Update on EHN1 Extension Beam Lines

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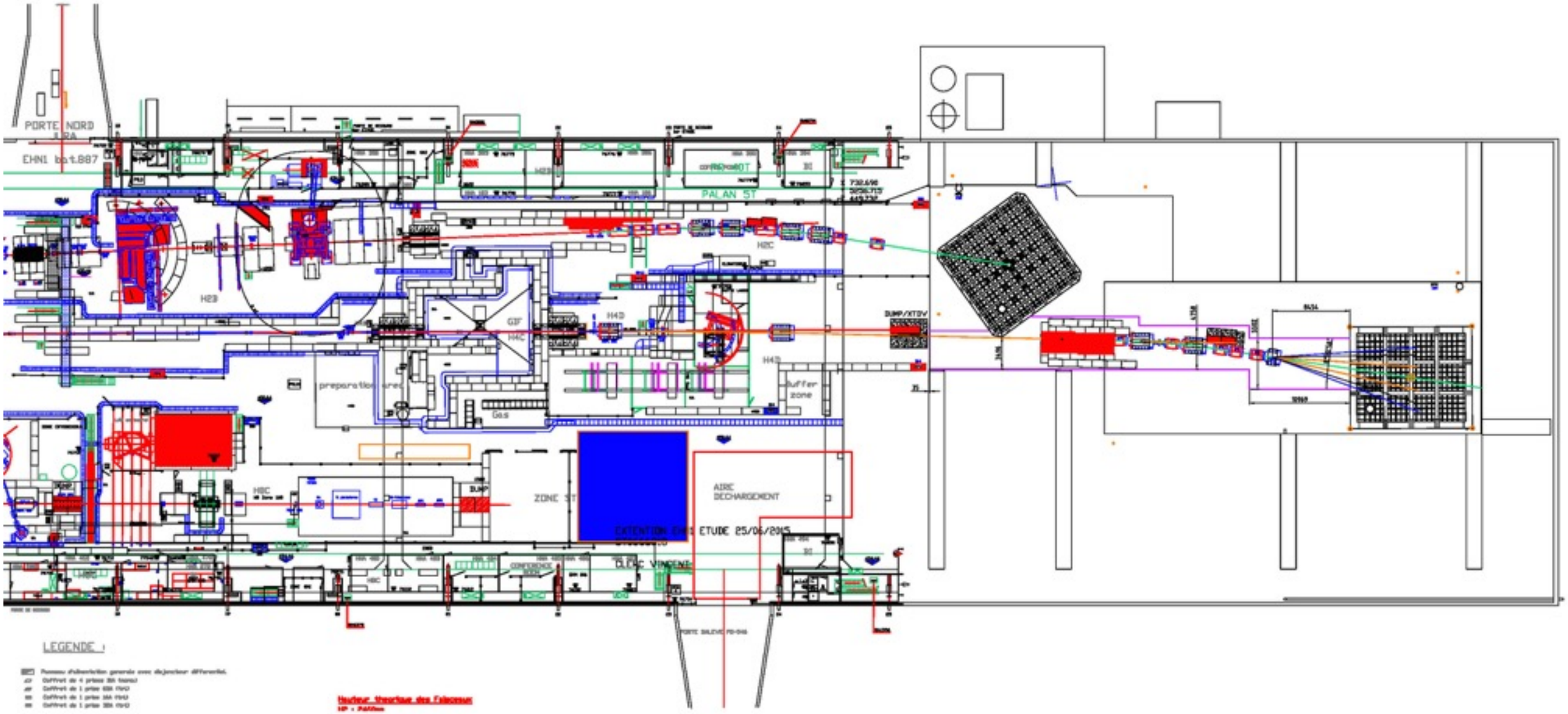
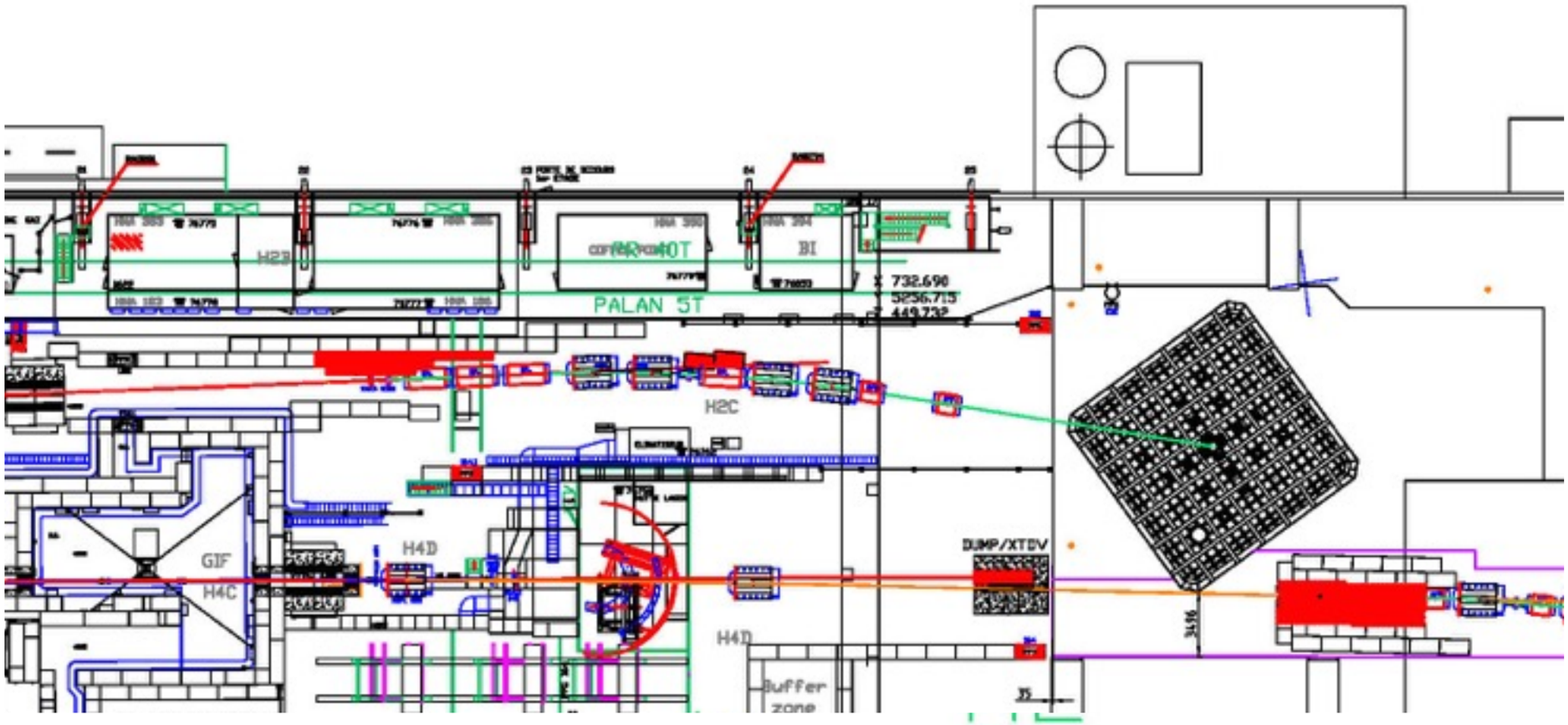
Beam Line Design

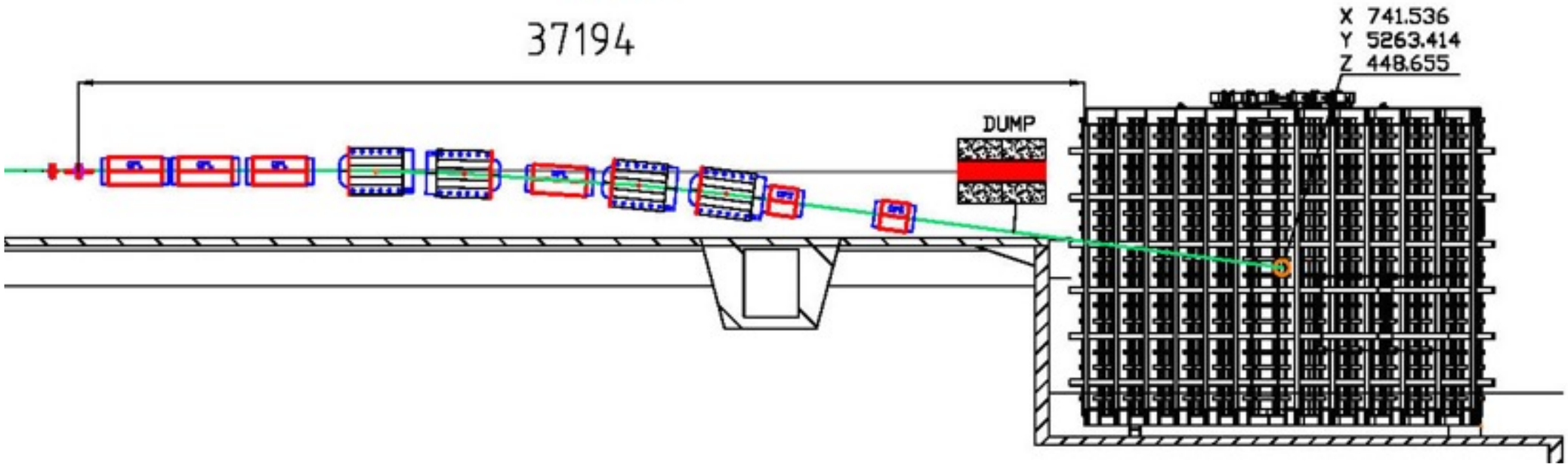
- New updated layout for both H2-VLEext and H4-VLEext
  - H2-VLEext : energy range 0.4 - 12 GeV/c
  - H4-VLEext : energy range 0.4 - 7 GeV/c [higher possible but needs to be reconfigured]
  - both beams would emerge from an 80 GeV/c secondary beam
- H2-VLEext:
  - simplified layout with tilted magnets
    - tilted dipoles by -33.5-deg, if proven necessary we can also tilt the quads or just follow the slope
    - beam length : 44.7m to WA105 centre
- H4-VLEext:
  - double existing dipole to provide an h-kick to the secondary beam in order to avoid the hiring the edge of the WA105 cryostat
  - target moved closer to experiment,
    - two tilted dipoles (-56.5 deg) to deflect the VLE beam to the experiment, a third dipole to allow variable entrance positions (vs. energy!)
    - beam length : 37.9 m to protoDUNE centre
- Beam Instrumentation:
  - for easier understanding is better it follows the beam plane, i.e. tilted, but not strictly necessary
  - should anyhow follow the steep (8-deg) slope !

EHN1 Extension - General beam layout

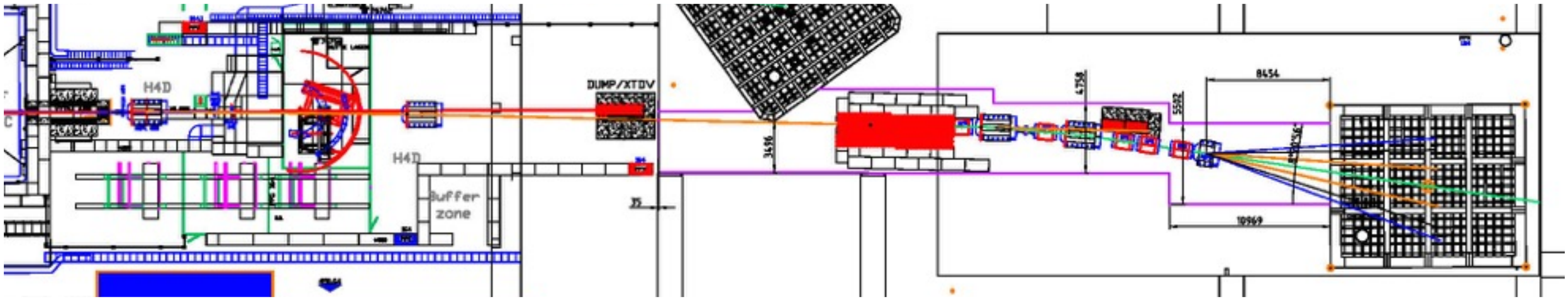


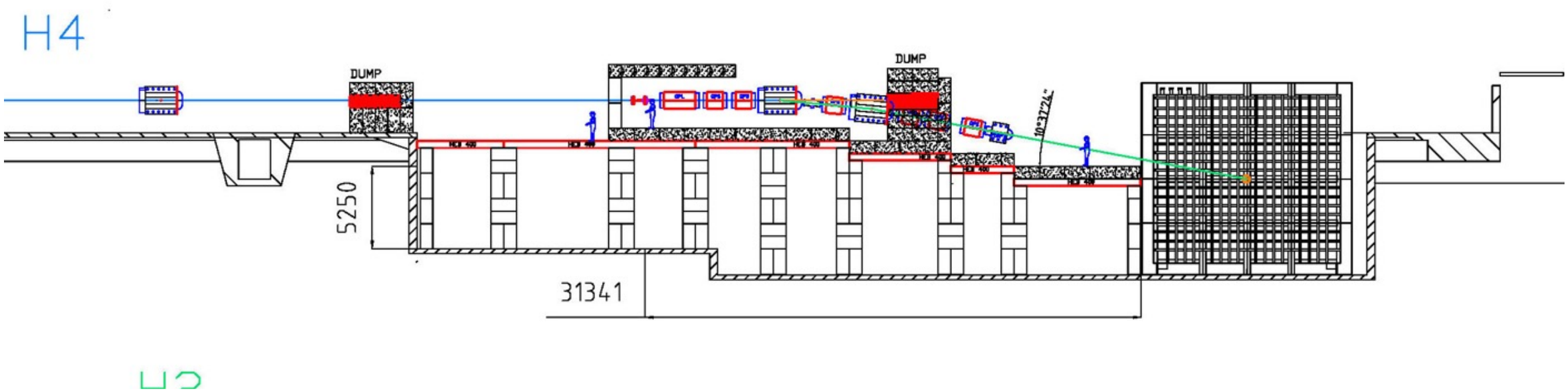
Beam layout - H2-VLEext



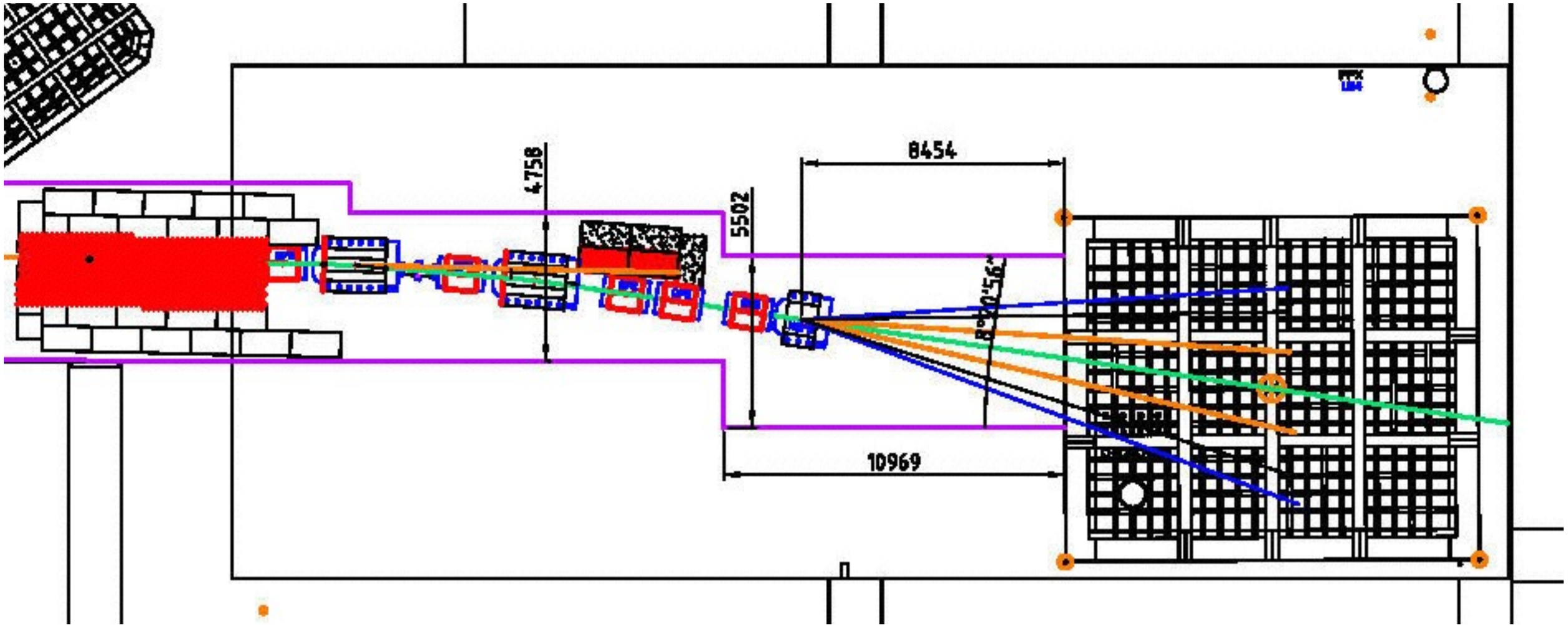


Beam layout - H4-VLEext





Beam layout - H4-VLEext



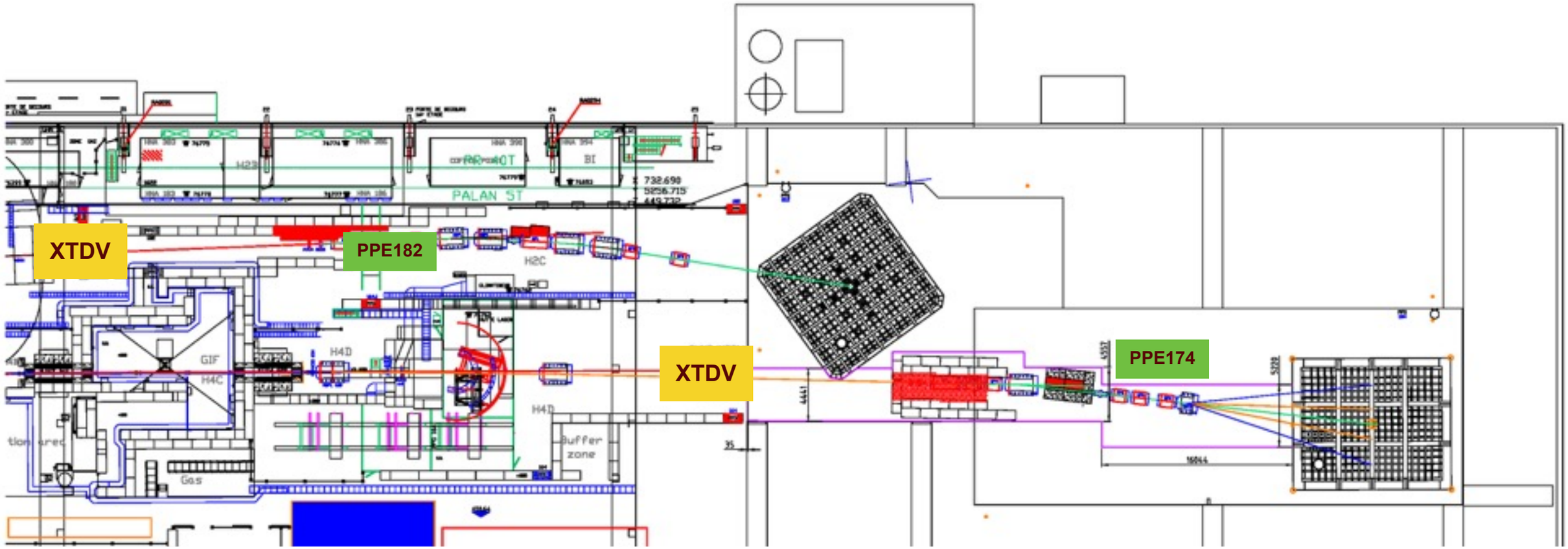
- Vertical : 10.5 deg downwards slope
- Horizontal :
  - default position (MBPS off) : 8.5 deg impact angle to the detector center
  - with MBPS on possible up to ±5 deg @ 7 GeV, or ±12 deg for < 3 GeV
  - 1-2 positions to define for the detector, the instrumentation should be movable

Beam parameters - Magnets - H2-VLEext

H2-VLEext			
Phys.Name	Eqip.Name	Tilt [deg]	I_max [A]
Q21	QPL.021.635	0	500
Q22	QPL.021.638	0	1000
Q23	QPL.021.640	0	500
B7a	MBPL.021.644	-33.5	850
B7b	MBPL.021.647	-33.5	850
Q24	QPL.021.651	slope	500
B8a	MBPL.021.654	-33.5	850
B8b	MBPL.021.657	-33.5	850
Q25	QPS.021.660	slope	500
Q26	QPS.021.664	slope	500

H4-VLEext			
Phys.Name	Eqip.Name	Tilt [deg]	I_max [A]
B15	MBPL.022.652	0	850
Q17	QPL.022.685	0	500
Q18	QPS.022.687	0	1000
Q19	QPS.022.689	0	500
B15a	MBPL.022.691	-56.5	850
Q20	QPS.022.695	slope	500
B15b	MBPL.022.697	-56.5	850
Q21	QPS.022.700	slope	500
Q22	QPS.022.702	slope	500
Q23	QPS.022.704	slope	500
B16	MBPS.022.706	slope	850

Access - H2-VLEext, H4-VLEext



- H2Ext:
  - PPE172 all beam area up to the detector
- H4Ext:
  - PPE164 extends to the end beginning for the pit
  - PPE174 to cover the VLE part
- Two XTDVs to separate the VLE part from the secondary beam
- A sub-sector in each beam for the detector (top) and another for the rest of the pit (bottom)

Access - H2-VLEext, H4-VLEext