lyncée tec DHM

デジタル ホログラフィック顕微鏡(DHM®)システム

～3D高速イメージングの新しいアプローチ

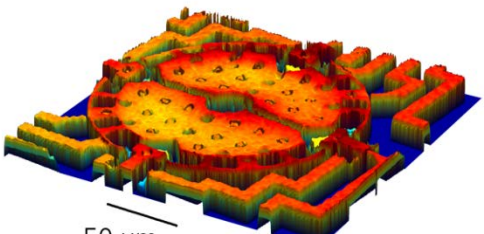
- High Speed
走査しないワンショット方式
短時間かつ除振対策不要

- Real Time
ビデオレートのデータ取得で
生体細胞や MEMS などの
3Dリアルタイムイメージングを実現

- Wide & Accuracy
最大15μmの段差をナノレベル
分解能で実現

- Easy Operation
自動焦点調整や広範囲の
スティッチ処理に対応
キャリブレーション不要

◆主なアプリケーション
- 表面粗さ評価
- MEMS
- 微小デバイス
- 生体サンプル
- バイオ
- マイクロレンズ



MEMSデバイス

無料デモ測定で効果をご体感ください

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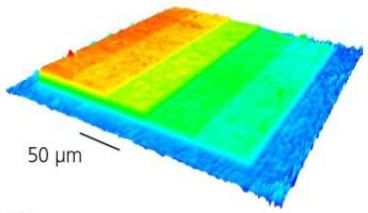
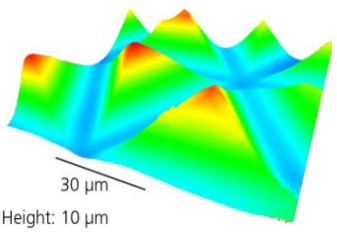
～ “No Scanning”、だからここまでできる ～

– ナノレベルの高さ分解能

除振対策なしで高精細な高さ測定
手軽に表面粗さ計測が可能
～薄膜、コーティングなど



Heights: 25, 35, 65, 80, 85 nm



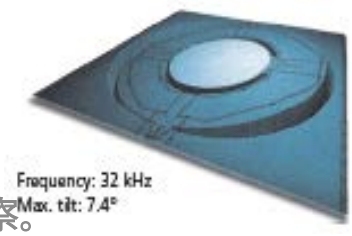
Height: 10 µm

– 大きい高さ計測範囲

15μm(垂直段差は3μm)までを
スキャンなしでワンショット計測
～デバイス、光学素子など

– 動くサンプルに効果的

ストロボスコピック機能(別売)で
高周波駆動MEMS観察・表面計測。
不規則挙動のバイオ試料などは
ビデオレート測定(標準)で3次元リアルタイム観察。



DHM® R2100 主な仕様

光源	短波長レーザ光源2基
サンプルステージ	XYZ3軸電動ステージ
CCDカメラ	1392 x 1040 pixel
Z分解能	0.2nm
高さ計測範囲	15μm(スムーズな凹凸)・3μm(垂直凹凸)
XY分解能	対物レンズの倍率による
ホログラム取得時間	最短1μ秒
キャプチャレート	15fps （別売ストロボモード300fps）

QuantumDesignJapan
日本カンタム・デザイン株式会社
本社 〒172-0042
東京都豊島区高松1-11-16 西池袋フジタビル2F
Phone:03-5964-6624 / Fax:03-5964-6621
http://www.qd-japan.com/ Email:info@qdj.co.jp

DHM® R2100 - R2200 series

Real-time measurements extended to 15 µm high steps keeping nanometer vertical resolution.

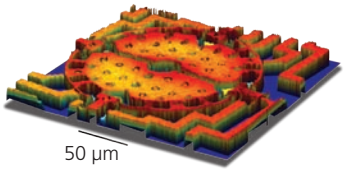
A new level is reached for real-time measurements in interference microscopy. The DHM R2000 family performs measurements at two wavelengths simultaneously. Its innovating optical schema is composed of two nested DHM with common object path and camera. This unique feature, offered by DHM's principle, provides a dual wavelength real-time measurement mode that allows:

- an increase of the measurement range to step heights of up to 15 µm, without any scanning or wavelength switch
- real-time measurements for both single and dual wavelengths modes and full frame phase and intensity images at video rate
- sub-nanometer resolution over the complete vertical range using mapping algorithms
- dual wavelength measurements providing the same tools, ease-of-use and insensitivity to vibrations as single wavelength

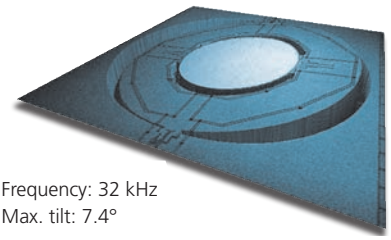
Dual wavelength mode:
keep the speed and ease-of-use

DHM R2000 family enables two interferences to take place simultaneously onto the same camera. Both are recorded on the same hologram and then independently reconstructed. They are combined at video rate to extend the measurement range to several microns as if the sample was imaged with a single wavelength, called synthetic wavelength, equivalent to the low frequency beating of the two monochromatic wavelengths. Working in dual wavelength mode is identical as in single wavelength. It keeps the same ease-of-use and facilities, such as sequences, roughness measurements, time monitoring,... Depending on your sample height, real-time measurements can be performed on either single monochromatic wavelengths data or on their synthetic combination. Switching between the measurement ranges is possible within a single acquisition as all the information is recorded simultaneously in the hologram and the measurements computed out of it .

The R2200 series integrates a third light source alternating with the second one. The DHM R2200 series thus comprises a second larger synthetic wavelengths that further extends the measurement range.



Height: 10 µm



Frequency: 32 kHz
Max. tilt: 7.4°

Mapping: keep the vertical resolution

The sub-nanometer vertical resolution of the monochromatic wavelength measurements can be kept over dual wavelength measurement ranges thanks to powerful mapping algorithms combining the synthetic and monochromatic wavelengths data. For short synthetic wavelengths mapping is performed out of a single acquisition. For longer synthetic wavelengths, a short synthetic wavelength measurement is also required for mapping. Alternate measurements in long and short dual wavelengths are therefor performed (acquisition time: 500 ms).

The simultaneous recording of data results in the fastest measurements over microns in interference microscopy. It avoids any artefacts due to acquisition time and thus ensures precision and robustness toward external vibrations. The real-time display of the measurements guaranties the ease-of-use and efficiency of DHM. The measurement range can further be increased to the millimeter range with the vertical coherence scanning module.

DHM R2101 and R2201 have a 3 µm short synthetic wavelength. The third source of the R2201 adds a 15 µm long synthetic wavelength. Both are compatible with the optional Lyncée Tec stroboscopic module in single wavelength. Other source combinations are available allowing higher measurement ranges without mapping or stroboscopic compatibility.

lyncée tec DHM
PSE-A
1015 Lausanne
Switzerland
info@lynceetec.com
www.lynceetec.com

DHM R2000 - 0809 / Printed in Switzerland /

Technical specifications

System	
Measurement techniques:	single and simultaneous dual wavelength digital holographic microscopy in reflection and vertical coherence scanning
Image types:	intensity and quantitative phase contrast image (DHM mode), optical topography (vertical scanning)
Light sources:	up to three monochromatic laser sources
Sample stage:	manual or automated XYZ stages up to 300 × 300 × 12.5 mm travel range
Camera:	1392 × 1040 pixels, 8 bits
Available objectives:	standard, high NA, long working distance, water/oil immersion microscope objectives
Objective mounting:	4-position turret
Computer:	Dell workstation with latest Intel® processor, optimized and configured for DHM, with 19" SXGA monitor
Software:	Lyncée Tec proprietary Koala classic software based on C++ and .NET
Optional working mode:	stroboscopic mode

Performance				
Measurement mode:	Single wavelength	Short Dual wavelength	Long Dual Wavelength[4]	Vertical scanning
Accuracy[1]:	0.1 nm	0.1 nm (25 nm)[5]	0.1 nm (25 nm)[5]	0.5 µm
Vertical resolution[2]:	0.2 nm	0.2 nm (50 nm)[5]	0.2 nm (50 nm)[5]	1.0 µm
Repeatability[3]:	< 0.01 nm	< 0.01 nm (0.25 nm)[5]	< 0.01 nm (0.25 nm)[5]	< 0.05 µm
Vertical calibration:	determined by the wavelength, no mechanical movement calibration			
Vertical measuring range in single wavelength:	up to depth of field for smooth samples, up to 340 nm for sharp edge samples			
Vertical measuring range in dual wavelength:	up to depth of field for smooth samples, up to 3 µm (R2100) / 15 µm (R2200) for sharp edge samples			
Vertical measuring range in vertical scanning:	up to 10 mm, z-stage dependent			
Lateral resolution:	objective dependent, down to 300 nm with oil immersion objectives (1.4 NA)			
Field of view:	objective dependent, up to 4.4 mm			
Working distance:	objective dependent, from 0.3 to 18 mm			
Digital focusing range:	up to 50× depth of field (objective dependent)			
Grabbing time (1 hologram):	down to 1 µs in a single image grab			
Spatial sampling:	1024 × 1024 pixels (hologram)			
Acquisition rate:	15 fps (1024 × 1024 pixels) *(optional up to 300 fps)*			
Single wavelength reconstruction rate:	15 fps (512 × 512 pixels), 4 fps (1024 × 1024 pixels)			
Dual wavelength acquisition time:	15 fps (512 × 512 pixels), 4 fps (1024 × 1024 pixels)			
Vertical scanning acquisition time:	scanning speed: 6 µm/s, reconstruction time: 6 s			
Min. sample reflectivity:	less than 1%			
Sample illumination:	down to 1 µW/cm^2			

Power requirements	
Input voltage:	85-260 VAC - 50/60 Hz
Power requirements (w/o computer):	max. 480 W

Dimensions & weight		
Microscope:	R2101 & R2201	R2102 & R2202
Dimensions (L × W × H):	600 × 600 × 800 mm	900 × 900 × 850 mm
Weight:	45 kg	80 kg
Maximum sample size (L × W):	∞ × 415 mm	530 × 870 mm

[1] As demonstrated by taking the temporal standard deviation on 1 pixel over 30 measurements.*
[2] Defined as twice the accuracy.
[3] As demonstrated by taking the one sigma Rq value of 30 repeatability measurements on SiC reference mirror.*
[4] Only for DHM R2200 serie
[5] Without single wavelength mapping.
** For single wavelength, 1 measurement is the average of 10 acquisitions.*

Specifications are subject to change without notice.