

Oct
2020

समाचार पत्रों से चयित अंश Newspapers Clippings

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

खंड : 45 अंक : 237 09 अक्टूबर 2020
Volume: 45 Issue: 237 09 October 2020



रक्षा विज्ञान पुस्तकालय
Defence Science Library
रक्षा वैज्ञानिक सूचना एवं प्रलेखन केंद्र
Defence Scientific Information & Documentation Centre
मेटकॉफ हाउस, दिल्ली - 110 054
Metcalfe House, Delhi - 110 054

CONTENT

S. No.	TITLE	Page No.
DRDO News		1-6
DRDO Technology News		1-6
1.	निर्भय और ब्रह्मोस मिसाइलें LAC पर तैनात, चीन को भारत ने दिखाई सैन्य ताकत	1
2.	Atmanirbhar Bharat is driving defence sector, says HAL	3
3.	Can LCA Tejas be turned into Rafale Jets if all goes well between Indian & French tech giants?	4
4.	Why India's SMART torpedo system is a breakthrough in anti-submarine warfare	5
Defence News		7-15
Defence Strategic National/International		7-15
5.	Air Chief Marshal RKS Bhaduria interview: 'Indigenisation essential for strategic development'	7
6.	IAF has shown capability to engage adversary: Air Chief	9
7.	Indian Air Force Day 2020: PM Modi, President Kovind, Rajnath Singh congratulate brave IAF warriors	11
8.	Two-day coastal security exercise concludes	12
9.	India, Japan finalise pact for cooperation in 5G, AI, critical information infrastructure	13
10.	Growing global footprint: Seventh logistics pact to extend naval reach from Japan to Bahrain	14
11.	To match Indian Navy, Pakistan rapidly growing its naval fleet with Chinese assistance	15
Science & Technology News		16-29
12.	A new magnetic material and recording process to vastly increase data capacity	16
13.	Graphene detector reveals THz light's polarization	18
14.	Cement, salt and water: A new storage material for green heat	20
15.	An electrical trigger fires single, identical photons	21
16.	Nanoscale machines convert light into work	23
17.	Generating photons for communication in a quantum computing system	24
COVID-19 Research News		26-29
18.	New research suggests coronavirus antibodies last at least 3 months after covid-19 infection	26
19.	Covid-19: Asthma patients less likely to die from virus; new test tells who is still infectious	27
20.	Potential COVID-19 vaccines not affected by recent mutations: Study	29



Fri, 09 Oct 2020

निर्भय और ब्रह्मोस मिसाइलें LAC पर तैनात, चीन को भारत ने दिखाई सैन्य ताकत

किसी भी युद्ध की स्थिति से निपटने के लिए भारत ने चीन सीमा के नजदीक लद्दाख में अपनी स्वदेश निर्मित निर्भय क्रूज मिसाइल की तैनाती कर दी है। यह मिसाइल एक हजार किमी दूरी तक मार करने में सक्षम है।

By Sanjay Pokhriol

वास्तविक नियंत्रण रेखा (एलएसी) पर जारी तनाव के बीच भारत ने अपनी सामरिक ताकत बढ़ा दी है। उल्लेखनीय है कि एलएसी पर करीब पांच माह से तनाव चल रहा है और कई जगहों पर तो भारत और चीन की सेनाएं आमने सामने हैं। किसी भी युद्ध की स्थिति से निपटने के लिए भारत ने चीन सीमा के नजदीक लद्दाख में अपनी स्वदेश निर्मित निर्भय क्रूज मिसाइल की तैनाती कर दी है।

यह मिसाइल एक हजार किमी दूरी तक मार करने में सक्षम है। यह बिना भटके अपने निशाने पर अचूक वार करती है। यह दो चरणों वाली मिसाइल है। पहली बार में लंबवत और दूसरे चरण में क्षैतिज। यह पहले पारंपरिक रॉकेट की तरह सीधा आकाश में जाती है और फिर दूसरे चरण में क्षैतिज उड़ान भरने के लिए 90 डिग्री का मोड़ लेती है। इस तरह यह अपने लक्ष्य को निशाना बनाती है।

निर्भय मिसाइल को रक्षा अनुसंधान एवं विकास संगठन (डीआरडीओ) ने पूर्णतया अपने दम पर बनाया है। इस मिसाइल में धीमी गति से आगे बढ़ने, बेहतरीन नियंत्रण एवं दिशा-निर्देशन, सटीक परिणाम देने तथा राडारों से बच निकलने की क्षमता है। यह सुपर सोनिक क्रूज मिसाइल एडवांस्ड सिस्टम लैबोरेटरी (एएसएल) द्वारा विकसित की गई है। यह मिसाइल ठोस रॉकेट मोटर बूस्टर से सुसज्जित है। इसमें टबरे-फैन इंजन लगा है जो इसे आगे बढ़ाता है।

मिसाइल के निश्चित ऊंचाई और गति तक पहुंचने के बाद बूस्टर मोटर अलग हो जाता है। इसके बाद टबरे-फैन इंजन आगे के प्रक्षेपण के लिए स्वयं ही कार्य करने लगता है। ठोस रॉकेट मोटर बूस्टर से संचालित इस मिसाइल की परिचालनगत मारक क्षमता एक हजार किमी तक है। डीआरडीओ के वैज्ञानिकों के मुताबिक यह मिसाइल रॉकेट से विमान और उसके पश्चात मिसाइल में तब्दील हो जाती है। लॉन्च करने के बाद निर्भय मिसाइल का रॉकेट मोटर बंद हो जाता है और पंख बाहर निकल आते हैं। उड़ान के रास्ते को



स्थिर करने के लिए निर्भय मिसाइल में आधुनिक कंप्यूटर लगाए गए हैं। धरती से दिए गए कमांड पर इसके पंख खुलते हैं। अपनी खूबियों के कारण यह शत्रु के राडार में दिखाई नहीं देती है।

अमेरिका की टॉमहाक मिसाइल का जवाब मानी जाने वाली निर्भय एक सब सोनिक क्रूज मिसाइल है। धरती से सटकर चलने वाली यह मिसाइल दुश्मन की निगाह से बचकर हमला करती है। इस मिसाइल का प्रहार एकदम सटीक होता है। लंबे समय तक यह हवा में रहने में सक्षम है। लक्ष्य तक बढ़ने के लिए इसके भीतर ही एक विशेष सिस्टम लगा है। यह अनेक तरह की युद्धक सामग्री अपने साथ ले जा सकती है। यह अत्याधुनिक किस्म की बहु-उपयोगी क्रूज मिसाइल है, जिसे जल, थल और आकाश में सभी तरह के प्लेटफॉर्म से हर मौसम में दागा जा सकता है। इसे तीनों सशस्त्र सेनाओं की जरूरतों के मद्देनजर तैयार किया गया है।

यह मिसाइल एक साथ कई लक्ष्यों से निपट सकती है और कई लक्ष्यों के बीच में किसी खास लक्ष्य के चारों तरफ घूमकर उस पर हमला करने में सक्षम है। यह भारत की सामरिक मजबूती का एक विशेष कदम है। इस तरह भारत अपनी सबसे भरोसेमंद क्रूज मिसाइल निर्भय की तैनाती के बाद चीन से निपटने के लिए पूरी तरह से सक्षम हो गया है। इससे चीन के कई शहरों को निशाने पर लिया जा सकता है। पाकिस्तान का तो लगभग पूरा भौगोलिक दायरा इसकी जद में आ सकता है।

ब्रह्मोस मिसाइल : इन्हीं तैयारियों में शामिल है ब्रह्मोस मिसाइल मिसाइल की तैनाती। ब्रह्मोस मिसाइल भारत का सबसे बड़ा हथियार है। यह मिसाइल न केवल हवा से हवा में, बल्कि जमीन से भी हवा में मार कर सकती है। ब्रह्मोस मिसाइल मिसाइल को लद्दाख सेक्टर में पर्याप्त संख्या में तैनात किया गया है, जिसमें सुखोई-30 एमकेआइ लड़ाकू विमान से लेकर स्टैंड-ऑफ हथियार पहुंचाने का विकल्प है। इसके अलावा ब्रह्मोस मिसाइल का उपयोग भारत के द्वीप क्षेत्रों में एयरबेस के जरिये हिंद महासागर में चॉक प्वाइंट बनाने के लिए किया जा सकता है।

वर्तमान समय में इस मिसाइल को थल, जल एवं नभ में कहीं से भी छोड़ा जा सकता है। यह मिसाइल जमीन के नीचे परमाणु बंकरों, कमांड एंड कंट्रोल सेंटर्स और समुद्र के ऊपर उड़ान भर रहे लड़ाकू विमानों को निशाना बनाने में सक्षम है। सुखोई-30 एमकेआइ के साथ जोड़कर ब्रह्मोस मिसाइल का पहला परीक्षण 25 जून 2016 को किया गया था। सुखोई विमानों में ब्रह्मोस मिसाइलों को लगाए जाने से भारतीय वायु सेना की मारक क्षमता काफी बढ़ चुकी है। अब सुखोई के जरिये हवा से जमीन पर मार करने में भारत सक्षम है।

संप्रति भारतीय वायु सेना पूरी दुनिया की अकेली ऐसी वायु सेना है, जिसके पास सुपरसोनिक क्रूज मिसाइल प्रणाली है। अब वायु सेना दृश्यता सीमा से बाहर के लक्ष्यों पर भी हमला कर सकेगी। उसके अनेक विमानों में यह प्रणाली लगाई जा चुकी है। दुनिया की सबसे तेज गति वाली मिसाइलों में शामिल ब्राह्मोस सर्वाधिक खतरनाक एवं प्रभावी शस्त्र प्रणाली है। यह न तो रडार की पकड़ में आती है और न ही दुश्मन इसे बीच में भेद सकता है। एक बार दागने के बाद लक्ष्य की तरफ बढ़ती इस मिसाइल को किसी भी अन्य मिसाइल या हथियार प्रणाली से रोक पाना लगभग असंभव है। इससे निश्चित तौर पर हमारी सैन्य ताकत में व्यापक बढ़ोतरी हुई है।

<https://www.jagran.com/editorial/apnibaat-indian-air-force-day-nirbhay-and-brahmos-missiles-deployed-on-lac-india-shows-military-strength-to-china-jagran-special-20851747.html>

Atmanirbhar Bharat is driving defence sector, says HAL

The move for suspending import of defence items should be linked to export requirements to increase competitiveness in the global market

By Avanne Dubash

Key Highlights

- **Atmanirbhar Bharat is driving the defence sector as far as manufacturing is concerned**
- **Covid impacted the Q1 earnings considerably, but Q2 will look promising**
- **Expects more than Rs 1 lakh crore orders in 5-6 months**

Mumbai: State-owned aerospace and defence company Hindustan Aeronautics Limited (HAL) is working high-profile aviation projects for the Indian forces and projects with DRDO and engineering institutes and lauds the strong push from the government through the 'Atmanirbhar Bharat Abhiyan' initiative.

ET NOW spoke to R Madhavan, Chairman and Managing Director of HAL to understand how the policy formulations and reforms on self-reliance and local production- how will this favourably impact the operations of the company and the defence sector.

"Atmanirbhar Bharat is driving the defence sector as far as manufacturing is concerned and the company is at the forefront as many platforms and a lot of equipment comes from our end," said Madhavan.

HAL supports medium and small industries who are dependent on the company and supply products to them.

Madhavan believes that while the COVID led pandemic impacted the Q1 earnings considerably, Q2 will look promising. The company affected and saw an impact of two months' worth of production.

"The impact of the supply chain has reduced but is still there, some MSMEs have still not recovered from impact. There has been a restriction on goods movement from foreign suppliers. The supply chain for MSMEs will take 4-6 quarters to recover."

While Madhavan believes the move of India suspending the import of 101 defence items to boost indigenous production is a positive move, it is a double-edged sword. "The move for suspending import of defence items should be linked to export requirements to increase competitiveness in the global market."

He says the government should look to export equipment instead of using tier II and III vendors and help in full systems like aircrafts, artillery and guns.

"HAL expects more than `1 lakh crores orders in 5-6 months, but the order flow needs to pick-up in December. Also, we need liquidity in the manufacturing sector with over `7 lakh crores pending. We need capex and tech upgradation in order to meet the indigenous requirements of the armed forces," said Madhavan. He acknowledged that the impact of issues at the China border cannot allow for reducing defence spend. "We are well placed to fight a two-pronged war between Pakistan and China but the preparedness is for armed forces to reply." The company is looking forward to the Tejas Mk-2 twin-engine multirole fighter jets.

<https://www.timesnownews.com/business-economy/companies/article/atmanirbhar-bharat-is-driving-defence-sector-says-hal/664219>



Representational Image

Can LCA Tejas be turned into Rafale Jets if all goes well between Indian & French tech giants?

Despite India inching ahead in its drive to build an indigenous fifth-generation fighter jet, the DRDO has continued to suffer setbacks in a critical technology that could make India one of very players to develop a fully indigenous fighter jet.

The biggest challenge that India faces in the development of a fighter jet engine or even the acquisition of the technology due to the absence of foreign partners.

However, India could soon be able to solve the conundrum, according to India's Chief of Air Staff, RKS Bhadauria, who said that the country's Defence Research and Development Organisation (DRDO) has been in negotiations with France's Safran and Britain's Rolls Royce among many.



HAL Tejas

In a report tabled in the Indian Parliament last month, the country's Comptroller and Auditor General (CAG) stated that under the offset contract related to the \$8.7 billion deal for 36 Rafale jets, French aerospace major Dassault Aviation and European missile maker MBDA have till date "not confirmed" the transfer of technology for the indigenous development of an engine for the Light Combat Aircraft (LCA) by DRDO.

"It is not clear if this technology transfer will take place, and there is need for MoD/DRDO to identify and acquire the right technologies in order to comply with the directions of Defence Acquisition Council (DAC) given in September 2016," said CAG's report.

With India currently embroiled in a conflict in Eastern Ladakh with China, Prime Minister Narendra Modi has called for lesser dependence on foreign nations by supporting the 'Aatmanirbhar Bharat' (Self-Reliant India) and 'Make in India' mission, having seen Beijing sail ahead with the development of indigenously produced fighters.

Under the initiative, the Indian Air Force (IAF) has rolled out plans to build an advanced multi-role fighter which would be powered by a new indigenously produced engine and home developed weapon systems.

While the plans have been stalled due to the failure of Rafale Offsets and subsequent delays of the transfer of technology (TOT) for the aero engine, Bhaduria has said the program could yet kick off soon.

"In the military aerospace zone, I think the engine is the biggest problem today and that is an area that we must address. DRDO has been at it as we had numerous discussions. This engine issue is a complex issue. The technology involved is complex. DRDO and all concerned be it- Safran, Rolls Royce and others- they have been in discussion." said Bhadauria.

The Indian Air Chief, while speaking about French multinational aircraft engine developers, Safran's role, said,

"As you asked specifically about Safran, the technology transfer did not materialize between DRDO & Safran and that is why it is not part of Offset as yet. Should it get firmed up between the two it will become part of the offset. So our understanding on that should be clear,"

It is from both sides. If they firm up the commitment to take the transfer of technology and sort out the negotiations with DRDO thereafter it will become part of the offset. Offsets contracts cater to such a possibility."

Bhadauria also clarified concerns over the revival of the stalled Kaveri engine programme, stating that efforts are underway to look for a joint venture.

“In terms of what is happening on the engine, what I am aware of is that there is a concerted effort to form a JV. Kaveri (Engine) came a long way but now it is not possible to assimilate it in AMCA kind of project. So JV is what we are looking at. We will see soon that the contours of JV get fructified,”

It is not that Kaveri has failed. Part of Kaveri has been quite successful. In terms of design and manufacturing, we will of course leverage the Kaveri know-how down the line and even assimilate in future JV for aero engine,”

So, there will be technology that will be part of our plan and there needed technology to be built up. Since we have a tight timeline and how much should be the capacity and on all that DRDO has to be finalized Chief elaborated on the sheer efforts and expertise gained such elusive technology that only very countries have been able to develop and master.” said Bhadauria.

French engine manufacturer Safran is expected to offer complete technology transfer to develop the engine and to use the offset credits from the French Dassault Rafale deal. It is also looking to accept a deal with HAL for the transfer of manufacturing technology for high-end engines.

The new engines will equip the future squadrons of the Indian Air Force, so essentially Indian AMCA (fifth-gen fighters) or even the advanced versions of LCA Tejas could be equipped with equally potent engines like what the latest jets like Rafales or Mirages are using, a defence expert told the EurAsian Times.

<https://eurasianimes.com/can-lca-tejas-be-turned-into-rafale-jets-if-all-goes-well-between-indian-french-tech-giants/>

TIMESNOWNEWS.COM

Thu, 08 Oct 2020

Why India’s SMART torpedo system is a breakthrough in anti-submarine warfare

The SMART system incorporates a mechanism by which a torpedo is fitted into a hypersonic missile system capable of carrying it distances far greater than it would ordinarily be able to travel

Key Highlights

- ***In the mid-2010s, the DRDO initiated a programme to build a system capable of launching torpedoes assisted by missiles***
- ***Light-weight torpedoes are limited by their range. Such torpedoes are, by and large, rendered defensive weapons against hostile submarines***
- ***However, a rocket-assisted torpedo like the one India has developed helps nullify this disadvantage by extending the range of anti-submarine light-weight torpedoes***

On Monday, India successfully flight-tested its indigenously crafted SMART torpedo system hailed by the Defense Research Organisation (DRDO) as a 'game-changer' in anti-submarine warfare. As per a defense ministry statement, the Supersonic Missile Assisted Release of Torpedo (SMART) was tested successfully at the APJ Abdul Kalam Island off the coast of Odisha.

'All the mission objectives (of SMART) including missile flight up to the range and altitude, separation of the nose cone, release of torpedo and deployment of velocity reduction mechanism (VRM) have been met perfectly,' the statement read.

What is SMART?

Self-propelled torpedoes are critical weapons in maritime warfare but are limited greatly by their range. In the mid-2010s, the DRDO initiated a programme to build a system capable of launching torpedoes assisted by missiles. While not much information was initially released to the public about the project, Monday's test was the first time the system was tested.

The SMART system incorporates a mechanism by which a torpedo is fitted into a hypersonic missile system capable of carrying it distances far greater than it would ordinarily be able to travel. For instance, a torpedo with a range of 10km can be sent to a distance as far as 1000km away by a hypersonic missile, before actually being launched. The technology drastically increases the flexibility afforded to India's maritime forces as it relates to their launch platforms.

Typically, warships carry light-weight torpedoes as their main weapon against submarines over heavy-weight ones that are larger in diameter (meaning fewer can be carried). But light-weight torpedoes are limited by their range. In this sense, such torpedoes are, by and large, rendered defensive weapons against hostile submarines.

In a scenario where the enemy has several submarines, and particularly nuclear-powered vessels capable of travelling at significantly higher speeds than conventional diesel-electric ones, a warship is automatically at a huge disadvantage.

However, a rocket-assisted torpedo like the one India has developed helps nullify this disadvantage by extending the range of anti-submarine light-weight torpedoes. Both, the United States and Russia have, reportedly, already developed rocket-assisted torpedoes. The US Navy, for instance, still uses its ASROC (Anti-Submarine Rocket), a rocket-propelled torpedo system first designed as far back as the 1950s. China is also believed to have been working on rocket-assisted torpedo technology for several decades.

The successful test of the SMART torpedo system comes at a moment when India faces a growing submarine threat from China and Pakistan. China, in particular, as per a report by the US Navy's Office of Naval Intelligence, is expected to have up to 76 submarines – eight nuclear-powered ballistic missile submarines, 13 nuclear-powered attack submarines, and 55 diesel-electric submarines – by 2030. As such, the SMART system may come to play a critical role in countering any maritime menace faced by India.

<https://www.timesnownews.com/india/article/why-india-s-smart-torpedo-system-is-a-breakthrough-in-anti-submarine-warfare/663676>



Defense Minister Rajnath Singh congratulated the DRDO for the successful launch of the SMART torpedo system. | Photo Credit: ANI



Fri, 09 Oct 2020

Air Chief Marshal R K S Bhadauria interview: ‘Indigenisation essential for strategic development’

By Anantha Krishnan M

Bangaluru: The Indian Air Force (IAF) celebrates its 88th anniversary on Thursday. Chief of Air Staff Air Chief Marshal R K S Bhadauria, who completed one year in office recently, tells Onmanorama in an interview that these are exciting times for the IAF with unprecedented infusion of technology.

“In the coming decade, IAF would have evolved into a modern, networked and effective force capable of thwarting future threats,” says Air Chief Marshal Bhadauria. Edited excerpts from an interview.



It will be a high-elevation battlefield with the Indian Army expecting IAF to perform at high altitudes. Does our entire aerial platform geared up for this?

All our aerial platforms are capable of undertaking unrestricted operations over high-altitude terrain. While the key role played by IAF during the Kargil war is a testimony to our experience, we have continued to refine our expertise over the years in this domain.

With two- frontier war inevitable, if the conflict escalates, the most important factor is the rapid mobilization. Can the existing C17s and Chinooks play a significant role?

C-17s and Chinooks have potent airlift capability and the same is being utilised in the northern sector. The IAF transport and helicopter fleet has adequate capacity and numbers to meet our strategic and tactical airlift requirements.

Artificial Intelligence (AI) in military applications will decide the future course of conflicts. Where do we stand compared to China? And, where do we see ourselves by 2030?

In China’s context, there has been an increased focus on integrating AI with the military. IAF is alive to these developments and a clear roadmap has been laid down to ensure effective AI capability by 2030. Presently, multiple projects related to AI integration in key domains of warfare are underway and significant progress has been made.

What is holding up the LCA Mk-1A and Light Combat Helicopter (LCH) deals?

The contract for 83 LCA MK-IA is likely to be signed in this calendar year. It is currently at the CFA stage. As far as LCH is concerned, the Initial Operational Clearance (IOC) for LCH limited series production has been accorded and the cost has already been finalized by the cost committee.

The contract is likely to be signed in this calendar year and we expect the induction to commence a year or so thereafter.

Given the LCH and Light Utility Helicopter (LUH)'s performance in Ladakh (both reported superlative, and the LCH was deployed for war fighting), will the IAF be seeking accelerated production of the two platforms?

Once the LCH is inducted, the initial phase would entail operationalisation of the platform. Once the platform is stabilised and the desired integration has been achieved, accelerated production could be sought to meet our operational requirements. With regards to LUH, we are sure that HAL will complete the full development this year. Case is already progressing on the procurement of an initial batch of helicopters.

We have been using the C-17 airframes quite a bit ever since they were inducted. What does the IAF's path for a follow-on heavy lifter look like?

The current utilisation rate of C-17 is factored in the overall airframe lifting and as mentioned earlier, we have adequate capacity and numbers to meet our strategic airlift requirements.

What is IAF's road map towards upcoming technologies like loyal wingman, 6G fighters with onboard DEW, UCAVs, optionally manned fighters and so on?

We have a clear roadmap. The planning process is already underway for combat systems like optionally manned sixth generation technologies, smart wingman concept, swarm drones, long persistent HALE (High Altitude Long Endurance) platforms and hypersonic weapons, among others.

Given the two front war becoming a reality more than ever and drastically changed situations of air warfare now, does the IAF still think that 42 Squadron assessment stands or is a new number and capability definition in the works?

At present, we are well short of the desired 42 Squadron strength that caters to a two-front contingency. Hence, rather than defining a new number and capability definition, IAF is presently focused on a more pragmatic approach to bridge the shortfall by improving serviceability and enhancing weapons suite. In this context, the planned induction of LCA Mk1A and other platforms is critical for halting the reducing trend and ensuring increase in the desired numbers in a short to medium timeframe.

What ails India's home-grown R&D efforts?

While it is true that the pace of building niche capabilities in defence manufacturing has been slow at times, the success of key projects like LCA, BrahMos and Astra highlights the talent and potential of our scientists and engineers. Indigenisation is a KRA (key result area) for the IAF. We firmly believe that indigenisation is essential for true strategic development. This will only be possible by a concerted effort from all stakeholders including Services, DRDO, PSUs and the private sector.

Tejas MK-2 and Advanced Medium Combat Aircraft (AMCA) are two aeronautical programmes that the IAF has keen interests in. How is IAF planning to drive these programmes differently keeping in mind the lessons from the past?

Every new programme evolves based on the experiences and lessons gleaned from previous ones. IAF is committed to the development of the LCA and the fifth generation AMCA which will be the mainstay of the IAF fighter fleet in the coming decades. The declared timelines are tight and we are hopeful that both the R&D agencies and the industry will deliver as promised. For AMCA programme to succeed, a focused collaborative effort involving the public and private sector is essential starting now. The IAF is closely enmeshed in both the Tejas and AMCA programmes and our teams are contributing to the development efforts.

IAF is losing some of its best professionals and officers to civil skies. What are the measures taken to avoid talent and leadership drain?

Due to the opening up of civil aviation, pilot retention has been an issue. IAF has initiated multiple steps to address the problem. Promotion policy is under review to reduce the stagnation

and ensure faster promotions for meritorious officers. The eligibility criteria for granting release have been tightened and more clarity is being given to officers about career growth.

You have completed one year in office now and what are the areas that got a renewed look during this time?

In the last one year, major focus has been on fast tracking weapons and system integration on our fighter platforms. Our operational training philosophy has been revamped to train in a realistic scenario and the use of simulators for combat and weapon training has been enhanced. Digitisation and automation of our processes whether in operations, maintenance or administration is a key focus which is crucial for a technologically sensitive force as ours. Many steps have been taken to reorient our HR policies to attract and retain our best people who are the mainstay of our organization.

What are your views on IAF in the next decade?

Air Forces are sensitive to changes in technology in multiple domains. These are interesting times as today we are laying a robust foundation for the future. In the coming decade, IAF would have evolved into a modern, networked and effective force capable of thwarting future threats through increasingly networked sensor and shooter systems and more lethal, precise and longer range weapons. The space domain is likely to dominate in times to come and is being given the required thrust. I would say we are moving in the right direction at the required pace and by 2030, we would be able to maintain the desired combat edge with respect to our adversaries.

Finally, what's your message to the new-age air warrior?

I would say that these are exciting times for IAF with unprecedented infusion of technology. Our air warriors have always displayed exceptional professionalism and courage during adversity. Air warriors would play a critical role in ensuring seamless assimilation of new technology and would need to display technical acumen to handle complex systems. At the same time, the IAF has rapidly progressed in enhancing the quality of life of our air warriors and steps are in place to ensure further improvement.

<https://www.onmanorama.com/news/nation/2020/10/08/indigenisation-is-essential-for-true-strategic-development--iaf-.html>



Fri, 09 Oct 2020

IAF has shown capability to engage adversary: Air Chief

Indian Air Force Chief Air Chief Marshal RKS Bhadauria on Thursday said the IAF had “clearly demonstrated” its resolve and operational capability to “effectively engage” the adversary should the need arise, at a time India and China are locked in border tensions in the sensitive Ladakh sector

By Peeyush Khandelwal

Ghaziabad: Indian Air Force chief Air Chief Marshal RKS Bhadauria on Thursday said the IAF had “clearly demonstrated” its resolve and operational capability to “effectively engage” the adversary should the need arise, at a time India and China are locked in border tensions in the sensitive Ladakh sector.

In his address on the 88th IAF Day celebrations at the Hindon airbase, during which Balakot heroes were presented gallantry awards, the IAF chief said, “I would like to commend all warriors for the quick response, in the recent stand-off on our northern frontiers, when we deployed our combat assets at short notice to handle any eventuality, and provided proactive support to all the requirements of deployment and sustenance for the Indian Army.”

Three days ago, the IAF chief said at his annual press conference that China couldn't get the better of India in any conflict and the air force was ready to handle any contingency, with its capability and intent serving as a deterrent for the adversary.

The IAF celebrated its 88th anniversary with a ceremonial parade and fly-past involving 59 aircraft including the Rafale jets. It was the second public appearance of the Rafales after the planes were formally inducted at the Ambala airbase on September 10. The fly-past this year was marked by elaborate air displays by front-line fighter jets, transport aircraft and helicopters that flew in synergy in line with the theme of 'Innovate, Integrate and Intimidate.'



IAF Chief Air Chief Marshal RKS Bhadauria addresses during the 88th Air Force Day celebrations at Hindon airbase in Ghaziabad, Thursday, Oct. 8, 2020. (PTI photo)

Bhadauria presented gallantry awards to several IAF personnel including fighter pilots who were associated with the air force's 2019 airstrikes against terror camps in Pakistan's Balakot. These awards were announced on the eve of Independence Day last year but given away on Thursday.

Several Yudh Seva Medals and Vayu Sena Medals for gallantry were announced last year for officers who were a part of the Balakot operation on February 26, 2019 and dogfight with the Pakistan air force the next day.

Those awarded the YSM by the IAF chief on Thursday included Air Vice Marshal Sunil Kashinath Vidhate, Group Captains Yeshpal Singh Negi, Hemant Kumar, Hansel Joseph Sequeira and Squadron Leader Minty Aggarwal. Aggarwal, a woman fighter controller, played a key role in intercepting the Pakistan air force's attempt to launch retaliatory air attacks after the IAF's Balakot airstrikes, which were in retaliation for the February 14, 2019 Pulwama suicide car bomb attack that killed 40 troopers of the Central Reserve Police Force (CRPF).

Those who were given Vayu Sena Medals for gallantry included Group Captain Pranav Raj, Wing Commander Amit Ranjan and Squadron Leaders Pankaj Bhujade, Shashank Singh and BKN Reddy.

"With Atmanirbharta {self-reliance} as the bedrock, IAF has been rapidly shifting to indigenous equipment. The light combat aircraft, advanced light helicopter, Netra AEW&C, Akash surface-to-air missile systems, ASTRA air-to-air missile, BrahMos...are many successes of our home industry, which are already operational in the IAF today," the IAF Chief said.

<https://www.hindustantimes.com/india-news/iaf-has-shown-capability-to-engage-adversary-air-chief/story-s1z2nL7pDqBt2r0V6D3ViM.html>

Indian Air Force Day 2020: PM Modi, President Kovind, Rajnath Singh congratulate brave IAF warriors

Prime Minister Narendra Modi extends greetings to the Indian Air Force on the 88th Air Force Day today

Edited By Namrata Agrawal

Highlights

- 1. Prime Minister Narendra Modi, President Kovind, Union Ministers Rajnath Singh and Amit Shah extend greetings to the Indian Air Force on the 88th Air Force Day today.**
- 2. You not only keep the skies of the country safe, but also play a leading role in the service of humanity in times of disaster, PM Modi said in a tweet.**

New Delhi: Prime Minister Narendra Modi extends greetings to the Indian Air Force on the 88th Air Force Day today.

The PM congratulated the 'brave warriors' with a tweet in Hindi which roughly translates to: "Many congratulations to all the brave warriors of the Indian Air Force on Air Force Day. You not only keep the skies of the country safe, but also play a leading role in the service of humanity in times of disaster. Your courage, valor and dedication to protect Maa Bharati is inspiring everyone."

PM Modi shared a video of the IAF with his tweet.

On the occasion, President Ram Nath too Kovind honoured the air warriors, veterans and the families of IAF saying that the nation remains indebted to their contribution in securing the skies.

President Kovind tweeted: "On Air Force Day, we proudly honour our air warriors, veterans, and families of the Indian Air Force. The nation remains indebted to the contribution of the IAF in securing our skies and assisting civil authorities in Humanitarian Assistance and Disaster Relief."

"The ongoing process of modernisation with induction of Rafale, Apache and Chinook will transform the IAF into an even more formidable strategic force. Confident that in the years to come, the Indian Air Force will continue to maintain its high standards of commitment and competence," he said in another tweet.

Union Ministers of Defence and Home Rajnath Singh and Amit Shah, respectively also extended their greetings to the IAF.

Singh said that the Centre is committed to enhancing its capabilities through modernisation and indigenisation. "My felicitations and best wishes to the air warriors and their families on the occasion of Air Force Day-2020. Eighty-eight years of dedication, sacrifice and excellence mark the journey of the IAF which is today a lethal and formidable force to reckon with," he said.

While Shah reiterated the Centre's commitment towards the IAF.

He wrote: "Greetings on Indian Air Force day! From safeguarding our skies to assisting in all odds, our brave Air Force personnel have served the nation with utmost courage and determination. The Modi government is doing everything possible to keep our mighty air warriors roaring loud in the skies," Shah said.

Meanwhile, the IAF Day Parade is scheduled to take place at the Hindon Air Force Station, Ghaziabad on October 8. Full-dress rehearsals were held on Wednesday by the various squadrons.



The IAF was established on October 8, 1932, in undivided India which was under the British rule. It was given the prefix "Royal" by King George VI for its contribution during the Second World War. The prefix was later dropped in 1950 when India became a republic.

(With inputs from agencies)

<https://zeenews.india.com/india/indian-air-force-day-2020-pm-modi-president-kovind-rajnath-singh-congratulate-brave-iaf-warriors-2315627.html>

Outlook

Fri, 09 Oct 2020

Two-day coastal security exercise concludes

Kochi: A two-day Coastal Security Exercise- "Sagar Kavach"- to assess the preparedness of all agencies towards dealing with an asymmetric threat emanating from the sea, concluded on Thursday. The exercise conducted along the coastal areas of Kerala, Karnataka and Lakshadweep assumes significance in the backdrop of prevailing security situation in the country, a Defence statement said here.

According to the statement, 20 ships of the Indian Navy and Coast Guard as well as 50 patrol crafts manned by various security agencies, took part in the exercise.

During the exercise, the participants were divided in two teams, Red (attack) and Blue (defence), with the Red Force simulating as terrorists attempting to infiltrate coastal areas of the state for attacks on vital assets as well as vital points and Blue Force carrying out coastal security surveillance to intercept and neutralize the attempts.

Extensive air patrol and surveillance of the adjoining seas were also undertaken by the aircraft, helicopters and Remotely Piloted Aircraft (RPA) of the Indian Navy and Coast Guard to detect ships and vessels of the opposing force, the statement said.

A high level of coastal surveillance was maintained all along the Kerala coast during the period.

A wide range of security contingencies including multi-layer security, infiltration from seaward, simulated attacks on vital installations/ assets, hijacking of merchant ships, and cross landings were exercised.

The defensive layers set up at sea thwarted attempts by the opposing force engaged in infiltration, it said.

Apart from Indian Navy and Indian Coast Guard, Coastal Police, Coastal District Administration, Cochin Port, Fisheries Department, Customs, Marine Enforcement Wing (MEW), Central Industrial Security force (CISF), Intelligence Bureau (IB), LightHouse Department and fishermen community participated in the exercise.

Vice Admiral Anil Kumar Chawla, Flag Officer Commanding in Chief, Southern Naval Command, reviewed the preparedness and conduct of the exercise with special emphasis on ensuring COVID-19 protocol by the concerned agencies, as the Commander-in-Chief, Coastal Defence.

The exercise was monitored from Joint Operations Centre, Kochi.

Sagar Kavach is a half yearly exercise with an objective to check Coastal Security mechanism and validate Standard Operating Procedures.

(Disclaimer: This story has not been edited by Outlook staff and is auto-generated from news agency feeds. Source: PTI)

<https://www.outlookindia.com/newscroll/twoday-coastal-security-exercise-concludes/1951897>

India, Japan finalise pact for cooperation in 5G, AI, critical information infrastructure

In a clear message to China, India and Japan have finalised an ambitious agreement that provides for cooperation in 5G technology, artificial intelligence and an array of other critical areas as the two strategic partners agreed to further broaden their ties including giving momentum to supply chain initiative in the Indo-Pacific region.

This was decided after a meeting between External Affairs Minister S Jaishankar and his Japanese counterpart Toshimitsu Motegi in Tokyo on Wednesday, held a day after the Quadrilateral Foreign Ministers' meet.

"Recognising the increasing role being played by digital technologies, the two ministers highlighted the need for robust and resilient digital and cyber systems and in this context, welcomed the finalisation of the text of the cybersecurity agreement," the ministry of external affairs (MEA), said.

"The agreement promotes cooperation in capacity building, research and development, security and resilience in the areas of Critical Information Infrastructure, 5G, Internet of Things (IoT), Artificial Intelligence (AI), among others," the ministry informed.

The cooperation between India and Japan on 5G technology comes in the backdrop of growing reluctance by a significant number of countries globally to allow Chinese telecommunications giant Huawei to roll out 5G services in their territories.

The US has already banned Huawei over concerns of security, and Washington has been advising other countries to restrict the operations of the Chinese telecom major. Australia and some other European countries have decided not to opt for Huawei for 5G services. Indian private telecom players have also identified non-Chinese partners for rolling out 5G technology.

The two ministers also emphasised that a free, open and inclusive Indo-Pacific region must be premised on diversified and resilient supply chains, and in this context, welcomed the Supply Chain Resilience Initiative between India, Japan, Australia and other like-minded countries. The issue was also on the agenda of Quad meet.

The two sides also announced that Japan agreed to be the lead partner in the connectivity pillar of the Indo-Pacific Oceans' Initiative (IPOI).

The IPOI is an India-backed framework aimed at making meaningful efforts to create a safe and secure maritime domain in the Indo-Pacific, a region where China has been expanding its military assertiveness triggering global concerns. At the East Asia summit in Bangkok last year, Prime Minister Narendra Modi proposed setting up of the Indo-Pacific Ocean's initiative to conserve and sustainably use the maritime domain and to make meaningful efforts to create a safe and secure maritime domain.

Jaishankar, in a tweet, said further expansion of India-Japan collaboration in third countries with focus on development projects also figured in the 13th India-Japan foreign ministers' strategic dialogue.

In their talks, Jaishankar and Motegi deliberated on a broad range of areas including maritime security, trade and investment, manufacturing, connectivity and infrastructure and reform of the United Nations, the MEA said.



It said the two ministers also concurred that the Indo-Pacific has acquired greater salience in recent times and underscored the need for India and Japan to work together for the benefit of the region.

"Reaffirming the similarities in their respective Indo-Pacific visions that are based on rule of law and respect for sovereignty and territorial integrity, the Japanese side agreed to be the lead partner in the connectivity pillar of the Indo-Pacific Oceans' Initiative and jointly take both countries' respective visions for the Indo-Pacific forward," the MEA said.

In the talks, the two ministers exchanged views on regional and global issues of mutual interest and agreed that the strong and enduring partnership between the two countries will play a pivotal role in overcoming challenges posed by the Covid-19, the MEA said.

The Japanese foreign ministry, in a statement, referred to the signing of exchanges of notes in late August for Japan's Covid-19 measures for India, namely a 50 billion yen emergency assistance loan and a 1 billion yen grant aid for the provision of medical equipment.

It said Motegi expressed his hope that the assistance will contribute to developing the health and medical systems of India, including the Covid-19 response.

<https://www.defencenews.in/article/India,-Japan-finalise-pact-for-cooperation-in-5G,-AI,-critical-information-infrastructure-972500>

THE ECONOMIC TIMES

Fri, 09 Oct 2020

Growing global footprint: Seventh logistics pact to extend naval reach from Japan to Bahrain

By Manu Pubby

Synopsis

The logistics pact, which will enable reciprocal use of bases and airfields for fuel, supplies and spares, has been under discussion with the UK, besides an agreement on joint training. Once the agreement is signed, India will have pacts with at least seven major nations that have interests in the Indo-Pacific.

New Delhi: India and the UK are in final stages of signing a defence logistics sharing pact, adding to a series of similar agreements with players in the Indo-Pacific that can greatly expand the reach of Indian warships and aircraft in the region.

The logistics pact, which will enable reciprocal use of bases and airfields for fuel, supplies and spares, has been under discussion with the UK, besides an agreement on joint training. Once the agreement is signed, India will have pacts with at least seven major nations that have interests in the Indo-Pacific.

"India's military logistics pacts have the potential to substantially enhance the Indian Navy's operational reach in the Indo-Pacific region. From Reunion to Djibouti and Salalah to Guam, India now has access to the remote reaches of the Indo Pacific. A logistics agreement with the UK will for the first time offer India access to naval facilities in the distant Atlantic," says Abhijit Singh, who heads the maritime policy initiative at the Observer Research Foundation.

While the practical use will be determined in coming years, these pacts can give India access to a range of ports and military bases in the region – from major garrisons in the Gulf to the remote Keeling island in the South Indian Ocean and strategic military locations like Okinawa and Busan.



India currently has logistics sharing pacts with the US, France, Singapore, South Korea, Australia and Japan. Advanced discussions are also on with Russia to ink the pact soon – possibly at the next bilateral meeting scheduled for this month.

“The agreement with the UK in a way provides a foundational access map for Indian across the Indo-Pacific. Depending on political will, through these logistics pacts India would not only have access to the entry and exit points in the Indian Ocean but reach and presence at strategic locations in the Indo-Pacific,” says Darshana Barua, Non Resident Scholar, Carnegie Endowment.

While India has been very careful in using these pacts – occasional refueling at sea and bases has taken places with the US, Indian planes have used the Reunion islands as a turnaround base and Singapore has acted as a hub – the potential to leverage these should be visible in coming years as the naval footprint increases in the region to counter China’s ambitions.

China has started creating military bases in the Indian Ocean Region – starting with Djibouti – while India has opted for the more benign approach by entering into logistics sharing pacts that ensure adequate reach for forces, without any underlying territorial aspirations.

<https://economictimes.indiatimes.com/news/defence/seventh-logistics-pact-to-extend-naval-reach-from-japan-to-bahrain/articleshow/78562338.cms>



Fri, 09 Oct 2020

To match Indian Navy, Pakistan rapidly growing its naval fleet with Chinese assistance

By Smriti Chaudhary

With a helping hand from China, Pakistan Navy is rapidly growing its fleet by adding at least 50 vessels, including 20 major ships as part of an ambitious modernisation plan, said the country’s outgoing Chief of Naval Staff (CNS), Admiral Zafar Mahmood Abbasi, PTI reported.

According to the report, the announcement was made in the outgoing Admiral’s farewell speech over the state-run Radio Pakistan. “This project will transform us from a submarine-operating Navy to a submarine-building one,” he said.

He added that the under the Hangor submarine project carried out with China, four submarines are being made by each partner. Apart from these Chinese warships, Islamabad will procure as many as Turkish medium-class ships between 2023 and 2025, stated the PTI report.

The outgoing chief also said his primary focus had been on transforming the Pakistan Navy into a combat-ready force, with special emphasis on optimum battle preparedness and professional competence.

Abbasi handed over the command to the new naval chief Admiral Amjad Khan Niazi on Wednesday in a ceremony held at PNS Zafar in Islamabad.

Admiral Niazi, who was commissioned in the Operations Branch of Pakistan Navy in 1985, has previously served as principal secretary to the chief of the naval staff, head of F-22P Mission China, deputy chief of naval staff (training and evaluation), and director-general of naval intelligence, the report said citing Pakistan Navy.

India and Pakistan have been at loggerheads for decades now. At a time when India is already engaged in a standoff with China on its northern border, the looming risk of a two-front war with China and Pakistan has become a real possibility.

Thousands of troops and heavy artillery is deployed in Eastern Ladakh. The Indian defence officials have reiterated that India stands fully prepared for the war with two of its neighbours.

<https://eurasianimes.com/with-eyes-on-india-pakistan-navy-growing-its-fleet-with-iron-brothers-help/>

A new magnetic material and recording process to vastly increase data capacity

Although out of sight to the majority of end users, data centers work behind the scenes to run the internet, businesses, research institutions and more. These data centers depend on high-capacity digital storage, the demand for which continues to accelerate. Researchers created a new storage medium and processes to access it that could prove game changing in this sector. Their material, called epsilon iron oxide, is also very robust so can be used in applications where long-term storage, such as archiving, is necessary.

It may seem odd to some that in the year 2020, magnetic tape is being discussed as a storage medium for digital data. After all, it has not been common in home computing since the 1980s. Surely the only relevant mediums today are solid state drives and Blu-ray discs? However, in data centers everywhere, at universities, banks, internet service providers or government offices, you will find that digital tapes are not only common, but essential.

Though they are slower to access than other storage devices, such as hard disk drives and solid state memory, digital tapes have very high storage densities. More information can be kept on a tape than other devices of similar sizes, and they can also be more cost effective too. So for data-intensive applications such as archives, backups and anything covered by the broad term big data, they are extremely important. And as demand for these applications increases, so does the demand for high-capacity digital tapes.

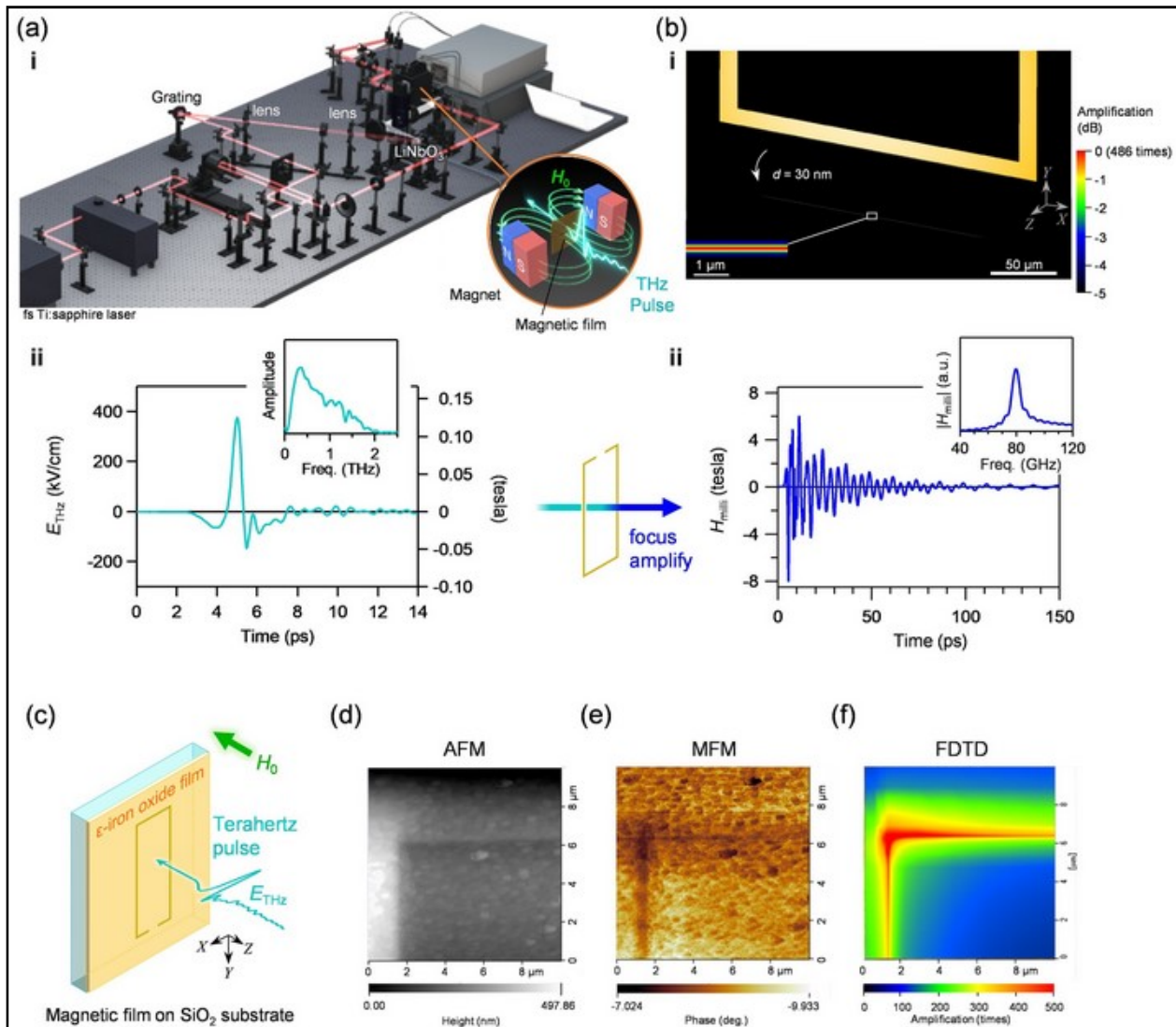
Professor Shin-ichi Ohkoshi from the Department of Chemistry at the University of Tokyo and his team have developed a magnetic material which, together with a special process to access it, can offer greater storage densities than ever. The robust nature of the material means that the data would last for longer than with other mediums, and the novel process operates at low power. As an added bonus, this system would also be very cheap to run.

"Our new magnetic material is called epsilon iron oxide, it is particularly suitable for long-term digital storage," said Ohkoshi. "When data is written to it, the magnetic states that represent bits become resistant to external stray magnetic fields that might otherwise interfere with the data. We say it has a strong magnetic anisotropy. Of course, this feature also means that it is harder to write the data in the first place; however, we have a novel approach to that part of the process too."

The recording process relies on high-frequency millimeter waves in the region of 30-300 gigahertz, or billions of cycles per second. These high frequency waves are directed at strips of epsilon iron oxide, which is an excellent absorber of such waves. When an external magnetic field is applied, the epsilon iron oxide allows its magnetic direction, which represents either a binary 1 or 0, to flip in the presence of the high-frequency waves. Once the tape has passed by the recording head where this takes place, the data is then locked into the tape until it is overwritten.

"This is how we overcome what is called in the data science field 'the magnetic recording trilemma,'" said Project Assistant Professor Marie Yoshikiyo, from Ohkoshi's laboratory. "The trilemma describes how, to increase storage density, you need smaller magnetic particles, but the smaller particles come with greater instability and the data can easily be lost. So we had to use more stable magnetic materials and produce an entirely new way to write to them. What surprised me was that this process could also be power efficient too."

Epsilon iron oxide may also find uses beyond magnetic recording tape. The frequencies it absorbs well for recording purposes are also the frequencies that are intended for use in next-generation cellular communication technologies beyond 5G. So in the not too distant future when you are accessing a website on your 6G smartphone, both it and the data center behind the website may very well be making use of epsilon iron oxide.



Magnetic pole flip. Millimeter waves irradiate epsilon iron oxide, reversing its magnetic states representing binary states 1 or 0. Credit: 2020 Ohkoshi et al.

"We knew early on that millimeter waves should theoretically be capable of flipping magnetic poles in epsilon iron oxide. But since it's a newly observed phenomenon, we had to try various methods before finding one that worked," said Ohkoshi. "Although the experiments were very difficult and challenging, the sight of the first successful signals was incredibly moving. I anticipate we will see magnetic tapes based on our new technology with 10 times the current capacities within five to 10 years."

More information: Shin-ichi Ohkoshi et al. Magnetic-Pole Flip by Millimeter Wave, *Advanced Materials* (2020). DOI: [10.1002/adma.202004897](https://doi.org/10.1002/adma.202004897)

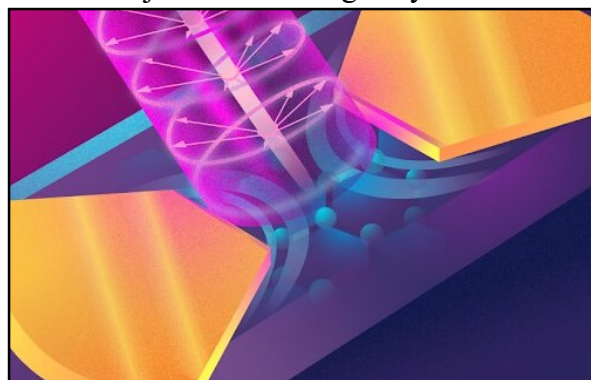
Journal information: [Advanced Materials](https://doi.org/10.1002/adma.202004897)
<https://phys.org/news/2020-10-magnetic-material-vastly-capacity.html>

Graphene detector reveals THz light's polarization

Physicists have created a broadband detector of terahertz radiation based on graphene. The device has potential for applications in communication and next-generation information transmission systems, security and medical equipment. The study came out in *ACS Nano Letters*.

The new detector relies on the interference of plasma waves. Interference as such underlies many technological applications and everyday phenomena. It determines the sound of musical instruments and causes the rainbow colors in soap bubbles, along with many other effects. The interference of electromagnetic waves is harnessed by various spectral devices used to determine the chemical composition, physical and other properties of objects—including very remote ones, such as stars and galaxies.

Plasma waves in metals and semiconductors have recently attracted much attention from researchers and engineers. Like the more familiar acoustic waves, the ones that occur in plasmas are essentially density waves, too, but they involve charge carriers: electrons and holes. Their local density variation gives rise to an electric field, which nudges other charge carriers as it propagates through the material. This is similar to how the pressure gradient of a sound wave impels the gas or liquid particles in an ever expanding region. However, plasma waves die down rapidly in conventional conductors.



Artist's rendering of a phase-sensitive terahertz interferometer. Credit: Daria Sokol/MIPT

That said, two-dimensional conductors enable plasma waves to propagate across relatively large distances without attenuation. It therefore becomes possible to observe their interference, yielding much information about the electronic properties of the material in question. The plasmonics of 2-D materials has emerged as a highly dynamic field of condensed matter physics.

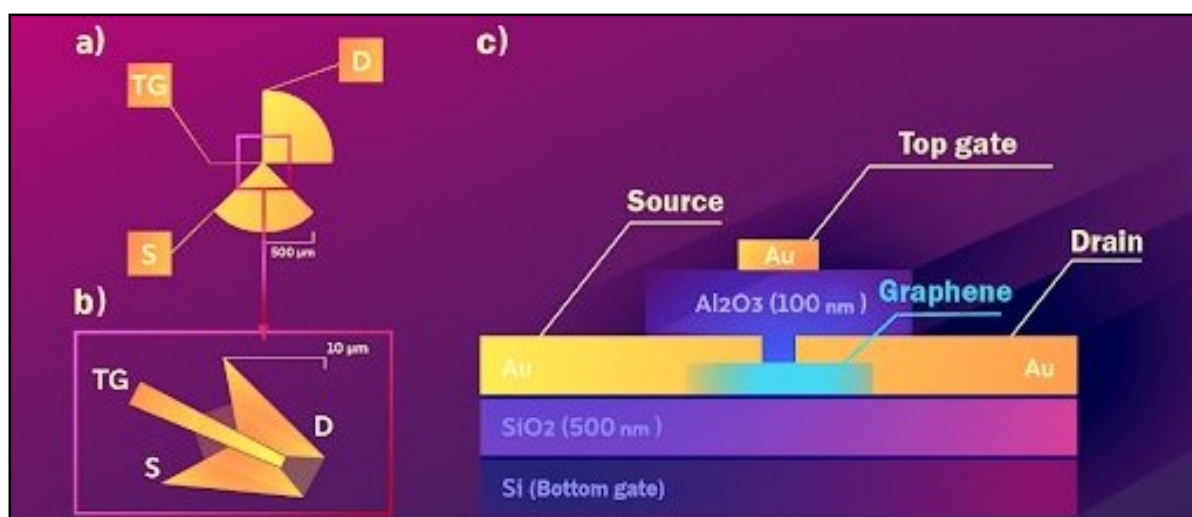


Figure 1. Inset (a) shows a top view of the device, with the sensitive region magnified in (b). The labels S, D, and TG denote the source, drain, and top gate. A side section of the detector is shown in (c). There are 1,000 nanometers (nm) in a micrometer (μm). Credit: Daria Sokol/MIPT

Over the past 10 years, scientists have come a long way detecting THz radiation with graphene-based-devices. Researchers have explored the mechanisms of T-wave interaction with graphene and created prototype detectors, whose characteristics are on par with those of similar devices based on other materials.

However, studies have so far not looked at the details of detector interaction with distinctly polarized T-rays. That said, devices sensitive to the waves' polarization would be of use in many applications. The study reported in this story experimentally demonstrated how detector response depends on the polarization of incident radiation. Its authors also explained why this is the case.

Study co-author Yakov Matyushkin from the MIPT Laboratory of Nanocarbon Materials commented: "The detector consists of a silicon wafer 4 by 4 millimeters across, and a tiny piece of graphene 2 by 5 thousandths of a millimeter in size. The graphene is connected to two flat contact pads made of gold, whose bow tie shape makes the detector sensitive to the polarization and phase of incident radiation. Besides that, the graphene layer also meets another gold contact at the top, with a nonconductive layer of aluminum oxide interlaid between them."

In microelectronics, this structure is known as a field transistor, with the two side contacts usually referred to as a source and a drain. The top contact is called a gate.

Terahertz radiation is a narrow band of the electromagnetic spectrum between microwaves and the far infrared light. From the applications standpoint, an important feature of T-waves is that they pass through living tissue and undergo partial absorption but cause no ionization and therefore do not harm the body. This sets THz radiation apart from X-rays, for example.

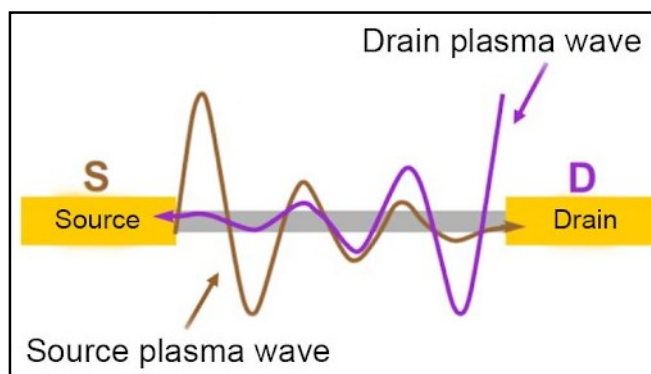


Figure 2. A schematic representation of plasma wave propagation in the transistor channel. Credit: Yakov Matyushkin et al./ACS Nano Letters

Accordingly, the applications traditionally considered for T-rays are medical diagnostics and security screening. THz detectors are also used in astronomy. Another emerging application is data transmission at THz frequencies. This means the new detector could be useful in establishing the 5G and 6G next-generation communication standards.

"Terahertz radiation is directed at an experimental sample, orthogonally to its surface. This generates photovoltage in the sample, which can be picked up by external measurement devices via the detector's gold contacts," commented study co-author Georgy Fedorov, deputy head of the MIPT Laboratory of Nanocarbon Materials. "What's crucial here is what the nature of the detected signal is. It can actually be different, and it varies depending on a host of external and internal parameters: sample geometry, frequency, radiation polarization and power, temperature, etc."

Notably, the new detector relies on the kind of graphene already produced industrially. Graphene comes in two types: The material can either be mechanically exfoliated or synthesized by chemical vapor deposition. The former type has a higher quality, fewer defects and impurities, and holds the record for charge carrier mobility, which is a crucial property for semiconductors. However, it is CVD graphene that the industry can scalably manufacture already today, making it the material of choice for devices with an ambition for mass production.

Another co-author of the study, Maxim Rybin from MIPT and Prokhorov General Physics Institute of the Russian Academy of Sciences is the CEO of graphene manufacturer Rusgraphene, and he had this to say about the technology: "The fact that it was CVD graphene that we observed plasma wave interference in, means such graphene-based THz detectors are fit for industrial production. As far as we know, this is the first observation of plasma wave interference in CVD graphene so far, so our research has expanded the material's potential industrial applications."

The team showed that the nature of the new detector's photoresponse has to do with plasma wave interference in the transistor channel. Wave propagation begins at the two opposite ends of the channel, and the special geometry of the antenna makes the device sensitive to the polarization and phase of the detected radiation. These features mean the detector could prove useful in building communication and information transmission systems that operate at THz and sub-THz frequencies.

The study reported in this story was co-authored by researchers from the MIPT Laboratory of Nanocarbon Materials and their colleagues from Moscow State Pedagogical University, Ioffe Institute of the Russian Academy of Sciences, and the University of Regensburg, Germany. This research was supported by the Russian Foundation for Basic Research and the Russian Ministry of Science and Higher Education.

More information: Yakov Matyushkin et al. Helicity-Sensitive Plasmonic Terahertz Interferometer, *Nano Letters* (2020). DOI: [10.1021/acs.nanolett.0c02692](https://doi.org/10.1021/acs.nanolett.0c02692)

Journal information: [Nano Letters](https://phys.org/news/2020-10-graphene-detector-reveals-thz-polarization.html)
<https://phys.org/news/2020-10-graphene-detector-reveals-thz-polarization.html>



Fri, 09 Oct 2020

Cement, salt and water: A new storage material for green heat

Heating the space where we live or work is a common necessity in most inhabited areas. The energy required for this process is responsible for a third of all the energy consumed in Europe; moreover, 75% of this energy is produced with fossil fuels.

The idea of a new material for thermochemical energy storage comes from a group of researchers of the Applied Science and Technology (DISAT) and Energy (DENERG) departments of the Polytechnic University of Turin, and from the Advanced Energy Technology Institute of the Italian National Research Center (CNR-ITAE). The paper was published on the journal *Scientific Reports*.

In this study, the researchers demonstrated how it is possible to produce heat by the hydration of salt present inside the pores of cement.

In order to reach sustainability goals in Europe, it is necessary to reduce the use of fossil fuels and to use instead renewable energy-based systems. However, the integration of renewable energy in heating systems entails a time gap between the energy surplus and the daily and annual peaks of demand.

Solar energy, for instance, is widely available in summer months, however most heating requirements occur during the winter, when at our latitudes, the day is much shorter. It is evident that the widespread exploitation of renewable energy sources must integrate with the development of low cost storage systems, with the goal to balance the time shift between the demand and the availability of energy. One of the possible ways to store energy is the thermochemical approach, that allows for heat storage for a virtually infinite time, contrary to the standard approaches.

"Try to dissolve a good amount of salt in a glass of water, what you will notice is that the glass heats up with some salts and cools down with others. A similar phenomenon is at the basis of our materials, with the difference that instead of liquid water we use aqueous vapor, without dissolving the salt. The aqueous vapor interacts with the salt and produces heat. Once completely hydrated, it will be possible to revert the salt to the initial state by a simple drying process, which allows for the elimination of the surplus water.

This kind of reaction is well known, and many thermal storage materials have already been developed; however, their cost is most often the limiting factor. For instance, zeolite is one of the best materials from a thermal point of view, but it can cost up to several tens of euros per kilogram. This is unbearable cost when storing the energy needed to heat a room or a whole building.



Credit: CC0 Public Domain

Cement, used as a matrix to host salt hydrates, is a very interesting material since it is well known, easily available and cheap," explains Luca Lavagna, a post-doc researcher of the Applied Science and Technology Department of Polytechnic of Turin and first author of the paper.

The innovative feature presented by the researchers here is the use of cement as a host matrix for the salt. The total cost of the materials is very low and energetic behavior is good: the energy cost, measured in stored €/kWh, is lower than most current materials used widely. This new material, moreover, shows an extraordinary stability even after hundreds of heating/cooling cycles. This work can represent the first step toward the creation of a new class of composite materials for thermochemical energy storage.

More information: Luca Lavagna et al, Cementitious composite materials for thermal energy storage applications: a preliminary characterization and theoretical analysis, *Scientific Reports* (2020). DOI: [10.1038/s41598-020-69502-0](https://doi.org/10.1038/s41598-020-69502-0)

Journal information: [Scientific Reports](https://www.nature.com/scientificreports/)
<https://phys.org/news/2020-10-cement-salt-storage-material-green.html>



Fri, 09 Oct 2020

An electrical trigger fires single, identical photons

By Rachel Berkowitz

Secure telecommunications networks and rapid information processing make much of modern life possible. To provide more secure, faster, and higher-performance information sharing than is currently possible, scientists and engineers are designing next-generation devices that harness the rules of quantum physics. Those designs rely on single photons to encode and transmit information across quantum networks and between quantum chips. However, tools for generating single photons do not yet offer the precision and stability required for quantum information technology.

Now, as reported recently in the journal *Science Advances*, researchers have found a way to generate single, identical photons on demand. By positioning a metallic probe over a designated point in a common 2-D semiconductor material, the team led by researchers at the U.S. Department of Energy's Lawrence Berkeley National Laboratory (Berkeley Lab) has triggered a photon emission electrically. The photon's properties may be simply adjusted by changing the applied voltage.

"The demonstration of electrically driven single-photon emission at a precise point constitutes a big step in the quest for integrable quantum technologies," said Alex Weber-Bargioni, a staff scientist at Berkeley Lab's Molecular Foundry who led the project. The research is part of the Center for Novel Pathways to Quantum Coherence in Materials (NPQC), an Energy Frontier Research Center sponsored by the Department of Energy, whose overarching goal is to find new approaches to protect and control quantum memory that can provide new insights into novel materials and designs for quantum computing technology.

Photons are one of the most robust carriers of quantum information and can travel long distances without losing their memory, or so-called coherence. To date, most established schemes for secure communication transfer that

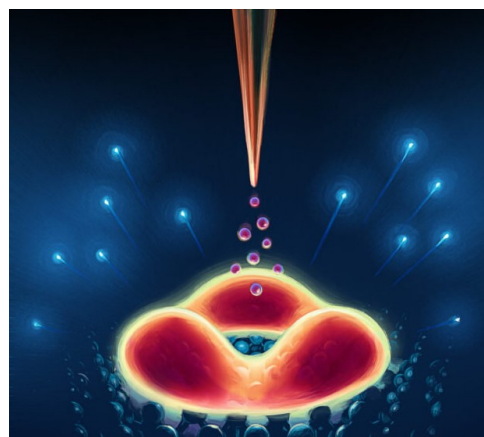


Illustration of a gold-covered probe tip injecting electrons into a carefully located imperfection in an atomically thin material. The energy from each electron causes the highly localized emission of a single photon, which may then be guided to a detector. Credit: Ignacio Gaubert

will power large-scale quantum communications require light sources to generate one photon at a time. Each photon must have a precisely defined wavelength and orientation. The new photon emitter demonstrated at Berkeley Lab achieves that control and precision. It could be used for transferring information between quantum processors on different chips, and ultimately scaled up to larger processors and a future quantum internet that links sophisticated computers around the world.

The photon emitter is based on a common 2-D semiconductor material (tungsten disulfide, WS_2), which has a sulfur atom removed from its crystal structure. That carefully located atomic imperfection, or defect, serves as a point where the photon can be generated through application of an electric current.

The challenge is not how to generate single photons, but how to make them truly identical and produce them on demand. Photon-emitting devices, like the semiconductor nanoparticles or 'quantum dots' that light up QLED TVs, that are fabricated by lithography are subject to inherent variability, since no pattern-based system can be identical down to a single atom. Researchers working with Weber-Bargioni took a different approach by growing a thin-film material on a sheet of graphene. Any impurities introduced to the thin film's atomic structure are repeated and identical throughout the sample. Through simulations and experiments, the team determined just where to introduce an imperfection to the otherwise uniform structure. Then, by applying an electrical contact to that location, they were able to trigger the material to emit a photon and control its energy with the applied voltage. That photon is then available to carry information to a distant location.

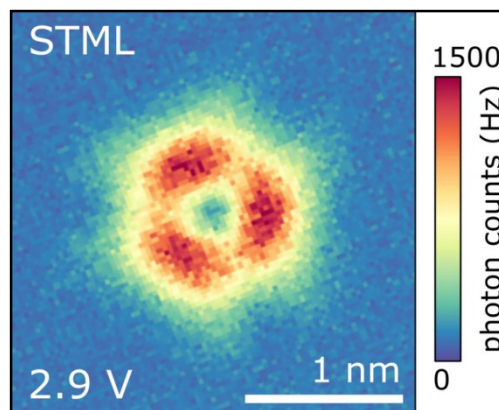
"Single-photon emitters are like a terminal where carefully prepared but fragile quantum information is sent on a journey into a lightning-fast, sturdy box," said Bruno Schuler, a postdoctoral researcher at the Molecular Foundry (now a research scientist at Empa—the Swiss Federal Laboratories for Materials Science and Technology) and lead author of the work.

Key to the experiment is the gold-coated tip of a scanning tunneling microscope that can be positioned exactly over the defect site in the thin film material. When a voltage is applied between the probe tip and the sample, the tip injects an electron into the defect. When the electron travels or tunnels from the probe tip, a well-defined part of its energy gets transformed into a single photon. Finally, the probe tip acts as an antenna that helps guide the emitted photon to an optical detector which records its wavelength and position.

By mapping the photons emitted from thin films made to include various defects, the researchers were able to pinpoint the correlation between the injected electron, local atomic structure, and the emitted photon. Usually, the optical resolution of such a map is limited to a few hundred nanometers. Thanks to extremely localized electron injection, combined with state-of-the-art microscopy tools, the Berkeley Lab team could determine where in the material a photon emerged with a resolution below 1 angstrom, about the diameter of a single atom. The detailed photon maps were crucial to pinpointing and understanding the electron-triggered photon emission mechanism.

"In terms of technique, this work has been a great breakthrough because we can map light emission from a single defect with sub-nanometer resolution. We visualize light emission with atomic resolution," said Katherine Cochrane, a postdoctoral researcher at the Molecular Foundry and a lead author on the paper.

Defining single-photon light sources in two-dimensional materials with atomic precision provides unprecedented insight critical to understanding how those sources work, and provides a strategy for making groups of perfectly identical ones. The work is part of NPQC's focus on exploring novel quantum phenomena in nonhomogenous 2-D materials.



A map shows the intensity and locations of photons emitted from a thin film material while a voltage is applied. Credit: Berkeley Lab

Two-dimensional materials are leading the way as a powerful platform for next-generation photon emitters. The thin films are flexible and easily integrated with other structures, and now provide a systematic way for introducing unparalleled control over photon emission. Based on the new results, the researchers plan to work on employing new materials to use as photon sources in quantum networks and quantum simulations.

More information: Bruno Schuler et al, Electrically driven photon emission from individual atomic defects in monolayer WS_2 , *Science Advances* (2020). DOI: [10.1126/sciadv.abb5988](https://doi.org/10.1126/sciadv.abb5988)

Journal information: [Science Advances](https://www.science.org)

<https://phys.org/news/2020-10-electrical-trigger-identical-photons.html>



Fri, 09 Oct 2020

Nanoscale machines convert light into work

Researchers have developed a tiny new machine that converts laser light into work. These optically powered machines self-assemble and could be used for nanoscale manipulation of tiny cargo for applications such as nanofluidics and particle sorting.

"Our work addresses a long-standing goal in the nanoscience community to create self-assembling nanoscale machines that can perform work in conventional environments such as room temperature liquids," said research team leader Norbert F. Scherer from the University of Chicago.

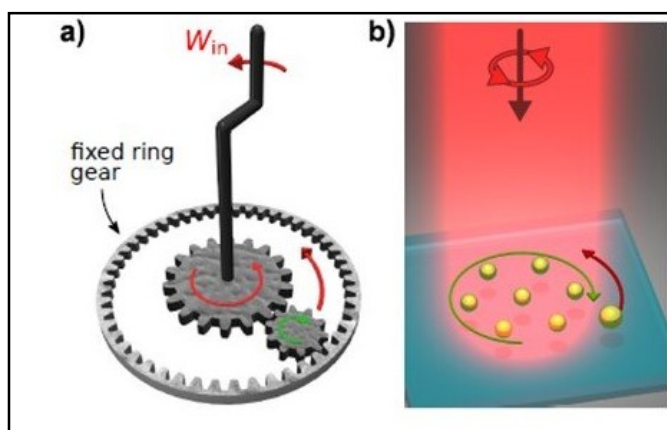
Scherer and colleagues describe the new nanomachines in *Optica*. The machines are based on a type of matter known as optical matter in which metal nanoparticles are held together by light rather than the chemical bonds that hold together the atoms that make up typical matter.

"Both the energy for assembling the machine and the power to make it work come from light," said Scherer. "Once the laser light is introduced to a solution containing nanoparticles, the entire process occurs on its own. Although the user does not need to actively control or direct the outcome, this could readily be done to tailor the machines for various applications."

Creating optical matter

In optical matter, a laser light field creates interactions between metal nanoparticles that are much smaller than the wavelength of light. These interactions cause the particles to self-assemble into ordered arrays. This is a similar principle to optical trapping, in which light is used to hold and manipulate particles, biological molecules and cells.

In previous work, the researchers discovered that when optical matter is exposed to circularly polarized light, it rotates as a rigid body in the direction opposite the polarization rotation. In other words, when the incident light rotates one way the optical matter array responds by spinning the other. This is a manifestation of "negative torque". The researchers speculated that a machine could be developed based on this new phenomenon.



Researchers created an optical matter machine that operates much like a mechanical machine in which if one gear is turned, a smaller interlocking gear will spin in the opposite direction (a). The optical matter machine (b) uses circularly polarized light to create a nanoparticle array that acts like the larger gear by spinning in the optical field. This makes a probe particle - analogous to the second smaller gear - orbit the nanoparticle array in the opposite direction. Credit: Norbert F. Scherer, University of Chicago

In the new work, the researchers created an optical matter machine that operates much like a mechanical machine based on interlocking gears. In such machines, when one gear is turned, a smaller interlocking gear will spin in the opposite direction. The optical matter machine uses circularly polarized light from a laser to create a nanoparticle array that acts like the larger gear by spinning in the optical field. This "optical matter gear" converts the circularly polarized light into orbital, or angular, momentum that influences a nearby probe particle to orbit the nanoparticle array (the gear) in the opposite direction.

Determining efficiency

The researchers made two machines based on this design using laser light with a 600-nanometer wavelength and silver nanoparticles just 150 nanometers in diameter in water. They found that using a gear made of eight nanoparticles created a more efficient machine than a seven-nanoparticle gear, suggesting that the machine's efficiency could be altered by building different gears.

"We believe that what we demonstrated, with further refinement, will be useful in nanofluidics and particle sorting," said John Parker, graduate student and first author. "Our simulations show that a much larger machine made of many more particles should be able to exert more power to the probe, so that is an aspect of refinement that we anticipate pursuing."

The researchers are now experimenting with making machines with many more particles or with particles of different materials. The practicality of the machine could also be improved by creating patterned gears where the nanoparticles are immobile. This would enable the ability to optically address and combine several gears to make a more complex machine.

More information: John Parker et al, An Optical Matter Machine: Angular Momentum Conversion by Collective Modes in Optically Bound Nanoparticle Arrays, *Optica* (2020). DOI: [10.1364/OPTICA.396147](https://doi.org/10.1364/OPTICA.396147)

Journal information: [Optica](https://doi.org/10.1364/OPTICA.396147)

<https://phys.org/news/2020-10-nanoscale-machines.html>



Fri, 09 Oct 2020

Generating photons for communication in a quantum computing system

By Michaela Jarvis

MIT researchers using superconducting quantum bits connected to a microwave transmission line have shown how the qubits can generate on demand the photons, or particles of light, necessary for communication between quantum processors.

The advance is an important step toward achieving the interconnections that would allow a modular quantum computing system to perform operations at rates exponentially faster than classical computers can achieve.

"Modular quantum computing is one technique for reaching quantum computation at scale by sharing the workload over multiple processing nodes," says Bharath Kannan, MIT graduate fellow and first author of a paper on this topic published today in *Science Advances*. "These nodes, however, are generally not co-located, so we need to be able to communicate quantum information between distant locations."



Entangled pairs of photons are generated by and propagate away from qubits placed along a waveguide. Credit: Sampson Wilcox

In classical computers, wires are used to route information back and forth through a processor during computation. In a quantum computer, the information itself is quantum mechanical and fragile, requiring new strategies to simultaneously process and communicate information.

"Superconducting qubits are a leading technology today, but they generally support only local interactions (nearest-neighbor or qubits very close by). The question is how to connect to qubits that are at distant locations," says William Oliver, an associate professor of electrical engineering and computer science, MIT Lincoln Laboratory fellow, director of the Center for Quantum Engineering, and associate director of the Research Laboratory of Electronics. "We need quantum interconnects, ideally based on microwave waveguides that can guide quantum information from one location to another."

That communication can occur via the microwave transmission line, or waveguide, as the excitations stored in the qubits generate photon pairs, which are emitted into the waveguide and then travel to two distant processing nodes. The identical photons are said to be "entangled," acting as one system. As they travel to distant processing nodes, they can distribute that entanglement throughout a quantum network.

"We generate the entangled photons on demand using the qubits and then release the entangled state to the waveguide with very high efficiency, essentially unity," says Oliver. The research reported in the *Science Advances* paper utilizes a relatively simple technique, Kannan says.

"Our work presents a new architecture for generating photons that are spatially entangled in a very simple manner, using only a waveguide and a few qubits, which act as the photonic emitters," says Kannan. "The entanglement between the photons can then be transferred into the processors for use in quantum communication or interconnection protocols."

While the researchers said they have not yet implemented those communication protocols, their ongoing research is aimed in that direction.

"We did not yet perform the communication between processors in this work, but rather showed how we can generate photons that are useful for quantum communication and interconnection," Kannan says.

Previous work by Kannan, Oliver, and colleagues introduced a waveguide quantum electrodynamics architecture using superconducting qubits that are essentially a type of artificial giant atom. That research demonstrated how such an architecture can perform low-error quantum computation and share quantum information between processors. This is accomplished by adjusting the frequency of the qubits to tune the qubit-waveguide interaction strength so the fragile qubits can be protected from waveguide-induced decoherence to perform high-fidelity qubit operations, and then readjusting the qubit frequency so the qubits are able to release their quantum information into the waveguide in the form of photons.

This paper presented the photon generation ability of the waveguide quantum electrodynamics architecture, showing that the qubits can be used as quantum emitters for the waveguide. The researchers demonstrated that quantum interference between the photons emitted into the waveguide generates entangled, itinerant photons that travel in opposite directions and can be used for long-distance communication between quantum processors.

Generating spatially entangled photons in optical systems is typically accomplished using spontaneous parametric down-conversion and photodetectors, but the generated entanglement achieved that way is generally random and therefore less useful in enabling on-demand communication of quantum information in a distributed system.

"Modularity is a key concept of any extensible system," says Oliver. "Our goal here is to demonstrate the elements of quantum interconnects that should be useful in future quantum processors."

More information: B. Kannan et al. Generating spatially entangled itinerant photons with waveguide quantum electrodynamics, *Science Advances* (2020). [DOI: 10.1126/sciadv.abb8780](https://doi.org/10.1126/sciadv.abb8780)

Journal information: [Science Advances](https://phys.org/news/2020-10-photons-quantum.html)
<https://phys.org/news/2020-10-photons-quantum.html>



Fri, 09 Oct 2020

New research suggests coronavirus antibodies last at least 3 months after covid-19 infection

Coronavirus antibodies can last at least three months after a person becomes infected with the virus that causes COVID-19, according to a new study published today in *Science Immunology*.

Researchers from the Lunenfeld-Tanenbaum Research Institute (LTRI) at Sinai Health and the Temerty Faculty of Medicine at the University of Toronto used both saliva and blood samples from COVID-19 patients to measure and compare antibody levels for over three months post-symptom onset.

They found that antibodies of the IgG class that bind to the SARS-CoV-2 spike protein are detectable for at least 115 days, representing the longest time interval measured. The study is also the first to show these antibodies can also be detected in the saliva.

“Our study shows that IgG antibodies against the spike protein of the virus are relatively durable in both blood and saliva,” said Jennifer Gommerman, professor of immunology at the University of Toronto and leader of the saliva testing effort. “Our study suggests saliva may serve as an alternative for antibody testing. While saliva is not as sensitive as serum, it is easy to collect.”

The saliva assay was developed at the University of Toronto, while a team at LTRI, led by senior investigator Anne-Claude Gingras, a professor of molecular genetics at the University of Toronto, executed the serum assay.

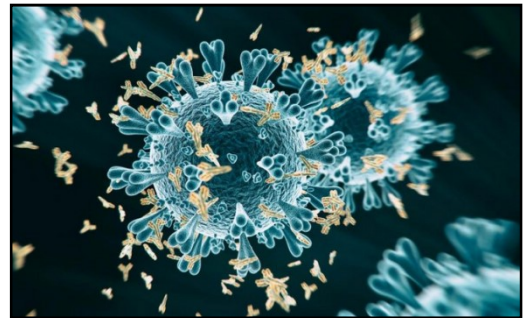
“The LTRI platform for detection of antibodies in serum, or blood, is incredibly robust and well suited for assessing the prevalence of infection within the community,” said Gingras. “This is another tool that can help us better understand and even overcome this virus.”

Most people who recover from COVID-19 develop immune agents in their blood called antibodies that are specific to the virus. These antibodies are useful in indicating who has been infected, regardless of whether they had symptoms or not.

A large team of scientists collaborated on the study. Dr. Allison McGeer, a senior clinician scientist at LTRI and principal investigator of the Toronto Invasive Bacterial Diseases Network, along with Dr. Mario Ostrowski at St. Michael’s Hospital of Unity Health Toronto provided access to the paired saliva and serum samples from dozens of patients for the study.

The study was co-led by graduate students Baweleta Isho, Kento Abe, Michelle Zuo and Alainna Jamal. Dr. James Rini, a professor of biochemistry and molecular genetics at the University of Toronto, and Yves Durocher from the National Research Council of Canada provided key protein reagents for the saliva studies.

The durability of the antibody response to SARS-CoV-2 has been debated in recent months. An earlier study published in *Nature Medicine* suggested the antibodies can disappear after two months for some individuals who had the virus but did not experience symptoms.



Coronavirus antibodies can last at least three months after a person becomes infected with the virus that causes COVID-19, according to a new study published today in *Science Immunology*.

This study led by the Toronto team is in agreement with findings from leading immunologists in the U.S. in describing the antibody response as longer lasting.

While the team admits there is a lot they still don't know about antibody responses to SARS-CoV-2 infection, including how long the antibodies last beyond this period or what protection they afford against re-infection, this research could have broader implications in the development of an effective vaccine.

"This study suggests that if a vaccine is properly designed, it has the potential to induce a durable antibody response that can help protect the vaccinated person against the virus that causes COVID-19," Gommerman said.

Reference: "Persistence of serum and saliva antibody responses to SARS-CoV-2 spike antigens in COVID-19 patients" by Baweleta Isho, Kento T. Abe, Michelle Zuo, Alainna J. Jamal, Bhavisha Rathod, Jenny H. Wang, Zhijie Li, Gary Chao, Olga L. Rojas, Yeo Myong Bang, Annie Pu, Natasha Christie-Holmes, Christian Gervais, Derek Ceccarelli, Payman Samavarchi-Tehrani, Furkan Guvenc, Patrick Budyłowski, Angel Li, Aimee Paterson, Resources, Feng Yun Yue, Lina M. Marin, Lauren Caldwell, Jeffrey L. Wrana, Karen Colwill, Frank Sicheri, Samira Mubareka, Scott D. Gray-Owen, Steven J. Drews, Walter L. Siqueira, Miriam Barrios-Rodiles, Mario Ostrowski, James M. Rini, Yves Durocher, Allison J. McGeer, Jennifer L. Gommerman and Anne-Claude Gingras, 8 October 2020, *Science Immunology*.

DOI: [10.1126/sciimmunol.abe5511](https://doi.org/10.1126/sciimmunol.abe5511)

<https://scitechdaily.com/new-research-suggests-coronavirus-antibodies-last-at-least-3-months-after-covid-19-infection/>



Fri, 09 Oct 2020

Covid-19: Asthma patients less likely to die from virus; new test tells who is still infectious

Researchers have found that people with asthma appear to have no higher risk of hospitalisation due to Covid-19 or need for mechanical breathing assistance as compared to coronavirus patients without asthma. Such Covid-19 patients are less likely to die due from virus

Covid-19 patients with asthma appear to have no higher risk of hospitalisation or need for mechanical breathing assistance compared to patients without asthma, a new study suggests.

As per the study, asthma patients are also less likely to die from the disease.

In a study, researchers at a Boston healthcare system studied 562 asthma patients with new coronavirus and 2,686 similarly-aged Covid-19 patients without asthma.

The two groups were hospitalised at similar rates (18 per cent to 21 per cent) and had a similar need for mechanical ventilation (3 per cent in the asthma group vs 4 per cent).

The asthma patients were, however, 70 per cent less likely to die from the virus, researchers said. None of the 44 patients with severe asthma in the study died.

"Although the factors underlying these findings are not yet known, important considerations include possible biologic mechanisms ... and possible protective effects of asthma medications (such as corticosteroids)," researchers said in a report posted on medRxiv ahead of peer review.

New test identifies who is still infectious

A new test has been found more efficient than gold-standard RT-PCR lab tests at distinguishing between the infectious and non-infectious virus in swab samples obtained within a week of symptom onset.

As per a new study, Becton Dickenson and Co's BD Veritor System for rapid detection of the novel coronavirus is better than RT-PCR lab tests.

Newer "antigen-based" tests look for viral proteins instead of RNA. But in RT-PCR, patients can test positive even after they are no longer infectious because the tests detect small amounts of viral RNA that most likely represent infected cells that have died.

The antigen-based approach could potentially "be used to identify and isolate contagious individuals more effectively than current RNA-based (RT-PCR) testing," coauthor Celine Roger-Dalbert of BD Life Sciences told Reuters.

"Although it may not replace RNA-based testing, because we still need to identify anyone who was infected in order to trace the spread of the virus, it should help make isolation more efficient and effective as a public health intervention used to slow down the spread of Covid-19," she added.

Intubation may be less risky for doctors than feared

Placing a tube in a patient's airway, or removing it, is thought to be one of the highest-risk procedures for medical staff. This is because of the very close proximity to air being expelled through the mouth of a potentially infected person.

But in operating rooms, at least, these procedures might present less of a risk of virus transmission than has been feared. In operating room experiments in anesthetized patients, intubation and extubation produced far fewer potentially virus-carrying aerosols than expected.

Overall, 19 tube insertions generated about one-thousandth of the aerosol generated by a single cough, the researchers reported on Tuesday in the journal *Anesthesia*. Fourteen tube removals produced more aerosols, but still less than 25% of that produced by a voluntary cough.

The same might not be true in an emergency room setting. Surgical teams presently wear respirators and high level personal protective equipment to avoid aerosols. After each case, special cleaning is undertaken, which reduces operating room turnover and increases waiting times for operations, the authors say.

The findings call for "reappraisal of what constitutes an aerosol-generating procedure and the associated precautions for routine anaesthetic airway management," they said.

Full beard need not rule out tight face mask seal

Frontline healthcare workers caring for Covid-19 patients must wear respirator face masks that form a tight seal with the skin, but full beards can make that impossible.

Doctors in the UK have come up with a solution.

The answer, outlined in a report published on Saturday in the *Journal of Hospital Infection*, involves covering the beard over the chin and cheeks with an under-mask elastic rubber sheet (as is used in yoga and pilates) and tying it in a knot at the top of the head.

The technique was pioneered by a transplant surgeon and adopted by 32 bearded British healthcare providers, 30 of whom passed respirator fit tests, according to the report.

"Bearded individuals who are unable to shave may have a new innovative technique to be able to wear respirator masks," the authors write. While noting it was tested in a small number of people, the authors said, "it provides encouraging results to pave way for larger scale studies."

(Reuters)

<https://www.indiatoday.in/science/story/covid-19-asthma-patients-virus-test-infectious-study-research-science-1729625-2020-10-08>

Potential COVID-19 vaccines not affected by recent mutations: Study

A research by Australia's national science agency the Commonwealth Scientific and Industrial Research Organisation (CSIRO), found no evidence that the change from the 'D-strain' to the 'G-strain' of the virus would adversely impact the efficacy of vaccine candidates

Melbourne: Vaccines currently being developed for COVID-19 should not be affected by recent mutations in the novel coronavirus, according to researchers, including one of Indian origin, who said the finding is good news for the hundreds of vaccine candidates around the world.

The researchers, including those from the University of York in the UK, noted that most vaccines under development worldwide have been modelled on the original 'D-strain' of the virus, which were more common amongst sequences published early in the pandemic. Since then, the virus has evolved to the globally dominant 'G-strain', which now accounts for about 85 per cent of published SARS-CoV-2 genomes, they said.

There had been fears the G-strain, within the main protein on the surface of the virus, would negatively impact on vaccines under development.

However, the research by Australia's national science agency the Commonwealth Scientific and Industrial Research Organisation (CSIRO), found no evidence the change would adversely impact the efficacy of vaccine candidates.

The study, published in the journal *npj Vaccines*, tested blood samples from ferrets given a candidate vaccine against virus strains that either possessed or lacked this mutation known as 'D614G'.

"This is good news for the hundreds of vaccines in development around the world, with the majority targeting the spike protein as this binds to the ACE2 receptors in our lungs and airways, which are the entry point to infect cells," said Professor Seshadri Vasana, who holds an honorary chair in Health Sciences at the University of York.

"Despite this D614G mutation to the spike protein, we confirmed through experiments and modelling that vaccine candidates are still effective", Vasana said in a statement.

"We've also found the G-strain is unlikely to require frequent 'vaccine matching' where new vaccines need to be developed seasonally to combat the virus strains in circulation, as is the case with influenza," he said.

CSIRO Chief Executive Larry Marshall said the research was critically important in the race to develop a vaccine.

"This brings the world one step closer to a safe and effective vaccine to protect people and save lives", Marshall said. he said.

<https://indianexpress.com/article/world/potential-covid-19-vaccines-not-affected-by-recent-mutations-study-6716124/>



The study, published in the journal *npj Vaccines*, tested blood samples from ferrets given a candidate vaccine against virus strains that either possessed or lacked this mutation known as 'D614G'. (REUTERS/Dado Ruvic/Illustration/File Photo)

