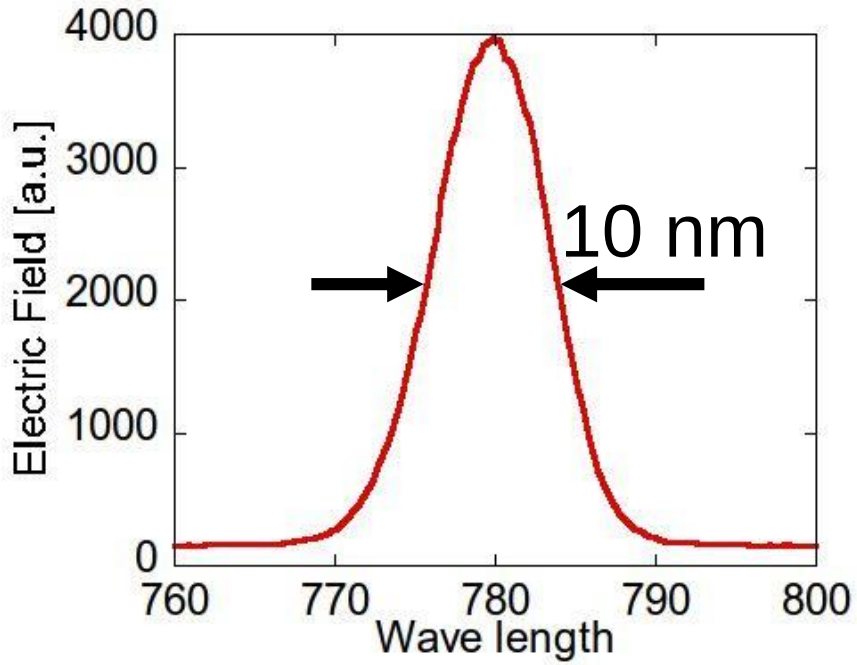
共焦点顕微鏡 with マルチャン分光器

2015/11/17　ERATO meeting

宮本、長谷

OPJ2015
質疑について

照明光に広帯域光を用いていることによる、色付きサンプルの計測への影響は？



実際の照明光のスペクトルは図のようになっているため、影響は少ないと考えられる。

スリットを用いることによる、スリットと直交方向に対する悪影響は？

スリットとの直交方向に対する面内の分解能が、通常の光学顕微鏡程度の分解能となる。

深さ方向の分解能には、ほぼ影響なし。

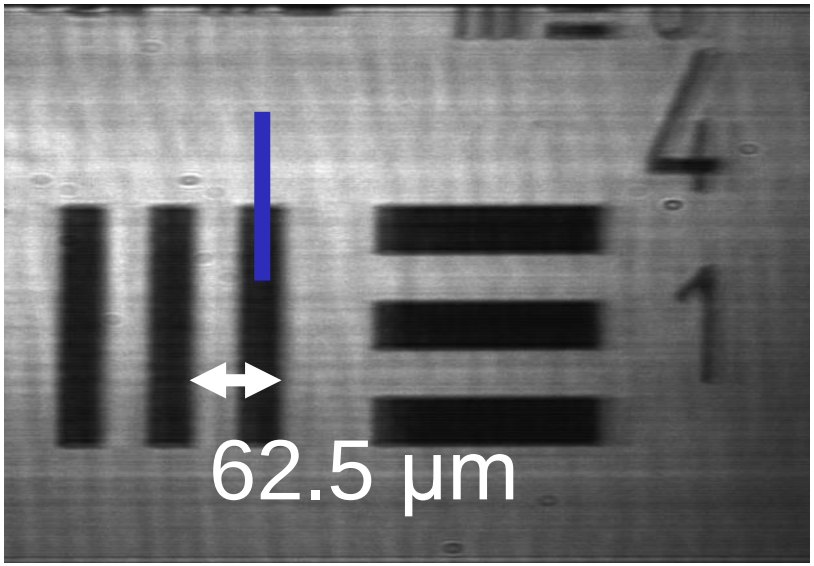
分解能は、何によって決まるか

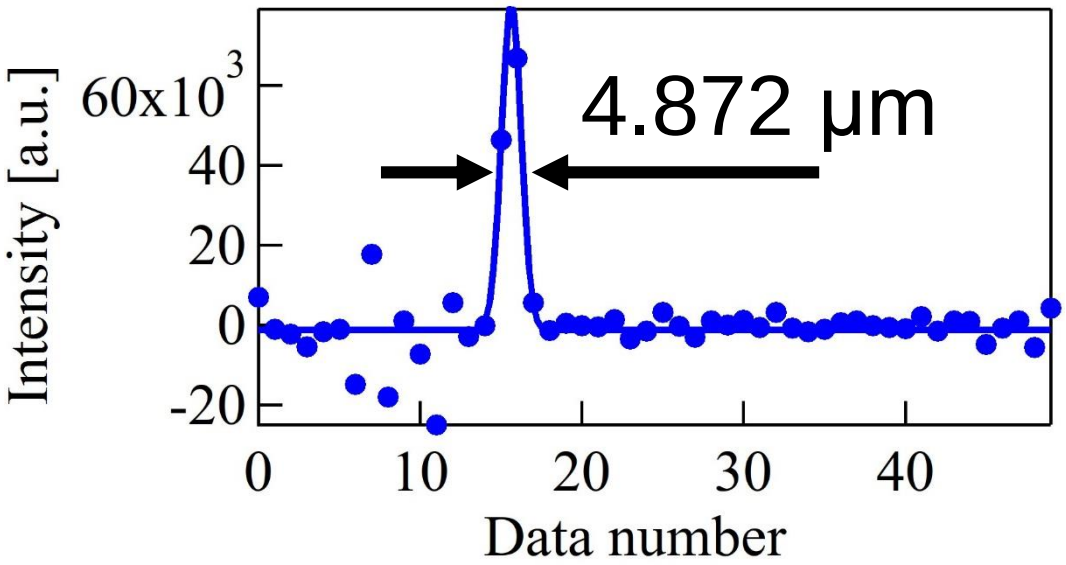
現状は達成できていないが、最終的には回折限界によって決まる。

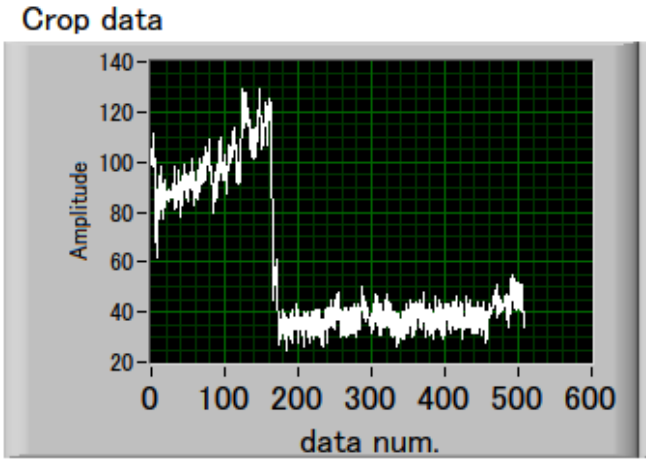
y軸（ライン方向）:$\delta = \lambda / NA = 3.12\ \mu m$

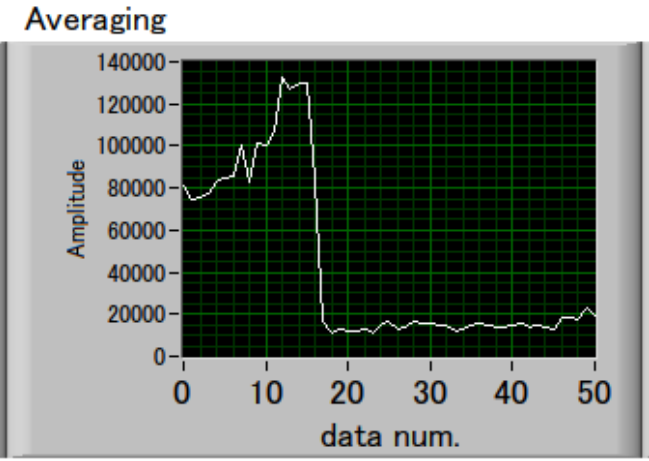
x軸（波長方向）:$\delta = 0.51\lambda / NA = 1.59\ \mu m$

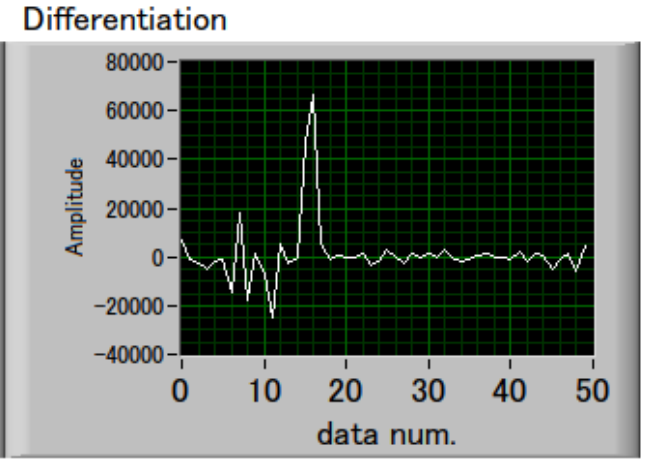
面内分解能の評価(y方向)





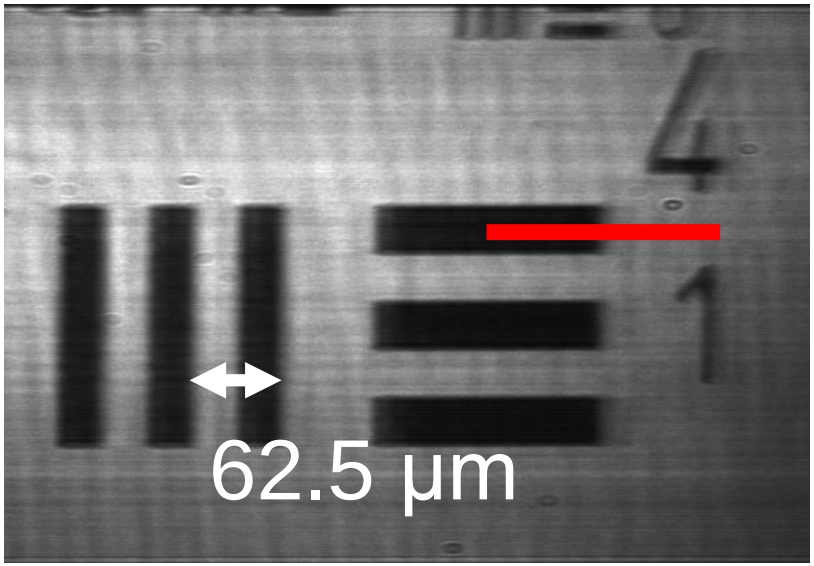


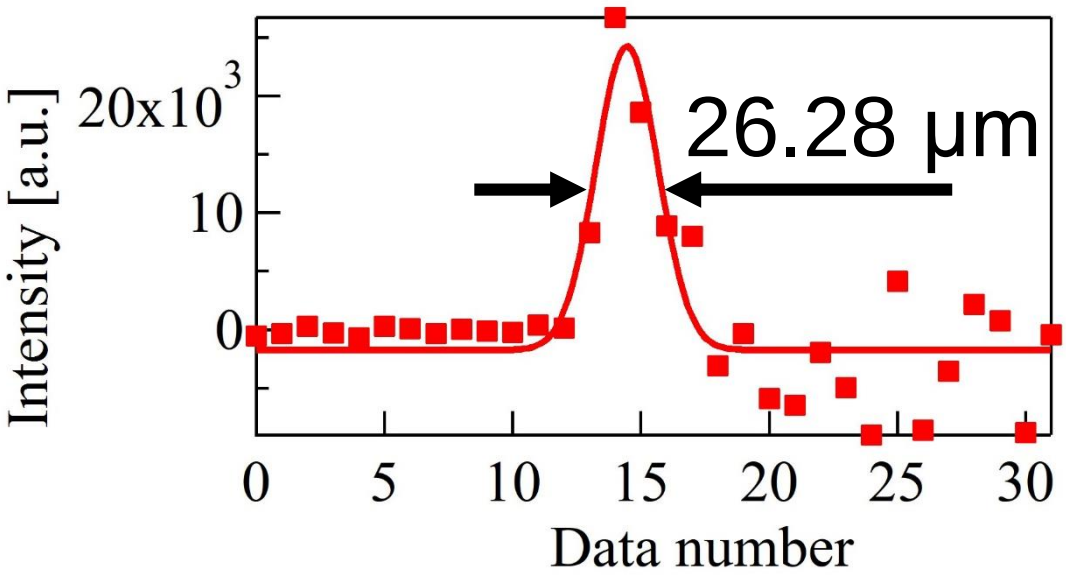




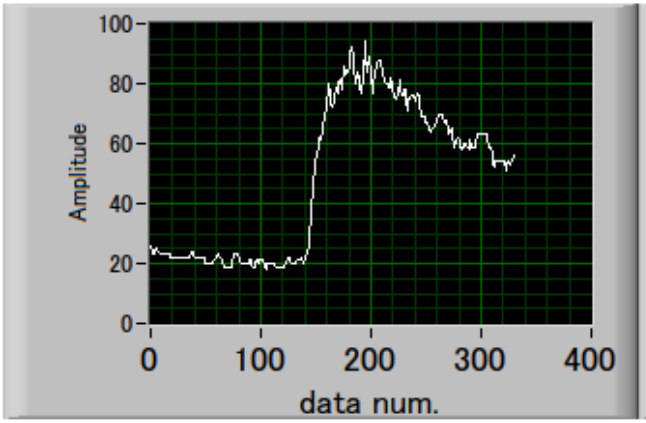
理論値：$\delta = \lambda / NA = 3.12\ \mu m$

面内分解能の評価(x方向)

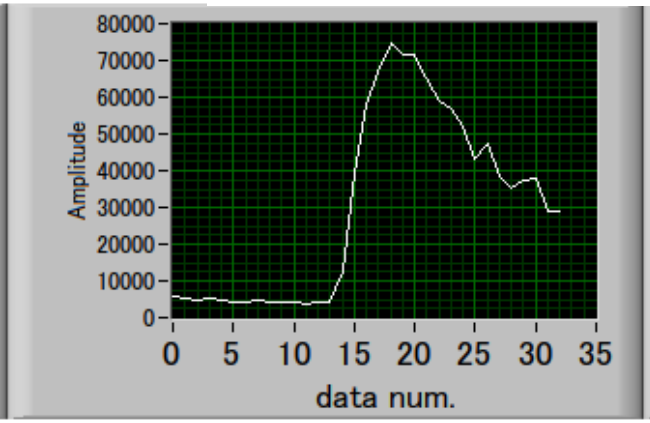


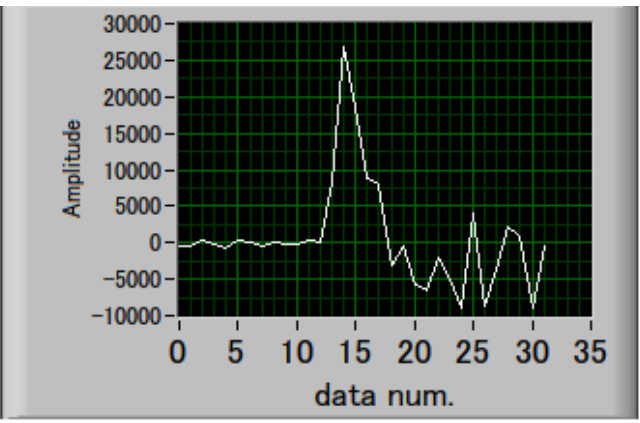


Crop data



Averaging





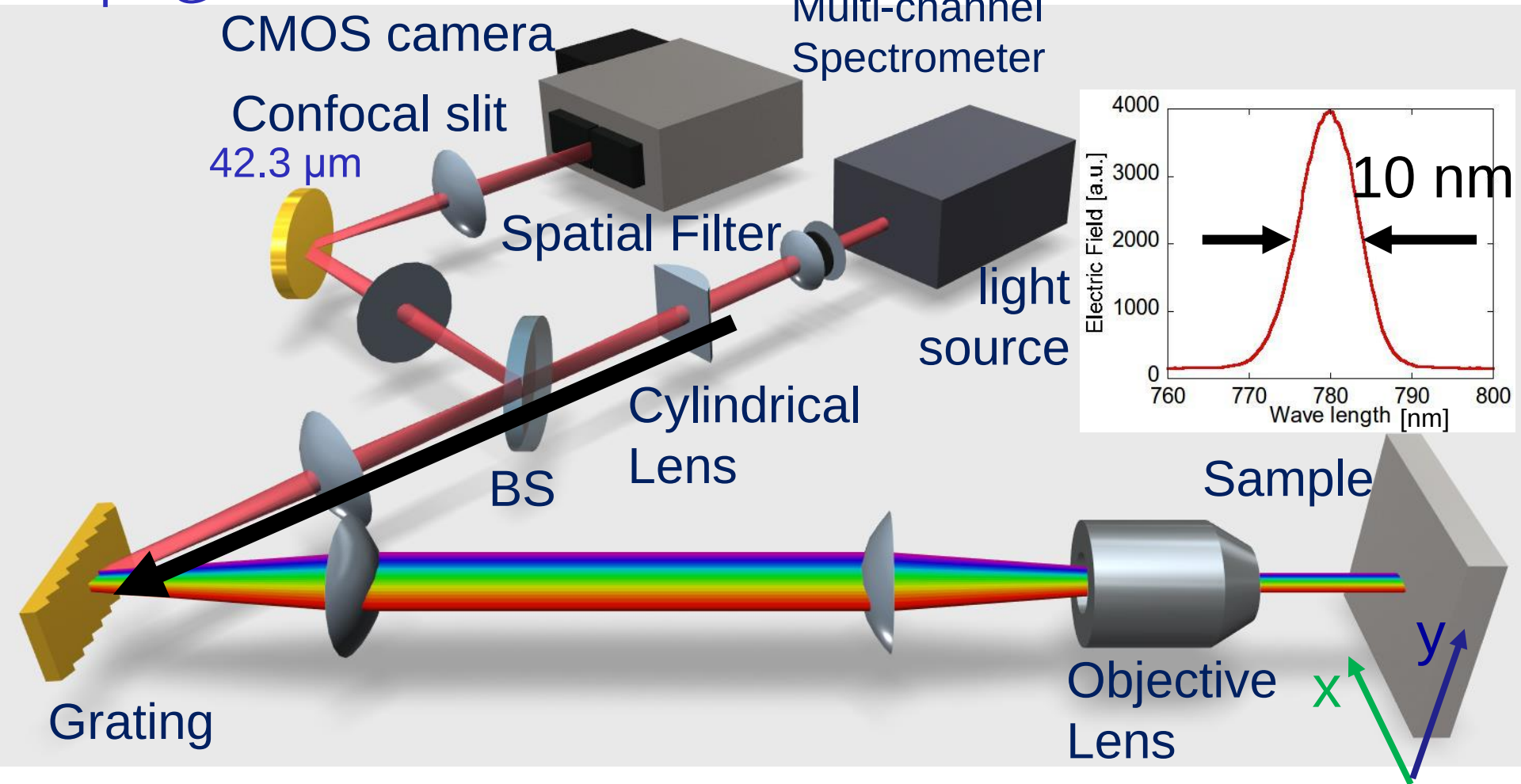
理論値：$\delta = 0.51\lambda / NA = 1.59\ \mu m$

実験装置

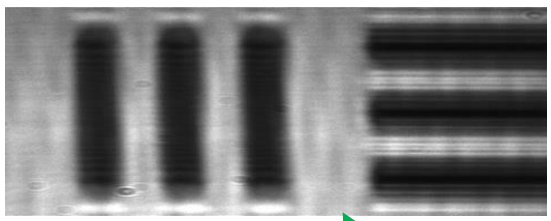
Model	Focal Length	Aperture Ratio
SP2300	300 mm	f/3.9

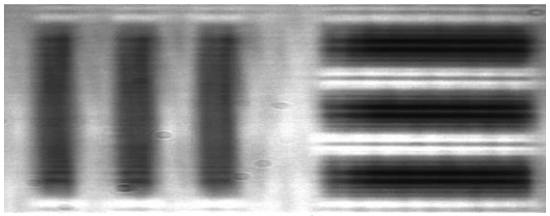
PMT Resolution*	CCD Resolution**	Linear Dispersion*
0.1 nm	0.14 nm	2.38 nm/mm

1280 * 1024 Pixels
25 fps @ freerun mode



共焦点効果の確認





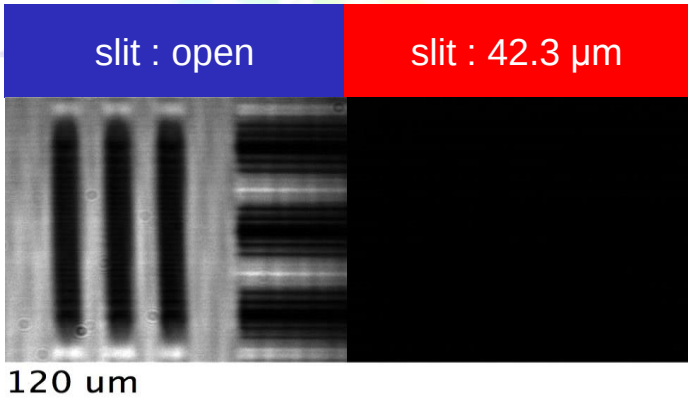
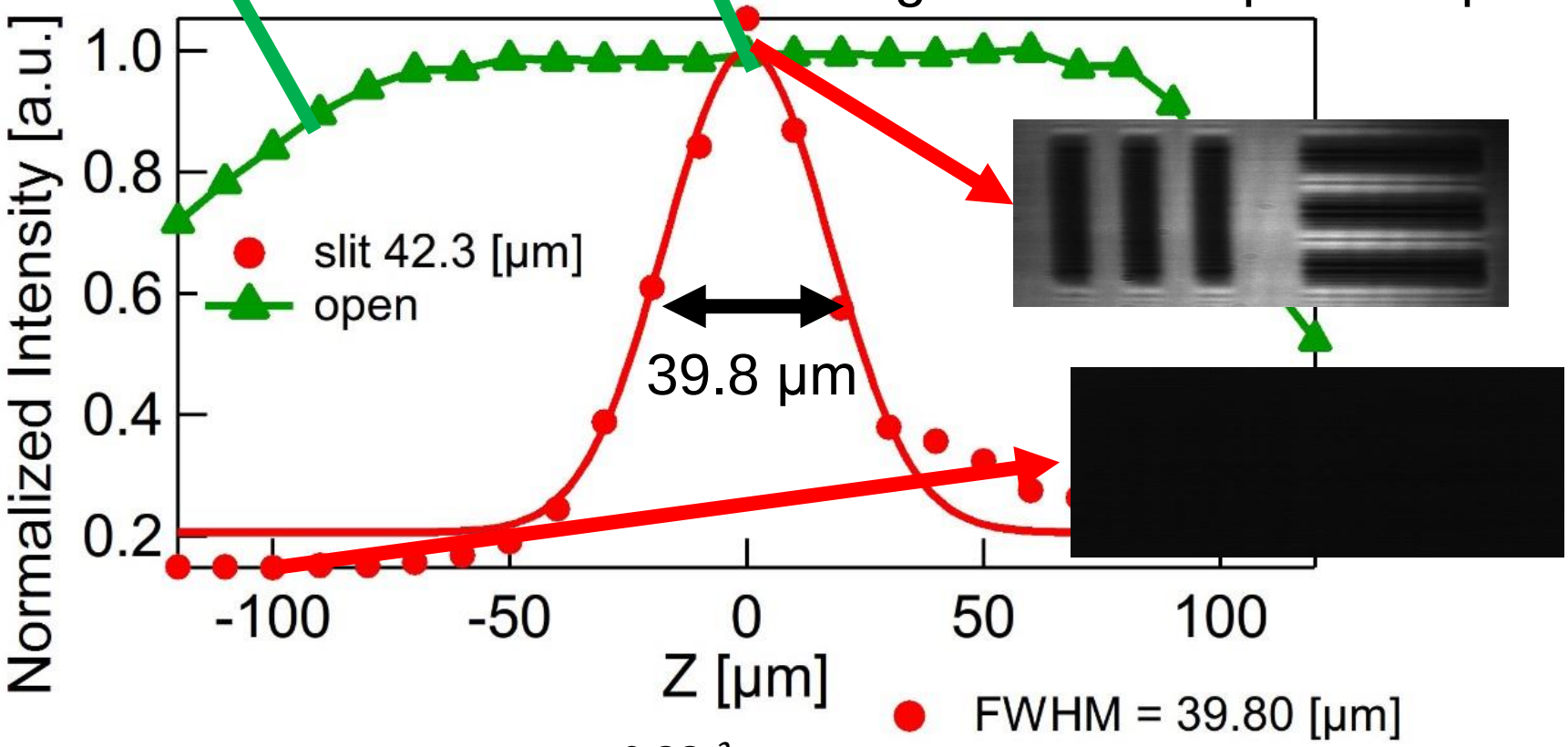


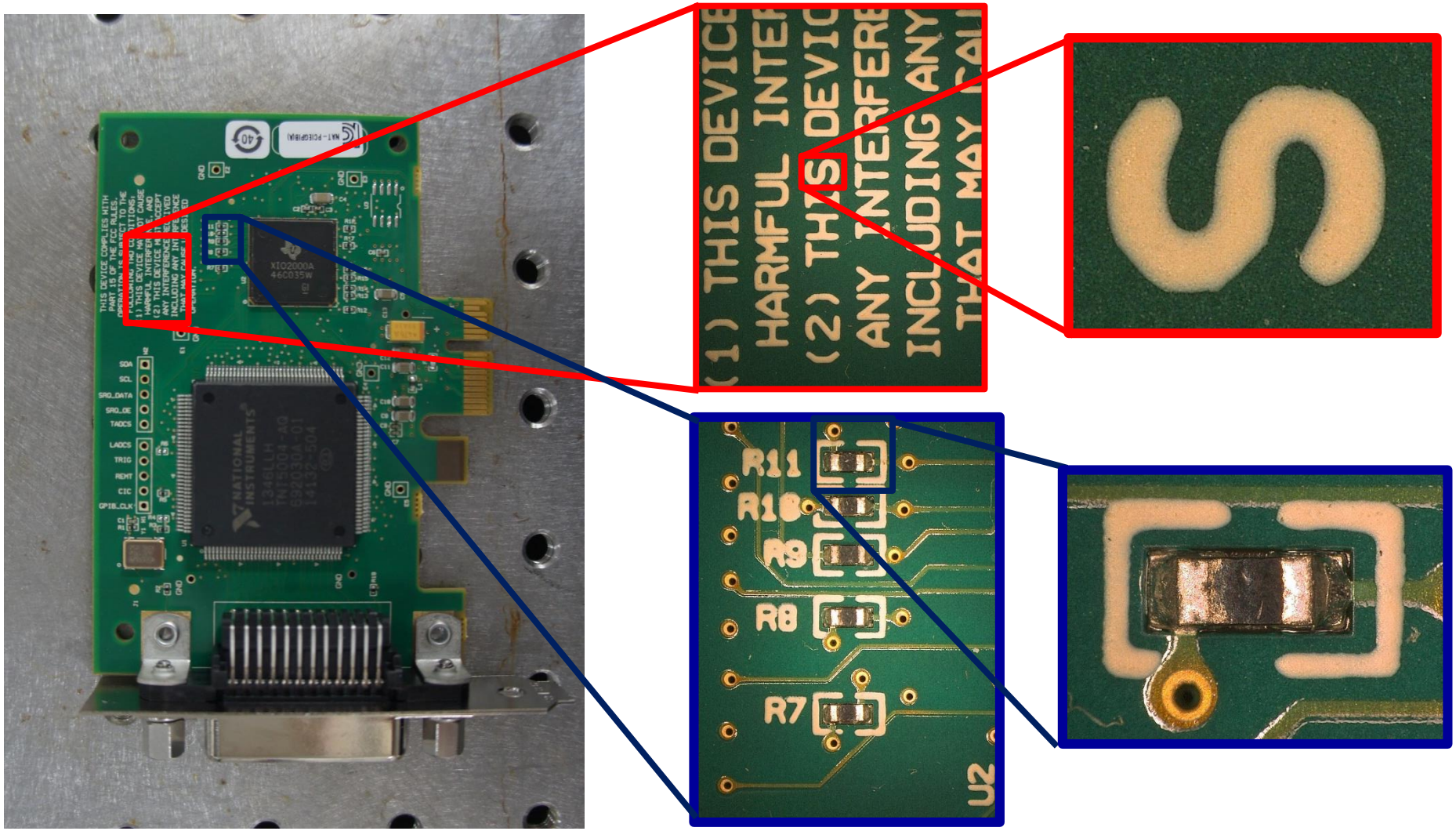
image size : 197 μm*419 μm



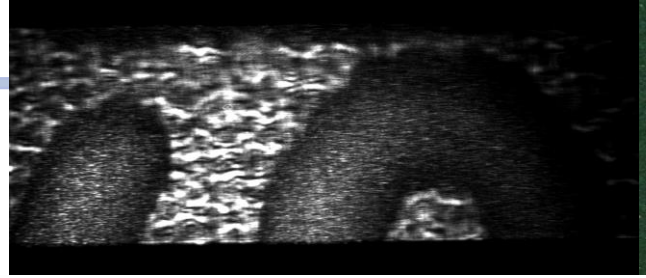
理論深さ分可能　$d_z = \frac{0.88\,\lambda}{n - \sqrt{n^2 - NA^2}} = 21.6\ [\mu m]$

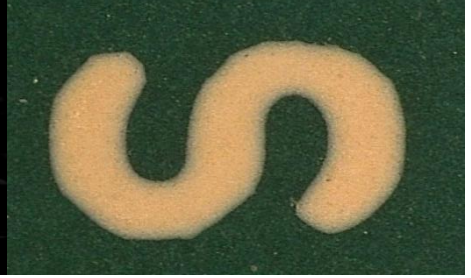
3D断層画像の取得

サンプル（NI GP-IB ボード）

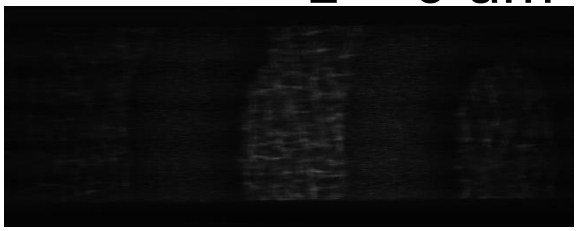


3D断層画像の取得

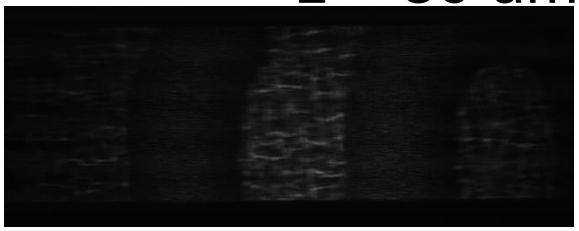




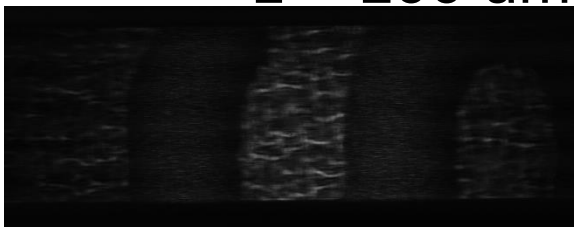
z = 0 um



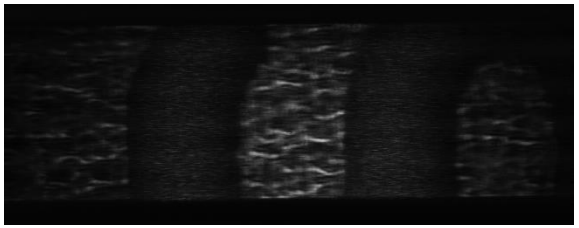
z = 50 um



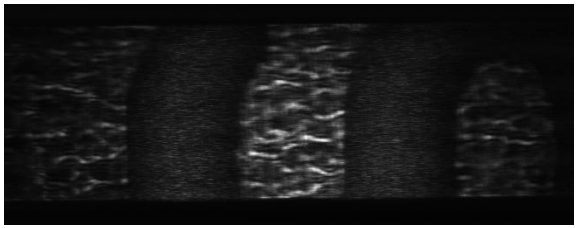
z = 100 um



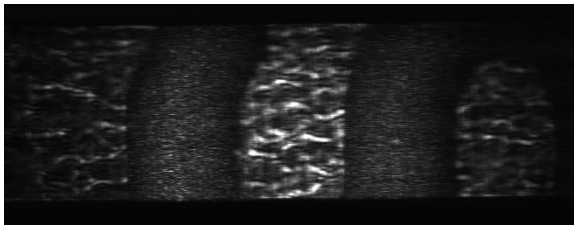
z = 150 um



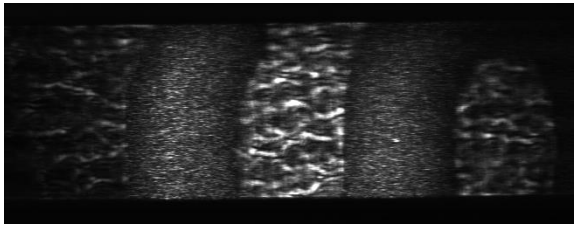
z = 200 um



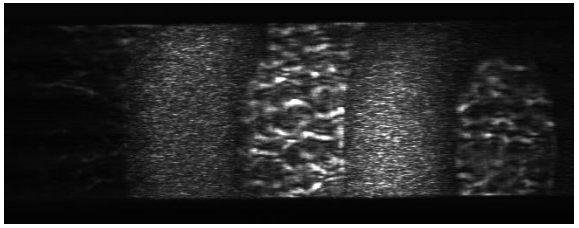
z = 250 um



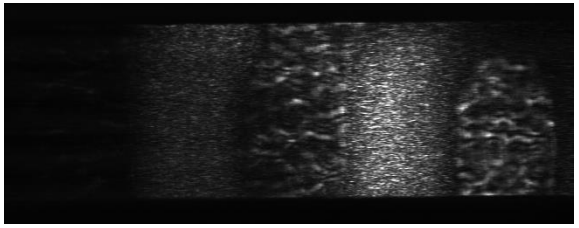
z = 300 um



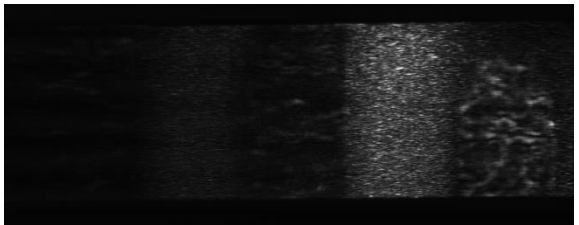
z = 350 um



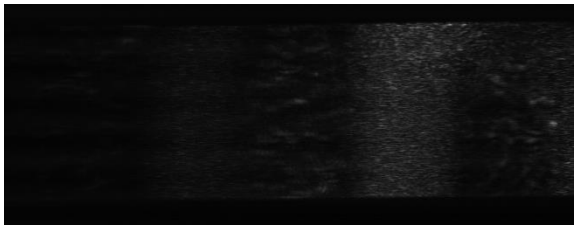
z = 400 um



z = 450 um

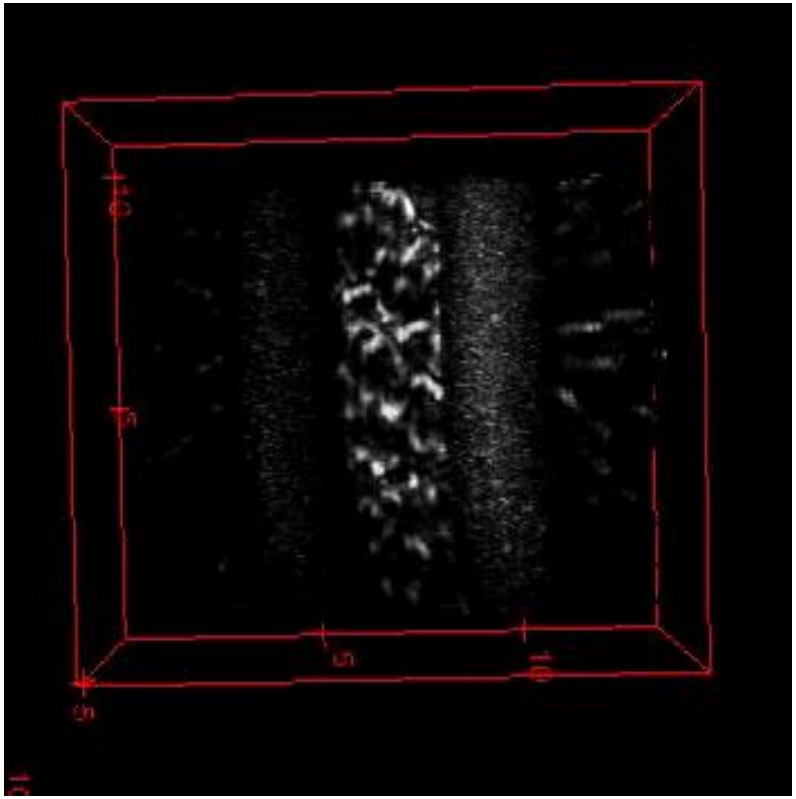


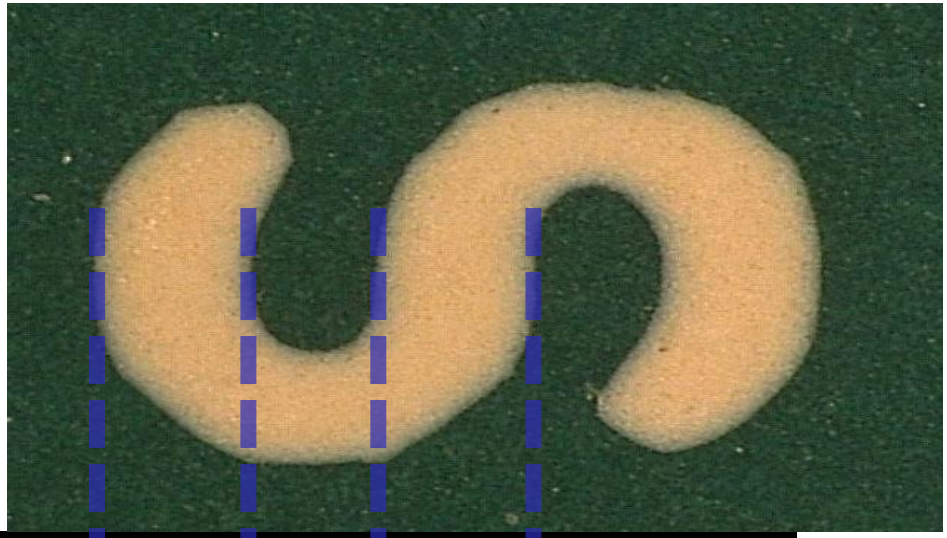
z = 500 um

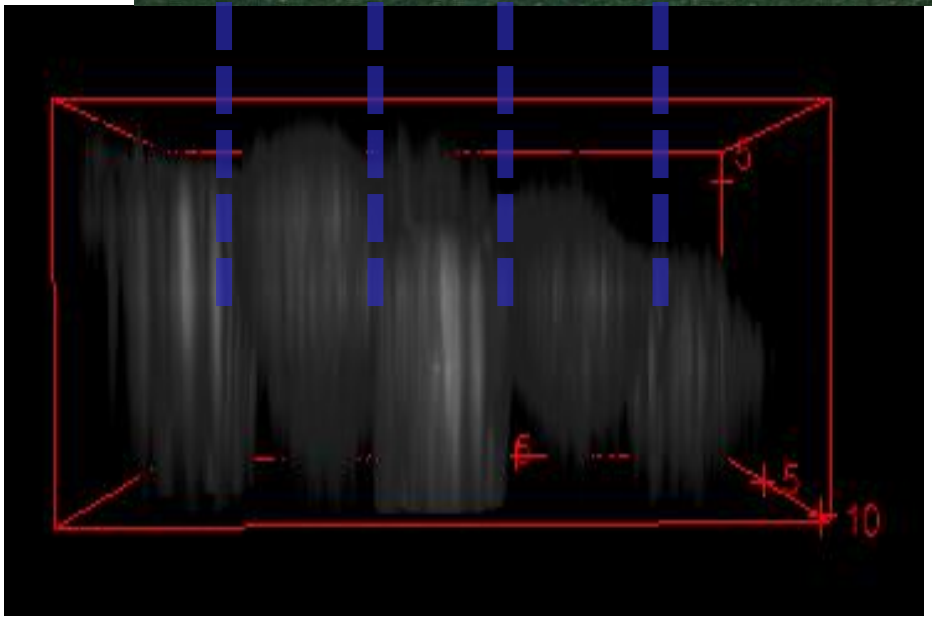


z = 550 um

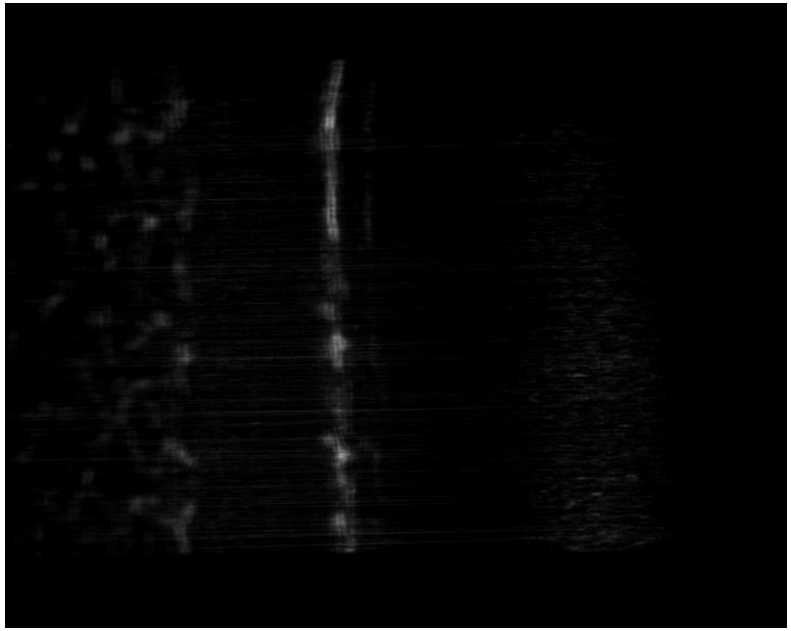
3D像の再構築

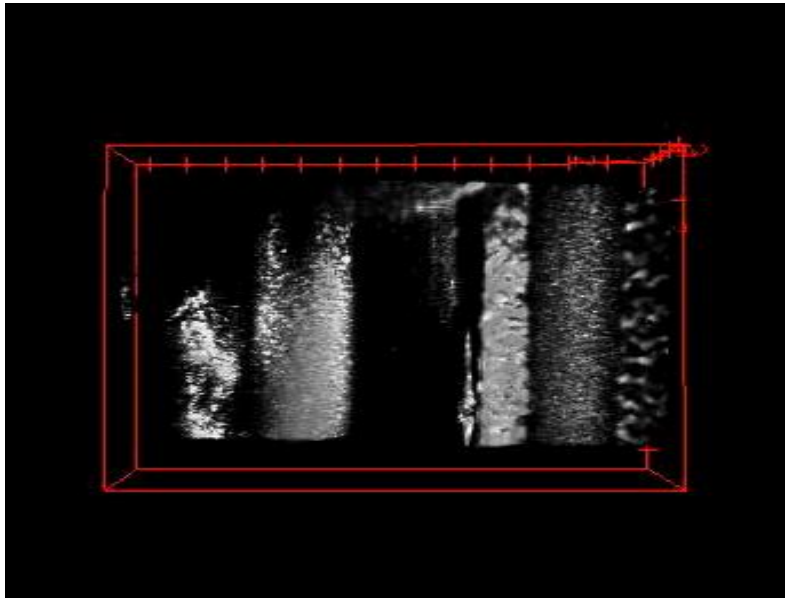


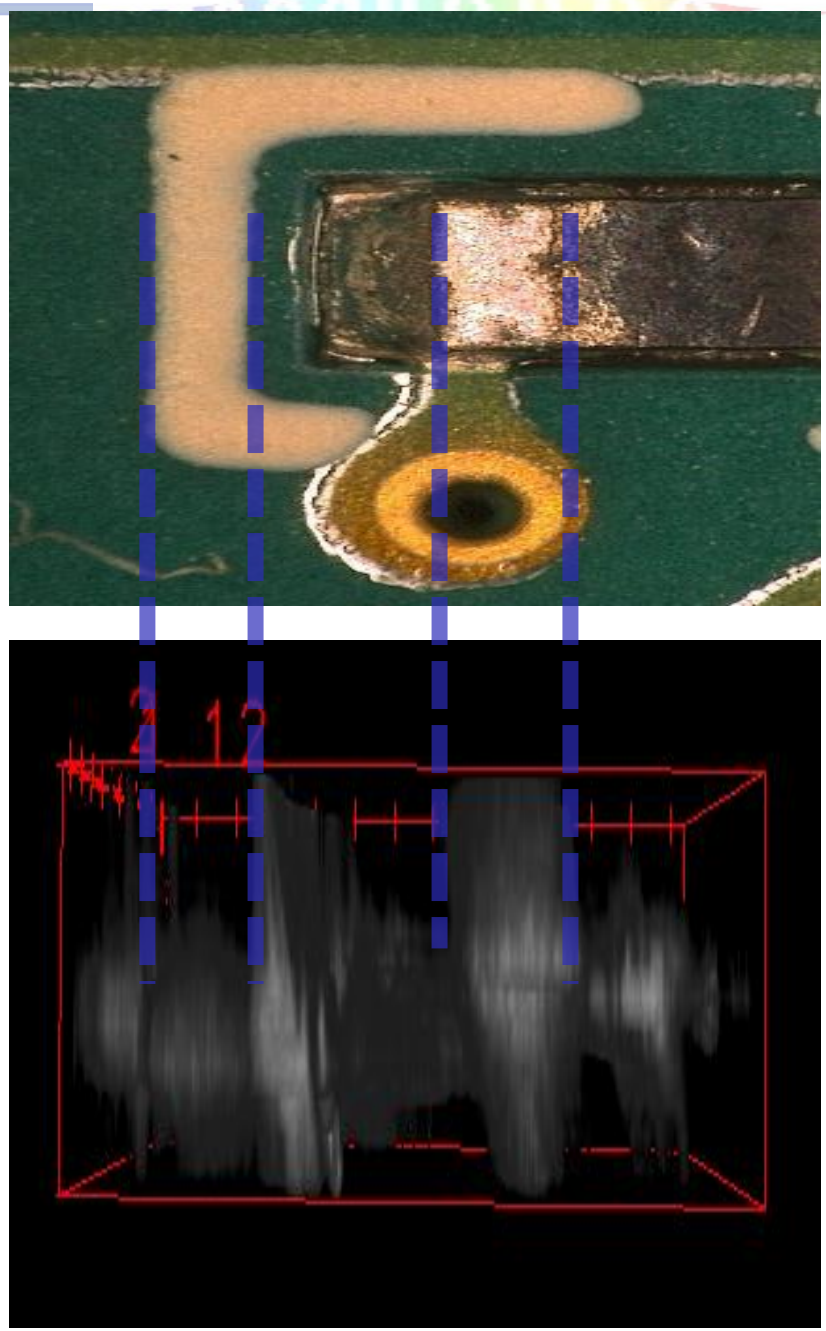




3D断層画像の取得

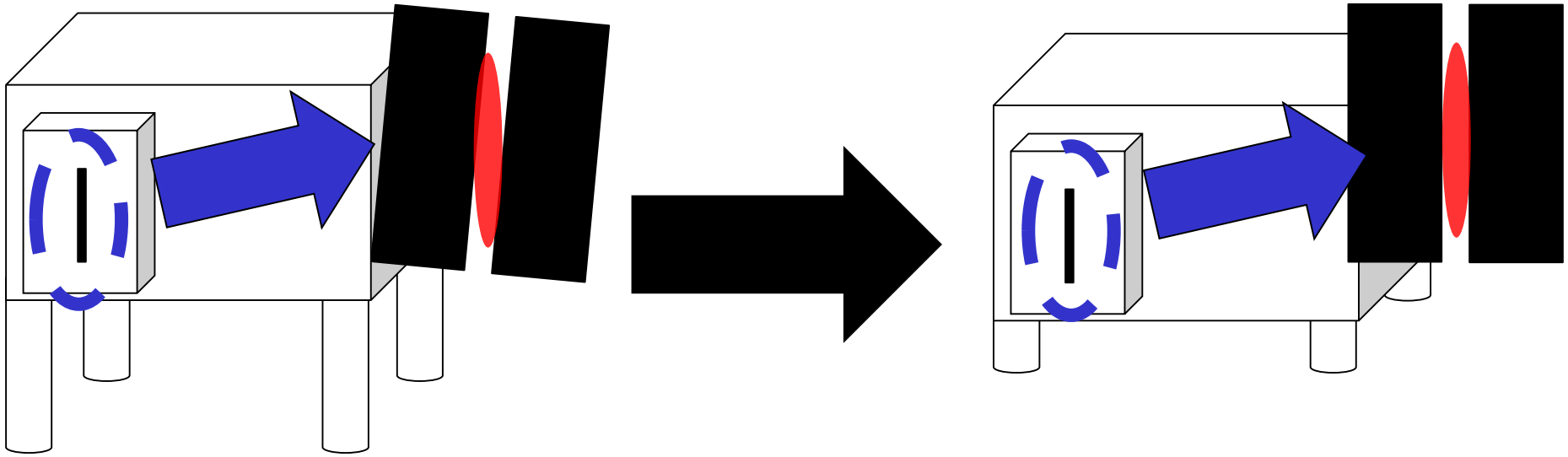




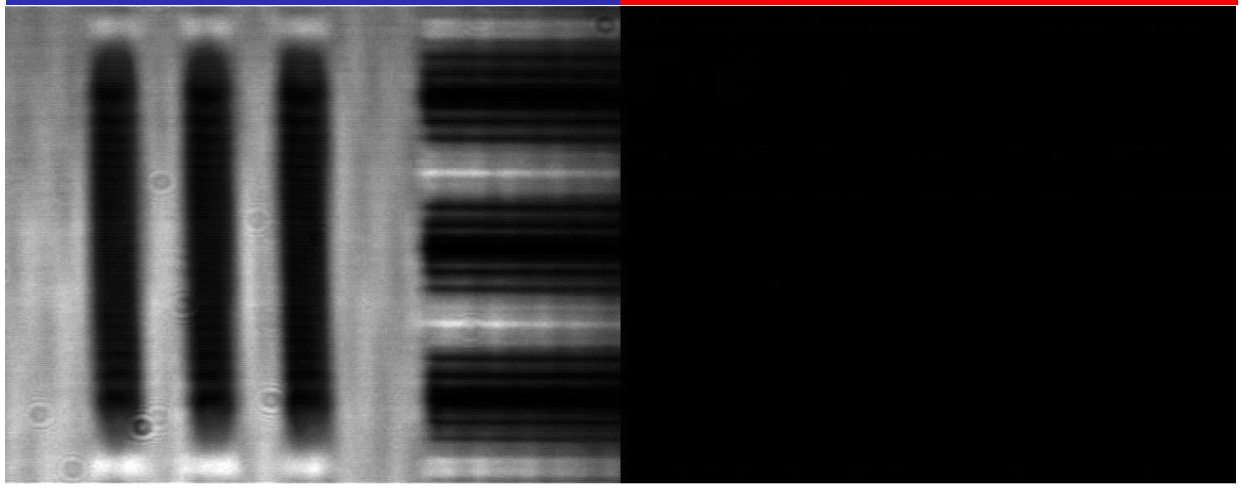


今後の予定

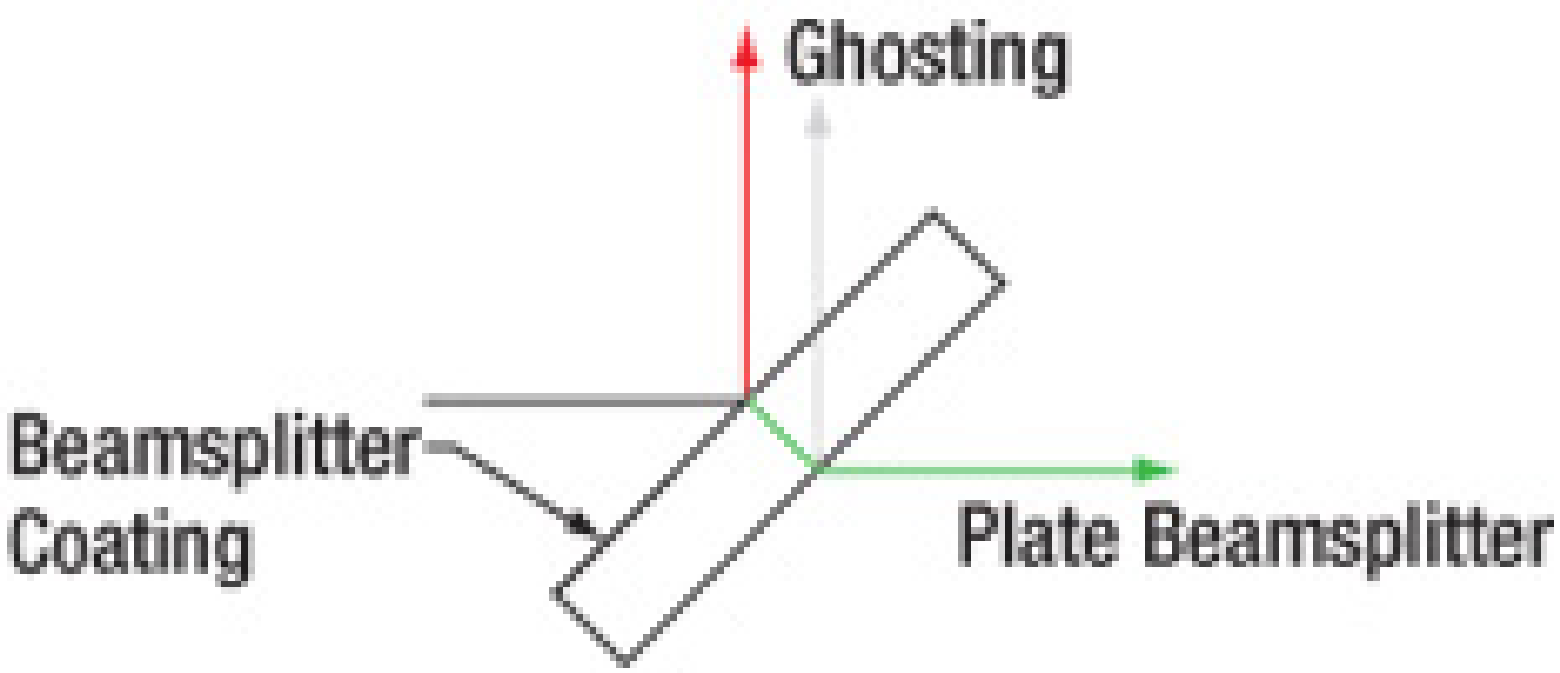
- 対物レンズ用Z軸PZTステージを用いて、3D像をビデオレート程度で取得する。



slit : open | slit : 42.3 μm



120 um


Ghosting
Beamsplitter
Coating
Plate Beamsplitter