SPES Beam Diagnostics Tools
- TAPE station -

WP: B1 Scientific support
WU: B1.1 – Nuclear Instrumentation

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Outline

1st T.A.C. report

The beam diagnostic [illegible] presented very rapidly. It is not clear who is in charge of the development and characterization of the diagnostic devices. The diagnostic equipment will be based on a micro-channel plate system for beam profiles, and on Faraday cups for intensity measurements. Tape stations will also be used. The TAC would like to know more technical details on the proposed devices, as well as the results of tests, in a dedicated

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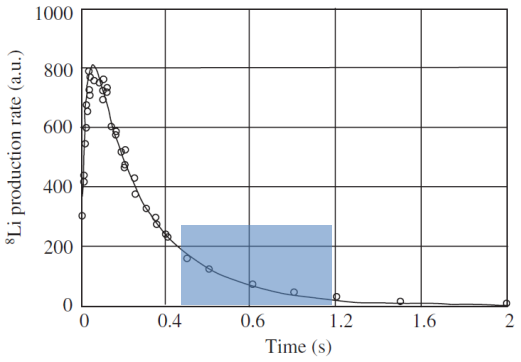
1. The tape station(s) for SPES
2. System overview
3. Placement of the TAPE stations (constraints, shieldings)
4. Machanics
5. Vacuum System
6. Automation
7. Detectors
8. DAQ
9. Post processing
10. Timeline

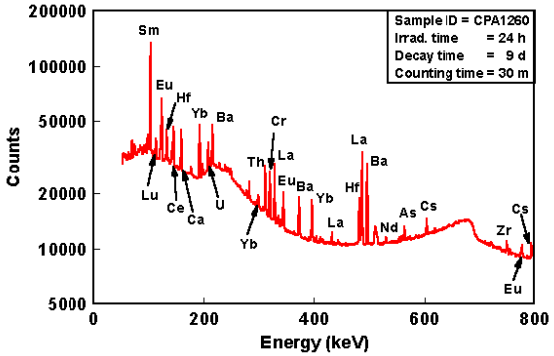
1.The tape station(s) for SPES

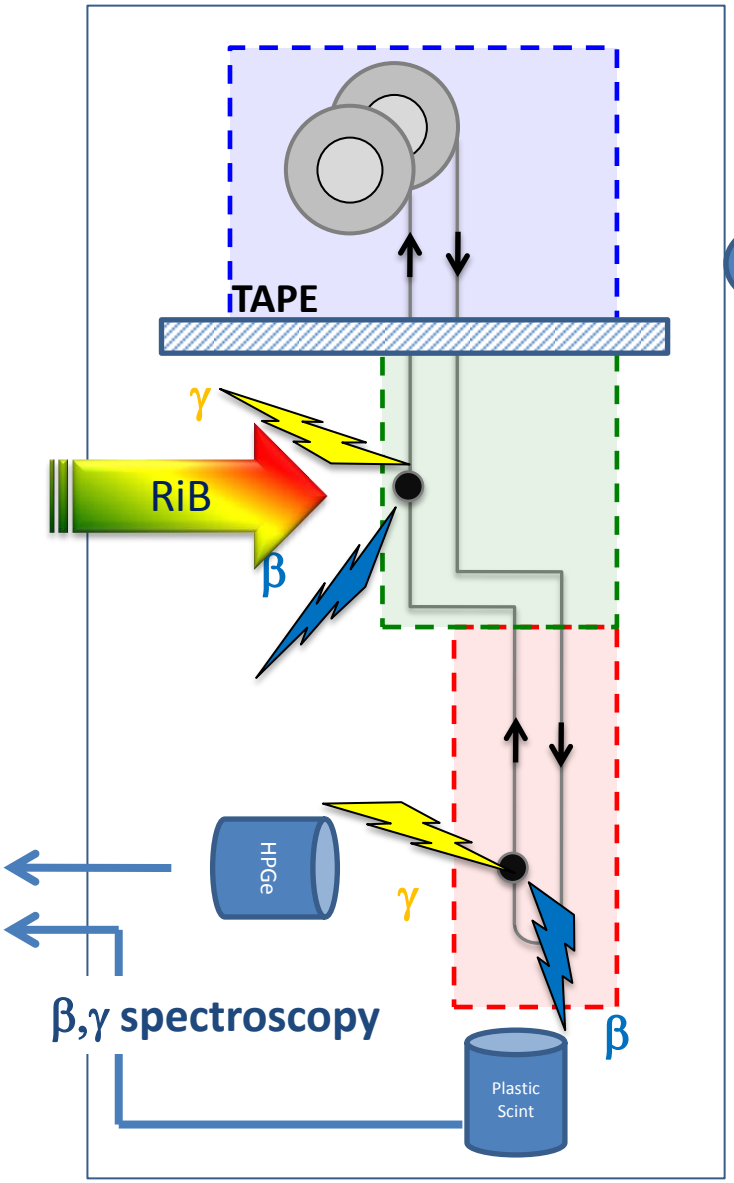
Beam characterization:

- **Release Curve**



- **Beam Composition and Isotopic Yields**





The tape station is the "eyes and ears" of an ISOL facility.
Tim Giles, seminar on ISOLDE diagnostic tools, LNL May 2014

Requirements:
1-Reliability
2-Lasting operability
3-Ease of use

Moving the tape, the residual activity due to the long lived isotopes is minimized.

2.System overview

Mechanics | Vacuum | Beam interface | Detectors | DAQ | Analysis Software | Motion Control

SPES CONTROLS

LIVE

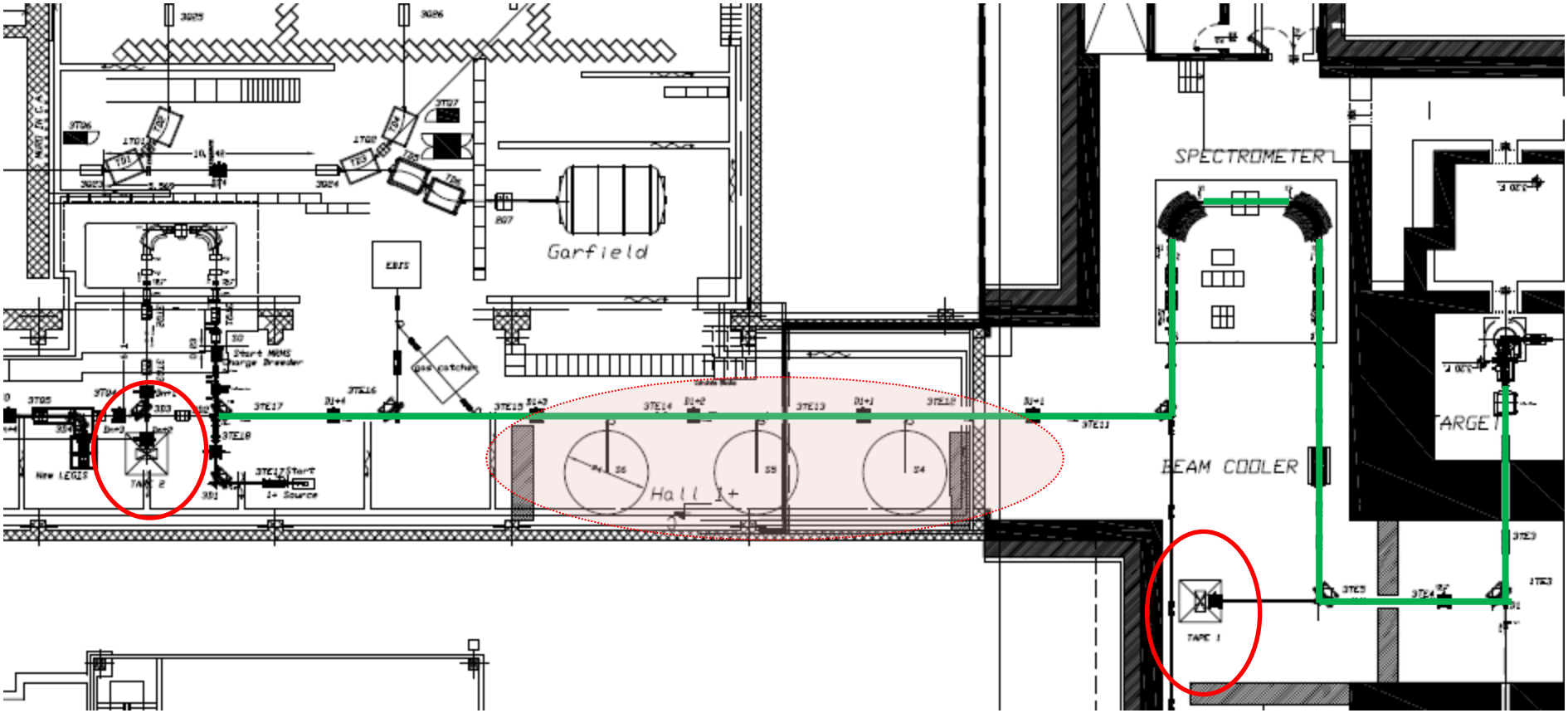
Control of:
1-Vacuum system
2-Beam Request (magnet)
3-Beam diagnostic box

TAPE STATION CONTROL SYSTEM

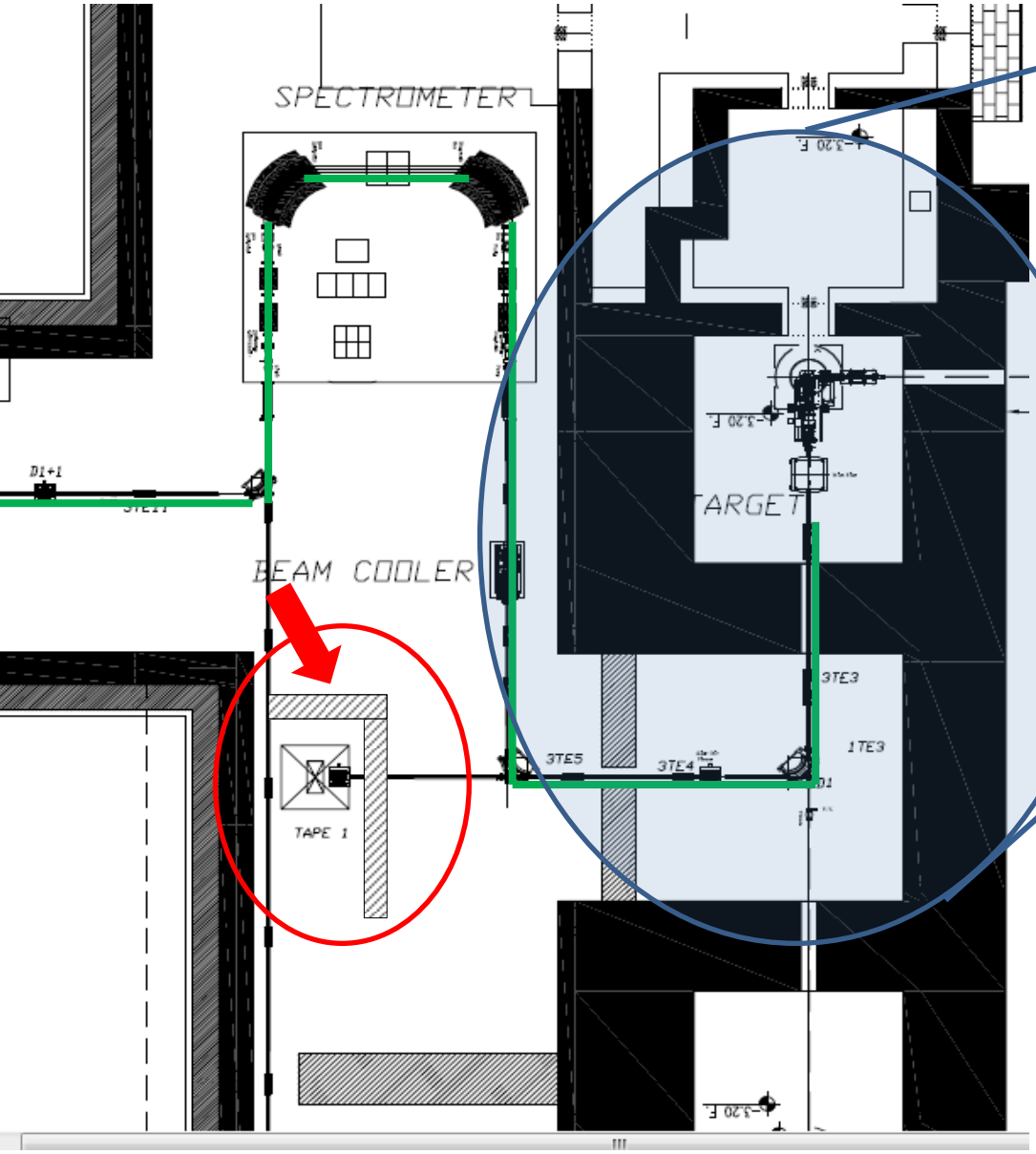
offline

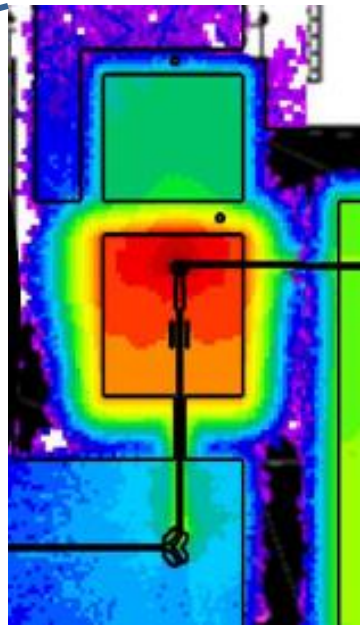
1-Report Logging (beam composition analysis result)

3.TAPES location within the SPES layout – to be confirmed



3.In this scenario TS1 might need additional shielding



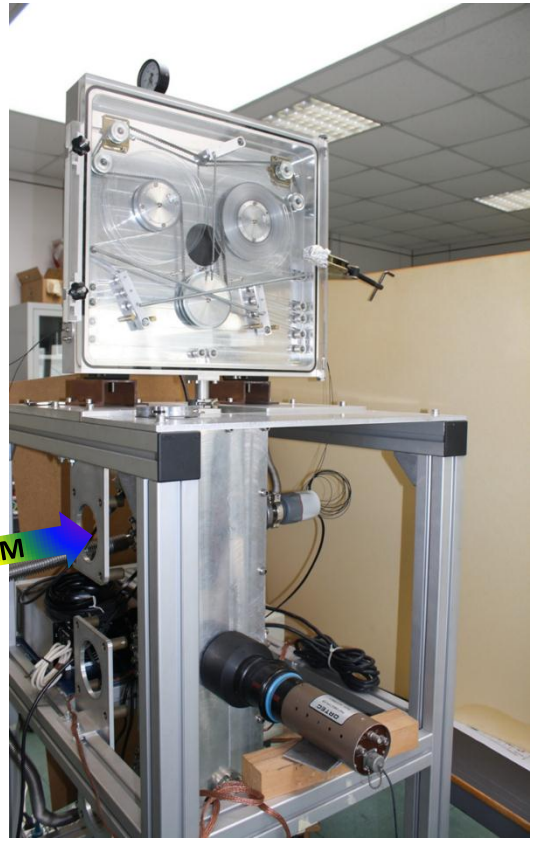


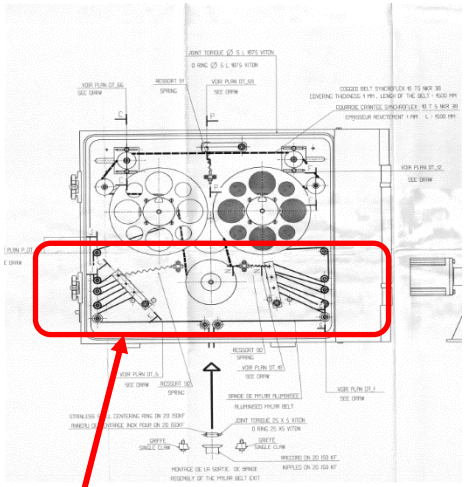
L. Sarchiapone D. Zafiropoulos
T.A.C. meeting LNL 23/1/2014

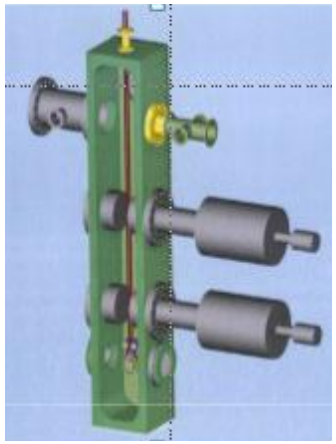
1-Final layout under evaluation
2-Neutron and gamma Fluxes under evaluation for some typical cases
3-Need to access the tape

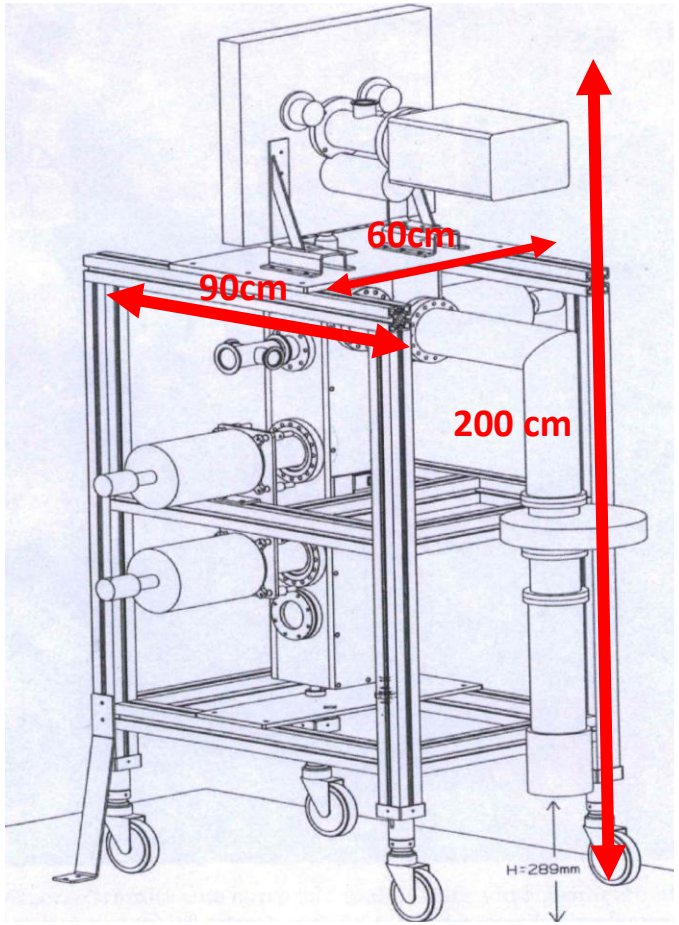
Final placement
Proper Shielding design
Beam Interface design

4.Mechanics – available now at LNL









Criticalities:

1-Very delicate damping system

2-Only one motor (newer systems use three motors)

3-No spare parts available, need to build one copy starting from non complete documentation

4-FAST (and radiation safe) tape replacement impossible

4.Mechanics: proposed solution

Collaboration with ALTO – IPN ORSAY (ref. D. Verney) [within LEA-COLLIGA]:

1-One working system available at ALTO (to be copied)
2-Need to build complete documentation from both sides (ITA and FR)
3-Need to build more than one new tape from both sides (ITA and FR)
4-Need to test the new devices (ITA and FR)

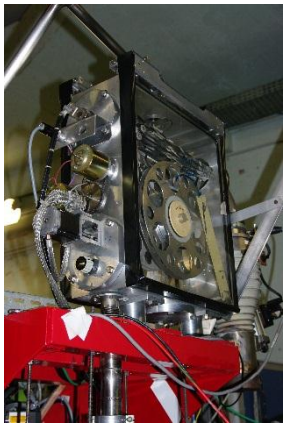
(IN)formal agreement on:

1-Sharing the efforts in building new documentation (dismounting the existing tape and measuring each part) [ITA supplies 2 weeks/man of mechanic experts]
2-Optimizing the new layout
3-Optimizing the machinery expenses (reduce cost/piece ordering/working several parts) [ITA supplies mechanical workshop support]
4-Commissioning the device and performing one test at ORSAY

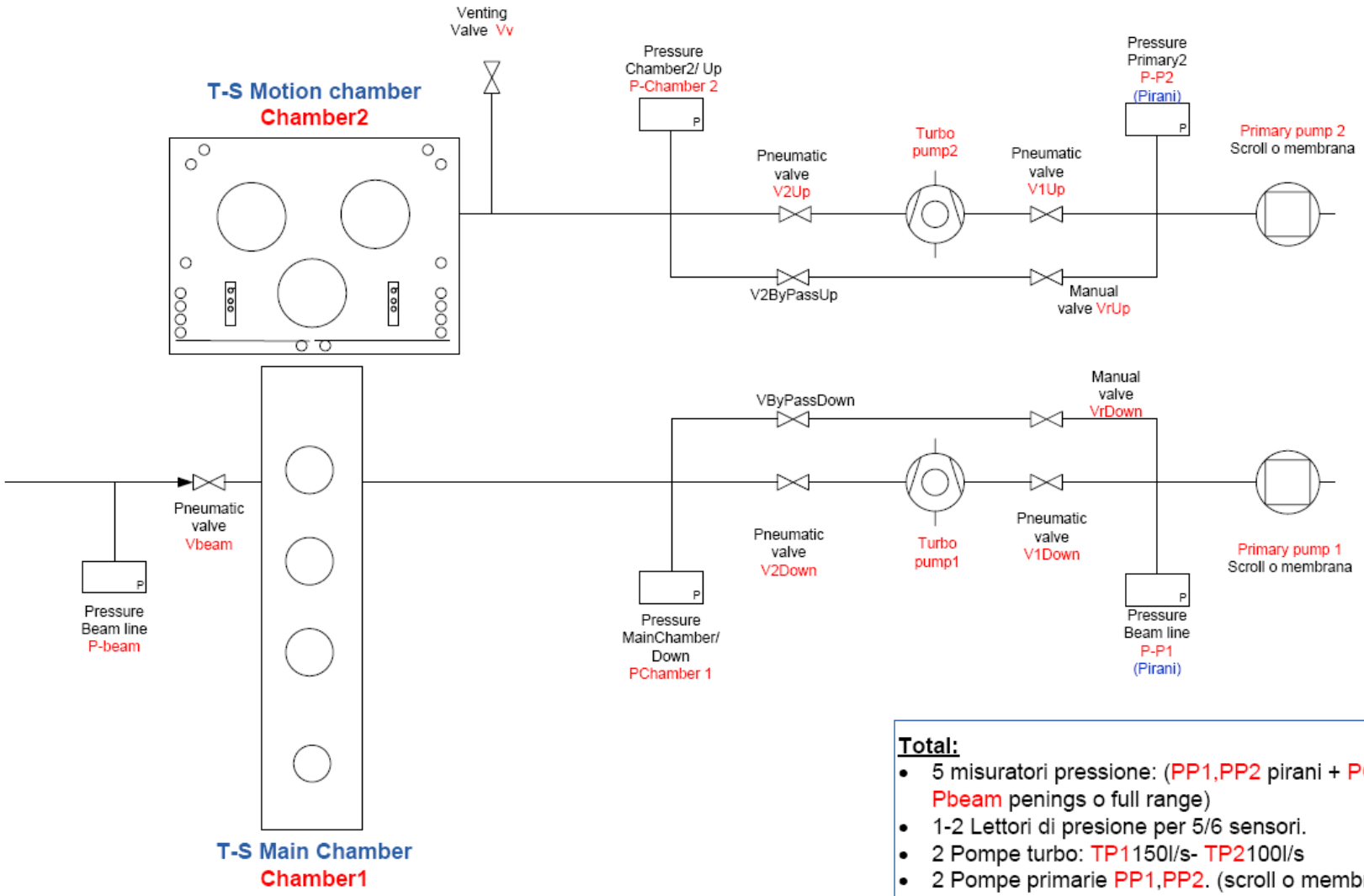
Activity planned in Dec 2014.

In standby because the last experiments with the existing tape at ALTO have been postponed to the next year.

We are waiting for new info from Orsay



5.Vacuum system - original layout

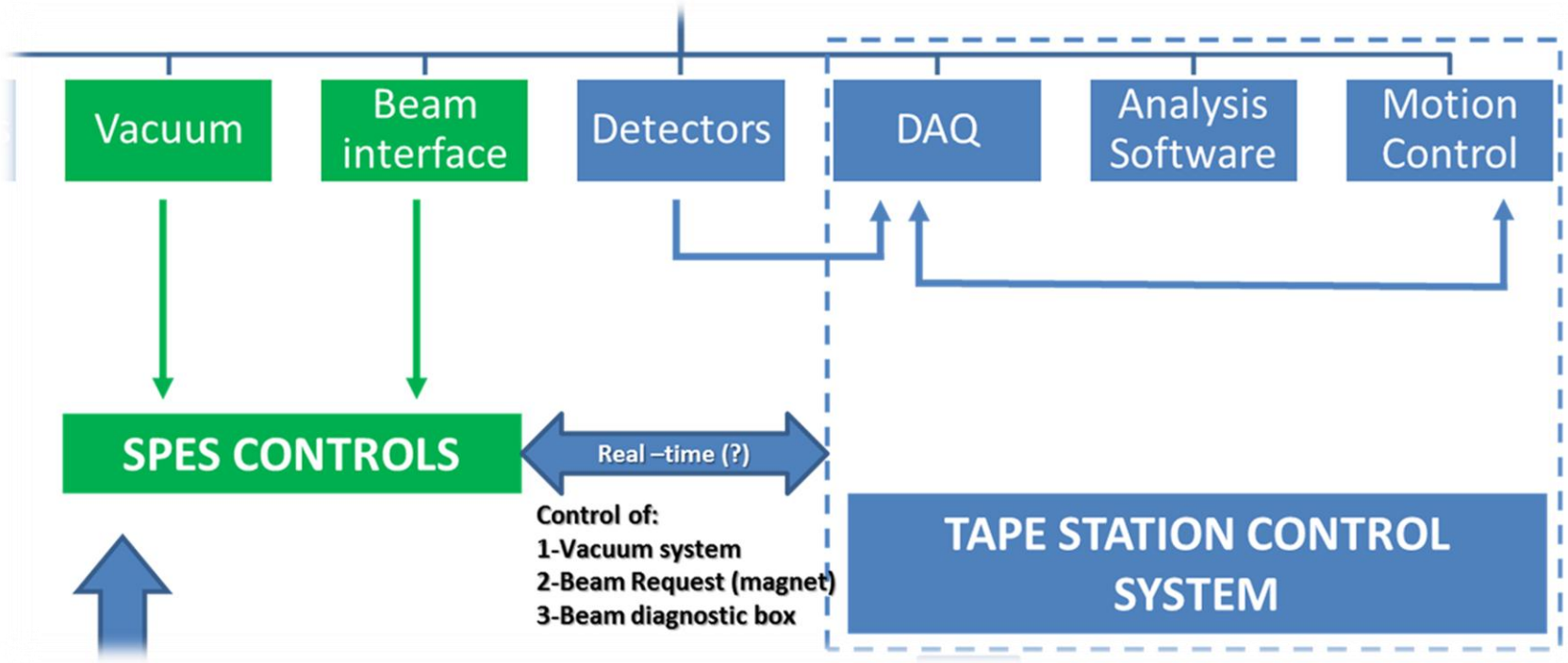


Total:

- 5 misuratori pressione: (PP1,PP2 pirani + PC1, PC2, Pbeam penings o full range)
- 1-2 Lettori di presione per 5/6 sensori.
- 2 Pompe turbo: TP1150l/s- TP2100l/s
- 2 Pompe primarie PP1,PP2. (scroll o membrana)
- 7 valvole pneumatiche (normalmente chiuse)

6.Vacuum system - new layout

- ✓ **SPES-standard pumping systems will be employed.**
- ✓ **The exact placement of the pumps will be defined according to the final mechanical layout**
- ✓ **Also in the new layout two separate pumping systems are foreseen: one for the beam area and one for the tape housing area.**
- ✓ **The operation will be possible through a proper interface with the general SPES control system.**



7.Detectors

Detector equipment for each tape station:
-1 (2) HPGe detectors
-Anti-Compton shielding (under discussion – efficiency issues)
-Plastic scintillators (β,γ coincidence)

The main cost is in the HPGe part and the connected cooling.
Building dedicated LN lines for one detector is costly.
The use of LN dewars is impossible due to radiation in the TS1 area
Two competitors have been considered: CANBERRA and ORTEC.

	Detector type	cost	With Electronics	Coments
Camberra	n + cooling	**49200**	**68100**	15% discount buying 2 systems
Ortec	n+ cooling	**54700**	**78140**	A new system recently developed

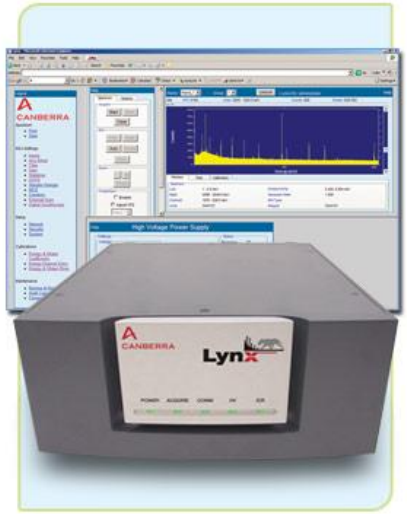
Almost ready for critical decision and ordering

8.DAQ

Each detector supplier offers the related electronics.
These systems are difficult to integrate if several channels are needed (i.e. Plastic-HPGe coincidence).
The cost is averagely higher than “standard” Nuclear Physics Electronics

The full commercial solutions are reliable, easy to use and do not require a huge work to be ready to operate

Critical decision needed
[also connected to the post processing software]



9.Processing SW

SPES TAPE Control System

DAQ

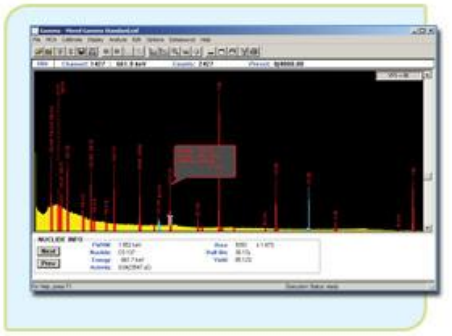
Motion Control

Custom Processing SW

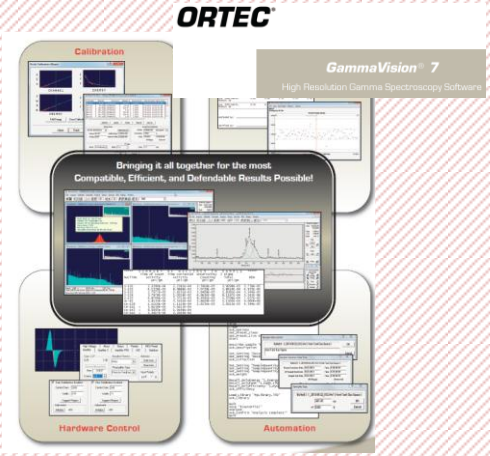
API

Commercial Processing SW

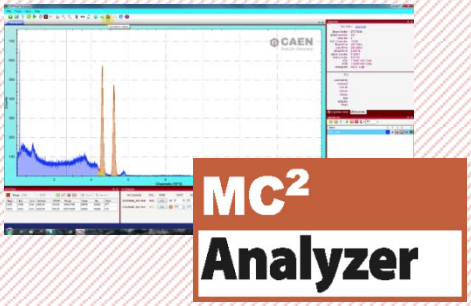
Certified gamma spectroscopy tools



Canberra: GENIE 2000



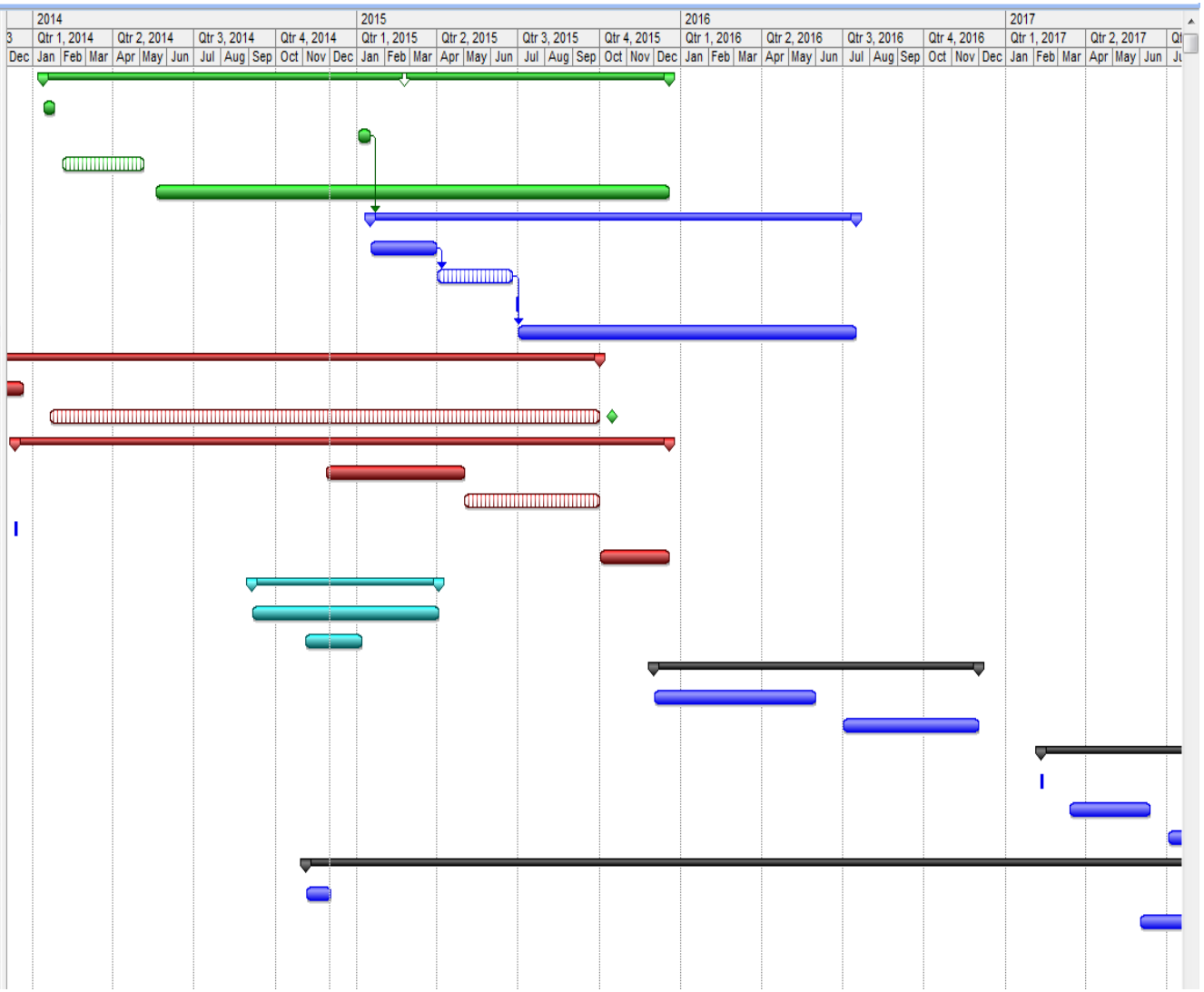
ORTEC: GammaVision



CAEN: MC2

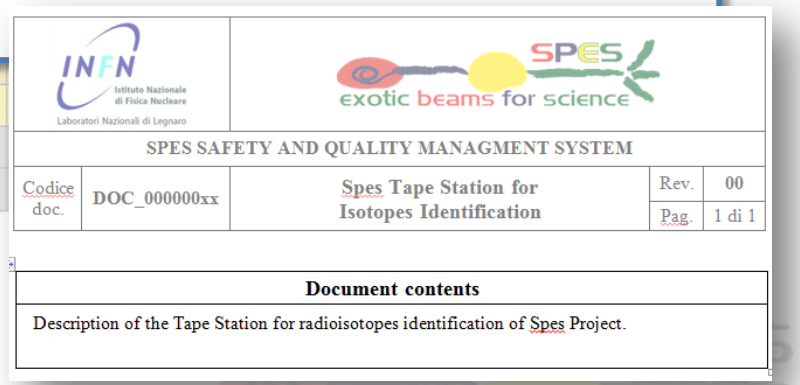
10.Timeline

	Task Name	Start	Finish	P
1	DETECTORS	Mon 13/01/14	Fri 18/12/15	
2	Test Camberra	Mon 13/01/14	Fri 24/01/14	
3	Test Ortec	Fri 02/01/15	Thu 15/01/15	
4	Purhese Order	Mon 03/02/14	Mon 05/05/14	
5	Commisioning Detectors	Mon 19/05/14	Fri 18/12/15	
6	DAQ Preliminary Test	Fri 16/01/15	Fri 15/07/16	3
7	DAQ Design	Fri 16/01/15	Tue 31/03/15	
8	DAQ Purchase order	Wed 01/04/15	Wed 24/06/15	7
9	DAQ Software Impelmentation	Tue 30/06/15	Tue 30/06/15	
10	General Test: Detectors+DAQ	Wed 01/07/15	Fri 15/07/16	8
11	VACUUM	Mon 25/11/13	Thu 01/10/15	
12	Specification	Mon 25/11/13	Fri 20/12/13	
13	Purchase	Mon 20/01/14	Thu 01/10/15	
14	MECCANICA	Thu 12/12/13	Fri 18/12/15	
15	Design Completion	Thu 27/11/14	Fri 01/05/15	
16	Purchase: Machining of Meccanical	Fri 01/05/15	Thu 01/10/15	
17	Motion and Control System Develop	Thu 12/12/13	Thu 12/12/13	
18	Assembly	Thu 01/10/15	Fri 18/12/15	
19	FLUKA+ PROCEDURES	Fri 05/09/14	Thu 02/04/15	
20	Fluka simulations	Fri 05/09/14	Thu 02/04/15	
21	Measurement Procedure	Mon 03/11/14	Tue 06/01/15	
22	Test Commisioning TAPE	Tue 01/12/15	Wed 30/11/16	
23	Comisioning at LNL	Tue 01/12/15	Tue 31/05/16	
24	Test at Partners Lab	Fri 01/07/16	Wed 30/11/16	
25	TAPE 2 Production	Fri 10/02/17	Fri 01/12/17	
26	Ordering	Fri 10/02/17	Fri 10/02/17	
27	Assembly	Mon 13/03/17	Mon 12/06/17	
28	Comissioning	Mon 03/07/17	Fri 01/12/17	
29	DOCUMENTATION	Wed 05/11/14	Fri 01/12/17	
30	Safety and Quality Management Sy	Wed 05/11/14	Tue 02/12/14	
31	Manual and Procedures	Thu 01/06/17	Fri 01/12/17	



Summary

1. SPES (α, β) will be equipped with two TAPE stations for the RIB characterization
2. The system will allow to probe the RIB composition prior, during and at the end of the experiment
3. The system will not allow on-line monitoring of the beam composition
4. The same system will also allow to measure the release properties of the ISOL target (useful for target development)
5. Design guidelines:
   1. Simple, Reliable, User friendly, Long-lasting tool
   2. Maximum integration with the SPES control system
   3. Exploit the know-how gained in partner laboratories (GANIL, ALTO, CERN, HRIBF)
6. Prototype TEST at partner laboratory by the end of 2016
7. *WG description document in preparation (technical documents will follow)*
8. *Ready for system integration analysis*



INFN Istituto Nazionale di Fisica Nucleare, Laboratori Nazionali di Legnaro

SPES exotic beams for science

SPES SAFETY AND QUALITY MANAGMENT SYSTEM

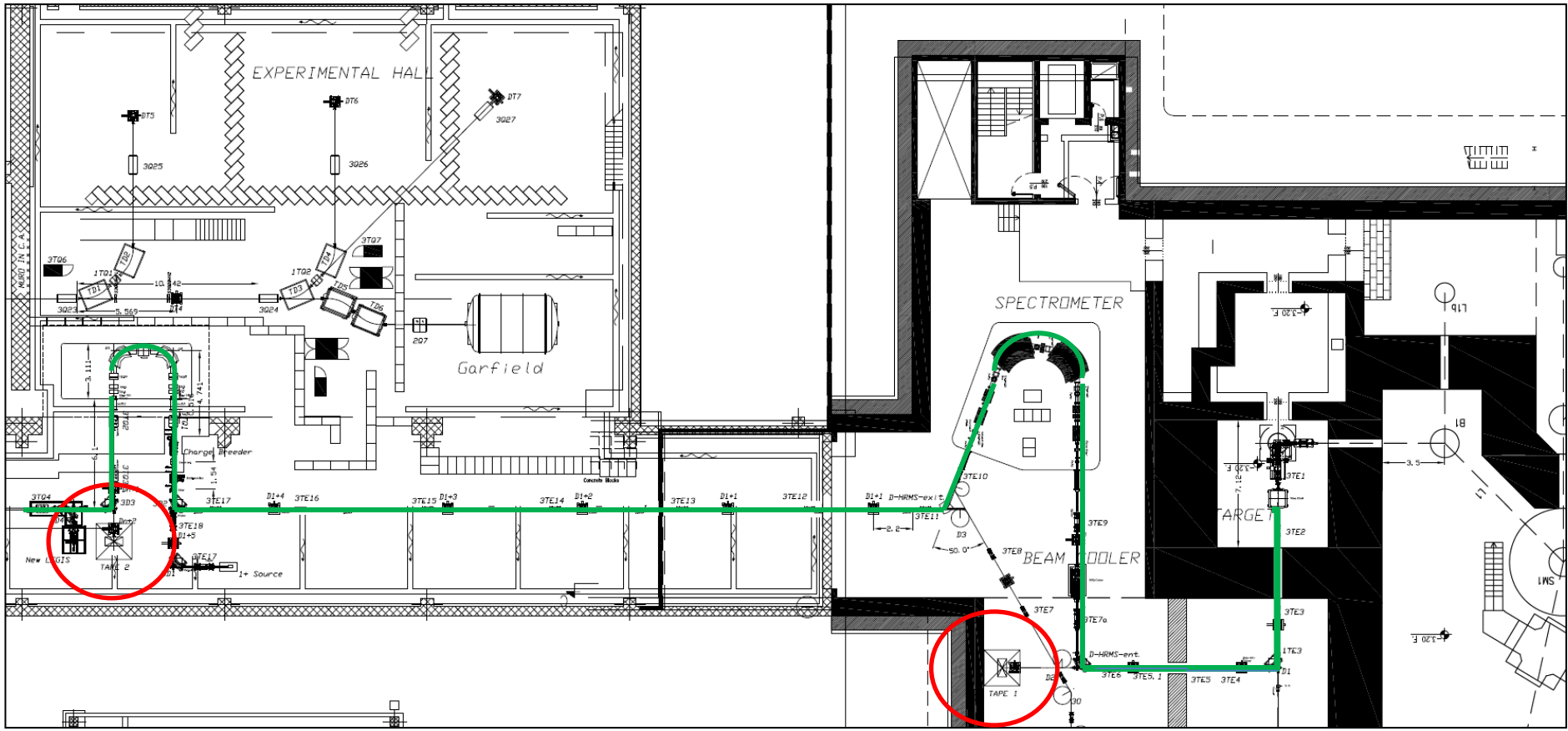
Codice doc.	DOC_000000xx	Spes Tape Station for Isotopes Identification	Rev.	00
			Pag.	1 di 1

Document contents

Description of the Tape Station for radioisotopes identification of Spes Project.

Backup

3.TAPES location within the SPES layout – to be confirmed



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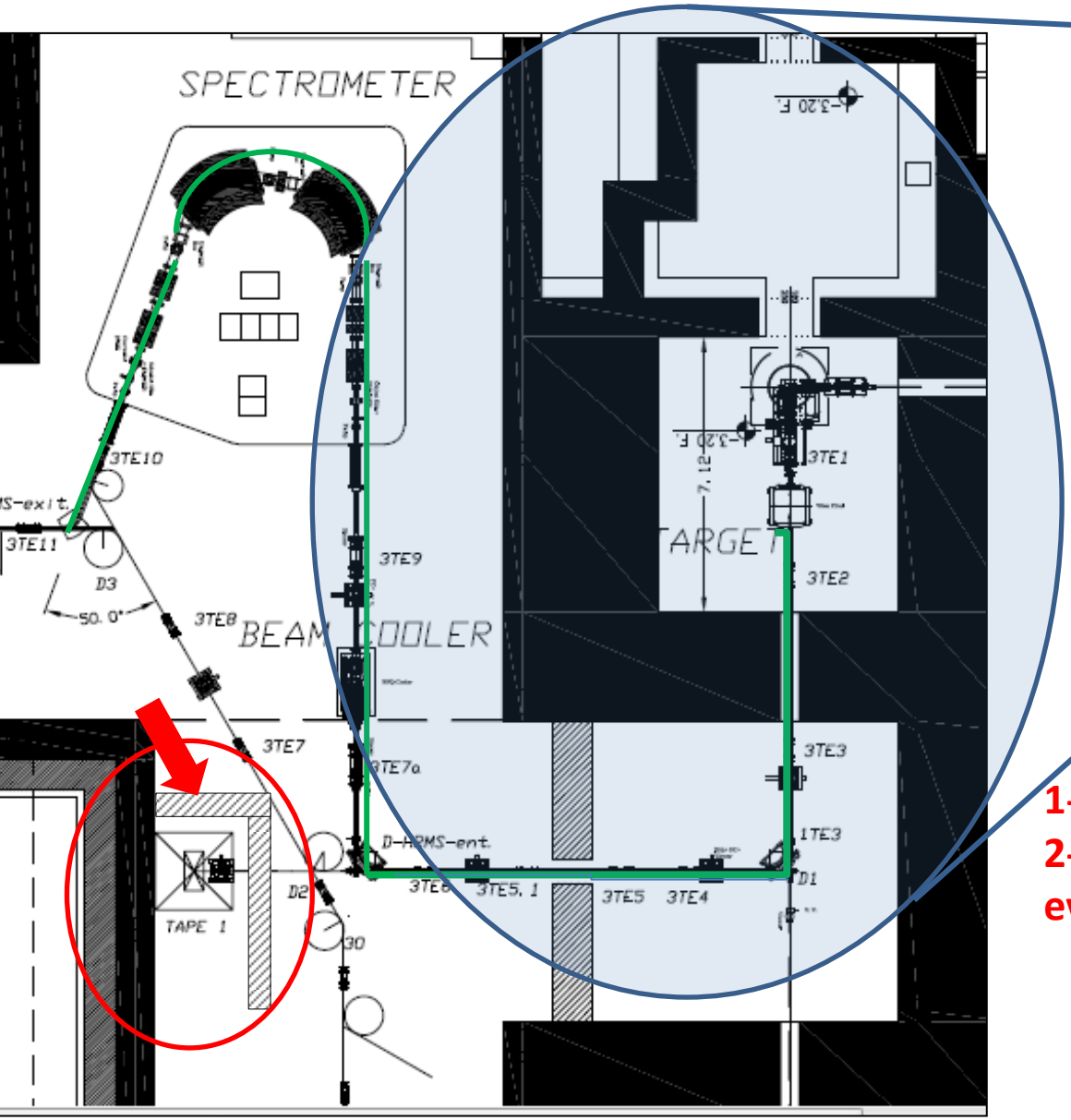

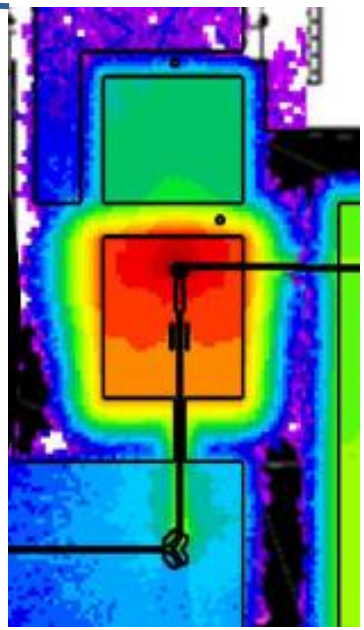

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1-Final layout needed
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Proper Shielding design
Beam Interface design

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