

Notes on the BGV Alignment

BGV Chambers & Detector

Plamen Hopchev
CERN BE-BI-BL

BGV meeting #47

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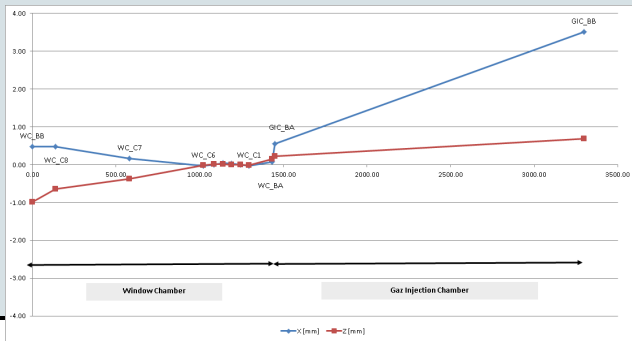
- This an overview of measurements and decisions made for the BGV alignment
 - Considered are both the BGV chambers, detector support and modules
- The main purpose is to collect information that can serve as reference and for future calculations

- 1 Chamber Assembly Gas Injection + Window chambers**
- 2 Detector Support and Modules**

Orientation in the longitudinal and transverse planes (1)

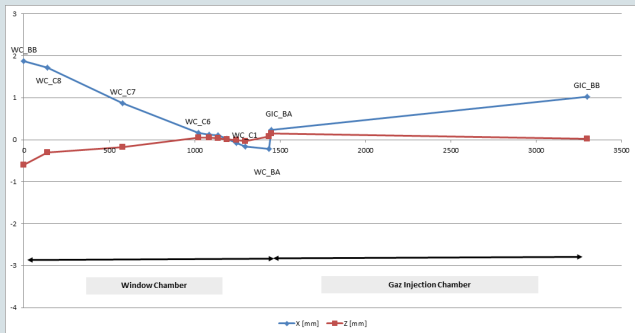
- All information on this topic was provided by J.F. Fuchs in emails from 9 – 11 July 2014 (For more details – see those emails)

- The BGV assembly (Gas Inj + Window chambers) was measured on the surface
- The points correspond to the centers of the assembly segments
- The horizontal axis corresponds to the theoretical beam line
- The two colors correspond to the two transverse coordinates
- Initially, a positioning/orientation of the assembly was proposed by J.F. Fuchs
 - Narrow part of the Window chamber aligned with the beam axis

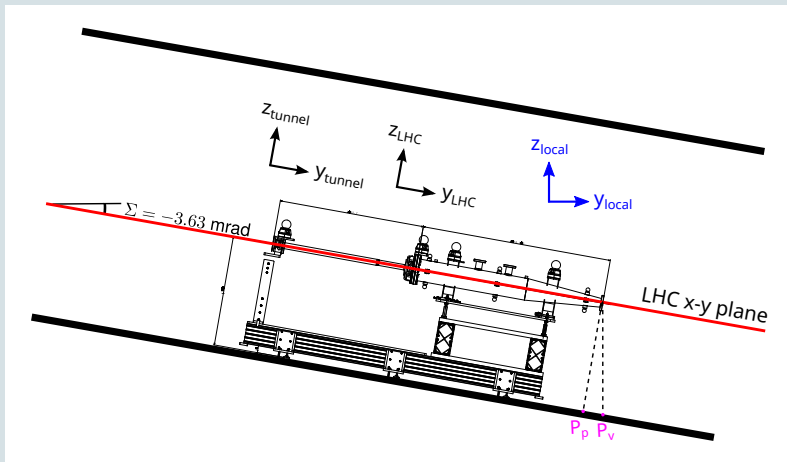


Orientation in the longitudinal and transverse planes (2)

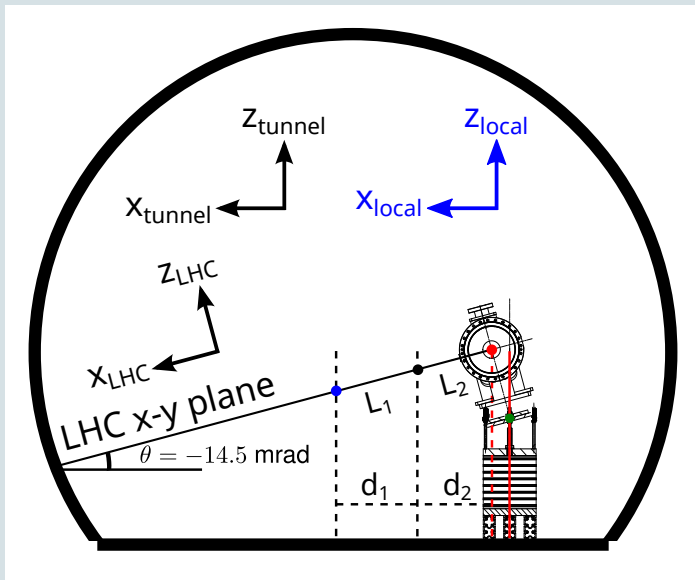
- Starting from this configuration, the BGV Assembly was rotated in the two planes
 - The goal was to distribute the offsets more regularly and to limit the offset at the bellow on the upstream end
 - Rotation angles: $R_z = +1.18$ mrad, $R_x = -0.32$ mrad
- The resulting configuration is shown below. This is the **final** positioning/orientation of the BGV assembly, according to which it was aligned



Positioning – longitudinal plane



Positioning – transverse plane



- 1 Chamber Assembly Gas Injection + Window chambers
- 2 Detector Support and Modules

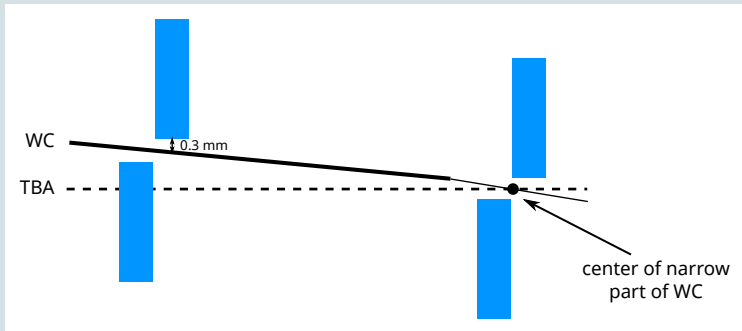
Reference frames for positioning and alignment

TBA = Theoretical Beam Axis

Element	Reference for Translation/Positioning	Orientation in the Longitudinal Plane	Orientation in the Transverse Plane
Chamber Assembly	TBA (Survey reference grid)	$R_z = +1.18$ mrad $R_x = -0.32$ mrad wrt the TBA	In the LHC plane (Tilt = -14.5 mrad)
Detector Support Frame	Protection box of Window Chamber	Perpendicular to floor and TBA (i.e. 3.6 mrad absolute slope)	Parallel to the floor, i.e. absolutely horizontal
Intermediate Plates	TBA	Perpendicular to the TBA	In the LHC plane (Tilt = -14.5 mrad), i.e. the Interm. Plates bring-in the tilt
2-module Assemblies	Wall of the Window Chamber (note: this axis is \neq from the TBA); Put the modules at 0.3 mm	Perpendicular to the TBA	In the LHC plane, i.e. no rotation wrt the Interm. Plates

Alignment accuracy achieved for frame and interm. plates (w2 and w3 2015):
position $\mathcal{O}(0.1)$ mm, orientation $\mathcal{O}(0.1)$ mrad

Modules positioning and alignment



- Position all modules at 0.3 mm from the WC wall
 - Ask survey to measure the distance of each module to the TBA, so that we can include it as a “misalignment” in the SW
- Align the modules perpendicular to the TBA and parallel to each other
- For each quadrant require the same rotation around the z axis
 - Manipulation of 2MAs only would be sufficient, provided the 2 modules in a 2MA are well position wrt each other