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THE HINDU

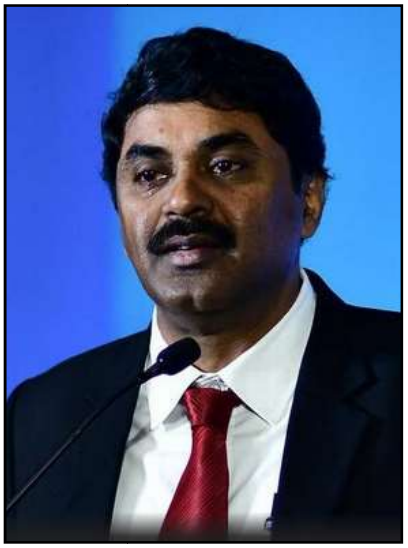
Thu, 27 Aug 2020

Expert committee to review charter of DRDO labs

As lots of new technologies have come into existence over the decades, we are working on the charter of duties of labs so that they are up to date and non-overlapping, says a Defence official

By Dinakar Peri

New Delhi: With a focus on indigenous development of futuristic defence technologies, a five member expert committee has been constituted to review the charter of duties for all laboratories of the Defence Research and Development Organisation (DRDO). The committee was constituted by Dr. G. Satheesh Reddy, Secretary, Department of Defence Research and Development (DDR&D), who is also the Chairman, DRDO.



G. Satheesh Reddy. | Photo Credit: K.V.S. GIRI

"As lots of new technologies have come into existence over the decades, we are working on the charter of duties of labs so that they are up to date and non-overlapping," a Defence official said on condition of anonymity. The five member committee is headed by Professor V. Ramagopal Rao, Director, Indian Institute of Technology (IIT), Delhi.

According to a letter dated August 24, the terms of reference are: to study and review the charter of duties of all the labs of the DRDO, to redefine the charter of duties of the labs on the current and futuristic defence and battlefield scenario, and to minimise the overlap of technologies amongst the labs. The committee has to submit its report within 45 days and Chairman of the committee may co-opt subject specialists as invitees to specific meetings, the letter states.

The other members in the committee include include S. Somnath, Director, Vikram Sarabhai Space Centre; Air Marshal Sandeep Singh, Deputy Chief of Air Staff; Dr. Samir V. Kamat, Director General-Naval Systems and Materials (NS&M); and Benjamin Lionel, Director, Instruments Research and Development Establishment (IRDE).

The last major review of DRDO was the P. Rama Rao committee of 2008, which had suggested that the DRDO be decentralised into seven technology clusters and focus be only on core technologies of strategic importance.

The DRDO has a network of 52 laboratories working on a range of disciplines from aeronautics, armaments, electronics, combat vehicles, missiles, naval systems, life sciences and agriculture, among others.

Dr. Reddy has just been given a two-year extension by the government as the Chairman DRDO, and Secretary DDR&D, beyond his earlier two-year tenure of August 26, 2020.

Earlier this week, as part of the Atmanirbhar Bharat initiative of the government, the DRDO announced a list of 108 military sub-systems and components for development by the Indian

industry only and the DRDO would provide support to industries for design, development and testing of these systems on a requirement basis.

https://www.thehindu.com/news/national/expert-committee-to-review-charter-of-drdo-labs/article32449272.ece

THE WEEK

Thu, 27 Aug 2020

EXCLUSIVE: Govt sets up expert panel to redefine DRDO for futuristic battles

Panel to review duties of DRDO's 52 laboratories, cut technology overlaps

By Pradip R Sagar

The central government has set up an expert committee to redefine the role of the Defence Research and Development Organisation (DRDO) for the current and futuristic defence and battlefield scenarios.

It aims to reduce Indian military's dependence on imports, as India is the second-largest arms importer in the world after Saudi Arabia. Moreover, its also a move towards Prime minister Narendra Modi's vision of "Aatmanirbhar Bharat" in the defence sector.

On day one of his second innings as DRDO head, Dr G. Satheesh Reddy, who is also the secretary of the department of defence research and development (ministry of defence), constituted the five-member elite panel. Incidentally, the Cabinet's Appointments Committee had on Monday approved a two-year extension of tenure for Reddy.

The committee is headed by Professor V. Ramagopal Rao, Director of IIT, Delhi. Other members include S. Somnath, Director, Vikram Sarabhai Space Centre; Air Marshal Sandeep Singh, Deputy Chief of Air Staff; Dr. Samir V. Kamat, Director General-Naval Systems & Materials (NS & M) and Benjamin Lionel, Director, Instruments Research & Development Establishment of DRDO.

The terms of reference of the committee will be to study and review the charter of duties of all 52 laboratories of DRDO and to redefine the same for both current and futuristic defence and battlefield scenarios. Part of the panel's tasks will be to minimise the overlap of technologies amongst the laboratories.

The committee has given a deadline of 45 days to submit its report and its chairman may co-opt subject specialists as invitees to specific meetings.

But, defence experts are apprehensive about the new panel, hoping it will not meet the fate of other expert committees, such as the P. Rama Rao Committee.

The committee headed by P. Rama Rao, former Secretary, Department of Science and Technology, had submitted its report in 2008. The report, DRDO's first external review aimed at restructuring the defence R&D body, suggested that DRDO concentrate only on "core technologies" of "strategic importance" instead of venturing into making juices, mosquito repellents, titanium dental implants and so on. The committee had also suggested de-centralization of DRDO management and making it a leaner organization. Subsequently, on the Rama Rao panel's suggestion, DRDO's management was decentralised by merging its 52 labs to form seven clusters based on technology domains such as missiles, electronic warfare, radars, aerial vehicles and underwater weapons.

DRDO has often been criticised for delayed projects and missing repeated deadlines with huge cost overruns. And in absence of self-reliance in defence, Indian armed forces continue to be heavily dependent on imports with over 70 per cent of armed forces requirements are met from foreign firms.

On Monday, a delegation by DRDO made a detailed presentation before Defence Minister Rajnath Singh, identifying 108 military sub-systems and components for development by Indian (private) industry and the DRDO will provide support the process. DRDO claims that the design and development of these subsystems would be done over the next couple of years. This announcement follows the negative list of 101 military hardware from imports, which have to be domestically procured in a phased manner.

https://www.theweek.in/news/india/2020/08/26/govt-sets-up-expert-panel-to-redefine-drdo-for-futuristic-battles.html

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Thu, 27 Aug 2020

DRDO labs to be overhauled, expert committee set to review charter for futuristic battles

By Manu Pubby

Synopsis

To be led by Prof P Ramagopal Rao, Director IIT Delhi, the select panel will delve deep into the nature of work being carried out by each lab under the organisation and will present a report to redefine the charter of work being carried out and minimize technology overlaps.

New Delhi: The Defence Research and Defence Organisation (DRDO) is going for a deep overhaul of its laboratories and has set up an expert panel to review their charter of duties to prepare the armed forces for futuristic battlefields.

To be led by Prof P Ramagopal Rao, Director IIT Delhi, the select panel will delve deep into the nature of work being carried out by each lab under the organisation and will present a report to redefine the charter of work being carried out and minimize technology overlaps.

Interestingly, the panel also includes representation from the armed forces, with Deputy Chief of Air Staff Air Marshal Sandeep Singh as a member. Others include ISRO Director S Somnath and two representatives from within the DRDO.

The committee is to present a roadmap within 45 days with the specific directive to "redefine the charter of duties of labs on the current and futuristic battlefield scenario; minimise the overlay of technologies amongst the labs."

The study could pave the way for a reorganisation of the organisation that has a network of 52 labs across the country engaged in a variety of projects – from nuclear missiles to development of fighters and UAVs, food products for soldiers, data analytics and laser technology.

The last major overhaul of the organisation took place after the Rama Rao Committee report of 2008 that had suggested that DRDO be reorganised into clusters of labs based on the role they were tasked with. Seven clusters were set up like missiles, armaments, aeronautical systems and life sciences.

The Rama Rao Committee had recommended the setting up of a Defence Technology Commission, a younger age profile for scientists, more involvement of the organization in defence procurements, more foreign collaborations, a dedicated research board, restructuring of labs and a commercial arm of the research body.

It had also recommended that DRDO concentrate efforts in 8-10 critical areas suiting its existing resources and that 11 labs related to life sciences be transferred out of DRDO to other departments.

https://economictimes.indiatimes.com/news/defence/drdo-labs-to-be-overhauled-expert-committee-set-to-review-charter-for-futuristic-battles/articleshow/77765362.cms

hindustantimes

Thu, 27 Aug 2020

Expert panel to help DRDO prepare for futuristic battles, defence needs

DRDO chief G Satheesh Reddy has constituted a five-member committee and asked it to submit its report within 45 days

By Rahul Singh

New Delhi: The Defence Research and Development Organisation (DRDO) has set up an expert panel to review the charter of its laboratories and minimise the overlap of technologies they are working on at a time when self-reliance in the defence sector is a top priority for the government, people familiar with the development said on Wednesday.

DRDO Chief G Satheesh Reddy has constituted the five-member committee under the chairmanship of Indian Institute of Technology, Delhi director V Ramagopal Rao and asked the panel to submit its report within 45 days, according to a government letter dated August 24 reviewed by Hindustan Times.

A DRDO delegation met defence minister Rajnath Singh on Monday and briefed him on the 108 defence items identified for local production by the industry to achieve self-reliance in the defence sector. (Photo: @DRDO_India)

The mandate given to the expert panel includes suggesting measures to provide a push to Prime Minister Narendra Modi's 'Atmanirbhar Bharat Abhiyan' (self-reliant India Movement) and cut dependence on imported weapons and systems, the officials cited above said on the condition of anonymity.

According to the letter, the terms of reference of the committee are to study and review the charter of duties of all DRDO labs, to redefine the charter of duties on the basis of current and futuristic defence and battlefield needs and to minimise the overlap of technologies amongst the labs.

The other members of the committee are Indian Air Force deputy chief Air Marshal Sandeep Singh, Vikram Sarabhai Space Centre director S Somanath, Instruments Research & Development Establishment (a Dehradun-based DRDO lab) director Benjamin Lionel and Director General-Naval Systems and Materials Samir V Kamath. The chairman of the committee may co-opt subject specialists as invitees to specific meetings, the letter said.

This is a long overdue review and the committee needs to critically, and clinically, analyse the work of the 57 DRDO labs since their inception vis-a-vis their outputs that have seen deployment with the armed forces, and not just their theoretical claims, said Air Vice Marshal Manmohan Bahadur (retd), additional director general, Centre for Air Power Studies.

"Money for R&D is scarce and must be used judiciously if the Atmanirbhar Abhiyaan is to move forward," Bahadur said.

The August 24 letter came on a day the Appointments Committee of the Cabinet approved the extension of DRDO chief Reddy's term by two years with effect from August 26. He was appointed to the post two years ago.

Before that, Reddy was the scientific adviser to the defence minister, a charge he was given in June 2015.

From mini unmanned aerial vehicles to fire detection systems and bullet proof vehicles to tank transporters, the Defence Research and Development Organisation (DRDO) has come out with a list of 108 systems and sub-systems that it will help the Indian industry design and develop to strengthen the local defence ecosystem.

A DRDO delegation met defence minister Rajnath Singh on Monday and briefed him on the 108 defence items identified for local production by the industry to achieve self-reliance in the defence sector. It will also allow the DRDO to sharpen its focus on advanced technologies, the defence ministry said.

Several steps have been taken in the past to make the DRDO more competitive and accountable. These include decentralising the DRDO's management by merging its labs to form seven clusters based on technology domains such as missiles, electronic warfare, radars, aerial vehicles and underwater weapons. The recommendations made by the P Rama Rao Committee in February 2008 — the DRDO's first external review — formed the bedrock of the roadmap for restructuring the R&D body.

https://www.hindustantimes.com/india-news/expert-panel-to-help-drdo-prepare-for-futuristic-battles-defence-needs/story-f6lwjovvH8F7unNO8XmgZM.html

Thu, 27 Aug 2020

आत्मनिर्भर भारतः बदलाव के दौर में DRDO, सैन्य जरूरतों के हिसाब से करेगा काम

DRDO में बदलाव के लिए पांच सदस्यीय विशेषज्ञ पैनल का गठन किया गया है जिसका नेतृत्व आईआईटी, दिल्ली के निदेशक वी रामगोपाल राव कर रहे हैं और उन्हें विस्तृत रिपोर्ट देने के लिए 45 दिनों की समयसीमा दी गई है।

अभिषेक भल्ला

स्टोरी हाइलाइट्स

- ***DRDO में बदलाव के लिए पांच सदस्यीय विशेषज्ञ पैनल का गठन किया***
- ***पैनल की अगुवाई आईआईटी, दिल्ली के निदेशक रामगोपाल राव करेंगे***
- ***विस्तृत रिपोर्ट देने के लिए पैनल को दी गई 45 दिनों की समयसीमा***

नई दिल्ली : रक्षा अनुसंधान और विकास संगठन (DRDO) ने मौजूदा संरचनाओं की ओवरहॉलिंग करने के उद्देश्य से भविष्य के युद्ध परिदृश्य को पूरा करने के अपने कर्तव्यों के चार्टर को फिर से नए रूप में ढालने के लिए एक विशेषज्ञ पैनल की स्थापना की है।

डीआरडीओ का यह फैसला ऐसे समय में आया है जब रक्षा मंत्रालय (MoD) सैन्य निर्यात को कम करने के लिए आत्मनिर्भरता मंत्र पर काम कर रहा है।

24 अगस्त को जारी एक अधिसूचना में कहा गया था कि पैनल डीआरडीओ की सभी 52 प्रयोगशालाओं के उद्देश्यों पर नजर रखेगा और प्रयोगशालाओं के बीच प्रौद्योगिकियों के ओवरलैप को कम करने को ध्यान में रखते हुए एक अध्ययन भी करेगा।

DRDO के प्रमुख सतीश रेड्डी PM मोदी के साथ (फाइल-पीटीआई)

पांच सदस्यीय विशेषज्ञ पैनल का नेतृत्व आईआईटी, दिल्ली के निदेशक वी रामगोपाल राव कर रहे हैं और उन्हें विस्तृत रिपोर्ट देने के लिए 45 दिनों की समयसीमा दी गई है।

सतीश रेड्डी को सेवा विस्तार

विशेषज्ञ पैनल में शामिल अन्य सदस्य हैं विक्रम साराभाई स्पेस सेंटर के निदेशक एस सोमनाथ, नेवल सिस्टम्स एंड मटीरियल्स (NS & M) के महानिदेशक डॉक्टर समीर वी कामत, एयर मार्शल संदीप सिंह, एयर स्टाफ के डिप्टी चीफ और इंस्ट्रूमेंट्स रिसर्च एंड डेवलपमेंट इस्टेब्लिशमेंट ऑफ डीआरडीओ के निदेशक बेंजामिन मिलेल शामिल हैं।

1958 में रक्षा अनुसंधान और विकास संगठन (DRDO) का गठन किया गया था और वर्तमान में संगठन की कमान डॉक्टर जी सतीश रेड्डी के हाथों में है। महीने के अंत में उन्हें रिटायरमेंट से पहले दो साल का सेवा विस्तार दिया गया है।

सोमवार को 'आत्म निर्भर' के नारे के साथ काम करते हुए डीआरडीओ ने कहा कि भारत में स्वदेशी रक्षा पारिस्थितिकी तंत्र को मजबूत करने के लिए 108 सिस्टम और सबसिस्टम विकसित किए जाएंगे।

रक्षा मंत्रालय ने भी 101 वस्तुओं की एक सूची तैयार की है जिन्हें आयात करने के लिए प्रतिबंधित कर दिया गया है और अब इस घरेलू निर्माताओं से सशस्त्र बलों द्वारा खरीदा जाएगा।

आत्मनिर्भर भारत के निर्माण की ओर

डीआरडीओ का एक प्रतिनिधिमंडल रक्षा मंत्री राजनाथ सिंह से भी मिला और उन्हें लगभग 108 सिस्टम्स और सबसिस्टम्स से अवगत कराया, जिनकी पहचान केवल भारतीय उद्योग द्वारा डिजाइन और विकास के लिए की गई है।

रक्षा मंत्रालय ने कहा कि इस पहल से भारतीय रक्षा उद्योग के लिए एक आत्मनिर्भर भारत के निर्माण की दिशा में कई तकनीकों को विकसित करने का मार्ग प्रशस्त होगा।

डीआरडीओ जरूरत के आधार पर इन प्रणालियों के डिजाइन, विकास और परीक्षण के लिए उद्योगों को सहायता प्रदान करेगा। अनुसंधान और विकास प्रतिष्ठानों, सशस्त्र बलों और अन्य सुरक्षा एजेंसियों द्वारा इन प्रणालियों की सभी आवश्यकताओं को उपयुक्त औद्योगिक उद्योग पर विकास अनुबंध या उत्पादन आदेशों के माध्यम से पूरा किया जा सकेगा।

https://www.aajtak.in/india/news/story/atmanirbhar-bharat-slogan-drdo-sets-out-revamp-path-expert-panel-for-military-needs-1119817-2020-08-26

The Indian EXPRESS

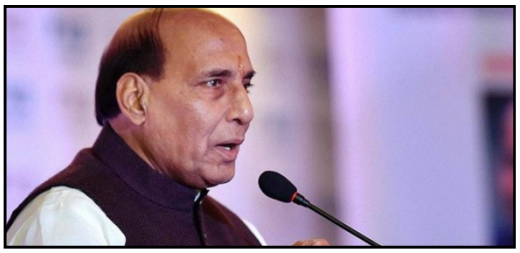
Thu, 27 Aug 2020

Defence Ministry working on second list of weapons that will be banned from import

India is one of the largest importers of arms globally. According to estimates, the Indian armed forces are projected to spend around USD 130 billion in capital procurement in the next five years

New Delhi: The defence ministry has started work on bringing out by December a second list of military platforms and weapons which will be banned from import under a staggered timeline to encourage their domestic production, officials said on Wednesday.

The ministry has already started preliminary discussions with major stakeholders like the defence public sector undertakings, private industries, Defence Research and Development Organisation (DRDO) and the three services on the second negative arms import list, they said.



The defence minister has already outlined the broad contours of the government's roadmap for making India a hub for defence manufacturing. (PTI)

On August 9, Defence Minister Rajnath Singh had announced that India will stop the import of 101 weapons and military platforms like transport aircraft, light combat helicopters, conventional submarines, cruise missiles and sonar systems by 2024.

Subsequently, the defence ministry released the first list of items, with a detailed timeline. “We are working on bringing out the second negative arms import list by end of December,” said a senior official.

The defence minister has already outlined the broad contours of the government’s roadmap for making India a hub for defence manufacturing.

India is one of the largest importers of arms globally. According to estimates, the Indian armed forces are projected to spend around USD 130 billion in capital procurement in the next five years.

The defence ministry has set a goal of a turnover of USD 25 billion (Rs 1.75 lakh crore) in defence manufacturing in the next five years that included an export target of USD 5 billion (Rs 35,000 crore) worth of military hardware. As part of efforts to promote the domestic defence industry, the ministry has bifurcated the capital procurement budget for 2020-21 between domestic and foreign capital procurement routes.

A separate budget head has been created with an outlay of nearly Rs 52,000 crore for domestic capital procurement in the current financial year. In sync with the government’s initiative, the DRDO on Monday identified 108 military systems and subsystems like navigation radars, tank transporters and missile canisters for the domestic industry to design, develop and manufacture.

The DRDO said it will also provide support to industries for design, development and testing of these systems on a requirement basis. The premier institute has set a target of next year in developing the 108 systems and subsystems.

The first list of 101 items banned from import included towed artillery guns, short-range surface to air missiles, cruise missiles, offshore patrol vessels, electronic warfare systems, next-generation missile vessels, floating dock, anti-submarine rocket launchers and short-range maritime reconnaissance aircraft.

https://indianexpress.com/article/india/defence-ministry-working-on-second-list-of-weapons-that-will-be-banned-from-import-6571217/lite/

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Thu, 27 Aug 2020

Bangalore based start-up developing air launched drones with US Air Force Research labs

By Manu Pubby

Synopsis

Details of the project have not been shared yet but is likely to involve drones that act as force multipliers for combat aircraft on mission. The project would be one of the first success stories for the intergovernmental DTTI that has yet to show significant results, despite intense efforts by both India and US.

New Delhi: A Bangalore based start-up is part of the first Indo-US technology collaboration project in the aerospace sector and will work with the US Air Force Research labs to develop future air launched drones for the armed forces.

NewSpace Research and Technologies Pvt Ltd, a start-up that lists itself as a 46 member team, is part of a project selected under the Indo-US Defence Technology and Trade Initiative (DTTI) to do-develop air launched unmanned aerial vehicles, ET has learnt.

While the company did not offer comments when contacted by ET, it is learnt that it has been selected for a futuristic program that involves collaboration with the US Air Force Research Labs, the Indian Air Force and the Defence Research and Development Organisation (DRDO).

Details of the project have not been shared yet but is likely to involve drones that act as force multipliers for combat aircraft on mission. The project would be one of the first success stories for the intergovernmental DTTI that has yet to show significant results, despite intense efforts by both India and US.

At a seminar last month, top Pentagon official Ellen M Lord, Under Secretary of Defence for Acquisition and Sustainment had referred to the air launched drones program but had not mentioned the name of the Indian start-up being involved.

Experts have welcomed the move to involve the private sector in the Indo-US technology sharing initiative. “A lot of the work under DTTI isn't terribly advanced, certainly not the kind that requires high-level enabling S&T research from organisations like DRDO and DARPA. Given that, it makes sense to involve private businesses, particularly the more agile and specialised outfits, to collaborate on meeting high level requirements set out by the militaries of both sides,” aviation expert Angad Singh with the Observer Research Foundation (ORF) says.

He adds that projects like these need to focus on development of technology and not be treated as an arms sale. “The key thing is to frame DTTI as cooperative tech development -- where both sides contribute and both benefit from the outcomes -- rather than one-sided arms sales or technology transfer from the USA to India,” Singh said.

While the US side seems to be keen to work with Indian companies and start ups, as is clear from the selection for the first aviation project, it remains to be seen how things go ahead, given that traditionally such initiatives have been driven by the DRDO that is bound to a set governmental procedure and pace.

https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/bangalore-based-start-up-developing-air-launched-drones-with-us-air-force-research-labs/articleshow/77766675.cms

Defence News

Defence Strategic: National/International

hindustantimes

Thu, 27 Aug 2020

Govt pushes hard to complete 1st all-weather route to Ladakh

Senior military commanders said the third route to connect Ladakh by road is urgently needed given Pakistan and its all-weather friend, China's interest in the Siachen Glacier and Daulat Beg Oldie

By Shishir Gupta

New Delhi: India's national security planners are pushing hard to complete an all-weather strategic route to Ladakh that will link Darcha in Himachal Pradesh to Nimu via Padum in Kargil's Zanskar valley, people familiar with the matter said.

Senior military commanders said the third route to connect Ladakh by road is urgently needed given Pakistan and its all-weather friend, China's interest in the Siachen Glacier and Daulat Beg Oldie.

Nimu is 35 kilometres from Leh town and headquarters of XIV Corps responsible for the defence of East Ladakh and Siachen Glacier.

An Indian army convoy moves on the Srinagar-Ladakh highway at Gagangeer, north-east of Srinagar.(AP)

This will be the first all-weather route to Ladakh which is already connected by two other routes; the first via Zoji La in Jammu and Kashmir and the second, via Himachal's Manali-Upshi-Leh axis. The 9.02 kilometre Atal tunnel at Rohtang La, which will reduce the distance between Manali and Leh by 46 km, is set to become operational next month.

The defence ministry's road project is being pushed hard by road and highways minister Nitin Gadkari and his colleague Gen VK Singh after China provoked a standoff along the Line of Actual Control in East Ladakh and started mobilising troops in the depth areas. New Delhi perceives Beijing's reluctance to disengage despite reminders as an effort to create a new normal at the border.

Officials said the third route requires upgrading the Darcha-Padum-Nimu trekking route into a metalled road and building a 4.5-kilometre tunnel under Shingo La on the Darcha-Padum route. The project, which has been in the pipeline for a decade, is scheduled to be completed by the defence ministry within two years.

In an effort to ensure that the project meets its two-year deadline, Gadkari's ministry has proposed that the task to build the tunnel should be given to the company that constructed the 9.02 km tunnel at Rohtang La on the condition that it meets the timeline.

According to military commanders, the need to build the third axis was felt as tunnelling would be required under four more high mountain passes on the existing Manali-Leh route if the road has to be kept open through the year. The Atal tunnel at Rohtang La on this route has been built at a height of 10,171 feet and is already the world's longest at this altitude.

The four passes that would require tunnels on the existing Manali-Leh route are at higher altitudes: Baralacha La (16,500 feet), Nakee La (15,547 feet), Lachung La (16,616 feet), and Tanglang La (17,480 feet). These passes are only open for traffic between mid-May and mid-November and covered with deep snow remaining part of the year.

However, the Darcha-Padum-Nimu route requires only a single 4.5 km tunnel through the 16,570 feet Shingo La between Darcha and Padum to ensure that the road is closed only for two months in winter. Darcha is 147 kilometres from Manali and lies on the highway to Leh after Jispa and Keylong across Rohtang La.

The distance between Darcha and Padum is about 148 kilometres with the Zanskar sub-divisional town connected to Kargil via a 230-km long single lane road. Work is already on to construct the Darcha-Padum road with another 260 km road work in progress between Padum and Nimu.

"We are looking to build a road that bisects the Leh-Kargil highway around Lamayuru monastery and connects Darcha via Padum. This road will allow the Indian military and the local population to get round-the-year supplies… The route is not under the prying eyes of the Pakistan Army as in Kaksar in Kargil district or the DSDBO (Darbuk-Shyok-Daulat Beg Oldie) route that is under the observation of the People's Liberation Army (PLA)," said a former army chief who asked not to be named.

Apart from keeping supply lines open for the military guarding Siachen, Kargil and DBO sectors, the Darcha-Nimu route will also develop the new union territory of Ladakh to match the aspirations of its people.

https://www.hindustantimes.com/india-news/govt-pushes-hard-to-complete-1st-all-weather-route-to-ladakh/story-bG46RSR4r0xZ2V1jvP5vLM.html

FINANCIAL EXPRESS
Read to Lead

Thu, 27 Aug 2020

India-China standoff: Special clothing, diet for the Indian Army troops this winter along LAC

New sleeping habitat like arctic tents and special high-nutrient diet are to be provided for almost 30,000 troops who have been in the region since May with heavy equipment to respond to any action by the Chinese side

By Huma Siddiqui

Indian Army gets ready for a long winter deployment along the 826-km Line of Actual Control in Ladakh and has plans of sending in additional troops. The Indian Army is already in the process of procuring gloves, sleeping bags, special world class boots as well as layered jackets which would help the troops to deal with the extreme cold. Besides the need additional habitat for more troops being deployed, winter clothing, rations, there is going to be a huge need for fuel and equipment to last through the deadly winters. According to experts while there is expected to be additional expenses involved, maintaining a supply chain too will be a challenge.

Though there are heated facilities with bunker beds for around 10,000 troops who are already there, with additional troops the Army is also working on special diet plan and special arctic tents as the temperatures in the night are expected to touch almost -30 C in winters. The soldiers will be given multiple pair of clothing including shoes which often get wet due to snow.

New sleeping habitat like arctic tents and special high-nutrient diet are to be provided for almost 30,000 troops who have been in the region since May with heavy equipment to respond to any action by the Chinese side.

During the winters patrolling has always been curtailed, however, this time with the tensions mounting between India and China, and the heavy presence of the People's Liberation Army (PLA) across the LAC, India is not ready to take any chances.

Special Diet

The troops have to be fed special diet as they will be staying in low oxygen areas where there are no trees in Eastern Ladakh. The Defence Institute of Physiology and Allied Sciences study has done a calorie intake study and concluded that the requirement could be anything between 4,270 and 4,550 calories per day per person. So the ration going for them would include energy bars, chocolates, more fruits and vegetables.

Expert View

An army marches on its stomach; this idiom has been attributed to Frederick the Great (1712) and Napolean Bonaparte (1760-1821). It is an English version of the French phrase c'est la soupe qui fait la soldat or 'it's the soup that makes the soldier.'

Sharing his view with Financial Express Online, Lt Col Manoj K Channan (Retd), says, "The current standoff along the LAC is a nightmare for the Operations and Logistics staff, as modern army's require much more than a piece of bread and soup. The super high altitude and desert terrain, sparse vegetation entails that all items need to be transported both by road and air. While the winter stocking must have been carried out, the lines of communication for logistics need to be kept open irrespective of the weather."

"This is a daunting task for the Border Roads Organisation (BRO) as in addition to carrying out the construction of new roads it now has to ensure that the passes are kept open despite the heavy snowfall and minus thirty degree temperatures. While the man is being looked after the 'machine' – equipment management will be tested to its extremes as the extreme cold weather conditions have its impact on perishable parts. Make shift shelters need to be created with heating and protection from the moisture."

There is a need to ensure that the troops deployed are sent on rotational rest and recuperation so that mental fatigue of deployment in a cold frigid region does not affect the moral of the troops.

"I am sure that the Military Leadership is well seized of the challenges that are being faced and have pragmatic solutions with years of experience, having done such deployments in areas akin to the present deployment," Lt Col Manoj K Channan concludes.

https://www.financialexpress.com/defence/india-china-standoff-special-clothing-diet-for-the-indian-army-troops-this-winter-along-lac/2065936/

BW BUSINESSWORLD

Thu, 27 Aug 2020

Indian Army organises 'Northern Command Equipment Display 2020' to promote Make-in-India initiative

Indian Army organises 'Northern Command Equipment Display 2020' to promote Make-in-India initiative

Udhampur: To promote Make-in-India initiative in defence technology, Indian Army organised 'Northern Command Equipment Display 2020' in Udhampur district on Wednesday. It was inaugurated by Lt General C Bansi Ponnappa, Chief of Staff, Northern Command. The display not only served to showcase cutting edge technologies and innovative products to meet the complex challenges faced by the security forces in the Northern Command but also acted as an ideal platform for mutual exchange of ideas between the Indian defence industry and the Army, stated a press released by PIB.

The technologies and products on display covered a wide canvas, the prominent being, counter-drone systems, alternate energy sources, situational awareness control measures, training aids amongst others, the release said.

The event witnessed active participation from the Indian Defence industry, said Northern Command, Indian Army, in a tweet.

The interaction with experts from defence industry has resulted in furthering the relationship with the common objective of developing customised and effective solutions for the Indian Army and progress towards self-reliance in the Indian Defence Industry to align with the government initiative of Make-in-India, the release added.

Amid the coronavirus pandemic, the participants were seen following health norms. (ANI)

(Disclaimer: The views expressed in the article above are those of the authors' and do not necessarily represent or reflect the views of this publishing house. Unless otherwise noted, the author is writing in his/her personal capacity. They are not intended and should not be thought to represent official ideas, attitudes, or policies of any agency or institution.)

http://www.businessworld.in/article/Indian-Army-organises-Northern-Command-Equipment-Display-2020-to-promote-Make-in-India-initiative/27-08-2020-313443/

THE ECONOMIC TIMES
WWW.ECONOMICTIMES.COM

Thu, 27 Aug 2020

Attempt to scale down ammunition orders dampener for private companies

By Manu Pubby

Synopsis

In a big blow to at least 11 Indian companies that were bidding to supply ammunition ranging from rifle-fired grenades, rockets, artillery shells and fuses to the army, the defence ministry has withdrawn seven tenders in June, saying bids are non-compliant without sharing specific reasons.

New Delhi: A decision to cancel orders worth billions of dollars for ammunition that were to be placed on the private sector and a new process in which limited numbers are being looked at have hit the industry hard, dampening hopes of creating a domestic ecosystem to replace imports.

In a big blow to at least 11 Indian companies that were bidding to supply ammunition ranging from rifle-fired grenades, rockets, artillery shells and fuses to the army, the defence ministry has withdrawn seven tenders in June, saying bids are non-compliant without sharing specific reasons.

Bank guarantees alone worth over Rs 300 cr had been pledged by cos since the bidding process started in 2017

This has been a major cause for concern given that banking guarantees alone worth over Rs 300 crore had been pledged by the companies since the bidding process started in 2017 and several Indian entities had signed up technology transfer agreements and had even made payments to foreign collaborators.

Industry insiders have told ET that a major disappointment has been that it took over three years to decide not to go ahead with the procurement plan, without even going for field trials where they could have demonstrated their ability to deliver a range of ammunition.

The decision to issue tenders to the private sector for a 10-year supply programme was taken after surgical strikes across Line of Control in 2016, following which India spent thousands of crores on emergency purchases as tensions arose with Pakistan.

Among major companies that took part in the competition were Kalyani Group, Mahindra Defence, Premier Explosives NSE -2.31 % and Solar Group. The companies had tied up with foreign partners, several of which had been earlier suppliers of ammunition being imported by India.

"It is difficult to understand why it took three years to decide that the process needs to be cancelled. For three years the companies remained tied down with banking guarantees worth crores and spent money on tie-ups and creating capacity," an industry insider said.

While there has been an attempt to revive the Make in India plan with request for information issued by the army earlier this month for seven types of ammunition, industry sources say that the numbers mentioned may not be financially viable for most of the projects.

"A minimum guaranteed order has to be in place to justify the huge investments required to set up manufacturing facilities of this kind. The numbers being described are not enough as they will be financially unviable, specially as this would be the first time the private sector is getting a chance to manufacture ammunition," another industry source said.

For example, among the requests for information, the army has specified that it needs only 30 of the 300mm Smerch Rockets annually. Another requirement for shoulder-fired rocket launchers is described as 90 per annum while a third request for 155 mm ammunition does not even specify numbers. The only proposals with significant numbers are 40mm grenades and 7.62 calibre ammunition.

https://economictimes.indiatimes.com/news/defence/attempt-to-scale-down-ammo-orders-dampener-for-private-cos/articleshow/77749080.cms

NAVAL TECHNOLOGY

Thu, 27 Aug 2020

India to bolster island territories' infrastructure

India is reportedly planning to upgrade the infrastructure at its two island territories, Andaman and Nicobar and Lakshadweep, amid China's increased presence in the Indian Ocean.

The Chinese Navy has increased its presence in the region with ports in Myanmar, Pakistan and Iran.

This move is expected to ensure that there is no hinderance for navigation or a repetition of South China Sea in its territory.

The Hindustan Times reported that India plans to upgrade the airstrip at INS Kohassa in Andamans and at the Campbell strip in Nicobar into complete fighter bases.

It also intends to upgrade the Agatti airstrip in Lakshadweep for military operations. This is expected to secure the Bay of Bengal up to Malacca Straits and up to Gulf of Aden in the Arabian Sea.

A tri-service commander was quoted by the newspaper as saying: "The two island territories will be like the new aircraft carriers for India, extending the navy's reach in the region far from the mainland.

"Both the islands sit on the busiest sea lanes of the world, with more than half the world trade going through this route."

As per the officials, the upgrade of the infrastructure is urgent due to China's efforts to urge Thailand to commence work on Thai Canal.

Some people have expressed concerns regarding the canal, which is promoted by the Belt and Road Initiative of China, stating that the canal could lead to long-term maritime security risks for India.

Last month, the Indian Navy expanded its deployment of frontline warships and submarines in the Indian Ocean Region (IOR).

India had deployed its ships in the IOR amid border clashes with China in the Galwan Valley in June that led to the death of 20 Indian Army personnel.

In June, the Indian and Japanese navies reportedly conducted an exercise in the Indian Ocean amidst the border tensions in Ladakh.

https://www.naval-technology.com/news/india-to-bolster-island-territories-infrastructure/

The Tribune

Thu, 27 Aug 2020

Indian, Chinese forces to exercise side by side

New Delhi: A combined tri-services contingent from India will take part in a 12-day military exercise in Russia. Two of India's edgy neighbours — China and Pakistan — will also be part of the exercise scheduled from September 15 to 26.

A combined tri-services contingent from India will take part in a 12-day military exercise in Russia. Two of India's edgy neighbours — China and Pakistan — will also be part of the exercise scheduled from September 15 to 26. - File photo

The Indian contingent of around 200 officers and troops will take part in the 'Kavkaz 2020' (Caucasus 2020), a "strategic command-post exercise" in the Astrakhan region.

Since early May, India and China are locked in a tense military standoff in Ladakh along the Line of Actual Control (LAC). The two sides were involved in a skirmish in the Galwan valley, leading to casualties on both sides on June 15.

India's participation will be of a company-level strength (around 180 troops from an infantry battalion). Elements of the Indian Air Force and observers from the Indian Navy will also be going.

China is sending a large contingent along with three ships for the exercise. "Our troops are going for a multilateral exercise where 18 countries are participating. It's not an India-China-Pakistan event. In total, 13,000 troops will participate," said an official here. — TNS

Military drill in Russia

- Around 200 Indian troops will attend 'Kavkaz 2020' in Russia from September 15 to 26
- China is sending a large contingent besides three ships. Pakistan will take part too
- The exercise involves offensive and defensive ops against international terror outfits

https://www.tribuneindia.com/news/nation/indian-chinese-forces-to-exercise-side-by-side-131950

Thu, 27 Aug 2020

Thai envoy announces the Royal Thai Army's purchase of 600 Tata Motors defence trucks

By K C Archana

Highlights

More recently, the Thai ambassador to India lauded India's Atmanirbhar Bharat initiative by announces the purchase of 600 Tata motors military trucks.

When the Prime Minister said to go 'vocal for local', he also meant that products be made competitive vis-a-vis global brands.

Tata Motors - India's leading auto brand - seems to have solidified the brand's stance for the 'Vocal for Local' initiative, by manufacturing high-end military support vehicles not just for the country, but one that fits the purpose of international defence deals.

Twitter/Chutintorn Sam Gongsakdi

More recently, the Thai ambassador to India lauded India's Atmanirbhar Bharat initiative by announces the purchase of 600 Tata motors military trucks.

Chutintorn Sam Gongsakdi tweeted saying, 'Atmanirbhar Bharat: The Royal Thai Army is in the process of completing its purchase of over 600 TATA LPTA military trucks...They are rugged & easy to maintain. Fit for purpose. Fit for service of the nation'.

According to *Motoroids report,* Tata Motors has been a prime defence supplier to the Armed and Paramilitary Forces of the country for a long time now. The Group's history with the Defence sector goes way back to the 1940s.

Apart from being a leading supplier of mobility solutions to the Indian Army, Navy, Air Force and various Paramilitary forces, the company also exports its range of specialized Defence vehicles to SAARC, ASEAN, African nations and the UN peacekeeping forces in conflict zones in Africa.

Chutintorn Sam Gongsakdi, in his tweet about the military purchase, ended up making an error of posting the Flag of Niger instead of India to indicate the deal.

After people online pointed out that he used the wrong flag, Sam Gongsakdi, immediately posted an apology saying 'Sorry. It is so small, I thought the detail was lacking. I actually checked before choosing'.

Tata Motors, India's largest vehicle manufacturer by revenue, is readying a range of sophisticated combat, tactical, logistical and armoured vehicles including high-end missile launchers for the Indian defence forces.

V S Noronha - vice-president (defence and government business), Tata Motors - told *Business Standard* earlier this year, "Tata Motors has been very proactive in the defence segment, so it is not that we wait for the order. We knew that somewhere down the line, there would be a better focus on indiginisation and keeping that in mind, we went ahead and developed the (LPTA 5252) 12X12. They are the military versions of the Prima truck."

Tata Motors's product line-up includes bullet-proof troop carriers, armoured buses, mine protected vehicles, mobile hospital, water bowser and even unmanned aerial vehicle launchers, among other things.

https://www.indiatimes.com/trending/social-relevance/thai-envoy-600-tata-lpta-military-trucks-from-india-521218.html

DECCAN HERALD

Thu, 27 Aug 2020

Chandrayaan-2 Orbiter in good health, but Gaganyaan worries ISRO

By Rasheed Kappan

Despite Mission Chandrayaan-2 recording another success with its Orbiter completing a year around the Moon last week, the Indian Space Research Organisation (Isro) has reason to be worried: India's maiden manned space mission, Gaganyaan overshooting its deadline due to Covid-19-triggered delays.

Launched on July 22, 2019, and well on course for a textbook landing, the mission had suffered a dramatic last-minute flaw. Credit: File Image

The space agency was euphoric in its declaration that the Chandrayaan-2 Orbiter had enough fuel on board to keep it alive for another seven years. This was a reiteration of what Isro chairman K Sivan had declared soon after acknowledging the failure of the mission's original purpose: A soft-landing on the lunar surface.

Launched on July 22, 2019, and well on course for a textbook landing, the mission had suffered a dramatic last-minute flaw. Barely metres away from a soft touchdown on September 7, the Orbiter had lost communication link with the Lander, Vikram. ISRO eventually ruled that Vikram had hard-landed, preparing the stage for a third attempt, Chandrayaan-3.

However, this mission's timeline, too, is now in big trouble. But for Isro, nothing could be more urgent than the Gaganyaan mission. Before the launch of the manned spaceflight, originally planned by 2022, the space agency had intended to undertake two unmanned missions.

Two years ago, Prime Minister Narendra Modi had declared the Gaganyaan mission would be a proud feat to accomplish by August 15, 2022, when India completes 75 years of Independence. The mission plan is to send three Indians to space for a period of five to seven days.

First of the two unmanned missions, planned for December 2020, is now very unlikely due to the disruptions caused by the Covid-19 pandemic. The virus, it is learnt, had also infected staff members at the space agency's multiple centres. Isro has reportedly communicated its inability on this front to the Space Commission.

However, since Gaganyaan is a prestige project overseen from the very top, Isro is making all efforts to ensure that the 2022 deadline is adhered to. The four astronauts shortlisted for the mission are currently undergoing training in Russia. After a brief disruption, the training has resumed.

In an official statement, Russian space agency Roscosmos had informed that the astronauts were in good health and determined to continue with their training at the Gagarin Cosmonaut Training Centre (GCTC). Operating the Soyuz MS crewed spacecraft is a key part of the training schedule.

https://www.deccanherald.com/national/chandrayaan-2-orbiter-in-good-health-but-gaganyaan-worries-isro-878307.html

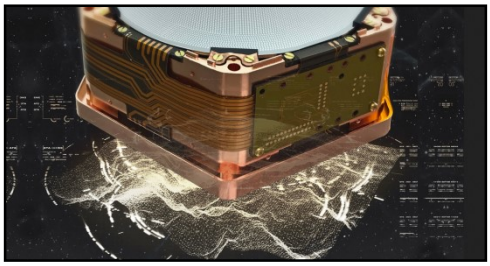
PHYS.ORG

Thu, 27 Aug 2020

Cosmic rays may soon stymie quantum computing

The practicality of quantum computing hangs on the integrity of the quantum bit, or qubit.

Qubits, the logic elements of quantum computers, are coherent two-level systems that represent quantum information. Each qubit has the strange ability to be in a quantum superposition, carrying aspects of both states simultaneously, enabling a quantum version of parallel computation. Quantum computers, if they can be scaled to accommodate many qubits on one processor, could be dizzyingly faster, and able to handle far more complex problems, than today's conventional computers.



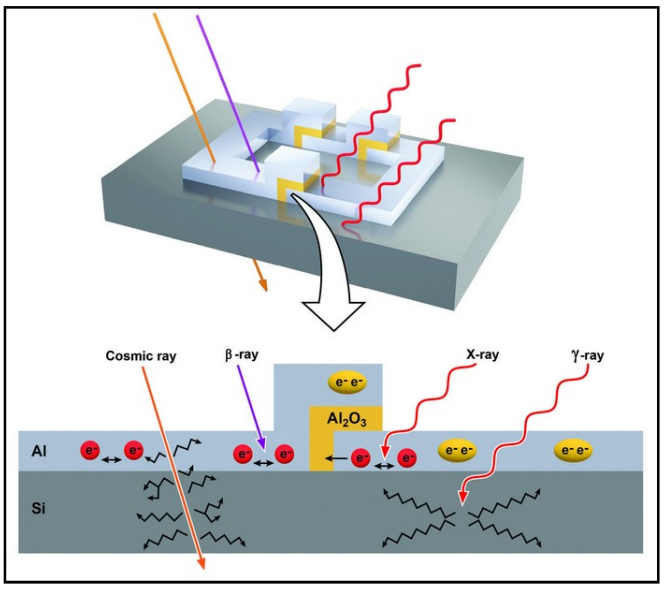
Natural radiation may interfere with both superconducting dark matter detectors (seen here) and superconducting qubits. Credit: Timothy Holland, PNNL

But that all depends on a qubit's integrity, or how long it can operate before its superposition and the quantum information are lost—a process called decoherence, which ultimately limits the computer run-time. Superconducting qubits—a leading qubit modality today—have achieved exponential improvement in this key metric, from less than one nanosecond in 1999 to around 200 microseconds today for the best-performing devices.

But researchers at MIT, MIT Lincoln Laboratory, and Pacific Northwest National Laboratory (PNNL) have found that a qubit's performance will soon hit a wall. In a paper published in *Nature*, the team reports that the low-level, otherwise harmless background radiation that is emitted by trace elements in concrete walls and incoming cosmic rays are enough to cause decoherence in qubits. They found that this effect, if left unmitigated, will limit the performance of qubits to just a few milliseconds.

Given the rate at which scientists have been improving qubits, they may hit this radiation-induced wall in just a few years. To overcome this barrier, scientists will have to find ways to shield qubits—and any practical quantum computers—from low-level radiation, perhaps by building the computers underground or designing qubits that are tolerant to radiation's effects.

"These decoherence mechanisms are like an onion, and we've been peeling back the layers for past 20 years, but there's another layer that left unabated is going to limit us in a couple years, which is environmental radiation," says William Oliver, associate professor of electrical engineering and computer science and Lincoln Laboratory Fellow at MIT. "This is an exciting result, because it motivates us to think of other ways to design qubits to get around this problem."



Natural radiation in the form of X-rays, beta rays, cosmic rays and gamma rays can penetrate a superconducting qubit and interfere with quantum coherence. Credit: Michael Perkins, PNNL

The paper's lead author is Antti Vepsäläinen, a postdoc in MIT's Research Laboratory of Electronics.

"It is fascinating how sensitive superconducting qubits are to the weak radiation. Understanding these effects in our devices can also be helpful in other applications such as superconducting sensors used in astronomy," Vepsäläinen says.

Co-authors at MIT include Amir Karamlou, Akshunna Dogra, Francisca Vasconcelos, Simon Gustavsson, and physics professor Joseph Formaggio, along with David Kim, Alexander Melville, Bethany Niedzielski, and Jonilyn Yoder at Lincoln Laboratory, and John Orrell, Ben Loer, and Brent VanDevender of PNNL.

A cosmic effect

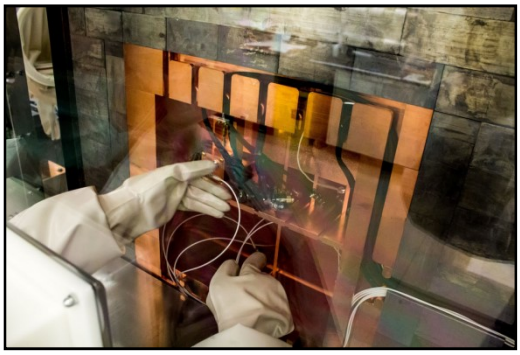
Superconducting qubits are electrical circuits made from superconducting materials. They comprise multitudes of paired electrons, known as Cooper pairs, that flow through the circuit without resistance and work together to maintain the qubit's tenuous superposition state. If the circuit is heated or otherwise disrupted, electron pairs can split up into "quasiparticles," causing decoherence in the qubit that limits its operation.

There are many sources of decoherence that could destabilize a qubit, such as fluctuating magnetic and electric fields, thermal energy, and even interference between qubits.

Scientists have long suspected that very low levels of radiation may have a similar destabilizing effect in qubits.

"I the last five years, the quality of superconducting qubits has become much better, and now we're within a factor of 10 of where the effects of radiation are going to matter," adds Kim, a technical staff member at MIT Lincoln Laboratotry.

So Oliver and Formaggio teamed up to see how they might nail down the effect of low-level environmental radiation on qubits. As a neutrino physicist, Formaggio has expertise in designing experiments that shield against the smallest sources of radiation, to be able to see neutrinos and other hard-to-detect particles.



A worker in the ultra-low radiation detection facility at the Shallow Underground Laboratory located at Pacific Northwest National Laboratory. Credit: Andrea Starr, PNNL

"Calibration is key"

The team, working with collaborators at Lincoln Laboratory and PNNL, first had to design an experiment to calibrate the impact of known levels of radiation on superconducting qubit performance. To do this, they needed a known radioactive source—one which became less radioactive slowly enough to assess the impact at essentially constant radiation levels, yet quickly enough to assess a range of radiation levels within a few weeks, down to the level of background radiation.

The group chose to irradiate a foil of high purity copper. When exposed to a high flux of neutrons, copper produces copious amounts of copper-64, an unstable isotope with exactly the desired properties.

"Copper just absorbs neutrons like a sponge," says Formaggio, who worked with operators at MIT's Nuclear Reactor Laboratory to irradiate two small disks of copper for several minutes. They then placed one of the disks next to the superconducting qubits in a dilution refrigerator in Oliver's lab on campus. At temperatures about 200 times colder than outer space, they measured the impact of the copper's radioactivity on qubits' coherence while the radioactivity decreased—down toward environmental background levels.

The radioactivity of the second disk was measured at room temperature as a gauge for the levels hitting the qubit. Through these measurements and related simulations, the team understood the relation between radiation levels and qubit performance, one that could be used to infer the effect of naturally occurring environmental radiation. Based on these measurements, the qubit coherence time would be limited to about 4 milliseconds.

"Not game over"

The team then removed the radioactive source and proceeded to demonstrate that shielding the qubits from the environmental radiation improves the coherence time. To do this, the researchers built a 2-ton wall of lead bricks that could be raised and lowered on a scissor lift, to either shield or expose the refrigerator to surrounding radiation.

"We built a little castle around this fridge," Oliver says.

Every 10 minutes, and over several weeks, students in Oliver's lab alternated pushing a button to either lift or lower the wall, as a detector measured the qubits' integrity, or "relaxation rate," a measure of how the environmental radiation impacts the qubit, with and without the shield. By comparing the two results, they effectively extracted the impact attributed to environmental radiation, confirming the 4 millisecond prediction and demonstrating that shielding improved qubit performance.

"Cosmic ray radiation is hard to get rid of," Formaggio says. "It's very penetrating, and goes right through everything like a jet stream. If you go underground, that gets less and less. It's probably not necessary to build quantum computers deep underground, like neutrino experiments, but maybe deep basement facilities could probably get qubits operating at improved levels."

Going underground isn't the only option, and Oliver has ideas for how to design quantum computing devices that still work in the face of background radiation.

"If we want to build an industry, we'd likely prefer to mitigate the effects of radiation above ground," Oliver says. "We can think about designing qubits in a way that makes them 'rad-hard,' and less sensitive to quasiparticles, or design traps for quasiparticles so that even if they're constantly being generated by radiation, they can flow away from the qubit. So it's definitely not game-over, it's just the next layer of the onion we need to address."

More information: Impact of ionizing radiation on superconducting qubit coherence, *Nature* (2020). DOI: 10.1038/s41586-020-2619-8 , www.nature.com/articles/s41586-020-2619-8

Journal information: *Nature*

https://phys.org/news/2020-08-cosmic-rays-stymie-quantum.html

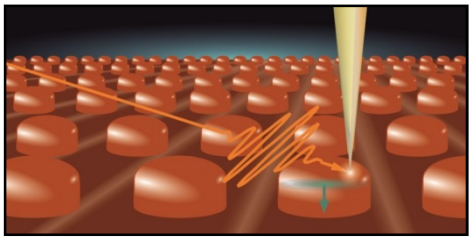
PHYS.ORG

Thu, 27 Aug 2020

Nanodots made of photovoltaic material support waveguide modes

By Renae Keep

Antimony sulfide, or stibnite (Sb_2S_3), has been investigated intensively in recent years as a promising material for nontoxic, environmentally friendly solar cells. It is now possible to fabricate thin photovoltaic films from an ink containing nanoparticles of stibnite, and to nanopattern those films for 2-D and 3-D structures of pretty much any shape. Such simple, cost-effective production methods fulfill prerequisites for reliable, widespread use.



Stibnite nanodots, Zhan et al., doi: 10.1117/1.AP.2.4.046004. Credit: SPIE

Since stibnite is an effective semiconductor (i.e., it has a high absorption coefficient and carrier mobility), its nanostructure holds promise as a photoswitchable material for all-optical signal processing and computing. Petra Groß, researcher at the Institute for Physics at University of Oldenburg explains, "Illumination with near-infrared light, with wavelengths for which stibnite is largely transparent, can result in an ultrafast change of its refractive index. This means that a surface patterned with stibnite nanoparticles could enable optical properties like reflection of color appearance to be switched by an infrared light pulse."

If stibnite nanostructures are to be used in switchable nanodevices, high optical quality is essential. A recent study published in *Advanced Photonics* investigated the optical properties of stibnite nanostructures. The study demonstrated that stibnite nanodots can act as high-optical quality waveguides. This finding, together with the easy 2-D and 3-D structuring capabilities and

interesting optical properties, indicates strong potential for stibnite nanostructures as switchable materials for future applications.

Stibnite nanodots

The lead author of the study, Jinxin Zhan, is currently a doctoral student in the Near-Field Photonics Laboratory of Professor Christoph Lienau at University of Oldenburg. Zhan explains that electron microscope images of stibnite indicate a rather uneven surface. Collaborating with researchers at University of Konstanz, Zhan and her team aimed to estimate the optical properties of the stibnite nanostructure by investigating stibnite nanodots (400-nm diameter) atop a stibnite surface.

Zhan says, "Such an optical inspection is difficult. The size of the nanostructures is usually smaller than the wavelength of visible light, such that spectroscopic measurements are typically performed only on ensembles of several nanostructures."

Nanoparticle focus

To achieve the difficult optical inspection, Zhan and her team developed a novel kind of near-field spectroscopy that allows optical study of single nanoparticles. It is based on scattering-type scanning near-field optical microscopy (SOM), where a gold probe with a sharp tip of about 10-nm radius of curvature is brought close to nanostructure's surface and scanned across it. The light scattered away from the structure by the tip is collected by a detector.

Zhan notes, "Usually, there is a large amount of background light present, which we suppress by modulating the tip-sample distance and by mixing the scattered light with a broadband reference laser. A monochromator equipped with a fast line camera enables us to measure complete spectra at every position while raster scanning." The spectral bandwidth is 200 nm, and the spatial resolution is about 20 nm, such that the team can study the optical properties, or spectrally resolved intensity profiles, within individual nanodots.

The resulting maps of the stibnite nanoparticles revealed that they act as high-refractive index, dielectric waveguides, despite their irregular surface apparent in structural studies. Zhan explains further, "With our new method, we see mode profiles across the nanodots that are very similar to the mode profiles of guided waves in optical glass fibers. A calculation shows that a cylindrical waveguide of stibnite with 400-nm diameter should support four modes. A calculated superposition of these four lowest-order modes matches our experimental observation very well. These modes are supported over the whole 200-nm bandwidth of our near-field spectroscopy measurement."

Lienau noted that this novel technique offers a totally new way of "seeing" minute amounts of nanomaterials and opens the door towards studying the dynamics of their optical excitations on ultrafast time scales. He says, "The spectroscopic technique developed by Jinxin Zhan and Petra Groß is exceptionally promising. Already now, the team has demonstrated local light scattering spectroscopy with deep subwavelength resolution and high sensitivity. We are confident that we will be able to further improve the spatial resolution to the few-nanometer range quickly."

More information: Jinxin Zhan et al, Spatial and spectral mode mapping of a dielectric nanodot by broadband interferometric homodyne scanning near-field spectroscopy, *Advanced Photonics* (2020). DOI: 10.1117/1.AP.2.4.046004

https://phys.org/news/2020-08-nanodots-photovoltaic-material-waveguide-modes.html

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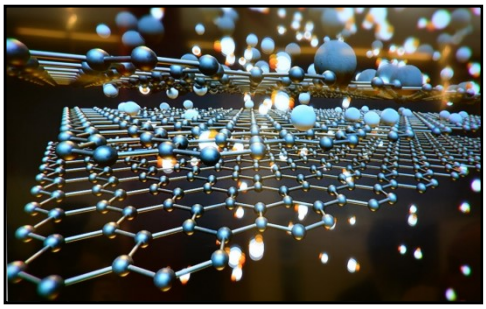
Thu, 27 Aug 2020

New tech extracts potential to identify quality graphene cheaper and faster

Engineers at Australia's Monash University have developed world-first technology that can help industry identify and export high quality graphene cheaper, faster and more accurately than current methods.



Credit: CC0 Public Domain

Published today in international journal *Advanced Science*, researchers used the data set of an optical microscope to develop a machine-learning algorithm that can characterize graphene properties and quality, without bias, within 14 minutes.

This technology is a game changer for hundreds of graphene or graphene oxide manufacturers globally. It will help them boost the quality and reliability of their graphene supply in quick time.

Currently, manufacturers can only detect the quality and properties of graphene used in a product after it has been manufactured.

Through this algorithm, which has the potential to be rolled out globally with commercial support, graphene producers can be assured of quality product and remove the time-intensive and costly process of a series of characterisation techniques to identify graphene properties, such as the thickness and size of the atomic layers.

Professor Mainak Majumder from Monash University's Department of Mechanical and Aerospace Engineering and the Australian Research Council's Hub on Graphene Enabled Industry Transformation led this breakthrough study.

Study co-authors are Md. Joynul Abedin and Dr. Mahdokht Shaibani (Monash, Department of Mechanical and Aerospace Engineering), and Titon Barua (Vimmaniac Ltd., Bangladesh).

"Graphene possesses extraordinary capacity for electric and thermal conductivity. It is widely used in the production of membranes for water purification, energy storage and in smart technology, such as weight loading sensors on traffic bridges," Professor Majumder said.

"At the same time, graphene is rather expensive when it comes to usage in bulk quantities. One gram of high quality graphene could cost as much as $1,000 AUD ($720 USD) a large percentage of it is due to the costly quality control process.

"Therefore, manufacturers need to be assured that they're sourcing the highest quality graphene on the market. Our technology can detect the properties of graphene in under 14 minutes for a single dataset of 1936 x 1216 resolution. This will save manufacturers vital time and money, and establish a competitive advantage in a growing marketplace."

Discovered in 2004, graphene is touted as a wonder material for its outstanding lightweight, thin and ultra-flexible properties. Graphene is produced through the exfoliation of graphite. Graphite, a crystalline form of carbon with atoms arranged hexagonally, comprises many layers of graphene.

However, the translation of this potential to real-life and usable products has been slow. One of the reasons is the lack of reliability and consistency of what is commercially often available as graphene.

The most widely used method of producing graphene and graphene oxide sheets is through liquid phase exfoliation (LPE). In this process, the single layer sheets are stripped from its 3-D counterpart such as graphite, graphite oxide film or expanded graphite by shear-forces.

But, this can only be imaged using a dry sample (i.e. once the graphene has been coated on a glass slide).

"Although there has been a strong emphasis on standardization guidelines of graphene materials, there is virtually no way to monitor the fundamental unit process of exfoliation, product quality varies from laboratory to laboratory and from one manufacturer to other," Dr. Shaibani said.

"As a result, discrepancies are often observed in the reported property-performance characteristics, even though the material is claimed to be graphene.

"Our work could be of importance to industries that are interested in delivering high quality graphene to their customers with reliable functionality and properties. There are a number of ASX listed companies attempting to enter this billion-dollar market, and this technology could accelerate this interest."

Researchers applied the algorithm to an assortment of 18 graphene samples—eight of which were acquired from commercial sources and the rest produced in a laboratory under controlled processing conditions.

Using a quantitative polarized optical microscope, researchers identified a technique for detecting, classifying and quantifying exfoliated graphene in its natural form of a dispersion.

To maximize the information generated from hundreds of images and large numbers of samples in a fast and efficient manner, researchers developed an unsupervised machine-learning algorithm to identify data clusters of similar nature, and then use image analysis to quantify the proportions of each cluster.

Mr Abedin said this method has the potential to be used for the classification and quantification of other two-dimensional materials.

"The capability of our approach to classify stacking at sub-nanometer to micrometer scale and measure the size, thickness, and concentration of exfoliation in generic dispersions of graphene/graphene oxide is exciting and holds exceptional promise for the development of energy and thermally advanced products," Mr Abedin said.

Professor Dusan Losic, Director of Australian Research Council's Hub on Graphene Enabled Industry Transformation, said: "These outstanding outcomes from our ARC Research Hub will make significant impact on the emerging multibillion dollar graphene industry giving graphene manufacturers and end-users new a simple quality control tool to define the quality of their produced graphene materials which is currently missing."

More information: Md. Joynul Abedin et al, A High Throughput and Unbiased Machine Learning Approach for Classification of Graphene Dispersions, *Advanced Science* (2020). DOI: 10.1002/advs.202001600

https://phys.org/news/2020-08-tech-potential-quality-graphene-cheaper.html

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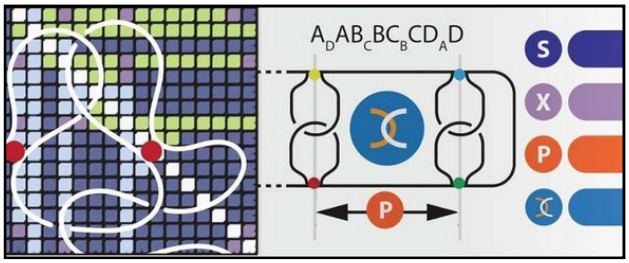
Thu, 27 Aug 2020

Scientists develop topological barcodes for folded molecules

The team of Alireza Mashaghi at the Leiden Academic Center for Drug Research has found a way to determine and classify the shape of proteins. Their new theory defines the topology of proteins as a simple and precise barcode that allows the identification of all types of folds. This barcode enables among others more profound research into diseases caused by misfolding proteins, such as neuromuscular diseases and some sorts of cancer.

Tying knots



"We are all familiar with tying a rope into a knot," says Mashaghi. "Just like that, molecular chains in our cells are folded into proteins and genes. Our goal was to find a way to describe these knots in a mathematical way, to describe the topology (see text box below) of proteins." About half a century ago, Nobel Prize winner Linus Pauling, predicted that one day it would become clear that this topology of biological molecules is as important in determining the physiological properties as the chemical structure of molecules. He also predicted that this insight would lead to great advances in biology and medicine.

Mathematicians have been studying the mathematics behind knots since 1833. Since then, the field of "knot theory" has become one of the most important fields of mathematics, with many applications in physics and chemistry. But although mathematicians were able to study and classify the entanglement of chains such as ropes, their theory could not yet explain the topology of proteins. "There has not even been a definition for it," adds Mashaghi.

Sticky and unraveling knots

Still, scientists did study and describe the geometry of the folded molecules with great precision. Scientific advances such as the invention of crystallographic methods and spectroscopy have made it possible to measure things as the exact location of each atom or the bending curvature of the protein chain. But the topology is a different story. Alireza gives two main reasons for this. "The first is that unlike ropes, proteins are sticky. This creates connections within the protein chain between certain points. Secondly, if we hold and pull the two ends of a protein like an intertwined rope, the proteins will unravel and in more than 97 percent of the cases, no knots will be left. According to the conventional knot theory, this means that all these proteins, that all have a different function in our body, have identical topology: they are the same as an unknotted rope. This means that conventional knot theory is blind to topological features in 97 percent of the proteins!"

Protein fingerprint

Half a century since Pauling's prediction, Mashaghi and his team were finally able to solve the problem. They present a new innovative theory called Circuit Topology. This theory not only makes it possible to determine and classify the shape of the majority of proteins, but also to compare their different shapes. In this way, a properly folded protein can be compared to a badly folded one, or proteins can be compared across their evolutionary path. "We define the topology of proteins as a simple and precise barcode that allows the identification of all types of folds," says Alireza. "For this reason, we'd like to call it a protein 'fingerprint.'"

Understanding evolution and disease

The topological barcode makes it possible to track the evolutionary changes of proteins and to discover the engineering mechanism of protein. Furthermore, the protein barcode enables the engineering of synthetic proteins for pharmaceutical and industrial applications.

Mashaghi: "The new theory will open up new research pathways in the fields of protein physics, protein engineering, evolutionary studies and even genome biology. Protein misfolding is seen especially in neuromuscular diseases as well as some cancers, including breast and prostate cancer, and topological studies may revolutionize the understanding of the disease mechanisms and find new treatments."

More information: Anatoly Golovnev et al. Generalized circuit topology of folded linear chains, *iScience* (2020). DOI: 10.1016/j.isci.2020.101492

Journal information: *iScience*

https://phys.org/news/2020-08-scientists-topological-barcodes-molecules.html

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Thu, 27 Aug 2020

Revised code could help improve efficiency of fusion experiments

By Raphael Rosen

An international team of researchers led by the U.S. Department of Energy's (DOE) Princeton Plasma Physics Laboratory (PPPL) has upgraded a key computer code for calculating forces acting on magnetically confined plasma in fusion energy experiments. The upgrade will be part of a suite of computational tools that will allow scientists to further improve the design of breakfast-cruller-shaped facilities known as stellarators. Together, the three codes in the suite could help scientists bring efficient fusion reactors closer to reality.

Credit: CC0 Public Domain

The revised software lets researchers more easily determine the boundary of plasma in stellarators. When used in concert with two other codes, the code could help find a stellarator configuration that improves the performance of the design. The two complementary codes determine the optimal location for the plasma in a stellarator vacuum chamber to maximize the efficiency of the fusion reactions, and determine the shape that the external electromagnets must have to hold the plasma in the proper position.

The revised software, called the "free-boundary stepped-pressure equilibrium code (SPEC)," is one of a set of tools scientists can use to tweak the performance of plasma to more easily create fusion energy. "We want to optimize both the plasma position and the magnetic coils to balance the force that makes the plasma expand while holding it in place," said Stuart Hudson, physicist, deputy head of the Theory Department at PPPL and lead author of the paper reporting the results in *Plasma Physics and Controlled Fusion*.

"That way we can create a stable plasma whose particles are more likely to fuse. The updated SPEC code enables us to know where the plasma will be for a given set of magnetic coils."

Fusion combines light elements in the form of plasma—the hot, charged state of matter composed of free electrons and atomic nuclei—and in the process generates massive amounts of

energy in the sun and stars. Scientists are seeking to replicate fusion in devices on Earth for a virtually inexhaustible supply of safe and clean power to generate electricity.

Plasma stability is crucial for fusion. If plasma bounces around inside a stellarator, it can escape, cool, and tamp down the fusion reactions, in effect quenching the fusion fire. An earlier version of the code, also developed by Hudson, could only calculate how forces were affecting a plasma if the researchers already knew the plasma's location. Researchers, however, typically don't have that information. "That's one of the problems with plasmas," Hudson said. "They move all over the place."

The new version of the SPEC code helps solve the problem by allowing researchers to calculate the plasma's boundary without knowing its position beforehand. Used in coordination with a coil-design code called FOCUS and an optimization code called STELLOPT—both of which were also developed at PPPL—SPEC lets physicists simultaneously ensure that the plasma will have the best fusion performance and the magnets will not be too complicated to build. "There's no point optimizing the shape of the plasma and then later finding out that the magnets would be incredibly difficult to construct," Hudson said.

One challenge that Hudson and colleagues faced was verifying that each step of the code upgrade was done correctly. Their slow-and-steady approach was crucial to making sure that the code makes accurate calculations. "Let's say you are designing a component that will go on a rocket to the moon," Hudson said. "It's very important that that part works. So you test and test and test."

Updating any computer code calls for a number of interlocking steps:

- First, scientists must translate a set of mathematical equations describing the plasma into a programming language that a computer can understand;
- Next, scientists must determine the mathematical steps needed to solve the equations;
- Finally, the scientists must verify that the code produces correct results, either by comparing the results with those produced by a code that has already been verified or using the code to solve simple equations whose answers are easy to check.

Hudson and colleagues performed the calculations with widely different methods. They used pencil and paper to determine the equations and solution steps, and powerful PPPL computers to verify the results. "We demonstrated that the code works," Hudson said. "Now it can be used to study current experiments and design new ones."

More information: S R Hudson et al, Free-boundary MRxMHD equilibrium calculations using the stepped-pressure equilibrium code, *Plasma Physics and Controlled Fusion* (2020). DOI: 10.1088/1361-6587/ab9a61

https://phys.org/news/2020-08-code-efficiency-fusion.html

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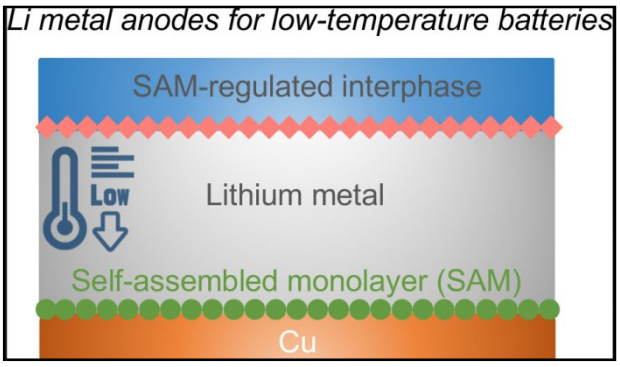
Thu, 27 Aug 2020

Thin layer protects battery, allows cold charging

By A'ndrea Elyse Messer

In the search for a reliable, quick-charging, cold-weather battery for automobiles, a self-assembling, thin layer of electrochemically active molecules may be the solution, according to a team or researchers.

"The lithium metal battery is the next generation of battery after the lithium ion battery," said Donghai Wang, professor of mechanical engineering and a key researcher in the Battery and Energy Storage Technology Center, Penn State. "It uses a lithium anode and has higher energy density, but has problems with dendritic growth, low efficiency and low cycle life."



The layers in a lithium metal anode for low temperature batteries Credit: Donghai Wang, Penn State

The solution to these problems, according to the researchers, is a self-assembling monolayer that is electrochemically active so that it can decompose into its proper components and protect the surface of the lithium anode.

The battery is composed of the lithium anode, a lithium metal oxide cathode and an electrolyte which also has lithium-ion conducting materials and the protective, thin film layer. Without this layer, the battery would tend to grow lithium crystal spikes if charged rapidly or under cold conditions. These lithium spikes eventually short out the battery, greatly decreasing the usefulness and cycle life.

"The key is to tune the molecular chemistry to self-assemble on the surface," said Wang. "The monolayer will provide a good solid electrolyte interface when charging, and protect the lithium anode."

The researchers deposit the monolayer on a thin copper layer. When the battery charges, lithium hits the monolayer and decomposes to form a stable interfacial layer. Some lithium is deposited on the copper along with the remaining layer, and the decomposed portion of the original layer reforms on top of the lithium, protecting the lithium and preventing dendrites of lithium from forming.

According to the researchers, this technology can increase the amount of storage capacity of the battery and can increase the number of times the battery can be charged. However, at this point, the battery can only be charged a few hundred times. The researchers reported their work in a recent issue of *Nature Energy*.

"The key is that this technology shows an ability to form a layer when needed on time and decompose and spontaneously reform so it will stay on the copper and also cover the surface of the lithium," said Wang. "Eventually it could be used for drones, cars, or some very small batteries used for underwater applications at low temperatures.

More information: Yue Gao et al, Low-temperature and high-rate-charging lithium metal batteries enabled by an electrochemically active monolayer-regulated interface, *Nature Energy* (2020). DOI: 10.1038/s41560-020-0640-7

Journal information: *Nature Energy*

https://phys.org/news/2020-08-thin-layer-battery-cold.html

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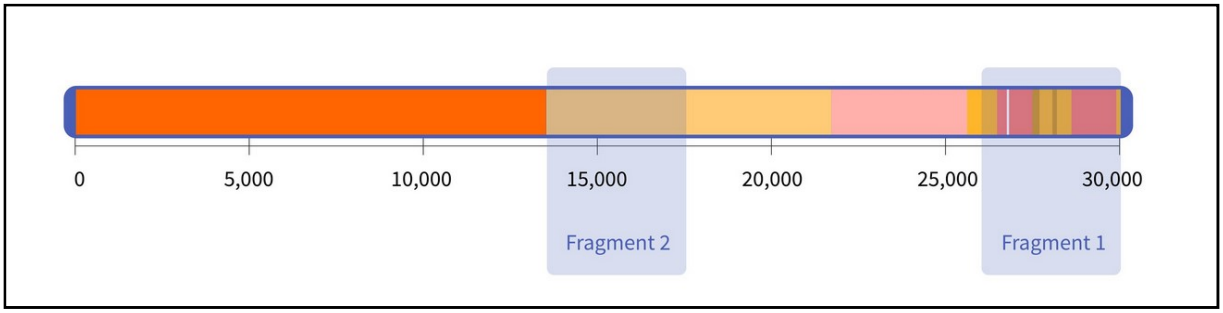
Thu, 27 Aug 2020

Measuring the sensitivity of COVID tests with new material from NIST

Researchers at the National Institute of Standards and Technology (NIST) have produced synthetic gene fragments from SARS-CoV-2, the virus that causes COVID-19. This material, which is non-infectious and safe to handle, can help manufacturers produce more accurate and reliable diagnostic tests for the disease.



The NIST material contains the two RNA fragments shown here. Each of these two fragments is roughly 4,000 letters long. NIST researchers chose to synthesize these particular fragments because they contain the RNA sequences targeted by a large number of diagnostic tests, including those designed by the CDC. Credit: N. Hanacek/NIST

Tests for an active infection—as opposed to antibody tests that indicate a past infection—work by detecting the virus's genes on a nasal swab. But a negative result does not necessarily mean that a person is disease-free. It could be that the amount of virus is too low for the test to detect, which is especially possible during the first days after catching the virus.

"Having better data on test sensitivity will help us understand how often tests for COVID-19 produce a negative result for people that are actually infected," said NIST research scientist Megan Cleveland.

To help with this, Cleveland and her colleagues at NIST have produced synthetic fragments of the virus's genes, which are written in RNA, a molecule that encodes information much like DNA.

Synthesizing RNA is not new or groundbreaking. What makes this material notable is that NIST scientists have measured very carefully how many fragments are in each vial they ship.

Using this material, researchers can measure sensitivity by running tests against known quantities of viral RNA. They can also use it to develop more sensitive tests or new types of tests that are faster or easier to administer.

The SARS-CoV-2 genome is approximately 30,000 base pairs long. The synthetic RNA fragments from NIST are each about 4,000 base pairs long, as shown here:

NIST researchers chose to synthesize these particular fragments because they contain the RNA sequences targeted by a large number of diagnostic tests, including those designed by the CDC.

These RNA fragments are distributed by NIST in small vials packed in dry ice, along with a data sheet that lists the concentration of the fragments in the solution. The solution contains roughly 1 million copies per microliter, or one millionth of a liter (one drop of water contains about 20 microliters). NIST measured this concentration multiple times using a technique called digital PCR, or dPCR, which counts the number of individual DNA fragments in a volume of liquid.

Researchers can use the RNA fragments from NIST to measure the sensitivity of coronavirus tests. To do that, they would use the concentrated solution from NIST to create a series of increasingly diluted samples. They would then run each of those dilutions through their test to find the lowest concentration of RNA fragments that still produces a positive result.

In addition to measuring sensitivity, researchers might also use the synthetic RNA from NIST to develop more sensitive tests or new kinds of tests. For instance, recent research has shown that it might be possible to track the spread of COVID-19 in a city by testing municipal wastewater. The material from NIST might help researchers ensure that they can reliably detect very low concentrations of virus in millions of gallons of wastewater.

NIST is releasing this synthetic RNA as a "research grade test material," though NIST scientists are planning to further develop it into the type of standard reference material (SRM) that NIST is known for. NIST is providing this material at no cost to researchers, test manufacturers and testing laboratories. Technical information and instructions for requesting the material are available on the NIST website.

Genetic supply companies are also synthesizing portions of the virus's RNA, but what sets the NIST material apart is the amount of data that comes with it. Detailed information on how NIST scientists synthesized the fragments and measured their concentration is available in an online Guidance Sheet. Additional information, including raw data and statistical analyses of the concentration measurements, is available on a GitHub site. NIST is providing this data as part of its mission, as the nation's measurement laboratory, to advance measurement science.

"Measuring sensitivity is an important part of test development," said Peter Vallone, the NIST research scientist who oversaw development of the new material. "And we want to make sure that people have the materials and information they need to make the most accurate measurements possible."

https://phys.org/news/2020-08-sensitivity-covid-material-nist.html

INDIA TODAY

Thu, 27 Aug 2020

Covid-19 can affect almost all organs, AIIMS' experts to study symptom-based classification of cases

Experts at AIIMS in New Delhi have also stressed that classification of Covid-19 cases into mild, moderate and severe categories based just on respiratory symptoms should be relooked to include other organ involvement

New Delhi: Not just the lungs, Covid-19 can affect almost all organs and the initial symptoms may be totally unrelated to chest complaints, experts at AIIMS in New Delhi said on Wednesday.

They stressed that classification of cases into mild, moderate and severe categories based just on respiratory symptoms should be relooked to include other organ involvement.

[REPRESENTATIVE IMAGE] Workers at an ICU ward in Bengaluru (Photo Credits: PTI)

Experts from the institute, including its director Dr Randeep Guleria, Dr MV Padma Srivastava, head of the Department of Neurology, Dr Ambuj Roy, Professor of Cardiology and Dr Neeraj Nischal, Associate Professor in the Department of Medicine during their weekly 'National

Clinical Grand Rounds' organised in collaboration with NITI Aayog discussed various possible extra-pulmonary complications of Covid-19.

Dr Guleria said eight months into Covid-19, a lot has been learnt and accordingly strategies are being changed from time to time.

From what we thought of as viral pneumonia has a lot of other manifestations which are beyond the lungs, he said.

"As we have known more and more about Covid-19, we have realised it causes many extrapulmonary manifestations. This is basically of the fact that this virus enters into the cell through ACE2 receptors which although are present abundantly in upper airways and lungs, they are also present in many organs and thus other organs are also affected.

"We have seen many patients who presented with features which are not been predominantly pulmonary but extrapulmonary manifestations," Dr Guleria said.

He said though pulmonary manifestations continue to dominate as far as the majority of Covid-19 cases are concerned, there is a significant number of patients who would present with manifestations which may be along with pulmonary manifestations or maybe without pulmonary manifestations.

"We as clinicians need to have a high index of suspicion during this pandemic -- when to suspect, treat and isolate these patients so that we can provide them good quality care," he stressed.

The experts in the programme presented a number of cases in which the patients were labelled as asymptomatic or mild Covid but had serious life-threatening extra-pulmonary manifestations like stroke and heart blocks.

"What started off as viral pneumonia is now a multi-systemic disease. However, the jury is out whether SARS-COV2 is the culprit in these extrapulmonary manifestations or just an innocent bystander which happens to be at the wrong place at a wrong time," Dr Nischal said.

"So the classification of Covid-19 into mild, moderate and severe cases based only on respiratory symptoms should be relooked into to incorporate other organ involvement," he said.

Dr Nischal further underlined that management of such patients with other organ involvement should be as per existing guidelines of that particular complication.

The doctor from the Medicine Department also highlighted the case of a 35-year old man who had a headache and was vomiting but was found to have life-threatening cortical vein thrombosis.

When tested, he was found positive for Covid-19. He was asymptomatic for Covid-19 as per existing severity guidelines, Dr Nischal said.

"There is a big spectrum of neurological manifestations which have been linked to Covid-19. In some patients, the brain is involved and it may lead to clotting, resulting in a stroke or can cause infection and lead to encephalitis or other complications which have nothing to do with lungs," Dr Padma said.

Dr Ambuj's team presented the case of a patient who came with a very low pulse rate, detected Covid-19 positive and required initial support with some medicines to improve heart rate.

"Normally pacemaker is put in such patients to improve their heart rate but based on experiences documented in the literature, we realised some of these could be due to Covid-19, so a pacemaker was not put and her heart rate gradually improved with supportive treatment."

"Sometimes, the electrical pulse system of the heart which gives rise to heartbeat can be affected in Covid-19 and it is self-limiting and improves with time. So these patients who would otherwise normally require pacemaker may not ever need it. However, more evidence is needed to be definitive about this as it is a new disease and limited information and experience regarding it is available as of now," Dr Roy said.

https://www.indiatoday.in/india/story/covid-19-can-affect-almost-all-organs-aiims-experts-to-study-symptom-based-classification-of-cases-1715498-2020-08-27

hindustantimes

Thu, 27 Aug 2020

N95 masks most effective at stopping Covid-19 spread: Indian scientists

The researchers noted that airborne transmission by respiratory aerosol droplets produced during coughing and sneezing is the dominant mode of spreading for infectious diseases such as Covid-19

New Delhi: N95 masks may be the most effective at reducing the spread of the novel coronavirus, according a study by researchers, including those from the Indian Space Research Organisation (ISRO), which suggests that any mask is better than no mask at preventing Covid-19.

The researchers noted that airborne transmission by respiratory aerosol droplets produced during coughing and sneezing is the dominant mode of spreading for infectious diseases such as Covid-19.

Padmanabha Prasanna Simha, from ISRO, and Prasanna Simha Mohan Rao, from the Sri Jayadeva Institute of Cardiovascular Sciences and Research in Karnataka, experimentally visualised the flow fields of coughs under various common mouth covering scenarios.

The, study published in the journal Physics of Fluids, found N95 masks to be the most effective at reducing the horizontal spread of a cough.

The N95 masks reduced a cough's initial velocity by up to a factor of 10, and limit its spread to between 0.1 and 0.25 meters, the researchers said.

An uncovered cough, in contrast, can travel up to three metres, but even a simple disposable mask can bring this all the way down to 0.5 metres, they said.

"If a person can reduce the extent of how much they contaminate the environment by mitigating the spread, it's a far better situation for other healthy individuals who may enter places that have such contaminated areas," Simha said.

Rao and Simha noted that density and temperature are intricately related, and coughs tend to be warmer than their surrounding area.

They utilised a technique called schlieren imaging, which visualises changes in density, to capture pictures of voluntary coughs from five test subjects.

By tracking the motion of a cough over successive images, the team estimated velocity and spread of the expelled droplets.

N95 masks have the best effectiveness and completely contain the horizontal spread to between 0.1 and 0.25 metres, researchers said.(Pratham Gokhale/HT file photo. Representative image)

N95 masks have the best effectiveness and completely contain the horizontal spread to between 0.1 and 0.25 metres, researchers said.

A disposable surgical mask greatly reduces this distance to between 0.5 and 1.5 metres, they said.

"Even if a mask does not filter out all the particles, if we can prevent clouds of such particles from traveling very far, it's better than not doing anything," said Simha.

"In situations where sophisticated masks are not available, any mask is better than no mask at all for the general public in slowing the spread of infection," said Simha.

The researchers also contradict the generally accepted notion that using an elbow to cover up a cough is a good alternative.

The found that unless covered by a sleeve, a bare arm cannot form the proper seal against the nose necessary to obstruct airflow.

The researchers added that a cough is able to leak through any openings and propagate in many directions.

Simha and Rao hope their findings will put to rest the argument that regular cloth masks are ineffective, but they emphasise that masks must continue to be used in conjunction with social distancing.

"Adequate distancing is something that must not be ignored, since masks are not foolproof," Simha added.

https://www.hindustantimes.com/health/indian-scientists-find-n95-masks-to-be-most-effective-at-stopping-covid-spread/story-PfCqGtFqq0aXKEMYL7PZLN.html

hindustantimes

Thu, 27 Aug 2020

Covid-19 pandemic: Sex difference in immune response to coronavirus decoded

Women with COVID-19 mount a more robust and sustained immune response via the body's T cells than men, according to a study that may help guide a sex-based approach to the treatment and care for those infected with the novel coronavirus

New York: Women with COVID-19 mount a more robust and sustained immune response via the body's T cells than men, according to a study that may help guide a sex-based approach to the treatment and care for those infected with the novel coronavirus.

The research, published in the journal Nature, assessed 98 patients -- aged 18 years or over -- admitted to the Yale New Haven Hospital in the US with mild to moderate disease, who had confirmed positive tests for novel coronavirus infection.

While previous research had shown that the severity of COVID-19 tends to be higher for men than for women, the underlying reasons for this discrepancy has remained unclear, according to the scientists, including those from Yale University in the US. In the current study, they found that female patients mounted a more robust and sustained immune response via the body's T cells than men. The researchers noted that T cells played an essential part in the immune system with their roles including the killing of infected cells. According to the scientists, including Akiko Iwasaki from the Yale University School of Medicine, poor T cell responses correlated with a worse disease outcome in male patients.

"We found that a poor T cell response negatively correlated with patients' age, and was associated with worse disease outcome in male patients, but not in female patients," the researchers wrote in the study.

Compared with healthy control individuals, they said patients with COVID-19 were found to have elevated levels of innate immune cytokines and chemokines, which are signalling molecules involved in the recruitment of immune cells to sites of inflammation.

However, the study noted that the levels of some of these molecules were higher in male patients than in female patients. In female patients, the scientists said, higher levels of the cytokine molecules were associated with a worse disease response. Based on the results, they said male patients may benefit from therapies that elevate T cell responses whereas female patients may benefit from therapies that dampen early innate immune responses. However, the scientists caution that they were unable to rule out other underlying factors that may modify the risk of poor outcome in male and female patients with COVID-19.

(This story has been published from a wire agency feed without modifications to the text. Only the headline has been changed.)

https://www.hindustantimes.com/health/covid-19-pandemic-sex-difference-in-immune-response-to-coronavirus-decoded/story-j2UFrRlHE1cBI07k9xJfpM.html

livemint

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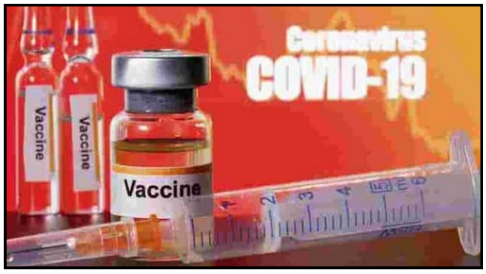
Oxford COVID-19 vaccine trial begins in India, two get first shot of Covishield. Key updates

By Anulekha Ray

- ***Five volunteers enrolled to get for the Phase II trial of 'Covishield' vaccine at Bharti Vidyapeeth's Medical College and Hospital in Pune***
- ***Serum Institute of India partnered with AstraZeneca to manufacture the Oxford COVID-19 vaccine candidate for India and low-and-middle income countries.***

The much-awaited trial of COVID-19 vaccine developed by the University of Oxford started in India on Wednesday. Pune-based Serum Institute of India partnered with AstraZeneca to manufacture the COVID-19 vaccine candidate for India and low-and-middle income countries.

Five volunteers enrolled to get for the Phase II trial of Covishield vaccine at Bharti Vidyapeeth's Medical College and Hospital in Pune. The doctors conducted COVID-19 and antibodies tests on all them. Three volunteers had tested positive for coronavirus antibodies test, hence they became ineligible for the trial. Two of them were administered the vaccine, according to news agency *PTI*.



SII selected 17 sites in India to conduct the Phase II trial of COVID-19 vaccine (Reuters)

"Doctors at the hospital administered the first shot of the Covishield vaccine to a 32-year-old man after his reports of COVID-19 and antibodies tests came out negative," Dr Sanjay Lalwani, medical director of Bharti Vidyapeeth's Medical College, Hospital and Research Centre told *PTI*.

Another 48-year-old male volunteer was also given the vaccine, he added. While the 32 year-old volunteer works for a private company, the other one is associated with the healthcare sector, he said. "The two volunteers, who were administered the vaccines are being monitored," Lalwani said.

Here are the latest updates of Covishield vaccine Phase II trial in India:

1) Serum Institute of India, the world's largest vaccine manufacturer by volume, selected 17 sites in India to conduct the Phase II trial of Oxford COVID-19 vaccine. A total of 1,600 candidates will take part in the study.

2) COVID-19 vaccine candidate developed by the Jenner Institute, a part of the Nuffield Department of Medicine at the University of Oxford, showed a positive result in its initial trial. According to a report published in the British medical journal, *The Lancet*, the COVID-19 vaccine produced a dual immune response in people aged 18 to 55.

3) The Bill & Melinda Gates Foundation earlier said that they will provide at-risk funding of $150 million to support Serum Institute of India's manufacturing of two promising vaccines by University of Oxford and Novavax.

4) Under this agreement, drugmaker SII can charge a maximum of $3 per dose for the two COVID-19 vaccines. The vaccine maker will get the funding from the Gates Foundation through international vaccine alliance GAVI.

5) Those who took Covishield will remain under medical observation for the next two months, said Maharashtra minister Dr Vishwajeet Kadam. At least 25 candidates will given the vaccine in the next seven days, according to sources.

https://www.livemint.com/news/india/oxford-covid-19-vaccine-two-get-first-shot-of-covishield-in-pune-will-be-under-observation-for-two-months-11598437342694.html