



Inter-SWG Taskforce: BlueGrism

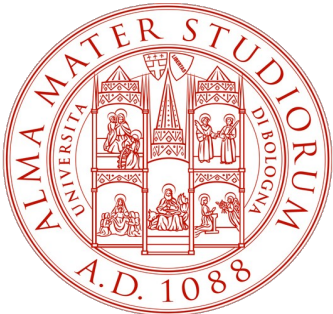


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on behalf of the IST-BG



Overview



- Assess the use of additional blue grism observations over the CPC fields, and the improvements that can bring to the derived purity for wide-like galaxies observed in the CPC fields.
- Provide feedback on the modes for the BG
- Verify that the proposed calibration plan is adequate for the BG
- Provide updated forecasts for the main science cases relevant to the BG and formulate a proposal on the observing strategies for the BG in the Deep Fields
- Evaluate the benefit for science cases and suggest BG use for any concrete proposals made to modify the Euclid Deep Field coverage, including wider areal coverage

People



- Claudia Scarlata (US, UMN) - coordinator
- **Margherita Talia (IT, Univ Bologna) – coordinator**

- Matthieu Bethermin (FR, LAM)
- Daniela Calzetti (US, UM-Amherst)
- **Paolo Cassata (IT, Univ Padova)**
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- Vincent Le Brun (FR, LAM)
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- **Lucia Pozzetti (IT, OAS Bologna)**
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- Daniela Calzetti (US, UMASS)
- Sean Bruton (US, UMN)
- **Roberto Decarli (IT, OAS Bologna)**
- Masafusa Onoue (CN, KIAA)
- **Olga Cucciati (IT, OAS Bologna)**

Purity/completeness in CPC fields from WISP

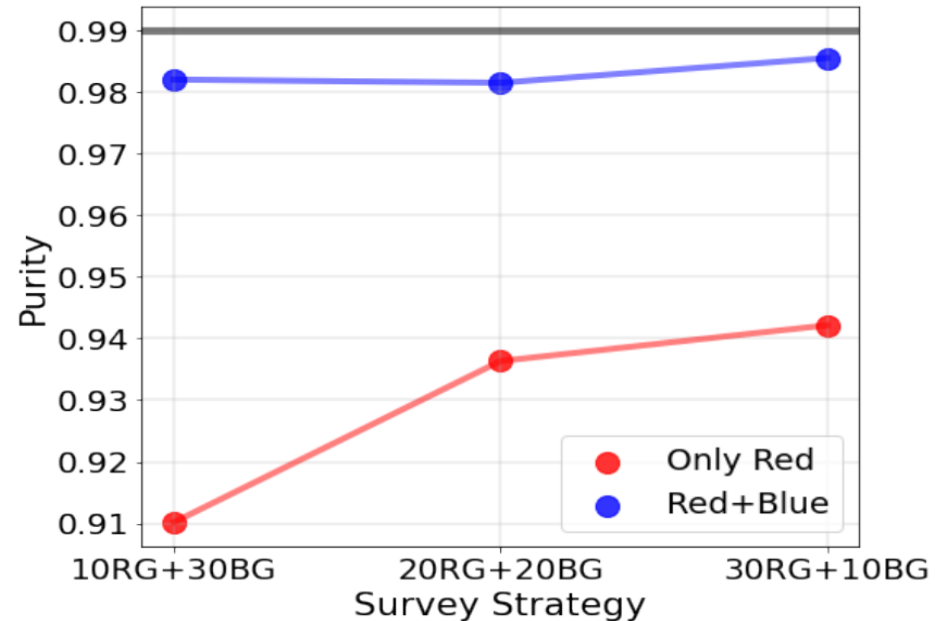


- Data from the WISP survey (Bagley+'20)
- Two sources of contaminants:
 - noise spikes
 - line misidentification
- Assumed depth of the CPC fields:
10 visits \rightarrow $f_{\text{Ha}} > 6.3e-17$ erg/s/cm²

WARNING! The WISP analysis provides an estimate of the contamination due only to the latter

Results:

- Red Grism only \rightarrow purity \sim 91%
- + Blue Grism at the same depth \rightarrow purity \sim 98%



Courtesy of C. Scarlata



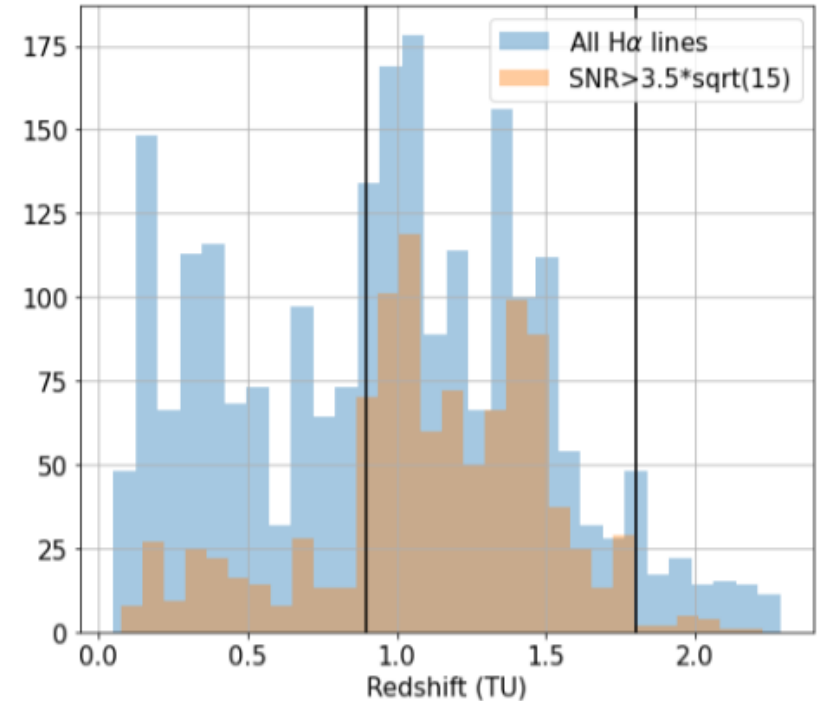
Purity/completeness in CPC fields from SC8



- Data from SC8 Deep fields. Only Red Grism simulations available so far
- Used central 0.342sq.deg. with uniform depth.
- The SC8 simulations include 15 visits over the area,
- while the actual CPC will have 10

Preliminary results:

- Red Grism only → purity ~70%
- A number of planned improvements in SIR and SPE will boost this value, e.g., decontamination from all angles, addition of Euclid photometric information
- Blue Grism simulated data are now complete, SIR pipeline running.



Courtesy of C. Scarlata and S. Bruton



Science cases for BG observations in the Deep fields



- Re-ionization of the Universe via observations of Ly α emitters at $z > 6.5$
- High redshift QSOs
- Passive galaxies at $z \sim 2$
- Metal abundance in SFGs at $z \sim 2$



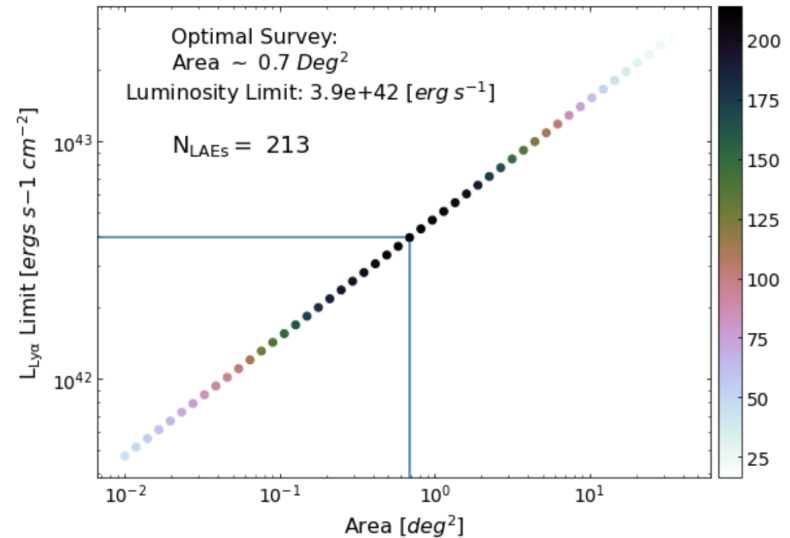
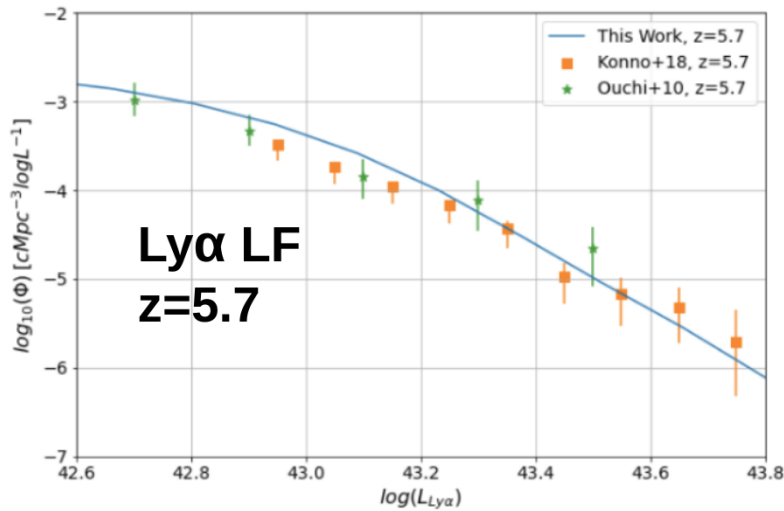
Science cases for BG observations in the Deep fields



- Re-ionization of the Universe via observations of Ly α emitters at $z > 6.5$

- Data from 21cmFast Simulation at $z=7$
 - empirical recipes to augment halos with galaxy properties
 - \Rightarrow Ly α luminosity, flux: $L_{\text{Ly}\alpha}$, $f_{\text{Ly}\alpha}$

- Find optimal balance between depth and area to maximize number of observed LAEs



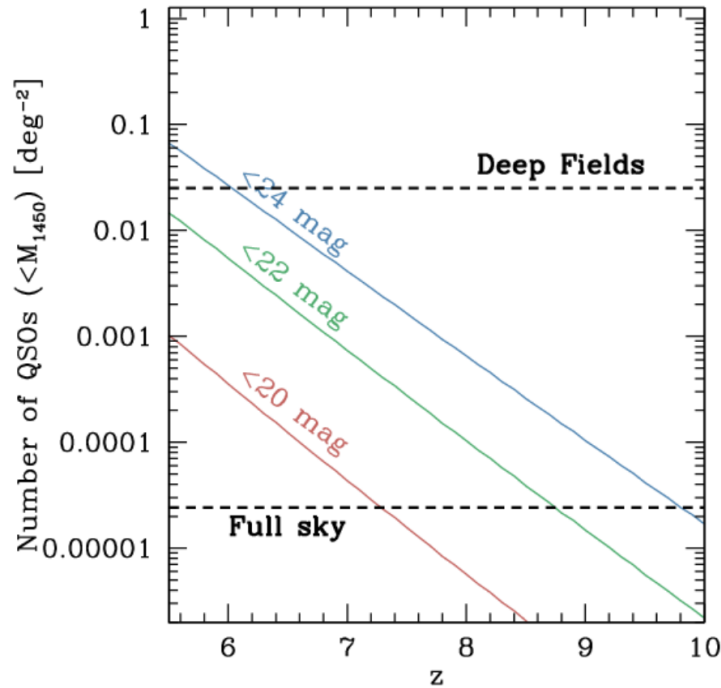
Courtesy of C. Scarlata and S. Bruton



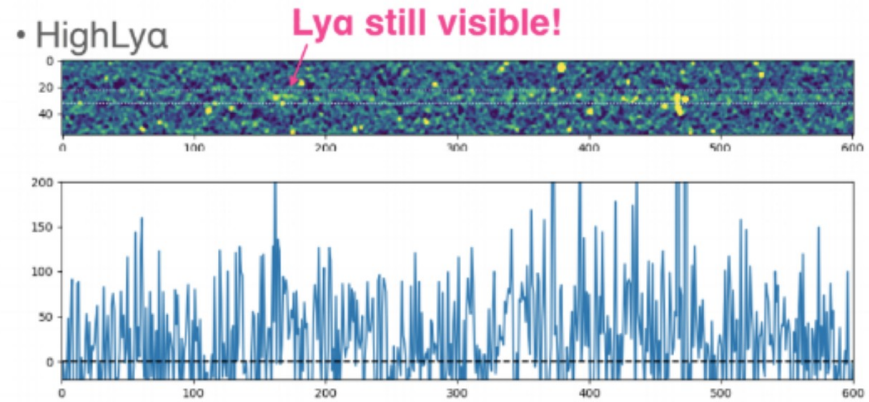
Science cases for BG observations in the Deep fields



- High redshift QSOs



- Number density estimates based on known LF constraints at $5.5 < z < 6.5$
- Expected yield:
 - a few $J < 24$ mag QSOs at $5.5 < z < 7.0$ (BG deep fields)
 - a few $J < 24$ mag QSOs at $z > 8$ (RG wide survey)
- Lessons from RG:
 - $z > 9$ QSOs identified if very bright (< 20)
 - down to < 22 mag if Ly α is strong



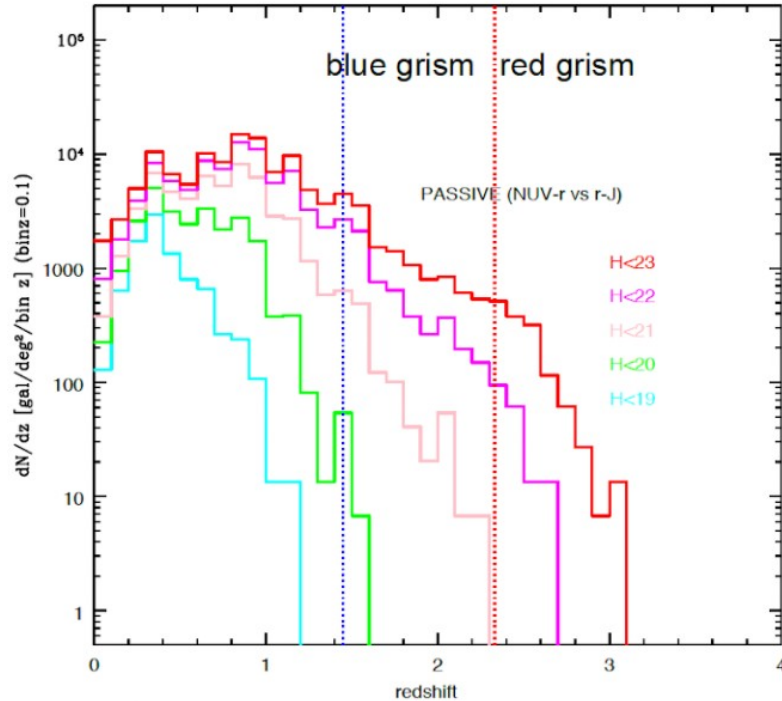
Courtesy of R. Decarli and M. Onoue



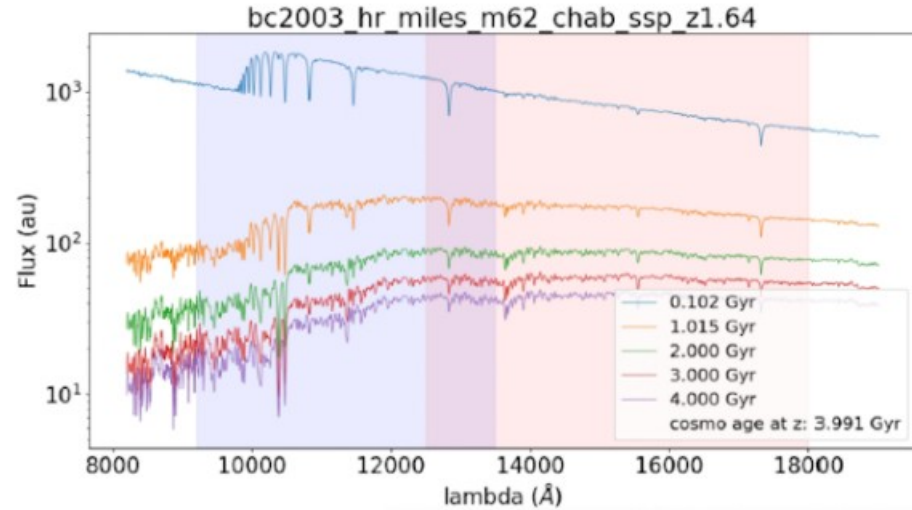
Science cases for BG observations in the Deep fields



- **Passive galaxies at $z \sim 2$**



- Data from the COSMOS15 catalogue
 - stellar mass – magnitude (Y, H) calibration and size assignment (following Cimatti+'12)
 - ⇒ catalog of passive galaxies with realistic ages, metallicities, sizes, magnitudes and redshifts



- Estimated the SNR of continuum, absorption lines and breaks as a function of the various parameters and the reliability of the recovered quantities

Courtesy of M. Moresco and L. Pozzetti

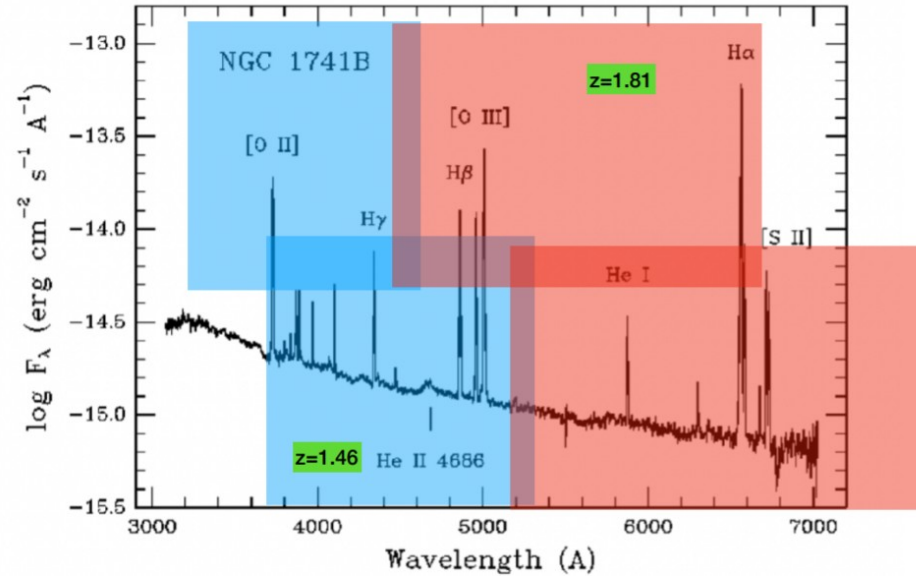
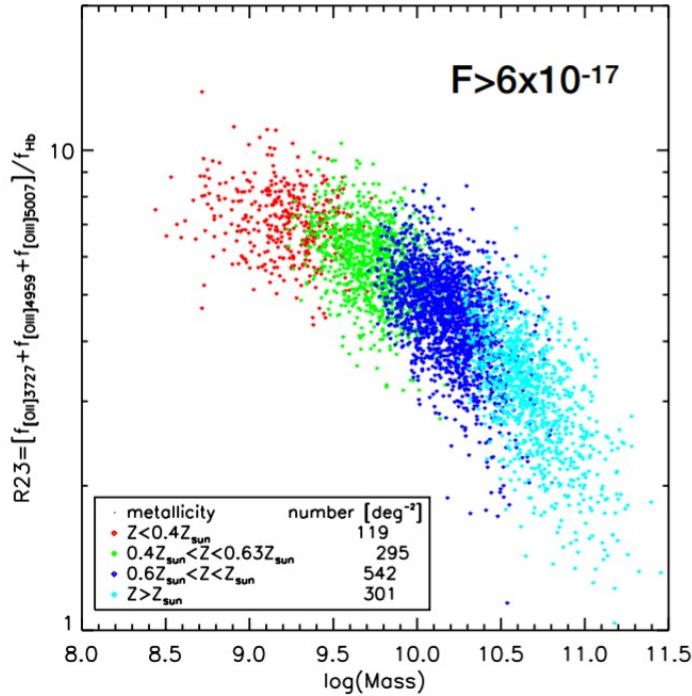


Science cases for BG observations in the Deep fields



- Metal abundance in SFGs at $z \sim 2$

- Data from the MAMBO catalogue
 - $1.46 < z < 1.81$
 - $m_K < 25$
- Assumed **same** depth for RG and BG observations: $f_{\text{H}\alpha} > 6. \cdot 10^{-17} \text{ erg/s/cm}^2$
 - 1257 gal/deg² → 50280 galaxies total



Courtesy of P. Cassata, L. Pozzetti and M. Talia



Summary



BG observations, at the same depth as the RG, are fundamental to reach the purity requirements.

We recommend that the BG is officially included in the Calibration plan for the GC survey. This implies the full coverage of the CPC fields.

We also propose to extend the BG coverage of CPC-N to the full 20sq. deg., at the same depth as the RG observations.

BG observations in the Deep Fields will enable science not possible with RG only

Mock catalogues specific for each science case have been collected/created

A framework is in place to explore the variation of forecasts as a function of different parameters (integration time, magnitude, redshift, RG/BG, etc...), in order to propose the optimal BG observations strategy

Simulations are needed!