SOLARIS
CENTRE

Radiation Protection and Personal Safety System at SOLARIS National Synchrotron Radiation Centre

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Outline

1. Overview
2. Radiation Safety
3. Personal Safety System
4. Conclusions

Overview of Solaris Centre

The SOLARIS storage ring main parameters

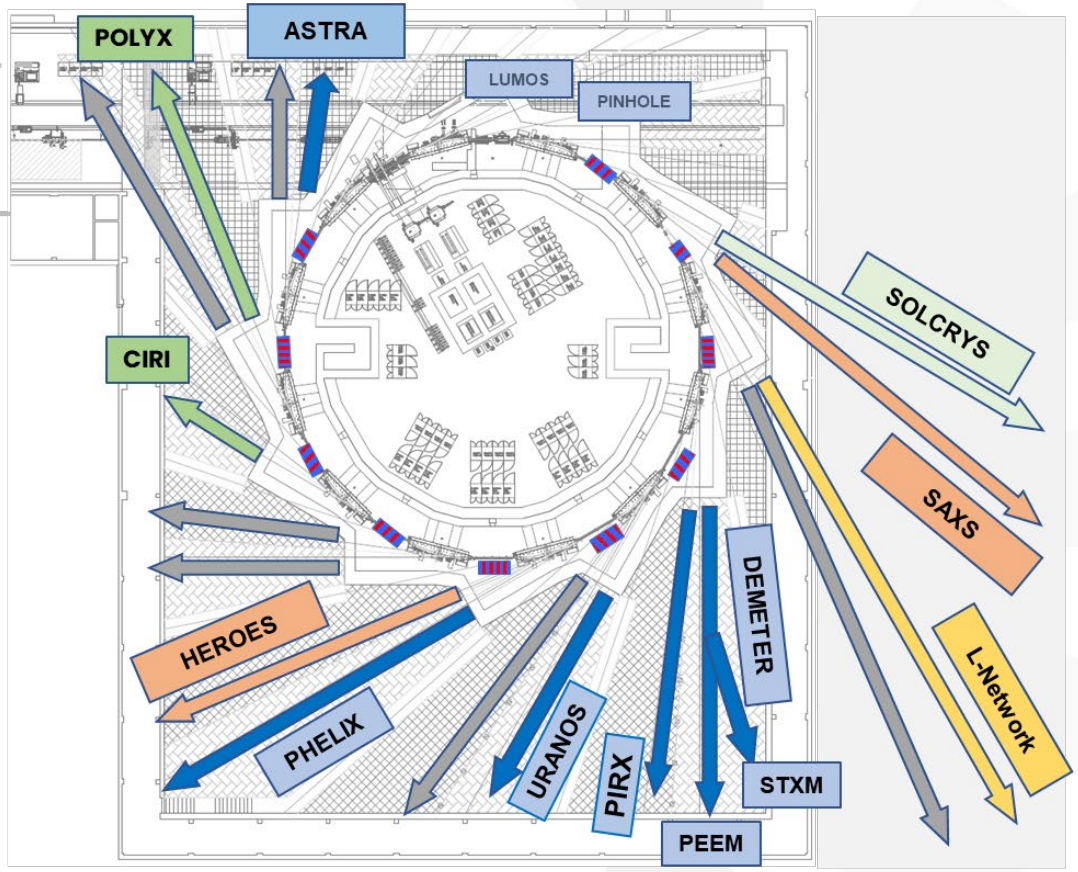
PARAMETER	VALUE
Energy	1.5 GeV
Max. current	500 mA
Circumference	96 m
Main RF frequency	99,93 MHz
Max. number of circulating bunches	32
Horizontal emittance (without insertion devices)	6 nm rad
Coupling	1%
Tune Q_x, Q_y	11.22; 3.15
Natural chromaticity ξ_x, ξ_y	-22.96, -17.14
Corrected chromaticity ξ_x, ξ_y	+1, +1
Electron beam size (straight section centre) σ_x, σ_y	184 µm, 13 µm
Electron beam size (dipole centre) σ_x, σ_y	44 µm, 30 µm
Max. number of insertion devices	10
Momentum compaction	3.055×10^{-3}
Total lifetime of electrons	13 h

The SOLARIS Centre operates in a 24/5 mode (24 hours a day, 5 days a week)

CryoEm facility

Krios

Structural Biology Core Facility



- In operation
- Under construction, available 2023
- Under construction, available 2024/2025
- Project application (decision 2023)
- Conceptual phase
- Slots available for 6 new beamlines

Radiation Safety at SOLARIS

Legal acts regulating the activity at SOLARIS:

The authority that supervises the activities of Solaris is National Atomic Energy Agency (PAA)

All the SOLARIS activities concerning radiation protection are compatible with requirements described in formal regulations:

Act 'Atomic law' of November 29, 2000 (Dz. U. z 2007 r. Nr 142, poz.276) [as amended (Dz.U. 2021 poz. 1941)]

Responsibilities in radiation protection:

- **Director of SOLARIS**, on behalf of **Rector of the Jagiellonian University**, among others, oversees respecting the requirements of radiation protection.
- **Radiation Protection Officer**, among others, internally supervise respecting the requirements of radiation protection.

Workers categories at SOLARIS Centre:

Category	Dose limits	Who?	Area classification
Radiation workers category A	20 mSv/year	No workers at Solaris	Controlled area
Radiation workers category B	6 mSv/year	Technical team of Solaris, Radiation Protection Officer	Supervised area
Public	1 mSv/year	Administrative and external workers, users, visitors	Unclassified area

An employee can start working in radiation conditions after receiving a certificate of no contraindications against such work, issued by a qualified doctor.

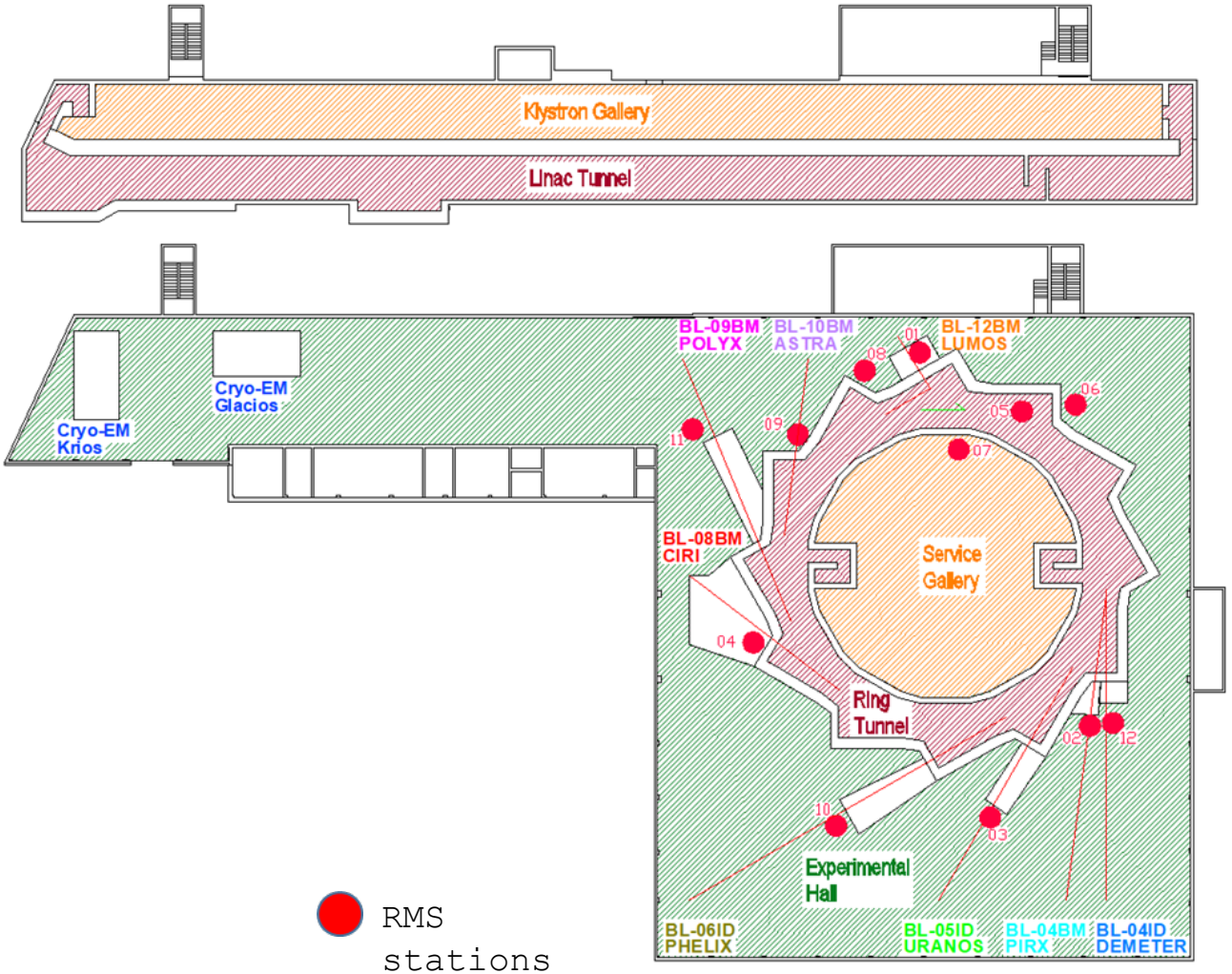
Additionally pregnant woman cannot work in the position, in which the unborn children may receive the effective dose higher than 1 mSv.

The number of total employees is 112, and qualified for category B is 93.

In 2022, the average received total effective dose for Solaris employee was **0.4 mSv**.

Areas classification at SOLARIS:

ACCELERATOR LABORATORY



unclassified area

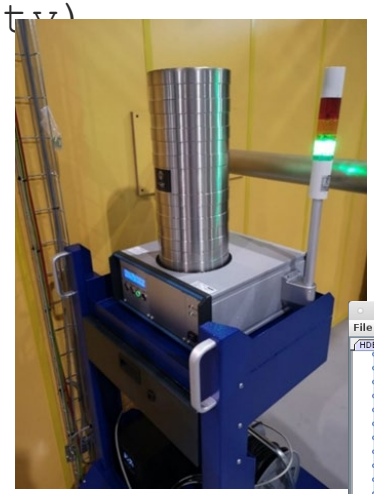
supervised area

controlled area

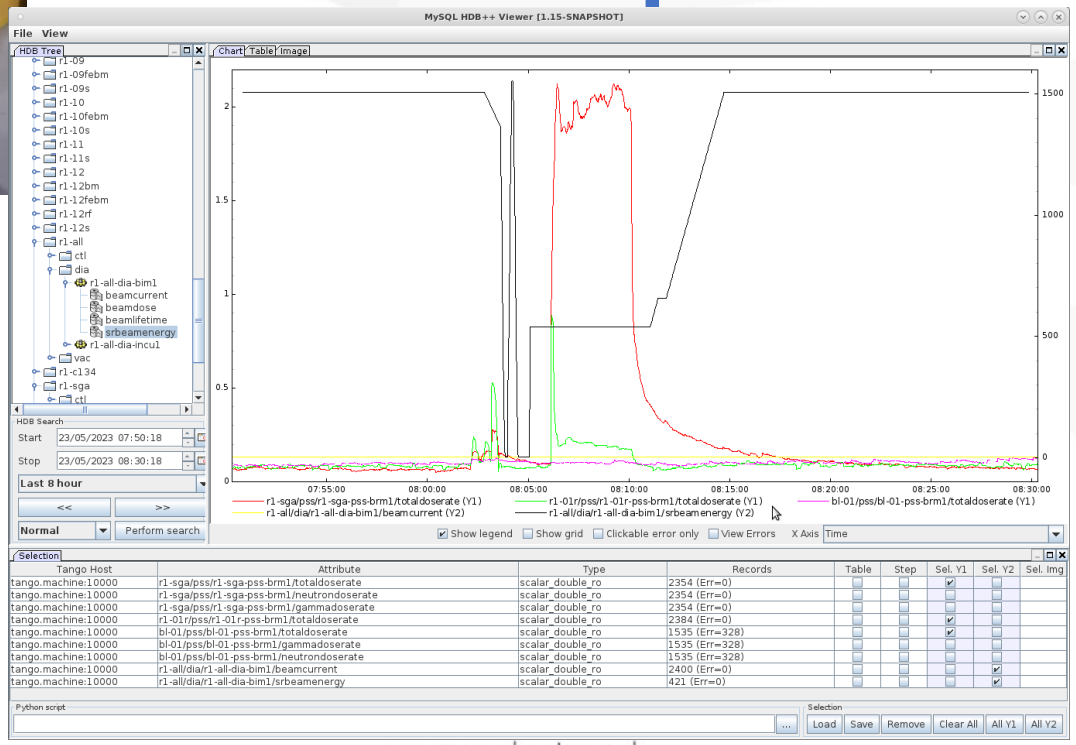
RMS stations

How is the radiation monitored at Solaris?

1. Radiation Station Monitor (13 RMS distribiuted througout the facility)



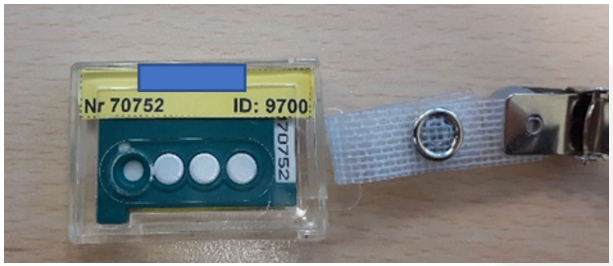
Dose rates and accumulated doses are continously read locally and in control room in dedicated apllication



Defined signals are constantly archived

How is the radiation monitored at Solaris?

- **Personal TLD dosimetry** used by SOLARIS category B employees



- **Environmental TLD dosimetry**

How is the radiation monitored at Solaris?

- **Portable radiometers**: periodical radiation measurements:



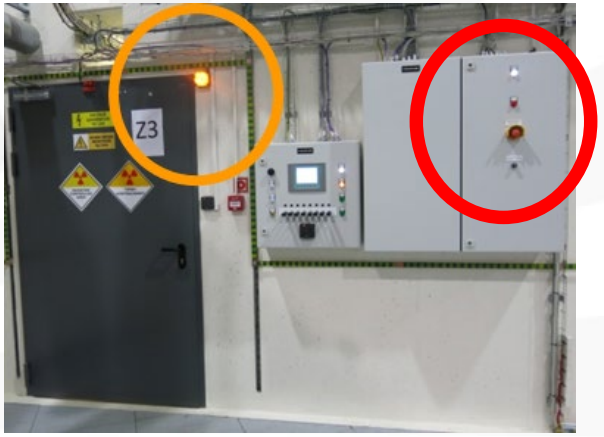
- **Electronic personal dosimeters**: used by employees while accessing supervised or controlled area, available at the Co m:

Personal Safety System (PSS):

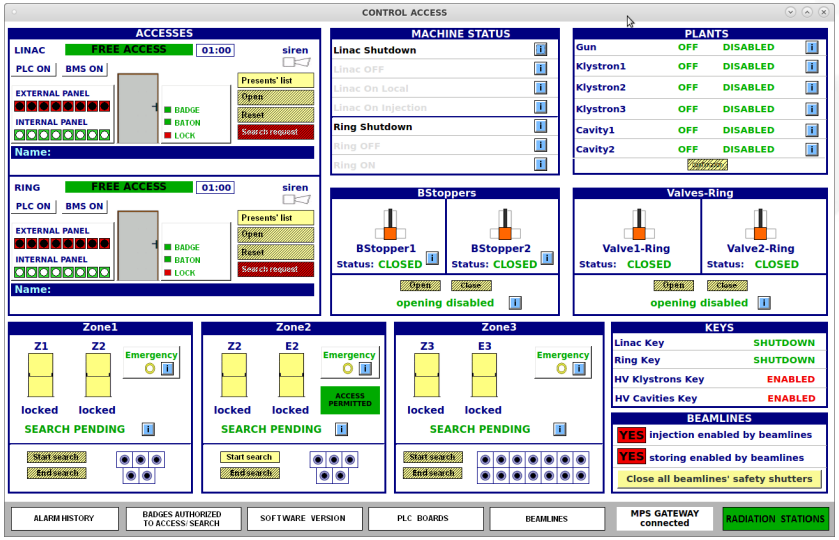
PSS role is to protect people against ionizing radiation at SOLARIS.

- **Synchrotron PSS:**
  - Switches off the machine in an emergency, after pressing an emergency button;
  - Informs about exceeding a radiation alarm threshold;
  - Closes the doors which lead to the tunnels.

Door of the ring tunnel



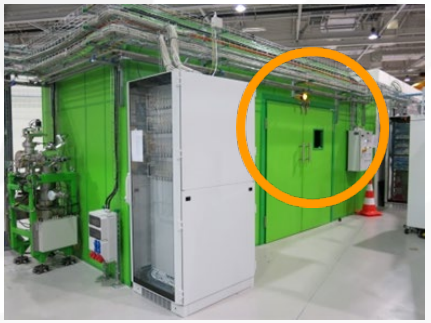
- **Panel available in Control Room**



Personal Safety System (PSS):

PSS role is to protect people against ionizing radiation at SOLARIS.

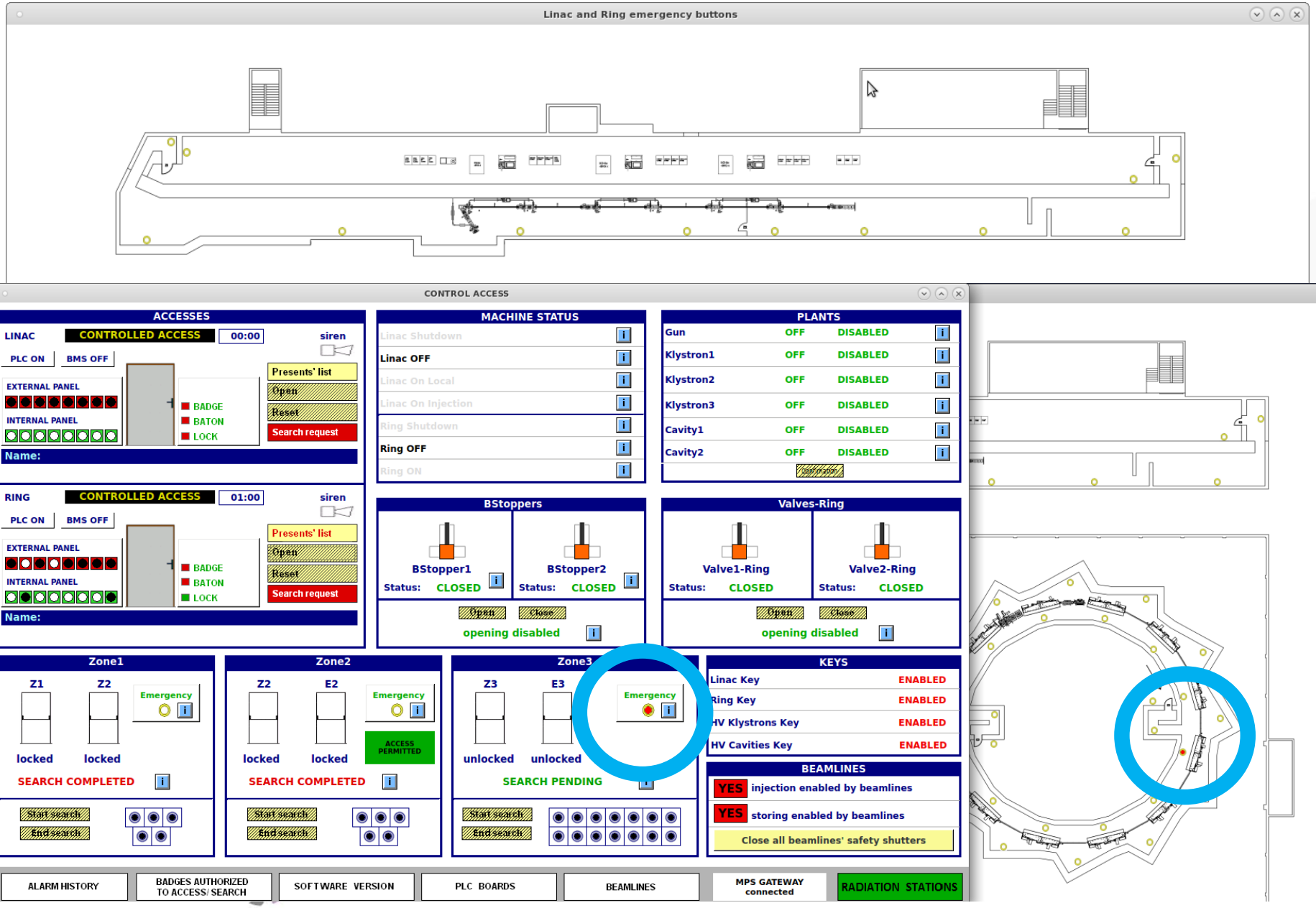
- **Beamlines PSS:**
  - Every beamline has a γ/X radiation monitoring station connected to the PSS;
  - In case of exceeding a radiation, alarm threshold safety shutters are closing.



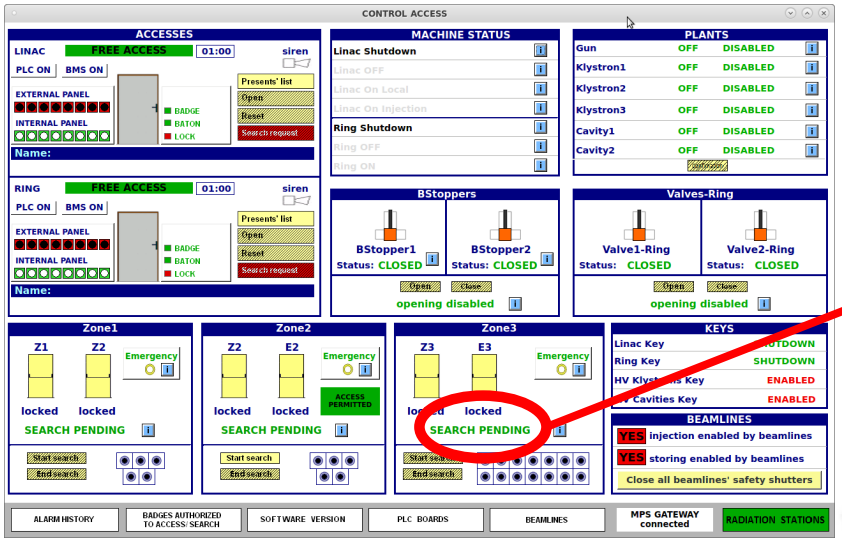
Users do not have access to supervised and controlled areas, including a lead hutch.

- **PSS panel outside the hutch:**

Personal Safety System (PSS):



Search training



Information light signals:

In the experimental hall, there are light columns which give information on the current status
of the storage ring:

There are also three tables indicating the synchrotron status on walls of the experimental hall:

SOLARIS Centre Team

SOLARIS Centre team

- Director of the SOLARIS Centre
- Department of Finance and Administration
- Department of Accelerators
- Scientific Department
- Technical Department
- Department of Control Systems & IT
- Radiation protection & health and safety officers
- Communication Section

Radiation protection & health and safety officers

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→ AUTOMATION SECTION

→ CONTROL SYSTEMS AND SOFTWARE SECTION

Thank you for your attention!!!