

PEPIC / AWAKE++

Civil Engineering

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Contents

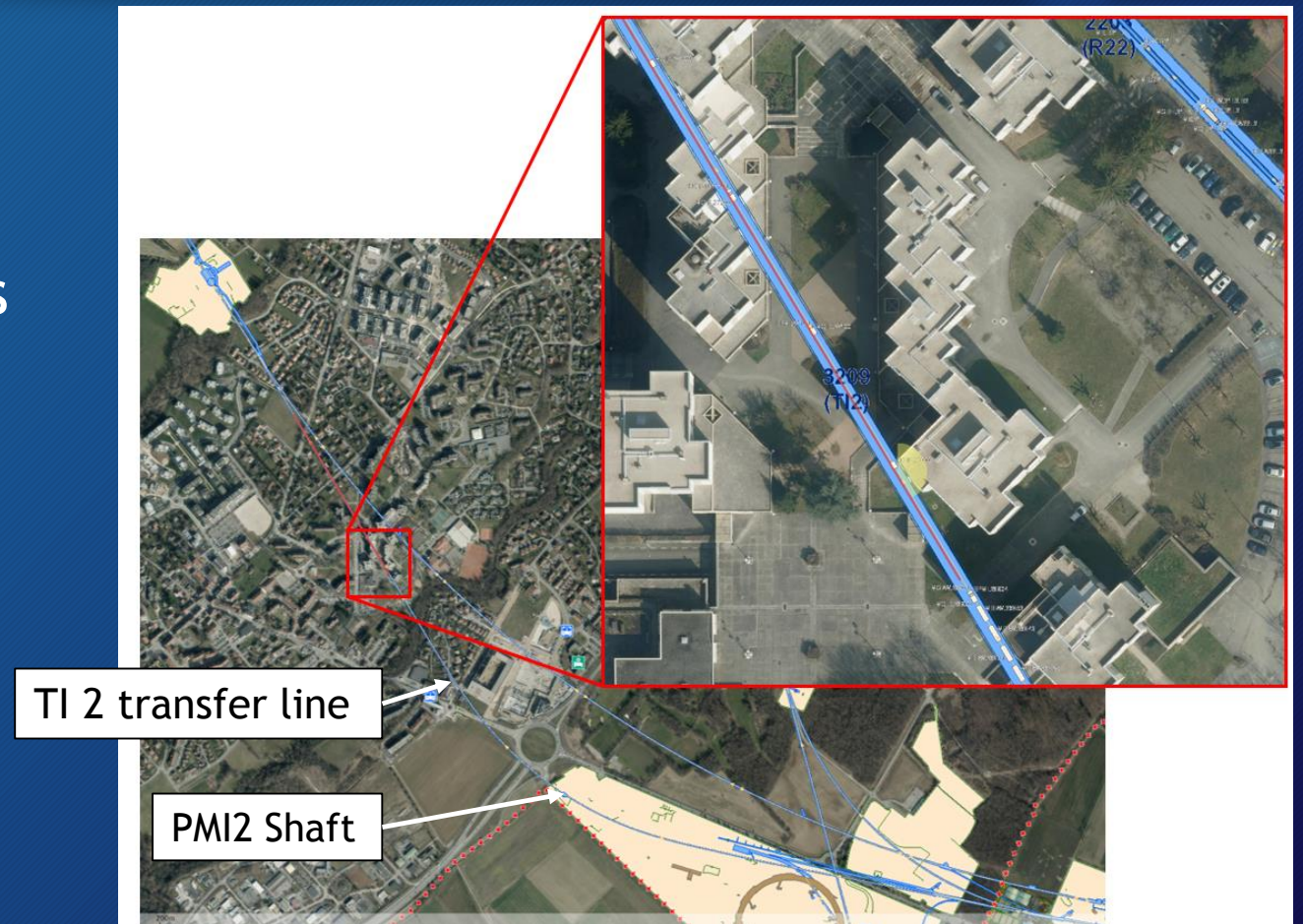


PEPIC

- Initial Concept options
- Key Civil engineering considerations
- Likely construction method
- Input into civil engineering
- Next steps

AWAKE++

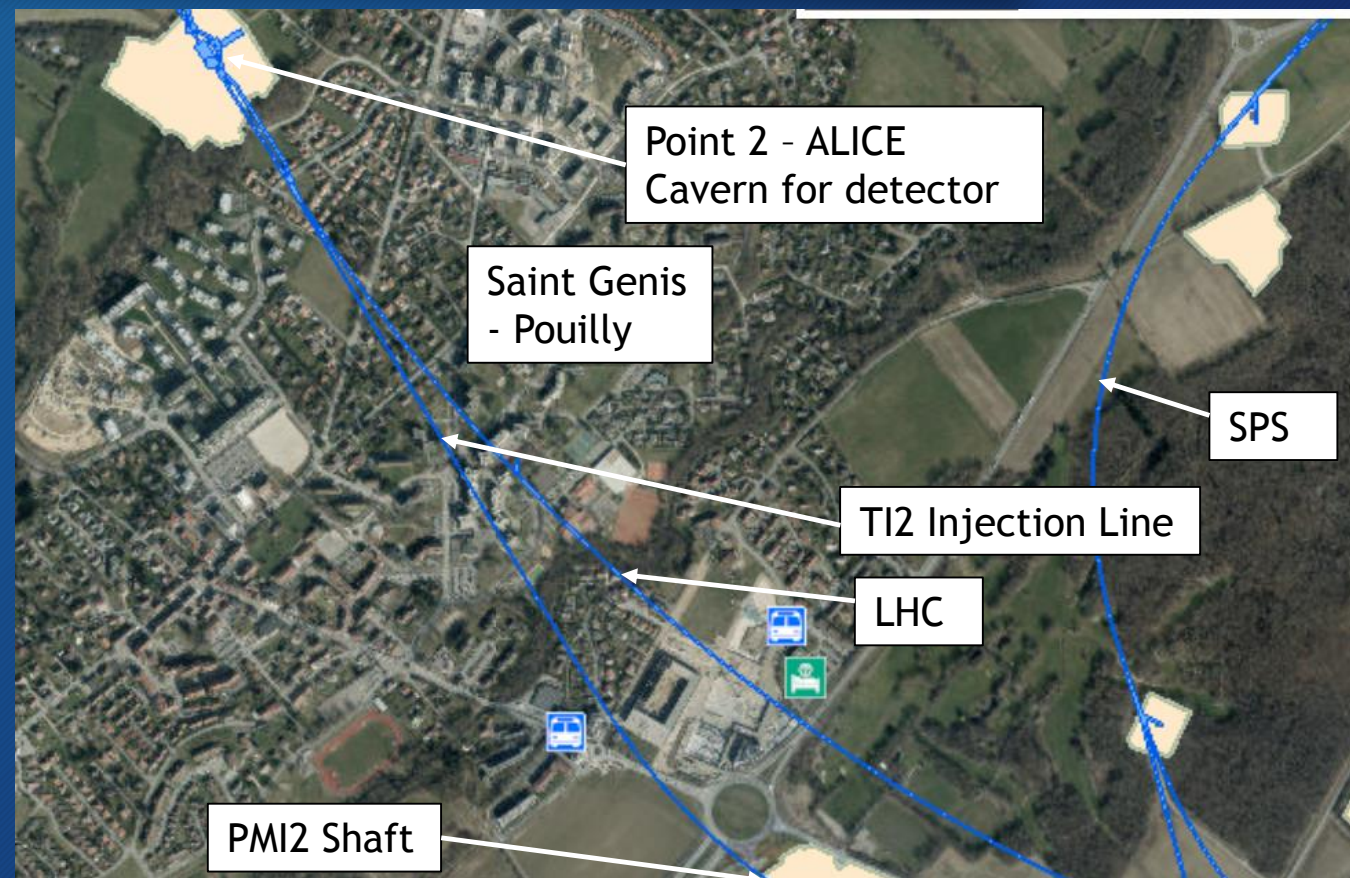
- Outline



PEPIC - Requirements and context



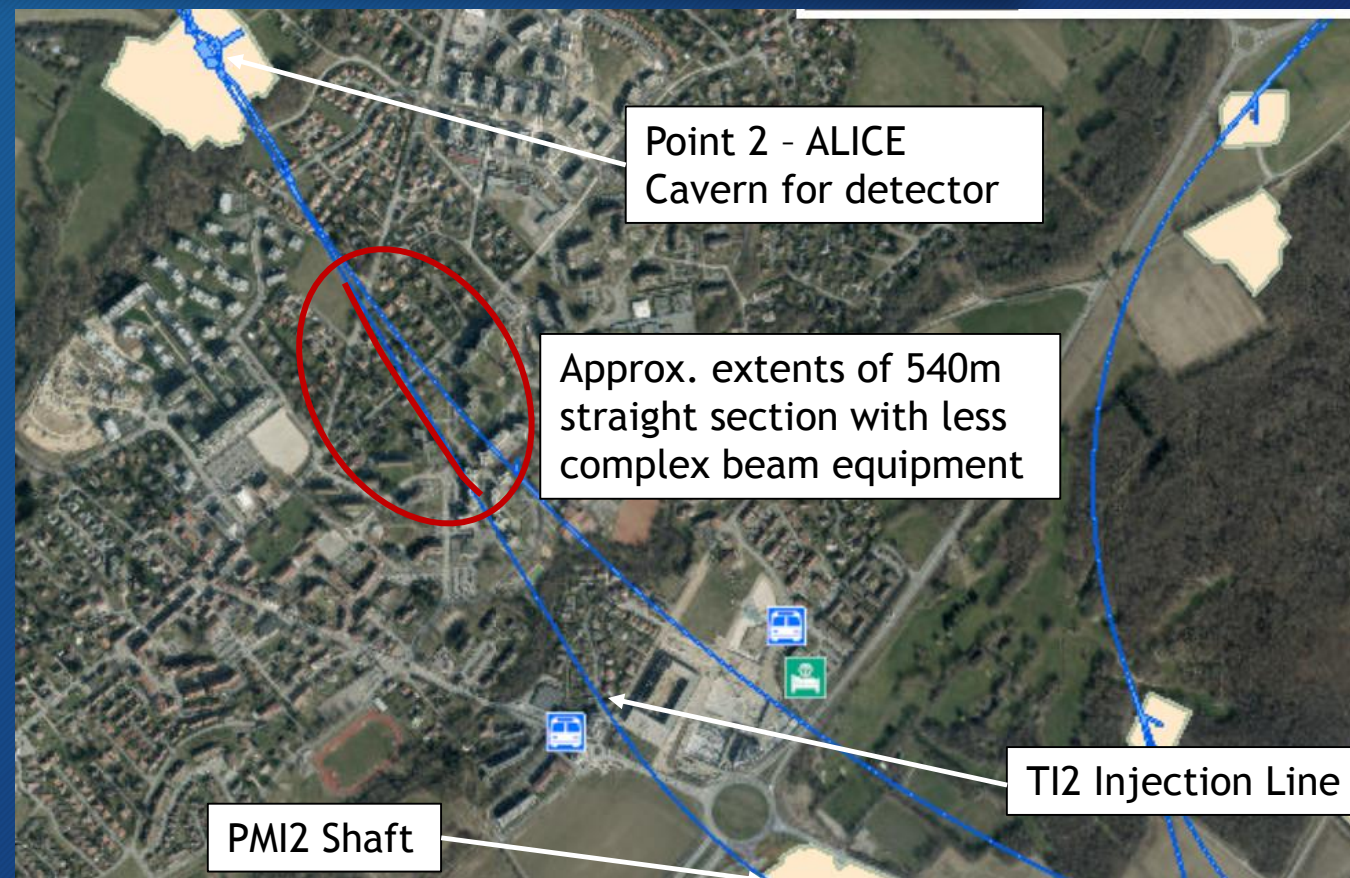
- 100-200m long plasma cell close to ALICE Cavern at LHC Point 2
- Minimise costs/ logistics
- Minimise bending radii of new tunnels before plasma cell ($\leq 1100\text{m R}$) and after ($\leq 4300\text{m R}$)
- Consider in context of physical constraints and existing infrastructure



PEPIC - Option 1 - Bypass tunnel

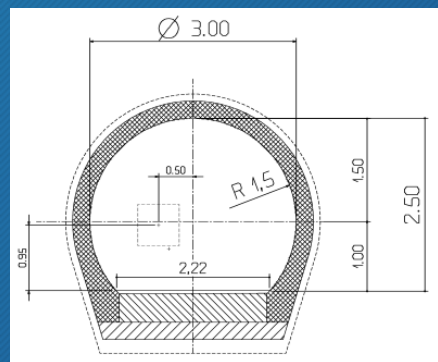


- New Bypass tunnel next to TI2
- Access from PMI2 or Point 2
- Bending radius to be minimised
- Bypass tunnel could be located anywhere on straight section - likely determined by access shaft to use
- Separation between tunnels to be at least 1.5 tunnel diameters ie approx. 6m

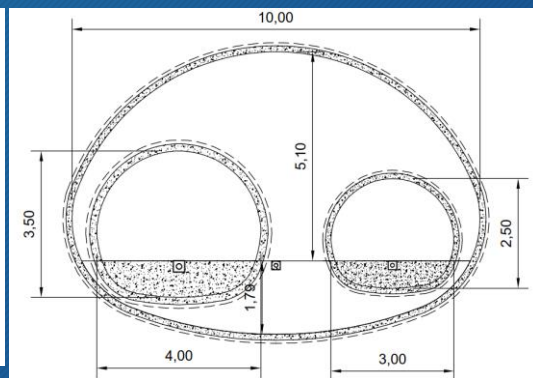


PEPIC - Option 1 - Bypass tunnel

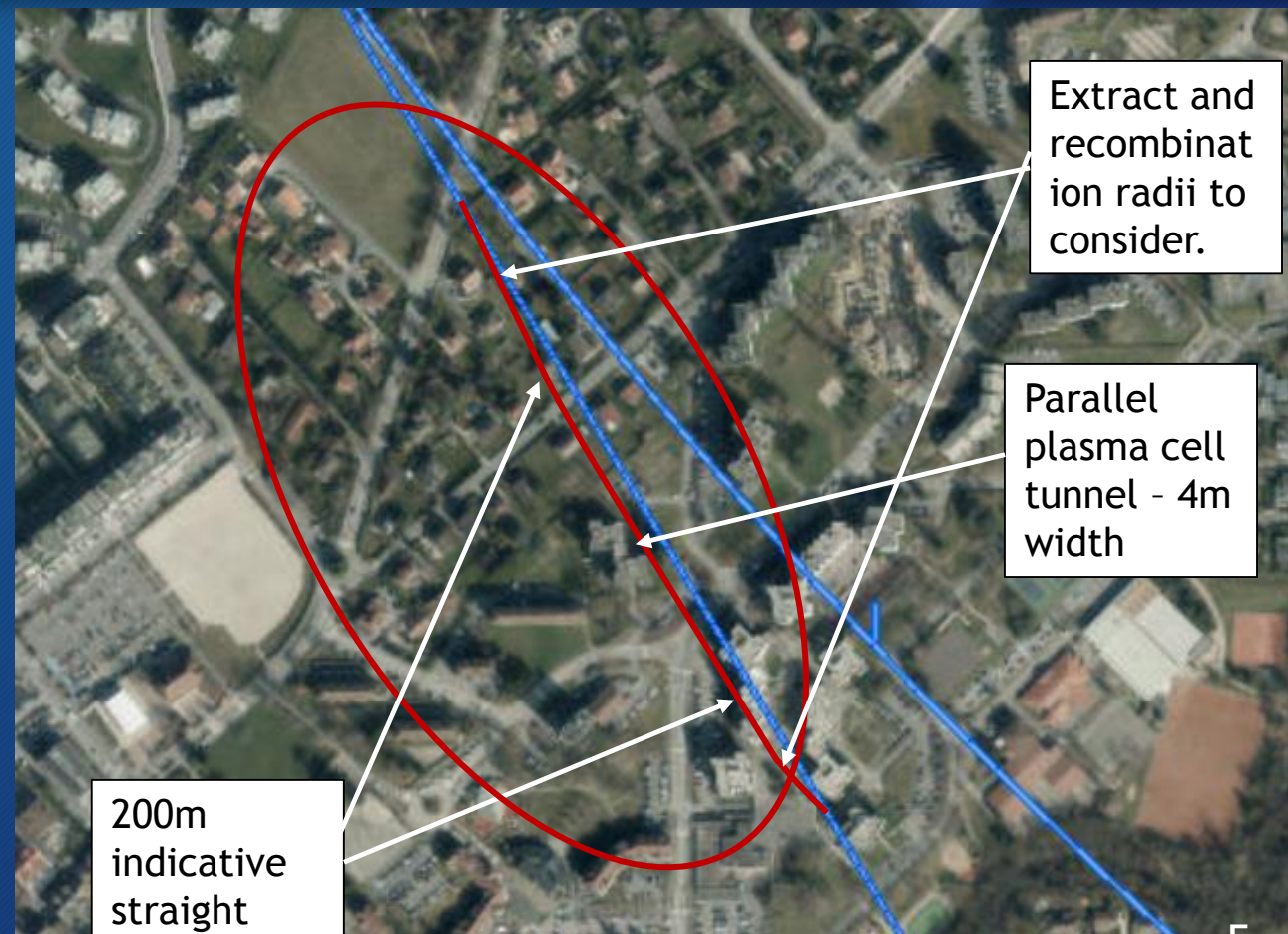
- Extract and tie in to be within 540m section if possible - confirm if a requirement?
- If radii are maintained then this may not be possible due to length of curves.
- T12 tunnel beam line removal - significant disruption



As built T12 Cross section



Indicative section of junction cavern and bypass tunnel



200m indicative straight

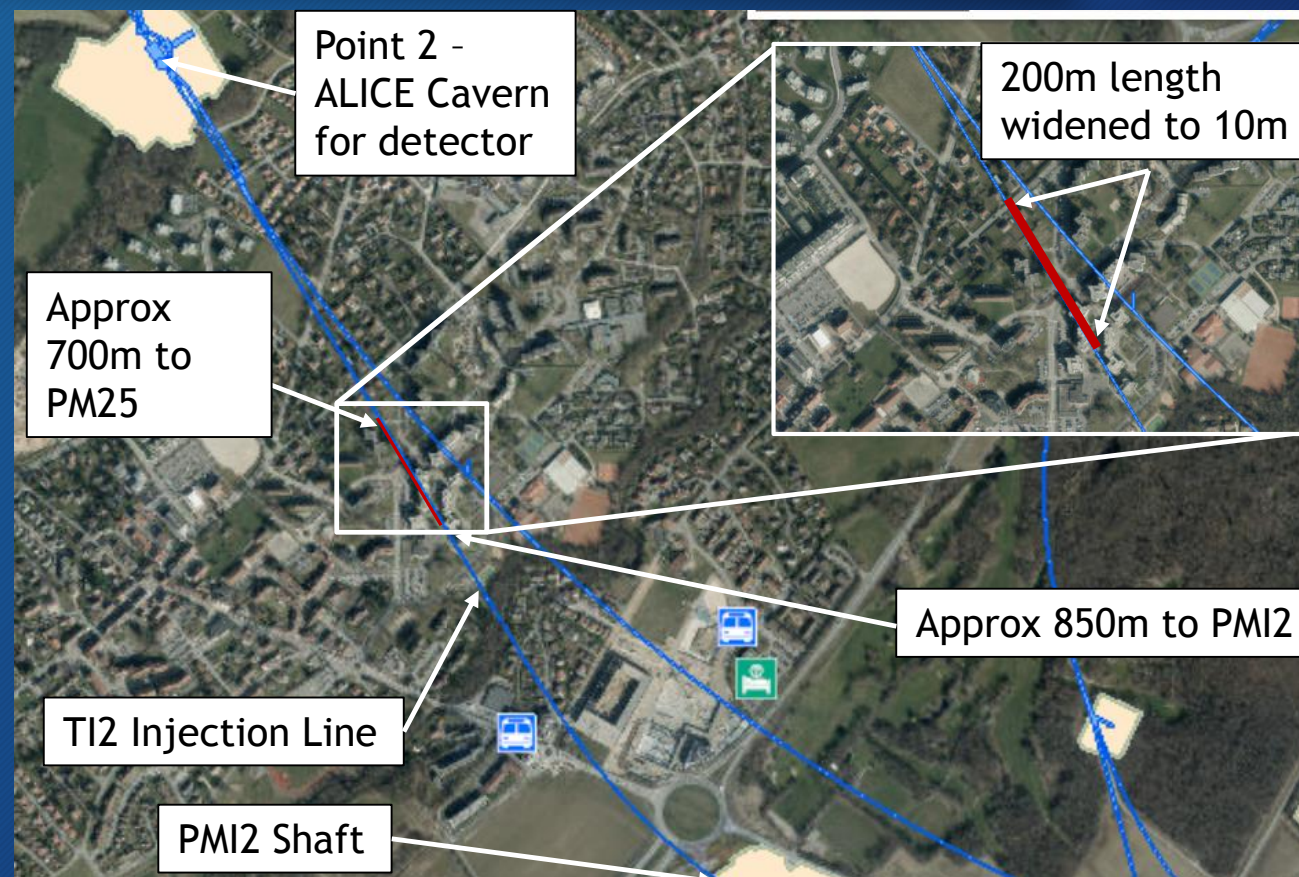
Extract and recombination radii to consider.

Parallel plasma cell tunnel - 4m width

PEPIC - Option 2 - Interchangeable beamline close to PMI2

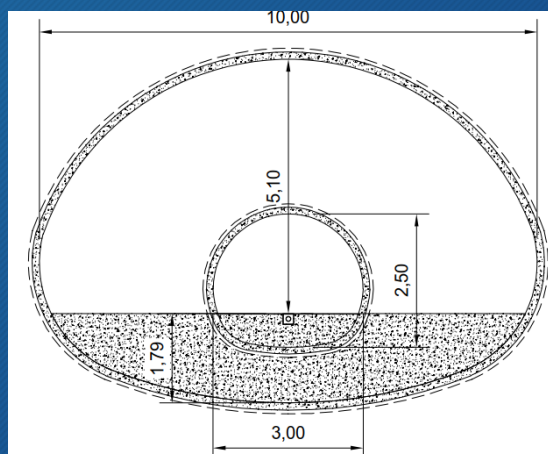
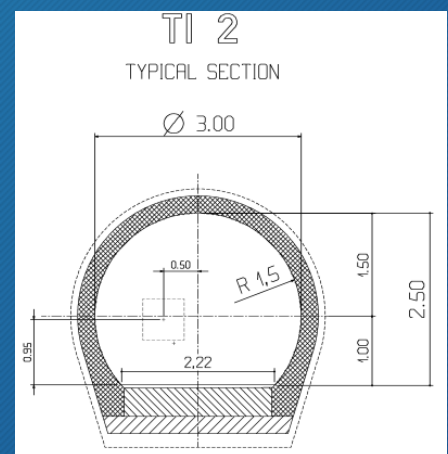


- Widening of existing TI2 tunnel to approx. 10m width
- Widening to allow sliding in/out of different beam line equipment
- Construction access from PMI2
- Straight section of TI2 utilised to minimise losses
- Widened section to be as close as possible to PMI2 while being located on the straight.
- Full demolition and widening on both sides anticipated.



PEPIC - Option 2 - Interchangeable beamline close to PMI2

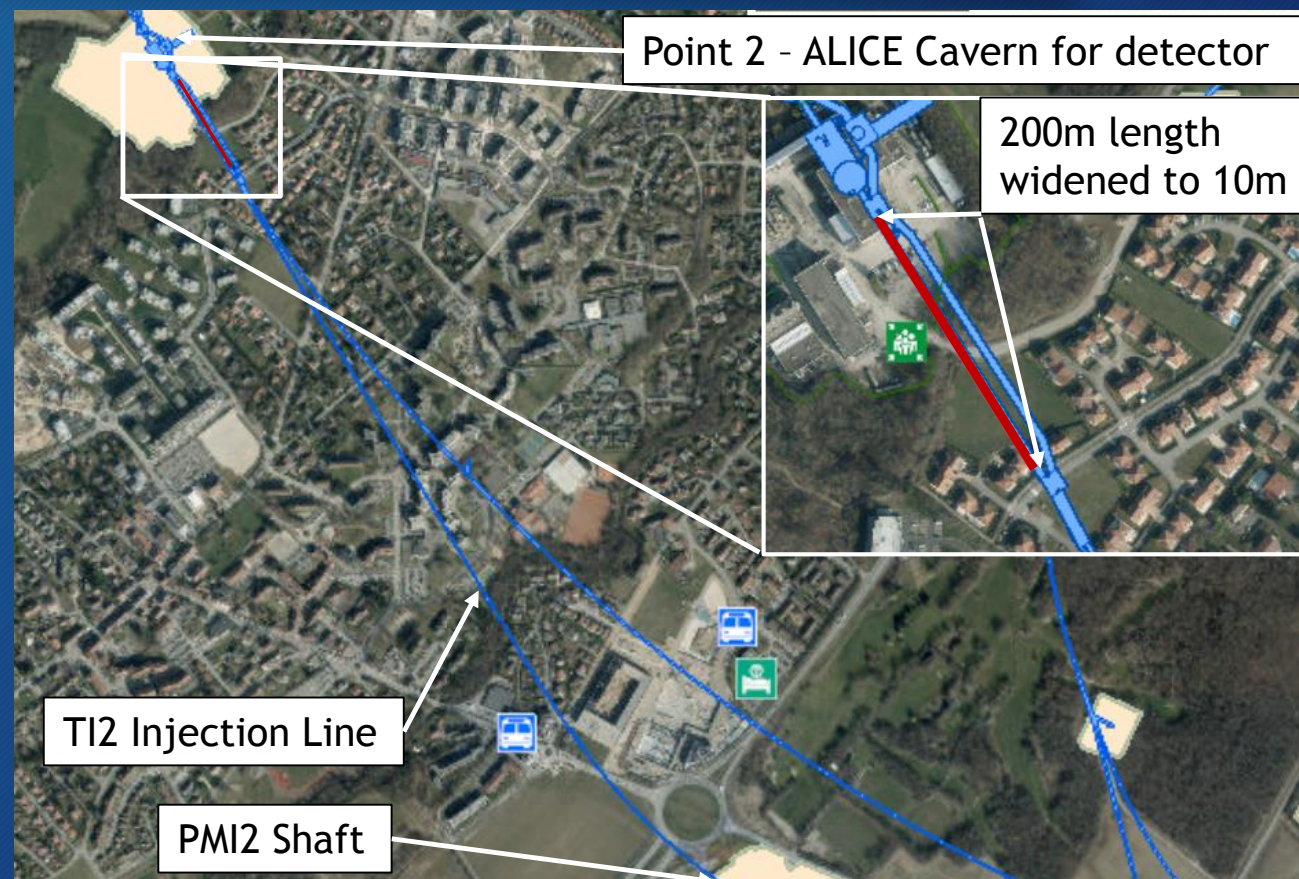
- Straight section with less complex beam line equipment arrangement.
- Would interchanging equipment be feasible in this location?
- T12 tunnel beam line removal - significant disruption



PEPIC - Option 3 - Interchangeable beamline close to ALICE

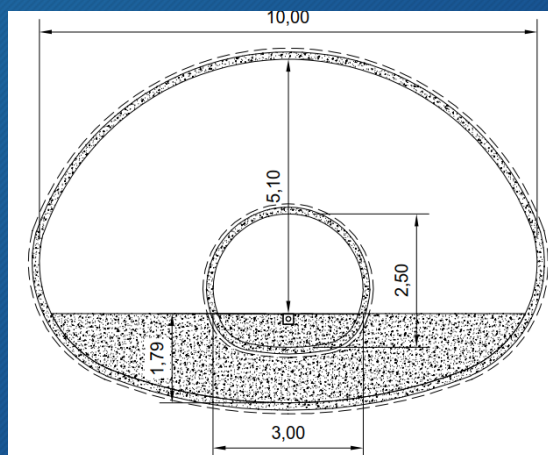
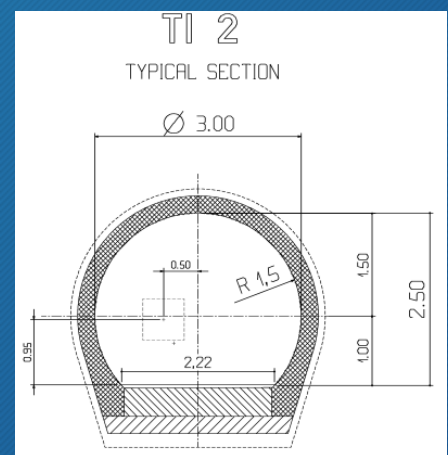


- Widening of existing T12 tunnel to approx. 10m width
- Widening to allow sliding in/out of different beam line equipment
- Construction access from PM25
- Look at whether plasma cell could be installed on straight close to ALICE
- Full demolition and widening on both sides of T12 anticipated.



PEPIC - Option 3 - Interchangeable beamline close to ALICE

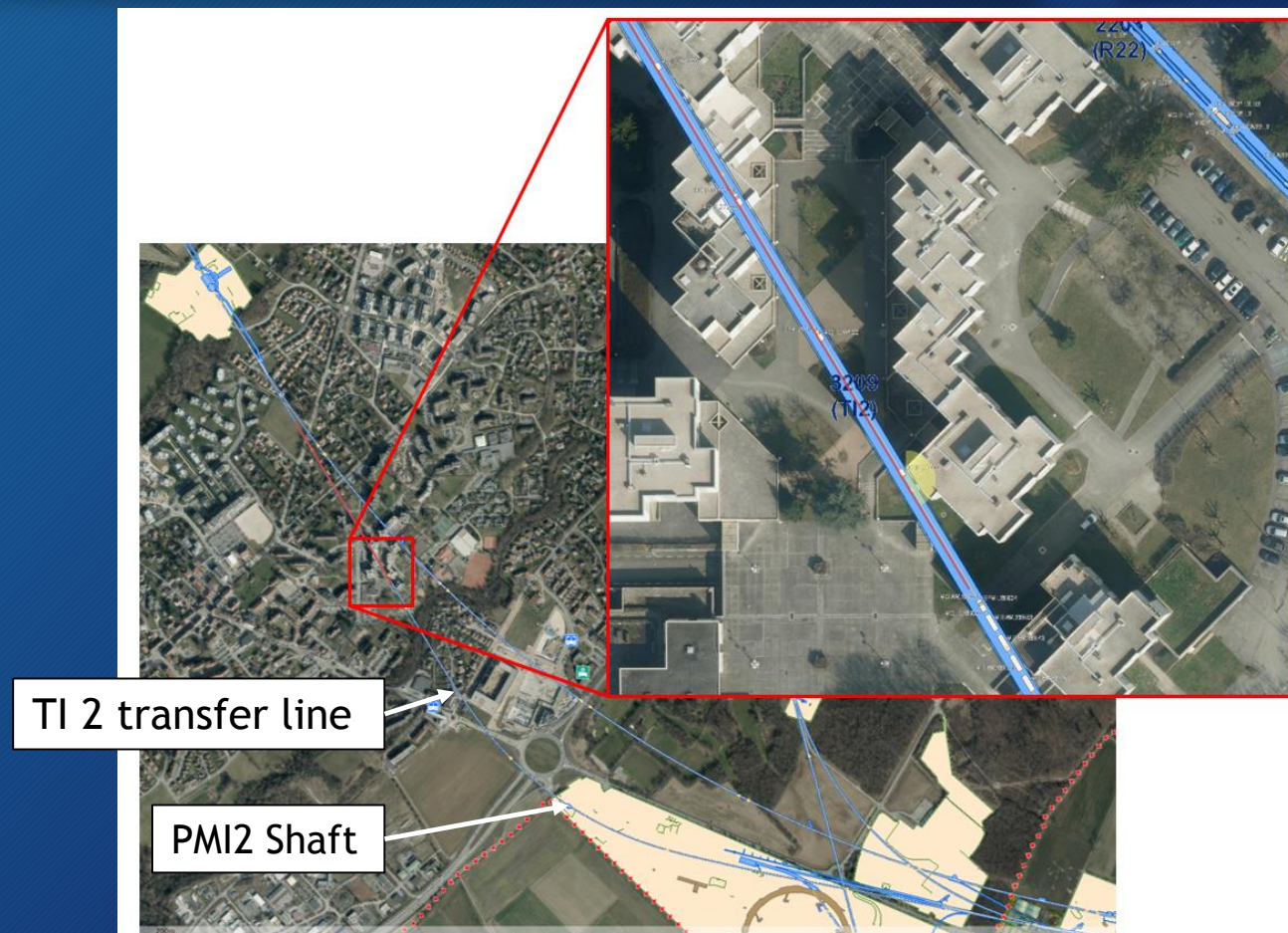
- Distance between existing junction caverns is only around 210m
- Close to PM25 shaft at point two
- Issues with beam line equipment?
- Should be less disruptive to beam line operation



PEPIC - Key Civil Engineering Considerations



- Orientation and location of tunnels
- Interaction with existing tunnels
- Proposed depth
- Method of construction
- Position of access shaft(s)
- Timing and method of construction in relation to beam operation



PEPIC - Likely construction method



- Standard tunnelling techniques to be used in competent Molasse.
- Access and logistics are the main consideration for removal of spoil and transport of materials to the tunnelling face



PEPIC - Input into civil engineering



- Any further constraints to take into consideration in feasibility?
- Input required for all disciplines



PEPIC - Next Steps - Civil Engineering



- Confirm feasibility in terms of beam optics
- Select preferred option
- Carry out further feasibility checks and increase level of detail to look at junction caverns, tunnel radii (if required), etc
- Further investigation into existing infrastructure to more closely examine tie ins

AWAKE++ - Overview



- AWAKE ++ is a fixed target experiment in CNGS area requiring tunnel enlargements
- Similar philosophy and techniques required to PEPIC Options 2 and 3
- Civil engineering feasibility to review for future meetings



Thank You



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Any Questions?