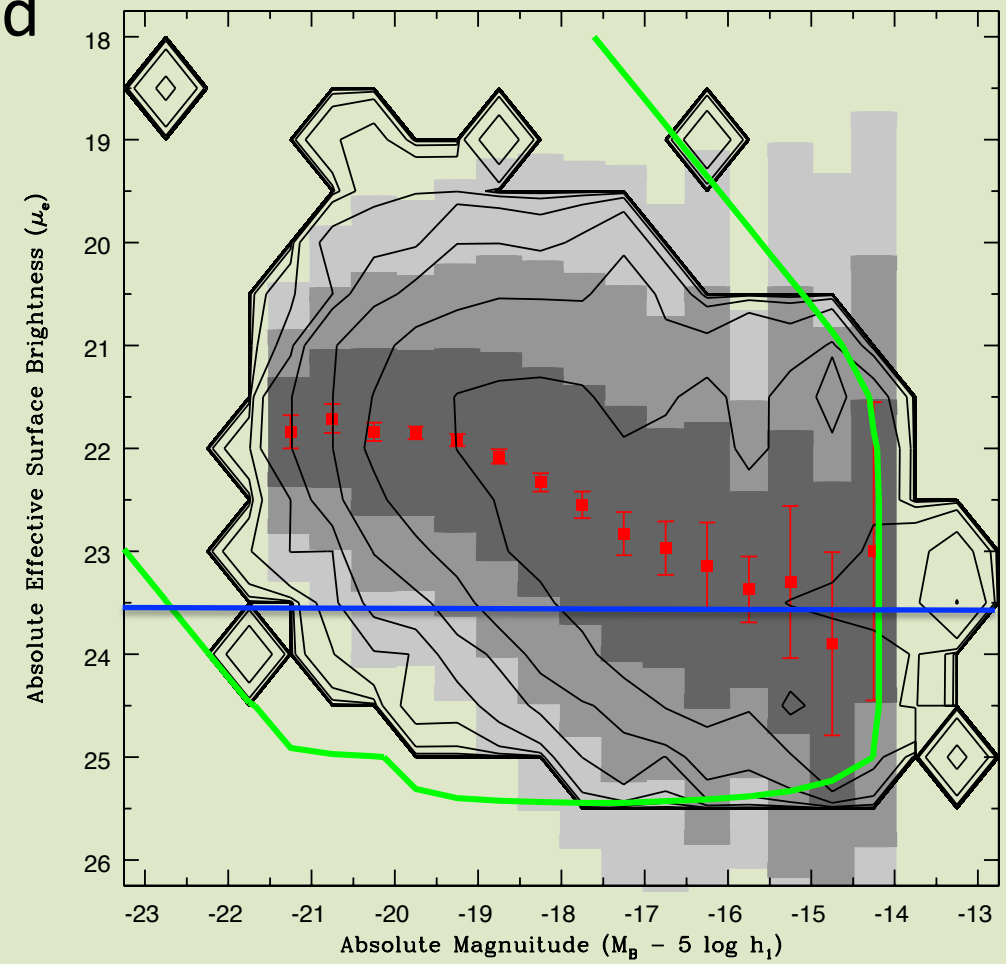
GAMA as the basis for IFU sample selection

- Sample selection critical for IFU campaigns
- GAMA is the optimal cat for low-z sample selection
  - What is GAMA
  - What GAMA can currently offer
  - Coming soon
- Galaxy formation
  - Duality v bimodality
  - The zero-parameter two-phase model
  - Modeling the energy output of the Universe (z=7 to 0)
- A possible GAMA IFU sample

IFU sample selection

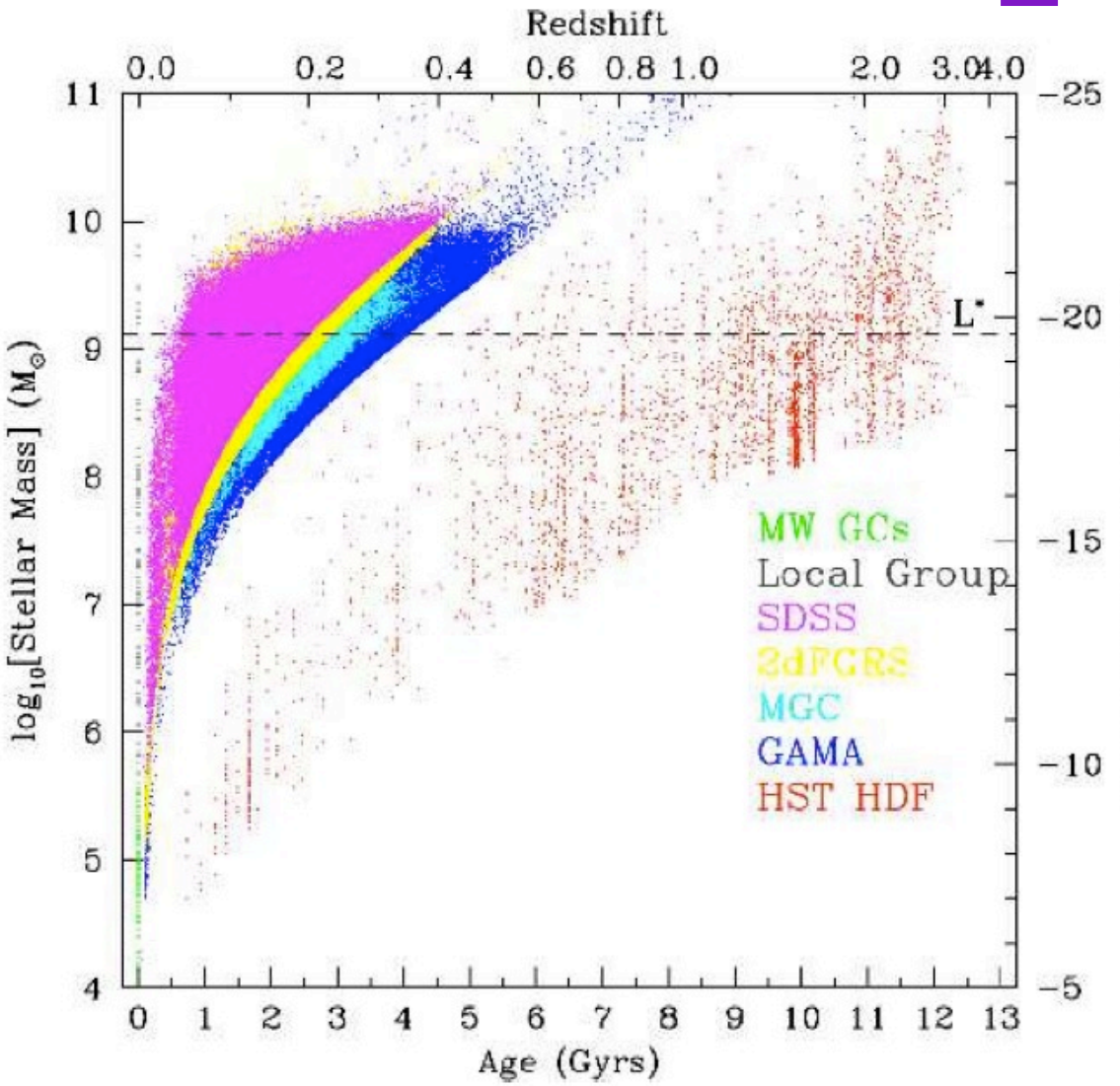
Parameter space occupied by galaxies →

For IFU surveys to be cosmologically relevant must sample as much parameter space as possible

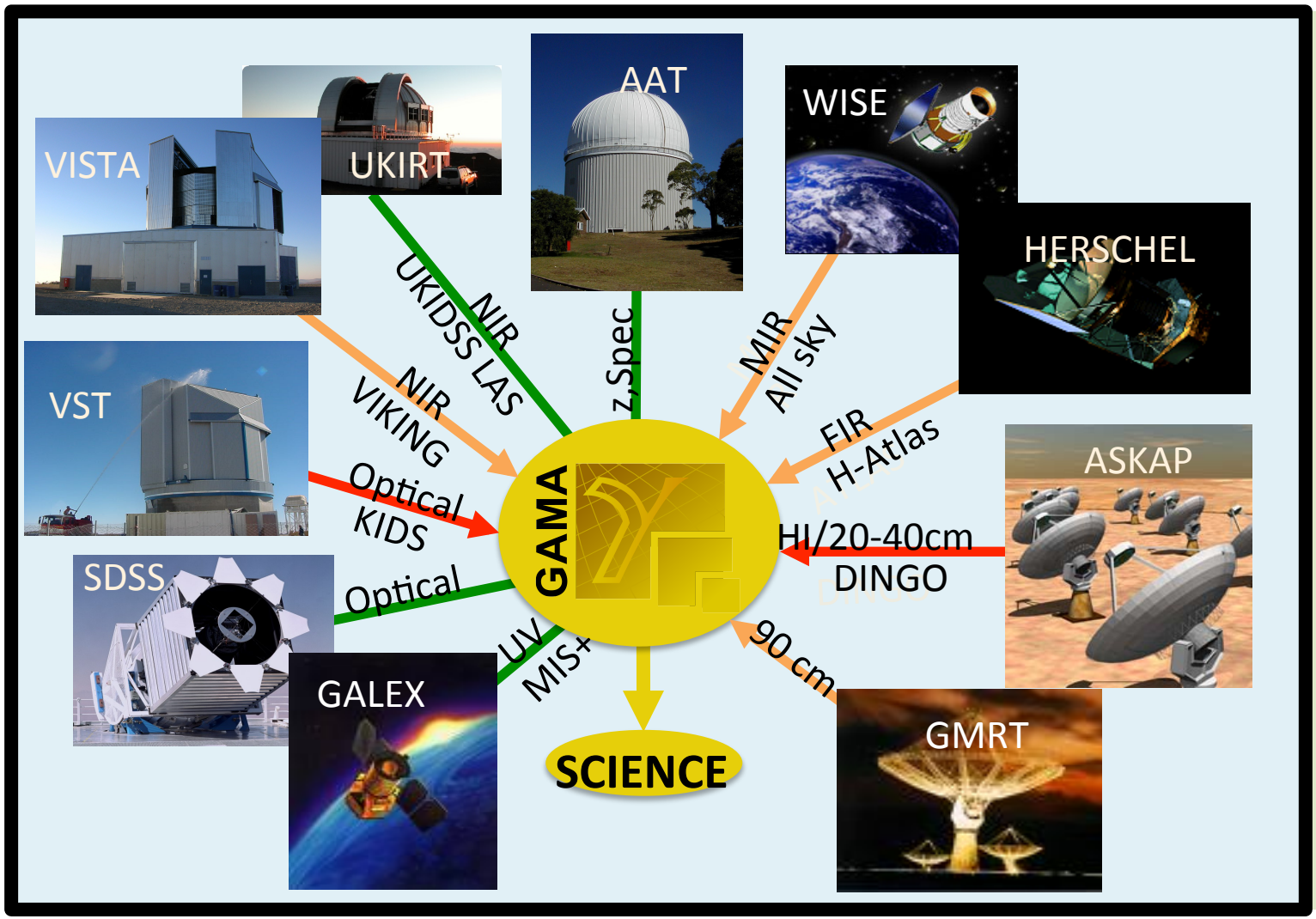


IFU sample selection

At high-z samples are either photo-z or super-massive



Galaxy And Mass Assembly



GAMAz: AAT

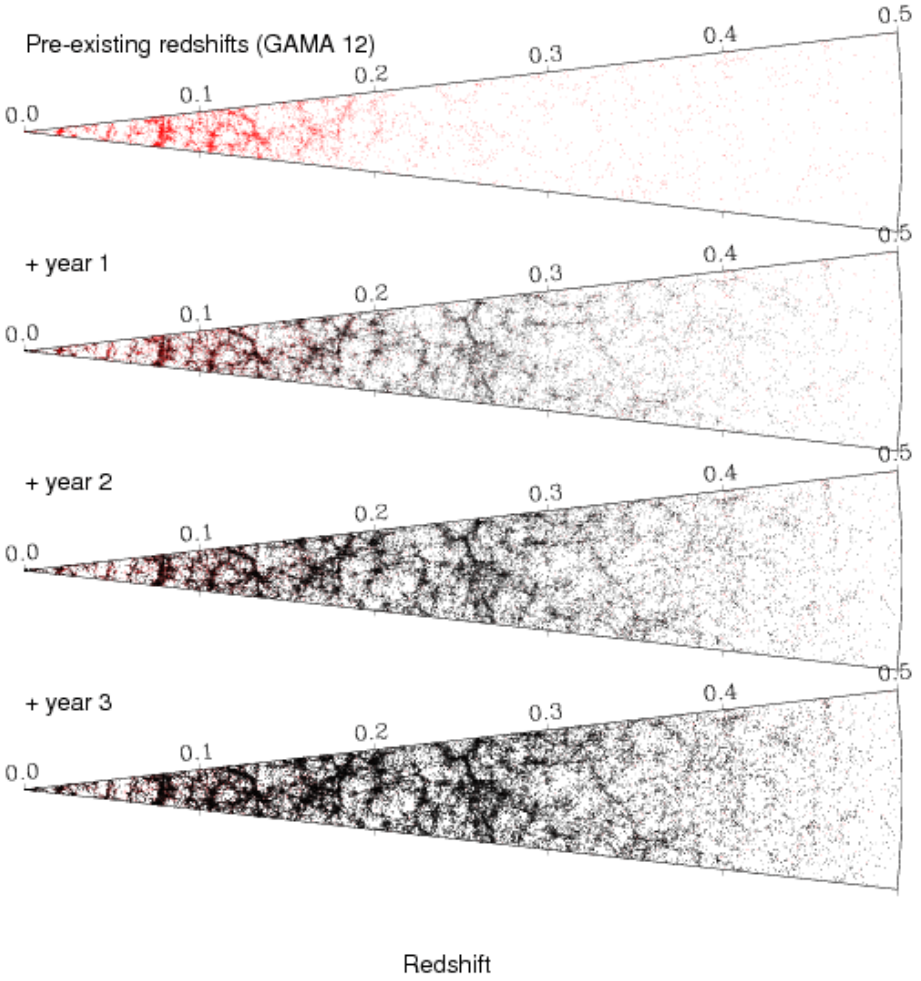
z-survey 2mags
deeper than SDSS

5/6 regions all RA

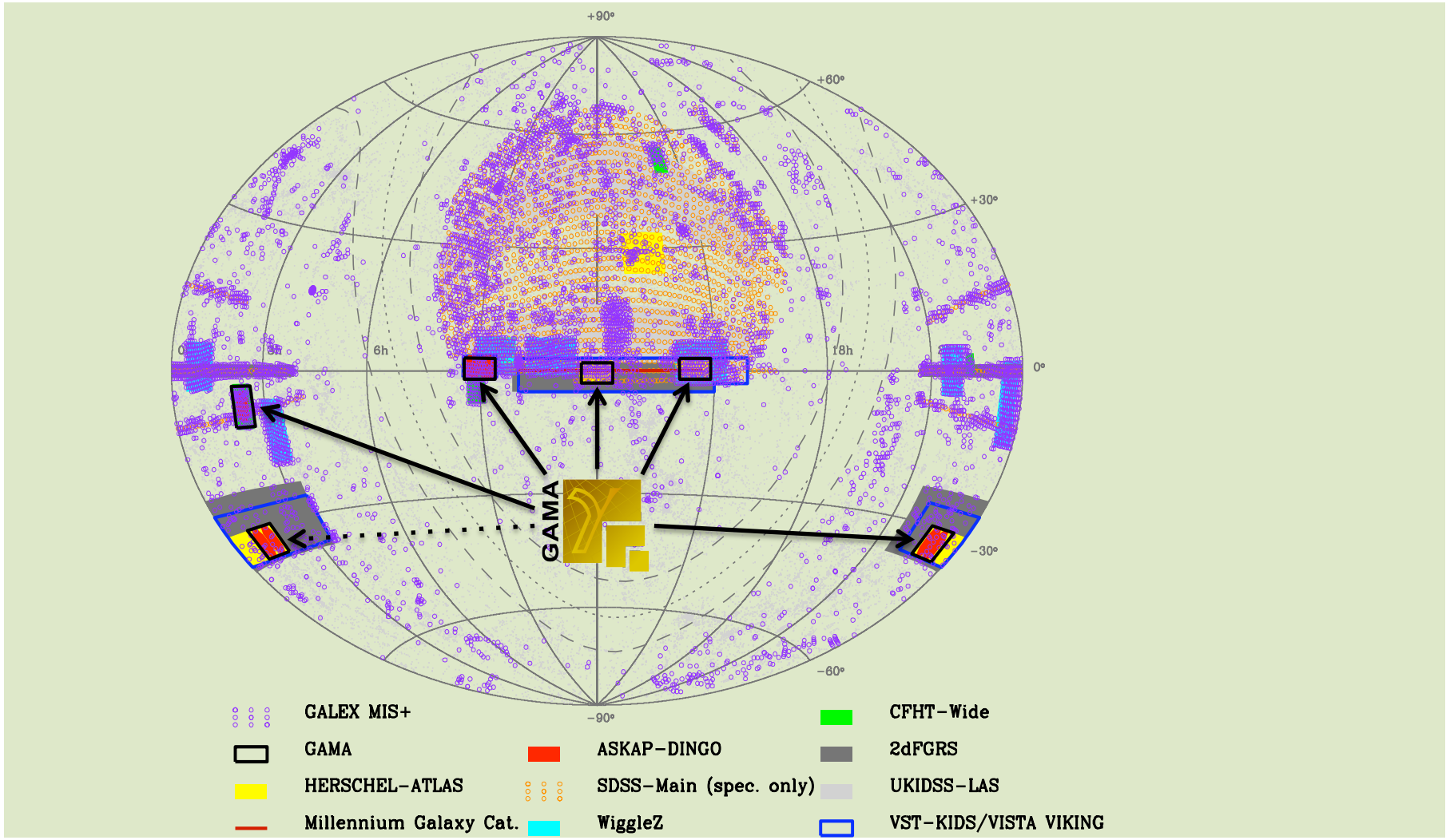
350,000 galaxies

z<0.5

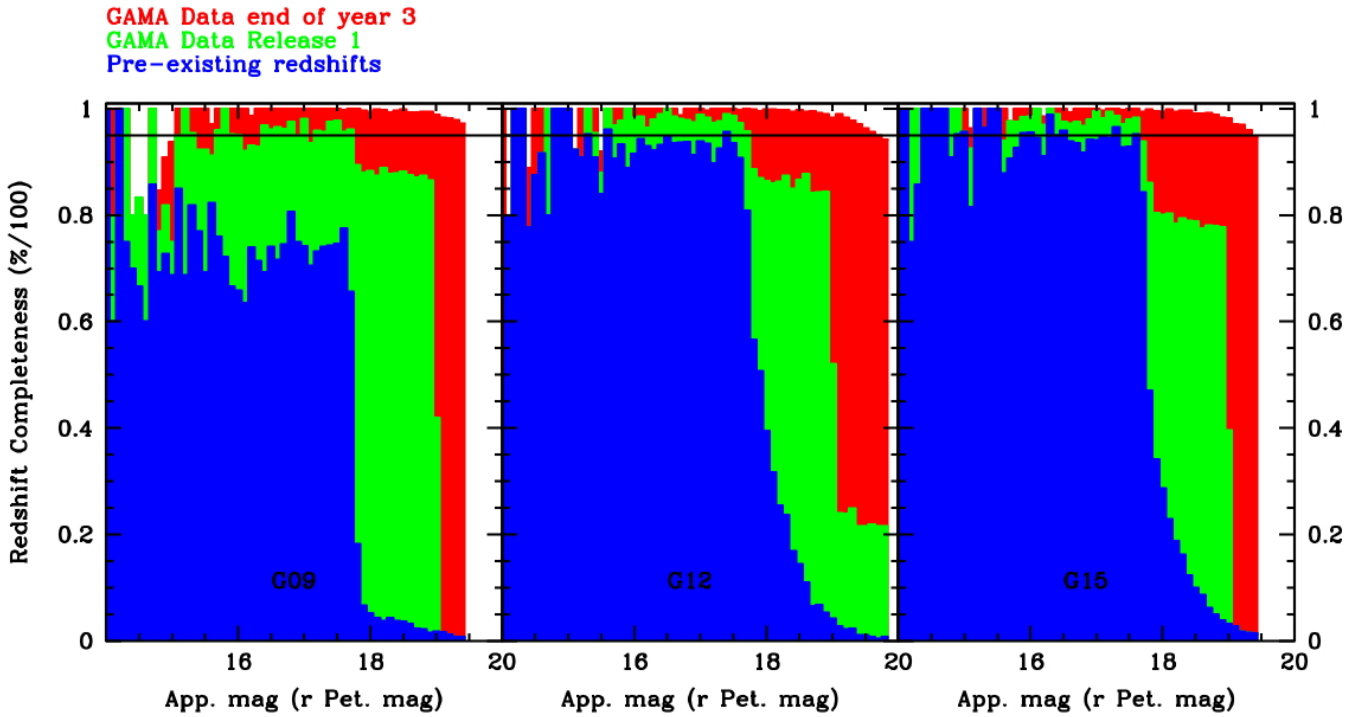
Giants to LMC range



GAMA regions

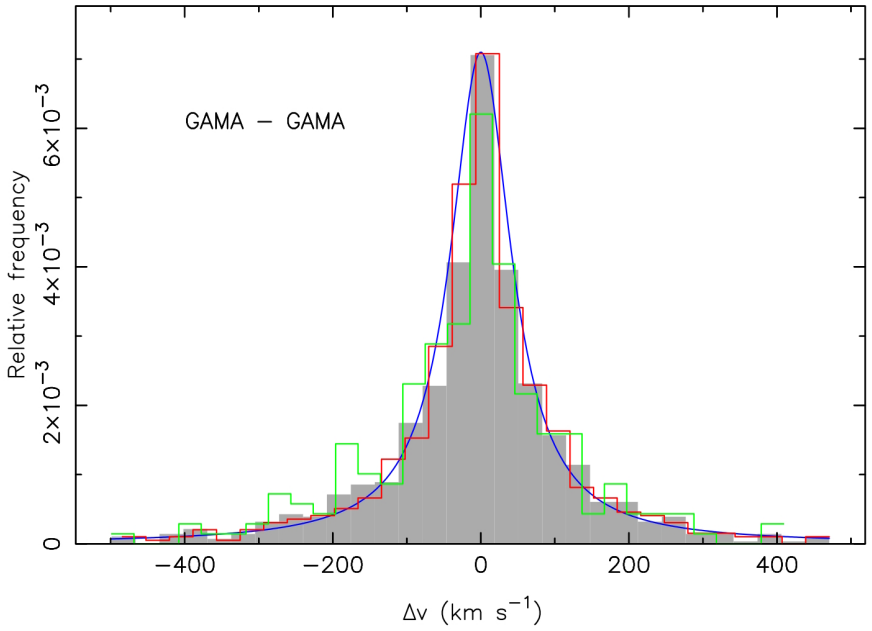


Completeness



Redshift Accuracy

σ ~+/- 65 km/s can we squeeze more out, spec. res. ~30km/s aspiration of +/-50 km/s



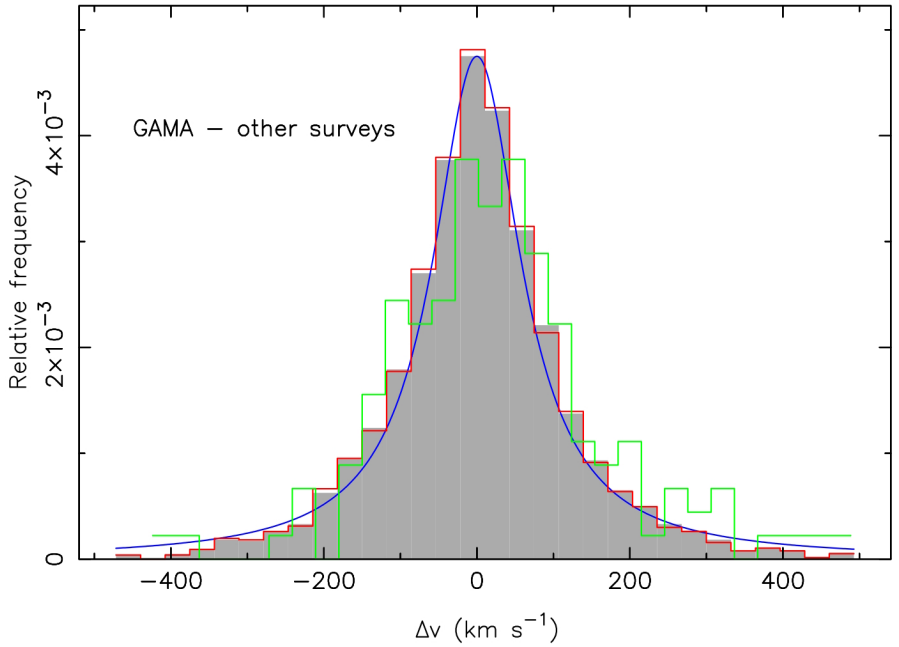
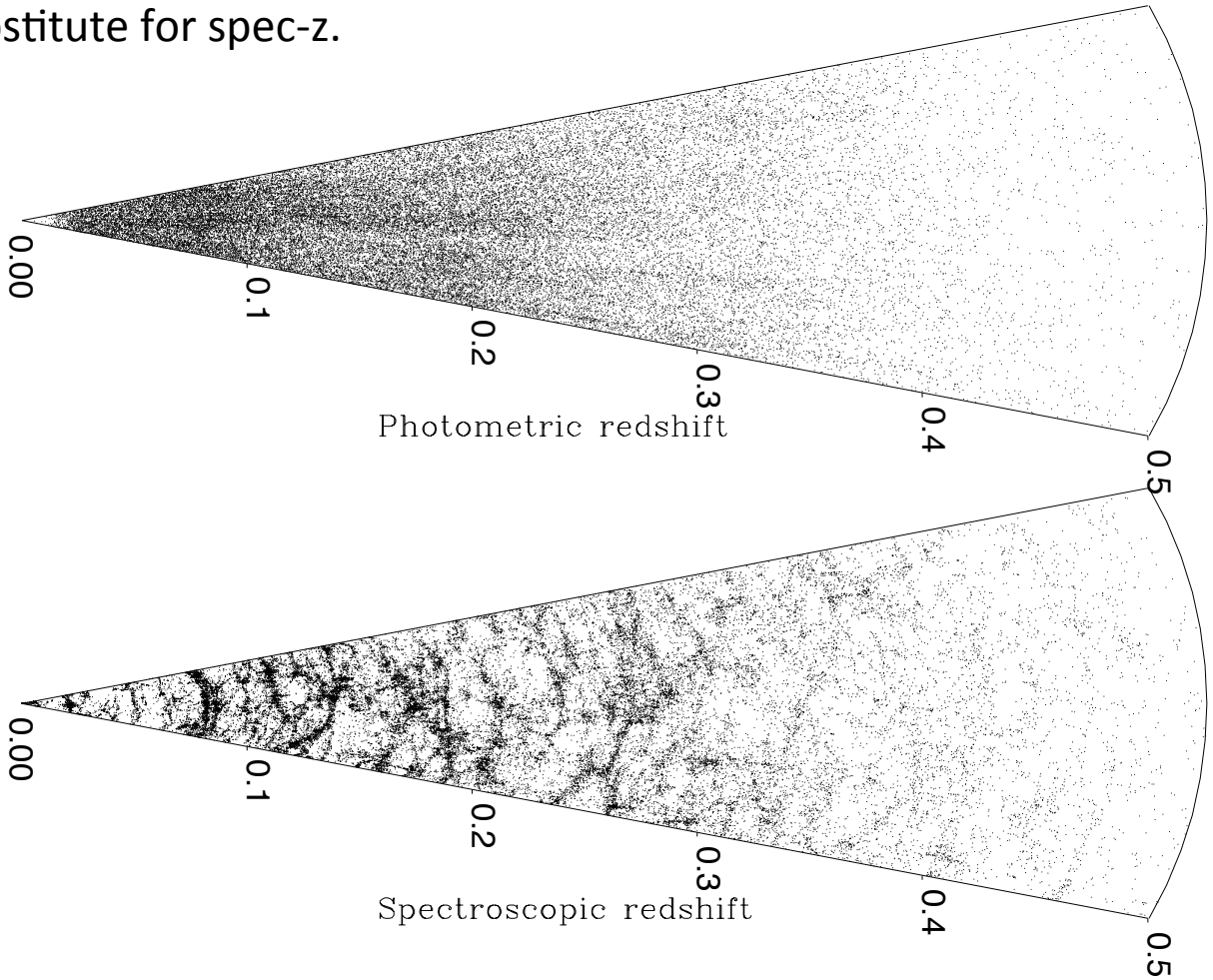
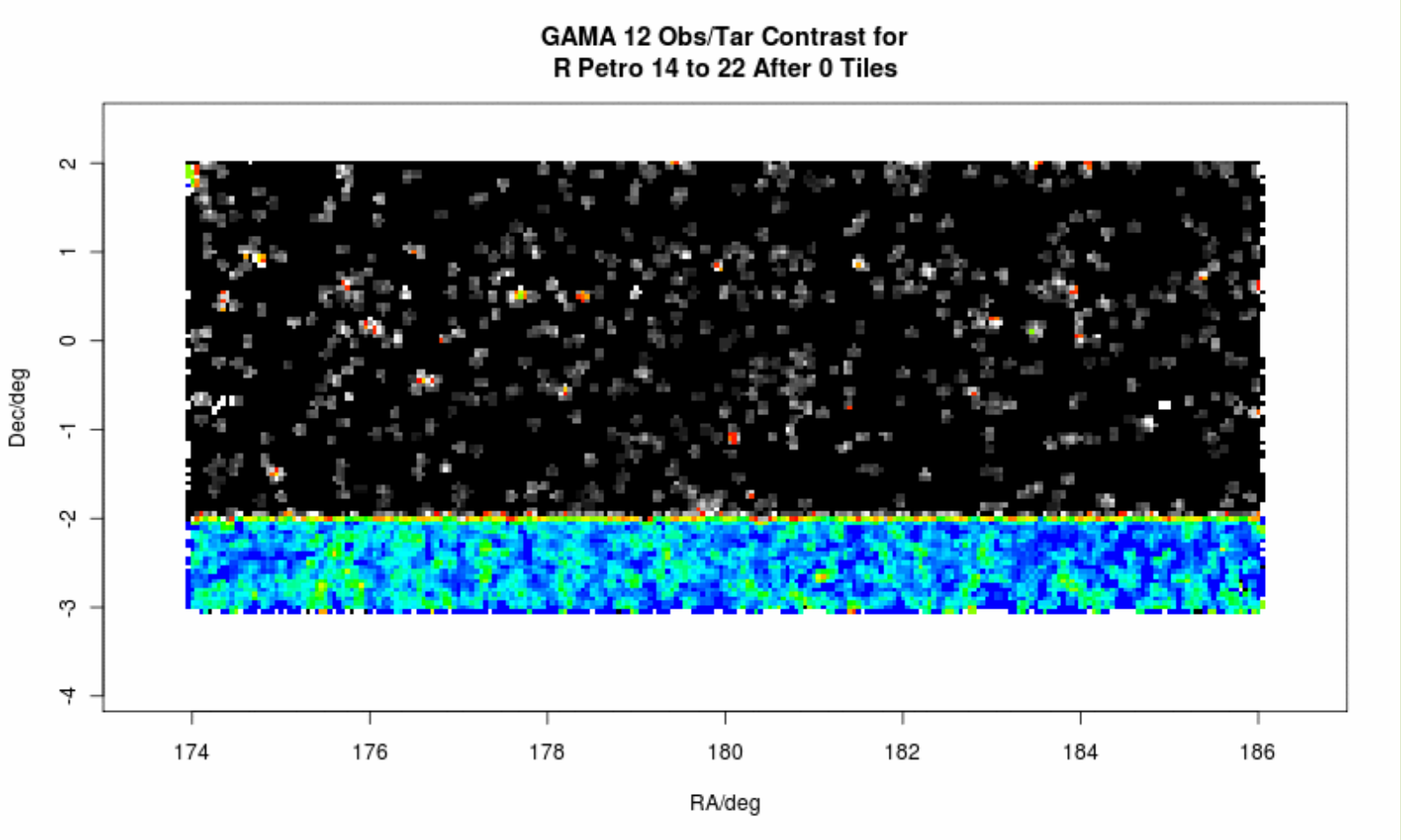


Photo-z v Spec-z

For many applications
there is no substitute for spec-z.



Spatial uniformity



Groups/Halo masses

High fidelty group cat due to revisiting each pointing 9x

FoF algorithm (bijective & calibrated against mocks)

15,000 groups in GAMA-I

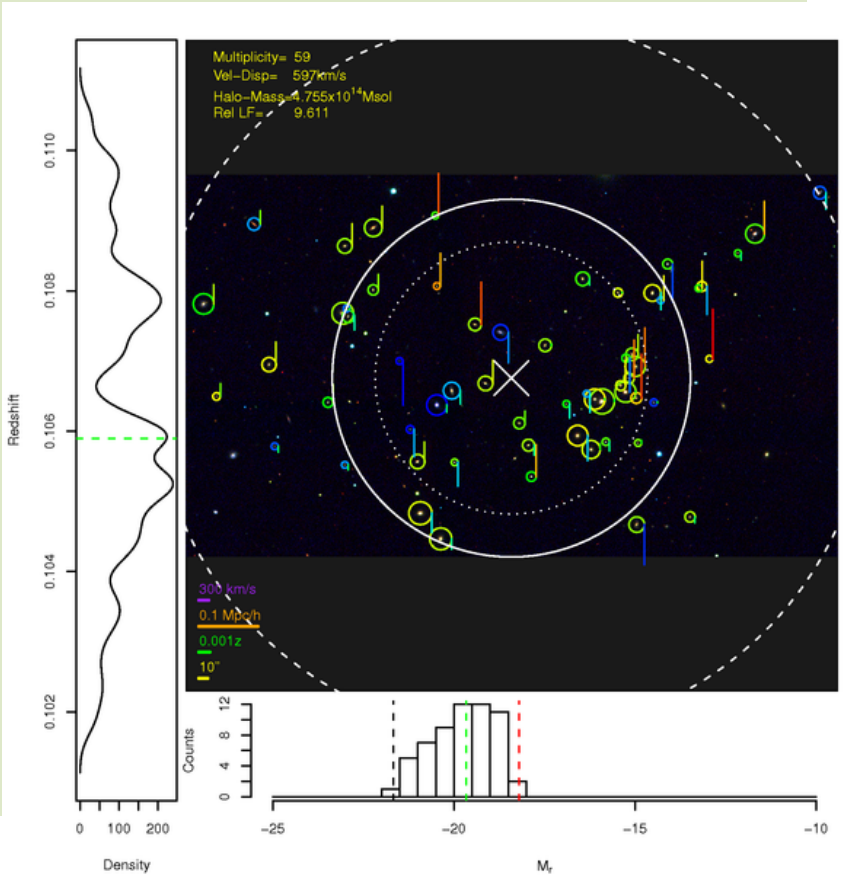
Halo masses: 10^{12} --- 10^{16} M_o

90% masses accurate to <x2

Halo mass median unbiased

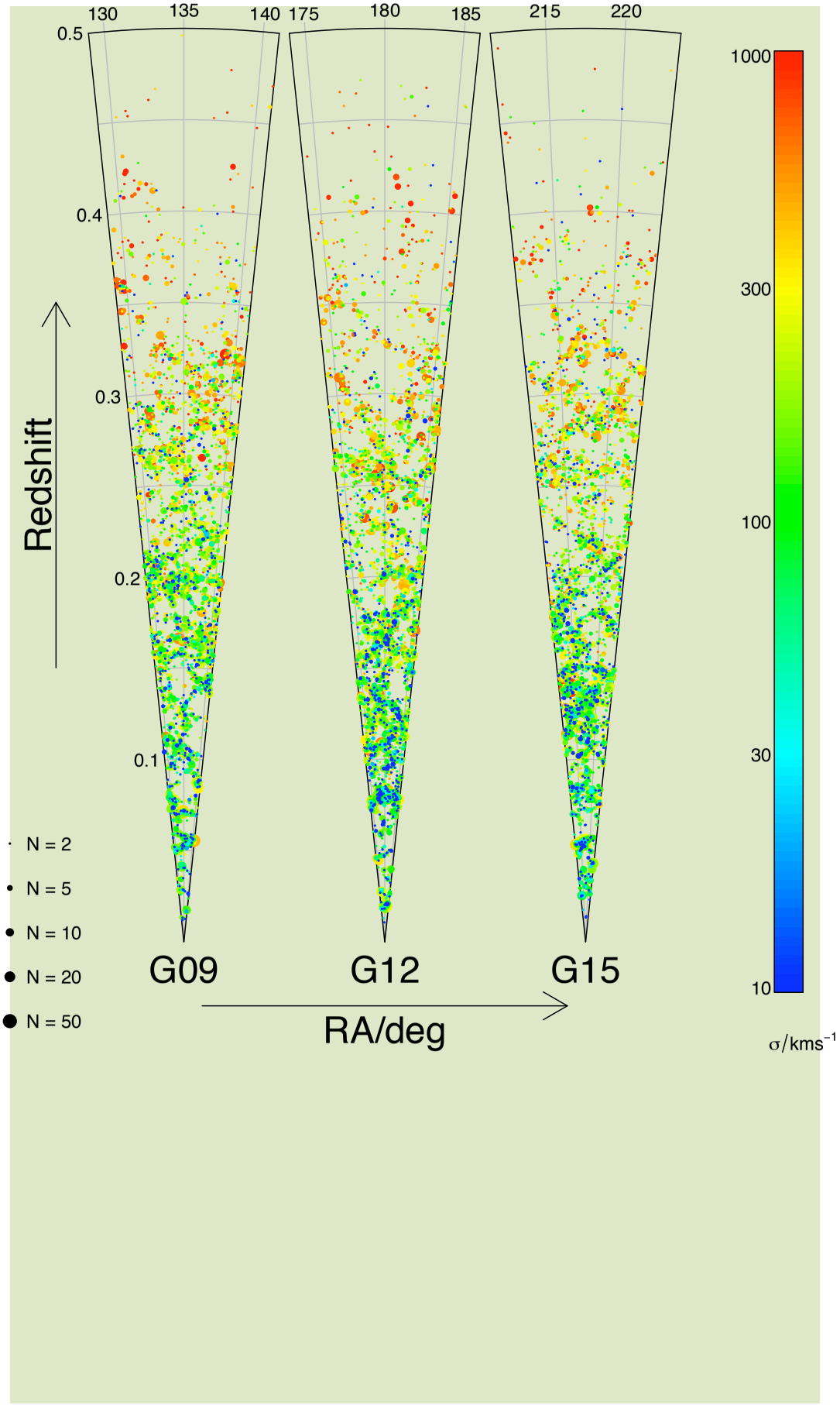
See Robotham et al (2011)

Hope to push to $10^{11}M_o$

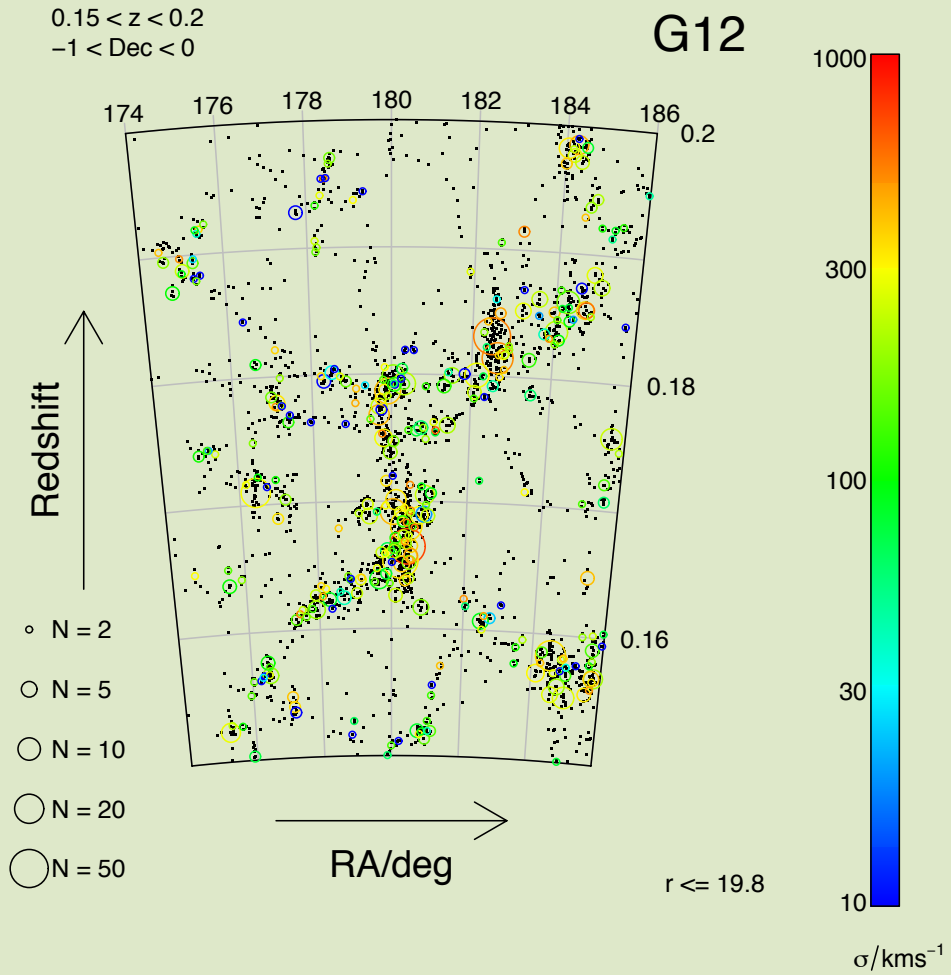


GAMA

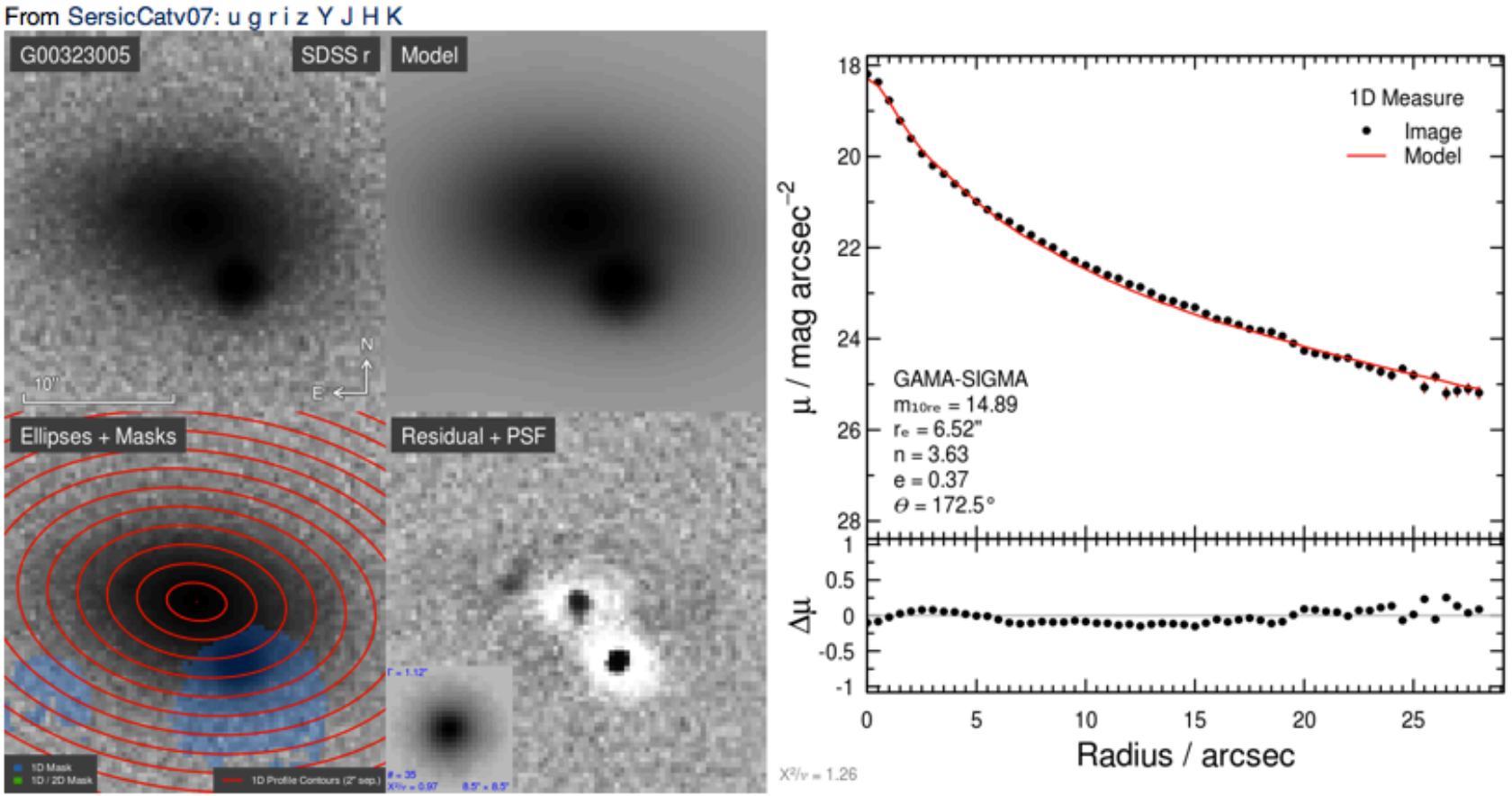
Groups to z~0.3



Filaments/Environment

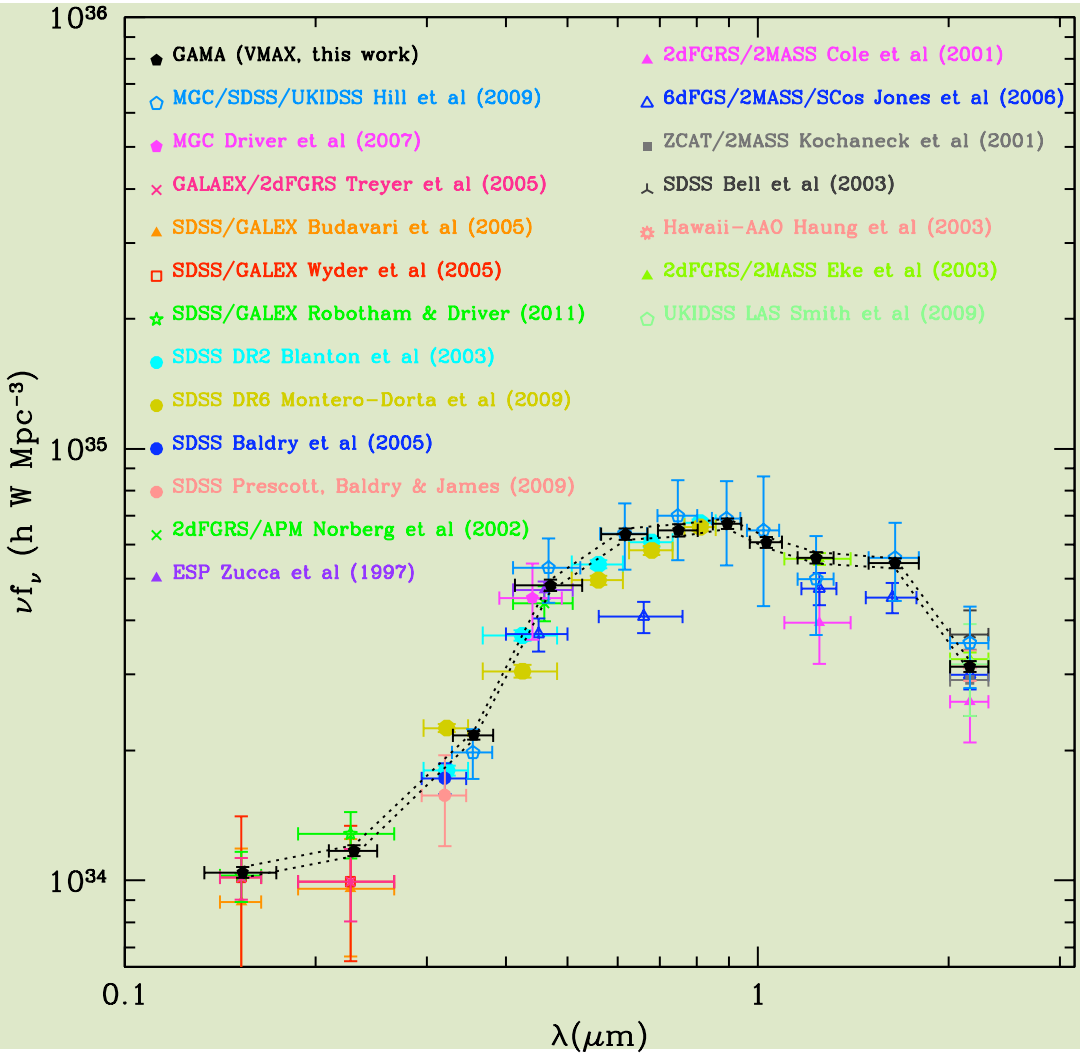


Single Sersic profiles

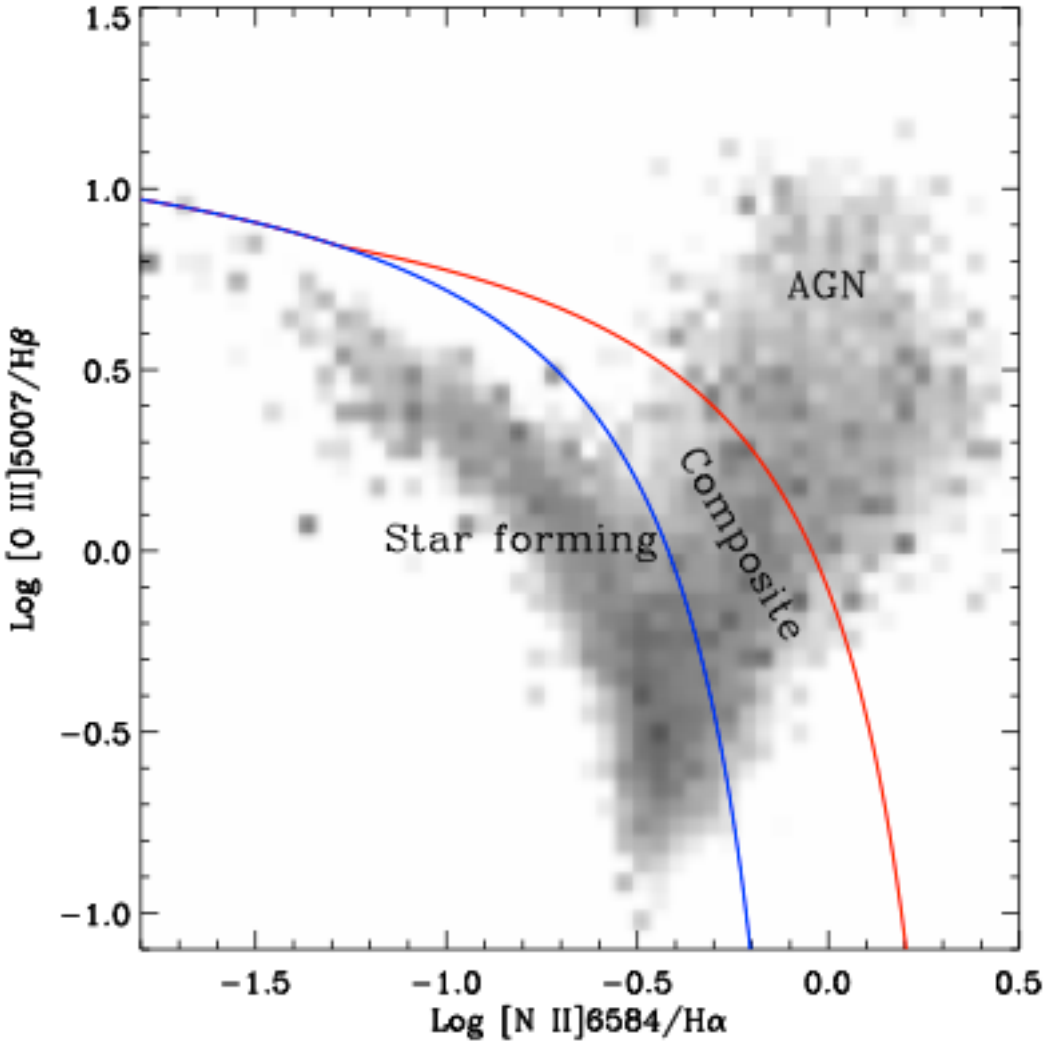


ugrizYJHK matched app photom

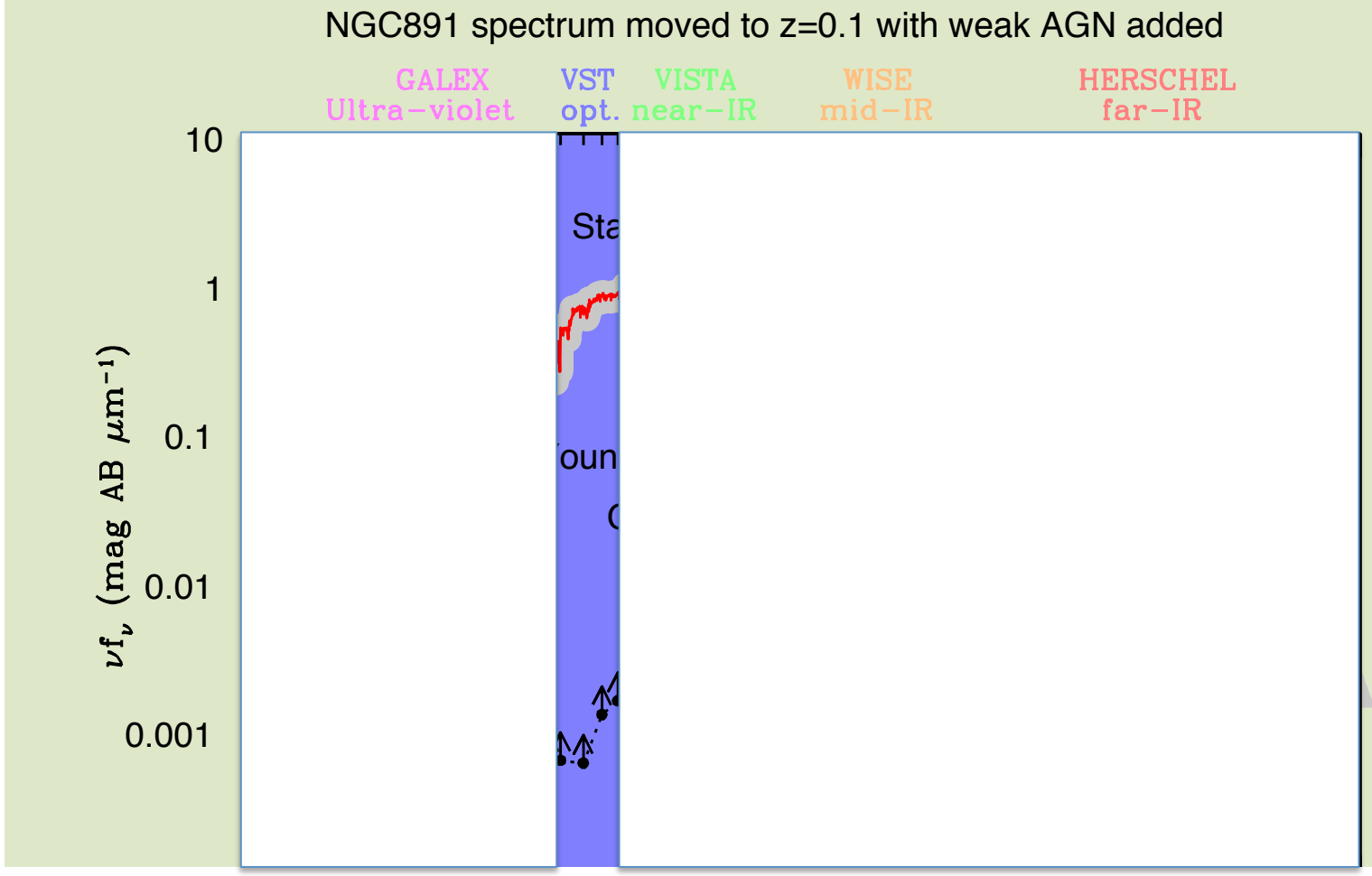
Energy output of nearby Universe →



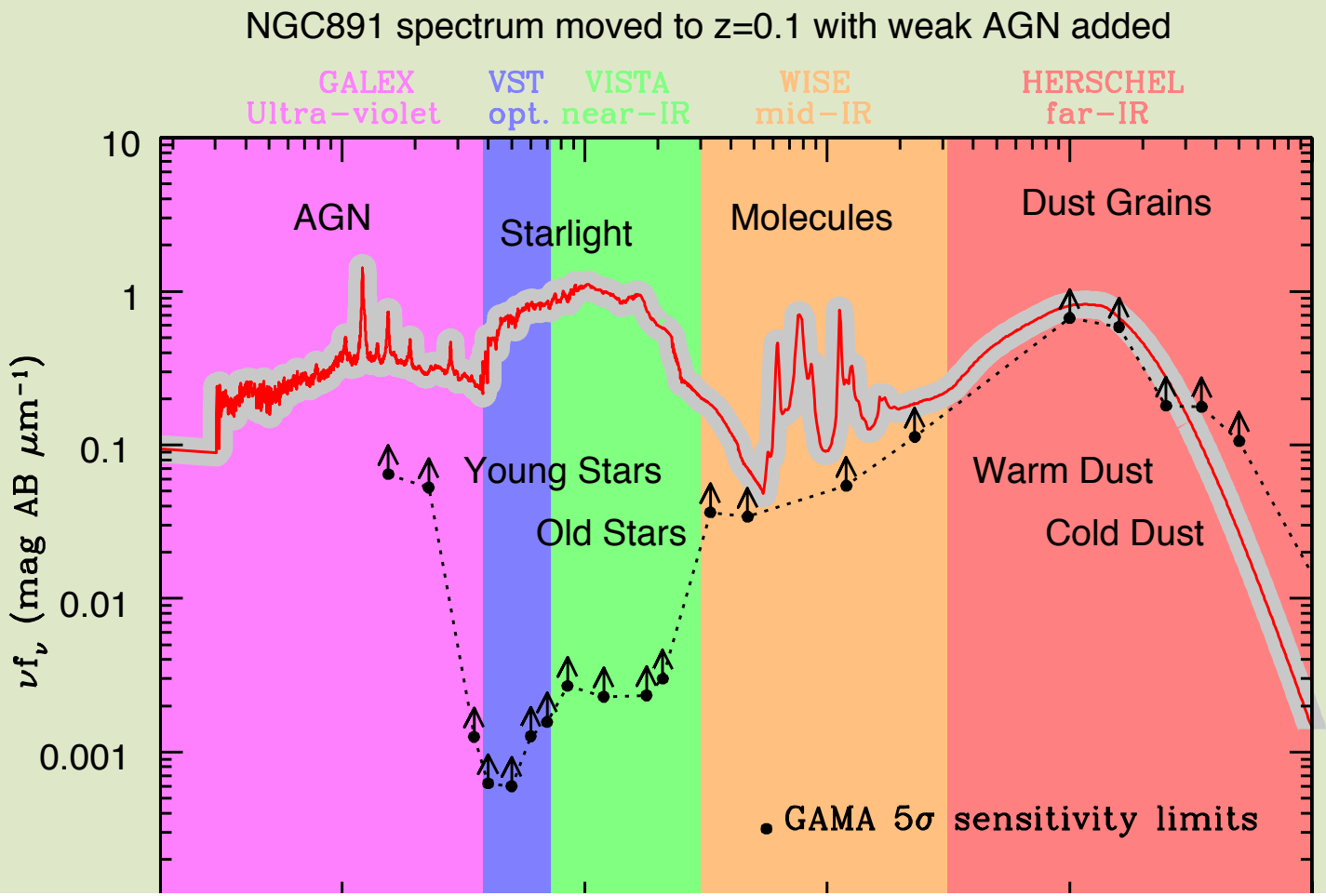
Coming soon: GANDALF analysis



Coming soon: UV-far-IR SEDs

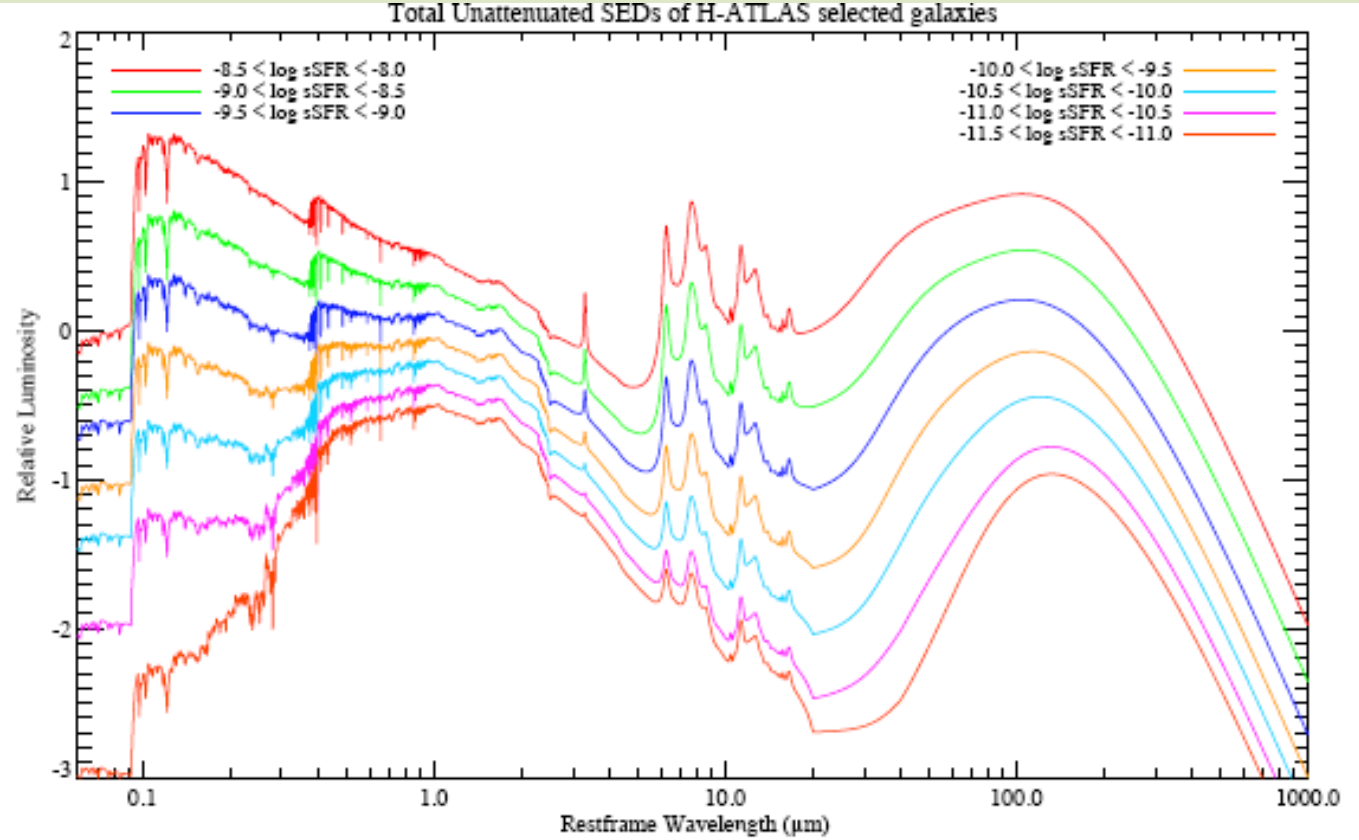


Coming soon: UV-far-IR SEDs

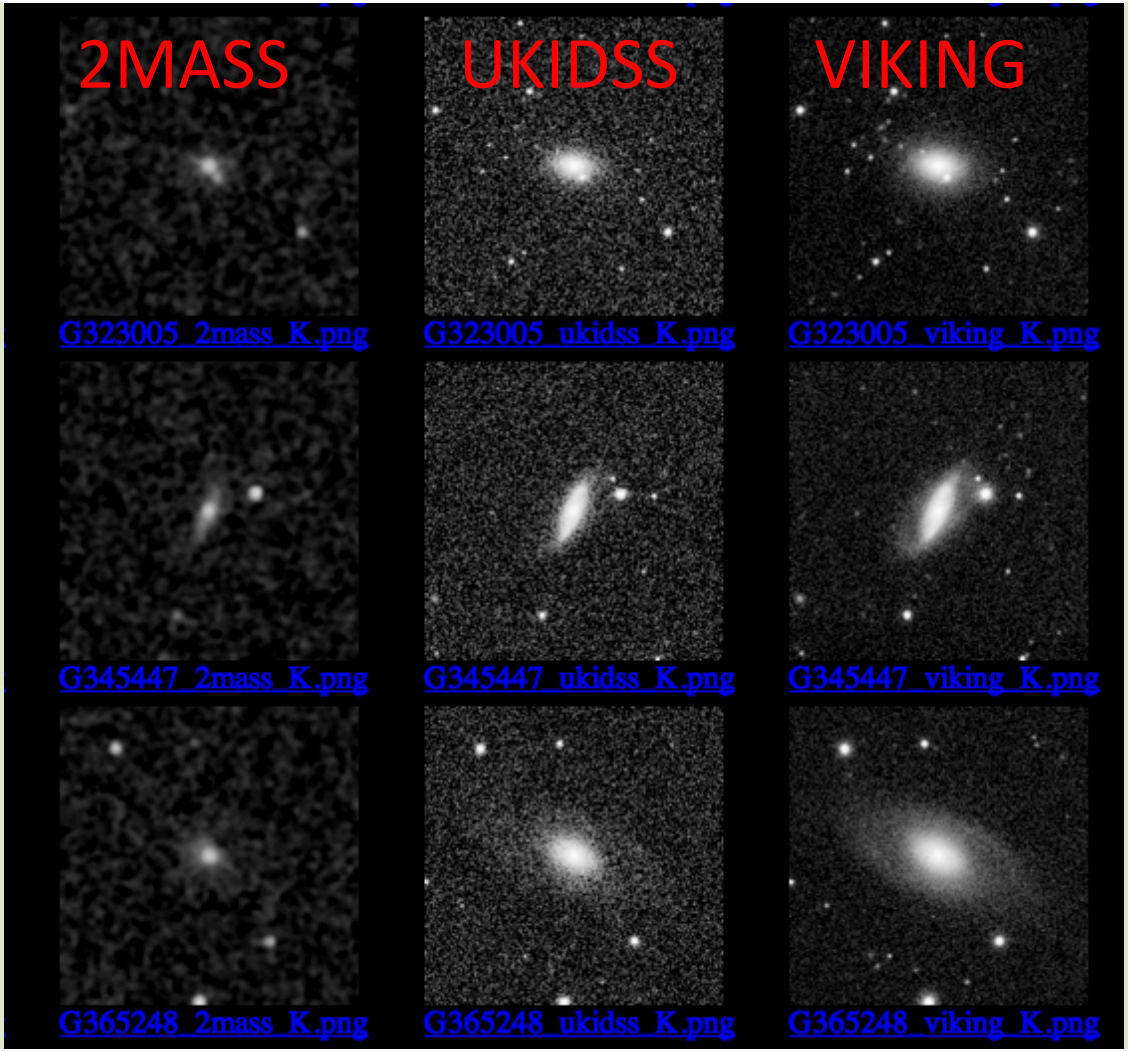


Coming soon: Dust masses

Dust masses via energy balance (da Cunha) and radiative transfer models (Popescu et al 2011)



Coming soon: VISTA & VST

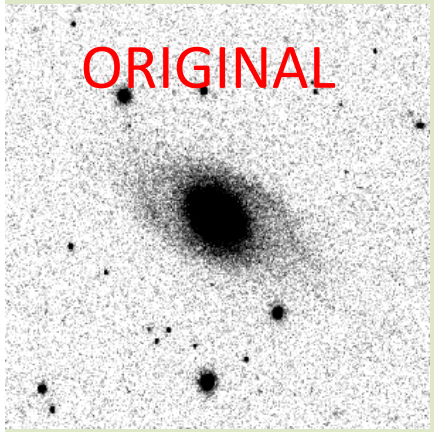


See http://star-www.st-and.ac.uk/~spd3/compare_all/ for more examples

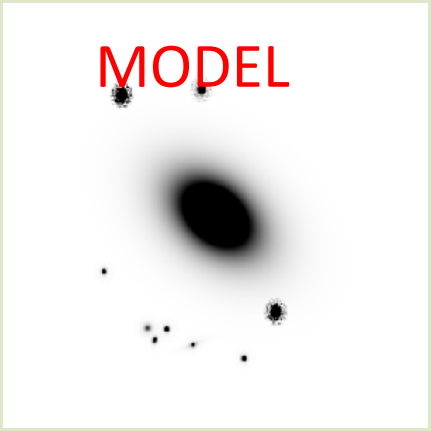
Coming soon: Bulge-disc decomp

All z<0.1 galaxies in all bands

ORIGINAL

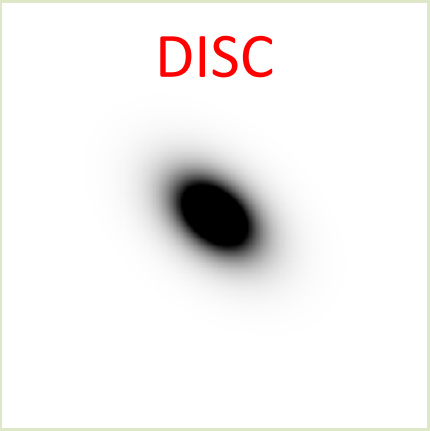


MODEL

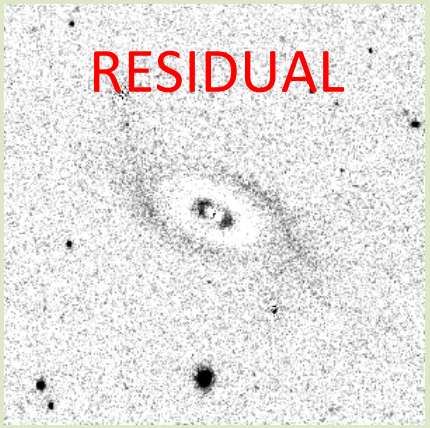


BULGE

DISC



RESIDUAL



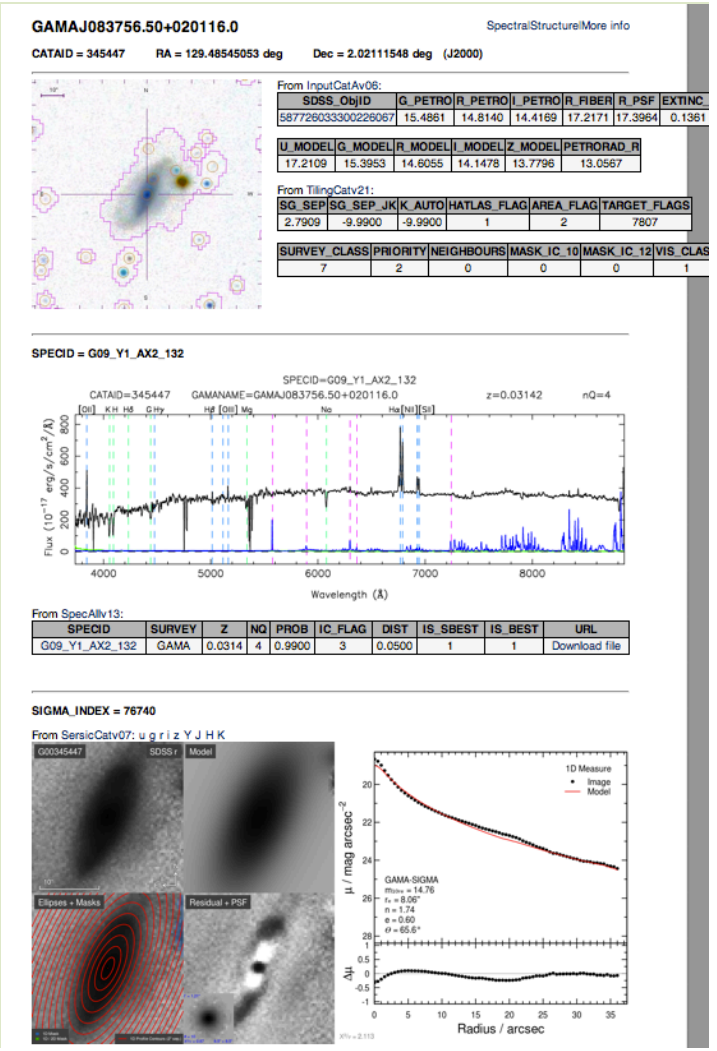
GAMA database

All info online:

1st data release 01/06/10

2nd data release soon

- Single Object Viewer
- Multi Object viewer
- VO compliant (TopCat etc)
- Multi-band Viewer
- SQL Query Builder
  - matches across DMUs



GAMAJ083756.50+020116.0 SpectralStructure|More info

CATAID = 345447 RA = 129.48545053 deg Dec = 2.02111548 deg (J2000)

From InputCatAv06:

SDSS_ObjID	G_PETRO	R_PETRO	I_PETRO	R_FIBER	R_PSF	EXTINC
587726033300226067	15.4861	14.8140	14.4169	17.2171	17.3964	0.1361

U_MODEL	G_MODEL	R_MODEL	I_MODEL	Z_MODEL	PETRORAD_R
17.2109	15.3953	14.6055	14.1478	13.7796	13.0567

From TilingCatv21:

SG_SEP	SG_SEP_JK	K_AUTO	HATLAS_FLAG	AREA_FLAG	TARGET_FLAGS
2.7909	-9.9900	-9.9900	1	2	7807

SURVEY_CLASS	PRIORITY	NEIGHBOURS	MASK_IC_10	MASK_IC_12	VIS_CLAS
7	2	0	0	0	1

SPECID = G09_Y1_AX2_132

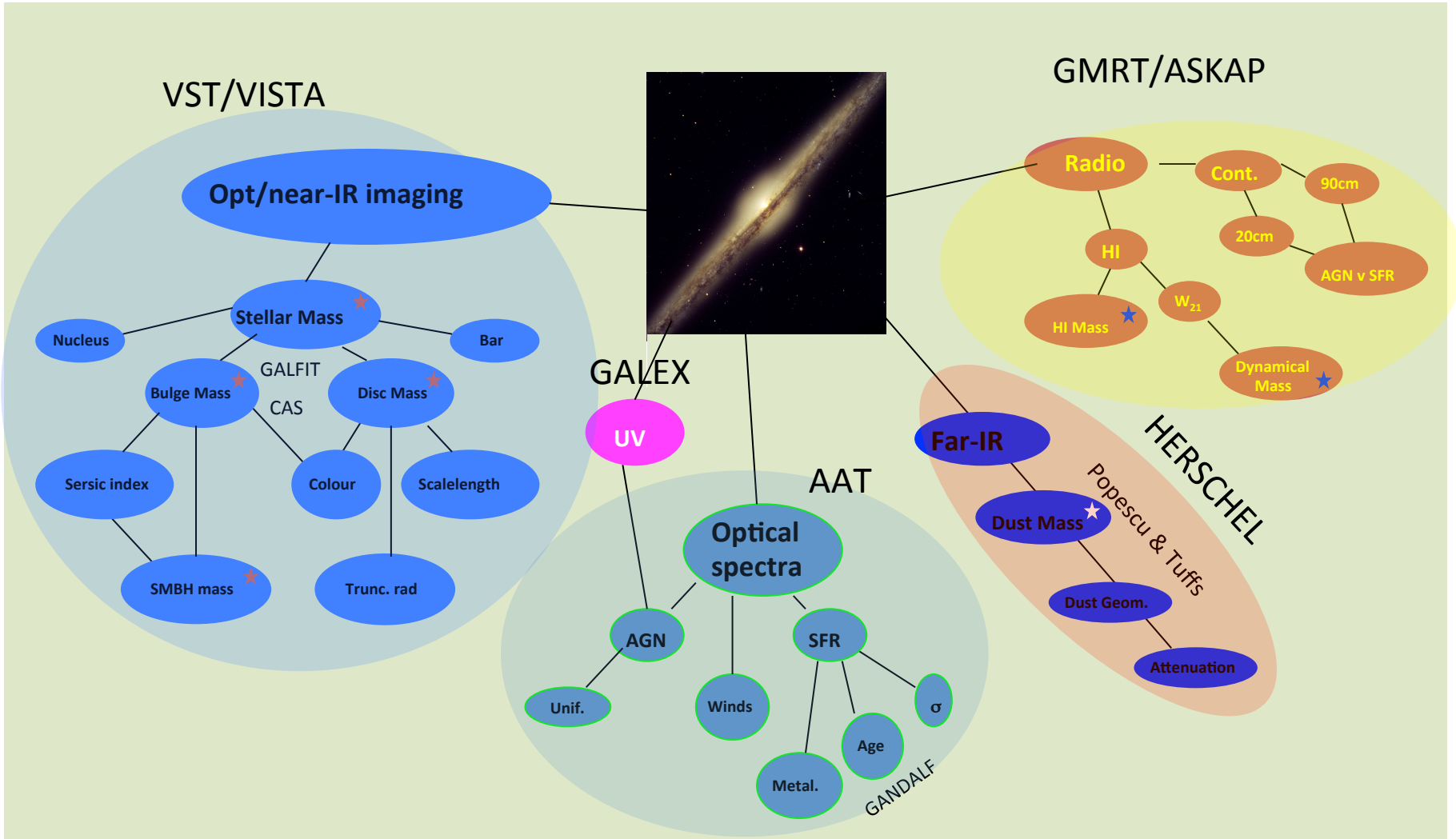
From SpecAllv13:

SPECID	SURVEY	Z	NQ	PROB	IC_FLAG	DIST	IS_SBEST	IS_BEST	URL
G09_Y1_AX2_132	GAMA	0.0314	4	0.9900	3	0.0500	1	1	Download file

SIGMA_INDEX = 76740

From SersicCatv07: u g r i z Y J H K

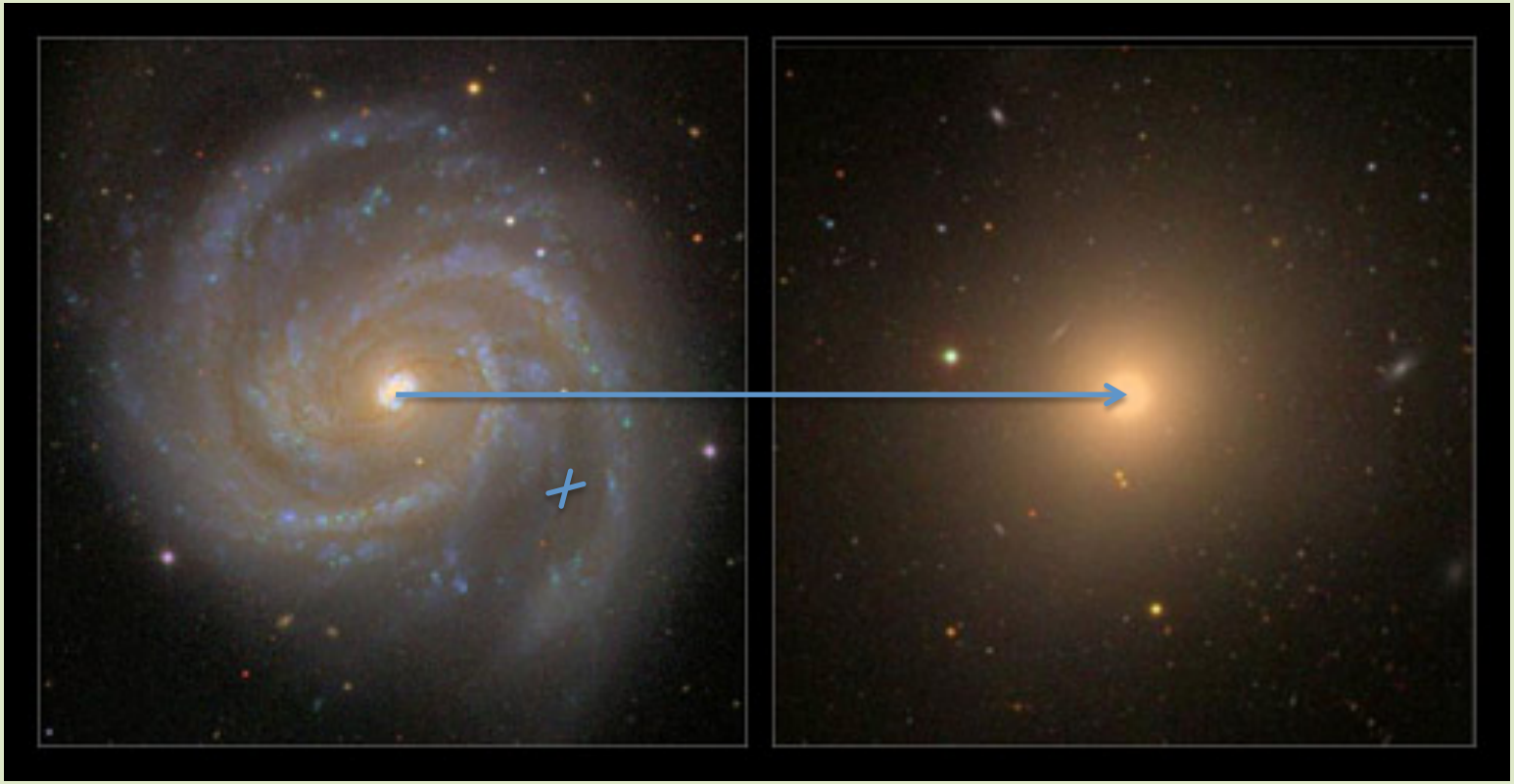
Ultimate galaxy database



Galaxy formation

Bimodality or Duality?

Red v blue or spheroid v disc?



Galaxy formation

Axioms:

AGN activity traces spheroid formation

CSFH traces total combined star-formation

Fully constrained, as CSFH and AGN activity known

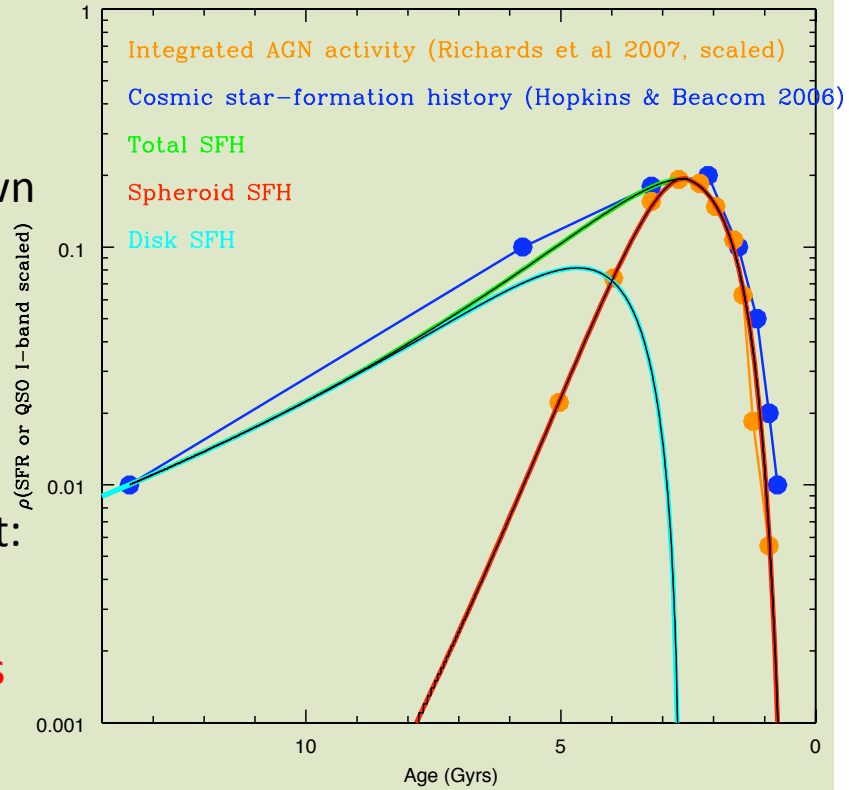
Hopkins & Beacom (2006)

Richards et al (2007)

Can now adopt an Universal IMF + stellar evolution model and run clock forward to predict:

Cosmic SED at all redshifts

How stars are distributed in spheroids+discs at all redshifts



… runs on a Mac in 15mins

Galaxy formation

SFH = Hopkins & Beacom (2006)

AGN = Richards et al (2007)

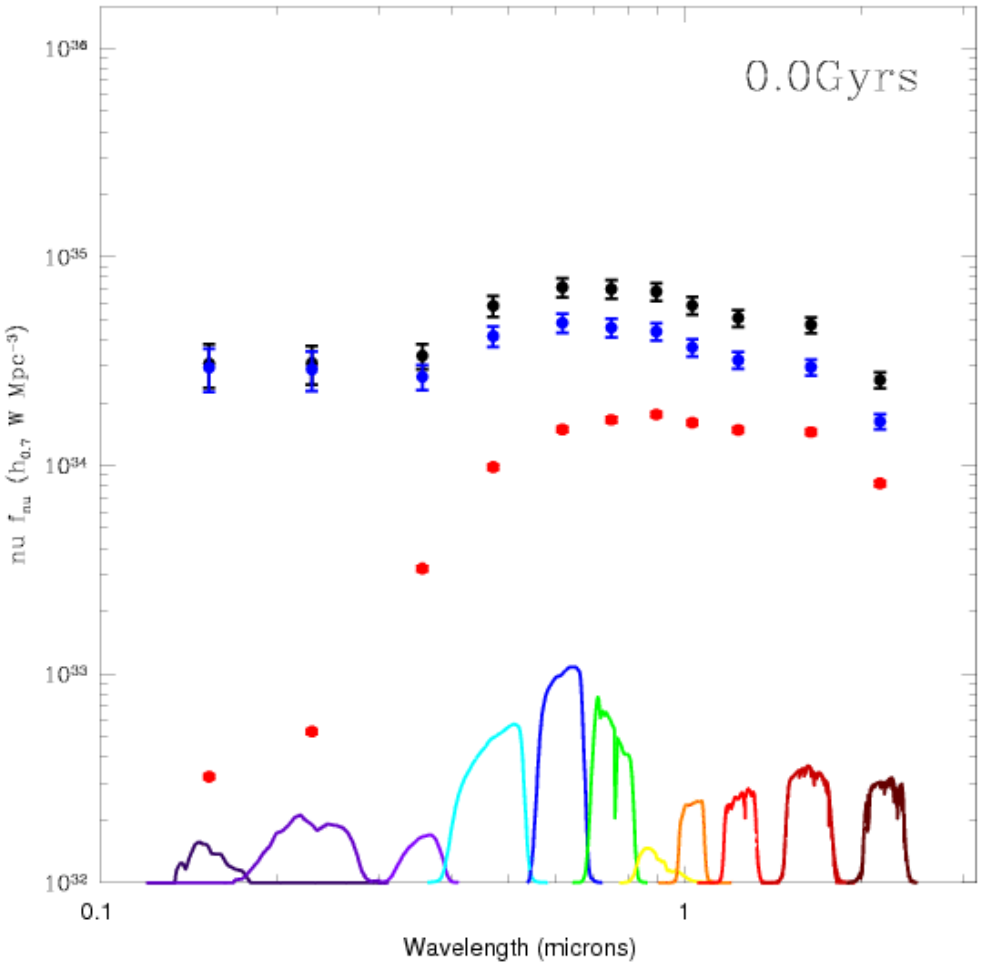
IMF = Baldry & Glazebrook (2003)

SPS = Pegase2 (Fioc et al 2001)

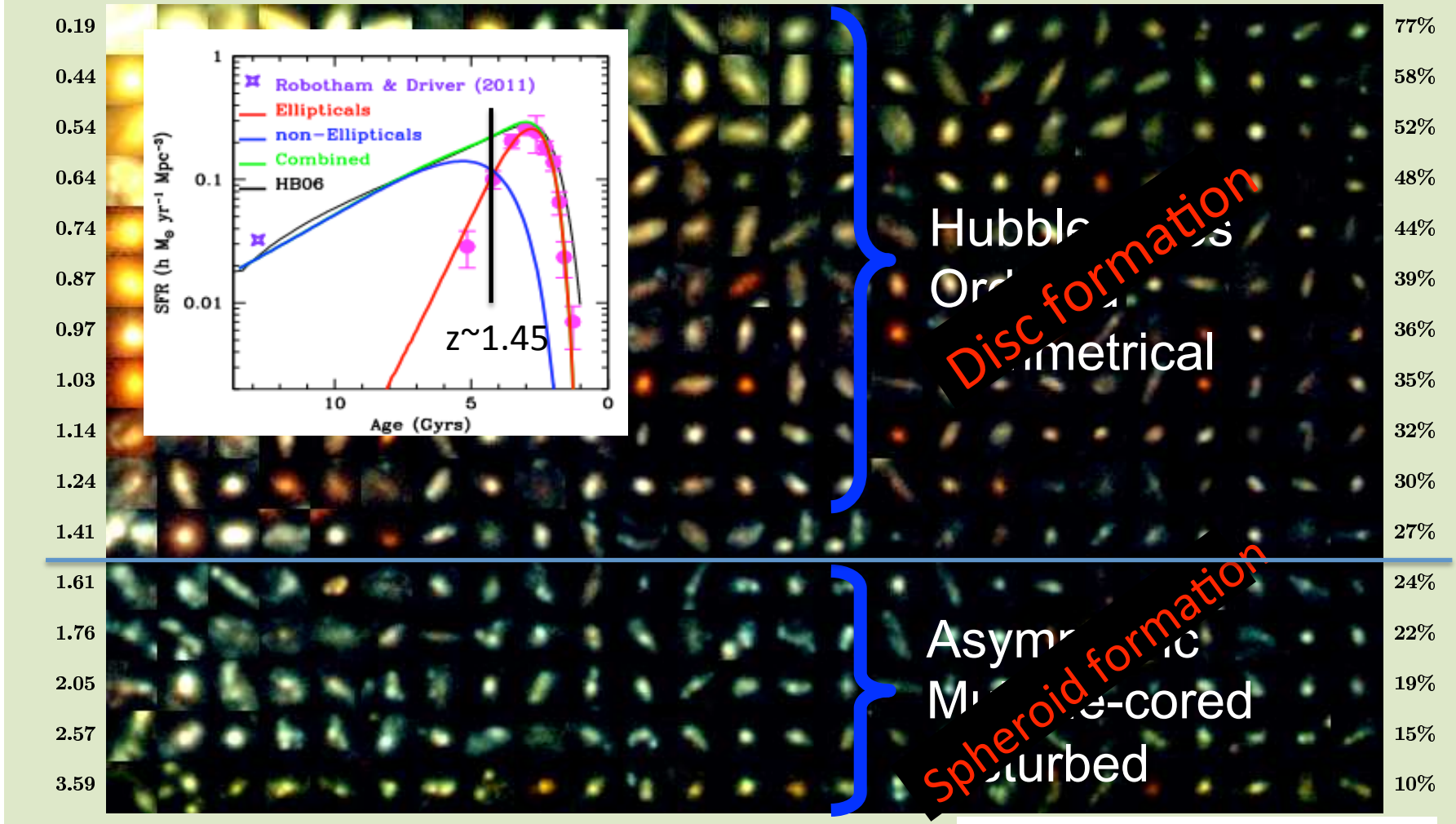
Z(t) = Linear

No free-params !

Data: GAMA unpublished



Galaxy formation



Driver et al (1998, ApJ, 496, 93)

Possible IFU Survey

Volume limited to make sample cosmologically representative

- Max z where typical bulges are resolved (i.e., 2kpc ~ 1.6'') → $z < 0.05$
- Min z where typical disks still lie within SAMI f.o.v. (i.e., 10kpc<14'') → $z > 0.035$
- i.e., $0.035 < z < 0.05$

No of GAMA galaxies within this range = 999 in GAMA-I

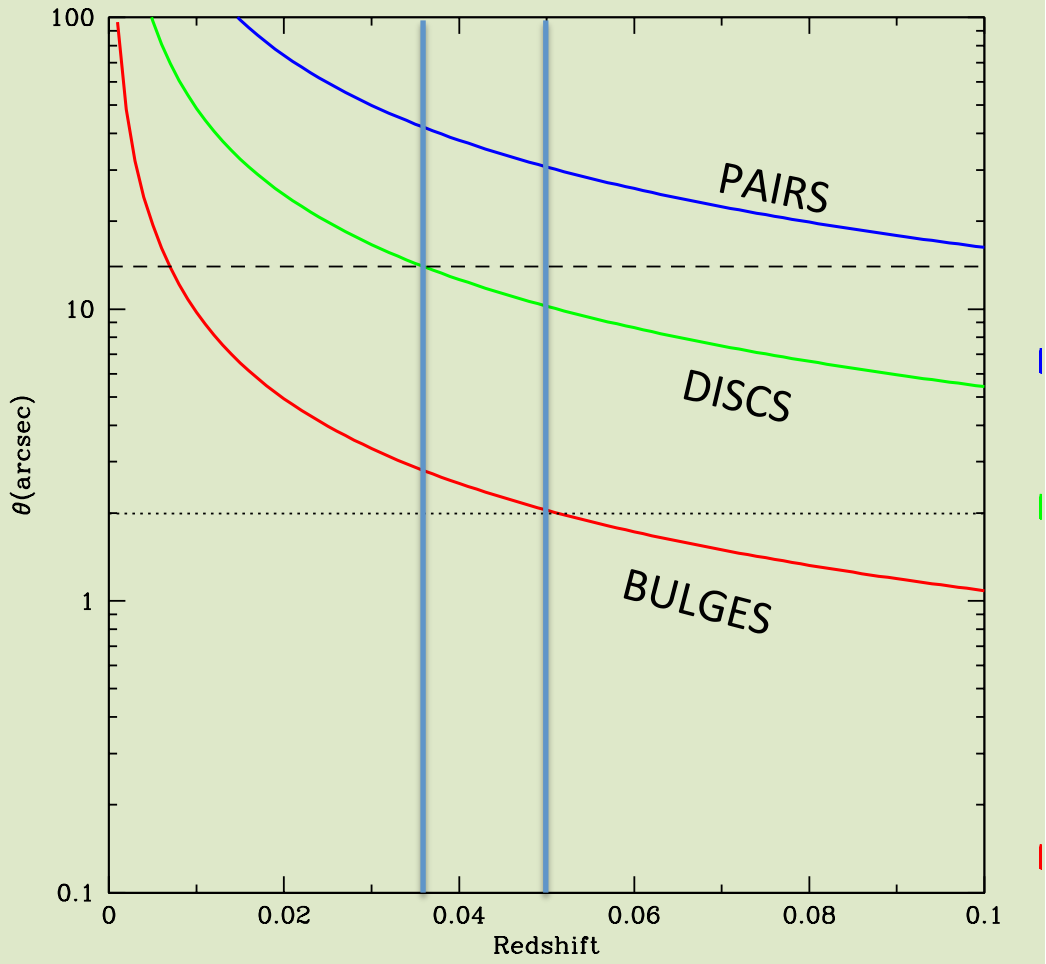
~3000 in GAMA-II (10/sq deg)

Stellar mass range probed = 10^6-10^{12}

Halo mass range probed = 10^{11}-10^{15}

Possible IFU survey

$0.035 < z < 0.05$



Conclusions

1. GAMA, optimal starting point for low-z IFU studies
   - Complete, multi-band, groups, bulge-disc decomps, HI velocity profiles
   - Spin-off projects now underway on Herschel, Chandra, Parkes, SAMI
2. Galaxy duality not bimodality
   - In the mean: spheroids then discs
   - Zero param. two-phase model works
3. Building a complete energy model of Universe
   - Improve dust modeling
   - Compare to EBL data
   - Incorporate AGN