

Anechoic Induction

Conditions of Use

| Date | Version | Comment | Reviewed By |
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Anechoic Chamber Induction

Overview

The Anechoic chamber is an RF test facility which utilises a lining of radio absorbing material (RAM) along its walls, ceiling and floor to create an electromagnetically quiet environment. Whilst the absorbing properties in the electromagnetic spectrum lie particularly in the 2GHz ~ 16GHz range, the material, being of foam like structure, is also highly absorbent of acoustic (eg voice) energy. These properties of the RAM create a safety consideration, as it may not be possible for a person inside the chamber to call for help, either using their mobile phone or by shouting, should an emergency arise or they become locked in. There are also additional safety considerations relating to the chambers enclosed construction, which, once the main door has been closed, may lead to feelings of claustrophobia given there are no windows or obvious exits. Resultantly under The University of Adelaide policies the anechoic chamber has officially been designated as a confined space. To help control access to this facility and to assist in control of some of the safety issues, a number of policies and guidelines have been defined in this document and are expected to be followed by all users who seek access to the chamber. Additionally, some of the outlined information is presented to maintain the technical aspects and properties of the chamber and the associated equipment, such that user activities are conducive to test measurement repeatability and general equipment care.

Bookings, Security & After Hours Use

Use of the chamber is strictly controlled via a booking process. To book the chamber or to check chamber availability please contact the responsible technical staff member:

Mr Pavel Simcik, Room N245, phone 8303 3161.
psimcik@eleceng.adelaide.edu.au

Once the booking has been confirmed and you are ready to use the chamber for your designated time slot, please make your way to the above named technical staff member.

Prior to your use of the chamber you will be issued with an activity card, an access card, and if this is your first time use of this facility an induction will be provided. The activity card, shown below, must be displayed behind the glass window in the door of the anechoic lab.

Anechoic Chamber in use - measurements in progress.
Please do not disturb!

The chamber is in use by:

Name: _____

Project: _____

Contact details - Phone: _____
e-mail: _____

Supervisor: _____

Activity description:

Start date: _____ Time: _____
End date: _____ Time: _____

If access to the chamber during this time is required by someone other than the above named person(s), please contact Pavel Simcik in room N245 or on ext 33161.

Security please note, measurements in the chamber are automated and may extend into periods after hours.

The purpose of the activity card is to give reason for people being in the lab, to indicate an activity is in progress, and to satisfy security requirements for after hours experiments whether they be autonomous or not.

The anechoic lab is under access card control rather than key control to limit entry into the lab by only the intended booked users. If you're planning to use the chamber with other project partners then you can request to be issued with up to three access cards. Please do not keep the lab door open, as this invites curious and unintended people, it also sets off an alarm in the security office causing security staff to unnecessarily investigate. The access cards are programmed to operate the lab door during normal hours only, 8:00am to 5:00pm Monday to Friday. Please make sure you have packed up and turned off your equipment well before the end of the day so that you aren't inadvertently locked out after 5:00pm.

After-hours use of the anechoic facility is strictly prohibited. The only exception to this rule is if the experiment is autonomous/unmanned, or if you have negotiated after hours access with the Operations Manager well before your scheduled booking. In either case, if experiments are to extend into after hours, then the technical staff member must be notified, otherwise all equipment will be turned off by the technical staff member at the end of the day. If you plan to negotiate after hours access, the Operations Manager may request that you fill out appropriate forms indicating the nature of your experiment, a risk assessment, and you may be required to have a working buddy. The Operations Manager is:

Mr Stephen Guest, Innova Bldg Room I3.18, phone 8303 5467.
stephen.guest@adelaide.edu.au

Chamber Door Operation

The anechoic chamber door illustrated in *figure 2* below needs special mention as serious bodily injury or equipment damage could result if not operated correctly. The chamber door is hung from a hinge and pulled up using a pulley system. The following points must be observed whenever the door is operated:

- Always use the controller only to operate the chamber door (*figure 3*).
- Never leave the door in mid position, or hanging solely from the pulley cable.
- Always allow the pulley to lift the door all the way up until the motor stops automatically.
- Always listen for an audible click when the door is fully lifted. If the click is not heard then the locking mechanism is not engaged, the door must never be left open in this condition. If unsure use the controller to lower the door and lift it again, if the problem persists leave the door in the fully closed position and seek assistance.
- Never leave objects in the door way when closing the door, eg network analyser.
- Never operate the door when somebody is standing underneath.
- Always exercise great care when engaging the pulley cable to the door, *figure 4*. Inspect the cable, hook, and attachment points for signs of fatigue or possible failure.

The chamber door has an emergency hatch installed as part of its construction. The purpose of this hatch is to allow for a secondary exit from the chamber should someone be inside and the main door fails to open. To operate the hatch from the outside simply pull at the handle, some force will be required as two RAM blocks are attached to the inside of the door with Velcro. If the hatch is to be operated from the inside, the two RAM blocks need to be pulled away first from the door and then the hatch door needs to be pushed outwards. The hatch is not to be used for routine access into the chamber but for emergency purposes only, the responsible technical staff member must be notified whenever the hatch door is operated.



Figure 2. The anechoic chamber door in its fully open position.



Figure 3. Door pulley controller



Figure 4. Pulley cable hook attachment to chamber door.

Whenever the chamber door is fully closed, a red light is illuminated in the corridor outside of the anechoic lab, the light is operated automatically. This safety mechanism aims to raise awareness of the use of the chamber particularly for the benefit of persons working inside with the door closed. The technical staff member will check the anechoic lab at the end of the day (5:00pm), and unless notified of scheduled after hours work/experiments, all equipment will be turned off, the anechoic chamber door will be opened, and the chamber inspected. The technical staff member will attempt to contact booked users before performing this shutdown and inspection. If after hours work has been scheduled the staff member will make contact before the days end with the users to make sure they are safe. Whether after hours access has been granted or experiments run autonomously after hours, it is in the users interest to make contact with the staff member and indicate their, or their experiments, status at the end of the day.



Figure 5. Chamber door closed indicator.

Radiation Hazards

Whilst there are numerous studies and arguments which draw links, or dismiss them, between RF radiation and health hazards, as a general rule it is preferred for the anechoic chamber door to be closed whenever RF transmissions are in progress. Persons are not allowed to be in the chamber whenever a transmitter is active.

There is also concern for the amount of transmitted power allowed in the chamber, since heating of the foam absorber needs to be considered. Too much power, or highly concentrated power could cause the foam to ignite. Power sourced from the network amplifier, or any of the amplifiers currently stocked in the lab are considered to not provide sufficient energy levels to cause a foam fire hazard. Amplifiers that are foreign to the equipment in the lab need to be declared prior to use.

Foam Storage and Handling

Blocks of RAM on the floor can be moved freely in and out of the chamber, particularly to gain access to the transmit and receive antenna structures. Racks outside of the chamber are provided for the storage of the RAM blocks, please use these as there are many more blocks than there is floor space outside of the chamber. The following points must be observed when moving these blocks around:

- Always handle RAM blocks by the base, never by the tips.
- Never place RAM blocks on top of one another, even if they are placed upside down on each other, doing so will cause the tips to become bent and break off.
- Always report all damage to the RAM, particularly if the tips have broken.
- Always wash your hands after handling the blocks and before eating, drinking or smoking. The RAM contains a high level of carbon which will dirty your hands. Digesting carbon can lead to health problems.

- Kicking the RAM blocks gently by the base to help them settle into position inside the chamber is permitted, please be gentle.
- Never attempt to extinguish a burning RAM block as the fumes are highly toxic. Evacuate the chamber and alert the fire wardens.

Air-conditioning is provided in the anechoic lab to primarily prevent deterioration of the foam due to heat stress. Please do not turn off the air-conditioning or otherwise alter the settings.

Connector and Equipment Care

Much of the equipment in the anechoic lab is expensive and needs to be treated with care and respect. The equipment is designed to give repeatable and reliable results, and is thus made from precision parts. Whilst the network analyser (NA) may be the more obvious expensive piece of equipment (>\$50000), items such as the cables, connectors, amplifiers and standard gain horns are also worth hundreds of dollars each. These items have been provided so you can obtain meaningful results, so it is your responsibility to treat these items properly. The following rules must be followed when using the relevant equipment:

Connectors:

- Always replace dust caps over unterminated connectors. Dust in a connector can render the connector and the measurement data useless. This includes the loose/inter-series connectors and the connectors on the NA, horns, amplifiers and cables.
- Always tighten N type connectors hand tight only!
- Always tighten SMA connectors using a torque wrench only! Over tightening any connector, especially an SMA, can cause the centre pin to be forced too far down the mating end resulting in permanent damage.
- Always turn only the freely moving barrel on the head of the connector and never the connector body itself. The mating faces of connectors must never be turned in respect to each other as scratches and scrapes will affect repeatability of measurement data and permanently deteriorate the connector itself.
- Never try to clean a connector with anything other than a lint free tissue dipped in IPA or compressed air.

Cables:

- Always replace dust caps on unconnected cables.
- Never bend a cable beyond its bending radius. Doing so will kink the cable and permanently reduce its specified operating characteristics. Consult the data sheet if you need to bend the cable beyond its natural flex.
- Never allow a cable to be strained, stressed, or pulled. Where appropriate support the cable.
- Never allow cables to lay across the floor, or in a manner which could result in trips or falls, or a cable being snagged, crushed, or pulled.

Connector and Equipment Care continued...

- Never store cables on hooks or in a manner where the majority of its length is unsupported. Preferably store cables on a flat surface like a table.
- Always use only flexible cables to connect to equipment. Rigid cables are not designed for repeated flexing.

Network analyser (NA):

- Only trained personnel are permitted to use the NA!
- Always use a torque wrench when connecting to the NA RF ports, and the calibration module!
- Always replace dust caps when cables are removed from the RF ports or the calibration module.
- Never remove the NA from its trolley. If this needs to be done consult the technical staff member in charge first.
- Always disconnect all cables from the NA before wheeling it around the lab. This is an easy oversight if not careful, remember cables may be attached to the rear of the NA eg. USB and power cables.
- Never remove the SMA to N type connectors on the NAs RF input and output ports. These are sacrificial connectors designed to protect the NAs OEM connectors.
- When turning the NA off, use the windows start menu to perform the shut down rather than the On/Off push button.

House Keeping

An equipment cupboard is provided in the lab, it houses some of the standard gain horns, amplifiers and other pieces of equipment. When you have finished using the chamber please return all equipment to its rightful place, and remove from the lab all materials and equipment not belonging to the lab. Particularly please pay attention to making sure you have re-connected all cables, the source antenna is attached to its mount, the receive antenna structure is assembled and on the turn table, and all connectors have dust caps fitted. Finally there is no reason to remove equipment from the lab, any equipment that is required must be used in the lab, even if this means moving your project to this facility. The lab will be inspected when you have vacated and if found to be not in the same condition as when you made the booking, you will be asked to come back and clean it up. It is your responsibility to allow adequate time in your booking for tidying up.

Users who continually leave the lab untidy after their booking will be banned from using this facility.

As this facility is a lab, lab rules apply. This means no eating, drinking, or smoking in the lab, and closed toe type shoes must be worn. Additionally there is no soldering allowed in the lab as this presents a fire and fume hazard in the chamber. The full set of lab rules are available from the following link [Laboratory Rules: general](#).

Or alternatively from the EEE schools web page under section 'R':

<http://www1.eleceng.adelaide.edu.au/students/undergraduate/policies/>