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अमर उजाला

Thu, 03 Dec 2020

वायुसेना ने परखा स्वदेशी एयर डिफेंस मिसाइल सिस्टम आकाश, रूस की इगला मिसाइल भी आजमाई

नई दिल्ली: भारतीय वायुसेना ने चीन के साथ चल रहे तनाव के बीच स्वदेश में विकसित एयर डिफेंस मिसाइल सिस्टम आकाश और कंधे पर रखकर छोड़ी जाने वाली रूस निर्मित इगला मिसाइल का परीक्षण किया। वायुसेना अधिकारियों ने बताया कि यह परीक्षण नियमित अभ्यास के तहत आंध्र प्रदेश में सूर्यलंका एयरफोर्स स्टेशन पर मंगलवार को किया गया।

मिसाइलों का परीक्षण करते भारतीय जवान - फोटो: ani

सतह से हवा में मार करने वाले इन एयर गाइडेड हथियारों की फायरिंग के अभ्यास के गवाह वाइस चीफ ऑफ एयर स्टाफ एयर मार्शल एचएस अरोड़ा भी रहे। अधिकारियों ने बताया कि मिसाइल लांच करने की यह एक्सरसाइज 23 नवंबर से 2 दिसंबर तक चल रहे नियमित अभ्यास का हिस्सा थी। इसका मकसद वायुसेना कर्मियों को असली युद्ध जैसी परिस्थितियों जैसा अभ्यास कराना है। एक अधिकारी ने कहा, जब देश लगातार कोविड-19 महामारी की अभूतपूर्व चुनौती का सामना कर रहा है, तो भारतीय वायुसेना मौजूदा सुरक्षा हालात पर नजर बनाए रखने के साथ ही लगातार अपनी परिचालन क्षमता परख रही है। वायुसैनिकों को संबोधित करते हुए एयर मार्शल अरोड़ा ने अभ्यास में भाग ले रही युद्धक स्क्वाड्रनों के पेशेवर रुख की प्रशंसा की। उन्होंने जवानों से अभ्यास में सीखी बातों को किसी भी सामने आने वाले हालात में उपयोग करने के लिए तैयार रहने को कहा।

लद्दाख में तैनात हैं आकाश सिस्टम और इगला

भारत ने चीन के साथ पूर्वी लद्दाख में वास्तविक नियंत्रण रेखा (एलएसी) पर चल रहे गतिरोध के बीच दुश्मन के जंगी जहाजों व हेलिकॉप्टरों को दूर रखने के लिए आकाश सिस्टम तैनात किया है। साथ ही इगला मिसाइल सिस्टम भी वहां तैनात किया गया है।

डीआरडीओ ने विकसित किया है आकाश

परमाणु हथियार ले जाने की क्षमता रखने वाले आकाश मिसाइल सिस्टम को भारतीय रक्षा अनुसंधान व विकास संगठन (डीआरडीओ) ने डिजइन किया है। इसकी हर एक मिसाइल 30 किलोमीटर के दायरे में 19 किलोमीटर की ऊंचाई तक लक्ष्य को भेद सकती है। करीब 4 हजार किमी/घंटा की सुपरसोनिक गति वाली आकाश मिसाइल का वजन 720 किलोग्राम और लंबाई 5.8 मीटर है। यह 60 किलोग्राम विस्फोटक ले जा सकती है। इसे स्वदेश निर्मित राजेंद्र रडार से लैस किया गया है। एक मिसाइल डिफेंस सिस्टम में चार

लांचर, एक राजेंद्र रडार होते हैं और हर लांचर पर तीन आकाश मिसाइल तैनात की जाती हैं। एक लांचर एक समय में 16 लक्ष्य को ट्रैक कर सकता है यानी 64 लक्ष्यों पर हर समय नजर रहती है और राजेंद्र रडार के एक इशारे पर एक साथ 12 आकाश मिसाइल अलग-अलग लक्ष्य भेदने निकल जाती हैं।

https://www.amarujala.com/india-news/indian-air-force-testfires-indigenous-akash-and-russian-igla-missiles

NEWS NATION

Thu, 03 Dec 2020

स्वदेशी आकाश और रूसी इगला रक्षा मिसाइलों का किया गया अभ्यास, जानें क्यों

आंध्र प्रदेश के सूर्यलंका में भारतीय वायुसेना स्टेशन पर स्वदेशी आकाश और रूसी इगला रक्षा मिसाइलों का परीक्षण करने पर बड़े पैमाने पर अभ्यास किया गया

नई दिल्ली: आंध्र प्रदेश के सूर्यलंका में भारतीय वायुसेना स्टेशन पर स्वदेशी आकाश और रूसी इगला रक्षा मिसाइलों का परीक्षण करने पर बड़े पैमाने पर अभ्यास किया गया। वायुसेना उप प्रमुख एयर मार्शल एचएस अरोड़ा के मौजूदगी में आकाश और इगला रक्षा मिसाइलों का हवाई अभ्यास किया गया।

आईएएफ (IAF) के वाइस चीफ एयर मार्शल एचएस अरोड़ा ने 1 दिसंबर को एयरफोर्स स्टेशन सूर्यलंका में कंबाइंड गाइडेड वेपंस फायरिंग 2020 के एक हिस्से के रूप में सर्फेस टू एयर गाइडेड वेपन फायरिंग देखी।

अभ्यास 23 नवंबर से 2 दिसंबर तक किया गया। रूसी लघु-रेंज इगला मिसाइलों के साथ स्वदेशी आकाश मिसाइल प्रणाली का भी अभ्यास किया गया। जहां देश को COVID-19 महामारी की अभूतपूर्व चुनौती का सामना करना पड़ रहा है, वहीं भारतीय वायुसेना मौजूदा सुरक्षा स्थिति पर नजर रखने के साथ अपनी संचालन क्षमताओं को जारी रखना चाहती है।

स्वदेशी आकाश और रूसी इगला रक्षा मिसाइलों का किया गया अभ्यास (Photo Credit: ANI)

अधिकारियों को संबोधित करते हुए एचएस अरोड़ा ने वायुसेना की प्रशंसा करते हुए कहा कि कोविड महामारी के बीच सावधानी के साथ इसका आयोजन किया गया। यह बेहद ही सराहनीय है। इसके साथ ही उन्होंने सभी वायु सेना के जवानों से किसी भी उभरते परिचालन परिदृश्य के लिए संयुक्त गाइडेड हथियार फायरिंग (CGWF) 2020 में सीखे गए सभी पाठों को लागू करने के लिए तैयार रहने का आग्रह किया।

https://www.newsnationtv.com/india/news/indigenous-akash-russian-igla-air-defence-missiles-were-testfired-from-iaf-station-suryalanka-in-andhra-pradesh-168452.html

ZEENEWS

Thu, 03 Dec 2020

IAF carries out firing of Akash and Igla missiles in Andhra Pradesh's Suryalanka

India carried out firing of the indigenously developed Akash missile system along with Russian short-range Igla missiles.

The Indian Air Force (IAF) has carried out firing of the indigenously developed Akash missile system along with Russian short-range Igla missiles as part of a drill at air force station Suryalanka in Andhra Pradesh.

Taking to micro-blogging site Twitter, the IAF said that Vice Chief of Air Staff (VCAS) Air Marshal HS Arora witnessed the surface-to-air guided weapons firing drill on December 1. The firing of the missiles was carried out as part of an exercise from November 23 to December 2, officials told news agency PTI.

The IAF tweeted, "Air Marshal HS Arora, VCAS witnessed Missile Firing at IAF Station #Suryalanka on 01 Dec. Indigenous Akash and Russian Igla missiles were fired."

It added, "He commended all personnel for professionalism and urged them to be ready to apply lessons learnt to any emerging operational scenario."

"Akash missile system along with Russian short-range Igla missiles were fired and engaged the Manoeuvrable Expendable Aerial Targets (MEAT) providing near realistic training to the combat crew," an IAF official told PTI.

Air Marshal HS Arora, VCAS witnessed Missile Firing at IAF Station #Suryalanka on 01 Dec. Indigenous Akash and Russian Igla missiles were fired. He commended all personnel for professionalism and urged them to be ready to apply lessons learnt to any emerging operational scenario. pic.twitter.com/ztTgCf6Wrz

"While the country continues to face the unprecedented challenge of COVID-19 pandemic, Indian Air Force continues to hone its operational capabilities with an eye on the prevailing security situation," PTI reported him as saying.

In his address to the air warriors, Air Marshal Arora commended the participating combat squadrons for their professionalism. He urged the air warriors to be ready to apply the lessons learnt in the exercise in any emerging operational scenario, officials told PTI.

https://zeenews.india.com/india/iaf-carries-out-firing-of-akash-and-igla-missiles-in-andhra-pradeshs-suryalanka-2328226.html

onmanorama

Wed, 02 Dec 2020

Indian Navy's BrahMos test is missile's 4th successful mission in 8 days

By Anantha Krishnan M

Bengaluru: The anti-ship version of BrahMos supersonic cruise missile was successfully test-fired by Indian Navy today. According to sources, the missile was fired from INS Ranvijay, a Rajput-class destroyer, in the Bay of Bengal region.

Brahmos anti-ship missile launched by INS Ranvijay struck the target ship at maximum range with pinpoint accuracy in the Bay of Bengal. Photo: Indian Navy

This was the fourth successful test of BrahMos missile in a span of just over a week.

On November 24, the Indian Army had test-fired a land-attack version of the missile. This was followed by another land version launch by both Indian Army and Indian Air Force, on November 25.

It was for the first time ever the three Services tested the readiness of BrahMos systems within the duration of one week.

Sources confirm that today's launch has been carried as a part of the capability-enhancement of the existing system in service with Indian Navy.

On November 24, the Indian Army had test-fired a land-attack version of the missile.

The BrahMos systems were commissioned in the Indian Navy 15 years back and have undergone several upgrades since then.

Tuesday's launch was part of the annual firing and the missile was tested for a range of 290 km.

"The missile found its mark and precisely hit the designated target. As per initial reports, significant damage to the target has been reported and we are waiting for detailed assessment," an official said. The missile was tested against a Battle Practice Target (BPT).

Several Missions

This year, the Navy has undertaken two successful test-firings of BrahMos. On October 18, the missile tested from INS Chennai, successfully penetrated the designated target with pinpoint precision.

In 2020, BrahMos missile had seven successful outings with two launches each being credited to Services, in addition to a developmental trial.

Despite the pandemic and lockdown, the teams of engineers and scientists at BrahMos Aerospace have worked quietly to conduct seven launches this year, out of which four were back-to-back missions spread over a week.

With its precision strike and highest range in its class, the missile holds the rare distinction of near-100-per-cent-accuracy from over 80 trials so far.

The missile has been tested against variety of targets on sea and land, including decommissioned warships and BPTs mimicking full displacement warships and land targets.

Enabling Jointness

The back-to-back BrahMos tests have given a huge boost to the confidence of the users.

"These successive tests are very important as they provide similar logistical and operational challenges, which we face in the actual operational scenario. Such firing checks operational preparedness of Services and establishes high reliability, confidence and operational expertise of system," a military official said.

With emphasis on jointness among the Services, the recent trials have proven the versatility of the missile and its systems.

In January this year, during the induction of Sukhois armed with BrahMos into the resurrected No 222 Squadron (The Tigersharks) at the Air Force Station (AFS) Thanjavur, Chief of Defence Staff Gen Bipin Rawat had spoken at length about the jointness among armed forces.

"Su-30MKI with BrahMos will be a game-changer. It will enhance the might of our own maritime domain. My role primary lies in jointness and integration. The first chapter in jointness and integrated military missions has been scripted at this temple town," Gen Rawat had said.

At the DefExpo2020 in Lucknow, Dr Sudhir Kumar Mishra, CEO & MD of BrahMos Aerospace told Onmanorama that the new variant of the missile, BrahMos-NG will be ready by 2024.

"There are several improvements coming into the BrahMos. It is a great missile and every three, six, nine months we are coming out with new additions. We keep evolving so as to give different strategies to our armed forces," Dr Mishra had said.

(The writer is an independent aerospace and defence journalist, who blogs at Tarmak007 and tweets @writetake.).

https://www.onmanorama.com/news/nation/2020/12/01/indian-navy-brahmos-test-4th-successful-mission-in-8-days.html

Defence News

Defence Strategic: National/International

THE NEW INDIAN EXPRESS

Thu, 03 Dec 2020

INS Vikrant will be commissioned by 2022, says Vice Admiral Chawla

Its sea trials expected to begin next year | CSL and Navy have completed the Basin Trials

Kochi: Vice Admiral Anil Kumar Chawla, Flag Officer Commanding-in-Chief, Southern Naval Command (SNC), said here on Wednesday that the country's first indigenous aircraft carrier -- INS Vikrant -- will be commissioned by early 2022. The sea trials are expected to begin in 2021. The Cochin Shipyard Limited and the Indian Navy had completed the Basin Trials of the aircraft carrier.Vice Admiral Chawla said, "Vikrant should commence the sea trials by the first half of next year. The machinery trials are just a small part of the trials of a ship. Its worthiness is dependent upon proving the flight operations on board the ship. A number of other formalities are also there before the ship will be commissioned," he told reporters.

The SNC chief also expressed preparedness in dealing with threats from adversaries amid the current tension between India and China."We are concentrating on further building our strengths including force levels, operational capabilities, human resources and partnerships. The present situation has given us added impetus and I don't think they will create any mischief on the sea if we remain strong and prepared," Chawla said.

File pic

The vice admiral also stressed upon the growing importance of anti-submarine warfare in the Indian Navy, which is planning to acquire a submarine of the Scorpene class before the end of this month. The navy will also be procuring multi-role helicopters (MRH) from the United States to strengthen its anti-submarine warfare capabilities."We have recently acquired a maritime reconnaissance and anti surveying warfare aircraft which has enhanced our capability for anti-submarine warfare to a great extent. Our ships are also equipped with sonars," he said.

The threat from sophisticated submarines has forced the Indian Navy to improve its own capabilities.

Highlighting the rapid increase in drug captures over the past few years, Chawla said operations centred at the naval base in Kochi, in coordination with all other agencies, are being carried out to curb the menace.

"Currently, fishing boats don't have reporting systems on board. We are collaborating with ISRO and state government to solve this.

The installation of the same in all fishing boats will also enhance the safety of fishermen during disasters," he said.The Navy is striving to strengthen security at fishing harbours and fish landing centres and are educating fishermen to report any suspicious activity on the seas, Vice Admiral Chawla added.

Navy touches new high

Despite the coronavirus outbreak, the Southern Naval Command touched a new high in the number of trainees this year. During the pandemic, the Indian Navy deployed ships as part of the Vande Bharat mission under Operation Samudra Setu for the repatriation of nearly 15,000 Indian citizens from Maldives, Iran and West Asian countries. Hospitals under the Southern Naval Command also coordinated with state hospitals and the navy organised community kitchens to support migrant labourers.

https://www.newindianexpress.com/nation/2020/dec/03/ins-vikrant-will-be-commissioned-by-2022-says-vice-admiral-chawla-2231093.html

Hindustan Times

Thu, 03 Dec 2020

Indian Navy ensured deterrence against any misadventure by PLA navy: Vice Admiral Chawla

The vice admiral was responding to a query on whether there was a clamour for India to assert itself in seas during the tense border standoff in eastern Ladakh involving the troops of the two countries

Kochi: The Indian Navy did play a crucial role in preventing any misadventure by the Chinese Navy in the Indian Ocean Region during the peak of the border standoff between the two countries, a top Navy officer said on Wednesday.

Vice Admiral AK Chawla, Flag Officer Commanding-in- Chief, Southern Naval Command, told a press conference here the Indian Navy ensured "deterrence" against any misadventure by the PLA navy in Indian Ocean Region at that time.

Vice Admiral AK Chawla, Flag Officer Commanding-in-Chief Southern Naval Command (SNC), presents Vishisht Seva Medal (VSM) to Rear Admiral Tarun Sobti during Naval Investiture ceremony, in Kochi.(PTI)

"I think the message has gone across to them very unambiguously that do not mess with us at sea and also at land for that matter," he said.

The vice admiral was responding to a query on whether there was a clamour for India to assert itself in seas during the tense border standoff in eastern Ladakh involving the troops of the two countries.

Asked whether India continues to remain alert and collaborate with friendly neighbours and other navies operating in the region, he said, "the answer is very simple.

We are very strong." "I don't think that anybody can play a mischief at sea against India," he said.

He said the Indian Navy is concentrating on further building its capabilities.

"Our forces have operational capabilities. We remain strong. We remain prepared...," he said.

India and China have held eight rounds of high-level military talks till November during the over six month long tense border standoff in eastern Ladakh which also saw a bloody clash that left 20 Indian soldiers dead, with the Chinese side also reportedly suffering casualties.

https://www.hindustantimes.com/india-news/indian-navy-ensured-deterrence-against-any-misadventure-by-pla-navy-vice-admiral-chawla/story-y3c3By8qxYR8d7qA7i8pPI.html

FINANCIAL EXPRESS
Read to Lead

Thu, 03 Dec 2020

Evolution of Indian Navy to a battle Ready Maritime Theatre Command

To achieve its National objective, the Indian Navy has undertaken many long term initiatives like Shipbuilding programme being one of the primary efforts

By Milind Kulshreshtha

India has a long coastline of 7,516 Kms which includes about 1,100 offshore islands and a large Exclusive Economic Zone (EEZ) of 2.01 million sq km. India's maritime role has gained higher importance in the current geopolitical and security situation prevailing in the Indo-Pacific and IOR regions. Indian Navy has accordingly developed the capability to achieve superiority in a limited Regional conflict and as a decisive forward-deployed naval power. It has been also designated as the sole authority responsible for the overall maritime security of India, which includes coastal security and offshore units.

Indian Navy is actively involved in the joint Naval exercises with multinational Naval tasks forces like MALABAR, SITMEX, SIMBEX, etc.

To achieve its National objective, the Indian Navy has undertaken many long term initiatives like Shipbuilding programme being one of the primary efforts. The indigenous warships construction has come a long way since its launch in the early 1970s. Today India is one of the few nations which are building their own Aircraft carriers and submarines. The indigenous warship construction has also spurred the local industry. The need to integrate Russian or Western weapon systems with indigenous systems led to ingenious digital technology growth and todayNaval establishments are developing niche solutions like Software Defined Radios (SDRs), Combat Management systems, Tactical Data link, Cybersecurity and Space ISR (Intelligence, Surveillance and Reconnaissance) systems with support from Defence PSUs and private industry.

Joint Naval Operations

With the emerging Chinese security threat to India's sovereignty, the land border tensions are likely to be extended to the high seas. China's single focussed agenda to increase its influence in the Indo-Pacific and IOR so as to ensure preserving unhindered crucial 'silk' sea lane traffic at all times, especially during the hostilities. China's confrontationist approach in the South China Sea in the international waters has also made the World concerned.

Indian Navy is actively involved in the joint Naval exercises with multinational Naval tasks forces like MALABAR, SITMEX, SIMBEX, etc. The primary objective here is to gain operational and doctrinal expertise, learn the 'best practices' and enhanced inter-operability for improved Maritime Domain Awareness. India has also constituted SAGAR (Security And Growth for All in the Region) to ensure free, and a cooperative and collaborative rules-based order for all in at the international waters. Similarly, MILAN initiative since 1995 is a multinational Naval interaction held biennially at Port Blair to discuss issues related to maritime security, humanitarian assistance, etc.

Maritime Theatre Command (MTC)

With the constitution of DMA (Department of Military Affairs) and appointment of Chief of Defence Staff (CDS)to head it, in 2020 the Indian Armed Forces commenced the process of creating Theatre Commands to achieve higher battle readiness and response proficiency. CDS as permanent Chairman of Chiefs of Staff Committee, which includes the three Chiefs as members

now have the tri-services mantle. Indian Armed Forces presently comprise of seven Commands each for Army and the Air Force and, further, three Commands for Navy. As part of the reforms, these single-service commands are to be re-organised into only five Joint Theatre Commands for tactical advantages. The Theatre Level Commands are expected to also address the issue regarding India's preparedness for a two-theatre war w.r.t. the size and composition of the Indian forces necessary for optimal military readiness at any given time to tackle two major regional contingency.

The plans to launch Maritime Theatre Command as first of the five Theatre level commands is scheduled for formation in 2021. The others planned are one Air Defence Theatre Command and other three commands for land forces. Multiple inter-services Commands and Institutions such as the Strategic Forces Command, Andaman and Nicobar Command (ANC) and the Integrated Defence Staff (IDS) are already functioning.

MTC Organisation

As per the geography of the Indian peninsula and the threat scenario, the Indian Navy has three commands with Western and Eastern Naval commands as the Operational Commands and the Southern command mainly focused as the Training command. The implementation of MTC shall see the formation of one Maritime Theatre Command headed by a Vice Admiral as the Commander-in-Chief (C-in-C). Under the MTC, the maritime units of the IAF and the Army along with the Indian Coast Guard shall be operationally conjoined with the Indian Navy and no additional resources are being budgeted by MoD here. IAF's maritime assets are the Jaguars fighter jets based at Jamnagar and Su-30MKIs/Tejas at Thanjavur and Army's amphibious brigades are located at Port Blair and Thiruvananthapuram. Under the C-in-C, two verticals for IAF and Army shall be formed and each of the verticals shall be headed by two-star IAF and Army officer. Through the Chiefs of Staff Committee, the C-in-C shall be responsible to the CDS. The Chief of Naval Staff shall be part of Chiefs of Staff Committee headed by CDS and shall hold a crucial administrative role for resource planning and training for the Indian Navy. The functional details of the MTC shall be guided by the Indian Armed Forces Joint Doctrine document of 2017.

INS Kadamba at Karwar shall house the C-in-C headquarter for MTC. INS Kadamba was commissioned in 2005 as the Base Depot Ship at Naval Base, Karwar as part of the Phase which was codenamed Project Seabird with the main aim of decongesting Mumbai naval base. The conclusion of Phase II of the project shall establish larger infrastructure like additional jetties, specialized submarine pens and Naval airfield. Now with MTC Headquarter and Staff planned to be positioned at Karwar, an impetus to work progress shall be expected to base a large Western Naval fleet.

Technology Focus for MTC

The Indian Armed Forces Joint Doctrine of 2017provides the stipulations for the MTC Role and Area of Responsibility. However, for a true Theatre level Netcentric Warfare paradigm, various technological gaps amongst the tri-services require to be centrally addressed. The inter-services Interoperability and Inter-changeability are likely to be the primary enablers here. The COMCASA and BECA Indo-US Agreements are now mandated for the multinational joint operations and these factors have to be centrally built for all the five Theatre Level Commands, starting with MTC. The Space and Cyberwarfare technologies shall play an important role in the Theatre Level operations. This is well emphasized in the Joint Doctrines document which states that Information Warfare along with Cyberspace, Space and special operations requires an integrated structure at strategic, operational and tactical levels to achieve a calibrated and coordinated operations in all the three battlespace dimensions.

The implementation of these concepts at the technological level shall be challenging even when all the other administrative aspect falls in place. Here, the private industry with their digital solutioning experience can play an important role. For the resources of the Theatre Command, maintenance support too can see the participation of private Industry (like private shipyards etc.) for long-term sustainability. To achieve the Theatre level operational parameters, still more work is required so as to evolve the underlying joint cooperation technologies and synergizing the three

services. With the growing Chinese aggressiveness, definitely, the time is limited but MTC needs a careful implementation to accrue its real Tactical benefits.

(The author is C4I expert. Views are personal)

https://www.financialexpress.com/defence/evolution-of-indian-navy-to-a-battle-ready-maritime-theatre-command/2141283/

JAGRAN English

Thu, 03 Dec 2020

Indian Navy Day 2020: When is Indian Navy Day 2020? Know about its importance and significance

Indian Navy Day 2020: Indian Navy Day is celebrated every year on December 4 to celebrate the victory of the Indian Navy in the 1971 India-Pakistan war

New Delhi: Naval Day (Indian Navy Day 2020) is celebrated every year on December 4 in the remembrance of Naval jabbers. Navy Day is celebrated as a celebration of the victory of the Indian Navy in the 1971 India-Pakistan war. On December 3, India's airspace and border area were attacked by the Pakistani Army. This attack started the 1971 war. After that, 'Operation Trident' was launched to give a befitting reply to Pakistan.

The operation was launched with a target of Karachi headquarters of the Pakistani Navy. An invading group consisting of a missile boat and two warships attacked a group of ships off the coast of Karachi. For the first time in this war, the ship was attacked with an anti-ship missile. Many ships of Pakistan were destroyed in this attack. During this, the oil tankers of Pakistan were also destroyed.

Navy Day celebration Significance

Navy Day is celebrated commemorating the strength and bravery of the Indian Navy that won the Indo-Pakistan war in 1971. On December 4, 1971, the Indian Navy attacked the Karachi naval base of Pakistan under 'Operation Trident'. Keeping in view the success of this operation, Naval Day is celebrated every year on December 4.

History

The Indian Navy is a maritime part of the Indian Army, which was established in 1612. The East India Company formed an army as the East India Company's Marine to protect its ships. Which was later named Royal Indian Navy. After the independence of India, the Navy was re-constituted in 1950 and renamed the Indian Navy.

Importance

The Indian Navy is a well balanced three-dimensional force, there are three basic purposes to observe Navy Day. First, the welfare of serving personnel and their families. Rehabilitation of battle casualties and resettlement and welfare of ex-servicemen and their families. This also motivates the servicemen and thanks given gesture from all the countrymen.

https://english.jagran.com/india/indian-navy-day-2020-when-is-indian-navy-day-2020-know-about-its-importance-and-significance-10020646

ThePrint

Thu, 03 Dec 2020

Why Indian Navy is getting a camouflage uniform like the Army and Air Force

Navy camouflage uniform that will replace 'Dress No. 10A' — light blue half-sleeve shirt and navy blue trousers — has been introduced for officers. Sailors will get it by October 2021

By Amrita Nayak Dutta

New Delhi: For the first time, the Indian Navy has introduced camouflage uniform on the lines of the Army and the Indian Air Force (IAF) as part of a larger uniform rationalisation and standardisation measure, ThePrint has learnt.

Navy sources said officers started using the new uniform with digital camouflage pattern a few months ago.

Camouflages or battle dress uniforms (BDU) are fatigues that are worn by the armed forces as the standard uniform for combat. The battle dress is generally camouflaged, either in monochrome such as shades of green or brown to approximate the background or in a disruptive pattern as in the latest change.

Chief of Naval Staff Admiral Karambir Singh at the Naval Air Station in Campbell Bay, Great Nicobar Island, on 13 November 2020. Photo: Twitter/@SpokespersonMoD

The new camouflage uniform will be worn by Navy personnel only on Fridays and ashore as of now, the sources said. For sea, there are existing fire retardant overalls, which would be used by the personnel.

Based on a study, which included looking at uniforms worn by navies around the world, the Indian Navy adopted its digital camouflage pattern, the sources said.

"The pattern is formed of small rectangular pixels of colour. This is much more effective camouflage than standard uniform pattern as it mimics the dappled texture and rough boundaries found in natural settings," said a Navy source.

The Navy has the largest number of uniforms at 16 — each for different occasions — among the three services. The Army has nine and the IAF has 15. All the uniforms are numbered.

Navy sources told ThePrint the camouflage uniform, sanctioned in June 2019, will replace Dress No. 10A — the light blue half-sleeve shirt and navy blue trousers.

"Introduction of this uniform for the entire service will eliminate dress No. 10A from the Navy inventory and lead to reduction in the number of uniforms and associated accoutrements being worn by Navy personnel," the Navy source quoted above said.

The uniform has already been introduced for officers. For sailors, it will be introduced by October 2021 as it involves large procurement chains, the source added.

'There would not be a mismatch'

Former Navy spokesperson Captain D.K. Sharma (retd) told ThePrint the trials for the new uniform were carried out when Admiral Sunil Lanba was the Navy chief.

"The uniforms were also introduced in the Naval Academy earlier. It is procured centrally for the sailors from the source and thereafter stitched at various naval bases. Navy uniforms have evolved from the khaki uniform to the blues to the Dungarees/overalls and the disruptive pattern is the latest change," he said.

Navy officers added the move also brings in an uniformity with other foreign navies, who have camouflage uniforms.

"For instance, in exercises with other navies, there would not be a mismatch as against earlier," a senior Navy officer said.

"The blue uniform (which is now being replaced with the camouflage uniform) was also mistaken at times with the IAF uniform. It, too, had a short life of about 10 years," the officer added.

Officers are granted allowances periodically to maintain their own uniforms. All sailors are entitled to free uniforms.

More changes in uniforms

A few other changes have also been introduced by the Integrated Headquarters of Ministry of Defence (Navy) last month with respect to Navy uniforms.

Navy sources said it has been decided that naval personnel will stop wearing dress number 4A and 4B.

Dress number 4A comprises a peaked cap/white turban, white bush jacket, shoulder rank stripes, ribbons, name tally, chest badges, white trousers and uniform accoutrements. It is worn on ceremonial occasions like meeting diplomats or heads of states, etc. 4B is the same as 4A, but with medals instead of ribbons.

Sources said it has also been decided that naval personnel will wear dress number 8A with medals as summer uniform on relevant occasions.

Dress 8A comprises peaked cap/white turban, white half-sleeve shirt, shoulder straps for officers, arm badges of ranks for POs and below, ribbons, name tally, chest badges, white trousers. It is the regular everyday white uniform worn by naval personnel.

Dress number 5 and 6 will not be used for the time being, sources said.

Dress number 6 comprises peaked cap/white turban, white full-sleeve shirt, black bow tie, white mess jacket, shoulder stripes, black summer trousers, and black cummerbund. It is the evening formal mess uniform for winters.

Dress number 5 comprises peaked cap/white turban, white full-sleeve shirt, black bow tie, black mess jacket, stripes on sleeves, black cummerbund, and black winter trousers. It is the summer evening mess uniform.

https://theprint.in/defence/why-indian-navy-now-has-a-camouflage-uniform-like-in-army-and-air-force/556190/

WION

Thu, 03 Dec 2020

India-China standoff: How Indian Navy's MARCOS can change the game along Pangong lake in eastern Ladakh

The Marine Commandos or MARCOS, called Marine Commando Force (MCF) belongs to the special forces team of the Indian Navy

Operation Cactus in the Maldives

Amid the ongoing stand-off between India and China, the Marine Commandos (MARCOS) of the Indian Navy have been deployed in the Pangong lake area in eastern Ladakh.

The Marine Commandos or MARCOS, called Marine Commando Force (MCF) belongs to the special forces team of the Indian Navy.

They have undertaken several covert operations over the years since the 80s with one of the famous being operation Cactus in 1988 when the elite Navy unit freed the Maldives from a coup

and helped to restore President Maumoon Abdul Gayoom's reign in a valiant effort which has become part of India's military history.

During the operation, not a single MARCOS commando was killed ensuring India's predominance in the Indian Ocean Region (IOR).

MARCOS deployed in eastern Ladakh

The idea behind the deployment of the commands in eastern Ladakh where Indian Air Force's Garud operatives and Indian Army's Para Special Forces, which have been there since day one of the conflicts, is to enhance the integration of the three services and provide the naval commandos exposure to extreme cold weather conditions, government sources told ANI.

Navy commandos

"MARCOS have been deployed in the Pangong lake area where the Indian and Chinese forces have been engaged in a conflict situation since April-May timeframe this year," the sources told ANI said.

The Navy commandos are also soon going to get new boats for operations in the lake along with the existing infrastructure for operations in the lake, they said.

Army's Special Forces including the Para Special Forces and Cabinet Secretariat's Special Frontier Force have been operating in eastern Ladakh for carrying out special operations for a long time.

Line of Actual Control

The Indian Air Force's Garud Special Forces moved to hilltops on the strategic heights on the Line of Actual Control (LAC) along with their Igla shoulder-fired air defence systems in the early days of the conflict to take care of any fighter or other aircraft of the enemy which may have tried to violate Indian air space.

The special troops belonging to both the Army and Air Force have been there for more than six months now also, the Indian side had used the special forces to occupy strategic heights along the LAC to preempt the Chinese from doing so.

The Chinese have also maintained special troops on their side of the LAC. The Indian Navy has deployed teams in the Wular lake area

MARCOS in Wular lake area

Indian Navy has deployed teams of its MARCOS in the Wular lake area of **Jammu and Kashmir** to tackle terrorism there.

The Indian Air Force started deploying Garuds in Kashmir valley after the 2016 Pathankot operations to give them the feel of real operations as part of plans of the then Army chief and now Chief of Defence Staff Gen Bipin Rawat.

Soon after their deployment, the Garuds proved their mettle and earned one Ashok Chakra, three Shaurya Chakras, and many other gallantry awards for eliminating a team of terrorists led by the nephew of 26/11 terrorist Zaki Ur Rehman Lakhvi.

After that operation, the Air Force has been sending regular Garud teams for forward deployment in Kashmir valley.

The Indian Army has many of its special forces battalions deployed in the Kashmir valley for counter-terrorist operations including the ones which carried out surgical strikes in 2016.

MARCOS take on LTTE

MARCOS have also undertaken several operations against the LTTE in the 1990s ensuring India's dominance in the unpredictable Sri Lankan zone is kept under control.

They were also deployed in Somalia in 1993 and they were deployed along with the Indian Army during the Kargil war in 1999.

The commandos are trained to undertake anti-piracy operations which they have carried out with clinical precision in the Gulf of Aden which is the hotbed of pirates.

MARCOS in Pangong lake

The area along the Pangong lake will provide the MARCOS a fresh new ground to showcase their skills situated in the **Ladakh**.

They are not only adept at giving support to the Army which they have on several occasions but can undertake missions on their own and can help the Indian Air Force in suppressing the enemy's **air defences** at high altitude.

MARCOS conduct operations

Recently the MARCOS had taken part in a military exercise Andaman and Nicobar with the Indian Army's Parachute Brigade and Indian Air Force amid tensions along the LAC.

The commandos were flown in from IAF's C-130J transport aircraft as they displayed their warfighting capabilities.

The Bull strike mission held in Teressa island in Andaman and Nicobar islands prepared the men for high altitude warfare in the upper Himalayas with the People's Liberation Army(PLA).

https://www.wionews.com/photos/india-china-standoff-how-indian-navys-marcos-can-change-the-game-along-pangong-lake-in-eastern-ladakh-346930#operation-cactus-in-the-maldives-346906

#SWARAJYA

Thu, 03 Dec 2020

Indian Army's winter preparation at LAC blindsides China, PLA now scrambles to make emergency procurement

China is making last minute efforts to make emergency procurements of high-altitude gear and clothing for its troops as they were caught unaware of India's readiness for the harsh winter atop the Eastern Ladkah heights -- that has been the bone of contention between the two Asian majors.

India has occupied critical mountain heights on the southern bank of the Pangong Lake including Rechin La, Rezang La, Mukpari that were unmanned till now.

This along with some other peaks allows India to dominate Spangur Gap under Chinese control and also the Moldo garrison on the Chinese side. This has irked the PLA which has made multiple attempts to dislodge Indian troops leading to instances of warning gunshots being fired.

Indian Army troops at Ladakh (Doordarshan)

Now, witnessing that India continues to occupy heights even as dark winter months approach just as temperatures have started to dip beyond minus 20 degrees Celsius, China is making emergency procurements to keep their troops also deployed at more than 16,000 feet.

Intelligence sources said that Chinese had procured bulk winter clothing meant for 9,000-10,000 feet but with no disengagement taking place and the standoff continuing, China started bulk procurements to winter gear.

Both the Asian majors have refused to blink despite a long and harsh winter ahead, deployment is being enhanced on either sides.

Sources said that PLA Joint Logistics Support Force (JLSF) has constituted a Quality Supervision Team for emergency procurement of Extreme Cold Climate clothing. This team has now been tasked to ensure good quality clothing and fast delivery to forward area troops.

Whereas Indian Army -- having an edge of experience of troop deployment at Siachen heights -- in October made procurement of additional high altitude winter clothing from US keeping in mind the needs of the enhanced troop deployment in Ladakh in peak winter amid the military tussle with China.

It was purchased under the Logistics Exchange Memorandum Agreement (LEMOA) between India and US that facilitates logistical support, supplies and services between the armed forces of the two countries. These include clothing, food, lubricants, spare parts, medical services among other essentials.

Apart from that the Indian Army has also completed establishment of habitat facilities for all troops deployed in the sector, sources said.

The living accommodation that will protect the troops from the severe cold and wind chill factor includes fast erectable modular shelters.

The force has also made state of the art habitat with integrated arrangements for electricity, water, heating facilities, health and hygiene have been recently created to accommodate the troops. These shelters can withstand temperatures dipping to minus 50 degrees Celsius.

India and China are engaged in an eight-month-long standoff at the Line of Actual Control in Eastern Ladakh. Despite several levels of dialogue, there has not been any breakthrough and the deadlock continues.

On June 15, at least 20 Indian soldiers and an unknown number of Chinese troops were killed in a violent clash in the Galwan Valley.

(The story has been published via a syndicated feed, only the headline has been changed)

https://swarajyamag.com/insta/indian-armys-winter-preparation-at-lac-blindsides-china-pla-now-scrambles-to-make-emergency-procurement

The EurAsian Times

Thu, 03 Dec 2020

Indian Rafales 'far superior' to Pakistan's JF-17 Thunder — Chinese military experts make rare admission

By Mansij Asthana

In what seems to be a rare admission, Chinese experts have said that the French-built Rafale fighter jets, procured by India, are far superior to Pakistan Air Force's (PAF) frontline fighters, the JF-17 Thunder.

Even before five of the 36 Rafale fighters made a touchdown at the Indian Air Force's Ambala airbase, military experts have been busy pitting the fighters against Pakistan's JF-17s.

The lightweight, single-engine, multi-role JF-17 fighter was designed in the wake of the PAF seeking a replacement for their aging combat aircraft such as the A-5C, F-7P/PG, Mirage III, and Mirage V.

The aircraft is the end-product of the collaboration of the Pakistan Aeronautical Complex (PAC) and the Chengdu Aircraft Corporation (CAC) of China. Pakistan currently has a fleet of over 100 JF-17 fighter jets, which it has developed with the help of China.

The fighters which can be used for multiple roles, including interception, ground attack, anti-ship, and aerial reconnaissance, are believed to have given the PAF the necessary air power to confront its eastern rival, the Indian Air Force.

However, according to the Chinese news website Sohu, the French Rafales are still considered the most advanced fighters in the world as compared to the JF-17s.

"India bought 36 Rafale fighters from France at a high price, which put a lot of pressure on Pakistan. After all, the Rafale fighter is one of the most advanced fighters in the world. Pakistan does not know its actual capabilities, so it is a little uncertain," Chinese experts, writing for Sohu said.

The 4+ generation Rafale is a twin-engine, canard-delta wing, multirole fighter aircraft equipped with a wide range of weapons.

The fighter which is already ready to be deployed from Ladakh can perform air supremacy, interdiction, aerial reconnaissance, ground support, in-depth strike, anti-ship strike, and nuclear deterrence missions.

JF-17 Block 3

However, last year, Yang Wei, the chief designer of the fighter jet, said the development and production of the JF-17 Block 3 were underway, with the third block seeing an enhancement in information-based warfare capability and weapons.

Moreover, there have been reports of potential deployment of long-range Chinese PL-15 missiles on the upgraded JF-17 jet.

The PL-15 missile, which is a radar-guided weapon, is said to have a greater range than both US-built AMRAAM and the Russian R-77, which is in service with the IAF. The missiles use a conventional rocket motor, unlike the Meteor that will be carried by the IAF's Rafale fighter jets.

According to experts, the PL-15 has a greater range than the Meteor on account of its higher fuel capacity and poses a serious threat to IAF's Rafales.

"The Rafale fighter has now been integrated with the Meteor long-range air-to-air missile. The maximum range of this missile is said to be 150 kilometers,"

The latest version of Xiaolong (JF-17) fighter BLOCK3 is compatible with the Thunderbolt 15 long-range air-to-air missile. It has a range of more than 160 kilometers and a maximum range of 200 kilometers," according to the expert writing for Sohu.

JF-17s Plagued With Issues

Regardless of the claims made by the experts based within China, the word in India is that the Pakistani fighter jets are currently been plagued by maintenance problems.

While Pakistan has gone ahead with the production of the advanced Block 3 variant of the fighters, the problem is that they have been hit by the unavailability of engines and spare parts.

According to Srinjoy Chowdhury, writing for Times Now News, "The reason is the JF-17's Russian-made engine, the RD-93, and the sanctions by the United States of America on Rosoboronexport, the Russian defense trade agency, since 2018. Engines need to be overhauled; they need to be replaced after a certain number of hours of flying. And only Rosoboronexport can ensure overhauling and provide new engines or spare parts."

"The sanctions prevent Rosoboronexport from doing US dollar transactions. So, there are payment issues that the two governments and the concerned banks have not sorted out, sources said. As a result, ensuring the JF-17 is ready to fly is becoming more difficult and will be more so in the future," he said.

For the time being, Pakistan is looking to replace the fighter's Russian RD-93 engines with Chinese versions, however, if they will be capable enough to power the fighters or not is still not clear.

https://eurasiantimes.com/indian-rafales-far-superior-to-pakistans-jf-17-thunder-chinese-military-experts-make-rare-admission/

PHYS.ORG

Thu, 03 Dec 2020

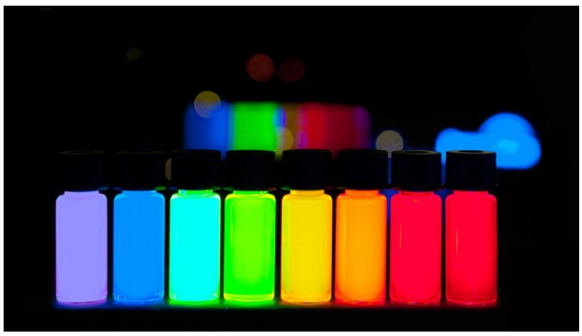
A machine learning solution for designing materials with desired optical properties

By Julie Chao

Understanding how matter interacts with light—its optical properties—is critical in a myriad of energy and biomedical technologies, such as targeted drug delivery, quantum dots, fuel combustion, and cracking of biomass. But calculating these properties is computationally intensive, and the inverse problem—designing a structure with desired optical properties—is even harder.

Now Berkeley Lab scientists have developed a machine learning model that can be used for both problems—calculating optical properties of a known structure and, inversely, designing a structure with desired optical properties. Their study was published in *Cell Reports Physical Science*.

"Our model performs bi-directionally with high accuracy and its interpretation qualitatively recovers physics of how metal and dielectric materials interact with light," said corresponding author Sean Lubner.



Controlling light-matter interactions is central to a variety of important applications, such as quantum dots, which can be used as light emitters and sensors. Credit: PlasmaChem

Lubner notes that understanding radiative properties (which includes optical properties) is equally important in the natural world for calculating the impact of aerosols such as black carbon on climate change.

The machine learning model proposed in this study was trained on spectral emissivity data from nearly 16,000 particles of various shapes and materials that can be experimentally fabricated.

"Our machine learning model speeds up the inverse design process by at least two to three orders of magnitude as compared to the traditional method of inverse design," said co-author Ravi Prasher, who is also Berkeley Lab's Associate Director for Energy Technologies.

Mahmoud Elzouka, Charles Yang, and Adrian Albert, all scientists in Berkeley Lab's Energy Technologies Area, were also co-authors.

More information: Mahmoud Elzouka et al, Interpretable Forward and Inverse Design of Particle Spectral Emissivity Using Common Machine-Learning Models, *Cell Reports Physical Science* (2020). DOI: 10.1016/j.xcrp.2020.100259

https://phys.org/news/2020-12-machine-solution-materials-desired-optical.html

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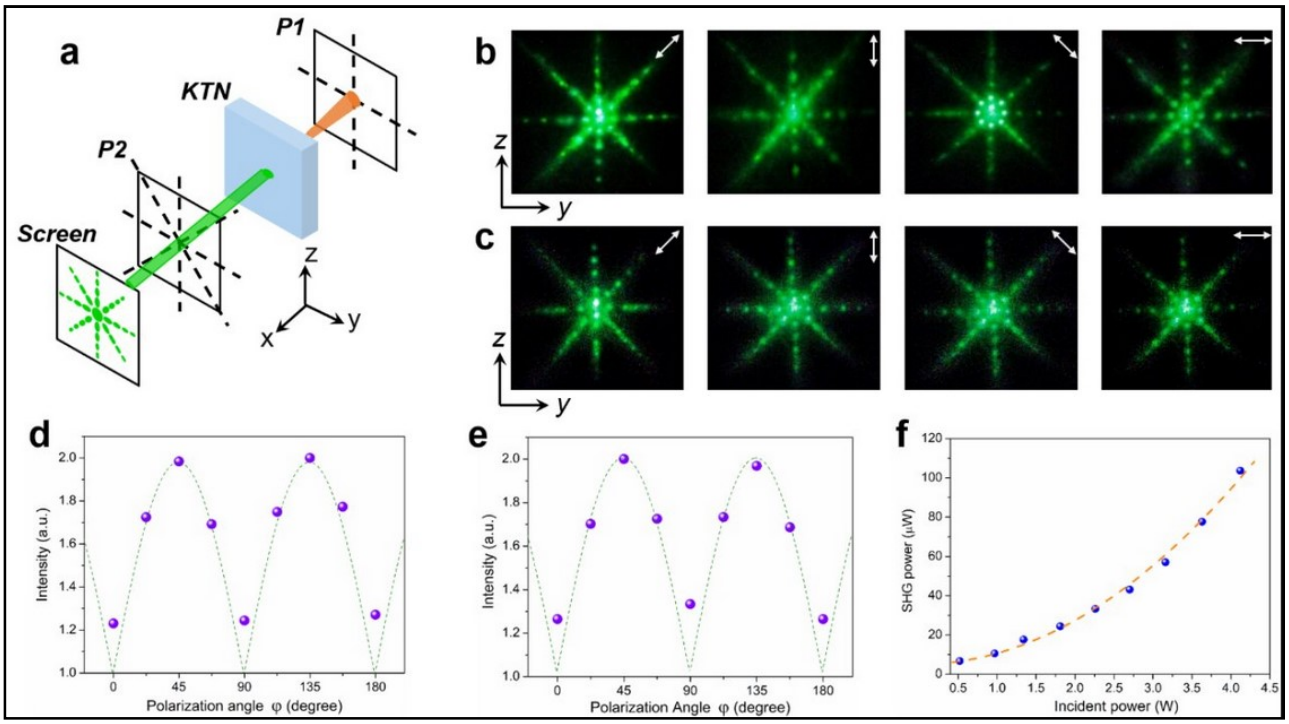
Thu, 03 Dec 2020

Natural three-dimensional nonlinear photonic crystal

Nonlinear photonic crystals (NPCs) are transparent materials that have a spatially uniform linear susceptibility, yet a periodically modulated quadratic nonlinear susceptibility. These engineered materials are used extensively for studying nonlinear wave dynamics and in many scientific and industrial applications. Over the past two decades, there has been a continuous effort to find a technique that will enable the construction of three-dimensional (3-D) NPCs. Such capability will enable many new schemes of manipulation and control of nonlinear optical interactions.



a, Experimental setup for 3D quasi-phase-matching SHG experiment. b-c, SHG spot in different polarization states when the polarization direction of incident fundamental light is along y-axis (b) and z-axis (c). d-e, Relative intensity of SHG in different polarization states when the polarization direction of incident fundamental light is along y-axis (d) and z-axis (e). f, The relationship between fundamental power and SH power. Credit: Chang Li, Xuping Wang, Yang Wu, Fei Liang, Feifei Wang, Xiangyong Zhao, Haohai Yu, Huaijin Zhang

Till now, only two artificial 3-D NPCs have been constructed using femtosecond laser poling in ferroelectric $LiNbO_3$ and $Ba_{0.77}Ca_{0.23}TiO_3$ crystal. However, both nonlinear crystals only feature up-down ferroelectric domains and no spatially rotating polarization. Therefore, the crystal cutting angle and incident light polarization are still limited to utilize the maximum nonlinear coefficient. The 3-D spatial rotation of ferroelectric domains may break the rigid requirement on incident light in common nonlinear photonic crystals, but seems difficult to reach by traditional electric or light poling technique.

In a new paper published in *Light Science & Applications*, scientists from the State Key Laboratory of Crystal Materials and Institute of Crystal Materials, Shandong University, China, and co-workers showed a natural potassium-tantalate-niobate ($KTa_{0.56}Nb_{0.44}O_3$, KTN) perovskite nonlinear photonic crystal with 3-D spontaneous Rubik's domain structures. It exhibits the near-room-temperature Curie temperature at 40° C. The Rubik's domain structure is composed of 90° and 180° domains with different polarization direction. Hence, the ferroelectric domain structures arranged in KTN crystal would supply rich 3-D reciprocal vectors to compensate phase-mismatch along arbitrary direction. Based on this 3-D KTN nonlinear photonic crystal, a second harmonic

generation with four-fold pattern spot was demonstrated, which is proved to be the superposition of two orthogonal polarization states in different nonlinear diffraction modes.

"KTN crystal contains 3-D ferroelectric polarization distributions corresponding to the reconfigured second-order susceptibilities, which can provide rich reciprocal vectors for compensating phase mismatch along an arbitrary direction and polarization of incident light," they added.

"KTN crystal is easily compatible to laser writing techniques, thus suggesting promising opportunities to create hierarchical nonlinear optical modulation. Therefore, this 3-D nonlinear photonic crystal in perovskite ferroelectrics would find a wide variety of applications in optical communications, quantum entanglement sources, nonlinear imaging, and on-chip signal processing," the scientists predict.

More information: Chang Li et al, Three-dimensional nonlinear photonic crystal in naturally grown potassium–tantalate–niobate perovskite ferroelectrics, *Light: Science & Applications* (2020). DOI: 10.1038/s41377-020-00427-z

Journal information: *Light: Science & Applications*

https://phys.org/news/2020-12-natural-three-dimensional-nonlinear-photonic-crystal.html

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Thu, 03 Dec 2020

Researchers improve the measurement of a fundamental physical constant

The validation and application of theories in physics require the measurement of universal values known as fundamental constants.

A team of French researchers has just conducted the most accurate measurement to date of the fine-structure constant, which characterizes the strength of interaction between light and charged elementary particles, such as electrons.

This value has just been determined with an accuracy of 11 significant digits; improving the precision of the previous measurement by a factor of 3.

The scientists achieved such precision by enhancing their experimental set-up, in an effort to reduce inaccuracies and to control effects that can create perturbations of the measurement.

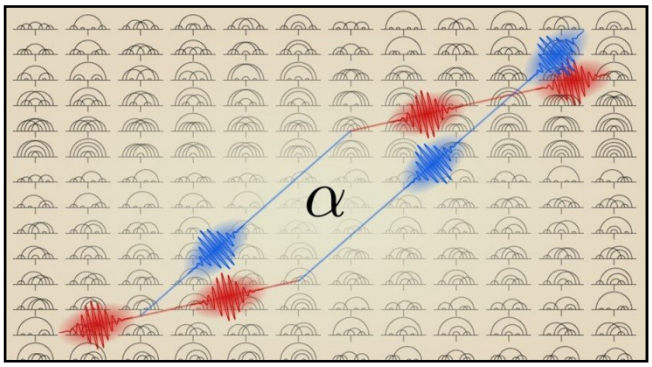

Illustration of the experimental measurement of the fine-structure constant. The background patterns in the image represent the actual Feynman diagrams used to help calculate the theoretical value of the electron magnetic moment anomaly (calculated using the fine-structure constant, among others). The scheme of the atom interferometer used for measuring the recoil velocity is represented in colour. Credit: Pierre Cladé, Saïda Guellati-Khélifa et Tatsumi Aoyama

The experiment involves cold rubidium atoms with a temperature approaching absolute zero.

When they absorb photons, these atoms recoil at a velocity that depends on their mass. The highly precise measurement of this phenomenon helps to improve the knowledge of the fine-structure constant.

These results, which will appear in *Nature* on 3 December, open new prospects for testing the Standard Model's theoretical predictions.

The use of more accurate constants can help to answer fundamental questions, such as the origin of dark matter in the universe.

More information: Determination of the fine-structure constant with an accuracy of 81 parts per trillion, *Nature* (2020). DOI: 10.1038/s41586-020-2964-7, www.nature.com/articles/s41586-020-2964-7

Journal information: *Nature*

https://phys.org/news/2020-12-fundamental-physical-constant.html

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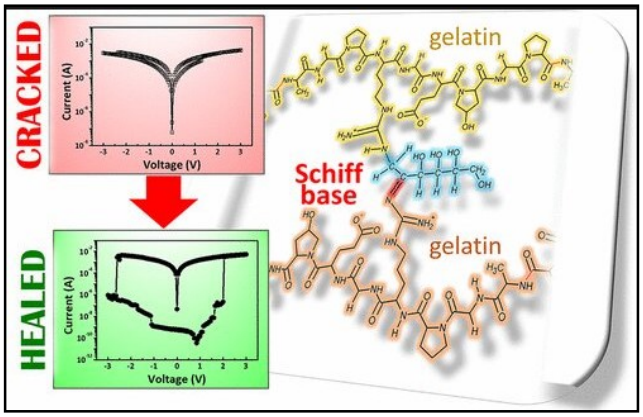
Thu, 03 Dec 2020

Self-repairing gelatin-based film could be a smart move for electronics

Dropping a cell phone can sometimes cause superficial cracks to appear. But other times, the device can stop working altogether because fractures develop in the material that stores data. Now, researchers reporting in *ACS Applied Polymer Materials* have made an environmentally friendly, gelatin-based film that can repair itself multiple times and still maintain the electronic signals needed to access a device's data. The material could be used someday in smart electronics and health-monitoring devices.



Credit: American Chemical Society

Global consumer demand for hand-held smart devices is rapidly growing, but because of their fragility, the amount of electronic waste is also increasing. Self-repairing films have been developed, but most only work a single time, and some are made with potentially harmful agents that curtail their use in biomedical applications. Researchers have tried incorporating gelatin in electronic devices because it is transparent, readily available and safe. In tests, however, damaged gelatin film was not restored quickly. Yu-Chi Chang and colleagues wanted to see if they could make a repeatedly self-healing gelatin-based film that would mend cracks in minutes and preserve electrical functionality.

The researchers mixed gelatin and glucose to create a flexible film that they sandwiched between conductive material to simulate an electronic device. After bending the simulated electronic device, the team saw breaks in the gelatin-glucose film disappear within three hours at room temperature and within 10 minutes when warmed to 140 F. Gelatin without glucose did not self-repair under the same conditions. The glucose-based gelatin also transferred an electrical signal following multiple rounds of damage and repair, with an unexpected improvement to the film's electrical performance. The experiments show that glucose and gelatin probably form reversible and interlocking imide bonds during the healing process. The new film could help maintain the durability of touchscreen and flexible display devices, advanced robotics and assisted health technologies, the researchers say.

More information: Yu-Chi Chang et al. A Green Strategy for Developing a Self-Healing Gelatin Resistive Memory Device, *ACS Applied Polymer Materials* (2020). DOI: 10.1021/acsapm.0c01119

https://phys.org/news/2020-12-self-repairing-gelatin-based-smart-electronics.html

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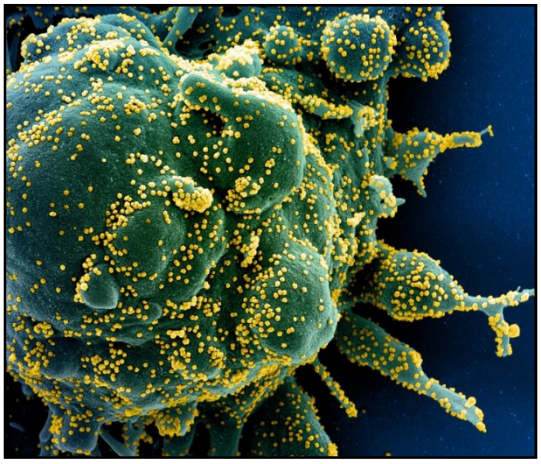
Thu, 03 Dec 2020

Researchers determine how the SARS-CoV-2 virus hijacks and rapidly causes damage to human lung cells

In a multi-group collaborative involving the National Emerging Infectious Disease Laboratories (NEIDL), the Center for Regenerative Medicine (CReM), and the Center for Network Systems Biology (CNSB), scientists have reported the first map of the molecular responses of human lung cells to infection by SARS-CoV-2. By combining bioengineered human alveolar cells with sophisticated, highly precise mass spectrometry technology, Boston University School of Medicine (BUSM) researchers have identified host proteins and pathways in lung cells whose levels change upon infection by the SARS-CoV-2, providing insights into disease pathology and new therapeutic targets to block COVID-19.

They found a crucial type of protein modification called phosphorylation becomes aberrant in these infected lung cells. Phosphorylation of proteins play a major role in regulating protein function inside the cells of an organism and both protein abundance and protein phosphorylation are typically highly controlled processes in the case of normal/healthy cells. However, they discovered that SARS-CoV-2 throws the lung cells into disarray, causing abnormal changes in protein amounts and frequency of protein phosphorylation inside these cells. These abnormal changes help the virus to multiply and eventually destroy the cells. The destruction of infected cells may result in widespread lung injury.



Colorized scanning electron micrograph of an apoptotic cell (green) heavily infected with SARS-COV-2 virus particles (yellow), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIH/NIAID

According to the researchers, as soon as the SARS-CoV-2 enters the lung cells, it rapidly begins to exploit the cell's core resources, which are otherwise required for the cell's normal growth and function. "The virus uses these resources to proliferate while evading attack by the body's immune system. In this way new viruses form which subsequently exit the exhausted and brutally damaged lung cell, leaving them to self-destruct. These new viruses then infect other cells, where the same cycle is repeated," explains corresponding author Andrew Emili, Ph.D., professor of biochemistry at BUSM.

The researchers examined lung alveolar cells from one to 24 hours after infection with SARS-CoV-2 to understand what changes occur in lung cells immediately (at one, three and six hours after infection by SARS-CoV-2) and what changes occur later (at 24 hours after infection). These changes were then compared to uninfected cells. All proteins from infected and uninfected alveolar cells, corresponding to the different time-points were extracted and labeled with unique barcoding tags called "tandem mass tag." These tags, which can be accurately detected only by a mass spectrometer, permit robust quantification of protein and phosphorylation abundance in cells.

"Our results showed that in comparison to normal/uninfected lung cells, SARS-CoV-2 infected lung cells showed dramatic changes in the abundance of thousands of proteins and phosphorylation events," said Darrell Kotton, MD, professor of pathology & laboratory medicine at BUSM and director of the CReM.

"Moreover, our data also showed that the SARS-CoV-2 virus induces a significant number of these changes as early as one hour post infection and lays the foundation for a complete hijack of the host lung cells," adds Elke Mühlberger, Ph.D., associate professor of microbiology and principal investigator at the NEIDL.

"There are important biological features specific to lung cells that are not reproduced by other cell types commonly used to study viral infection," said Andrew Wilson, MD, associate professor of medicine at BUSM and CReM investigator. "Studying the virus in the context of the cell type that is most damaged in patients is likely to yield insights that we wouldn't be able to see in other model systems."

The researchers also analyzed their data to identify prospective opportunities for COVID-19 treatment and found that at least 18 pre-existing clinically approved drugs (developed originally for other medical conditions/diseases) can be potentially re-purposed for use towards COVID-19 therapy. These drugs have shown exceptional promise to block the proliferation of the SARS-CoV-2 in lung cells.

More information: Ryan M. Hekman et al, Actionable Cytopathogenic Host Responses of Human Alveolar Type 2 Cells to SARS-CoV-2, *Molecular Cell* (2020). DOI: 10.1016/j.molcel.2020.11.028

Journal information: *Molecular Cell*

https://phys.org/news/2020-12-sars-cov-virus-hijacks-rapidly-human.html

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Method could improve SARS-CoV-2 testing in variety of sewage systems

With the purpose of contributing to a monitoring or early-warning system for pandemic spread through a given region, a Swedish research team has reportedly optimized a method for concentrating SARS-CoV-2 particles in municipal sewage systems.

After comparing with other standard techniques, the researchers concluded that the optimized method, which was developed at KTH Royal Institute of Technology, addresses two challenges in measuring coronavirus levels in wastewater: that substantial differences are found in sewage collected in various parts of the world, and that virus particles become highly diluted in wastewater.

Inside the lab where coronavirus particles are concentrated from sewage water samples. Wastewater-based epidemiology can be a cost-effective alternative to testing large populations for SARS-CoV-2 virus, and it has the potential to be used as an early warning system for the pandemic spread. Credit: Zeynep Cetecioglu Gurol

The researchers also reported that in applying the methodology, their measurements of coronavirus in Stockholm sewage during the last five months have been consistent with infection data gathered by public health authorities through individual testing.

Wastewater-based epidemiology can be a cost-effective alternative to testing large populations for SARS-CoV-2 virus, and it has the potential to be used as an early warning system for the pandemic spread, says Hakim Jafferali, a researcher with Science for Life Laboratory at KTH (SciLifeLab).

"So, a reliable detection system requires a validated method – and a suitable reference virus – in order for concentrated SARS-CoV-2 virus to be ready for further processing and analysis," he says.

The technique published in *Science of the Total Environment* is a modification of an existing ultrafiltration method. Several of the standard methods for concentrating the virus in wastewater were compared, using samples of wastewater from Sweden and Northern Italy. For purposes of evaluation, the researchers added a similarly-spiked bovine coronavirus from the same genus as SARS-CoV-2, as an external reference. Pepper mild mottle virus (PMMV), which is an indicator of fecal contamination in wastewater systems, was found to be a reliable internal reference virus.

Jafferali says that an ultrafiltration-based technique consistently proved most sensitive with changes such as doubling the number of times the samples are centrifuged. The method is paired with the laboratory technique of real-time, qualitative polymerase chain reaction (qPCR), which monitors the amplification of a targeted DNA molecule during the PCR, not at its end, as in conventional PCR. The research was performed at KTH and SciLifeLab.

https://phys.org/news/2020-12-method-sars-cov-variety-sewage.html