



19th May 2005
NIKHEF, Amsterdam

OUTER TRACKER

Demineralised water cooling system



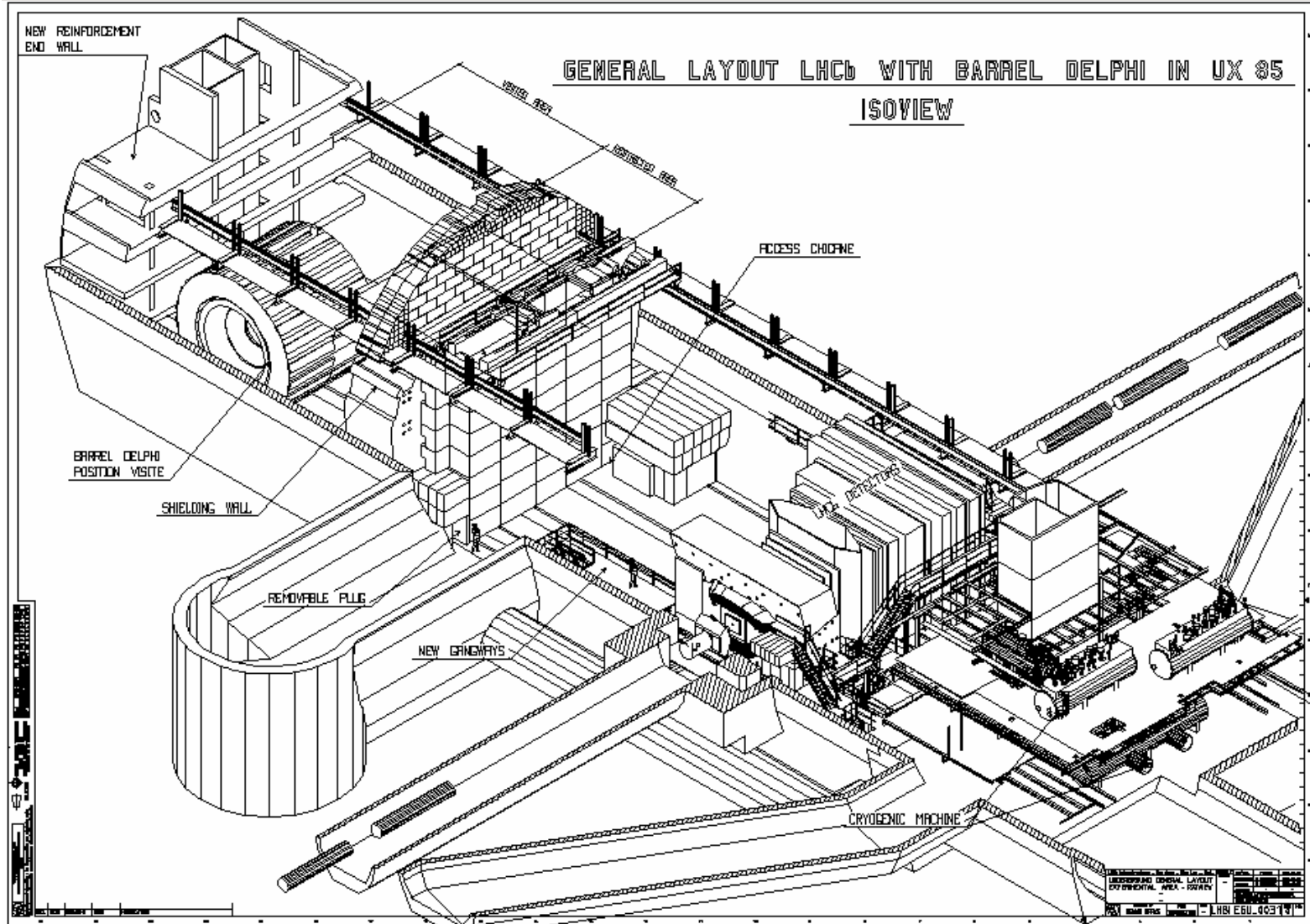
Paolo Guglielmini
CERN, TS Department
Cooling & Ventilation Group
Detector Cooling Section



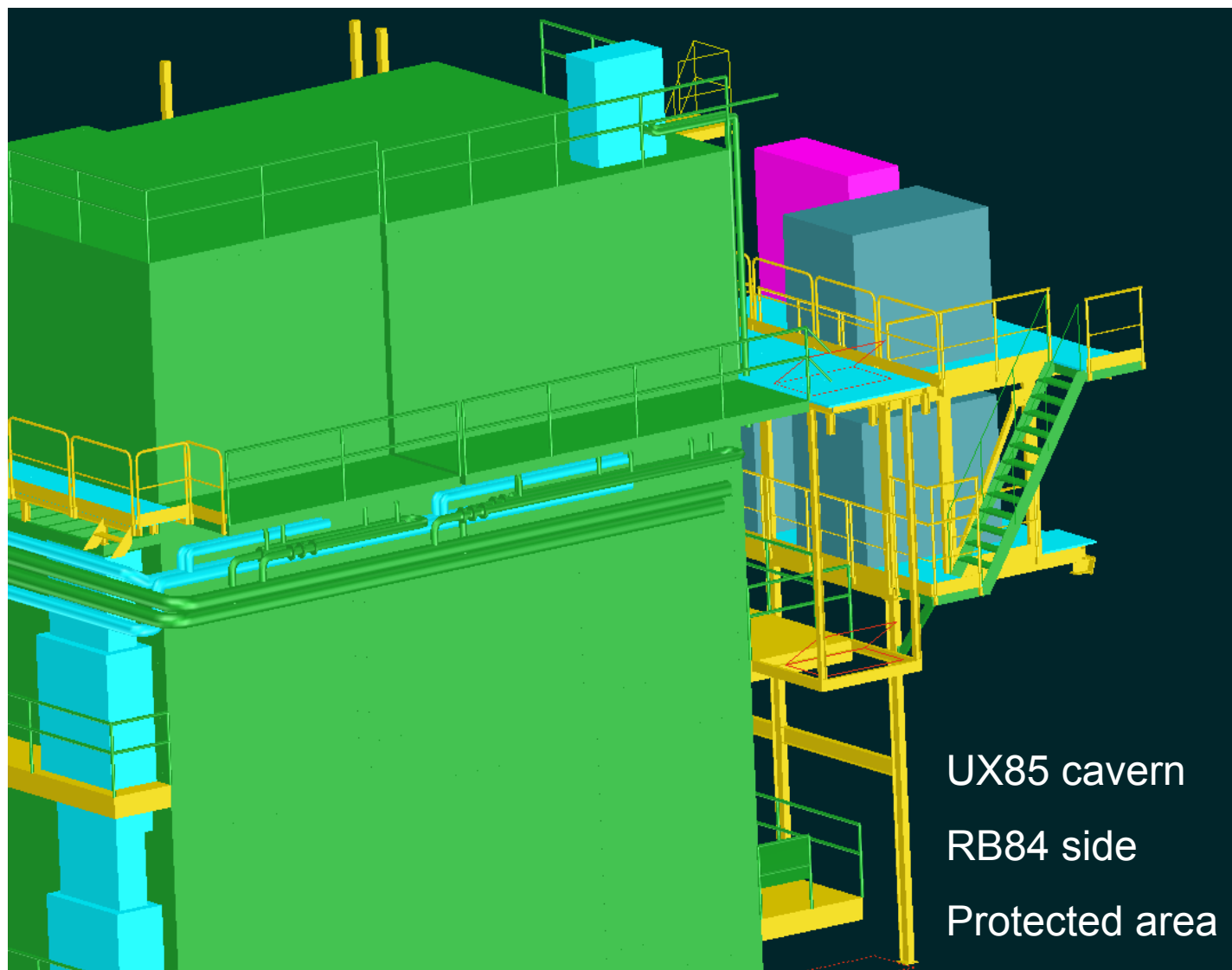
Main scopes of the work

1. hydraulic and mechanical works for the construction of a cooling unit at demineralised water for the LHCb Outer Tracker sub-detector, the related supply/return transfer lines and distribution manifolds
2. control and electricity works for the OT cooling plant
3. tests on hydraulic performances and control functionalities
4. commissioning, training and validation of the system
5. supply of all required technical documents

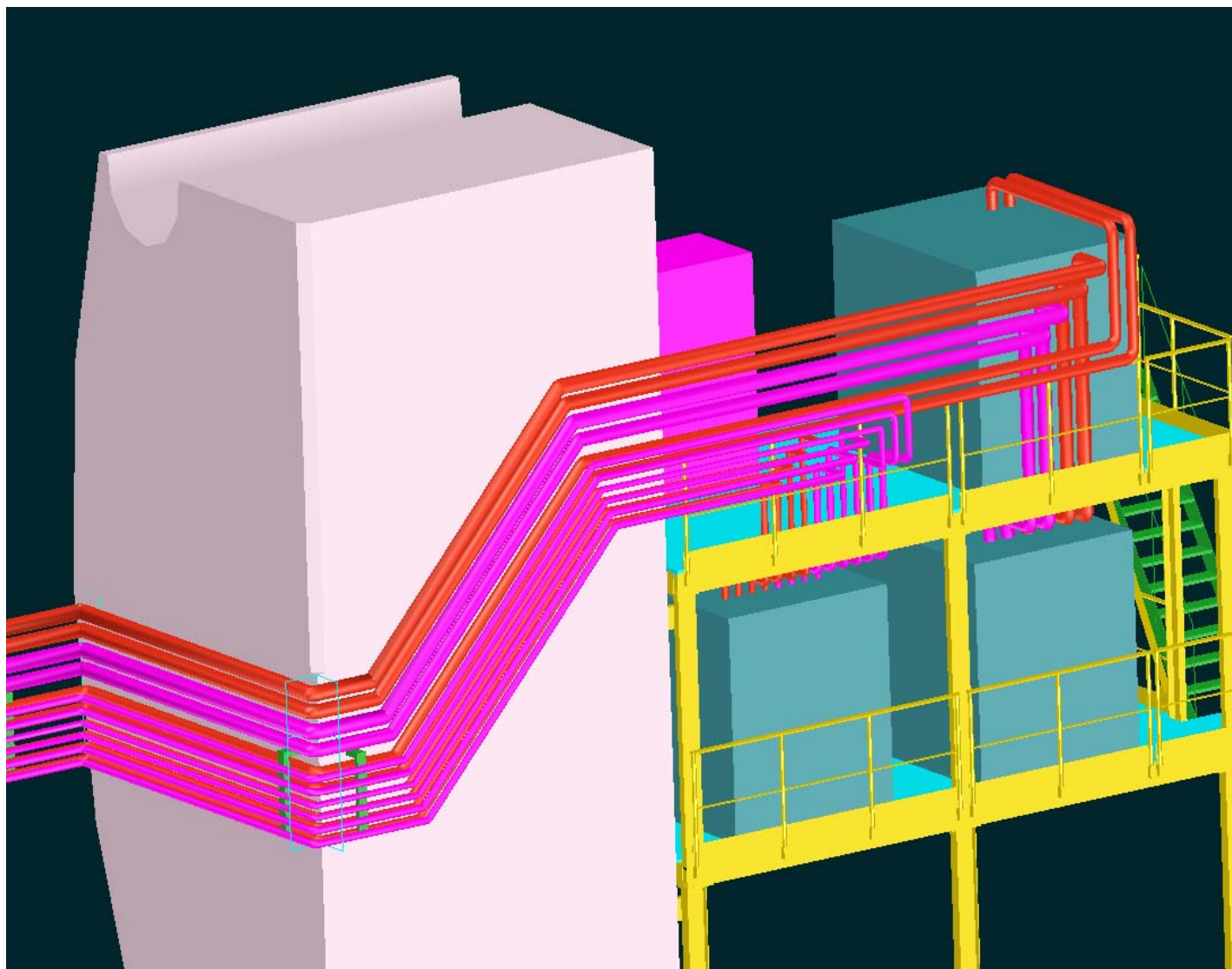
Experimental cavern UX 85 – Layout



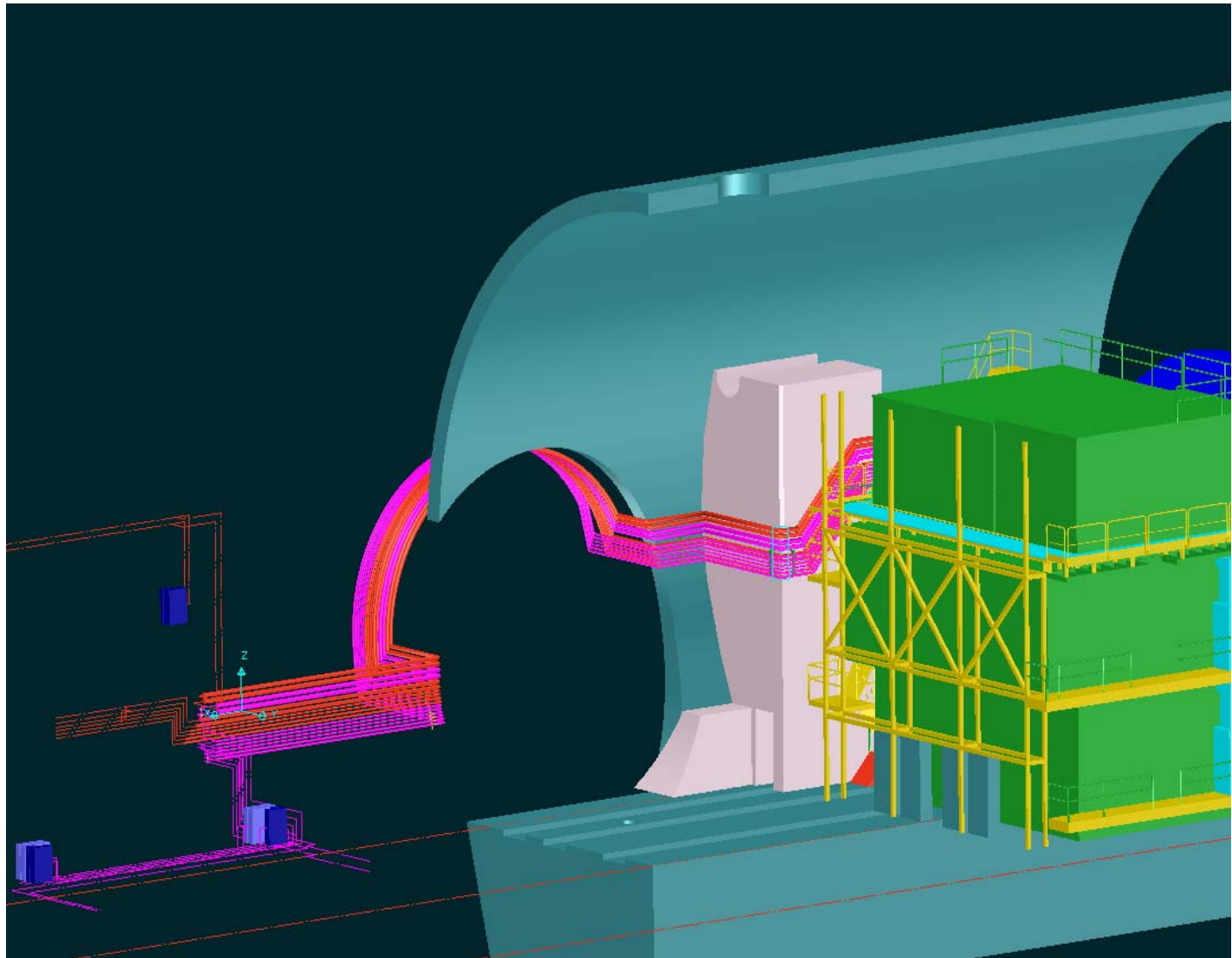
Positioning of the OT cooling station



Passage around shielding wall

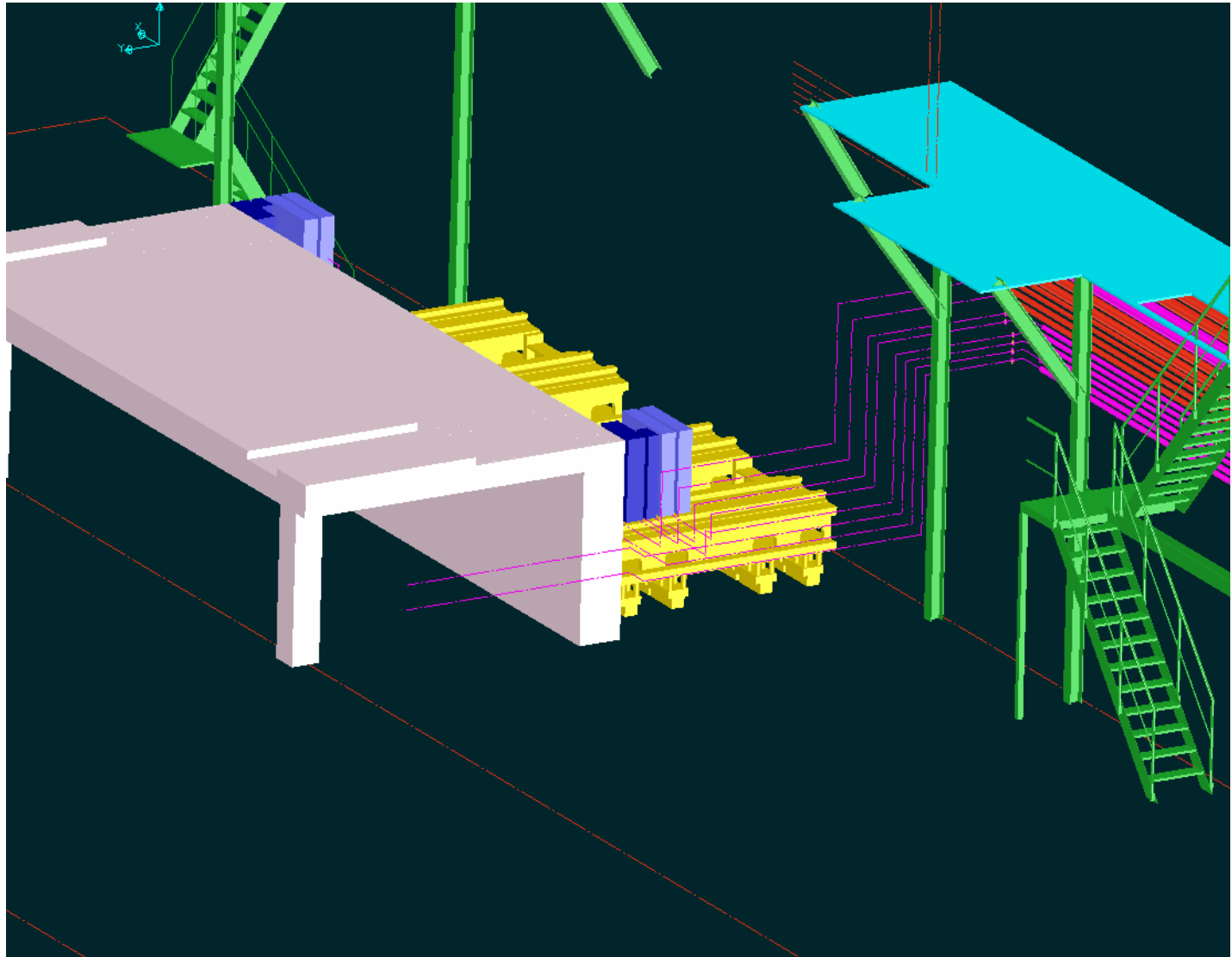


Transfer lines – Passage through the TX84



Outer Tracker distribution manifolds

Outer
Tracker
manifolds
represented
in light blue





OT Cooling Station – Project Steps



Engineering Specification

“Cooling systems for the LHCb detector and its associated electronics”

Daniel Gasser - EDMS 480222 v.3

“...The Outer Tracker is cooled down with demineralised water; the coolant is supplied at 19 C by an independent loop connected to the CERN mixed water network through a heat exchanger.

The demineralised water, supplied by the OT cooling system, is sent to the detector through one transfer line (in+out) that splits into two manifolds on either side of the beam at the periphery of the detector. Each manifold has 6 distribution lines that feed the detector stations. The total flow rate is equally shared among the twelve distribution lines.

The limit of the supply is located after each manifold. The connection between the manifolds and the OT is done by the LHCb collaboration.”



OT Cooling Station – Project Steps



Engineering Specification

“Cooling systems for the LHCb detector and its associated electronics”

Daniel Gasser - EDMS 480222 v.3

“...The local process for the OT cooling station is controlled by a single PLC connected via Ethernet to the CCC (CERN Control Centre), the DCS (Detector Control System) and to a local SCADA in charge of UX85 cooling systems.

Main data and actions available at DCS and local SCADA:

DATA

- Inlet and outlet coolant temperature on the transfer line
- leak detection in the coolant loop
- flow rate status Q in each distribution line
- cooling station status
- general fault

ACTION

- Modify set point of the coolant inlet temperature T_i
- remote action to switch on/off the cooling station.”



OT Cooling Station – Project Steps



Market Survey MS-3307/TS

“Design, manufacture, delivery and installation of a demineralised water cooling plant for the LHCb Outer Tracker”

Daniel Gasser – 26th April 2004

Contacted companies	71 (20 countries)
Positive answers	12
Selection criteria	type of firm, turnover, workforce, experience, quality assurance, references, origin of material

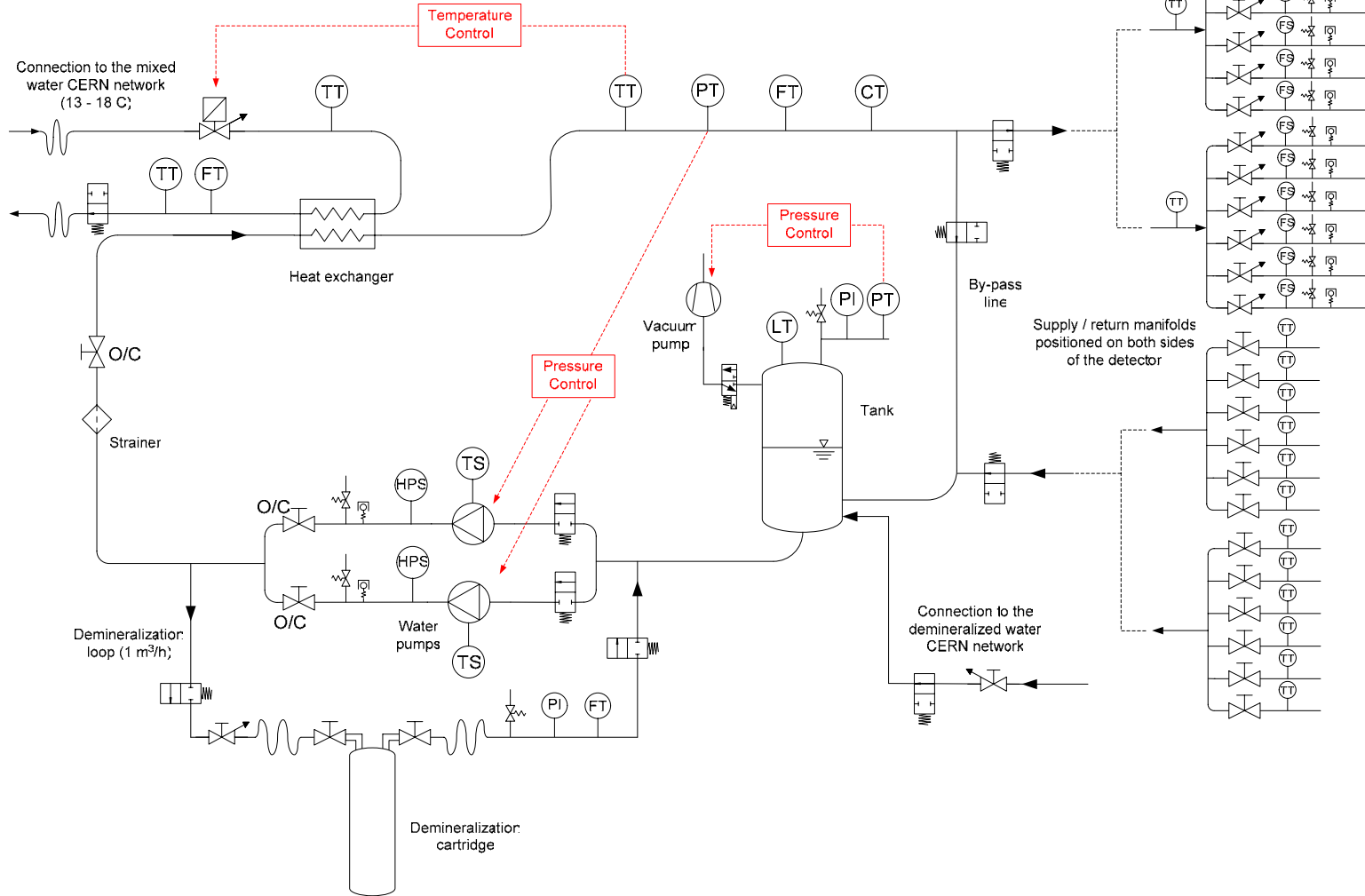


Selected Bidders: 8
(4 declined once received the IT)

Outer Tracker – Requirements

Pressure drop inside the detector (including all piping located after the manifolds)	1.5 bars
Flow rate	10 m ³ /h (flow to the detector) 1 m ³ /h (flow in the demineralization loop)
Inlet temperature	19 ± 1 °C
Temperature increasing inside the detector	2 °C
Volume of coolant in the detector (including all piping located after the manifolds)	50 litres
Demineralised water conductivity	0.1 to 1 µS/cm
Cooling capacity	23 kW
CERN Mixed water network: - Inlet temperature - ΔT available - Inlet pressure - ΔP available	13 °C 5 °C 10 bar (a) 2 bar
Ambient conditions inside the cavern: - Dry temperature - Dew point	17 to 27 °C ≤12 °C

Outer Tracker – Principle Schema





OT Cooling Station – Project Steps



Invitation to Tender IT-3307/TS/LHCb

“Supply and Installation of water cooling equipment for the LHCb detector”

Guglielmini Paolo – 24th January 2005

EDMS 549196 v.1

- | | |
|------------|---|
| WORK LOT 1 | Hydraulic and mechanical works for Outer Tracker cooling system (piping and manifolds included) |
| WORK LOT 2 | Control works for OT cooling system |
| WORK LOT 3 | Electricity works for OT cooling system |
| ----- | |
| WORK LOT 4 | Hydraulic and mechanical works for primary cooling system
(LHCb general infrastructure and installation) |

[Included: tests, commissioning, training and supply of all technical documents]



OT Cooling Station – Project Steps

Invitation to Tender IT-3307/TS/LHCb

“Supply and Installation of water cooling equipment for the LHCb detector”

Guglielmini Paolo – 24th January 2005

EDMS 549196 v.1

Best offer received
INEO ALPES S.A.R.L. (F)

WL 1	96.655 CHF
WL 2	67.136 CHF
WL 3	29.933 CHF

Total OT **193.724 CHF** (estimated 200 kCHF)



Provided delivery schedule



Installation of supply/return transfer lines and distribution manifolds	End of July 2005
Complete installation of the OT cooling station at Contractor's premises	September 2005
Performance tests at Contractor's premises	October 2005
Installation of the unit in the cavern, connection to CERN networks, performance tests and commissioning	End 2005