NUKLEAR MALAYSIA

N.U.R
NUKLEAR UNTUK RAKYAT

Catalogue of Technical Services & Consultancy, Malaysian Nuclear Agency

KATALOG PERKHIDMATAN TEKNIKAL & RUNDINGAN

AGENSI NUKLEAR MALAYSIA



ASPIRASI PENGKOMERSIALAN TEKNOLOGI NUKLEAR

ASPIRATION FOR THE COMMERCIALIZATION OF NUCLEAR TECHNOLOGY



Cetakan Pertama 2023
Hak cipta Agensi Nuklear Malaysia (Nuklear Malaysia), 2023

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Diterbitkan Oleh:
AGENSI NUKLEAR MALAYSIA (NUKLEAR MALAYSIA)
43000 KAJANG, SELANGOR
MALAYSIA



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MALAYSIA



PERUTUSAN KETUA PENGARAH *Director General's Message*

Nuklear Untuk Rakyat (N.U.R)

Nuclear for The People (N.U.R)

Setinggi-tinggi syukur ke hadrat Allah SWT kerana dengan izin-Nya, Katalog Perkhidmatan Teknikal dan Rundingan Agensi Nuklear Malaysia berjaya diterbitkan. Katalog ini dihasilkan sebagai salah satu bahan promosi pengkomersialan untuk 21 Pusat khidmat Nuklear Malaysia kepada pelanggan.

Bagi pihak pengurusan tertinggi Nuklear Malaysia, saya ingin merakamkan setinggi-tinggi penghargaan kepada Bahagian Pengkomersilan Teknologi (BKT). Semoga dengan adanya katalog ini, ianya akan dapat meningkatkan prestasi pengkomersialan Nuklear Malaysia dan memberi maklumat kepada para pelanggan dan pemegang taruh berkaitan perkhidmatan yang ditawarkan.

With immense gratitude, I extend my heartfelt thanks to Allah SWT, whose divine blessings have paved the way for the publication of the Catalogue of Technical Services and Consultancy by the Malaysian Nuclear Agency. This comprehensive catalogue details the commercialization promotional materials for the 21 Malaysian Nuclear Agency service centres providing technical and consultancy services.

I express my deepest appreciation to the Technology Commercialization Division (BKT) for their visionary leadership and relentless efforts in crafting this invaluable resource. Their initiative has highlighted our capabilities and opened doors for us to connect with our clients on a deeper level.

Dr. Rosli Bin Darmawan, Ketua Pengarah, Agensi Nuklear Malaysia.
***Dr. Rosli bin Darmawan**, Director General, Malaysian Nuclear Agency*



PRAKATA PENGARAH BAHAGIAN PENGKOMERSILAN TEKNOLOGI (BKT)

A Message from the Director of Technology Commercialization Division (BKT)

Aspirasi Pengkomersialan Teknologi Nuklear

Aspiration for the Commercialization of Nuclear Technology

Alhamdulilah dengan izin-Nya, Bahagian Pengkomersilan Teknologi (BKT) dapat menerbitkan Katalog Perkhidmatan Teknikal dan Rundingan, Agensi Nuklear Malaysia (Nuklear Malaysia). Katalog terbitan ini adalah satu inisiatif BKT dalam mempromosikan aktiviti pengkomersialan; perkhidmatan teknikal dan rundingan.

Selaras dengan pelan pendigitalan negara, katalog yang dibangunkan ini juga akan diwujudkan dalam bentuk salinan lembut dan mudah dimuat turun dari laman web serta platform pendigitalan rasmi Nuklear Malaysia. Katalog ini berjaya dihasilkan dengan usahasama yang diterajui oleh pihak BKT dengan kerjasama Bahagian Pengurusan Maklumat (BPM), Pengurus-pengurus Pusat Khidmat serta Jawatankuasa Penerbitan.

Akhir kata, ungkapan terima kasih kepada pihak Pengurusan Tertinggi Nuklear Malaysia yang sentiasa memberi sokongan dalam aktiviti pengkomersialan yang dilaksanakan oleh BKT bagi meningkatkan ekonomi negara.

Alhamdulillah, the Technology Commercialization Division (BKT) proudly presents the Catalogue of Technical and Consultancy Services of the Malaysian Nuclear Agency. This comprehensive catalogue is a beacon of inspiration, showcasing our commercialization activities, the depth of our technical expertise, and the breadth of our consultancy services. Crafted with dedication and collaboration, it represents a collaboration involving BKT, the Information Management Division (BPM), our esteemed service centre managers, and the diligent publication committee.

We have seamlessly blended innovation and efficiency to create a tangible resource that aligns with our national digitization plan. In an era where digital accessibility is paramount, this catalogue will be available as a user-friendly soft copy, easily downloadable from our official website and Nuklear Malaysia's digitization platform.

I extend my heartfelt appreciation to our visionary top management at Nuklear Malaysia, whose unwavering support has fuelled our commercialization activities. Their encouragement has been the driving force behind our initiatives to bolster the national economy.

Dr. Rasif bin Mohd Zain, Pengarah Bahagian Pengkomersilan Teknologi (BKT)

***Dr. Rasif bin Mohd Zain**, Director, Technology Commercialization Division (BKT)*

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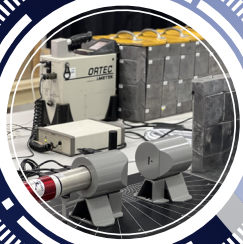
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NUKLEAR MALAYSIA

PUSAT TEKNOLOGI REAKTOR (PTR)

Pusat Teknologi Reaktor (PTR) mengendalikan satu-satunya reaktor penyelidikan nuklear di Malaysia, Reaktor TRIGA PUSPATI (RTP) jenis TRIGA Mark II yang telah ditauliahkan pada 28 Jun 1982. RTP mempunyai kuasa nominal 1 MWatt yang direka untuk melaksanakan pelbagai bidang penyelidikan berasaskan sumber neutron, khidmat penyinaran untuk aplikasi nuklear di dalam bidang industri, perubatan dan alam sekitar termasuk untuk pendidikan dan latihan dalam teknologi reaktor nuklear. RTP dilengkapi dengan kemudahan penyinaran di dalam teras, instrumentasi alur neutron dan makmal. Kemudahan penyinaran ini menawarkan khidmat penyinaran neutron secara tetap dan stabil. RTP dilesenkan mengikut Akta 304 dan dikendalikan oleh Pengendali Reaktor yang bertauliah bagi menjamin keselamatan pada tahap tertinggi.

KEMUDAHAN PENYINARAN DALAM TERAS RTP:

1. Jidal Tengah (CT)
2. Rak Berputar (RR)
3. Tiub Kering (DT)
4. Sistem Pemindahan Pneumatik (PTS)

KEMUDAHAN PENYINARAN INSTRUMENTASI ALUR NEUTRON:

1. Radiografi Neutron (NUR)
2. Difraktometer Neutron (ND)
3. Penyerakan Neutron Bersudut Kecil (SANS)

KEMUDAHAN MAKMAL:

1. Makmal Fizik Neutron
2. Makmal Simulasi Reaktor TRIGA
3. Makmal Simulasi Reaktor Nuklear Berasaskan Komputer









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REACTOR TECHNOLOGY CENTER (PTR)

The Reactor Technology Centre (PTR) operates Malaysia's only nuclear research reactor, the Reaktor TRIGA PUSPATI (RTP). The TRIGA Mark II-type reactor was commissioned on June 28, 1982. It has a nominal power of 1 MWatt and designed to facilitate various neutron-based research. It provides irradiation services for nuclear applications in industries, medicine, and environmental sectors. It also supports education and training in nuclear reactor technology. The RTP is equipped with an in-core irradiation facility, neutron beam instrumentation, and laboratories. The facility provides persistent and stable neutron irradiation services. The RTP is licensed under Act 304 and is operated by certified Reactor Operators to ensure the highest level of safety.

IN-CORE IRRADIATION FACILITIES:

1. *Central Thimble (CT)*
2. *Rotary Rack (RR)*
3. *Dry Tube (DT)*
4. *Pneumatic Transfer System (PTS)*

NEUTRON BEAM INSTRUMENTATION FACILITIES:

1. *Neutron Radiography (NUR)*
2. *Neutron Diffractometer (ND)*
3. *Small Angle Neutron Scattering (SANS)*

LABORATORIES FACILITIES:

1. *Neutron Physics Laboratory*
2. *TRIGA Reactor Simulator Laboratory*
3. *PC-based Nuclear Power Simulator Laboratory*







NUKLEAR MALAYSIA

LOJI MINTEC - SINAGAMA

Loji MINTec-Sinagama menggunakan tenaga pengion dalam bentuk sinaran gama daripada sumber Kobalt-60. Loji penyinaran ini beroperasi menggunakan JS10000 (IR-219) yang mampu menyinari pelbagai produk yang memerlukan dos yang berbeza secara serentak.

MINTec-Sinagama beroperasi pada skala komersial bagi pensetrilan atau dekontaminasi peranti perubatan, makanan, rempah ratus, herba dan buah-buahan.

MINTec-Sinagama juga menawarkan perkhidmatan pensterilan tisu dan tulang melalui penyinaran gama untuk tujuan perbankan tisu kepada pihak berkuasa yang berkaitan seperti hospital dan Bank Tisu Negara dan perkhidmatan pembasmian serangga dalam komoditi pertanian, termasuk untuk tujuan kuarantin.

PERKHIDMATAN PENYINARAN MINTec-SINAGAMA:

1. Pensterilan Peranti Perubatan, Bahan Pembungkusan dan Makmal
2. Pensterilan Produk Farmaseutikal
3. Produk Veterinar
4. Makanan, Herba dan Rempah
5. Produk Kosmetik
6. Sampel untuk tujuan R&D

PENGIKTIRAFAN:

1. ISO 9001
2. ISO 13485
3. Lesen Premis Iradiasi Makanan

Logo RADURA
RADURA Logo

TREATED BY IRRADIATION



Pensijilan ISO 9001
ISO 9001Certificate



Pensijilan ISO 13485
ISO 13485 Certificate



Lesen Premis
Iradiasi Makanan





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MINTEC - SINAGAMA PLANT

MINTec-Sinagama Irradiation Plant irradiates gamma radiation derived from Cobalt-60 source. The irradiation plant employs JS10000 (IR 219) irradiator, that can simultaneously irradiate various products requiring different doses.

The gamma irradiation plant offers commercial services for sterilisation, and decontamination of medical devices, food, spices, herbs, and fruits.

It also provides tissue and bone sterilisation services via gamma irradiation for tissue banking purposes to hospitals and the National Tissue Bank and is also involved in eradicating insects in agricultural commodities, including for quarantine purposes.

MINTEC - SINAGAMA IRRADIATION SERVICES:

1. *Sterilisation of Medical Devices, Packaging Materials and Laboratories*
2. *Sterilisation of Pharmaceutical Products*
3. *Veterinary Products*
4. *Food, Herbs and Spices*
5. *Cosmetic Products*
6. *Samples for R&D purposes*

RECOGNITION:

1. *ISO 9001*
2. *ISO 13485*
3. *Food Irradiation Premises License*







NUKLEAR MALAYSIA

LOJI ALURTRON

Loji ALURTRON menawarkan khidmat penyinaran alur elektron (EB) ke atas produk untuk tujuan taut silang, pengubahsuaian polimer, rawatan permukaan, rawatan air, litografi, pendopan elektron dan lain-lain tujuan untuk menyokong pertumbuhan sektor industri dan aktiviti penyelidikan dan pembangunan (R&D). Proses penyinaran menghasilkan keseragaman dos yang baik, output yang tinggi dalam masa yang pantas dengan kos operasi yang rendah dan mesra alam. ALURTRON juga menyediakan perkhidmatan ujian makmal dan diperakui dengan pensijilan Sistem Pengurusan Kualiti (QMS) ISO 9001.

PERKHIDMATAN PENYINARAN ALURTRON:

1. Wayar/kabel dan tiub Polimer
2. Wafer Silikon Semikonduktor
3. Filem dan Lembaran
4. Produk Hidrogel
5. Pembangunan Produk Baru (R&D)

UJIAN MAKMAL DAN KAWALAN KUALITI:

1. Ujian *Hot Set*
2. Ujian *Gel Content*
3. Ujian Dosimetri



Penyinaran produk
Product irradiation

Sijil Akreditasi
MS QMS ISO 9001

QMS ISO 9001 Accreditation Certificate



CERTIFICATE

SIRIM QAS International hereby certifies that

MALAYSIAN NUCLEAR AGENCY (NUKLEAR MALAYSIA),
ALURTRON BANGI
KAJANG
SELANGOR DARUL EHSAN
MALAYSIA

has implemented a Quality Management Systems complying with

ISO 9001:2015
QUALITY MANAGEMENT SYSTEMS – Requirements

Scope of Certification

PROVISION OF ELECTRON BEAM IRRADIATION SERVICES FOR COMMERCIAL PRODUCTS.

Issue date : 07 September 2022
Original certification date : 10 August 2007
Expiry date : 09 August 2025
Certificate no. : QMS 01766

Nur Fadhlah Muhammad
Chief Executive Officer
SIRIM QAS International Sdn. Bhd.









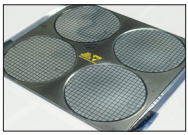


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ALURTRON PLANT

ALURTRON offers Electron Beam (EB) irradiation services on products for chemical crosslinking, polymer modification, surface treatment, water treatment, lithography, and electron doping and other purposes to support the growth of the industrial/commercial sector and research and development (R&D) activities. The irradiation process produces high dose uniformity, high throughput and fast process at low operating cost and is environmentally friendly. ALURTRON also provides laboratory testing services and is certified to Quality Management System QMS ISO 9001.







ALURTRON IRRADIATION SERVICES:

1. *Wire/cable and polymer tube*
2. *Silicon wafer semiconductor*
3. *Film and sheet*
4. *Hydrogel products*
5. *New product development (R&D)*

LABORATORY TESTING AND QUALITY CONTROL:

1. *Hot Set Test*
2. *Gel Content Test*
3. *Dosimetry Test*







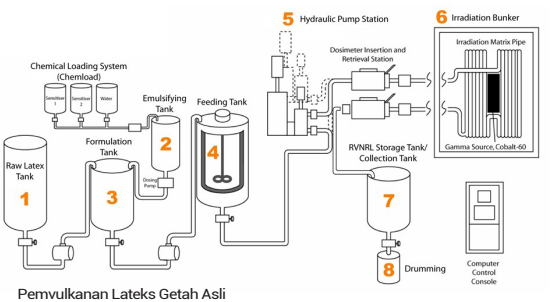
NUKLEAR MALAYSIA

LOJI RAYMINTEX

Loji RAYMINTEX merupakan sebuah kemudahan perintis untuk tujuan penyediaan lateks getah asli pra-pemvulkanan dengan sinaran (RVNRL) melalui penggunaan sinaran gama. Ia merupakan sebuah kemudahan semi automatik yang mampu menghasilkan sehingga 6000 tan RVNRL setahun, dengan menggunakan punca sinaran kobalt-60 sehingga 1 MCi. RVNRL ini dapat memenuhi keperluan sektor pembuatan produk celupan lateks dan industri berkaitan secara berkesan sambil menggalakkan promosi dan pemindahan teknologi RVNRL.

Lateks getah asli perlu divulkan sebelum digunapakai dalam industri. RVNRL yang dihasilkan di Loji RAYMINTEX merupakan lateks tervulkan dengan sinaran gama yang mempunyai sifat fizikal dan mekanikal untuk memenuhi keperluan/ spesifikasi pelbagai produk celupan lateks seperti sarung tangan, belon, sarung jari, puting bayi, pelapik gigi dan lain-lain.

Loji RAYMINTEX telah membangun dan melaksanakan sistem pengurusan kualiti ISO 9001 dan diperakui oleh badan pensijilan LRQA pada tahun 2003.



Pemvulkanan Lateks Getah Asli
Vulcanization of Natural Rubber Latex



Certificate of Approval

This is to certify that the Management System of:

Raymintex Plant, Malaysian Nuclear Agency (Nuclear Malaysia)

Bangi, 43000 Kajang, Selangor, Malaysia

has been approved by Lloyd's Register to the following standards:

ISO 9001:2015

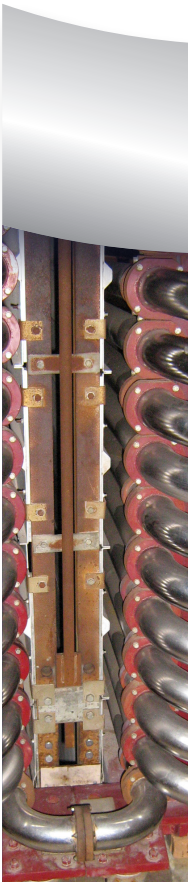
Approval number(s): ISO 9001 – 00441561

The scope of this approval is applicable to:

Production of pre-cutsumer natural rubber latex by using gamma radiation.

Luis Coelho
Area Operations Manager - SAMEA
Issued by: LRQA Malaysia Sdn Bhd

Pensijilan ISO 9001:2015
ISO 9001:2015 Certificate









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RAYMINTEX PLANT

The RAYMINTEX plant is a pilot facility that uses gamma ray for the preparation of Radiation Pre-vulcanised Natural Rubber Latex (RVNRL). It is a semi-automated plant capable of producing 6000 tons of RVNRL annually, which is realised by harnessing the power of cobalt-60 radioactive sources of up to 1 MCi. RVNRL is critical to the latex-dipped product manufacturing sectors and related industries, as it effectively addresses customer requirements while fostering promotion, commercialisation, and the transfer of RVNRL technology.

Natural rubber latex needs to be vulcanised before being used in industries. The RVNRL produced at the RAYMINTEX Plant is a radiation pre-vulcanised natural rubber latex that possesses the physico-mechanical properties meeting the requirements/ specifications of a broad spectrum of latex-dipped products such as gloves, balloons, finger cots, baby pacifiers, dental pads and more.

The plant is ISO 9001 certified by the LRQA certification body since 2003.







NUKLEAR MALAYSIA

PUSAT KECEMERLANGAN NUKLEAR (CoNE)

Pusat Kecemerlangan Nuklear (CoNE) merupakan sebuah pusat latihan awam kerajaan di bawah Nuklear Malaysia yang bertanggungjawab untuk melaksanakan program latihan dalam bidang teknologi nuklear dan teknologi berkaitan kepada kumpulan profesional, warga industri awam-swasta, belia dan masyarakat. Matlamatnya untuk meningkatkan kemahiran yang diperlukan, menggalakkan kesedaran keselamatan dan mewujudkan tenaga kerja yang cekap dalam memainkan peranan yang lebih besar dalam agenda pembangunan negara. Program latihan ang ditawarkan merangkumi tujuh (7) Sektor Latihan iaitu Keselamatan Sinaran dan Kesihatan, Sinaran Perubatan, Ujian Tanpa Musnah, Keselamatan Persekitaran dan Kesihatan, Sains Nuklear dan Kejuruteraan, Pengurusan Teknologi dan Latihan Antarabangsa.

PERKHIDMATAN CoNE:

1. Melatih (*facilitate learning*) tenaga kerja dalam bidang berkaitan teknologi nuklear dan teknologi berkaitan melalui Program Latihan Awam, Program Serantau, Program Bersekutu/Kerjasama Latihan, Program Asas Agensi & Konsortia, Sangkutan Penyelidikan dan Program *E-Learning*.
2. Merekabentuk dan membangunkan produk latihan yang memfokuskan kepada keperluan pelanggan dan kehendak pasaran.
3. Menawarkan, mengendali dan menyelaras program latihan, bengkel, seminar, persidangan, simposium dan sebagainya.
4. Menyediakan khidmat profesional dalam aktiviti berkaitan latihan diperingkat tempatan dan luar negara.

PENGIKTIRAFAN/ *Recognition*:

KEMENTERIAN SUMBER MANUSIA
KEMENTERIAN KEWANGAN
KEMENTERIAN KESIHATAN MALAYSIA
JABATAN TENAGA ATOM
JABATAN PEMBANGUNAN KEMAHIRAN
JABATAN KESELAMATAN DAN KESIHATAN PEKERJAAN
IAEA International Atomic Energy Agency
MBOT LEMBAGA TEKNOLOGIS MALAYSIA
CIDB MALAYSIA
SGS ACB QMS 04
SGS UKAS
MY06/0164
MY06/00734
ISO 9001:2015 since July 2018







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CENTRE OF NUCLEAR EXCELLENCE (CoNE)

The Centre of Nuclear Excellence (CoNE) is a government public training centre operated under Nuklear Malaysia. It is responsible for conducting training programs in nuclear technology and related technologies for professionals, public-private industries, and the individuals. It aims to upskill, promote safety awareness, and establish a competent workforce to play a more significant role in the national development agenda. Training programs are divided into seven (7) Sectors: Radiation Safety and Health, Medical Radiation, Non-Destructive Testing, Environmental Safety and Health, Nuclear Science and Engineering, Technology Management, and International Training.

CoNE SERVICES:

1. *Train (facilitate learning) professionals in fields related to nuclear technology through Public Training Programs, Regional Programs, Associated/Cooperation Training Programs, In-company and consortium Programs, Scientific Attachment, and E-Learning Programs.*
2. *Design and develop training products that are market-driven and focus on customer needs.*
3. *Offer, organise and coordinate training programs, workshops, seminars, conferences, and symposiums.*
4. *Provide professional services in training-related activities nationally and internationally.*







NUKLEAR MALAYSIA

PUSAT PEMBANGUNAN LOJI DAN PROTOTAIP/PUSAT INSTRUMENTASI DAN AUTOMASI (PDC/PIA)

Pusat Pembangunan Loji dan Prototaip/Pusat Instrumentasi dan Automasi (PDC/PIA) menjalankan penyelidikan dan pembangunan kejuruteraan berkaitan teknologi nuklear dan teknologi berkaitan termasuk penginstrumentasian, pengautomasian dan memberikan perundingan kejuruteraan serta khidmat sokongan teknikal.

PDC/PIA juga menawarkan perkhidmatan rekabentuk dan pembuatan dalam membangunkan penggunaan teknologi nuklear. Selain itu, PDC/PIA menawarkan perkhidmatan pembangunan prototaip dan sistem automasi serta latihan penyenggaraan instrumentasi nuklear.

PERKHIDMATAN PDC/PIA:

1. Rekabentuk Pintu Plumbum dan Perisai Sinaran
2. Rekabentuk Bilik Penyinaran
3. Pembuatan Kaca Makmal
4. Rekabentuk Prototaip dan Komponen
5. Pemesinan Bahan Logam dan Plastik
6. Peleburan Plumbum Menggunakan Relau
7. Sel Aktif Mudah Alih
8. Peleraian Peralatan/Mesin Penyinaran bagi Tujuan Pelupusan
9. Latihan Penyenggaraan Instrumentasi Nuklear







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PROTOTYPE AND PLANT DEVELOPMENT CENTRE/ INSTRUMENTATION AND AUTOMATION CENTRE (PDC/PIA)

PDC/PIA conducts engineering research and development in nuclear and related technologies, encompassing instrumentation and automation and provides engineering consultancy and technical support services.

PDC/PIA offers design and fabrication services pertaining to nuclear technology. PDC/PIA also offers prototype and automation system development services and nuclear instrumentation maintenance training.

PDC/PIA SERVICES:

1. *Lead door and radiation shielding design*
2. *Irradiation room design*
3. *Laboratory glass blowing*
4. *Prototype and component design*
5. *Metal and plastic machining*
6. *Lead smelting using a furnace*
7. *Mobile Hot Cell*
8. *Dismantling of irradiation equipment/machines for disposal purposes*
9. *Nuclear instrumentation maintenance training*







NUKLEAR MALAYSIA

PUSAT PEMBANGUNAN TEKNOLOGI SISA (WasTeC)

Pusat Pembangunan Teknologi Sisa (WasTeC) adalah Pusat Pengurusan Sisa Radioaktif Kebangsaan yang telah dipertanggungjawabkan oleh Kerajaan bagi pengurusan sisa radioaktif di Malaysia. WasTeC menjalankan khidmat pungutan, penanggalan, pengkondisian, penyimpanan dan pelupusan sisa radioaktif yang diperolehi dari industri pembuatan, hospital, sekolah, institusi pengajian dan makmal-makmal penyelidikan. WasTeC juga menawarkan perkhidmatan dalam bidang pengurusan sisa pepejal perbandaran (MSW).

PERKHIDMATAN WasTeC:

- Pelupusan sisa radioaktif jenis pepejal, cecair dan sisa radioaktif jenis punca terkedap terpakai (DSRS).
- Pelupusan alat penangkap kilat dan alat pengesan asap.
- Khidmat pungutan, penanggalan, pengkondisian, pengangkutan, penyimpanan dan pelupusan sisa radioaktif.
- Analisis pencirian sisa pepejal perbandaran mengikut kaedah ASTM (persampelan, analisis proksimat dan penentuan nilai kalori).
- Analisis tingkah laku pembakaran (*combustion characterization*) sisa pepejal (termasuk plastik, kertas dan bahan organik).
- Khidmat perundingan konsep 'Sisa kepada Tenaga' melalui teknologi rawatan terma.







Sijil Pengiktirafan
MS ISO 9001:2015

Certified with MS ISO 9001:2015









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WASTE TECHNOLOGY DEVELOPMENT CENTRE (WasTeC)

WasTeC is the National Radioactive Waste Management Centre that has been entrusted by the government for the management of radioactive waste in Malaysia. WasTeC provides collection, dismantling, conditioning, storage and disposal of radioactive waste obtained from the manufacturing industry, hospitals, schools, educational institutions and research laboratories. WasTeC also offers services in the field of municipal solid waste management (MSW).

WasTeC SERVICES:

- *Disposal of various types of radioactive waste – solid, liquid and disused sealed radioactive sources (DSRS).*
- *Disposal of lightning arrestor and smoke detector.*
- *Collection, dismantling, conditioning, transportation, storage and disposal of radioactive waste.*
- *Municipal Solid Waste Characterization Analysis according to ASTM Method (sampling, proximate analysis and calorific value).*
- *Combustion Characterisation Analysis of Solid Waste (plastic, paper and organic materials).*
- *Consultation of 'Waste to Energy'.*







NUKLEAR MALAYSIA

KUMPULAN APLIKASI PENYURIH ALAM SEKITAR (E-TAG)

Kumpulan Aplikasi Penyurih Alam Sekitar (e-TAG) merupakan pusat khidmat yang menawarkan khidmat penyelidikan menggunakan teknologi nuklear dan disokong oleh teknik konvensional berkaitan. Penggunaan teknik dan aplikasi penyurih untuk kajian pengurusan air adalah satu-satunya yang terdapat di Malaysia. Penggunaan teknik penyurih dan juga teknik isotop stabil dalam kajian alam sekitar membantu dalam pengurusan serta pencirian sumber air bawah dan permukaan tanah. Penggunaan teknik ini juga telah membantu meningkatkan pengurusan sumber air di banyak negara di seluruh dunia. Teknik penyurih dan teknik konvensional seperti geofizik digunakan bersama dalam kajian penyelidikan seperti eksplorasi tapak, hidrologi, kajian '*fingerprinting*', pengukuran aliran dan arah air tanah/permukaan, sedimentologi, pencemaran air tanah dan sebagainya. e-TAG mempunyai pakar dalam bidang geologi bertauliah yang diiktiraf oleh Lembaga Ahli Geologi Malaysia.

MAKMAL UTAMA e-TAG:

1. WDXRF (*Wavelength Dispersive X-ray Fluorescence*)
2. *Liquid Water Isotope Analyser* (LWIA)

PERKHIDMATAN e-TAG:

1. Kajian '*fingerprinting*' menggunakan teknik penyurih.
2. Kajian alam sekitar menggunakan teknik geofizik:
   i. *Electrical Resistivity Imaging* – khidmat penyiasatan geologi sub-permukaan, potensi serta pencemaran air tanah, penyiasatan awal penerokaan tanah/empangan.
   ii. Seismik - kaedah penerokaan geofizik menggunakan prinsip seismologi untuk menganggarkan sifat-sifat bawah permukaan bumi daripada gelombang seismik yang dipantulkan.
3. Pengukuran aliran dan arah air tanah/permukaan (kadar aliran & halaju)
4. Kajian resapan/kebocoran.
5. Kajian punca bahan cemar di sekitaran.
6. Analisis isotop stabil 2H, 17O & 18O (cecair).
7. Penentuan elemen yang terkandung dalam unsur (cecair @ pepejal).





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ENVIRONMENTAL TRACER APPLICATION GROUP (E-TAG)

The e-TAG (Environmental Tracer Application Group) service centre provides research services pertaining to nuclear technology supported by conventional techniques. Tracer techniques and applications for water management studies are only available in Malaysia. Using tracer and stable isotope techniques in environmental studies helps manage and characterise groundwater and surface water resources. This technique has also helped improve water resource management in many countries. The tracer and geophysical methods are used together in research studies involving site exploration, hydrology, fingerprinting studies, groundwater and surface water flow and direction measurement, sedimentology, and groundwater pollution. Our service centre employs a geology expert certified by the Board of Geologist Malaysia.

e-TAG MAIN LABORATORIES:

1. *Wavelength Dispersive X-ray (WDXRF)*
2. *Liquid Water Isotope Analyser (LWIA)*

e-TAG SERVICES:

1. *Fingerprinting study using tracer technique*
2. *Environmental studies using the Geophysical method:*
   i. *Electrical Resistivity Imaging – sub-surface geological investigation, groundwater potential/pollution, geological preliminary study (site/dam etc.)*
   ii. *Seismic - geophysical exploration methods using seismological principles to estimate the properties of the earth's subsurface from reflected seismic waves*
3. *Measurement of groundwater/surface water flow and direction (flow rate and velocity)*
4. *Seepage/leakage studies*
5. *Study the causes of pollutants in the environment*
6. *Stable isotope analysis 2H, 17O & 18O (liquid)*
7. *Elemental analysis of substances (liquid or solid)*





NUKLEAR MALAYSIA

MAKMAL RADIOKIMIA DAN ALAM SEKITAR (RAS)

Makmal Radiokimia dan Alam Sekitar (RAS) menyediakan perkhidmatan radioanalisis untuk keperluan agensi kerajaan dan swasta. Makmal RAS mengamalkan QA/QC dan mempunyai prosedur pengurusannya sendiri yang telah ditauliah dengan MS ISO/IEC 17025: 2017 sejak Disember 2005 oleh Jabatan Standard Malaysia bagi skop analisis keradioaktifan gama.

Makmal RAS merupakan makmal kebangsaan yang diluluskan dan diiktiraf oleh Kementerian Kesihatan Malaysia (KKM) untuk melakukan analisis pengukuran keradioaktifan dalam sampel makanan untuk tujuan eksport dan air mineral serta air minuman berbungkus sebagai sebahagian daripada syarat perlesenan KKM.

PERKHIDMATAN RAS:

1. Pengukuran pemancar gama dalam sampel makanan
2. Pengukuran pemancar gama dalam sampel alam sekitar/industri
3. Pengukuran Am-241 dalam pengesan asap
4. Pengukuran gross alfa/beta dalam pelbagai sampel
5. Pengukuran gross alfa/beta dalam *air borne/particulate*', penapis dan '*smear test*'
6. Pengukuran Po-210/Pb-210 dalam pelbagai sampel
7. Pengukuran U-234, U-235 dan U-238 dalam pelbagai sampel
8. Pengukuran Th-228, Th-230 dan Th-232 dalam pelbagai sampel
9. Pengukuran Pu-239+240 dalam pelbagai sampel
10. Pengukuran H-3 dalam air/ais
11. Pengukuran Sr-90 dalam pelbagai sampel

PERALATAN UTAMA:

1. Sistem Spektrometri Gama
2. Sistem Pembilang Gros Alfa/Gros Beta
3. Sistem Spektrometri Alfa
4. Sistem Pembilang Sintilasi Cecair



STANDARDS MALAYSIA

Certificate of Accreditation

RADIOCHEMISTRY AND ENVIRONMENT LABORATORY (RAS)
MALAYSIAN NUCLEAR AGENCY (NUCLEAR MALAYSIA)
KAJANG, SELANGOR
MALAYSIA

Sijil Akreditasi MS ISO/IEC 17025:2017

MS ISO/IEC 17025:2017 Accreditation Certificate







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RADIOCHEMISTRY AND ENVIRONMENT LABORATORY (RAS)

Radiochemistry and Environment Laboratory (RAS) offers internal and external clients radiochemical analysis services. RAS laboratory practices its own QA/QC and management procedures. It has been accredited with MS ISO/IEC 17025:2017 since 2005 by the Department of Standards Malaysia for gamma radioactivity analysis scope.

RAS laboratory is a national laboratory approved by the Malaysian Ministry of Health (MOH) to conduct radioactivity measurement analysis samples for export purposes and mineral water as well as bottled drinking water as part of the MOH's licensing requirement.

RAS SERVICES:

1. *Measurement of gamma emitters in food samples*
2. *Measurement of gamma emitters in environmental/industrial samples*
3. *Measurement of Am-241 in smoke detector*
4. *Measurement of gross alpha/beta in various samples*
5. *Measurement of gross alpha/beta in airborne/ particulate, filter, and smear test*
6. *Measurement of Po-210 / Pb-210 in various samples*
7. *Measurement of U-234, U-235 and U-238 in various samples*
8. *Measurement of Th-228, Th-230 and Th-232 in various samples*
9. *Measurement of Pu-239+240 in various samples*
10. *Measurement of H-3 in water/ice*
11. *Measurement of Sr-90 in various samples*

MAIN INSTRUMENT:

1. *Gamma Spectrometry System*
2. *Gross Alpha/Gross Beta Counting System*
3. *Alpha Spectrometry System*
4. *Liquid Scintillation Counter*







NUKLEAR MALAYSIA

KUMPULAN *NON-IONIZING RADIATION* (NIR)

Sinaran Tidak Mengion (NIR) adalah radiasi bertenaga rendah, di mana spektrumnya meliputi radiasi frekuensi lampau rendah (*Extremely Low Frequency* - ELF), frekuensi radio (RF), sinaran inframerah, cahaya nampak, laser (*Light Amplification by Stimulated Emission of Radiation*) dan ultra-ungu (UV).

Kumpulan NIR bertanggungjawab untuk menyediakan khidmat sokongan teknikal dan kepakaran berkaitan NIR kepada sektor industri, agensi-agensi kerajaan dan orang awam. Kumpulan NIR juga menawarkan penilaian keselamatan, khidmat nasihat, kursus, latihan dan perkhidmatan dalam Sinaran Tidak Mengion (NIR) dari julat ELF sehingga UV.

Kumpulan NIR telah diakreditasikan dengan MS ISO/IEC 17020 untuk Penilaian Keselamatan Frekuensi Radio (RF).

KEMUDAHAN MAKMAL:

1. Makmal Frekuensi Radio (RF) & Gelombang Mikro
2. Makmal Frekuensi Lampau Rendah (ELF)
3. Makmal *Ultraviolet* & LASER

PERKHIDMATAN NIR:

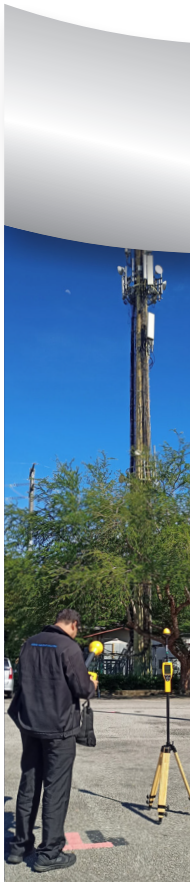
1. Penilaian Keselamatan Sinaran Tidak Mengion (NIR) meliputi ELF, RF, LASER & UV.
2. Penilaian Keselamatan Sinaran Tidak Mengion (ELF, RF, LASER & UV) Barangan Pengguna.
3. Projek Kerjasama dengan Syarikat dalam Bidang Keselamatan NIR.
4. Program Kesedaran Awam & Pembangunan kapasiti.


STANDARDS MALAYSIA

Certificate of Accreditation

Sijil Akreditasi MS ISO/IEC 17020

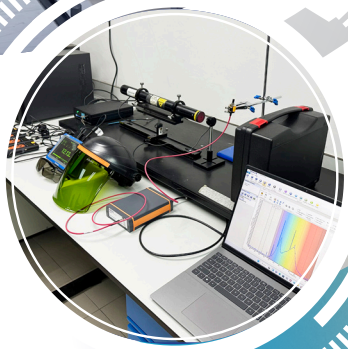
MS ISO/IEC 17020 Accreditation Certificate













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NON-IONISING RADIATION LABORATORY (NIR)

Non-Ionising Radiation (NIR) is a low-energy radiation, in which the spectrum covers the Extremely Low Frequency (ELF) radiation, Radio Frequency (RF), Infrared, Visible Light, LASER (Light Amplification by Stimulated Emission of Radiation) and Ultraviolet (UV).

NIR Group provides NIR-related technical support services and expertise to industries, government agencies, and the public. The NIR Group also offers technical safety assessments, consultation services, training, courses and services in Non-Ionizing Radiation within the ELF to UV range.

The NIR group has been accredited with the MS ISO/IEC 17020 for Radio Frequency safety assessment.

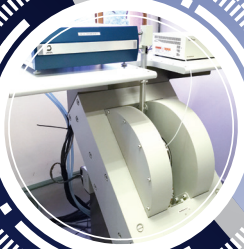
LABORATORY FACILITIES:

1. *Radiofrequency & Microwave (RF & MW) Lab*
2. *Extremely Low Frequency (ELF) Lab*
3. *Ultraviolet & LASER Lab*

NIR SERVICES:

1. *NIR Safety Assessment comprised of ELF, RF, LASER and UV.*
2. *NIR safety assessment (ELF, RF, LASER and UV) on consumer products.*
3. *Collaboration Projects with companies in the field of Non-Ionizing Radiation (NIR).*
4. *Public Awareness Program and Capacity Building.*







NUKLEAR MALAYSIA

MAKMAL TEKNOLOGI SINARAN (MTS)

Makmal Teknologi Sinaran (MTS) merupakan makmal yang menawarkan kaedah analisia yang boleh dipercayai bagi pencirian bahan dan getah kepada pengguna akademik dan industri. Makmal ini dilengkapi dengan peralatan termoden bagi kerja-kerja pencirian bahan termasuk kajian sifat terma, sifat kimia, sifat fizik dan sifat mekanik. Makmal ini juga menawarkan perkhidmatan rundingan bagi penyediaan sampel penyelidikan berasaskan adunan polimer, sintesis produk baharu, penyediaan bahan nano dan demonstrasi kaedah penggunaan sinaran bagi tujuan modifikasi bahan.

PERKHIDMATAN MTS

1. **Khidmat sewaan alat bagi penyediaan sampel berasaskan polimer**
   - Mesin Pengadun/ Pemampat/ Penyemperit/ Pengacuan/ Tangki Pencampur biopolimer/ Reaktor sintesis resin
2. **Khidmat Pencirian Sifat Kimia Bahan**
   - Spektroskopi Infra-Merah Transformasi Fourier (FTIR)/ Resonan Putaran Elektron (ESR)
3. **Khidmat Pencirian Sifat Terma Bahan**
   - Analisa Termogravimetri (TGA) / Analisa Kalorimetri Pengimbas Perbezaan (DSC)
4. **Khidmat Pencirian Sifat Fizikal dan Mekanikal Bahan**
   - Analisa Reologi/ Kelikatan/ Daya lebur/ Kekerasan Bahan/ Regangan/ Mampatan/ Lenturan/ Hentaman/ Mekanik-Dinamik/ Medan Magnet Bergetar (VSM)/ Pembelauan Sinar-X (XRD)
5. **Khidmat Pencirian Morfologi dan Permukaan Sampel Bahan**
   - Analisa Sudut Sesentuh Optikal/ Keporosan Permukaan/ Mikroskopi Daya Atom (AFM)
6. **Khidmat Pencirian Sifat Keterlarutan Cecair**
   - Analisa Berat Molekul Polimer (GPC-MALLS)/ Daya keupayaan zeta/ Taburan saiz partikel
7. **Khidmat Analisa Kegagalan Bahan (Polimer/Getah)**
8. **Khidmat Rundingan bagi Teknik Penghasilan Polimer dan Teknik Penghasilan Bahan menggunakan Sinaran**







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RADIATION TECHNOLOGY LABORATORY (MTS)

Radiation Technology Laboratory (MTS) is a laboratory that offers reliable analytical methods for polymer and rubber characterization to academician and industrial players. It is equipped with modern analytical equipment for characterization work that include thermal, chemical, physical and mechanical properties. It also offers consultation services for polymer-based sample preparation including blending, polymer synthesis, nanomaterial preparation, and demonstration of radiation processing techniques for material modification.

MTS SERVICES:

1. ***Equipment Rental for Polymer-based Sample Preparation***
   - *Internal Mixer/ Blending Machine/ Hot-press/ Extruder / Injection moulding/ Biopolymer Mixing/ Resin Synthesis Reactor*
2. ***Analysis of Chemical Properties***
   - *Fourier Transform Infrared (FTIR)/ Electron Spinning Resonance (ESR)*
3. ***Thermal Properties Identification***
   - *Thermogravimetry Analyzer (TGA)/ Differential Scanning Calorimetry (DSC)*
4. ***Physical and Mechanical Properties Identification***
   - *Rheology / Viscosity / Melt-flow/ Hardness / Surface Hardness/ Tensile/ Compression/ Flexural/ Impact Strength test/ Dynamic Mechanical Analyzer (DMA)/ Vibrating-Sample Magnetometer (VSM)/ X-Ray Diffraction (XRD)*
5. ***Surface and Morphological Analysis***
   - *Optical Contact Angle with topography/ Surface Analyzer BET (mesopore/ micropore)/ Atomic Force Microscopy (AFM)*
6. ***Dilute Solution Properties Identification***
   - *Molecular Weight Analysis (GPC-MALLS)/ Zeta Potential/ Particle Size Distribution*
7. ***Polymer/Rubber Failure Analysis Services***
8. ***Consultation Service for Polymer Processing and Radiation Processing Technique***







NUKLEAR MALAYSIA

MAKMAL APLIKASI KIMIA ANALISIS (ACA)

Seiring dengan Pelan Strategik BAS 2017-2030, iaitu **"Menyediakan Perkhidmatan Analisis Kimia yang Cemerlang, Cekap, dan Berkualiti kepada Pelanggan Dalam dan Luar Agensi Nuklear Malaysia"**, Makmal Aplikasi Kimia Analisis (ACA) dilengkapi dengan kemudahan instrumentasi analisis dan berkeupayaan dalam menyediakan perkhidmatan analisis unsur untuk pelbagai jenis sampel (alam sekitar, produk, makanan dll) kepada sektor awam dan swasta. Makmal ACA juga turut menyediakan kemudahan latihan dan panduan kepada pelajar universiti dalam mengendalikan peralatan analisis. Makmal ini mengaplikasikan kawalan kualiti dan amalan jaminan kualiti yang baik bagi memberikan output berkualiti tinggi dan ianya memenuhi piawaian antarabangsa.

PERKHIDMATAN ACA:

1. **Analisis Pengaktifan Neutron (APN)**
   Merupakan analisis teknik nuklear dan dikategorikan sebagai ujian tanpa musnah, APN mampu mengesan dan mengukur lebih 30 unsur termasuk logam nadir bumi.

2. **Analisis Spektrometri Jisim Plasma Gandingan Aruhan (ICP-MS)**
   Teknik ICP-MS boleh mengesan dan mengukur pelbagai unsur logam berat dan unsur surih dalam pelbagai jenis sampel pelanggan dalam kepekatan yang rendah (ppb).

3. **Analisis Spektrometri Penyerapan Atom (AAS)**
   Teknik AAS boleh mengesan dan mengukur pelbagai unsur logam berat seperti Al, Ca, Cu, Fe, Mg, Na, Pb dan Zn dalam kepekatan yang tinggi (ppm).

4. **Analisis Pengukur Unsur CHNS**
   CHNS mampu menentukan unsur karbon, hidrogen, nitrogen dan sulfur daripada pelbagai jenis sampel seperti tanah, tumbuh-tumbuhan, arang batu dan minyak.

5. **Analisis Ion Kromatografi (IC)**
   Teknik IC membolehkan penentuan spesies ion (anion dan kation) bukan organik dan organik, dalam kepekatan sekitar 0.50 ppm.









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ANALYTICAL CHEMISTRY APPLICATION LABORATORY (ACA)

*In a line with the **BAS Strategic Plan 2017-2030,** which is "**Providing Excellent, Efficient, and Quality Chemical Analysis Services to Customers Inside and Outside the Malaysian Nuclear Agency**", the ACA laboratory is equipped with analytical instrumentation facilities and capable of providing elemental analysis services for various types of samples (environment, products and food) to the public and private sectors. The ACA laboratory also provides training facilities and guidance to university students in operating analytical equipment. The laboratory applies reasonable quality control and quality assurance practices to practices to deliver high-quality output and meets international standards.*

ACA SERVICES:

1. **Analysis of Neutron Activation Analysis (NAA)**
   an analysis of nuclear techniques and categorised as non-destructive testing, NAA can detect and measure more than 30 elements including rare earth elements (REEs).
2. **Analysis of Inductively Coupled Plasma Mass Spectrometry (ICP-MS)**
   The ICP-MS technique can detect and measure heavy metals and trace elements in various types of samples in low concentrations (ppb).
3. **Analysis of Atomic Absorption Spectrometry (AAS)**
   AAS technique can detect and measure of heavy metal elements such as Al, Ca, Cu, Fe, Mg, Na, Pb and Zn in high concentration (ppm).
4. **Analysis of CHNS Analyser**
   CHNS can determine the elements carbon, hydrogen, nitrogen and sulphur from various types of samples such as soil, plants, coal and oil.
5. **Analysis of Ion Chromatography (IC)**
   The IC technique allows the determination of non-organic and organic ionic species (anions and cations), in a concentration of about 0.50 ppm.



NUKLEAR MALAYSIA

KUMPULAN FIZIK KESIHATAN (KFK)

Kumpulan Fizik Kesihatan (KFK) menyediakan khidmat kepakaran pemantauan dan analisis dalam bidang keselamatan sinaran dan nuklear.

Kepakaran kami juga merangkumi bidang keselamatan radiologi dan keselamatan alam sekitar. Misi kami adalah untuk memastikan tempat kerja selamat dan sihat kepada pekerja, orang awam dan alam sekitar.

PERKHIDMATAN KFK :

1. Khidmat Ujian Kebocoran Bahan Radioaktif Terkedap
2. Khidmat Perundingan Radiologi
3. Pemantauan Radiologi Industri
4. Pemantauan Radiologi Alam Sekitar
5. Pemantauan Aras Cemaran
6. Sewaan Alat Meter Tinjau



Ujian kebocoran punca terkedap
Leak test for sealed radioactive source



Persampelan sampel alam sekitar debu udara dan radon
Environmental sampling for air particulate and radon







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HEALTH PHYSICS GROUP (KFK)

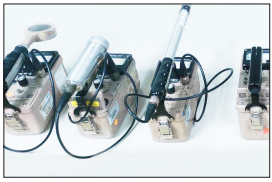
Health Physics Group (KFK) provides expert services in monitoring and analysis of radiation and nuclear safety.

Our expertise includes radiological and environmental safety. Our mission is to ensure a safe and healthy workplace for employees, the public and the environment.

KFK SERVICES:

1. *Leak test for Sealed Radioactive Sources*
2. *Radiological Consultation*
3. *Industrial Radiological Monitoring*
4. *Environmental Radiological Monitoring*
5. *Radiation Screening*
6. *Survey Meter Rental*











NUKLEAR MALAYSIA

KUMPULAN *MATERIAL STRUCTURAL INTEGRITY* (MSI-NDT)

Pusat Khidmat Kumpulan *Material Structural Integrity* (MSI-NDT) menawarkan servis dan perundingan berkaitan keutuhan struktur menggunakan teknik Ujian Tanpa Musnah (NDT) untuk bahan metalik dan bukan metalik, khusus untuk industri kejuruteraan awam, perkapalan dan juga minyak/gas. Pengujian biasanya terdiri daripada pengambilan sampel ataupun pengujian dijalankan secara in-situ di lapangan.

Teknik NDT yang digunakan bergantung kepada keperluan kerja sama ada memerlukan sumber radioaktif ataupun tidak.

PERKHIDMATAN MSI-NDT:

1. NDT untuk kejuruteraan awam (bangunan, jambatan, terowong, empangan).
2. Pengesanan objek bawah tanah (kebocoran paip, lapisan tanah, harta karun, pemetaan).
3. Mengenalpasti ketidak selanjaran material (permukaan kapal, kualiti kimpalan, tangki simpanan, keadaan dalaman objek).
4. Infrastruktur pengujian kualiti kimpalan spesifik untuk '*crawler*' untuk industri minyak/gas
5. Infrastruktur latihan untuk pengujian '*underwater ultrasonic*'.
6. Infrastruktur latihan untuk ground penetrating radar.
7. Infrastuktur Pusat Kecemerlangan Aliran (pergerakan cecair dalam paip industri).







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MATERIAL STRUCTURAL INTEGRITY GROUP (MSI-NDT)

The Material Structural Integrity Group Service Center (MSI-NDT) provides services and consultations on structural integrity using Non-Destructive Testing (NDT) methods for metallic and non-metallic materials for the civil engineering, shipping, and oil/gas industries. Typically, testing involves taking samples or conducting tests on-site.

The NDT technique depends on the client's needs and whether it requires a radioactive source.

MSI-NDT SERVICES:

1. *Non-Destructive Testing for Civil Engineering (buildings, bridges, tunnels, dams).*
2. *Detection of underground objects (pipe leaks, soil layers, treasures, mapping).*
3. *Identify material discontinuities (ship surface, welding quality, storage tanks, internal condition of objects).*
4. *Specific welding quality testing infrastructure for 'crawlers' for the oil/gas industry.*
5. *Training infrastructure for 'underwater ultrasonic' testing.*
6. *Training infrastructure for ground-penetrating radar.*
7. *Flow Centre of Excellence Infrastructure (fluid movement in industrial pipes).*







NUKLEAR MALAYSIA

KUMPULAN TEKNOLOGI UJIAN TANPA MUSNAH TERMAJU (LENDT)

Kumpulan Teknologi Ujian Tanpa Musnah Termaju (LENDT) menawarkan khidmat kepakaran, sokongan teknikal dan kemudahan Ujian Tanpa Musnah (NDT) Termaju kepada industri untuk menilai integriti dan kualiti bahan, komponen atau struktur. Antara teknologi yang digunakan ialah *Radiographic Testing - Digital* (RT-D), *Phased Array Ultrasonic Testing* (PAUT) dan *Infrared Thermography Testing* (IRT).

LENDT juga menawarkan penilaian keselamatan, khidmat nasihat, kursus, latihan dan perkhidmatan dalam Ujian Tanpa Musnah Termaju.

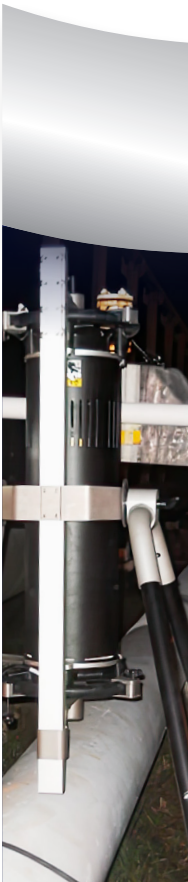
LENDT telah dilantik sebagai pusat kerjasama untuk penyelidikan, latihan dan pembangunan dalam NDT Termaju oleh Agensi Tenaga Atom Antarabangsa (IAEA).

3 MAKMAL UTAMA LENDT:

1. *Radiographic Testing- Digital* (RT-D)
2. *Phased Array Ultrasonic Testing* (PAUT)
3. *Infrared Thermography Testing* (IRT)

PERKHIDMATAN LENDT:

1. Khidmat nasihat melaksanakan ujian radiografi (filem dan digital).
2. Pembangunan prosedur NDT untuk ujian radiografi (filem dan digital) dan PAUT berasaskan keperluan kod, piawaian, atau spesifikasi.
3. Pemeriksaan paip atau objek datar (plat) yang disambung melalui proses sekunder (kimpalan atau pateri).
4. Pengukuran baki ketebalan dinding paip atau lain-lain spesimen.
5. Latihan dan kursus untuk melaksanakan ujian PAUT dan radiografi digital (ISO 9712).
6. Pemeriksaan bangunan (keutuhan dinding, kebocoran bumbung dan lain-lain).
7. Pemeriksaan sistem pemasangan elektrik (MCB, LV *cable, transformer*).







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LEADING EDGE NON-DESTRUCTIVE TESTING TECHNOLOGY GROUP (LENDT)

The LENDT offers Advanced Non-Destructive Testing (NDT) services and facilities for assessing the integrity and quality of materials, components or structures. Among the technologies used are Radiographic Testing - Digital (RT-D), Phased Array Ultrasonic Testing (PAUT) and Infrared Thermography Testing (IRT).

The LENDT provides technical support services and expertise related to Advanced Non-Destructive Testing to the industrial sector in the field of Radiographic Testing - Digital (RT-D) and Phased Array Ultrasonic Testing (PAUT) and Infrared Thermography Testing (IRT). The LENDT Group also offers safety assessments, consultancy, courses, training and services in Advanced Non-Destructive Testing.

LENDT has been appointed as a collaboration centre for research, training and development in Advanced Non-Destructive Testing by the International Atomic Energy Agency (IAEA).

Three of LENDT main laboratories are:

1. *Radiographic Testing- Digital (RT-D)*
2. *Phased Array Ultrasonic Testing (PAUT)*
3. *Infrared Thermography Testing (IRT)*

LENDT SERVICES:

1. *Advisory services for performing radiographic tests (film and digital).*
2. *Development of NDT procedures for radiographic (film and digital) and PAUT testing based on code, standard, or specification requirements.*
3. *Inspect pipes or flat objects (plates) connected through secondary processes (welding or soldering).*
4. *Measurement of the remaining thickness of the pipe wall or other specimens.*
5. *PAUT and RT-D (ISO 9712) training and courses.*
6. *Building inspection (wall integrity, roof and leaks).*
7. *Inspect the electrical installation system (MCB, LV cable, transformer).*







NUKLEAR MALAYSIA

MAKMAL TEKNOLOGI AGRO & BIOSAINS (TAB)

Makmal Teknologi Agro dan Biosains (TAB) adalah pusat yang menawarkan pelbagai khidmat dalam bidang agroteknologi dan biosains. Dengan kepakaran dan kemudahan yang ada di TAB, pelanggan boleh terus memohon untuk mendapatkan khidmat yang disediakan ataupun hadir untuk perbincangan terlebih dahulu bagi mendapatkan pandangan dan khidmat nasihat daripada pakar dalam bidang tersebut.

PERKHIDMATAN TAB:

1. Analisa pengesanan makanan diiradiasi menggunakan teknik *Photostimulated Luminescence* (PSL) – Kaedah "*screening* PSL".
2. Khidmat Analisis isotop stabil.
3. Khidmat penyinaran menggunakan kebuk gama Biobeam GM8000.
4. Khidmat penyinaran rumah hijau gama (GGH).
5. Khidmat perundingan untuk pengeluaran komersial anak benih kultur tisu tanaman.
6. Kursus dan amali sangkutan (teori dan amali) kultur tisu tanaman (1 bulan).
7. Penyaringan mikrob berfaedah / pengiraan bakteria.
8. Benih kultur pemula pisang.
9. Benih kultur tisu pisang.
10. Latihan Intensif Penyediaan Benih Cendawan.







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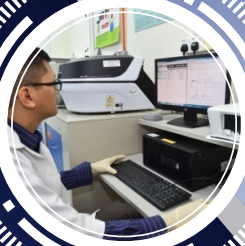
THE AGROTECHNOLOGY AND BIOSCIENCE LABORATORY (TAB)

The Agrotechnology and Biosciences Laboratory (TAB) is a service centre in the Agrotechnology and Biosciences Division of Nuklear Malaysia that offers various services in agrotechnology and bioscience. Clients are welcome to contact us for consultations with our experts before engaging our services.

TAB SERVICES:

1. *Detection of irradiated food using the Photostimulated Luminescence (PSL) technique - "PSL screening" method.*
2. *Stable isotope analysis.*
3. *Biobeam GM8000 gamma cell irradiation.*
4. *Gamma Greenhouse irradiation (GGH).*
5. *Consultancy services for the commercial production of plant tissue culture seedlings.*
6. *Course and practical application (theory and practice) of plant tissue culture (1 month).*
7. *Beneficial microbe screening / bacterial count.*
8. *Banana starter culture seedlings.*
9. *Banana tissue culture seedlings.*
10. *Intensive Training on mushroom seed preparation.*





NUKLEAR MALAYSIA

KUMPULAN TEKNOLOGI BAHAN (MTEG)

Pusat Khidmat Kumpulan Teknologi Bahan (MTEG) menjalankan aktiviti R&D&I&C dalam bidang seramik, metalurgi, perlindungan kakisan, bahan nano, biomaterial, pelindung radiasi, kerosakan radiasi, bahan elektronik, mineral, sensor, pemeliharaan warisan, pemprosesan mineral dan instrumen nuklear serta pemodelan dan simulasi.

MTEG memperoleh kepercayaan yang baik dan pendekatan inovatif dalam melakukan pelbagai pencirian dan ujian terhadap sifat mekanikal, struktur mikro, morfologi, terma, fizikal dan kimia bahan dalam pelbagai keadaan. MTEG bukan sahaja mampu bertindak sebagai penyelesai masalah teknikal pelanggan dalam sains dan kejuruteraan bahan, malah ia juga merupakan pusat perkhidmatan sehenti yang menyediakan perkhidmatan pencirian bahan yang penting untuk kajian bahan, pembangunan dan pengkomersialan produk.

PERKHIDMATAN DAN PERALATAN MTEG:

1. Pendaflor Sinar-X (XRF)
2. Serakan Sinar-X Sudut Kecil (SAXS)
3. Spektrometer Pembelauan Sinar-X (XRD
4. Mikroskop Elektron Imbasan Pancaran Medan (FESEM)
5. Spektrometer Sinar-X Serakan Tenaga (EDX)
6. Mikroskop Daya Atom (AFM)
7. Spektrometer RAMAN
8. Spektrofotometer Ultralembayung/Nampak (UV-Vis)
9. Spektroskopi Spektrum Cahaya (*Photoluminescence*/PL)
10. Penganalisa Kakisan
11. Penganalisis Terma Serentak (STA)
12. Penganalisis Saiz Zarah (PSA)
13. *Universal Testing Machines* (UTM)





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MATERIAL TECHNOLOGY GROUP (MTEG)

The Materials Technology Group (MTEG) is a pioneering force in the innovative landscape of materials science and engineering, engaging in extensive Research, Development, Innovation, and Consultation (R&D&I&C) activities. MTEG delves into various domains, including ceramics, metallurgy, corrosion protection, nanomaterials, biomaterials, radiation protection, electronic materials, minerals, sensors, heritage preservation, mineral processing, nuclear instruments, modelling, and simulation. Our commitment lies in exploring the frontiers of science shaping the future of materials technology.

MTEG specialises in characterising materials across various conditions, meticulously examining their mechanical, microstructural, morphological, thermal, physical, and chemical properties. Beyond assessment, MTEG is a solution hub addressing clients' technical challenges in materials science and engineering. We pride ourselves on being a one-stop service centre, offering comprehensive material characterization services for materials research, product development, and commercialization endeavours.

MTEG EQUIPMENT AND SERVICES:

1. *X-Ray Pendaflor (XRF) Small-Angle X-Ray*
2. *Scattering (SAXS)*
3. *X-Ray Diffraction Spectrometer (XRD)*
4. *Field Emission Scanning Electron Microscope (FESEM)*
5. *Energy Dispersive X-Ray Spectrometer (EDX)*
6. *Atomic Force Microscope (AFM)*
7. *RAMAN spectrometer*
8. *Ultraviolet/Visible Spectrophotometer (UV-Vis)*
9. *Light Spectrum Spectroscopy (Photoluminescence/PL)*
10. *Corrosion analyzer*
11. *Simultaneous Thermal Analyzer (STA*
12. *)Particle Size Analyzer (PSA)*
13. *Universal Testing Machines (UTM)*







NUKLEAR MALAYSIA

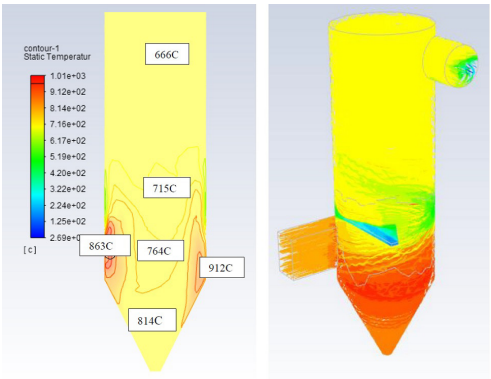
KUMPULAN TEKNOLOGI PENILAIAN LOJI (PAT)

Kumpulan Teknologi Penilaian Loji (PAT) menyediakan perkhidmatan di lapangan antaranya mengimbas loji dan paip menggunakan sinar gama, menentukan aras antara bahan menggunakan neutron serta menggunakan teknik penyurih industri bagi loji petrokimia, kemudahan industri, loji rawatan air dan kemudahan lain.

PAT juga memiliki makmal sinar-X dan Gamma Tomografi Berkomputer yang menawarkan perkhidmatan imbasan sampel menggunakan sinar-X.

PERKHIDMATAN PAT:

1. Imbasan Turus
2. Imbasan Paip
3. Teknologi Penyurih bagi Industri
4. Pengesanan Kelembapan di Bawah Penebat (MUI)
5. Pengesanan Kakisan di Bawah Penebat (CUI)
6. Imbasan Paras Teknik Serak Balik Neutron (NBT)
7. *Computional Fluid Dynamics* (CFD) ANSYS
8. X-ray Tomografi Berkomputer
9. X-ray Mikro Tomografi Berkomputer



Paparan keputusan CFD
Result from CFD









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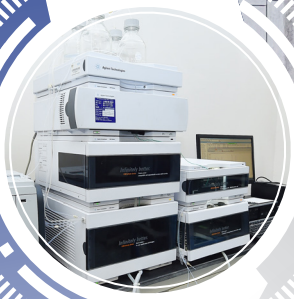
PLANT ASSESSMENT TECHNOLOGY GROUP (PAT)

The Plant Assessment Technology Group (PAT) provides field services encompassing scanning and investigating plants and pipes using gamma ray, determining interface levels and moisture under pipe insulation using neutron back scattered technique and industrial tracer technique to determine the performance or abnormality at the petrochemical plants, industrial facilities, water treatment plants and other facilities.

The Plant Assessment Technology Group (PAT) also has an X-ray and Gamma Computed Tomography laboratory that offering the X-ray sample scanning services.

PAT SERVICES:

1. *Column Scanning*
2. *Pipe Scanning (Pipe Scanning)*
3. *Industrial Tracer Technology*
4. *Moisture Under Insulation Detection (MUI)*
5. *Corrosion Under Insulation Detection (CUI)*
6. *Neutron Backscatter Technique (NBT) Level Scan*
7. *Computational Fluid Dynamics (CFD) ANSYS*
8. *X-ray Computed Tomography*
9. *X-ray Micro Computed Tomography*







NUKLEAR MALAYSIA

PUSAT KHIDMAT BEKALAN RADIOISOTOP (BRI)

Pusat Khidmat Bekalan Radioisotop (BRI) terdiri daripada 2 makmal iaitu;

1. Makmal Pengeluaran Radioisotop yang dilengkapi dengan kemudahan pengeluaran radioisotop bertanggungjawab bagi perkhidmatan pengeluaran radioisotop untuk kegunaan perubatan nuklear dan industri.
2. Makmal Khidmat Analisis Farmaseutikal yang dilengkapi dengan peralatan-peralatan saintifik bertanggungjawab menawarkan pelbagai khidmat analisis dalam industri farmaseutikal dan herba.

PERKHIDMATAN DAN MAKMAL BRI:

Makmal Pengeluaran Radioisotop:

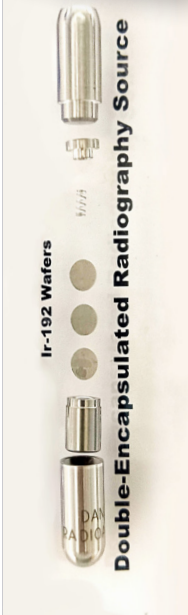
1. Menawarkan kepakaran dalam pemasangan punca terkedap Iridium-192 (Ir-192) yang digunapakai dalam sektor industri bagi ujian tanpa musnah.



Sijil makmal berstatus BioNexus Partner (BNP)
BioNexus Partner (BNP) laboratory status certificate

Makmal Khidmat Analisis Farmaseutikal:

1. Analisis LCMS/MS *Triple* ToF
2. Penyaringan Fitokimia
3. Ujian Radikal Bebas
4. Ujian Toksisiti Embrio Ikan (FETT)
5. Ujian Toksisiti Anak Udang (BSLA)
6. Analisis UHPLC
7. Assai Apoptosis
8. Ujian Perembesan Insulin
9. Assai Toksisiti Sel (MTT)
10. Assai Jumlah Fenolik









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RADIOISOTOPE SUPPLY SERVICE CENTRE (BRI)

Radioisotope Supply Service Centre (BRI) consists of two laboratories, namely:

1. *Radioisotope Production Laboratory, which equipped with radioisotope production facilities, is responsible for radioisotope production services for nuclear medicine and industrial applications.*
2. *The Pharmaceutical Analysis Services Laboratory, which equipped with scientific equipment, is responsible for offering various analytical services in the pharmaceutical and herbal industries.*

BRI LABORATORIES AND SERVICES:

Production Radioisotope Laboratory:

1. *Provides expertise in the installation of Iridium-192 (Ir-192) sealed sources used in the industrial sector for non-destructive testing*

Pharmaceutical Service Analysis Laboratory:

1. *LCMS/MS Triple ToF Analysis*
2. *Phytochemical Screening*
3. *Free Radical Scavenging (DPPH) Assay*
4. *Fish Embryo Toxicity Test (FETT)*
5. *Brine Shrimp Lethality Assay (BSLA*
6. *UHPLC Analysis*
7. *Apoptosis Assay*
8. *Insulin Secretion Assay*
9. *Cell Viability (MTT) Assay*
10. *Total Phenolic Content Analysis*







NUKLEAR MALAYSIA

MAKMAL FIZIK PERUBATAN (MPL)

Makmal Fizik Perubatan (MPL) dipertanggungjawabkan memberi perkhidmatan untuk tujuan perundingan bagi aktiviti pengujian dan pengesahan (ujian kawalan mutu) radas penyinaran perubatan serta kemudahan berkaitan, pengujian dan pengesahan penentuan ketebalan plumbum bagi perisaian bilik X-ray perubatan dan bilik-bilik berkaitan serta pengujian kemudahan berkaitan penentukuran dos perubatan nuklear di seluruh Malaysia. MPL juga merupakan satu-satunya makmal standard tentukuran radas ujian kawalan mutu (QC *test tools*) radiologi diagnostik di Malaysia dan Asia Tenggara yang mematuhi piawaian MS ISO/IEC 17025 dan ditauliah oleh Skim Akreditasi Makmal Malaysia (SAMM) semenjak tahun 2013. Selain itu, MPL juga ada menawarkan perkhidmatan ujian ketebalan kesetaraan plumbum sampel perisai perlindungan sinaran, ujian intergriti PPE, ujian serakan sinaran, tentukuran pembilang tiroid.

PERKHIDMATAN MPL:

1. **Perkhidmatan ujian kawalan mutu (QC) radas sinar-X diagnostik perubatan dan kemudahan berkaitan**
   i. Pengujian dan pengesahan dibawah skop lesen kelas H yang merangkumi modaliti sinar-X seperti sinar-X am, Pergigian, Angiografi, densitometer tulang, C-Arm, Fluoroskopi, Mamografi dan Pengimbas CT.
   ii. Pemeriksaan bilik gelap.
   iii. Ujian integriti peralatan perlindungan diri (PPE) sinar-X gred perubatan.
   iv. Ujian serakan radiasi.
2. **Perkhidmatan tentukuran peralatan ujian kawalan mutu (QC test tools) radiologi diagnostik**
   i. Tentukuran dosemeters dalam radiologi diagnostik untuk kualiti sinar-X RQR, RQA dan RQT yang mematuhi Standard IEC 61267 dan TRS 457 serta telah diiktiraf mengikut piawaian ISO / IEC 17025 oleh SAMM.
   ii. Tentukuran kualiti mammografi Mo/Mo.
   iii. Tentukuran meter kVp dan pemasa (*timer*).
   iv. Tentukuran densitometer dan sensitometer.
3. **Perkhidmatan Perlindungan sinaran**
   i. Ujian ketebalan kesetaraan plumbum (LET) bagi perisaian bilik sinar-X perubatan dan bilik-bilik berkaitan dibawah skop lesen kelas H KKM.
   ii. Ujian ketebalan kesetaraan plumbum sampel perisai perlindungan sinaran dan PPE.
   iii. Ujian integriti PPE.
   iv. Pengukuran dos pesakit (diagnostik).
   v. Pemonitoran perlindungan sinaran.
   vi. Perkhidmatan rundingan.
4. **Perkhidmatan tentukuran *dose calibrator* perubatan nuklear**
   i. Pengujian dan pengesahan dose calibrator perubatan nuklear. dibawah skop lesen kelas H KKM.
   ii. Perkhidmatan tentukuran pembilang tiroid.











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MEDICAL PHYSICS LABORATORY (MPL)

More than 20 years of experience, Malaysian Nuclear Agency is one of the Holders of Class H License for consultancy under the Atomic Energy Licensing Act 1984 (Act 304) for medical purposes administrated by the Malaysian Ministry of Health (MOH). The MPL is responsible for providing consultant services for testing and verification (quality control testing) of medical irradiation apparatus and related facilities, lead equivalent shielding thickness for medical X-ray rooms and related rooms and calibration of dose calibrators at nuclear medicine facilities in Malaysia. MPL is the only standard laboratory for the calibration of quality control test tools (QC test tools) for diagnostic radiology in Malaysia and Southeast Asia that complies with MS ISO/IEC 17025 standards and has been accredited by the Malaysian Laboratory Accreditation Scheme (SAMM) since 2013.

MPL SERVICES:

1. ***Diagnostic X-ray apparatus and related facilities***
   - i. *Testing and verification under the scope of the class H licensed which includes X-ray modalities such as general X-ray, Dental, Angiography, bone densitometer, C-Arm, Fluoroscopy, Mammography and CT Scanner.*
   - ii. *Darkroom inspection.*
   - iii. *Integrity testing for medical X-ray personal protective equipment (PPE).*
   - iv. *Scattered radiation testing*
2. ***Tools (QC Test Tools) In Diagnostic Radiology***
   - i. *Calibration of dosemeters in diagnostic radiology for RQR, RQA and RQT x-ray beam qualities according to Standards IEC 61267 and TRS 457 and complies with ISO / IEC 17025 standards recognised by SAMM.*
   - ii. *Calibration for Mo/Mo mammography beam quality.*
   - iii. *Calibration for kVp meter and timer.*
   - iv. *Calibration for densitometer and sensitometer.*
3. ***Radiation Protection Service***
   - i. *Lead equivalent thickness (LET) testing for medical X-ray shielded rooms and other related rooms under the scope of the MOH class H license.*
   - ii. *Lead equivalent thickness testing for samples and PPE.*
   - iii. *PPE integrity testing.*
   - iv. *Patient dose measurement (diagnostic).*
   - v. *Radiation protection monitoring.*
   - vi. *Consultant services*
4. ***Nuclear Medicine Dose Calibrator Calibration Service***
   - i. *Testing and verification of dose calibrators for nuclear medicine under the scope of the MOH class H license.*
   - ii. *Calibration service for thyroid counter.*







NUKLEAR MALAYSIA

MAKMAL STANDARD DOSIMETRI SEKUNDER (SSDL)

Makmal Standard Dosimetri Sekunder (SSDL) ditubuhkan pada tahun 1980 dan bertanggungjawab bagi menyedia, menjaga dan membangunkan piawaian bagi sinaran mengion di Malaysia untuk keperluan Akta Perlesenan Tenaga Atom 1984 (Akta 304), Peraturan-Peraturan Perlindungan Sinaran (Standard Keselamatan Asas) 1988 (pindaan 2010) yang merangkumi industri, perlindungan dan keselamatan sinaran, perubatan (radioterapi dan brakiterapi), pendidikan dan penyelidikan. SSDL pada tahun 2007 telah dilantik oleh Institut Metrologi Kebangsaan Malaysia (NMIM) sebagai 'institut bertanda' untuk pusat rujukan sinaran mengion kebangsaan. SSDL telah diakreditasi MS ISO/IEC 17025 sejak Julai 2004.

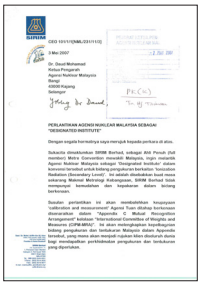
PERKHIDMATAN SSDL:

1. **Perkhidmatan Tentukuran**
   i. Tentukuran Meter Tinjau dan Dosimeter Aras Perlindungan.
   ii. Tentukuran Kebuk Pengionan Aras Perlindungan dan Aras Terapi.
   iii. Tentukuran Dosimeter Peribadi (Saku & Penggera).
2. **Pembekalan dan Penganalisaan Dosimeter Peribadi dan kawasan**
   i. Perkhidmatan TLD.
   ii. Perkhidmatan OSL.
3. **Perkhidmatan Dosimetri Aras Tinggi**
   i. Perkhidmatan dosimeter Ceric-Cerous.
   ii. Perkhidmatan Dosimeter *Fricke*.
   iii. Pemetaan dos loji penyinaran gama.



SAMM ISO\IEC 17025:2017

SAMM ISO\IEC 17025:2017

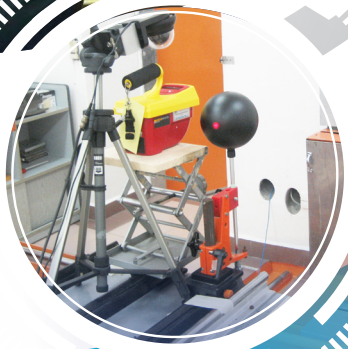


Pengiktirafan sebagai *Designated Institute*

Appointment as Designated Institute







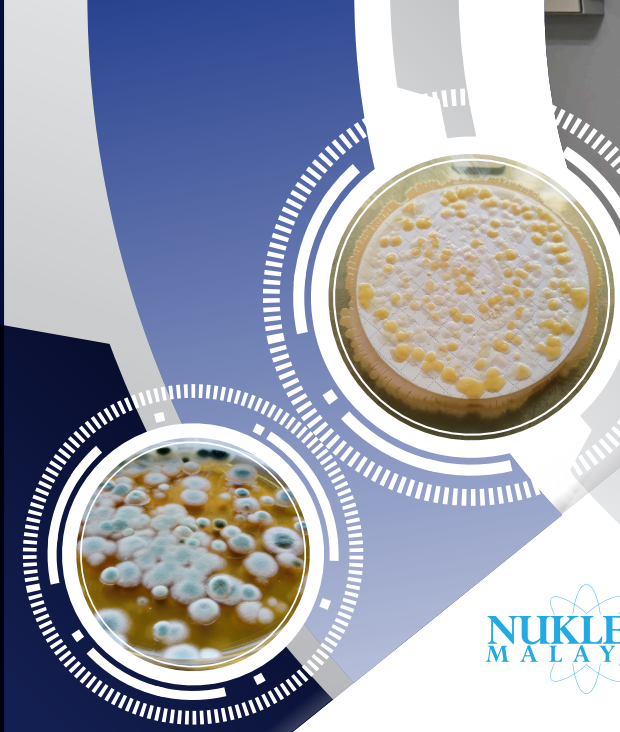
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SECONDARY STANDARD DOSIMETRY LABORATORY (SSDL)

SSDL was established in 1980 and has been tasked to prepare, maintain and develop ionising radiation standards in Malaysia for the requirements of the Atomic Energy Licensing Act 1984 (Act 304), the Radiation Protection Regulations (Basic Safety Standards) 1988 (amendment 2010), encompassing industry, radiation protection and safety, medicine (radiotherapy and brachytherapy), education and research. SSDL was appointed by the National Metrology Institute of Malaysia (NMIM) as a 'designated institute' for the National Ionising Radiation Reference Centre in 2007. SSDL's Calibration Laboratory has been accredited with the MS ISO/IEC 17025 standard since July 2004.

SSDL SERVICES:

1. ***Calibration Services***
   - *i. Calibration of Survey Meters and Dosimeters (Protection Level)*
   - *ii. Calibration of Ionization Chambers (Protection Level and Therapy Level)*
   - *iii. Calibration of Personal Dosimeter (Pocket & Alarm)*
2. ***Supply and evaluation of Personal and Area Dosimeter Services***
   - *i. TLD Service*
   - *ii. OSL Service*
3. ***High Dose Dosimetry Services***
   - *i. Ceric-cerous dosimeter service*
   - *ii. Fricke dosimeter service*
   - *iii. Gamma Plant Dose mapping*





NUKLEAR MALAYSIA

MAKMAL UJIAN BIOLOGI (BIOTEST/BIODOS)

Makmal Kawalan Mutu Mikrobiologi (BIOTEST) menawarkan khidmat ujian bagi memenuhi keperluan pengesahan kualiti ke atas produk untuk kegunaan perubatan seperti produk radiofarmaseutikal dan peranti perubatan.

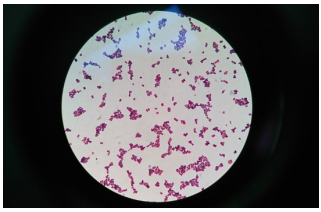
Makmal Biodosimetri (BIODOS) menawarkan khidmat ujian aberasi kromosom untuk menganalisa dos dedahan pekerja sinaran di Malaysia.

PERKHIDMATAN BIOTEST:

1. Ujian Kesterilan
2. Ujian Biobeban (bakteria atau fungus)
3. Ujian Had Endotoksin Bakteria (Kaedah Pembekuan Gel : Sensitiviti 0.125 IU)
4. Ujian Penggalakan Pertumbuhan
5. Pengeraman dan Pemantauan Sampel Plat Mikrobiologi
6. Pengeraman dan Pemantauan Sampel Media Fill dan Kesterilan
7. Validasi Ujian Kesterilan Menggunakan Mikroorganisma
8. Validasi Ujian Had Endotoksin Bakteria (Kaedah Pembekuan Gel : Sensitiviti 0.125 IU)

PERKHIDMATAN BIODOS:

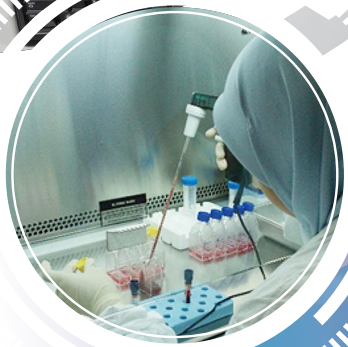
1. Ujian Aberasi Kromosom (Teknik Disentrik)
2. Penggunaan Alat Sistem Biodosimetri



Bakteria Gram Positif
Gram Positive Bacteria









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BIOLOGICAL TEST LABORATORY (BIOTEST/BIODOS)

Microbiology Quality Control Laboratory (BIOTEST) offers testing services to meet the quality assurance requirements of products for medical use such as radiopharmaceutical products and medical devices.

Biodosimetry Laboratory (BIODOS) offers chromosome aberration testing services to analyse the exposure dose of radiation workers in Malaysia.

BIOTEST SERVICES:

1. *Sterility Test.*
2. *Bioburden Test (bacteria or fungus).*
3. *Bacterial Endotoxin Limit Test (Gel Clot Method : Sensitivity 0.125 IU).*
4. *Growth Promotion Test.*
5. *Incubation and Monitoring on Microbiology Sample Plate.*
6. *Incubation and Monitoring on Media Fill and Sterile Test Sample.*
7. *Validation of Sterility Tests Using Microorganisms.*
8. *Validation of Bacterial Endotoxin Limit Test (Gel Clot Method : Sensitivity 0.125 IU).*

BIODOS SERVICES:

1. *Chromosome Aberration Test (Dicentric Technique)*
2. *Equipment Rental (Biodosimetry System)*

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Bahagian Teknologi Pemprosesan Sinaran (BTS)
Bahagian Agroteknologi Biosains (BAB)
Bahagian Teknologi Sisa & Alam Sekitar (BAS)
Bahagian Kejuruteraan (BKJ)
Bahagian Keselamatan & Kesihatan Sinaran (BKS)
Bahagian Sokongan Teknikal (BST)
Bahagian Perancangan & Hubungan Antarabangsa (BPA)
Bahagian Khidmat Pengurusan (BKP)
Bahagian Pembangunan Sumber Manusia (BSM)
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