Status of LCGT project

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Key features

- **Underground**
  Stable operation due to low seismic noise
- **Cryogenic mirrors and suspensions**
  Reduction of thermal noise

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Two stage construction

**iLCGT**
- Room-temp
- 10kg silica TM
- Type-C' (stack + isolator)
- Low laser power (10W)

**bLCGT**
- Cryogenic
- 30kg sapphire TM
- Type-A, B, and C
- High laser power (150W)

Type of SAS
- Type-A
- Type-B
- Type-C
- Type-C' in iLCGT

Graph showing strain vs. frequency for CLIO, TAMA300, iLCGT, bLCGT, and other systems.
The project got started last year
- Due to the March 11 earthquake, some of the construction items are affected
- LCGT will be in 2 stages: iLCGT and bLCGT
Tunnel

- Φ4.5m TBM (Tunnel Boring Machine)
- 1/300 tilt for natural water drainage
- Double layer structure for test-mass V.I.
- Two entrances
- Excavation schedule has not been fixed due to delay of budget execution
Vacuum

500 unit tubes (Φ0.8m x 12m long)
- Expensive, but needed for quick installation after tunnel excavation
- 120 being done, all done by March, 2013
Vibration isolation

Type-A: Test Masses
Type-B: RM, BS
Type-C: Others

IP: Inverted Pendulum
GASF: Geometric Anti-Spring Filter
PI: Pre-Isolator = IP + GASF

Performance test of prototypes

Type-B being designed

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Cryogenic

Simulation result

Roughly 1 month to cool down the test mass

Test mass

Baffles added from CLIO's experience

Cryostat

Prototype test

Ultra-low vibration Cryocooler
(Sumitomo, 1W @ 4.2K)

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Special thanks to LIGO Laboratory

**bLCGT**

- ITMs & ETMs will be replaced by **sapphire**
  The supplier not determined yet, but **absorption** will be the decision maker
- Lots of investigation/tests to determine polishing/coating manufacturer

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Summary

• LCGT started in September 2010: the key technologies are prepared by TAMA and CLIO

• LCGT construction/commissioning are planned in two stages (iLCGT & bLCGT)

• Although the construction has been affected by the March 11 Earthquake, we would like to start the observation in 2017

• Many thanks to the support/help by the LIGO lab, LSC, and VIRGO collaborations

LCGT homepage  http://gwcenter.icrr.u-tokyo.ac.jp/en/
LCGT wiki       http://gwwiki.icrr.u-tokyo.ac.jp/JGWwiki/LCGT