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

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COVID 19: DRDO's Contribution**mint***Fri, 14 May 2021***Lab warriors must stay in a state of high alert**

India's defence R&D labs have adapted pre-pandemic efforts to the war on covid and come up with innovations. They should also get set to shield us from a potentially worse third wave

India's second wave of covid has thrown us into a full-blown war. In any such outbreak, research and development (R&D) always plays a vital role. It should not surprise us, therefore, that the Defence Research and Development Organisation (DRDO), our premier developer of weaponry, has had its laboratories whirring away. It is the country's most heavily funded R&D institution, after all, with a budget that is the envy of others. What has lifted spirits in a manner we did not exactly expect, however, is its quick adaptation of a few pre-pandemic initiatives to shield the country from the dreaded affliction. Since covid struck India last year, the DRDO has offered us innovations on the fronts of both therapy and life support. It has come up with a drug that may prove useful in covid treatment, for example, and an aircraft oxygen machine rejigged for hospital use. If it can also adapt its covid efforts to preparations for a potential third wave of infections, it would do the nation a service worthy of its stature.



The DRDO has offered us innovations on the fronts of both therapy and life support

The Drugs Controller General of India has accorded approval for emergency-use to a formulation called 2-Deoxy-D-Glucose, or 2-DG, which was developed by a DRDO lab called The Institute of Nuclear Medicine & Allied Sciences in association with Dr Reddy's Laboratories, a private pharma company. This drug sprang from anti-cancer work, reportedly, and is claimed to be effective against moderate to severe cases of covid. Its trials are said to have shown that it's not just safe, but also able to speed up the recovery of hospitalized patients and reduce their dependence on supplemental oxygen. Also of significance is the DRDO's quick-fire setting up of covid hospitals in cities as far apart as Patna and Ahmedabad, not to mention its Oxycare system, which, developed by a bio-engineering and electro-medical lab, regulates oxygen based on a patient's level of haemoglobin saturation. The agency's more interesting breakthrough, at least for its origin as a device meant for combat use, is an oxygen supplier hewed out of its Tejas fighter plane's on-board O2 generator. This technology has been shared with Tata Advanced Systems Ltd and Trident Pneumatics, which are together expected to make 380 such plants for installation at various hospitals. Indeed, other state-run institutions have done their bit too. The Indian Space Research Organisation's Vikram Sarabhai Space Centre, for instance, has developed three mechanical ventilator models and a portable oxygen concentrator.

None of these R&D labs can afford to rest; not so long as the pandemic has even a slim chance of worsening, which cannot be ruled out if the virus mutates further and sets off a third wave of attacks after the second one ebbs. Scenario planners at the DRDO must stay alert, study how it might differ in its impact, and devote pre-emptive resources to hedge the country against such an eventuality. As cardiac surgeon Devi Shetty has warned, children and even infants might turn more vulnerable to covid as the pathogen seeks out newer groups of hosts, and treating under-age patients would call for redesigned devices for drug delivery and life support. Most of what we have deployed so far was designed for adults. Adapting all this for kids is an exercise that must begin right now, regardless of whether it turns out to be a waste. Modern warfare, let's not forget, is about what's achieved away from the actual theatre of action as much as what happens in the thick of battle. R&D matters. So too in this case.

<https://www.livemint.com/opinion/online-views/lab-warriors-must-stay-in-a-state-of-high-alert-11620920965608.html>



Fri, 14 May 2021

Shattered & battered by Covid-19, India's DRDO comes forward to fight the pandemic

India's premier defense research body DRDO has lined up an impressive array of products and facilities that could help tackle the Covid-19 pandemic

Known for its cutting-edge R&D work in the military domain, the Defence Research and Development Organisation (DRDO) has now lent its tech support to the government, which is struggling to tackle the devastating second wave of the pandemic.

The DRDO has contributed immensely by developing a 2-DG drug against COVID-19, an oxygen supply system, an artificial intelligence (AI)-based Covid detection technology among others. It is also installing oxygen generation plants and setting up makeshift hospitals.

Makeshift Hospitals

On April 20, when India's daily cases crossed the 300,000-mark, Defence Minister Rajnath Singh asked DRDO to scale up India's medical infrastructure. The agency was asked to provide oxygen cylinders and extra beds to various state governments at the earliest.

According to Hindustan Times, DRDO has made makeshift hospitals with negative pressure tents. A negative pressure isolation room isolates a patient to protect others in the hospital and reduces the airborne concentration of the coronavirus.

DRDO has set up nine hospitals in the worst-hit cities such as Delhi, Ahmedabad, Lucknow, Varanasi, Gandhi Nagar, Haldwani, Rishikesh, Jammu, and Srinagar so far. One in Panipat will become operational next week. Some of these hospitals had been used last year as well. Besides, the DRDO-run Sardar Vallabhbhai Patel COVID Hospital in Delhi Cantt that was closed in the first week of February this year reopened on April 19.

Oxygen Plants

On April 28, the DRDO announced its plan to install about 500 oxygen plants under PM CARES Fund within the next three months. One plant can generate up to 1,000 liters of oxygen per minute which can cater to about 190 patients.

As reported by The Eurasian Times, these plants will be based on self-sustainable oxygen generation technology that has been used by the research body for IAF pilots flying the LCA Tejas.

Called Onboard Oxygen Generation System (OBOGS), this technology is used in fighter jet cockpits to compensate for the rapid decrease in oxygen levels at high altitudes.

According to DRDO, the OBOGS replaces the traditional Liquid Oxygen System (LOX) by utilizing bleed air or the compressed air from the aircraft engine and separating its components using molecular sieve (Zeolite) Pressure Swing Adsorption (PSA) technology.

To fast-track the project, the DRDO has decided to transfer this technology to Tata Advanced Systems Limited and Trident Pneumatics Pvt. Ltd.

The first two oxygen plants have been set up at All Indian Institute of Medical Science (AIIMS) and Ram Manohar Lohia (RML) Hospital in Delhi on May 6. Similarly, there are plans to install lower-capacity medical oxygen plants at smaller hospitals.

In addition, DRDO, in collaboration with the German armed forces, has set up an oxygen plant at DRDO's Sardar Vallabhbhai Patel Covid Hospital in Delhi. Apart from meeting the requirement of this hospital, the plant can cater to other hospitals in need of oxygen as it has a facility to refill cylinders, news agency ANI reported.

Oxycare

Equipment made for soldiers also proves useful for COVID patients. On April 19, Bengaluru-based Defence Bioengineering and Electromedical Laboratory under DRDO announced the development of a SpO2 (Blood Oxygen Saturation) supplemental Oxygen Delivery System called Oxycare for soldiers stationed at high altitude.

The conditions of COVID patients are similar to the ones soldiers face at high altitudes. Both reach the condition of Hypoxia due to a lack of oxygen in which the amount of oxygen reaching the tissues is inadequate to fulfill all the energy requirements of the body.

SpO2 level is usually monitored with the help of an oximeter.

“The system reads SpO2 levels of the subject from a wrist-worn pulse oximeter module through a wireless interface and will automatically increase/decrease the O2 flow based on SpO2 setting,” DRDO said in a statement.

Anti-Covid Drug

The Institute of Nuclear Medicine and Allied Sciences of DRDO and pharmaceutical company Dr Reddy's Laboratories have developed 2-deoxy-D-glucose or 2-DG drug.

On May 8, the Drug Controller General of India (DCGI) approved the medicine for emergency use among COVID patients with moderate and severe symptoms.

Dr. Sudhir Chandana, DRDO Project Director and Scientist of 2-DG, told News18 that his organization discovered 2-DG's effects on the coronavirus in April last year. “In May 2020, we got permission for the clinical trials. By the end of October 2020, we had completed the second phase of trials, and the results were very good,” he added.

The results showed that the drug's molecule helps in the faster recovery of hospitalized patients and reduces supplemental oxygen dependence.

Despite criticism over the lack of published data on the effectiveness of this drug, DRDO chairman Dr. G Satheesh Reddy said it would be available in the market in three weeks.

AI-Based Technology

DRDO's Centre for Artificial Intelligence and Robotics (CAIR) has developed with the support of 5C Network & HCG Academics, an artificial intelligence-based application called 'ATMAN AI', that can detect Covid-19 infection by analyzing chest x-rays.

According to DRDO, this “AI-based intelligent, secure, web-based, Covid detection application software ATMAN...can classify the x-ray images into Normal, Covid-19 and Pneumonia classes using limited number (few hundreds) of sample images”.

“The virus affects the lungs early even before the patient starts showing significant symptoms. Thus, compared to an RT-PCR test which takes many hours, an X-ray-based diagnostic tool can detect the infection in the early stages with processing time in seconds,” the research body says.

The results show a 96.73% accuracy, according to UK Singh, director, CAIR, DRDO.

<https://eurasianimes.com/indias-drdo-joins-the-battle-against-covid-19-pandemic/>

How Defence Research and Development Organisation is taking the fight to COVID-19

1. DRDO's Oxycare system

According to a report by PTI, the government on May 12 approved the procurement of 1,50,000 units of 'Oxycare' system, developed by the Defence Research and Development Organisation (DRDO), for Rs 322.5 crore from the PM-CARES Fund to help in the treatment of COVID-19 patients. Oxycare is an oxygen supply system based on SpO₂ (oxygen saturation) level. The DRDO has already transferred the technology to multiple industries in India for large-scale production of the Oxycare system.

How it works

Oxycare was developed by the DRDO's Bengaluru-based Defence Bio-Engineering and ElectroMedical Laboratory (DEBEL) for soldiers posted at extreme high-altitude areas. "The basic version consists of a 10-litre oxygen cylinder, a pressure regulator cum flow controller, a humidifier and a nasal cannula. The oxygen flow is regulated manually based on the SpO₂ readings," the ministry said. "In the second configuration, the oxygen cylinder is equipped with electronic controls which automatically regulate the oxygen flow through a low-pressure regulator and SpO₂ probe," it said.



2. Medical oxygen plants

DRDO has decided to set up seven medical oxygen plants in Odisha. The plants will come up at Boudh, Cuttack, Bhadrak, Gajapati, Jharsuguda, Nayagarh and Koraput districts, CGM of National Highways Authority of India (NHAI), Odisha, Ram Prasad Panda, said. The DRDO's move is a part of its massive drive under which it has decided to set up 500 medical oxygen plants in the country within three months with the help of its indigenous developed technology.

3. 750-bed COVID hospital

A 750-bed hospital set up by the DRDO for COVID-19 patients on Banaras Hindu University's campus in Varanasi opened on May 10. Medicines and food will be provided free of charge to all patients. There will be no direct walk-in admissions to the hospital and all admissions will be managed through referrals by the Integrates Command and Control Centre, Varanasi under the State administration.

4. Anti-COVID oral drug

The Drugs Controller General of India has approved an anti-COVID oral drug, developed by DRDO, for emergency use as adjunct therapy in moderate to severe coronavirus patients, the defence ministry said on May 8. It said clinical trials of the drug 2-deoxy-D-glucose (2-DG) showed that it helps in faster recovery of hospitalised patients and reduces supplemental oxygen dependence. The drug has been developed by Institute of Nuclear Medicine and Allied Sciences (INMAS), a leading laboratory of DRDO, in collaboration with Dr Reddy's Laboratories in Hyderabad.

<https://economictimes.indiatimes.com/news/defence/how-defence-research-and-development-organisation-is-taking-the-fight-to-covid-19/drds-oxycare-system/slideshow/82601806.cms>

DRDO has pitched in to tackle the second wave of Covid-19

By Nishtha Goel

The primary mission of the Defence Research and Development Organisation (DRDO) is to develop cutting-edge rockets, nuclear missiles, and ballistic missile submarines. However, the raging pandemic in India has forced the organization to shift its attention from missile testing to saving the lives of Covid-affected Indians.

To assist those who need specialized medical treatment as a result of Covid-19, the organization has set up temporary clinics with negative pressure tents. The hospital infrastructure requirements for ICU beds, oxygen beds, and regular beds were established in collaboration with the state health authorities.



The DRDO stated that the equipment for Covid-19 treatment is given in accordance with established requirements. The equipment is maintained and upheld around the clock at a time when the spread of Covid-19 has resulted in lockdown-like situations in many states, according to the statement.

The DRDO has established nine hospitals for Covid-19 in cities such as Delhi, Ahmedabad, Lucknow, Varanasi, Gandhi Nagar, Haldwani, Rishikesh, Jammu, and Srinagar. The Dhanvantri Covid Care Hospital in Gandhi Nagar is the largest, with 700 oxygen beds and 200 ICU beds. There are 500 ICU beds in Sardar Patel Covid Care Centre in Delhi.

The DRDO has also requested that oxygen generation plants be installed in various hospitals across the country. These oxygen plants, according to the organization, can produce up to 1,000 liters of oxygen per minute, which can serve up to 190 patients. These plants have the capacity to charge 195 cylinders a day.

The first two oxygen plants arrived in Delhi on May 6 and were turned on at AIIMS and Ram Manohar Lohia (RML) hospitals in the district, according to the research organization. The next three plants will be built at Lady Hardinge Medical College, Safdarjung Hospital, and AIIMS in Jhajjar when they arrive in Delhi.

How DRDO helps?

The DRDO has also taken steps to enlist more business partners. It is to increase the development of medical oxygen plants with lower capacity for smaller hospitals.

DRDO also developed its own oxygen supply system based on SpO₂ (oxygen saturation) levels to improve oxygen production even further. Oxycare is a system that comes in two versions: manual and automatic. It was created by the Defence Bio-Engineering and Electro Medical Laboratory (DEBEL) of the Defence Research and Development Organization (DRDO) in Bengaluru for soldiers stationed in extremely high-altitude areas.

The government approved the purchase of 1,50,000 units of the 'Oxycare' device on Wednesday. The technology has already been transferred to multiple Indian industries for large-scale development of the device by the DRDO.

Aside from that, the DRDO's safety testing laboratory has donated more than 100 large cylinders with a capacity of 1,200 liters to hospitals. One of the DRDO's labs has developed a 2-deoxy-D-glucose anti-Covid-19 therapeutic application (2-DG). The findings of clinical trials indicate that this molecule aids in the quicker recovery of hospitalized patients and decreases suicidality.

After successful phase 3 trials, the Drugs Controller General of India (DCGI) approved the drug for emergency use. That is instead of therapy in moderate to extreme Covid-19 patients on May 1. The medication comes in powder form in a sachet that must be dissolved in water before being taken orally.

<https://theindiasaga.com/saga-corner/lifetsyle/drdo-has-pitched-in-to-tackle-the-second-wave-of-covid-19/>



Fri, 14 May 2021

DRDO's 2-DG drug being developed for brain tumour patients initially but recently they transformed it for Covid treatment: Dr Anil Mishra

Scientists of Defence Research and Development Organisation DRDO's research wing Institute of Nuclear medicine and applied sciences have recently developed a life saving drug for COVID patients named 2 DG. The drug helps the serious patients in recovery and will also stop the spread of infection further. It will also decrease the need of medical oxygen in such patients. In a special interview with All India Radio News Dr. Anil Kumar Mishra, Director, Institute of Nuclear medicine and applied sciences explained how the drug works on any patient and saves life.

Dr. Mishra also said that this drug was being developed for brain tumour patients initially but recently they transformed it for COVID treatment.

<http://www.newsonair.com/News?title=DRDO%26%2339%3Bs-2-DG-drug-being-developed-for-brain-tumour-patients-initially-but-recently-they-transformed-it-for-COVID-treatment%3A-Dr-Anil-Mishra&id=416713>

कोरोना की दूसरी लहर में DRDO ने बदल दी प्राथमिकता, अस्पताल से लेकर जीवन रक्षक दवाइयां बनाने में झोंकी ताकत

नई दिल्ली: देश में कोरोना का संकट है। केंद्र से लेकर राज्य सरकारों की एजेंसियां लगातार इससे देश को बाहर निकालने के लिए काम कर रही हैं। रक्षा अनुसंधान और विकास संगठन (DRDO), जिसकी प्राथमिकता अत्याधुनिक हथियारों, रणनीतिक मिसाइलों और बैलिस्टिक मिसाइल वाली पनडुब्बियों को विकसित करना है, वह भी देशवासियों को इस महामारी से बचाने के लिए प्रतिबद्ध है। संगठन ने अपनी पूरी ताकत इन दिनों कोरोना के खिलाफ लड़ाई में लगा दिया है।

डीआरडीओ ने कोविड -19 के कारण विशिष्ट चिकित्सा देखभाल की आवश्यकता वाले मरीजों की मदद करने के लिए नकारात्मक दबाव वाले टेंट के साथ अस्पताल बनाया है। आईसीयू बेड, ऑक्सीजन बेड और सामान्य बेड पर अस्पताल के बुनियादी ढांचे को विकसित करने के लिए राज्य के स्वास्थ्य अधिकारियों के परामर्श से काम किया।

DRDO ने 9 शहरों में खोले अस्पताल

डीआरडीओ द्वारा दिल्ली, अहमदाबाद, लखनऊ, वाराणसी, गांधी नगर, हल्द्वानी, ऋषिकेश, जम्मू और श्रीनगर जैसे शहरों में नौ अस्पताल खोले गए हैं। इनमें सबसे बड़ा गांधी नगर में धन्वंतरि कोविड केयर अस्पताल है जिसमें 700 ऑक्सीजन बेड और 200 आईसीयू बेड हैं। दिल्ली में, सरदार पटेल कोविड केयर सेंटर में 500 आईसीयू बेड की सुविधा है।

DRDO ने देश भर के विभिन्न अस्पतालों में ऑक्सीजन उत्पादन संयंत्रों की स्थापना का भी ऑर्डर दिया है। संगठन ने कहा कि ये ऑक्सीजन संयंत्र प्रति मिनट 1,000 लीटर तक ऑक्सीजन उत्पन्न कर सकते हैं जो 190 रोगियों की जरूरत को पूरा करने की क्षमता रखता है। ये प्लांट प्रतिदिन 195 सिलेंडर तक चार्ज कर सकते हैं।

आक्सीजन की कमी दूर करने में जुटा DRDO

शोध संगठन ने कहा कि पहले दो ऑक्सीजन प्लांट दिल्ली पहुंचे और 6 मई को एम्स और राम मनोहर लोहिया (आरएमएल) अस्पतालों में इनका परिचालन किया गया। दिल्ली में आने वाले तीन संयंत्र लेडी हार्डिंग मेडिकल कॉलेज, सफदरजंग अस्पताल और झज्जर स्थित एम्स में स्थापित किए जाएंगे। डीआरडीओ ने छोटे अस्पतालों के लिए कम क्षमता वाले मेडिकल ऑक्सीजन संयंत्रों के उत्पादन में तेजी लाने के लिए और अधिक उद्योग भागीदारों के साथ डील की पहल की है।

ऑक्सीजन के उत्पादन को बढ़ावा देने के लिए विकसित की प्रणाली

ऑक्सीजन के उत्पादन को और बढ़ावा देने के लिए, DRDO ने SpO2 (ऑक्सीजन संतृप्ति) स्तर के आधार पर अपनी ऑक्सीजन आपूर्ति प्रणाली विकसित की। इसे ऑक्सीकारे कहा जाता है। ये मैनुअल और ऑटोमेटिक होते हैं। इसे DRDO के बंगलुरु स्थित डिफेंस बायो-इंजीनियरिंग और इलेक्ट्रो मेडिकल लेबोरेटरी (DEBEL) द्वारा अत्यधिक ऊंचाई वाले क्षेत्रों में तैनात सैनिकों के लिए विकसित किया गया था। सरकार ने बुधवार को 'ऑक्सीकार' प्रणाली की 1,50,000 इकाइयों की खरीद को मंजूरी दे दी। डीआरडीओ ने बड़े पैमाने पर प्रणाली के उत्पादन के लिए भारत में पहले ही कई उद्योगों को तकनीक हस्तांतरित कर दी है।

इसके अलावा, सुरक्षा अनुसंधान पर काम कर रहे DRDO की प्रयोगशाला ने सरकारी एजेंसी द्वारा बनाए गए अस्पतालों को 1,200 लीटर के 100 से अधिक सिलेंडर दिए हैं। डीआरडीओ की एक प्रयोगशाला ने 2-डीऑक्सी-डी-ग्लूकोज (2-डीजी) दवा का एक एंटी-कोविड-19 चिकित्सीय अनुप्रयोग विकसित किया है। नैदानिक परीक्षण के परिणामों से पता चला है कि यह मरीजों की तेजी से रिकवरी में मदद करता है और पूरक ऑक्सीजन निर्भरता को कम करता है।

1 मई को, ड्रग्स कंट्रोलर जनरल ऑफ इंडिया (DCGI) ने सफल चरण 3 परीक्षणों के बाद गंभीर कोविड -19 रोगियों के लिए सहायक चिकित्सा के रूप में दवा के आपातकालीन उपयोग की अनुमति दी। दवा पाउच में पाउडर के रूप में आती है, जिसे पानी में घोलकर पीया जाता है।

<https://www.livehindustan.com/national/story-drdo-changes-priority-in-corona-second-wave-pouring-power-from-hospital-to-life-saving-medicines-4028479.html>



Fri, 14 May 2021

Centre approves 1.5 lakh units of DRDO's Oxycare system, how it will benefit during Covid-19?

The Oxycare system is a boon during the deadly second wave of coronavirus pandemic.

It can be used at COVID-19 care centers, Quarantine centers, hospitals as well as at homes

The PM CARES Fund on May 12, 2021, approved the procurement of 1.5 lakh units of the Oxycare system, developed by DRDO, at a cost of Rs 322 crores. The Oxycare system aids in regulating the oxygen being administered to patients based on the SpO2 levels.

The Defence Ministry, Government of India, on May 12, 2021, announced that it will procure 50,000 automatic and 1 lakh manual Oxycare systems, along with non-breather masks, under the PM Cares Fund.

The Oxycare system is a boon during the deadly second wave of coronavirus pandemic. It can be used at COVID-19 care centers, Quarantine centers, hospitals as well as at homes.

Oxycare System: Key Points

- The Oxycare system has been indigenously developed by the Defence Bio-Engineering and ElectroMedical Laboratory (DEBEL), Bengaluru of the Defence Research and Development Organisation (DRDO).
- The DRDO has developed the Oxycare system for soldiers posted at extremely high-altitude 'field area' locations.
- The Oxycare system delivers supplemental oxygen based on the SpO2 levels and prevents the person from sinking into a state of hypoxia (shortage of oxygen in the body), which is a similar condition experienced by COVID-19 infected patients.
- The Oxycare system is a boon during the deadly second wave of coronavirus pandemic. It can be used at COVID-19 care centers, Quarantine centers, hospitals as well as at homes.
- The system has developed to function in extreme conditions such as low temperatures, humidity, and low barometric pressures.
- There are two versions of the Oxycare system, one consists of a nasal canula, a humidifier, a pressure regulator cum flow controller, and a 10-liter oxygen cylinder.



DRDO's Oxycare system,
Source: ANI

- Another is an automatic version that is equipped with electronic controls that automates the process of regulating the oxygen flow a SpO2 probe and a low-pressure regulator.
- The automatic version of Oxycare gives out an audio warning in care of failure scenarios such as probe disconnections or low SpO2 levels.

How is the Oxycare System beneficial during the pandemic?

- The Oxycare system can be used at COVID-19 care centers, Quarantine centers, hospitals as well as at homes with a controlled oxygen flow at 2/5/7/10 lpm flow.
- The automatic version of Oxycare will give out an audio warning in care of failure scenarios such as probe disconnections or low SpO2 levels. Such a feature increases its ease of use for people at home and also aids in limiting the exposure of medical staff to monitor the oxygen levels of patients.

<https://www.jagranjosh.com/current-affairs/centre-approves-15-lakh-units-of-drdo-oxycare-system-how-it-will-benefit-during-covid19-1620901710-1>

DAILYEXCELSIOR.COM

Fri, 14 May 2021

500 bedded COVID Hospital will be functional soon: Jugal

Jammu: Member of Parliament BJP Lok Sabha Jammu -Poonch, Jugal Kishore Sharma along with former Minister and MLA Jammu West, Sat Sharma and District Development Commissioner, Jammu Anshul Garg with administrative staff visited 500 Bedded COVID-19 Hospital at Bhagwati Nagar Jammu.

Jugal Kishore Sharma inspected the construction work of 500 bedded hospital constructed by Defence Research and Development Organization (DRDO) at Bhagwati Nagar Jammu. He also took stock of other arrangements and provision like electricity, water, connectivity and other facilities. He, while speaking at the occasion said that this 500 bedded hospital constructed by DRDO will provide a great help in alarming situations aroused in COVID-19.



MP, Jugal Kishore Sharma inspecting under construction DRDO Hospital at Jammu on Thursday.

He said that this hospital is spread over the area of 40 Kanals and comprises 500 beds in which 125 beds are equipped with ventilators reserved for Intensive Care and 375 beds are also Oxygen supportive beds. Sharma also said that requirement of Oxygen to maximum patients who get infected with double mutation Corona Virus are also posing a threat to the shortage of Oxygen and this hospital is having 40 Metric tons Liquid Medical Oxygen Tank.

Member of Parliament directed Chief Engineer (Constructions) DRDO, Dr. Anil Khurana and Anshul Garg DDC & all the administrative staff to chart out this work collectively and complete this 500 bedded hospital before 25 May to make it functional.

Jugal Kishore Sharma said that Bharatiya Janata Party is the only largest Party which always stands with the public even in difficult times. He said that under the leadership of Prime Minister, Narendra Modi and its activists are playing a good role in serving humanity under nationwide programme Sewa Hi Sangathan.

ADDC Jammu, Ganisham Singh, SE PWD Nathyal, SE PDD Rajinder Gupta, Executive Engineers, UEED,PWD, PDD and Jal Shakti, senior officers of DRDO Kamlesh Kumar, Brijesh Kumar, Scientist(E) Kalpana Kalsi, Dy Chief Engineer, DRDO, Councilor JMC Pramod Kapahi, senior leaders BJP Adv Rajesh Gupta, Sahil Sharma and others were also present at the occasion.

<https://www.dailyexcelsior.com/500-bedded-covid-hospital-will-be-functional-soon-jugal/>



Fri, 14 May 2021

Odisha proposes 40 medical oxygen plants

In view of rising caseload and demand for medical oxygen, Odisha government on Wednesday proposed the Centre for installation of 40 oxygen plants in the State

Bhubaneswar: In view of rising caseload and demand for medical oxygen, Odisha government on Wednesday proposed the Centre for installation of 40 oxygen plants in the State. The plants would be set up in all medical college and hospitals, district headquarters hospitals (DHHs), Capital Hospital, Rourkela Government Hospital and Acharya Harihar Post Graduate Institute of Cancer (AHPGIC) at Cuttack.

The Centre had sought proposals from the State government based on the requirement of medical oxygen plants. Sources said the pressure swing adsorption (PSA) plants will be set up by the Union Ministry of Health and Family Welfare in collaboration with several agencies, including the Defence Research and Development Organisation (DRDO) and Indian Oil Corporation Ltd (IOCL).



An employee refills oxygen cylinders for covid-19 patients, at an oxygen refilling centre. (Photo | PTI)

Additional Chief Secretary of Health PK Mohapatra said the list of hospitals with bed strength has been sent to the Ministry. “The State government will make provision and construct the medical gas pipeline system in the hospitals where the plants will be set up,” he said. Apart from this, Mohapatra said the government is also setting up 16 liquid medical oxygen plants at a cost of Rs 75 lakh to Rs 1 crore each at strategic locations alongside the medical institutions.

While work on one plant at Berhampur has been completed, the rest are under process, he added.

Meanwhile, of the 40 proposed sites, the DRDO has been allotted seven districts. Based on the on-board oxygen generation technology developed by Defence Bioengineering and Electromedical Laboratory for light combat aircraft Tejas, the plants will be set up at Cuttack, Boudh, Bhadrak, Gajapati, Jharsuguda, Koraput and Nayagarh.

While NHAI has been tasked for construction of the shed and electrification, DRDO will install the plants funded by PM Cares. Construction work for the plants at AHPGIC and Boudh DHH has already commenced.

NHAI Chief General Manager Ram Prasad Panda said, “We have received approval for two plants in the first phase and five in the second. The sheds at the two places will be ready within the next 15-20 days and thereafter the DRDO will set up the plant.” The oxygen plant is designed for a capacity of 1,000 litre per minute to cater to around 200 patients while charging 195 cylinders per day.

<https://www.newindianexpress.com/states/odisha/2021/may/13/odisha-proposes-40-medical-oxygen-plants-2301970.html>

Defence Strategic: National/International

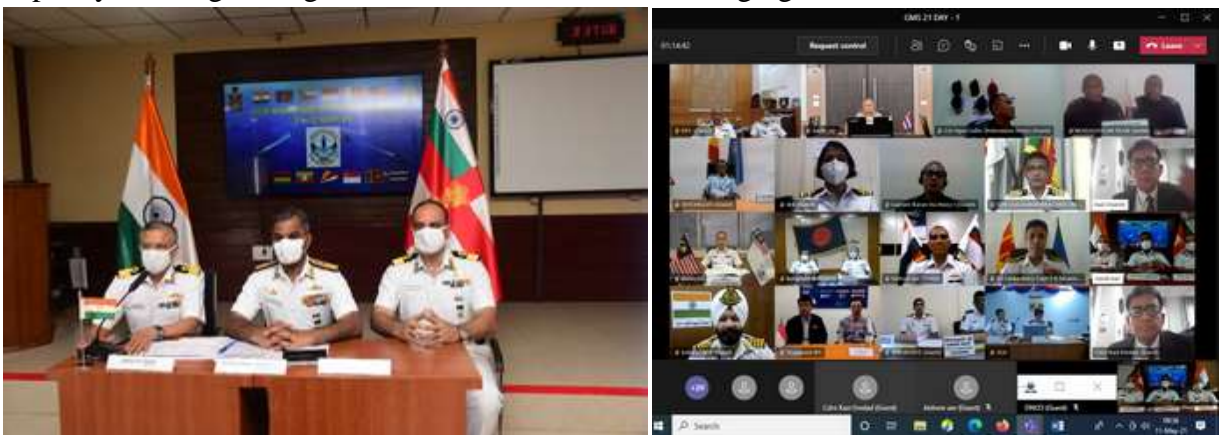


Press Information Bureau
Government of India
Ministry of Defence

Thu, 13 May 2021 5:29PM

GOA MARITIME SYMPOSIUM (GMS) - 2021

Towards fostering friendly relations with its maritime neighbours, Indian Navy hosted 'GMS-21' under the aegis of Naval War College, Goa on 11 and 12 May 21. Owing to the COVID-19 pandemic, the event for the first time was hosted in virtual mode, with online participation of Naval representatives from 13 Indian Ocean Littoral countries, which included India, Bangladesh, Comoros, Indonesia, Madagascar, Malaysia, Maldives, Mauritius, Myanmar, Seychelles, Singapore, Sri Lanka and Thailand. The theme for GMS-21 was focused on "Maritime Security and Emerging Non-Traditional Threats: A Case for Proactive Role for IOR Navies," with emphasis on capacity building amongst the IOR Navies to tackle emerging common maritime threats.



With the Indian Ocean becoming the locus of 21st century strategic landscape, the symposium will play a constructive role in bringing together the stakeholders who have a role in evolving strategies, policies and implementation mechanisms on the issues of common interest in maritime domain. In addition to presenting cooperative strategies for enhancing interoperability among partner maritime agencies, the event provided a forum for articulation of views on the crucial maritime issues, followed by theme based discussions.

Commodore Nitin Kapoor, Deputy Commandant Naval War College welcomed the member participants through a welcome address post which the symposium was formally inaugurated by Rear Admiral Sai Venkat Raman, VSM, Commandant Naval War College, who also delivered the key note address. Commodore Shantanu Jha, Commodore (Foreign Cooperation), in his closing address, thanked all member countries for their valuable contribution during the Goa Maritime Symposium-21.

<https://pib.gov.in/PressReleasePage.aspx?PRID=1718329>



पत्र सूचना कार्यालय भारत सरकार

रक्षा मंत्रालय

Thu, 13 May 2021 5:29PM

गोवा समुद्री संगोष्ठी (जीएमएस) - 2021

अपने समुद्री पड़ोसियों के साथ मैत्रीपूर्ण संबंधों को बढ़ावा देने की दिशा में भारतीय नौसेना ने दिनांक 11 और 12 मई 2021 को गोवा के नेवल वॉर कॉलेज के तत्वावधान में 'जीएमएस-21' की मेजबानी की। कोविड-19 महामारी के कारण पहली बार इस कार्यक्रम को वर्चुअल मोड में आयोजित किया गया था जिसमें तटवर्ती हिंद महासागर के 13 देशों की नौसेना प्रतिनिधियों की ऑनलाइन भागीदारी थी। कार्यक्रम में भारत, बांग्लादेश, कोमोरोस, इंडोनेशिया, मेडागास्कर, मलेशिया, मालदीव, मॉरीशस, म्यांमार, सेशेल्स, सिंगापुर, श्रीलंका एवं थाईलैंड शामिल थे। जीएमएस-21 का विषय "समुद्री सुरक्षा और उभरते गैर-पारंपरिक खतरे: हिन्द महासागर क्षेत्र में स्थित नौसेनाओं हेतु सक्रिय भूमिका निभाने वाले हालात" पर केंद्रित था जिसमें उभरते साझा समुद्री खतरों से निपटने के लिए हिंद महासागर क्षेत्र की नौसेनाओं के बीच क्षमता निर्माण पर जोर दिया गया था।

हिंद महासागर के 21वीं सदी के रणनीतिक परिदृश्य का ठिकाना बनने के साथ ही यह संगोष्ठी उन हितधारकों को एक साथ लाने में रचनात्मक भूमिका निभाएगी जिनकी समुद्री क्षेत्र में साझा हित के मुद्दों पर रणनीतियां, नीतियां और कार्यान्वयन तंत्र विकसित करने में भूमिका रही है। साझेदारों के बीच अंतरसंचालनीयता बढ़ाने के लिए सहकारी रणनीतियां पेश करने के अलावा इस कार्यक्रम में महत्वपूर्ण समुद्री मुद्दों पर विचारों की अभिव्यक्ति के लिए एक मंच प्रदान किया गया जिसके बाद विषय आधारित विमर्श आयोजित किए गए।

नेवल वॉर कॉलेज के डिप्टी कमांडेंट कमोडोर नितिन कपूर ने स्वागत भाषण के माध्यम से प्रतिभागी सदस्यों का स्वागत किया जिसके बाद सिम्पोजियम का औपचारिक उद्घाटन रीयर एडमिरल साई वेंकट रमन, वीएसएम, कमांडेंट नेवल वॉर कॉलेज ने किया। उन्होंने प्रमुख संबोधन भी दिया। कमोडोर शांतनु झा, कमोडोर (विदेशी सहयोग), ने अपने समापन भाषण में गोवा समुद्री संगोष्ठी-21 के दौरान बहुमूल्य योगदान के लिए सभी सदस्य देशों को धन्यवाद दिया।



<https://pib.gov.in/PressReleasePage.aspx?PRID=1718389>

Indian Armed Forces at the fore-front in the battle against COVID-19

By Vicky Nanjappa

New Delhi: The role of the Indian Armed Forces has been a relentless one amidst the rising number of COVID-19 cases. The Indian Air Force and Navy are working round the clock to provide oxygen and other medical supplies to the civil administration in a bid to help tackle the pandemic.

On May 12, the aircraft of the IAF airlifted 403 oxygen containers of 6,856 Metric Tonnes (MT) capacity along with other equipment of 163 MT capacity, in 634 sorties from different parts of the country. The cities covered are Jamnagar, Bhopal, Chandigarh, Panagarh, Indore, Ranchi, Agra, Jodhpur, Begumpet, Bhubaneswar, Pune, Surat, Raipur, Udaipur, Mumbai, Lucknow, Nagpur, Gwalior, Vijayawada, Baroda, Dimapur and Hindan.



The IAF aircraft have also conducted 98 sorties from different countries, airlifting 95 containers of 793 MT capacity and other equipment of 204 MT capacity. The equipment has been procured from Singapore, Dubai, Thailand, Germany, Australia, Belgium, Indonesia, the Netherlands, United Kingdom, Israel and France.

As part of operation 'Samudra Setu II', seven Indian Naval Ships have returned home with 260 MT of Liquid Medical Oxygen (LMO) from 13 containers for direct supply to various states, eight oxygen containers of total capacity 160 MT, approx. 2,600 oxygen filled cylinders and 3,150 empty cylinders for Oxygen from Persian Gulf and Southeast Asia. While INS Jalashwa is presently in Brunei, INS Shardul is scheduled to enter Kuwait on May 12, 2021.

The DRDO on the other hand made makeshift hospitals with negative pressure tents to help those in need of medical care due to the pandemic. The DRDO set up nine hospitals in the cities Delhi, Ahmedabad, Lucknow, Varanasi, Gandhi Nagar, Haldwani, Rishikesh, Jammu and Srinagar. The Dhanvantri COVID-19 care hospitals has 700 oxygen beds and 200 ICU beds, while the Sardar Patel COVID-19 Care Centre in Delhi has 500 ICU beds.

On the other hand the nursing Officers of Military Nursing Service (MNS) are among the health care professionals who are at the forefront in the nation's ongoing fight against the second COVID-19 wave. The officers are deployed at various Armed Forces hospitals to provide medical care to the COVID-19 patients. Two hundred and ninety-four MNS Officers are being mobilised for the newly-raised COVID-19 hospitals by Defence Research and Development Organisation (DRDO) at Delhi, Lucknow, Ahmedabad, Varanasi and Patna, the Defence Ministry said.

They played a vital role in various repatriation missions as part of Operation Namaste and Operation Samudra Setu. The MNS Officers have been integral part of the country's war efforts, humanitarian assistance, rescue operations, ambulance trains, hospital ships and submarines. They are serving in advanced echelons such as Leh, Rajouri, Doda, Kargil and many other far-flung areas for the care for the troops in India.

<https://www.oneindia.com/india/indian-armed-forces-at-the-fore-front-in-the-battle-against-covid-19-3258616.html>

India-France naval exercise: Growing strategic synergy

By Rajeswari Pillai Rajagopalan

Two weeks ago, the Indian and French navies conducted a three-day (April 25-27) bilateral naval exercise. The exercise was part of the annual series of bilateral exercises between the Indian and French militaries that have the stated goal of upholding the rules-based order and promoting a stable maritime security order in the Indo-Pacific. Varuna 2021 was the 19th edition of this series of exercises. France has remained one of India's strongest strategic partners and given the growing security challenges India faces in its immediate neighborhood and in the Indo-Pacific, it is likely that there will be further enhancement of this partnership.

An Indian Ministry of Defense statement on the Varuna 2021 exercises stated that “the three-day Varuna [exercises] will see high tempo-naval operations at sea, including advanced air defense and anti-submarines exercises, intense fixed and rotary wing flying operations including cross deck helicopter landings, tactical maneuvers, surface and anti-air weapon firings, underway replenishment and other maritime security operations.” The exercise comes against the backdrop of the Quad plus France naval exercise



Credit: Twitter

that took place in the Bay of Bengal earlier in April. Along with the Quad countries, France remains a key Indo-Pacific power with an important presence and influence in the Indo-Pacific. The Quad plus France exercise was a significant opportunity to demonstrate the naval strength that these five key naval powers bring to the maritime spaces in the Indo-Pacific. Commenting on the Quad plus exercise, Rear Admiral Jean-Mathieu Rey, the joint commander of French armed forces in the Asia-Pacific, said that “Such exercises are excellent opportunities for our respective units to train together, with the intention to heighten the level of our bilateral and multilateral partnerships and to demonstrate our ability to operate together in the area.”

France's military presence in the Indian Ocean is significant, with facilities in the island of La Réunion, Mayotte, and the French Southern and Antarctic Lands. India and France signed a military logistics agreement in 2018, which gives reciprocal access to each other's military facilities. With that agreement in hand, India can be expected to widen its strategic outreach in the Indian Ocean. This will enhance India's overall naval capacity, especially in the western Indian Ocean.

A French Embassy statement said “The ‘Varuna’ joint exercise is part of the French carrier strike group's ‘CLEMENCEAU 21’ deployment, which the French Navy is conducting from February to June 2021 in the eastern Mediterranean, the Gulf and the Indian Ocean (Arabian Sea). Its goal is to contribute to the stabilization of these strategic zones and strengthening cooperation with the navies of partner countries, in particular India for the Indian Ocean component.”

For the Varuna 2021 exercises, the Indian side was represented by the guided missile destroyer INS Kolkata, guided missile frigates INS Tarkash and INS Talwar, Fleet Support Ship INS Deepak, a Kalvari class submarine (an Indian-built version of the French Scorpene class submarine) and P8I Long Range Maritime Patrol Aircraft. The French force included the aircraft carrier Charles-de-Gaulle (carrying various types of aircraft including Rafale-M fighters and E2C

Hawkeye for surveillance), Horizon-class air defense destroyer Chevalier Paul, Aquitaine-class multi-missions frigate FNS Provence and the command and supply ship Var.

Following the exercise, the French ambassador to India stated in a tweet that “During three days of intensive drills, 8 Flag of France and Flag of India warships & their air wings demonstrated high level of interoperability in all aspects of naval warfare: anti-surface, anti-submarine, air defense.” The French Embassy in a statement on the exercise noted that “this exercise underscores the shared interests and commitment of both nations in promoting maritime security in the Indo-Pacific. It bears testimony to the vitality of the strategic partnership between France and India, which continued being strengthened despite the pandemic.”

The Indian Navy was also upbeat about the exercise, with the navy spokesperson praising in a tweet the growing “scope, complexity of ops & level of participation.” The Indian Ministry of Defense stated that the “INS Tarkash will continue to exercise with the French Navy’s Carrier Strike Group (CSG)” for a few more days. Clearly, this is a demonstration of the comfort level between the Indian and French militaries as well as the increasing strategic synergy between the two countries.

This comfort level has been growing. It was evident when the India and France for the first time undertook joint patrols from Reunion Island in March 2020, France’s naval base in the Indian Ocean. Following that exercise, the commander of the Indian Navy P-8I, which was part of the joint patrols, reportedly stated that these operations “make it possible to maintain the security of international maritime routes for trade and communications.” The kind of patrols India undertook with France is significant because previously India typically did Coordinated Patrols (CORPAT) only with its neighbors, countries like Bangladesh, Myanmar, Thailand, and Indonesia. The U.S. had earlier pitched for such an exercise with India, but Delhi is reported to have turned down the request.

France has emerged as one of India’s closest strategic partners and this relationship is likely to bloom in different formats in the coming years. While the bilateral engagement will remain a key pillar, involving Paris in many trilateral and minilateral platforms in the Indo-Pacific will strengthen India’s maneuverability as India aligns closely with the U.S. and other Western powers. France has expressed its keenness to join the India-Australia bilateral exercise, AUSINDEX. Reportedly, talks are on regarding the modalities of such engagement.

<https://thediplomat.com/2021/05/india-france-naval-exercise-growing-strategic-synergy/>



Fri, 14 May 2021

Researchers 3D print complex micro-optics with improved imaging performance

In a new study, researchers have shown that 3D printing can be used to make highly precise and complex miniature lenses with sizes of just a few microns. The microlenses can be used to correct color distortion during imaging, enabling small and lightweight cameras that can be designed for a variety of applications.

"The ability to 3D print complex micro-optics means that they can be fabricated directly onto many different surfaces such as the CCD or CMOS chips used in digital cameras," said Michael Schmid, a member of the research team from University of Stuttgart in Germany. "The micro-optics can also be printed on the end of optical fibers to create very small medical endoscopes with excellent imaging quality."

In *The Optical Society (OSA) journal Optics Letters*, researchers led by Harald Giessen detail how they used a type of 3D printing known as two-photon lithography to create lenses that combine refractive and diffractive surfaces. They also show that combining different materials can improve the optical performance of these lenses.

"3D printing of micro-optics has improved drastically over the past few years and offers a design freedom not available from other methods," said Schmid. "Our optimized approach for 3D printing complex micro-optics opens many possibilities for creating new and innovative optical designs that can benefit many research fields and applications."

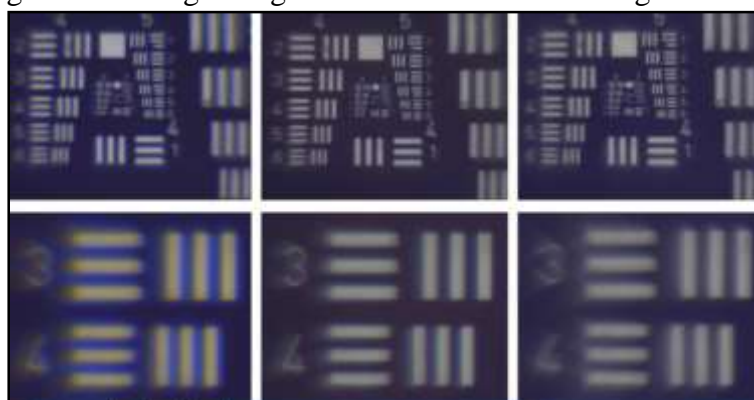
Pushing the limits of 3D printing

Two-photon lithography uses a focused laser beam to solidify, or polymerize, a liquid light-sensitive material known as photoresist. The optical phenomenon known as two-photon absorption allows cubic micrometer volumes of the photoresist to be polymerized, which enables fabrication of complex optical structures on the micron scale.

The research team has been investigating and optimizing micro-optics made with two-photon lithography for the past 10 years. "We noticed that color errors known as chromatic aberrations were present in some of the images created with our micro-optics, so we set out to design 3D printed lenses with improved optical performance to reduce these errors," said Schmid.

Chromatic aberrations occur because the way that light bends, or refracts, when it enters a lens depends on the color, or wavelength, of the light. This means that without correction, red light will focus to a different spot than blue light, for example, causing fringes or color seams to appear in images.

The researchers designed miniature versions of lenses traditionally used to correct for chromatic aberrations. They began with an achromatic lens, which combines a refractive and diffractive



In tests of the new lenses, the reference lens (left) shows color seams due to chromatic aberrations. The 3D printed achromat lenses (middle) reduced these drastically while images taken with the apochromat (right) completely eliminated the color distortion. Credit: Michael Schmid, University of Stuttgart

component to limit the effects of chromatic aberration by bringing two wavelengths into focus on the same plane. The researchers used a commercially available two-photon lithography instrument made by NanoScribe GmbH to add a diffractive surface to a printed smooth refractive lens in one step.

They then took this a step further by designing an apochromatic lens by combining the refractive-diffractive lens with another lens made from a different photoresist with different



optical properties. Topping the two-material lens with the refractive-diffractive surface reduces chromatic aberrations even more, thus improving

Researchers used 3D printing to make highly precise and complex apochromatic miniature lenses that can be used to correct color distortion during imaging. Credit: Michael Schmid, University of Stuttgart

imaging performance. The design was performed by Simon Thiele from the Institute of Technical Optics in Stuttgart, who recently spun out the company PrintOptics which gives customers access to the entire value chain from design over prototyping to a series of micro-optical systems.

Testing the micro-optics

To show that the new apochromatic lens could reduce chromatic aberration, the researchers measured the focal spot location for three wavelengths and compared them to a simple refractive lens with no color correction. While the reference lens with no chromatic correction showed focal spots separated by many microns, the apochromatic lenses exhibited focal spots that aligned within 1 micron.

The researchers also used the lenses to acquire images. Images taken using the simple reference lens showed strong color seams. Although the 3D printed achromat reduced these drastically, only images taken with the apochromat completely eliminated the color seams.

"Our test results showed that the performance of 3D printed micro-optics can be improved and that two-photon lithography can be used to combine refractive and diffractive surfaces as well as different photo resists," said Schmid.

The researchers point out that fabrication time will become faster in the future, which makes this approach more practical. It currently can take several hours to create one micro-optical element, depending on size. As the technology continues to mature, the researchers are working to create new lens designs for different applications.

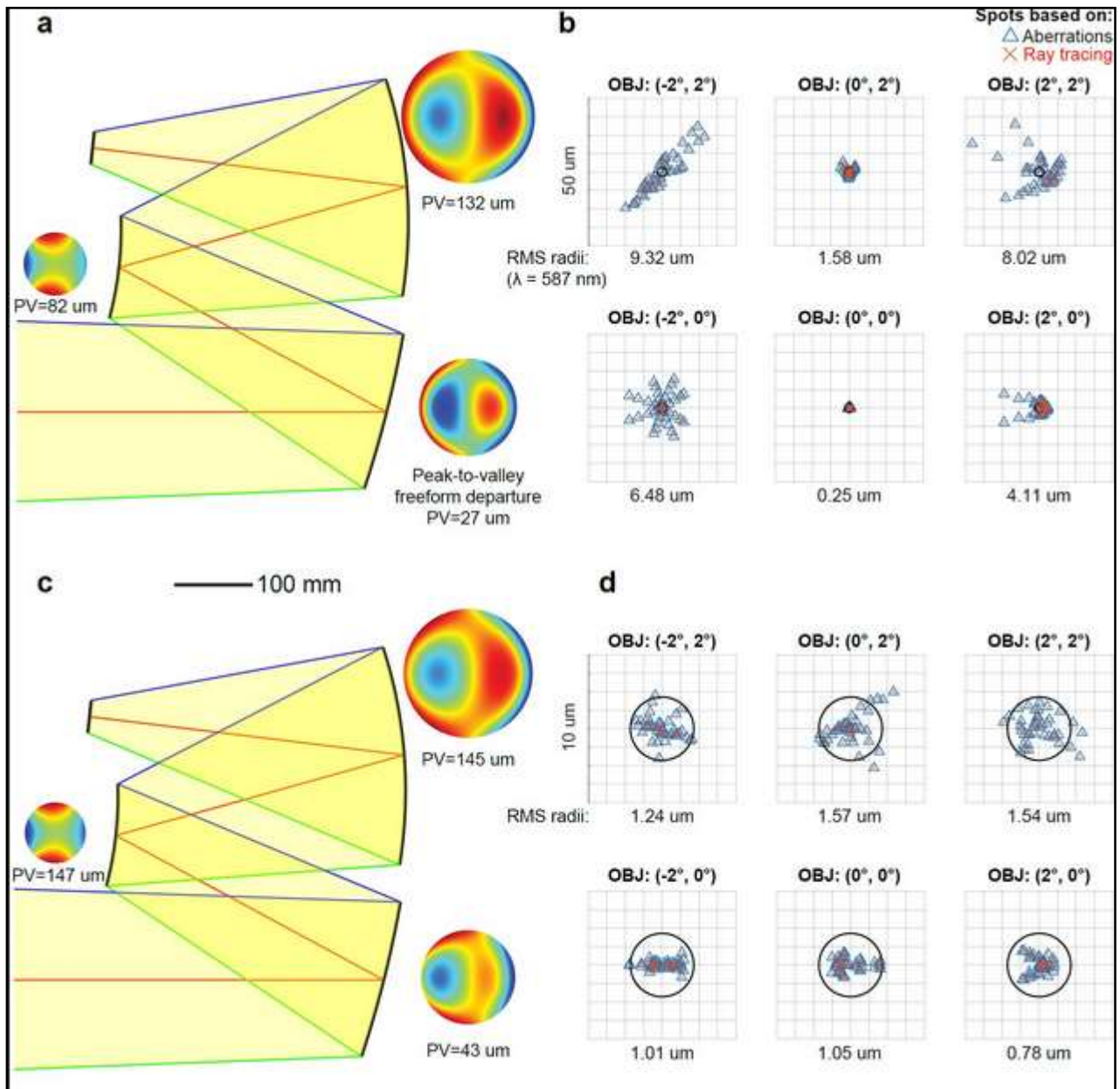
More information: Michael Schmid et al, 3D printed hybrid refractive/diffractive achromat and apochromat for the visible wavelength range, *Optics Letters* (2021). [DOI: 10.1364/OL.423196](https://doi.org/10.1364/OL.423196)

Journal information: [Optics Letters](https://doi.org/10.1364/OL.423196)

<https://phys.org/news/2021-05-3d-complex-micro-optics-imaging.html>

Freeform imaging systems: Fermat's principle unlocks 'first time right' design

Researchers at Brussels Photonics, Vrije Universiteit Brussel, have developed a 'first time right' design method that eliminates the "step-and-repeat" and "trial-and-error" approach in optical system design. They demonstrated the systematic, deterministic, scalable, and holistic character of their disruptive technique with various freeform lens- and mirror-based high-end examples and invite optical designers to experience their new method hands-on via an open-access trial web application.



a Cross-section of the directly calculated initial system combined with peak-to-valley freeform departures (PV) from the base sphere for the primary, secondary and tertiary mirror. b Corresponding spot diagrams for six selected fields based on aberration calculations (blue triangles) and ray tracing (red crosses) in comparison. c Cross-section of the subsequently optimized system combined with peak-to-valley freeform departures (PV) from the base sphere for each mirror. d Corresponding spot diagrams for the same six fields based on aberration calculations (blue triangles) and ray tracing (red crosses) in comparison. Credit: Fabian Duerr and Hugo Thienpont

Optical imaging systems have been playing an essential role in scientific discovery and societal progress for several centuries. For more than 150 years scientists and engineers have used aberration theory to describe and quantify the deviation of light rays from ideal focusing in an imaging system. Until recently most of these imaging systems included spherical and aspherical refractive lenses or reflective mirrors or a combination of both. With the introduction of new ultra-precision manufacturing methods, it has become possible to fabricate lenses and mirrors that lack the common translational or rotational symmetry about a plane or an axis.

Such optical components are called freeform optical elements and they can be used to greatly extend the functionalities, improve performance, and reduce volume and weight of optical imaging systems. Today, the design of optical systems largely relies on efficient raytracing and optimization algorithms. A successful and widely used optimization-based optical design strategy therefore consists of choosing a well-known optical system as a starting point and steadily achieving incremental improvements. Such a "step-and-repeat" approach to optical design, however, requires considerable experience, intuition, and guesswork, which is why it is sometimes referred to as 'art and science.' This applies especially to freeform optical systems.

In a newly published paper in *Light Science & Applications*, researchers at Brussels Photonics (B-PHOT), Vrije Universiteit Brussel, Belgium have developed a deterministic direct optical design method for freeform imaging systems based on differential equations derived from Fermat's principle and solved using power series. The method allows calculating the optical surface coefficients that ensure minimal image blurring for each individual order of aberrations. They demonstrate the systematic, deterministic, scalable, and holistic character of their method for mirror- and lens-based design examples. The reported approach provides a disruptive methodology to design optical imaging systems from scratch, while largely reducing the 'trial and error' approach in present-day optical design.

The scientists summarize the operational principle of their method:

"We only need to specify the layout, the number and types of surfaces to be designed and the location of the stop. The established differential equations and solution scheme requires only two further steps: (1) solve the non-linear first order case using a standard non-linear solver; (2) solve the linear systems of equations in ascending order by setting unwanted aberrations to zero or by minimizing a combination thereof as required by the targeted specifications of the imaging freeform system. Most importantly, these two steps are identical for all (freeform) optical designs."

"The presented method allows a highly systematic generation and evaluation of directly calculated freeform design solutions that can be readily used as an excellent starting point for further and final optimization. As such, it allows the straightforward generation of 'first time right' initial designs that enable a rigorous, extensive and real-time evaluation in solution space when combined with available local or global optimization algorithms."

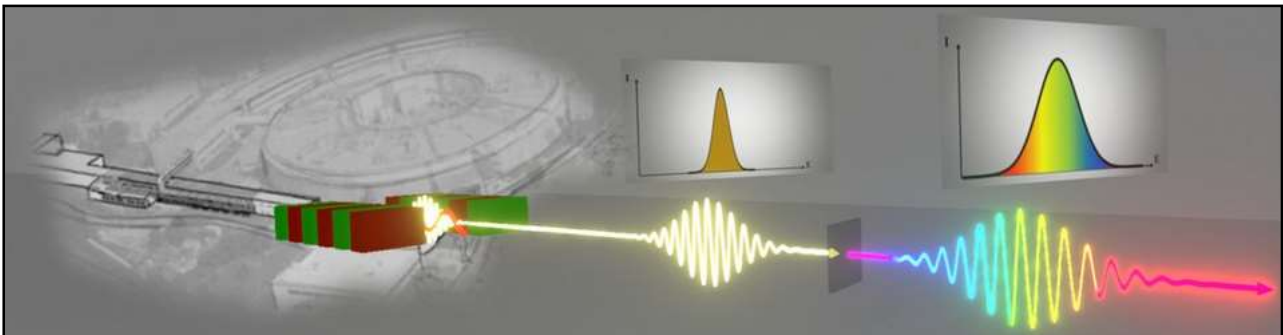
More information: Fabian Duerr et al, Freeform imaging systems: Fermat's principle unlocks "first time right" design, *Light: Science & Applications* (2021). DOI: [10.1038/s41377-021-00538-1](https://doi.org/10.1038/s41377-021-00538-1)

Journal information: [Light: Science & Applications](https://phys.org/news/2021-05-freeform-imaging-fermat-principle.html)
<https://phys.org/news/2021-05-freeform-imaging-fermat-principle.html>

Non-linear optics meets X-rays

The recent advent of femtosecond X-ray sources offers unprecedented opportunities for structural and dynamical studies. It requires, however, manipulating spectral properties, as commonly done by non-linear optics at visible/infrared wavelengths. Here we show the first evidence for Self-Phase Modulation, a key non-linear effect in ultrafast laser science, in soft X-Rays. Building on such an effect, we demonstrate how to tune spectral properties in this wavelength region critical for core electron pump-probe spectroscopy and nanoimaging.

The relevance for radiology applications is probably the most well-known advantage of X-ray beams (keV energies) with respect to visible radiation (eV energies) and can be traced back to their superior penetration depth. On a more fundamental point, however, the relevance of this photon energy range relies on the capability of probing inner shell electrons (as they have comparable binding energies) and mapping molecular structures on the atomic-scale (as typical interatomic spacings are comparable to X-ray wavelengths). Building on such capabilities, efforts have been devoted by the scientific community to develop X-ray sub-picosecond sources able to access matter properties with a time resolution sufficient to access elemental molecular motions. Free electron lasers (FEL), nowadays available at several large-scale facilities around the world, represent a prime candidate to generate femtosecond X-ray pulses with high brilliance. One of the main challenges to exploit the enormous potential of FEL sources is developing methods for tuning the spectral and temporal beam properties, a task which is customarily achieved at visible wavelengths resorting to non-linear optics.



An illustrative scenario of the observed effect is shown. The pulses with a subpicosecond duration pulsed in the soft X-ray generated from FERMI@elettra interacts with a submicrometric metallic foil. The non-linear optical interaction generates a modification of chromatic components in the pulses. Credit: Carino Ferrante, Emiliano Principi, Andrea Marini, Giovanni Batignani, Giuseppe Fumero, Alessandra Virga, Laura Foglia, Riccardo Mincigrucci, Alberto Simoncig, Carlo Spezzani, Claudio Masciovecchio, Tullio Scopigno.

In a new paper published in *Light Science & Applications*, a team of scientists from the Italian Institute of Technology, University of L'Aquila, FERMI Trieste and "Sapienza" University of Rome have shown the first evidence of self-phase modulation (SPM) in the soft X-ray regime. The experiment, performed in the facility FERMI@elettra of Trieste, consists in the observation of spectral modulation after the interaction of focused FEL beams with a very thin metallic foil (100-300 nm).

"Our experiment demonstrates a new control knob for spectral shaping of FEL pulses. Blue to red shift accompanied by bandwidth increase can be obtained by moving the input wavelength across the material's absorption edge," prof. Tullio Scopigno explains.

The atomic absorption edges in the X-ray region feature sharp discontinuities: an optical transparent material can absorb light modifying the photon energy by less than 1%, correspondingly generating specific core electron excitations.

"This first observation of SPM effects in the soft X-Ray regime allows to unveil specific atomic properties on the subpicosecond time scale. In particular, the interplay with a light-induced out-of-equilibrium electron plasma generated on the femtosecond timescale in thin metallic foils," concludes Dr. Carino Ferrante.

Below the absorption edge, the observed SPM is induced by the Kerr effect, i.e. by a modification of the non-linear refractive index mimicking the pulse intensity profile, which ultimately results in spectral broadening, accompanied by a redshift due to valence electrons heating. In striking difference, above edge, the highly excited core photoelectrons generated by the pulse leading edge form a transient hot dense ionized plasma, responsible for a sharp decrease of the refractive index. Consequently, the pulse trailing edge is accelerated giving rise to an asymmetric temporal compression which, in turn, results in a blueshift.

The results provide a proof of concept for spectral shaping of soft X-ray pulses, a key milestone towards the development of new protocols for femtosecond core electrons spectroscopies.

More information: Carino Ferrante et al, Non-linear self-driven spectral tuning of Extreme Ultraviolet Femtosecond Pulses in monoatomic materials, *Light: Science & Applications* (2021). DOI: [10.1038/s41377-021-00531-8](https://doi.org/10.1038/s41377-021-00531-8)

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<https://phys.org/news/2021-05-non-linear-optics-x-rays.html>

COVID-19 Research News

Business Standard

Fri, 14 May 2021

Mixing Covid-19 vaccine doses safe but increases side effects: Study

The research team said adverse reactions from this mix and match approach were short-lived and there were no other safety concerns

London: Mixing the doses of different types of two-dose coronavirus vaccines has been found to be safe but increased the frequency of mild to moderate symptoms, a new UK study has found.

The COM-COV study, led by the University of Oxford, has been investigating the immune responses of volunteers given a dose of the Oxford/AstraZeneca vaccine followed by the Pfizer/BioNTech jab, and vice versa, since February.

In its report for the medical journal *Lancet* on Wednesday, the research team said adverse reactions from this mix and match approach were short-lived and there were no other safety concerns.

The findings at this stage are limited to "reactogenicity" findings, or how people feel after the vaccine, and not the immunogenicity findings, that is how well the mixed dosing worked at inducing an immune response, work on which remains ongoing.



The mild side effects included symptoms like chills, fatigue, headaches and feeling feverish, and were short-lived

“The results from this study suggest mixed dose schedules could result in an increase in work absences the day after immunisation, and this is important to consider when planning immunisation of health care workers,” said Matthew Snape, associate professor in paediatrics and vaccinology at the University of Oxford.

"Importantly, there are no safety concerns or signals, and this does not tell us if the immune response will be affected. We hope to report these data in the coming months," he said.

The mild side effects included symptoms like chills, fatigue, headaches and feeling feverish, and were short-lived. The research suggests that as the study data was recorded in participants aged 50 and above, there is a possibility such reactions may be more prevalent in younger age groups.

One in 10 of over 800 volunteers given two AstraZeneca jabs four weeks apart reported feverishness – but if they received one AstraZeneca jab and one Pfizer, in any order, the proportion rose to about 34 per cent.

Last month, the study was expanded to add another 1,050 volunteers to test combinations of the Moderna and Novavax Covid vaccines, alongside the Pfizer and AstraZeneca, which is being produced in India as Covishield.

China backs talks on intellectual property waiver for Covid jabs

China’s Commerce Ministry spokesman Gao Feng said on Thursday that Beijing supports a proposal by the World Trade Organization for an intellectual property protection waiver on Covid-19 vaccines to enter the consultation stage. British and European Union officials have been sceptical about the usefulness of a US proposal to waive patent protections for Covid-19 vaccines, while saying they are prepared to discuss it.

Drugmakers and some other governments opposed the idea, saying it would not solve global inoculation shortages.

“China supports the WTO’s proposal on IP exemptions for anti-epidemic materials such as the Covid vaccine to enter the text consultation stage,” Gao said at a regular news conference in Beijing.

“China will work with all parties to actively participate in consultations and jointly promote a balanced and effective solution,” he said. Reuters

Top scientists question need for booster jabs

In interviews with Reuters, more than a dozen infectious disease and vaccine experts said there is growing evidence that a first round of vaccinations may offer enduring protection against Covid and most of its variants discovered. Some expressed concern that expectations around boosters are being set by pharmaceutical executives rather than health specialists. Reuters

(This story has not been edited by Business Standard staff and is auto-generated from a syndicated feed.)

https://www.business-standard.com/article/current-affairs/mixing-covid-19-vaccine-doses-safe-but-increases-side-effects-study-121051301408_1.html

