

Aperture for AFP, ALICE, and LHCb (LHC)

M. Giovannozzi

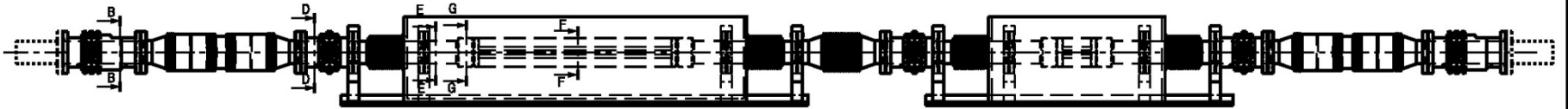
Acknowledgements: H. Burkhardt, B. Holzer, D. Macina, M. A. Gallilee, J. Jowett, G. Spigo

Disclaimer: unless otherwise stated, nominal parameters are used.

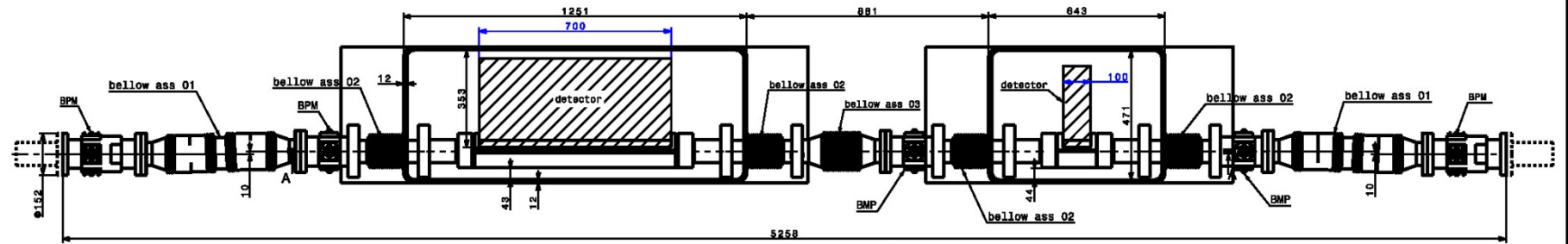
AFP layout - I

"HAMBURG" BEAM PIPE long part for C6L1 layout
injection position

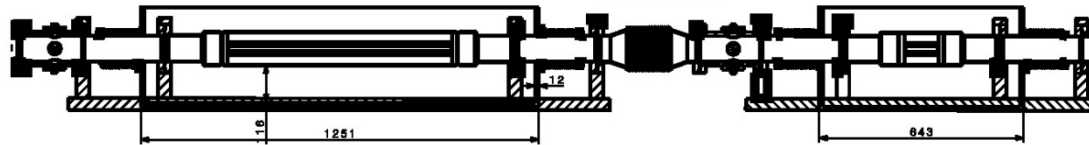
front view



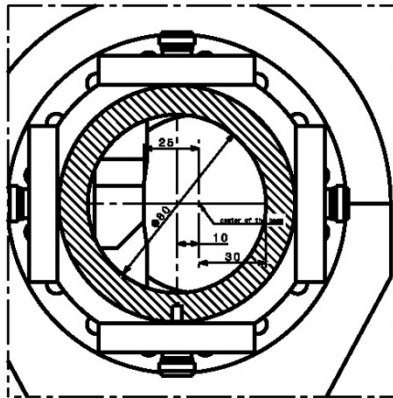
top view



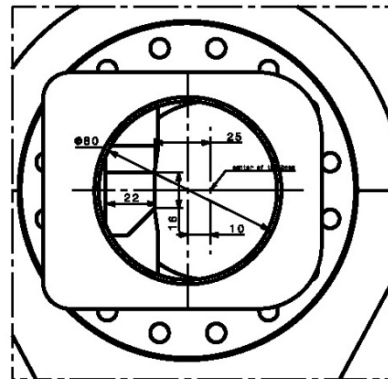
section A-A



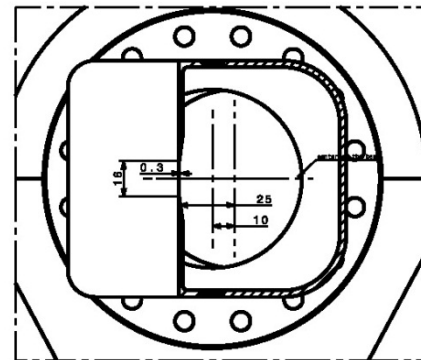
section D-D



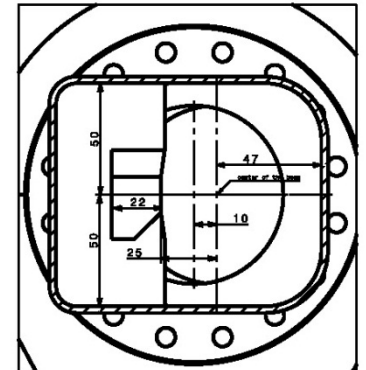
section E-E



section F-F



section G-G



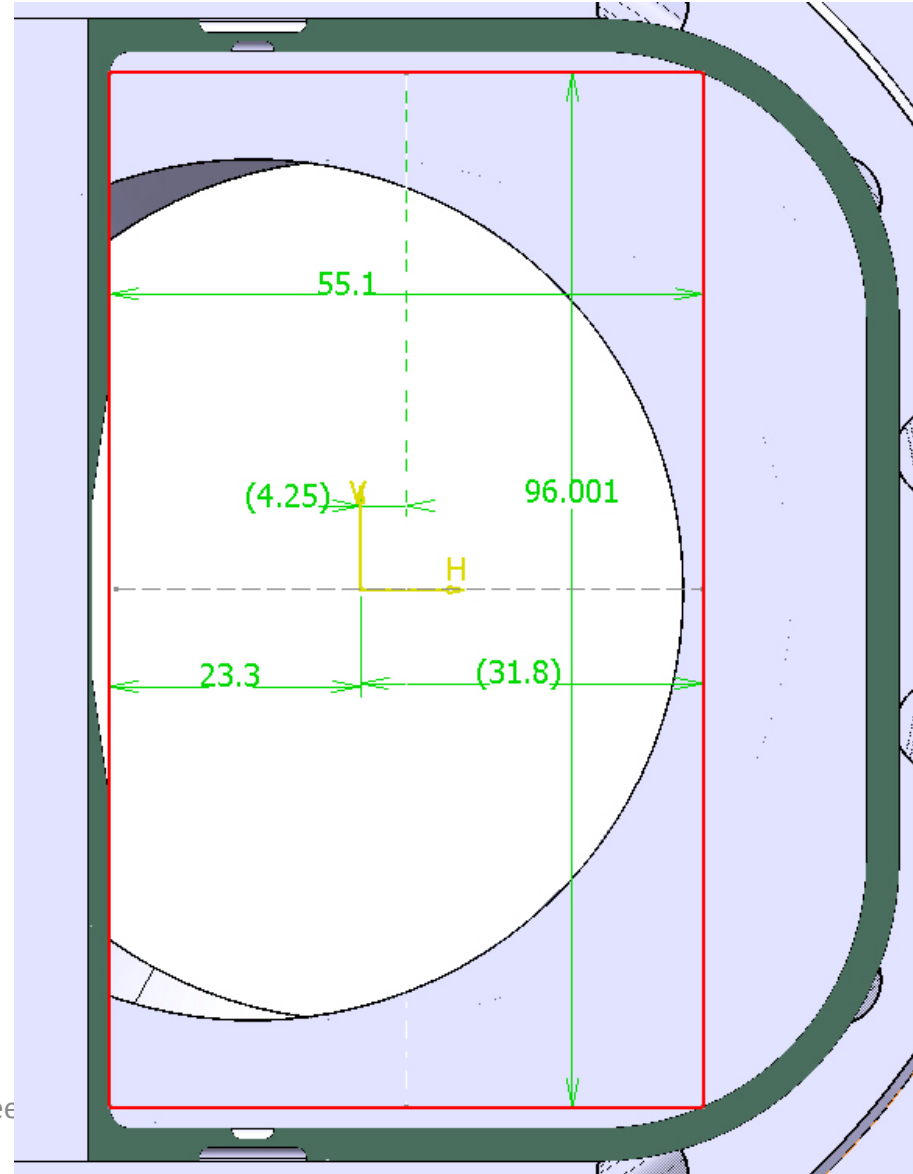
version from 08.08.2012

OLD DRAWING: LUDWIG BREMER - HAMBURG PIPE HAMBURG BEAM PIPE (LONG PART) FOR C6L1 LAYOUT INJECTION POSITION	DRAWN BY: [] CHECKED BY: [] DATE: [] PROJECT NUMBER: ST14002781_02	DATE: 2012-03-30 DRAWING NO.: [] PROJECT NO.: [] DRAWING SCALE: []
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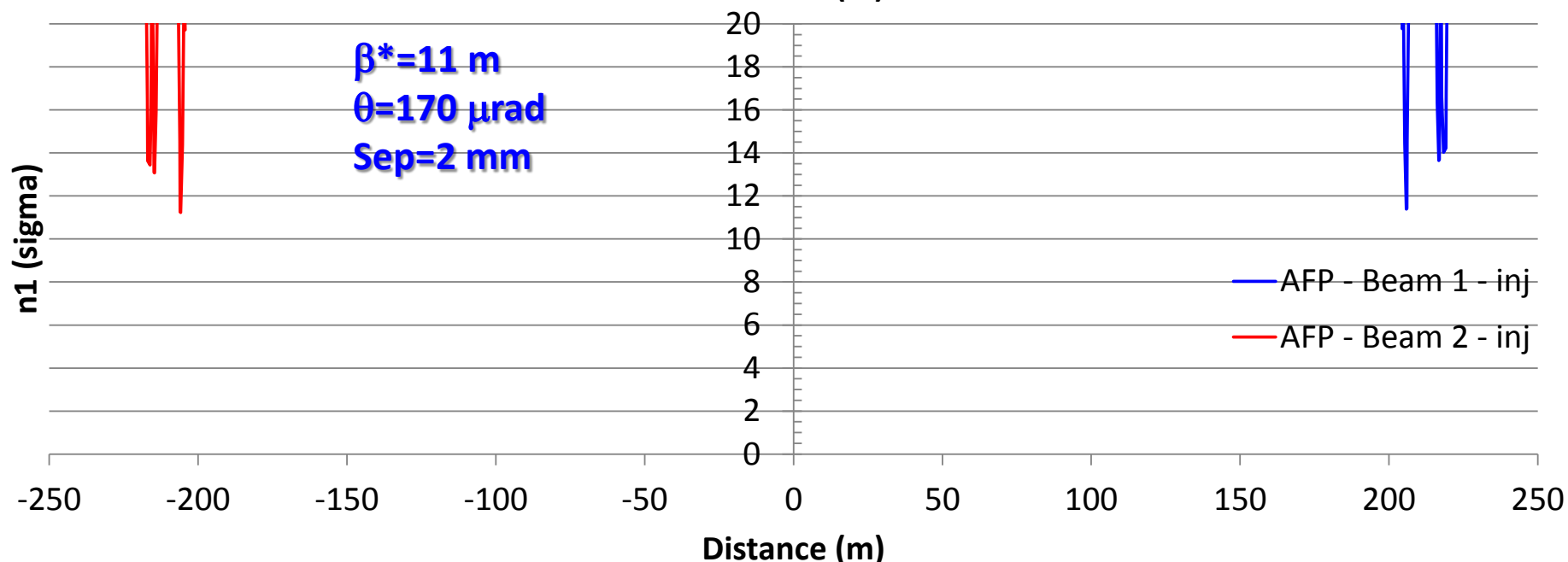
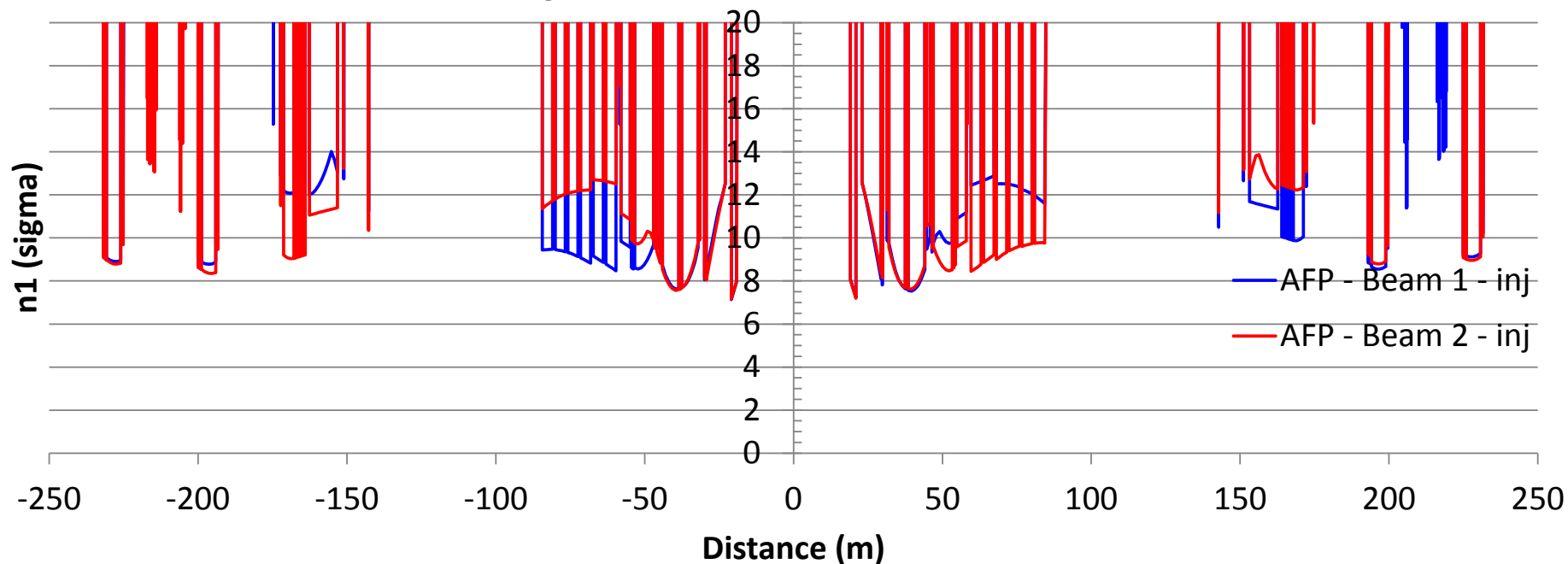
FOR VALUABLE FOUR EXECUTION NOT VALID FOR EXECUTION - ATUJH 0006 1

AFP layout - II

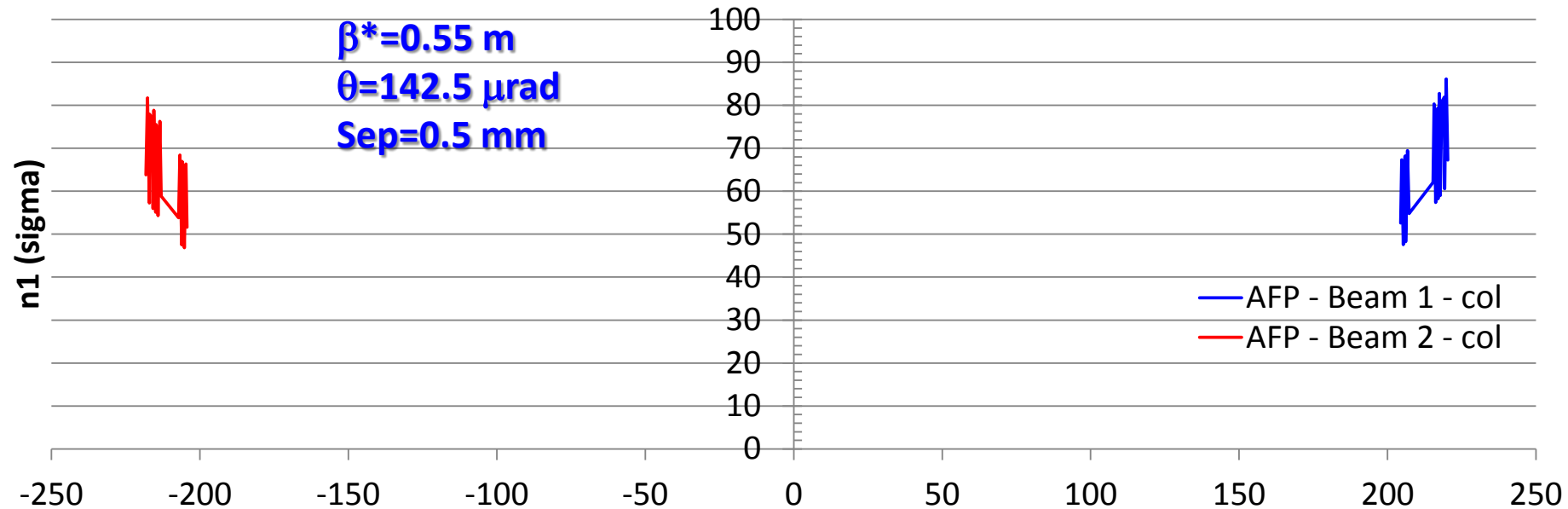
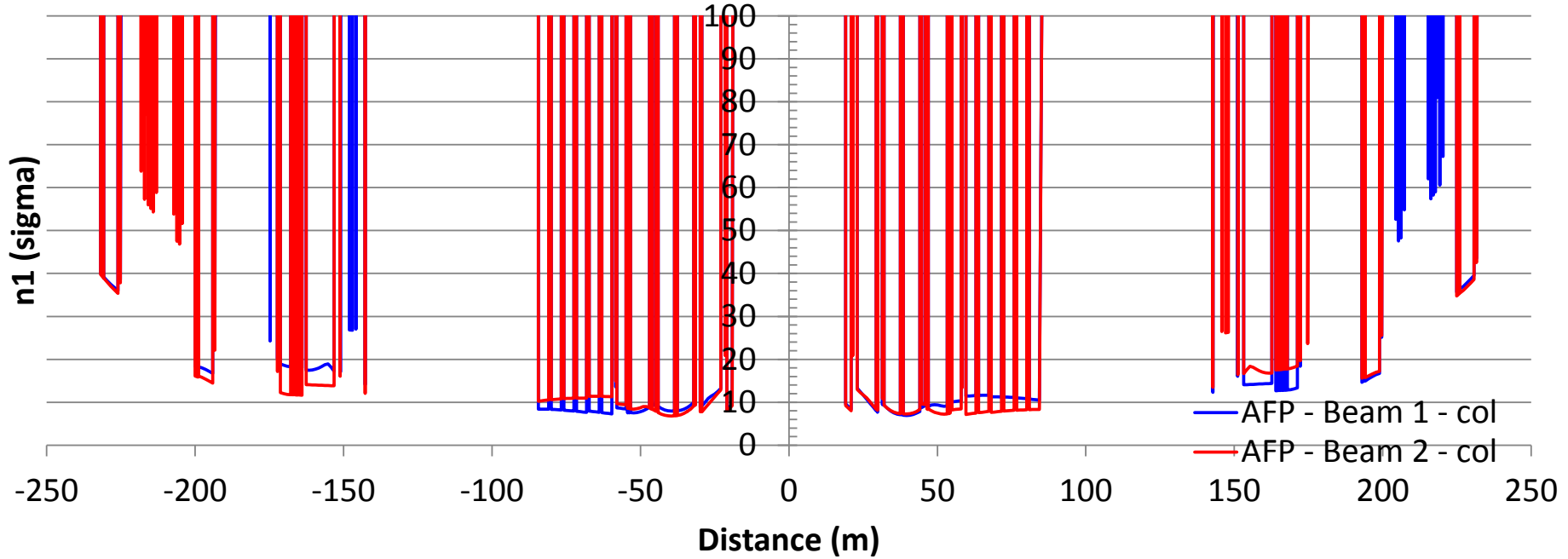
- Layout provided by G. Spigo.
- Defined maximum aperture markers for MAD-X model:
 - Mechanical tolerances equal to those of neighbouring magnetic elements, i.e., 0.84 mm radial, 0.36 mm horizontal.
 - Aperture definition: maximum rectangle inscribed into real aperture shape.
- Defined installation of markers for Beam 1 and Beam 2 elements.
- Defined offset files.
- No change in position between injection and top energy.
- All files (and sample job) available under afs at [~giovanno/public/For_AFP](afs://giovanno/public/For_AFP)



AFP aperture: results - I



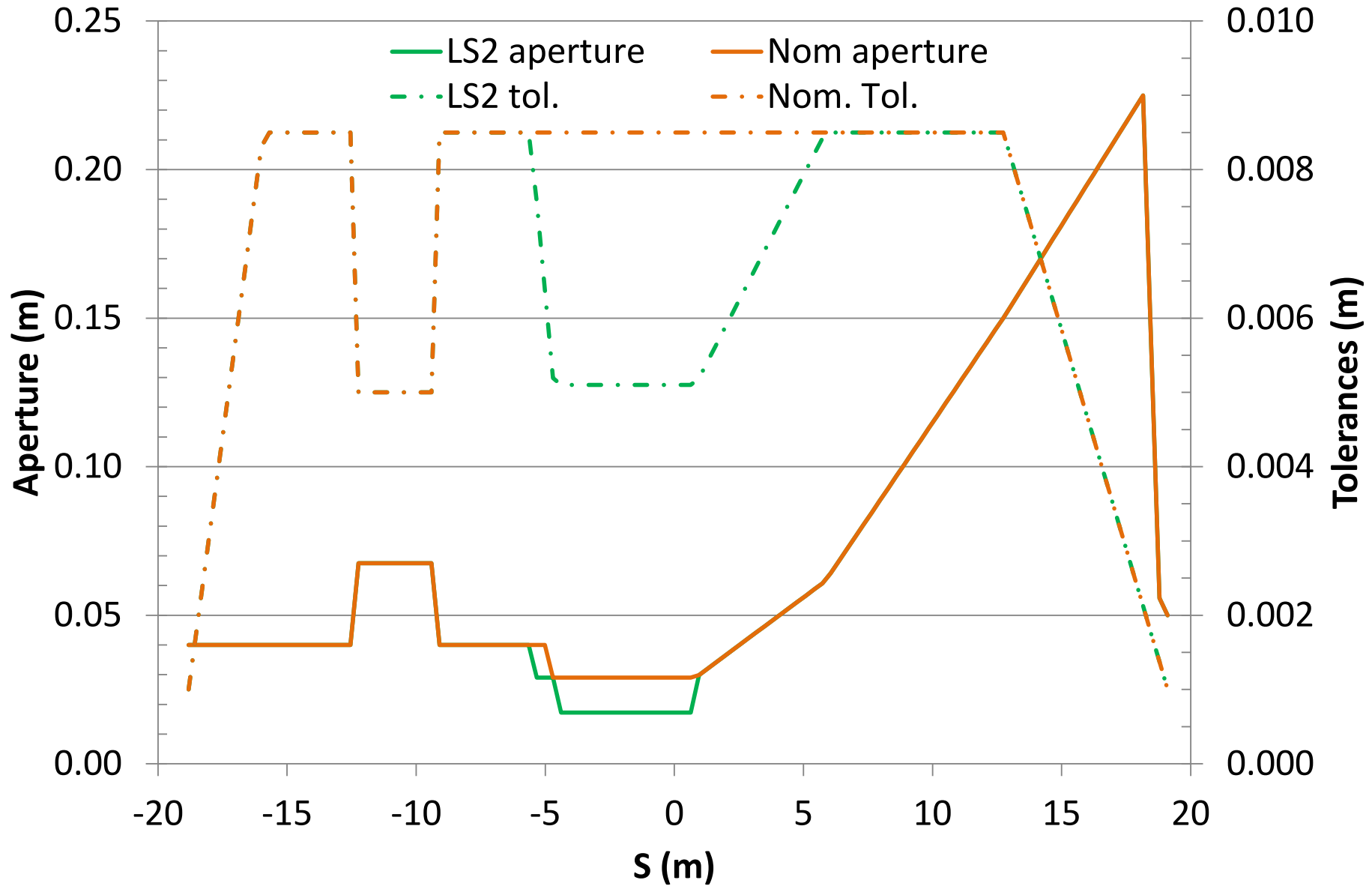
AFP aperture: results - II



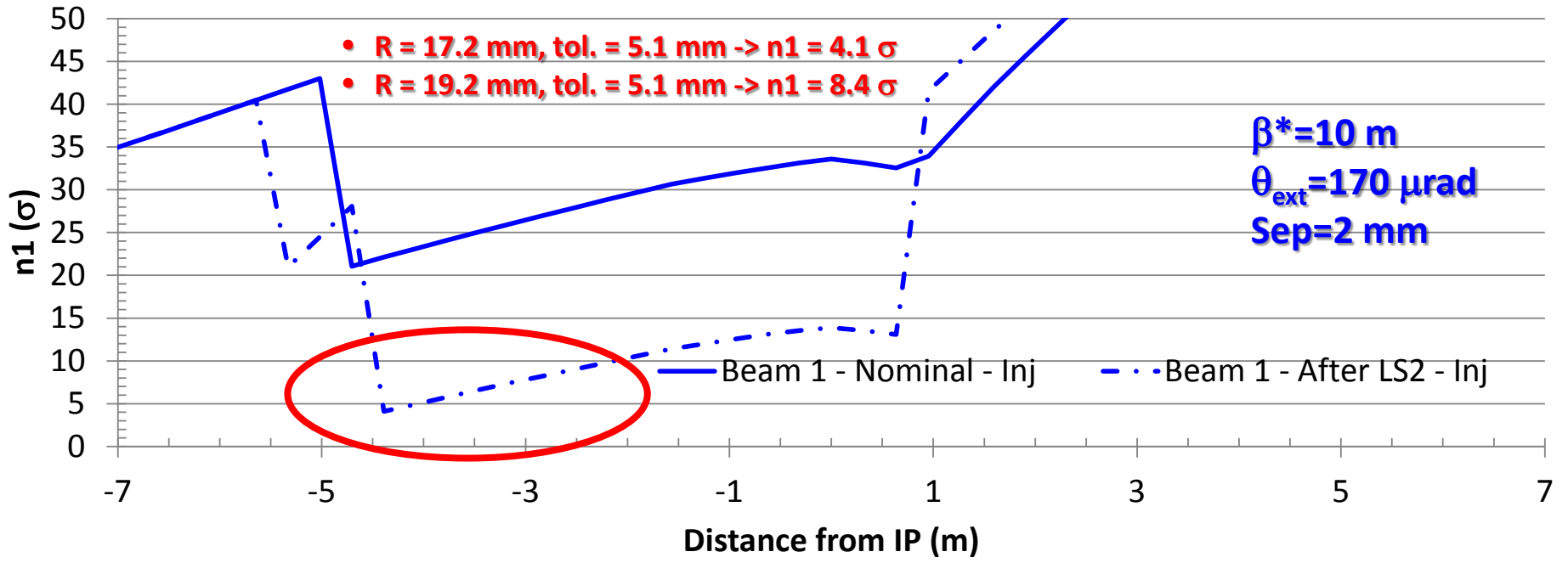
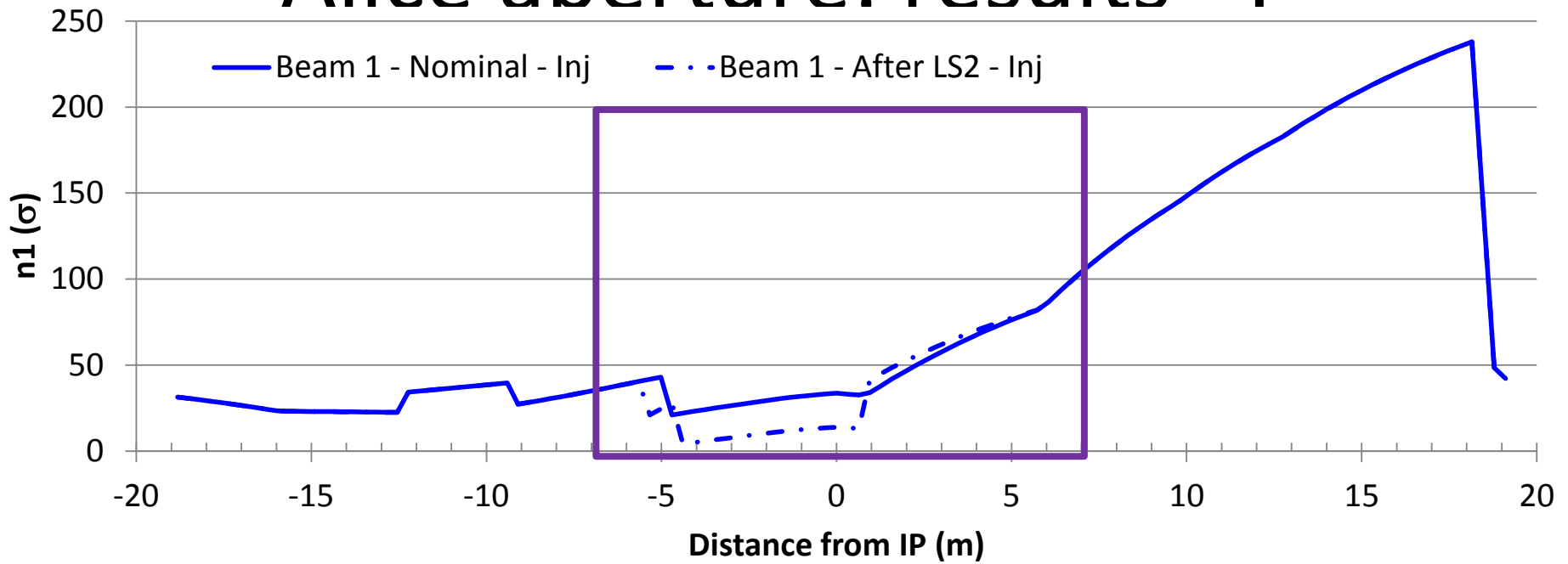
Alice beam pipe - I

- New layout before LS2: certified (by M. A. Gallilee) nominal layout.
- New layout after LS2: certified (by M. A. Gallilee) proposed layout.
- S-dependent tolerances have been introduced for both layouts.
- Several configurations considered:
 - Nominal injection
 - Nominal collision – proton physics
 - Nominal squeezed - ion physics

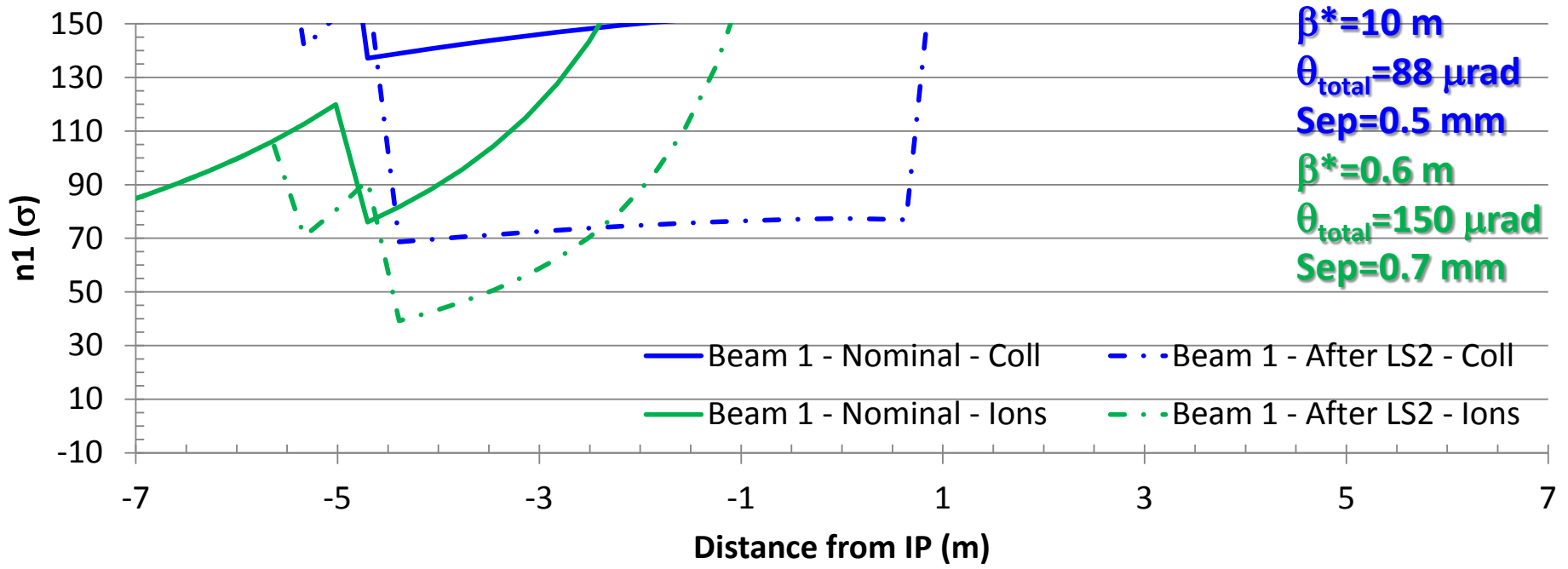
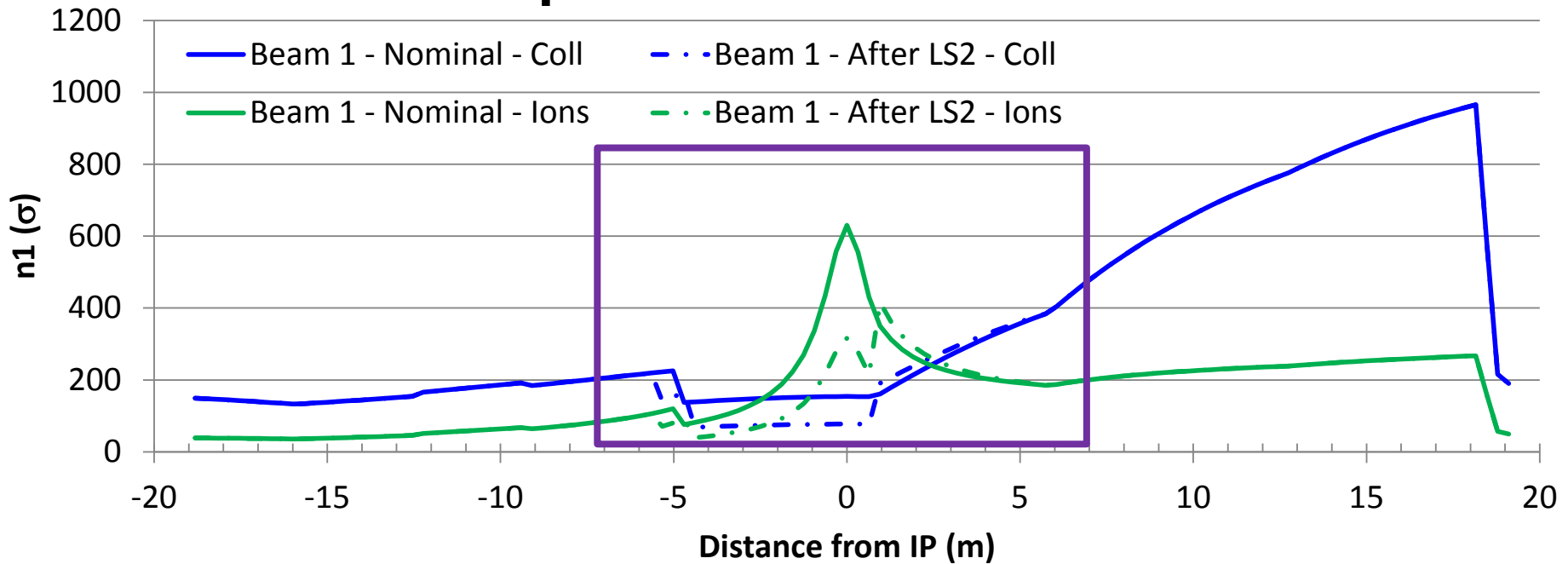
Alice beam pipe - II



Alice aperture: results - I



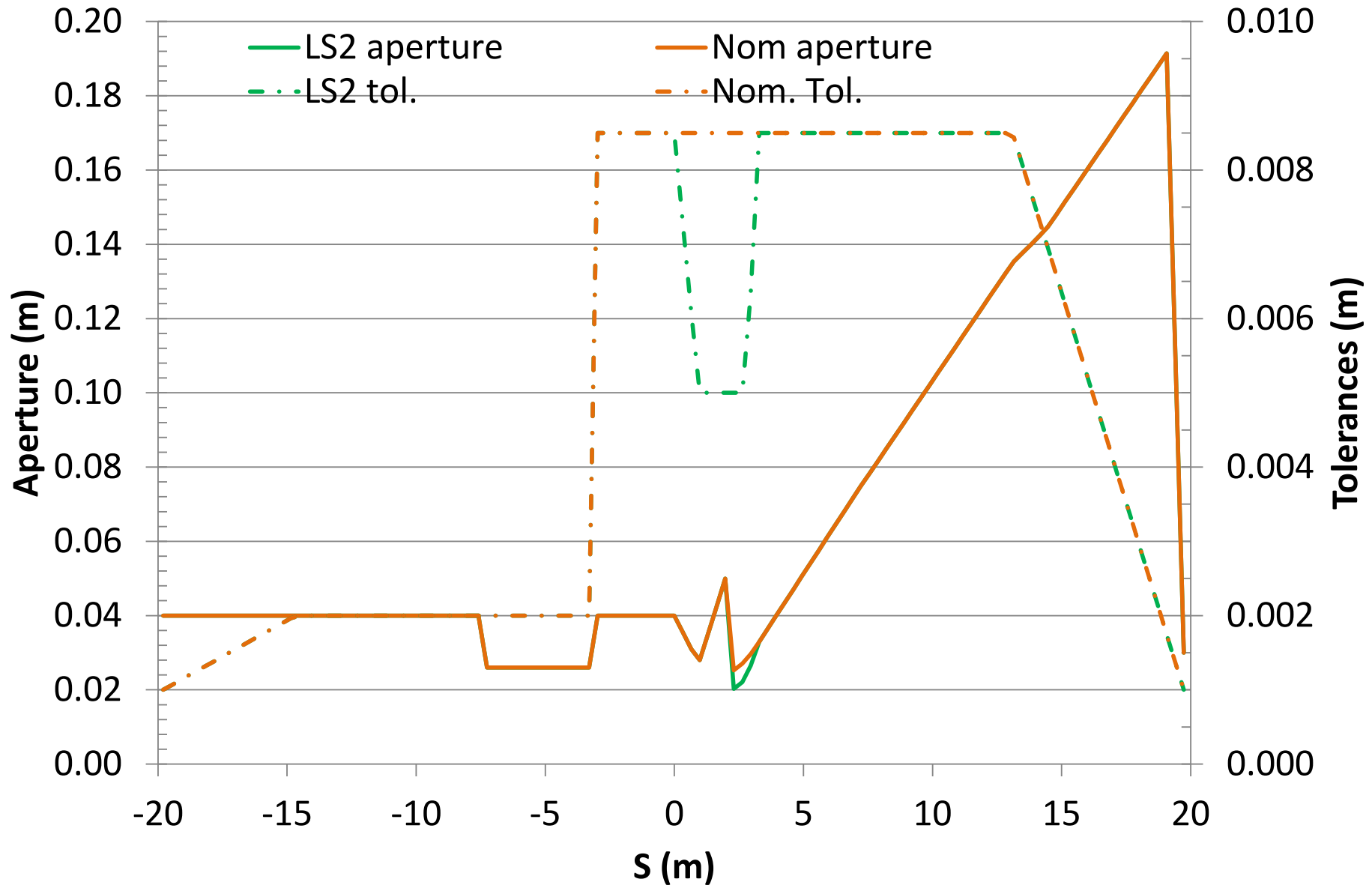
Alice aperture: results - II



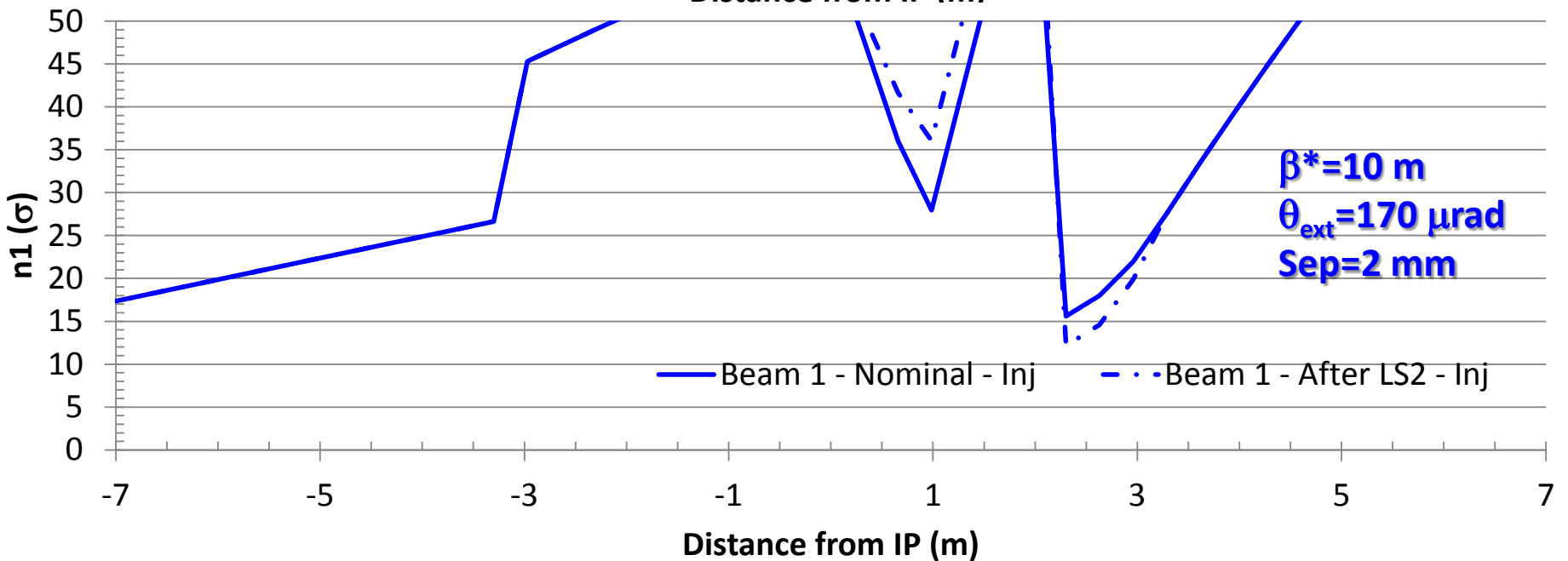
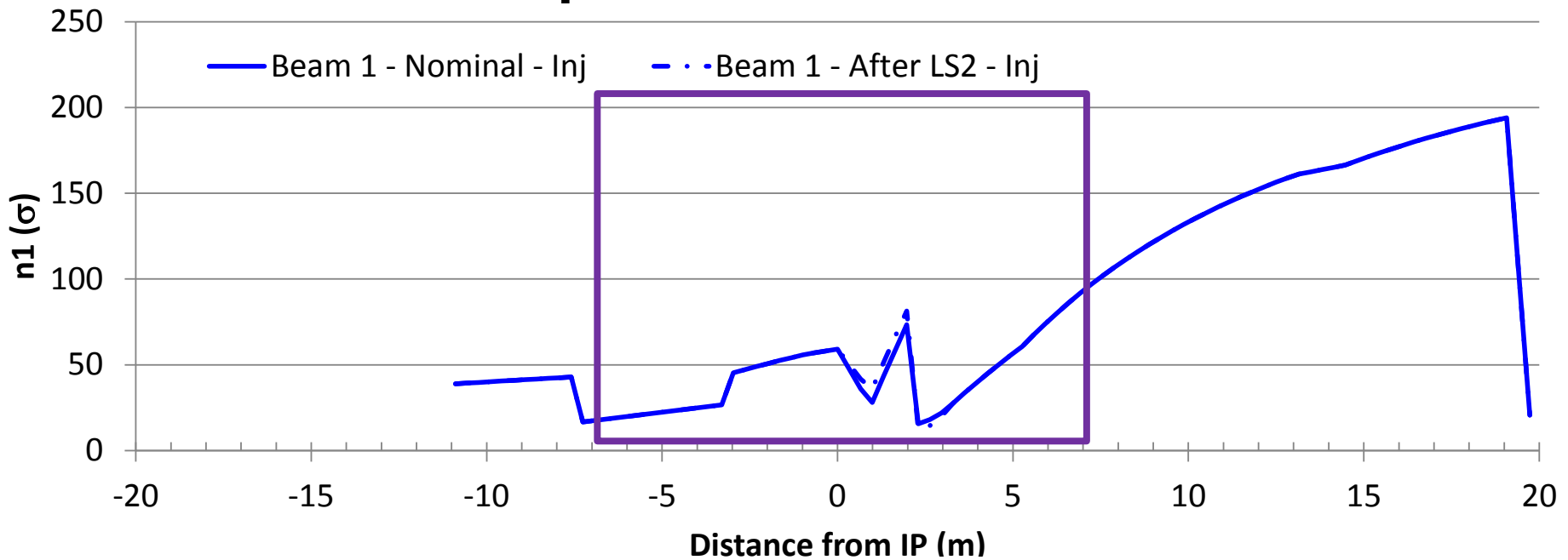
LHCb beam pipe - I

- New layout before LS2: certified (by M. A. Gallilee) nominal layout.
- New layout after LS2: certified (by M. A. Gallilee) proposed layout.
- S-dependent tolerances have been introduced for both layouts.
- Several configurations considered:
 - Nominal injection
 - Nominal collision – proton physics
 - Nominal squeezed – proton physics

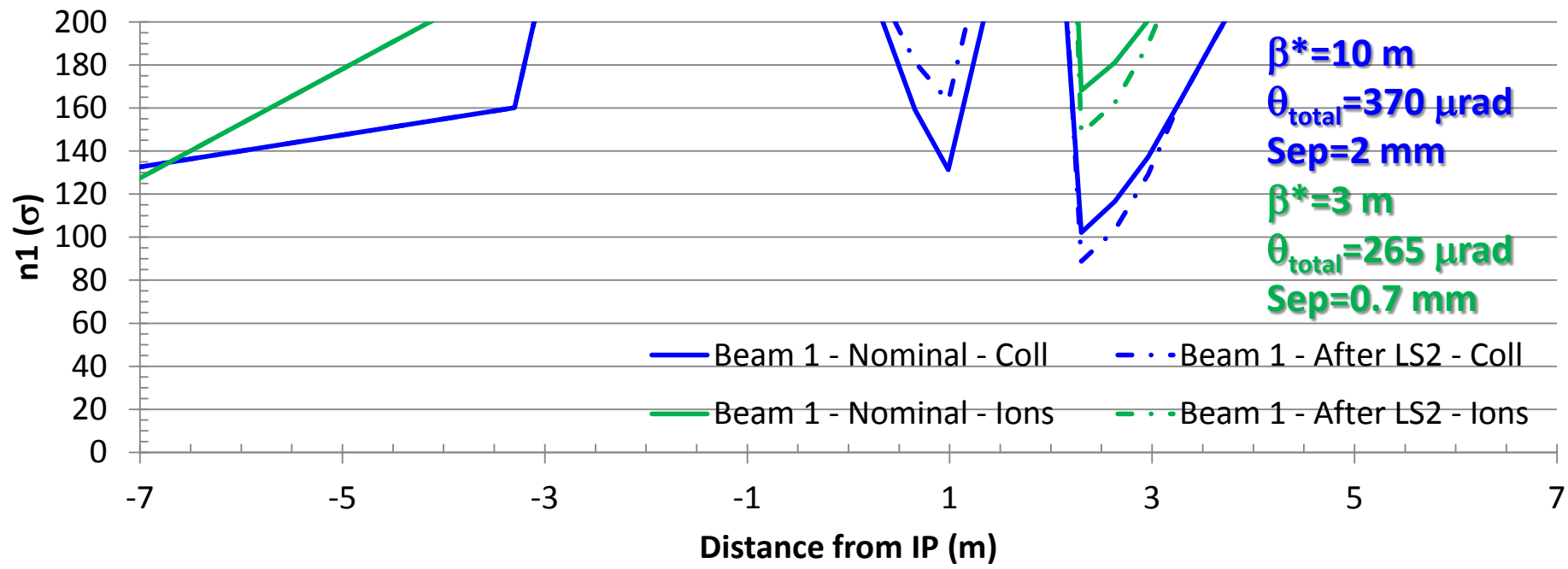
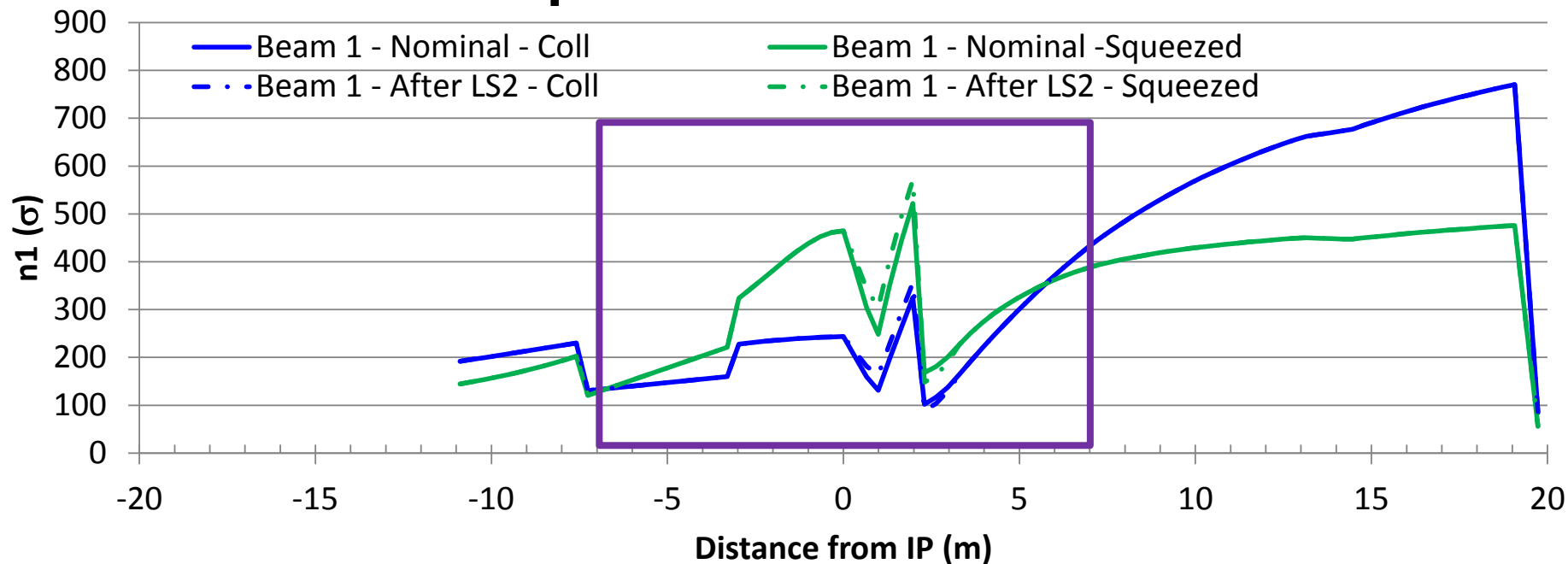
LHCb beam pipe - II



LHCb aperture: results - I



LHCb aperture: results - II



Conclusions for **nominal** LHC - I

- AFP
 - Current proposal is compatible with aperture requirements. It is also compatible with high-beat optics.
 - Further aperture restrictions (installation of Ferrites) should be re-evaluated.
 - Compatibility between AFP and ALFA should be carefully assessed.
 - The AFP area will be completely changed in the HL-LHC era.
- Alice
 - Too small aperture at injection beyond -2 m from IP!
 - High-beta optics not considered: it will enhance the aperture problems.
 - Top energy configurations are fine.
- LHCb
 - No specific problems found.
 - V-crossing at top energy with $\beta^*=3$ m considered: no problem found
- All the files for Alice and LHCb are available under
 - </afs/cern.ch/eng/lhc/optics/V6.503/aperture>: nominal beam pipe
 - </afs/cern.ch/eng/lhc/optics/V6.503/aperture/as-built>: upgraded beam pipe

Any feedback is more than welcome!

Conclusions for **nominal** LHC - II

An important remark: the running conditions after LS2 are not completely defined (or at least known to me). An exhaustive analysis is therefore not possible, to date.