HL-LHC cell 4 collimators mock-up

- Objectives
- Tests to be performed
- Preparation status
- Timeline discussion

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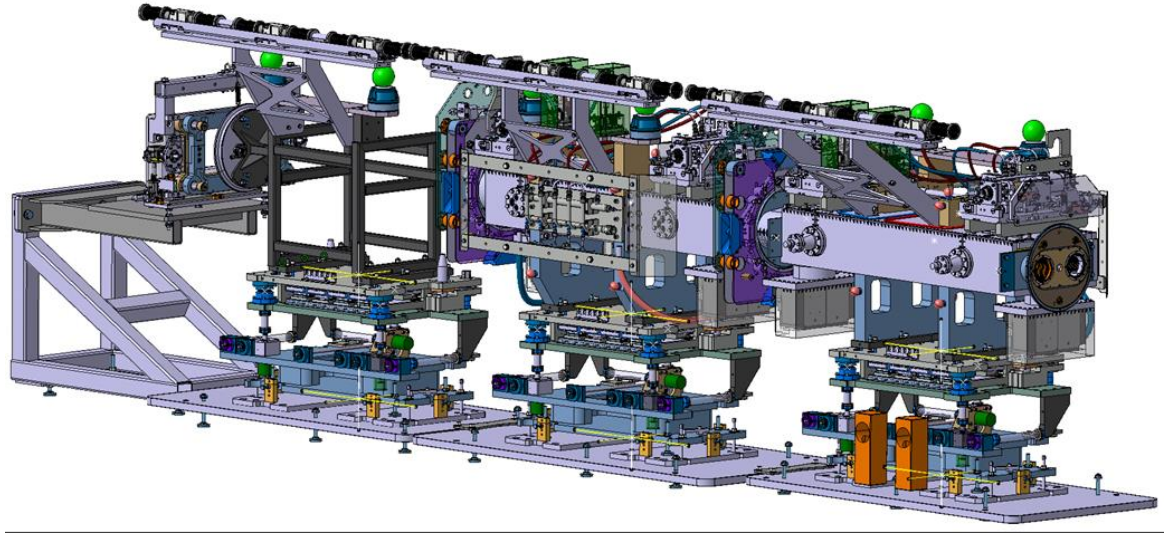
HL-LHC cell 4 collimators mock-up – FRAS components

- Scope of the mock-up FRAS equipment for 2 collimators TCTPXH and TCLPX)
  - 2 side pillars + 2WPS (wire supports + reference)
  - 6 WPS on arms (3 per collimator)
  - 2 inclinometers (capacitive) → For the first tests in case of delays with capacitive inclinometers readiness - the WYLER inclinometer (preferred) or FSI-inclinometers to be used as replacer for the test period. The SCT optical inclinometers to be used for integration tests.
  - Only 1 UAP (TCLPX) motorized considered for now (manual parametrization of motorized axes)
- Main objective
  - Validation of the different systems and their respective interfaces



Mock-up validations, related to FRAS integration, installation and exchange

- Rehearsal platform prior to the installation in the tunnel
  - Alignment of supporting foot – **DONE**
  - Pre-adjustment of collimator by ASG – **DONE**
  - Test of WPS supporting arm rigidity, tests of UAP – **DONE**
  - WPS system, inclinometers, motors integration – **DONE**
  - FRAS cables routing + ergonomics of installation validation - **ONGOING**
  - Collimator handling – **DONE**

- Rehearsal platform for repair and exchange procedure to proof ALARA principle – **ONGOING**
  - FRAS related activities when replacement of a collimator is requested
    - In situ mount/dismount of the different key equipment:
      - Removing/re-installation of WPS line components and triple-WPS installation bar)
      - Mount/dismount of inclinometer
      - Mount/dismount of motorized adapters
      - Cables handling while collimator replacement
    - All of above activities to be crosschecked versus ALARA: validation of assumptions from of working dose planning

- Tests details and report links:
  - https://confluence.cern.ch/display/FRAS/Collimator+mock-up+927

Mock-up validations – vacuum systems, UAP FRAS operation

- Validation of collimators and UAP equipped in FRAS sensors/motorized adapters (representative to FRAS operation) - tests of position determination, 3D motion, safety functions – **TO DO**
  - **Test steps**:
    - Validation of adjustment precision and motorized adapters resolution - performed only on motorized collimator.
    - 3D alignment (with sensors and motorized adapters / or setting position manually on non-motorized UAP). Various motion steps will be applied to UAP axes / motorized adapters.
  - Simplest approach for above validation test is to use LGC software which is in big
    - Motion/adjustment steps follow-up by LGC software block
    - Multiple steps, representing various scenarios (1D/2D/3D motions including angular) to be applied
    - Safety functions validation with collimator assembly → use of LGC “Bellows” software
    - Test with (minimum necessary) parallel AT401 measurements to confirm system performance.
- Validation of vacuum systems during FRAS UAP operation requested by TE-VSC – details and movements still to be discussed (can be done parallel to UAP-FRAS representative test) – **TO DO**

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FRAS components preparation status

- Mechanics and sensors:
  - Extremity pillars : ***installed***
  - 5 Motorized adapters : ***Being assembly and tests (available end of June)***
  - Pulley + fixed point : ***installed***
  - Reference sensor support : ***installed***
  - Temperature sensor : ***Installed***
  - Pulley system : ***installed***
  - Tension point : ***installed***
  - WPS 3 balls interface : ***Installed***
  - WPS Sensor (8 Units): ***Production in progress (end of June)***
  - WPS Sensor mock up (3x): ***Ready, but need to wait for protection beam installation***
  - WPS protection pipe (new design - new pipe - bellow included) : ***Parts received. To be installed***
  - Inclinometer - Wyler version : ***Adaptation design ready. To be manufactured***
  - Inclinometer - Capa version - developments ongoing: ***September***

- Electronics and controls related:
  - RACK - ***installed***
  - FEC ***- requested to Julien (see RQF2654677) - mid June***
  - FIP extension; Ethernet in the rack - ***requested to Julien as part of same ticket of FEC - mid June***
  - DIOT Crate + Main board - ***can temporarily use ones meant for SM18 IT String test***
  - 8 WPS conditioner cards - ***ordered and ready from last batch***
  - WPS Cables - ***in progress from EN/EL (see RQF2617226)***
  - Inclinometer (Wyler version) **-** ***Jonas did preliminarily-design***. ASG might borrow 2 Wylers up-to 1 month
  - CEM-MRO equipment:
    - Patch panel + temporary rack for tests period - ***TBC (?)***
    - Temporary (semi-m annual) motion control racks for 5 axis ***TBC (?)***

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- Software preparation:
  - Preparing the GEODE data structure and insert all necessary data
  - Preparation of LGC configuration file
  - FESA/SCADA:
    - LGC - Aligned component position is ready. The bellows need to be finalized
    - Inclinometer object finalization and data acquisition from WYLER

Summary, Timeline discussion

- Big part of collimator test stand ready. Most of the system could be installed in next few months
- Following initial analysis - UAP-FRAS representative test date could be chosen for end of August ’24 (?), but this must be confirmed:
  - Software deployed + LGC file readiness
  - MRO equipment readiness
  - Availability of ASG (Ludovic). Help of ASG discussed, but due to delays need to be re-confirmed
  - Test should not take longer than 2 days
- Remaining validations (routing, installation/de-installation of components) will be performed during installation of FRAS systems (when ready)
- Other constraints ?