Dec
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समाचार पत्रों से चयित अंश
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Press Information Bureau
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Ministry of Defence

Wed, 15 Dec 2021 8:48PM

'Azadi ka Amrit Mahotsav' Iconic Week Celebration by DRDO's Micro Electronics Devices and Computational Systems Cluster

Key Highlights:

- ***Three products handed over to the user laboratories of DRDO***
- ***Four Transfer of Technology (ToT) agreements executed with public and private sector companies***
- ***Release of 'Yatra', a Compendium on 60 Glorious years of SSPL and SSPL Safety Manual***
- ***Release of Process Design Kit (PDK) for X band Gallium Nitride (GaN) MMIC***
- ***Release of hardware and software products for secure communication***

Secretary DD R&D and Chairman DRDO Dr G Satheesh Reddy, handed over three products developed by MED & CoS Cluster to the user laboratories at an event held at DRDO Bhawan, New Delhi today as part of Azadi Ka Amrit Mahotsav celebrations and iconic week of the Ministry of Defence. He also handed over four Transfer of Technology (ToT) agreements to public and private sector companies.

Founded in 1961, SSPL has completed 60 years and is celebrating its Diamond Jubilee Year. 'Yatra', the Compendium, traces historical journey of the laboratory and includes memoirs from several retired scientists. The compendium has been compiled in association with IDST.

The GaN process development kit has been released for MMIC designers to enable them to design indigenous GaN MMICs for various frequencies upto X-band. The devices can be manufactured at GAETEC.

Secretary DD R&D handed over High-g MEMS Switch, UHF 1kW High Power Amplifier and X band Power Amplifier to user laboratories. He also handed over SSPL developed technology of

0.5W Stirling Cryocooler for Integrated Detector Dewar Cooler Assembly (IDDCA) to Bharat Electronics Limited.

Technology document of 10W laser diode chip fabrication technology and X-band GaN HEMT MMIC was handed over to GAETEC. Technology document for HgCdTe based DDCA was handed over to STAR-C.

The technology of Acoustic Emission (AE) Sensors, AE Data Acquisition & Analysis System was handed over to industry. The sensors and the system will be used for site specific snow avalanche monitoring/prediction.

Secretary, DD R&D handed over CAIR developed INDIGIS, a Geographical Information System to industry. Secure mobile handset to facilitate secure transmission of voice and instant messaging over 4G cellular networks for usage in sensitive environment was launched.

Reliable and secure key transfer Quantum Key Distribution (QKD) at a distance over 100 km using commercial telecom optical fiber link was announced.

On this occasion, SAG, Delhi issued certificates of assurance for IT products, namely Data Diode to BEL and software product of CAIR. Data Diode is a device for enforcing one-way traffic to the internet from internal network. The improved bandwidth internal network and various IT portals were launched during the event.

The event was attended by various cluster & corporate DGs, Directors, senior scientists from various DRDO laboratories, former DRDO Directors and industry representatives.

https://pib.gov.in/PressReleasePage.aspx?PRID=1781958

THE NEW INDIAN EXPRESS

Thu, 16 Dec 2021

Rustom-II UAV crosses important milestone, will be up for production in two months

Informing about the future plans, a programme for the improved, more capable, High Altitude Long Endurance UAV is also in the works, said Dr. Thomas.

By Mayank Singh

New Delhi: India's indigenous Unmanned Aerial Vehicle (UAV) programme Rustom-II achieved an important milestone in its development cycle and has moved a step forward towards production stage.

UAV Rustom-II (File Photo | EPS)

Dr. Satheesh Reddy, Secretary R&D and DRDO Chairman said, "The indigenous Medium Altitude Long Endurance (MALE) Unmanned Aerial Vehicle (UAV) development programme by the Defence Research and Development Organisation (DRDO) has crossed a milestone by reaching an altitude of 25,000 feet and an endurance of 10 hours".

The tests are expected to be completed in next two months and then it will be handed over to the Hindustan Aeronautics Limited (HAL) and Bharat Electronics Limited (BEL) for production, told Dr Thomas. Rustom-2 has been designed and developed by Aeronautical Development Establishment (ADE).

Informing about the future plans, a programme for the improved, more capable, High Altitude Long Endurance (HALE) UAV is also in the works, said Dr. Thomas.

The Medium Altitude UAVs fly between 25000 ft to 28,000 ft and those flying above this altitude come under High Altitude told GP. Captain RK Narang, Director, Drone Federation of India.Primarily these drones are utilised for Intelligence Surveillance and Reconnaissance purpose but can be modified for any use as per the requirements added, Narang.

The Armed Forces are moving forward with major plans which include a proposal for 30 armed drones, 10 for each service, is said to be in its advance stages.

The DRDO has also come up with a Structural fire-fighting suit which on Tuesday, was among several systems Defence Minister Rajnath Singh handed to the Home Ministry. It has been developed by DRDO's Centre for Fire, Explosive and Environment Safety (CFEES), Delhi.

As per the DRDO, the multi layered suit weighing 2.8 kgs, with the outer layer being the most durable and protects against heat, flames, water, chemicals and also against cuts and abrasion. The inner thermal layer provides insulation by creating air cushions and micro climate chambers.

Dr. Prasun Roy from CFEES told that it's for the first time that such a suit has been developed in the country and meets the stringent US standards and costs less. Dr. Prasun has been involved in the development of this and is also part of special "Fire Entry Suit".

The 'Fire entry suit' will be able to withstand the fire for 150 seconds and is in the advanced stages of development. The work is on to reduce the weight from 25 kgs and increase the indigenous content in it, said Prasun.

https://www.newindianexpress.com/nation/2021/dec/15/rustom-iiuav-crosses-important-milestone-will-be-up-for-production-in-twomonths-2395927.html

THE HINDU

Thu, 16 Dec 2021

Rustom-2 indigenous UAV crosses a milestone

It is set to reach 30,000 altitude and and 18 hours endurance within two months

By Dinakar Peri

New Delhi: The indigenous Medium Altitude Long Endurance (MALE) Unmanned Aerial Vehicle (UAV) development programme by the Defence Research and Development Organisation (DRDO) has crossed a milestone by reaching an altitude of 25,000 feet and an endurance of 10 hours, Secretary R&D and DRDO Chairman Dr. Sateesh Reddy said.

File image of Rustom-2 UAV. Photo: Special Arrangement

Within two months, we will demonstrate an altitude of 30,000 feet and 18 hours endurance meeting the requirements of the Services, said Dr. Tessy Thomas, Director General (Aeronautical Systems), DRDO.

It has advanced capabilities and meets the requirements of the three Services, Dr. Thomas said. Once the capabilities are demonstrated in two months, it should be ready to be handed to the Services. A programme for a more capable High Altitude Long Range (HALE) UAV is also in the works, Dr. Thomas said.

It technologically matches contemporary UAVs available and will also be cheaper than the imported ones, officials said. With some delays in development, the Rustom-2 last year successfully flew for eight hours at an altitude of 16,000 feet.

It has been designed and developed by the Aeronautical Development Establishment (ADE), Bengaluru with production partners being the Hindustan Aeronautics Ltd and the Bharat Electronics Limited. It is being developed to carry out surveillance and reconnaissance (ISR) roles and is capable of carrying different combinations of advanced payload and capable of auto landing among others.

High endurance UAVs are a priority requirement for the armed forces especially in the standoff with China in Eastern Ladakh. The armed forces rely heavily on the Israeli Searcher and Heron drones and need more such UAVs.

The Services have embarked on a major upgrade project of the Heron UAVs. A separate proposal for 30 armed Predator drones, 10 for each Service, from the U.S. is also at advanced stages.

Structural fire-fighting suit

On Tuesday, among several systems Defence Minister Rajnath Singh had handed to the Home Ministry over a structural fire-fighting suit developed by DRDO's Centre for Fire, Explosive and Environment Safety (CFEES), Delhi.

The suit weighing 2.8 kg is an ensemble of several layers, with the outer layer being the most durable and protects against heat, flames, water, chemicals and also against cuts and abrasion, according to the DRDO. The inner thermal layer provides insulation by creating air cushions and micro climate chambers.

Such a suit has been developed for the first time in the country and meets European standards while at the same time lowering import costs, said Dr. Prasun Roy from CFEES who was involved in the development.

Dr. Roy said a special "fire entry suit" which can without significant fire for 150 seconds is also in the advanced stages of development. The aim is to reduce the weight of the suit which is present at 25 kg and reduce the import content, he said.

https://www.thehindu.com/news/national/rustom-2-indigenous-uav-crosses-a-milestone/article37963891.ece

The EurAsian Times

Thu, 16 Dec 2021

India's Hypersonic Missile: As DRDO 'Goes Vertical', US Speculates Indian Navy could go Hypersonic by 2025-28

By Nitin J Ticku, Shreya Mundhra

As China has been rapidly expanding its hypersonic missile capability that has even flustered the US, the Indian Defence Minister said that New Delhi must work towards developing hypersonic missiles to maintain credible deterrence.

Speaking at a DRDO event on Tuesday, Rajnath Singh said ballistic missile defense systems are getting more and more robust with the passage of time. "In order to maintain a minimum credible deterrence, we have to immediately think about hypersonic cruise missile development. It will be a revolutionary step in our defense sector and we all have to put our efforts into it."

A BrahMos II model on display.

India's Hypersonic Ambitions

Earlier, India joined select nations by successfully conducting the maiden test of the High-Speed Technology Demonstrator Vehicle (HSTDV) using an indigenously developed propulsion system.

Singh had then tweeted: The DRDO has today successfully flight tested the Hypersonic Technology Demonstrator Vehicle using the indigenously developed scramjet propulsion system. With this success, all critical technologies are now established to progress to the next phase.

The successful test was a significant achievement in developing hypersonic delivery platforms including development as a carrier vehicle for cruise missiles and for the launching of satellites at an economical cost.

DRDO is also believed to be working on BrahMos-II hypersonic anti-ship missile. According to reports, it is expected to obtain over six times the speed of sound on hypersonic scramjet technology.

The BrahMos-2 is twice as fast as BrahMos-1 and can reach a speed of over Mach 6. Even though the missile is expected to have a range of 600 km, experts claim that the BrahMos II, which

could be akin to Russia's Zircon hypersonic missile, can exceed its range of 1000 km and can glide at a speed as high as Mach 8.

According to a recent report by the Congressional Research Service (CRS), a US Congress think tank, India is amongst the very few nations that is developing hypersonic weapons.

The report stated that the US, Russia, and China have one of the most advanced hypersonic programs in the world, however, various other nations like India, Australia, France, Germany, and Japan are also developing the technology.

The BrahMos II was originally planned to be deployed by 2017. However, it faced substantial delays and is now anticipated to achieve initial operational capability between 2025 and 2028.

DRDO Tests Vertical Missile

India's DRDO successfully recently tested the Vertical Launch Short Range Surface to Air Missile (VL-SRSAM) from the Integrated Test Range in Chandipur, off the coast of Odisha.

The testing of the missile, which was fired from a vertical launcher and aimed at an electronic target at a very low altitude, was conducted to validate the integrated operation of all the components of the weapon system. These include the vertical launcher unit with a canisterized flight vehicle, controller, and weapon control system, etc.

These components will be crucial for future launches of the missile from Indian Navy ships. Both the missile and the Vertical Launch System (VLS) make a deadly combo.

The VL-SRSAM has been designed and developed jointly by three facilities of the DRDO (Defence Research and Development Organisation). The missile has the capability of neutralizing various aerial threats at close ranges.

Sea-skimming objects are also under the scope of targets that the missile can neutralize. The armament has been specially designed to strike at high-speed airborne targets at the range of 40 to 50 km. The range extends to an altitude of around 15 km. DRDO officials have said its design is based on the Astra Beyond Visual Range (BVR) air-to-air missile.

Two main features of the missile are its cruciform wings and its thrust vectoring capability. It has four small wings arranged like a cross on four sides. They provide the missile with a much-needed stable aerodynamic posture. Regarding the thrust vectoring ability, an official told The Indian Express that it refers to the capacity to change the direction of the thrust from its engine and to control the angular velocity and the attitude of the missile.

The launch of the missile depends on a hot launch type VLS. The system itself has 8 cell modules fitted in 2 rows of 4.

The Vertical Launch System

During the era of the Cold War, missile launches were dependent on rotating-arm launchers that fired one or two projectiles at a time. In contrast to this, the more modern VLS technology consists of dozens of launch tubes that are called "cells".

These cells serve the purpose of holding as well as firing missiles from a moving naval platform such as a warship or a submarine. Perhaps the most popular VLS system is the US Navy's Mark 41, which is currently used by close to 20 nations.

Most VLS employs two different methods of firing: the hot launch or the cold launch. Besides this, there is also the concentric canister launch. In the hot launch system, the missile ignites in the launch tube while in the latter, it gets ignited after being expelled by gas produced by a gas generator which is separate from the missile itself. The concentric canister launch mechanism can use both hot and cold methods.

India used the hot launch method to flight test the VL-SRSAM. While this method does not need an ejection mechanism, it still demands some way to get rid of the missile's exhaust and heat when it leaves the cell.

If the missile ignites in a cell that does not possess an ejection mechanism, the cell must bear the huge amount of heat that gets generated without igniting the missiles in the adjoining cells. This

method is advantageous as it eliminates the need for a separate system for the ejection of the missile from the launching tube.

It is built such that the missile is to propel itself out of the launching cell using its own engine. As a result, the hot launch vertical launch system itself is comparatively lighter, smaller, and cost-effective. In addition, these systems have a much faster engagement time owing to the fact that the missile is released from the ship as soon as the motor is ignited.

However, the system has one very potent risk: in case of a missile malfunctioning, the launch tube or the cell could be completely ruined. This risk isn't present in the cold launch method as that system can eject the missile if its engine fails during launch.

Overall, the fixed, multi-missile VLS still poses a big threat to enemy platforms as it allows naval vessels to increase their rate of fire manifold. It also saves the time that earlier rail launchers used to take up to get "re-loaded" after a launch.

As most hot launch VLSs (especially the Mark 41) follow a method wherein the missile launches vertically upwards first and then turns toward its target, there is no requirement for the launcher to be aimed at the target, or for the ship to maneuver before the launch to let the missile reach its aim.

https://eurasiantimes.com/indias-hypersonic-missile-drdo-indian-navy-could-go-hypersonic/

TheDefensePost

Thu, 16 Dec 2021

Indian Army receives anti-drone systems, military hardware

By Joe Saballa

The Indian army has taken delivery of locally-produced military hardware, including anti-drone systems, smart air-launched weapons, and an advanced radar countermeasure system from the Defence Research and Development Organisation.

The delivery of indigenous military equipment improves the country's defense capabilities while developing the local arms manufacturing sector.

Anti-drone systems the Indian military has recently received include "soft kill" and "hard kill" options to tackle new and evolving aerial threats, according to a report by the *Hindustan Times*.

India's first indigenously developed anti-drone system, NADS. Photo: Indian Ministry of Defence

The smart anti-airfield weapon handed over to the Indian army enables the targeting of enemy airfield assets such as radars, bunkers, taxiways, and runways from a distance of up to 100 kilometers (62 miles).

In addition to cutting-edge military hardware, the Indian Defence Ministry will soon deliver coastal surveillance radar to the military. A transfer of technology agreement has been signed with seven public and private defense firms to develop the equipment.

More Technological Advancements

India has been taking steps to boost local armament production, crafting a list of 209 weapons and systems that cannot be imported. The Asian nation has also allocated a separate budget to purchase the indigenous equipment.

Indian defense minister Rajnath Singh has revealed that the country is now focusing on developing hypersonic missiles.

The first stages of development for the ultra-modern weapon, which travels six times the speed of sound, reportedly began last year. The country is also set to develop hypersonic cruise missiles powered by air-breathing scramjet engines within four years.

https://www.thedefensepost.com/2021/12/15/india-anti-drone-military-hardware/

THE HINDU BusinessLine

Thu, 16 Dec 2021

Ashok Leyland in pact with DRDO arm to develop combat vehicle engines

The 600-HP engine will undergo rigorous testing in lab and will be qualified for application in tanks

Chennai: Ashok Leyland has partnered with Combat Vehicles Research and Development Establishment (CVRDE), a premier lab of Defence Research and Development Organisation (DRDO), to develop and manufacture 600-HP indigenous engine to power futuristic combat vehicles under Atmanirbhar Bharat mission.

As the development-cum-production partner, Ashok Leyland has developed the engine in a record time despite the total lockdown due to Covid-19, according to a statement.

Defence requirements

Pravin Kumar Mehta, Distinguished Scientist and Director General, Armament & Combat Engineering Systems (ACE), inaugurated on Wednesday the testing of the engine at the Engine Development Centre of Ashok Leyland located near Chennai.

The 600-HP engine will undergo rigorous testing in lab and will be qualified for application in tanks. Ashok Leyland will undertake series production of the engine post induction into service.

For over five decades, Ashok Leyland has developed and expanded its scope within the defence space. This partnership with CVRDE has given the company an opportunity to further innovate in the mobility space for defence requirements.

https://www.thehindubusinessline.com/companies/ashok-leyland-in-pact-with-drdo-arm-to-develop-combat-vehicle-engines/article37963448.ece

COVID 19: DRDO's Contribution

Press Information Bureau
Government of India

Ministry of Health and Family Welfare

Wed, 15 Dec 2021 3:57PM

Centre reviews Commissioning, Installation & Functional Status of Oxygen supply Equipments Supplied by it to the States/UTs

Medical Oxygen is an essential Public Health Commodity; its Uninterrupted Supply of Critical Importance

Ensure No Gap between Equipments/Systems supplied, installed and made Fully Functional at Health Facility level

States to Conduct Mock Drills to ensure full Functionality of all Oxygen Equipments

Medical oxygen is an essential public health commodity andits uninterrupted supply in sufficient quantity is of critical importance to tackle the pandemic. This was underlined by Shri Rajesh Bhushan, Union Health Secretary as he addressed the meeting with States and UTs to review the status and their preparedness regarding Medical Oxygen devices and systems (PSA Plants, LMO Plants, Oxygen Concentrators, Medical Gas Pipeline System), through a video conference today.

Informing the States and UTs that the Union Government has assisted them through availability of equipment, technical and financial support for PSA plants, oxygen concentrators, ventilators, oxygen cylinders, Liquid Medical Oxygen (LMO) plants and Medical Gas Pipeline systems (MGPS), the States were urged to review and monitor the status of these on a daily basis to ensure that the gap between the equipments and systems delivered to the Districts and installed at the healthcare facilities is reduced to zero. While equipment and systems have been sanctioned and delivered, in many states these have not been sent to the district healthcare facilities and when delivered, some have still not been made functional. State nodal officers were requested to streamline coordination with Defence Research and Development Organization (DRDO), HLL Infra Tech Services Limited (HITES) and Central Medical Services Society (CMSS) etc., for resolution of electricity related and site related issues for ensuring quick operationalization of the entire medical oxygen supply infrastructure supplied to them.

As on date, a total of 3236 PSA plants have been installed in the country from various sources with a total commissioned oxygen capacity of 3783 MT. Moreover, 1,14,000 Oxygen Concentrators are being provided to States under PM CARES (1 lakh) and ECRP-II (14,000).

It was also pointed out to the States that ECRP-II funds have been sanctioned to them for installation of 958 LMO Storage Tanks and medical gas pipeline systems in 1374 hospitals. States were advised to utilize this opportunity to enhance domestic oxygen production capacity and

ensure the completion, installation and commissioning of medical gas pipelines in government hospitals expeditiously.

The States were strongly urged to schedule and conduct mock drills of all installed and commissioned PSA Plants to ensure that they are in fully operational status, so that the oxygen with the required quantity, pressure and purity reaches the intended patients at their bedside. These drills are to be completed by the end of December 2021. The report to this effect is to be submitted to the Union Health Ministry through designated portals for live tracking and monitoring of the functional status of these equipments. States were also requested to complete the pending Oxygen Audit reports and submit this through the designated portal by the end of December 2021.

The Union Health Ministry is conducting comprehensive training programmes to build and enhances capacities of technicians and clinicians for operation and maintenance of the PSA plants and other medical oxygen related infrastructure. States that have yet to complete the scheduled training programmes were urged to expedite them and complete the pending ones by December end, in coordination with the District Skill development Councils.

Dr Manohar Agnani, AS (HFW), Principal Secretary (Health), Mission Director (NHM) and State Surveillance Officers of all States participated in the review meeting. Representatives from Ministries of Coal, Power, Railways, Petroleum & Natural Gas were also present.

https://pib.gov.in/PressReleasePage.aspx?PRID=1781722

DRDO on Twitter

DRDO @DRDO_India · 9h

#CVRDE has indigenously developed a compact & light weight 600HP engine ab-initio with the help of industry, for futuristic Combat Field Vehicles. Today first cranking of this engine was demonstrated successfully.

#AtmaNirbharta #IconicWeek

DRDO @DRDO_India · 12h

ToT agreements with PSU & industry, handing over of products to user laboratories, release of 'Yatra' compendium on journey of #SSPL, release of secure communication products - Micro Electronic Devices & Computational Systems cluster of DRDO organises

#AmritMahotsav #IconicWeek

DRDO @DRDO_India · 16h

Indigenously developed Magazine Fire Fighting System by Centre for Fire Explosive & Environment Safety #CFEES was demonstrated successfully for its functionality in the presence of @indiannavy #AmritMahotsav #IconicWeek

Defence News

Defence Strategic: National/International

INDIA TODAY

Thu, 16 Dec 2021

Old system till new CDS appointed: Gen Naravane as senior-most service Chief fills in for Gen Bipin Rawat

After the demise of CDS Gen Bipin Rawat and until the new CDS is appointed, Indian Army chief General MM Naravane has taken over as the Chairman of the Chiefs of Staff Committee.

By Abhishek Bhalla

New Delhi: After the demise of India's first Chief of Defence Staff (CDS) General Bipin Rawat, it's back to the old system for the time-being with the senior-most among the three service chiefs taking the mantle as Chairman of the Chiefs of Staff Committee to ensure synergy among the three forces.

Indian Army chief Gen MM Naravane (Photo: File)

Indian Army chief General MM Naravane, being the senior-most, has taken over as the Chairman of the Chiefs of Staff Committee as was the practice before the office of the CDS came into being.

Sources say this is only a stopgap arrangement till the new CDS is appointed. "It is a procedural step that in the absence of a CDS, the senior-most chief takes over as the Chairman, Chiefs of Staff Committee," said an official.

This change was necessitated after General Bipin Rawat along with his wife Madhulika Rawat, his defence assistant Brigadier LS Lidder, staff officer Lt Col Harjinder Singh and ten others died in a helicopter crash on December 8 in Coonoor in Tamil Nadu.

The Chief of Integrated Defence Staff to the Chairman Chiefs of Staff Committee (CISC), who used to report to the CDS, will report to General Naravane for the time-being as he heads the Chiefs of Staff Committee by virtue of seniority.

This is exactly what used to happen in the old system before the CDS was appointed.

Other roles played by CDS

The Chief of Defence Staff also heads the newly created Department of Military Affairs apart from acting as the Permanent Chairman of the Chiefs of Staff Committee.

The second senior-most officer in the Department of Military Affairs is an additional secretary, a three star military officer. Currently, the post is held by Lt Gen Anil Puri.

The Department of Military Affairs plays a key role in promoting jointness in procurement, training and staffing of the services through joint planning and integration of their requirements.

Facilitation of restructuring of military commands for optimal utilisation of resources by bringing about jointness in operations, including through establishment of joint and theatre commands, and promoting use of indigenous equipment by the services are also included in the mandate. While the chiefs continue to head the operations for their respective forces, the CDS has

powers on tri-service administrative issues. Additionally, tri-service training, an essential part of jointmanship, is under the office of the CDS and the Department of Military Affairs.

At the time of appointment of the CDS in 2019, the government issued a statement that said, "He will act as the Principal Military Advisor to Raksha Mantri [RM] on all tri-services matters. The three chiefs will continue to advise RM on matters exclusively concerning their respective services. CDS will not exercise any military command, including over the three service chiefs, so as to be able to provide impartial advice to the political leadership."

https://www.indiatoday.in/india/story/old-system-new-cds-army-chief-general-naravane-bipin-rawat-1888316-2021-12-16

INDIA TODAY

Thu, 16 Dec 2021

Big push for local defence industry, govt to place orders for items in indigenisation lists

This list was prepared by late General Bipin Rawat after holding several rounds of consultations with government and private manufacturing industries.

By Manjeet Negi

New Delhi: With more than 200 items put in the indigenisation list, the defence ministry is going to place orders from the indigenous industry which would mean billions of dollars of business for domestic companies.

Photo for representation

The Defence Ministry under the DMA headed by late Chief of Defence Staff General Bipin Rawat had come out with two lists of 108 items each which had to be mandatorily acquired from local industry with exception only during emergencies.

"The big push to the domestic industry would be through this list as now the Prime Minister's Office has asked us to follow up the positive list with orders for the industry," top government sources told India Today TV. The Sources said the list is being prepared and would be followed up with the stakeholders soon.

This list was prepared by late General Bipin Rawat after holding several rounds of consultations with government and private manufacturing industries to assess future capabilities of Indian industry which will be able to meet the requirements of the Armed Forces.

"The Defence industry can now use the opportunity to build robust Research and Development facilities but also will enhance the self-reliance pursuit of the nation. The second positive list also provides an excellent opportunity for 'start-ups' as MSMEs will also get a tremendous boost from this initiative", defence officials said.

https://www.indiatoday.in/india/story/defence-industry-order-government-big-push-1888285-2021-12-15

The Indian EXPRESS

Thu, 16 Dec 2021

BEL develops customisable drone detection radar with 360-degree coverage

The DDR is capable of monitoring a designated airspace day and night in all weather conditions

By Aksheev Thakur

Bengaluru: The Bharat Electronics Limited (BEL) has developed frequency-modulated continuous-wave (FMCW) drone detection radar to detect and track mini- and micro-class drones and UAVs. BEL officials said that they started working on the product nine months ago.

"It delivers a complete surveillance solution (search and track) to threats from drones/UAVs. The maximum detection range for micro drones are 1 km, mini drones are 2 km and small drones are 3 km. The operating temperature of the radar is -20 degree Celsius to +55 degree Celsius. This is a complete indigenous product developed at the BEL with no Transfer of Technology (ToT) from any other organisation," the official said.

The radar can be controlled and operated remotely through wired communication, it is portable and easy to deploy.

He further added that the drone detection radar (DDR) is capable of providing 360-degree coverage in azimuth. One of the advantages of the radar is that the transmitted power is low and this makes it LPI (Low Probability of Intercept) capable. "Due to its LPl capability, it is extremely difficult for intercept receivers to correctly identify the radar parameters and radar type. Its high processing gain and good range resolution enables very low radar cross section (RCS) target detection. It can also prompt other sensors like electro optical and laser to take countermeasures against the threat by providing target range, azimuth and elevation," the BEL official explained.

The DDR is capable of monitoring a designated airspace day and night in all weather conditions. The radar can be controlled and operated remotely through wired communication. It is easy to deploy and can be carried in backpacks which makes it portable.

The officials say that the product is customisable. "This can be put on a vehicle, jammer and a gun. It has been tested with various flying objects and the capabilities have been demonstrated before the Indian Army and the Indian Air Force," he said.

Drones with Hard kill and Soft Kill mechanism

In September, the Indian Navy signed a contract with the BEL for India's first locally made naval anti-drone system (NADS) with "hard kill" and "soft kill" capabilities. These machines have been developed by the Defence Research Development Organisation (DRDO) and manufactured by the BEL. The system comprises a radar that comes with 360-degree coverage with detection of micro drones up to 4 km and electro-optical/infrared (EO/IR) sensor which can detect micro-drones up to 2 km in select azimuth direction in clear weather. It has radio frequency (RF) detector with a detection capability of RF communication up to 3 km, radio frequency/Global Navigation Frequency Satellite System (RF/GNSS) jammer (jamming up to 3 km for RF/GNSS signals) and a laser-based hard kill system used to neutralise microdrones between 150 m to 1 km. The sensors are integrated through a command post. Soft kill uses electronic warfare measures like jamming. "Under this, we can spoof enemy drones and misdirect them…" an official said.

"In the hard kill, we use lasers to destroy vital segments of the drone leading to its crash. We can burn the target drones. Both soft kill and hard kill options can be exercised," he added.

https://indianexpress.com/article/cities/bangalore/bel-develops-customisable-drone-detection-radar-with-360-degree-coverage-7673961/

THE ECONOMIC TIMES

Thu, 16 Dec 2021

Committee on Defence recommends three aircraft carriers for Navy

By Manu Pubby

Synopsis

Making the point that a carrier each is required for the two coasts, the committee has said in its report submitted in Parliament that a third ship is needed to bridge operational deficiencies as repair work on the colossal vessels is a time-consuming affair.

Making a strong recommendation that the Navy should have three aircraft carriers, the standing committee on defence has suggested that future acquisition plans need to take into consideration the requirement to enhance combat capabilities. The committee also went into the details of winter clothing for troops posted on the northern borders and bulletproof jackets for soldiers but the replies of the government have been deemed as classified and were redacted from the reports.

In its response to queries raised by the committee on acquisition plans, the government has said that "the requirement of the third Aircraft Carrier will be worked out on the Indian Navy's committed liabilities and future acquisition projects", without committing on a timeline

It has also suggested that the Border Roads Organisation (BRO) should concentrate on infrastructure projects along the northern borders and the feasibility of engaging another organisation for the development of coastal roads needs to be considered as an interim measure.

Making the point that a carrier each is required for the two coasts, the committee has said in its report submitted in Parliament that a third ship is needed to bridge operational deficiencies as repair work on the colossal vessels is a time-consuming affair.

"Taking into account the long coastline and hostile adversities on both sides of the Indian peninsula, an aircraft carrier on both sides of the coast is quintessential to uphold operational requirements. However, repair work of a huge vessel such as an aircraft carrier takes a considerably long time. Therefore, to bridge operational deficiencies thus arising, three aircraft carriers are an unavoidable requirement to meet any eventualities," the committee has suggested.

In its response to queries raised by the committee on acquisition plans, the government has said that "the requirement of the third Aircraft Carrier will be worked out on the Indian Navy's committed liabilities and future acquisition projects", without committing on a timeline.

https://economictimes.indiatimes.com/news/defence/committee-on-defence-recommends-three-aircraft-carriers-for-navy/articleshow/88308905.cms

TIMESNOWNEWS.COM

Thu, 16 Dec 2021

8th Indian Ocean Dialogue: Eye on China, India bats for PM Modi's SAGAR doctrine for peace in Indo-Pacific

Speaking at the 8th Indian Ocean Dialogue on Post Pandemic Indian Ocean, MoS, MEA Rajkumar Ranjan Singh said that India's vision for Indo-Pacific envisions peace and prosperity based on a climate of trust.

New Delhi: India, on Wednesday, batted for freedom of navigation and respect for maritime laws in the Indian Ocean Region (IOR) and greater Indo-Pacific. Speaking at the 8th Indian Ocean Dialogue on Post Pandemic Indian Ocean, Minister of State for External Affairs (MoS MEA) Rajkumar Ranjan Singh advocated Prime Minister Narendra Modi's SAGAR doctrine, which spells - Security & Growth for All in the Region.

India bats for PM's SAGAR doctrine for peace in Indo-Pacific | Photo Credit: ANI

"India's vision of the Region is the pulse on SAGAR doctrine - Security and Growth for All in the Region as outlined by our PM encompassing political, security, economic and socio-cultural spheres," Singh said.

Singh further said that the doctrine envisions the Indian Ocean Region and the greater Indo-Pacific as a region of peace and prosperity based on a climate of trust and transparency, respect for international maritime rules, equal access as a right under the international law, peaceful resolution of the dispute and enhanced maritime cooperation.

Singh's repeated reference to respect for maritime laws and peaceful resolution of disputes comes at a time when the global community is watching with caution, China's expansionist manoeuvres in the Indo-Pacific region. While the occasional presence of Chinese submarines near its Exclusive Economic Zones (EEZ) has alarmed New Delhi, Beijing's claims on Pacific Islands has disturbed its equations with Japan and other neighbouring nations in the South China Sea.

US, Australia, India, UK and Japan have established the Quad and AUKUS dialogues in a subtle effort to counter the Chinese presence in the region. While China has often claimed that the Indian Ocean is not India's Ocean, New Delhi and its allies have carried out naval exercises advocating freedom of navigation in the Pacific Region, including the South China Sea.

https://www.timesnownews.com/india/article/8th-indian-ocean-dialogue-eye-on-china-india-bats-for-pm-modis-sagar-doctrine-for-peace-in-indo-pacific/840698

दैनिक भास्कर

Thu, 16 Dec 2021

दूसरे देशों में निर्यात होगा बीएमसीएस:दूसरे देशों में निर्यात होगा राजगीर में बना बीएमसीएस, चार देश खरीदने को इच्छुक

आयुध निर्माणी नालंदा में बन रहे बाई मॉड्यूलर चार्ज सिस्टम (बीएमसीएस) में दूसरे देशों ने भी रुचि दिखाई है। महाप्रबंधक मनोज श्रीधर वाघ ने बताया कि आयुध निर्माणी में बन रहे आधुनिकतम बीएमसीएस की उत्पादन क्षमता को बढ़ाया गया है। पहले भारत इसकी खरीद साउथ अफ्रीका से करता था। अब इसका निर्माण नालंदा आयुध निर्माणी में नई टेक्नालॉजी के से किया जा रहा है। इसका निर्यात अब दूसरे देशों में किया जाएगा। आयुध निर्माणी नालंदा से चार देश संपर्क किया है। ट्रायल लेने के बाद इसे यहां से दूसरे देशों में भेजा जायेगा। जल्द ही उड़ीसा में इसका ट्रा॓यल किया जाएगा। ट्रा॓यल की प्रक्रिया पूरी होने के बाद निर्यात शुरू कर दी जाएगी।

राजगीर में जानकारी दे रहे महाप्रबंधक

महाप्रबंधक ने कहा कि यह हमारे लिए गर्व की बात है हम इसे दूसरे देशों से लेते थे । लेकिन आज हम खुद नए टेक्नोलॉजी के माध्यम से निर्माण कर अब दूसरे देशों में निर्यात करेंगे। उन्होंने कहा कि बहुत कम लागत पर इसका निर्माण किया जा रहा है। फिलहाल सेना के लिए प्रति वर्ष 4 लाख मॉडल तैयार कर रहे हैं। अब जरूरत के अनुसार इसे बढ़ाया भी जाएगा। उन्होंने कहा कि जल्द ही नालंदा में दो यूनिट और चालू होगा। जिसकी सारी प्रक्रियाएं पूरी कर ली गई है। आयुध निर्माण में अब तक 7 लाख 50 हजार बीएमसीएस बना चुके है। उन्होंने कहा कि 14 अप्रैल 1999 में तत्कालीन रक्षा मंत्री जार्ज फर्नांडीस द्वारा शिलान्यास के पश्चात इस निर्माणी का निर्माण डीआरडीओ द्वारा किया गया। निर्माणी 155 एमएम के आर्टगैलरी तोपों के लिए आधुनिकतम प्रोपेलेंट बीएमसीएस बनाने के लिए स्थापित की गई थी। निर्माणी का उत्पादन वर्ष 2016 से प्रारंभ हुआ और तब से निर्माणी आधुनिक तकनीक पर आधारित महत्व के इस मॉड्यूल का उत्पादन कर प्रति वर्ष निर्धारित उत्पादन लक्ष्य को पूरा कर रहा है। उन्होंने कहा कि आयुध निर्माणी नालंदा गोला बारूद एवं विस्फोटक उत्पादन करने वाली निर्माणियों में नवीनतम इकाई है। जहां पहली बार स्वदेशी प्रणाली के तहत बाई मॉड्यूलर चार्ज सिस्टम बीएमसीएस का उत्पादन किया जा रहा है।

तीन तरह का हो रहा उत्पादन

कहा कि निर्माणी में प्रमुखत: तीन प्रकार की प्रतीरक्षा सामग्रियों का उत्पादन किया जा रहा है। पहला बाई मॉड्यूलर चार्ज सिस्टम बीएमसीएस-91 जिसकी मारक क्षमता 6-12 किलोमीटर दूरी तक है। दूसरा बाई मॉड्यूलर चार्ज सिस्टम बीएमसीएस- एम-92 जिसकी मारक क्षमता लगभग 40 किलोमीटर है। इसके अतिरिक्त सभी प्रकार के विस्फोटकों के मूल रसायन नाइट्रोसेलुलोज (एनसी) का उत्पादन भी किया जाता है। उन्होंने कहा कि इन मॉड्यूलस को 155 एमएम आर्ट गैलरी तोप से दाग कर निर्धारित लक्ष्य तक गोले को पहुंचाया जाता है। वर्तमान में भारतीय सेना को इसकी प्रबल आवश्यकता को देखते हुए आयुध निर्माणी नालंदा ने इसकी उत्पादन क्षमता को और बढ़ाने के लिए कार्ययोजना तैयार किया है। इसी क्रम में सिंगल बेस प्रोपेलेंट, ट्रिपल बेस प्रोपेलेंट के उत्पादन के लिए एनसी -एनजी यंत्र के निर्माण की दिशा में तेजी से कार्य हो रहा है। उन्होंने कहा कि आयुध निर्माणी नालंदा अपने रक्षा उत्पादन के साथ-साथ अपने आसपास

के पर्यावरण , स्वच्छता, संरक्षा, सामाजिक एवं आर्थिक विकास जैसे गंभीर मामलों में भी अपनी भूमिका का निर्वाह कर रहा है। निर्माणी से लगे हुए पर्वतों एवं अन्य स्थानों से वर्षा जल संचयन के लिए गारलैंड ड्रेन तथा उनके संरक्षण के लिए 5 कृत्रिम तालाबों का निर्माण किया गया है। इनमें चार सरोवर निर्माणी परिसर के अंदर है। जबकि एक सरोवर निर्माणी के दूसरे द्वार के पास धन सरोवर के नाम से एक रमणीय स्थल है।

लगाया गया है सौर ऊर्जा प्लांट: उन्होंने बताया कि निर्माणी ने गैर पारंपरिक उर्जा के संवर्द्धन एक मेगावाट के सौर उर्जा संयंत्र की स्थापना की है। जिसके उपयोग से उत्पादन एवं गैर उत्पादन दोनों ही क्षेत्रों में पारंपरिक ऊर्जा की खपत कम हो गई है। उन्होंने कहा कि राष्ट्रीय स्वच्छता मिशन अंतर्गत निर्माणी में उत्पादन अपशिष्ट प्रबंधन के लिए गीले एवं सूखे अपशिष्ट के पृथक्कीकरण तथा निस्तारण के लिए अपशिष्ट प्रबंधन क्षेत्र का निर्माण किया गया है।

8 यूनिट होगी चालू: उन्होंने कहा कि आयुध निर्माणी नांलदा में कुल 8 यूनिट चालू होना है। जिसमें तीन यूनिट पर काम चल रहा है और दो यूनिट जल्द ही चालू होगा। जिसकी तैयारी की जा रही है। बिल्डिंग का भी निर्माण कार्य जल्द शुरू किया जायेगा। इस अवसर पर अपर महाप्रबंधक यूके शर्मा, संयुक्त महाप्रबंधक प्रवीण कुमार, जेपी यादव, दीपक कुमार, रमेश कुमार आदि उपस्थित थे।

https://www.bhaskar.com/local/bihar/patna/rajgir/news/bmcs-made-in-rajgir-to-be-exported-to-other-countries-four-countries-willing-to-buy-129213299.html

Thu, 16 Dec 2021

French Defence Minister Florence Parly to arrive in India on Thursday

Parly will hold wide-ranging talks with her Indian counterpart Rajnath Singh on Friday to enhance defence and security ties between the two countries.

French Defence Minister Florence Parly is scheduled to arrive in India on Thursday on a two-day visit that is aimed at further strengthening the already close bilateral strategic ties, people familiar with the developments said. Parly will hold wide-ranging talks with her Indian counterpart Rajnath Singh on Friday to enhance defence and security ties between the two countries besides delving into pressing regional issues, they said.

French defence minister Florence Parly (left) . (Image: Ludovic MARIN/AFP)

The recent developments in Afghanistan and the situation in the Indo-Pacific region are likely to figure in the talks. It will be Parly's fourth visit to India since 2017. She had visited India in September last year primarily to attend a ceremony in Ambala that was held to induct the first batch of five Rafale jets into the Indian Air Force.

In 2016, India had signed an inter-governmental agreement with France to procure 36 of the aircraft for Rs 59,000 crore. The ties between India and France are on an upswing in the last few years with cooperation witnessing a significant expansion in key areas.

The areas of defence and security, civil nuclear cooperation and trade and investment constitute the principal pillars of the Indo-French strategic partnership. In addition, India and France are

increasingly engaged in new areas of cooperation such as in the Indian Ocean region, climate change and sustainable growth and development.

The two countries share a close degree of convergence on a range of regional and global issues as well including ways to deal with terrorism and extremism. It will be the first high-level visit from France to India after Australia, the UK and the US (AUKUS) announced a security partnership in September.

The AUKUS security will facilitate Australia getting technology to build nuclear-powered submarines. France reacted angrily to the formation of the new alliance as it resulted in Paris effectively losing a multi-billion dollar deal to build 12 conventional submarines for Australia. France is also upset over its exclusion from the alliance.

In October, India and France agreed to strengthen the defence and security partnership by enhancing intelligence and information sharing, bolstering mutual capabilities, and pursuing new initiatives in maritime, space and cyber domains. The two countries resolved to expand the defence ties at a meeting of India-France strategic dialogue in Paris that was co-chaired by NSA Ajit Doval and Emmanuel Bonne, the Diplomatic Advisor to French President Emmanuel Macron.

https://www.news18.com/news/india/french-defence-minister-florence-parly-to-arrive-in-india-on-thursday-4558655.html

Hindustan Times

Thu, 16 Dec 2021

China: PLA conducts nuclear, chemical, biological warfare drill in Tibet

The PLA exercise, including commandos, armoured assault groups and soldiers trained for chemical warfare were drawn from various wings of the army.

By Sutirtho Patranobis, Edited by Amit Chanda

A joint military brigade of China's People's Liberation Army (PLA) has recently carried out a "real combat drill" involving anti-nuclear, chemical and biological warfare in Tibet in the backdrop of the ongoing Sino-India border tension in eastern Ladakh.

The exercise, including commandos, armoured assault groups and soldiers trained for chemical warfare were drawn from various wings of the army.

It was organised by the Tibet military region under the Western theatre command (WTC), the largest of China's five commands that is responsible for the Sino-India disputed border, extending for 3,488 km from Ladakh to Arunachal Pradesh.

Soldiers and vehicles of China's People's Liberation Army (PLA) Marine Corps march during a drill in Taonan, Jilin province. (REUTERS/FILE)

The news of the 24-hour long exercise held in late November was published in an official PLA news portal on Tuesday.

Chinese official military media rarely mentions drills that involve Chinese armed forces and non-conventional weapons.

The article described in brief the nature of the drill and what the participating soldiers were responding to but did not specifically mention where the exercise was held. "A joint military brigade under the Tibet military area command held a real-combat drill on a snowy plateau in late November," the article said.

It was headlined: "A synthetic brigade of the Tibet military region carried out a cross-day and night mobile multi-arm coordinated actual combat drill".

After rockets were launched and the armoured assault group was deployed, army engineers were called in to install explosives on the targeted "obstacle", the article said.

Subsequently, the commanding officer warned of "nuclear, biological and chemical attack". "Encountered a nuclear, biological and chemical attack! Suddenly, an immediate guidance command came. Li Qunfeng, commander of the third battalion, put on gas masks, quickly passed through the poisoned zone, and then reported the situation to the command post, requesting the chemical defence detachment to help and decontaminate."

"The drill closely focused on the 'enemy' situation, focusing on key and difficult subjects such as day and night manoeuvring and multi-arms coordination, and tempered the firepower attack capability of the troops in complex environments," the report added.

The report carried photos of the exercise including one in which soldiers were wearing gas masks.

In a report in November, the US department of defence said China is carrying out research in chemical and biological dual-use technology.

"The PRC has engaged in biological activities with potential dual-use applications, which raise concerns regarding its compliance with the Biological and Toxins Weapons Convention (BWC) and the Chemical Weapons Convention (CWC)," the report said.

"Studies conducted at PRC military medical institutions discussed identifying, testing, and characterising diverse families of potent toxins with dual-use applications."

"Based on available information, the US cannot certify that the PRC has met its obligations under the CWC due to concerns regarding the PRC's research of pharmaceutical-based agents (PBAs) and toxins with potential dual-use applications," the US report added.

The drill in November is likely to have been closely followed by the Indian defence establishment.

It is part of the PLA's continuous efforts to remain combat ready along the Sino-India border, where it is said to have deployed an unknown number of troops - estimates run into thousands - and heavy cache of advanced weaponry.

The PLA has published how it has improved the facilities and living conditions for its border troops in high-altitude areas of Tibet and Xinjiang, indicating that they have been deployed for the long-run.

Indian and Chinese militaries have been locked in a border standoff in eastern Ladakh since May, 2020, when a violent clash in Pangong lake area led to both sides gradually deploying tens of thousands of soldiers as well as heavy weaponry along the border.

Several rounds of military and diplomatic talks have only resulted in partial disengagement of troops until now.

Soldiers were killed on both sides in a brutal fight on the night of June 15 at Galwan Valley.

India has repeatedly and consistently rejected China's allegations that Indian troops crossed over to the Chinese side of the Line of Actual Control in eastern Ladakh, asserting that New Delhi has always taken a responsible approach towards border management and maintaining peace and tranquillity in the border areas.

https://www.hindustantimes.com/world-news/china-pla-conducts-nuclear-chemical-biological-warfare-drill-in-tibet-101639551500287.html

Thu, 16 Dec 2021

Quantum theory needs complex numbers

Physicists construct theories to describe nature. Let us explain it through an analogy with something that we can do in our everyday life, like going on a hike in the mountains. To avoid getting lost, we generally use a map. The map is a representation of the mountain, with its houses, rivers, paths, etc. By using it, it is rather easy to find our way to the top of the mountain. But the map is not the mountain. The map constitutes the theory we use to represent the mountain's reality.

Artistic illustration of the study published in Nature. Credit: Georgy Ermakov and Sergey Lebedyanskiy.

Physical theories are expressed in terms of mathematical objects, such as equations, integrals or derivatives. During history, physics theories evolved, making use of more elaborate mathematical concepts to describe more complicated physics phenomena. Introduced in the early 20th century to represent the microscopic world, the advent of quantum theory was a game changer. Among the many drastic changes it brought, it was the first theory phrased in terms of complex numbers.

Invented by Mathematicians centuries ago, complex numbers are made of a real and imaginary part. It was Descartes, the famous philosopher considered as the father of rational sciences, who coined the term "imaginary," to strongly contrast it with what he called "real" numbers. Despite their fundamental role in mathematics, complex numbers were not expected to have a similar role in physics because of this imaginary part. And in fact, before quantum theory, Newton's mechanics or Maxwell's electromagnetism used real numbers to describe, say, how objects move, as well as how electro-magnetic fields propagate. The theories sometimes employ complex numbers to simplify some calculations, but their axioms only make use of real numbers.

Schrödinger's bewilderment

Quantum theory radically challenged this state of affairs because its building postulates were phrased in terms of complex numbers. The new theory, even if very useful for predicting the results of experiments, and for instance perfectly explains the hydrogen atom energy levels, went against the intuition in favor of real numbers. Looking for a description of electrons, Schrödinger was the first to introduce complex numbers in quantum theory through his famous equation. However, he could not conceive that complex numbers could actually be necessary in physics at that fundamental level. It was as though he had found a map to represent the mountains but this map was actually made out of abstract and non-intuitive drawings. Such was his bewilderment that he wrote a letter to Lorentz on June 6, 1926, stating "What is unpleasant here, and indeed directly to be objected to, is the use of complex numbers. Ψ is surely fundamentally a real function." Several decades later, in 1960, Prof. E.C.G. Stueckelberg, from the University of Geneva, demonstrated that all predictions of quantum theory for single-particle experiments could equally be derived using only real numbers. Since then, the consensus was that complex numbers in quantum theory were only a convenient tool.

However, in a recent study published in *Nature*, ICFO researchers Marc-Olivier Renou and ICREA Prof. at ICFO Antonio Acín, in collaboration with Prof. Nicolas Gisin from the University

of Geneva and the Schaffhausen Institute of Technology, Armin Tavakoli from the Vienna University of Technology, and David Trillo, Mirjam Weilenmann, and Thinh P. Le, led by Prof. Miguel Navascués, from the Institute of Quantum Optics and Quantum Information (IQOQI) of the Austrian Academy of Sciences in Vienna have proven that if the quantum postulates were phrased in terms of real numbers, instead of complex, then some predictions about quantum networks would necessarily differ. Indeed, the team of researchers came up with a concrete experimental proposal involving three parties connected by two sources of particles where the prediction by standard complex quantum theory cannot be expressed by its real counterpart.

Two sources and three nodes

To do this, they thought of a specific scenario that involves two independent sources (S and R), placed between three measurement nodes (A, B and C) in an elementary quantum network. The source S emits two particles, say photons, one to A, and the second to B. The two photons are prepared in an entangled state, say in polarization. That is, they have correlated polarization in a way which is allowed by (both complex and real) quantum theory but impossible classically. The source R does exactly the same, emits two other photons prepared in an entangled state and sends them to B and to C, respectively. The key point in this study was to find the appropriate way to measure these four photons in the nodes A, B, C in order to obtain predictions which cannot be explained when quantum theory is restricted to real numbers.

As ICFO researcher Marc-Olivier Renou comments "When we found this result, the challenge was to see if our thought experiment could be done with current technologies. After discussing with colleagues from Shenzhen-China, we found a way to adapt our protocol to make it feasible with their state-of-the-art devices. And, as expected, the experimental results match the predictions." This remarkable experiment, realized in collaboration with Zheng-Da Li, Ya-Li Mao, Hu Chen, Lixin Feng, Sheng-Jun Yang, Jingyun Fan from the Southern University of Science and Technology, and Zizhu Wang from the University of Electronic Science and Technology is published at the same time as the *Nature* paper in *Physical Review Letters*.

The results published in *Nature* can be seen as a generalization of Bell's theorem, which provides a quantum experiment which cannot be explained by any local physics formalism. Bell's experiment involves one quantum source S that emits two entangled photons, one to A, and the second to B, prepared in an entangled state. Here, in contrast, one needs two independent sources, the assumed independence is crucial and was carefully designed in the experiment.

The study also shows how outstanding predictions can be when combining the concept of a quantum network with Bell's ideas. For sure, the tools developed to obtain this first result are such that they will allow physicists to achieve a better understanding of quantum theory, and will one day trigger the realization and materialization of so far unfathomable applications for the quantum internet.

More information: Miguel Navascués, Quantum theory based on real numbers can be experimentally falsified, *Nature* (2021). DOI: 10.1038/s41586-021-04160-4. www.nature.com/articles/s41586-021-04160-4

Journal information: *Nature* , *Physical Review Letters*

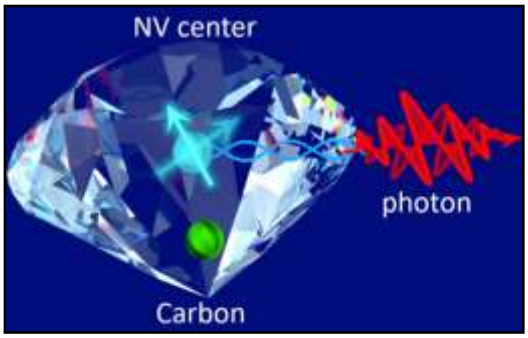
https://phys.org/news/2021-12-quantum-theory-complex.html

PHYS.ORG

Thu, 16 Dec 2021

Flawed diamonds may provide perfect interface for quantum computers

Flaws in diamonds—atomic defects where carbon is replaced by nitrogen or another element—may offer a close-to-perfect interface for quantum computing, a proposed communications exchange that promises to be faster and more secure than current methods. There's one major problem, though: These flaws, known as diamond nitrogen-vacancy centers, are controlled via magnetic field, which is incompatible with existing quantum devices. Imagine trying to connect an Altair, an early personal computer developed in 1974, to the internet via WiFi. It's a difficult, but not impossible task. The two technologies speak different languages, so the first step is to help translate.



By combining the entangled emission demonstrated in this study with the previously demonstrated quantum teleportation transfer from a photon to a nuclear spin in diamond, researchers will generate quantum entanglement between remote locations based on quantum teleportation. Credit: Yokohama National University

Researchers at Yokohama National University have developed an interface approach to control the diamond nitrogen-vacancy centers in a way that allows direct translation to quantum devices. They published their method on December 15 in *Communications Physics*.

"To realize the quantum internet, a quantum interface is required to generate remote quantum entanglement by photons, which are a quantum communication medium," said corresponding author Hideo Kosaka, professor in the Quantum Information Research Center, Institute of Advanced Sciences and in the Department of Physics, Graduate School of Engineering, both at Yokohama National University. "

The promised quantum internet is rooted in more than a century's worth of work in which researchers determined that photons are both particles and waves of light simultaneously—and that their wave state can reveal information about their particle state and vice versa. More than that, the two states could influence each other: pinching the wave could bruise the particle, so to speak. Their very nature is entangled, even across vast distances. The aim is to control the entanglement to communicate discrete data instantaneously and securely.

Previous research has demonstrated this controlled entanglement can be achieved by applying a magnetic field to the nitrogen-vacancy centers, Kosaka said, but a non-magnetic field approach is needed to move closer to realizing the quantum internet.

His team successfully used microwave and light polarized waves to entangle an emitted photon and left spin qubits, the quantum equivalent of information bits in classical systems. These polarizations are waves that move perpendicular to the originating source, like seismic waves radiating out horizontally from a vertical fault shift. In quantum mechanics, the spin property—either right- or left-handed—of the photon determines how the polarization moves, meaning it is predictable and controllable. Critically, according to Kosaka, when inducing entanglement via this property under a non-magnetic field, the connection appears steadfast against other variables.

"The geometric nature of polarizations allows us to generate remote quantum entanglement that is resilient to noise and timing errors," Kosaka said.

According to Kosaka, his team will combine this approach with a previously demonstrated quantum information transfer via teleportation to generate quantum entanglement, and the resulting exchange of information, between remote locations. The eventual goal, Kosaka said, is to facilitate a connected network of quantum computers to establish a quantum internet.

"The realization of a quantum internet will enable quantum cryptography, distributed quantum computation and quantum sensing over long distances of more than 1,000 kilometers," Kosaka said.

More information: Geometric entanglement of a photon and spin qubits in diamond, *Communications Physics* (2021). DOI: 10.1038/s42005-021-00767-1

Journal information: *Communications Physics*

https://phys.org/news/2021-12-flawed-diamonds-interface-quantum.html

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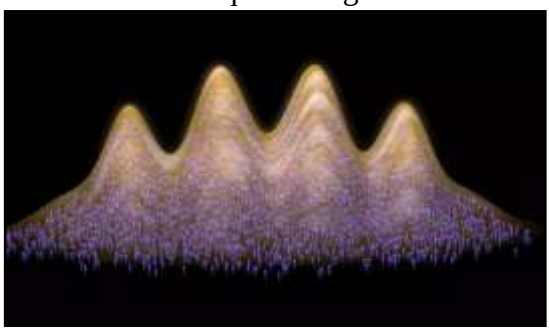
Lanthanoids offer great potential

A quarter of a century after the first creation of Bose-Einstein condensates, the journal *Nature Physics* publishes a focus issue on developments in the field of ultracold quantum gasses and their potential in the future. For example, in what direction will atomic microscopes, optical tweezers, or new laser traps develop? What potential lies in quantum gasses from lanthanides has been detailed by Francesca Ferlaino and Matthew Norcia from the Department of Experimental Physics at the University of Innsbruck and the Institute of Quantum Optics and Quantum Information of the Austrian Academy of Sciences in a review article in the special issue.



Researchers have obtained evidence of supersolidity in lanthanoids. Credit: Uni Innsbruck

When ultracold quantum gasses were started to be condensed three decades ago, simple particles from the group of alkali or alkaline earth atoms, with only one or two electrons in their outer shells, such as lithium or rubidium, were chosen for this purpose. They were used to realize the first Bose-Einstein condensates, which was celebrated in 2001 when Eric Cornell, Wolfgang Ketterle and Carl Wieman were awarded the Nobel Prize in Physics.

A decade later, first research groups, including a team led by Francesca Ferlaino at the University of Innsbruck, were beginning to condense more complex particles, the lanthanides. These are silvery, relatively soft and reactive metals. Their atoms have many electrons in their outer shells, and they are also magnetic.

"At first glance, this sounds like making life unnecessarily complicated, and at the time it wasn't clear whether these elements could be condensed in the same way as the simpler elements," Ferlaino says. "But as it turned out, after a lot of work, the lanthanides, especially erbium, were a stroke of luck: Because of the many ways they can absorb photons, cooling is actually easier. And the multiple ways in which these atoms interact make it possible to perform entirely new kinds of experiments."

In 2012, for example, Francesca Ferlaino's team succeeded in condensing erbium for the first time. Since then, many research groups have realized these potentials, and there are now scores of groups around the world working on ultracold quantum gasses of more complex elements.

In the review article in *Nature Physics*, Ferlaino and Norcia present the properties of lanthanides and elaborate on their potential for research.

More information: Matthew A. Norcia et al, Developments in atomic control using ultracold magnetic lanthanides, *Nature Physics* (2021). DOI: 10.1038/s41567-021-01398-7

Journal information: *Nature Physics*

https://phys.org/news/2021-12-lanthanoids-great-potential.html

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Study finds a longer lasting Covid vaccine

California: Researchers have found rare naturally occurring T cells that are capable of targeting a protein found in SARS-CoV-2 and a range of other coronaviruses. The study has been published in the 'Cell Reports Journal'. The findings suggested that a component of this protein, called viral polymerase, could potentially be added to Covid-19 vaccines to create a longer-lasting immune response and increase protection against new variants of the virus.

Most Covid-19 vaccines use a part of the spike protein found on the surface of the virus to prompt the immune system to produce antibodies. However, newer variants -- such as delta and omicron -- carry mutations to the spike protein, which can make them less recognizable to the immune cells and antibodies stimulated by vaccination. Researchers said that a new generation of vaccines will likely be needed to create a more robust and wide-ranging immune response capable of beating back current variants and those that may arise in the future.

One way to accomplish this was by adding a fragment of a different viral protein to vaccines -- one that is less prone to mutations than the spike protein and that will activate the immune system's T cells. T cells are equipped with molecular receptors on their surfaces that recognize foreign protein fragments called antigens. When a T cell encountered an antigen its receptor recognized, it self-replicated and produced additional immune cells, some of which target and kill infected cells immediately and others which remain in the body for decades to fight that same infection should it ever return. The researchers focused on the viral polymerase protein, which is found not only in SARS-CoV-2 but in other coronaviruses, including those that cause SARS, MERS and the common cold. Viral polymerases serve as engines that coronaviruses use to make copies of themselves, enabling infection to spread. Unlike the spike protein, viral polymerases are unlikely to change or mutate, even as viruses evolve.

To determine whether or not the human immune system has T cell receptors capable of recognizing viral polymerase, the researchers exposed blood samples from healthy human donors (collected prior to the COVID-19 pandemic) to the viral polymerase antigen. They found that certain T cell receptors did, in fact, recognize the polymerase. They then used a method they developed called CLInt-Seq to genetically sequence these receptors. Next, the researchers engineered T cells to carry these polymerase-targeting receptors, which enabled them to study the receptors' ability to recognize and kill SARS-CoV-2 and other coronaviruses.

More than 5 million people have died from Covid-19 worldwide. Current vaccines provide significant protection against severe disease, but as new, potentially more contagious variants emerge, researchers recognized that vaccines may need to be updated -- and the new UCLA findings point toward a strategy that may help increase protection and long-term immunity. The researchers are now conducting further studies to evaluate viral polymerase as a potential new vaccine component. Pavlo Nesterenko, a UCLA graduate student, is the study's first author; the corresponding author is Dr Owen Witte, who holds the presidential chair in developmental immunology in the UCLA Department of Microbiology, Immunology and Molecular Genetics and is founding director emeritus of the Broad Stem Cell Research Center.

The research was supported by the Parker Institute for Cancer Immunotherapy, a Ruth L. Kirschstein Institutional National Research Service Award from the National Institutes of Health and the UCLA W.M. Keck Foundation COVID-19 Research Award Program.

https://timesofindia.indiatimes.com/world/us/study-finds-a-longer-lasting-covid-vaccine/articleshow/88297222.cms