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THE NATIONAL INTEREST

Fri, 12 March 2021

The BrahMos missile is the military monster coming to China's doorstep

As tensions between India and China rise, New Delhi is looking to sell its super-fast cruise missile to other countries that have problems with Beijing

By Mark Episkopos

The Philippine military has announced its intention to acquire BrahMos supersonic cruise missiles.

"The BrahMos Missile and Launching System is the most promising alternative for the Shore-Based Anti-Ship Missile System as assessed by the PN Technical Working Group," Vice Adm. Giovanni Carlo Bacordo told the Philippine News Agency. "The project proposal was already presented to the Senior Leaders, however (it is) still for further approval by the Commander-in-Chief and subsequent funding," he added.

Adm. Bacordo's statement follows a March 2 defense agreement between India and the Philippines, paving the way for Manila's acquisition of the missile.

BrahMos is a supersonic cruise missile jointly developed by India and Russia in the early 2000s. It is closely derived from Russia's P-800 Oniks anti-ship cruise missile. Widely regarded as the world's fastest supersonic cruise missile, the BrahMos system can reach a top speed of Mach 3 (roughly 2300 miles per hour) and boasts a range of around 450 kilometers. The missile can receive inertial as well as GPS guidance, and is capable of flying at an altitude of as low as five meters. A remarkably versatile system, the BrahMos missile can be launched from submarines, a wide range of surface ships, aircraft, and land-based platforms.

Subsequent revisions have dramatically expanded the missile's performance and capabilities; though originally conceived as an anti-ship missile, later BrahMos variants can engage land-based targets. The most recent Block III upgrade added new navigation features, as well as steep dive functionality to strike targets in mountainous areas. The BrahMos system supports a 200 or 300 kg high explosive semi-armor-piercing warhead, with an additional option for a 250 kg submunitions warhead depending on use-case.

Aside from these conventional configurations, India's Air Force has modified as many as forty-two of its Su-30MKI fighters to carry nuclear-capable BrahMos missiles. India reportedly plans to upgrade all of its BrahMos missiles to a range of up to 1500 km, but the current state of those efforts is unclear.

Bacordo added that the Philippine military seeks to procure one BrahMos battery, consisting of three systems.

It appears that the Philippines intends to operate BrahMos as a land-based system, though future ship-based deployments have not been ruled out.

The Philippines' planned BrahMos acquisition comes amid its ongoing territorial dispute with Beijing over parts of the South China Sea. The BrahMos purchase is part of a broader Philippine military modernization program to boost the country's lagging coastal defenses; the capability to credibly threaten Chinese vessels encroaching on Philippine-claimed littoral waters is a key part of those efforts. If finalized, the deal would make the Philippines the first foreign client to purchase India's BrahMos system—a victory for India's nascent defense export industry.

Beyond its prospects as a regional arms seller, there are geopolitical factors at play for India. New Delhi, which is currently engaged in a border dispute of its own with Beijing, looks to pressure China on a separate front by bolstering its competitors' capabilities. Vietnam, another maritime rival of Beijing and also a player in the South China Sea dispute, has recently expressed interest in signing a BrahMos acquisition deal with India.

https://nationalinterest.org/blog/buzz/brahmos-missile-military-monster-coming-chinas-doorstep-179969

Defence News

Defence Strategic: National/International

Press Information Bureau
Government of India

Ministry of Defence

Thu, 11 March 2021 6:04PM

Indian Navy Ship Shardul arrives at Port Louis for Mauritius National Day celebrations

INS *Shardul*, a ship of the First Training Squadron of the Indian Navy (*IN*) is visiting Port Louis, Mauritius from 10 to 13 March, 2021 as part of an overseas deployment to Southern Indian Ocean nations. The ship will undertake EEZ surveillance of Mauritius, in coordination with Mauritian National Coast Guard as part of the deployment, and will also participate in the National Day celebrations of Mauritius on 12 March 2021 during the port call.

The visit by the Indian Navy ship to Mauritius on the occasion of its National Day celebrations highlights the close relations and strong friendship between the two countries and is aimed at strengthening bilateral ties and enhancing maritime security cooperation between the two countries.

Indigenously built at Garden Reach Shipbuilders and Engineers (GRSE) Kolkata and commissioned in the Indian Navy in 2007, INS *Shardul* is an amphibious warfare ship capable of carrying battle tanks, troops and an integral helicopter. The ship has also played an important role in Humanitarian Assistance and Disaster Relief (HADR) operations in the recent past. Notable among these include delivery of 600 Tons of food grains to drought hit Madagascar in March 2020 and operation *Samudra Setu* for evacuation of overseas Indians in June 2020 during COVID-19 pandemic.

https://pib.gov.in/PressReleasePage.aspx?PRID=1704178

पत्र सूचना कार्यालय
भारत सरकार

रक्षा मंत्रालय

Thu, 11 March 2021 6:04PM

मॉरीशस के राष्ट्रीय दिवस समारोह के लिए भारतीय नौसेना का जहाज आईएनएस शार्दुल पोर्ट लुई पहुंचा

भारतीय नौसेना (आईएन) के पहले प्रशिक्षण स्क्वाड्रन का एक जहाज, आईएनएस शार्दुल 10 से 13 मार्च, 2021 तक मॉरीशस में पोर्ट लुई की यात्रा पर है। आईएनएस शार्दुल, दक्षिणी हिंद महासागर के देशों में विदेशी तैनाती के हिस्से के रूप में यात्रा कर रहा है। यह पोत 12 मार्च, 2021 को मॉरीशस के राष्ट्रीय दिवस पर आयोजित समारोह में हिस्सा लेगा और ईईजेड की निगरानी में मॉरीशस नेशनल कोस्ट गार्ड के साथ समन्वय करेगा।

मॉरीशस के राष्ट्रीय दिवस समारोह पर भारतीय नौसेना के जहाज की यह यात्रा दोनों देशों के बीच घनिष्ठ संबंधों और मजबूत दोस्ती को उजागर करती है। इस यात्रा का उद्देश्य द्विपक्षीय संबंधों को मजबूत करना और दोनों देशों के बीच समुद्री सुरक्षा सहयोग को बढ़ाना भी है।

आईएनएस शार्दुल पूर्ण रूप से स्वदेशी है, जिसे गार्डन रीच शिपबिल्डर्स एंड इंजीनियर्स (जीआरएसई) ने कोलकाता में बनाया है। इसे 2007 में भारतीय नौसेना में कमीशन किया गया था। आईएनएस शार्दुल भारतीय नौसेना का युद्धक जहाज है, जो युद्धक टैंक, सैनिकों और एक साथ कई हेलीकॉप्टर ले जाने में सक्षम है। जहाज आईएनएस शार्दुल ने हाल के दिनों में मानवीय सहायता और आपदा राहत अभियानों में भी महत्वपूर्ण भूमिका निभाई है। खासकर मार्च, 2020 में मेडागास्कर में 600 टन खाद्यान्न की डिलीवरी की। कोविड-19 महामारी के दौरान विभिन्न देशों में फंसे प्रवासी भारतीयों को सुरक्षित स्वदेश लाने के लिए जून, 2020 में चलाये गए *ऑपरेशन समुद्र सेतु* में भी हिस्सा लिया था।

https://pib.gov.in/PressReleasePage.aspx?PRID=1704250

Hindustan Times

Fri, 12 March 2021

Second Rafale squadron to be raised in Bengal's Hasimara in April

By Rahul Singh

- ***India ordered 36 warplanes from France (equivalent of two squadrons) in September 2016 for ₹59,000 crore under a government-to-government deal. IAF's Ambala-based Golden Arrows Squadron has already inducted 11 Rafale jets so far.***

The Indian Air Force is ready to raise its second Rafale squadron at Hasimara in West Bengal next month in line with its original induction plan for the French-origin fighters, people familiar with the developments said on Thursday. The second squadron will be raised in mid-April after the first one has been fully raised in Ambala, said one of the officials cited above.

India ordered 36 warplanes from France (equivalent of two squadrons) in September 2016 for ₹59,000 crore under a government-to-government deal. IAF's Ambala-based Golden Arrows Squadron has already inducted 11 Rafale jets so far. Both Rafale squadrons will have 18 jets each.

"Ten more jets are expected to arrive in India from France by April-end. With this, the first squadron will be fully formed and the raising of the second squadron will begin," said a second official.

All the 36 planes are likely to join the IAF's fighter fleet by the year-end. The 11 Rafales inducted so far have arrived in three batches from France.

"Located in the crucial Siliguri corridor, the Hasimara airbase will cover both central and eastern Tibet. The Rafale will augment and add a bigger punch along with the IAF's Su-30 MKIs which are already based in the Brahmaputra valley," said Air Marshal Anil Chopra (retd), director general, Centre for Air Power Studies.

All the 36 planes are likely to join the IAF's fighter fleet by the year-end. The 11 Rafales inducted so far have arrived in three batches from France. (AFP PHOTO).(AFP Photo)

The IAF has operated the fighter jets in the Ladakh theatre where the military is on high alert amid a border standoff with China and where both sides are negotiating disengagement of troops at friction points along the contested Line of Actual Control (LAC).

India's Rafale jets are equipped with modern weapons such as the Meteor beyond visual range air-to-air missiles, Mica multi-mission air-to-air missiles, Scalp deep-strike cruise missiles and the Hammer smart weapon.

India-specific enhancements on the jets include cold engine start capability to operate from high-altitude bases such as Leh, radar warning receivers, flight data recorders with storage for 10 hours of data, infrared search and track systems, jammers and towed decoys to ward off incoming missiles.

The twin-engine jet is capable of carrying out a variety of missions - ground and sea attack, air defence and air superiority, reconnaissance and nuclear strike deterrence. It can carry more than nine tonnes of weapons on as many as 14 hard points.

Meanwhile, the commanding officer of the Rafale squadron at Ambala, Group Captain Harkirat Singh, is being posted to the eastern sector to oversee the raising and operationalisation of the second squadron, people familiar with development said.

https://www.hindustantimes.com/india-news/second-rafale-squadron-to-be-raised-in-bengal-s-hasimara-in-april-101615473901498.html

Fri, 12 March 2021

Rafale Fighter Aircraft का दूसरा स्क्वॉड्रन West Bengal के Hashimara में होगा तैनात, दुश्मनों की खैर नहीं

Rafale Fighter Aircraft Second Squadron: भारत ने फ्रांस से 59 हजार करोड़ रुपये में 36 रफाल लड़ाकू विमान खरीदने के लिए साल 2015 में डील पर हस्ताक्षर किए थे। रफाल लड़ाकू विमान के दूसरे स्क्वॉड्रन को इस साल अप्रैल में हाशिमारा में मेन ऑपरेटिंग बेस पर मुस्तैद किया जाएगा।

नई दिल्ली: इंडियन एयरफोर्स (Indian Air Force) अप्रैल महीने में रफाल लड़ाकू विमान के दूसरे स्क्वॉड्रन (Rafale Fighter Aircraft Second Squadron) की तैनाती के लिए तैयार है। रफाल लड़ाकू विमान का यह स्क्वॉड्रन पश्चिम बंगाल के हाशिमारा एयरफोर्स बेस पर मुस्तैद रहेगा। गुरुवार को आधिकारिक सूत्रों ने यह जानकारी दी।

रफाल फाइटर एयरक्राफ्ट (फाइल फोटो) | साभार: रॉयटर्स

रफाल का पहला स्क्वाड्रन यहां हैं तैनात

बता दें कि रफाल लड़ाकू विमानों का पहला स्क्वॉड्रन (Rafale Fighter Aircraft First Squadron) हरियाणा के अंबाला एयरफोर्स स्टेशन पर तैनात है। रफाल लड़ाकू विमानों की पहली खेप पिछले साल 2020 में 29 जुलाई को फ्रांस से भारत आई थी। भारत ने फ्रांस (Rafale France Deal) से 59 हजार करोड़ रुपये में 36 रफाल लड़ाकू विमान खरीदने के लिए साल 2015 में डील पर हस्ताक्षर किए थे।

औपचारिक रूप से IAF में शामिल रफाल

पिछले साल 10 सितंबर को अंबाला में हुए एक कार्यक्रम में रफाल लड़ाकू विमानों (Rafale Fighter Aircraft) को औपचारिक रूप से इंडियन एयरफोर्स (Indian Air Force) के बेड़े में शामिल कर लिया गया था। तीन विमानों की दूसरी खेप तीन नवंबर को भारत आई थी जबकि तीन और विमानों (Rafale Fighter Aircraft Squadron) की तीसरी खेप 27 जनवरी को भारत पहुंची।

यहां तैनात किया जाएगा रफाल का दूसरा स्क्वॉड्रन

सूत्रों के मुताबिक, रफाल लड़ाकू विमान के दूसरे स्क्वॉड्रन (Rafale Fighter Aircraft Second Squadron) को इस साल अप्रैल में हाशिमारा में मेन ऑपरेटिंग बेस (Hashimara Main Operating Base) पर मुस्तैद किया जाएगा।

गौरतलब है कि भारत को अगले कुछ महीनों में फ्रांस से और रफाल लड़ाकू विमान मिलने की उम्मीद है। एक स्क्वॉड्रन में लगभग 18 विमान होते हैं।

https://zeenews.india.com/hindi/india/indian-air-force-to-deploy-second-squadron-of-rafale-fighter-aircraft-in-hashimara-west-bengal/864091

The EurAsian Times

Fri, 12 March 2021

Indian Navy ready to induct first batch of MH-60R SeaHawk helicopters by mid-2021?

The Indian Navy will receive its first batch of 3 MH-60R 'SeaHawk' naval utility helicopters from the US by mid-2021, according to reports.

India had in February last year inked a $2.6-billion deal with US defense and aerospace giant Lockheed Martin for two dozen MH-60R maritime utility helicopters.

The first three out of 24 MH-60R SeaHawks are expected to be delivered between June and September 2021, LiveMint reported.

Recently, the Indian Navy has also acquired P-8I Neptune maritime patrol aircraft and MQ-9B Guardian surveillance drones from the US.

MH-60R 'SeaHawk'

The MH-60R SeaHawk is a twin-engine, multi-mission, all-weather naval utility helicopter, based on the Army's UH-60 BlackHawk.

It is used for a variety of roles including anti-submarine warfare (ASW), anti-surface warfare (ASUW), naval special warfare (NSW) insertion, search and rescue (SAR), combat search and rescue (CSAR), vertical replenishment (VERTREP), and medical evacuation (MEDEVAC) operations.

This versatile helicopter can be deployed on any air-capable vessel, be it frigates, destroyers, aircraft carriers, cruisers, fast combat ships, amphibious assault ships, or the navy's new littoral combat ships.

Claimed to be the world's most advanced maritime helicopter, its avionics include dual controls. Instead of the complex array of dials and gauges in Bravo and Foxtrot aircraft, it has 4 fully integrated 8″ x 10″ night vision goggle-compatible and sunlight-readable color multi-function displays, all part of glass cockpit produced by Owego Helo Systems division of Lockheed Martin.

Its onboard sensors include AN/AAR-47 Missile Approach Warning System by ATK, Raytheon AN/AAS-44 electro-optical system that integrates FLIR and laser rangefinder, AN/ALE-39 decoy dispenser and AN/ALQ-144 infrared jammer by BAE Systems, AN/ALQ-210 electronic support measures system by Lockheed Martin, AN/APS-147 multi-mode radar/IFF interrogator, which during a mid-life technology insertion project is subsequently replaced by AN/APS-153 Multi-Mode Radar with Automatic Radar Periscope Detection and Discrimination (ARPDD) capability.

Both radars were developed by Telephonics. The chopper has a more advanced AN/AQS-22 advanced airborne low-frequency sonar (ALFS) jointly developed by Raytheon & Thales, AN/ARC-210 voice radio by Rockwell Collins, an advanced airborne fleet data link AN/SRQ-4 Hawklink with radio terminal set AN/ARQ-59 radio terminal, both by L3Harris, and LN-100G dual-embedded global positioning system and inertial navigation system by Northrop Grumman Litton division.

The MH-60R does not carry the MAD (magnetic anomaly detector) suite.

The helicopter's offensive capabilities are improved by the addition of new Mk-54 air-launched torpedoes and Hellfire missiles. All Helicopter Anti-Submarine Light (HSL) squadrons that receive the Romeo are redesignated Helicopter, Strike Maritime (HSM) squadrons in the US Navy.

https://eurasiantimes.com/indian-navy-ready-to-induct-first-batch-of-mh-60r-seahawk-helicopters-by-mid-2021/

ThePrint

Fri, 12 March 2021

Faced with budget crunch, Navy could relook at long-term modernisation plans, lease vessels

Navy had planned to become a 200-warship force. It cut down this number to 175. Security circumstances may now lead the Navy to recalibrate capital procurements

By Amrita Nayak Dutta

New Delhi: The Navy will have to recalibrate its immediate and long-term capital requirements, particularly in view of the threats from China after over a nine-month standoff in eastern Ladakh, a top Naval officer said.

This will likely include reassessing the numbers for landing platform docks (LPDs) and minesweepers originally planned by the Navy, among other items, for which the acceptance of necessity (AoN) has already been accorded.

File photo | Indian Navy | Facebook/IndianNavy

In the wake of a dwindling capital budget in the last few years, the Navy cut down its plans to be a 200-warship force — down to 175 — and reduced the numbers of some of its long-term planned procurements.

During a press meet in 2019, Navy chief Admiral Karambir Singh had pointed out that the Navy's share of defence budget fell from 18 per cent in 2012-13 to 13 per cent in 2019-20. "It is a fact that our budget has decreased. We have projected this. Our hope is that we will get some money and accordingly we will prioritise," Singh had said.

The force cut down the number of LPDs it was seeking to buy to two from the planned four, and the number of minesweepers to eight from 12, aside from cutting down on other fleet auxiliary ships.

The Navy also decided to procure only six Kamov KA-31 early warning helicopters against the 10 planned originally, and brought down the number of additional P-8I aircraft it sought to buy from the US to six from 10. Moreover, it reportedly planned to close the cadet training ship programme.

However, irrespective of the Navy's plans to bring down the numbers of its planned procurements as envisaged in its Maritime Capability Perspective Plan (MCPP) for 2012-2027, the AoNs for many of its big ticket procurements were already approved. Since the AoNs exist for certain planned procurements, there is possibly of going back to the original numbers planned.

"…there is a need for a relook and a reassessment of the Navy's immediate and long term capital requirements as planned earlier, for which there would be a requirement of more funds," said the officer quoted above.

The officer declined to comment on the specifics of which other capital procurements would need a reassessment.

In the capital budget for 2021-2022, the Navy saw an increase of 24.6 per cent at Rs 33,000 crore from its previous year's allocations, but it was much lower than the force's projected requirement of Rs 70,920.78 crore.

The Army saw an increase of 12.6 per cent and the Air Force saw a hike of 22.9 per cent in their capital budgets for 2021-22 as compared to the previous fiscal.

Speaking about the 15th Finance Commission's proposals, which suggested raising funds from defence land monetisation, the officer said it is yet to be seen how the concept can be materialised.

"The monetisation of defence land will yield some funds, which would be used up immediately for some immediate procurement. But this way, we will lose the land and the funds too will be exhausted immediately," the officer said.

Considering leasing vessels

The Navy could also be looking at leasing vessels as an interim measure. This includes diving support vessels that can also double up as a submarine rescue vessel.

"The Navy is looking at leasing different kinds of vessels, including diving support vessels and other smaller ships," said the officer quoted above.

The force is also looking at leasing small fuelling tankers, which can be used for support trips and other logistical purposes.

Besides, the Navy is in the process of gathering information from other countries from where it could lease minesweepers and naval utility helicopters as a stop-gap arrangement, even as it will continue to pursue the original contract for such systems to be made in India with foreign collaboration, said sources.

The Navy currently has on lease two Sea Guardian drones from a US firm, and a logistics ship from an Indian private firm for travel between Kochi and Lakshadweep.

https://theprint.in/defence/faced-with-budget-crunch-navy-could-relook-at-long-term-modernisation-plans-lease-vessels/619818/

FINANCIAL EXPRESS
Read to Lead

Fri, 12 March 2021

Quad leaders' virtual summit: Where does India stand?

Many aspects like India's technological competence to collaborate intrinsically within QUAD etc. are likely to evolve in the next couple of years

By Milind Kulshreshtha

Prime Minister Modi will be holding virtual talks with US President Joe Biden and the prime ministers of both Australia and Japan in the first-ever leaders' meeting of the Quad on 12th March'2021. QUAD is considered as a significant development coalesced primarily to counter China's growing economic and military influence in the Western Pacific region. The economic collaboration and Climate crisis too shall be discussed in the Quad meeting.Issues regarding Maritime security and cooperation towards maintaining free, open and inclusive Indo-Pacific are also planned to be discussed.

QUAD to QUAD Plus

Australia took part in Exercise Malabar 2020 last year as part of QUAD Navies and its involvement was viewed with concern by China. Overall, Australia amplifies the US posture in the region, and is seen by China as an impediment to its influence in the region. The option of QUAD growing into QUAD Plus with other countries from Europe and SE Asia participating shall be highly dependent on the accomplishment of the existing core team of QUAD. The effective implementation of a cohesive economic and military strategy by these nations shall surely encourage other regional countries to participate in the QUAD objective. India's foreign policy is likely to seemore testing times in the near future.

US-India Core Agreements: COMCASA, BECA, LEMOA

Last year's third annual US-India 2+2 Ministerial Dialogue concluded a major agreement — BECA (Basic Exchange and Cooperation Agreement).

Agreements including COMCASA (Communications Compatibility and Security Agreement) and LEMOA (Logistics Exchange Memorandum of Agreement) and BECA shall make India an active participant in the US Comprehensive Global Strategic Partnership. And, this will be through military cooperation, information sharing and defence trade to achieve Joint service synchronization through interoperability. However, the technology behind BECA and COMCASA is highly advanced and can take a couple of years to be fully functional and be able to generate the Common Operational Picture (COP) amongst the multi-national units. Implementation of LEMOA is physical in nature and is about the resource redeployment, setting up of repair facilities etc. Making the BECA, COMCASA and LEMOA shall be critical for India for achieving an active and closer participation with the other NATO alliance countries.

Limitation of Space Capabilities

Despite some stellar performance by ISRO, Indian Defence Space Agency is at a nascent stage. The indigenous NAVIC Global Positioning System for mil-grade precision is yet to be implemented due to technological limitations. Collaboration with the advanced Defence Space network of QUAD shall enhance India's surveillance competence. The all weather 24/7 military grade precision look' capability in theIndo-Pacific and SE Asia region is critical for India. Chinese own dual-use Space capabilities are ahead of India's efforts, and the physical or cyber threat to Indian satellite system from China is real.

Five Eyes Alliance (FVEY)

This is an intelligence-sharing partnership between the US, United Kingdom, Canada, Australia and New Zealand. At some stage, the inclusion of three more countries viz. India, Japan and South Korea to FVEY is expected so as to counter China's growing capabilities in military and cyber technologies.

BrahMos SSMs to Philippines

Even though India would have preferred to register Akash SAM sales to the Philippines in its order book, the planned Brahmos supply to the Philippines could be a conspicuous factor for China. Land based BrahMos SSMs shall provide the Philippines a reach to engage targets in the South China Sea. The fishing Trawler aggression by China in the South China Sea now shall have deterrence with highly lethal Brahmos missiles.

Malabar 2021 Plans

Malabar 2021 would be a keenly awaited naval exercise. Today Western Pacific is considered the new potent flash point where China and the US Naval task force are likely to see closer skirmishes for sea dominance. Malabar 2021 is still likely to be closer to Indian coasts.The East Coast of India may see intense Anti-Submarine Warfare collaborative drills by the QUAD flotilla. The Aircraft Carrier Battle Group is likely to be seen more on the West coast. The probability of deployment of the sole Aircraft carrier on the Eastern seaboard by Indian Navy during hostilities is likely to be low due to Chinese nuclear submarines (which can traverse freely and undetected with their long endurance underwater capabilities).

Conclusion

Even though Indian R&D and defence industry can keep claiming a series of successes on each 'test cycle', China shall always be a potent adversary in the region since it has the ability to replace its destroyed or damaged war-fighting assets at a pace which is far superior to that by any other nation around. This gives a decisive edge to a nation in any combat zone. An arms race with an adversary like China is something India cannot afford to start now or in the near future. QUAD based jointness may be more than simply a choice for India, and probably a necessity to maintain the positive pressure on an adversary with whom we share a disputed border, is aggressive and expansionist Superpower in economic and military terms. A well measured approach in the QUAD, with a clearly defined role can make this inevitable relationship advantageous for India.

Many aspects like India's technological competence to collaborate intrinsically within QUAD etc. are likely to evolve in the next couple of years. India is expected to show some tentativeness in its military activities in the western Pacific waters; however, this may be the right approach while

we are still building modern armed forces with objectives like Theater Commands for Maritime and Air Defence operations.

https://www.financialexpress.com/defence/quad-leaders-virtual-summit-where-does-india-stand/2210536/lite/

FINANCIAL EXPRESS
Read to Lead

Fri, 12 March 2021

India to talk fighter jets, unmanned drones, communications systems with the US Defence Secretary

In 2016, the US had designated India as a Major Defence Partner, and this was then in 2018 elevated to Strategic Trade Authorization tier 1 status

By Hyma Siddiqui

Deepening of the Comprehensive Global Strategic partnership, military trade, Indo-Pacific, the Quad, as well as multilateral military drills are some of the major issues that will be the focus of talks when the new US Secretary of Defence Lloyd J Austin comes later this month.

The India-US military trade is expected to touch $ 25 billion soon.

Both countries share a vision of free and open Indo-Pacific. As has been reported, in 2016, the US had designated India as a Major Defence Partner, and this was then in 2018 elevated to Strategic Trade Authorization tier 1 status.

What does this mean?

India will have a license-free access to an entire range of military and dual-use technologies which have been regulated by the US Department of Commerce.

The military trade with the US companies takes place through Foreign Military Sales route. So far, the military trade between the two countries has touched almost USD 20 and in the next couple of years is expected to touch USD 25 billion.

The two countries have inked agreements including the Logistics Exchange Memorandum of Agreement (LEMOA), Communications, Compatibility and Security Agreement (COMCASA), and the Industrial Security Agreement (ISA).

Deals expected to be discussed

As was reported in 2020 in Financial Express Online, while the Indian Air Force is looking at 114 fighter aircraft; the Navy has plans to buy around 57of fighter aircraft for its aircraft carrier.

As has been reported earlier by Financial Express Online, the US aerospace company Boeing has offered the F15EX for the Indian Air Force's requirement of 114 fighter jets and it has also offered the F/A-18 Super Hornet for the Navy's proposal to acquire 57 new jets.

"The Indian Navy is looking for deck-based fighters as the MiG-29s it has are not enough. And since the Navy will be getting the IAC1, more fighters are needed," a source told Financial Express Online.

A contract for 10 Naval Shipborne Unmanned Aerial System, will be discussed for which the US-based Boeing is the front runner.

The sale of a USD 189 Large Aircraft Infrared Countermeasure, a missile defence system for large aircraft (those which are used by VIPs).

A missile defence system — the Integrated Air Defence Weapon System (IADWS), already approved by the US State Department during the Trump administration. This deal is valued up to $ 1.867 billion.

Communications Security Account and Equipment – this is a package that builds on COMCASA and is valued at USD 5 million. Though the deal is relatively small, it is a very critical component for advancing communication and enhancing interoperability.

Is Leasing an Option? Yes. The Indian armed forces are open to the idea of leasing military platforms to meet urgent operational requirements. The option of leasing too is expected to be discussed when the US Secretary of Defence meets with his counterpart defence minister Rajnath Singh and other senior officials.

Highly placed sources told Financial Express Online that, "The Indian Navy is open to leasing some critical platforms including Minesweepers, Helicopters, and Mid-air refuellers."

https://www.financialexpress.com/defence/india-to-talk-fighter-jets-unmanned-drones-communications-systems-with-the-us-defence-secretary/2210787/

FINANCIAL EXPRESS
Read to Lead

Fri, 12 March 2021

US aerospace giant Boeing offers KC-46 tankers to IAF! Dates announced for the US Def Sec visit to India

Japan, part of the Quad grouping which is meeting for the first Leaders summit virtually on Friday, is the KC-46 program's first international customer

By Huma Siddiqui

The US aerospace Boeing Company is open to leasing KC-46tanker, a derivative of the Boeing 767 passenger aircraft to the Indian Air Force (IAF), which is seeking quotes for mid-air refuellers. Confirming this to Financial Express Online, in an exclusive interaction with Financial Express Online, Torbjorn Sjogren, VP, International Government & Defence, Boeing Global Services, said "We are in talks with the IAF for KC-46tanker. There is a requirement for air-to-air refuelling and we are working through certain issues. We are open to leasing these tankers. We already lease commercial aircraft to various domestic airlines in India; we understand there is provision for leasing military platforms in the Defence Acquisition Procedure (DAP)."

IAF which is facing a critical shortage of mid-refuellers is keen to lease at least two platforms to plug the gap. (Photos Credit: Boeing Company)

KC-46 Tanker Vs Airbus

Comparing Boeing's KC46 with the European aerospace major Airbus' A330 Multi Role Tanker Transport (MRTT), Mr Sjogren, said, "There is a need for mid-air refuellers in India. What we are offering can operate out of both big and small airports. This means that operational cost will be less compared to others. Boeing's KC-46 is more of a combat tanker."

Interestingly, Japan Air Self-Defense Force (JASDF) will soon be having KC-46 tanker in service. Japan, part of the Quad grouping which is meeting for the first Leaders summit virtually on Friday, is the KC-46 program's first international customer.

Unlike the Airbus' MRTT which is a derivative of the twin-engine A330 passenger aircraft of Airbus, the KC-46 tanker has the ability to carry cargo and passengers and can be used in

humanitarian relief efforts. The KC-46 refuelling certification encompasses US Air Force, Navy, Marine Corps and JASDF aircraft.

IAF which is facing a critical shortage of mid-refuellers is keen to lease at least two platforms to plug the gap. And for this it has sought financial quotes from Boeing and the European aerospace major Airbus. Leasing of two platforms is besides the IAF's plan to acquire six mid-air refuellers.

The tanker being offered by Boeing has been designed to operate in nuclear and bio environments. And because of its size, the tanker in a war like situation can land and take off from over more than 100 airstrips.

Current status on the refuellers

Speaking on condition of anonymity, a senior officer confirmed that "Discussions are going on with both the Airbus as well as the Boeing Company. Due to the continued standoff between India and China along the Line of Actual Control, there have been several military drills involving the Quad (India, the US, Japan and Australia). Japan is soon going to get the KC-46."

The leasing of defence systems may be a new option that has been introduced by the Defence Acquisition Procedure (DAP) of 2020.

Why is IAF looking for new mid-air refuellers?

India has six Russian IIyushin-78 tankers which were first inducted in service in 2003. These have now aged and need a lot of maintenance and servicing.

The need for tankers is also felt as these add range-enhancing capability to fighters, which helps the pilots carry out strikes at longer ranges and also stay in-flight without requiring landing and refuelling.

The IAF has the new Rafale fighters from France which has a long range capability because it can be refuelled midair. Same is the case with the Light Combat Aircraft `Tejas' Mk 1A which has capability of refuelling mid-air.

As has been reported by Financial Express Online, last October, the IAF chief Air Chief Marshal RKS Bhadauria had said in response to a media query that "Since the plans to acquire tankers has not materialised yet, the IAF is open to leasing these."

Expert View about Leasing of Military Platforms

A new provision made in the Defence Acquisition Procedure-2020 (DAP-2020) would enable the Ministry of Defence (MoD) in future to acquire and operate military assets -equipment and platforms- by taking them on lease from the Indian and foreign sources, without owning them.

"Outright purchase of assets requires the entire capital cost -quite substantial in most cases- to be paid during the delivery period of the contract. This initial cost would get staggered, in the event it is found viable to take the asset on lease, as rental payment will be spread over the entire period of the lease, making it a more viable option for the MoD which has been facing acute budgetary constraints," Amit Cowshish, former Financial Advisor (Acquisition), Ministry of Defence, tells Financial Express Online.

According to him, "The MoD may consider taking an asset on lease if outright procurement is not feasible due to constraint of time, if it is needed in limited numbers for a specific period, or the asset may remain underutilised if procured. An asset may also be taken on lease for gaining operational experience or to meet any other operational exigency. It could be an operating or a finance lease. Typically, the ownership of the asset is retained during and after the lease term by the lessor under an operating lease agreement, whereas under a finance lease agreement, the asset is transferred to the lessee when the lease ends."

"An operating lease could be a dry lease in which only the asset is transferred to the lessee, or a wet lease which requires the lessor to provide not only the asset but also the operating crew, maintenance support, etc. Recognising that quite often lessors are independent third parties, operating in partnership with the Original Equipment Manufacturers (OEMs), DAP-2020 provides that the lease agreement may require coordination between a leasing firm, financiers, OEM, and the country concerned," Mr Cowshish adds.

In conclusion he says, "An elaborate and flexible procedure has been laid down which, among other things, envisages finalisation of terms and conditions peculiar to leasing of assets, such as insurance, title and risk, modification and re-modification of the asset, payment of commitment fee to the lessors, and limitation of liability."

Ministry of Defence formally announces the visit of the US Secretary of Defence

According to an official release issued on March 10, 2021, the US Secretary of Defence is going to visit India from March 19-20. During his two day visit Secretary Austin will meet his counterpart Rajnath Singh and other senior officials.

What is the agenda?

His visit as part of his overseas travel emphasizes the strength of the India-US strategic partnership.

The focus of the talks will be further strengthening bilateral defence cooperation and exchange views on regional security challenges. Both sides will also discuss maintaining a free, open and inclusive Indo-Pacific region.

https://www.financialexpress.com/defence/us-aerospace-giant-boeing-offers-kc-46-tankers-to-iaf-dates-announced-for-the-us-def-sec-visit-to-india/2210714/

Science & Technology News

ZEENEWS

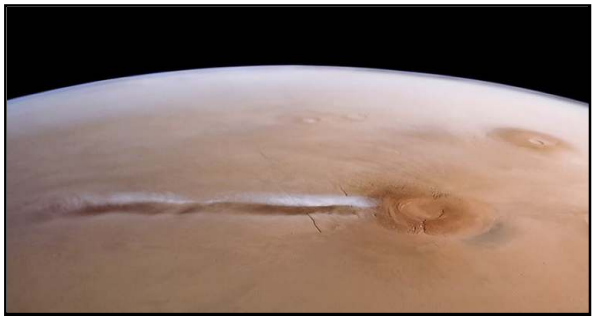
Fri, 12 March 2021

Martian Cloud: मंगल ग्रह पर दिखा 1800 KM लंबा सफेद बादल, ISRO के मंगलयान ने उठाया रहस्य से पर्दा

मंगल ग्रह पर सौर मंडल का सबसे बड़ा ज्वालामुखी है। इसका नाम ओलिंपिस मॉन्स (Olympus Mons) है। कहते हैं कि यह ज्वालामुखी सौर मंडल का सबसे ऊंचा पहाड़ है। यह मंगल ग्रह के दक्षिणी हिस्से में स्थित है। इसके ऊपर से हर साल एक सफेद बादल की लंबी सी पूंछ मंगल ग्रह पर देखने को मिलती है।

खास बातें

1. ***1800 KM लंबे सफेद बादल का खुला रहस्य***
2. ***पांच सैटेलाइट्स की मदद से की गई स्टडी***
3. ***धरती पर भी बनते हैं ऐसे बादल***



Martian cloud

नई दिल्ली: मंगल ग्रह (Mars) पर जीवन के प्रमाण की खोज के तहत एक विचित्र तरह का लंबा सफेद बादल देखने को मिला है। पिछले कई वर्षों से ये बादल मंगल के आसमान में अक्सर देखने को मिल रहे हैं। लेकिन अब जाकर इस बादल का रहस्य खुला है। इस रहस्य को सुलझाने में भारत के मंगलयान की भी अहम भूमिका है।

रहस्यमयी बादल

इस बादल की उत्पत्ति सौर मंडल के सबसे ऊंचे ज्वालामुखी पहाड़ के आसपास ही होती है। ये लंबा सफेद बादल बेहद रहस्यमयी था। वैज्ञानिकों ने इसे पहले भी कई बार देखा था। आइए जानते हैं इस बादल से जुड़े सभी रहस्य के बारे में।

मंगल ग्रह पर सौर मंडल का सबसे बड़ा ज्वालामुखी

गौरतलब है कि मंगल ग्रह पर सौर मंडल का सबसे बड़ा ज्वालामुखी है। इसका नाम ओलिंपिस मॉन्स (Olympus Mons) है। कहते हैं कि यह ज्वालामुखी सौर मंडल का सबसे ऊंचा पहाड़ है। यह मंगल ग्रह के दक्षिणी हिस्से में स्थित है। इसके ऊपर से हर साल एक सफेद बादल की लंबी सी पूंछ मंगल ग्रह पर देखने को मिलती है।

हर दिन करीब 80 बार बनता और बिगड़ता है ये बादल

आपको जानकार हैरानी होगी कि ओलिंपिस मॉन्स (Olympus Mons) के ऊपर बनने वाला यह सफेद बादल हर दिन करीब 80 बार बनता और बिगड़ता है। जैसे- पिछली बार इसकी पूंछ की लंबाई 1800 किलोमीटर थी और इसकी चौड़ाई 150 किलोमीटर थी। इस बादल को अर्सिया मॉन्स एलॉन्गेटेड क्लाउड (Arsia Mons Elongated Cloud) कहते हैं।

कैसे ली गई तस्वीर

यूरोपियन स्पेस एजेंसी (ESA) के मार्स एक्सप्रेस ऑर्बिटर (Mars Express Orbiter - MEO) ने अर्सिया मॉन्स एलॉन्गेटेड क्लाउड (Arsia Mons Elongated Cloud) की तस्वीर ली है।

MEO में विजुअल मॉनिटरिंग कैमरा (VMC) ने इसकी तस्वीरें और वीडियो बनाया है।

सूरज निकलने से पहले आता है ये बादल

यूरोपियन स्पेस एजेंसी और नासा के वैज्ञानिकों ने इस सफेद बादल स्टडी की तो पता चला कि यह बादल सूरज के उगने से पहले बना था। यह करीब ढाई घंटे तक मंगल ग्रह की सतह पर दिखाई देता रहा। ये खूबसूरत स दिखने वाला बादल 600 किलोमीटर प्रतिघंटा की रफ्तार से अपने सिरे से पूंछ की तरफ बह रहा था। इसके बाद यह अपनी उत्पत्ति वाली जगह से अलग हो गया और धूप खिलने तक गायब हो गया।

धरती पर भी बनते हैं ऐसे बादल

लाल ग्रह पर बने अर्सिया मॉन्स एलॉन्गेटेड क्लाउड (Arsia Mons Elongated Cloud) को ओरोग्राफिक (Orographic) बादल भी कहते हैं। ये सतह पर दक्षिण दिशा से उत्तर दिशा की ओर बहता है। धरती पर भी कई बार ऐसे बादल बनते हैं लेकिन इनकी लंबाई-चौड़ाई इतनी ज्यादा नहीं होती। न ही मंगल ग्रह पर बने इस सफेद बादल की तरह धरती के बादल डायनेमिक होते हैं।

पांच सैटेलाइट्स की मदद से की गई स्टडी

इस बादल की स्टडी के लिए पांच सैटेलाइट्स का उपयोग किया है उसमें भारत का मंगलयान (Mars Orbiter Mission) भी शामिल हैं। बाकी चार मिशन हैं- नासा का MAVEN, MRO, Viking-2 और मार्स एक्सप्रेस ऑर्बिटर। मंगलयान से प्राप्त तस्वीरें भी इस बादल और इसकी उत्पत्ति के जगह की तस्वीरें ले चुका है। जिसे यूरोपियन स्पेस एजेंसी ने इसरो से मांगा था।

https://zeenews.india.com/hindi/science/nasa-martian-cloud-reveals-its-secrets-isro-science-news-in-hindi/863867

THE HINDU

Fri, 12 March 2021

India, Japan space agencies review cooperation

Earth observation, lunar cooperation and satellite navigation figure in discussion

New Delhi: Indian and Japanese space agencies on Thursday reviewed cooperation in earth observation, lunar cooperation and satellite navigation, and also agreed to explore opportunities for cooperation in "space situational awareness and professional exchange programme".

This was agreed during a bilateral meeting between the Indian Space Research Organisation (ISRO) and the Japan Aerospace Exploration Agency (JAXA) held virtually.

"Both agencies signed an Implementing Arrangement for collaborative activities on rice crop area and air quality monitoring using satellite data," an ISRO statement said.

India and Japan are already working on a joint lunar polar exploration (LUPEX) mission and the two space agencies have been working on the mission that aims to send a lander and rover to the Moon's south pole around 2024.

Early this month, India and Italy decided to explore opportunities in earth observation, space science and robotic and human exploration.

Last month, India and Australia signed an amendment to the MoU which will build on the Comprehensive Strategic Partnership. Both countries are also in discussions for Australia to host vital tracking infrastructure to support the Gaganyaan manned space flight mission.

https://www.thehindu.com/sci-tech/science/india-japan-space-agencies-review-cooperation/article34045001.ece

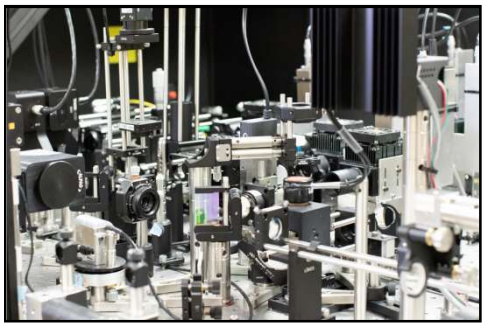
PHYS.ORG

Fri, 12 March 2021

Researchers set new resolution record for imaging the human eye

Researchers have developed a noninvasive technique that can capture images of rod and cone photoreceptors with unprecedented detail. The advance could lead to new treatments and earlier detection for retinal diseases such as macular degeneration, a leading cause of vision loss.

"We are hopeful that this technique will better reveal subtle changes in the size, shape and distribution of rod and cone photoreceptors in diseases that affect the retina," said research team leader Johnny Tam from the National Eye Institute. "Figuring out what happens to these cells before they are lost is an important step toward developing earlier interventions to treat and prevent blindness."



The researchers customized this adaptive optics scanning light ophthalmoscope to improve the imaging resolution by strategically blocking light in various locations of the instrument. Using less light is an advantage for imaging the human eye. Credit: Johnny Tam, National Eye Institute

In *Optica*, The Optical Society's (OSA) journal, the researchers show that their new imaging method overcomes resolution limitations imposed by the diffraction barrier of light. The researchers accomplish this feat while using light that is safe for imaging the living human eye.

"The diffraction limit of light can now be routinely surpassed in microscopy, which has revolutionized biological research," said Tam. "Our work represents a first step toward routine sub-diffraction imaging of cells in the human body."

Using less light to see more

Achieving high-resolution images of photoreceptors in the back of the eye is challenging because the eye's optical elements (such as lens and cornea) distort light in a way that can substantially reduce image resolution. The diffraction barrier of light also limits the ability of optical instruments to distinguish between two objects that are too close together. Although there are various methods for imaging beyond the diffraction limit, most of these approaches use too much light to safely image living human eyes.

To overcome these challenges, the researchers improved upon a retinal imaging technique known as adaptive optics scanning light ophthalmoscopy, which uses deformable mirrors and computational methods to correct for optical imperfections of the eye in real time.

"One might think that more light is needed to get a better image, but we demonstrate that we can improve resolution by strategically blocking light in various locations within our instrument," said Tam. "This approach reduces the overall power of light delivered to the eye, making it ideal for live imaging applications."

For the new approach, the researchers generated a ring-shaped, or hollow, beam of light. Using this type of beam improved the resolution across the photoreceptors but at the expense of depth resolution. To regain the lost depth resolution, the researchers used a small pinhole called a sub-Airy disk to block light coming back from the eye. They showed that this imaging approach could be used to enhance a microscopy technique called non-confocal split-detection, which is used to acquire complementary views of the photoreceptors.

Testing in the clinic

After demonstrating that imaging resolution was improved in theoretical simulations, the researchers confirmed their simulations using various test targets. They then used the new method to image rod and cone photoreceptors in five healthy volunteers at the National Institutes of Health's Clinical Center.

The new approach yielded about a 33 percent increase in transverse resolution and 13 percent improvement in axial resolution compared to traditional adaptive optics scanning light ophthalmoscopy. Using their optimized approach, the researchers were able to see a circularly shaped subcellular structure in the center of cone photoreceptors that could not be clearly visualized previously.

"The ability to noninvasively image photoreceptors with subcellular resolution can be used to track how individual cells change over time," said Tam. "For example, watching a cell begin to degenerate, and then possibly recover, will be an important advance for testing new treatments to prevent blindness."

The researchers plan to image the eyes of more patients with the new technique and use the images to begin to answer fundamental questions linked to rod and cone health. For example, they are interested in visualizing rod and cone health in people who have rare genetic diseases. They say that their imaging approach could be applied to other point scanning-based microscopy and imaging approaches in which it is important to image with low levels of light.

More information: Rongwen Lu et al, In vivo sub-diffraction adaptive optics imaging of photoreceptors in the human eye with annular pupil illumination and sub-Airy detection, *Optica* (2021). DOI: 10.1364/OPTICA.414206

Journal information: *Optica*

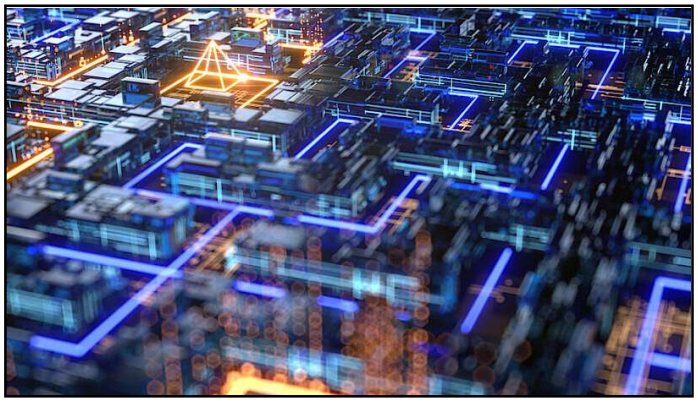
https://phys.org/news/2021-03-resolution-imaging-human-eye.html

PHYS.ORG

Fri, 12 March 2021

Robots learn faster with quantum technology

Artificial intelligence is part of our modern life by enabling machines to learn useful processes such as speech recognition and digital personal assistants. A crucial question for practical applications is how fast such intelligent machines can learn. An experiment at the University of Vienna has answered this question, showing that quantum technology enables a speed-up in the learning process. The physicists, in an international collaboration within Austria, Germany, the Netherlands, and the U.S., have achieved this result by using a quantum processor for single photons as a robot. This work, which con-tributes to the advancement of quantum artificial intelligence for future applications, is published in the current issue of the journal *Nature*.



Artistic impression of the quantum learning concept. Credit: Rolando Barry, University of Vienna

Robots solving computer games, recognizing human voices, or helping in finding optimal medical treatments: those are only a few astonishing examples of what the field of artificial intelligence has produced in the past years. The ongoing race for better machines has led to the question of how and with what means improvements can be achieved. In parallel, huge recent progress in quantum technologies have confirmed the power of quantum physics, not only for its often peculiar and puzzling theories, but also for real-life applications. Hence, the idea of merging the two fields: on one hand, artificial intelligence with its autonomous machines; on the other hand, quantum physics with its powerful algorithms.

Over the past few years, many scientists have started to investigate how to bridge these two worlds, and to study in what ways quantum mechanics can prove beneficial for learning robots, or vice versa. Several fascinating results have shown, for example, robots deciding faster on their next move, or the design of new quantum experiments using specific learning techniques. Yet, robots were still incapable of learning faster, a key feature in the development of increasingly complex autonomous machines.

Within an international collaboration led by Philip Walther, a team of experimental physicists from the University of Vienna, together with theoreticians from the University of Innsbruck, the Austrian Academy of Sciences, the Leiden University, and the German Aerospace Center, have been successful in experimentally proving for the first time a speed-up in the actual robot's learning time. The team has made use of single photons, the fundamental particles of light, coupled into an integrated photonic quantum processor, which was designed at the Massachusetts Institute of Technology. This processor was used as a robot and for implementing the learning tasks. Here, the robot would learn to route the single photons to a predefined direction. "The experiment could show that the learning time is significantly reduced compared to the case where no quantum physics is used," says Valeria Saggio, first author of the publication.

In a nutshell, the experiment can be understood by imagining a robot standing at a crossroad, provided with the task of learning to always take the left turn. The robot learns by obtaining a reward when doing the correct move. Now, if the robot is placed in our usual classical world, then it will try either a left or right turn, and will be rewarded only if the left turn is chosen. In contrast, when the robot exploits quantum technology, the bizarre aspects of quantum physics come into play. The robot can now make use of one of its most famous and peculiar features, the so called superposition principle. This can be intuitively understood by imagining the robot taking the two

turns, left and right, at the same time. "This key feature enables the implementation of a quantum search algorithm that reduces the number of trials for learning the correct path. As a consequence, an agent that can explore its environment in superposition will learn significantly faster than its classical counterpart," says Hans Briegel, who developed the theoretical ideas on quantum learning agents with his group at the University of Innsbruck.

This experimental demonstration that machine learning can be enhanced by using quantum computing shows promising advantages when combining these two technologies. "We are just at the beginning of understanding the possibilities of quantum artificial intelligence" says Philip Walther, "and thus every new experimental result contributes to the development of this field, which is currently seen as one of the most fertile areas for quantum computing."

More information: V. Saggio et al. Experimental quantum speed-up in reinforcement learning agents, *Nature* (2021). DOI: 10.1038/s41586-021-03242-7

Journal information: *Nature*

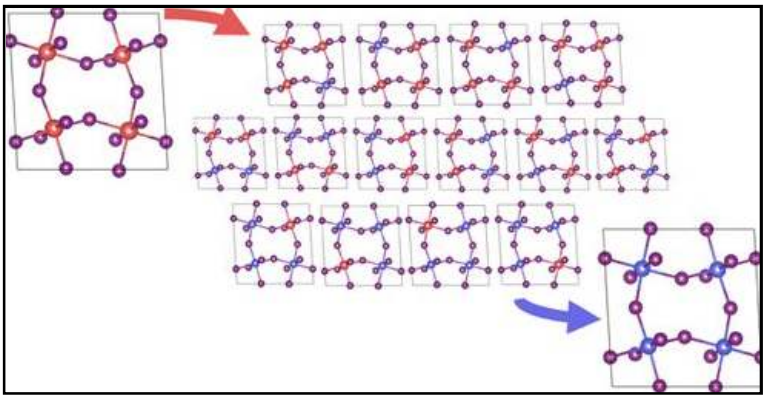
https://phys.org/news/2021-03-robots-faster-quantum-technology.html

Fri, 12 March 2021

New analysis of 2D perovskites could shape the future of solar cells and LEDs

An innovative analysis of two-dimensional (2D) materials from engineers at the University of Surrey could boost the development of next-generation solar cells and LEDs.

Three-dimensional perovskites have proved themselves remarkably successful materials for LED devices and solar panels in the past decade. One key issue with these materials, however, is their stability, with device performance decreasing quicker than other state-of-the-art materials. The engineering community believes the 2D variant of perovskites could provide answers to these performance issues.



Two-dimensional (2D) Ruddlesden–Popper perovskites (RPPs) of the form PEA2Pb1–xSnxI4 can be used as the tunable active layer in photovoltaics, as the passivating layer for 3D perovskite photovoltaics or in light emitting diodes. Here, we show a nonlinear band gap behavior with Sn content in mixed phase 2D RPPs. Density functional theory calculations (with and without spin–orbit coupling) are employed to study the effects of the short-range ordering of Pb and Sn in PEA2Pb1–xSnxI4 compositions with x = 0, 0.25, 0.5, 0.75, and 1. Analysis of the partial density of states shows that the energy mismatch of the Pb 6s and Sn 5s states in the valence band maximum determines the nonlinearity of the band gap, leading to a bowing parameter of 0.35–0.38 eV. This research provides a critical insight for the design of future metal alloy 2D perovskite materials. The positions of the tunable energy band discontinuity may point to intraband transitions of interest to device engineers. Credit: *The Journal of Physical Chemistry Letters* (2021). DOI: 10.1021/acs.jpclett.0c03699

In a study published in the *Journal of Physical Chemistry Letters*, researchers from Surrey's Advanced Technology Institute (ATI) detail how to improve the physical properties of 2D perovskite called Ruddlesden-Popper.

The study analyzed the effects of combining lead with tin inside the Ruddlesden-Popper structure to reduce the toxic lead quantity. This also allows for the tuning of key properties such as the wavelengths of light that the material can absorb or emit at the device level—improving the performance of photovoltaics and light-emitting diodes.

Cameron Underwood, lead author of the research and postdoctoral researcher at the ATI, said:

"There is rightly much excitement about the potential of 2D perovskites, as they could inspire a sustainability revolution in many industries. We believe our analysis of strengthening the performance of perovskite can play a role in improving the stability of low-cost solar energy and LEDs."

Professor Ravi Silva, corresponding author of the research and Director of the ATI, said:

"As we wean ourselves away from fossil energy sources to more sustainable alternatives, we are starting to see innovative and ground-breaking uses of materials such as perovskites. The Advanced Technology Institute is dedicated to being a strong voice in shaping a greener and more sustainable future in electronics—and our new analysis is part of this continuing discussion."

More information: Cameron C. L. Underwood et al. Nonlinear Band Gap Dependence of Mixed Pb–Sn 2D Ruddlesden–Popper PEA2Pb1–xSnxI4 Perovskites, *The Journal of Physical Chemistry Letters* (2021). DOI: 10.1021/acs.jpclett.0c03699

Journal information: *Journal of Physical Chemistry Letters*

https://phys.org/news/2021-03-analysis-2d-perovskites-future-solar.html

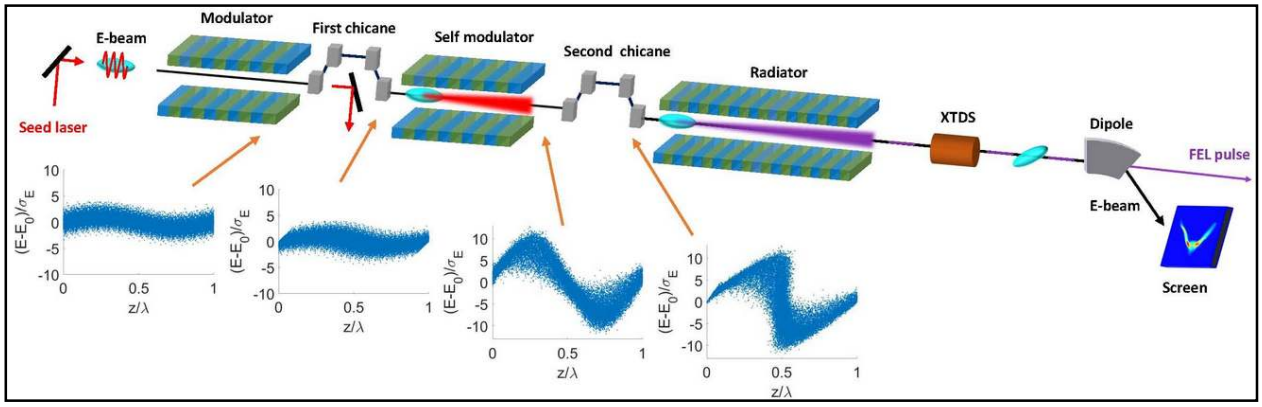
PHYS.ORG

Fri, 12 March 2021

Scientists propose novel self-modulation scheme in seeded free-electron lasers

By Zhang Nannan

Seeded free-electron lasers (FELs), which use frequency up-conversion of an external seed laser to improve temporal coherence, are considered ideal for supplying stable, fully coherent, soft X-ray pulses. However, the requirement for an external seed laser with sufficient peak power to modulate the electron beam can hardly be met by the present state-of-the-art laser systems, it remains challenging for seeded FELs to operate at high repetition rate, e.g., MHz repetition rate.



The self-modulation scheme together with the electron-beam longitudinal phase spaces at various positions. Credit: SARI

Motivated by such a challenge, researchers at the Shanghai Advanced Research Institute and the Shanghai Institute of Applied Physics of the Chinese Academy of Sciences reported a novel self-modulation method to enhance laser-induced energy modulation, thereby significantly reducing the requirement of an external laser system.

Based on the Shanghai soft X-ray FEL test facility, the self-amplification of coherent energy modulation in a seeded FEL is experimentally verified. The peak power requirement of an external seed laser is demonstrated to be relaxed by a factor of 10 to 25 when utilizing the proposed scheme.

Moreover, the high harmonic generation in a seeded FEL is realized by using an unprecedentedly small energy modulation. A 795 MeV electron beam with a laser-induced energy modulation amplitude as small as 1.8 times the slice energy spread is used for lasing at the 7th harmonic of a 266-nm seed laser in a single-stage high-gain harmonic generation (HGHG) and the 30th harmonic of the seed laser in a two-stage HGHG.

The results pave a way for a high-repetition-rate seeded FEL, which is expected to show great promise for multidimensional coherent spectroscopies, far beyond what has been demonstrated to date.

Furthermore, the self-modulation scheme proposed in this work is also promising to solve other critical problems of seeded FELs such as reaching shorter wavelengths and improving stability.

More information: Jiawei Yan et al. Self-Amplification of Coherent Energy Modulation in Seeded Free-Electron Lasers, *Physical Review Letters* (2021). DOI: 10.1103/PhysRevLett.126.084801

Journal information: *Physical Review Letters*

https://phys.org/news/2021-03-scientists-self-modulation-scheme-seeded-free-electron.html

COVID-19 Research News

THE HINDU BusinessLine

Fri, 12 March 2021

Kent variant of Covid-19 associated with higher mortality rate: Study

By Prashasti Awasthi

Mumbai: Epidemiologists from the Universities of Exeter and Bristol carried out research that stated variant B.1.1.7 of Covid-19 is linked to a significantly higher mortality rate compared to previously circulating strains.

The highly contagious Covid-19 variant discovered in Kent is between 30 and 100 per cent more deadly than previous strains, according to the researchers.

For the study, the researchers compared death rates among people infected with the new variant and those infected with other strains.

It revealed that the new variant led to 227 deaths in a sample of 54906 patients - compared to 141 amongst the same number of closely matched patients who had the previous strains.

Lead author Robert Challen, from the University of Exeter, said: "In the community, death from Covid-19 is still a rare event, but the B.1.1.7 variant raises the risk. Coupled with its ability to spread rapidly this makes B.1.1.7 a threat that should be taken seriously."

The study noted that the higher transmissibility of the Kent strain meant that more people who would have previously been considered low risk were hospitalized with the newer variant.

Leon Danon, senior author of the study from the University of Bristol said: "We focused our analysis on cases that occurred between November 2020 and January 2021, when both the old variants and the new variant were present in the UK."

He added: "This meant we were able to maximize the number of "matches" and reduce the impact of other biases. Subsequent analyses have confirmed our results."

The findings of the study were published in the British Medical Journal on March 10.

https://www.thehindubusinessline.com/news/science/kent-variant-of-covid-19-associated-with-higher-mortality-rate-study/article34044130.ece#