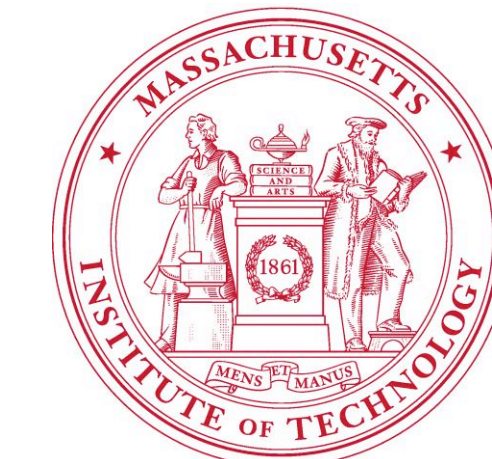


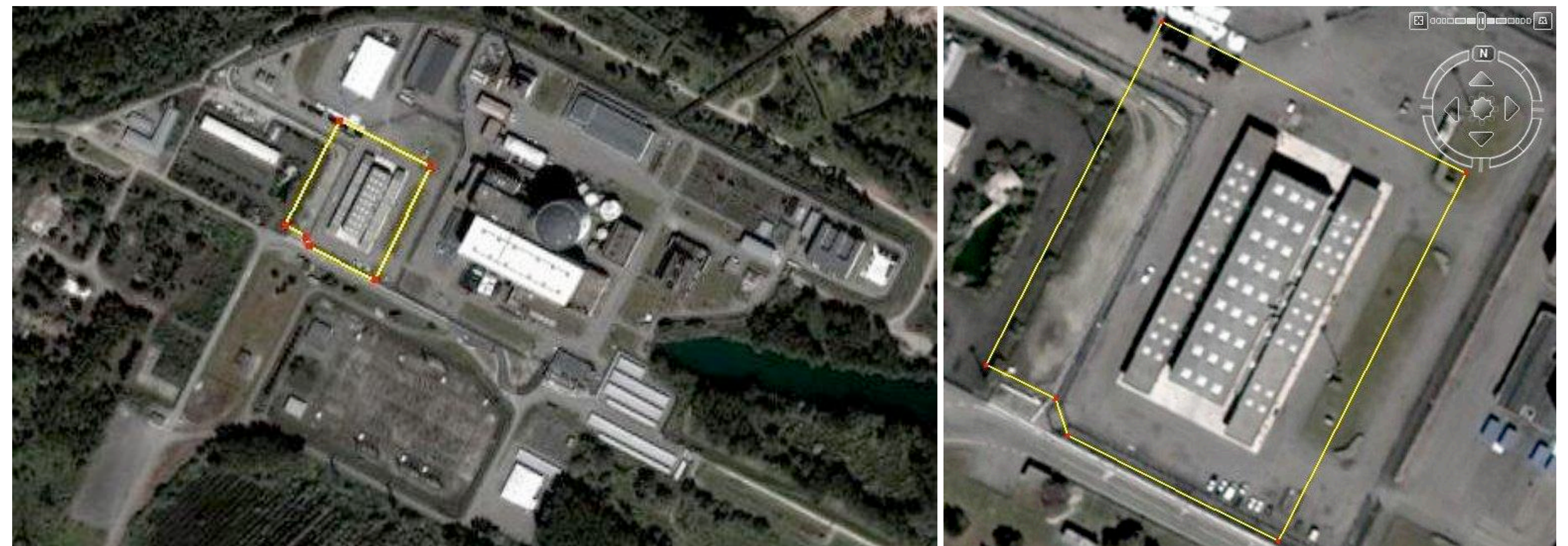
# Installation of the Ignitor Machine at the Caorso Site

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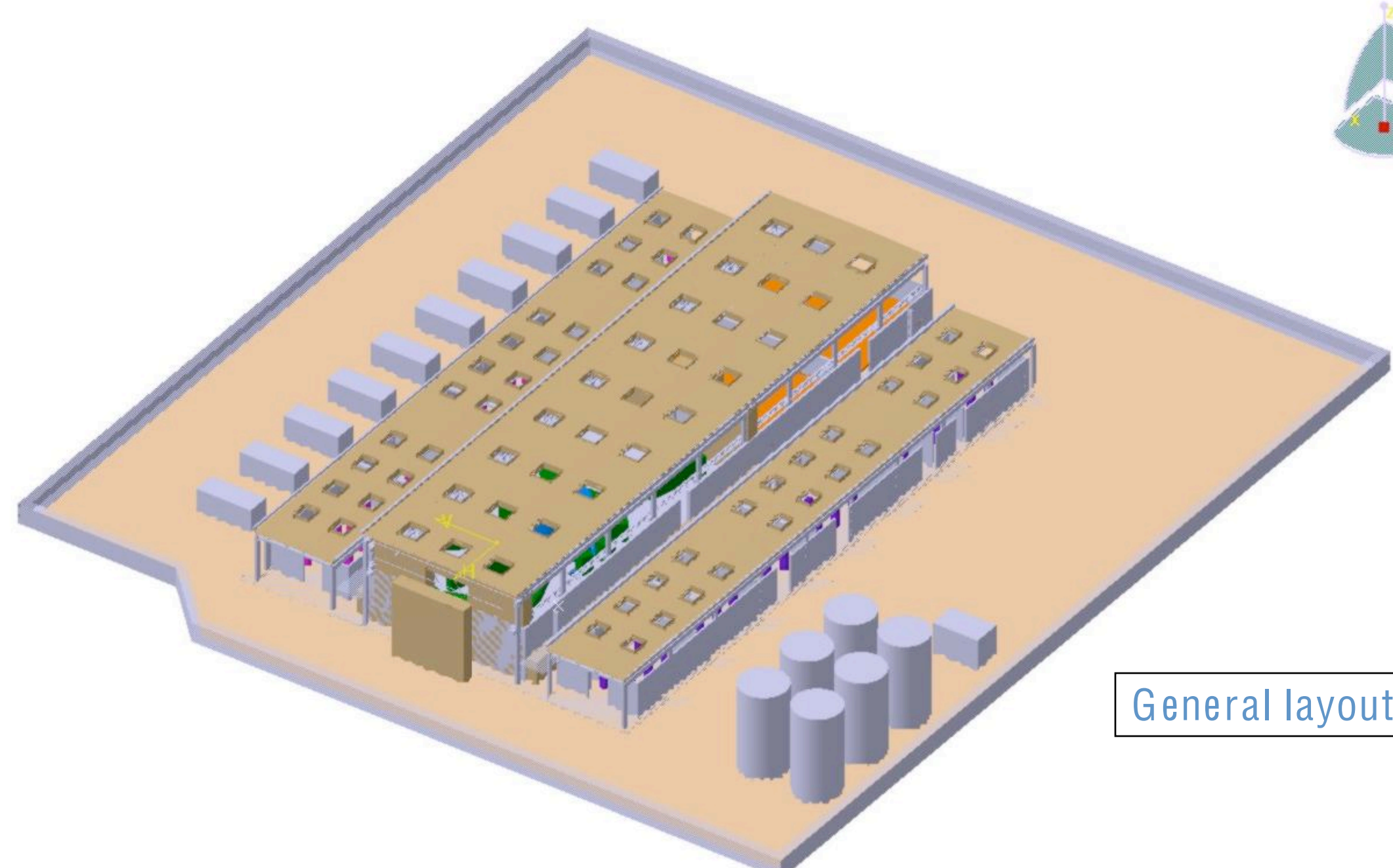


## Abstract

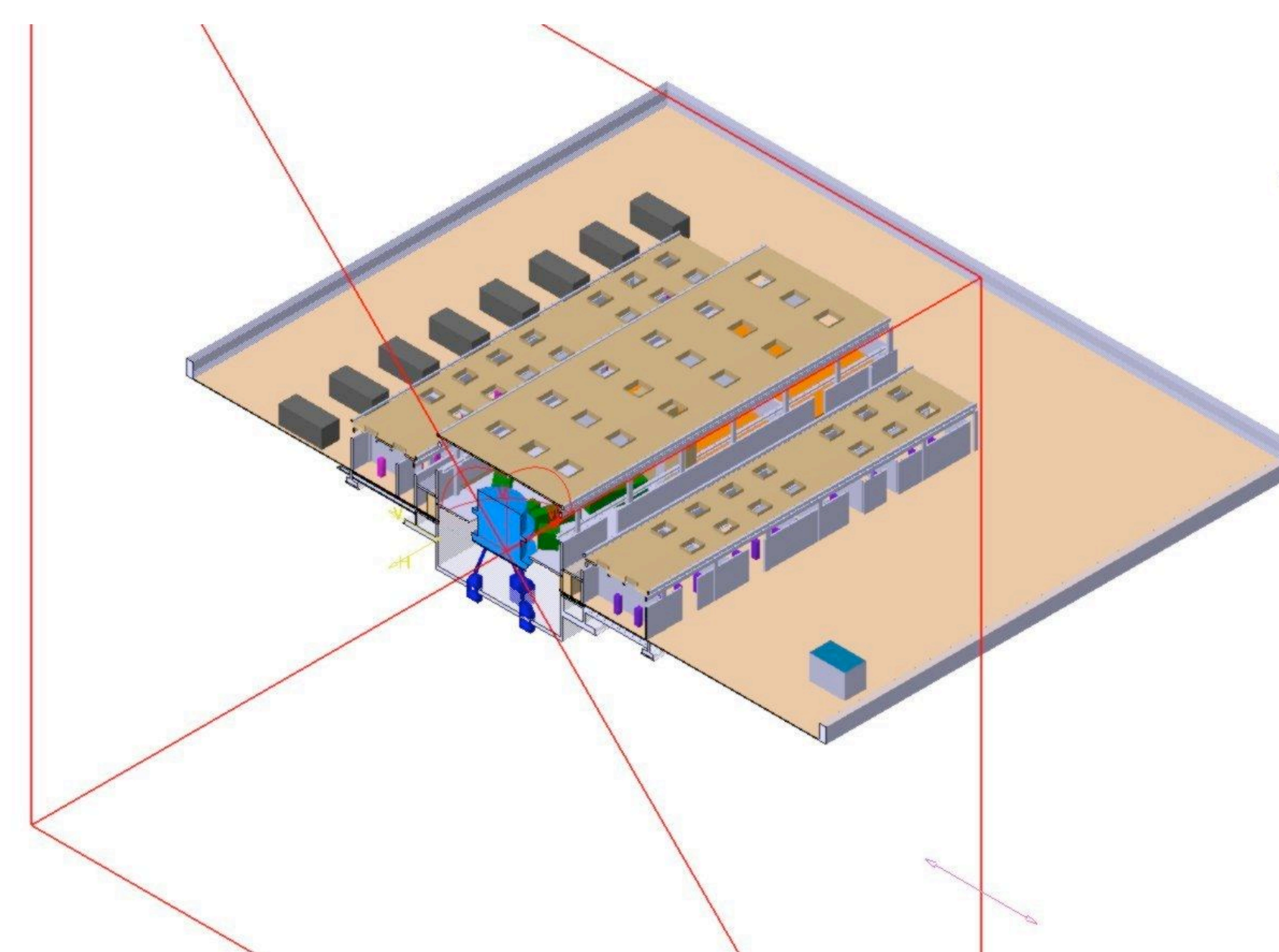
The actual cost of building a new experiment can be considerably contained if infrastructures are already available on its envisioned site. The facilities of the Caorso site (near Piacenza, Italy) that, at present, houses a spent nuclear power station, have been analyzed in view of their utilization for the operation of the Ignitor machine. The main feature of the site is its robust connection to the electrical national power grid that can take the disturbance caused by Ignitor discharges with the highest magnetic fields and plasma currents, avoiding the need for rotating flywheels generators. Other assets include a vast building that can be modified to house the machine core and the associated diagnostic systems. A layout of the Ignitor plant, including the tritium laboratory and other service areas, the distribution of the components of the electrical power supply system and of the He gas cooling system are presented. Relevant safety issues have been analyzed, based on the in depth activation analysis of the machine components carried out by means of the FISPAC code. Waste management and environment impact issues, including risk to the population assessments, have also been addressed



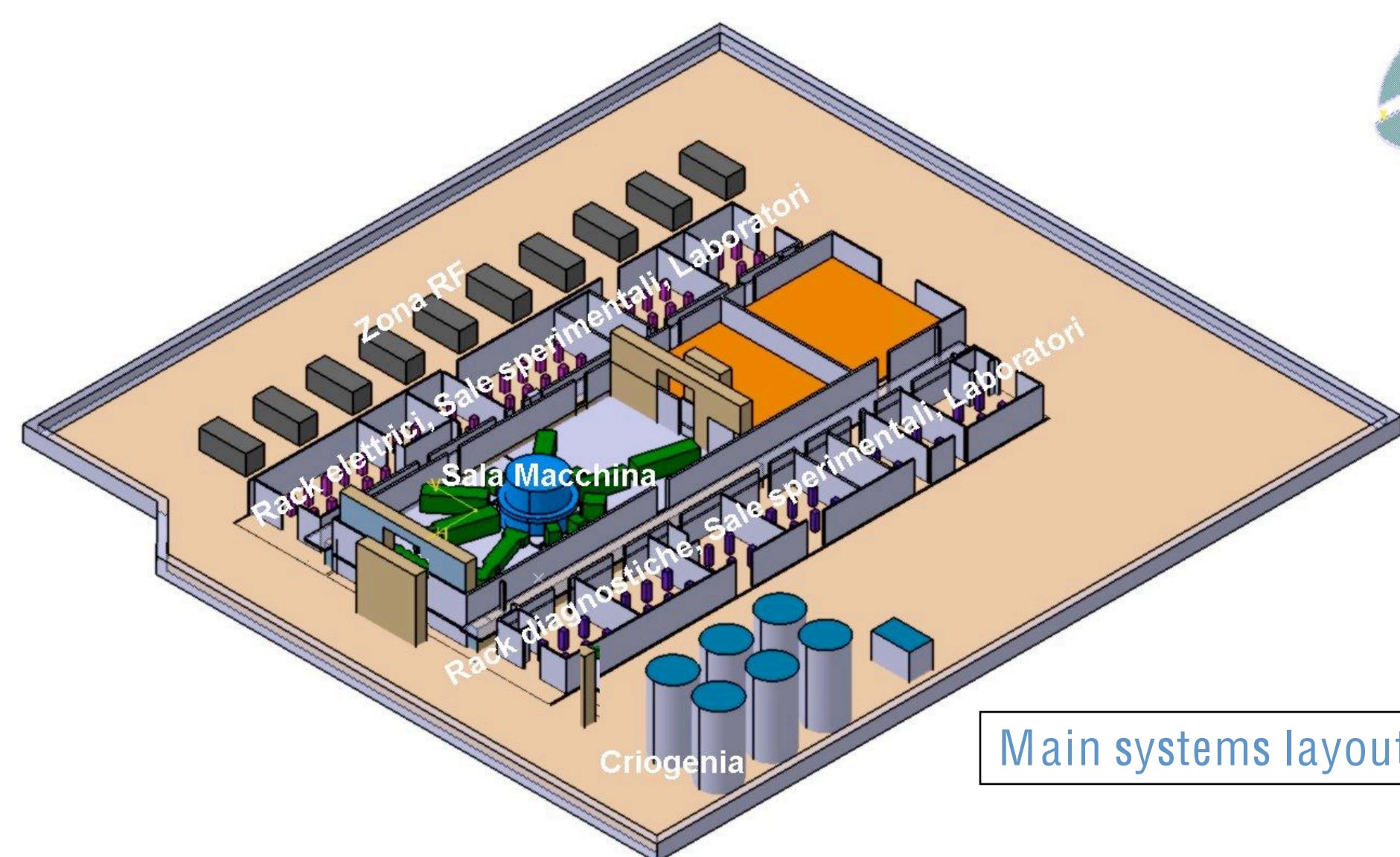
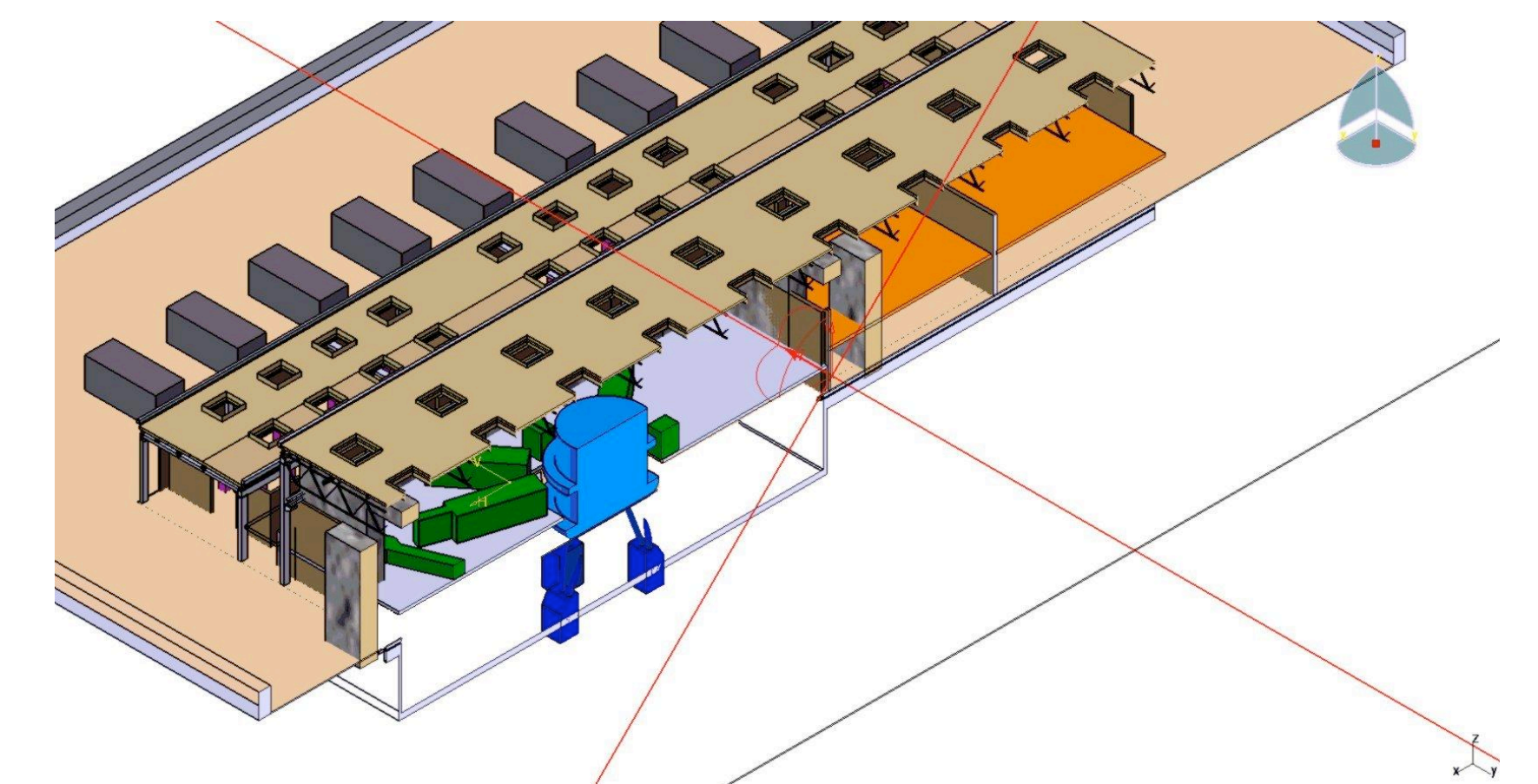
Area so-called "Officina Fredda" within the Caorso plant



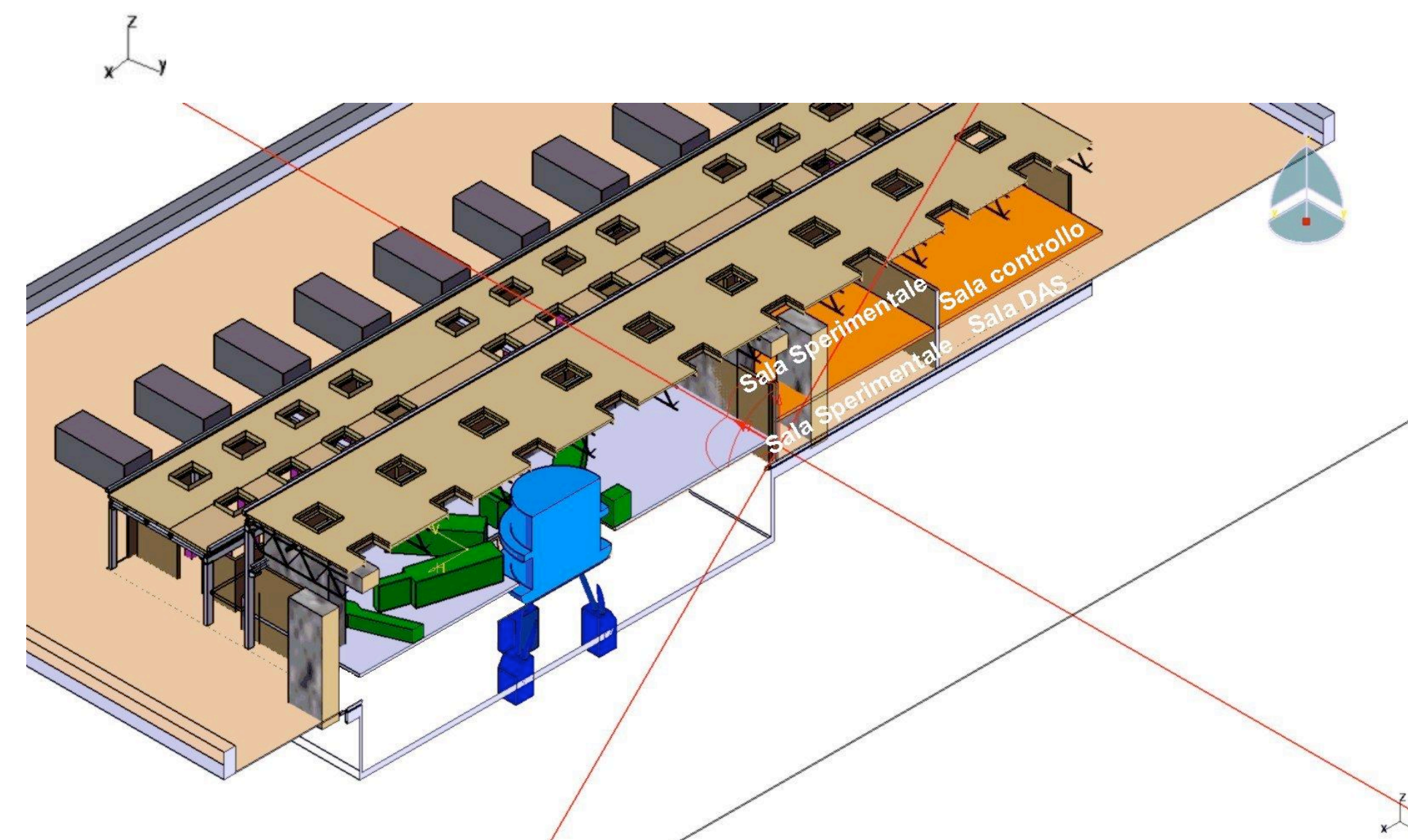
General layout



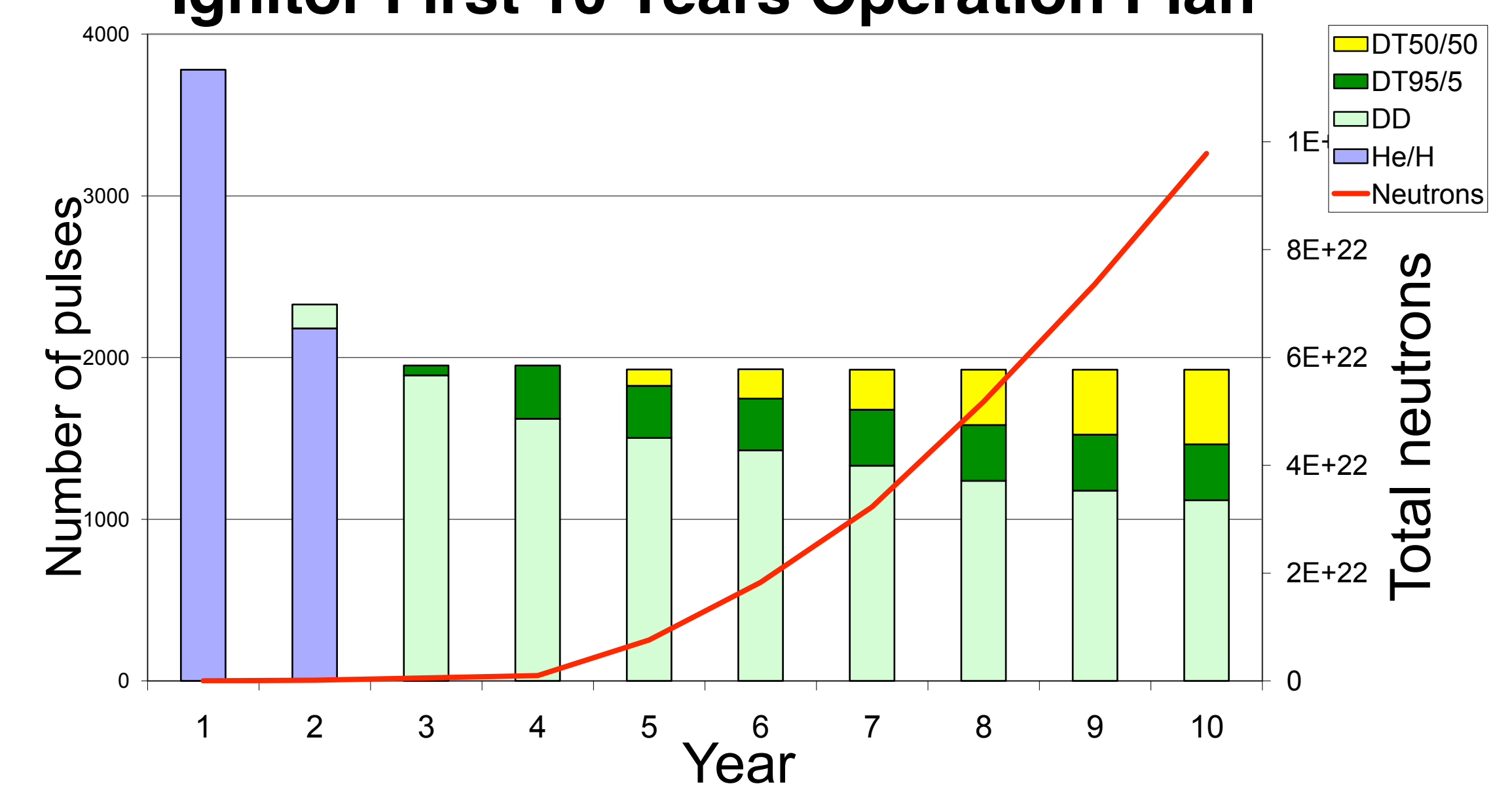
Cross sections



Main systems layout



## Ignitor First 10 Years Operation Plan



## Production of n/s per reaction, for different operational scenarios and plasma fuel composition

Scenario	DD	DT 95/5	DT 50/50
A ohmico	1.25E+16	1.25E+16	2.50E+18
A icrf	1.67E+17	1.67E+17	1.67E+19
B ohmico	8.33E+16	8.33E+16	1.67E+19
B icrf	3.33E+17	3.33E+17	3.33E+19
C ohmico	1.67E+17	1.67E+17	3.33E+19
C icrf	3.33E+17	3.33E+17	3.33E+19

A detailed representation of the Ignitor machine has been used to estimate the neutron flux in every component, including streaming through the ports. The resulting fluxes are then used as input for the FISPACT code to evaluate the activation at end-of-life and at intermediate times. The results are used for:

1. Estimate of radioactive wastes
2. Environment impact and risk assessment
3. Calculation of personnel exposure during normal operation

- A  $I_p \leq 7$  MA;  $B_T \leq 9$  T  
B  $I_p \leq 10$  MA;  $B_T \leq 11$  T  
C  $I_p \leq 11$  MA;  $B_T \leq 13$  T

Waste classification according to the present Italian legislation					
Componente	Materiale	Peso (10 <sup>1</sup> )	Volume (m <sup>3</sup> )	Classificazione della scoria	Tempo di decadimento necessario per rientrare nei limiti
Vacuum Vessel	INCONEL 625	20.4	4.4	II Categoria (LLW)	100 anni
Prima Parete	Molibdeno	16.8	2	I Categoria (VLLW)	1 settimana
Magneti	Rame	96	12.2	II Categoria (LLW)	Meno di 10 anni
C-Clamp-Strutture	Acciaio AISI 316	192	24	II Categoria (LLW)	Meno di 5 anni
Criostato	Resina epossidica	1.12	2.5	I Categoria (VLLW)	Meno di 5 anni
Totale		326	~45		

The vast majority of the machine structures at the end of life can be classified as II category LLW (Low Level Waste) – Nothing would be classified as III category waste. Also the Vacuum Vessel and First Wall systems would fall into this category after about 100 years of cooling, which is not too long considering that only about 4 m<sup>3</sup> would be involved. The most significant hazard derives from the Tritium gas handling. However, the very modest inventory ensures that even in the worse possible accident the maximum dose would be below the natural background dose, whereas the collective dose to the population in the immediate neighborhood would be totally negligible.