The Taipan galaxy survey

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Australian Government
Australian Research Council
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Taipan →

- **deadly Aussie snake**
- **astronomical instrument**
- **galaxy survey**

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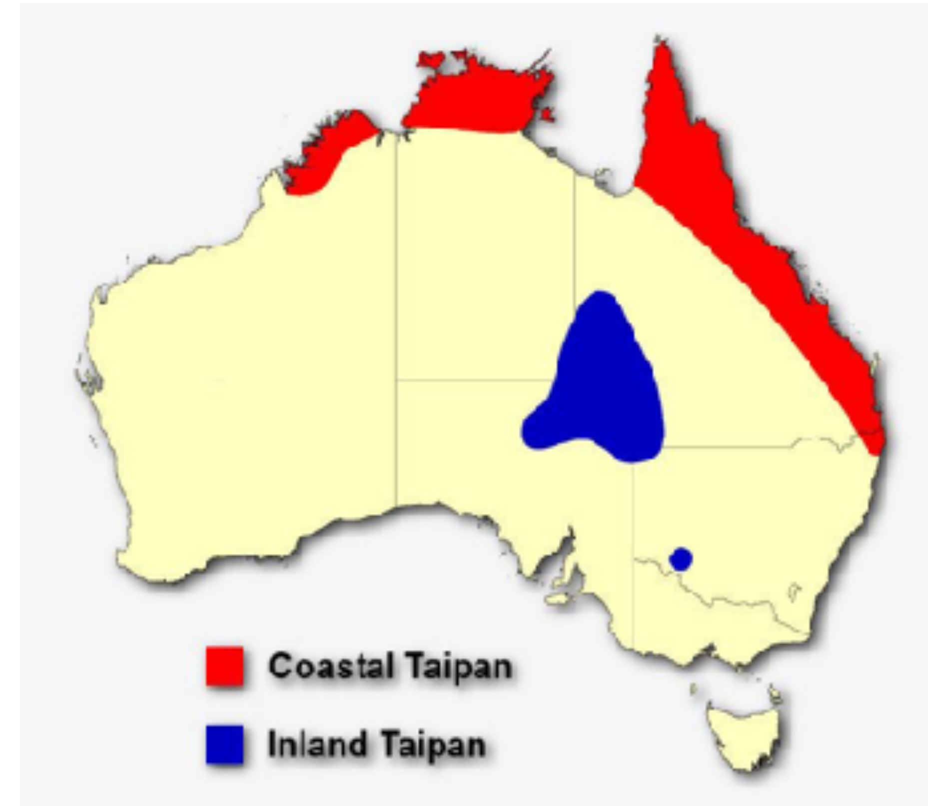


Various species' mice and estimated human fatality count based on maximum venom dose

Species	LD_{50} SC	Dose	Mice	Humans
Inland taipan (*O. microlepidotus*)	0.01 mg/kg[6]	110 mg[7]	1,085,000	289
Forest cobra (*N. melanoleuca*)	0.225 mg/kg[6][8]	1102 mg[9]	244,889	65
Eastern brown snake (*P. textilis*)	0.03 mg/kg[6]	155 mg[9]	212,329	58
Coastal taipan (*O. s. scutellatus*)	0.106 mg/kg[6]	400 mg[7]	208,019	56
Caspian cobra (*N. oxiana*)	0.18 mg/kg[10]	590 mg[11]	162,165	42
Black mamba (*D. polylepis*)	0.28 mg/kg[12]	400 mg[13]		
Russell's viper (*D. russelli*)	0.162 mg/kg[6]	268 mg[14]	88,211	22
King cobra (*O. hannah*)	1.09 mg/kg[6]	1000 mg[15]	45,830	11
Indian cobra (*N. naja*)	0.80 mg/kg[16]	610 mg[12]	33,689	10
Cape cobra (*N. nivea*)	0.4 mg/kg[6]	250 mg[17]	31,250	9
Terciopelo (*B. asper*)	3.1 mg/kg[6]	1530 mg[18]	24,380	6
Gaboon viper (*B. gabonica*)	5 mg/kg[6]	2400 mg[14]	24,000	6
Saw-scaled viper (*E. carinatus*)	0.151 mg/kg[6]	72 mg[19]	23,841	6

(from Wikipedia)

The TAIPAN instrument

FOV diameter	6 deg
number of fibres	150 (300 planned from 2019 onwards)
fibre diameter	3.3 arcsec
resolving power	1960 = 65 km/s (blue) 2740 = 46 km/s (red)
wavelength range	370 to 870 nm
reconfiguration time	<5 minutes

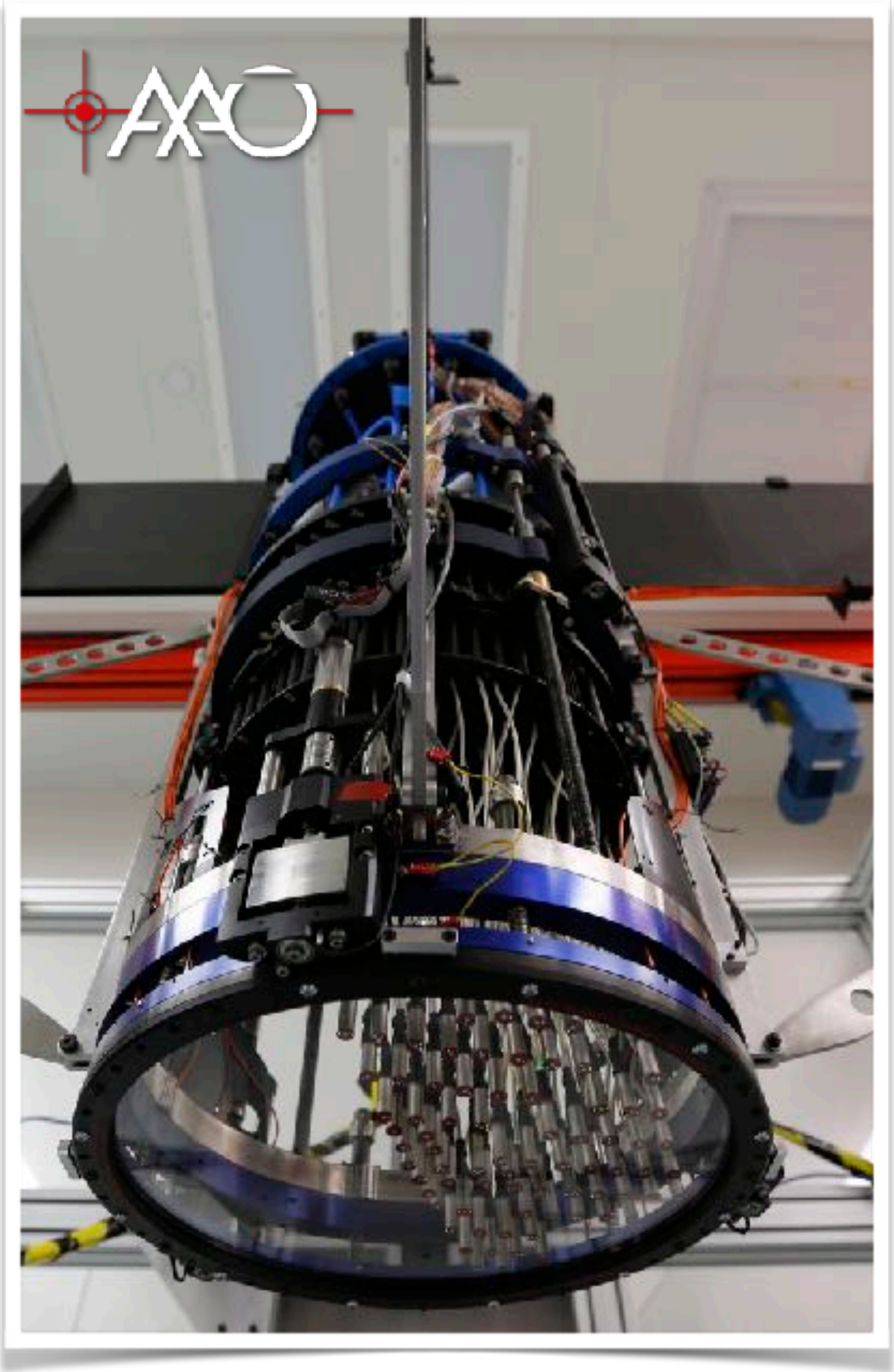
Galaxy survey

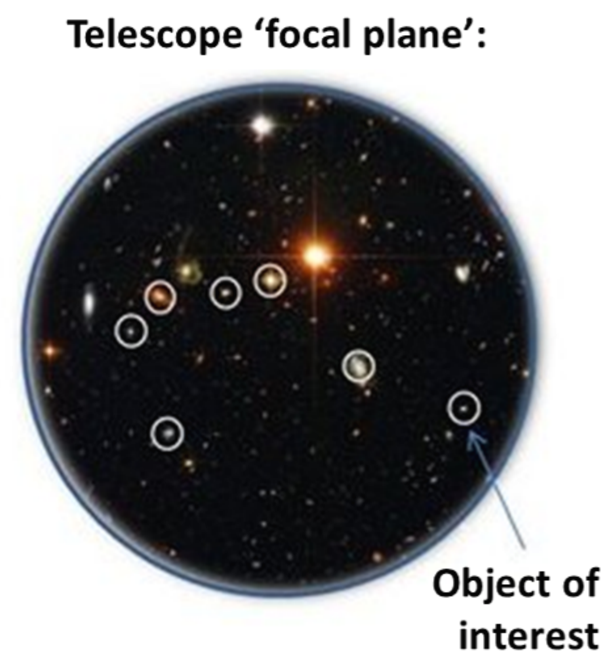
taipan-survey.org

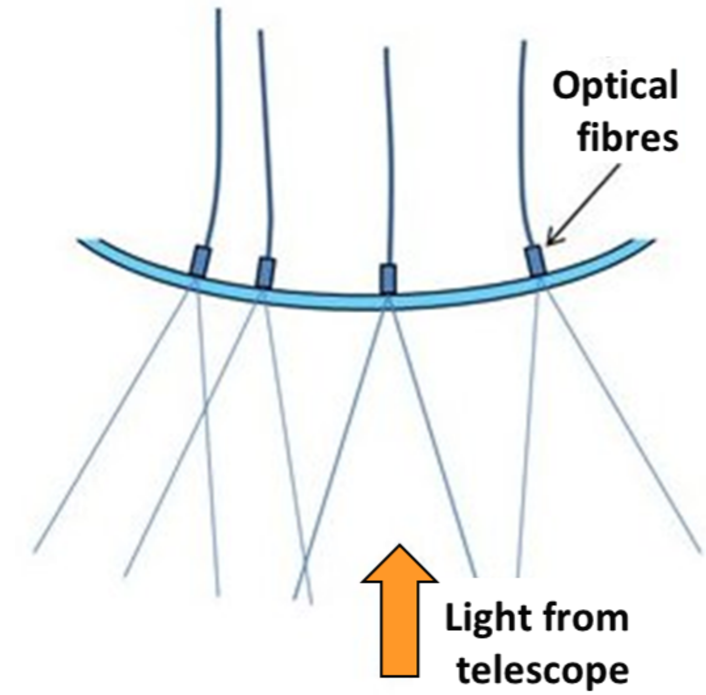
Stellar survey

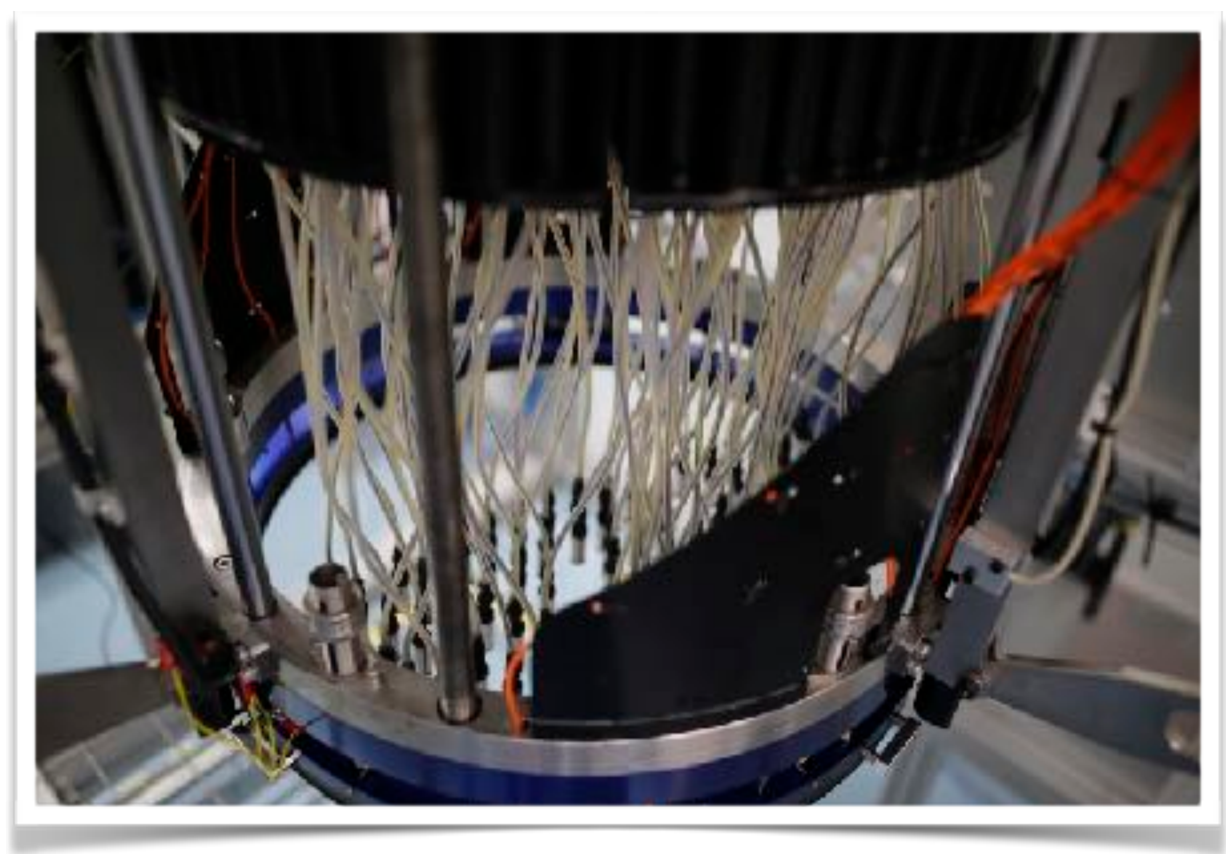
funnel-web.wikispaces.com

Starbug positioners

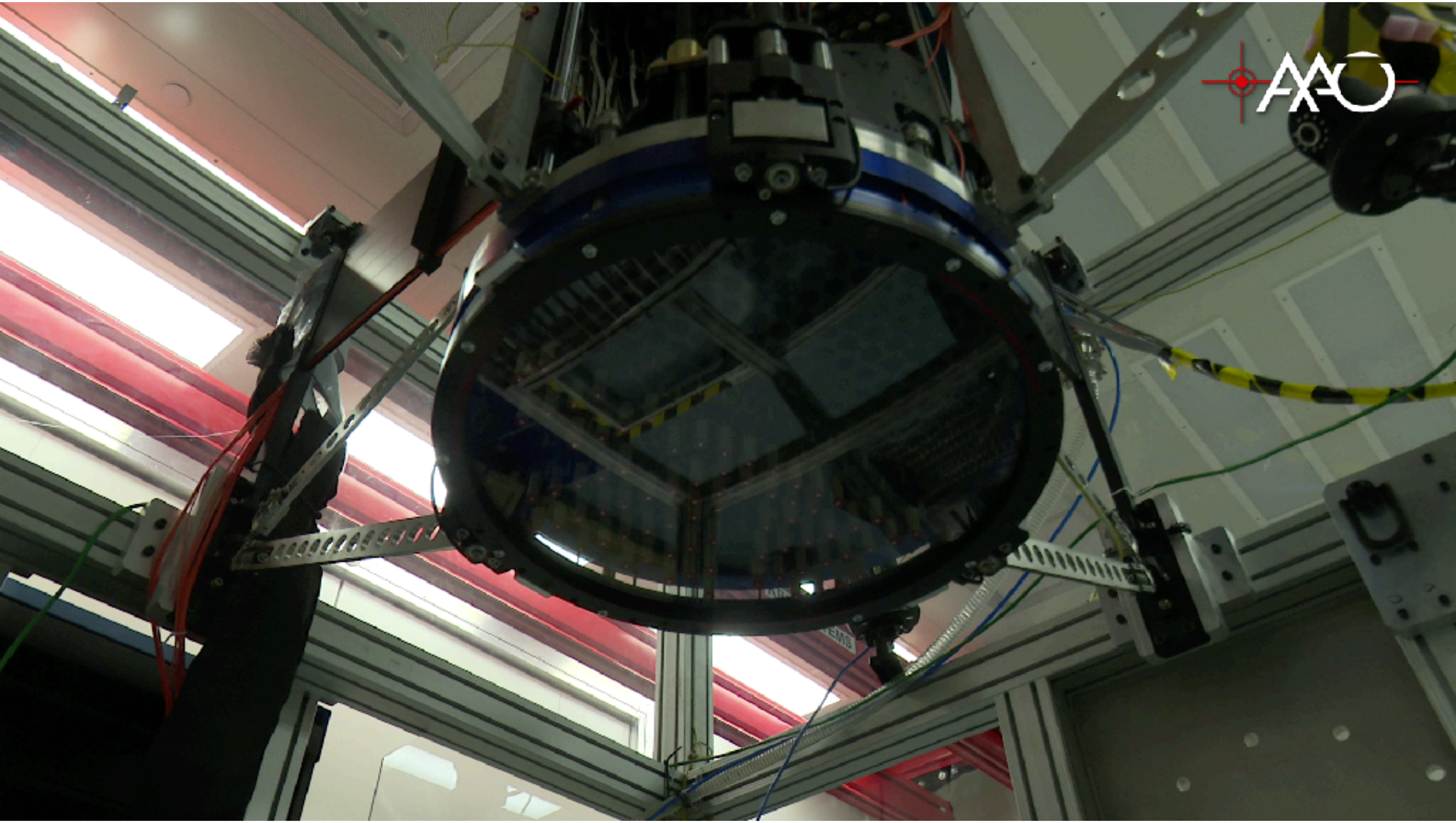








Starbugs being deployed onto the glass field plate



Credit: *Kyler Kuehn (AAO)*

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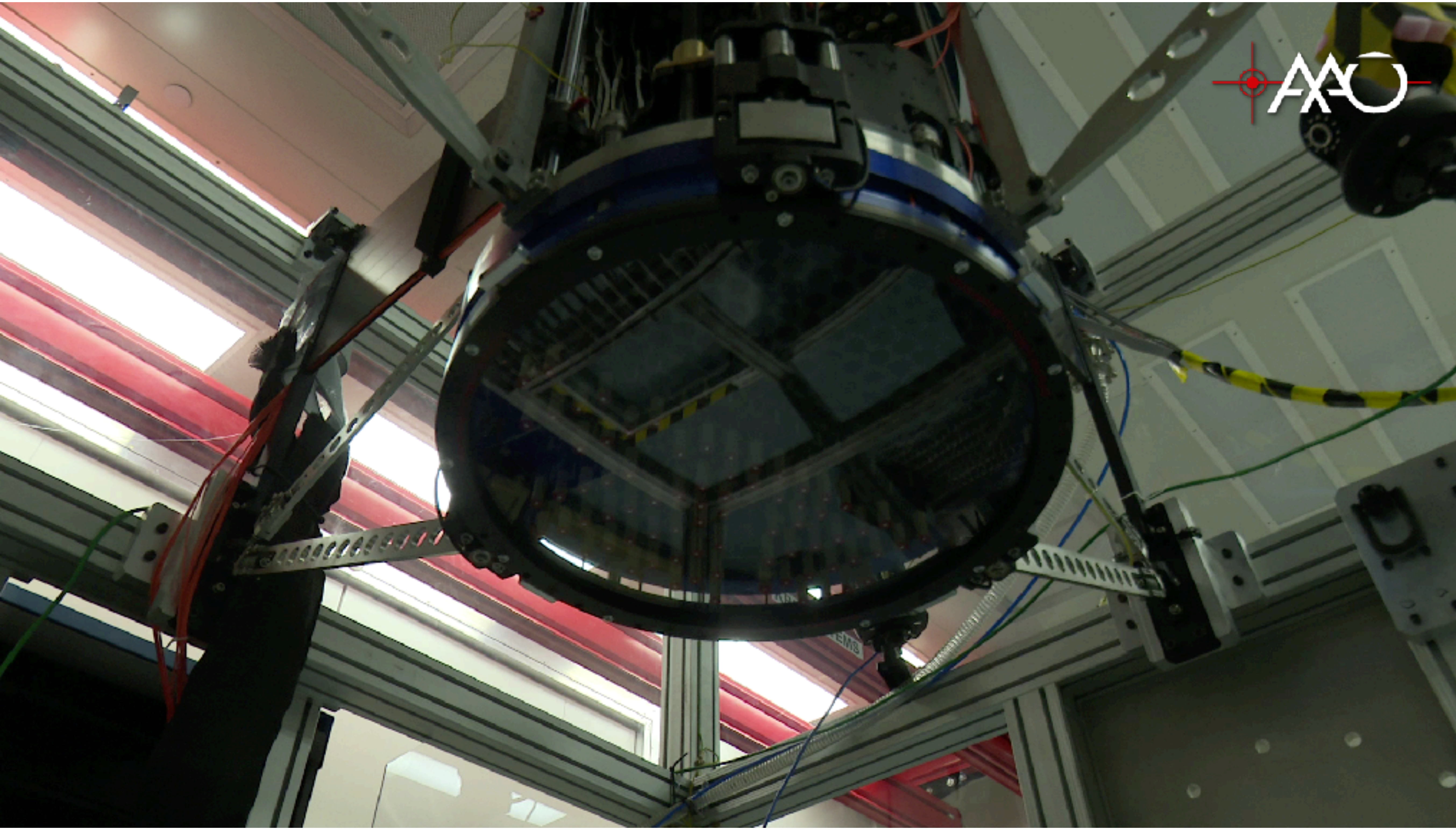

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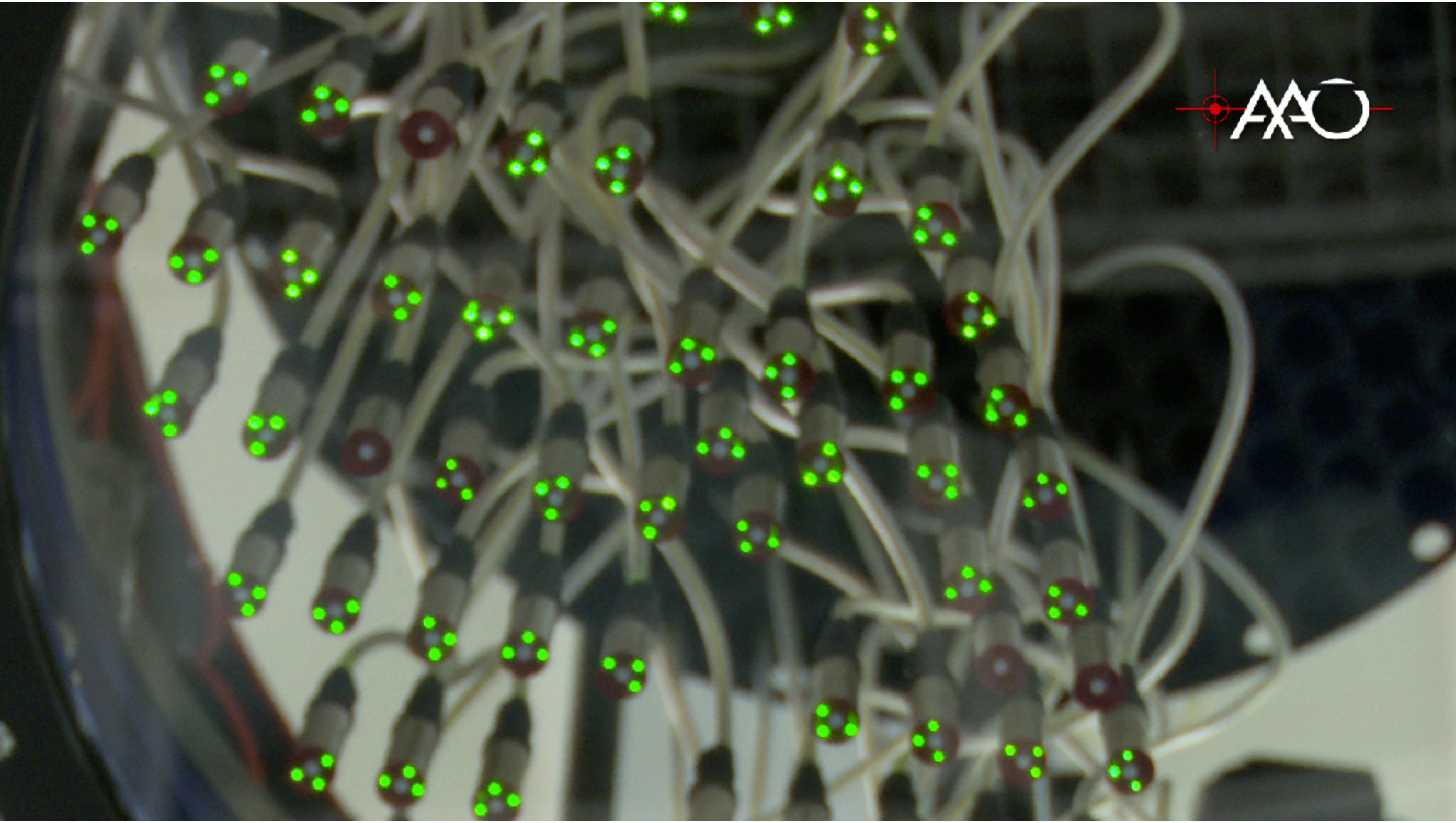
Starbugs moving onto target positions (with metrology LEDs on)



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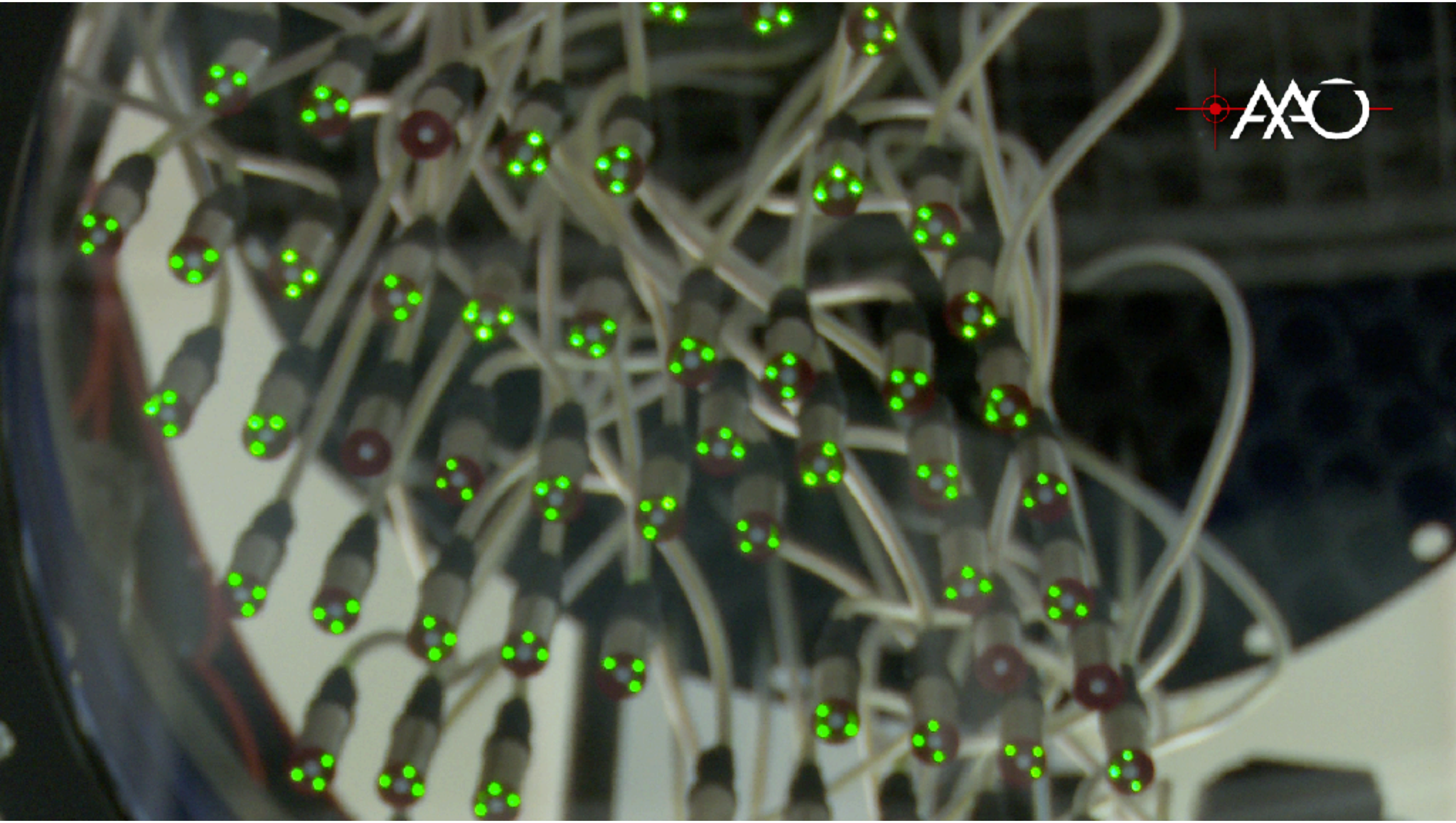

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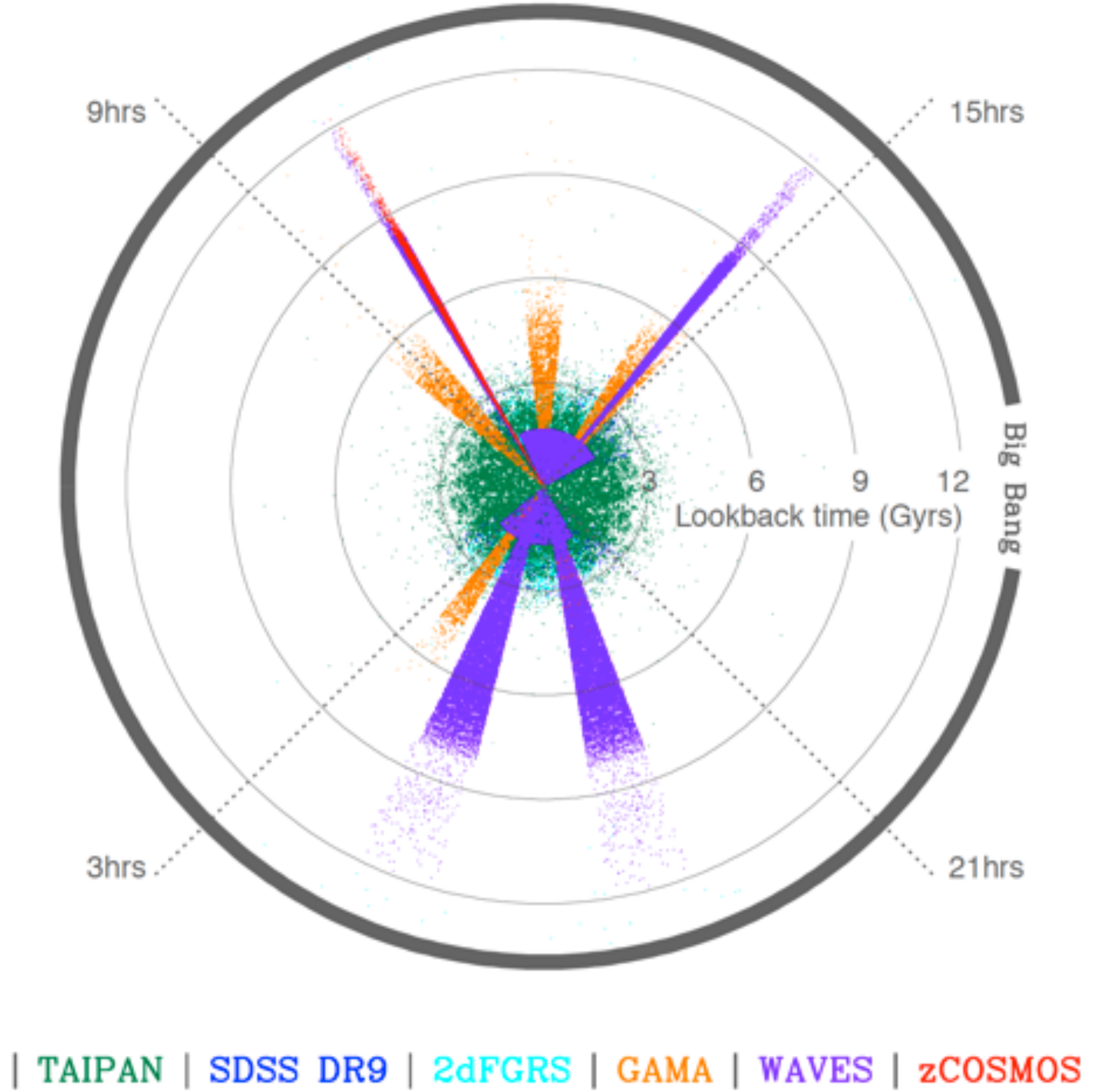
The Taipan galaxy survey: basics



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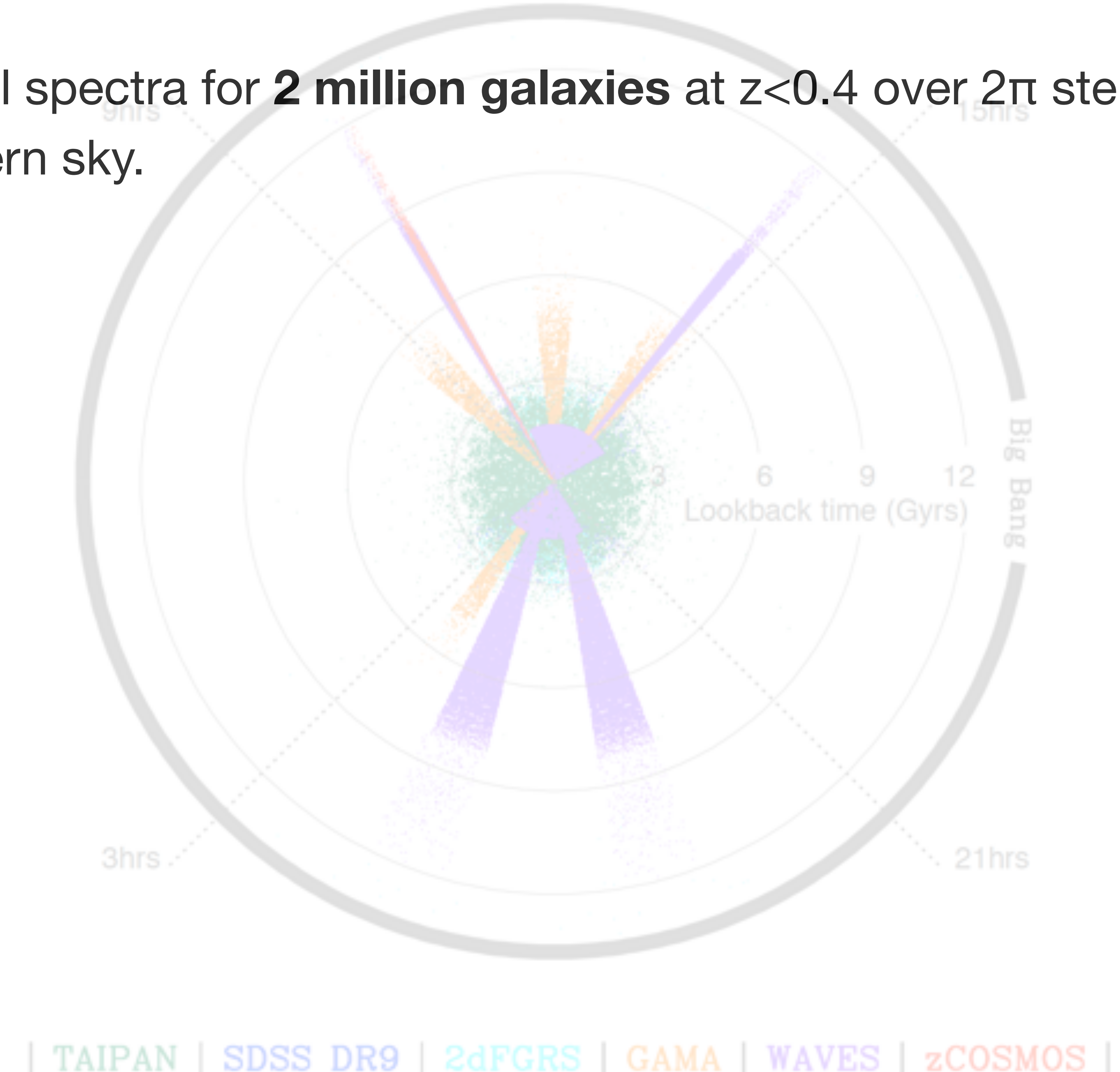
The Taipan galaxy survey: basics

- Optical spectra for **2 million galaxies** at z<0.4 over 2π steradians in the southern sky.



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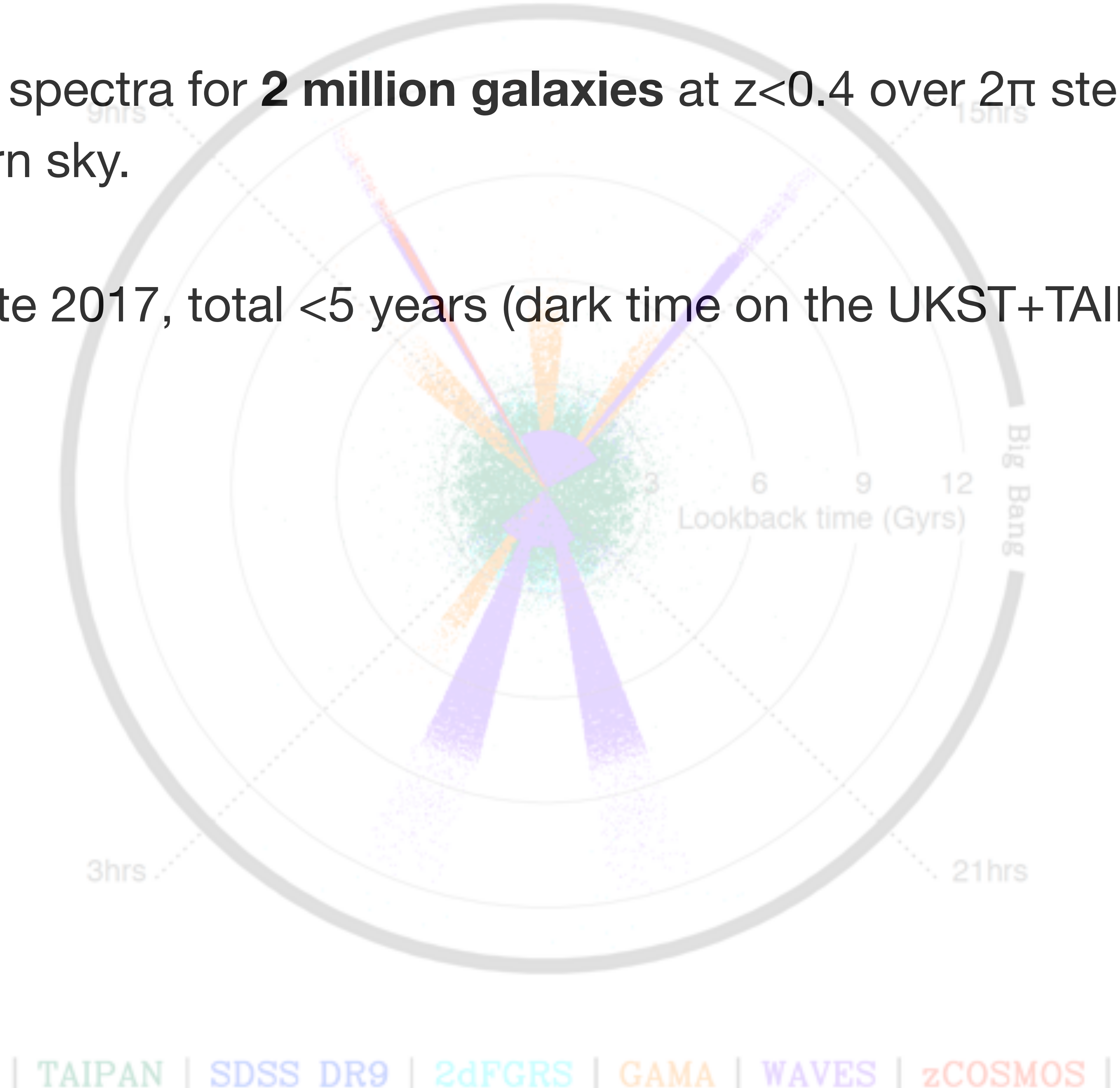

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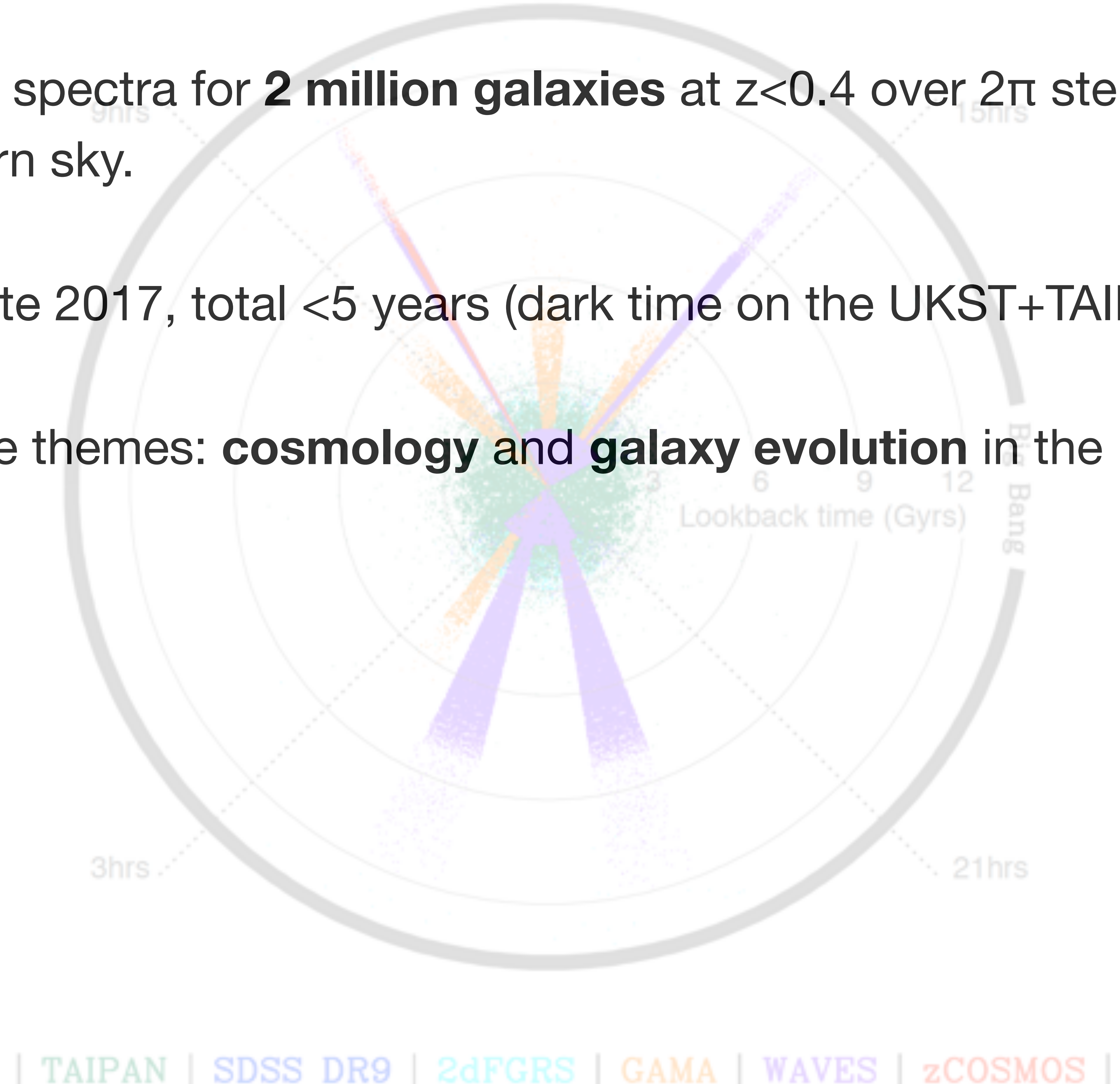

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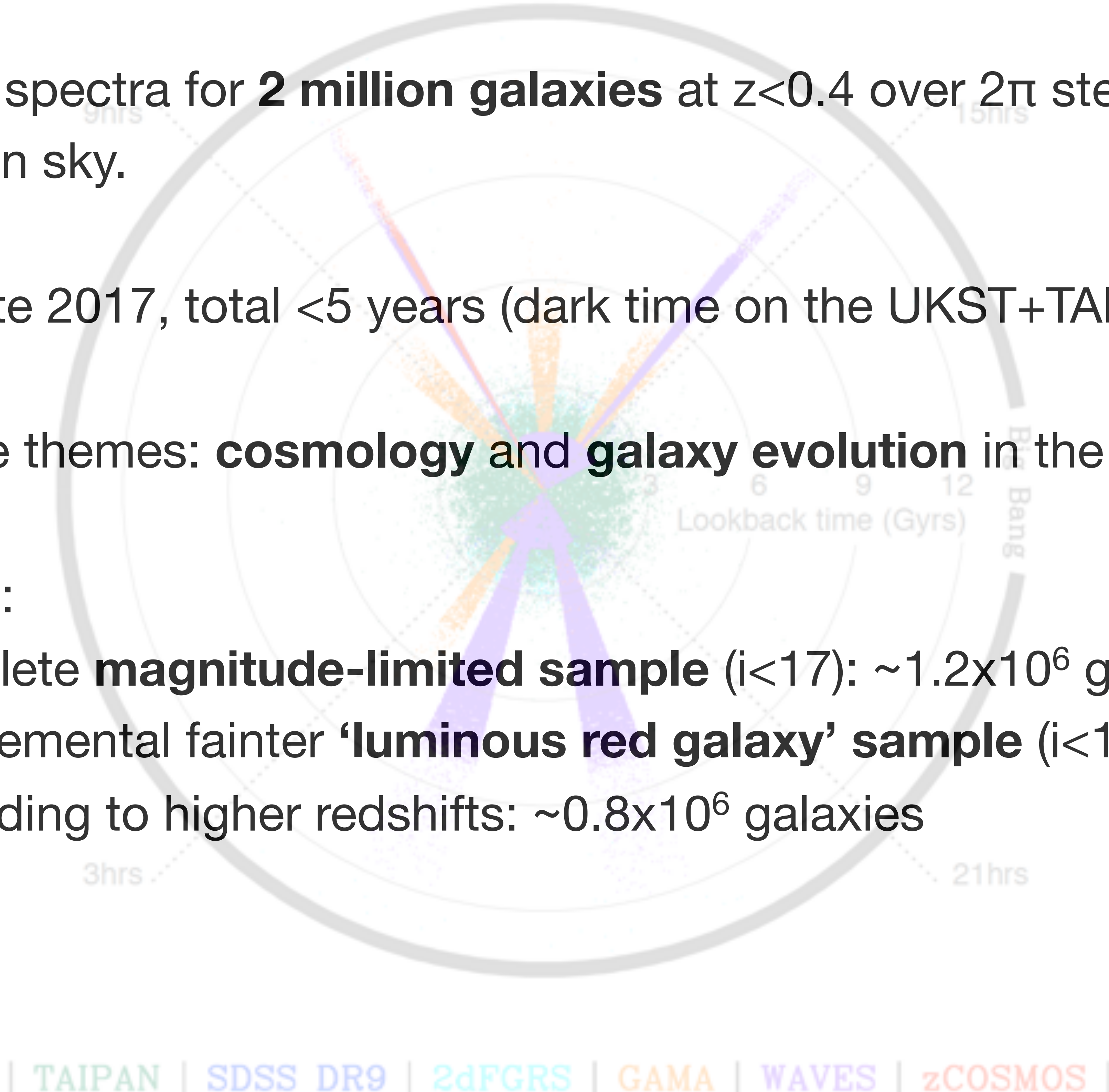

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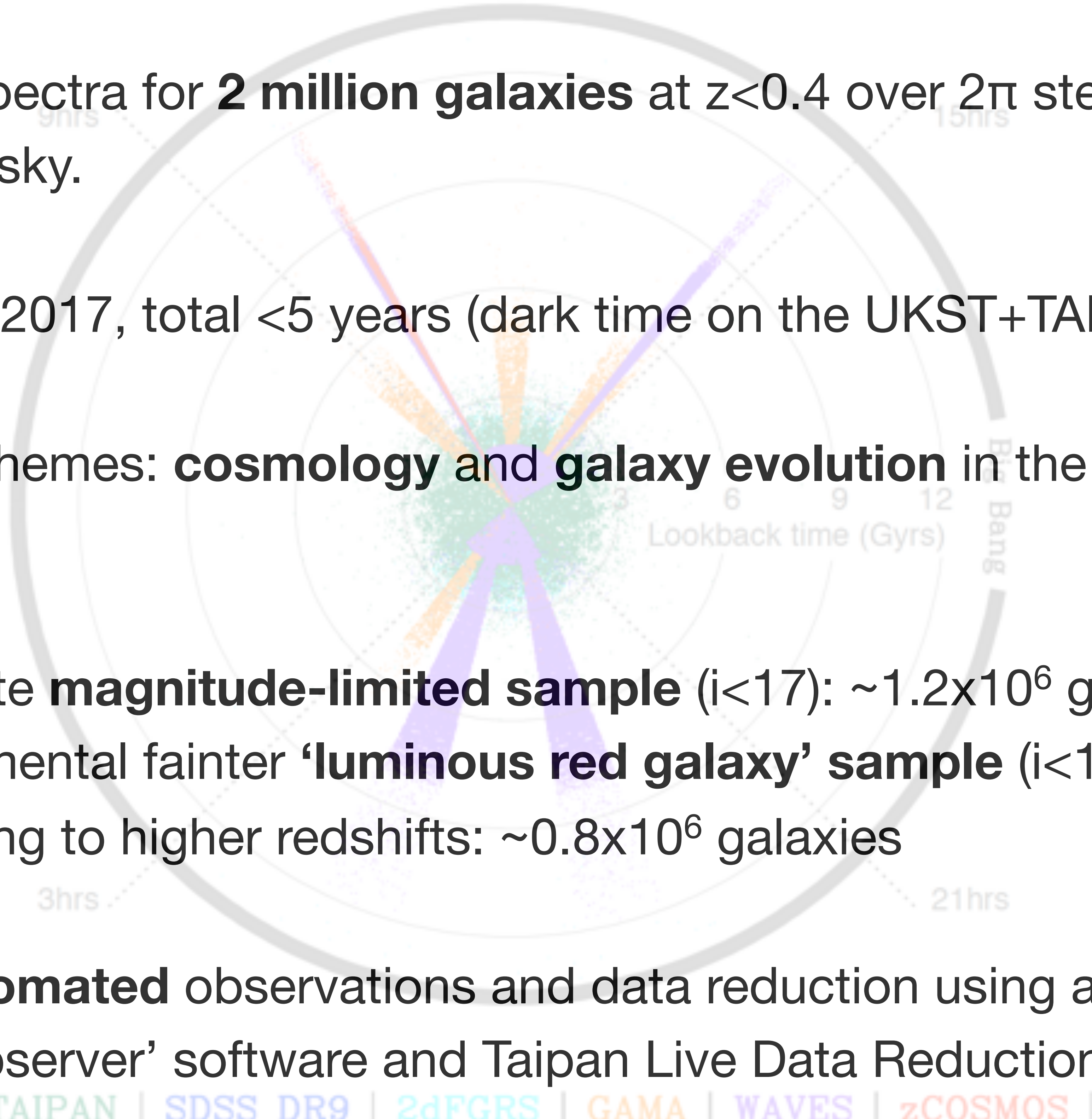
- **Fully automated** observations and data reduction using a purpose-built 'virtual observer' software and Taipan Live Data Reduction (TLDR) pipeline.



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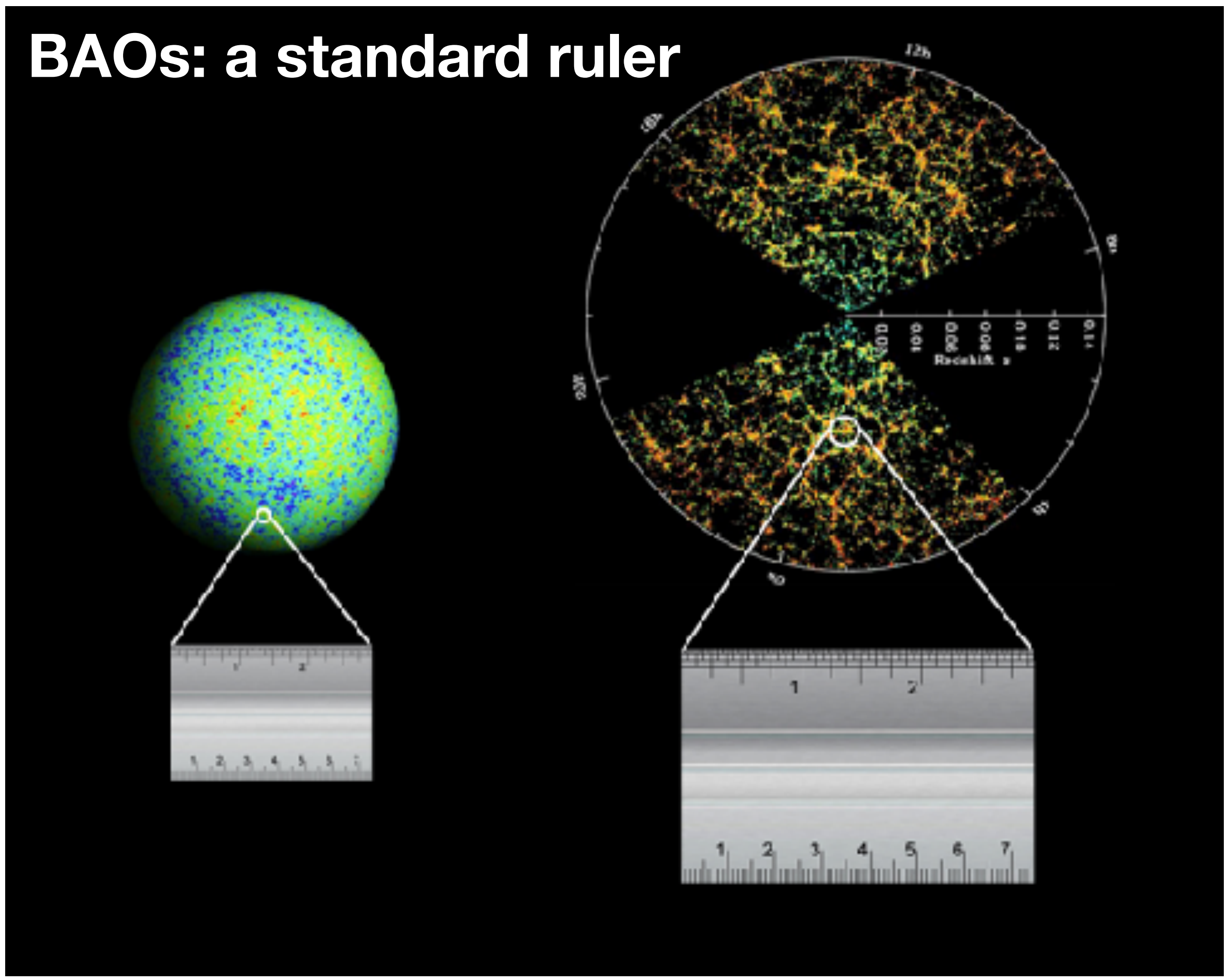
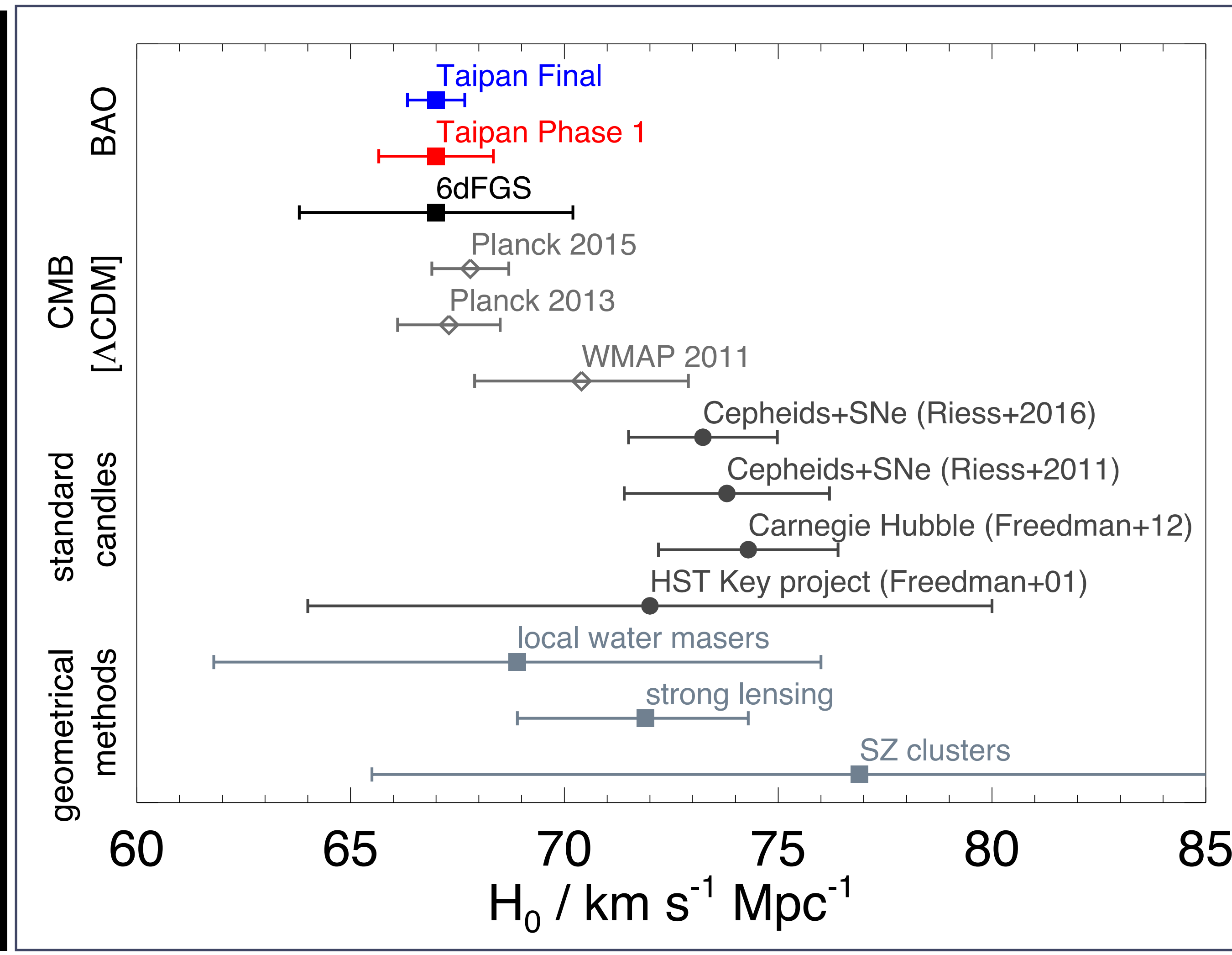
Goal I: local Hubble parameter

Measure the ***distance scale of the Universe*** (primarily governed by H_0) to 1% precision, using baryonic acoustic oscillations (BAOs).

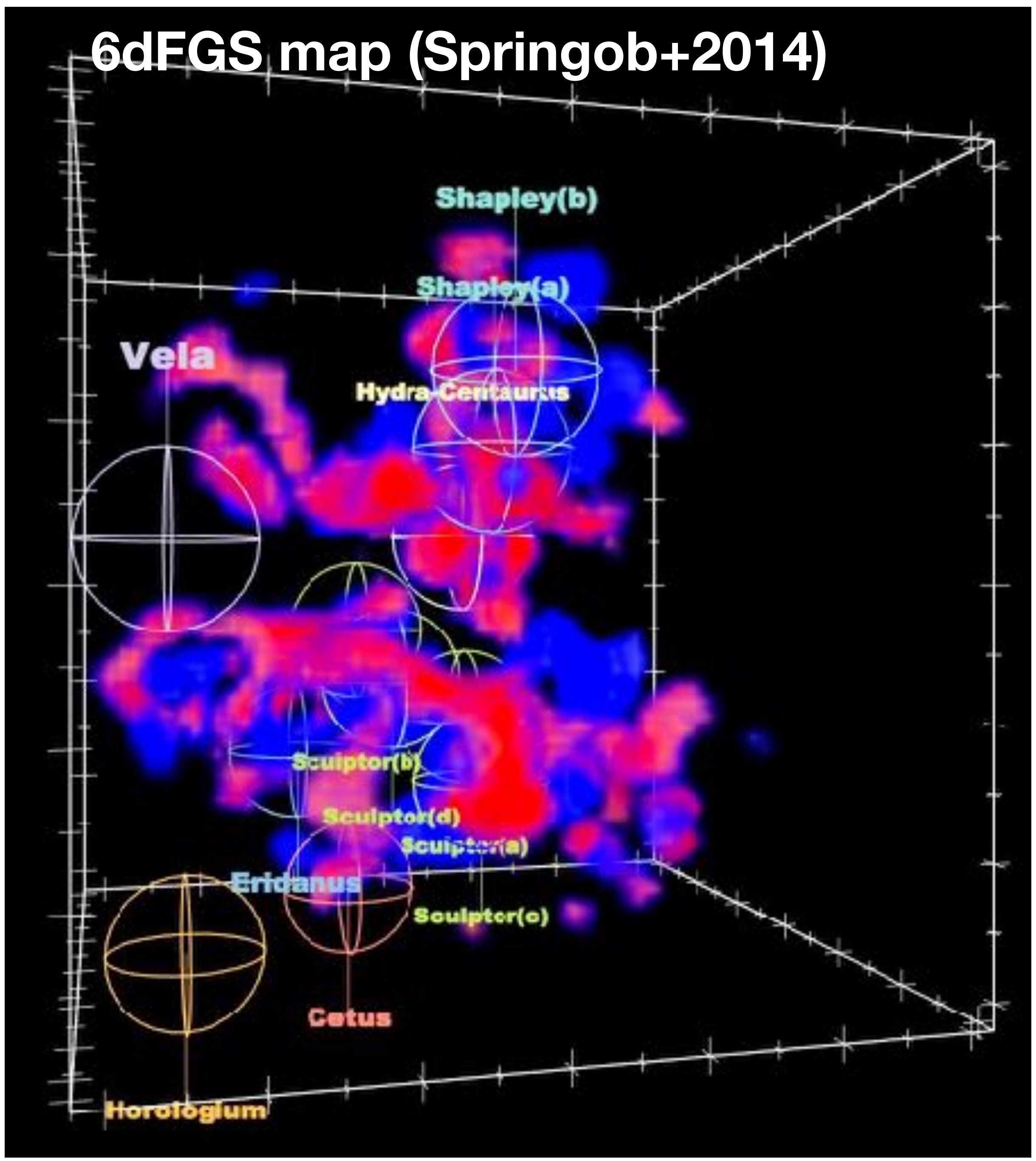


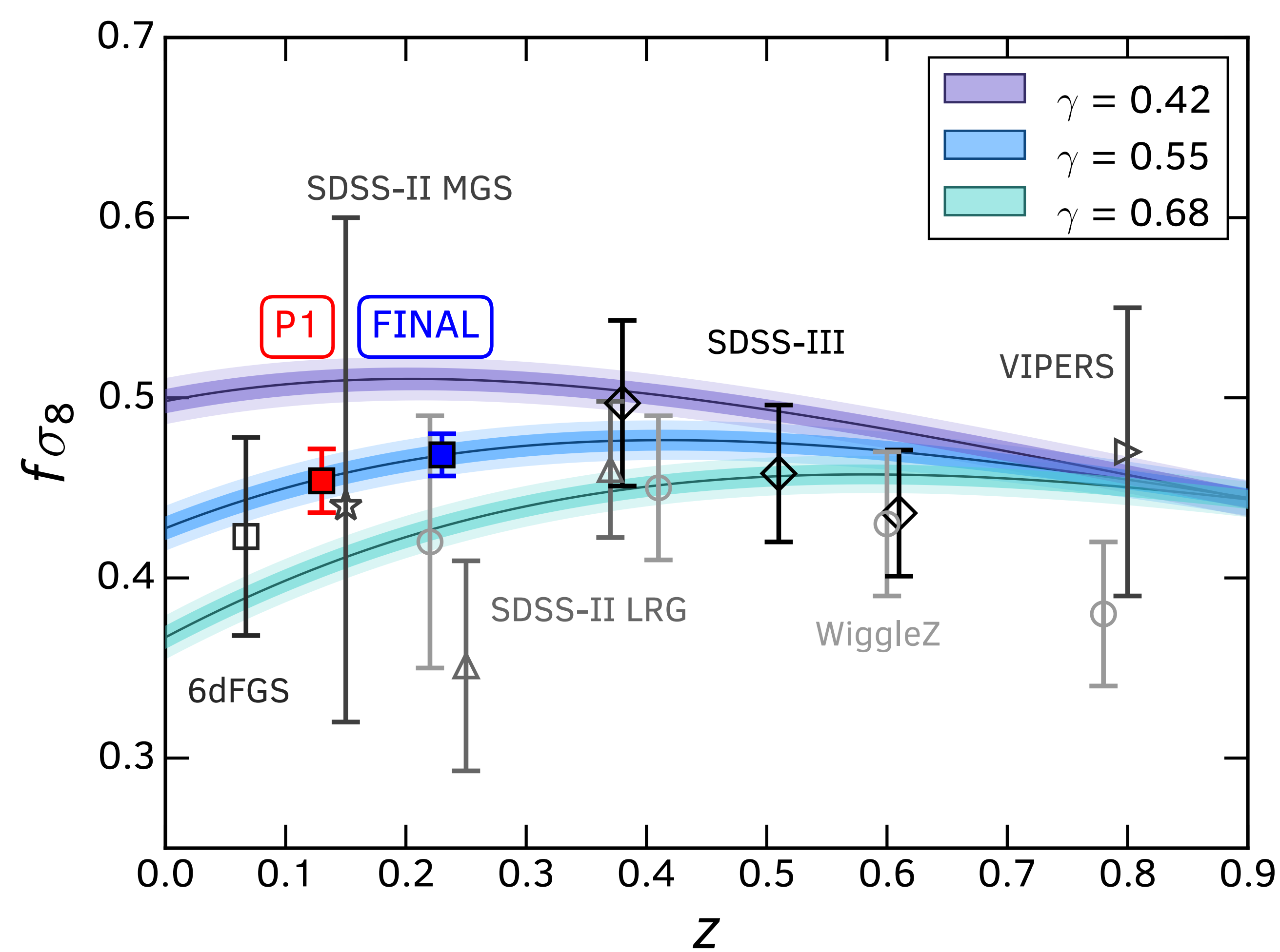


➡ Test of ΛCDM cosmology; nature of dark energy

Goal II: local density field and motions

Measure the ***growth rate of structure*** to 5% precision, using peculiar velocities and redshift-space distortions (RSDs).





➡ Test of General Relativity

Goal III: legacy sample for galaxy evolution

Galaxy evolution as a function of baryonic mass and environment.

- what determines star formation efficiency in galaxies? (environment, gas supply)
- why and how does star formation get quenched? (AGN, environment?)
- what are the connections between star formation history and different ISM phases? (metal/dust production, gas accretion, feedback processes etc)

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advantages over SDSS:

- not limited by fibre collisions (multiple field visits) → ***environment***
- overlap with ASKAP-WALLABY → ***gas content***

advantage over GAMA:

- large volume (low z) → track the evolution ***objects in transition*** as a function of mass and environment

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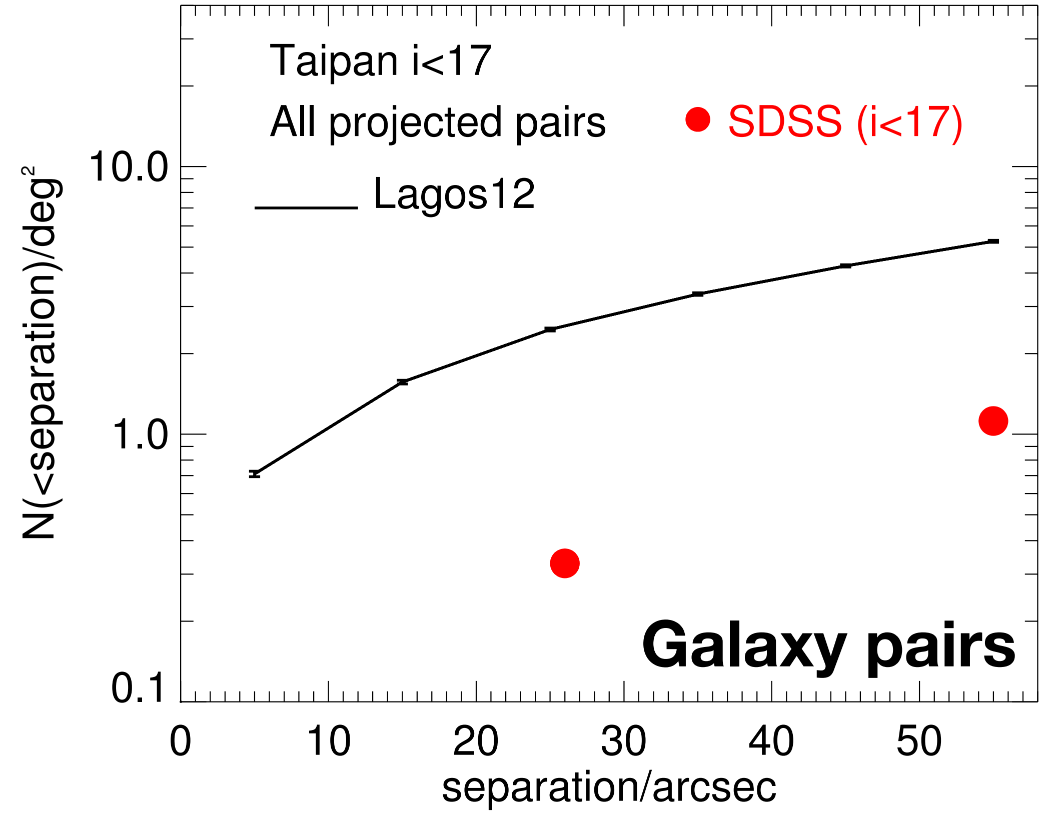
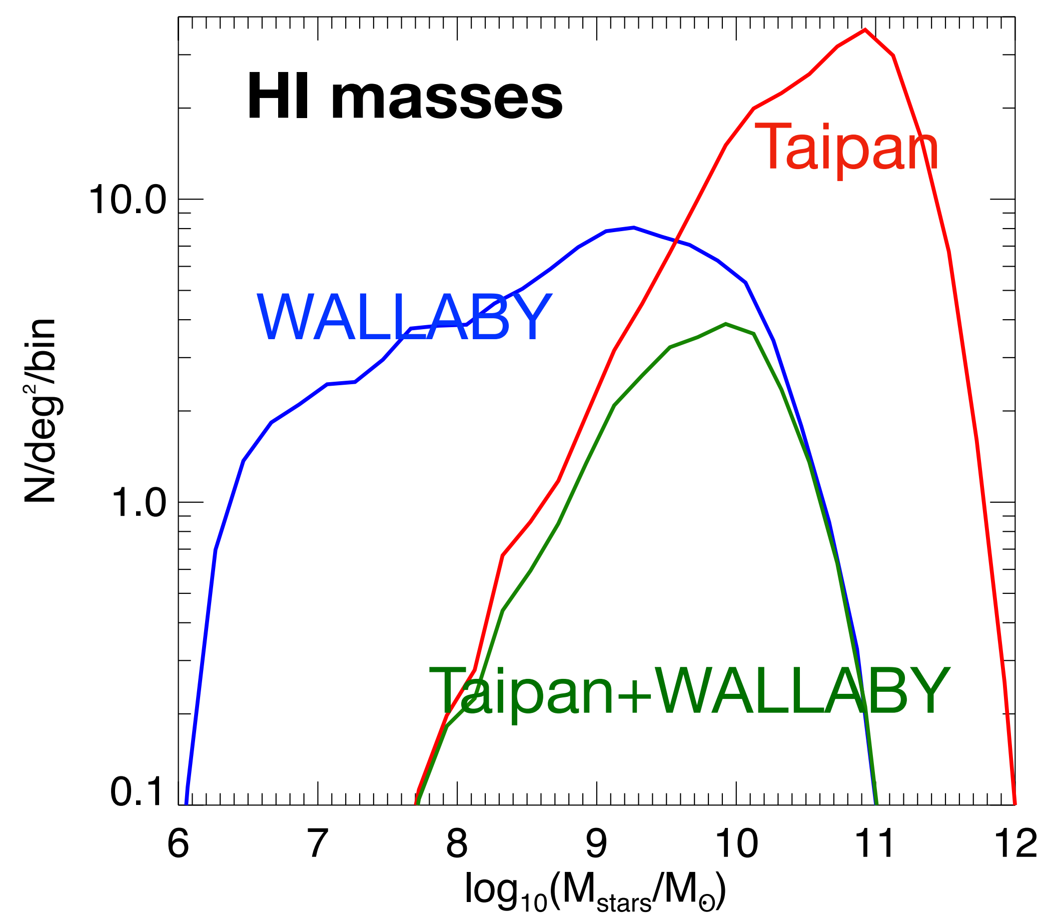
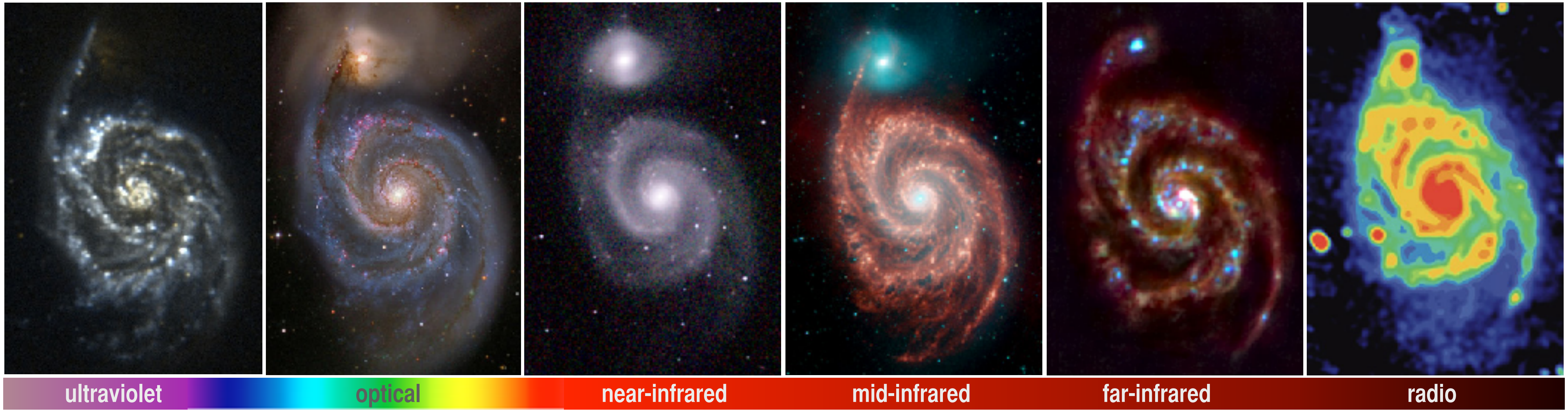
WALLABY EMU Taipan





All-Sky Ancillary Data in the Southern Sky



eRosita (X-rays; all-sky, planned)

GALEX (UV; public data but coverage not optimal)

SkyMapper (optical; ongoing)

VISTA VHS (near-infrared)

2MASS (near-infrared; public data, but shallow)

WISE (mid-infrared; all sky)

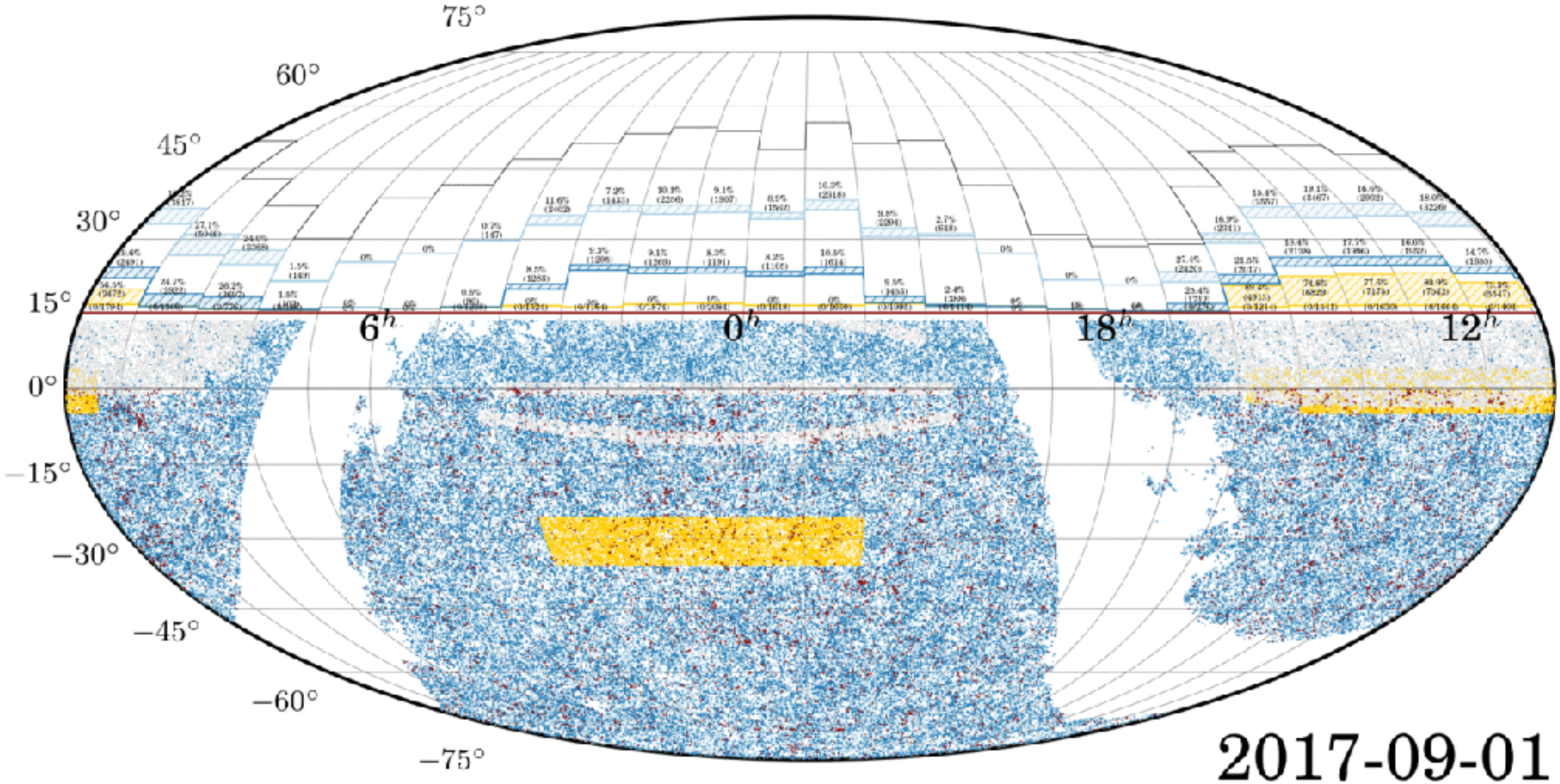
Herschel (far-infrared/submm; H-ATLAS, large area but not all sky)

ALMA (submm; future follow-up?)

WALLABY (radio HI line)

EMU (radio continuum)

Simulating the survey (Phase 1 - 2018)



Credit: Ned Taylor (Swinburne) & Marc White (ANU)

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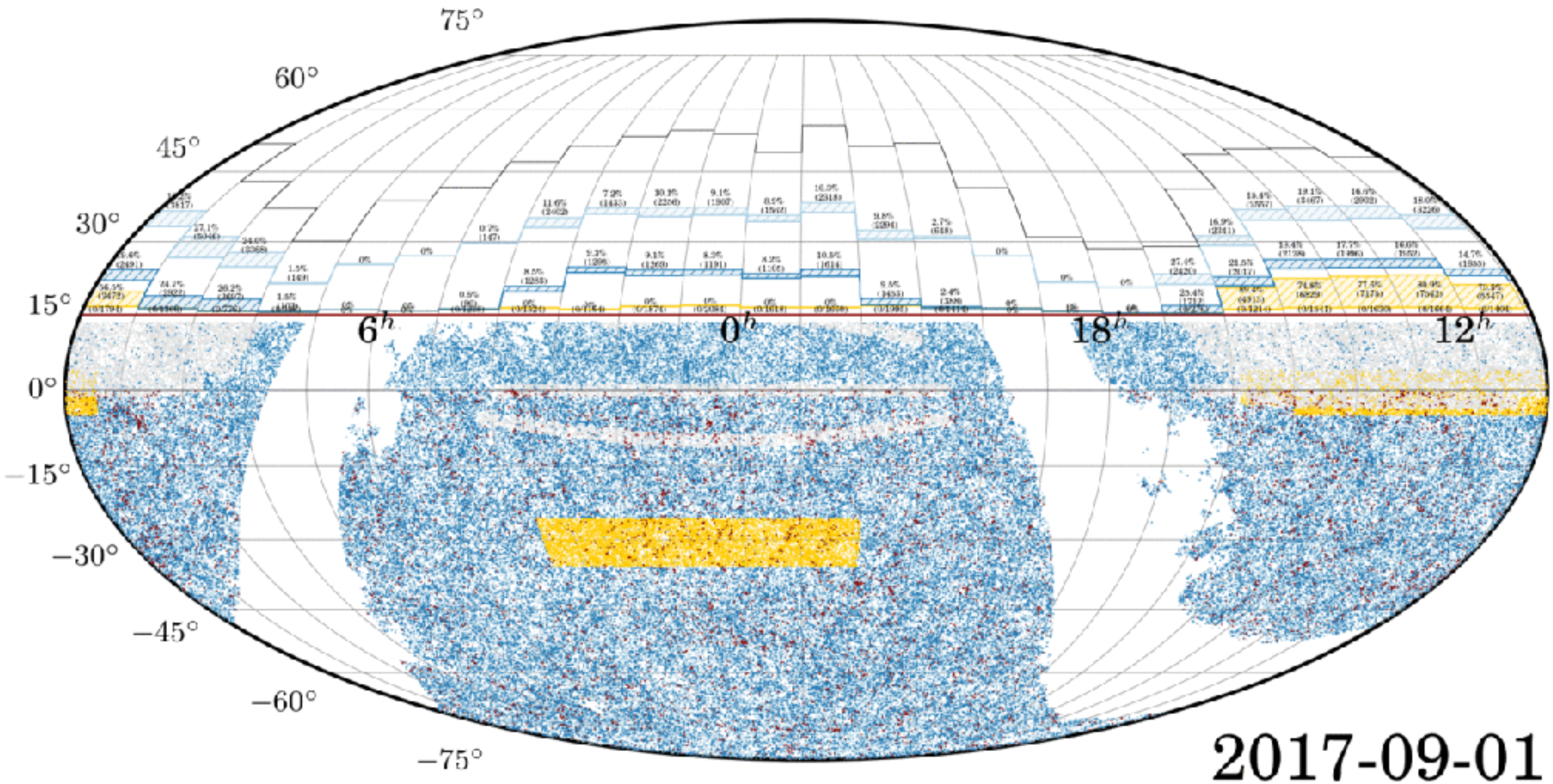

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- ***Taipan description paper***: da Cunha et al. 2017 (arXiv:1706.01246)