Detailed Introduction to the Workshop

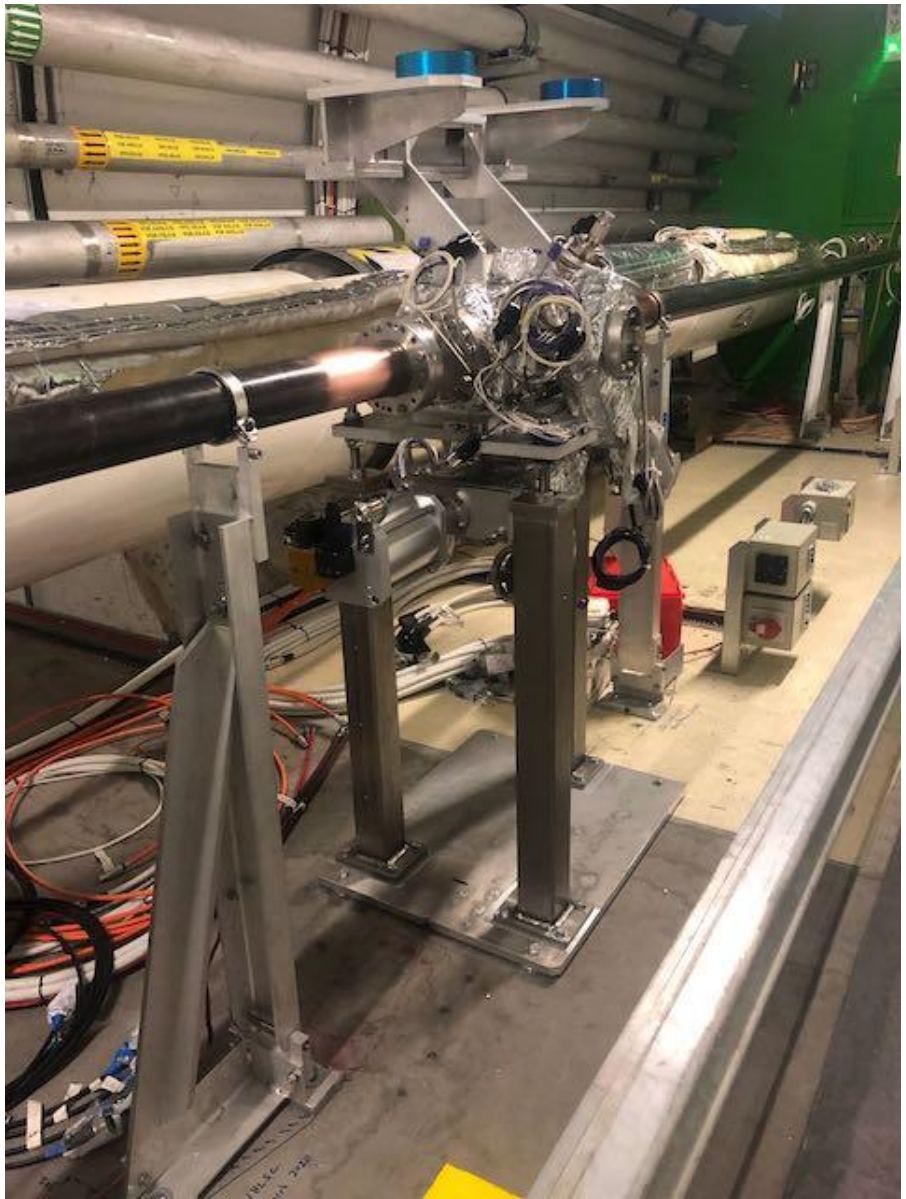
Objectives, timeline and actions for the project

BGC Collaboration meeting, December 2020

Objectives for this meeting

- Review status of the collaboration, publications, manpower and budget planning
- Summary of experimental measurements performed and results from CI since March 2020
- Covid-19 impact on BGC progress
- For the Version 3 instrument:
  - Give the status on the LHC tunnel installation, instrument design and procurement
  - Phase 1 remaining LHC tunnel installations for 2021
  - Phase 2 manufacturing, quality control and assembly status update
  - Cockcroft Institute (CI): commissioning and performance evaluation plan for Version 3 Ph. 2
- For the HEL test stand with the BGC Version 3 design:
  - Define the objectives of the tests (including gases and background light from the cathodes),
  - Present the expected performance,
  - Define work share and planning
- For the V4 instrument with performance defined from the acceptance criteria (EDMS: 2369616):
  - Give updates on design issues including gas jet generation and vacuum constraints in the HEL context

V3 phase 1 installed in the LHC (August 2020)



HL-UK2 Document completed

EDMS NO.	REV.	VALIDITY
2369616	0.5	DRAFT

REFERENCE : LHC-BGC-ES-0001

ACCEPTANCE CRITERIA

DELIVERY OF GAS-CURTAIN BEAM PROFILE MONITORS [BGC] FOR HL-LHC

COLLABORATION BETWEEN CERN, THE COCKCROFT INSTITUTE (UK), AND LIVERPOOL UNIVERSITY (UK)

Abstract

This document summarises the criteria for accepting the deliverables associated with Task 2 (Gas-Curtain Beam Profile Monitors) of Addendum No. 3 KEXXXX to Framework Collaboration Agreement KNXXXX as part of the HL-UK2 contribution to the HL-LHC project. These deliverables are to be supplied by the Cockcroft Institute (UK) and Liverpool University (UK).

Project roadmap (March 2020)

Surface

Continue tests with v2 or v2++ at CI

v3 commission at CI

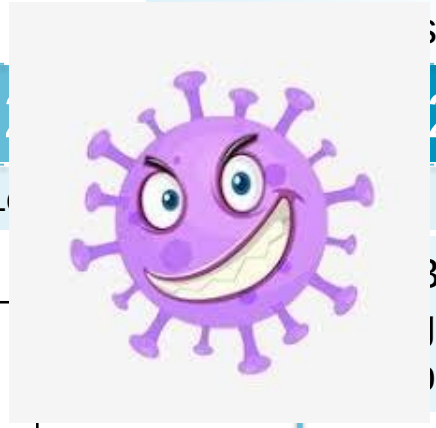
Commission and test 'Unit-1' at CI

Integrate and test 'Unit-1' at CERN

st on HEL stand

2021 | 2022 | 2023 | 2024

YETS | YETS | YETS | LS3



Background gas test programme

v3 commissioning & experimental programme in the LHC

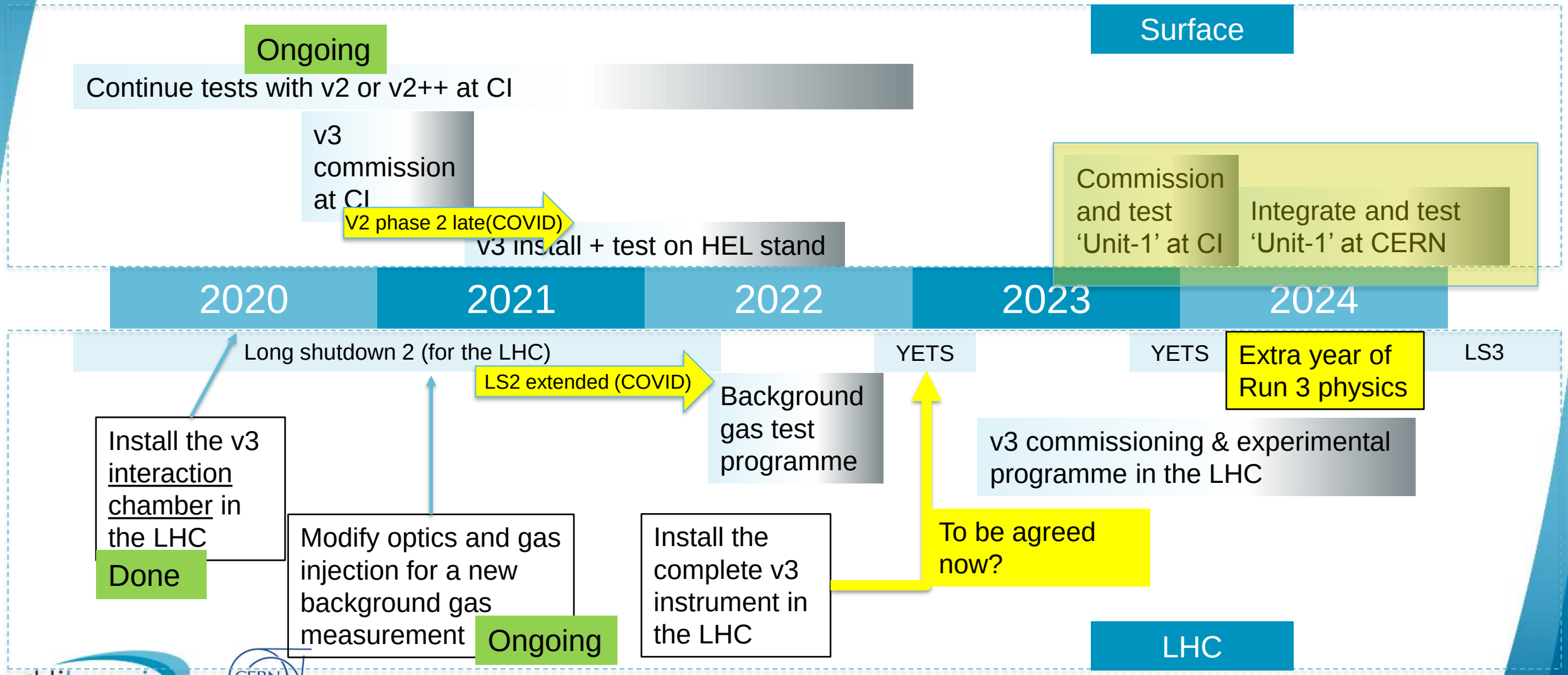
Install the v3 interaction chamber in the LHC

Modify optics and gas injection for a new background gas measurement

Install the complete v3 instrument in the LHC

LHC

Project roadmap (December 2020) [TBC]



Action Item	Open	Responsible	Domain	Status	Comments
Decide if we delay the tunnel installation by 1 year so we can have more time for testing in CI and HEL test stand in order to obtain more testing data	31/03/2020	Ray	General	Ongoing	Final decision in the meeting today
Decide if we need to change the delivery dates for the units shipped? Is there any issue with the funding? (scheduling wise)	31/03/2020	Ray	General	Done	
Decide on how many optical systems we can make available and when	31/03/2020	Gerhard	General	Ongoing	Hao will report
Agree on where to test different gases.	31/03/2020	Gerhard	Experiments	Ongoing	Ray will report on HEL experiments
Compare noise level of the electronics of the LHC with the data from Stefano with the noise level of CI	31/03/2020	Hao	Experiments	Ongoing	Hao will report
Compare YAG screen results with BGC image in HEL	31/03/2020	N/A	Experiments	Not started	Who has this action?
Make full qualification of Vantablack coating	31/03/2020	Giannis	Experiments	Ongoing	Ioannis will report
Check if the alignment of the nozzle, 1st and 2nd skimmers can be made with the enlarged dimensions using Johanna's laser alignment method.	31/03/2020	Hao	Design	Ongoing	Hao will report
Define and procure nozzles for LHC operation assuming a 20 mm wide gas sheet	31/03/2020	Gerhard	Design	Ongoing	Giannis will present results
Procure all parts for V3 Phase 2	31/03/2020	Hao	General	Ongoing	Hao will report
Develop a detailed BOM for V3 Phase 2	31/03/2020	Giannis	Design	Done	
Investigate if we can produce rectangular 2nd skimmer and how we can align it	31/03/2020	Hao	Design	Ongoing	Hao will report
Confirm pumps and estimated pumping speeds for v3	31/03/2020	Marton	Interfaces	Done	Marton presented in bi-weekly
Define the operation scenario for the vacuum pumps and injection that will be used at Cockcroft and possibly on the HEL test stand in the first part of the operation. This will then the baseline for the CERN operation system, that will be tested on the HEL test stand during a later phase of the tests of the BGC on the HEL test stand before tunnel installation	31/03/2020	Hao	Interfaces	Ongoing	Hao will report. This needs a document

Action Item	Open	Responsible	Domain	Status	Comments
Confirm with simulations if the new dump chamber design is optimised	31/03/2020	Marton	Simulations	Done	Marton will report??
Design and add gas trap in the gas dump side, (4th skimmer at the entry of the dump side)	31/03/2020	Giannis	Design	Done	
Agree on gas jet thickness (as opposed to width) to be 5 sigma of the proton beam, hence about 1.5 mm.	31/03/2020	Ray	Simulations	Done	In the specification to CI
Do SR/fluorescence/cathode light intensity comparison	31/03/2020	Marton/Noah	Simulations	Ongoing	Has been done individually --> Conclude on the ratios / compare the results
Define if it is necessary to cool the intensifier	31/03/2020	Stefano	Experiments	Done	Not needed
Estimate the noise in the LHC and the gains from the new v3 design compared with the run 2 tests	31/03/2020	Stefano	Simulations	Done	Stefano will report
Finalise the V3 Phase 2 design	31/03/2020	Gerhard	Design	Done	
Finalise gas injection line design	31/03/2020	Giannis	Design	Done	
Define all pressure gauges for the BGC	31/03/2020	Gerhard	Design	Ongoing	Hao/Chiara will present exactly where and type
Add all piping and cabling to the installation drawings	31/03/2020	Giannis	Design	Done	
Define the vacuum valves between the primary pumps and the TMPs	31/03/2020	Chiara	Design	Ongoing	Clarify where and when we will have valves in the HEL test stand and LHC operation
Define optimum skimmer dimensions, following Serban's, Martons, Cockcrofts presentation and gas sheet dimensions in view of the V3 tunnel installation	31/03/2020	Marton	Design	Ongoing	To be presented by …?

Summary

- Good progress on the BGC, despite COVID
  - Most of our key milestones were achieved in the year
    - In-vacuum hardware for v3 phase 1 installed in the LHC
    - Specification for HL-UK2 agreed
  - 11 of the 25 actions we gave ourselves in March are fully completed
- Looking forward to an interesting meeting
  - Shame we can't be together, but looking forward to escaping from Carsten's room…
- Thanks to…

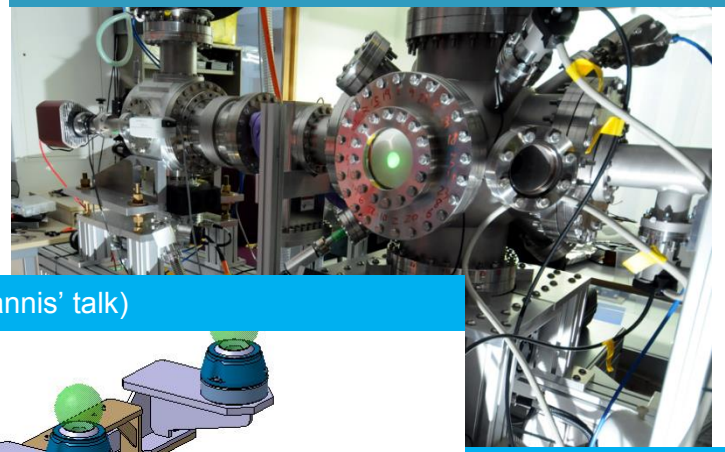
End

Backup slides follow

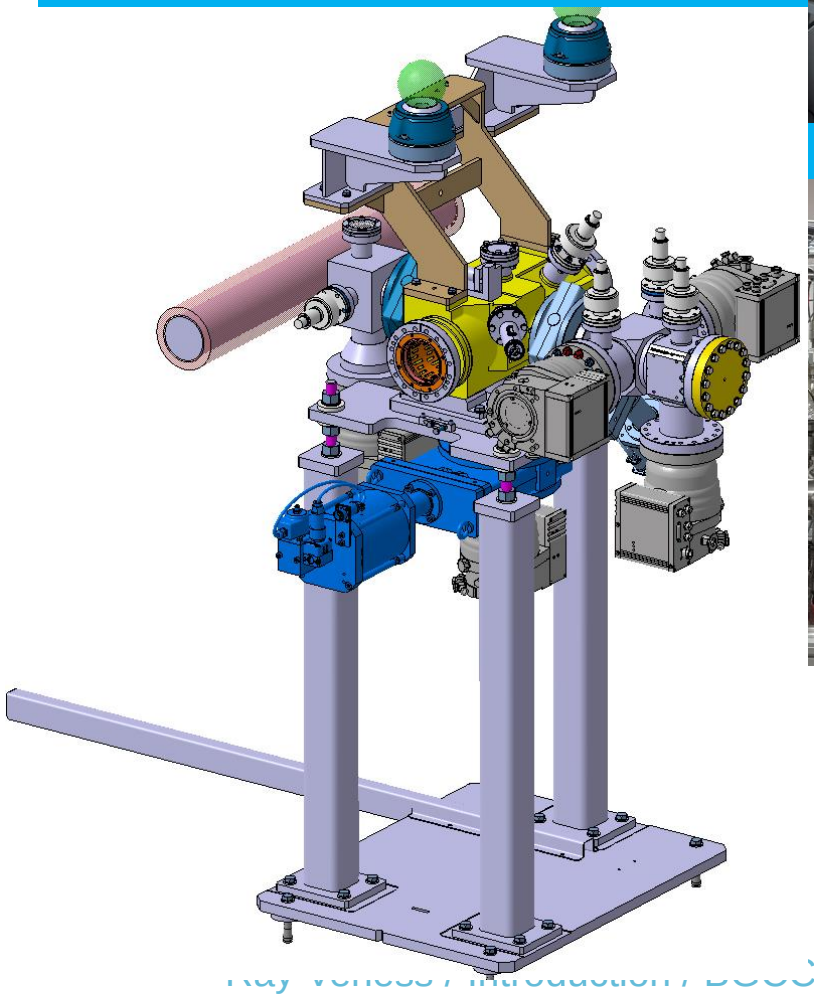
Brief glossary of BGC ‘versions’

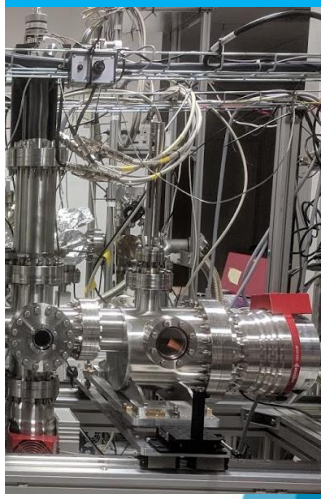
- v1: was the original test stand designed and built at CI, used for preliminary studies, still operational
- v2: was the first deliverable from the HL-UK1 collaboration. Designed for the laboratory with CERN, it is the main experimental tool in use at CI,
- v3: is the second (and final) deliverable for HL-UK1. It is designed for installation in the LHC
- Units 1 and 2: are the planned deliverables from HL-UK2. They will be designed to be integrated into the final HEL for installation in LS3

Prototype v1 beam-gas curtain florescence monitor at the Cockcroft Institute



v3 instrument (see Ioannis’ talk)





Draft milestones for the v3 instrument from CI

- Assemble the system and vacuum test without baking. Dec 2020.
- Gas jet quantification. Jan 2021.
- Measurement of Lab electron beam. Feb 2021.
- Report the device and preparing to ship. March 2021.
- Devices arrived at CERN and installed to HEL test stand. May 2021