATE UNIVERSITY

BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES:
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

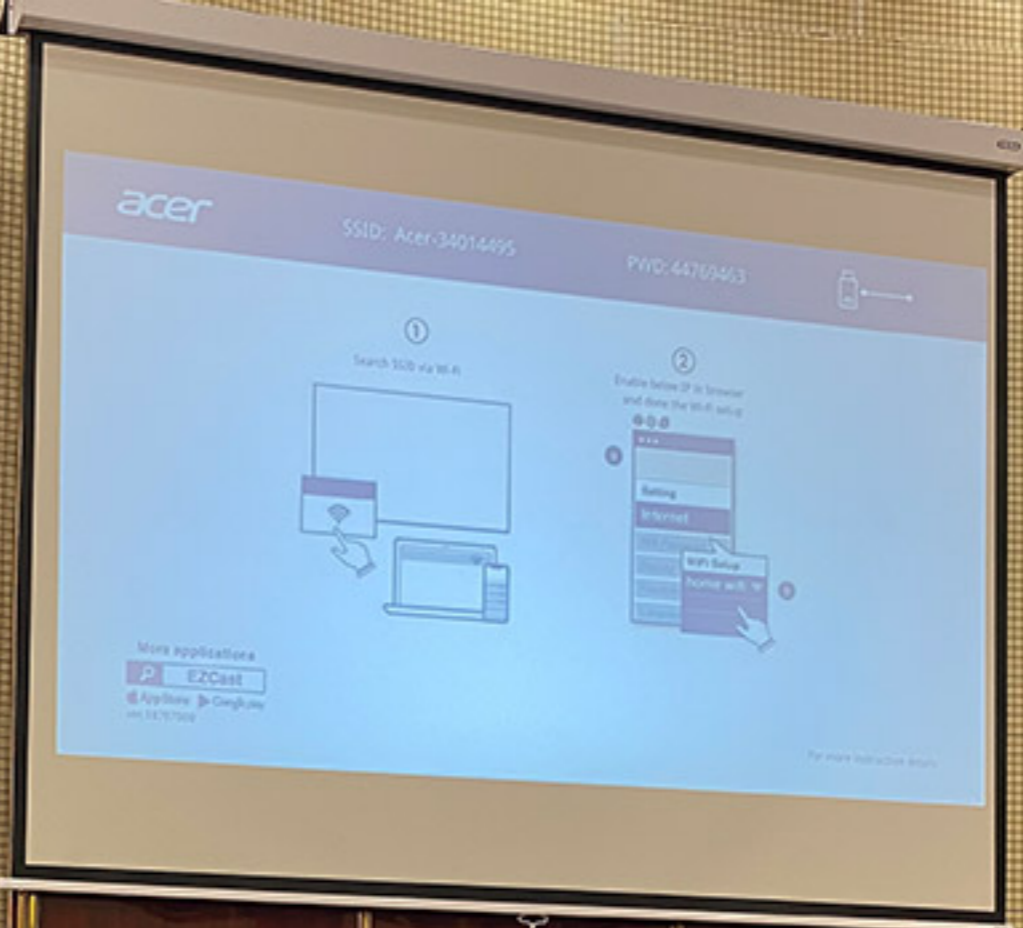
$\frac{1}{4} \sum_{i,j} \sum_{a,b} t_{ab}^i a_a^\dagger a_b^\dagger a_j a_i$

Co-organized by VolkswagenStiftung
VolkswagenStiftung

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN







...ing remarks
...inary
...netic
...ill appear in
...n Scattering of
...749-756



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF Bi₂Te₃ AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBi₂Te₄n (Bi₂Te₃)"

Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan

The slide features a circular portrait of Prof. Nazim Mamedov, the Baku State University logo, and a silhouette of the city skyline at the bottom.





Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan

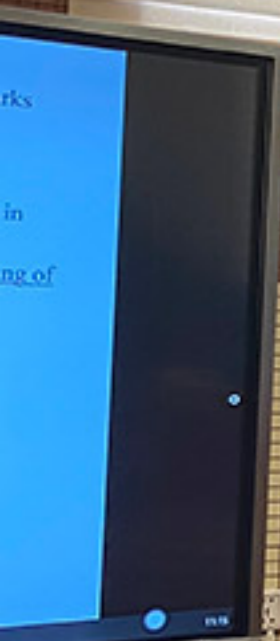


SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF BiZTe_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING
OF TOPOLOGICAL INSULATORS MnBiZTe_4 (BiZTe_3)"





cluding remarks
liminary
agnetic
will appear in
nan Scattering of
S, 749-756



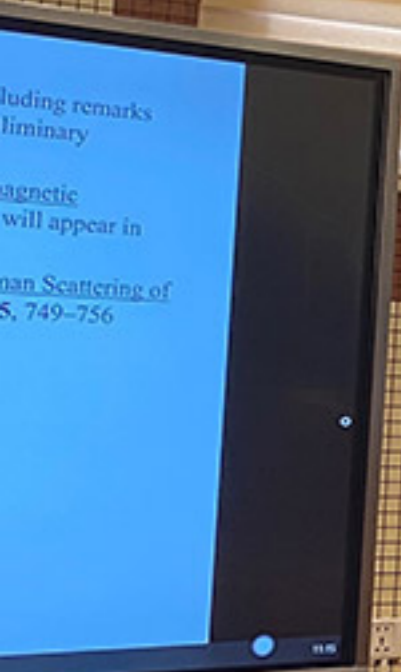
Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF Bi_2Te_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING
OF TOPOLOGICAL INSULATORS MnBi_2Te_4 (Bi_2Te_3)"



remarks
ary
ic
appear in
attering of
9-756



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF Bi_2Te_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBi_2Te_4 (Bi_2Te_3)"



CERTIFICATE



Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF BiZnTe_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBiZnTe_3 (BiZnTe_3)"





Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan



SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF BiZrTe_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBi_2Te_4 (Bi_2Te_3)"

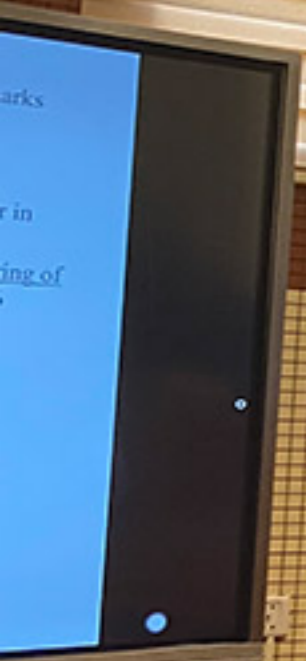


BAKU STATE UNIVERSITY





A large projection screen displays a presentation slide for a summer school. The slide includes a circular portrait of Prof. Nazim Mamedov, the text "Prof. Nazim Mamedov, Institute of Physics, Azerbaijan", and the event details: "SUMMER SCHOOL: Modern trends in quantum science and technologies: From quantum materials to quantum information, September 22 - October 02, 2022, BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN". The main topic is "LATTICE DYNAMICS OF Bi_2Te_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBi_2Te_4 (Bi_2Te_3)". The slide also features logos of the organizing institutions and a silhouette of a city skyline.





Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan

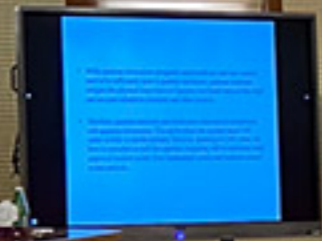


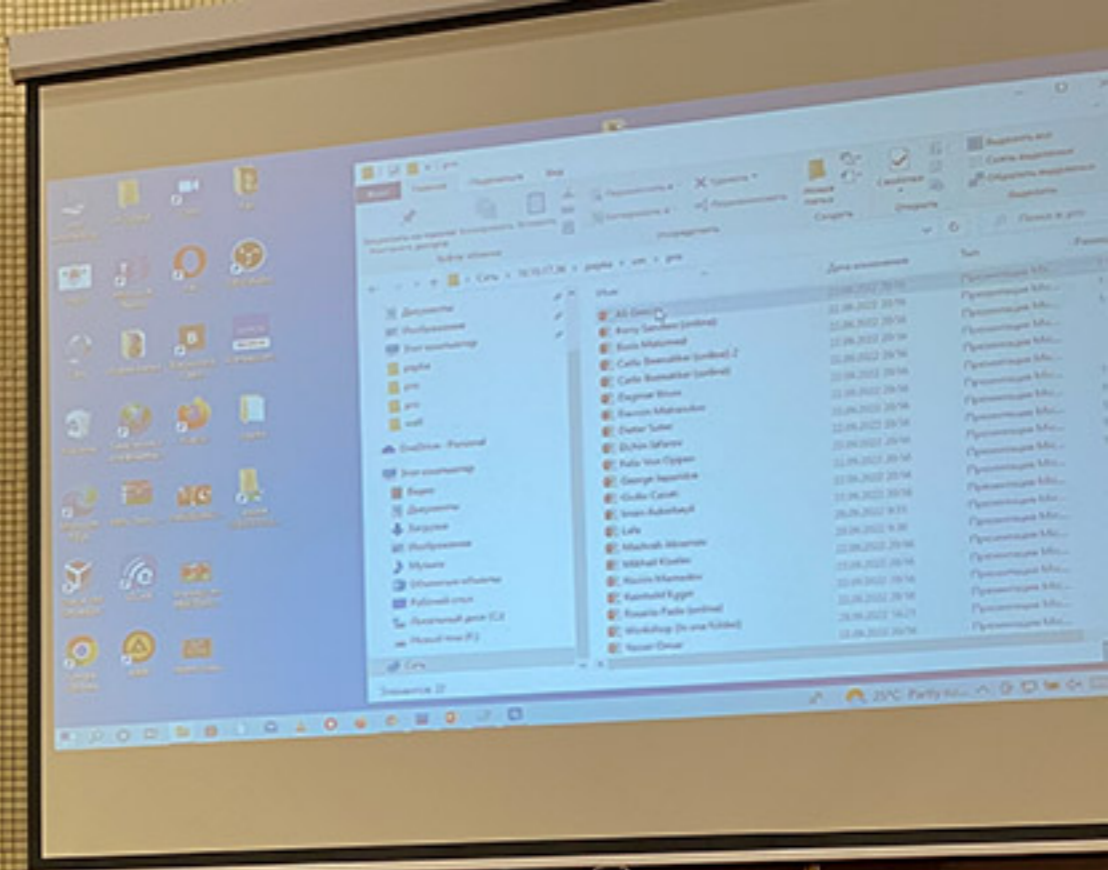
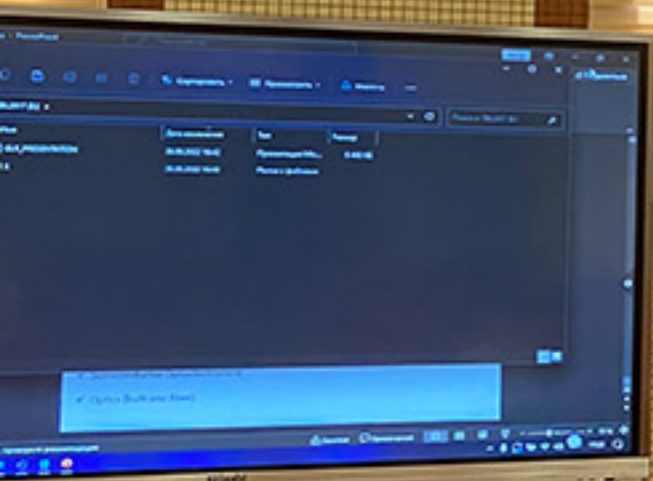
SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF Bi_2Te_3 AND VIBRATIONAL MODES IN RAMAN SCATTERING
OF TOPOLOGICAL INSULATORS MnBi_2Te_4 (Bi_2Te_3)"









marks
car in
ering of
66







SUMMER SCHOOL:
Modern trends in quantum science and technologies:
From quantum materials to quantum information

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN

"LATTICE DYNAMICS OF BiZTe₃ AND VIBRATIONAL MODES IN RAMAN SCATTERING OF TOPOLOGICAL INSULATORS MnBiZTe_{4n} (BiZTe₃)"




Prof. Nazim Mamedov
Institute of Physics,
Azerbaijan

Quantum Optics
Transparent quantum systems

TRANSPARENT BOUNDARY CONDITIONS (1D)

Using Laplace transformation techniques one can obtain the right TBC at $x = L$:

$$\partial_x \psi(L, t) = \sqrt{\frac{2}{\pi}} e^{-i\pi/4} \int_0^L \frac{\psi(L, t')}{\sqrt{L-t'}} dt'$$

Similarly, the left TBC at $x = 0$ is obtained as

$$\partial_x \psi(0, t) = -\sqrt{\frac{2}{\pi}} e^{-i\pi/4} \int_0^L \frac{\psi(L, t')}{\sqrt{L-t'}} dt'$$

SEPTEMBER 22 - OCTOBER 02, 2022 - BAKU, AZERBAIJAN

BAKU STATE UNIVERSITY

SUMMER SCHOOL ON
MODERN TRENDS IN QUANTUM SCIENCE & TECHNOLOGIES
FROM QUANTUM MATERIALS TO QUANTUM INFORMATION

September 22 - October 02, 2022
BAKU STATE UNIVERSITY | BAKU, AZERBAIJAN



Education at ICTP
ICTP's Postgraduate Diploma Programme:
Preparing young scholars for PhD studies
Since 1991
- more than 1000 Diploma graduates
- more than 75% earned or working towards a PhD



Meruzəçi: M...
Abdus Salam adına Beynəlxalq N...
(The Abdus Salam International
Theoretical Physics (ICTP), Italy) t...
MÖVZU
ICTP-nin Təhsil və Tədq...
Bakı, 27 sentyabr 2022





ŞƏHİDLƏR
XİYABANI





Homidov
Izzat Atakishi o'g'li
05.12.1930 - 20.01.1998

Bessantina
Vera Luvara
02.03.1929 - 02.08.1998

Sadiqov
Yusif Abdurashid o'g'li
02.03.1929 - 02.08.1998

LARBEV
02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

02.03.1929 - 02.08.1998

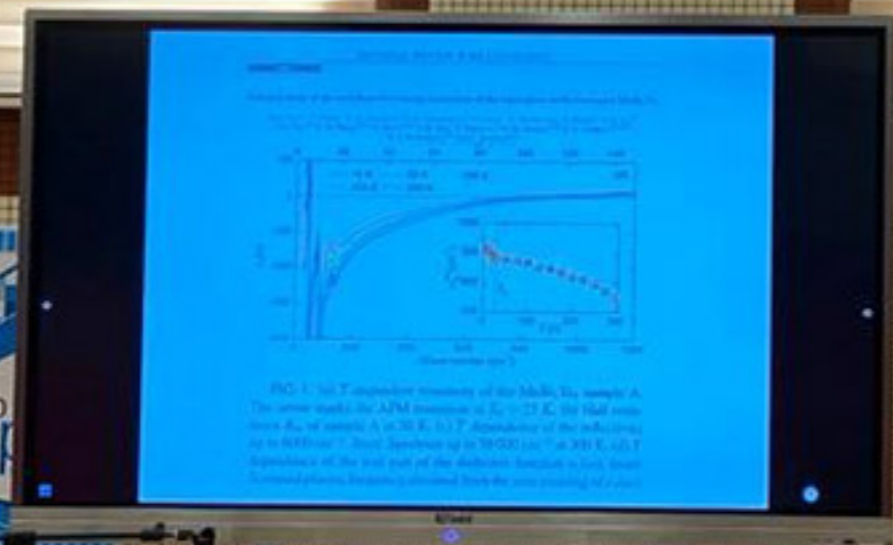






Summer school on
Modern trends in quantum science
and technologies: From quantum materials
to quantum information, Baku, Azerbaijan,
September 22 - October 2, 2022





BAKI DÖVLƏT UNIVERSITETİ BAKU STATE UNIVERSITY

BAKI DÖVLƏT UNIVERSITETİ BAKU STATE UNIVERSITY

BAKU STATE UNIVERSITY

