



City Tech Team’s Quantum Technology Patent Offers a Glimpse of the Future

Brooklyn, NY—October 27, 2021—A New York City College of Technology (City Tech) professor and his then-undergraduate research partner have been granted a patent that may revolutionize quantum technology and cybersecurity. Their work has the potential to provide the missing part of the ultimate quantum technology: coupling of existing internet/data transfer telecom lines with quantum encryption/computing hardware.

The utility patent was awarded to the City Tech team of **Dr. German Kolmakov**, chair of the college’s Physics Department, and then City Tech undergraduate student **Shaina Raklyar**. With the support of the US Department of Defense, the National Science Foundation (NSF), The City University of New York (CUNY) and prospective New York State funding, a quantum interconnect enabling the coupling of existing internet/data transfer telecom lines with quantum encryption/computing hardware has been designed by the City Tech team and is now being prototyped for testing by US quantum computing companies. Until now, the absence of this quantum interconnect has been a significant obstacle to the deploying of quantum computing.

Quantum computing (QC) is the long-expected next step in dramatically increasing the speed with which computers can perform, tackling problems previously regarded as unsolvable because of the daunting number of variables involved. QC is the processing of information that’s represented by special quantum states. By relying on quantum phenomena like “superposition” and “entanglement,” these machines handle information in a fundamentally different way to “classical” computers like smartphones, laptops, or even today’s powerful supercomputers. It can be seen as a revolution in the way computers function.

Linkage to quantum technology can revolutionize surveillance and homeland security, effectively transforming cybersecurity, the secure transmission of information, artificial intelligence, the creation of new materials and even the advancement of science through the development of new drugs. The main directions of quantum technology development include quantum computing, quantum secure internet and unbreakable quantum encryption of information.

The potential for this breakthrough work is profound. With quantum encryption enabled by the team’s patent, Twitter and other social media would never be hacked again, personal data would never be leaked and private conversations would be immune to eavesdropping. With quantum acceleration of computations, new vaccines could be developed in weeks. This technology also has the potential to reduce energy costs for data centers by 50%, and dramatically reduce their carbon footprint – a reduction equal to half of the carbon footprint of global aviation.

To facilitate the commercialization of this technology and attract private funding, Raklyar established a Brooklyn-based, woman-owned, woman-operated startup company – Next Generation Quantum Corp (NGQ). With the support of the NSF, the team led a “customer discovery” session, interviewing 130+ decision makers, top officers and technology experts from the nation's leading high-tech companies, including IBM, AWS, D-Wave, Intel, and Google, as well as potential adopters of the technology, including Lyft, Uber, Bank of America and Morgan Stanley. The interviews underscored the importance of the prototyping now being done and an angel investor has come forward to fund its development.

“Shaina’s work forms the basis of this technological breakthrough, not only within the world of high-performance computing, but in the digital ecosystem as a whole, which has become an essential part of our daily lives. I’m sure it will bring new experiences to homes, workplaces and free up time for almost all of us,” said Prof. Kolmakov. “I’m really lucky that Shaina joined in on this research and brought her passions and, also, her scientific and entrepreneurial energy to this project.”

It is not by accident that this technological breakthrough is the result of joint research by a City Tech faculty member and his student. City Tech prides itself on the value add of its programs in student-faculty collaborative research.

City Tech President Russell K. Hotzler states, “City Tech is proud to be an incubator for the development of innovative technologies such as Ms. Raklyar and Dr. Kolmakov’s quantum computing device. Their achievement will leave a lasting imprint in the field of quantum computing and the world of technology in general. We are excited to be the home of such groundbreaking research and congratulate this team on their newly acquired patent.”

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Shaina Raklyar was born in Kiev, Ukraine at the time of the collapse of the Soviet Union. She moved to the US in 2012 and has lived in New York ever since. When she learned about the opportunities that City Tech provides, her first thought was “Wow! this is a cool place with unique majors.” This sounded like the future to her, she says, so she immediately applied. Ms. Raklyar completed her bachelor’s degree in Biomedical Informatics in June 2020 and is now enrolled in a doctoral program at the City College of New York.

When asked about her hopes for the outcome of her work with Professor Kolmakov, she replied, “I have three big hopes for the startup. The first is to revolutionize technology and to have our piece integrated in every computer in the future. The second hope is for Next Generation Quantum to go to an IPO. The third hope is for NGQ to get a Nobel prize in physics, or an equivalent in engineering (or both).”

Professor German Kolmakov is a professor of physics, and chairman of the Physics Department at City Tech. He received his Ph.D. from the L.D. Landau Institute for Theoretical Physics in Moscow, Russia. Professor Kolmakov is the author or co-author of a long list of articles on theoretical physics. Of Kolmakov, Shaina says, “German is the smartest person that I know. I truly hope that this is not the last technology that we build together.”

City Tech, of The City University of New York (CUNY), located in downtown Brooklyn, is the largest four-year public college of technology in the Northeast and a national model for technological education. In fall 2019, City Tech had an enrollment of more than 17,000 students in 31 baccalaureate and 30 associate degree programs, and was ranked ninth among more than 2,000 U.S. institutions in overall economic mobility for its students (www.equality-of-opportunity.org). For more information, visit www.citytech.cuny.edu.

Photos:

#1 – Prof. German Kolmakov and Shaina Raklyar. Courtesy of Shaina Raklyar.

#2 – Shaina Raklyar working in CUNY’s Advanced Research Center. Courtesy of Prof. German Kolmakov.

#3 – The quantum interconnect. Courtesy of Prof. German Kolmakov.

#4 – Shaina Raklyar working in the cleanroom of CUNY’s Advanced Science Research Center. Courtesy of Prof. German Kolmakov.