Dual tunnel seismic isolation

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Discussion

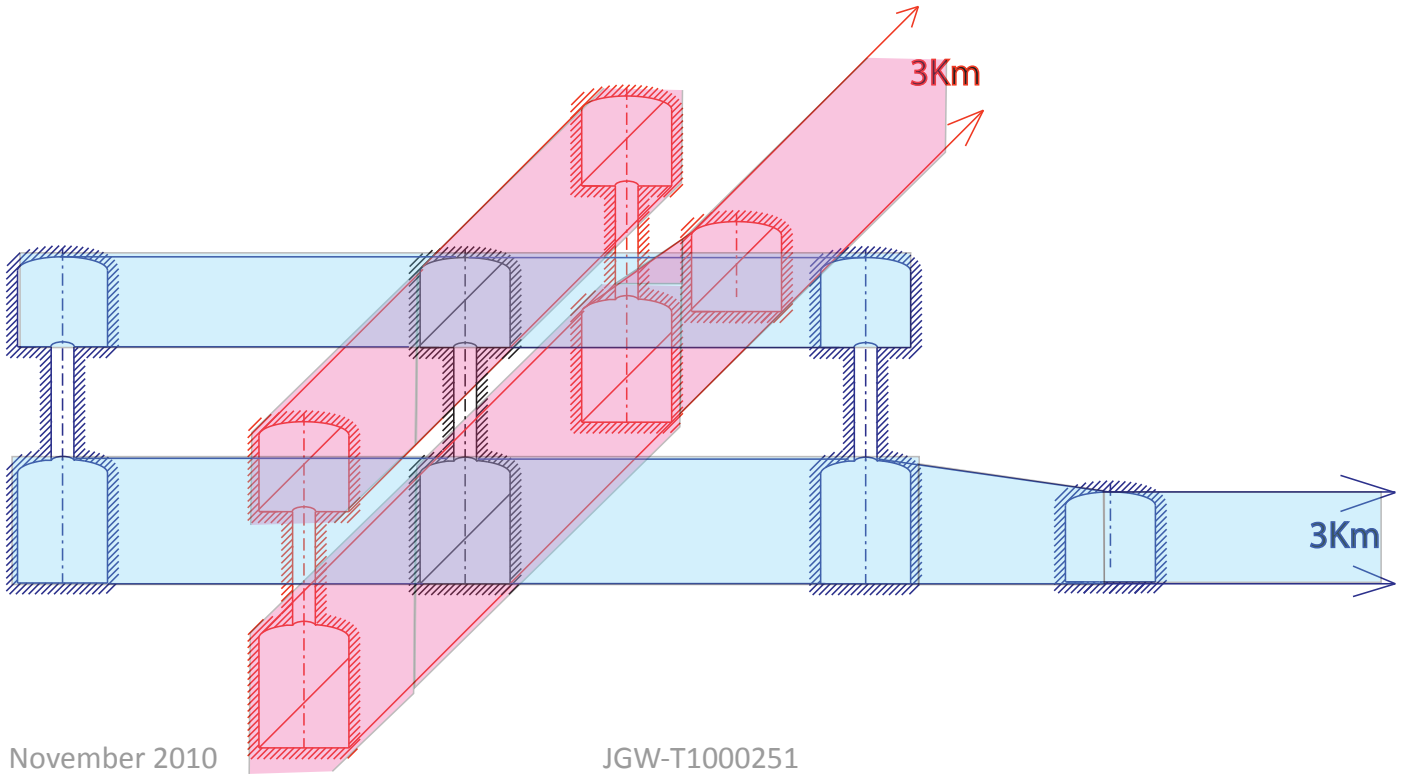
configuration with a dual tunnel geometry

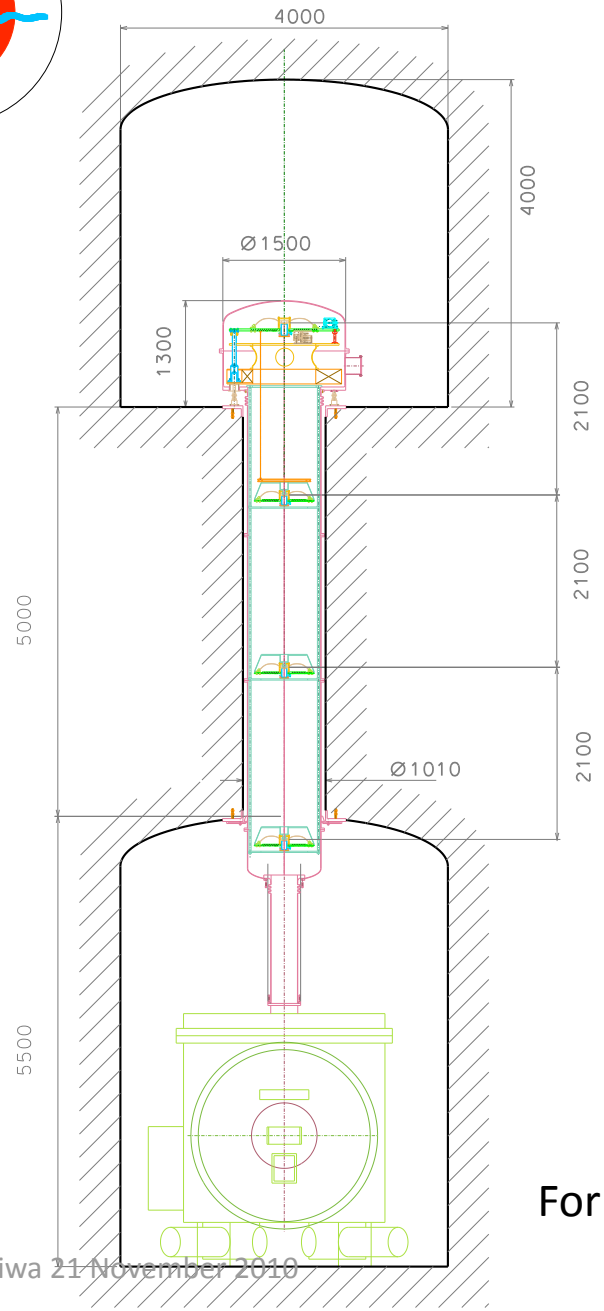
for improved seismic isolation

JGW-T1000251

Dual tunnel - general description

- Eliminate the large experimental Hall
- Replace with two superimposed tunnels



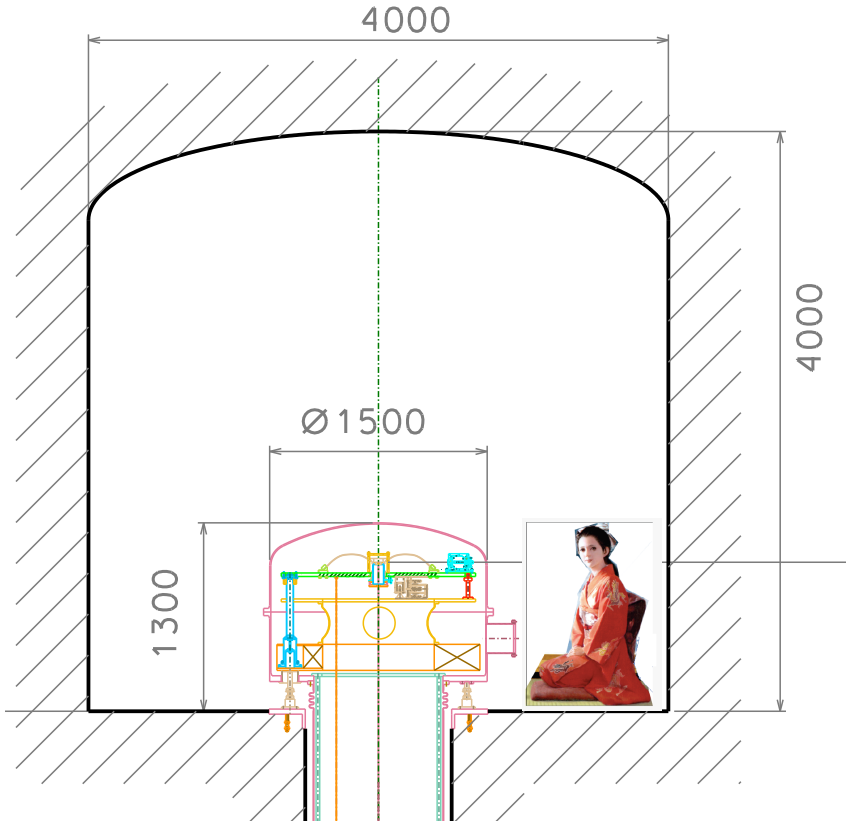


Generalities

- 4m x 4m upper tunnel containing pre-attenuator
- 1 m diameter ≥5 m tall bore-hole with SAS chain
- 5.5 m tall containing main beam and cryostat

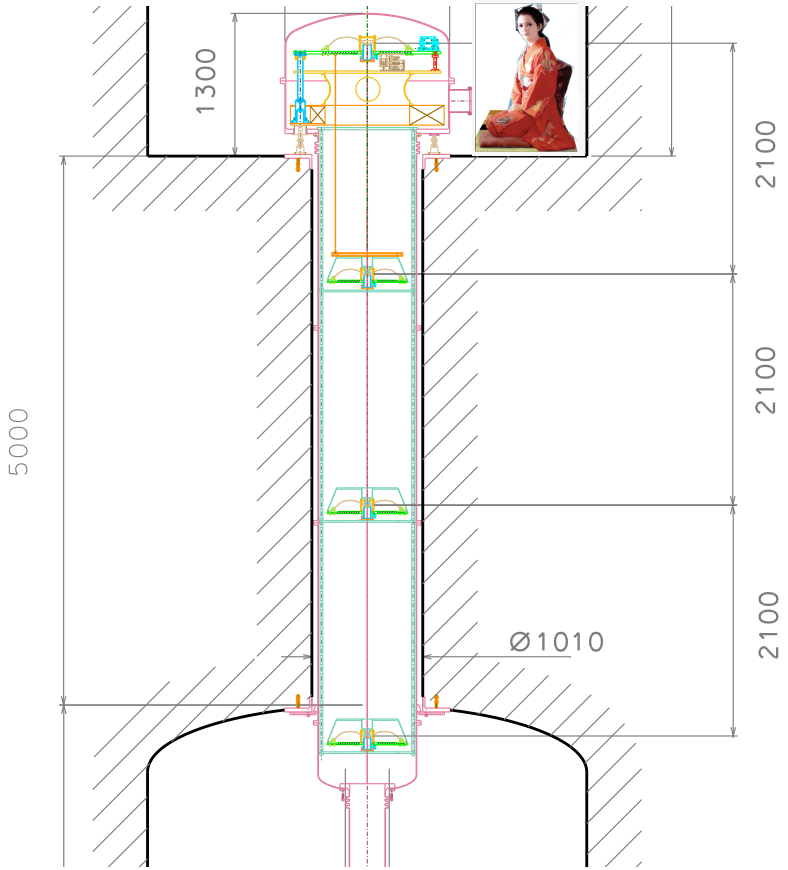
For more detailed discussion, please see JGW-T1000249

Physical advantages



- Pre-isolator footed on solid rock
- Inverted Pendulum table short
  - Found shall size = better performance
- Easy of access for pre-isolator tuning

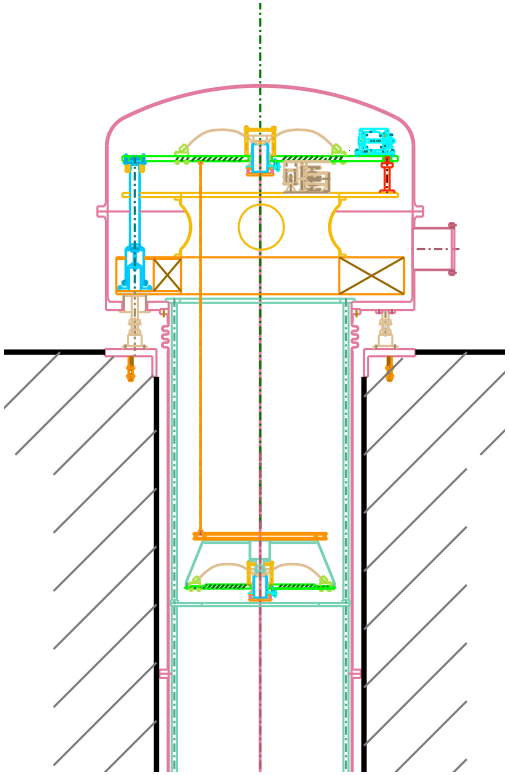
Physical advantages



- Naturally longer pendulum length between filters
- Lower frequency performance
- Opens door to possible physics from lower underground

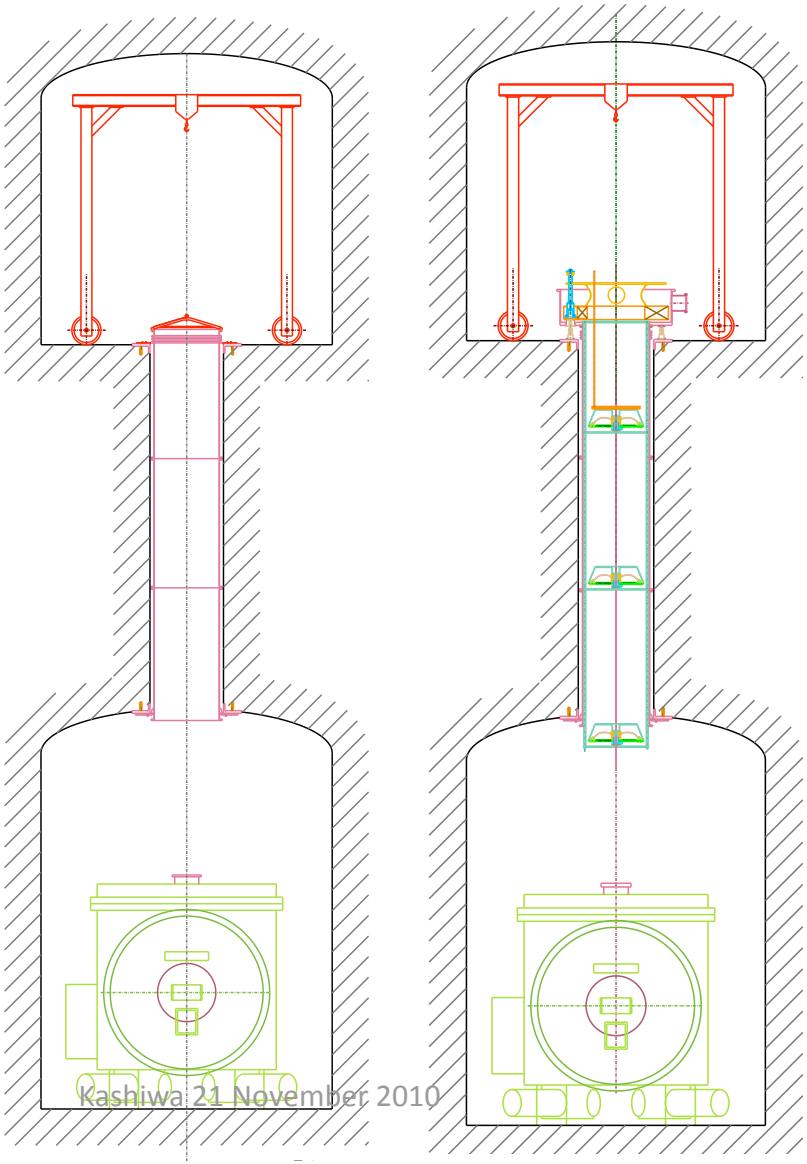
  Newtonian Noise

Controls advantages



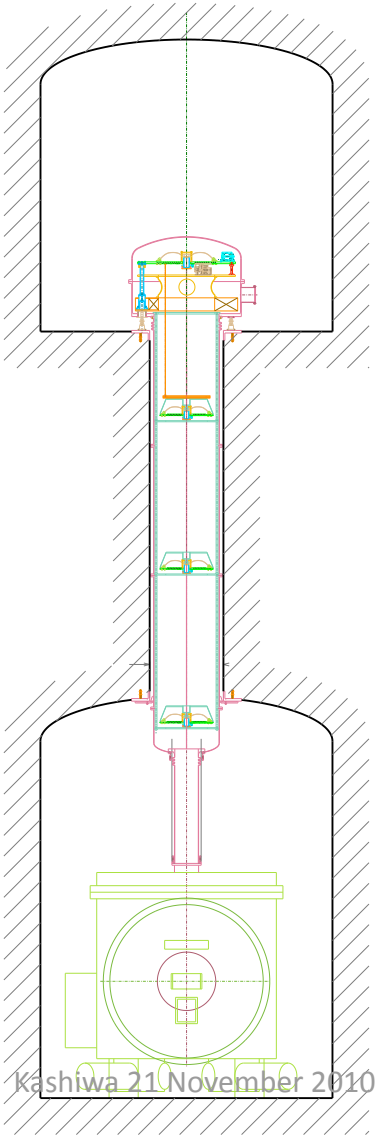
- Additional filter allows effective chain damping for easier and more reliable Interferometer locking

Technical advantages



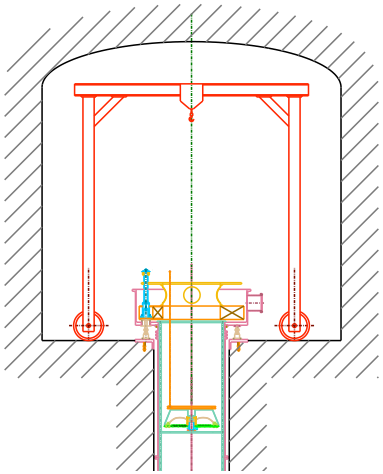
- Ease of installation
- No need of large, expensive rigid structures

Technical advantages



- Safer installation procedures
- Large separation between suspension point and main tunnel, cryogenics, . . .
  - Longer path for noise transmission
- Ease of payload/cryostat replacement

Economical advantages



- Much smaller and cheaper vacuum structure
- Much lighter crane requirements

Mining advantages

- Smaller dug out volume
  - Less stability problems
  - Less lining thickness
- Tunnel-like structures
  - No need of larger machineries to make large halls
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Disadvantages

- Need new bore-holes to re-position any optical element
- Need to know where to locate all mirrors !
- Re-boring alone ~M¥

- Need ~ 75 m (15% slope) of 4m x 4m tunnel ramp to connect floors

Dual tunnel

- More stable pre-isolator footing
- Keep door open for exclusive physics
- At marginal or no additional cost