1. K-SPEC for A-SPEC: Overview
2. Spectrograph of K-SPEC

2022. 02. 14.

Jae-Woo Kim (KASI)
K-SPEC Team

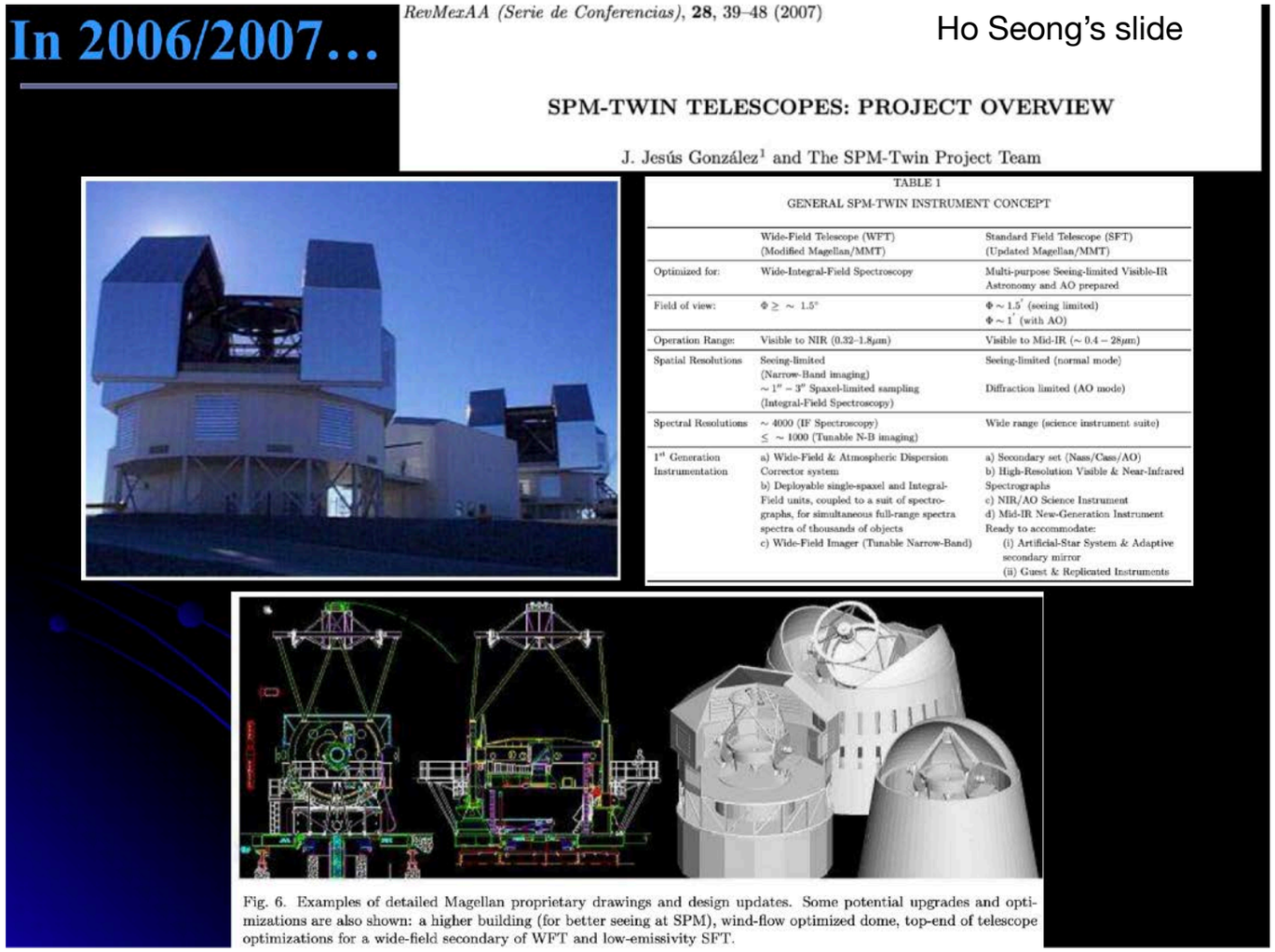
1. K-SPEC for A-SPEC

- K-SPEC: Multi-object Spectrograph System, Instrument
- A-SPEC: Survey, Scientific

15-20 yrs ago

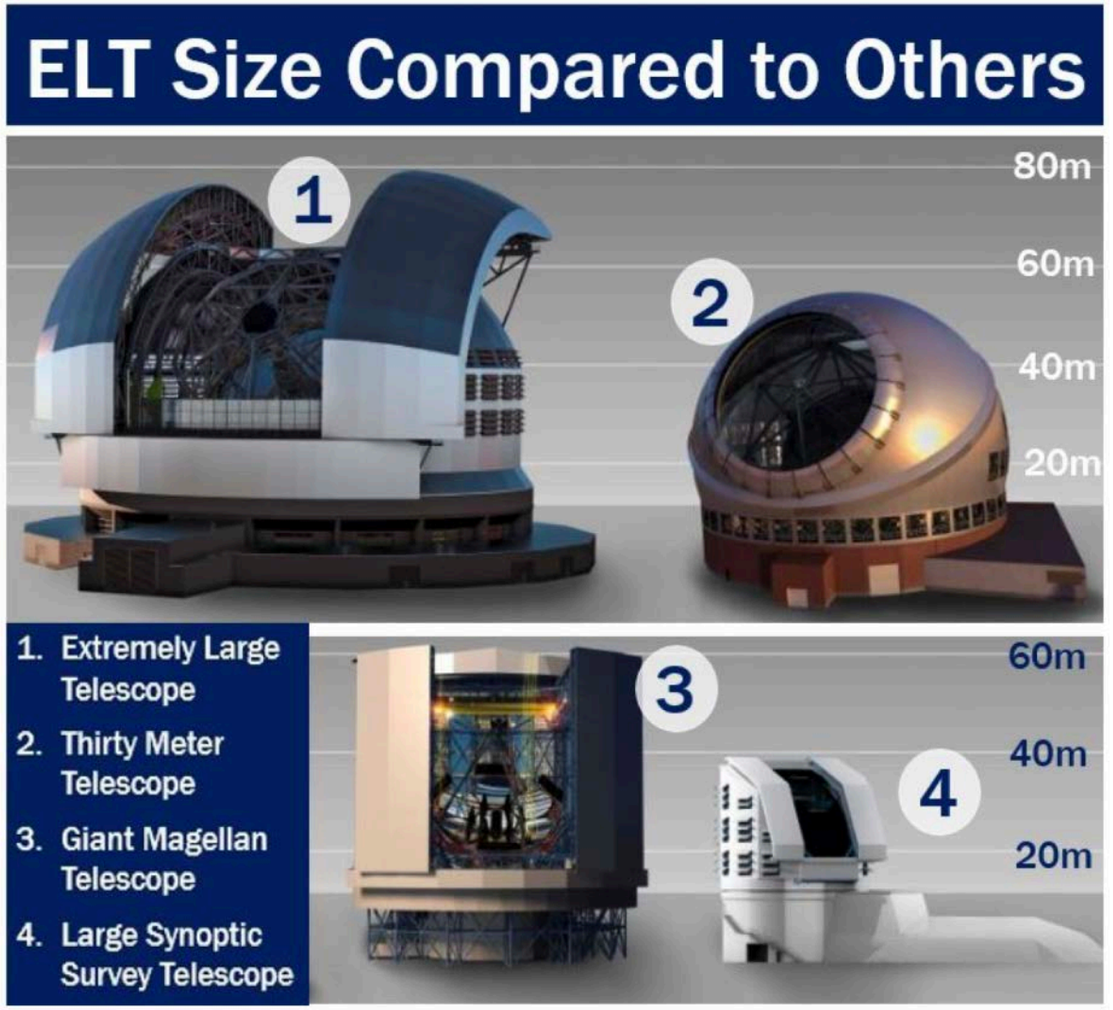
Our own telescope

Member of large telescope



Ho Seong's slide

Fig. 6. Examples of detailed Magellan proprietary drawings and design updates. Some potential upgrades and optimizations are also shown: a higher building (for better seeing at SPM), wind-flow optimized dome, top-end of telescope optimizations for a wide-field secondary of WFT and low-emissivity SFT.



https://marketbusinessnews.com/worlds-largest-telescope-built-chilean-desert/159642/

Technology secure
Own Instrument
Narrow + Wide field: Survey

Latest technology
Narrow field, but deeper
Fainter & More distant

15-20 yrs ago

Our own telescope

Member of large telescope

In 2006/2007…

Ho Seong's slide

RevMexAA (Serie de Conferencias), **28**, 39–48 (2007)

SPM-TWIN TELESCOPES: PROJECT OVERVIEW

J. Jesús González[1] and The SPM-Twin Project Team

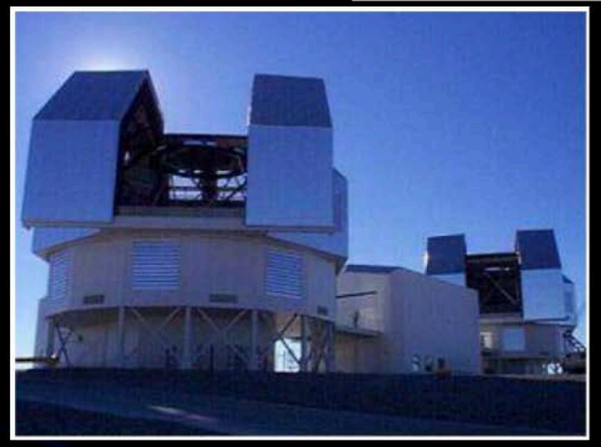


TABLE 1

GENERAL SPM-TWIN INSTRUMENT CONCEPT

	Wide-Field Telescope (WFT) (Modified Magellan/MMT)	Standard Field Telescope (SFT) (Updated Magellan/MMT)
Optimized for:	Wide-Integral-Field Spectroscopy	Multi-purpose Seeing-limited Visible-IR Astronomy and AO prepared
Field of view:	$\Phi \geq \sim 1.5^{\circ}$	$\Phi \sim 1.5'$ (seeing limited) $\Phi \sim 1'$ (with AO)
Operation Range:	Visible to NIR (0.32–1.8μm)	Visible to Mid-IR ($\sim 0.4 - 28\mu$m)
Spatial Resolutions	Seeing-limited (Narrow-Band imaging) $\sim 1'' - 3''$ Spaxel-limited sampling (Integral-Field Spectroscopy)	Seeing-limited (normal mode) Diffraction limited (AO mode)
Spectral Resolutions	$\sim$ 4000 (IF Spectroscopy) $\leq \sim$ 1000 (Tunable N-B imaging)	Wide range (science instrument suite)
1st Generation Instrumentation	a) Wide-Field & Atmospheric Dispersion Corrector system b) Deployable single-spaxel and Integral-Field units, coupled to a suit of spectrographs, for simultaneous full-range spectra spectra of thousands of objects c) Wide-Field Imager (Tunable Narrow-Band)	a) Secondary set (Nass/Cass/AO) b) High-Resolution Visible & Near-Infrared Spectrographs c) NIR/AO Science Instrument d) Mid-IR New-Generation Instrument Ready to accommodate: (i) Artificial-Star System & Adaptive secondary mirror (ii) Guest & Replicated Instruments

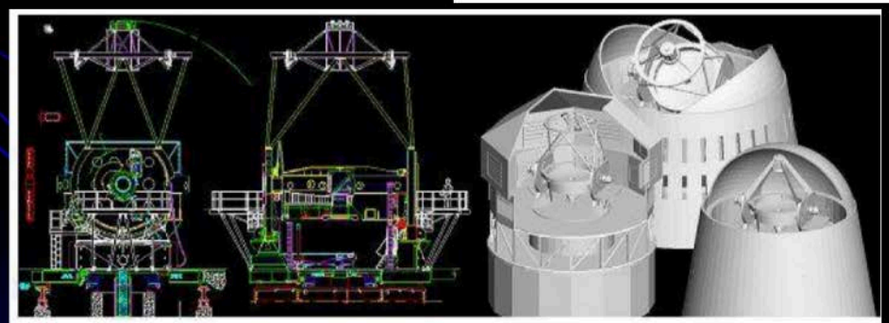
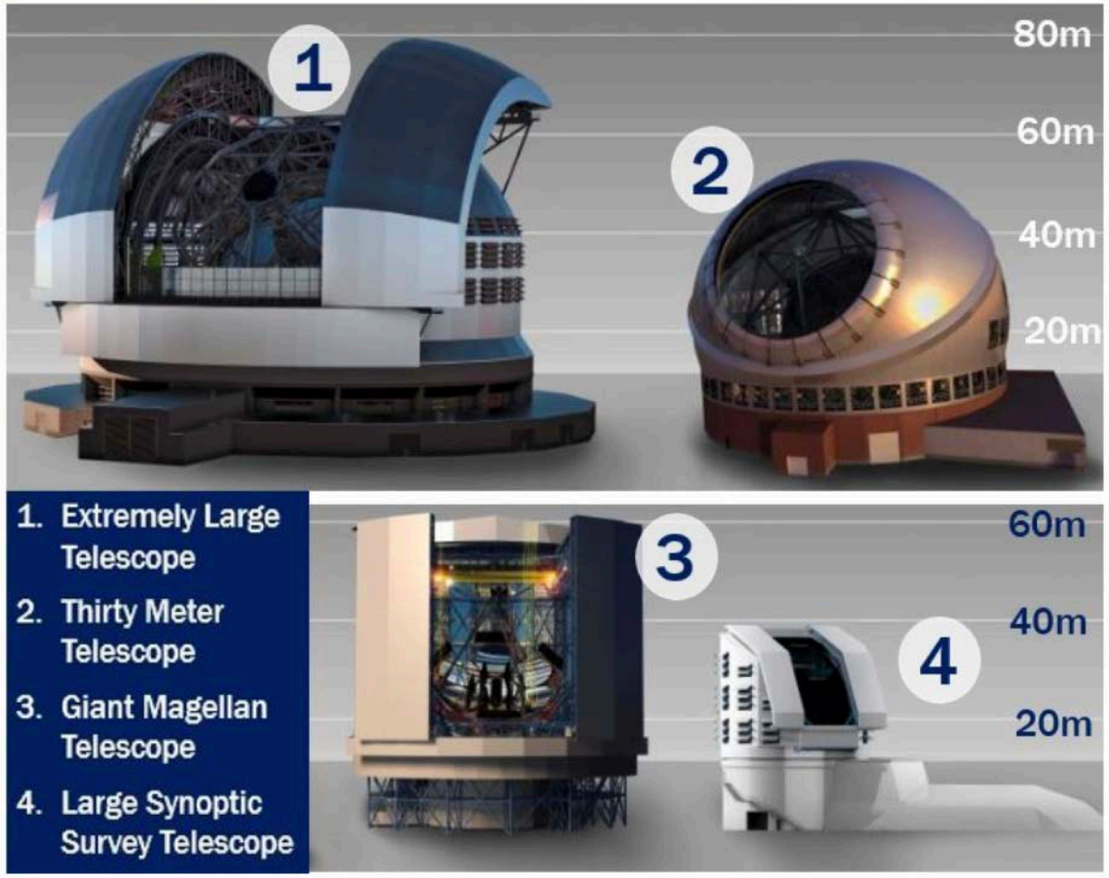


Fig. 6. Examples of detailed Magellan proprietary drawings and design updates. Some potential upgrades and optimizations are also shown: a higher building (for better seeing at SPM), wind-flow optimized dome, top-end of telescope optimizations for a wide-field secondary of WFT and low-emissivity SFT.



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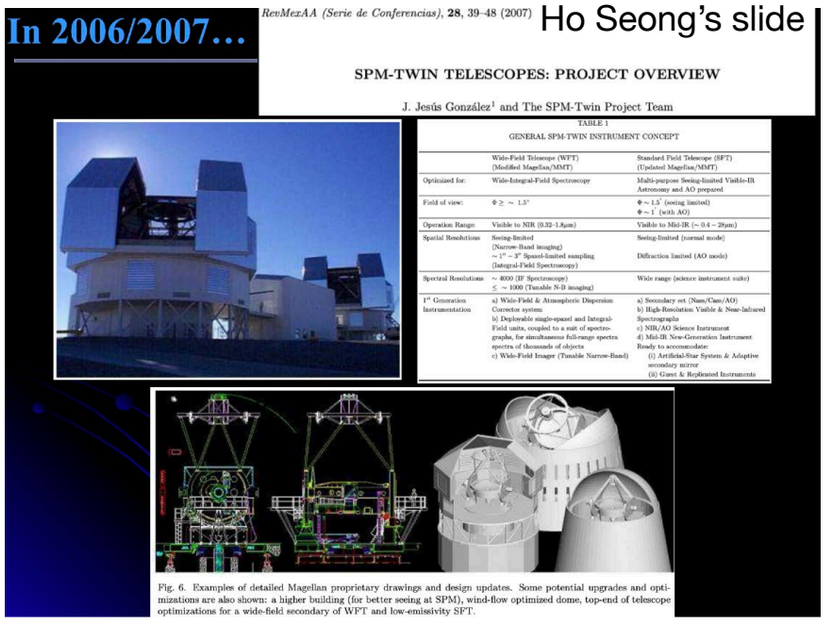
Technology secure
Own Instrument
Narrow + Wide field: Survey

Latest technology
Narrow field, but deeper
Fainter & More distant

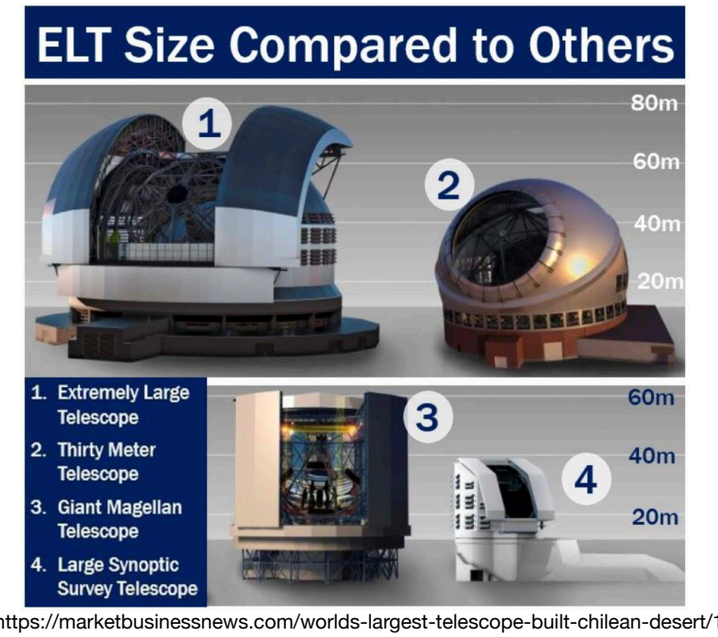
We have nothing yet!!!

But Now & Near Future

Our own telescope



Member of large telescope



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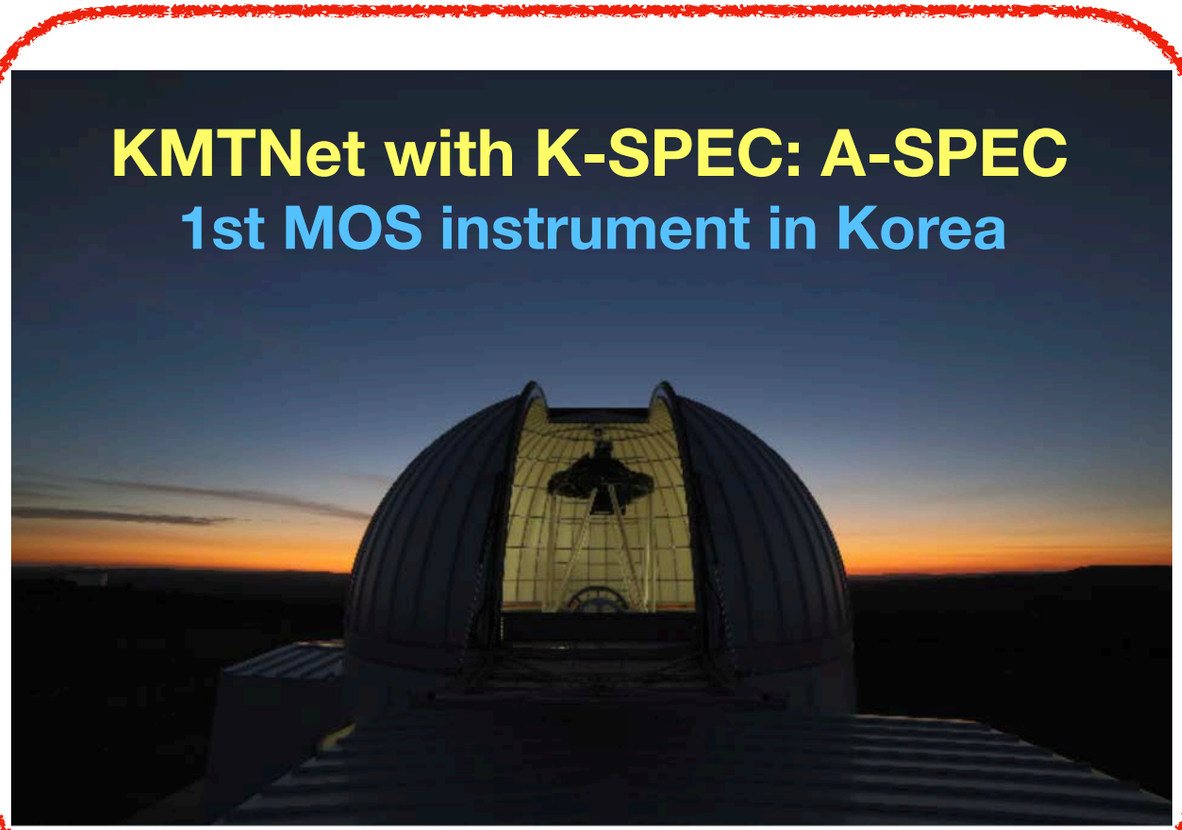


www.gmto.org

Why do we need a new survey?

Science cases demanded for the close universe

Galaxy Evolution & Galaxy Cluster

- Local superclusters and their members (with K-DRIFT)
- Construction of a complete catalog of galaxy clusters/groups
- Connection between BCG and host clusters
- Evolutionary stage of galaxy clusters from their environment
- Effect of cluster-cluster interaction on galaxy properties
- All-sky bright quasar survey

Cosmology

- Cosmic expansion history and dark energy
- Accurate measurement of local density for the Hubble parameter discrepancy
- Cosmological study with local galaxies
- Reconstruction of the local dark matter distribution
- Testing isotropy in the local universe

Stellar

- Nearby stars, halo stars & SPHEREx ice source
- Chemical linking of dynamical substructures and stellar stream in the MW
- Red supergiant stars in LMC & SMC

What we need is …

Spectra of sources
- redshift, spectral lines, etc

Large Volume
- wide sky coverage

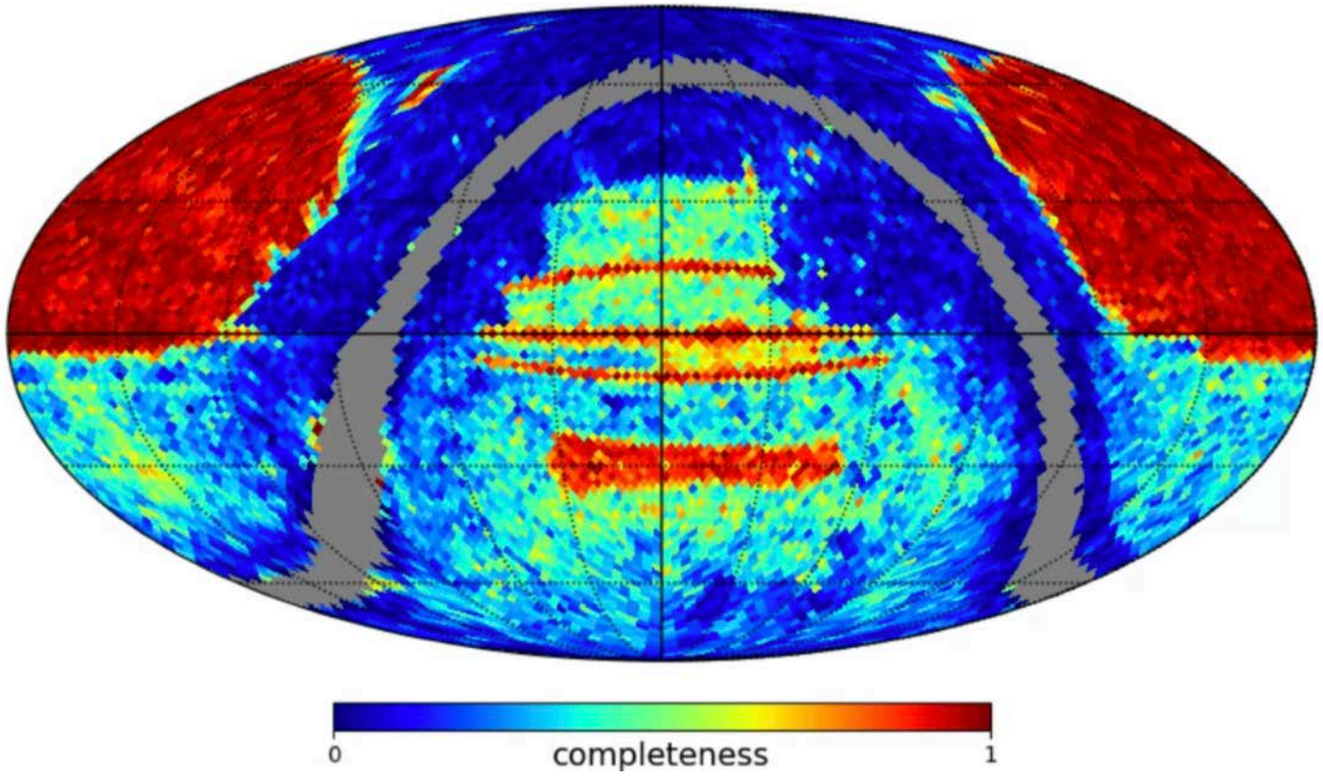
Complete

All-sky Redshift Survey
- Few all-sky surveys

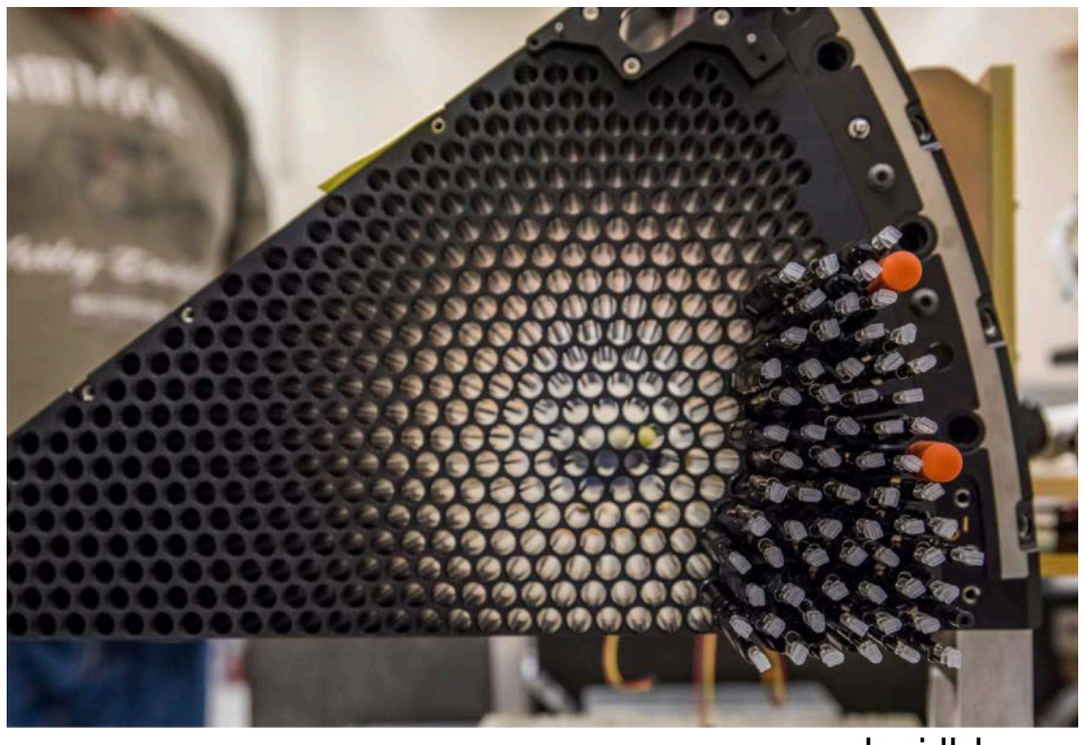
Multi-object spectroscopy
- Fibre fed spectrograph

Wide Field of View
- at least a few deg^2

New Instrument for the survey



Jong Chul's slide



www.desi.lbl.gov

What we need is …

Demanded requirement for the science cases

Item	Value
Redshift	z_{max}>0.1 (a large enough volume)
Magnitude limit	Ks<13.75 (a reliable volume limited sample)
Spectral Coverage	3700 - 7500 Å
Uncertainty of v_{rad}	< 50 km/s
Spectral Resolution	≳ 2000
Effective survey area	South: 23,230 deg^2 & North: 5,920 deg^2
Multiflexing power	≳ 19 galaxies/deg^2

Korea Microlensing Telescope Network

	Southern Hemisphere
Telescope	1.6m KMTNet @ SSO
Focal Plane	Prime Focus
Field-of-view	~6 deg^2
Effective survey area	23,230 deg^2
Target per pointing	150 **(fiber+fiducial=169)**
Sky sampling size	3 arcsec

➢ 팀 구성 (26 in total: 20 professors/staffs, 4 postdocs, 2 grad student)

➢ 천문연 (Project management: Planning, Manufacture, Science)

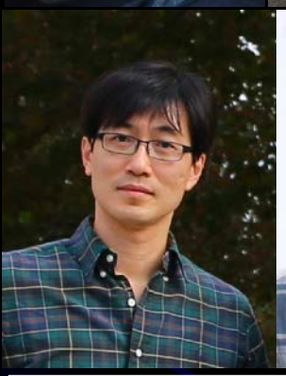
- ➢ Galaxy Evolution/Cosmology Group
  (Sang-Hyun Chun, Sungwook Hong, Minhee Hyun, Jongwan Ko, Jong Chul Lee, Jae-Woo Kim)
- ➢ GMT Science/Instrumentation Group
  (Kang-Min Kim, Moo Young Chun, Chan Park, Heeyoung Oh, Ho-Gyu Lee, UeeJeong Jeong)
- ➢ Technology Center for Astronomy and Space Science (Sungho Lee, Yunjong Kim)
- ➢ KMTNet Operation Group (Chung-Uk Lee, Yongseok Lee)

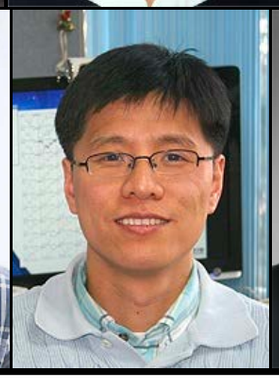


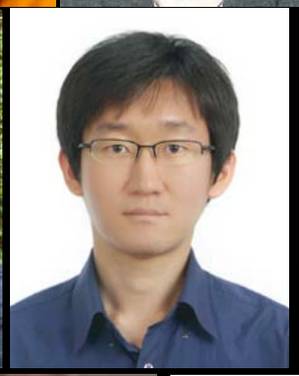









Kim, Dongguk

Lim, Hyun-Ho

➢ 국내

- ➢ KIAS (Planning, Science:
  Changbom Park, Junsup Shim, Yongmin Yoon)
- ➢ SNU (Management, Manufacture:
  Ho Seong Hwang, Dongguk Kim)
- ➢ CNU (Science: Hyunmi Song)
- ➢ Ajou (Fiber Positioner:
  Young-Man Choi, Hyun-Ho Lim)





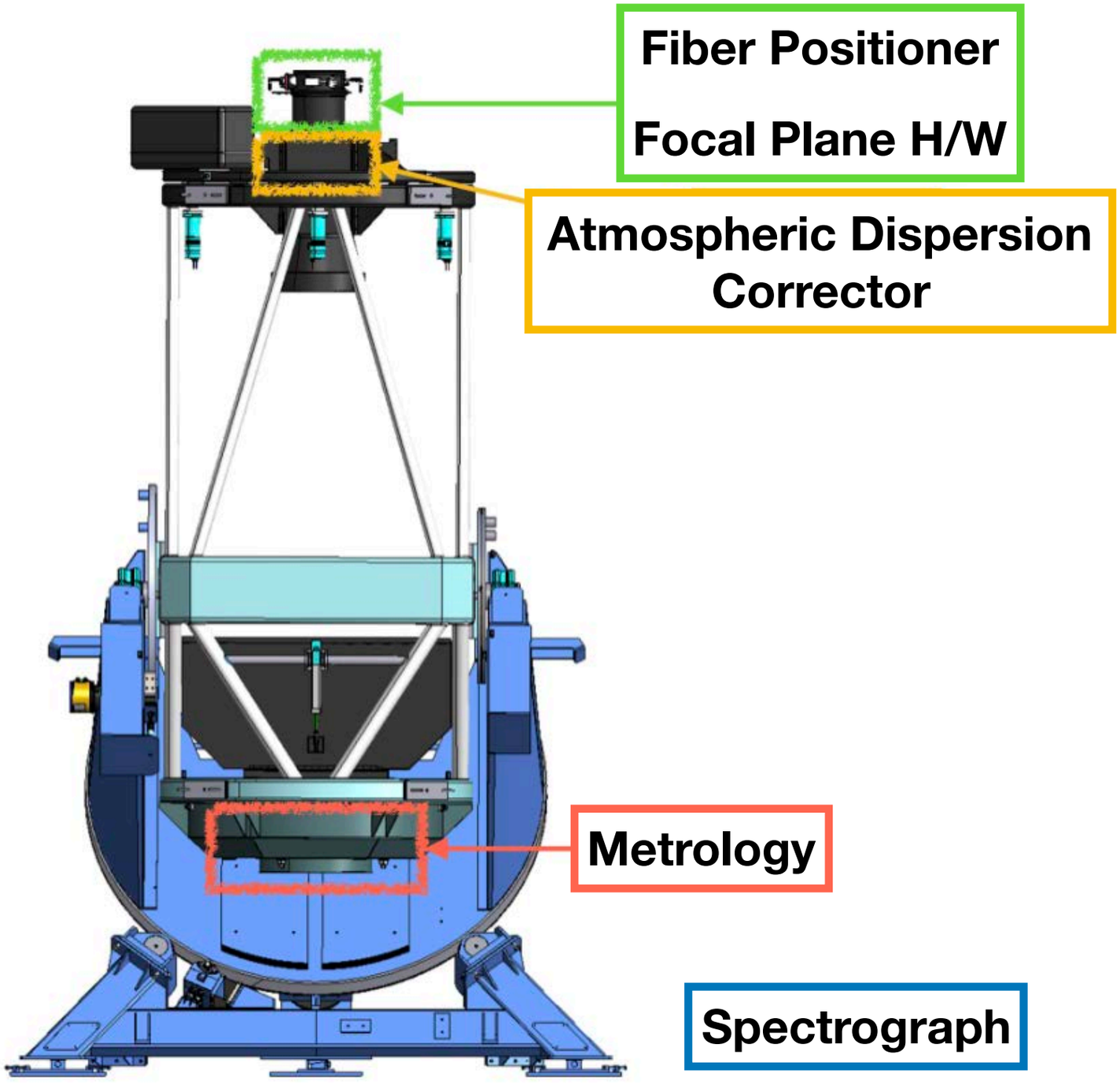


Ho Seong's slide

➢ 국외

- ➢ University of Arizona (MOS design: Haeun Chung)
- ➢ Penn State University (Science: Donghui Jeong)

Southern Sky with KMTNet



Commissioning with KMTNet
Dec., 2023 - Feb., 2024

Full operation with KMTNet
Nov., 2024

Work for KMTNet

1. Fiber Positioner
2. Fiber Cable Management
3. Wide Field Corrector
4. Spectrograph
5. Focal Plane H/W
6. Plate & Cage for Focal Plane H/W
7. Electronics, Power & Thermal
8. Metrology system
9. Interface Control System
10. Data Management
11. Instrument Storage
12. Delivery & Installation
13. Survey Plan
14. Science Cases

Summary

K-SPEC

- 1st MOS Instrument in Korea
- Allowing us to perform the 1st spectroscopic survey

A-SPEC

- 1st all-sky spectroscopic mapping performed by Korean institutes
- Allowing us to study interesting topics from stellar objects to cosmology

First light in 2024 with KMTNet @ SSO

Huge synergy between KASI, KIAS & SNU

Development of multi-fibre spectrograph with AAO-Macquarie

Hope to show wonderful results here again