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Newspapers Clippings

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DRDO Technology News

REPUBLICWORLD.COM

Wed, 07 April 2021

DRDO enables Indian private sector to develop and manufacture air missile systems

The Defense Research and Development Organisation (DRDO) has enabled private sector firms to both develop and manufacture air missile system

By Srishti Goel

The Defense Research and Development Organisation (DRDO) has enabled private sector firms to both develop and manufacture missile systems such as the vertical launched surface to air missile systems programme in order to support the domestic defence industry. The Vertically-launched Short-range Surface to Air Missile system (VL-SRSAM) project has gotten a lot of interest from the private sector, DRDO officials informed.

DRDO to open up for missile production partnership with Indian private sector

"Under the Development cum Production Partner (DCPP) programme, we have allowed the private sector to co-develop missile systems with us and then also produce them," ANI quoted senior DRDO officials as saying. They said, "Private sector firms have responded very enthusiastically for participation and bids have been received for the Vertically-launched Short-range Surface to Air Missile system (VL-SRSAM) project."

(Picture Credit: PTI)

The initiative is part of the Narendra Modi government's Make in India programme, which aims to train the private sector to build complex military systems. The all-weather air defence missile system is being designed to provide point and area defence against aerial threats such as jets, fighter planes, and unmanned aerial vehicles.

The effort is part of the Modi government's initiative Make in India

With a high kill probability, the canister-based state-of-the-art weapon system will be able to locate, monitor, engage, and destroy the target. It has a strike range of approximately 40 kilometres. The DRDO has also assisted private sector companies such as Tata and Baba Kalyani Industries in developing the ATAGS howitzer, which is expected to be the Indian Army's main artillery gun for the next few decades.

As per the official website of DRDO, the Defence Research and Development Organisation (DRDO) was founded in 1958 when the Indian Army's Technical Development Establishments (TDEs) and the Directorate of Technical Development and Production (DTDP) merged with the Defence Science Organisation (DSO). DRDO was a small organisation at the time, with just ten institutions or laboratories. It has grown in a variety of ways over the years, including the number of subject disciplines, laboratories, accomplishments, and stature.

https://www.republicworld.com/india-news/general-news/drdo-enables-indian-private-sector-to-develop-and-manufacture-air-missile-systems.html

Wed, 07 April 2021

DRDO allows private sector to develop missile systems

The private sector will now be allowed to develop systems such as vertical launched surface to air missile systems programme

By Sangeeta Nair

The Defence Research and Development Organisation (DRDO) has decided to allow private sector firms to develop and produce missile systems in an attempt to promote the domestic defence industry.

With this, the private sector will now be able to develop complex systems such as vertical launched surface to air missile systems programme.

DRDO also informed that the private has been allowed to co-develop missile systems with them and then also produce them under the Development cum Production Partner (DCPP) programme.

Key Highlights

- The first missile programmes opened for the private sector under the DCPP programme includes the Vertical Launched Short Range Surface to Air Missile system (VL-SRSAM).
- The private sector has reportedly responded very enthusiastically to this development and bids have already been received to develop the VL-SRSAM project.
- The DCPP programme aims to help the private sector industry and enable them to produce world-class defence hardware systems.
- The Vertical Launched Short Range Surface to Air Missile system, which has been designed and developed by DRDO for the Indian Navy, is capable of neutralising various aerial threats at close ranges including sea-skimming targets.
- The VL-SRSAM with weapon control system was deployed during the trials.

Significance

The effort to involve the private sector in missile production is a part of the efforts taken by the government to prepare the private sector industry to be able to develop complex military systems under its Make in India initiative.

Other Details

- DRDO is developing an all-weather air defence missile system that will provide defence against various aerial targets such as fighter jets and unmanned aerial vehicles.
- The state-of-the-art weapons system will be able to track, identify and engage and destroy the target with a high kill probability with a strike range of about 40 km.
- Besides this, the DRDO has also helped private companies including Tata and Baba Kalyani industries in developing the ATAGS howitzer gun.
- The ATAGS howitzer gun is likely to be used as the main artillery gun by the Indian Army for the next many decades to come.

https://www.jagranjosh.com/current-affairs/drdo-opens-up-missile-production-partnership-for-indian-private-sector-1617708386-1

Wed, 07 April 2021

मिसाइल प्रोडक्शन पार्टनरशिप के लिए भारतीय प्राइवेट सेक्टर के लिए DRDO ने खोले द्वार

डीआरडीओ) DRDO) ने एक बड़ा फैसला लेते हुए मिसाइल प्रोडक्शन पार्टनरशिप के लिए भारतीय प्राइवेट सेक्टर के द्वार खोल दिए हैं। इसके बाद प्राइवेट सेक्टर की कंपनियों ने हिस्सा लेने के लिए काफी उत्साह दिखाया है। इसकी जानकारी खुद डीआरडीओ अधिकारियों ने दी।

By Pooja Singh

नई दिल्ली: डीआरडीओ (DRDO) ने एक बड़ा फैसला लेते हुए मिसाइल प्रोडक्शन पार्टनरशिप के लिए भारतीय प्राइवेट सेक्टर के द्वार खोल दिए हैं। इसके बाद प्राइवेट सेक्टर की कंपनियों ने हिस्सा लेने के लिए काफी उत्साह दिखाया है। इसकी जानकारी खुद डीआरडीओ अधिकारियों ने दी। दरअसल, घरेलू रक्षा उद्योग को बढ़ावा देने के मकसद से रक्षा अनुसंधान और विकास संगठन ने निजी क्षेत्र की फर्मों को मिसाइल सिस्टम को विकसित करने और उत्पादन करने की इजाजत प्रदान की है।

इनमें इनमें वर्टिकल लॉन्च सरफेस टू सरफेस एयर मिसाइल सिस्टम प्रोग्राम शामिल है। डीआरडीओ के वरिष्ठ अधिकारियों ने बताया कि डेवलपमेंट कम प्रोडक्शन पार्टनर (DCPP) प्रोग्राम के अंतर्गतृ निजी क्षेत्र को अपने साथ मिसाइल सिस्टम विकसित करने और फिर उनका उत्पादन करने की अनुमति प्रदान की गई है।

रिपोर्ट के अनुसार, डीआरडीओ के अधिकारियों का कहना है कि प्राइवेट सेक्टर की कंपनियों ने हिस्सा लेने के लिए काफी उत्साह दिखाया है और वर्टिकल लॉन्च सरफेस टू सरफेस एयर मिसाइल सिस्टम प्रोग्राम (VL-SRSAM) प्रोजेक्ट के लिए आगे आए हैं। यह प्रयास नरेंद्र मोदी सरकार की 'मेक इन इंडिया प्रोजेक्ट' के तहत कॉम्प्लेक्स मिलिट्री सिस्टम विकसित करने में सक्षम होने के लिए प्राइवेट सेक्टर की इंडस्ट्री को तैयार करने की पहल का एक हिस्सा है।

सभी मौसम की एयर डिफेंस मिसाइल सिस्टम को तमाम हवाई लक्ष्यों जैसे जेट, लड़ाकू विमान, मानव रहित हवाई वाहनों को टारगेट करने के लिए विकसित किया जा रहा है। कैनिस्टर बेस्ड स्टेट ऑफ वेपन सिस्टम टारगेट को पहचानने, ट्रैक करने, इंगेज करने और नष्ट करने में कारगर होगा, जिसकी लगभग 40 किमी की स्ट्राइक रेंज है। डीआरडीओ ने टाटा और बाबा कल्याणी इंडस्ट्री सहित प्राइवेट सेक्टर की इंडस्ट्रीज को ATAGS होवित्जर विकसित करने में मदद की है, जोकि अगले कई दशकों में भारतीय सेना के लिए मुख्य आटलरी गन रहने वाली हैं।

https://www.jagran.com/news/national-drdo-opens-up-missile-production-partnership-for-indian-private-sector-21532897.html

Wed, 07 April 2021

DRDO का बड़ा फैसला, मिसाइल प्रोडक्शन पार्टनरशिप के लिए भारतीय प्राइवेट सेक्टर के लिए खोले द्वार

डीआरडीओ (DRDO) के अधिकारियों का कहना है कि प्राइवेट सेक्टर की कंपनियों ने हिस्सा लेने के लिए काफी उत्साह दिखाया है

Edited By: **रामदीप मिश्रा**

घरेलू रक्षा उद्योग को बढ़ावा देने के लिए रक्षा अनुसंधान और विकास संगठन (DRDO) ने निजी क्षेत्र की फर्मों को मिसाइल सिस्टम को विकसित करने और उत्पादन करने की अनुमति दी है। इनमें इनमें वर्टिकल लॉन्च सरफेस टू सरफेस एयर मिसाइल सिस्टम प्रोग्राम शामिल है। डीआरडीओ के वरिष्ठ अधिकारियों ने का कहना है कि डेवलपमेंट कम प्रोडक्शन पार्टनर (DCPP) प्रोग्राम के तहत, हमने निजी क्षेत्र को अपने साथ मिसाइल सिस्टम विकसित करने और फिर उनका उत्पादन करने की अनुमति दी है।

समचार एजेंसी एएनआई की रिपोर्ट के अनुसार, डीआरडीओ के अधिकारियों का कहना है कि प्राइवेट सेक्टर की कंपनियों ने हिस्सा लेने के लिए काफी उत्साह दिखाया है और वर्टिकल लॉन्च सरफेस टू सरफेस एयर मिसाइल सिस्टम प्रोग्राम (VL-SRSAM) प्रोजेक्ट के लिए आगे आए हैं। यह प्रयास नरेंद्र मोदी सरकार की मेक इन इंडिया प्रोजेक्ट के तहत कॉम्प्लेक्स मिलिट्री सिस्टम विकसित करने में सक्षम होने के लिए प्राइवेट सेक्टर की इंडस्ट्री को तैयार करने की पहल का हिस्सा है।

सभी मौसम की एयर डिफेंस मिसाइल सिस्टम को तमाम हवाई लक्ष्यों जैसे जेट, लड़ाकू विमान, मानव रहित हवाई वाहनों को टारगेट करने के लिए विकसित किया जा रहा है। कैनिस्टर बेस्ड स्टेट ऑफ वेपन सिस्टम टारगेट को पहचानने, ट्रैक करने, इंगेज करने और नष्ट करने में कारगर होगा, जिसकी लगभग 40 किमी की स्ट्राइक रेंज है। DRDO ने टाटा और बाबा कल्याणी इंडस्ट्री सहित प्राइवेट सेक्टर की इंडस्ट्रीज को ATAGS होवित्जर विकसित करने में मदद की है, जोकि अगले कई दशकों में भारतीय सेना के लिए मुख्य आटलरी गन रहने वाली हैं।

DRDO ने कम वजन की बुलेटप्रूफ जैकेट की विकसित

इससे पहले डीआरडीओ ने बताया था कि कानपुर स्थित उसकी प्रयोगशाला रक्षा सामग्री एवं भंडार अनुसंधान एवं विकास प्रतिष्ठान (डीएमएसआरडीई) ने कम वजन की बुलेटप्रूट जैकेट विकसित की है जिसका भार केवल नौ किलोग्राम है। यह जैकेट भारतीय सेना की गुणवतता संबंधी जरूरतें पूरी करने में मदद करेगी। फ्रंट हार्ड आर्मर पैनल' (एफएचएपी) जैकेट का चंडीगढ़ स्थित टर्मिनल बैलिस्टिक अनुसंधान प्रयोगशाला में (टीबीआरएल) में परीक्षण किया गया और भारतीय मानक ब्यूरो संबंधी मानक प्राप्त कर लिए गए। इस महत्वपूर्ण विकास की अहमियत इस तथ्य में है कि जैकेट के वजन में प्रत्येक ग्राम की कमी सैनिकों की सुरक्षा सुनिश्चित करते हुए उन्हें वजन से राहत प्रदान करती है। प्रौद्योगिकी के जरिए मध्यम आकार की बुलेटप्रूफ जैकेट का वजन 10.4 किलोग्राम से नौ किलोग्राम कर दिया गया है।

https://www.tv9hindi.com/india/drdo-opens-up-missile-production-partnership-for-indian-private-sector-606242.html

Wed, 07 April 2021

Explained: Chaff Technology developed by DRDO to safeguard Indian Naval Ships from missiles

DRDO has developed an advanced technology that could be used to safeguard the Indian Naval Ships from missile attacks. This is called a chaff technology which has been indigenously developed

By Tulika Tandon

Why in News?

Defence Research and Development Organization (DRDO) has developed Advanced Chaff Technology that would help safeguard Indian Navy ships from enemy missile attacks. Take a look at the tweet below:

DRDO has developed an Advanced Chaff Technology to safeguard the naval ships against enemy missile attack. The three variants namely Short Range Chaff Rocket, Medium Range Chaff Rocket, and Long Range Chaff Rocket met Indian Navy's qualitative requirements. #AtmaNirbharBharat pic.twitter.com/T1RVu3elaK

— DRDO (@DRDO_India) April 5, 2021

Chaff Technology DRDO

About the discovery:

1. The DRDO Unit at Defence Laboratory Jodhpur has developed three variants of the technology. These are called
   a. Long Range Chaff Rocket
   b. Medium Range Chaff Rocket
   c. Short Range Chaff Rocket
2. The trials were conducted at the Arabian Sea recently
3. Chaff is a passive expendable electronic counter measure used for protection of the naval ships from enemy's radar and missile seekers based on radio frequency.
4. This is an indigenous technology that is unavailable anywhere else.
5. As informed by DRDO Scientists, "The new development assumes significance as a very small quantity of chaff material deployed in the air acts as a decoy to deflect enemy missiles for the safety of our ships. DRDO has also gained the expertise to meet futuristic threats from adversaries. The technology is unique and not available elsewhere. It will be handed over to industries for production of chaff rockets in large quantities."

Significance

1. The importance of the discovery is that a very small amount of the chaff material deployed in the air would act as a decoy to deflect the enemy's missiles from the ships. It would thus provide safety to the ship.
2. At the same time now DRDO has been able to meet futuristic threats from their adversaries.

Difference between a chaff and flair:

Both chaff and flares are defensive countermeasures deployed by military aircraft. The purpose is to confuse radar-guided or infrared-guided anti aircraft missiles fired so that they could be diverted.

Chaff is composed of many small aluminium or zinc coated fibres stored on-board the aircraft in tubes. In case the aircraft feels threatened by any radar tracking missiles, chaff is ejected into the turbulent wake of air behind the plane.

Flares however are useful in distracting the heat seeking missiles. Mostly magnesium pellets are ejected from the tubes to ignite while being followed by an aircraft behind. The flares burn at more than 2000 Fahrenheit and emit high amounts of infrared light.

Dr G Satheesh Reddy, Secretary, Department of Defence R&D and Chairman, DRDO also praised the efforts of the teams involved in the indigenous development of this vital technology to safeguard Indian Naval Ships.

https://www.jagranjosh.com/general-knowledge/explained-chaff-technology-to-safeguard-indian-naval-ships-from-missiles-developed-by-drdo-1617693802-1

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Tue, 06 April 2021 3:06PM

General Manoj Mukund Naravane, Chief of the Army Staff, visits Defence Services Staff College, Wellington

General Manoj Mukund Naravane, Chief of the Army Staff (COAS), visited DSSC, Wellington (TN) from 05 to 06 April 2021. The COAS delivered a lecture on "Developments along the Western and Northern Borders and their Impact on the Future Road Map of the Indian Army" to the faculty & officers attending 76th Staff Course at the Defence Services Staff College (DSSC), Wellington. He emphasised that the Nation is facing renewed challenges along its borders and exhorted the students on the need to remain abreast of all developments.

Lt Gen MJS Kahlon, Commandant DSSC, gave an update to the COAS on the ongoing training activities and incorporation of new initiatives with specific reference to Professional Military Training on Jointmanship amongst the three Services. The COAS was briefed on the changes being undertaken in training curriculum and infrastructural development as a step towards enhancing the role of DSSC as a Centre of Excellence for Professional Military Education. He complimented the College for maintaining a very high state of training inspite of COVID-19 pandemic constraints.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1709847

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Tue, 06 April 2021 3:06PM

सेनाध्यक्ष जनरल मनोज मुकुंद नरवणे ने डिफेंस सर्विसेज़ स्टाफ कॉलेज, वेलिंगटन का दौरा किया

सेना प्रमुख जनरल मनोज मुकुंद नरवणे ने दिनांक 05 से 06 अप्रैल 2021 तक डीएसएससी, वेलिंगटन तमिलनाडु का दौरा किया। सेना प्रमुख ने रक्षा डिफेंस सर्विसेज स्टाफ कॉलेज डीएसएसस, वेलिंगटन में 76 वें स्टाफ कोर्स में भाग लेने वाले संकाय और अधिकारियों को" पश्चिमी और उत्तरी सीमाओं पर हुई घटनाएं एवं भारतीय सेना के भविष्य के रोड मैप पर उनका प्रभाव "विषय पर एक व्याख्यान दिया। उन्होंने जोर देकर कहा कि राष्ट्र अपनी सीमाओं पर नए सिरे से चुनौतियों का सामना कर रहा है और छात्रों को सभी घटनाक्रमों से अवगत रहने की जरूरत का आह्वान किया।

डीएसएससी के कमांडेंट लेफ्टिनेंट जनरल एमजेएस कहलों ने सेना के तीनों अंगों के बीच संयुक्तता पर व्यावसायिक सैन्य प्रशिक्षण के विशिष्ट संदर्भ के साथ चल रही प्रशिक्षण गतिविधियों और नई पहलों के समावेश पर सेना प्रमुख को अपडेट दिया। सेना प्रमुख को पेशेवर सैन्य शिक्षा के लिए उत्कृष्टता केंद्र के रूप में डीएसएससी की भूमिका को बढ़ाने की दिशा में एक कदम के तौर पर प्रशिक्षण पाठ्यक्रम और ढांचागत विकास में किए जा रहे बदलावों के बारे में भी जानकारी दी गई। उन्होंने कोविड-19 महामारी की बाधाओं के बावजूद प्रशिक्षण की बहुत बेहतर स्थिति बनाए रखने के लिए कॉलेज की सराहना की।

https://pib.gov.in/PressReleasePage.aspx?PRID=1709864

ThePrint

Wed, 07 April 2021

Army HQ is in the middle of a makeover, and these are the changes introduced so far

From having 3 deputy chiefs to DG Rashtriya Rifles being moved out to Northern Command as ADG, many key changes have taken place at the Army HQ over the last one year

By Snehesh Alex Philip

New Delhi: Lieutenant General C.P. Cariappa has taken over as the Master General Sustenance (MGS) of the Army — a new position that has been introduced as part of a series of reforms carried out in the force headquarters over the last year.

This week, Cariappa became the second officer to assume the role of MGS after Lt Gen S.K. Upadhya.

The post was created to replace the earlier position of the master general ordnance (MGO). The MGO was a principal staff officer (PSO) to the Army chief. However, the MGS now comes under one of the three deputy chiefs of the force.

The Ministry of Defence at South Block in New Delhi | Commons

Moreover, new posts have been created in the Army HQ over the last year while some positions have been subsumed as part of the revamp. The makeover was initiated by former chief Gen. Bipin Rawat, who is now the Chief of Defence Staff.

The plan is to eventually reduce the number of officers deployed in the HQ to 1,203 from 1,332 earlier — including the Army chief, and introduce better and faster decision making process.

New profile for two deputy chiefs

While the Army had two deputy chiefs earlier besides the vice chief, there are three deputy chiefs now.

The earlier rank of deputy chief (Planning and Systems) has now been amended to deputy chief (Capability Development and Sustenance). This officer now takes care of all capital and revenue procurement. The rank is currently held by Lt Gen. Shantanu Dayal.

The MGS position comes under this officer now. While director general (DG) of Ordnance and Electronics and Mechanical Engineers (EME) used to come under the MGO earlier, these positions now report to deputy chief CD&S.

The various directorates like the DG Infantry, DG Armoured, ADG Mechanised Infantry, DG Artillery and DG Air Defence also come under the same umbrella. Moreover, the DG War Equipment has now been rechristened as DG Capability Development. The rank now comes under the Deputy Chief CD&S.

Deputy chief (Info System and Training) is the other deputy position to be amended. It has been rechristened as deputy chief (Info Systems and Coordination).

Army HQ functioning and info systems — like the DG Signal, DG Info System and DG Staff Duty matters — come under this officer.

New deputy chief post created

A third and new post of deputy chief strategy has also been made at the Army HQ. The first officer to take over this position is Lt Gen Paramjit Singh Sangha.

According to Army sources, this is one of the most important changes carried out in the rejig.

The director general of military operations (DGMO), which was earlier a PSO rank, now reports to the newly-created deputy chief.

Along with the DGMO, the DG military intelligence, DG operation logistics and newly created vertical of DG information warfare will report to the deputy chief strategy.

Changes in vice chief secretariat

Changes have also been made in the vice chief secretariat with the creation of a new post — ADG Human Rights, who will report to the vice chief.

The post of ADG Vigilance is also being created, and will come under the Army chief.

ADG international cooperation also reports to the vice chief.

The DG Financial Planning, who used to earlier report to the erstwhile position of deputy chief of Planning and Systems, now reports to the vice chief.

MS and E-in-C remain PSO

The changes have not affected the positions of the military secretary and the engineer-in-chief, who continue to be PSO to the Army chief.

The military secretary takes care of all posting and movement related matters in the 13-lakh-strong force while E-in-C takes care of all engineering related aspects.

DG Rashtriya Rifles becomes ADG

Another significant change has been the re-designation of the DG Rashtriya Rifles (Lt Gen rank position) to the ADG level (Major General rank officer).

The DG rank was subsumed to create the position of the new deputy chief, which is a Lt Gen rank.

The Rashtriya Rifles ADG is now based at the Northern Army Command as earlier opposed to the Army HQ.

The Directorate General of Military Training has also been subsumed into the Army Training Command. Its Lt Gen rank was used for the creation of DG Information Warfare.

Impact of the changes

According to Army sources, the series of changes have streamlined the functioning at the headquarters.

"Now both revenue and capital procurement comes under single head. The training issues also comes under one head rather than two earlier. Also, all operational related matters like the DGMO and the MI come under one head than earlier when they used to report to multiple heads," a source said.

A second source said these changes have also substantially increased the quality of inputs that is generated for the Army chief and vice chief.

"The deputy chief (strategy) is able to give a more concrete and holistic input to the vice chief and the chief because various critical operations related directorates now report to him," said a third source.

It's a similar case for the other deputy chiefs too, the source added.

Former Army commanders laud changes

Lt Gen. D.S. Hooda, former Northern Army commander, welcomed the changes, saying they streamline a lot of issues.

"All operational related matters are now under one head which is the new deputy chief (strategy). This is a very good initiative. Similarly, streamlining the procurement process under one head is also a welcome change since the office handling it now gets the complete picture. This was not so earlier because while revenue expenditure was looked after by the MGO, the capital procurement was looked after by the deputy chief (P&S)," he said.

He also welcomed the introduction of DG Information Warfare, saying this was an important step and rightly brought under deputy chief strategy.

However, while most officers the ThePrint spoke to welcomed the changes, a former high ranking officer who has served in the Army HQ said the deputy chief CD&S has been given a lot

to handle. This is because the position now has the additional responsibilities of the erstwhile MGO.

Former Western Army commander Lt Gen K.J. Singh, who has served in the Perspective Planning Directorate, lauded the changes, saying the "name of the game is convergence".

The reforms trace their origins to the tenure of former Army chief Gen V.K. Singh, who had initiated studies to make changes, he said.

"What happened in between, from the time of Gen V.K. Singh to now, is that the turf centrality of the Indian Army prevailed. Nobody wants to lose an appointment or power. The changes that have now been initiated are forward looking," he said.

https://theprint.in/defence/army-hq-is-in-the-middle-of-a-makeover-and-these-are-the-changes-introduced-so-far/635178/

नवभारत टाइम्स

Wed, 07 April 2021

Military Reform: सेना में कम होंगे 1 लाख जवान, सीडीएस ने संसदीय समिति से कही बड़ी बात

टूथ टू टेल अनुपात को कैसे कम किया जाएगा, स्टैंडिंग कमिटी के इस सवाल पर सीडीएस ने मौखिक जवाब में बताया कि 3-4 साल में करीब एक लाख सैनिकों को कम करने का लक्ष्य है। यह लगातार चलने वाली प्रक्रिया है। अभी भारतीय सेना में करीब 14 लाख सैनिक हैं।

By ***पूनम पाण्डे***

हाइलाइट्स:

- **3-4** ***साल में*** **1** ***लाख सैनिकों को कम करने का लक्ष्य***
- ***सीडीएस जनरल बिपिन रावत ने दी यह जानकारी***
- ***संसद की स्टैंडिंग कमिटी को सीडीएस ने बताई योजना***
- ***कहा- हमारा ज्यादा फोकस पैदल सैनिकों पर***

नई दिल्ली: भारतीय सेना में आने वाले 3-4 साल में 1 लाख सैनिक कम हो जाएंगे। चीफ ऑफ डिफेंस स्टाफ जनरल बिपिन रावत ने इस लक्ष्य के बारे में संसद की स्टैंडिंग कमिटी को बताया। स्टैंडिंग कमिटी में सीडीएस जनरल रावत ने कहा कि जब जनरल वी पी मलिक आर्मी चीफ थे तब उन्होंने 50 हजार सैनिक कम करने की सोची थी। हमारा लक्ष्य अगले तीन से चार साल में करीब एक लाख सैनिक कम करने का है। जनरल रावत ने कहा कि इससे जो पैसा बचेगा उसका इस्तेमाल तकनीक को बढ़ावा देने के लिए किया जाएगा। सरकार ने भी सेना को इस रकम के तकनीक में इस्तेमाल का आश्वासन दिया है। स्टैंडिंग कमिटी की रिपोर्ट पिछले महीने संसद में पेश की गई।

सांकेतिक तस्वीर।

क्या है टूथ टु टेल रेशियो

भारतीय सेना में रीस्ट्रक्चरिंग (ढांचागत बदलाव) की प्रक्रिया चल रही है। जिसमें दिल्ली स्थित आर्मी हेडक्वॉर्टर से भी ऑफिसर्स को कम कर फील्ड में भेजने की योजना पर काम चल रहा है। स्टैंडिंग कमिटी को सेना के "टूथ टू नेल"

रेशियो के बारे में भी बताया गया। टूथ टू टेल रेशियो सैन्य कार्रवाइयों में भाग लेने वाले और उनके लिए रसद आदि पहुंचाने वाले सैनिकों के बीच के अनुपात को कहा जाता है।

3-4 साल में एक लाख सैनिक घटाने की योजना

अगर टेल यानी सीधी सैन्य कार्रवाई में भाग न लेने वाले सैनिकों की तादाद ज्यादा होगी तो असल सैन्य कार्रवाइयों के लिए जरूरी सैनिकों की तादाद में कमी आती जाएगी। इसलिए अगर सैन्य कार्रवाइयों के लिए जरूरी सैनिकों की संख्या ज्यादा रखनी है तो टेल को कम करना होगा। टूथ टू टेल अनुपात को कैसे कम किया जाएगा, स्टैंडिंग कमिटी के इस सवाल पर सीडीएस ने मौखिक जवाब में बताया कि 3-4 साल में करीब एक लाख सैनिकों को कम करने का लक्ष्य है। यह लगातार चलने वाली प्रक्रिया है। अभी भारतीय सेना में करीब 14 लाख सैनिक हैं।

जवानों की संख्या में कटौती का यह मकसद

सीडीएस ने स्टैंडिंग कमिटी को यह भी बताया कि हम तकनीक के ज्यादा इस्तेमाल पर जोर दे रहे हैं। हम ज्यादा पैदल सैनिकों (इंफ्रेंट्री सैनिकों) पर फोकस कर रहे हैं, वह ही असल में बॉर्डर की निगरानी करते हैं। हमारी प्राथमिकता उन्हें आधुनिक राइफल देना है। हम उन्हें आधुनिक सर्विलांस सिस्टम देना चाहते हैं, हम उन्हें ज्यादा सक्षम बनाने के लिए ज्यादा तकनीक देना चाहते हैं।

सीडीएस ने कहा कि हम अपने लॉजिटिस्टिक टेल को कम करने के लिए आईबीजी (इंटीग्रेटेड बैटल ग्रुप) कॉन्सेप्ट पर जा रहे हैं। इंटिग्रेटेड बैटल ग्रुप छोटी छोटी टुकड़ियां होंगी जिनमें युद्ध करने की क्षमता होगी लेकिन इनकी लॉजिस्टिक टेल छोटी कर दी जाएगी। लॉजिस्टिक टेल को कम करने के लिए हम उसे आउटसोर्स कर देंगे। सीडीएस ने स्टैंडिंग कमिटी को उदाहरण देते हुए बताया कि जिस कंपनी की गाड़ी भारतीय सेना में इस्तेमाल की जा रही है उन्हें अपने वर्कशॉप में रिपेयर करने की बजाय कंपनी के वर्कशॉप से रिपेयर कराया जाएगा। उन्होंने साफ कहा कि हमारा ज्यादा फोकस आउटसोर्सिंग पर है।

https://navbharattimes.indiatimes.com/india/one-lakh-jawans-to-be-reduced-from-indian-army-says-cds-general-bipin-rawat/articleshow/81929892.cms

Hindustan Times

Wed, 07 April 2021

India, Russia discuss ways to strengthen strategic ties

These matters figured in the meeting between external affairs minister S Jaishankar and his Russian counterpart Sergey Lavrov, the focus of whose visit to New Delhi was preparations for the annual India-Russia Summit to be held in the country later this year

By Reazul H Laskar

New Delhi: India and Russia on Tuesday discussed ways to deepen military and strategic cooperation, including manufacturing of Russian military hardware in the country and the start of talks on creating a free trade area between India and the Eurasian Economic Union.

These matters figured in the meeting between external affairs minister S Jaishankar and his Russian counterpart Sergey Lavrov, the focus of whose visit to New Delhi was preparations for the annual India-Russia Summit to be held in the country later this year.

"We talked about the longstanding partnership in nuclear, space and defence sectors... We spoke of connectivity, including the International North-South Transport Corridor and the Chennai-Vladivostok Eastern Maritime Corridor," Jaishankar told a joint news conference after the talks. Lavrov said the two sides discussed military cooperation, including the expansion of the manufacturing of state-of-the-art Russian weapons in India under the "Make in India" and

"Atmanirbhar Bharat" initiatives. "In this strategically important area, Russia is a major foreign contractor for India. We are the only partner that indeed transfers to India cutting edge military technology," he said. "Deepening of military cooperation serves national interests of both countries. At the same time, we respect the right of our Indian friends to diversify ties in this area," he said.

Jaishankar said India's "defence sector requirements in the past year were expeditiously addressed" by Russia – an apparent reference to the country's emergency military needs amid the border standoff with China in Ladakh sector.

According to a recent estimate by the Stockholm International Peace Research Institute (Sipri), Russia was the most-affected supplier as India's arms imports fell 33% between 2011-15 and 2016-20.

Responding to a question on reported US pressure on India to prevent military-technical cooperation with Russia, Lavrov said: "We did not discuss these statements from the US, instead we confirmed that we are going to deepen our military cooperation."

Lavrov said the two sides discussed military cooperation, including the expansion of the manufacturing of state-of-the-art Russian weapons in India under the "Make in India" and "Atmanirbhar Bharat" initiatives.(Russian Foreign Ministry/Handout via Reute

Did not meet PM

Lavrov did not have an interaction with the Indian Prime Minister, usually a standard feature for a visit to New Delhi by a senior Russian leader. The people familiar of the developments sought to play down the matter, saying no such meeting was scheduled as the PM Narendra Modi was away in West Bengal to address public meetings at Cooch Behar and Howrah as part of the BJP's campaign for the state elections. There were no indications of differences at the joint press conference with both Lavrov and Jasishankar giving a positive readout on their discussions.

Lavrov said the two sides had also agreed on joint efforts to tackle a decline in mutual trade due to the Covid-19 pandemic. They also discussed cooperation in nuclear energy, space, including manned programmes, building rocket engines and satellite navigation, and transportation infrastructure projects in Russia's Far East and the Arctic, he said.

Vaccine contracts

Collaboration on Covid-19 vaccines figured in the talks, and Lavrov noted that the Russian Direct Investment Fund (RDIF) has signed contracts with several Indian firms to manufacture about 750 million doses of the Sputnik V vaccine. He didn't rule out further cooperation to cover manufacturing of Indian vaccines in Russia, while Jaishankar said a decision would be made by regulatory authorities of both sides. "For us, were those vaccines to be made in India, it would be one more affirmation of the importance of 'Make in India' and our own vaccine capacities," Jaishankar said. The Russian minister also conveyed a message from President Valdimir Putin to Prime Minister Narendra Modi and invited Jaishankar to visit Russia. Former ambassador Vishnu Prakash said there are various difficulties associated with infrastructure development projects in Russia's Far East and the proposed free trade area with the Eurasian Economic Union. "Besides India's resource constraints, there's also the influence of China. It won't be easy for us to compete with China's financial resources and economic muscle-flexing. Russia itself has been concerned about increasing Chinese influence in these areas," he said.

https://www.hindustantimes.com/india-news/india-russia-discuss-ways-to-strengthen-strategic-ties-101617740732350.html

Press Information Bureau
Government of India

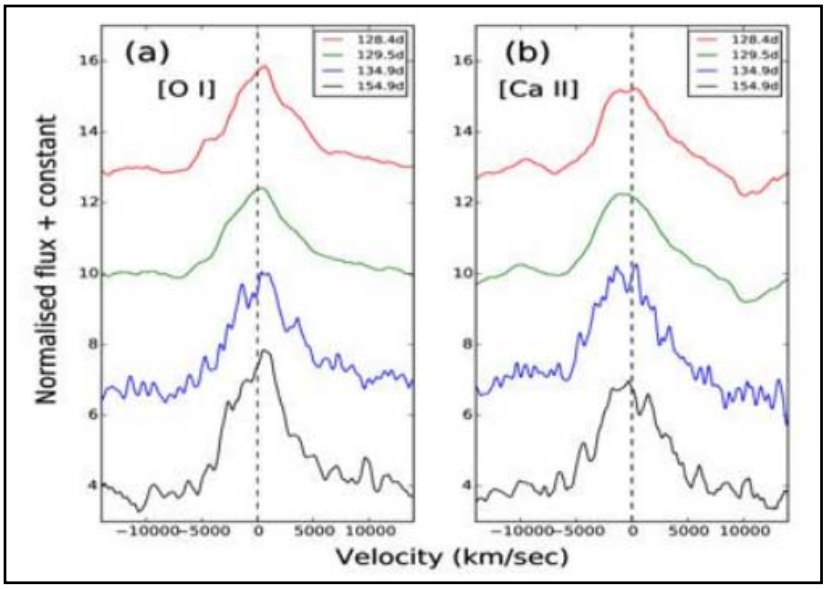
Ministry of Defence

Tue, 06 April 2021 4:00PM

Supernova explosion traced to one of the hottest kind of stars

Indian astronomers have tracked a rare supernova explosion and traced it to one of the hottest kind of stars called Wolf–Rayet *stars or WR stars.*

The rare Wolf–Rayet stars are highly luminous objects a thousand times that of the Sun and have intrigued astronomers for long. They are massive stars and strip their outer hydrogen envelope which is associated with the fusion of Helium and other elements in the massive core. Tracking of certain types of massive luminous supernovae explosion can help probe these stars that remain an enigma for scientists.



A team of astronomers from Aryabhatta Research Institute of Observational Sciences (ARIES), Nainital an autonomous institute under the Department of Science & Technology, Govt. of India with international collaborators have conducted the optical monitoring of one such stripped-envelope supernova called SN 2015dj hosted in the galaxy NGC 7371 which was spotted in 2015. They calculated the mass of the star that collapsed to form the supernovae as well as the geometry of its ejection. This work has been recently published in *'The Astrophysical Journal.*

The scientists also found that the original star was a combination of two stars – one of them is a massive WR star and another is a star much less in mass than the Sun. Supernovae (SNe) are highly energetic explosions in the Universe releasing an enormous amount of energy. Long-term monitoring of these transients opens the door to understand the nature of the exploding star as well as the explosion properties. It can also help enumerate the number of massive stars.

Figure 1: This figure reveals the spherical nature of the explosion associated with SN 2015dj.

https://www.pib.gov.in/PressReleasePage.aspx?PRID=1709863

पत्र सूचना कार्यालय
भारत सरकार

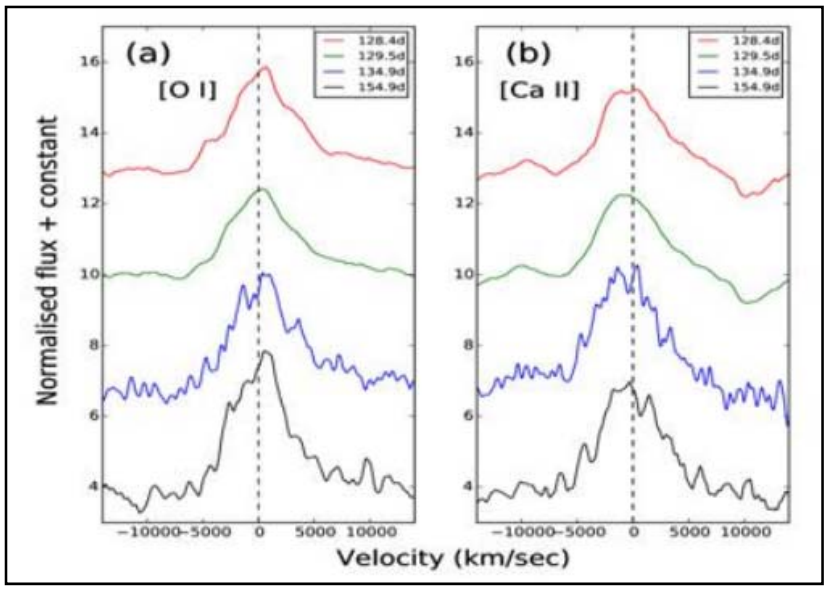
रक्षा मंत्रालय

Tue, 06 April 2021 4:00PM

सुपरनोवा विस्फोट से सबसे गर्म में से एक तारे का पता लगा

भारतीय खगोलविदों ने एक दुर्लभ सुपरनोवा विस्फोट की निगरानी कीजिससे एक वुल्फ-रेएट तारे या डब्ल्यूआर तारे नाम सेसबसे गर्म तारों में से एक के बारे में पता लगा है।

दुर्लभ वुल्फ-रेएट तारे सूर्य से एक हजार गुना अधिक प्रकाशमान होते हैं जिससे खगोलविद लंबे समय तक संशय में रहे। वह आकार में बहुत बड़े तारे हैं और उनका बाहरी हाइड्रोजन वाला हिस्सा खाली है और भीतर के बड़े कोर में हिलीयम के संलयन और अन्य तत्वों के साथ जुड़ा। इस प्रकार के बड़े प्रकाशमान सुपरनोवा विस्फोट की निगरानी से वैज्ञानिकों को इन तारों की जांच में सहयोग मिलेगा जो कि अब तक उनके लिए पहेली बने हुए थे।



भारत सरकार के विज्ञान एवं प्रौद्योगिकी विभाग के अधीन आने वाले नैनीताल स्थित स्वायत्त संस्थान आर्यभट्ट प्रेक्षण विज्ञान शोध संस्थान (एरियस) से खगोलविदों की एक टीम ने अन्तर्राष्ट्रीय सहयोगियों के साथ 2015 में मिले एनएसजी 7371 आकाशगंगा में इसी प्रकार के खाली-आवृत्त वाले सुपरनोवा एसएन 2015डीजे की ऑप्टिकल मॉनिटरिंग की। उन्होंने इस सितारे के द्रव्यमान की गणना की जो सुपरनोवा और इसके निष्कासन की ज्यामितीय की स्थापना के लिए ढेर हो गया था। यह कार्य हाल ही में 'दएस्ट्रोफिजिकल जर्नल' में प्रकाशित हुआ है।

वैज्ञानिकों ने यह भी पाया कि असली तारा दो सितारों का मिश्रण था- जिनमें से एक विशाल डब्ल्यूआर तारा था और दूसरा तारा द्रव्यमान में सूर्य से कम था। सुपरनोवा (एसएनई) ब्रह्मांड में होने वाले अत्यधिक ऊर्जावान विस्फोट होते हैं जिनमें बड़ी संख्या में ऊर्जा जारी होती है। इन विस्फोटों की दीर्घकालीन निगरानी विस्फोट वाले तारे की प्रकृति और विस्फोट के तत्वों को समझने में मदद करते हैं। यह विशालकाय तारों की गणना में भी मदद करते हैं।

चित्र 1: यह चित्र एसएन 2015डीजे से जुड़े विस्फोट की अंतरिक्ष संबंधी प्रकृति को दर्शाता है।

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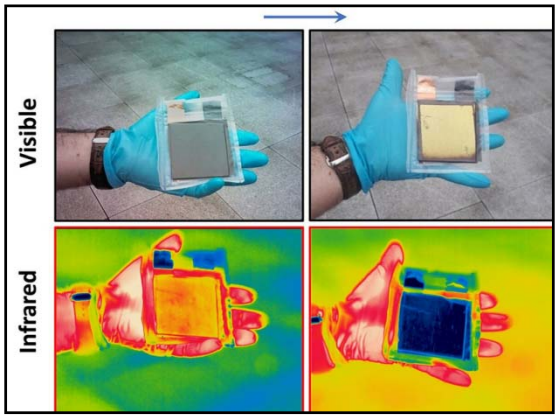
Graphene 'smart surfaces' now tunable for visible spectrum

Researchers at The University of Manchester's National Graphene Institute have created optical devices with a unique range of tunability, covering the entire electromagnetic spectrum, including visible light.

A paper published in *Nature Photonics* outlines applications for this 'smart surface' technology range from next-generation display devices to dynamic thermal blankets for satellites and multi-spectral adaptive camouflage.

The devices' tunability is achieved by a process known as electro-intercalation, which in this case involves lithium ions being interposed between sheets of multilayer graphene (MLG), offering control over electrical, thermal and magnetic properties.



Credit: University of Manchester

The MLG device is laminated and vacuum-sealed in a low-density polyethylene pouch that has over 90% optical transparency from visible light to microwave radiation.

Charge turns gray to gold

During charge (intercalation) or discharge (de-intercalation), the electrical and optical properties of MLG change dramatically. The discharged device appears dark gray owing to the high absorptivity (>80%) of the top graphene layer in the visible regime. When the device is fully charged (at ~3.8V), the graphene layer appears gold in color. The achievable color space can be enriched to include a range from red to blue using optical effects such as thin-film interference.

Professor Coskun Kocabas, lead author of the study, said: "We have fabricated a new class of multispectral optical devices with previously unachievable color-changing ability by merging graphene and battery technology.

"The successful demonstration of graphene-based smart optical surfaces enables potential advances in many scientific and engineering fields."

For example, a dynamic thermal blanket could selectively reflect visible or infrared light and allow a satellite to reflect radiation from the side facing the sun, while emitting radiation from its shaded faces. Similarly, when in Earth's shadow, that blanket can insulate the satellite from deep-space cooling [see figure below]. These actions would regulate internal temperatures far more effectively than a static thermal coating.

Previous studies have examined devices at specific wavelength ranges of microwave, terahertz, infrared and visible, using single and multilayer graphene. But it was the challenge of extending coverage to visible light while maintain optical activity at longer wavelength that required innovation in the structure of the device, overcoming established difficulties in the integration of optical devices with electrochemical cells.

"Here we used a graphene-based lithium-ion battery as an optical device," he added. "By controlling the electron density of the graphene, we are now able control light from visible to microwave wavelengths on the same device."

Nobel laureate Professor Sir Kostya Novoselov was a co-author on the paper and said: "Few-layer graphene offers unprecedented control over its optical properties through charging. Such devices can find their applications in many areas: from adaptive optics to thermal management."

More information: M. Said Ergoktas et al. Multispectral graphene-based electro-optical surfaces with reversible tunability from visible to microwave wavelengths, *Nature Photonics* (2021). DOI: 10.1038/s41566-021-00791-1

Journal information: *Nature Photonics*

https://phys.org/news/2021-04-graphene-smart-surfaces-tunable-visible.html

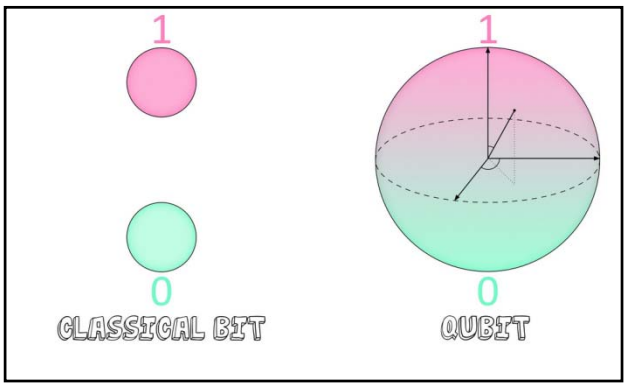
Wed, 07 April 2021

New computing algorithms expand the boundaries of a quantum future

By Katrina Miller

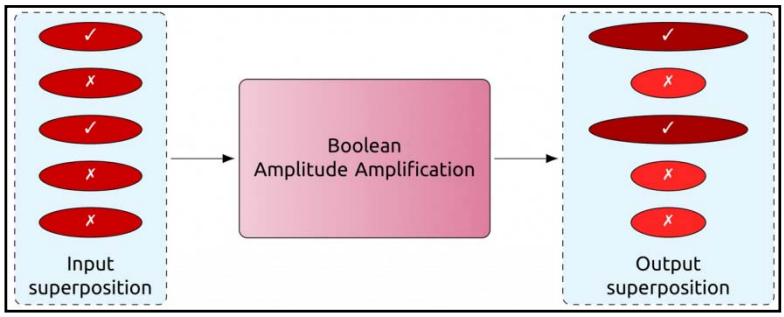
Quantum computing promises to harness the strange properties of quantum mechanics in machines that will outperform even the most powerful supercomputers of today. But the extent of their application, it turns out, isn't entirely clear.

To fully realize the potential of quantum computing, scientists must start with the basics: developing step-by-step procedures, or algorithms, for quantum computers to perform simple tasks, like the factoring of a number. These simple algorithms can then be used as building blocks for more complicated calculations.



Qubits can be in a superposition of 0 and 1, while classical bits can be only one or the other. Credit: Jerald Pinson

Prasanth Shyamsundar, a postdoctoral research associate at the Department of Energy's Fermilab Quantum Institute, has done just that. In a preprint paper released in February, he announced two new algorithms that build upon existing work in the field to further diversify the types of problems quantum computers can solve.



A quantum computer can amplify the probabilities of certain individual records and suppress others, as indicated by the size and color of the disks in the output superposition. Standard techniques are able to assess only Boolean scenarios, or ones that can be answered with a yes or no output. Credit: Prasanth Shyamsundar

"There are specific tasks that can be done faster using quantum computers, and I'm interested in understanding what those are," Shyamsundar said. "These new algorithms perform generic tasks, and I am hoping they will inspire people to design even more algorithms around them."

Shyamsundar's quantum algorithms, in particular, are useful when searching for a specific entry in an unsorted collection of data. Consider a toy example: Suppose we have a stack of 100 vinyl records, and we task a computer with finding the one jazz album in the stack.

Classically, a computer would need to examine each individual record and make a yes-or-no decision about whether it is the album we are searching for, based on a given set of search criteria.

"You have a query, and the computer gives you an output," Shyamsundar said. "In this case, the query is: Does this record satisfy my set of criteria? And the output is yes or no."

Finding the record in question could take only a few queries if it is near the top of the stack, or closer to 100 queries if the record is near the bottom. On average, a classical computer would locate the correct record with 50 queries, or half the total number in the stack.

A quantum computer, on the other hand, would locate the jazz album much faster. This is because it has the ability to analyze all of the records at once, using a quantum effect called superposition.

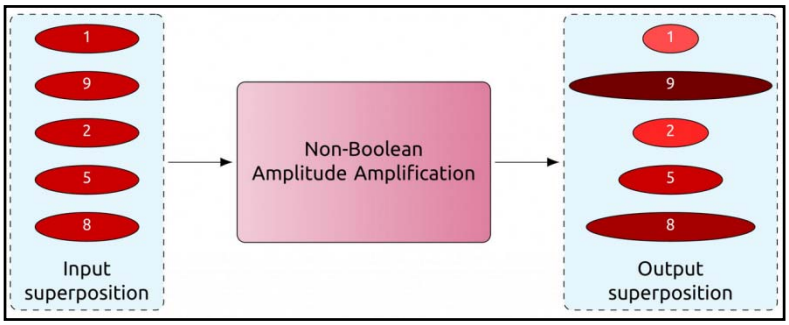
With this property, the number of queries needed to locate the jazz album is only about 10, the square root of the number of records in the stack. This phenomenon is known as quantum speedup and is a result of the unique way quantum computers store information.

The quantum advantage

Classical computers use units of storage called bits to save and analyze data. A bit can be assigned one of two values: 0 or 1.

The quantum version of this is called a qubit. Qubits can be either 0 or 1 as well, but unlike their classical counterparts, they can also be a combination of both values at the same time. This is known as superposition, and allows quantum computers to assess multiple records, or states, simultaneously.

"If a single qubit can be in a superposition of 0 and 1, that means two qubits can be in a superposition of four possible states," Shyamsundar said. The number of accessible states grows exponentially with the number of qubits used.



New amplification algorithms expand the utility of quantum computers to handle non-Boolean scenarios, allowing for an extended range of values to characterize individual records, such as the scores assigned to each disk in the output superposition above. Credit: Prasanth Shyamsundar

Seems powerful, right? It's a huge advantage when approaching problems that require extensive computing power. The downside, however, is that superpositions are probabilistic in nature—meaning they won't yield definite outputs about the individual states themselves.

Think of it like a coin flip. When in the air, the state of the coin is indeterminate; it has a 50% probability of landing either heads or tails. Only when the coin reaches the ground does it settle into a value that can be determined precisely.

Quantum superpositions work in a similar way. They're a combination of individual states, each with their own probability of showing up when measured.

But the process of measuring won't necessarily collapse the superposition into the value we are looking for. That depends on the probability associated with the correct state.

"If we create a superposition of records and measure it, we're not necessarily going to get the right answer," Shyamsundar said. "It's just going to give us one of the records."

To fully capitalize on the speedup quantum computers provide, then, scientists must somehow be able to extract the correct record they are looking for. If they cannot, the advantage over classical computers is lost.

Amplifying the probabilities of correct states

Luckily, scientists developed an algorithm nearly 25 years ago that will perform a series of operations on a superposition to amplify the probabilities of certain individual states and suppress others, depending on a given set of search criteria. That means when it comes time to measure, the superposition will most likely collapse into the state they are searching for.

But the limitation of this algorithm is that it can be applied only to Boolean situations, or ones that can be queried with a yes or no output, like searching for a jazz album in a stack of several records.

Scenarios with non-Boolean outputs present a challenge. Music genres aren't precisely defined, so a better approach to the jazz record problem might be to ask the computer to rate the albums by how "jazzy" they are. This could look like assigning each record a score on a scale from 1 to 10.

Previously, scientists would have to convert non-Boolean problems such as this into ones with Boolean outputs.

"You'd set a threshold and say any state below this threshold is bad, and any state above this threshold is good," Shyamsundar said. In our jazz record example, that would be the equivalent of saying anything rated between 1 and 5 isn't jazz, while anything between 5 and 10 is.

But Shyamsundar has extended this computation such that a Boolean conversion is no longer necessary. He calls this new technique the non-Boolean quantum amplitude amplification algorithm.

"If a problem requires a yes-or-no answer, the new algorithm is identical to the previous one," Shyamsundar said. "But this now becomes open to more tasks; there are a lot of problems that can be solved more naturally in terms of a score rather than a yes-or-no output."

A second algorithm introduced in the paper, dubbed the quantum mean estimation algorithm, allows scientists to estimate the average rating of all the records. In other words, it can assess how "jazzy" the stack is as a whole.

Both algorithms do away with having to reduce scenarios into computations with only two types of output, and instead allow for a range of outputs to more accurately characterize information with a quantum speedup over classical computing methods.

Procedures like these may seem primitive and abstract, but they build an essential foundation for more complex and useful tasks in the quantum future. Within physics, the newly introduced algorithms may eventually allow scientists to reach target sensitivities faster in certain experiments. Shyamsundar is also planning to leverage these algorithms for use in quantum machine learning.

And outside the realm of science? The possibilities are yet to be discovered.

"We're still in the early days of quantum computing," Shyamsundar said, noting that curiosity often drives innovation. "These algorithms are going to have an impact on how we use quantum computers in the future."

More information: Non-Boolean Quantum Amplitude Amplification and Quantum Mean Estimation. arXiv:2102.04975v1 [quant-ph] arxiv.org/abs/2102.04975

https://phys.org/news/2021-04-algorithms-boundaries-quantum-future.html

Pharmacy Times

Wed, 07 April 2021

Study: COVID-19 Antibody Tests, Rapid Finger Pricks Effective

By Jill Murphy

New findings from a Michigan Medicine study indicate that antibody testing is predictive of prior COVID-19 infection and rapid screening methods, even from finger pricks, are effective testing tools.

The research team analyzed antibody tests conducted on more than 500 subjects in patient care settings, finding that people who had COVID-19, including those with mild symptoms, produced antibodies, according to the study.

"For a long time, people were very worried that people with mild COVID did not make immune responses," said Charles Schuler, MD, a clinical assistant professor of allergy and immunology at Michigan Medicine, in a press release. "This should give people confidence that the tests that are available to them aren't just random number generators. They're actually giving them something useful."

Further, the findings indicate that rapid screens can predict infection with nearly the same precision as antibody tests conducted in a lab, which could be useful for providers, according to Schuler.

"I was actually surprised at how well some of these tests did because it's a very different experiment," Schuler said in the press release. "[If you have] a patient at a clinic that does not have a lab on site, we can find out if you had COVID before and we can do it now and we can do it at low cost."

The researchers also examined lateral flow assays, which Schuler describes as modern litmus tests, also known as a drop of blood or serum placed on filter paper that changes color to indicate whether antibodies are present.

The researchers compared 3 rapid screens taken by finger pricks or blood draws in point-of-care settings to serology tests assessed in a lab. They examined samples from 512 patients, of whom 104 had a history of COVID-19 and a positive PCR test, according to the study.

Despite some false positives, 2 rapid tests agreed with positive lab results between 93% and 97% of the time. Both tests outperformed the third brand, which lost its FDA emergency use authorization during the trial.

"I think the FDA has done a nice job regulating bad tests out of the market," Schuler said in a press release. "These are still accurate in a point-of-care setting…[so], you've got a test that can be taken to different parts of the world and can be done without the need for a higher-complexity lab setting."

Schuler added that these point-of-care antibody tests could help determine who is prioritized in places where immunization lags.

"It's important to vaccinate everyone," he said. "But, if you can direct vaccines to people, in particular, who may be totally unprotected, something like this would be useful. I do think more data is [sic] needed to say that from a policy perspective."

There were some limitations to the study, including the study population being 90% health care workers. However, the research team will continue evaluating with a new focus and to get more concrete answers.

“This is a down payment on, hopefully, a lot of great future data” Schuler said in a press release. “While antibodies may or may not tell you how immunity happens, they might tell you about reinfection risk. That is the functional clinical significance that we need to know as soon as possible.”

Reference

COVID-19 antibody tests, even rapid finger pricks, are effective, new study finds. Michigan Health Lab. Published March 31, 2021. Accessed April 2, 2021. https://labblog.uofmhealth.org/lab-report/covid-19-antibody-tests-even-rapid-finger-pricks-are-effective-new-study-finds

https://www.pharmacytimes.com/view/study-covid-19-antibody-tests-rapid-finger-pricks-effective