

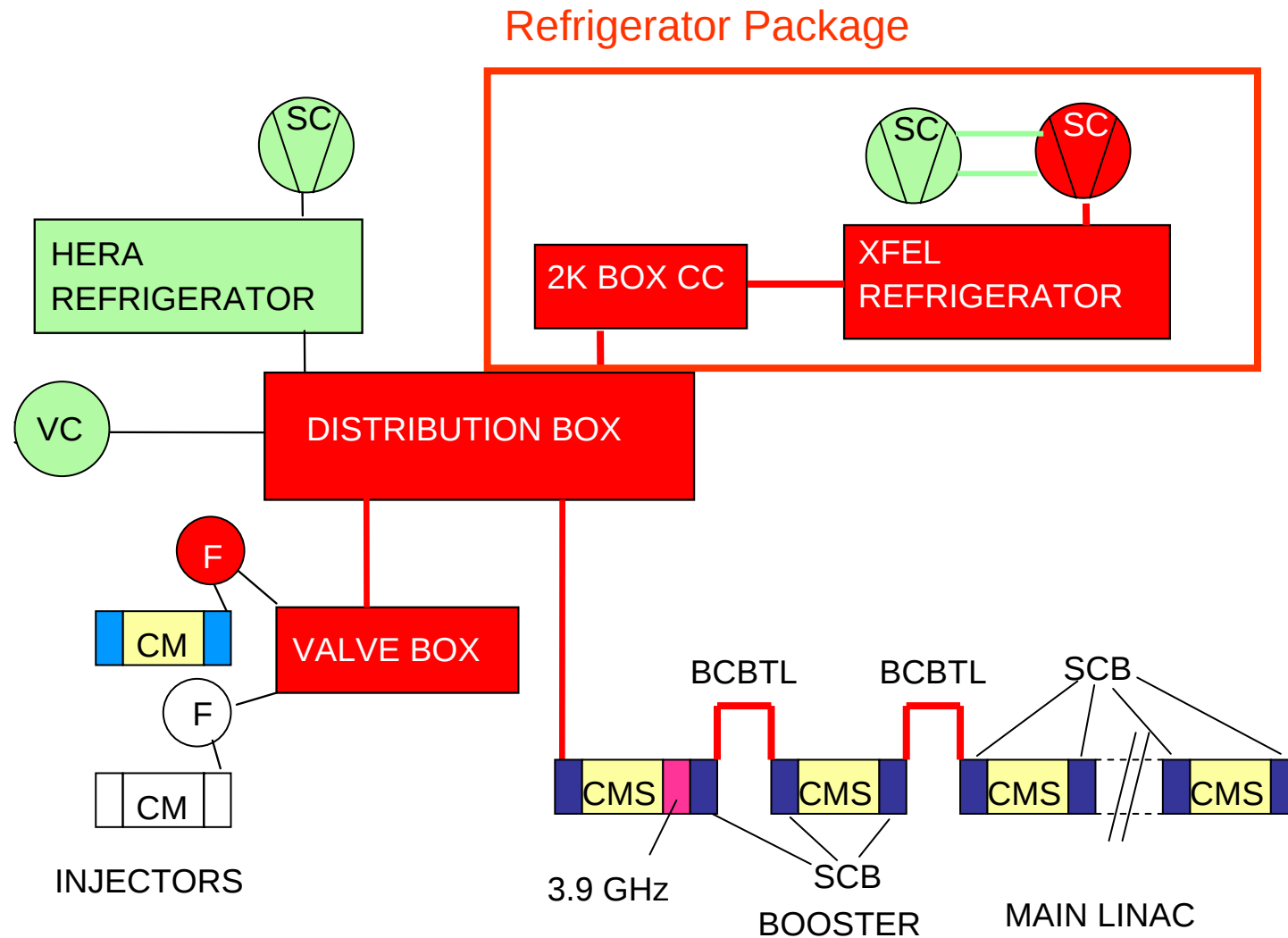


Cryogenics & Cryostats

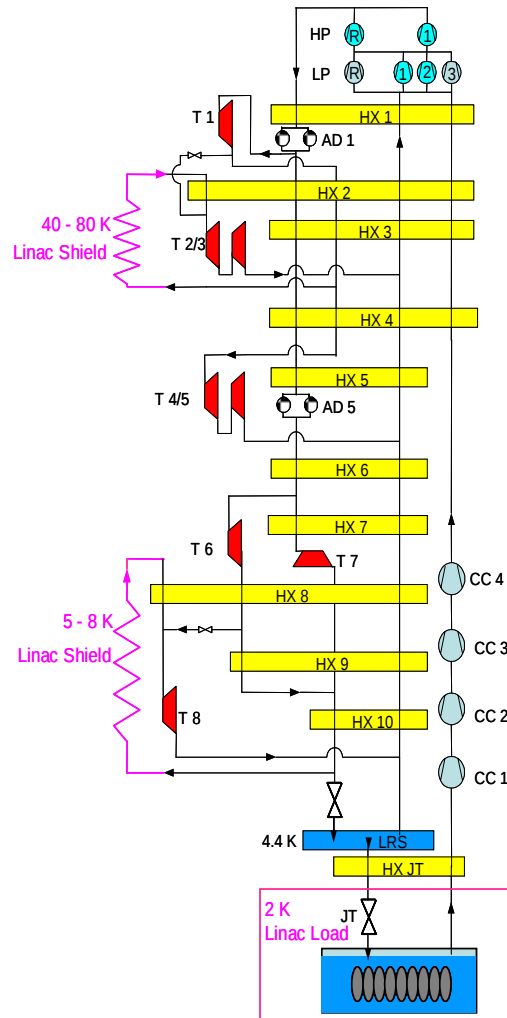


XFEL-Linac Cryogenics

DESY MKS
Machine, Cryogenics, Superconductivity
Bernd Petersen



XFEL Refrigerator (12 KW @ 4.5K equivalent)



		mass flow	outlet	return
2K load	2450 W	117 g/s	1.1 bar 2.2 K	0.025 bar 3.5 K
5-8K shield	4000 W	142 g/s	5.5 bar 5.16 K	5.4 bar 8.2 K
40-80K shield	30000 W	142 g/s	18 bar 40 K	17 bar 80 K
compressors				
LP 3		117 g/s	floating	0.5 – 0.9 bar 295 K
LP 1+2		1045 g/s	floating	1.2 bar 295 K
HP 1		1162 g/s	20 bar 295 K	floating
power consumption	refrigeration	COP	specific load	% of power
2K	2.45 KW	≤ 870 W/W	2.13 MW	59
5-8K	4.00 KW	≤ 220 W/W	0.88 MW	24
40-80K	30.00 KW	≤ 20 W/W	0.60 MW	17
total			≤ 3.61 MW	100



Use of HERA plant pros & cons



Final result of industrial study due for June 2006

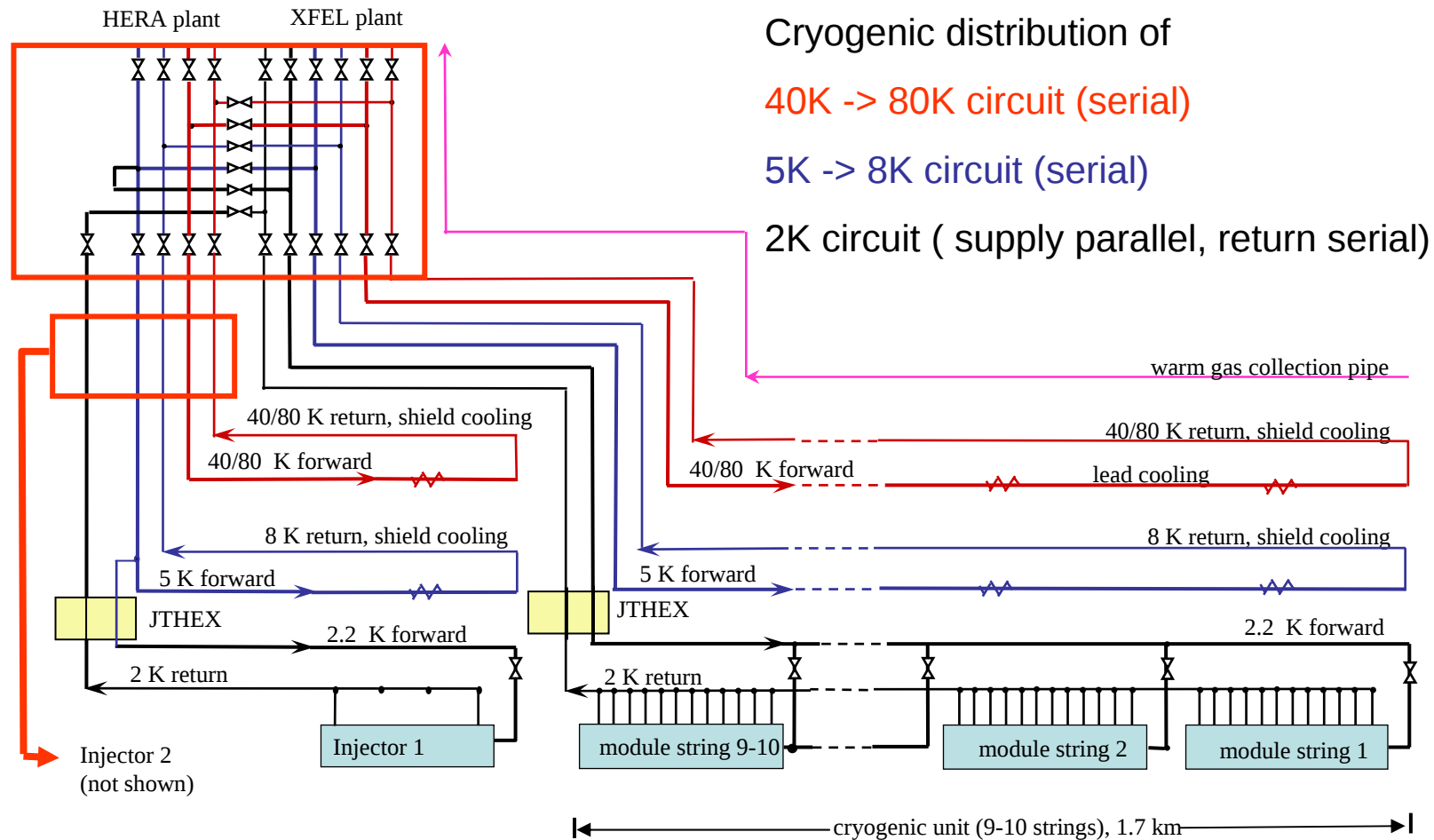
PRO	CON
Technical feasible	Parallel operation of 2 CBs
Reduced costs (CB,screws)	Reduced efficiency (~ 30 %)
Additional capacity ,for free'	Replacement of out-dated equipment required
	No additional redundancy
	CB modifications required
	Installations might interfere with VUV & AMTF operations

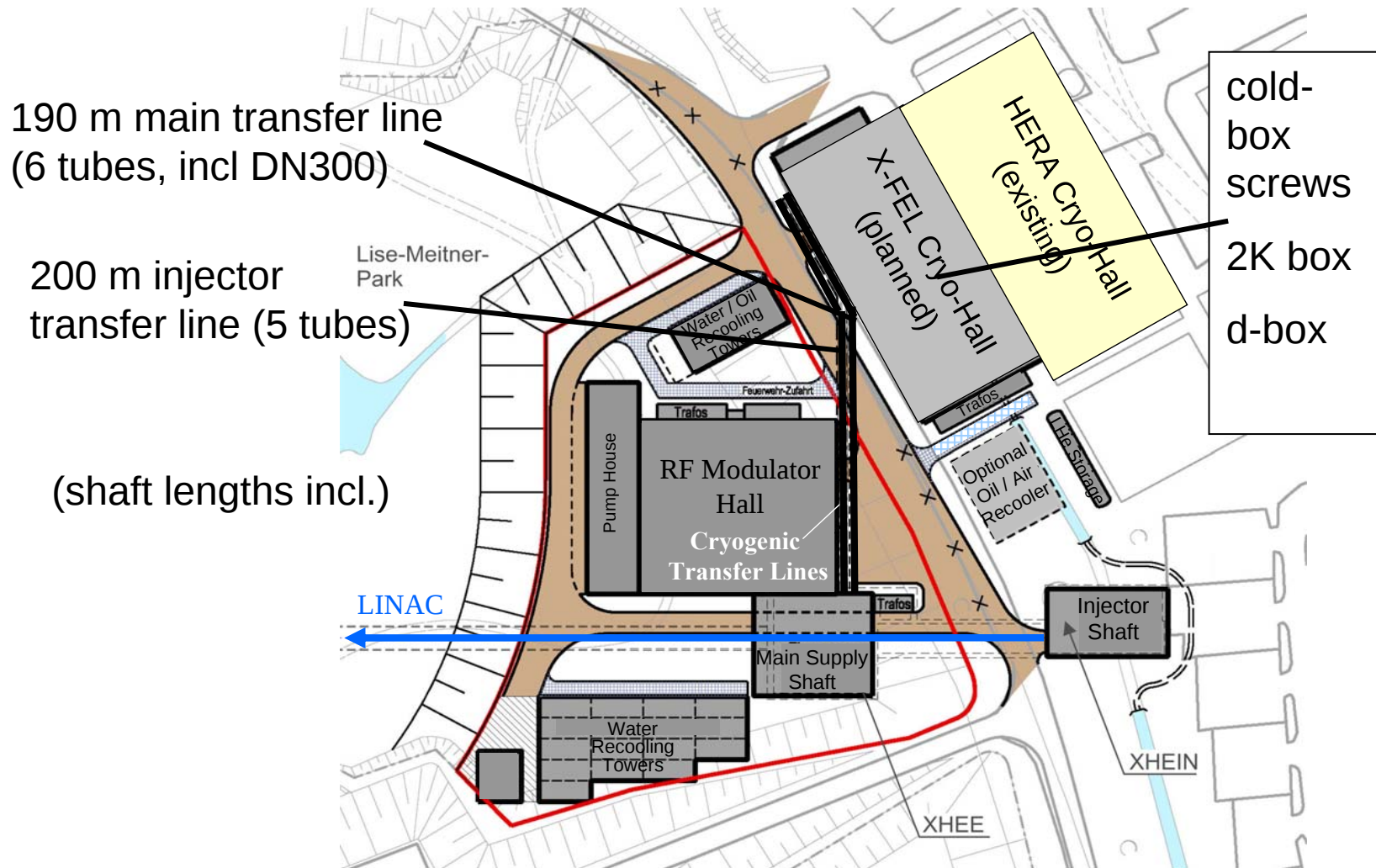


Refrigerator Questionnaire



1. Package defined: refrigerator, 2K box, compressors
2. Acceptance tests have to be defined in detail
3. Optimization left over to industry: number and size of turbines, cold compressors etc.
4. Low performance risk, LHC experience, bonus/malus ?
5. Call for tender will be started 2008 , see schedule
6. Industrial studies before call for tender: use of HERA plant, process studies
7. Work at DESY: installation & commissioning,
XFEL-operation (like HERA?)







Helium Distribution



- **Distribution Valve Box** (~ 30 cryo valves , DN50<>DN250)
- **Injector Valve Box** (~ 15 cryo valves , DN25<>DN150,)
- **Main XFEL-Transfer Line** (6 tubes, DN50<>DN300, 190 m)
- **Injector Transfer Line** (5 tubes, DN25<>DN150, 200 m)
- **HERA-XFEL transfer Line** (5 tubes, DN50<>DN100, 50 m)
- **Injector Feed-Box** (9 cryo valves), **Feed-Cap,End Cap**
(may be seen in connection to the AMTF module test stands)
- **Warm gas tubing** around the valve boxes, 2 km DN200 tube in tunnel
DN 500 vent tubes in the shafts etc.



Helium Distribution Questionnaire



1. Procurement packages: [easy to define components = packages](#)
2. Technical requirements/fabrication/test procedures: DESY standard spec
[Do we have to change specs ? Use-less cost-drivers in specs ?](#)
3. Room for optimization ?
4. Performance risks ? [Low, well known components](#)
5. Schedule: [call for tenders 2007/2008](#) , see schedule
6. Industry actions before procurement ?
7. Work at DESY: [installation, comissioning](#)