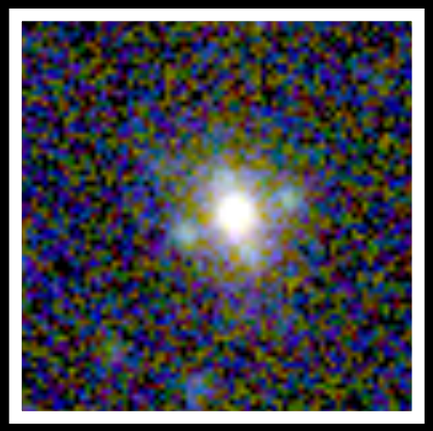


KiDS-SQUAD

Chiara Spiniello

N. Napolitano, F. Getman, M. Spavone, M.A. Raj, G.D'Ago, M.Capaccioli
A. Agnello, A. Sergeyev, C. Tortora, E. Petrillo, E. Bannikova
and the KiDS Collaboration

VST in the era of the large sky surveys
Naples 5-8 June 2018

INAF

Marie Skłodowska-Curie Actions

OUTLINE

★ **The Kilo Degree Survey (KIDS) and the Strong Gravitational Lensing challenge**

★ **GOTTA CATCH'EM ALL**

- **Multiple images of lensed QSOs**

- **Gravitational Arcs (Crescenzo's talk)**

★ **SPECTROSCOPIC FOLLOW-UP of the best QSOs candidates**

OUTLINE

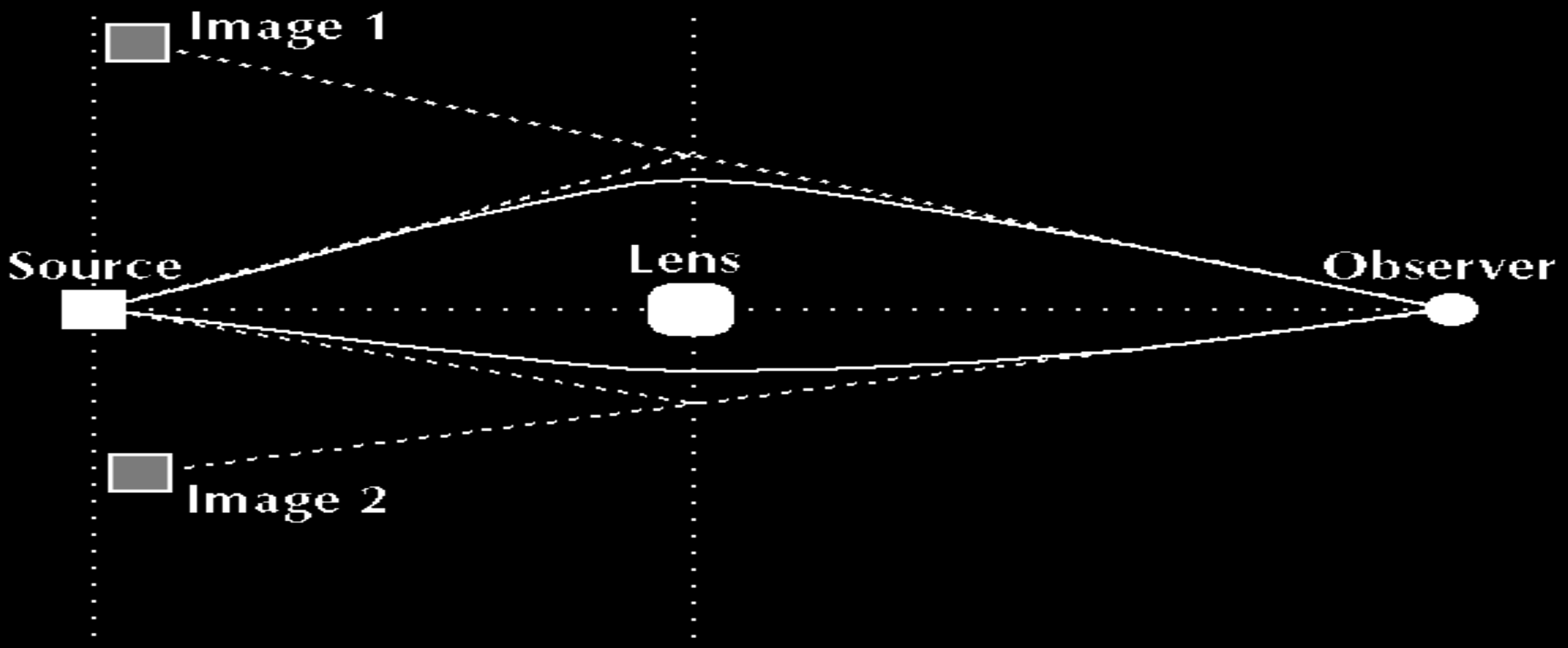
★ **The Kilo Degree Survey (KIDS)**
and the Strong Gravitational Lensing challenge

★ **GOTTA CATCH'EM ALL**

Multiple images of lensed QSOs

★ **SPECTROSCOPIC FOLLOW-UP**
of the best QSOs candidates

STRONG GRAVITATIONAL LENSING



★ **Lensing as MAGNIFYING GLASS: study of the distant Universe**

★ **TIME DELAY: Cosmography (H_0)**
(Adriano's talk)

H0LiCOW
H_0 Lenses in COSMOGRAIL's Wellspring.

Suyu et al., 2016

★ **Physics of quasars (QSOs): accretion disk size and thermal profile**

★ **Mass (Dark+Luminous) Distribution of the LENS**

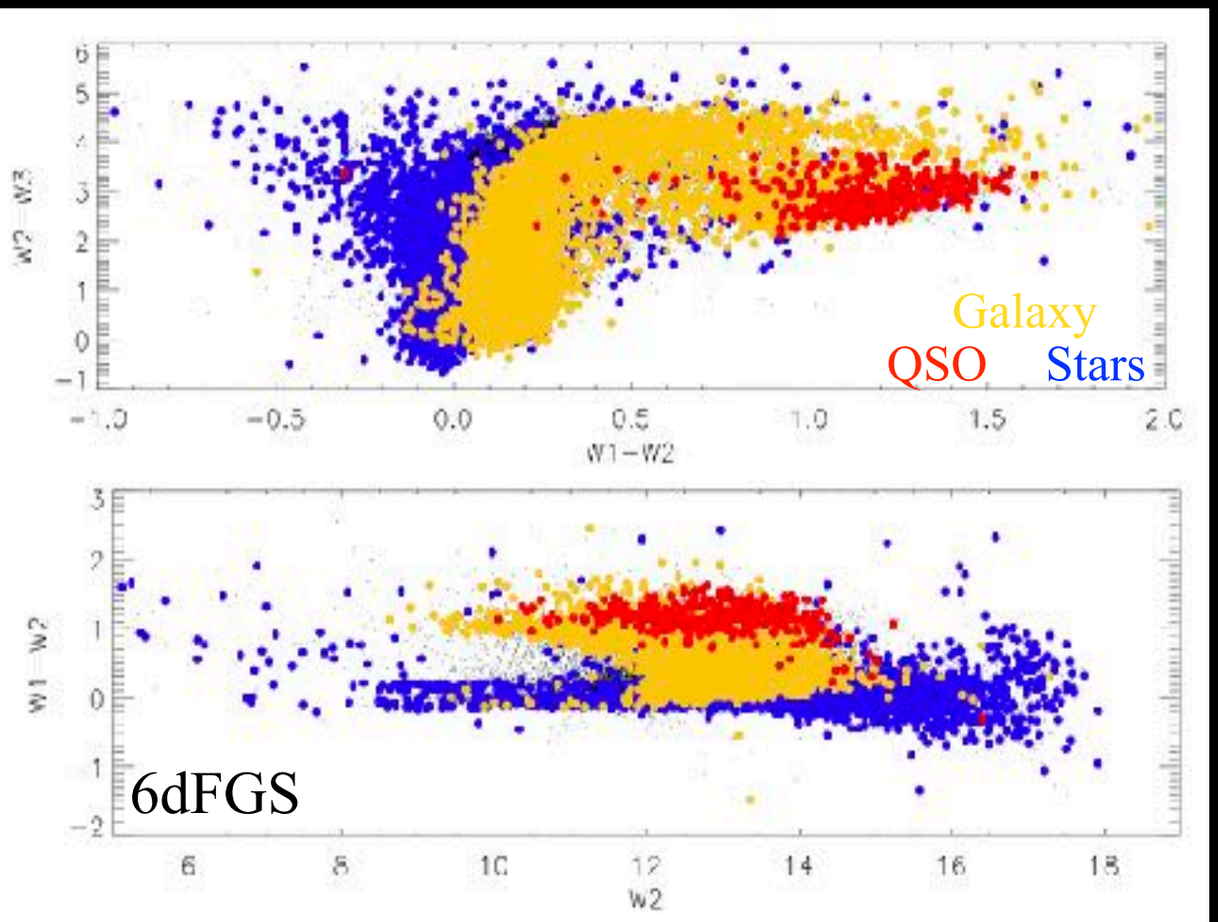
FINDING MULTIPLE QSO IMAGES

Color pre-selection

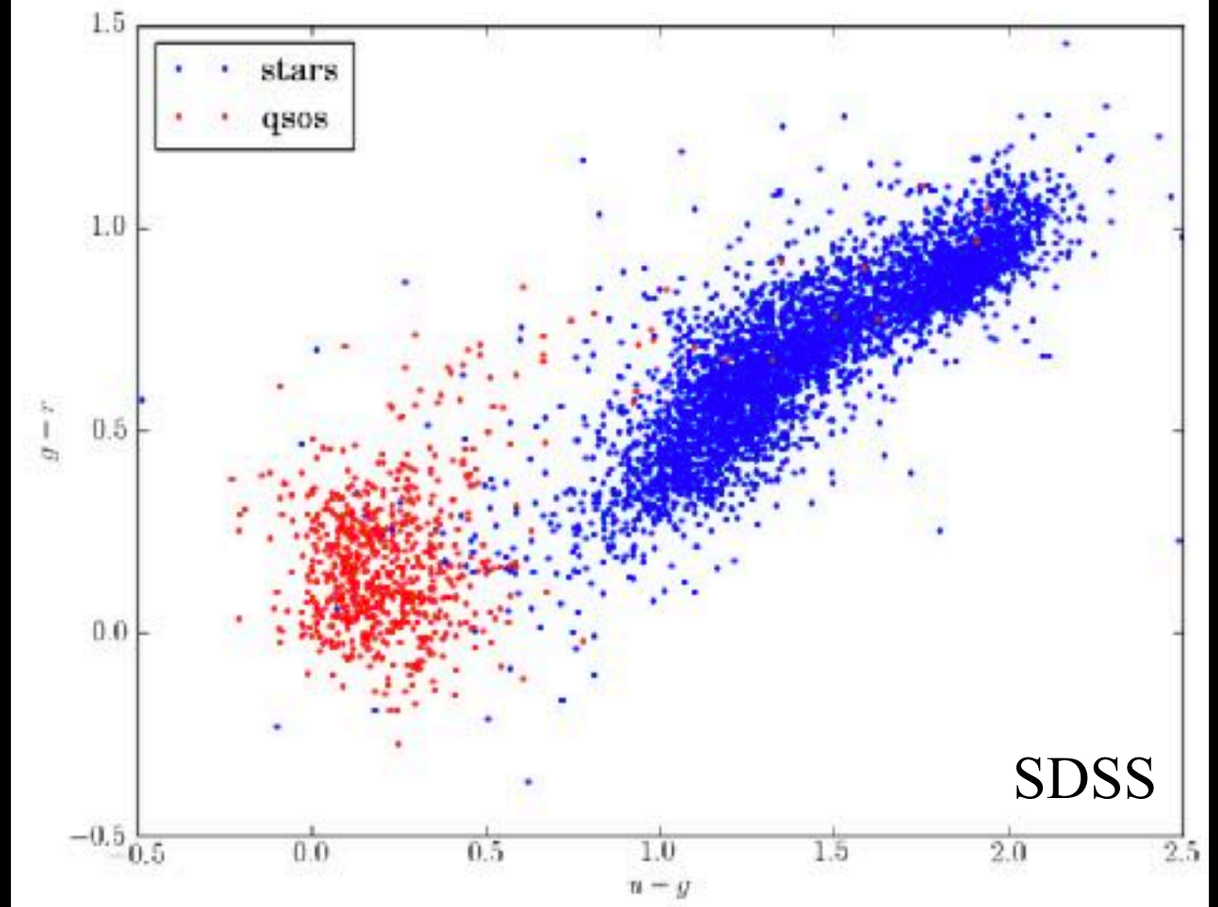
to separate QSOs
from stars and galaxies

WISE

KiDS



6dFGS



SDSS

FINDING MULTIPLE QSO IMAGES

Color pre-selection

to separate QSOs
from stars and galaxies

WISE

KiDS

Differential Deblending

Objects whose centroids in WISE are offset with respect to the centroids in KiDS

KiDS Multiplet

Objects in WISE with multiple correspondence in KiDS (within r=5”)

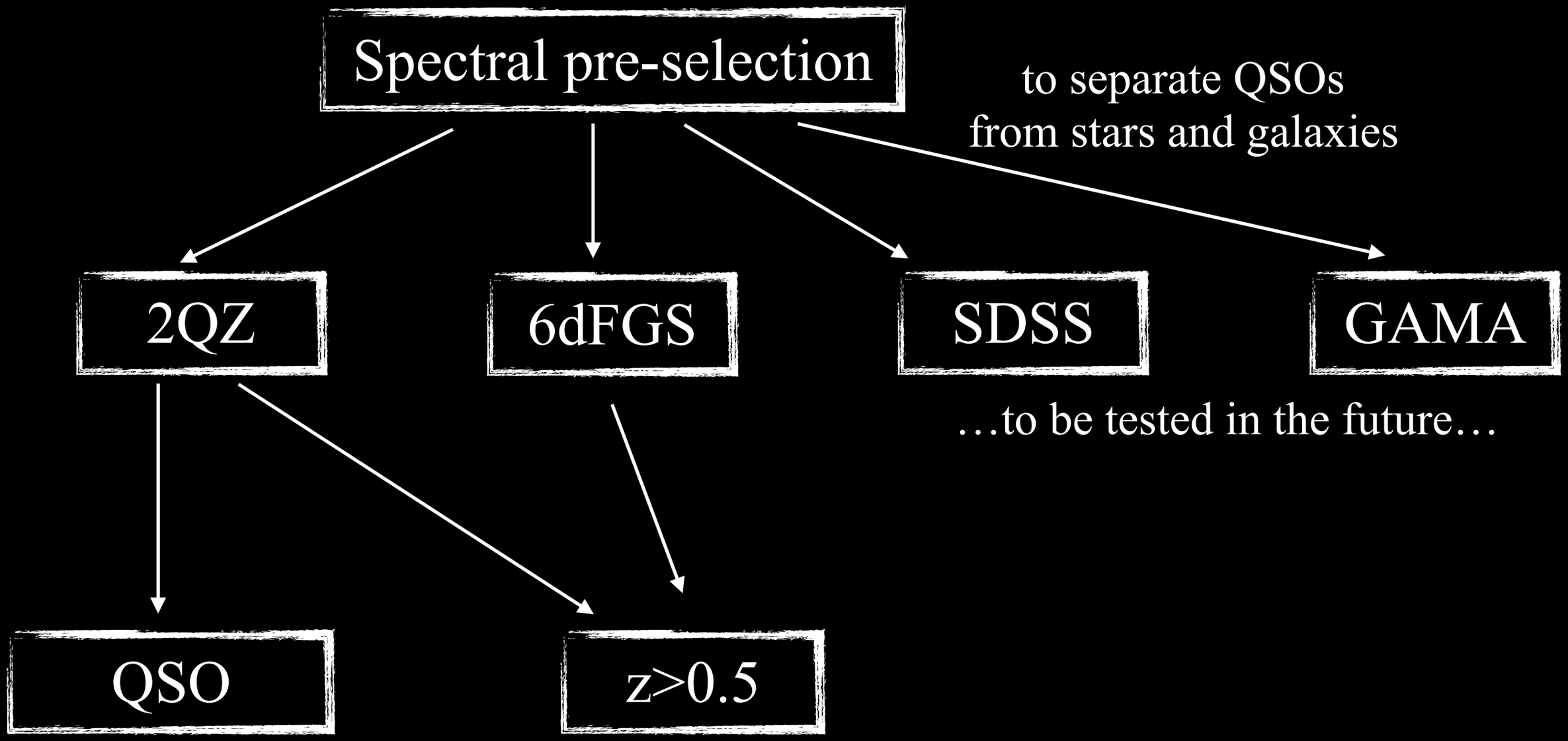
Direct Image Analysis (PSF)

PSF-analysis to search for residuals (from deflector)

Spiniello et al. 2018 (submitted):

KiDS-SQuaD-I: The KiDS Strongly lensed Quasar Detection project

FINDING MULTIPLE QSO IMAGES



Agnello & Spiniello, 2018 (submitted):

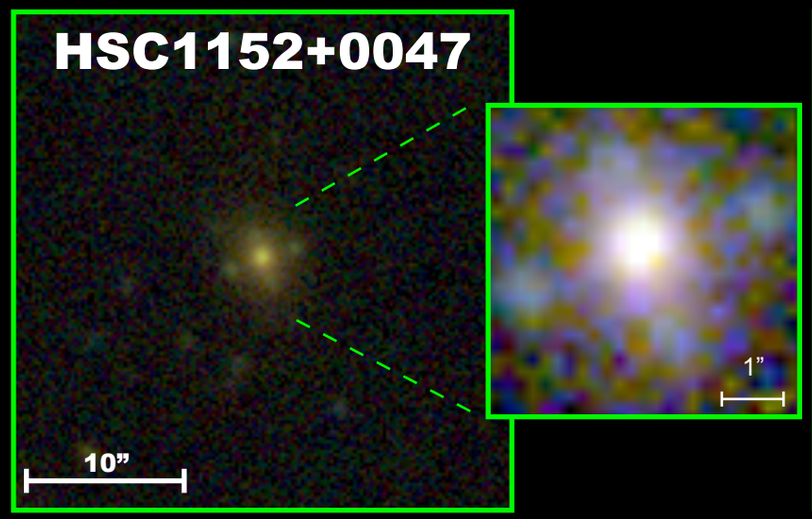
Quasar Lenses in the South: searches over the DES public footprint

RECOVERY OF KNOWN STRONG LENSES : 7(8)/10

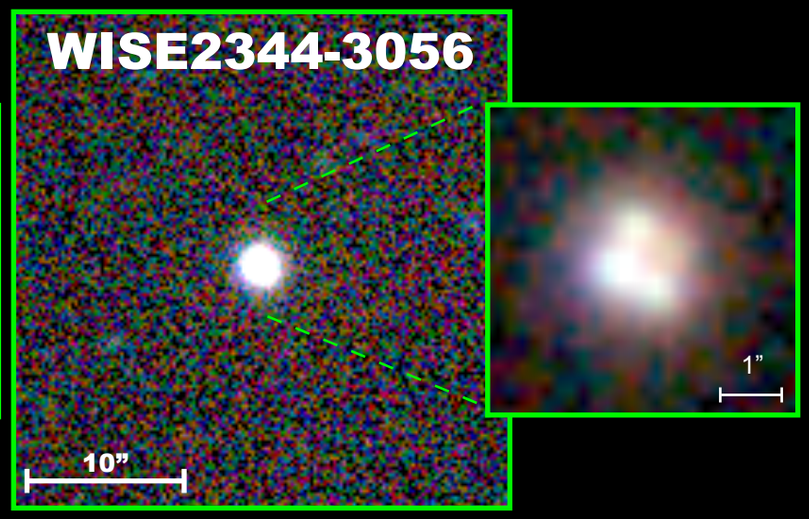
Multiplets, BaROQuES, DIA

Multiplets, BaROQuES, DIA

Multiplets, BaROQuES



DIA (Lost in WISE)



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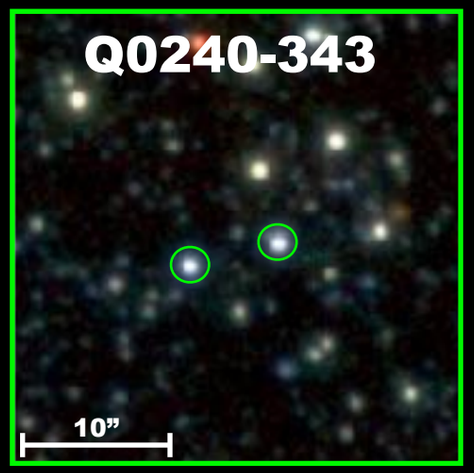
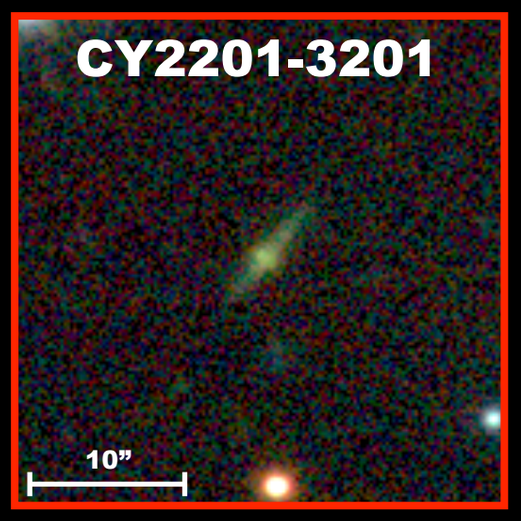


Multiplets

BaROQuES

Lost in WISE, but will be recovered with new selection criteria



THE BEST CANDIDATES

9 candidates detected by more than one method:

ID	RA (J2000)	DEC (J2000)	Methods	Grade	Notes
KIDS0848+0115	08:48:56	+01:15:39	Multipl., BaROQuES, DIA	2.5	One of the images has a QSO SDSS spectrum (z= 0.645)
KIDS2307-3039	23:07:18	-30:39:15	Multipl., BaROQuES, DIA	2.5	
KIDS0841+0101	08:41:35	+01:01:56	Multipl., BaROQuES	2.5	Possible gravitational arc
KIDS1217-0256	12:17:09	-02:56:21	Multipl., BaROQuES	2.5	
KIDS2316-3320	23:16:27	-33:20:02	Multipl., BaROQuES	2.5	Possible NIQ
KIDS0324-3042	03:24:27	-30:42:50	Multipl., DIA	2.5	
KIDS0924-0128	09:24:37	-01:28:44	Multipl., DIA	3.0	One of the images has a QSO SDSS spectrum (z= 2.446)
KIDS1441+0237	14:41:45	+02:37:43	Multipl., DIA	3.0	One of the images has a QSO SDSS spectrum (z= 1.61)
KIDS1042+0023	10:42:37	+00:23:02	Multipl., DIA	3.5	Spectroscopic data confirmed the lensing nature (Fig. 4)

62 high-grade candidates found by only one method in KiDS DR3

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62 high-grade candidates found by only one method in KiDS DR3

assuming a >40% successful rate

30

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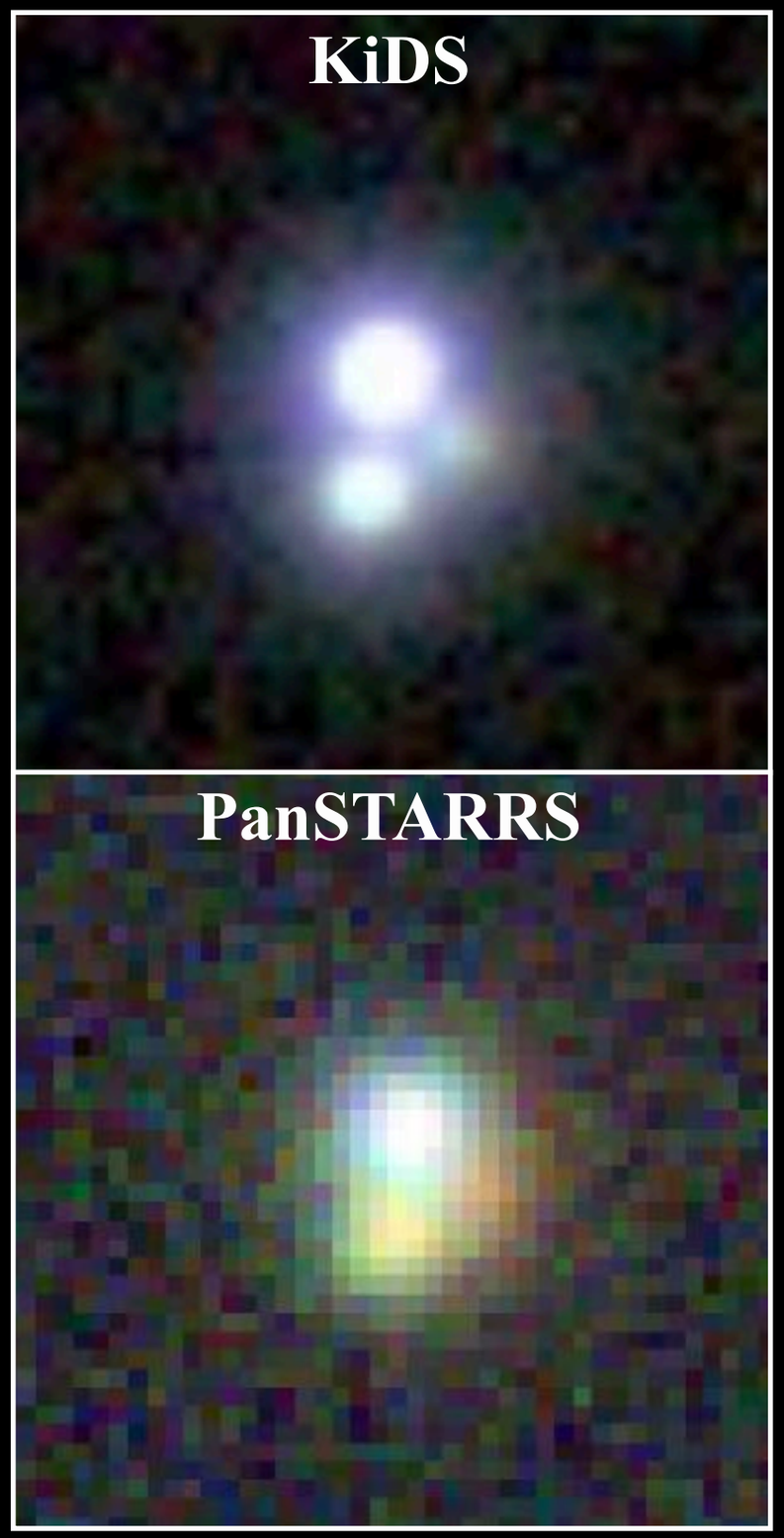
62 high-grade candidates found by only one method in KiDS DR3

assuming a >40% successful rate

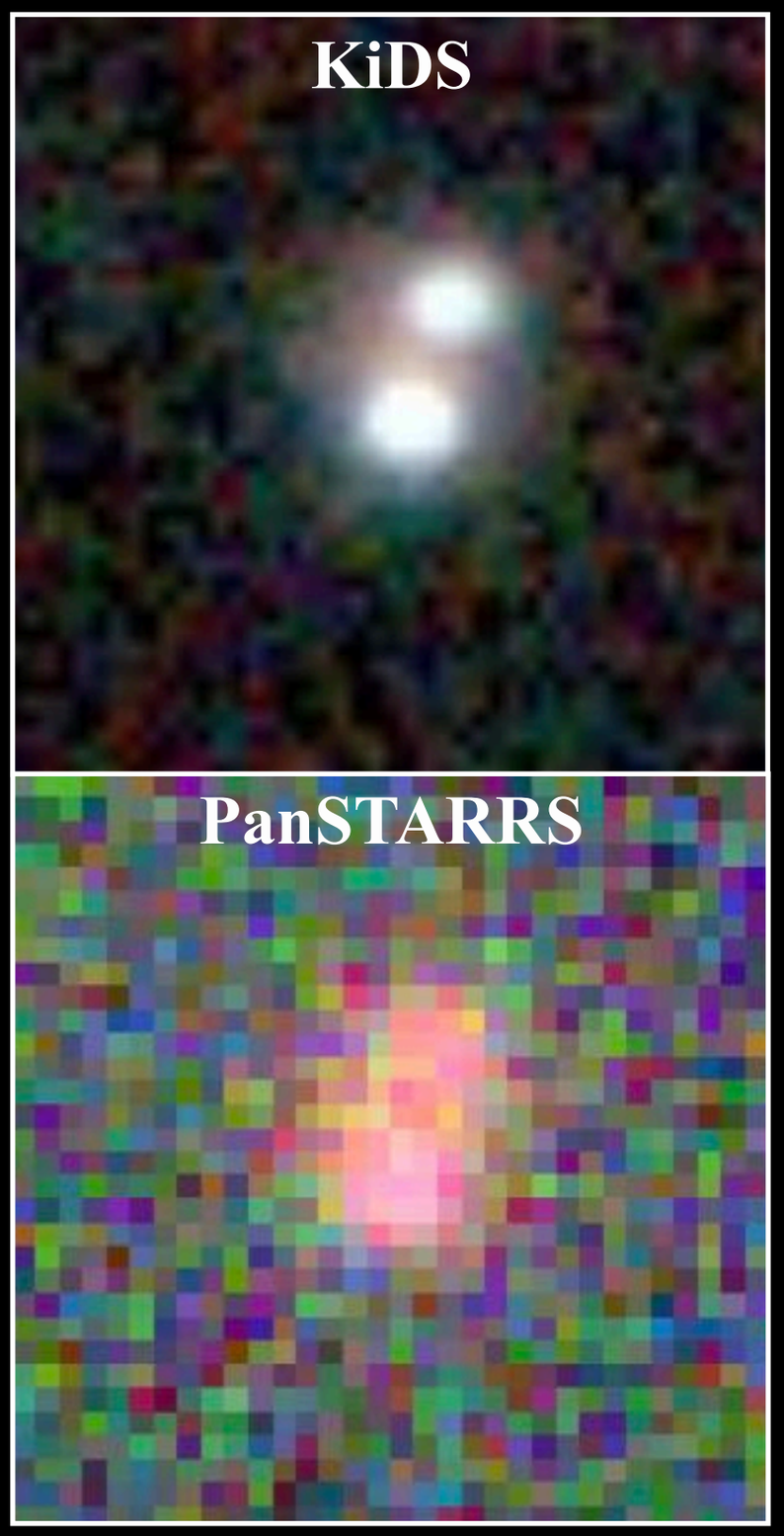
30
x 3
(once KiDS will be completed)

Up to 90 new QSOs lenses

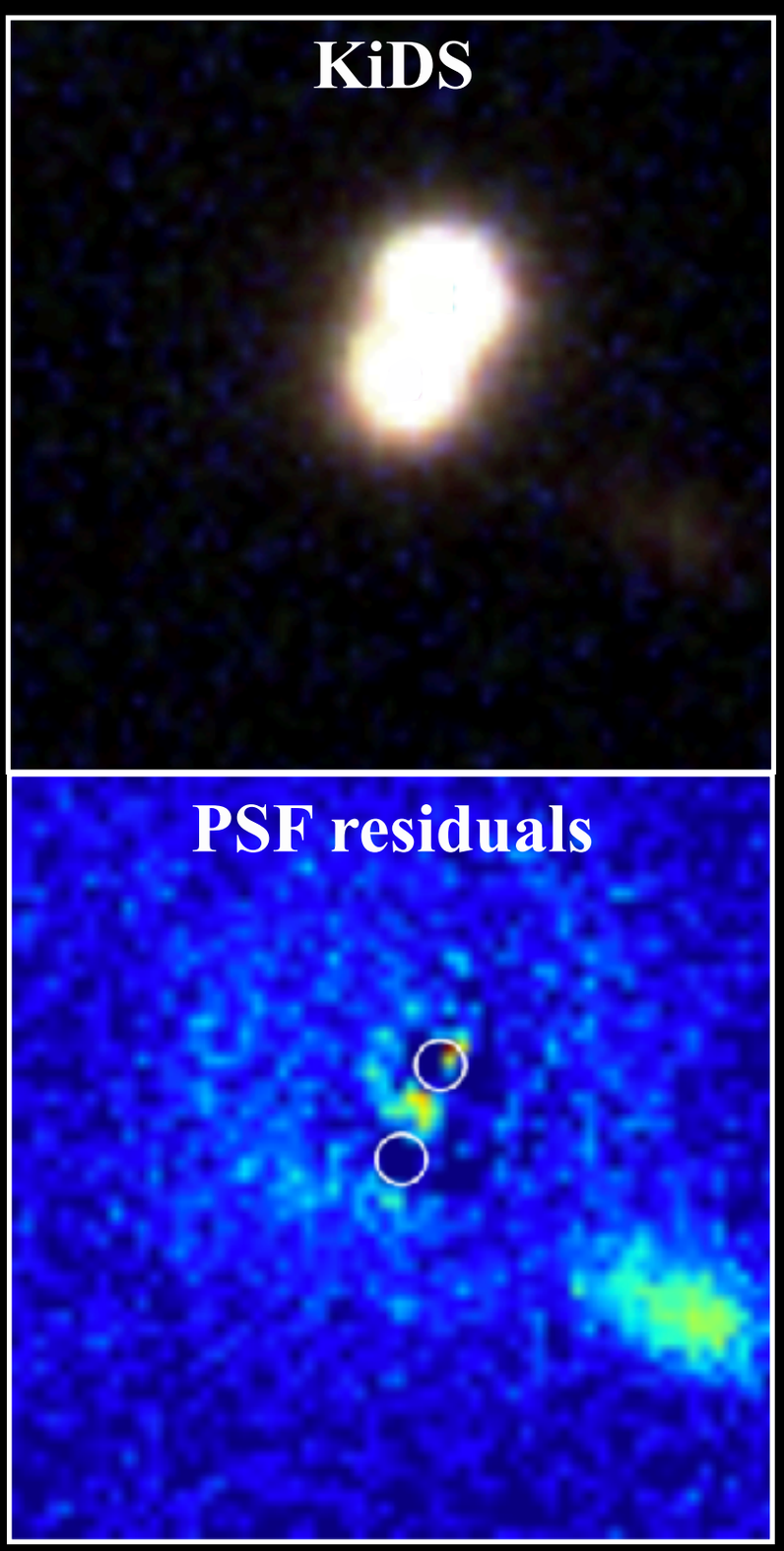
THE BEST CANDIDATES



Multiplet WISE-KiDS
KIDS0848+0115

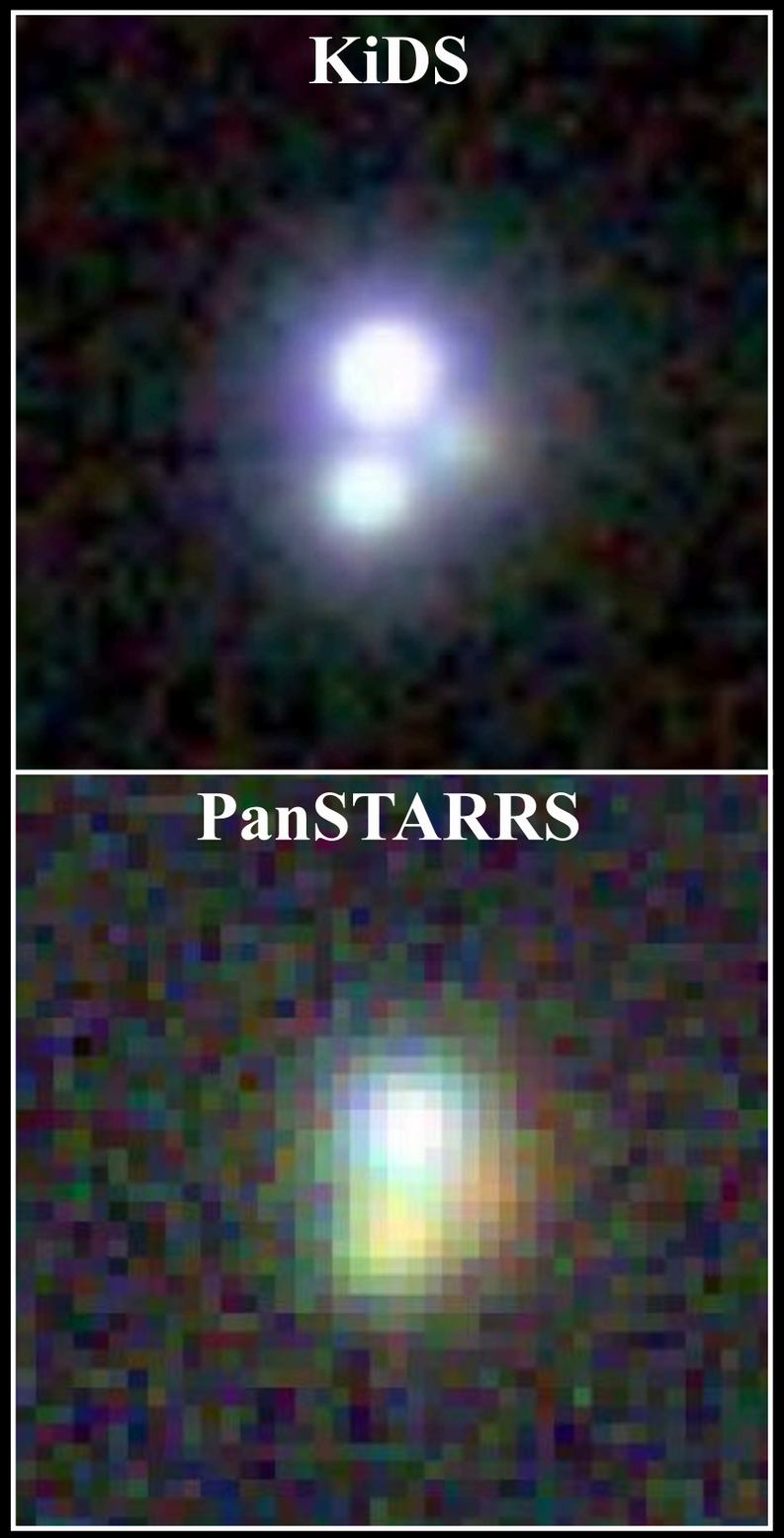


Differential Deblending
KIDS1042+0023

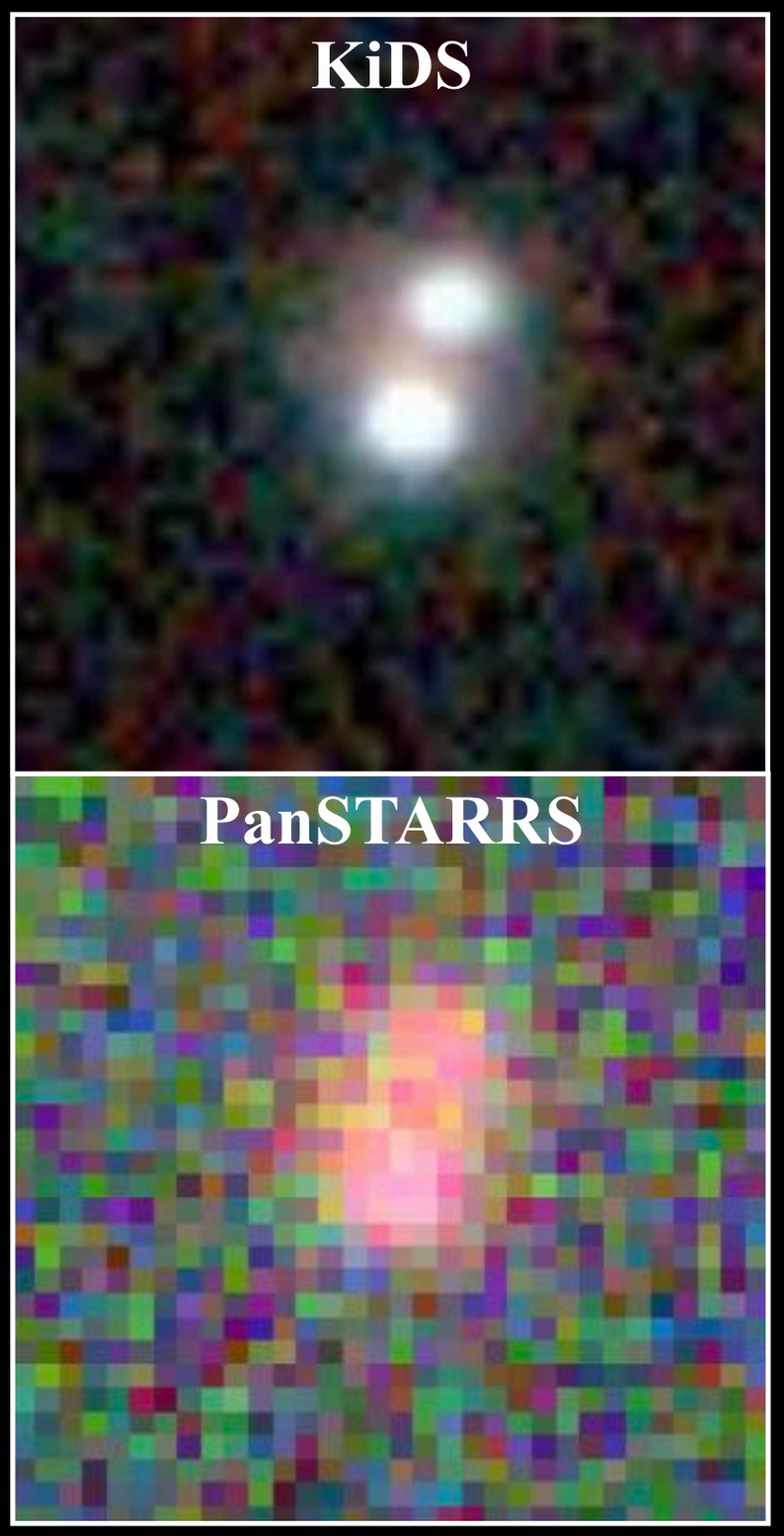


Direct Image Analysis
KIDS0901+0111

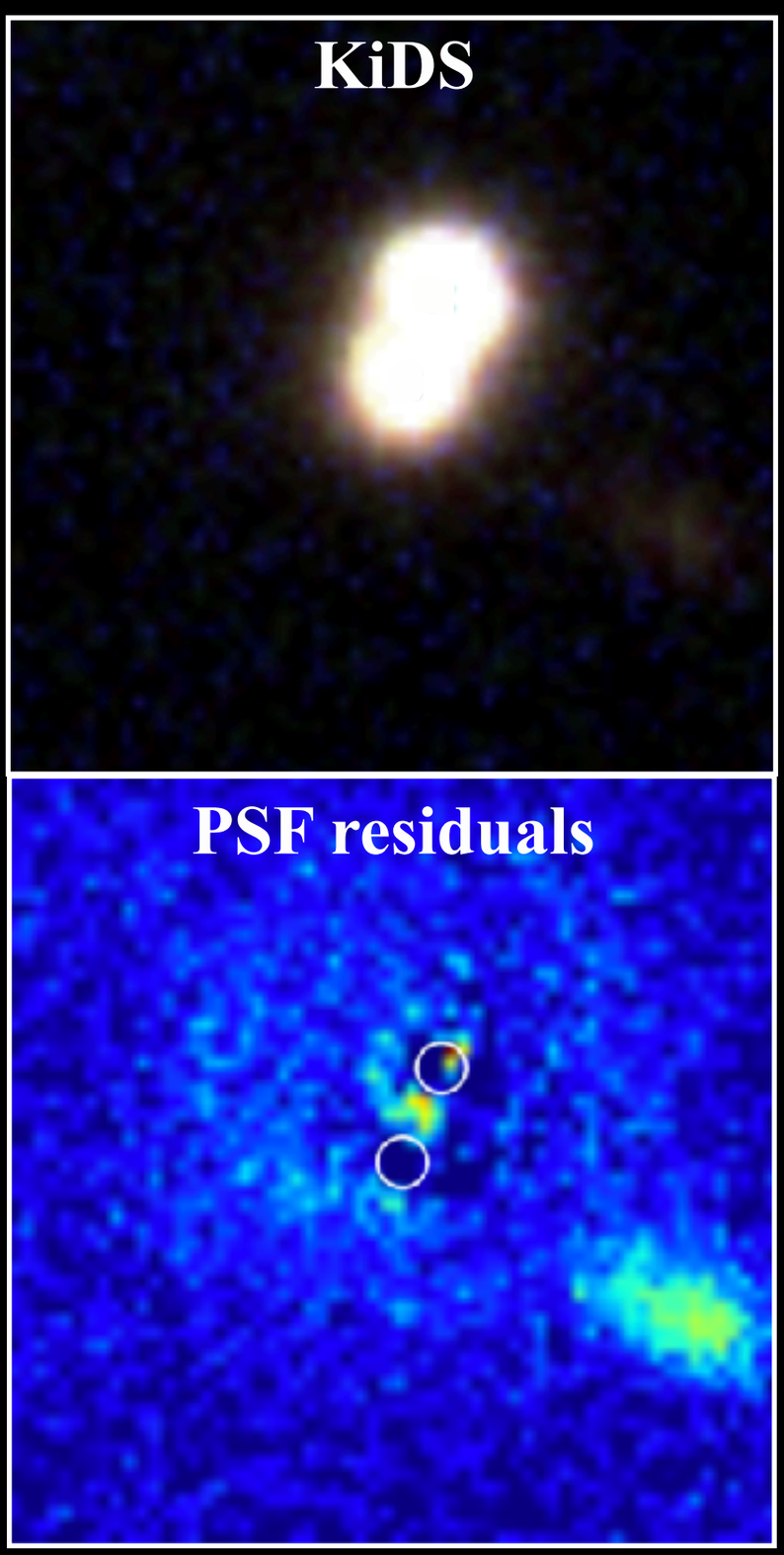
THE BEST CANDIDATES



Multiplet WISE-KiDS
KIDS0848+0115



Differential Deblending
KIDS1042+0023

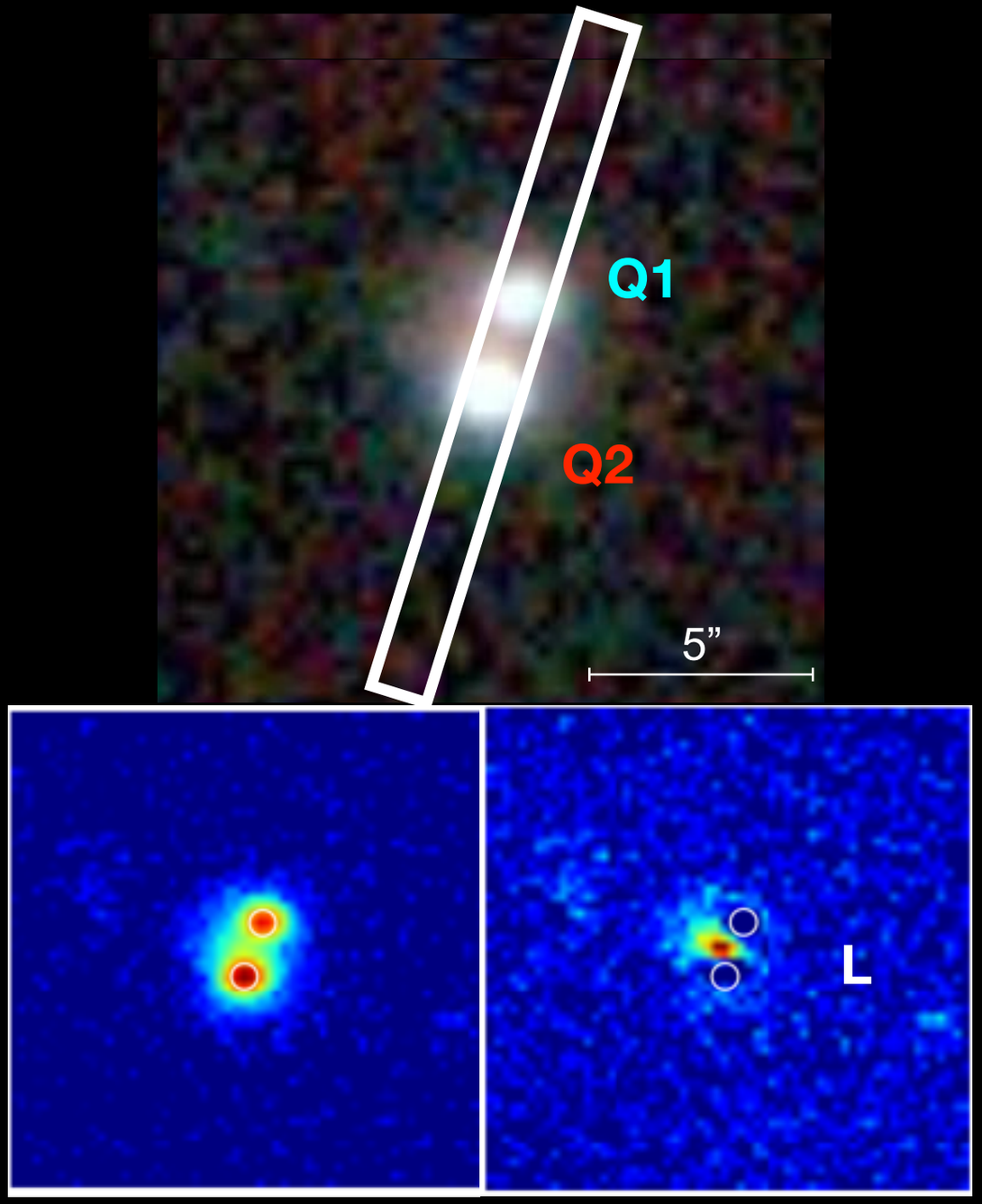


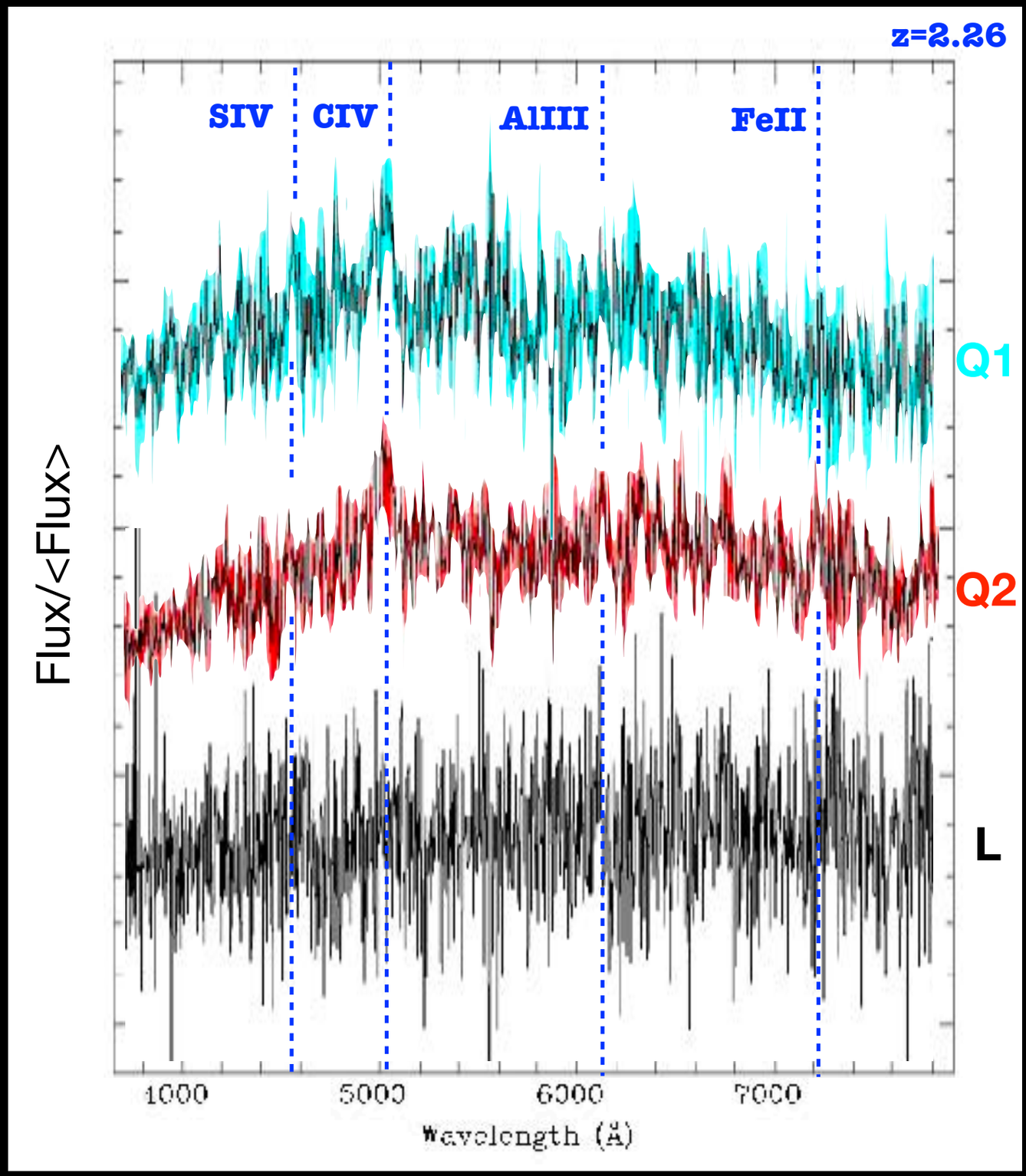
Direct Image Analysis
KIDS0901+0111

SPECTROSCOPIC FOLLOW UP

of the first lensed QSO candidate (TNG)

KiDS1042+0023





Data Reduction: M.Spavone

CONCLUSIONS

★ **Strong Gravitational Lenses are very powerful astrophysical and cosmological tools… but they are rare…**

★ **KiDS image quality is perfect to search for this kind of rare objects…**

★ **<u>KiDS-SQuaD: The KiDS Strongly lensed Quasar Detection project</u>**
- Searching for lensed quasars in KiDS with state-of-the art of morphological and photometric methods (Spiniello et al. 2018).
- First spectroscopically confirmed lensed quasar in KiDS