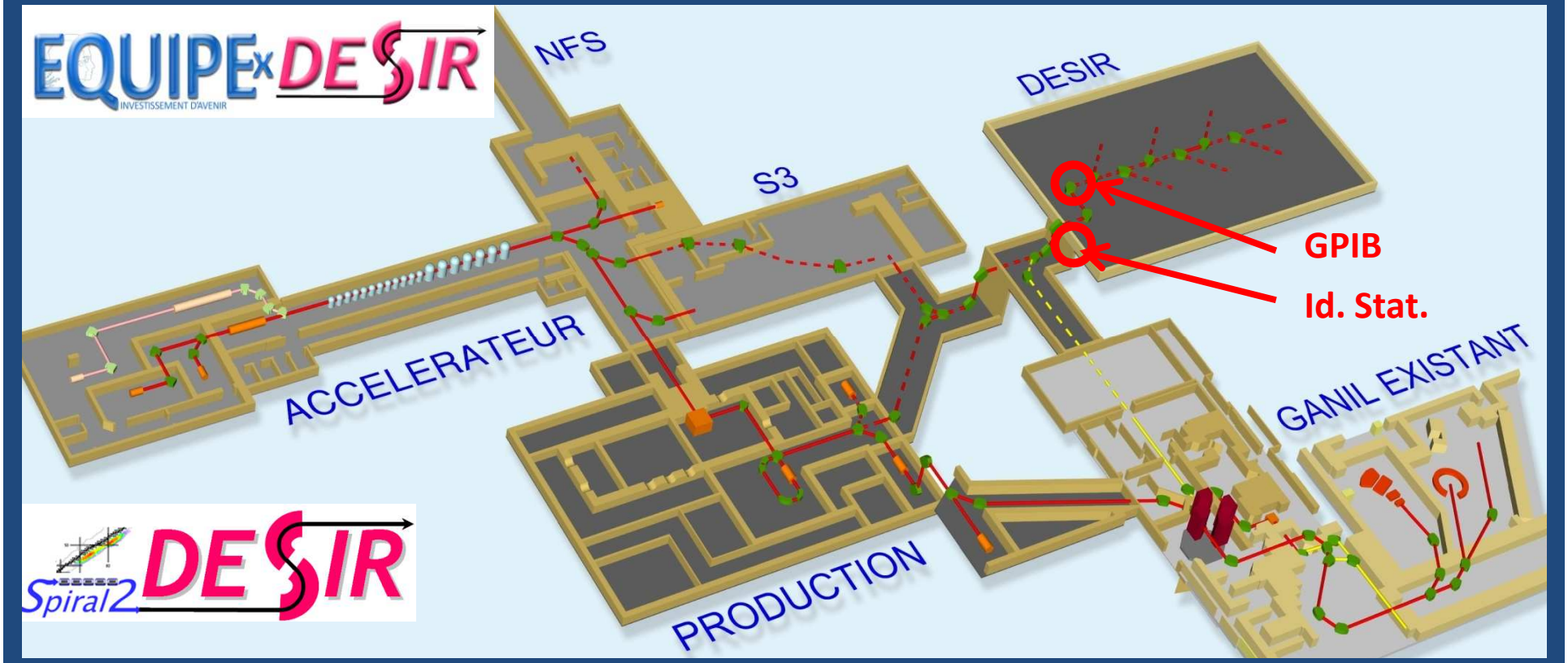
DESIR status report

- EQUIPEX funding for DESIR
- Cooler SHIRaC
- High-resolution separation HRS
- PIPERADE
- Neutron multiplicity detector TETRA
- Neutron ToF detector

SAC – SC meeting, Paris, June 6-7, 2012

DESIR EQUIPEX funding

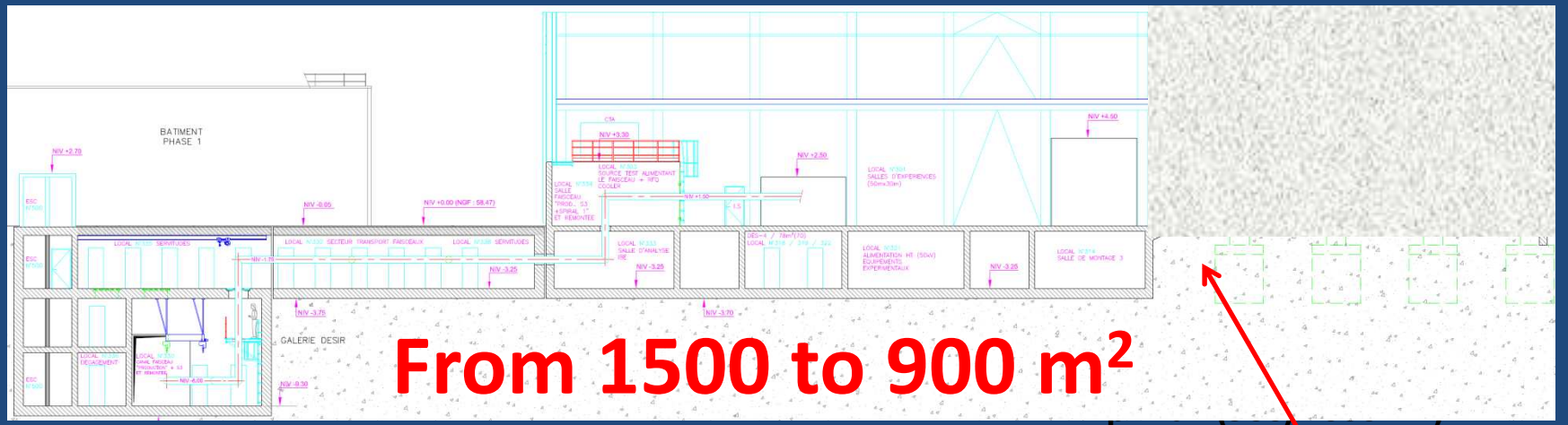
Phase 1 of the project



Phase1: Construction (2012-2016) + Operation (2017-2019)

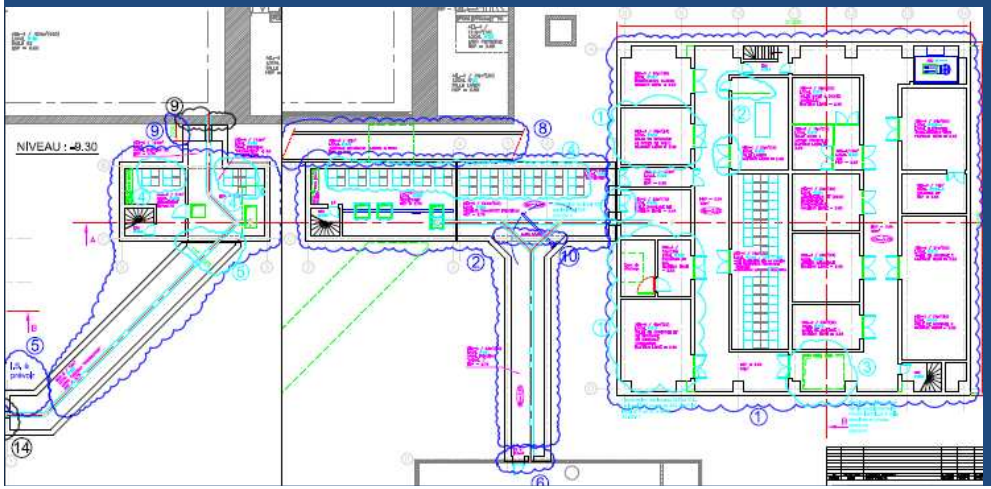
- Infrastructure: beam transport tunnels + reduced experimental area
- S3 -> DESIR beam line + 10 m inside the experimental hall
- Commissioning of the PIPERADE GIPB
- Implementation of an identification station

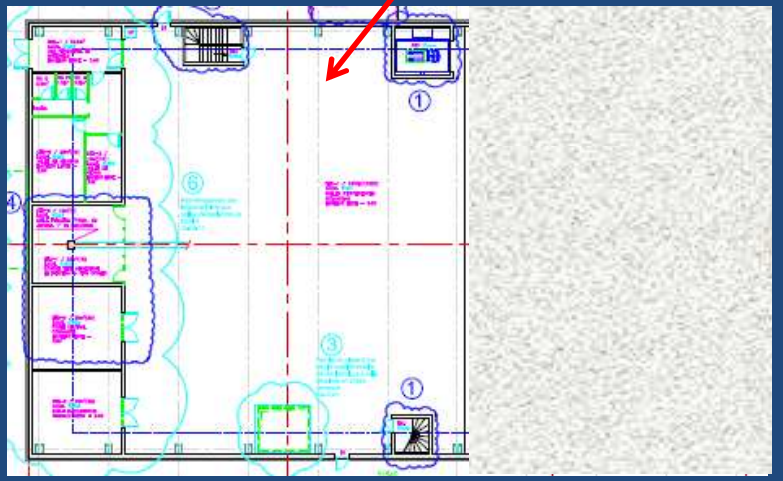
DESIR buildings – Surface reduction



Smaller experimental hall

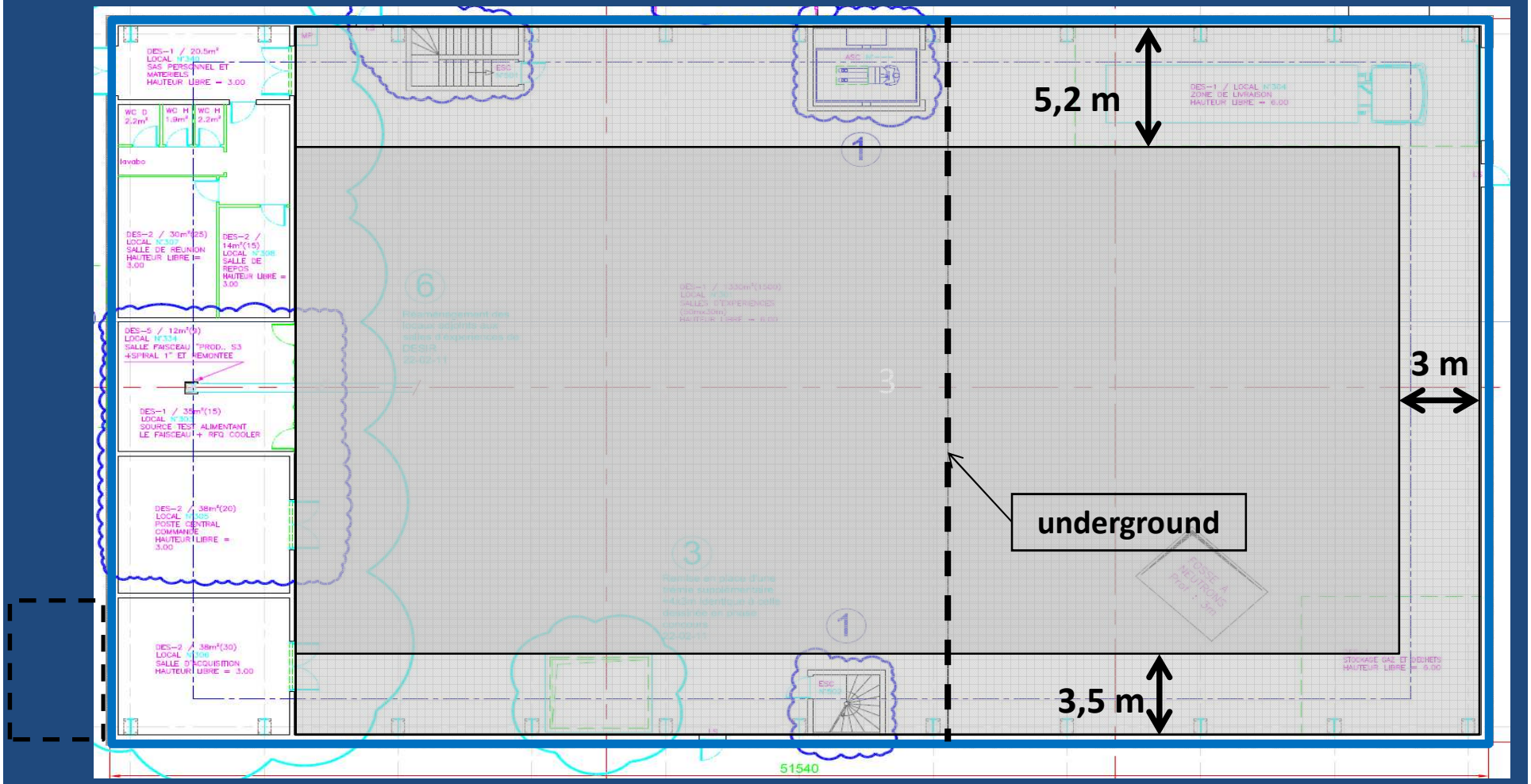
Basement and beam transport tunnels: unchanged

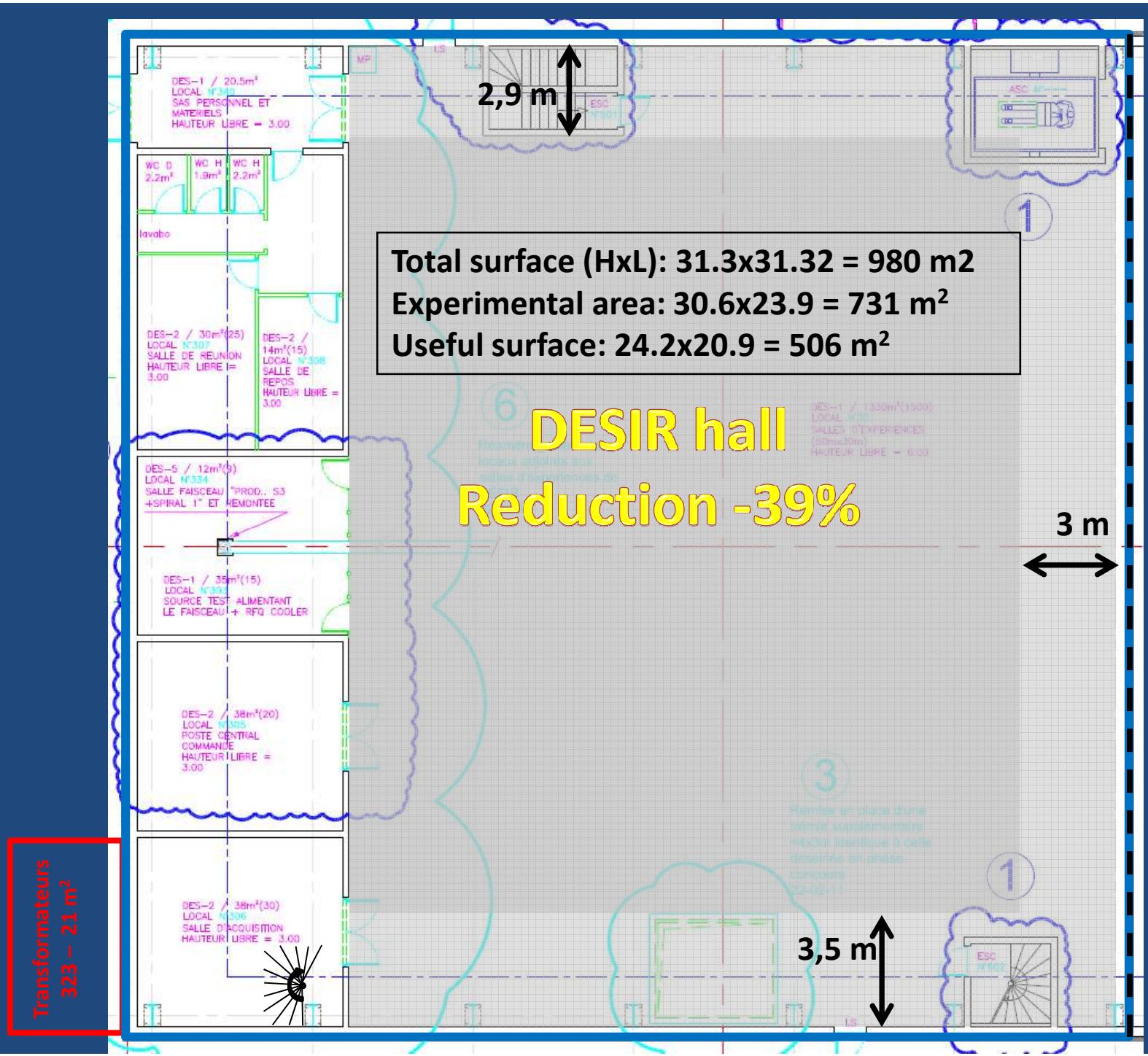




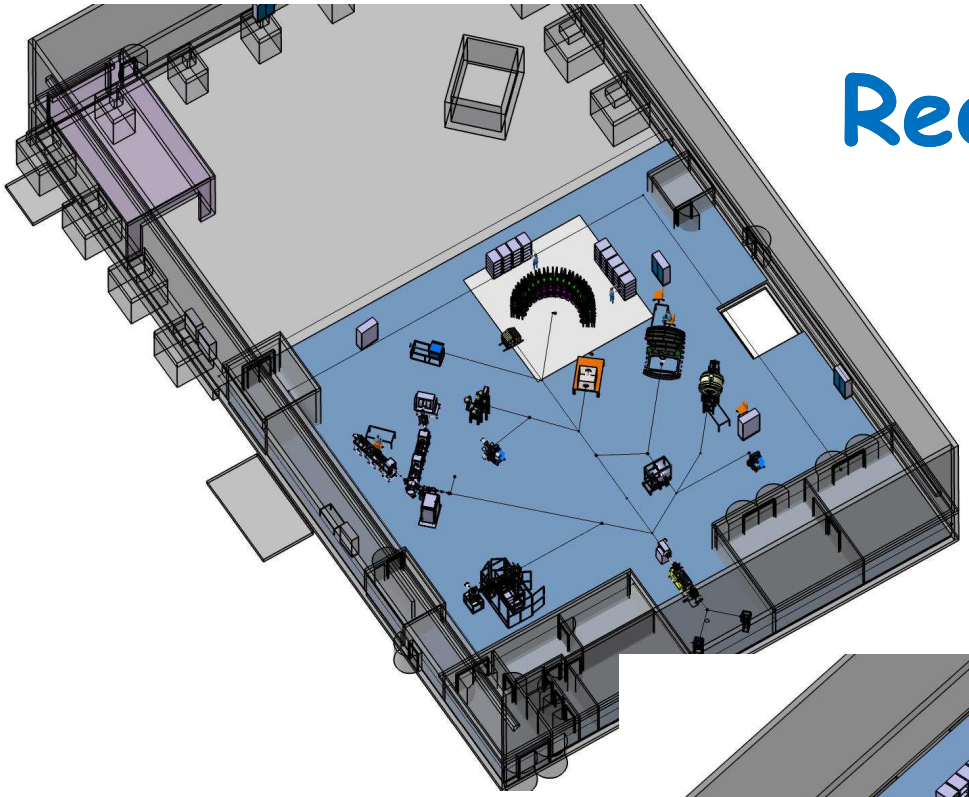
DESIR Hall: initial drawing

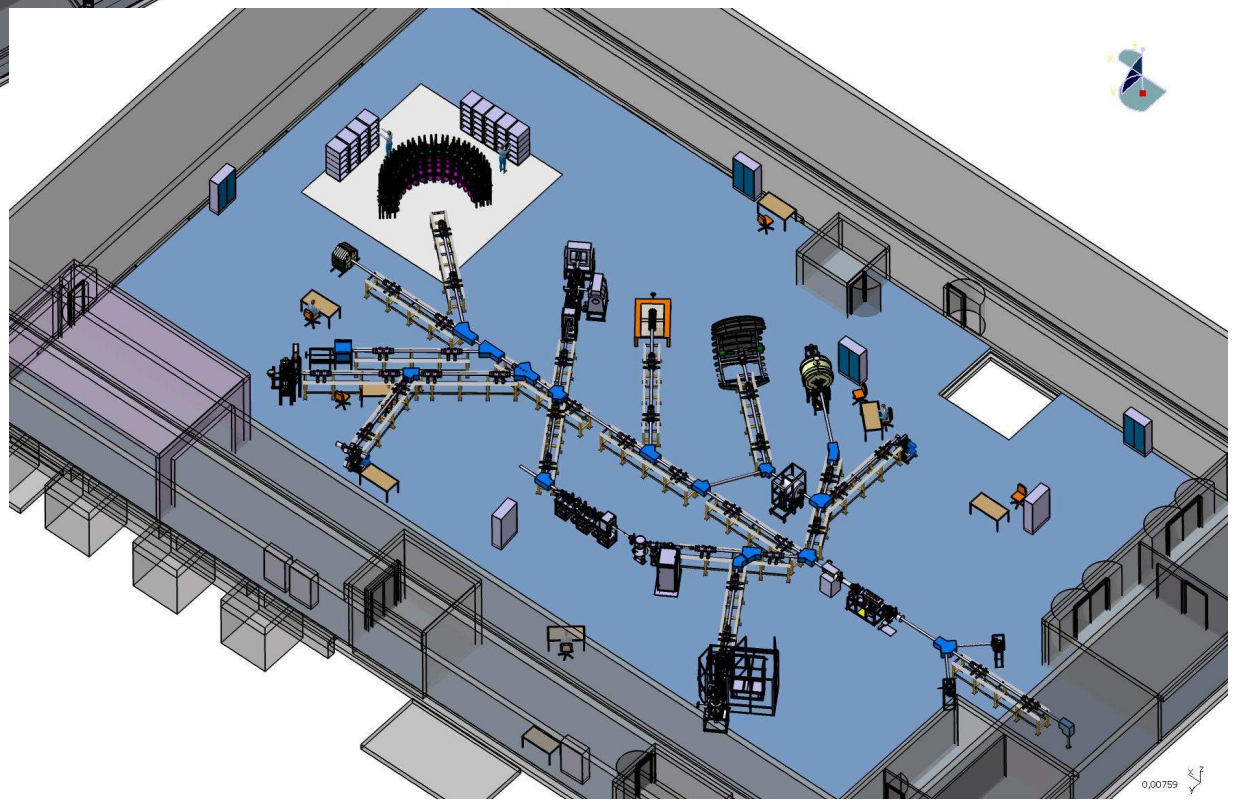
Total surface (HxL) 31.3x51.54 = 1613 m²
Experimental area: 30.6x44.3 = 1356 m²
Useful surface: 21.9x41.3 = 904 m²




2,9 m
Total surface (HxL): 31.3x31.32 = 980 m2
Experimental area: 30.6x23.9 = 731 m²
Useful surface: 24.2x20.9 = 506 m²
DESIR hall
Reduction -39%
3 m
3,5 m
Transformateurs
323 – 21 m²
DES–1 / 20.5m²
LOCAL N°340
SAS PERSONNEL ET MATERIELS
HAUTEUR LIBRE = 3.00
WC D 2.2m²
WC H 1.9m²
WC H 2.2m²
lavabo
DES–2 / 30m²(25)
LOCAL N°307
SALLE DE REUNION
HAUTEUR LIBRE = 3.00
DES–2 / 14m²(15)
LOCAL N°308
SALLE DE REPOS
HAUTEUR LIBRE = 3.00
DES–S / 12m²(9)
LOCAL N°334
SALLE FAISCEAU "PROD.. S3 +SPIRAL 1" ET REMONTEE
DES–1 / 35m²(15)
LOCAL N°303
SOURCE TEST ALIMENTANT LE FAISCEAU + RFQ COOLER
DES–2 / 38m²(20)
LOCAL N°305
POSTE CENTRAL COMMANDE
HAUTEUR LIBRE = 3.00
DES–2 / 38m²(30)
LOCAL N°306
SALLE D'ACQUISITION
HAUTEUR LIBRE = 3.00

Reduced DESIR hall





Estimate of the project cost

Investment costs:

• WP1: Buildings (2940 m^2)	7565 k€
• WP2: Beam lines (100+40 m)	5460 k€
•WP3: General Purpose Ion Buncher (GPIB)	390 k€
• WP4: Identification station	209 k€
• WP5.1: Radioprotection Lab	87 k€
• WP5.2: Mechanical workshop	57 k€
• WP5.3: Stable ion sources	59 k€
total:	**~14 M€**

Running costs: ~220 k€/y (15 weeks/y)

EQUIPEX 2011:

- request ~ 14 M€ (investment, 36 months) + 1 M€ (operation, 54 months)

- granted 9 M€ -> 8 M € (investment, 54 months)

+ 1 M€ (operation, 36 months)

Complementary funding:

- experimental equipment: ~ 5M€ (DECA)

- SPIRAL2 Phase2 High Resolution Separator: 1.7 M€ (CPER)

Cost reduction

Smaller experimental area (INGEROP preliminary study 11/05/2012):

- ~20% smaller basement =230 k€ reduction -> not considered
- ~40% smaller experimental hall = 735 k€ reduction -> considered

➢ **DESIR infrastructure costs (EQUIPEX) = 6.65 M€**

Phasing of the beam lines implementation

- S3 -> DESIR: 1.7 M€
- 10 m inside the DESIR hall: 0.4 M€

-> DESIR beam lines cost (EQUIPEX): 2.1 M€, including contributions from GANIL (0.6 k€) and outside (0.4 k€, asked to the Basse-Normandie Region in April 2012)

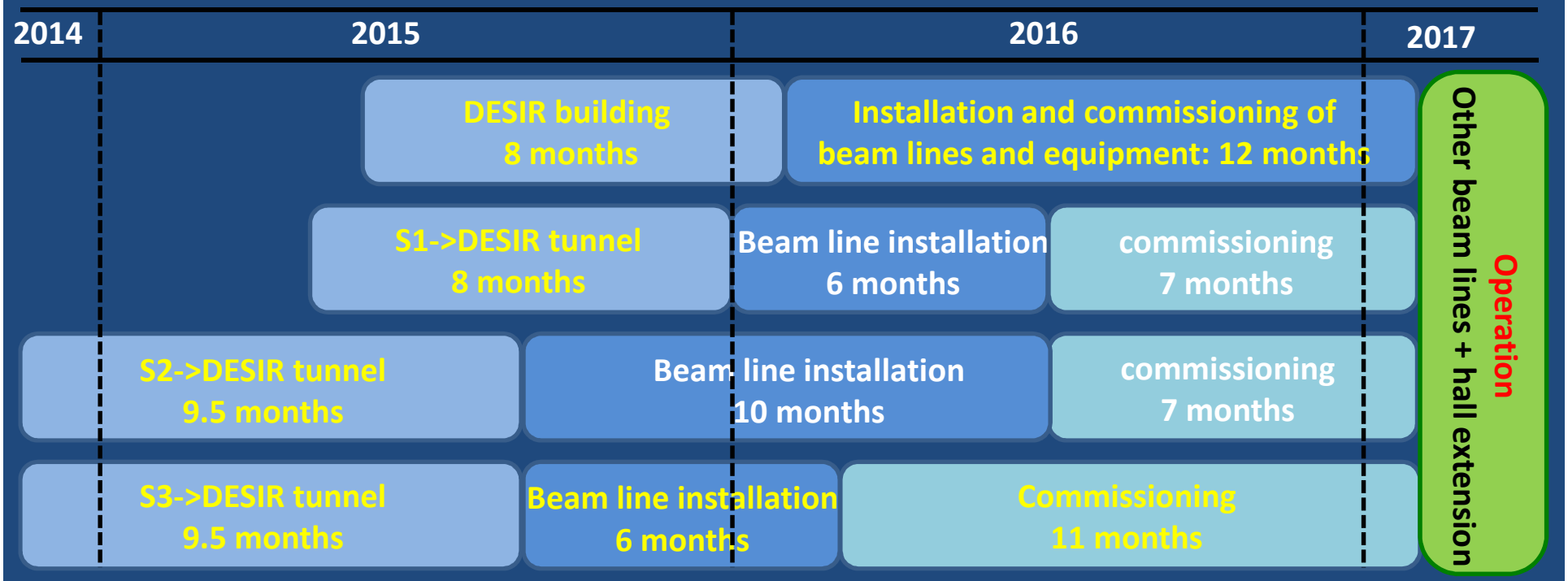
Outside EQUIPEX: connection to Spiral2 Production = 1.3 M€
Outside EQUIPEX: connection to Spiral 1 = 1.5 M€
+ DESIR building extension (600 m^2) : > 1 M€ ?
+ 40 m of beam lines inside DESIR : 1.6 M€

-> Missing funding: 5.4 M€

DESIR Timetable

T0 for the beginning of the Phase2 of SPIRAL2 = January 2014

- Yellow: EQUIPEX
- White: outside EQUIPEX



EQUIPEX grant distribution

T0 for the beginning of the Phase2 of SPIRAL2 = January 2014

		Phase 1					Phase 2		
		2012	2013	2014	2015	2016	2017	2018	2019
WP0-Coordination	0								
WP1-Building	7648			665	3204	2779	255	261	255
WP2-Beam lines	1131		195	568	287	81	62	62	62
WP3-Identification station	94			44	50				
WP3-GPIB	0								
WP5-User facilities	55			28	28				
WP6-Applications	5				5				
Management	111	5.8	14	11	21	16	16	10	16
		5.8	209	1315	3594	2875	333	333	333

Phase 1	8000
Phase 2	1000
Total	9000

Manpower

- Only permanent staff
- Reduced by ~140 m.m

Total GANIL	228
Total IPNO	74
Total CENBG	29
Total IPHC	24
Total LPC	20
Total CIMAP	4.5
Total	380

Work Package	Partner	Phase1 (m.m)	Phase2 (m.m)
WP0 - Project coordination	GANIL	14.4	19.6
WP1 - Infrastructure building and equipment operation (GANIL)	GANIL	33.3	38.7
WP2 – Beam lines construction and operation (IPNO)	IPNO	73.6	
	GANIL	85.2	17.3
	CENBG	12.2	0.0
	TOTAL	171.0	17.3
WP3 – Identification station (IPHC)	IPHC	24.1	0.0
	LPC	1.5	0.0
	GANIL	0.0	4.7
	TOTAL	25.6	4.7
WP4 – General Purpose Ion Buncher (GANIL/LPC)	LPC	6.0	8.7
	GANIL	6.0	8.7
	TOTAL	12.0	17.3
WP5 – User facilities (CENBG)		5.0	
WP5.1 – Stable ion source	LPC	3.0	0.7
	GANIL		1.5
WP5.2 – Mechanical workshop			
WP5.3 – Radioprotection lab			
WP5.4 – EPICS control/commande	CENBG	6.0	6.0
	TOTAL	14.0	8.2
WP6 – Applications (GANIL)			
WP6.1 – Nuclear energy (GANIL)	GANIL	2.7	1.8
WP6.2 – Pluridisciplinary (CIMAP)	CIMAP	2.7	1.8
WP6.3 – Industrial applications (GANIL)	GANIL	2.7	1.8
	Total	8.1	5.4
Total (m.m) 379.6		278.4	101.2

DESIR-EQUIPEX: Summary

Requested: 14 M€ (36 months) + 1 M€ (54 months)
<-> Granted: 8 M€ + (54 months) + 1M€ (36 months)

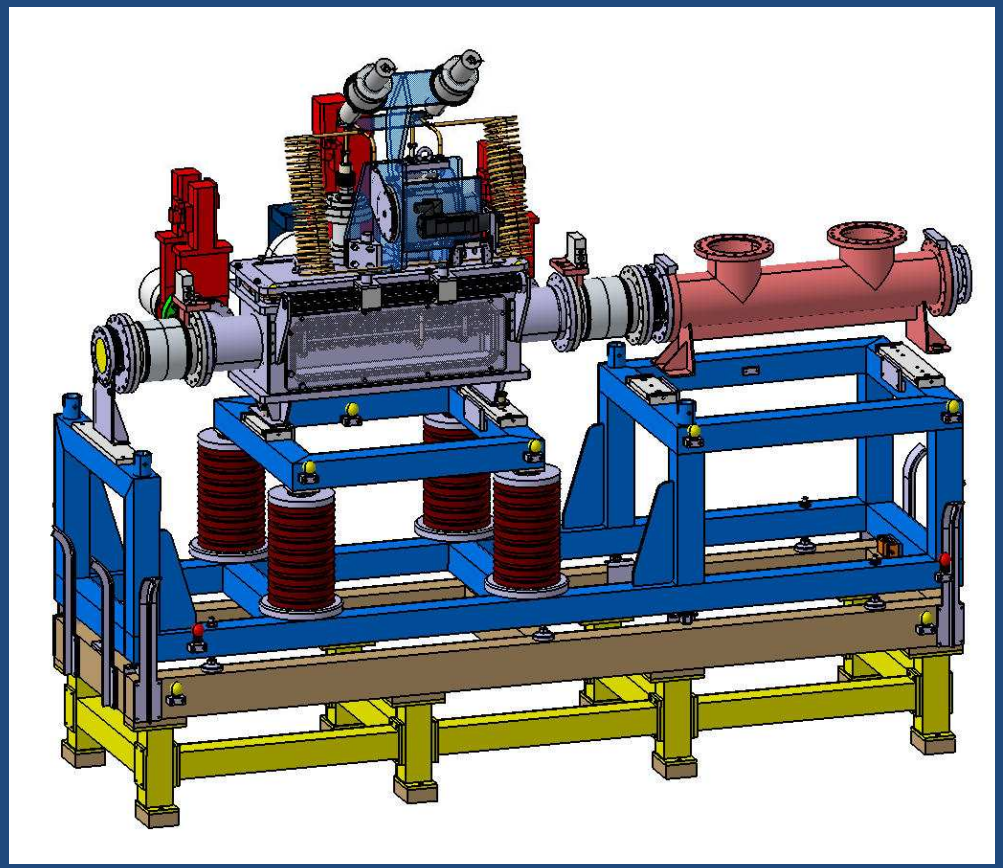
- ~40% smaller experimental hall
- Phasing of the beam line implementation
- 0.6 M€ from GANIL + 0.4 M€ from outside (still missing)

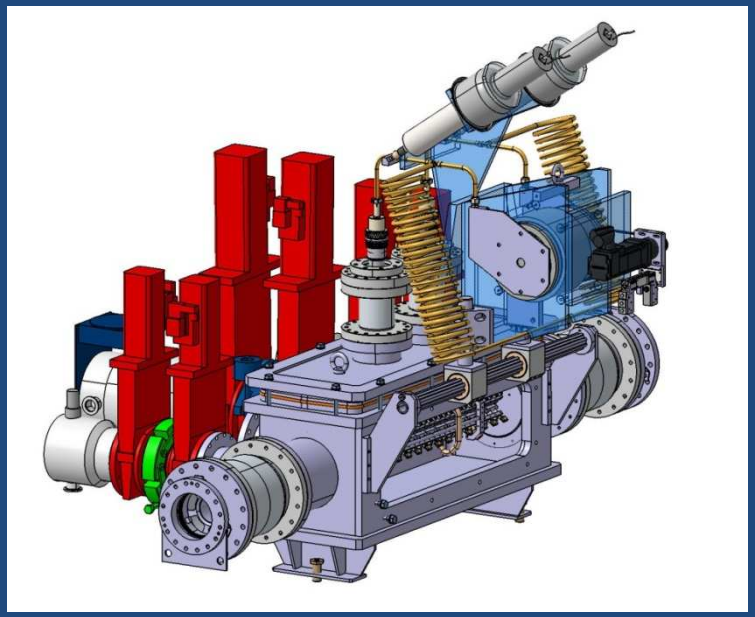
- **Longer construction phase: commissioning in 2017**
- **Delayed Physics program**
- **5.4 M€ missing to complete the project (including ~1 M€ for a hall extension)**

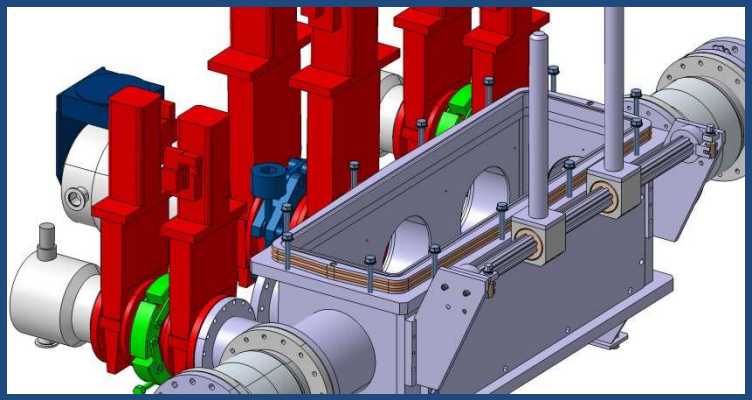
Cooler SHIRaC

Adaptation to nuclear environement:

- extraction from the top
- quick RF connection/disconnection
- top flange is designed for Vinyl sleeve for radioactive containment

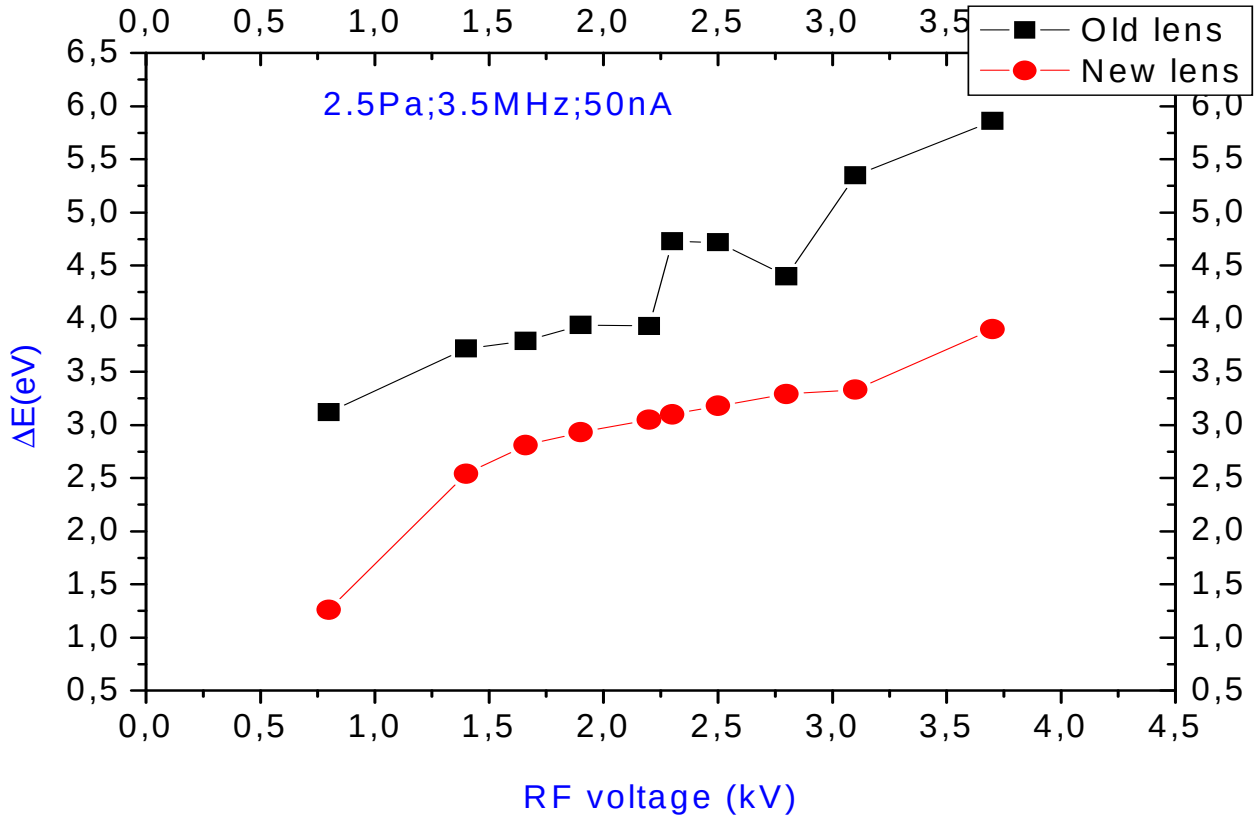






Cooler SHIRaC

Energy spread



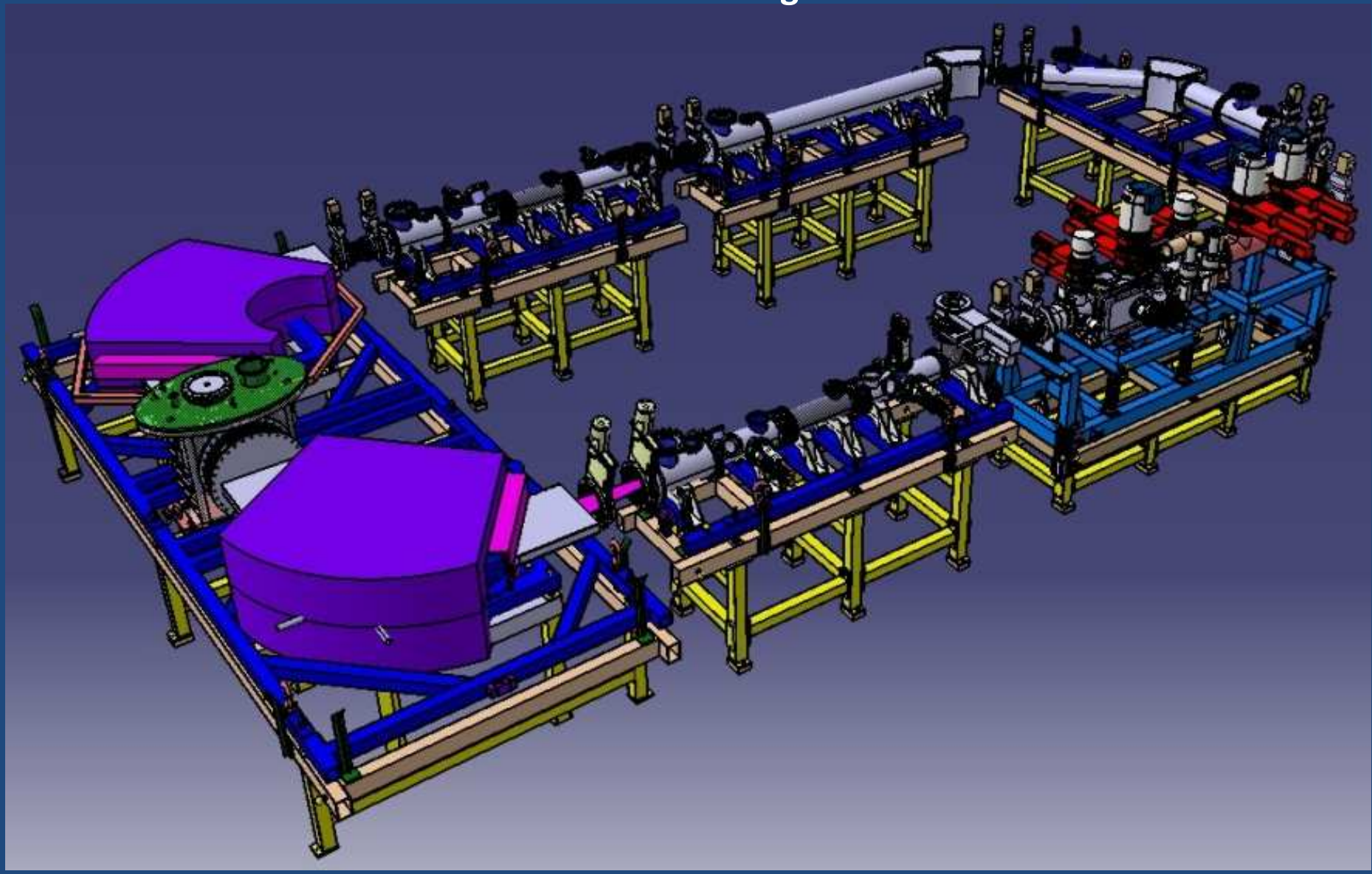
Energy spread with new and old extraction lens
The energy spread is still under investigations

High-resolution separator HRS

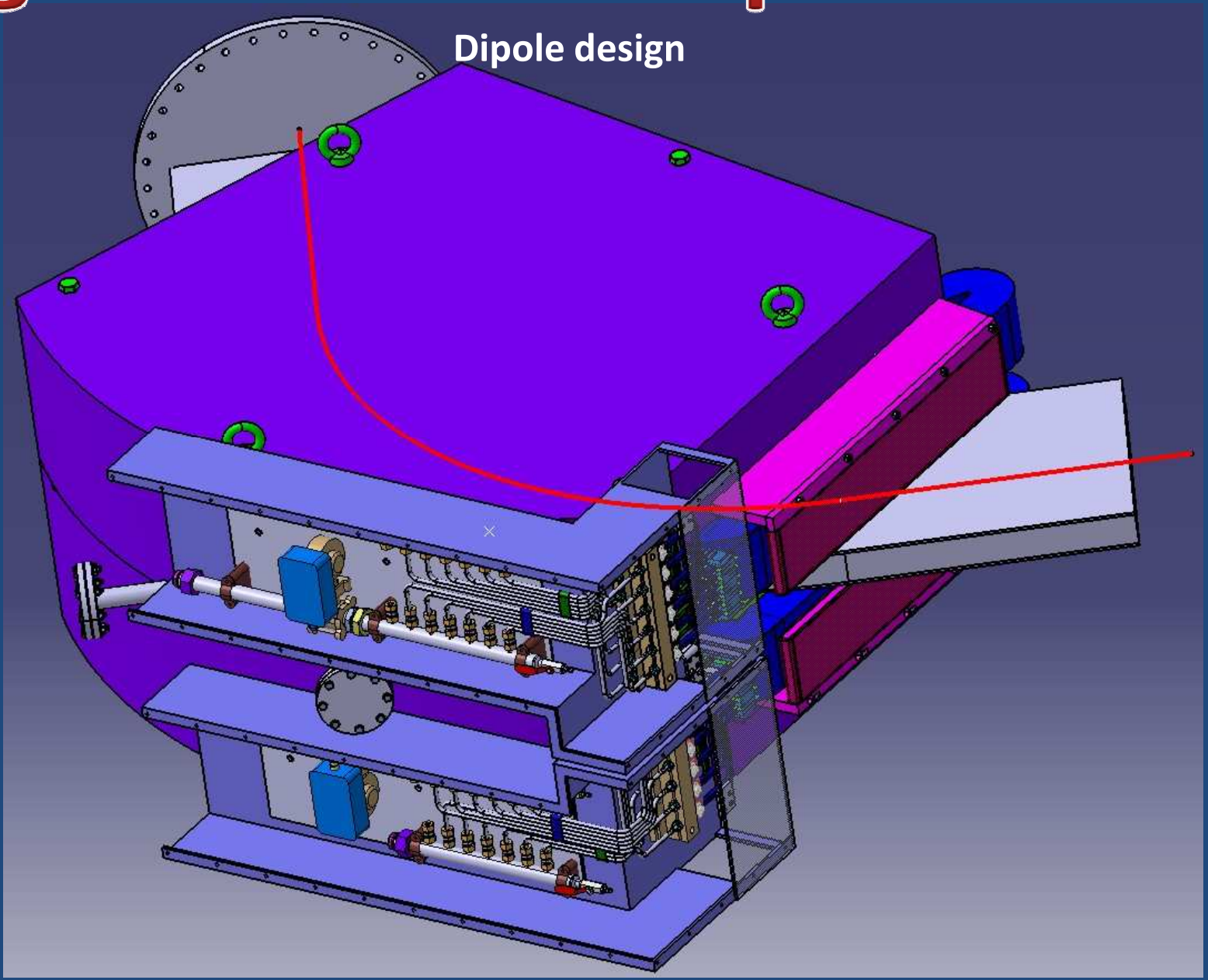
- Mechanical design and integration of HRS to fulfill safety requirements for "yellow zone" ready
- Dipoles magnets:
  - Dipoles designed to obtain best homogeneity in the central zone
  - 3D simulations have been done using software OPERA
  - Field transversal homogeneity of 10^{-5} is obtained over a zone of ± 150 mm
  - Field maps: 3D field maps used in ion-optical simulations with ZGOUBY
  - Study of curvature of pole faces is under the way to correct second order aberrations
  - Final results are expected by end of June 2012
  - Full specifications and detailed mechanical design of the magnets will be provided
  - Call for Tender document ready before end of the summer 2012
  - Ordering of the dipoles foreseen for beginning of 2013
- Misalignment studies:
  - investigate effects of misalignments on the resolution of the HRS
  - Which level of precision required for the mechanical design?
  - Which precision for the (re)positioning?
  - (Re)Positioning precision of ± 0.25 mm induces decrease on the resolution from 31000 to 28000
  - Rotations and tilts of ± 0.02 degrees reduce the HRS resolution to ~20000
  - The most sensible element is the mid-plane multipole, followed by the dipole magnets
- A project review of the HRS is to be scheduled after summer

High-resolution separator HRS

Technical design



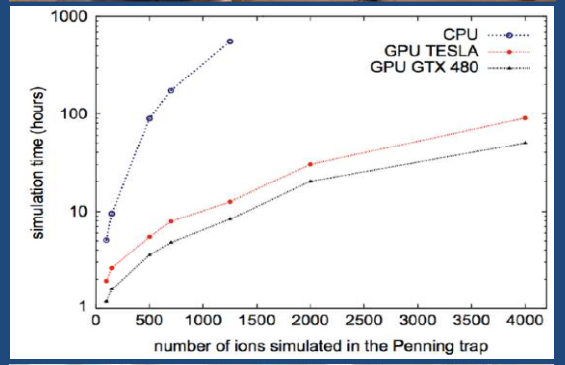
High-resolution separator HRS

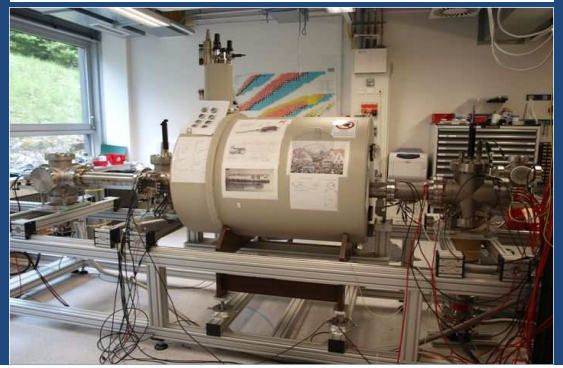


PIPERADE

Piège de Penning pour des ions radioactifs pour DESIR

Aim: purify and bunch large samples of radioactive ions and deliver them to users
It consists of a stable ion source, an RFQ cooler and buncher, a double-Penning trap system
Collaboration: CENBG, CSNSM, GANIL, MPIK Heidelberg





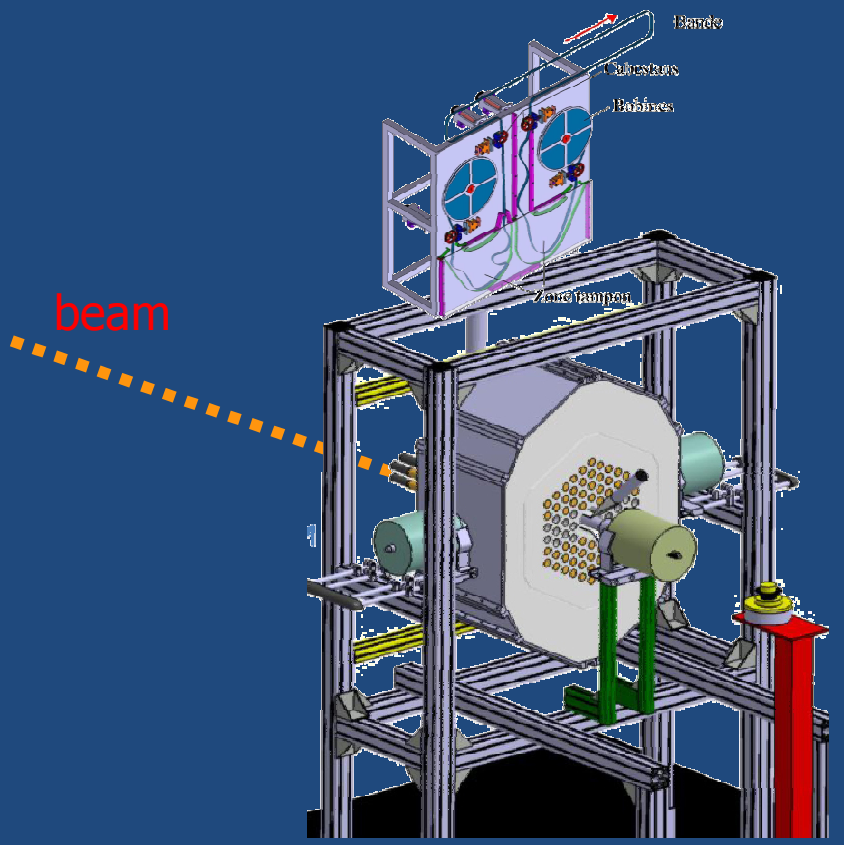
Progress:

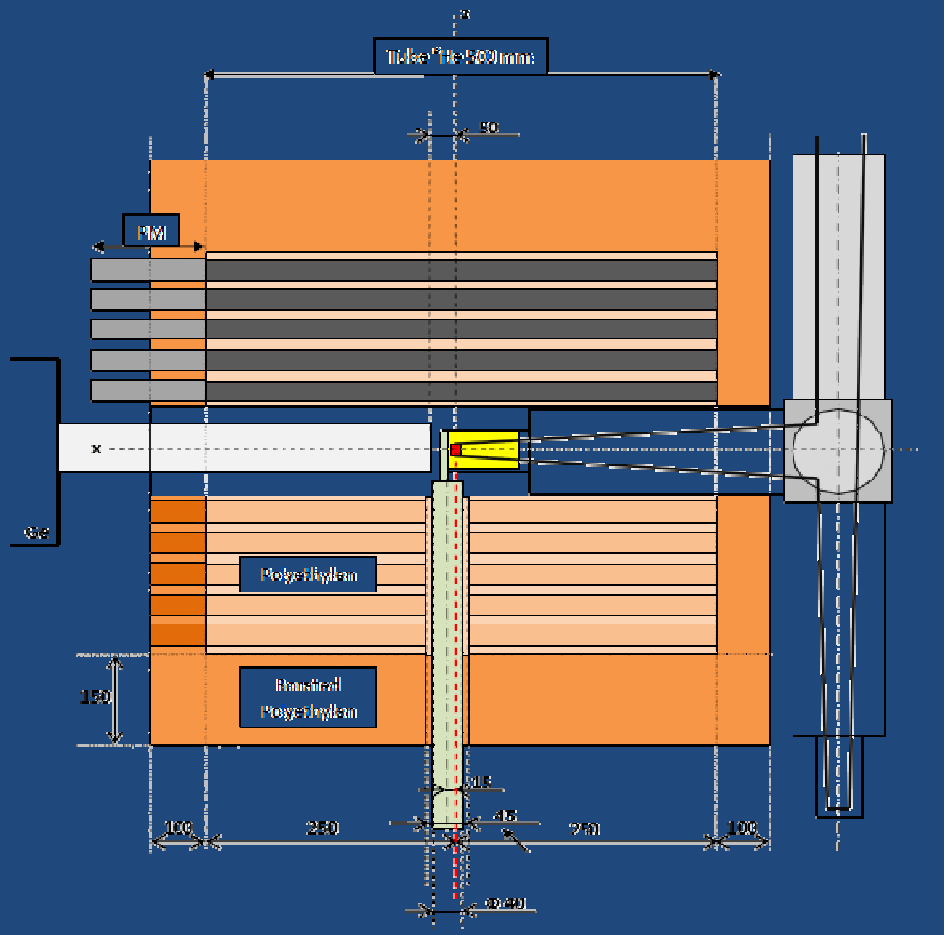
- Source:
  - former MISTRAL source being installed at CENBG
  - SIMEON simulation for extraction optics under way
- RFQ:
  - decision to build ISCOOL type RFQ
  - preliminary simulations for transmission and cooling performed at CENBG
- Penning trap:
  - simulations started at CSNSM
  - experimental tests started at MPIK
- Detection system:
  - tests with an MCP and a channeltron under way at CENBG

TETRA at IPN Orsay

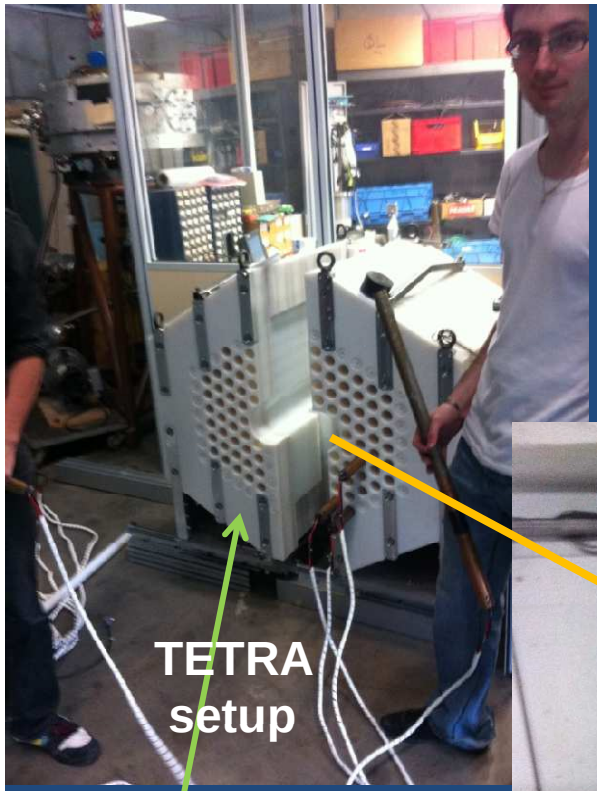
Measurement of β-n branching ratios

- TETRA installed at IPNO with BEDO β-decay station
- 60 % efficiency reached for large energy range
- measurements with ^{83}Ga and ^{84}Ga performed this June



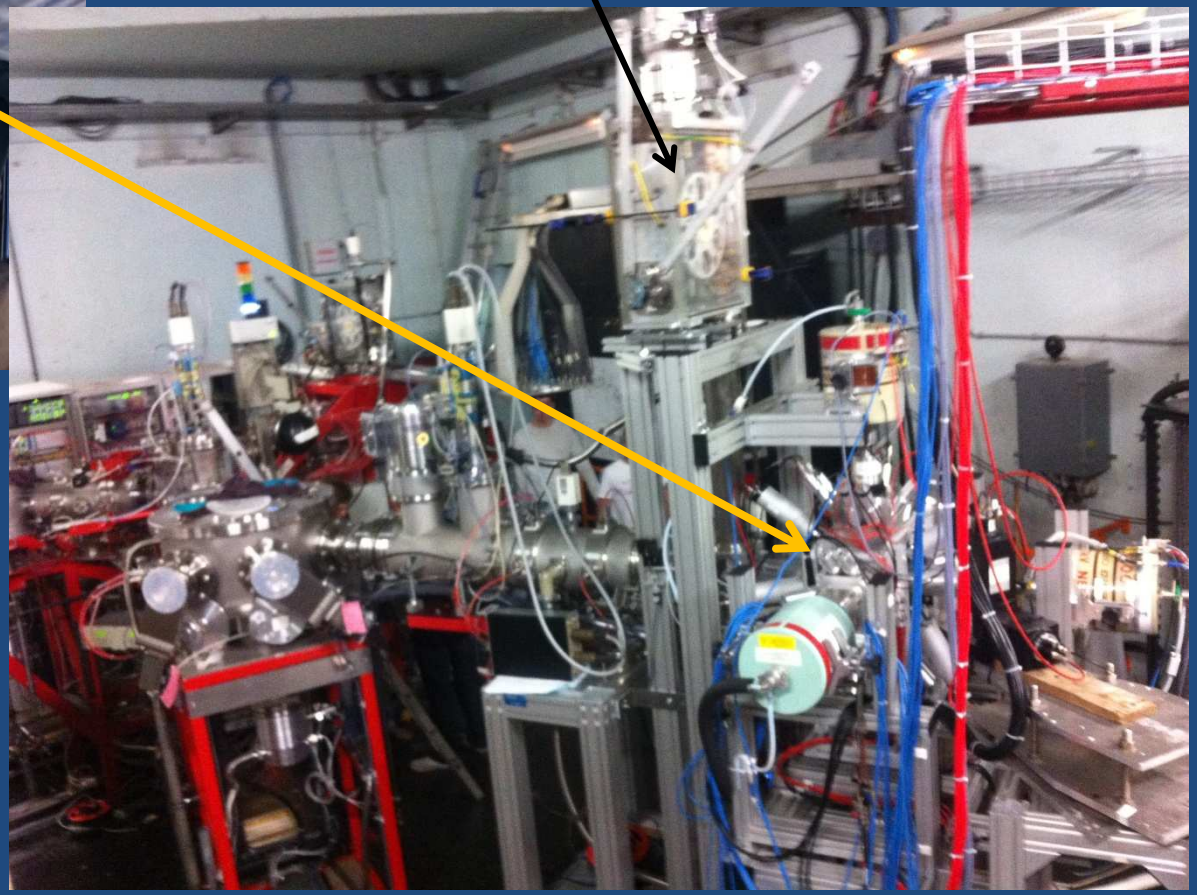


TETRA at IPN Orsay



tape
station

borate
polyethylene
shielding



BEDO line

Neutron ToF detector

Measurement of neutron energies

100 liquid scintillator modules from LPC Caen and CIEMAT Madrid

aim:

- measure neutron energy spectra for astrophysics and nuclear energy
- study rare phenomena like β2n, β3n, … decays

status:

- 30 modules purchased by CIEMAT
- support structure constructed at CIEMAT
- fast DAQ system built and commissioned by LPC

Summary

- DESIR funding scheme proposed to French ANR
- Additional funding needed for phase 1 (0.4 M€)
  and phase 2 (5.4 M€)
- Continued efforts to improve the capabilities of SHIRaC
- HRS dipoles to be ordered beginning of 2013
- PIPERADE project funded and started
- First TETRA experiments soon at IPN Orsay
- Neutron energy detector under construction
- Progress also on other setups like MLL trap,
  LUMIERE, BELEN, TAGS….

Limiting factor: SPIRAL2 phase 2 schedule