Risk Assessment | Actions | Blog

NOTIFICATION FORM:
RISK ASSESSMENT FOR ACTIVITIES
WITH MACHINES, APPARATUSES AND TEST-SETUPS (MAT)

Complete this form electronically, in consultation with your promotor and HSE contact [1]

1. IDENTIFICATION OF THE ACTORS

1.1 Requestor

Requestor:	Gert Steurs;
Tel:	003216328432
Email:	gert.steurs@kuleuven.be
Division:	CHEM - Sustainable Chemistry for Metals and Molecules - Erik Van der Eycken (50407968)
Stockroom code[2]:	01.188

1.2 Actors of the workflow

HSE-contact:	Risk Assessments;
Promotor:	Wim De Borggraeve;

1.3 Participants

Persons who be conducting the experiment (only applicable in case of a *new* risk assessment):

u-/s-nummer/…:	Staff group:
u0110721 (Facility manager)	KU Leuven
KU Leuven (Association) staff with NMR clearance and access to the high-field spectrometers	KU Leuven
KU Leuven (Association) students with NMR clearance and access to the high-field spectrometers	Student KU

add new participant

2. IDENTIFICATION OF THE EXPERIMENT

2.1 Title (name) (max.40 characters):

High-field NMR spectrometers

Version No. of this risk assessment (in case of modification/expansion):

Scope of the risk assessment (definition):

Day to day use and maintenance of the spectrometer

☑ Use ☑ Maintenance ☑ Setup/Configuration

Additional info:

2.2 This risk assessment concerns:

- ◉ a new MAT,
- ○ an existing MAT without previously submitted notification,
- ○ a modification/expansion of an existing MAT with previously submitted notification,

  This modification/expansion concerns
  (please indicate below and describe further down in this form):
  - ☐ locations where the MAT is installed
  - ☐ agents
  - ☐ modification or remodeling of MAT
  - ☐ other

  File number or reference number of previously submitted notification (if known):
- ○ termination of the experiment / dismantling or MAT with file number:

2.3 Activities for the HSE file:

(in consultation with your HSE network coordinator and Promotor/Executive [3])

- ◉ Existing activity: Enter the number of the activity, as shown in KU Loket:

  Chem - MDS _ NMR (638)

  add item
- ○ New activity for the HSE file: Enter a name for the activity (max. 40 characters):

  Item invoegen

2.4 Dates

Desired startup date: 12/02/2023 (DD/MM/YYY)
Sheduled end date: 31/12/9999 (DD/MM/YYY)

3. IDENTIFICATION OF MAT

Name: High-field NMR spectrometer
Serial Number:
Building: Leuven Chem&Tech
Room: Leuven NMR Core
Year Of Construction:

Total nominal power: kW
Water content: liter
Own construction: ☐
Second hand: ☐
Foreign supplier: ☑
The MAT could be sold later on: ☐

There is a CE-mark on the MAT or on the individual parts (not applicable (N/A) if the year of construction is before 1995).
○ N/A ◉ Yes ○ No (comment):

In case of assembly-setup, please describe the parts

NMR spectrometer setups, comprising of:
- High-field superconducting cryomagnet fitted with NMR probe
- Console
- Temperature controller (BCU I, BCU II or own-made device with separate MAT)

4. DESCRIPTION OF THE ACTIVITIES WITH MAT AND RISK ASSESSMENT

4.1 Describe the purpose of this MAT and the preconditions (detailed description):

This MAT is intended for all users (staff and students) of the high-field NMR spectrometers at the Leuven NMR Core. It provides safety information for operating and maintaining high-field NMR spectrometers.

4.2 Describe all necessary manual operations:

nr.	description	equipment	location	
1	USE IN AUTOMATION MODE: Insert sample into the autosampler or directly into the bore of the magnet and program the experiment in the computer	Sample, NMR spectrometer, high-field NMR magnet, computer	building room cont. lvl unit [5]	Leuven Chem&Tech - C Leuven NMR Core own unit
2	USE IN MANUAL MODE: Insert sample into the autosampler or directly into the bore of the magnet and program the experiment in the computer. If required, adjust VT gas flow (N2 or air) and tune and match the probe manually.	Sample, NMR spectrometer, high-field NMR magnet, computer	building room cont. lvl unit [5]	Leuven Chem&Tech - C Leuven NMR Core own unit
3	MAINTENANCE OF SPECTROMETER/MAGNET: Depending on type of maintenance: probe exchange, maintenance of the sample changer (re-alignment, lubing, ...), tuning gas flows, cleaning shim stack / BST, calibrating shims / pulses, determination of probe spectrometer specifications, ...	Sample, NMR spectrometer, high-field NMR magnet, computer, NMR probe, sample changer, tools	building room cont. lvl unit [5]	Leuven Chem&Tech - C Leuven NMR Core own unit
4	MAINTENANCE OF SPECTROMETER PARTS / PROBE: Depending on type of maintenance: probe cleaning or repair, fault analysis on hardware parts, ...	NMR probe or hardware part, tools, VNA, oscilloscope, multimeter, cleaning equipment, EtOH / iPrOH, ...	building room cont. lvl unit [5]	Leuven Chem&Tech - C 00.415 C3 own unit
5	CRYOGEN REFILLING: Refilling the magnet dewar with liquid nitrogen (LN2) or liquid helium (LHe)	NMR magnet dewar, dewar with LN2 or LHe, transfer lines	building room cont. lvl unit [5]	Leuven Chem&Tech - C Leuven NMR Core own unit

4.3 Frequency of execution of the experiment
◉ Daily
○ Weekly
○ Monthly
○ Less than monthly

4.4 Use this space to include any additional information essential to perform the risk assessment (e.g. photo's, descriptions, schematic of the reaction) or to refer to any annexes:

Description	attachment
The 5 Gauss line of the superconducting magnet is marked on the floor using black tape and also indicated by the necessary GHS safety symbols (see image attached). An additional safety radius is marked around the 5 Gauss line with red tape, representing an exclusion zone which should not be entered unless specifically authorized by a room manager. There are several moving parts in the autosampler that should not be blocked during operation. However the system monitors the status of this part to avoid issues. Although large quantities of cryogens (liquid helium and liquid nitrogen) are present, these cryogens are confined in the thermally insulated magnet system. Additional oxygen sensors monitor the oxygen levels in the rooms, as to prevent the room from filling with dangerous levels of nitrogen or helium gas (to prevent suffocation). Regular users should not be affected by these cryogens. Possible dangers are only encountered in case of a magnet quench or during refill of the cryogens. In case of a magnet quench, the created overpressure will cause mechanical overpressure relief vents in the ceiling to open, releasing the nitrogen and helium gas to the outside environment.	IMG_20240617_122631.jpg 3,79 MB

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4.5 Risks associated with the experiment

General risks

	yes	no	n/a
There is a risk of damage to hearing, e. g. because of noise levels exceeding 85dB.	○	◉	○
There is a risk of being cut, crushed, clamped, perforated, grasped, of damage to the eye/other, from e. g. • sharp edges or corners • unshielded moving parts/engine mechanisms • shields that are easily bypassed (without tools/safety contact) • emissions of dust, vapor or liquids • falling/flinging parts. • parts that can break or shatter	◉	○	○
There is a risk of falling or tripping e. g. • limited space to move • insufficient lighting around (and possibly within) the apparatus. • loose wires • altitude (relevant height as of 50 cm)	◉	○	○
There is a risk of electrocution (direct or indirect) e.g. • electrical parts exposed to touch • insufficient or lack of grounding (or no double insulation). • damaged or incorrectly connected electrical wires	○	◉	○
There is a risk of getting burns e. g. • hot or extremely cold surfaces exposed to touch • working with open flames	◉	○	○
The MAT can tip over or fall over because of unstable positioning.	○	◉	○
There is a risk of fire.	○	◉	○
There is a risk of explosion, chemical or physical (a.o. because of pressure, dust, gas, liquids ...).	◉	○	○
Other:			
Large magnetic fields (> 14 Tesla) and cryogens (liquid helium and nitrogen)	◉	○	○
If "Yes", please describe the precautionary measures that need to be put in place:			
The proper safety symbols and 5 Gauss radius are marked on the floor to notify users about the possible dangers of the magnetic fields. Cryogens form only a possible danger during a magnet quench or cryogen refill. During a refill, the proper precautions are taken (for working with cryogens).			

Operating conditions

	ok	nok	n/a
The MAT can be quickly and safely switched off in all circumstances. (If this is not possible using the standard controls, an emergency stop is recommended).	○	◉	○
When the emergency stop (if present) is activated, the MAT is put into safety condition.	○	○	◉
Only an intentional action can activate the MAT.	○	○	◉
The MAT cannot restart automatically after a power cut, or this poses no risk.	◉	○	○
The operating mechanisms are outside the danger zone.	○	◉	○
The stop-command has a higher priority than the start-command.	○	○	◉
The MAT can easily be disconnected from the electric circuitry.	◉	○	○
The user manual is present on site and contains:			
- Instructions for use (start, stop, signalization ...)	◉	○	○
- Instructions for maintenance (maintenance program, tests ...)	◉	○	○
- Instructions for (dis)assembly and commissioning	◉	○	○
Other:			
	○	○	○
If “NOk”, please describe the safety measures that need to be put in place:			
The permanent cryomagnet cannot be shut down; RF pulses, however, can be switched off.			

Specific risks

	Description	Condition for notification (indicate where condition is met)
☑	Use of gases (which + pressure): nitrogen (10 bar), compressed air (10 bar)	☐ As of class E4+, acute dangerous
☑	Use of cryogenic gases (which + amount): liquid helium (~ 500 L), liquid nitrogen (~ 500 L)	☑ In case there is a risk for O2-depletion (<19%O2 in air)
☐	Use of powders (which)	☐ As of class E4+, acute dangerous ☐ Pyrophoric
☑	Use of chemicals	☑ As of class E4+, acute dangerous

Name of product	CAS	Class	Amount, concentration	Most significant risk (flammable, toxic, …)
See separate RA	See separate RA	Selecteren...	See separate RA	See separate RA

add item

☐	Use of biological agents (which):	☐ Only in case of no previous notification ...
☐	Only in case of no previous notification.	☐ Only in case of no previous notification.
☐	Use of ionizing radiation (which):	☐ Risk of exposure
☐	Use of material-processing machines (workspace machines ...)	☐ Always

☑ Magnetic fields: Maximum field strength 147000 Gauss ☑ Static magnetic field. ☑ Variable magnetic field: frequency: Hz	☑ As of static field of 5 Gauss outside the setup.
☑ Use of lasers: - laser class: 1 - wavelength: nm	Risk of exposure to: ☐ Laser class 3 and 4 with open beam (including during alignment). ☐ Reflections from laser class 4 beam
☐ Use of increased/reduced pressure with risk of ☐ emission of toxic/flammable/hot/... gases or substances. ☐ rupture of the vessel (without pressure relief).	☐ Risk of emission and/or rupture.
☐ Use of high voltage (as of 1000V): - max. tension = V - max. output current = mA	☐ Contacts are not shielded and Imax≥10mA. ☐ Unshielded capacitive power.
☐ Use of nano materials: ☐ in solid matrix. ☐ in solution. ☐ in open air. specify the parent material:	☐ Risk of exposure.
☐ Other (falling from height ...):	
Which specific risks are present?: Extremely high permanent and oscillating magnetic fields, large amounts of cryogens (O2-depletion) and radio-frequency pulses	
Which specific measures have been taken to deal with these risks?: The samples are submitted in sealed vials and small amounts of solvents are used (500-600 microliter per experiment).	

Interaction with surroundings

Are there any other activities present in the same location? (f. ex. office or lab) ○ Yes ◉ No
If "Yes", please describe the activities:
Which are the measures put in place to minimize any interaction with other activities?

Organizational measures:

	yes	no	n/a
Maintenance, repairs and periodic cleaning are executed according to the specifications. In these cases, the MAT is first rendered inoperative.	◉	○	○
A technical construction file is available which contains at least the construction data, the user manual, the necessary maintenance and an the necessary check-ups of the MAT (applicable for self-constructed MAT with risks).	◉	○	○
If periodical maintenance or check-ups are necessary for a good and safe use, a log should be present.	○	◉	○
The main instructions (if applicable) are stored and available with the MAT.	○	◉	○
The MAT is not used outside its normal intended purpose (described in section 1).	○	◉	○
Every operator of the MAT has sufficient knowledge (through training, experience, user manual ...)			
on operating the apparatus (start-stop-emergency stop),	○	○	◉
on the intended purpose of the MAT,	◉	○	○
to recognize a dangerous or abnormal situation.	◉	○	○
Every operator has knowledge of the emergency procedures and is aware of what to do in case of a failure or incident.	◉	○	○
In case of isolated employment (i.e. remote location or space with very little staff or passers-by) with a risk that in case of a grave incident, one is NOT able to autonomously raise the alarm, at least one of the following measures is put in place (indicate which):	○	○	○
☐ Another person is in the vicinity and is aware of the activity.			
☐ An automatic dead-man switch is present (to be requested at the Central Dispatch).			
Which residual risks (e.g. warm surfaces, electrical risk, moving parts ...) and attention points (goggles, hearing protection, gloves ...) are signalized through pictograms?			
Magnetic fields, O2-depletion			
Is this sufficient?	◉	○	○
A responsible person has been indicated for the MAT (only applicable for high-risk MAT).	◉	○	○
Other	○	○	○
If "No", please describe the precautionary measures that need to be put in place:			

5. PROTECTIVE EQUIPMENT

Protective equipment

	normal use	maintenance	setup/config
5.1 Collective protective Equipment			
Closed System (specify type)	☐	☐	☐
Fume Cabinet (extraction hood)	☐	☐	☐
Local Ventilation	☐	☑	☑
General Ventilation	☑	☑	☑
Safety Screen	☐	☐	☐
Spillage Collectors underneath the setup	☐	☐	☐
Gas Detection (type)			
Portable	☐	☐	☐
In the room/lab	☑	☑	☑
Fire Detection (general)	☑	☑	☑
Other:	☐	☐	☐
5.2 Personal Protective Equipment			
General Protection			
Labcoat/Workwear	☐	☑	☑
Safety Shoes	☐	☑	☑
Disposable Overshoes	☐	☐	☐
Disposable Hygienic Hairnet	☐	☐	☐
Disposable Overalls	☐	☐	☐
Disposable Lab Coat	☐	☐	☐
Other: Labcoat required during refill of cryogens.	☐	☐	☐
Facial Protection			
Safety Glasses	☐	☑	☑
Safety Visor	☐	☑	☑
Face Shield	☐	☑	☑
Other: Glasses required during refill of cryogens.	☐	☐	☐
Respiratory Protection			
Disposable Dust Mask P1	☐	☐	☐
Disposable Dust Mask P3	☐	☐	☐
Dispoasable hygienic mask/surgical mask	☐	☐	☐
Half face mask with following cartridges:	☐	☐	☐
Full face mask with following cartridges:	☐	☐	☐
Other:	☐	☐	☐
Gloves			
Disposable Nitril EN 374	☐	☐	☐
Disposable Vinyl EN 374	☐	☐	☐
Nitril EN 374	☐	☐	☐
Cryogenic Gloves	☐	☑	☑
Other: Cryogenic gloves required during refill of cryogens.	☐	☐	☐
Hearing protection			
Disposable Earplugs	☐	☐	☐
Hearing Bracket	☐	☐	☐
Earmuffs	☐	☐	☐
Custom made otoplast	☐	☐	☐
Other:	☐	☐	☐

5.4 Work practices

- [x] Apply the Code of Good Laboratory Practice
- [x] Provide internal training and guidance
- [x] Organize selective collection of waste
- [x] Other:

All users are required to read the NMR house rules (including the safety information), pass the online test and receive on-site training.
Only after all these steps, badge access is activated to the NMR Core.

6. WASTE MANAGEMENT - MAT

6.1 Which waste fractions do you expect and how will these be disposed of?

Description
Solvents and analytes will be disposed in the appropriate waste vessels, as taken up in a separate RA.

add item

7. PARTICULAR MEASURES

7.1 In case of failure and reactivation of utilities (incl. deviation from the specifications)

Utilities	Consequence(s) in case of failure/malfunction	Is this an HSE issue, yes/no?	If yes, please describe the measures
Electricity	none, setups connected to emergency power supply. Setups connected through a UPS will not suffer any consequences. Other spectrometers may shutdown during the transition period to emergency power supply. Consoles will reboot. Acquisition computers will stay offline.	☐	
Ventilation	Room might fill with inert gases (He, N2)	☑	Oxygen level sensors and emergency relief vents available
Gas-supply	Room temperature spectrometers will halt. Cryoprobe will initiate emergency procedure.	☐	
(Cooling) water		☐	
Compressed air	-70 compressed air required for VT gas, sample spin and sample changer control	☐	
Inert atmosphere		☐	
Vacuum		☐	
N2	N2 compressed air required for VT gas, sample spin and sample changer control	☐	

7.2 Can the experiment take place when the setup is left unattended (= continuous experiments)?

- ○ Not applicable: the setup will never be left unattended
- ◉ Yes. Apply the procedure "Continuous activities - unattended"
- ○ No, additional measures are required.

Describe the additional measures:

Samples can be added to the experiment queue preferably during the regular working hours, measurements can run overnight without user intervention.
In addition, apply the procedure "Continuous activities - unattended".

7.3 Is working outside normal working hours permitted?

- ○ No
- ◉ Yes

Describe which additional measures have been put in place (e.g. ventilation, second person present, dead-man switch ...):

Regular users are not allowed to access the NMR Core outside normal working hours. Exceptions can be made for administrators.

7.4 Describe your procedure for rapid shutdown,
or the measures to be taken in case of evacuation of the premises:

Leave the NMR Core facilities immediately through the normal exit.

8. CONCLUSION / COMMENTS / QUESTIONS

Use this space to note down any additional comments or questions you may have:

FILL IN THIS CHECKLIST.

In case one or more of the following criteria apply, the HSE network coordinator will present this risk assessment to the HSE Department by starting a **type 3** advice workflow.

- [ ] A "Yes" from section 4.4 is not followed up with an adequate preventative measure or the specified measures are inadequate to sufficiently reduce/eliminate the risk.
- [x] In section 4.4, "specific risks", a check is marked for one or more of the conditions for notification.
- [x] A failure of utilities has HSE-relevant consequences.

- ☐ Despite the implementation of the safety measures as described, there is still a realistic risk at physical injury (short- and/or long-term).
- ☐ The MAT is self-made and poses risks when used.
- ☐ The unit would like to request additional advice from the HSE Department. (Specify your request above)

Additional information may be requested if necessary.

9. ADVICE BY HSE-DEPARTMENT

This space is reserved for the HSE-Department

HSE-reference:

[1] You can find the members of your local HSE network through KU Loket > HSE & Spaces > My HSE > My HSE network

[2] If you don't know the stockroom code, please consult your HSE contact

[3] This is the hierarchical responsible according to the official organisational chart.

[4] Number of agent as indicated in section 3.1.

[5] If manipulations are conducted within a room allocated to another unit, then a copy of this risk assessment must be sent to the concerned manager (in cc.).

[6] Number of sub-experiment as indicated in section 4.2.

[7] For guidelines on how to acquire Personal protective equipment (PPE), please consult your HSE contacts or visit the HSE Department website.

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