DESIR SAFETY ISSUES

- **Safety requirements**
- **Induced intensity limitations**

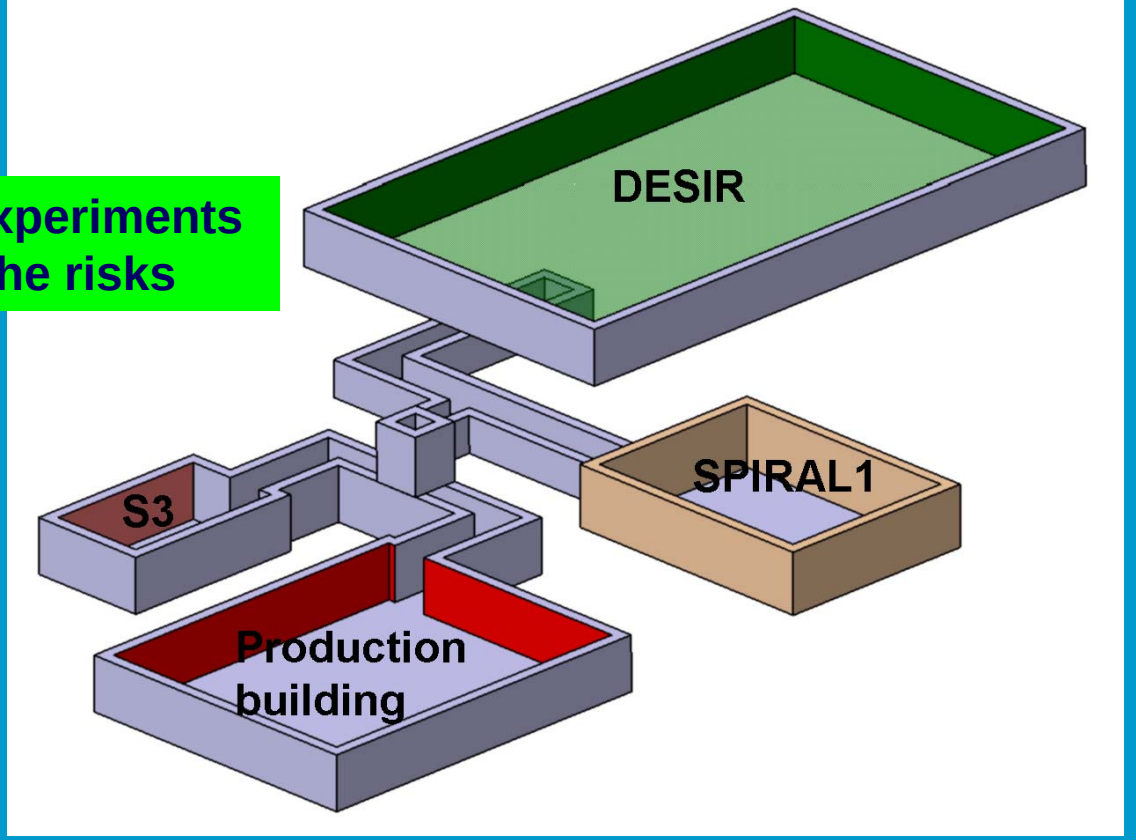
-> http://www.cenbg.in2p3.fr/desir/IMG/pdf/DESIR-Technical-Proposal-V090105.pdf

- **Technical solutions**

SAFETY REQUIREMENTS

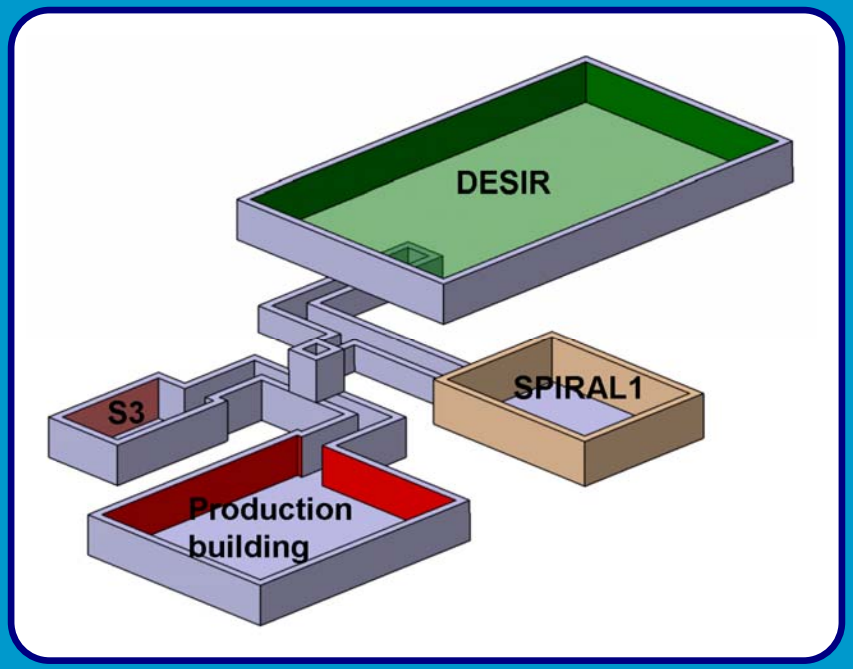
DESIR building + beam lines to DESIR : green zones on and off operation
-> controlled accesses
-> activity confinement and monitoring (external exposure dose rate + inhalation risks)
-> limited impact on the environment

-> impact evaluation prior to experiments
-> technical solutions to limit the risks



The Dose rate issue (DeD)

- ✓ working area: DeD < 7.5 µSv/h
  < 2 mSv/year/worker
- ✓ temporary working area (< 10 min): DeD < 100 µSv/h



- ✓ RIB from S1: (10^8 pps ^{19}Ne)
  -> definitely an issue but: short lifetime and temporary shielding can be mounted (30 cm air + 30 cm concrete)
- ✓ RIB from S2: can be an issue if long-lived and produced at high yields + contaminants
- ✓ RIB from S3: I < 10^6 pps, N~Z nuclei : can be an issue depending on the selectivity

Accidental activity release (inhalation risks)

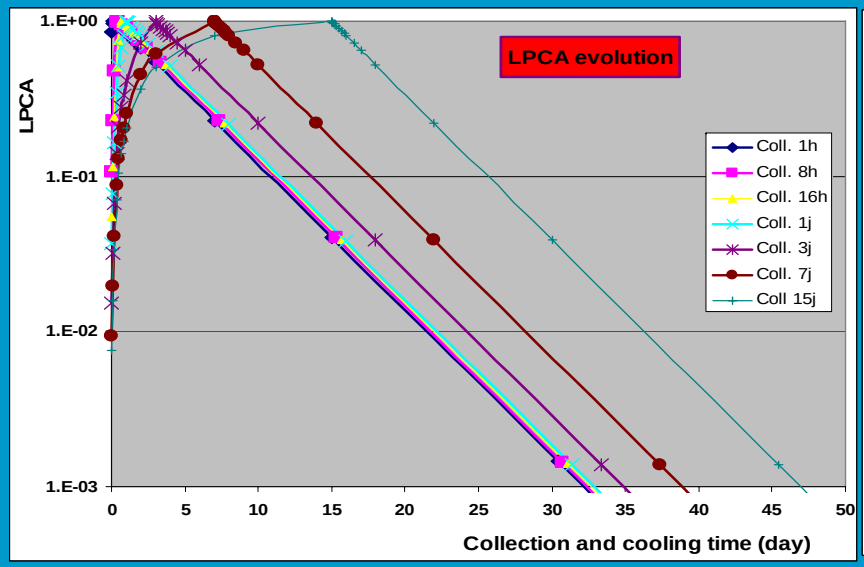
- ✓For any RIB presenting inhalation risks: induced LPCA in Bq/m^3 associated with a dose limitation (20 mSv for 2000 h and 1.2 m^3/h inhalation)
- ✓DESIR safety requirement : released activity < 1 LPCA (at any time -> cooling to be considered)

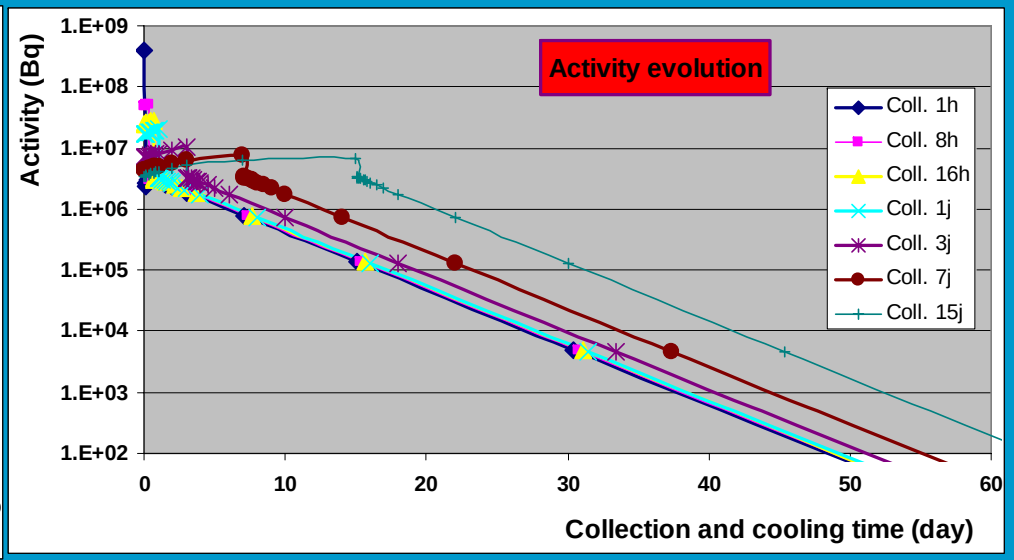
Example of ^{131}I: $T_{1/2}$ = 8.02 d

LPCA = 400 Bq/m^3 assuming a 100 % release at room temperature

-> Considering a release volume of 10*10*5 m^3 = 500 m^3, A(^{131}I)^{MAX} = 2.E+05 Bq
i.e. A(^{131}I)^{MAX} = 2.4E+06 pps for 1 day of implantation

^{132}Sn only





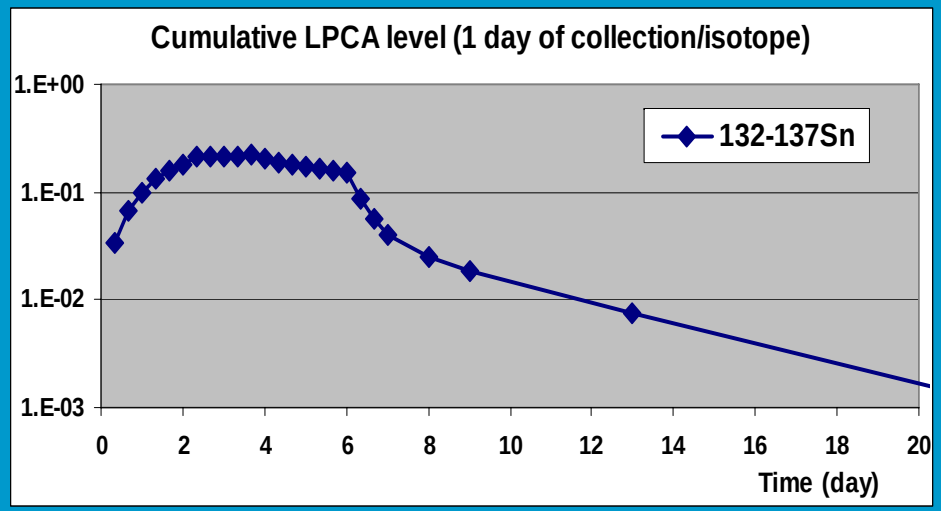
V = 500 m^3		
Collection time	I^{MAX} (pps) for 1 LPCA	Cooling time to reach 0.01 LPCA
1 d	8.5E+06	22 d

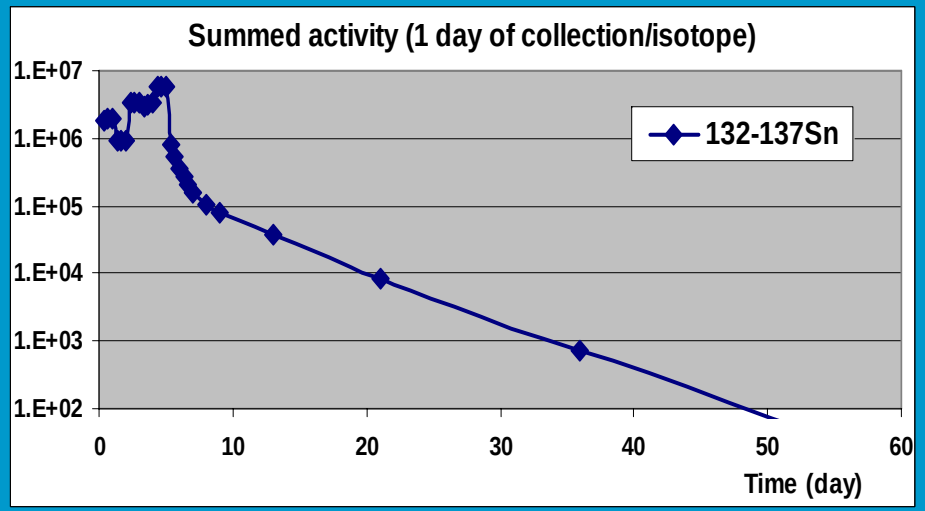
In target yield (10^{14} f/s)
$7.7\ 10^{11}$ to $7.9\ 10^{11}$

Beam intensity limitation ~10^5

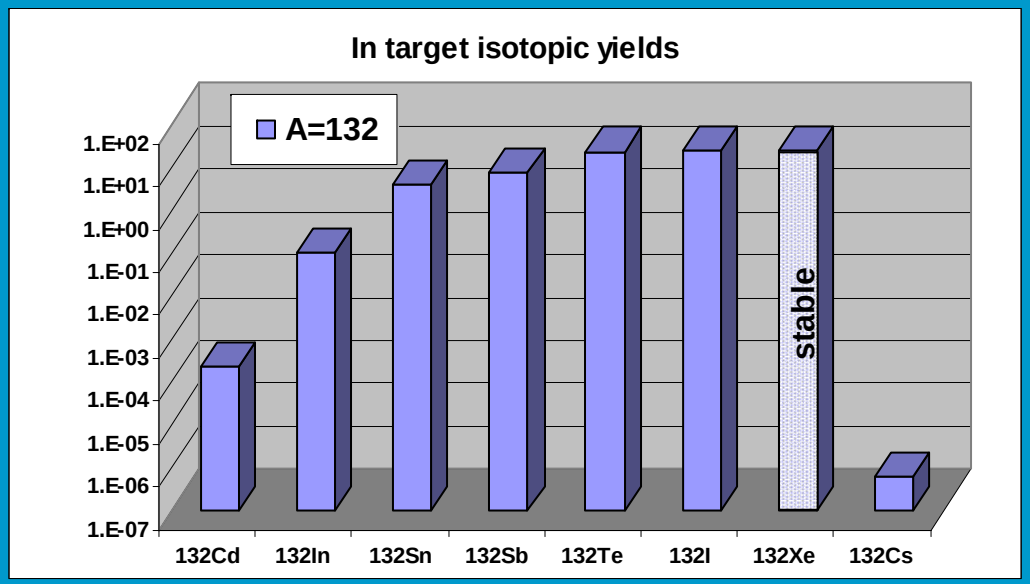
Simulation of a laser spectroscopy experiment:
6*1 day run on $^{132\text{-}137}$Sn, delivered as pure beams

V = 500 m^3		
Beam	I^{MAX} (pps) for 1 LPCA	I^{RED} (pps) for 1 day
^{132}Sn	8.5E+06	8.5E+05
^{133}Sn	1.9E+06	1.9E+05
^{134}Sn	7.6E+06	7.6E+05
^{135}Sn	6.7E+06	6.7E+05
^{136}Sn	1.3E+07	1.3E+06
^{137}Sn	5.2E+07	5.2E+06

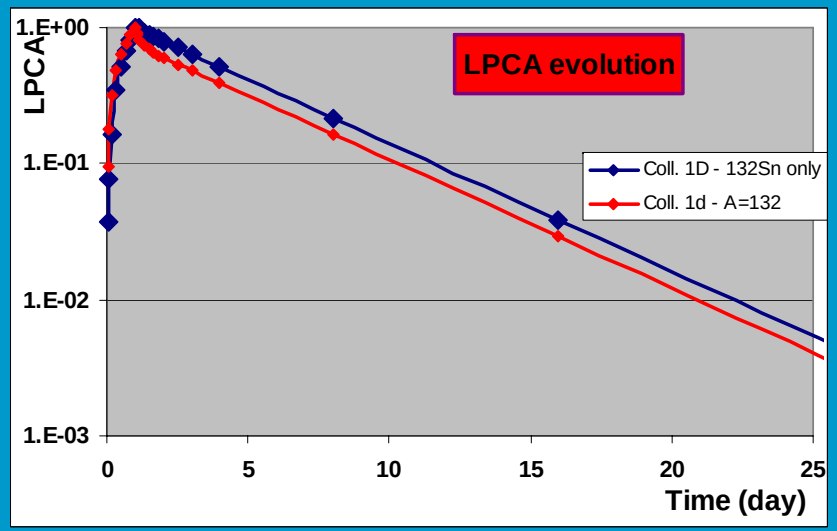


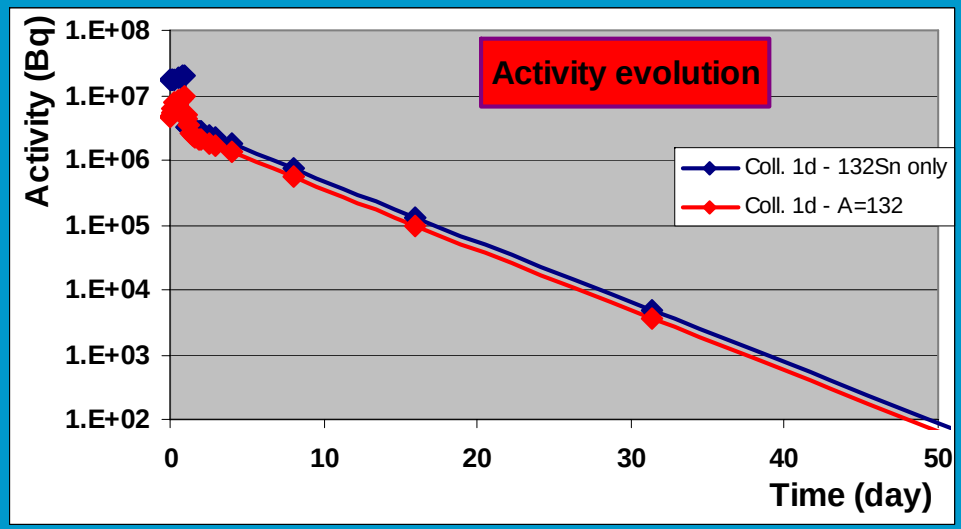


Without isotopic separation: ^{132}Sn case



V = 500 m^3	
Beam	I^{MAX} (pps) for 1 LPCA
^{132}Sn only	8.5E+06
^{132}Sn without isotopic separation	5.7E+05

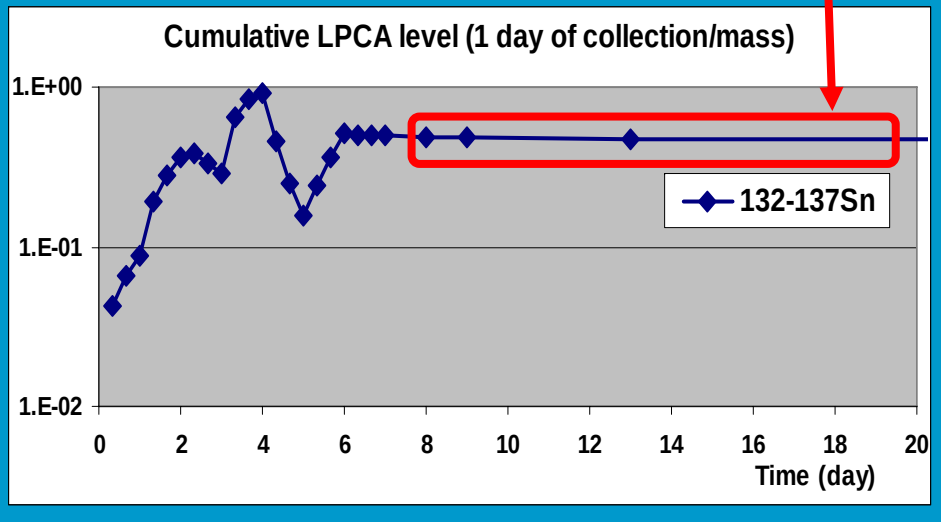


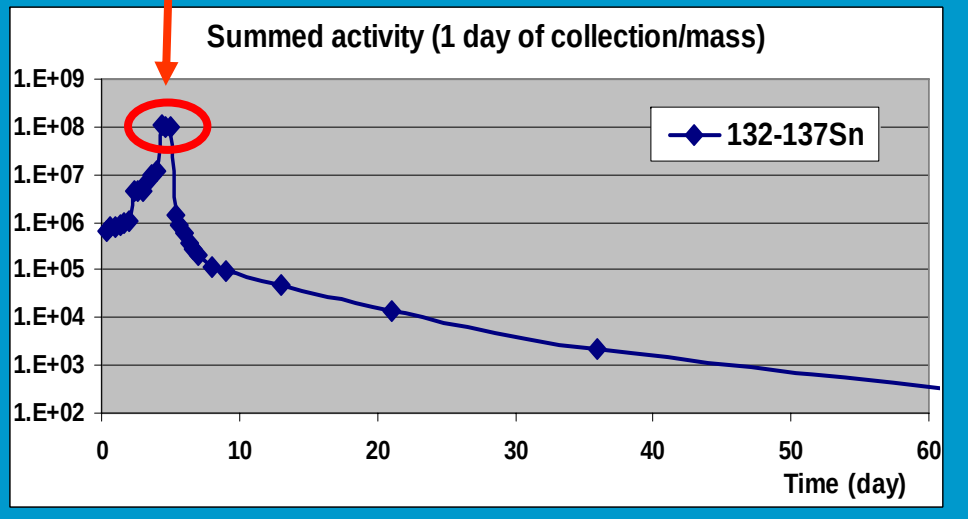


Simulation of a laser spectroscopy experiment:
6*1 day run on $^{132\text{-}137}$Sn, without isotopic separation

V = 500 m^3		
	Sn only	No isotopic separation
Beam	I^{MAX} (pps) for 1 LPCA	I^{MAX} (pps) for 1 LPCA
^{132}Sn	8.5E+06	5.7E+05
^{133}Sn	1.9E+06	3.3E+04
^{134}Sn	7.6E+06	9.5E+04
^{135}Sn	6.7E+06	3.1E+03
^{136}Sn	1.3E+07	1.3E+05
^{137}Sn	5.2E+07	2.1E+04

V = 500 m^3	
	No isotopic separation
Beam	I^{MAX} (pps) for 1 LPCA
^{132}Sn	5.E+04
^{133}Sn	1.E+04
^{134}Sn	1.E+04
^{135}Sn	3.E+03
^{136}Sn	5.E+03
^{137}Sn	1.E+04

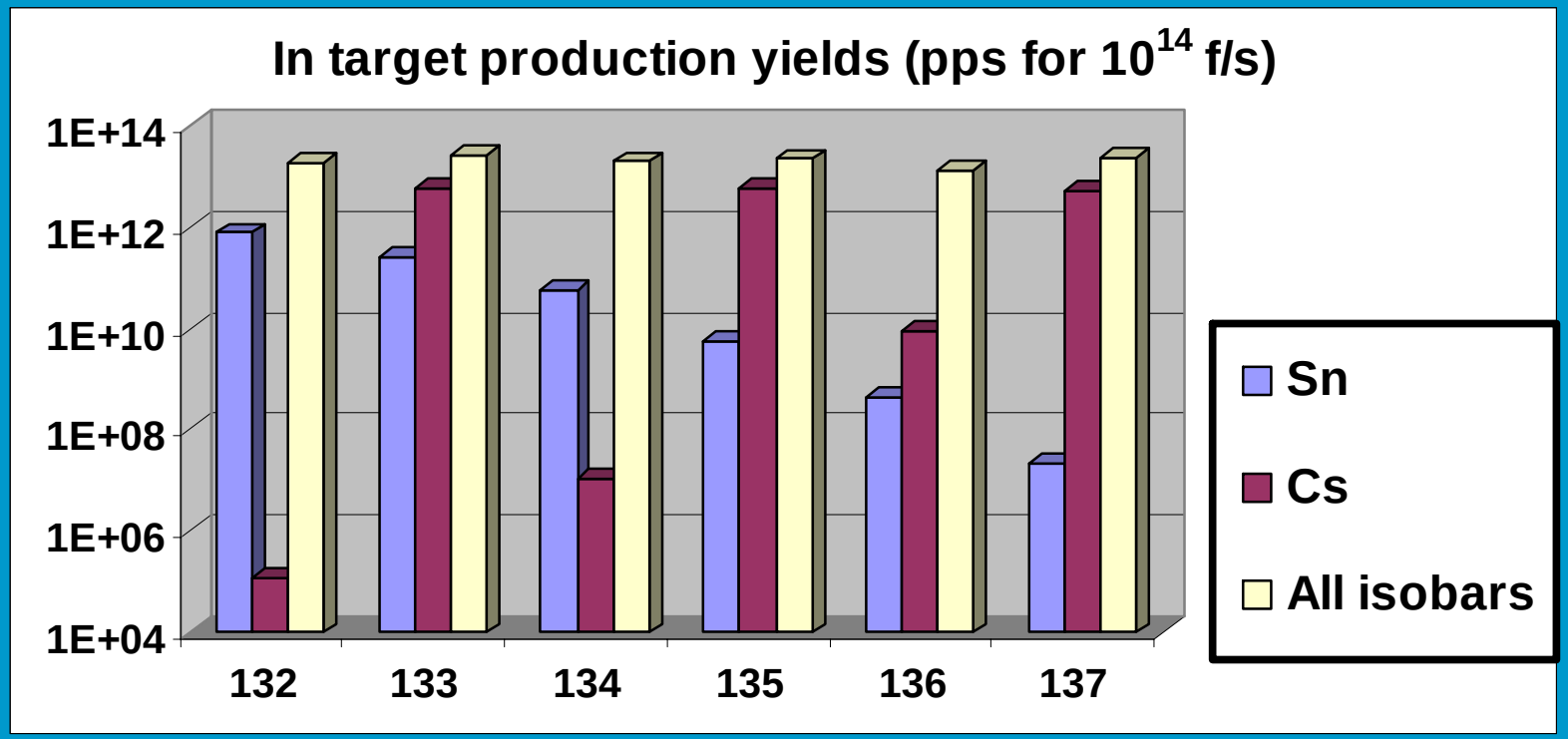




Technical solutions

- External dose rate exposure: local shielding + DeD monitoring
- Activity confinement: vacuum + specific dismounting procedures
- Limited impact on the environment: low depression + limited amount of activity < 100 MBq (activity inventory)
- “On-line” beam monitoring before the DESIR building: dedicated DeD monitoring station + beam stopper

Beam intensity limitations



- pepperpots
- selectivity (ionization process + mass separation)

-> both need to be controlled

Next steps

- DESIR safety report (including technical solutions) to be produced by the end of 2009
- Impact evaluations taking into account realistic ionization efficiencies, mass separation resolutions and release fractions -> what are the RIBs of interest?