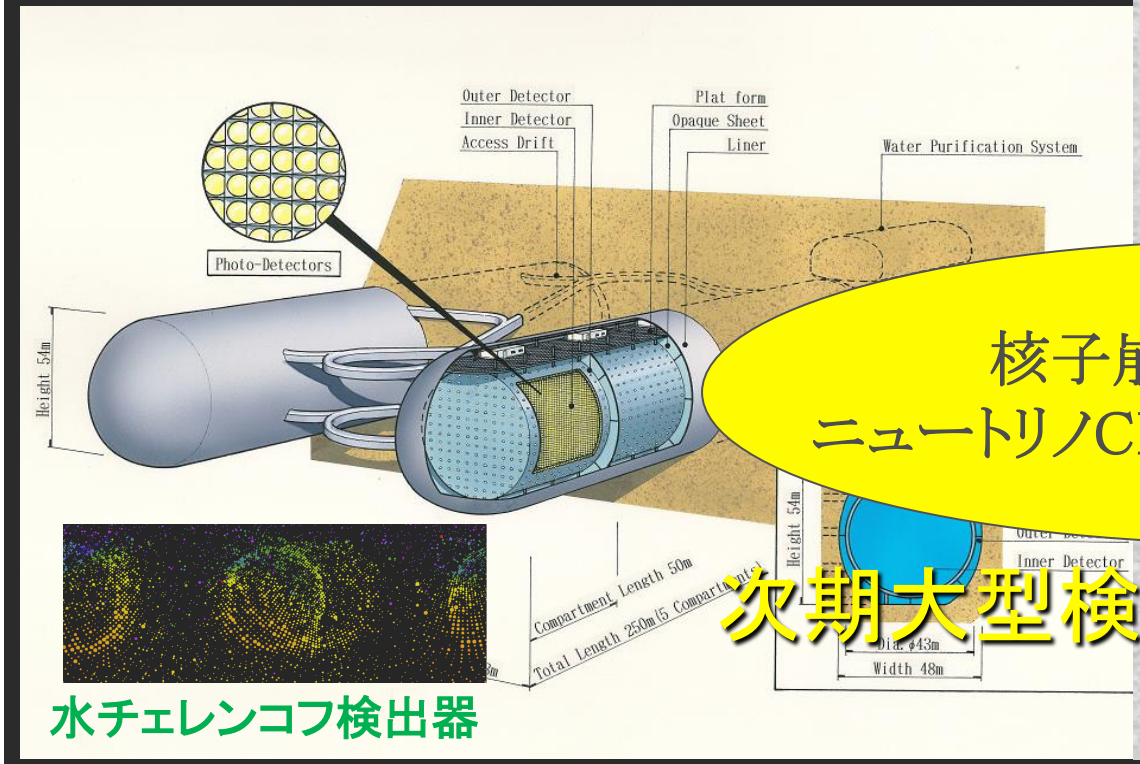
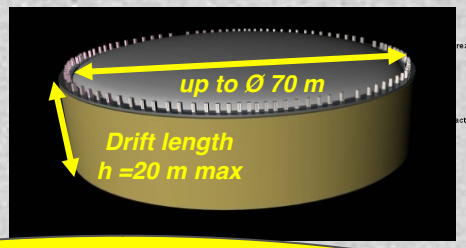
100万トン水チェレンコフ検出器（ハイパーカミオカンデ）の開発研究

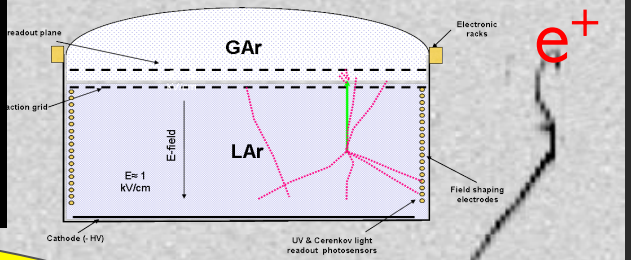
宇宙線研究所研究所

塩澤　真人



水チェレンコフ検出器





液体アルゴン飛跡検出器

核子崩壊事象の発見
ニュートリノCP対称性の破れの探索

次期大型検出器による

素粒子の大統一描像
物質優勢宇宙創成・宇宙進化の謎

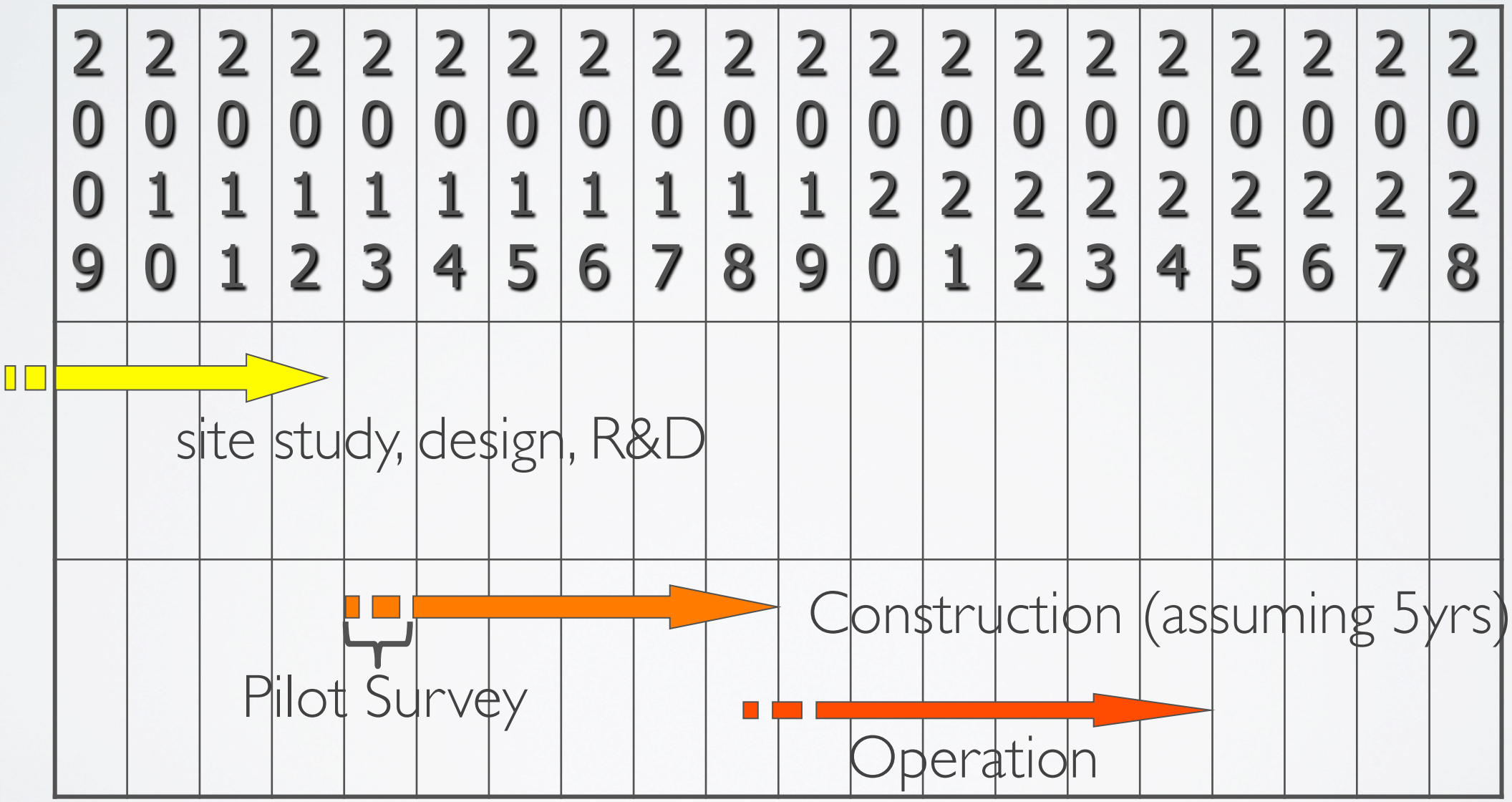
の究明

世界最高強度
J-PARC
ニュートリノビーム

超新星爆発の観測
残存超新星起源ニュートリノの測定

大気ニュートリノの高精度測定
太陽ニュートリノの高精度測定

Hyper-K timetable



今年度目標

- 建設にGOをかけられる状態にする。
  - 水槽レイアウト（深さ、間隔、方向）、ずり廃棄、掘削工法、工期、コスト
    - サイト全体の地質調査再開（10月～）
  - 水槽デザイン（壁、構造、センサー取り付け、工期、コスト）
  - センサー（必要最小限の数を決定、生産期間とコスト）
  - 物理解析の感度study
- 外部に発信
  - 日本で国際会議(December 13-16, Toyama, Workshop on Next Generation Nucleon Decay and Neutrino Detectors)
- デザインレポートにまとめる。

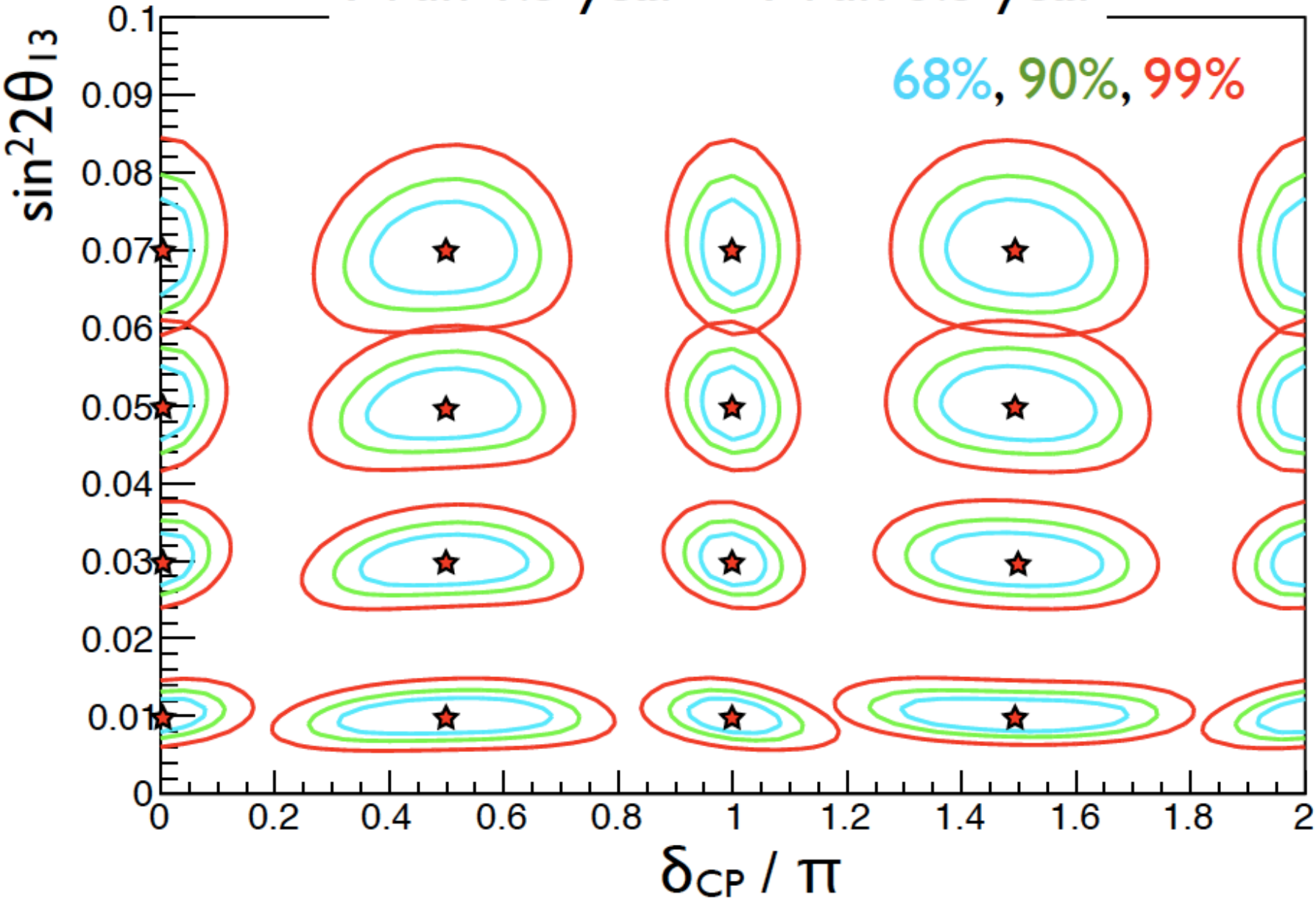
T2K (JPARC-SK)の物理ラン開始！

discovery of ν_e appearance (nonzero θ_{13})

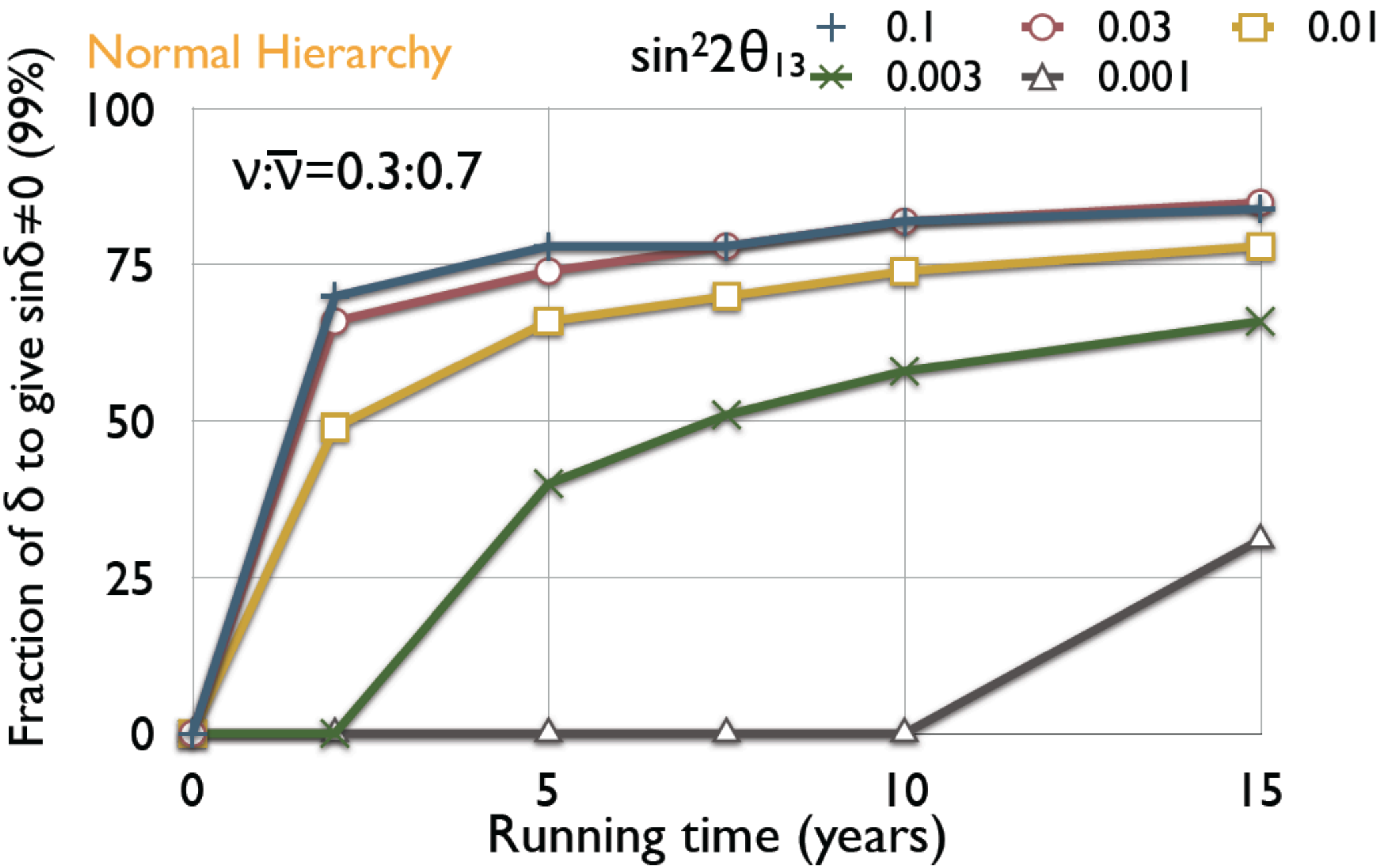
→ open door to CP phase measurement !

Allowed region

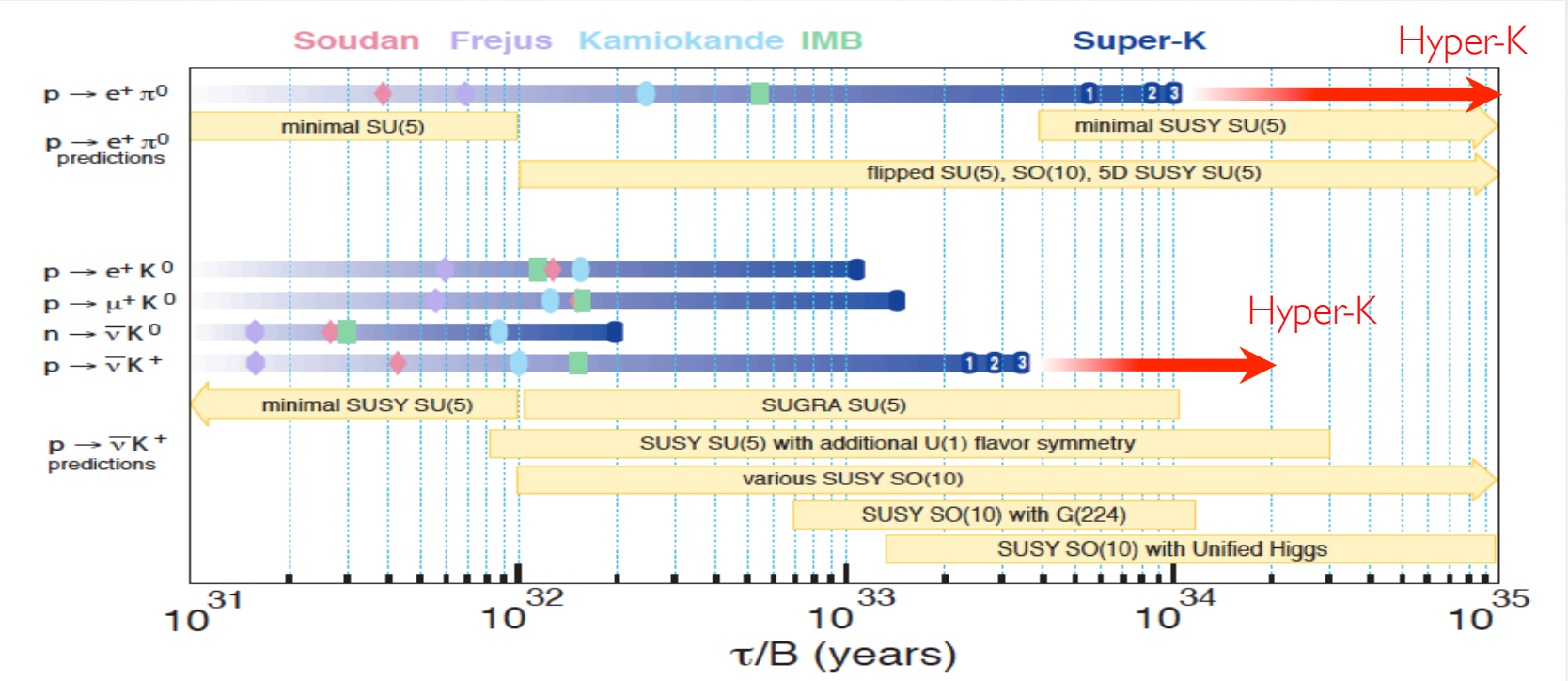
Normal hierarchy

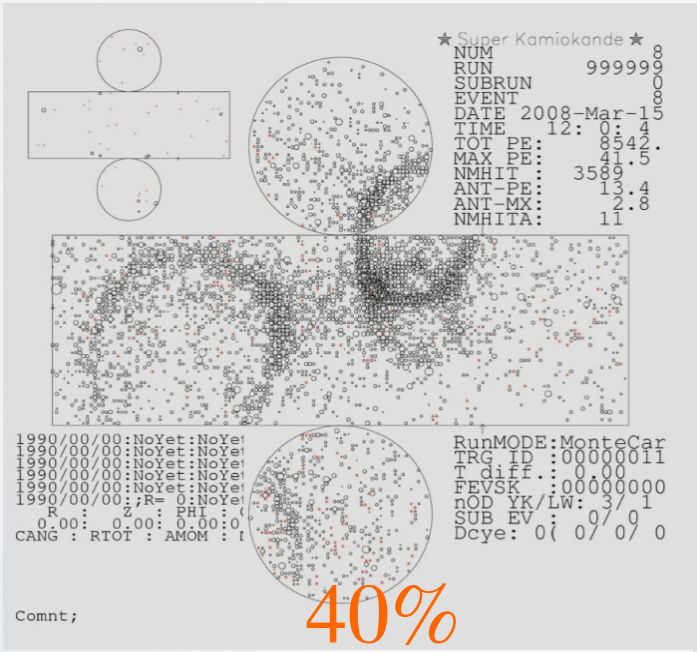


Sensitivity vs. time



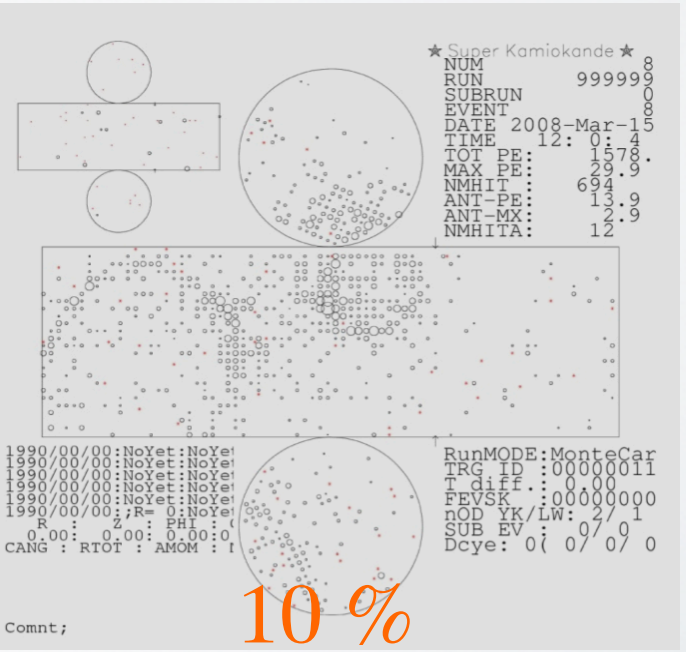
陽子崩壊感度





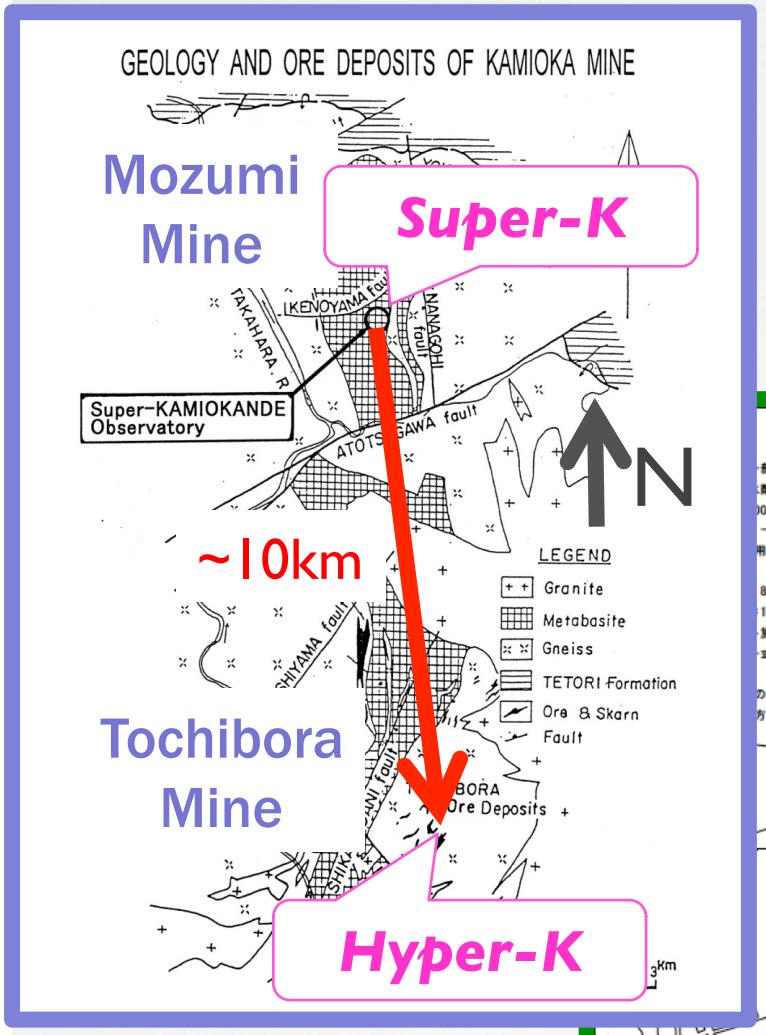
40%

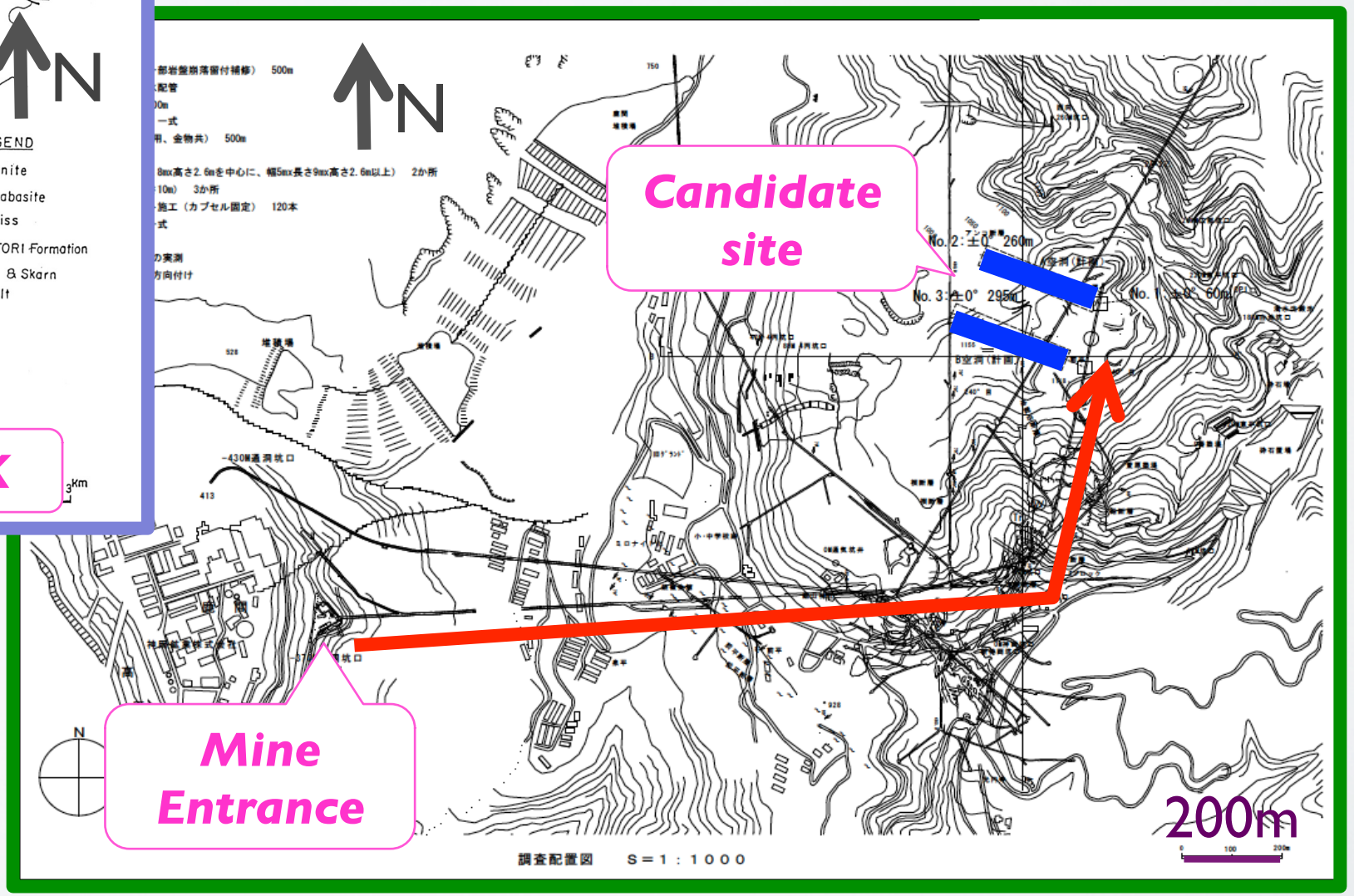
20 %



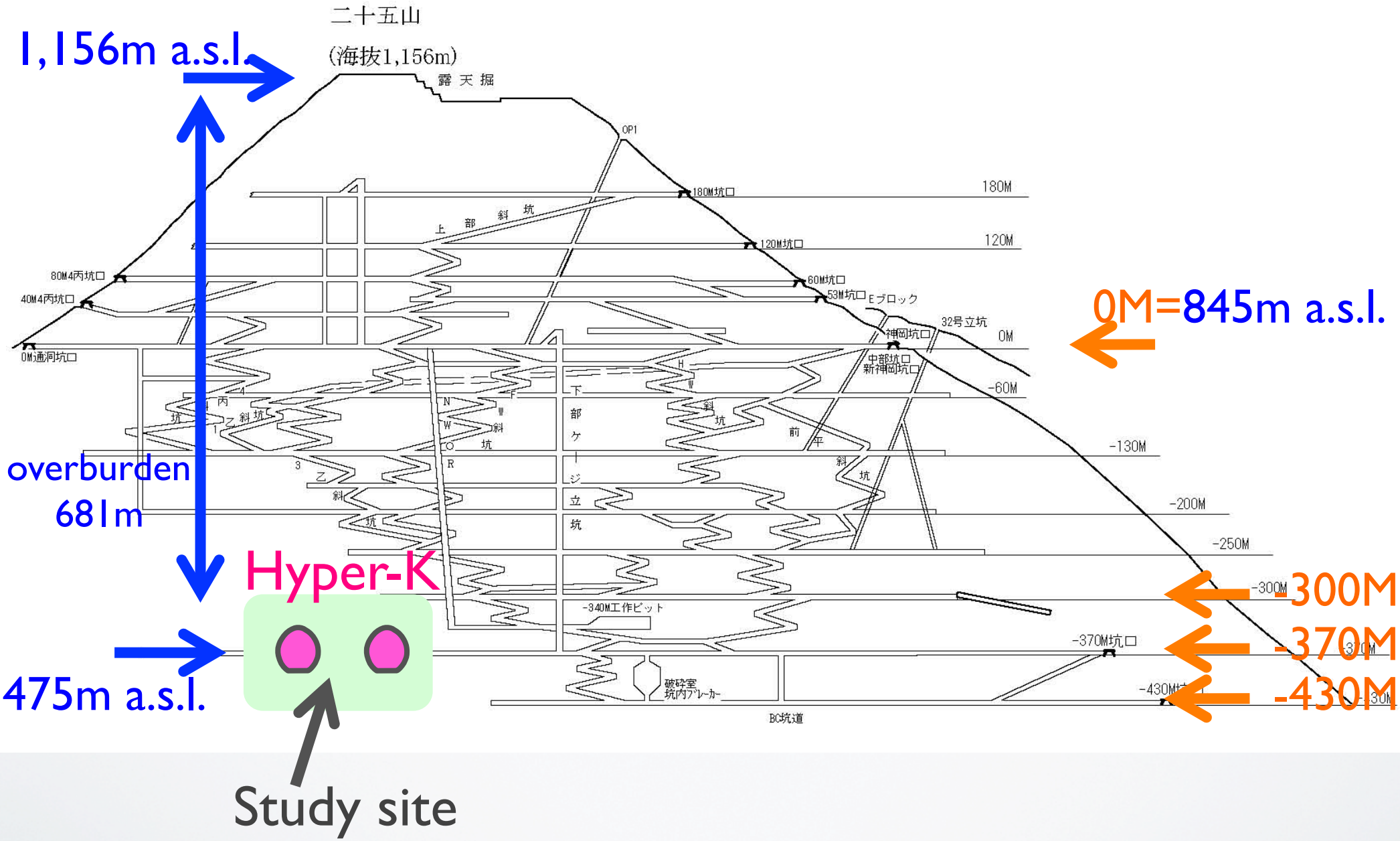
10 %

Candidate detector site

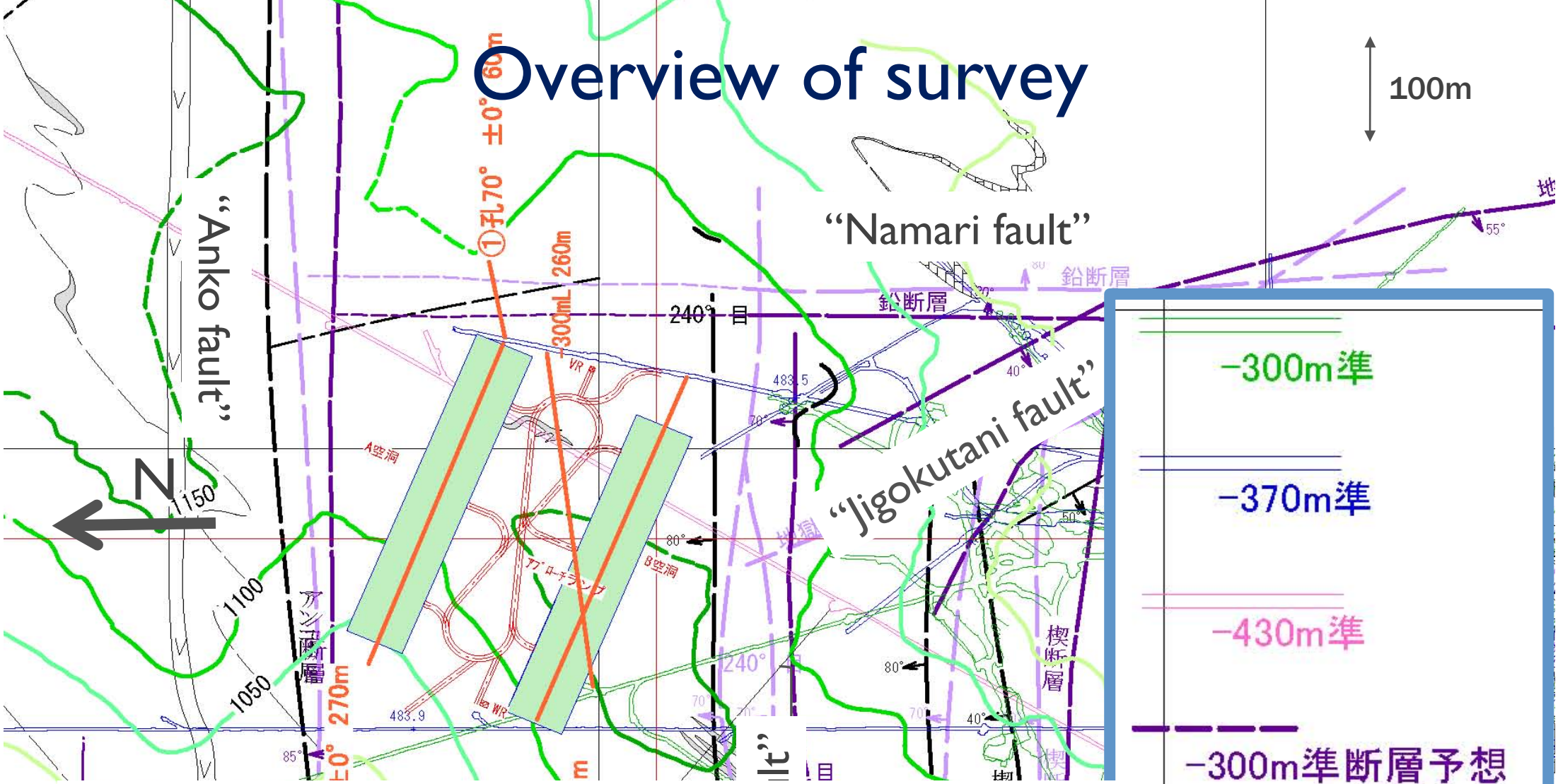




Global Site Study



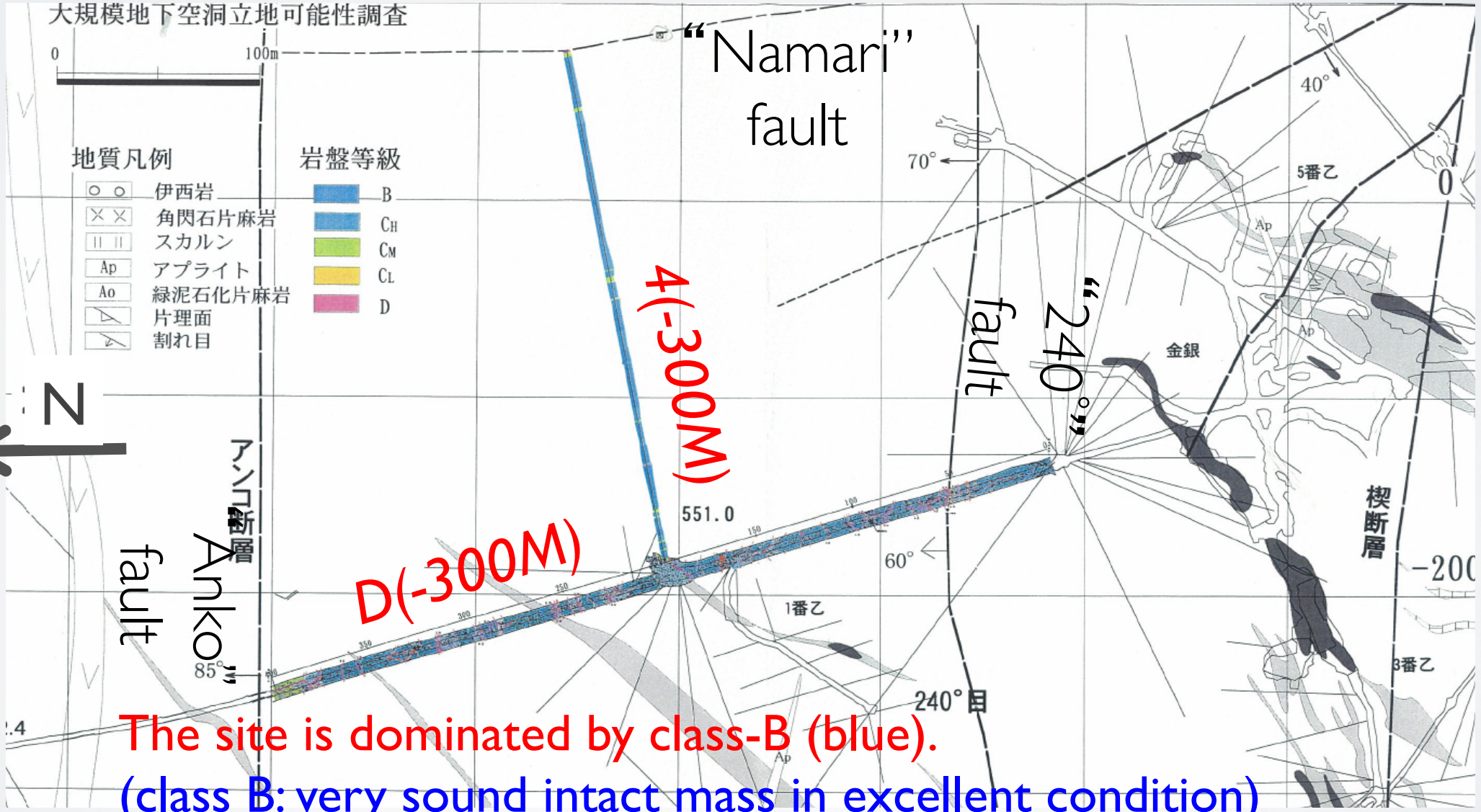
Overview of survey



- 4 borehole coring @-300M,-370M
- Tunnel survey in the three levels
- in-situ stress measurements (two points)
- rock properties

Survey at higher level (-300m)

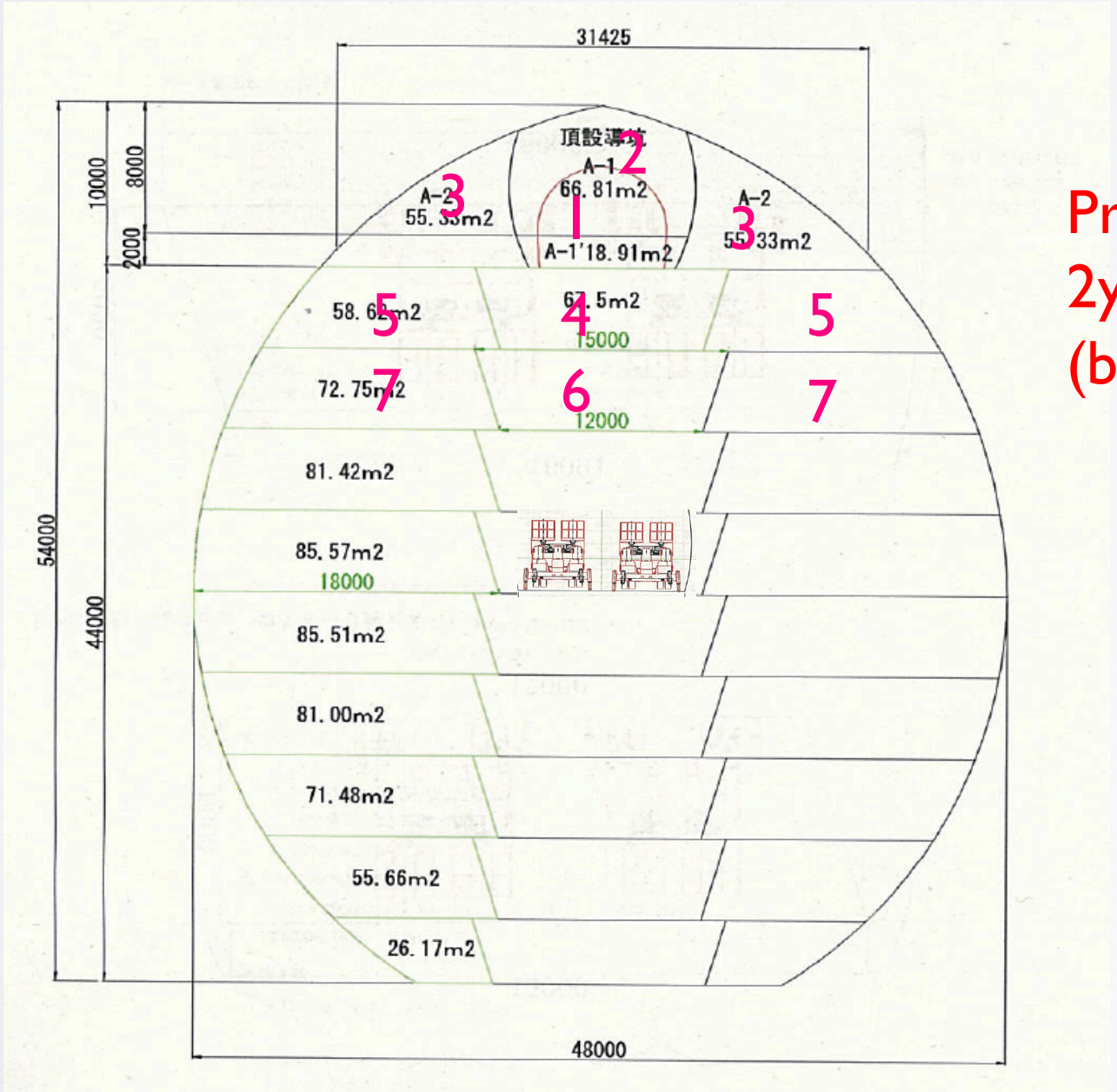
- Joint Survey in the tunnel and the borehole were Performed
- Borehole Loading Tests were also Performed to Estimate the Mechanical Properties of In-situ Rock mass.



The site is dominated by class-B (blue).
(class B: very sound intact mass in excellent condition)
Gneiss & Migmatite.


December-16, 2010

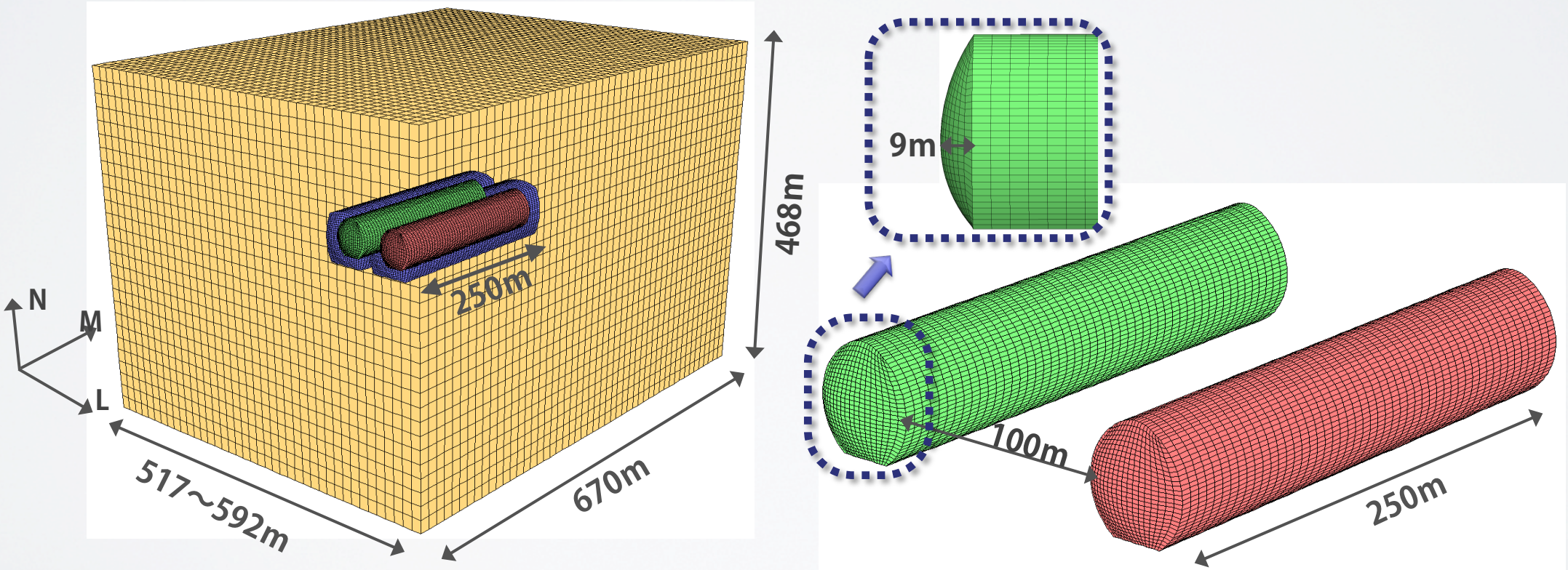
Excavation Procedure (very preliminary)



Preliminary estimation:
2years excavation
(by 2 cars, 2 cavity in parallel)

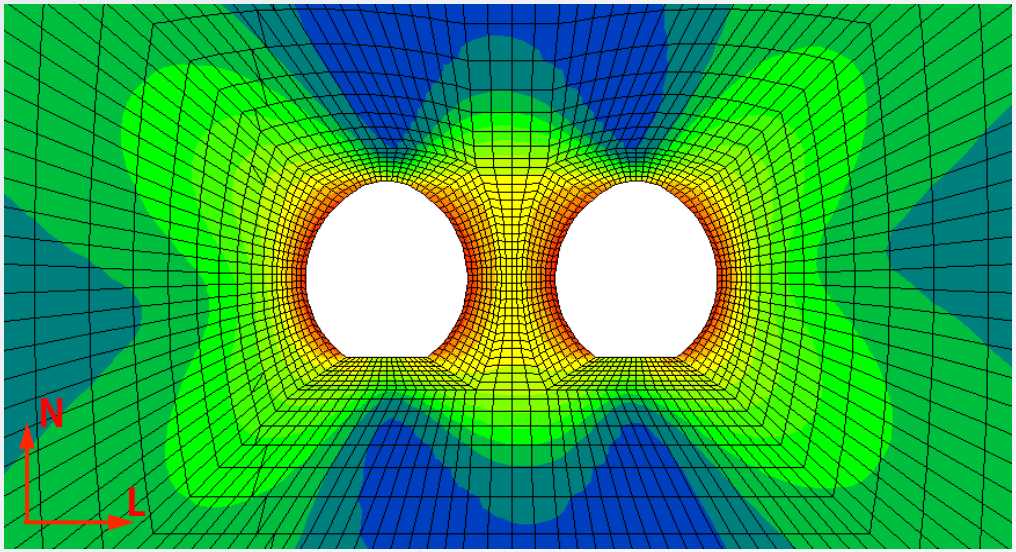
Twin Cavity Analysis

- The widths of four FLAC3D models are 517 ~ 592 m and the numbers of elements employed are 245,788 ~ 286,012.
- The FLAC3D models are finished to have curved surfaces at the both ends of the caverns to reduce the stress concentration effects.

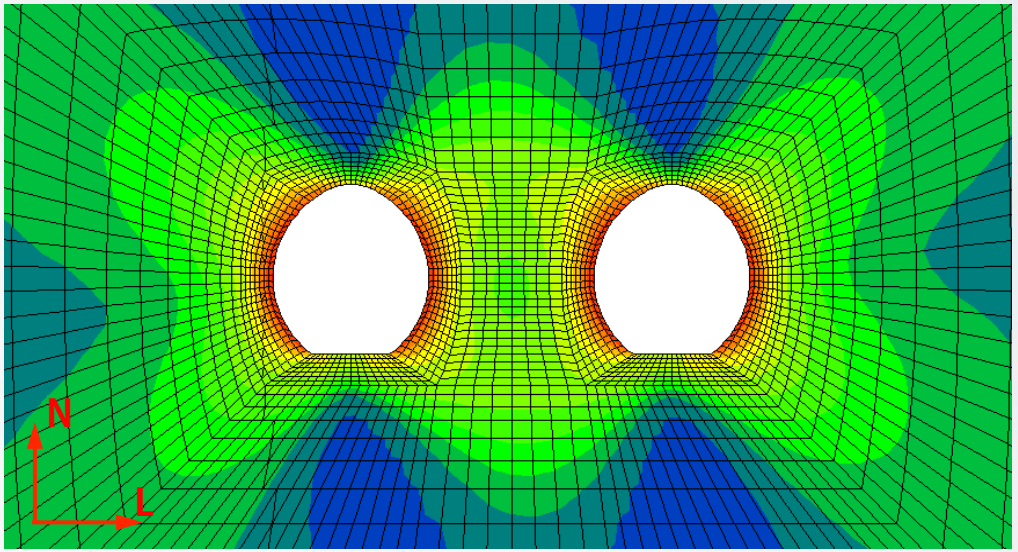


RESULT(θ = 120°, parallel to the rock stress)

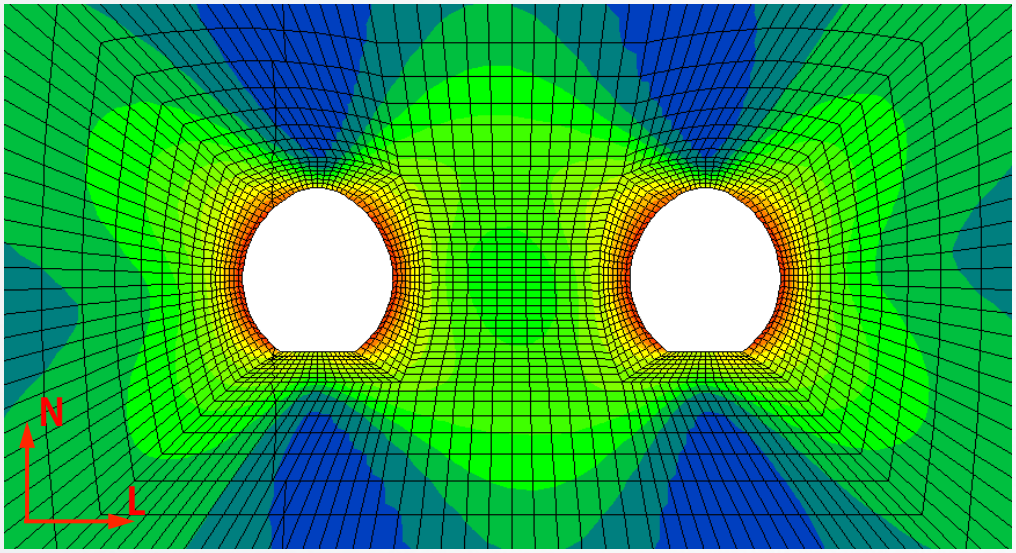
Width of Pillar : 25m



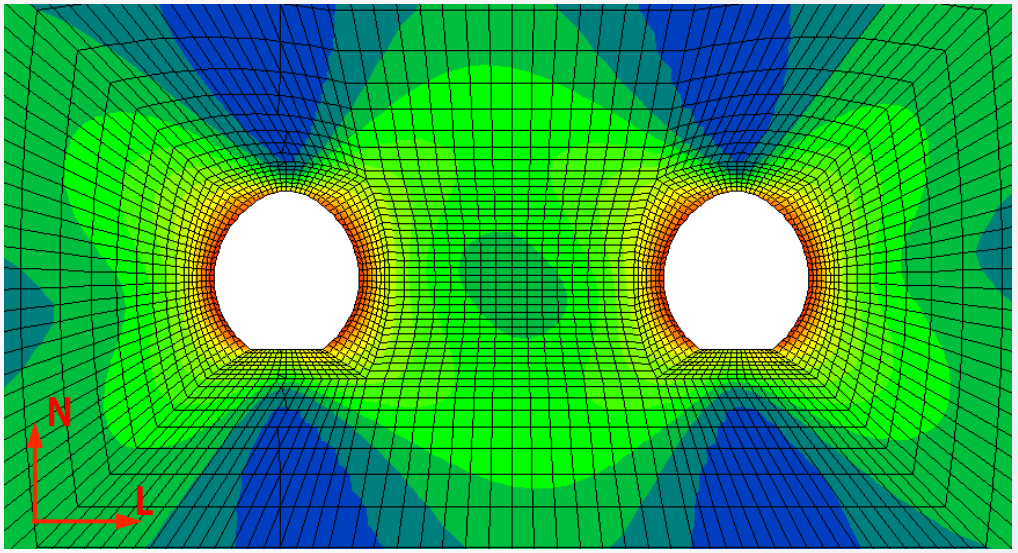
Width of Pillar : 50m



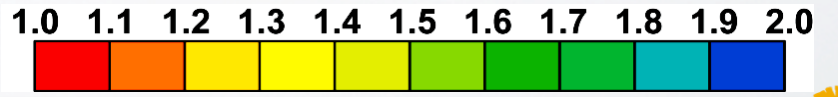
Width of Pillar : 75m



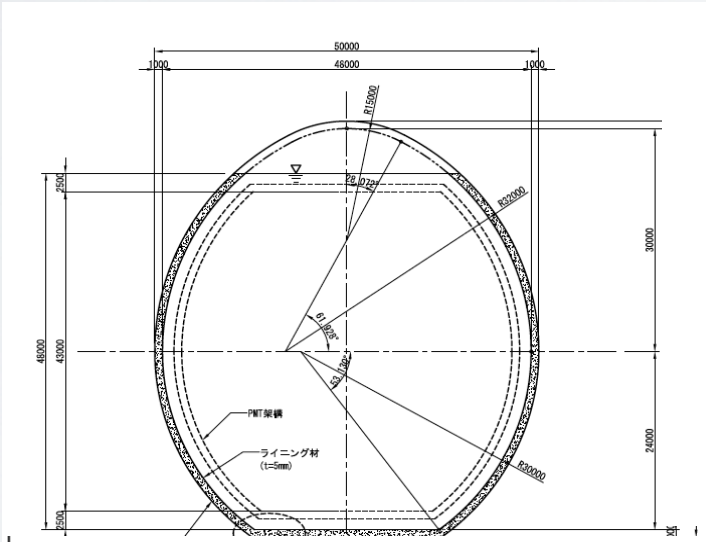
Width of Pillar : 100m

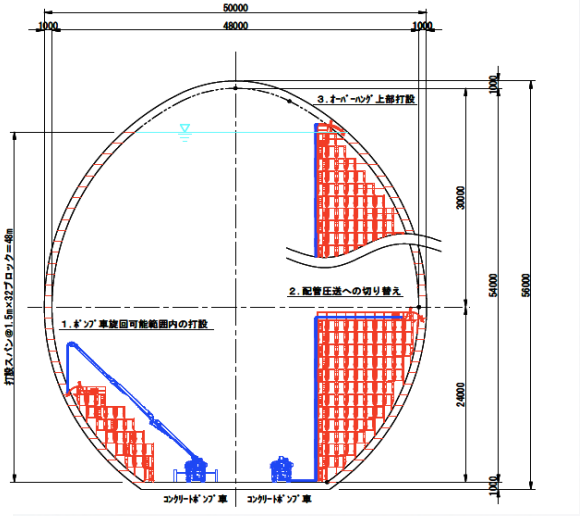


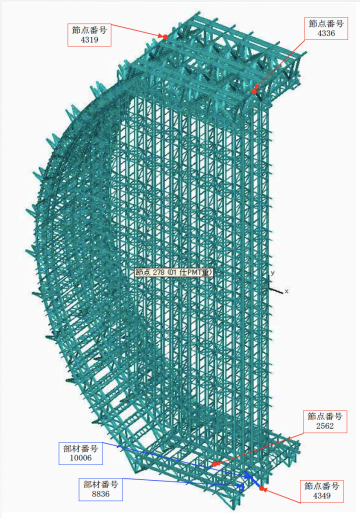
Factor of safety

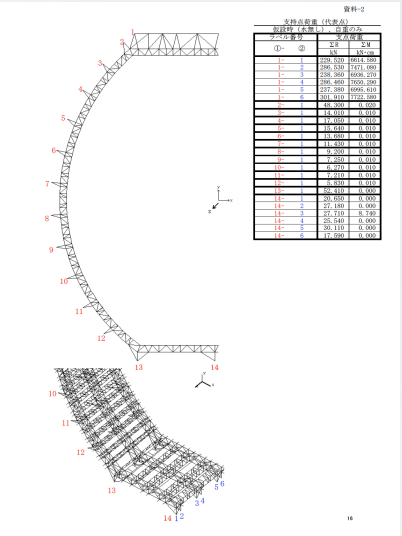


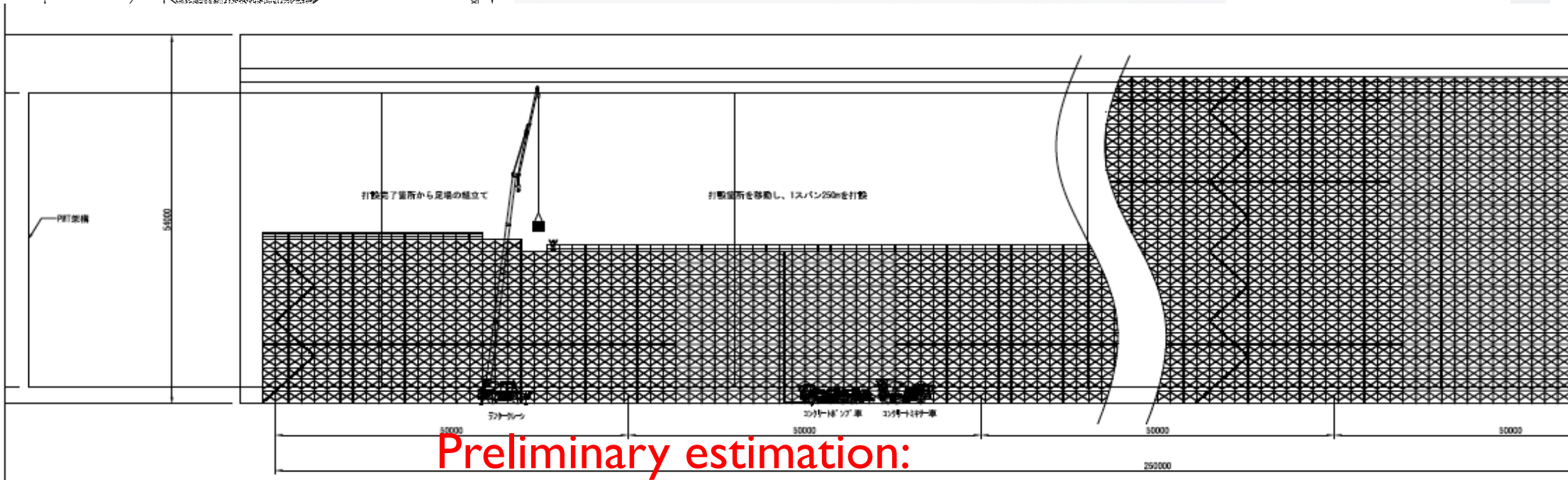
Tank Construction
(water sealing and support structure)











Preliminary estimation:

2 years construction period

8” and 13” HPDs available in 2012

- Hamamatsu will release in 2012