AB and Vega magnitude systems

Galaxy brightness in optical passbands is represented in logarithmic magnitude scales. Magnitude of an object is calculated based on a magnitude and radiation flux of a reference object.

$$m - m_{ref} = -2.5 log_{10} \frac{f}{f_{ref}} \tag{1}$$

Magnitudes can be calculated in AB or Vega magnitude systems ([2, 5]).
In Vega system magnitudes are calculated in respect to Vega (α Lyrae):

$$m_{Vega} = -2.5 \cdot log_{10} \left(\frac{\int f_\nu \cdot S_\nu \cdot d\nu}{\int f_\nu (Vega) \cdot S_\nu \cdot d\nu} \right) \tag{2}$$

where f_ν is flux per unit frequency in $ergs \cdot s^{-1} \cdot cm^{-2} \cdot Hz^{-1}$, S_ν - unitless transmission of a passband filter.
Magnitude in AB magnitude system is defined as:

$$m_{AB} = -2.5 \cdot log_{10}(f_\nu) - 48.60 \tag{3}$$

Conversion between AB and Vega for some of the filters is given in table 1.

Band	λ_{eff}, (Å)	$m_{AB} - m_{Vega}$	M_{AB}	M_{Vega}
U	3571	0.79	6.35	5.55
B	4344	-0.09	5.36	5.45
V	5456	0.02	4.80	4.78
R	6442	0.21	4.61	4.41
I	7994	0.45	4.52	4.07
K_s	21603	1.85	5.14	3.29
u	3546	0.91	6.36	5.47
g	4670	-0.08	5.12	5.20
r	6156	0.16	4.64	4.49
i	7472	0.37	4.53	4.16
z	8917	0.54	4.51	3.71

Table 1: Conversion between AB and Vega magnitude systems from [3] based on solar spectrum. $UBRVI$ filters from [1], K_s from [4], $ugriz$ from SDSS DR4 web site.

References

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