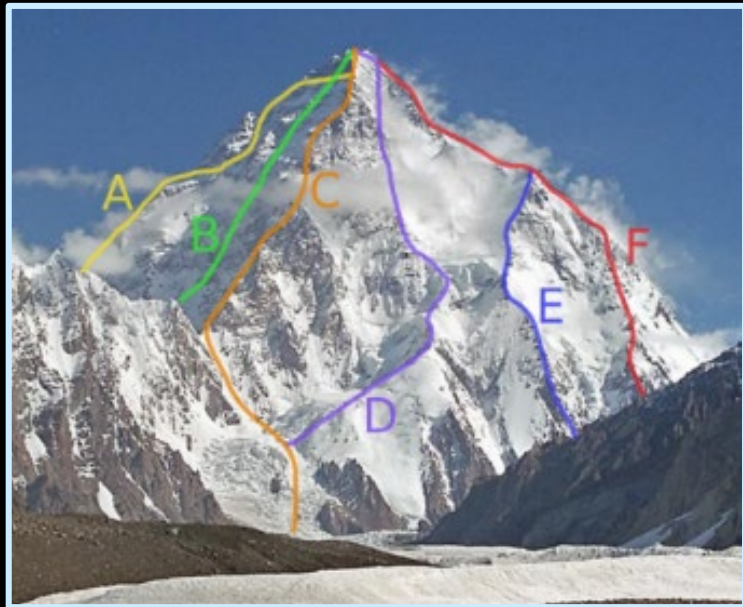


Broad Strategies/Maps/Plans on Experimental Gravitation in Taiwan



- Broad Overview [*This Talk*]
- Next Level Details [*Y. Inoue's Report*]

Henry T. Wong / 王子敬

Academia Sinica / 中央研究院

November 2023



@



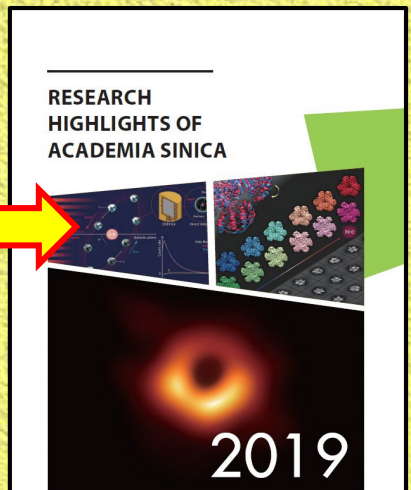
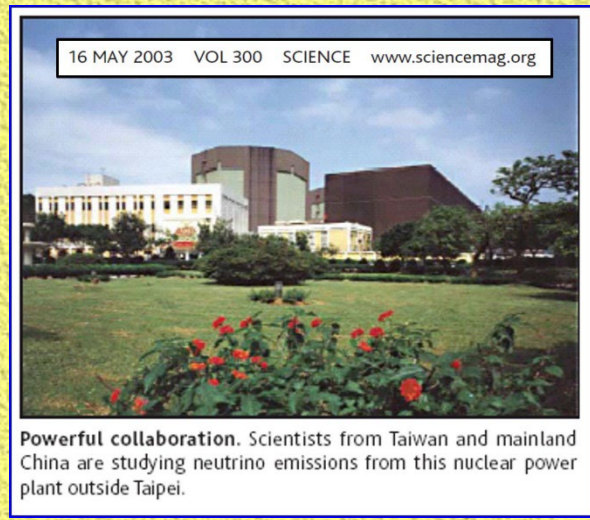
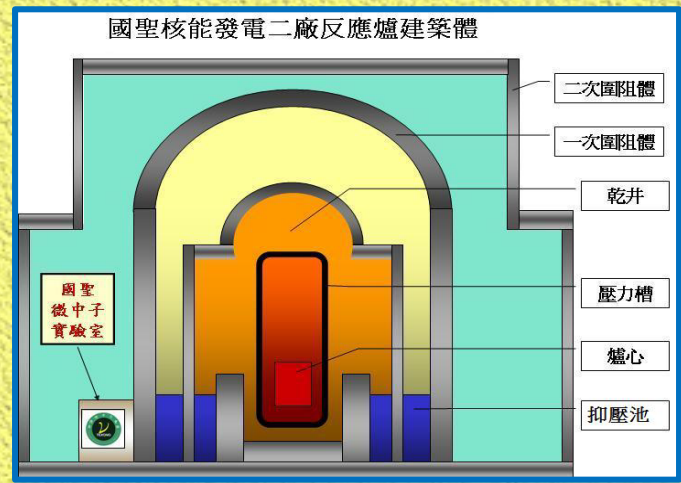
From My Comfort Zone



Taiwan EXperiment On Neutrino — History and Prospects

International Journal of Modern Physics A
Vol. 33, No. 16 (2018) 1830014 (30 pages)
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Annual Review of Nuclear and Particle Science
Annu. Rev. Nucl. Part. Sci. 2017. 67:231–51

The China Jinping Underground Laboratory and Its Early Science

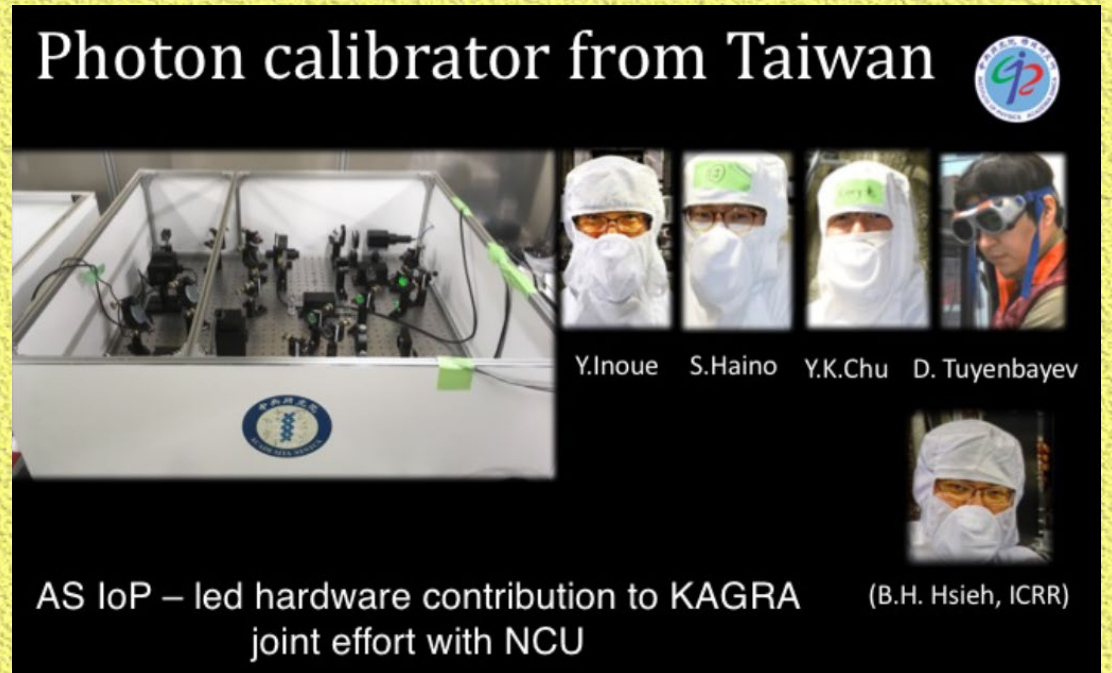
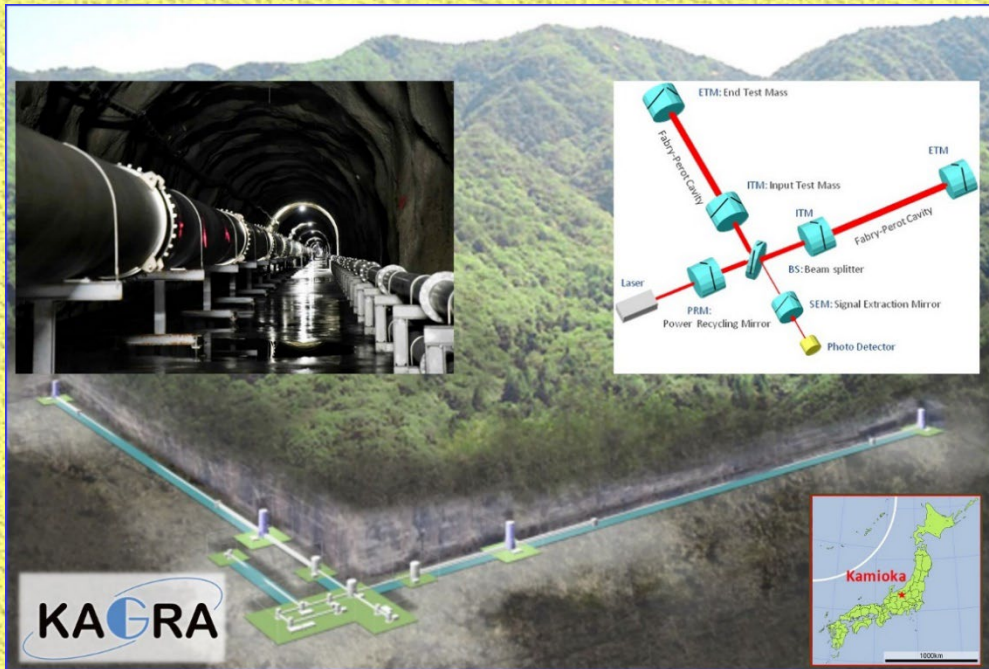
Jian-Ping Cheng,¹ Ke-Jun Kang,¹ Jian-Min Li,¹ Jin Li,¹ Yuan-Jing Li,¹ Qian Yue,¹ Zhi Zeng,¹ Yun-Hua Chen,² Shi-Yong Wu,² Xiang-Dong Ji,³ and Henry T. Wong⁴

Facing Our Next Mountain



Experimental Gravitation in Taiwan

- Early table-top BSM-GR experiments at NTHU (Ni...)
- Sada Haino (AS) initiated KAGRA in TW (since ~2016)
- Expanding teams & communities: *NCU, NTHU, NTNU, TKU + Theorists*
- AS @ KAGRA: *Calibration [Leading Group, Y. Inoue], High-Power Lasers, Computing Resources*
- Other TW@KAGRA: *Quantum Optics (NTHU), Analysis (Astro, Cosmo..)*



TEXONO.Gravitation

(since ~2018; ~15 members 2023)

- ✓ Yuki Inoue (NCU, AS)
- ✓ Chao Shiuh 趙煦 (NTHU)



CHRONOS May 2023

- ✓ RAs & Students joined KAGRA Calibration
 - ✗ Analysis of “PCAL” (photon calibrator) data (till 2021)
 - ✗ Constructed “GCAL” 1.0 (gravity calibrator) at AS
- ✓ AS+NCU approved to join LIGO June 2021:
 - ✗ LIGO: significantly more advanced in hardware; relevant R&Ds at frontiers.
 - ✗ Official LIGO listed:
 - ✓ Take over NTHU Mirror Coating Expertise and Facilities and NG-R&D
 - 🏆 *TW's only facility directly linked to a Nobel Prize !*
 - ✓ Calibration software & analysis
 - ✓ Detector Monitoring Shifts
 - ✗ R&D Items:
 - ✓ NG-GW techniques with Cryogenics
 - ✓ “GW System Test Facility” for future GWs @ ASGRAF
 - ✓ “Get into” analysis GW public and internal data
- ✓ Domestic CHRONOS Project



Challenges, Plans, Strategies (Personal Bias):

■ **Natural Scale: Taiwan, not ASIoP**

■ **MY Focuses & Themes:**

➤ **A Physics Program – multi & diverse/balance projects**

⇒ Instrumentation (Domestic-based)

⇒ + Software (DAQ, ROOT & GEANT equivalence...)

⇒ + Operation

⇒ + Physics/Science

➤ Build multi-institute, multi-disciplinary teams

➤ Build Broad Programs, Teams, Ecosystems -- beyond GW, beyond LIGO

■ **Hope to Connect in TW**

➤ Physics subjects beyond mainstream GW astrophysics,

☑ particle physics and cosmology

☑ esp. the missing energy-density problem

☑ leave astrophysics to professionals [first phase]

➤ TW experimental HEP resources & expertise

➤ IoP expertise in semiconductors & cryogenics

➤ Resources from TEXONO & CDEX (ν & DM) teams

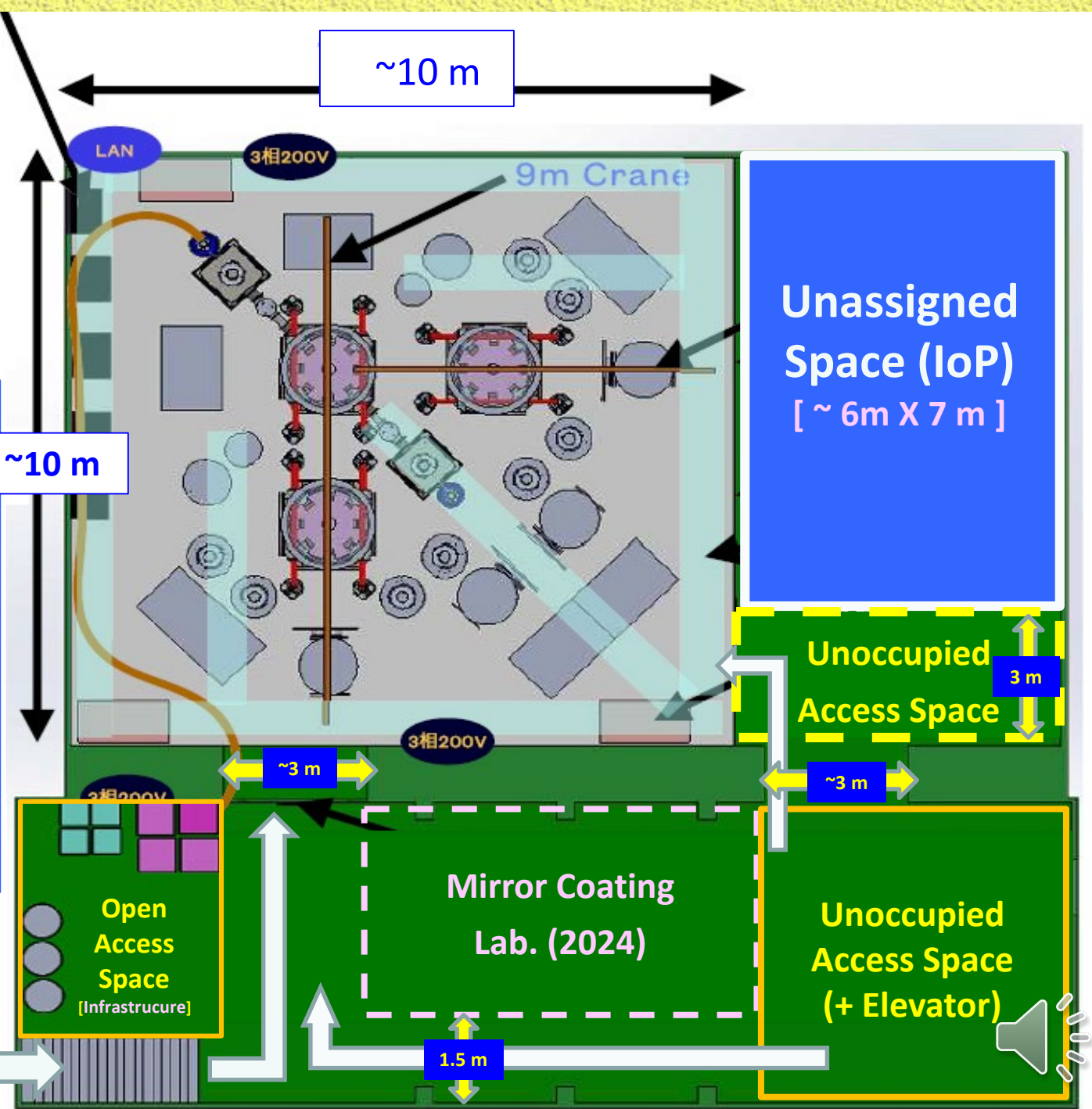
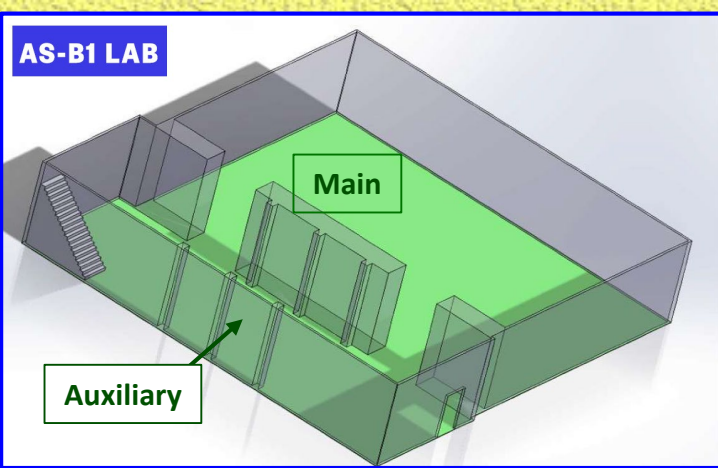
■ **Get inspired by LIGO culture & operation “Play with the Big Boys”**

➤ young, dynamic, forward-looking, democratic, inclusive, “contemporary”



Research Projects Menu:

- Mirror Coating [TSRI] & Characterization [AS] for NG (Cryo) GW.
- Cryogenic Techniques for NG (Cryo) GW [AS]
- GW Optics System [NCU]
- Calibration Data Analysis & Instrument Response Modelling [NCU]
- Operation: Data Filtering, Hardware Monitor Shifts [All]
- Theory Flavor Subjects
 - GW Detector Sensitivities (Noises) [NCU]
 - BSM Particle and Gravitation in GW [+ M. Spinrath]
 - ✓ Get into LIGO public data
 - ✓ Enable Theorists to turn *“Sensitivity Projections”* to *“Physics Limits”*
 - Stochastic Background Analysis [+GC Liu, KW Ng]
 - ✓ Get into LVK internal data (via KAGRA!) & the Subject.
- Homegrown CHRONOS Project
 - An Idea for Homework (before a Proposal or Program) !!



ASGRAF (AS Gravitation Facility):

- IOP B1 10X10 m²
- Clean Room Spec @ C-10000
- Menu (Plans):
 - Mirror & Cryo & VIS Research
 - Move NTHU Lab (2024)
 - GW "System" Test Facility
 - Future CHRONOS prototype

Walk-In Possible
with Hand-Held
Equipment

期待：依然精彩

