

HiLumi LHC Task 2.2

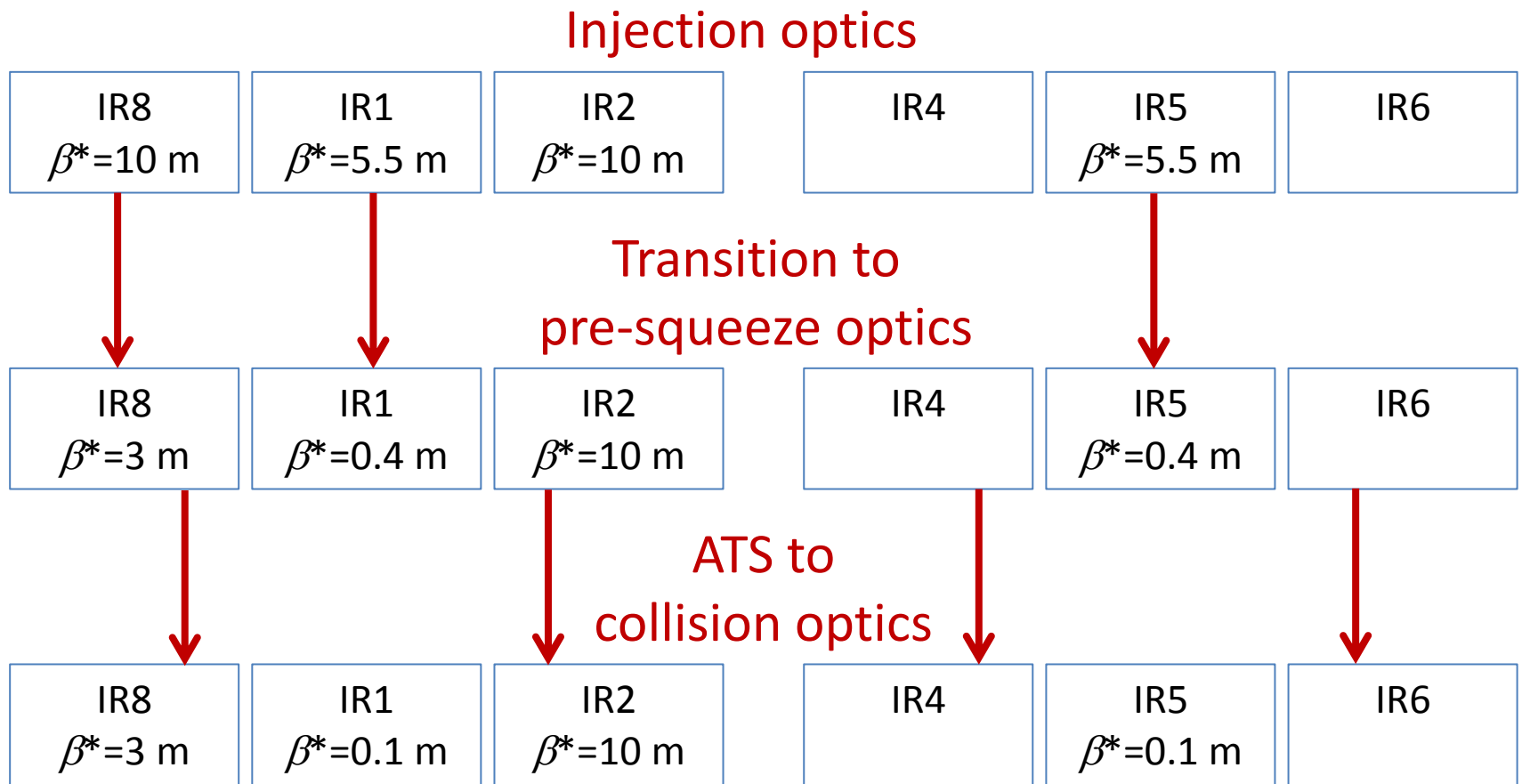
CERN Meeting, 19-20 September 2012

Summary and closing remarks

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HL-LHC optics: injection to proton collisions



250 - 300 fb⁻¹ per year

HL-LHC optics: injection to ion collisions

Injection optics



Transition to pre-squeeze optics



Squeeze to collision optics



The Plan for HiLumi LHC Task 2.2

November 2011

Proposed specifications and options

New IR2/8 optics

New baseline optics

New transitions

September 2012

Agreed magnet specifications, layout, optics specifications (phase advances, beta functions...) and constraints

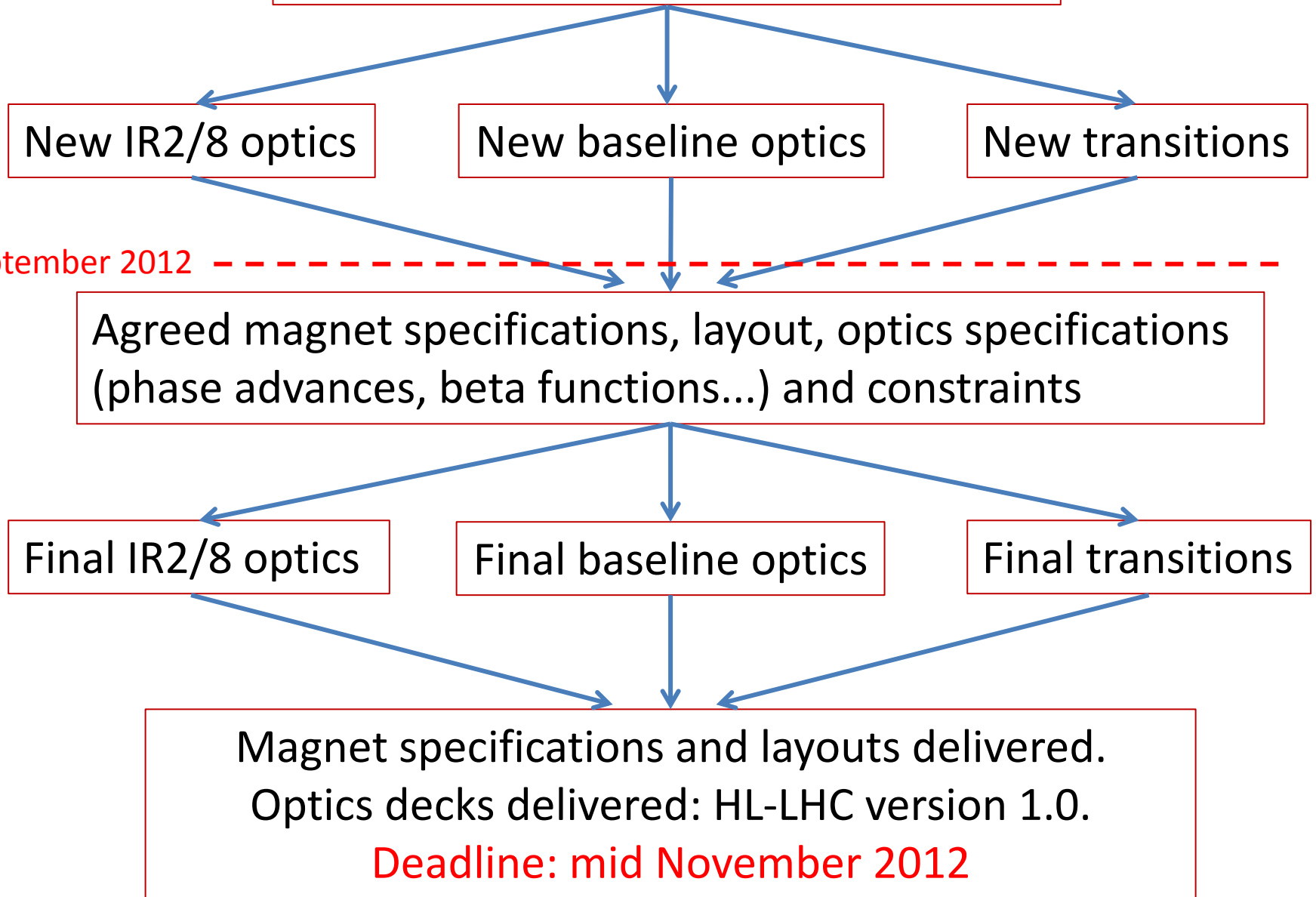
Final IR2/8 optics

Final baseline optics

Final transitions

Magnet specifications and layouts delivered.
Optics decks delivered: HL-LHC version 1.0.

Deadline: mid November 2012



Comments and Issues

- The present baseline specifications for the final triplets are:
 - 150 mm aperture
 - 140 T/m gradient
- Increasing the aperture would be of more benefit than increasing the gradient (limits to chromatic correction).
 - If the magnet developers can provide more aperture, we can use it... (HL-LHC version 2.0..?)
- There are many, many detailed specifications and constraints. Having learned the tools, the next steps can be completed more quickly.
- The lattices and optics decks will provide an essential foundation for the ongoing HiLumi LHC studies.

Comments and Issues

- Some work is still needed to meet all the specifications e.g. for beta functions at the crab cavities, apertures during transition...
- The optics must be shown to be robust against magnet errors.
- Fringe field effects should be fully quantified and understood (and mitigated...)
- The optics need to be *flexible*. For example:
 - to allow range of β^* in IR2 and IR8 (with ATS applied)
 - for luminosity levelling (β^* , beam separation, crab cavities...)
- Back-up solutions need to be prepared, and alternatives investigated, including:
 - Flat beam option should be developed as a back-up for crab cavities.
 - “Radical” redesigns of IR1/5 should be looked at, to see whether any tricks have been missed.

Final remarks

Six months ago, it all looked hopelessly complicated.
It still appears daunting: *but success is within reach.*

The HiLumi LHC lattice and optics studies are setting a high standard in technical and organisational achievements.

Much of the progress has been possible because of the support and guidance from our colleagues at CERN – *many thanks!*

Many thanks also to Bernhard and his colleagues at CERN for their efficient organisation of such a stimulating and useful meeting, and for their generous hospitality!