Budgets and spares for reference design

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Main inputs from: A. Rossi, D. Perini, P. Fessia
Specific systems: D. Agulia, R. Jones, G. Kirby, M. Martino, D. Wollmann, VSC team (V. Baglin)

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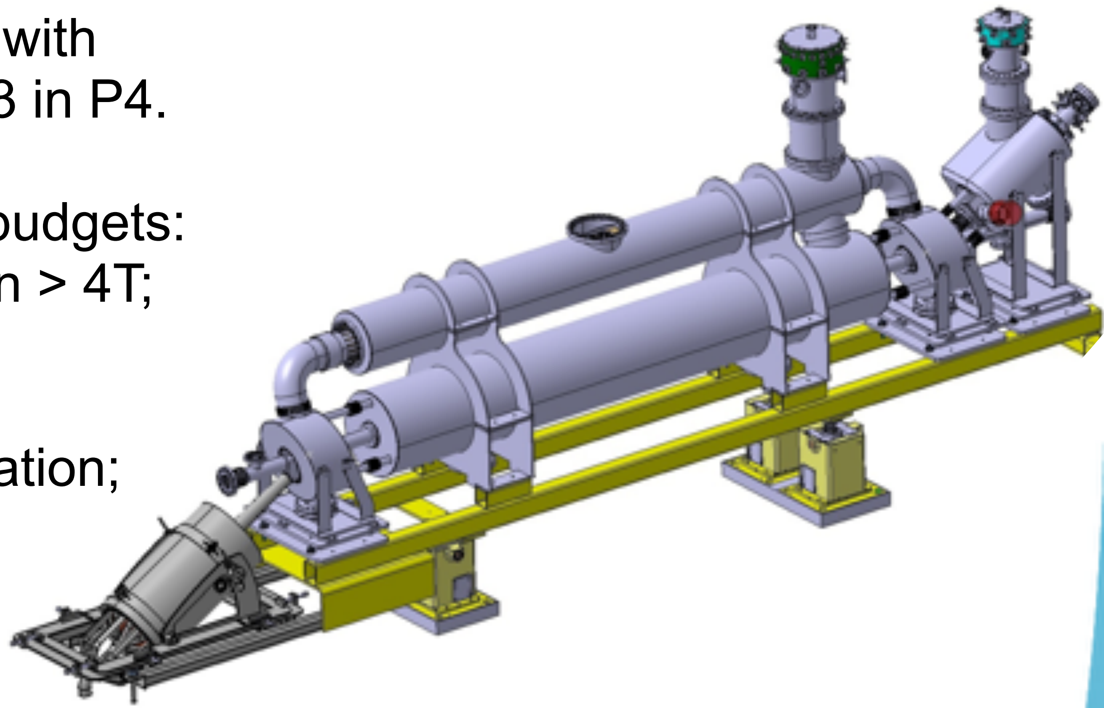
Introduction

Project goal:
Build 2 hollow e-lens devices, with spares, and install them in LS3 in P4.

Reference design driving the budgets:
— 4T main field; serious option > 4T;
— 5 A current along 3 m;
— full set of correctors;
— adequate beam instrumentation;
— spares to ensure reliable operations.



Scope of this talk:
- — Collect present estimates from CERN teams that will be responsible of production of sub-components;
- — Comment of possible alternative scenarios and uncertainties;
- — Indicative break down in work units.

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    Lenses are not yet in the baseline — difficult to find resources.
    Several teams where only triggered on that by this review.
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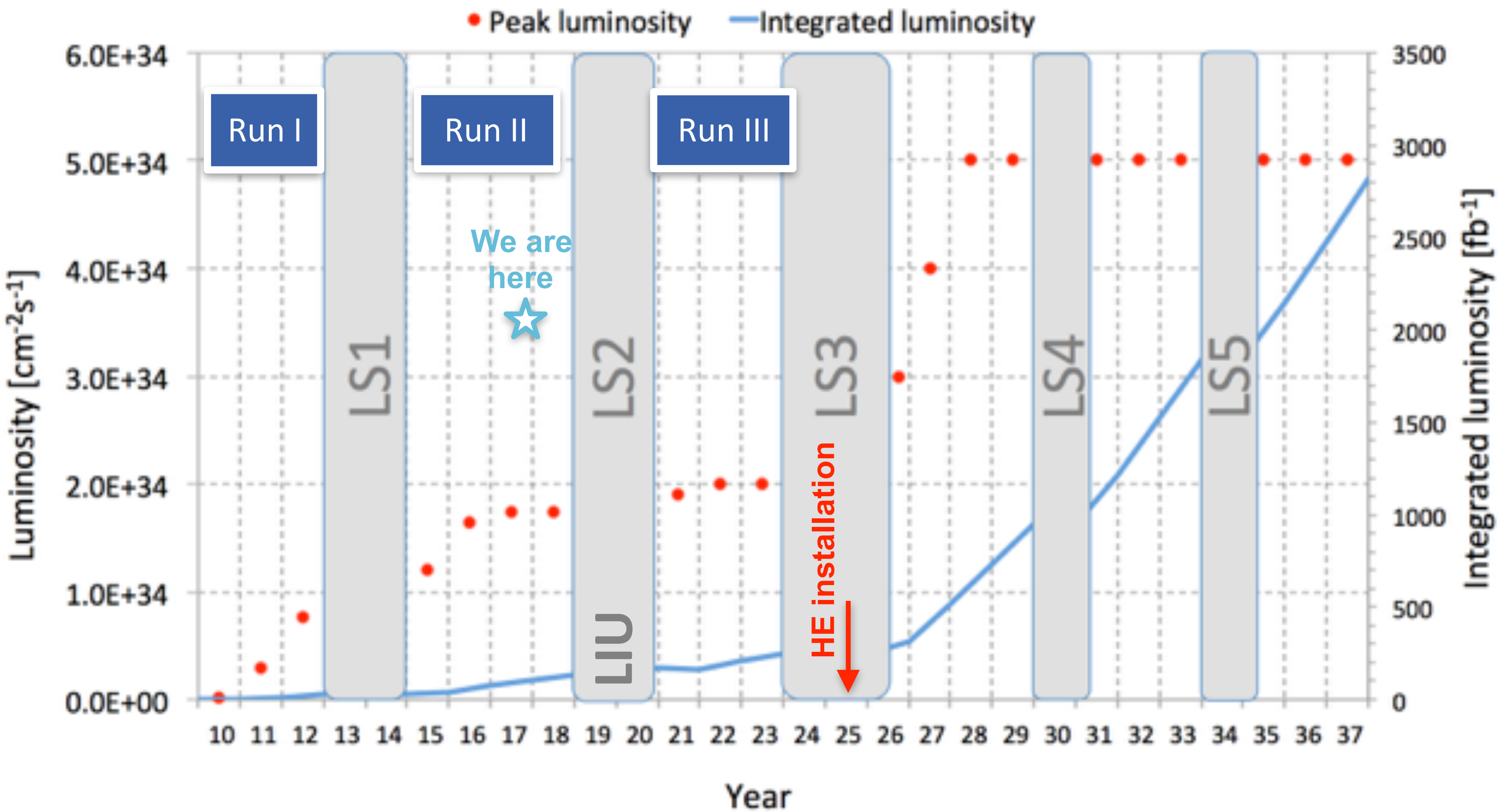
- Still uncertainties on final design choices (“baseline” vs “optional” scenarios)

    Need some time to assess implications of alternatives.

Timeline



Driving items for schedule: magnet systems (~2-3 years); decision for interventions on cryogenics system that have to be implemented in long shutdowns (*e.g., ~March 2018 for any work during LS2*).

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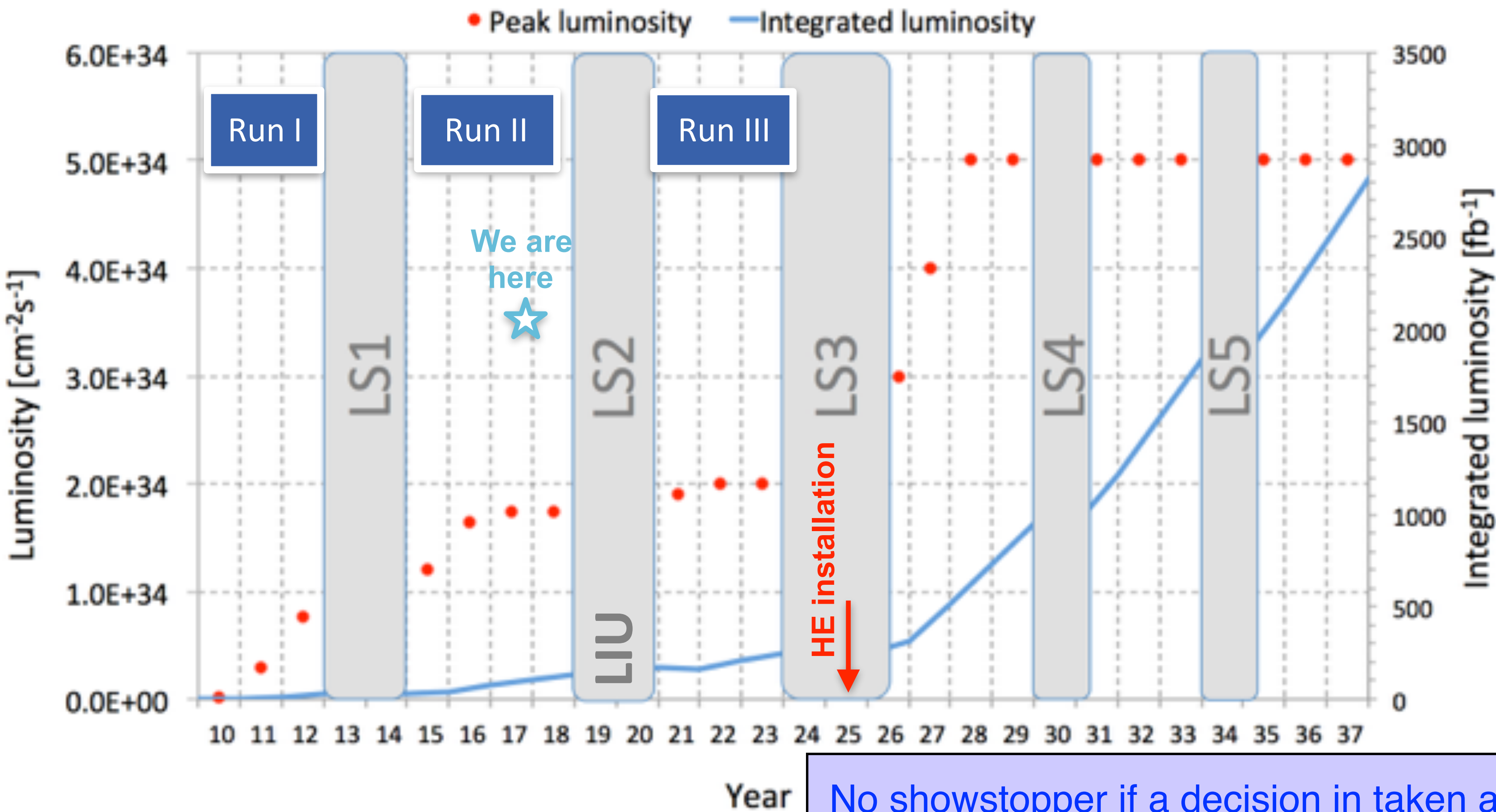

No showstopper if a decision in taken at cost&schedule review in March 2018.

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Looking forward to receiving reviewer’s feedback!

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- Integration, transport, cooling and cabling
  - Tunnel work for 2 lenses

Budget approach "Bonaventura"

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"Qui comincia l'avventura del
signor Bonaventura…"
Il Corriere dei Piccoli, 1917

Budget estimates

System	Cost [kCHF] for 2 units	Cost [kCHF] spares	TOTAL
Magnets systems (solenoid, correctors, cryostats, leads)	2100	700	2800
Cryogenics system	2000	-	2000
Power converters (with HV cables)	1080	119	1199
Supports and feet	200	-	200
Vacuum systems	200	-	200
Gun and collector	240	30	270
Cabling, integration, transport, cooling, alignment	500	-	500
Beam instrumentation: BPM, BLM	320	30	350
Beam instrumentation: gas jet monitor	400	50	450
Electron beam modulators	150	75	225
Energy extraction system and protection	300	20	320
TOTALS	**7490**	**1024**	**8514**

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- Power converters: might need additional manpower ~70kCHF

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  - Might remove one beam curtain monitor per lens (see slides A. Rossi), would reduce cost by ~200kCHF.
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- Could gain 300kCHF if Al shield can make magnet stably without EE system

Comment on component for the “third” lens

We decided to build within the present R&D budgets a “conform” prototypes of gun and collector:

- Can be used in a test stand;
- Goal to use them as spares for operational system;
- If not possible, cost to complete a third lens would be increased by ~ 200kCHF.

Strategy to keep components on surface seems appropriate:

- Final mounting in the tunnel if individual component fails.
- Possibility to assemble the whole unit if one needs to be replaced.

Conclusions

- Presented budget estimates for 2+1 hollow electron lenses
  — We propose to plan for having component for one full lens on surface.
- We come to a total estimated production cost of 8.5 MCHF
- Spares and 1 more magnet system amount to ~1 MCHF
- Consistent with previous figures (review 2016), now with solid feedback from CERN groups/teams responsible for hardware
  — Thanks to all teams involved!
- Some contingency and “risk” or missing items were identified.
  — Hard to be more precise without another “final” iteration on systems
- This will have to be followed by a top-down revision before cost and schedule review next year.
- Effort was made to isolate work units that could be appealing for external collaborators
  — Several concrete interests expressed, more follow up at Annual meeting