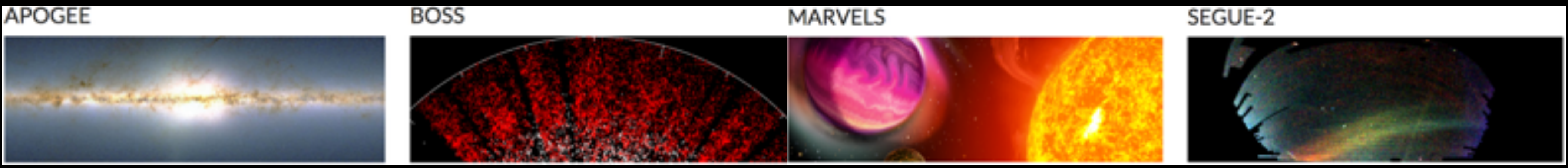
Current Status of SDSS-IV/V and DESI

Hwang, Ho Seong; Park, Changbom
Korea Institute for Advanced Study

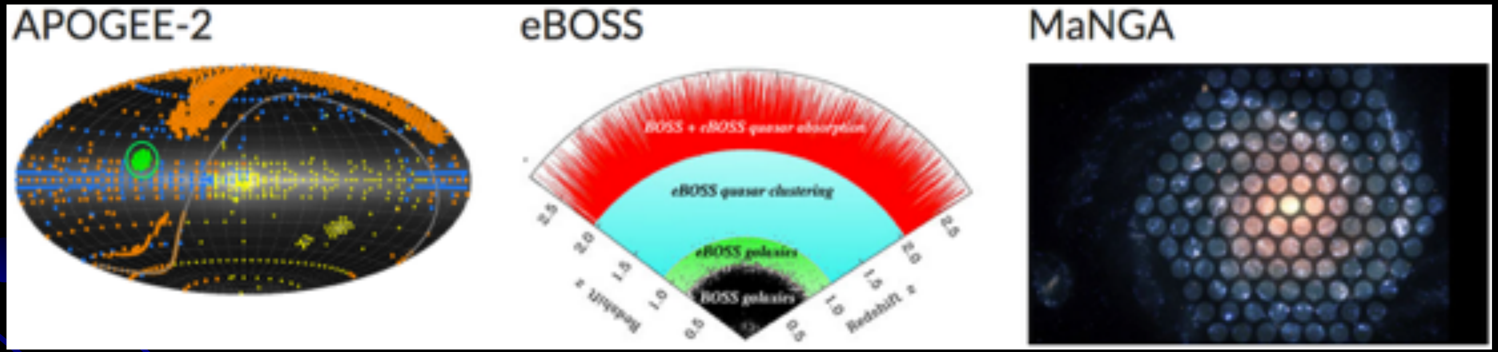
January 15, 2018
The 7th Survey Science Group Workshop

➢ SDSS-I/II: 2000 - 2008

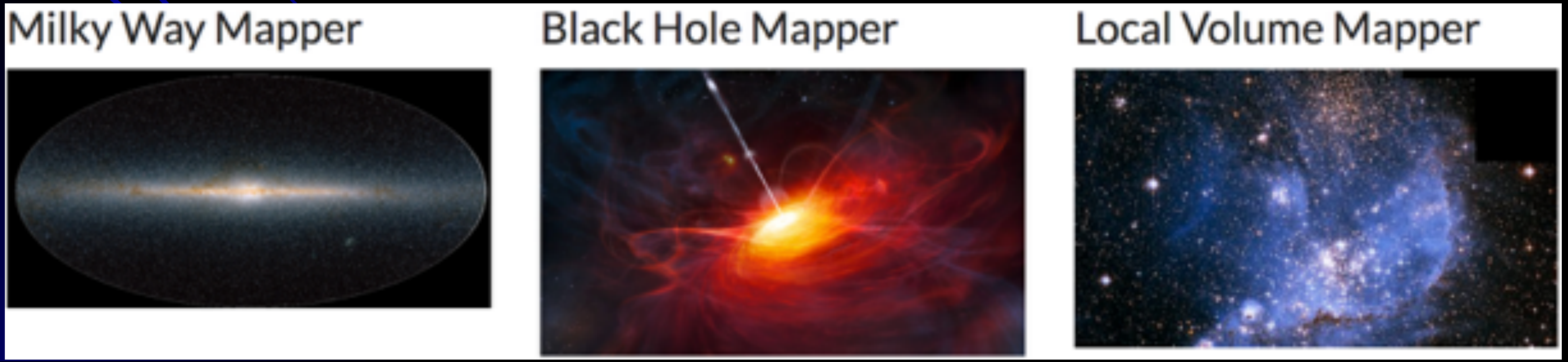
➢ SDSS-III: 2008 - 2014



➢ SDSS-IV: 2014 - 2020



➢ SDSS-V: 2020 - 2024



The Astronomical Journal, 154:28 (35pp), 2017 July https://doi.org/10.3847/1538-3881/aa7567

Sloan Digital Sky Survey IV: Mapping the Milky Way, Nearby Galaxies, and the Distant Universe

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2017, AJ, 154, 28

The Astrophysical Journal Supplement Series, 233:25 (25pp), 2017 December https://doi.org/10.3847/1538-4365/aa8992

The 13th Data Release of the Sloan Digital Sky Survey: First Spectroscopic Data from the SDSS-IV Survey Mapping Nearby Galaxies at Apache Point Observatory

Franco D. Albareti[1,2,126], Carlos Allende Prieto[3,4], Andres Almeida[5], Friedrich Anders[6], Scott Anderson[7], Brett H. Andrews[8], Alfonso Aragón-Salamanca[9], Maria Argudo-Fernández[10,11], Eric Armengaud[12], Eric Aubourg[13], Vladimir Avila-Reese[14], Carles Badenes[8], Stephen Bailey[15], Beatriz Barbuy[16,17], Kat Barger[18], Jorge Barrera-Ballesteros[19], Curtis Bartosz[7], Sarbani Basu[20], Dominic Bates[21], Giuseppina Battaglia[3,4], Falk Baumgarten[6,22], Julien Baur[12], Julian Bautista[23], Timothy C. Beers[24], Francesco Belfiore[25,26], Matthew Bershady[27], Sara Bertran de Lis[3,4], Jonathan C. Bird[28], Dmitry Bizyaev[29,30,31], Guillermo A. Blanc[32,33,34], Michael Blanton[35], Michael Blomqvist[36], Adam S. Bolton[23,37], J. Borissova[38,39], Jo Bovy[40,41], William Nielsen Brandt[42,43,44], Jonathan Brinkmann[29], Joel R. Brownstein[23], Kevin Bundy[45], Etienne Burtin[12], Nicolás G. Busca[13], Hugo Orlando Camacho Chavez[17,46], M. Cano Díaz[14], Michele Cappellari[47], Ricardo Carrera[3,4], Yanping Chen[48], Brian Cherinka[19], Edmond Cheung[45], Cristina Chiappini[6], Drew Chojnowski[30], Chia-Hsun Chuang[6], Haeun Chung[49], Rafael Fernando Cirolini[17,50], Nicolas Clerc[51], Roger E. Cohen[52]

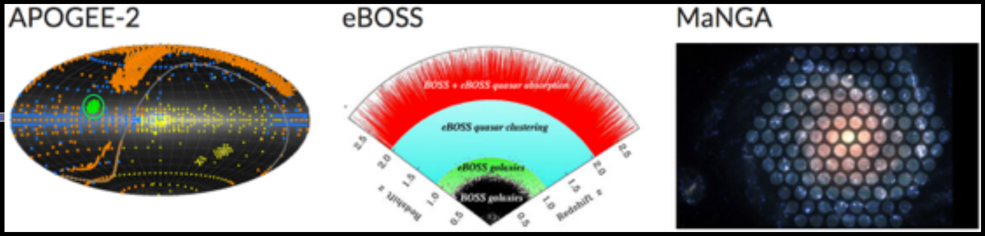
2017, ApJS, 233, 25

THE FOURTEENTH DATA RELEASE OF THE SLOAN DIGITAL SKY SURVEY: FIRST SPECTROSCOPIC DATA FROM THE EXTENDED BARYON OSCILLATION SKY SURVEY AND FROM THE SECOND PHASE OF THE APACHE POINT OBSERVATORY GALACTIC EVOLUTION EXPERIMENT

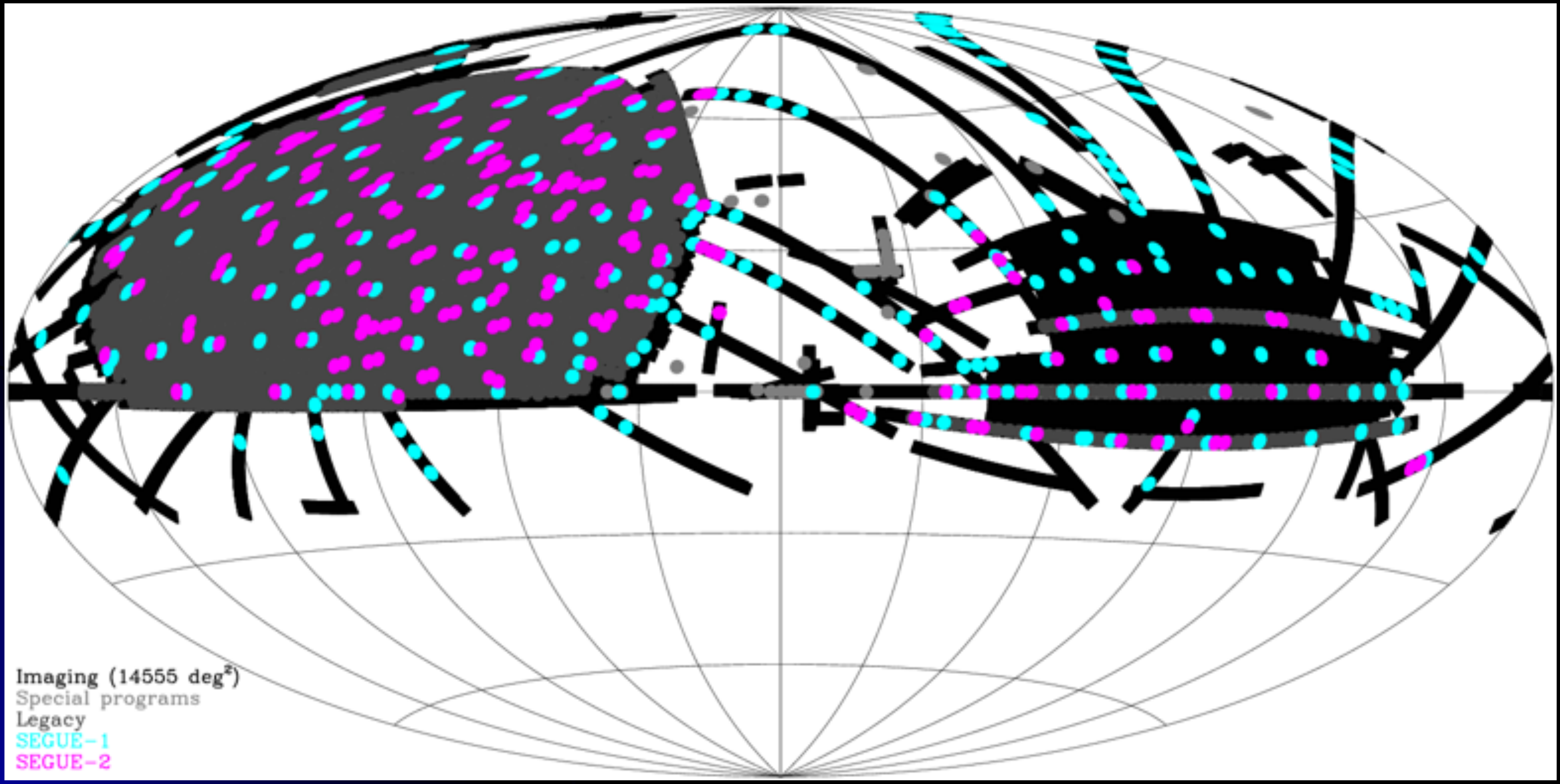
Bela Abolfathi[1], D. S. Aguado[2], Gabriela Aguilar[3], Carlos Allende Prieto[2,4], Andres Almeida[5], Tonima Tasnim Ananna[6], Friedrich Anders[7], Scott F. Anderson[8], Brett H. Andrews[9], Borja Anguiano[10], Alfonso Aragón-Salamanca[11], Maria Argudo-Fernández[12], Eric Armengaud[13], Metin Ata[7], Eric Aubourg[14], Vladimir Avila-Reese[3], Carles Badenes[9], Stephen Bailey[15], Kathleen A. Barger[16], Jorge Barrera-Ballesteros[17], Curtis Bartosz[8], Dominic Bates[18], Falk Baumgarten[7,19], Julian Bautista[20], Rachael Beaton[21], Timothy C. Beers[22], Francesco Belfiore[23,24,25], Chad F. Bender[26], Mariangela Bernardi[27], Matthew A. Bershady[28], Florian Beutler[29], Jonathan C. Bird[30], Dmitry Bizyaev[31,32,33], Guillermo A. Blanc[21], Michael R. Blanton[34], Michael Blomqvist[35], Adam S. Bolton[36], Médéric Boquien[12], Jura Borissova[37,38], Jo Bovy[39,40,41], Christian Andres Bradna Diaz[42], William Nielsen Brandt[43,44,45], Jonathan Brinkmann[31], Joel R. Brownstein[20], Kevin Bundy[25], Adam J. Burgasser[46], Etienne Burtin[13], Nicolás G. Busca[14], Caleb I. Cañas[43], Mariana Cano-Díaz[47], Michele Cappellari[48], Ricardo Carrera[2,4], Andrew R. Casey[49], Yanping Chen[50], Brian Cherinka[51], Cristina Chiappini[7], Peter Doohyun Choi[52], Drew Chojnowski[32], Chia-Hsun Chuang[7], Haeun Chung[53], Nicolas Clerc[54,55,56],

arXiv:1707.09322

Latest Data Release: DR14



- ➢ **When?: July 31, 2017**
- ➢ **To whom: Public**
- ➢ **Includes the most current reprocessed imaging and spectra from the SDSS legacy survey**



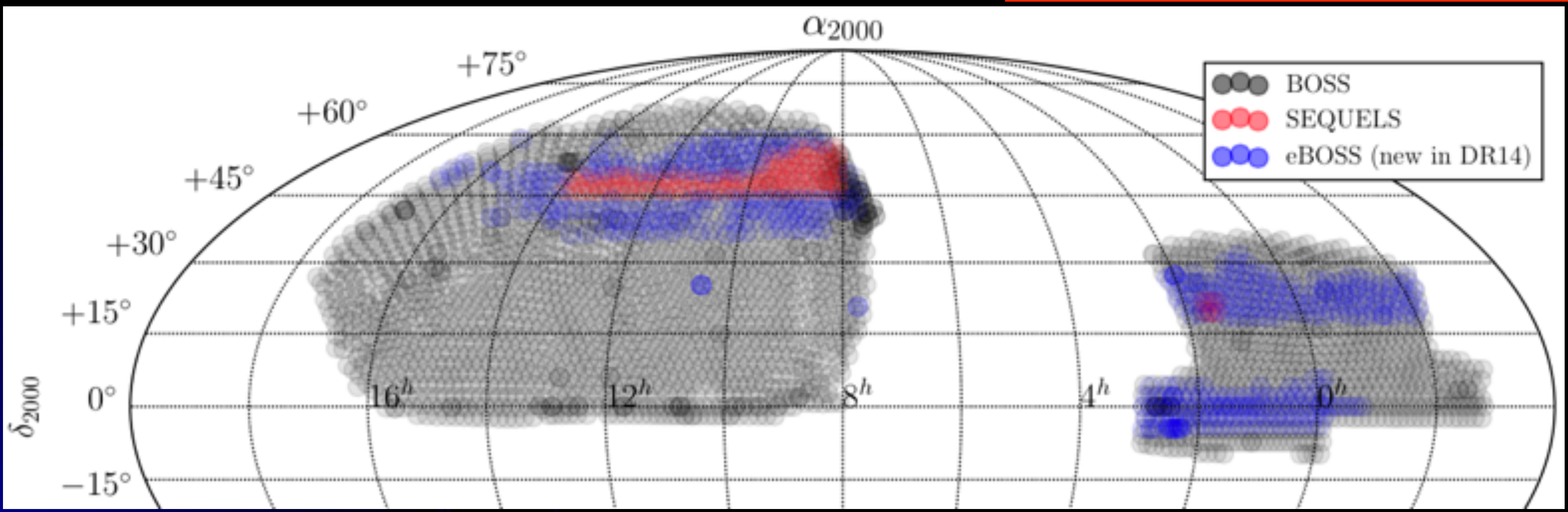
Latest Data Release: DR14

➢ **First spectra of galaxies and quasars from eBOSS**

[including SPectroscopic IDentfication of ERosita Sources (SPIDERS) & Time-Domain Spectroscopic Survey (TDSS)]

Extragalactic (BOSS/eBOSS)

Statistic	Total	Unique
Spectroscopic effective area (deg^2)	...	9,376
Plates	3,008	2,913
Spectra	2,987,105	2,696,287
All Galaxies	1,608,987	1,493,503
CMASS	933,387	863,761
LOWZ	369,673	344,423
All Quasars	539,297	444,217
Main	242,556	212,156
Main, $2.15 \leq z \leq 3.5$	175,518	150,592
Stars	335,844	303,518
Standard stars	62,979	50,574
Sky	282,344	261,098
Unclassified spectra	229,418	201,549

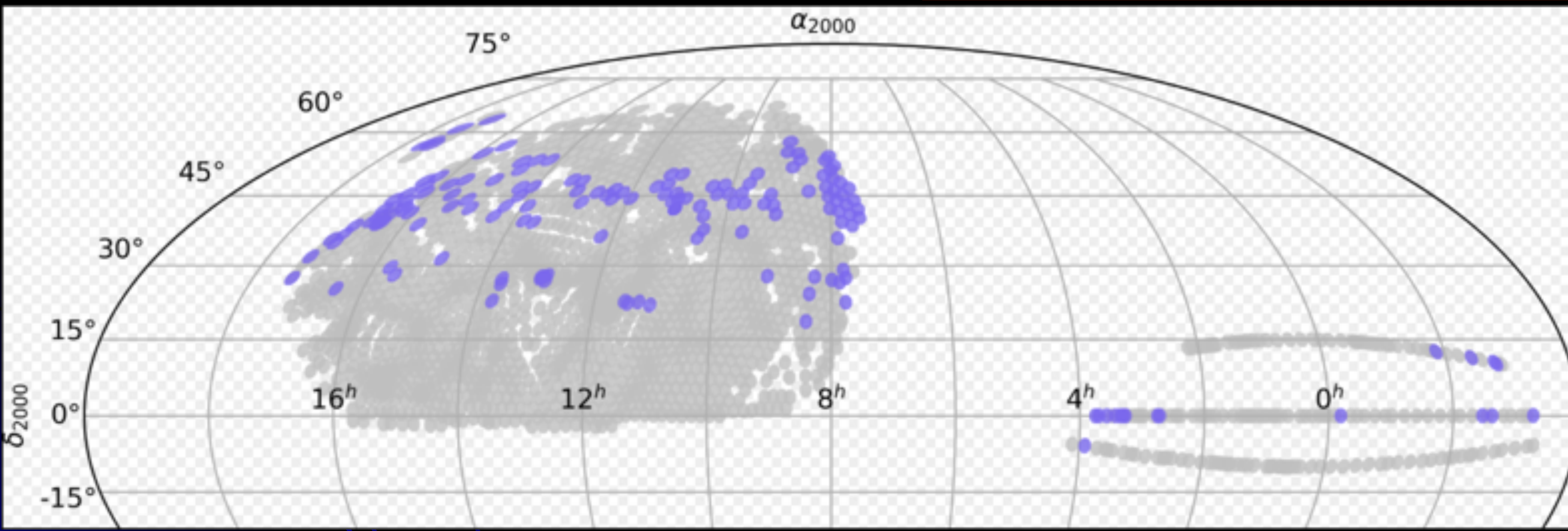


Latest Data Release: DR14

- ➢ **More data cubes from MaNGA**
  - ➢ **2812 galaxies among 10^4 targets**

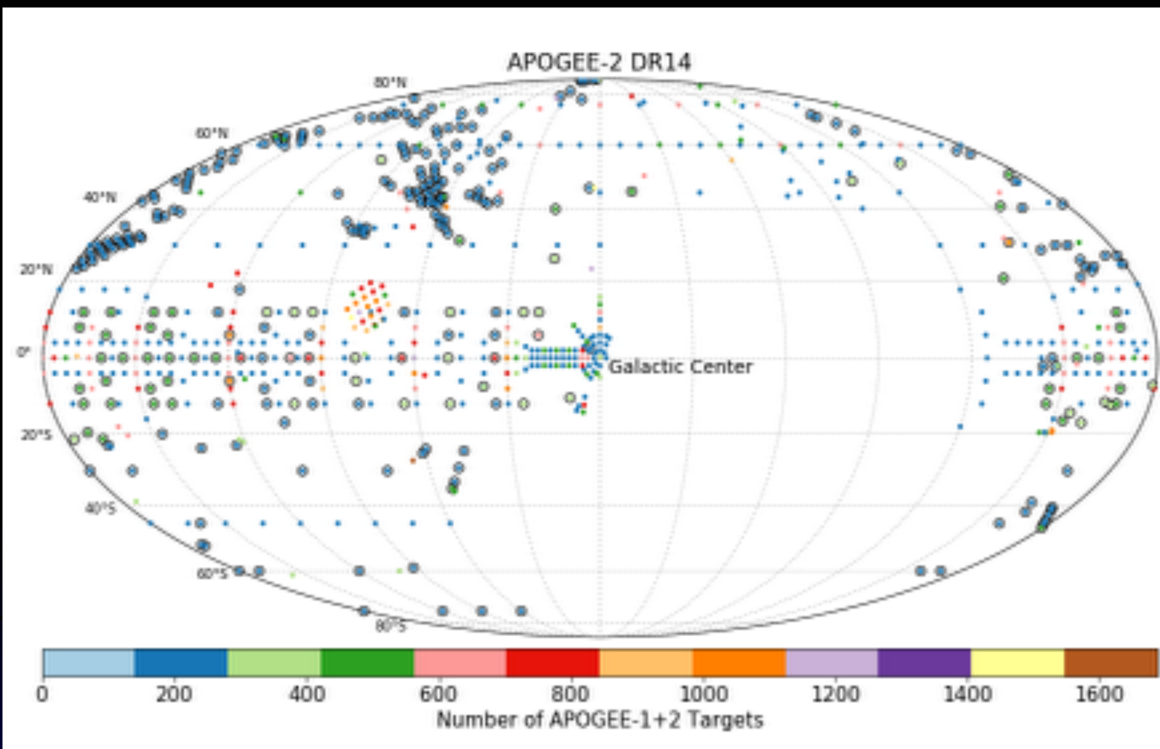
IFU spectroscopy (MaNGA)

Total galaxies	2,812
Unique galaxies	2,744
Plate scale	7 deg^2
IFUs per plate	17
Wavelength	3600-10,000 Å



Latest Data Release: DR14

- **First stellar infrared spectra and stellar parameter determinations from APOGEE-2**



Infrared (APOGEE) spectroscopic data statistics

DR14 includes data for ~263,000 APOGEE targets. This includes 231,000 science targets, located in distinct types of survey fields:

~13,000 stars	in Bulge fields
~129,600 stars	in Halo and Halo Stream fields
~76,000 stars	in Disk fields
~3,200 stars	in Satellite Galaxies fields
~400 stars	in Kepler Objects of Interest (KOI) Program fields
~19,500 stars	in Star Cluster fields
~13,300 objects	in Ancillary Science fields
~1000 bright stars	observed with the NMSU 1m telescope + APOGEE, including bright standards

Exact counts are given in the table below.

Statistic	Total	Unique
Pointings	--	780
Plates	4,012	1,363
All stars	1,054,381	263,444
with NMSU 1-m	1,438	1,018
Commissioning stars	27,387	12,914
Survey stars	872,844	184,148
with S/N > 100	--	144,309
with ≥ 3 visits	--	143,154
with ≥ 12 visits	--	6,200
Stellar parameter standards	10,006	1,300
Radial velocity standards	288	15
Telluric line standards	128,974	23,611
Ancillary science program objects	37,369	12,641
Kepler target stars	34,789	17,218

Latest Data Release: DR14

A Study of Environmental Effects on Galaxy Spin Using MaNGA Data

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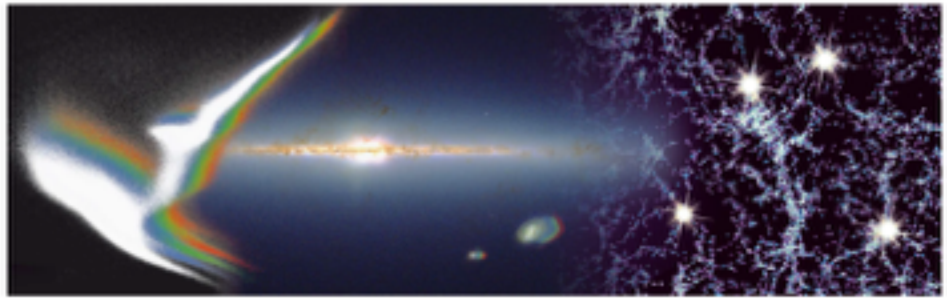
Accepted XXX. Received YYY; in original form ZZZ

ABSTRACT

We investigate environmental effects on galaxy spin using a sample of 1830 galaxies from the recent public data of MaNGA integral field spectroscopic survey. We determine the spin parameter λ_{Re} of galaxies through the analysis of two-dimensional stellar kinematic maps within the effective radii, and study its dependence on the large-scale (background mass density from 20 nearby galaxies) and small-scale (distance to and morphology of the nearest neighbour galaxy) environments. We first examine the mass dependence of galaxy spin, and find that the spin parameter of early-type galaxies decreases with stellar mass at $\log(M_*/M_\odot) \gtrsim 10$, consistent with the results from previous studies. We then divide the galaxies into three subsamples using their stellar masses to minimize the mass effects on galaxy spin. The spin parameters of galaxies in each subsample do not change with background mass density, but do change with distance to and morphology of the nearest neighbour. In particular, the spin parameter of late-type galaxies decreases as early-type neighbours approach within the virial radius. These results suggest that the large-scale environments hardly affect the galaxy spin, but the small-scale environments such as hydrodynamic galaxy-galaxy interactions can play a substantial role in determining galaxy spin.

Key words: galaxies: evolution – galaxies: fundamental parameters – galaxies: general – galaxies: interactions – galaxies: kinematics and dynamics

LeeJC+18, MNRAS, submitted



SDSS-V: Pioneering Panoptic Spectroscopy

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Rafael A. García (CEA/AIM), Patrick Gaulme (MPS/NMSU), Ortwin Gerhard (MPE),
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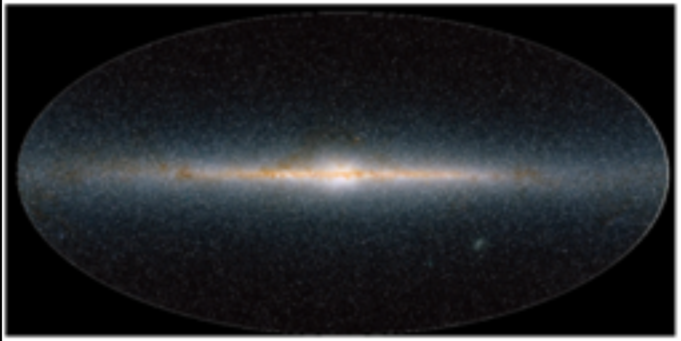
arXiv:1711.03234

SDSS-V: Pioneering Panoptic Spectroscopy

Milky Way Mapper



A time-domain stellar spectroscopic survey of the Milky Way. (Image credit: 2MASS)

Explore Milky Way Mapper

Contact person: Jennifer Johnson (Ohio State University), johnson.3064@osu.edu

Black Hole Mapper

A time-domain spectroscopic quasar survey. (Image credit: ESO/M. Kornmesser)

Explore Black Hole Mapper

Contact person: Scott Anderson (University of Washington), anderson@astro.washington.edu

Local Volume Mapper

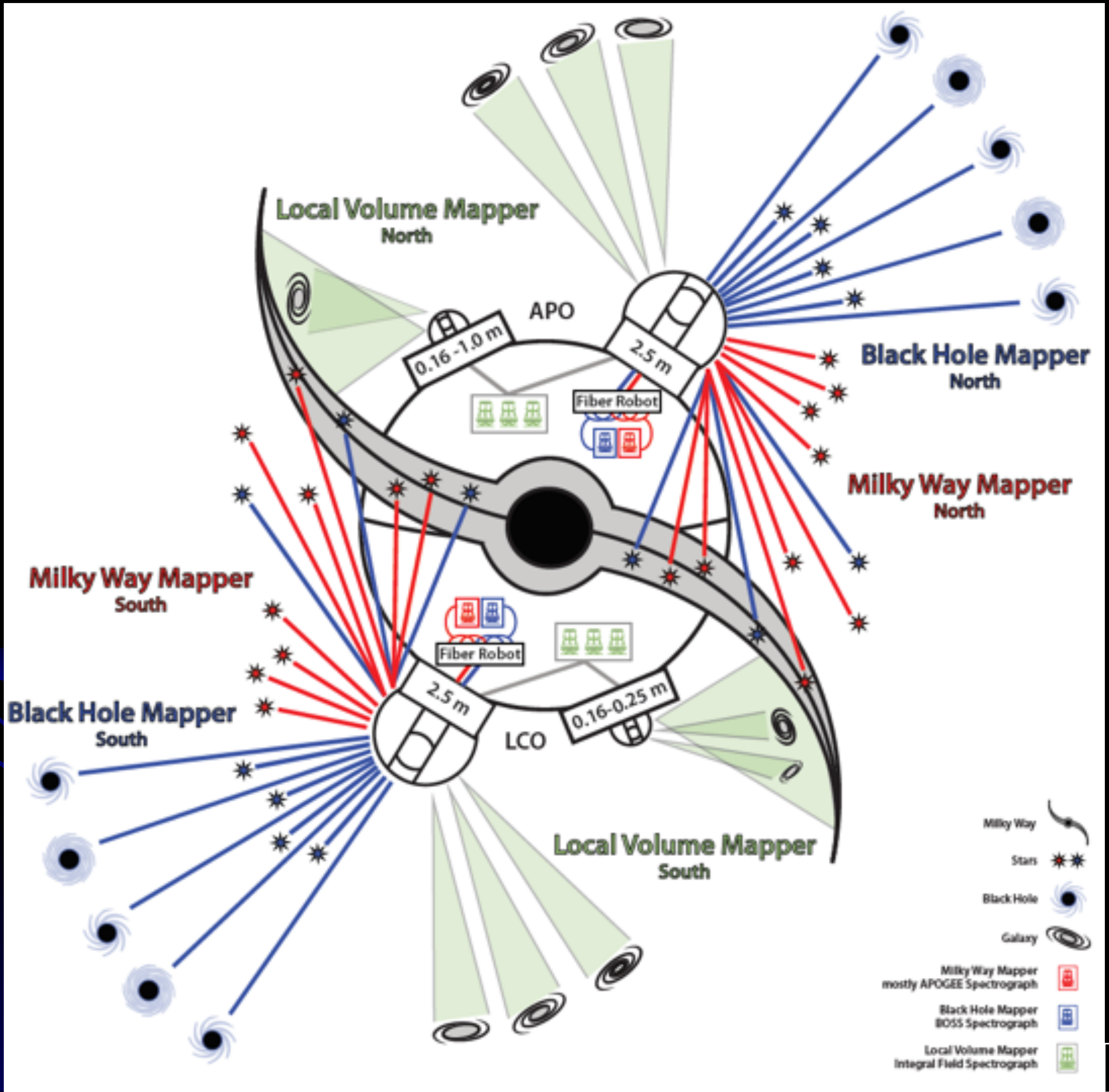
An integral-field survey of the Milky Way and its galactic neighbors. (Image credit: NASA, ESA/A. Nota)

Explore Local Volume Mapper

Contact person: Niv Drory (University of Texas at Austin), drory@astro.as.utexas.edu

Program	Science Targets	$N_{Objects}$ and/or Sky Area	Primary Spectral Range and Hardware	Primary Science Goals
Milky Way Mapper (MWM)	Stars across the Milky Way	>6M stars; all-sky	IR; APOGEE ($R \sim 22,000$) with fiber-positioning system	Understanding the formation of the Milky Way and the physics of its stars
Black Hole Mapper (BHM)	Primarily supermassive black holes	>400,000 sources; all-sky	Optical; e.g., BOSS ($R \sim 2000$) with fiber-positioning system	Probing black hole growth and mapping the X-ray sky
Local Volume Mapper (LVM)	ISM & stellar populations in the MW, Local Group, and nearby galaxies	>25M contiguous spectra over 3,000 deg^2	Optical; new integral field spectrographs covering 3600-10000Å at $R \sim 4000$	Exploring galaxy formation and regulation by star formation; feedback, enrichment, & ISM physics

SDSS-V: Pioneering Panoptic Spectroscopy



Kollmeier+17

SDSS-V: Pioneering Panoptic Spectroscopy

Wide-field Space Missions Enhanced by SDSS-V			
Mission	Science Goals / Data Products	Timeframe	Primary Mag Range
Kepler/K2	(transiting) exoplanets & stellar astrophysics seismology from precision lightcurves	2009–2018	$m_V \sim 7$–17; selected fields
Gaia	positions, distances, motions from astrometry; basic stellar parameters	2013–2020	$m_G \sim 7$–19; all-sky
TESS	(transiting) exoplanets & stellar astrophysics seismology from precision lightcurves	2018–2022	$m_i \sim 8$–14; ~all-sky
eROSITA	X-ray fluxes & spectra	2018–2022	$f_{0.5-2\mathrm{keV}} > 10^{-14}$ erg $\mathrm{s^{-1}}$ $\mathrm{cm^{-2}}$; ~all-sky

SDSS-V: Pioneering Panoptic Spectroscopy

Spectroscopic Survey Facilities by 2020–2025								
Survey (facility)	N_{target}	R_{spectra}	N_{multi}	$\lambda\,[\mu m]$	Ω_{sky}	N_{epoch}	Timeframe	m_{primary}
SDSS-V	7×10^6	**22,000** **2,000**	**500**	**1.51–1.7** **0.37–1.0**	4π	**1–174**	**2020–2024**	$m_H \lesssim 13.4$ $m_i \lesssim 20$
Gaia (RVS)	8×10^6	11,000	—	0.85–0.87	4π	$\sim$60	2013–2020	$m_G \lesssim 12$
Gaia-ESO	0.1×10^6	17,000	140	0.55 & 0.85	0.02π	$\sim$1	2013–2018	$m_G \lesssim 17$
GALAH	0.8×10^6	28,000	400	0.40–0.85	π, $\|b\| \geq 10$	$\sim$1	2015–2020	$m_G \lesssim 13$
WEAVE	0.8×10^6	5,000 20,000	1000	0.37–0.9	$\sim\pi$	$\sim$1–2	2018–2023	$m_G \lesssim 19$
DESI	4×10^7	3,000	5000	0.36–0.98	1.35π, $\|b\| \geq 25°$	1–4	2019–2024	$m_r \lesssim 23$
LAMOST	8×10^6	1,800	4000	0.4–0.9	0.5π	$\sim$1	2010–2020	$m_G \lesssim 16$
4MOST	10×10^6	5,000 20,000	1600 800	0.4–0.9	1.5π	1–2	2023–2028	$m_r \lesssim 22$ $m_V \lesssim 16$
APOGEE-1& 2	5×10^5	22,000	300	1.51–1.7	0.5π	$\sim$1–30	2011–2019	$m_H \lesssim 12.2$
PFS	1×10^6	3,000	2400	0.4–1.6	0.05π	1	2018–2021	$m_i \lesssim 23$
MOONS	2×10^6	5,000 20,000	1000	0.6–1.8	0.05π	1	2020–2025	$m_g \lesssim 22$ $m_H \lesssim 17$

DESI (Dark Energy Spectroscopic Instrument)

- **Imaging & Spectroscopic Survey with 4m Mayall telescope**
- **2018 - 2022**

The DESI Experiment Part I: Science,Targeting, and Survey Design

arXiv:1611.00036

DESI Collaboration: Amir Aghamousa[68], Jessica Aguilar[70], Steve Ahlen[78], Shadab Alam[27,56], Lori E. Allen[74], Carlos Allende Prieto[60], James Annis[48], Stephen Bailey[70], Christophe Balland[82], Otger Ballester[54], Charles Baltay[77], Lucas Beaufore[41], Chris Bebek[70], Timothy C. Beers[36], Eric

The DESI Experiment Part II: Instrument Design

arXiv:1611.00036

DESI Collaboration: Amir Aghamousa[68], Jessica Aguilar[70], Steve Ahlen[78], Shadab Alam[27,56], Lori E. Allen[74], Carlos Allende Prieto[60], James Annis[48], Stephen Bailey[70], Christophe Balland[82], Otger Ballester[54], Charles Baltay[77], Lucas Beaufore[41], Chris Bebek[70], Timothy C. Beers[36], Eric

Conclusion

- SDSS-IV is going well! (2014-2020)
  - DR14 is currently available
  - SDSS-V is being ready
- DESI is also going well! (2018-2022)
  - Some imaging data are available.