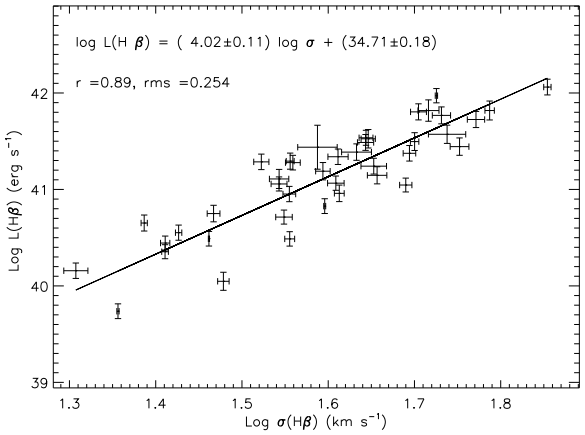

Fig. 1. Logarithmic plot of the integrated Hβ luminosities of a subsample of H II galaxies versus the rms widths of their emission lines profiles. The solid line shows a least squares fit to the data. A Hubble constant of $H_0 = 3$ km s^{-1} Mpc^{-1} was used to compute the H II galaxies' luminosities.

the High Dispersion Spectrograph (HDS) at the National Astronomical Observatory of Japan (NAOJ) Subaru Telescope in Hawaii. We used the UVES Red Arm (31.6 gr mm^{-1} grating, 75.04° Blaze angle) with Cross Disperser 3 configuration (600 gr mm^{-1} grating) centered at 5800 Å; the width of the slit was 2″, giving a spectral resolution of ∼22,500 (0.014 Å pix^{-1}). The HDS echelle grating had 31.6 gr mm^{-1} and a Blaze angle of 70.3°; we used the red arm cross disperser (250 gr mm^{-1} grating, 5° Blaze angle) centered at ∼5413 Å, the width of the slit was 4″, giving a spectral resolution of ∼9000 (0.054 Å pix^{-1}).

The UVES data reduction was carried out using the UVES pipeline V4.7.4 over the GASGANO V2.4.0 environment[6]. The HDS data were reduced using IRAF[7] packages and a script for overscan removal and detector linearity corrections provided by the NAOJ-Subaru telescope team.

3. ANALYSIS AND RESULTS

We have performed a kinematical analysis on a subsample (54 objects) of the high resolution data which allowed us to discard 4 objects that present rotation or peculiar features, additionally we have removed 9 objects for which the SDSS data was unsuitable or inexistent. With the remaining data (41 objects) we have performed a least squares fit considering errors in both velocity dispersion and luminosity; the results are shown in Figure 1. The parameters of the fit are given by: $\log_{10}\ L(\mathrm{H}\beta) = (4.02 \pm 0.11)\log_{10}\ \sigma + (34.71 \pm 0.18)$ and $\delta \log_{10}\ L(\mathrm{H}\beta) = 0.254$.

[6]GASGANO is a JAVA based Data File Organizer developed and maintained by ESO.

[7]IRAF is distributed by the National Optical Observatory, which is operated by the Association of Universities for Research in Astronomy, Inc., under cooperative agreement with the National Science Foundation.

TABLE 1

PCA FOR H II GALAXIES PARAMETERS

Parameter	1	2	3
$\log_{10}\ L(\mathrm{H}\beta)$	0.98	0.03	−0.21
$\log_{10}\ \sigma$	0.20	0.11	0.97
$\log_{10}\ (\mathrm{O/H})$	0.06	−0.99	0.10
Eigenvalues	94.03%	4.89%	1.08 %

In order to take care of a possible additional component to the $L(\mathrm{H}\beta) - \sigma$ correlation (cf. Melnick et al. 1988), we have performed a Principal Component Analysis (PCA) considering oxygen abundance, giving a parameter space $[L(\mathrm{H}\beta), \sigma, \mathrm{O/H}]$. The results are shown in Table 1, it is clear that the Hβ luminosity of young H II galaxies is determined by its gas velocity dispersion and oxygen abundance.

4. CONCLUSIONS

We have obtained a useful $L(\mathrm{H}\beta) - \sigma$ correlation calibration from a subsample of the initially proposed data. The scatter obtained from this calibration is better that the one reported in the literature[8] (cf. Melnick et al. 1988).

The next step in this project is to extend the correlation to a sample of similar objects at higher redshift. We hope to perform the relevant observations in the near future.

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[8]After the LARIM XIII Conference was held, a paper was published which deals with the same problem (Bordalo & Telles 2011).