MaNGA：Mapping Nearby Galaxies at APO

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outline

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- ★Instrument
- ★Sample selection
- ★Strategy and assignment
- ★Data access
- ★FAQ
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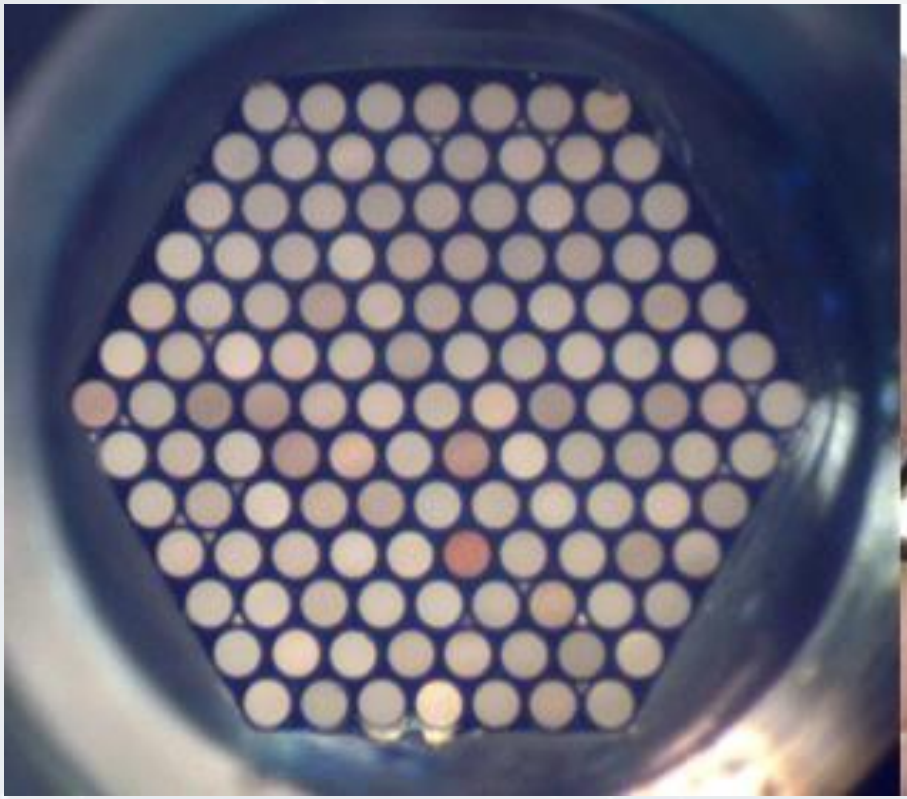
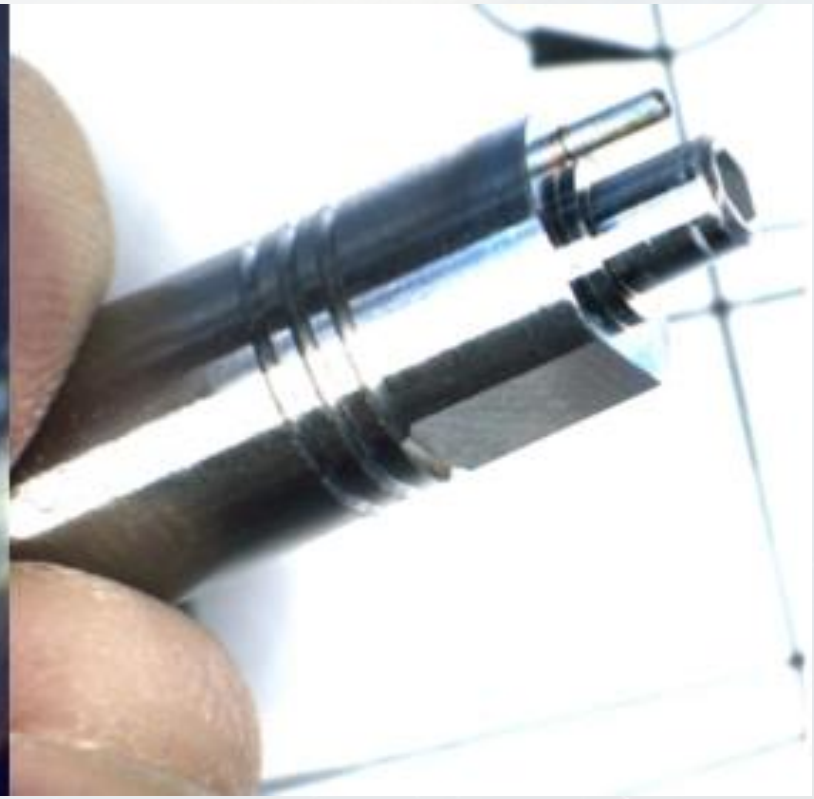
Overview

- ★MaNGA is the newest survey component of the Sloan Digital Sky Survey, which aims to understand the “life history” of present day galaxies from imprinted clues of their birth and assembly, through their ongoing growth via star formation and merging, to their death from quenching at late times.
- ★Goal: mapping the detailed composition and kinematic structure of 10000 nearby galaxies from 2014 to 2020

Instrument

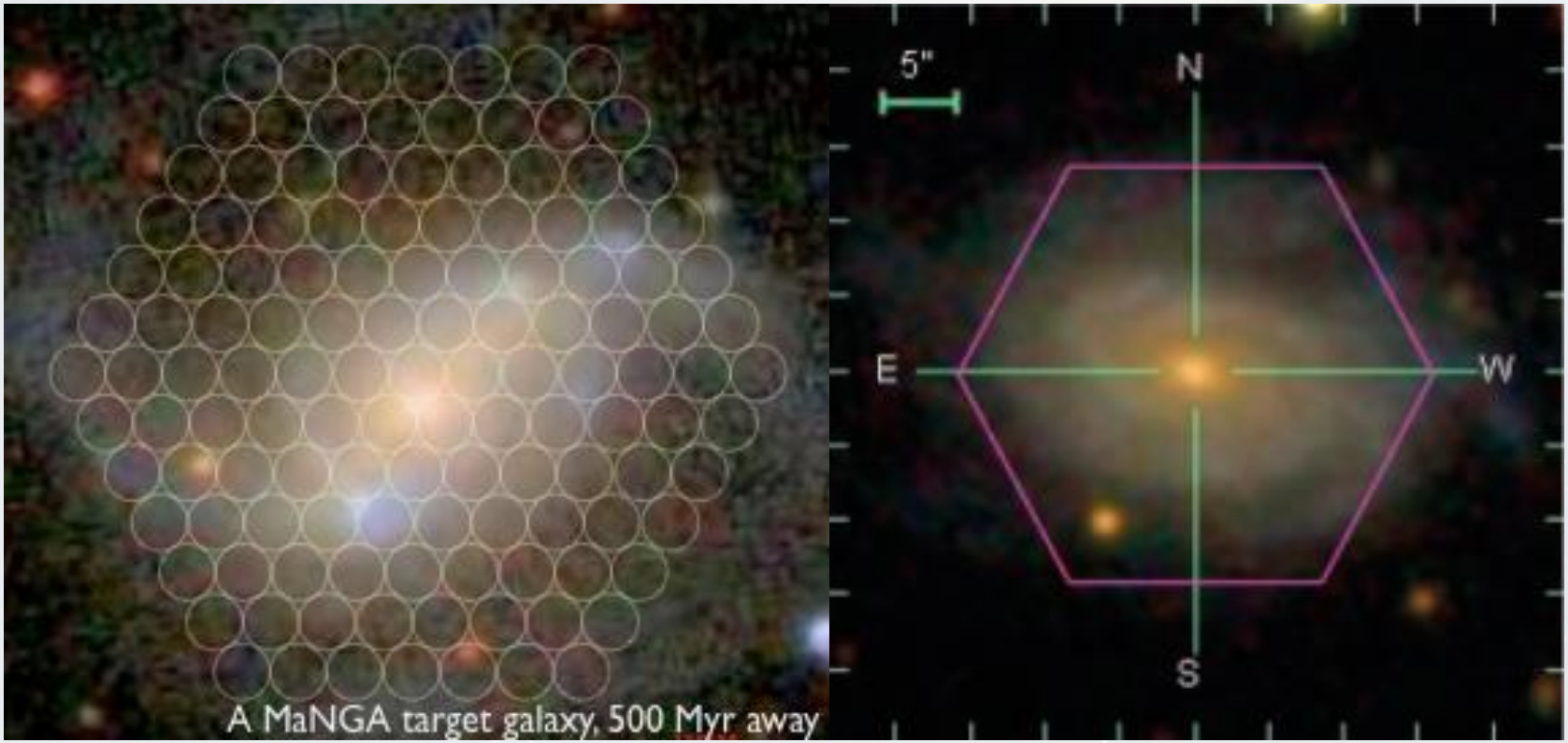
★IFUs





Instrument

★IFUs



Instrument

★IFUs

- ☆ Buffered fibers with 120 micron (2″) core diameters
- ☆ Close-packed hexagonal fibers IFUs, 54% live-core fill factor
- ☆ IFU size from 19 to 127 fibers, diameters from 12″ to 32″
- ☆ IFU complement per plate: 2×19; 4×37; 4×61; 2×91; 5×127
- ☆ 92 IFU-associated sky fibers
- ☆ 12 7-fiber “mini-bundles” for spectrophotometric calibration
- ☆ Total number of fibers: 1423

Instrument

★IFUs

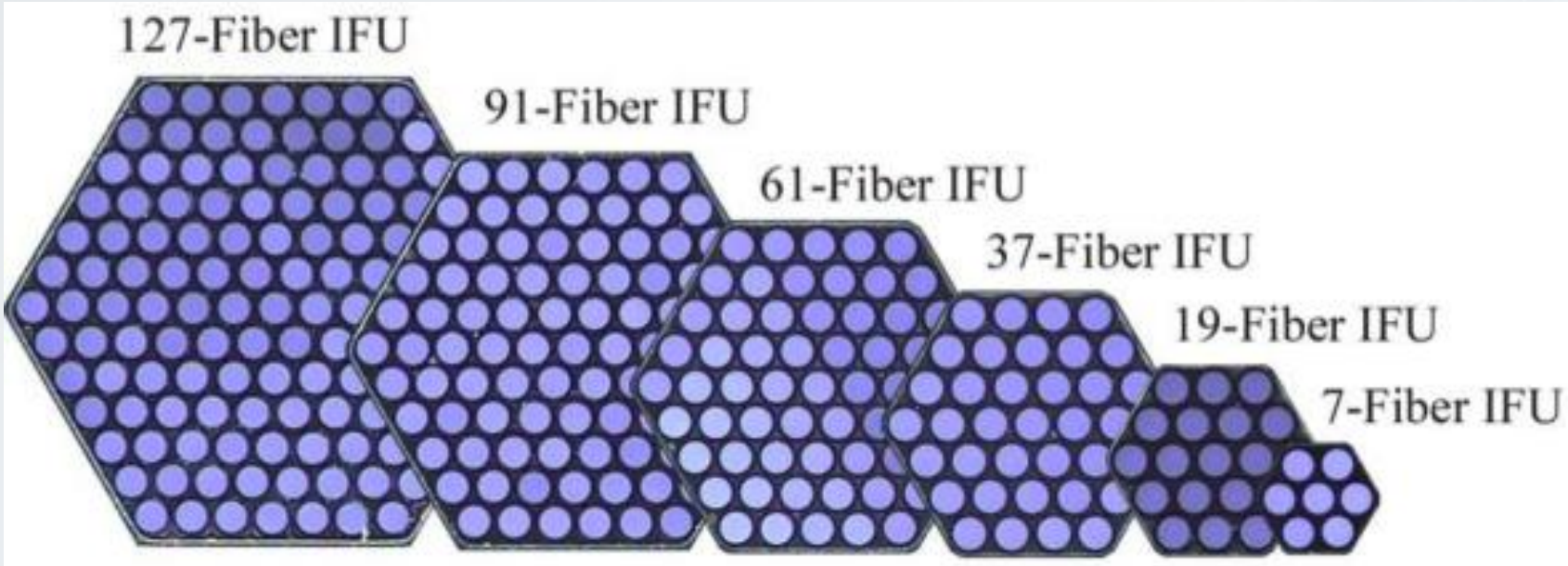
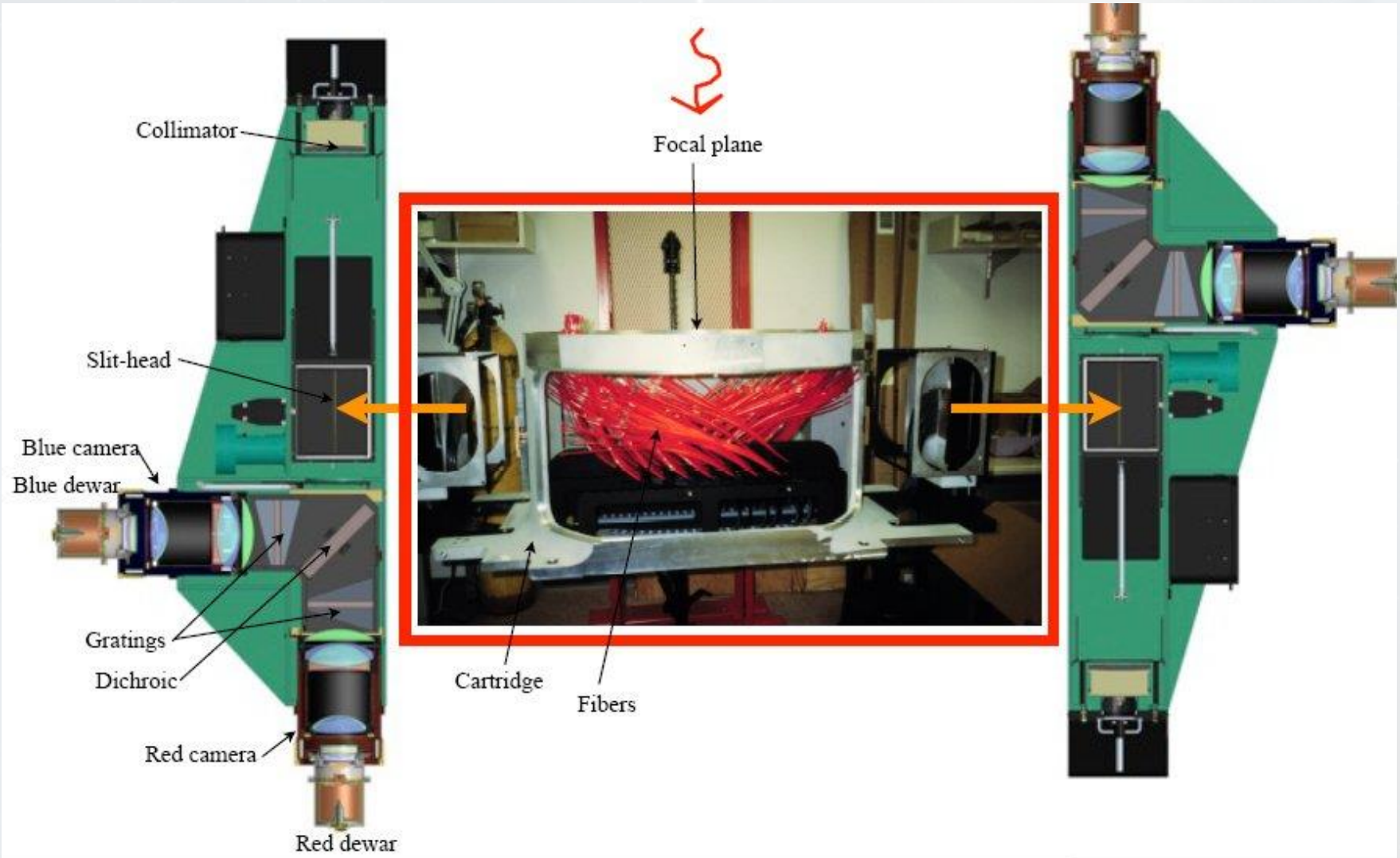


Figure 1. Photographs of MaNGA IFUs, ranging from the largest IFU (127 fibers, left) to the mini-bundle used for standard star observations (7 fibers, right). Individual fibers deviate with an RMS of only 3 μm from an ideal hexagonal packing. Image taken from Drory et al. (2015).

Instrument

★Spectrograph



Instrument

★Spectrograph

Main Parameter Summary

Number of spectrographs	2
Spectral resolution	1560-2270 in the blue channel, 1850-2650 in the red channel
Wavelength coverage	3600-10,400 Angstroms
Fiber diameter	2 arcsec
CCDs	4Kx4K fully-depleted LBNL CCDs with 15 micron pixels for the red side, blue-sensitive 4Kx4K e2V CCDs with 15 micron pixels for the blue side
Collimator coating reflectivity	>95% from 420 nm to 1000 nm

Sample selection

★Basic goal

- with a reproducible method based on only absolute magnitude (and color for a subsample) and redshift
- with a flat number density distribution in absolute i-band magnitude
- that can be covered by the MaNGA IFUs beyond a physical radius given in units of the effective radius (Re; the radius containing 50% of the light of the galaxy)
- maximizing the spatial resolution and S/N while satisfying the above requirements

Sample selection

★absolute-magnitude-dependent redshift limits:

lower redshift: angular sizes of galaxies in the sky can fit within our largest IFUs(higher for more luminous galaxies

upper redshift: equal number density of galaxies in the sky for different absolute magnitudes(wider towards more luminous galaxies)

★No size or inclination cuts

Sample selection

★All the main target galaxies are selected using the reprocessed NSA (NASA-Sloan Atlas) photometry.

★main sample

Primary sample: 63%, radial coverage to 1.5 Re

Secondary sample:37%, radial coverage to 2.5 Re

Sample selection

★MaNGA Ancillary Targets

designed to accomplish additional scientific goals to those of the main MaNGA samples. Some of samples do not selected from NSA.

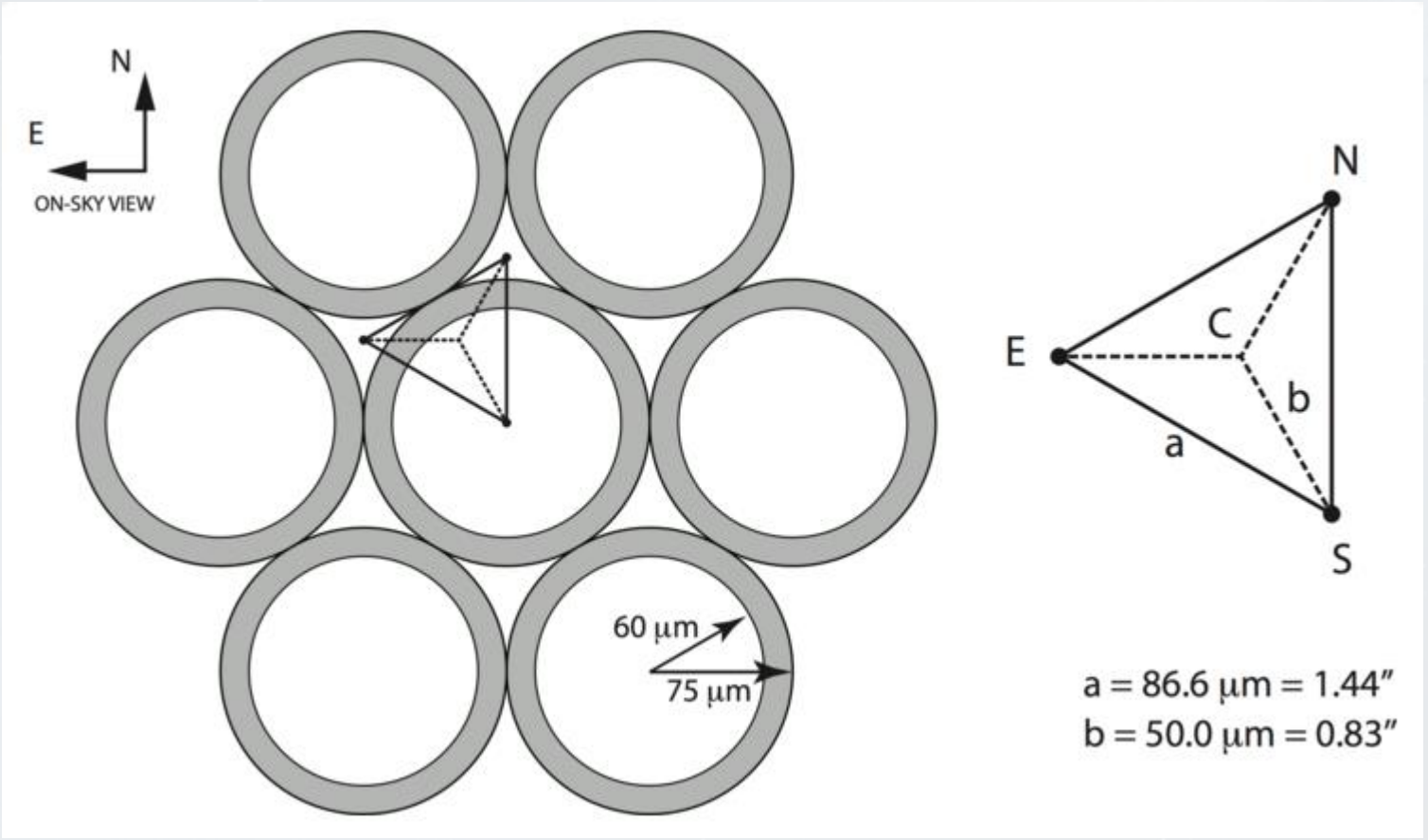
Strategy and assignment

MaNGA Technical Details

- ☆ Dark-time observations
- ☆ Fall 2014 – Spring 2020
- ☆ 17 IFUs per 7 deg^2 plate
- ☆ Wavelength: 360-1000 nm, resolution R~2000
- ☆ 10,000 galaxies across ~2700 deg^2, redshift z~0.03
- ☆ roughly 3-hour dithered exposures
- ☆ Spatial sampling of 1-2 kpc
- ☆ Per-fiber S/N=4-8 (per angstrom) at 1.5 Re

Strategy and assignment

★Dithered exposure



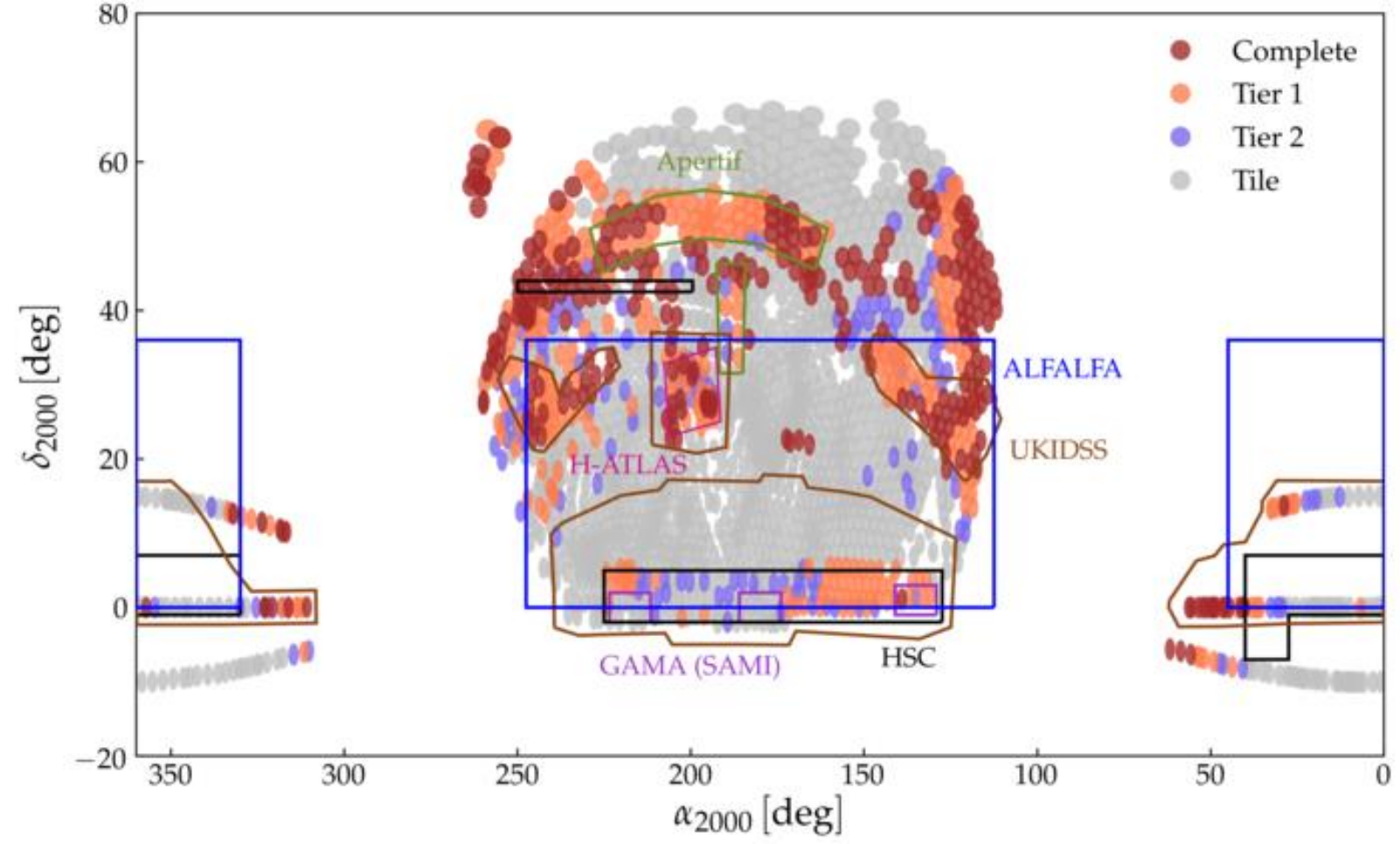
Strategy and assignment

★Footprint

600 of 1800 tiles could be observed in six years, 166 plates have been released in DR14 which exclude all-sky plates and standard star plates.

Strategy and assignment

★Footprint



Data access

★MaNGA Data Reduction Pipeline (DRP)

Raw data(2-D images) →1423 one-dimensional spectra(one for each MaNGA fiber)→ RSS→CUBE

★ Row Stacked Spectra (RSS)

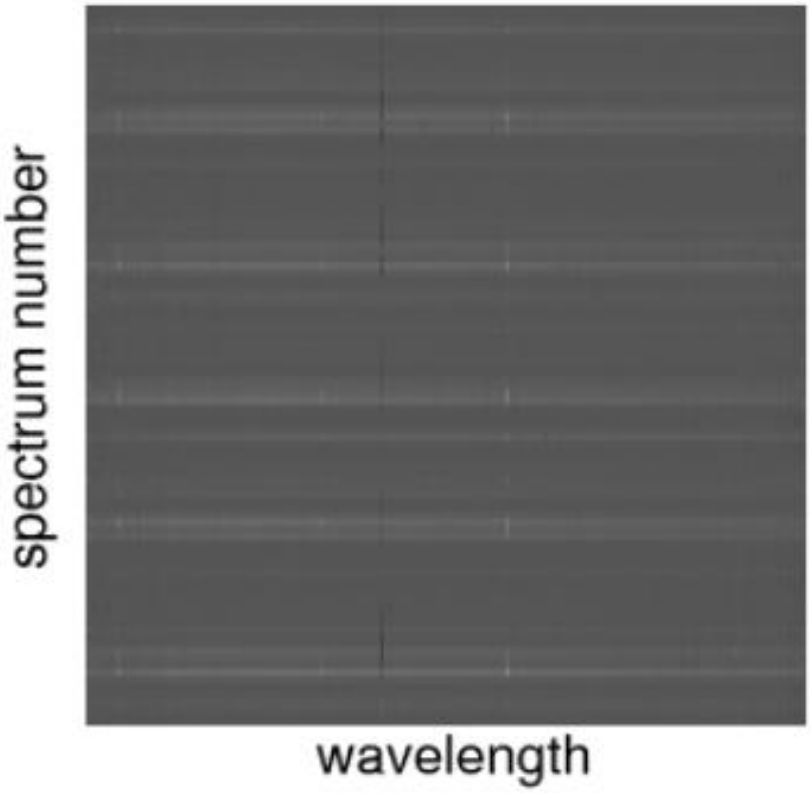
A two-dimensional data array containing the calibrated spectra measured by individual MaNGA IFU fibers.

★3-D data cube(CUBE)

A three-dimensional data array containing calibrated MaNGA imaging spectra for a single galaxy.

Data access

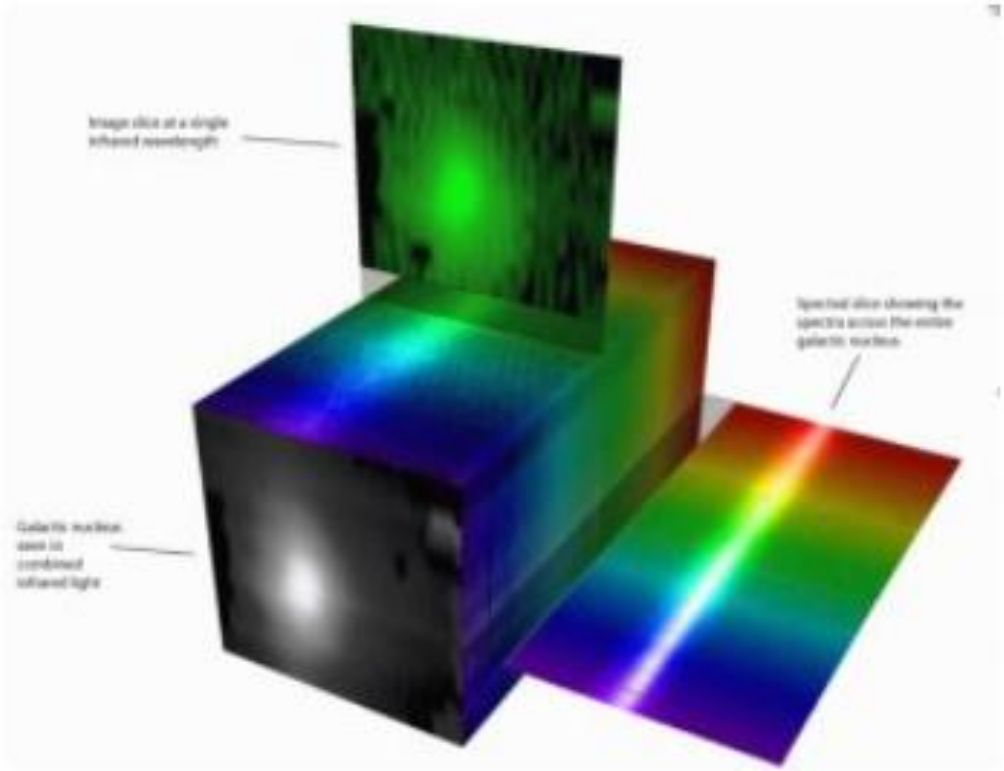
★RSS



An example of an RSS file. Each row represents a spectrum from one observation with a given fiber.

Data access

★CUBE



A representation of a data cube. Image credit: Stephen Todd (ROE) and Douglas Pierce-Price (JAC)

Data access

★Raw data, intermediate DRP output files, end-stage data(RSS,CUBE), mangatarget summary table，drpall summary table.

★SAS: https://data.sdss.org/sas/

★SkyServer：

http://skyserver.sdss.org/dr14/en/home.aspx

★CasJobs：http://skyserver.sdss.org/casjobs/

FAQ

★Where can I find general information about the MaNGA sample?

Drpall summary table

★Will my favourite galaxy be observed by MaNGA for a future data release?

Target summary table

★How can I identify and select galaxies or standard star targets?

Bitmasks:MANGA_TARGET1, 2, 3

http://www.sdss.org/dr14/algorithms/bitmasks/#MANGA_TARGET1

FAQ

★How do I check the data quality of my MaNGA cube?

Bitmask: MANGA_DRP3QUAL

★More questions：

http://www.sdss.org/dr14/manga/manga-tutorials/manga-faq/

★Tutorials：

http://www.sdss.org/dr14/manga/manga-tutorials/

What can we do with MaNGA?

- ★Birth and assembly
- ★Star formation and merging
- ★Quenching

What can we do with MaNGA?

★29 papers from arXiv.org

Chemical, Kinematic, Relations, Environment dependence

Stellar Mass assembly history

Star formation history

Stellar initial mass function

Stellar population gradients

What can we do with MaNGA?

★How?

Properties such as magnitude and redshift: drpall summary table, target summary table

Spatial resolved spectrum: RSS, CUBE

Modeling the Panchromatic Spectral Energy Distributions of Galaxies