



The PFS 1D-Pipeline team

A mixed team of scientist, permanent LAM staff and short-term software engineers, working together on the PFS and Euclid pipelines, as well as a generic tool.











The (AMAZED) team Resp. V. Le Brun

The permanent staff:

- Pierre-Yves CHABAUD (80%)
- Morgan GRAY (50%)
- Christian SURACE (20%)
- Didier VIBERT (50%)













Update on the AMAZED team

The working people (2 from Euclid, 1 from PFS):

- Florian Fauchier left in March 2019
- Guillaume Pernot left in July 2019
- Alain Schmitt left in August 2019

Replaced by:

- Edouard MARGUERITE (July 2019)
- Mira SARKIS (September 2019)
- Ali ALLAOUI (October 2019)

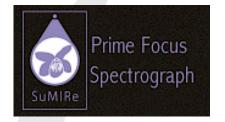














The methods











Redshift estimation method

A least-square fit of model parameters weighed by signal variance

$$-2\log \mathcal{L}(z) = \min_{\theta} \sum_{\lambda} \frac{(S_{\lambda} - M_{\theta}(\frac{\lambda}{1+z}))^2}{\sigma_{\lambda}^2}$$

- A redshift Probability Distribution Function calculation for each model
- Combination of all zPDFs into one
- The best redshift is defined as the location of the maximum of the PDF













The model

Continuum (including stellar absorption lines)

21 templates built from BC03 models (Tremonti+ 2003)

The amplitude is fitted

Emission lines

A predefined list of lines (excluding Lyα)
Relative ratios predefined from 13 VVDS stacked spectra
The position and width are fitted













The model

Interstellar absorption lines

Velocity shift is fixed (-150 km/s)

Relative ratios predefined from 13 VVDS/Steidel stacked spectra

Intergalactic Medium absorption

Tabulated from Meiksin (2002)

7 curves at 11 redshifts between 2 and 7

Interstellar extinction

Tabulated from Calzetti (2000)

9 curves









PDF computation

- PDF from each model are combined
 - Marginalization
 - Best model parameter
- The best redshift is taken at the maximum after a gaussian fit
- Secondary redshift values at following peaks
- Code is ready to integrate priors (N(z), L(Hα), ...)













Two Steps process

- Step 1 : produce a coarse PDF on a ∆z=1e⁻³ grid
 - Rebinned spectrum
 - Reduced number of parameters
 - Produces from 2 to 10 preliminary redshift solutions
- Step 2: Full model on a fine grid around the preliminary solutions

Faster computation

No solution is lost during the first step











Galaxy/Stars/QSO classification

- Direct comparison of maximum values of the 3 PDF
 - Galaxy method:
 - Fullmodel as described earlier
 - Stellar method:
 - **Template**-fitting with a 37-star templates catalog
 - extinction fitted (same as galaxies)
 - Redshift in the range [-1e-3; 1e-3]
 - QSO method:
 - **Template**-fitting with 1 Mean QSO template (Paris et al.),
 - IGM fitted (Meiksin)
 - Redshift in the range [0.0; 6.0]











Global results and future tests

- Tests presented last year :
 - 7k galaxies from the galaxy evolution working group
 - 7k galaxies from the cosmology WG

More than 95% success in redshift measurement

- New samples
 - 50k galaxies from GE-WG, processed but not analyzed
 - 500k galaxies from Cosmology-WG
- Future/missing samples
 - Stars, QSO, high-z galaxies, outputs of the 2D simulator

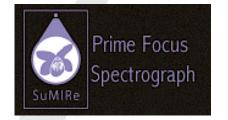














Pipeline status and evolution











Open Issues and future evolutions

- Apply IGM to em/abs lines (eg Lyman series)
 - Produces a better profil for Lyα
 - Reduces the number of free parameters
- Produce a new set of templates
 - Equiprobable in the Mass/SFR plane
- Compression of the PDF
 - Currently 6.10⁴ points
 - Keep only peaks or compress outside peaks?













Open Issues and future evolutions

- Allow variations in the amplitudes of emission lines
 - Less rigidity but not fully open
 - Reduces the number of free parameters
 - Max variation to be decided (10%, 20%, ?)
- Convolution of IGM curves by LSF to avoid discontinuities
- Develop the visualization tool ...







