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# समाचार पत्रों से चयित अंश Newspapers Clippings

A Daily service to keep DRDO Fraternity abreast with DRDO Technologies, Defence Technologies, Defence Policies, International Relations and Science & Technology

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**Press Information Bureau  
Government of India**

**Ministry of Defence**

*Thu, 10 Dec 2020 2:32PM*

## **Successful Trials of 5.56 x 30 mm Joint Venture Protective Carbine (JVPC)**

Defence Research and Development Organisation (DRDO) designed 5.56x30 mm Protective Carbine has successfully undergone the final phase of User trials on 7th December 2020 meeting all the GSQR parameters. This has paved the way for induction into the services. This was the last leg of trials in a series of User trials which have been carried out in extreme temperature conditions in summer and high altitudes in winter. JVPC has successfully met the stringent performance criteria of reliability and accuracy in addition to quality trials conducted by DGQA.

JVPC is a Gas Operated Semi Bull-pup automatic weapon having more than 700 rpm rate of fire. The effective range of the carbine is more than 100 m and weighs about 3.0 kg with key features like high reliability, low recoil, retractable Butt, ergonomic design, single hand firing capability, and multiple Picatinny rails etc. These features make it a very potent weapon for Counter Insurgency /Counter Terrorism operations by security agencies.

The carbine has been designed as per Indian Army's GSQR, by Armament Research and Development Establishment (ARDE), a Pune based laboratory of DRDO. The Weapon is manufactured at Small Arms Factory, Kanpur while the Ammunition is manufactured at ammunition Factory, Kirkee Pune.

The weapon has already passed the MHA trials and procurement action is initiated by the CAPFs and various State Police organisations.

Raksha Mantri Shri Rajnath Singh had unveiled the 5.56 x 30 mm JVPC during DefExpo- 2020 at Lucknow.

Secretary DD R&D & Chairman DRDO Dr Satheesh Reddy has congratulated DRDO team, user team and all public and private agencies involved in manufacturing for successful reaching this milestone.

<https://www.pib.gov.in/PressReleasePage.aspx?PRID=1679664>





## 5.56x 30 मिलीमीटर संयुक्त उद्यम सुरक्षात्मक कार्बाइन (जेवीपीसी) का सफल परीक्षण

रक्षा अनुसंधान और विकास संगठन (डीआरडीओ) द्वारा डिजाइन की गई 5.56x30 मिलीमीटर सुरक्षात्मक कार्बाइन का सभी जीएसक्यूआर मापदंडों को पूरा करते हुए 07 दिसम्बर, 2020 को उपयोगकर्ता परीक्षणों के अंतिम चरण से गुजरते हुए सफल परीक्षण किया गया। इससे सेवाओं में इसे शामिल करनेका मार्ग प्रशस्त हुआ है। यह उपयोगकर्ता परीक्षणों की श्रृंखला में होने वाले परीक्षणों का अंतिम चरण था, जो गर्मियों में बहुत अधिक तापमान और सर्दियों में उच्च अक्षांश की स्थिति में किया गया है। जेवीपीसी ने डीजीक्यूए द्वारा आयोजित गुणवत्ता परीक्षणों के अलावा विश्वसनीयता और सटीकता के कड़े प्रदर्शन मानदंडों को भी सफलतापूर्वक पूरा किया है।

जेवीपीसी एक गैस परिचालित सेमी ब्रुल-प्यूप ऑटोमैटिक हथियार है, जिससे 700 आरपीएम से भी अधिक दर से फायर किया जा सकता है। इस कार्बाइन की प्रभावी रेंज 100 मीटर से भी अधिक है। इसका वजन लगभग तीन किलोग्राम है और इसमें उच्च विश्वसनीयता, कम पुनरावृत्ति, रिट्रेक्टेबल बट, एर्गोनॉमिक डिजाइन, सिंगल हैंड फायरिंग क्षमता और विविध पिक्टाटिनी रेल्स जैसी प्रमुख विशेषताएं मौजूद हैं। ये विशेषताएं इसे बहुत शक्तिशाली हथियार बनाती हैं, जो इसे सुरक्षा एजेंसियों द्वारा इसका उग्रवाद/आतंकवाद के नियंत्रण संबंधी परिचालनों के लिए उपयुक्त बनाता है।



इस कार्बाइन को आर्मामेंट रिसर्च एंड डेवलपमेंट एस्टेब्लिशमेंट पुणे आधारित डीआरडीओ की प्रयोगशालाद्वारा भारतीय सेना के जीएसक्यूआर के अनुसार डिजाइन किया गया है। यह हथियार स्माल आर्म्स फैक्ट्री, कानपुर में विनिर्मित है और इसके गोला बारूद का निर्माण किर्की पुणे में किया जाता है।

इस हथियार में एमएचए परीक्षण पहले ही पास कर लिये हैं और इसकी खरीदारी कार्रवाई सीएपीएफ और विभिन्न राज्य पुलिस संगठनों द्वारा शुरू की गई है। रक्षा मंत्री श्री राजनाथ सिंह ने लखनऊ में डेफएक्सपो- 2020 के दौरान इस कार्बाइन का अनावरण किया था।

सचिव डीडी आरएंडडी और अध्यक्ष डीआरडीओ के अध्यक्ष डॉ. सतीश रेड्डी ने डीआरडीओ टीम, उपयोगकर्ता टीम और इस कार्बाइन के विनिर्माण में शामिल सभी सार्वजनिक और निजी एजेंसियों को यह उपलब्धि सफलतापूर्वक हासिल करने के लिए बधाई दी है।

<https://pib.gov.in/PressReleasePage.aspx?PRID=1679749>

## Firearm developed by DRDO lab completes user trials, ready for induction into services

*Designed and developed by Pune-based Armament Research and Development Establishment (ARDE), a DRDO lab, the Joint Venture Protective Carbine (JVPC) has been manufactured at Small Arms Factory, Kanpur*

*By Hemant Kumar Rout*

Bhubaneswar: The 5.56x30 mm protective carbine developed by the DRDO has successfully completed its final phase user trials meeting all the parameters related to General Staff Qualitative Requirements (GSQRs). The trials paved the way for the induction of the weapon system into the services.

Designed and developed by Pune-based Armament Research and Development Establishment (ARDE), a DRDO lab, the Joint Venture Protective Carbine (JVPC) has been manufactured at Small Arms Factory, Kanpur, while the ammunition is manufactured at a factory at Khadki in Maharashtra.

Defence sources said the last leg of the trials was carried out in extreme temperature conditions in summer and high altitudes in winter. The JVPC has successfully met the stringent performance criteria of reliability and accuracy in addition to quality trials conducted by the Directorate General of Quality Assurance (DGQA), the sources said.

JVPC is a gas-operated semi bull-pup automatic weapon having more than 700 rpm rate of fire. The effective range of the carbine is more than 100 metres. With key features like high reliability, low recoil, retractable butt, ergonomic design, single hand firing capability and multiple picatinny rails, it weighs about three kg.

“The features make the firearm a very potent weapon for counter insurgency /counter terrorism operations by security agencies. It has been designed as per Indian Army’s qualitative requirements,” a DRDO official said.

The weapon has already passed the trials conducted in the presence of officials from the Ministry of Home Affairs following which procurement process has already been initiated by the Central Armed Police Forces (CAPFs) and various State Police organisations. Defence Minister Rajnath Singh had unveiled the 5.56 x 30 mm JVPC during the Defence Expo - 2020 at Lucknow.

Secretary of Department of Defence (Research and Development) and DRDO Chairman Dr G Satheesh Reddy has congratulated all the stakeholders, user teams and private agencies involved in manufacturing it for successfully reaching the milestone.

<https://www.newindianexpress.com/nation/2020/dec/10/firearm-developed-by-drdo-lab-completes-user-trials-ready-for-induction-into-services-2234470.html>



Security forces conducting final trials of the 5.56x30 mm protective carbine (Photo | Express)

stringent performance criteria of reliability and accuracy in addition to quality trials conducted by the Directorate General of Quality Assurance (DGQA), the sources said.

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<https://www.newindianexpress.com/nation/2020/dec/10/firearm-developed-by-drdo-lab-completes-user-trials-ready-for-induction-into-services-2234470.html>

## DRDO-designed protective Carbine undergoes successful trials, to be inducted into services: Defence ministry

*The steps for procurement of the JVPC have been initiated by the Central Armed Police Forces (CAPFs) and various state police organisations*

New Delhi: The Ministry of Defence on Thursday announced that the Defence Research and Development Organisation (DRDO)-designed 5.56x30 mm Protective Carbine has successfully undergone the final phase of user trials on December 7, meeting all the parameters.

According to the Ministry of Defence, the Joint Venture Protective Carbine (JVPC) has successfully met the stringent performance criteria of reliability and accuracy in addition to quality trials conducted by the Directorate General of Quality Assurance (DGQA). "This has paved the way for induction into the services," the Ministry of Defence said.

It added, "This was the last leg of trials in a series of user trials carried out in extreme temperature conditions in summer and high altitudes in winter. Joint Venture Protective Carbine has successfully met stringent performance criteria of reliability and accuracy."

The development comes at a time when the Indian Army had been hunting for a new carbine. Recently, the Army's tender was stuck at the final stage in which a middle-Eastern weapon was selected.

Defence Minister Rajnath Singh had unveiled the 5.56 x 30 mm JVPC during DefExpo- 2020 at Lucknow. The JVPC has also passed the Ministry of Home Affairs (MHA) trials. The steps for procurement have been initiated by the Central Armed Police Forces (CAPFs) and various state police organisations.

### Features of the Joint Venture Protective Carbine

The JVPC is a very potent weapon for counter-insurgency/counter-terrorism operations that can be used by security agencies. It is a gas-operated semi-bull-pup automatic weapon having more than 700 rpm rate of fire. The effective range of the carbine is more than 100 m and weighs about 3.0 kg with key features like high reliability, low recoil, retractable butt, ergonomic design, single hand firing capability, and multiple picatinny rails etc.

The carbine has been designed as per the Indian Army's General Staff Qualitative Requirement, by the Pune-based Armament Research and Development Establishment (ARDE) laboratory of the DRDO. The weapon is made at Kanpur while the ammunition is manufactured at an ammunition factory in Kirkee Pune.

<https://www.timesnownews.com/india/article/drdo-designed-protective-carbine-undergoes-successful-trials-to-be-inducted-into-services-defence-ministry/693009>



The JVPC has successfully undergone the final phase of user trials on December 7, 2020.

## सेना की बढ़ेगी ताकत, इस प्रोटेक्टिव कार्बाइन का ट्रायल रहा सफल, जानिए खासियत

मीडिया रिपोर्ट्स के मुताबिक, जॉइंट वेंचर प्रोटेक्टिव कार्बाइन यानि जेपीवीसी एक गैस चालित सेमी ऑटोमैटिक हथियार है। 3 किलोग्राम वजनी यह हथियार 100 मीटर की रेंज तक 700 आरपीएम की दर से गोलियां दाग सकता है। रक्षा मंत्रालय की मानें तो गर्मियों में अत्यधिक तापमान और सर्दियों में उच्च ऊंचाई पर किए गए परीक्षणों में खरा उतरते हुए इसने अंतिम में प्रवेश किया था।

**खास बातें**

1. DRDO की तैयार की 5.56x30 मिमीकी प्रोटेक्टिव कार्बाइन (Protective Carbine) का सफल परिक्षण किया गया है
2. 3 किलोग्राम वजनी यह हथियार 100 मीटर की रेंज तक 700 आरपीएम की दर से गोलियां दाग सकता है

नई दिल्ली: भारतीय सेना की ताकत लगातार बढ़ रही है। DRDO की तैयार की 5.56x30 मिमीकी प्रोटेक्टिव कार्बाइन (Protective Carbine) का सफल परिक्षण किया गया है। सोमवार को हुए इस परीक्षण में हथियार ने ट्रायल्स के आखिरी दौर में प्रवेश कर लिया था।

गुरुवार को रक्षा मंत्रालय की तरफ से जानकारी मिली है। रक्षा मंत्रालय की मानें तो गर्मियों में अत्यधिक तापमान और सर्दियों में उच्च ऊंचाई पर किए गए परीक्षणों में खरा उतरते हुए इसने अंतिम में प्रवेश किया था। इस गन के सेवाओं में शामिल होने का मार्ग अब खुला है।

### सभी मापदंडों को किया पूरा

जानकारी के मुताबिक, DRDO की ओर से डिजाइन की गई 5.56x30 मिमी प्रोटेक्टिव कार्बाइन ने सात दिसंबर को सभी मापदंडों को पूरा करते हुए सफलतापूर्वक परीक्षणों के अंतिम चरण में प्रवेश किया है। इस कार्बाइन को संयुक्त उपक्रम के तहत बनाया गया है।

इसने विश्वसनीयता और सटीकता के कड़े प्रदर्शन मानदंडों को पूरा किया है। DRDO ने क्वांटम की डिस्ट्रिब्यूशन (Quantum Key Distribution, QKD) टेक्नोलॉजी के जरिए संचार करने का सफल परीक्षण किया था।

### 100 मीटर की रेंज तक दाग सकता है गोलियां

मीडिया रिपोर्ट्स के मुताबिक, जॉइंट वेंचर प्रोटेक्टिव कार्बाइन यानि जेपीवीसी एक गैस चालित सेमी ऑटोमैटिक हथियार है। 3 किलोग्राम वजनी यह हथियार 100 मीटर की रेंज तक 700 आरपीएम की दर से गोलियां दाग सकता है।



यह कार्बाइन डीआरडीओ की पुणे स्थित लैब आर्मामेंट रिसर्च एंड डेवलपमेंट एस्टेब्लिशमेंट (ARDE) ने भारतीय सेना के GSQR के आधार पर डिजाइन किया गया है। खास बात है कि यह हथियार पहले ही MHA ट्रायल्स को सफलतापूर्वक पूरा कर चुका है।

### **DRDO को दी बधाई**

DRDO ने बुधवार को अपनी दो प्रयोगशालाओं के बीच संचार का यह परीक्षण किया था। दरअसल, रक्षा और सामरिक एजेंसियों के लिए सुरक्षित संचार दुनिया भर में महत्वपूर्ण है। क्वांटम आधारित संचार बेहद सुरक्षित माना जाता है। इससे सूचनाएं लीक होने का जोखिम नहीं होता।

रक्षा मंत्री राजनाथ सिंह ने हैदराबाद की दो प्रयोगशालाओं के बीच क्यूकेडी आधारित संचार के सफल परीक्षण के लिए डीआरडीओ को बधाई दी।

### **लखनऊ डिफेंस एक्सपो में हुआ था अनावरण**

डीआरडीओ के अनुसार, जॉइंट वेंचर प्रोटेक्टिव कार्बाइन कम रेंज के ऑपरेशन्स के लिए एक खास कैलीबर हथियार है। खास बात है कि लगातार गोलीबारी के दौरान इसे आराम से संभाला जा सकता है और केवल एक हाथ से भी फायरिंग की जा सकती है। सेना काफी समय से कार्बाइन की तलाश कर रही थी।

हाल ही में इसका टैंडर आखिरी चरण में अटक गया था, जहां मिडिल ईस्ट के एक हथियार का चुनाव कर लिया गया था। रक्षा मंत्री राजनाथ सिंह ने लखनऊ में हुए डिफेंस एक्सपो में इसका अनावरण किया था।

<https://zeenews.india.com/hindi/zee-hindustan/national/armys-strength-will-increase-trial-of-this-protective-carbine-has-been-successful-know-the-specialty/804039>

## **BUSINESS NEWS THIS WEEK**

*Fri, 11 Dec 2020*

### **DRDO affirms that India does not want to be a technology follower, rather wants to become a technology leader**

*By Neel Achary*

Hyderabad: 87% by value of the largest order of Akash Missile backed by BDL valued at 25,000 – 30,000 crores originate from the private industries stated Dr. G. Sateesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO. He was speaking on Opportunities in the defence sector, a panel discussion organized as part of the ongoing TiE Global Summit 2020.

JA Chowdary Chairman, India Blockchain Standards Committee & General Partner, Succeed Innovations Fund moderated the discussion. The panellists include Dr. G. Sateesh Reddy, Secretary, Dept of Defence R&D and Chairman, DRDO and Vish Sahasranamam. Forge Forward – Incubator for Defense Tech

About 2000 tier – I and tier – II industries are now working with DRDO he added.

The Government of India has listed 101 defence items that are not to be imported, rather be designed and developed by the industry in India. Thereby creating vast opportunities for the industry to participate in the defence space he informed.

The government and its defence organisations have devoted themselves to smoothening the regulatory and administrative processes to make the industry partnership with the defence sector a seamless experience he informed.



Dr. Sateesh was delighted to inform the audience that more than 1500+ patents along with, testing facilities and R&D capabilities of DRDO have been made available for all the participating Indian organisations to help them in their partnership with the government in the defence sector.

Dr. Sateesh strongly affirmed that India does not want to be a technology follower anymore, rather become a technology leader.

With the participation of the industry in the defence sector, Dr. Sateesh envisions the industry to lead the research and development in the sector while DRDO would concentrate on futuristic technology.

Under the Government of India's Atmanirbhar Bharat, the government envisions and facilities mean to see India design, develop, test, supply (within India) and export in the domain of defence Dr.Sateesh said.



Participating in the discussion, Vish Sahasranamam, CEO & Co-Founder, FORGE Accelerator said Initiatives like iDEX by the GOI have successfully helped connect the military users (army, navy and air force) to collaborate and co-create with industry innovators he expressed.

He added that the forum iDEX also grants funds ranging 1.5 crores to innovators to produce prototypes, facilitates access to testing and advanced field-testing trials as well. He also informed the audience that the defence sector would also help the innovators retain the IP with them.

Vish informed the entrepreneur audience that iDEX would be a great launchpad for innovators to translate their vision and fulfil the needs of the country. He suggested that innovators can become a part of iDEX platform through dedicated and open innovation challenges that are frequently listed on the iDEX website.

He mentioned that 29 innovation challenges put forth by the Indian Army, Navy, and Air Force to which they have received 1200+ responses from start-ups as solutions.

<http://businessnewsthisweek.com/business/drdo-affirms-that-india-does-not-want-to-be-a-technology-follower-rather-wants-to-become-a-technology-leader/>

## Govt encouraging defence manufacturing in pvt sector: DRDO Chief

Hyderabad: Indian defence manufacturing has evolved over the years with DRDO backing private sector. Today, there are over 2,000 companies in India that make systems and sub-systems, based on the specifications. While DRDO focuses on more advanced, translational and applied research, there are more opportunities for the private sector in near future, says a top official.

DRDO chairman Satheesh Reddy speaking at the TiE Global Summit emphasised that India is transforming from an import-dependent nation to a self-reliant country with the government encouraging design, development and manufacturing of systems to take place in the country. The government has recently barred import of 101 defence items so that the domestic sector can be encouraged to meet the sector needs.

The government has come out with policies and measures to ease licensing activity to improve the ease of doing business and Innovations for Defence Excellence (iDEX) initiative is also helping innovation. Soon, the government will roll out schemes to encourage industrial research.

DRDO too from its side rolled out a technology development fund to support innovators and product developers with Rs 10-crore support. The organisation has given the private industry access to its 1,500 patents in addition to extending testing facilities.

He said, “The upcoming missile programmes will further open up opportunities for the private sector participation. Companies will be able to design, test, develop and make systems. This will not only enable them to meet the domestic needs but also make them export-ready. Government is consciously making efforts to reduce the time taken for clearances by increasingly adopting digital platforms, besides removing obstacles such as the bank guarantees.”

Each missile programme opens up several thousand crore worth of opportunities and the private sector should gear up with requisite capabilities, he asserted.

<https://telanganatoday.com/we-hub-has-worked-with-3497-entrepreneurs-so-far-deepthi-ravula>

## DRDO achieves milestone in in key quantum technology, maiden trials successful

*Quantum Key Distribution technology enables two communicators to produce a random secret key known only to them, which can be used to encrypt and decrypt messages*

*By Hemant Kumar Rout*

Bhubaneswar: The Defence Research and Development Organisation (DRDO) on Wednesday achieved a milestone in Quantum Key Distribution (QKD) technology that underwent maiden trials at two of its laboratories establishing highly secure communication.

The trials were conducted at Defence Research and Development Laboratory (DRDL) and Research Centre Imarat (RCI) at Hyderabad under realistic conditions.

QKD is a secure communication method that uses cryptographic protocol involving components of quantum mechanics. Developed by Bengaluru-based Centre for Artificial Intelligence and Robotics (CAIR) and Defence Young Scientists' Laboratory - Quantum Technology (DYSL-QT), Mumbai, the technology enables two communicators to produce a random secret key known only to them and later it can be used to encrypt and decrypt messages.



DRDO Chairman Dr G Satheesh Reddy said the maiden trials of the newly developed technology have been highly successful (Photo | EPS)

The quantum communication using time-bin QKD technology was performed during the trials and the setup demonstrated validation of detection of a third party trying to gain knowledge of the communication.

Defence sources said quantum based security against eavesdropping was validated for the deployed system at over 12 km range and 10 decibel attenuation over fibre optic channel. Continuous-wave laser source was used to generate photons without depolarisation effect. DRDO Chairman Dr G Satheesh Reddy said the maiden trials of the newly developed technology have been highly successful.

"This is a great achievement as quantum based communication offers a robust solution for secure communication. QKD is a significant achievement towards the development of futuristic quantum communication technologies," he told *The New Indian Express*.

Secure communications are vital for defence and strategic agencies worldwide and distribution of encryption keys from time to time is an important requirement. Sharing of keys over the air or wired links requires encryption which in turn requires encryption keys to be pre-shared. The DRDO had undertaken the project for development of the technology exclusively for Indian armed forces.

The work being done at DRDO will be used to enable start-ups and SMEs in the domain of quantum information technologies. The technology will also serve to define standards and crypto policies that can leverage QKD system in a unified Cipher Policy Committee (CPC) framework for more secure and pragmatic key management for current and future military cryptographic systems.

Defence Minister Rajnath Singh congratulated the DRDO team for successful demonstration of QKD communication.

<https://www.newindianexpress.com/nation/2020/dec/09/drdo-achieves-milestone-in-in-key-quantum-technology-maiden-trials-successful-2233993.html>

## A quantum leap: DRDO's quantum-comm success big, now focus on NM-QTA

*The Defence Research and Development Organisation (DRDO) demonstrated communication between two labs using quantum key distribution technology. This point-to-point connection was established between Defence Research and Development Laboratory (DRDL) and The Research Centre Imarat (RCI) in Hyderabad, situated a little under 10 km apart*

Earlier this year, when the University of Chicago (UoC) created a 52-mile quantum loop to transfer sub-atomic particles, this was hailed as a step towards quantum internet given a successful connection over such a distance had not been established before. The UoC experiment involved a connection between two points, and not over a network like the present-day internet offers. Subsequently, the US department of energy released a blueprint for national quantum internet, predicting that this technology would be available within a decade.

The US is not the only country working on quantum internet; China, the Netherlands, and the UK have conducted similar experiments, but over relatively smaller distances. The University of Bristol in the UK has also created a hub linking eight different connections. Against this backdrop, India joining this elite group on Wednesday is a welcome development.

The Defence Research and Development Organisation (DRDO) demonstrated communication between two labs using quantum key distribution technology. This point-to-point connection was established between Defence Research and Development Laboratory (DRDL) and The Research Centre Imarat (RCI) in Hyderabad, situated a little under 10 km apart. While India's achievement is modest in comparison to other countries—Delft University will be connecting two cities using the technology later this month—it is still significant, given that the country has only invested only Rs 186 crore in this so far.

The government had announced plans to invest Rs 8,000 crore in a National Mission on Quantum Technologies and Applications (NM-QTA)—to put India on a par with other countries—but allocations are yet to be made. However, with the government trying to rope in the private sector and academia, there is reason to believe that not only will funding problems ease but also that R&D and application are not limited to the government's efforts and purposes. In an interview with FE, the secretary of the department of science and technology had stated that the government will follow a four-tier model under which an apex committee with equal participation from academia, industry and government will set the broad parameters, and hubs, which will be independent entities, will oversee implementation of the NM-QTA. The centres will be the focus for innovation, and the spokes will focus on individual parameters related to quantum technology. The department also plans to create a quantum computer with a 50-qubit capacity within five years. But, as most of these plans are still in the consultation stage, and India lags behind other countries by at least two-three years, it will have to move fast in this direction.

Even if quantum technology has limited application—internet speeds would be much slower, but the connection will be extremely secure—security infrastructure and scientific research will largely be dependent on such systems. Countries can use quantum computers to break encryption protocols easily. India is already far behind other countries in terms of supercomputers. It is about time it took a quantum leap.

<https://www.financialexpress.com/opinion/a-quantum-leap-drdo-quantum-comm-success-big-now-focus-on-nm-qa/2147644/>

## IAF Chief discusses cooperation, interoperability with Japanese counterpart

*Gen. Shunji's visit comes close on the heels of last month's Malabar naval exercise involving India, Japan, the US and Australia*

New Delhi: The visiting Chief of Staff of Japan's Air Self-Defense Force, Gen Izutsu Shunji, and the Indian Air Force chief, Air Chief Marshal RKS Bhadauria, on Thursday discussed ways to enhance cooperation and interoperability between the two sides.

Gen. Shunji's visit comes close on the heels of last month's Malabar trilateral naval exercise involving India, Japan and the US, which was joined this year by Australia. It also comes in the wake of efforts by India, Australia and Japan to forge alternative and resilient supply chains.

Both Japan and India are also grappling with China's assertive actions. Japan has described China's growing maritime activities in waters around the country as a threat, while India and China are locked in a standoff along the Line of Actual Control (LAC) in Ladakh.

Shunji, who is visiting India at the invitation of the IAF chief, also met defence minister Rajnath Singh, the Chief of Defence Staff, Gen Bipin Rawat, the navy chief and the vice chief of the army.

On arrival at the Air Headquarters, Shunji was presented a guard of honour.

"In subsequent discussions, the IAF chief and Shunji] recognised the progress made in defence ties between India and Japan and discussed avenues to further enhance cooperation and interoperability between the two air forces," an official statement said.

They discussed the scope for enhancing joint exercises and training between the two air forces. "A broader cooperation for strengthening collective response to humanitarian aid and disaster relief contingencies was also discussed," the statement said.

Shunji's visit amid the unprecedented challenges posed by the Covid-19 pandemic "reaffirms the deep rooted commitment to maintain and strengthen the relationship between the air forces", it said.

<https://www.hindustantimes.com/india-news/iaf-chief-discusses-cooperation-interoperability-with-japanese-counterpart/story-hNb3CqeghulJFB5gQFqP9M.html>



IAF Chief Air Chief Marshal RKS Bhadauria and Japanese Chief of Staff of Japan's Air Self-Defense Force General Izutsu Shunji during their meeting in New Delhi on Thursday.(PTI)

## **Indian Army discussing dual-task formations to tackle China, Pakistan fronts**

*In a step which will further enhance India's preparedness for a two-front war scenario, the Indian Army is discussing proposals to create dual-task formations. These formations will simultaneously look after both the Pakistan and China borders*

*By Manjeet Singh Negi*

In a step which will further enhance India's preparedness for a two-front war scenario, the Indian Army is discussing proposals to create dual-task formations. These formations will simultaneously look after both the Pakistan and China borders.

The proposals are part of the discussions that are going on within the services to further enhance their preparedness along the border with China in view of the ongoing military standoff.

"There will be no need to raise any additional forces or a new strike corps in view of the ongoing conflict. The existing fighting formations can be given dual-tasking to look after both fronts," top government sources told India Today.



(Rep Image)

The need for rebalancing the troops' focus on the two borders has been necessitated in the wake of the Chinese border becoming an active zone since April-May, and just like the Pakistan front, a large deployment is required there as well. Secondly, there has been deepening of military ties between China and Pakistan in the Ladakh and Jammu and Kashmir areas.

Different proposals in this regard are being considered by the Army headquarters and suggestions have also been sought from the different Army commanders. A need to further enhance preparedness along the Line of Actual Control (LAC) has been felt, the sources said in the view of changing dynamics on the frontiers.

The way these formations could be made dual tasked would be decided as per the discussions and decisions based on them, the sources said.

The Strike Corps on the western front including the 21 Strike Corps in Bhopal along with the Strike One in Mathura and the Kharga Corps in Ambala are heavy-armoured and have their formations located all over the western, central and northern sector. Some of them are very close to the China border.

The reorientation of the fighting formations of the 1.3 million-force would be a major exercise. It is expected to prepare the defence forces for a two-front war in real senses, the sources said.

The BMPs, T-90s and T-72s of the Indian Army have been deployed heavily to more than match the Chinese presence opposite the Ladakh sector.

Three Indian Army Mountain Divisions are additionally deployed in the eastern Ladakh sector against around 60,000 Chinese troops in that area. India and China have been engaged in a military standoff about eight months in eastern Ladakh. The deployments have gone up significantly in other sectors too along the entire LAC.

<https://www.indiatoday.in/india/story/indian-army-discussing-dual-task-formations-to-tackle-china-pakistan-fronts-1748515-2020-12-11>

## Garden Reach shipbuilders to benefit from government's Rs 150 crore export grant, says company CMD VK Saxena

*Chairman-cum-Managing Director of Garden Reach shipbuilders, VK Saxena, in 'News per Views' segment told Zee Business Managing Editor Anil Singhvi that the company will benefit from the government export grant of Rs 150 crore*

*Edited By Harish Dugh*

Chairman-cum-Managing Director of Garden Reach shipbuilders, VK Saxena, in 'News per Views' segment told Zee Business Managing Editor Anil Singhvi that the company will benefit from the government export grant of Rs 150 crore.



He said the company already builds warships for Indian Navy, however, given the government's thrust on export, the company for the first time has done bidding of an ocean-going ferry of 13 million USD for Government of Guinea and is a successful bidder.

He said the company already builds warships for Indian Navy, however, given the government's thrust on export, the company for the first time has done bidding of an ocean-going ferry of 13 million USD for Government of Guinea and is a successful bidder there. He said as per the information, there is a good chance that the company will get letter of acceptance from the Government of Guinea and shortly contract will also be signed. "It's not a very big project, but certainly a good beginning for us," he said.

He said the thrust on export by the government is a very healthy development for the company as well as all Indian shipyards, either private or Defense. "Grant is required to push exports. Many countries such as South Korea, Japan, China and others that support their shipyards get good result in export. Similarly, this grant will help Indian shipyard and push their export due to competition in the sector," VK Saxena said.

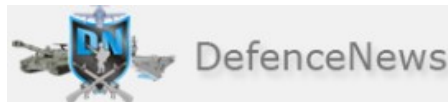
About the scheduled launch of P17 A Frigate, Saxena said P17 A Nilgiri, the first ship of the class frigate, will be launched on December 14. "It's a massive ship and a mega shipbuilding project for us. The ship is 149 metres long and it is 6,670-tonne frigate. This will be the most advanced and modernized frigate of the Indian Navy and 'birth of the ship' will take place on December 14," he said.

Saxena said the company, which has orders of three P 17 A ships, also plans to launch another ship within 15 months, to give an edge to the Indian Navy.

We have so far delivered 105 ships to the Indian Navy and coastguard, he said. This will be 106th ship that company will deliver to our maritime forces, said Saxena.

“We also have one major project of the Navy of eight anti-submarine warfare shallow water craft (ASWSWCs) worth around Rs 6,300 crore that has almost completed design phase. We plan their production from December end itself,” he added.

<https://www.zeebiz.com/companies/news-garden-reach-shipbuilders-to-benefit-from-governments-rs-150-crore-export-grant-says-company-cmd-vk-saxena-143441>



*Fri, 11 Dec 2020*

## **China and Pakistan conduct joint air drills -- with eye on India**

China and Pakistan are conducting joint air force exercises in the southern desert of the Islamic Republic near the border with India in a not-so-subtle message to a country with which both have long had tense relations.

The drills come just a week after Chinese Defense Minister Gen. Wei Fenghe visited Pakistan and signed a memorandum of understanding for deepening military cooperation. The exercises, dubbed Shaheen -- or Falcon -- IX, are underway at the newly operational Bholari air base in the arid region of Sindh in the country's south, less than 200 km from the Indian border.

The Pakistan Air Force released a video showing the wide range of military aircraft on display in the exercise, which will last until late December. China has sent its fourth-generation Shenyang J-11 air superiority fighters and Chengdu J-10 multirole jets. Pakistan, meanwhile, is flying a mix of third-generation Chinese-made Chengdu F-7 interceptors, French Dassault Mirage 5 attack planes and the new multirole JF-17 Thunder -- jointly produced by China and Pakistan. No American equipment, such as the F-16, has been deployed, the Pakistanis said.



China's Defense Ministry said the drills will "deepen practical cooperation between the two air forces."

Pakistan's air force, which comprises a mix of U.S., French and Chinese hardware, has become increasingly reliant on Beijing. Islamabad's economic and political proximity to China and decades of simmering tensions with archrival India have created what it sees as a need for closer tactical cooperation with its larger neighbor and stronger ally.

At the opening ceremony on Wednesday, Air Vice Marshal Ahmed Sulehri, the deputy chief of Pakistan's air staff, said the exercises "will further enhance interoperability of both air forces, thereby fortifying brotherly relations between the two countries." Major Gen. Sun Hong, the assistant chief of staff of the People's Liberation Army Air Force, said they "will improve actual level of combat training and strengthen cooperation."

India has recently featured as a common perceived threat for both the Chinese and Pakistani militaries.

Pakistan and India, both nuclear-armed, have been rivals since independence from Britain more than 70 years ago, fighting wars and engaging in frequent border skirmishes, with tensions especially high in the disputed region of Kashmir.



India and China, meanwhile, have also long been at odds and fought a brief war in 1962. Last summer, the PLA and the Indian Army clashed in a secluded but disputed part of the Himalayas, which saw 20 Indian Army personnel killed in the bloodiest fighting between the world's two most populous countries in more than 40 years. The Chinese side has not disclosed its casualties.

While the Chinese military has been modernizing for years, the recent violence has triggered a series of reactions in New Delhi, including a rethink about India's security arrangements and military exercises.

India recently hosted the massive Malabar 2020 naval exercise with the U.S., Japan and Australia. New Delhi's inclusion of Canberra as a participant helped revitalize the "Quad," or Quadrilateral Security Dialogue -- a loose body consisting of the four countries but now being viewed as a democratic bulwark against China's growing assertiveness in the Asia-Pacific and beyond.

India has also signed a series of security agreements -- ranging from intelligence sharing to logistical support -- with its Quad partners.

Beijing and Islamabad, meanwhile, have been strengthening their relationship which they have glowingly described as an "all-weather friendship" and "iron brotherhood" since the 1950s, with decades of steady economic, military and even nuclear support from China for Pakistan. A hallmark of their closeness is the China Pakistan Economic Corridor, or CPEC, a \$60 billion communications, energy and infrastructure project to connect western China to the Arabian Sea and the Persian Gulf through ports and pipelines. CPEC, considered a flagship project of Chinese President Xi Jinping's Belt and Road initiative, is protected and led by elements of the Pakistani military.

As for the ongoing drills, while they are not the first joint air exercise between the Chinese and the Pakistanis -- the maneuvers are called Xiongying, or Eagle, when held in China -- the timing, location and size are significant.

Across the border, the Indian military has been cautious about a "two-front war" with China and Pakistan for decades. Though India's current chief of defense staff, Gen. Bipin Rawat, has been prolific in warning about such a scenario while insisting that India is ready for such a challenge, think tanks such as the New Delhi-based Observer Research Foundation have expressed caution. "It is clear to many in positions of authority that the Indian military remains fundamentally unprepared for such a challenge," it said in a 2018 report.

Analysts like retired Rear Adm. Sudarshan Shrikhande, India's former chief of naval intelligence, think that the exercise is reflective of China and Pakistan's larger strategic posture toward India.

"The issues of growing coherence and collusion between China and Pakistan have become concerns for India," Shrikhande told Nikkei Asia.

At no stage during the war with China in 1962 and the wars with Pakistan in 1965 or 1971 "could concerns of multifront problems be dismissed by New Delhi," he said. "In recent years, the threat is increasing and the scope of Sino-Pak security cooperation deepening and widening."

The Pakistanis, meanwhile, have their own concerns about the increasing closeness of Washington and New Delhi, which they insist is shifting the balance of power in the region as well as triggering an arms race.

"Considering the recently signed intelligence agreements between the Indians and the Americans, and also the recent clashes between the Chinese and Indian armies in the Himalayas, this is an important time and space for the exercise," a senior Pakistani military officer told Nikkei, requesting anonymity.

The Basic Exchange and Cooperation Agreement on Geospatial Cooperation signed in October between the U.S. and India allows New Delhi access to American satellite intelligence for better weapon accuracy.

Referring to that agreement, the Pakistani officer was clear about how Islamabad felt endangered by India's new capacity.

"The satellite-intelligence-sharing agreement is going to give India clear insight about what we are doing and how we are positioned," the officer said. "The Indians are never going to attack China. They're going to attack Pakistan. With this exercise, we send a clear message to India. We have friends too."

In a similar vein, the Global Times newspaper, a Chinese Communist Party-backed publication, in an analysis published this week declared that "although the timing of the joint air force training this year is later than previous years, the fact that it was held as usual shows the deep friendship between China and Pakistan and the importance the two countries attach to military exchanges," citing a Chinese military expert.

Pakistan's military, which prides itself as a British-patterned force with colonial-era roots and Western traditions, finds itself in a difficult balancing act between the U.S. and China, given current trade and political tensions between Washington and Beijing.

Even as it continues to draw closer to China, Pakistan's military still wants to maintain cordial ties with the U.S., with which it has often partnered since joining the U.S.-led alliance against the Soviet Union during the Cold War, an arrangement which helped it both gain Washington's favor and provide benefits in return for decades.

"When we granted the Americans an air force base to spy on the Soviets in the 1950s, we received American hardware to fight the Indians in the 1960s," the Pakistani officer said. "When Pakistani intelligence supported the Afghan mujahedeen in the 1980s, and defeated the Soviets in Afghanistan without one American boot on the ground, we got F-16s in return. The same happened again, when the Americans invaded Afghanistan.

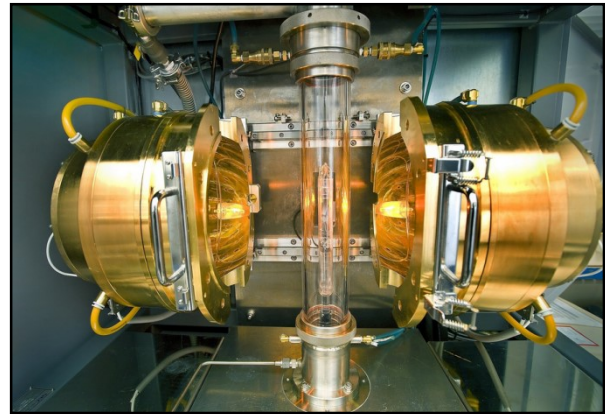
"Yes, we've been transactional allies, but dependable allies. Now, the Americans have found a new friend in the Indians. But they should know better," the officer said.

<https://www.defencenews.in/article/China-and-Pakistan-conduct-joint-air-drills---with-eye-on-India-1033033>

## Revolutionary superconducting magnet plate design and analysis

In the production of integrated circuits (computer chips), continuous innovation is essential to remain competitive. A major goal is to increase the productivity of photolithography machines, which is partly determined by their electromagnetic motors. Ph.D.-candidate Bart Koolmees, from the TU/e department of Mechanical Engineering, focused on developing a superconducting alternative for these motors. His work showed that such a design could increase the power of the motor by more than 500%, and he also devised solutions to some of the main technical challenges: thermal insulation and the integrity of the superconducting coils. He will defend his thesis on 9 December.

In a photolithography machine, an image on a mask is projected multiple times onto a wafer with a photosensitive layer. The image is not projected at once, but is scanned with a small slit of light, like in a photocopier. Accurate electromagnetic motors are used to move both the mask and the wafer synchronously during scanning and reversal. Increasing the acceleration of the motors to increase productivity is often attempted by making optimizations to the current motor design. Using superconductors, as Koolmees proposes, changes the design significantly and allows for a large step forward.



Credit: CC0 Public Domain

"High" temperature superconducting (HTS) materials have zero electrical resistance at temperatures below 90 K (-183 degrees Celsius); the maximal current they can conduct increases with decreasing temperature. Current densities of 100.000 A/mm<sup>2</sup> to 600.000 A/mm<sup>2</sup> are feasible in the temperature range of 4 K to 20 K (-269 degrees Celsius to -253 degrees Celsius) compared to 35 A/mm<sup>2</sup> in state-of-the-art copper motor coils at room-temperature. For a first demonstrator design, Koolmees proposed to replace one motor half with the superconducting alternative to increase magnetic field strength within the motor.

### Five-fold improvement

Because efficiencies for cooling to 4 K (-269 degrees Celsius) lie in the range of 0.04% to 0.14%, Koolmees designed a highly efficient thermal insulation to minimize the cooling effort. This insulation would pass between the two motor halves; to maintain motor efficiency, it should have minimal thickness. Koolmees developed two insulation designs with a thickness of 5 mm, which both maintain the temperature difference of almost 300 degrees while requiring a cooling capacity of less than 1 W for an area of 1.5 m by 2.5 m. He also analyzed the supports and fixation for the superconducting coil for heat loss to a temperature of 4K, showing a thermal conduction below 0.5 W. These heat loads are sufficiently low that commercially available, closed-cycle, coolers would suffice to remove them.

The superconducting coils designed for the motor application experience high mechanical loads, and it is important to understand if mechanical failure can be prevented. Koolmees performed an

in-depth analysis to compute mechanical loads for the main load cases. This showed that failure of the superconducting coils can be prevented with the right manufacturing methods.

Koolmees' research showed that a superconducting magnet plate can provide a more than 5-fold improvement in magnetic field strength compared to current state-of-the-art electromagnetic motors. Additionally, his solutions to the main technical challenges make the feasibility of such a magnet plate very likely.

**More information:** A Superconducting Magnet Plate – for a planar motor application. [research.tue.nl/en/publication ... ar-motor-application](https://research.tue.nl/en/publication/...ar-motor-application)

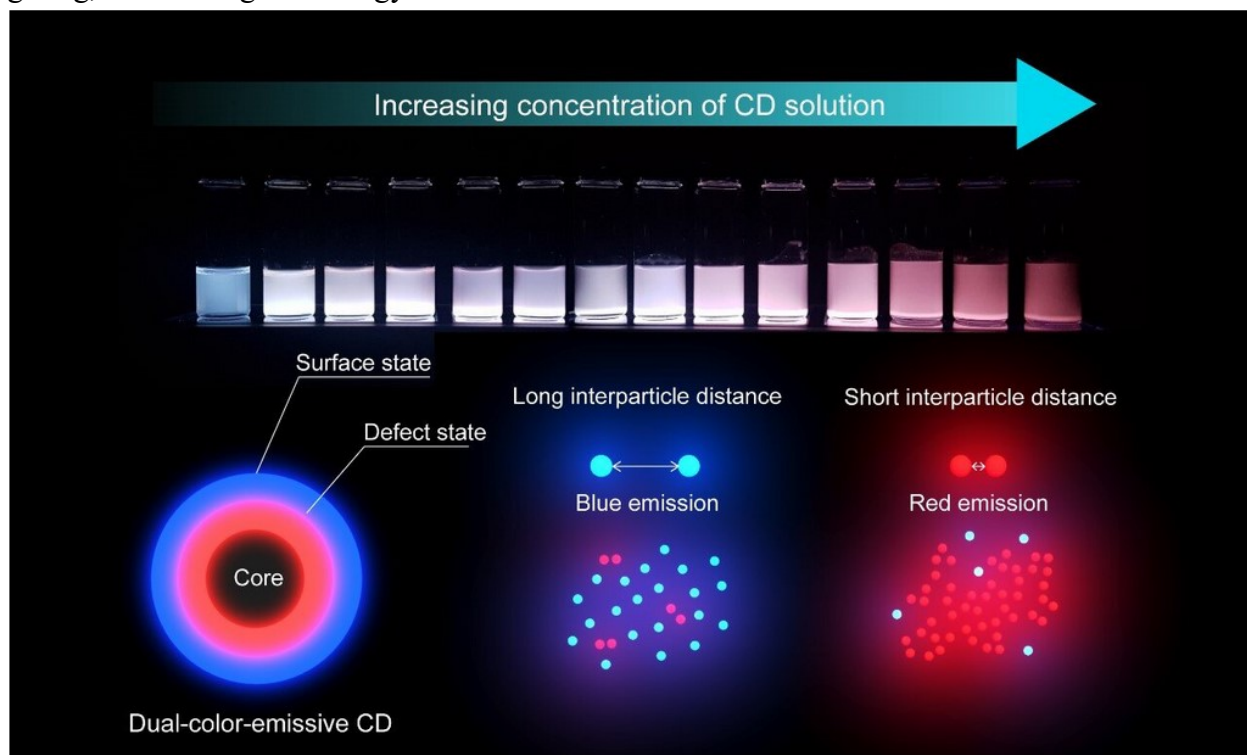
Provided by [Eindhoven University of Technology](https://www.eindhovenuniversity.nl)  
<https://phys.org/news/2020-12-revolutionary-superconducting-magnet-plate-analysis.html>



*Fri, 11 Dec 2020*

## Researchers control multiple wavelengths of light from a single source

KAIST researchers have synthesized a collection of nanoparticles, known as carbon dots, capable of emitting multiple wavelengths of light from a single particle. Additionally, the team discovered that the dispersion of the carbon dots, or the interparticle distance between each dot, influences the properties of the light the carbon dots emit. The discovery will allow researchers to understand how to control these carbon dots and create new, environmentally responsible displays, lighting, and sensing technology.



**Figure: Photoluminescence change of dual-color-emissive carbon dots (CDs) depending on their concentration. Blue- and red-emissions show different contributions with different interparticle distances. Credit: The Korea Advanced Institute of Science and Technology (KAIST)**

Research into nanoparticles capable of emitting light, such as quantum dots, has been an active area of interest for the last decade and a half. These particles, or phosphors, are nanoparticles made out of various materials that are capable of emitting light at specific wavelengths by leveraging

quantum mechanical properties of the materials. This provides new ways to develop lighting and display solutions as well as more precise detection and sensing in instruments.

As technology becomes smaller and more sophisticated, the usage of fluorescent nanoparticles has seen a dramatic increase in many applications due to the purity of the colors emitting from the dots as well as their tunability to meet desired optical properties.

Carbon dots, a type of fluorescent nanoparticles, have seen an increase in interest from researchers as a candidate to replace non-carbon dots, the construction of which requires heavy metals that are toxic to the environment. Since they are made up of mostly carbon, the low toxicity is an extremely attractive quality when coupled with the tunability of their inherent optical properties.

Another striking feature of carbon dots is their capability to emit multiple wavelengths of light from a single nanoparticle. This multi-wavelength emission can be stimulated under a single excitation source, enabling the simple and robust generation of white light from a single particle by emitting multiple wavelengths simultaneously.

Carbon dots also exhibit a concentration-dependent photoluminescence. In other words, the distance between individual carbon dots affects the light that the carbon dots subsequently emit under an excitation source. These combined properties make carbon dots a unique source that will result in extremely accurate detection and sensing.

This concentration-dependency, however, had not been fully understood. In order to fully utilize the capabilities of carbon dots, the mechanisms that govern the seemingly variable optical properties must first be uncovered. It was previously theorized that the concentration-dependency of carbon dots was due to a hydrogen bonding effect.

Now, a KAIST research team, led by Professor Do Hyun Kim of the Department of Chemical and Biomolecular Engineering has posited and demonstrated that the dual-color-emissiveness is instead due to the interparticle distances between each carbon dot. The research was published in the 36th Issue of *Physical Chemistry Chemical Physics*.

First author of the paper, Ph.D. candidate Hyo Jeong Yoo, along with Professor Kim and researcher Byeong Eun Kwak, examined how the relative light intensity of the red and blue colors changed when varying the interparticle distances, or concentration, of the carbon dots. They found that as the concentration was adjusted, the light emitted from the carbon dots would transform. By varying the concentration, the team was able to control the relative intensity of the colors, as well as emit them simultaneously to generate a white light from a single source (See Figure).

"The concentration-dependence of the photoluminescence of carbon dots on the change of the emissive origins for different interparticle distances has been overlooked in previous research. With the analysis of the dual-color-emission phenomenon of carbon dots, we believe that this result may provide a new perspective to investigate their photoluminescence mechanism," Yoo explained.

The newly analyzed ability to control the photoluminescence of carbon dots will likely be heavily utilized in the continued development of solid-state lighting applications and sensing.

**More information:** Hyo Jeong Yoo et al. Interparticle distance as a key factor for controlling the dual-emission properties of carbon dots, *Physical Chemistry Chemical Physics* (2020). DOI: [10.1039/d0cp02120b](https://doi.org/10.1039/d0cp02120b)

**Journal information:** [Physical Chemistry Chemical Physics](https://phys.org/news/2020-12-multiple-wavelengths-source.html)  
<https://phys.org/news/2020-12-multiple-wavelengths-source.html>

## Researchers publish significant step toward quantum advantage

The team, led by Bristol researcher and Phasecraft co-founder, Dr. Ashley Montanaro, has discovered algorithms and analysis which significantly lessen the quantum hardware capability needed to solve problems which go beyond the realm of classical computing, even supercomputers.

In the paper, published in *Physical Review B*, the team demonstrates how optimised quantum algorithms can solve the notorious Fermi-Hubbard model on near-term hardware.

The Fermi-Hubbard model is of fundamental importance in condensed-matter physics as a model for strongly correlated materials and a route to understanding high-temperature superconductivity.

Finding the ground state of the Fermi-Hubbard model has been predicted to be one of the first applications of near-term quantum computers, and one that offers a pathway to understanding and developing novel materials.

Dr. Ashley Montanaro, research lead and cofounder of Phasecraft: "Quantum computing has critically important applications in materials science and other domains.

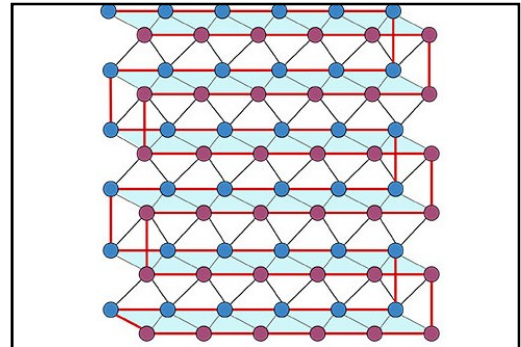
Despite the major quantum hardware advances recently, we may still be several years from having the right software and hardware to solve meaningful problems with quantum computing. Our research focuses on algorithms and software optimisations to maximise the quantum hardware's capacity, and bring quantum computing closer to reality.

"Near-term quantum hardware will have limited device and computation size. Phasecraft applied new theoretical ideas and numerical experiments to put together a very comprehensive study on different strategies for solving the Fermi-Hubbard model, zeroing in on strategies that are most likely to have the best results and impact in the near future.

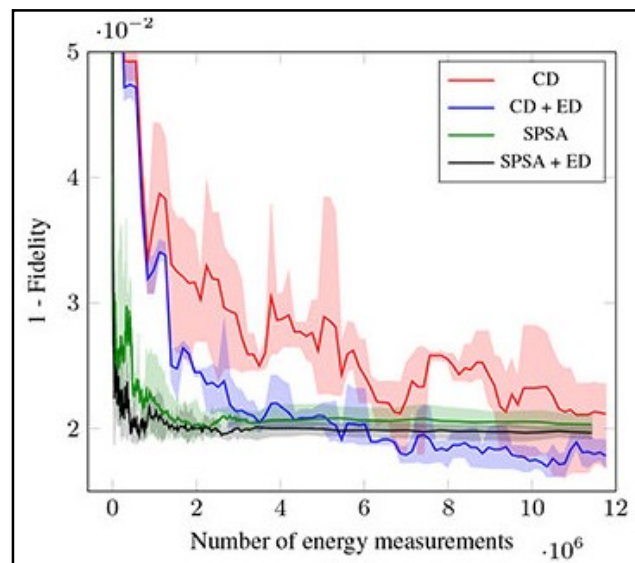
"The results suggest that optimising over quantum circuits with a gate depth substantially less than a thousand could be sufficient to solve instances of the Fermi-Hubbard model beyond the capacity of a supercomputer. This new research shows significant promise for the capabilities of near-term quantum devices, improving on previous research findings by around a factor of 10."

*Physical Review B*, published by the American Physical Society, is the top specialist journal in condensed-matter physics. The peer-reviewed research paper was also chosen as the Editors' Suggestion and to appear in *Physics* magazine.

Andrew Childs, Professor in the Department of Computer Science and Institute for Advanced Computer Studies at the University of Maryland: "The Fermi-Hubbard model is a major challenge in condensed-matter physics, and the Phasecraft



Layout of qubits in Google's Sycamore architecture. Credit: A. Montanaro



Performance of variational algorithms in a noisy simulation. Credit: A. Montanaro

team has made impressive steps in showing how quantum computers could solve it. Their work suggests that surprisingly low-depth circuits could provide useful information about this model, making it more accessible to realistic quantum hardware."

Hartmut Neven, Head of Quantum Artificial Intelligence Lab, Google: "Sooner or later, quantum computing is coming. Developing the algorithms and technology to power the first commercial applications of early quantum computing hardware is the toughest challenge facing the field, which few are willing to take on. We are proud to be partners with Phasecraft, a team that are developing advances in quantum software that could shorten that timeframe by years."

Phasecraft Founder Dr. Toby Cubitt: "At Phasecraft, our team of leading quantum theorists have been researching and applying quantum theory for decades, leading some of the top global academic teams and research in the field. Today, Ashley and his team have demonstrated ways to get closer to achieving new possibilities that exist just beyond today's technological bounds."

Phasecraft has closed a record seed round for a quantum company in the UK with £3.7m in funding from private-sector VC investors, led by LocalGlobe with Episode1 along with previous investors. Former Songkick founder Ian Hogarth has also joined as board chair for Phasecraft. Phasecraft previously raised a £750,000 pre-seed round led by UCL Technology Fund with Parkwalk Advisors and London Co-investment Fund and has earned several grants facilitated by InnovateUK. Between equity funding and research grants, Phasecraft has raised more than £5.5m.

Dr. Toby Cubitt: "With new funding and support, we are able to continue our pioneering research and industry collaborations to develop the quantum computing industry and find useful applications faster."

**More information:** 'Strategies for solving the Fermi-Hubbard model on near-term quantum computers,' by Cade, C., Mineh, L., Montanaro, A. and Stanisic, S. in *Physical Review B*.

**Journal information:** [Physical Review B](#)

<https://phys.org/news/2020-12-publish-significant-quantum-advantage.html>



Fri, 11 Dec 2020

## Energy-efficient magnetic RAM: A new building block for spintronic technologies

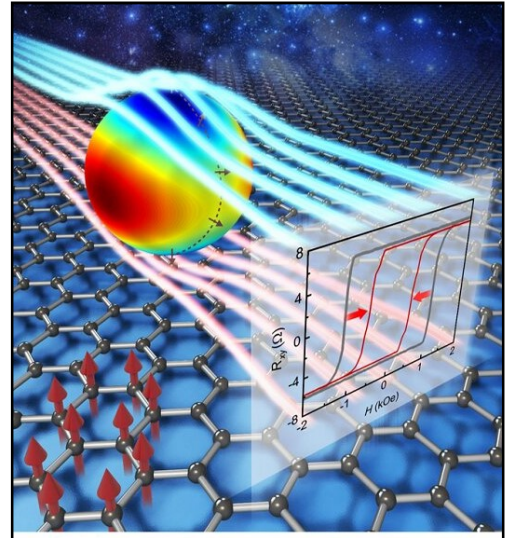
Researchers at Pohang University of Science and Technology (POSTECH) and Seoul National University in South Korea have demonstrated a new way to enhance the energy efficiency of a non-volatile magnetic memory device called SOT-MRAM. Published in *Advanced Materials*, this finding opens up a new window of exciting opportunities for future energy-efficient magnetic memories based on spintronics.

In modern computers, the random access memory (RAM) is used to store information. The SOT-MRAM (spin-orbit torque magnetic RAM) is one of the leading candidates for the next-generation memory technologies that aim to surpass the performance of various existing RAMs. The SOT-MRAM may operate faster than the fastest existing RAM (SRAM) and maintain information even after the electric energy supply is powered off whereas all fast RAMs existing today lose information as soon as the energy supply is powered off. The present level of the SOT-MRAM technology falls short of being satisfactory, however, due to its high energy demand; it requires large energy supply (or large current) to write information. Lowering the energy demand and enhancing the energy efficiency is an outstanding problem for the SOT-MRAM.

In the SOT-MRAM, magnetization directions of tiny magnets store information and writing amounts to change the magnetization directions to desired directions. The magnetization direction change is achieved by a special physics phenomenon called SOT that modifies the magnetization

direction when a current is applied. To enhance the energy efficiency, soft magnets are ideal material choice for the tiny magnets since their magnetization directions can be easily altered by a small current. Soft magnets are bad choice for the safe storage of information since their magnetization direction may be altered even when not intended—due to thermal noise or other noise. For this reason, most attempts to build the SOT-MRAM adopt hard magnets, because they magnetize very strongly and their magnetization direction is not easily altered by noise. But this material choice inevitably makes the energy efficiency of the SOT-MRAM poor.

A joint research team led by Professor Hyun-Woo Lee in the Department of Physics at POSTECH and Professor Je-Geun Park in the Department of Physics at Seoul National University (former associate director of the Center for Correlated Electron Systems within the Institute for Basic Science in Korea), demonstrated a way to enhance the energy efficiency without sacrificing the demand for safe storage. They reported that ultrathin iron germanium telluride ( $\text{Fe}_3\text{GeTe}_2$ , FGT)—a ferromagnetic material with special geometrical symmetry and quantum properties—switches from a hard magnet to a soft magnet when a small current is applied. Thus when information writing is not intended, the material remains a hard magnet, which is good for the safe storage, and only when writing is intended, the material switches to a soft magnet, allowing for enhanced energy efficiency.



Credit: Pohang University of Science & Technology (POSTECH)

"Intriguing properties of layered materials never cease to amaze me: the current through FGT induces a highly unusual type of spin-orbit torque (SOT), which modifies the energy profile of this material to switch it from a hard magnet to a soft magnet. This is in clear contrast to SOT produced by other materials, which may change the magnetization direction but cannot switch a hard magnet to a soft magnet," explains Professor Lee.

Experiments by Professor Park's group revealed that this FGT-based magnetic memory device is highly energy-efficient. In particular, the measured magnitude of SOT per applied current density is two orders of magnitude larger than the values reported previously for other candidate materials for the SOT-MRAM.

"Controlling magnetic states with a small current is essential for the next-generation of energy-efficient devices. These will be able to store greater amounts of data and enable faster data access than today's electronic memories, while consuming less energy," notes Dr. Kaixuan Zhang who is a team leader in Professor Park's group, interested in studying the application of correlated quantum physics in spintronic devices.

"Our findings open up a fascinating avenue of electrical modulation and spintronic applications using 2-D layered magnetic materials," closed Professor Lee.

**More information:** Kaixuan Zhang et al, Gigantic Current Control of Coercive Field and Magnetic Memory Based on Nanometer-Thin Ferromagnetic van der Waals  $\text{Fe}_3\text{GeTe}_2$ , *Advanced Materials* (2020). DOI: [10.1002/adma.202004110](https://doi.org/10.1002/adma.202004110)

**Journal information:** [Advanced Materials](https://doi.org/10.1002/adma.202004110)

<https://phys.org/news/2020-12-energy-efficient-magnetic-ram-block-spintronic.html>



## 8 Covid-19 vaccine candidates scheduled to be manufactured in India: Vardhan

- *The health minister was digitally addressing the Inter-Ministerial meeting on Vaccination of South Asia against covid-19 by the World Bank on Thursday*
- *Pune-based SII is in a process to manufacture Covishield which undergoing phase 3 stage of the clinical trials*

Day after a government panel of experts tasked with vetting coronavirus vaccines asked two pharma majors for more data on the safety and efficacy of their shots and deferred recommending them for emergency use, Union Health Minister Harsh Vardhan ensured "no compromise" on scientific and regulatory norms, stretching from safety of the trials to efficacy of the vaccines.

The health minister was digitally addressing the Inter-Ministerial meeting on Vaccination of South Asia against covid-19 by the World Bank on Thursday.

"It is expected that the vaccine will be available in the coming few weeks and the vaccination process will kickstart in India as soon as it is approved by the concerned regulatory agency. With stringent oversight, we are ensuring, that there is no compromise on scientific and regulatory norms, stretching from safety of the trials to efficacy of the vaccines," said Harsh Vardhan.



File Photo: Dr. Harsh Vardhan (ANI Photo)

"260 vaccine candidates are in different stages of development globally. Out of these, 8 are scheduled to be manufactured in India, including 3 indigenous ones. We have enthusiastically leveraged the support of international partners like Oxford University, UK, and Thomas Jefferson University, USA, for vaccine research with Indian entities, both public and private," said the health minister.

The subject expert committee of the Central Drugs Standards Control Organisation on Wednesday asked Bharat Biotech International Ltd and Serum Institute of India for more data on the safety and efficacy of their vaccines.

Pune-based Serum Institute of India (SII) is in a process to manufacture Covishield which is developed by Oxford University and pharma giant AstraZeneca which is undergoing phase stage of the clinical trials.

Another coronavirus vaccine—Covaxin-- is being developed by Bharat Biotech in association with the country's apex biomedical research body Indian Council of Medical Research (ICMR). India-made Covaxin began its phase-three human clinical trial at All India Institute of Medical Sciences (AIIMS) New Delhi.

The number of covid-19 cases continues to rise in the country. The total number of covid-19 cases ballooned to 97,68,643 and the toll climbed to 1,42,920 on Thursday. The new confirmed cases in the last 24 hours have however fallen below 27,000 (26,567) for the first time after nearly 5 months. The new cases were 26,506 last on 10th July, 2020.

The active cases have declined to 3.83 lakh. The total positive cases of the country are 3,83,866 and comprise (3.96%) of the total cases.

Ten States/UTs have contributed 72.50% of the new cases. Kerala has reported 3,272 cases in the last 24 hours. Maharashtra recorded 3,075 new cases while West Bengal has registered 2,214 new cases yesterday, the union health ministry.

75.58% of the 385 case fatalities that reported in the past 24 hours are from Ten States/UTs.

16.36% of new fatalities reported are from Delhi which reported 63 deaths. West Bengal also saw a fatality count of 48 while Maharashtra reported 40 new deaths, the union health ministry said.

Meanwhile, 39,045 new recoveries were registered during the last 24 hours. It has led to a net decline of 12,863 cases from the total Active Caseload in the last 24 hours.

New Recoveries outnumbering the daily New Cases has also improved the Recovery Rate to 94.59% today. The total recovered cases stand at 91,78,946 today.

At least 76.31% of the new recovered cases are contributed by ten States/UTs. With 7,345 persons recovering from covid-19, Maharashtra has recorded the maximum number of recoveries. Kerala has registered another 4,705 daily recoveries while Delhi has reported 3,818 new recoveries in the past 24 hours, the health ministry said.

“Effective planning and strategic management has enabled India to keep its cases per million at 7,078 against the global average of 8,883. The fatality rate is 1.45%, well below the global average of 2.29%,” said Harsh Vardhan.

<https://www.livemint.com/news/india/8-covid-19-vaccine-candidates-scheduled-to-be-manufactured-in-india-varadhan-11607613026942.html>

