

# SPES Safety File

The SPES Safety documentation has been progressively implemented since last years, greater effort has been put in particular in recent months.

## Structure of the documents

The SPES Safety File is composed of four Parts:

- I. SPES Descriptive Part
- II. SPES Demonstrative Part
- III. SPES Operational Part
- IV. SPES Record, Experience and Monitoring Part

The documents are stored in a dedicated content repository (*ALFRESCO*).

All the documents follow precise management rules (coding, issuance, distribution, storage, revision).

# SPES Safety File

## SPES Descriptive Part

Provides a description of the facility and its processes in terms of Safety

## SPES Demonstrative Part

Identifies the hazard, assess the risks and provides the list of the technical and organizational control measures

## SPES Operational Part

Compiles all the operational procedures that cover normal operations, tests, maintenance and incident management/remediation

## SPES Record, Experience and Monitoring Part

Inventory of all feedbacks, inspections, safety reports, nonconformities, near-misses, incidents, accidents and experience gained.

# SPES Documentation

List of the SPES documents written up to now and connected to safety aspects

	Code	Title	Description	Status
SPES Descriptive Part	DOC_00000002	Risk Analysis of the SPES project	Documento che descrive il progetto SPES e contiene gli elementi di riferimento (dati, calcoli...) utilizzati per la valutazione dei rischi del progetto SPES	60 % (ITA)
	DOC_00000006	Description of the SPES production area	This document provides a general description of the SPES production area and of the macro-components composing it. References to the official SPES CAD codification scheme are reported, with the aim to create a solid basis for the future technical documentations.	100 % (ENG)
	DOC_00000022	Description of the water cooling circuit for the equipment of the room A6 Bunker ISOL	Documento contenente le specifiche per la progettazione dell'impianto, la descrizione degli impianti (dati caratteristici progettuali, componenti, schema funzionale) e la descrizione delle operazioni di manutenzione ordinaria e straordinaria previste	80 % (ITA)
	DOC_00000025	The Handling system of the SPES TIS unit	This document describes the handling system of the SPES TIS Unit which is composed by: the front end coupling table, the horizontal handling vehicle, the temporary storage area and the vertical handling system. The document gives an overview about the characteristics of the system and describes its operational mode. Finally some safety aspects are discussed considering what to do in case of emergency or component failure.	90 % (ENG)
	DOC_00000027	SPES Laboratories	Documento che riporta la descrizione funzionale dei laboratori della sorgente SPES che verranno ubicati nel primo piano dell'edificio in fase di costruzione. Viene inoltre proposta una possibile compartimentazione della zona uffici che saranno realizzati nel secondo piano dell'edificio SPES. Infine si propone l'ottimizzazione della volumetria per la zona riservata ai laboratori con la creazione di uno spazio utilizzabile al piano superiore.	90 % (ITA)

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	Code	Title	Description	Status
SPES Descriptive Part	DOC_00000029	SPES Hot Cell	Documento che riporta le caratteristiche e le funzionalità della futura cella calda del progetto SPES che verrà prossimamente installata presso i laboratori per la produzione dei bersagli in carburo di uranio nel nuovo edificio SPES. Il documento dà le linee guida per la realizzazione del dispositivo in modo che risponda alle necessità particolari del progetto SPES. La principale attività per cui la Hot Cell verrà impiegata è l'ispezione della camera bersaglio dopo l'irraggiamento, ulteriore possibile funzione è quella che riguarda lo smontaggio della camera sia al fine di sostituire parti danneggiate che suddividere e raggruppare tutti i componenti presenti in essa.	90 % (ITA)
	DOC_00000044	Preliminary design of the 50 kW beam dump for SPES Cyclotron	Preliminary MCNPX-FLUKA analyses about the SPES 50kW (70 MeV, 750 uA) beam dump. Preliminary study using MC codes of neutron/gamma production taking into account 2 different Dump materials (Cu, Al). Preliminary design of the Beam Dump.	40 % (ENG)
	DOC_00000045	Recovery system for the exhaust gas of the TIS vacuum system	This document describes the recovery system for the exhaust gas of the TIS vacuum system.	60 % (ENG)
	DOC_00000054	The SPES target - ion source system life cycle	This document reports the life cycle of the SPES target – ion source system. The main working steps are accurately described, together with the specific areas dedicated for their executions.	100 % (ENG)

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	Code	Title	Description	Status
SPES Demonstrative Part	MOD_00000033	Risk Analysis of target area	The main objective of the present study is to highlight the main hazardous scenarios that could lead to exposure of the personnel to ionizing radiation and then define additional control measures to prevent their occurrence or reduce the time of exposure. The most critical scenarios will be then presented to the relevant persons concerned and a test of the failures/hazardous events will be done in-situ confirm or disconfirm the severity of the scenarios.	100 % (ENG)
	MOD_00000034	Risk Analysis of handling system	The main objective of the present study is to highlight the main hazardous scenarios that could lead to failures of the handling system that could potentially have consequences on the exposure of the personnel to ionizing radiation and then define additional control measures to prevent their occurrence or reduce the time of exposure. The most critical scenarios will be then presented to the relevant persons concerned and a test of the failures/hazardous events will be done in-situ confirm or disconfirm the severity of the scenarios.	100 % (ENG)
	MOD_00000035	Risk Analysis of target storage area	The main objective of the present study is to highlight the main hazardous scenarios that could lead to failures of the storage area that could potentially have consequences on the exposure of the personnel to ionizing radiation and then define additional control measures to prevent their occurrence or reduce the time of exposure. The most critical scenarios will be then presented to the relevant persons concerned and a test of the failures/hazardous events will be done in-situ confirm or disconfirm the severity of the scenarios.	100 % (ENG)
	DOC_00000018	Description of the network of radiological monitoring of SPES	Documento che descrive la rete di rivelatori di radiazioni ionizzanti per la sorveglianza radiologica di SPES. Sono descritti i principi generali per la sorveglianza radiologica, il tipo e la localizzazione dei rivelatori, la rete di collegamento, il sistema centralizzato di raccolta dei dati e il trasferimento dei dati al supervisore EPICS.	10 % (ITA)
	DOC_00000020	Distribution of the radioactivity along the beam line of SPES	The main aim of this document is to describe the radioactivity along the beam line of SPES from the target to the charge breeder. For this purpose seven beam cases have been identified and a detailed description of the hotspots produced along the beam line for this seven cases is given.	100 % (ENG)

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	Code	Title	Description	Status
SPES Demonstrative Part	DOC_00000021	SPES Safety System design report	This document aims to provide the main guidelines of the SPES Safety System (3S) concept to be followed and how it has to be implemented in the main facility control system of the SPES Radioactive Ion Beam facility in construction stage at the Legnaro National Laboratories (LNL). The basic goal of the SPES Safety System is to deal with all the safety hazards and manage the safety risks in a coordinated way.	80 % (ENG)
	DOC_00000024	Access control system for SPES (alpha phase)	Documento che descrive il Sistema di Controllo Accessi per il progetto SPES – Fase Alfa.	100 % (ITA)
	DOC_00000026	Safety System of the SPES production area	The present document provides a description of the safety system of the production area.	40 % (ENG)
	DOC_00000032	Radioactive gas migration and vacuum system at SPES	Document that describes the radioactivity induced by the volatile elements in the operation of SPES and general criteria for the vacuum system.	90 % (ENG)
	DOC_00000033	SATTS Safety System	Documento che descrive le procedure di operazione durante i test del ciclotrone (SAT Site Acceptance Test), le condizioni dell’edificio, i sistemi di sicurezza installati per eseguire le prove e le procedure di emergenza (SAT Safety System).	80 % (ITA)
	DOC_00000037	Indirect temperature measurement for the SPES target system: a feasibility study	The temperature monitoring of the SPES target when it is impinged by the primary proton beam is a critical issue both for operation and safety. Conventional solutions (typically thermocouples and pyrometers) are difficult to implement mainly because of the high radiation levels in proximity of the target system. In this work, an indirect temperature measurement approach is presented, supported by both theoretical and experimental data.	100 % (ENG)

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	Code	Title	Description	Status
SPES Demonstrative Part	DOC_00000038	Chamber emissivity evaluation and measurement	The vacuum chamber hosting the Target – Ion Source (TIS) system is interested by a high radiative thermal flux during both the Joule effect and the proton beam heating phases. Since the inner aluminum surfaces are high reflective a large amount of the radiative thermal flux is reflected to other components like for example to the proton beam channel VAT valve steel plates. This may cause the overheating and the consequent degradation of the O-ring placed on one of steel discs, leading to a warning situation when the chamber has to be uncoupled and handled, since the valve has to be closed and the radioactive contaminated inner volume of the target chamber has to be insulated from the outer air. In order to decrease the amount of heating flux involving the components at the periphery, the surface emissivity of the chamber has to be increased with a surface treatment (micro shot – peening). Since the obtained emissivity is unknown, the aim of this document is to summarize the experimental measurements of this parameter on the treated chamber and the related topics.	100 % (ENG)
	DOC_00000042	Report of the qualified expert for the authorization of SPES (phase ALFA)	Relazione tecnica in materia di radioprotezione relativa al progetto SPES - Fase ALFA dei Laboratori Nazionali di Legnaro dell'INFN.	100 % (ITA)
	DOC_00000062	Failure test report vacuum pump	The document aims at providing a description of the tests carried out on the OFF-Line test bench on November 18th 2014 regarding the simulation of failures on the vacuum system.	100 % (ENG)
	MOD_00000035	Matrix failure scenarios UCx target	The main objective of the present document is to identify the immediate actions to be taken in order to limit the consequences for Safety in case of occurrence of the scenarios mentioned below. The list of safety interlocks and operational parameters only takes into consideration the ones present in the production area.	100 % (ENG)

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	Code	Title	Description	Status
SPES Operational Part	IOT_00000001	Operating Procedure for the Production and Handling of UCx Targets	This document describes the operating procedure for the production and handling of UCx targets in the new SPES laboratories. Besides the operational point of view (detailed description of the production process and required equipment), safety and radioprotection aspects are taken into account.	100 % (ENG)