Claims

1. A device for measuring amplitude of a scanning mirror, comprising:

a light source for outputting an optical signal;

a diaphragm for modifying a size and a shape of a light spot of the optical signal output by the light source;

a scanning mirror retainer for placing a scanning mirror to be measured, the scanning mirror, after being retained, being able to periodically reflect the optical signal;

a photoelectric sensor disposed lateral to the scanning mirror, the photoelectric sensor comprising three or more sensing elements and configured to detect and collect the optical signal reflected by the scanning mirror, wherein in a scanning cycle, when the scanning mirror is oriented in correspondence with an initial orientation, the reflected optical signal is collected by a center one of the three or more sensing elements, otherwise the reflected optical signal is collected by other ones of the three or more sensing elements; and

a signal acquisition and processing unit for processing a signal collected by the photoelectric sensor to derive an amplitude of the scanning mirror.

2. The device for measuring amplitude of a scanning mirror of claim 1, wherein the optical signal output by the light source is an optical signal with a spatial Gaussian distribution.

3. The device for measuring amplitude of a scanning mirror of claim 1, wherein a number of the sensing elements is odd.

4. The device for measuring amplitude of a scanning mirror of claim 1, wherein the sensing elements are densely arranged.

5. The device for measuring amplitude of a scanning mirror of claim 1, wherein the light spot is round and has a diameter of equal to an effective area of the sensing element.

6. The device for measuring amplitude of a scanning mirror of claim 1, further comprising a position adjusting unit for adjusting a horizontal position of the

photoelectric sensor, allowing the photoelectric sensor to locate at a first horizontal position or a second horizontal position.

7. The device for measuring amplitude of a scanning mirror of claim 6, wherein a distance from the first horizontal position to the second horizontal position ranges from 0.2 m to 1 m.

8. The device for measuring amplitude of a scanning mirror of claim 7, wherein the distance from the first horizontal position to the second horizontal position is 0.5m.

9. A method for measuring amplitude of a scanning mirror using the device for measuring amplitude of a scanning mirror of claim 1, comprising:

recording vertical positions of sensing elements $y_1, y_2, \ldots y_N$;

placing the scanning mirror on a scanning mirror retainer, causing the scanning mirror to vibrate at a frequency of so as to project a light spot onto a photoelectric sensor;

collecting, by a signal acquisition and processing unit, light intensities I_{ji} detected by the sensing elements at time instants t_{ji}:

sensing element 1: $(t_{11}, I_{11}), (t_{12}, I_{12}), \ldots, (t_{1i}, I_{1i}) \ldots,$

sensing element 2: $(t_{21}, I_{21}), (t_{22}, I_{22}), \ldots, (t_{2i}, I_{2i}) \ldots,$

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sensing element j: $(t_{j1}, I_{j1}), (t_{j2}, I_{j2}), \ldots, (t_{ji}, I_{ji}) \ldots,$

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sensing element N: $(t_{N1}, I_{N1}), (t_{N2}, I_{N2}) , \ldots, (t_{Ni}, I_{Ni});$

fitting the collected light intensities I_{ji} to determine, for each of the sensing elements, time instants T_{jk} when maximum light intensities are recorded:

sensing element 1: $T_{11}, T_{12}, \ldots, T_{1k},\ldots$, where $T_{11}<T_{12}<\ldots<T_{1k}<\ldots,$

sensing element 2: $T_{21}, T_{22}, \ldots, T_{2k},\ldots$, where $T_{21}<T_{22}<\ldots<T_{2k}<\ldots,$

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sensing element j: $T_{j1}, T_{j2}, \ldots, T_{jk},\ldots$, where $T_{j1}<T_{j2}<\ldots<T_{jk}<\ldots,$

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sensing element N: T_{N1}, T_{N2},…, T_{Nk}, …, where $T_{N1}<T_{N2}<\ldots<T_{Nk}<\ldots$;

calculating, for each of the sensing elements, two successive time instant differences $T_{j\,(k+1)}-T_{jk}$ and $T_{jk}-T_{j\,(k-1)}$; identifying the $T_{j\,(k+1)}-T_{jk}$ for the sensing element having the two successive time instant differences both being greater than 1/(2f), and obtaining a vibration frequency fc of the light spot as $1/(T_{j\,(k+1)}-T_{jk})$; and

for the sensing elements with the two successive time instant differences not both being greater than 1/(2f), obtaining the amplitude of the scanning mirror based on the vibration frequency fc of the light spot and vertical positions and time instants corresponding to maximum light intensities of said sensing elements with the two successive time instant differences not both being greater than 1/(2f), according to a vibration function, wherein N, i, j and k are positive integers, $N\geq 3$, and $1\leq j\leq N$.

10. The method for measuring amplitude of a scanning mirror of claim 9, further comprising: arranging the photoelectric sensor at a first horizontal position to conduct measuring so as to obtain, by fitting, a first amplitude A1 of the scanning mirror at the first horizontal position; arranging the photoelectric sensor at a second horizontal position to conduct measuring so as to obtain, by fitting, a second amplitude A2 of the scanning mirror at the second horizontal position, where a distance from the second horizontal position to the first horizontal position is ΔL; and obtaining a maximum swing angle θ_m of a light beam reflected by the scanning mirror based on the first amplitude A1, the second amplitude A2 and the distance ΔL.