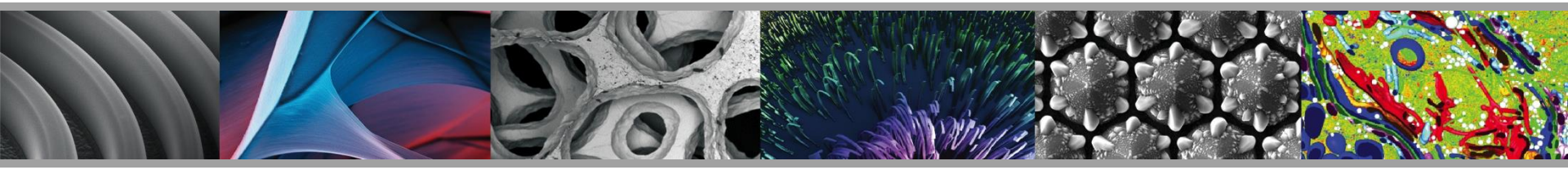
FEI™ Explore. Discover. Resolve.

FEI SmartSCAN™ and Drift Corrected Frame Integration (DCFI)



Scanning Strategy

- Live
- Frame averaging
- Frame Integration
- Line integration
- Scan Interlace
- Drift Corrected Frame Integration

Scanning Strategy

- Frame averaging N=4

(1 (2 (3 [4] 5] 6] 7] 8 9 10… Continuous acquisition

/4 /4 /4 /4

- Frame Integration N=4

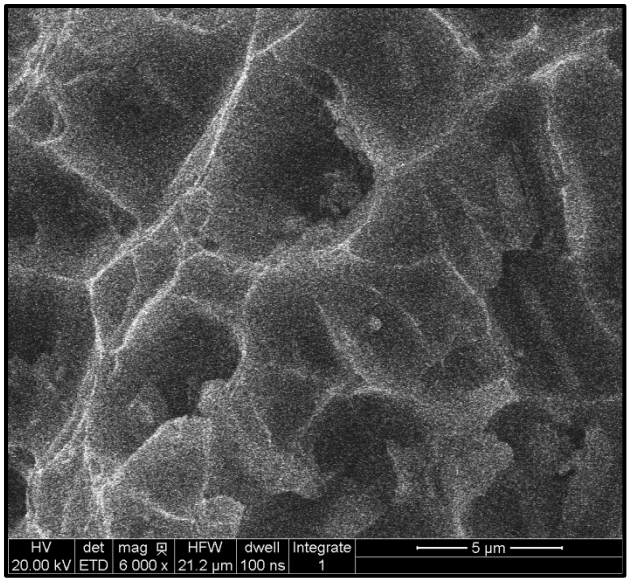
[1 2 3 4] 5 6 7 8 9 10… Acquisition pauses after integration

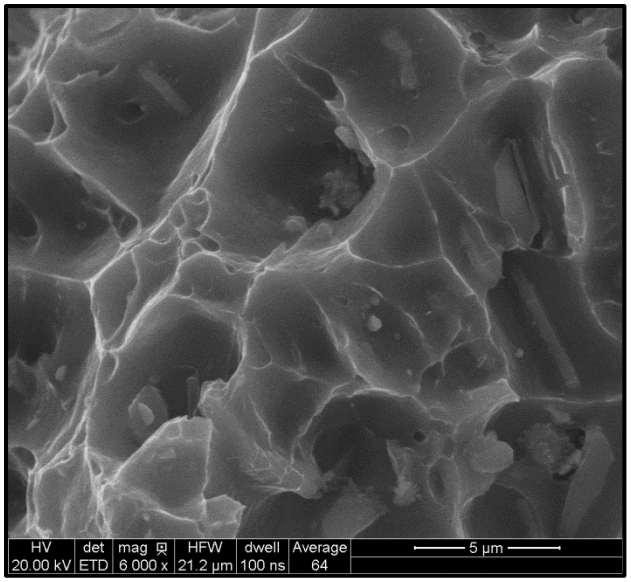
∫4

Frame Averaging

Dwell time 100ns

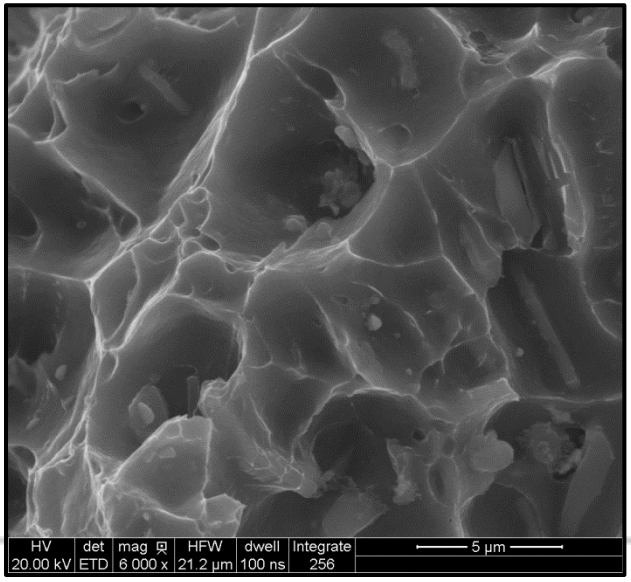
N=1

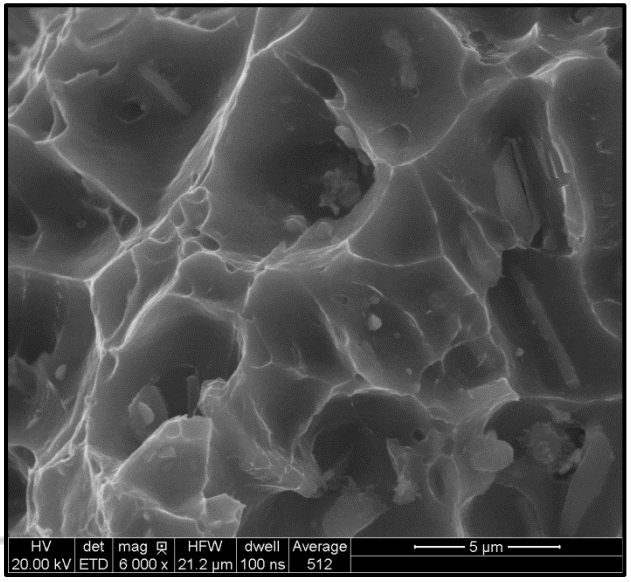




N=64

N=256





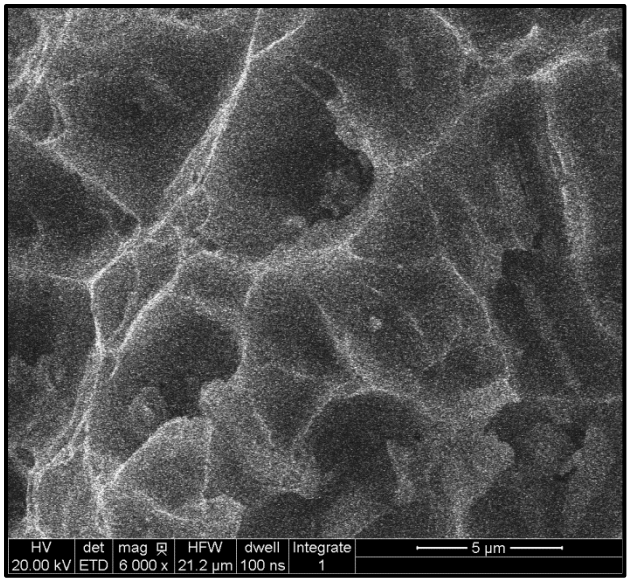
N=512

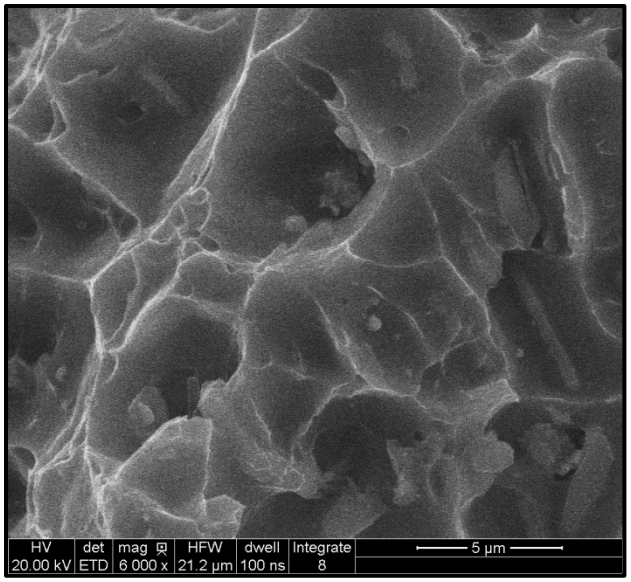
FEI

Frame Integration

Dwell time 100ns

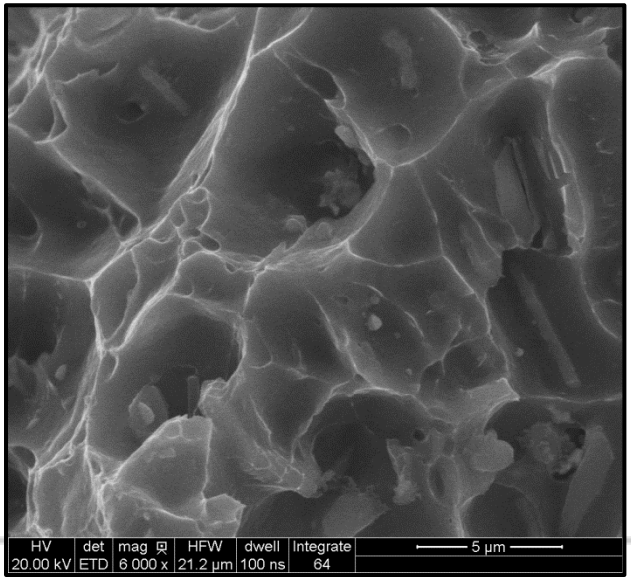
N=1

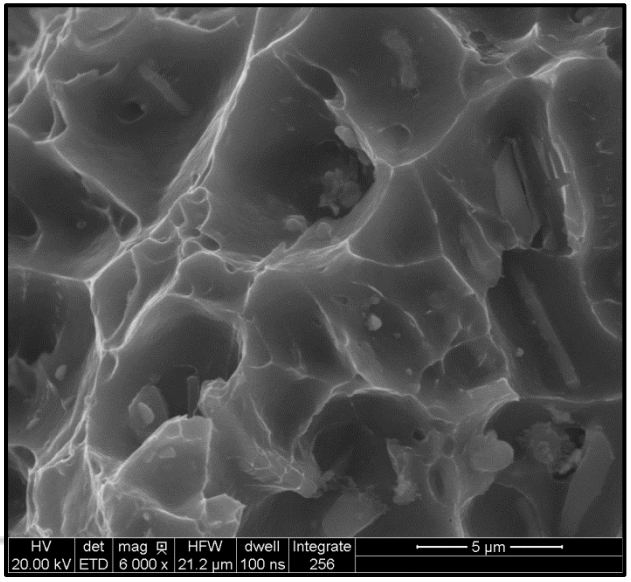




N=8

N=64





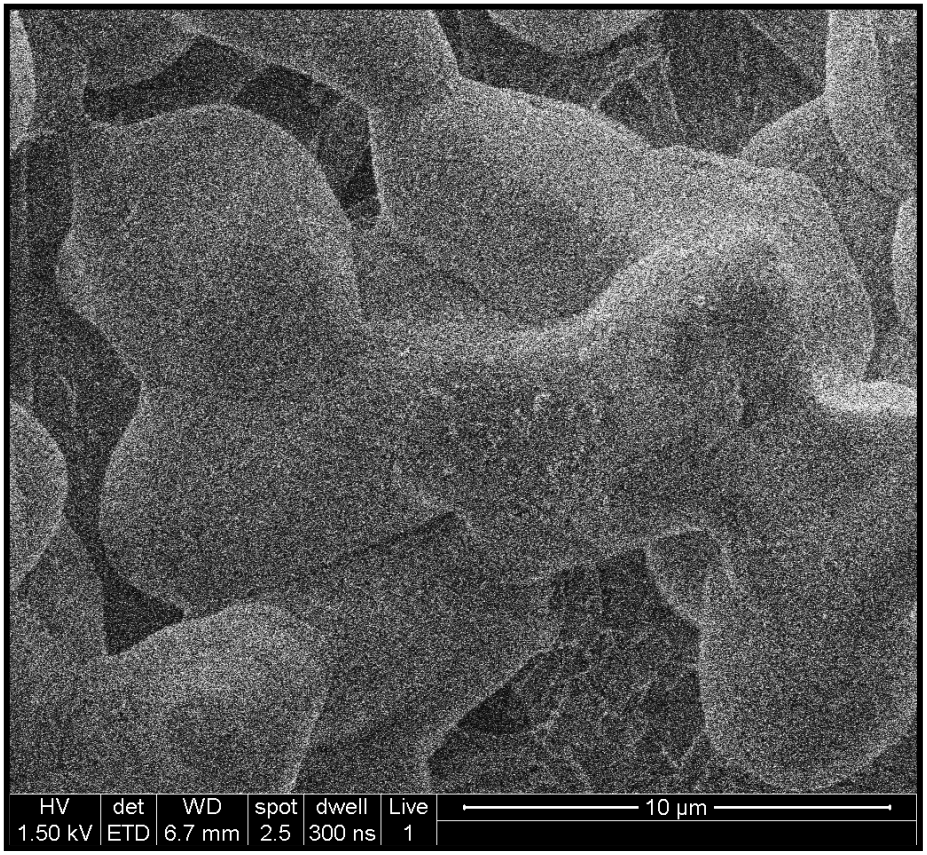
N=256

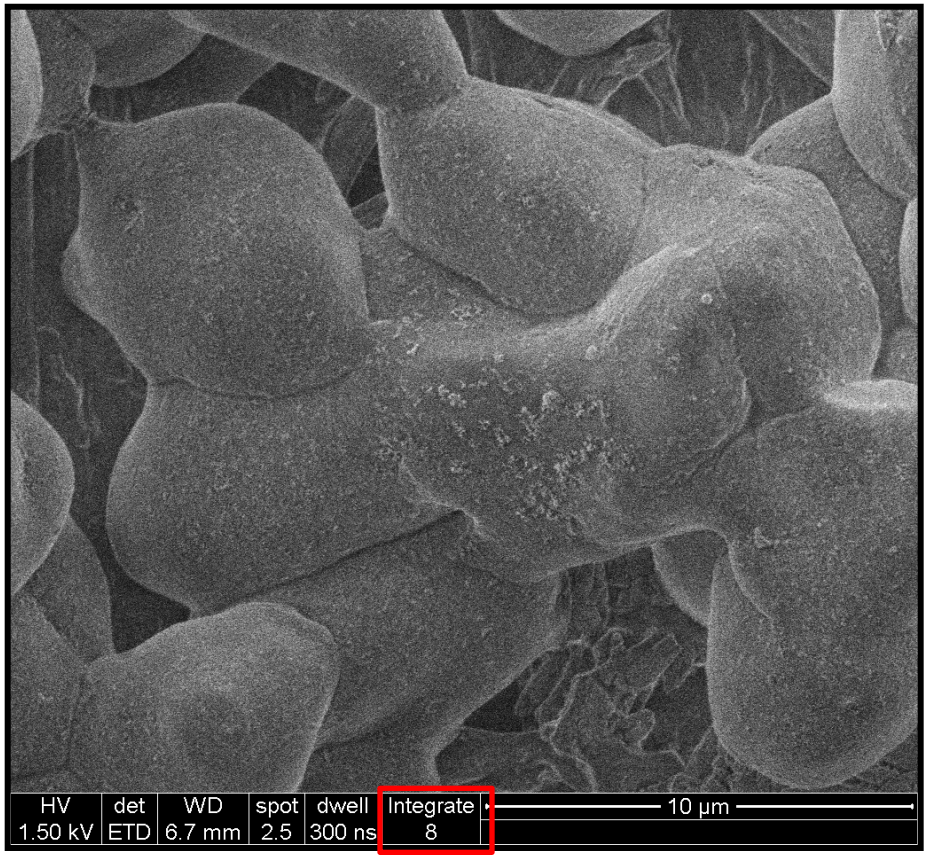
FEI

Frame Integration

Non conductive specimen
in High Vacuum mode

Dwell time = 300ns





Live scan

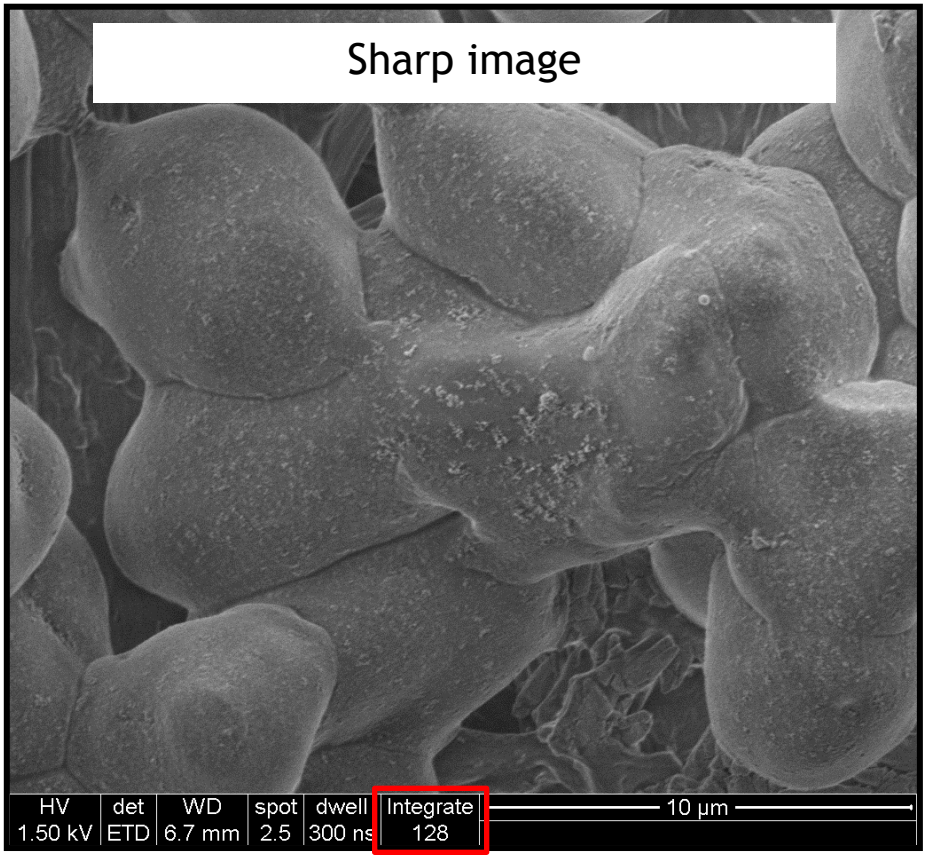
Number of Integration = 8

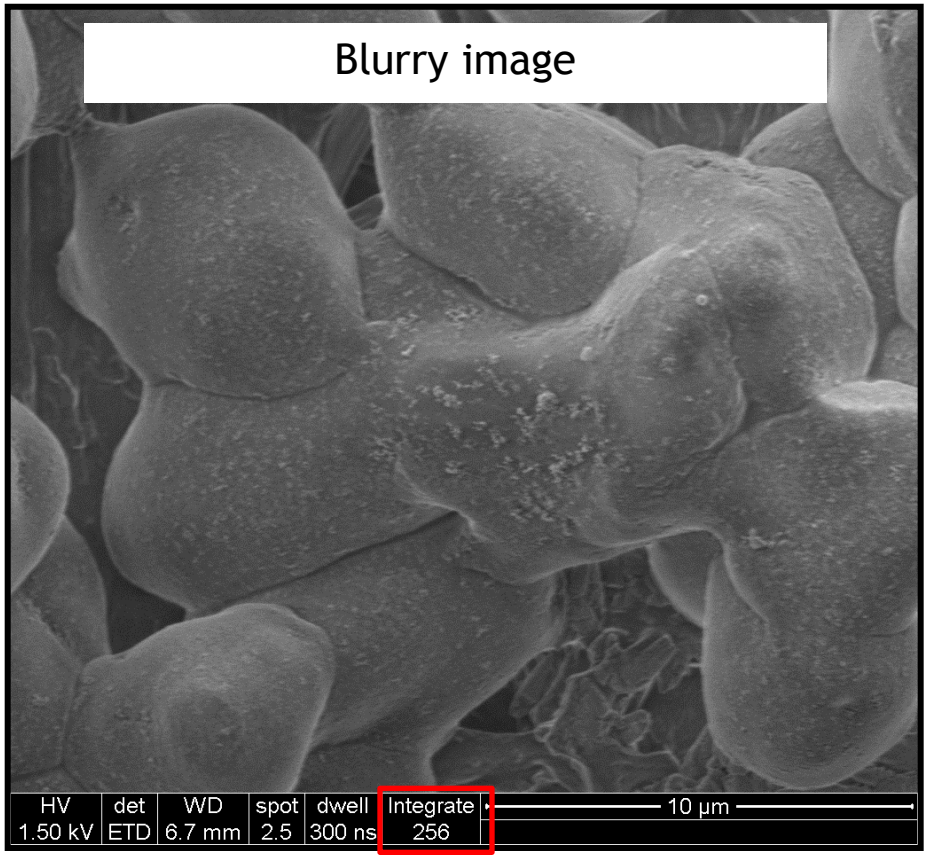
FEI

Frame Integration

Non conductive specimen
in High Vacuum mode

Dwell time = 300ns





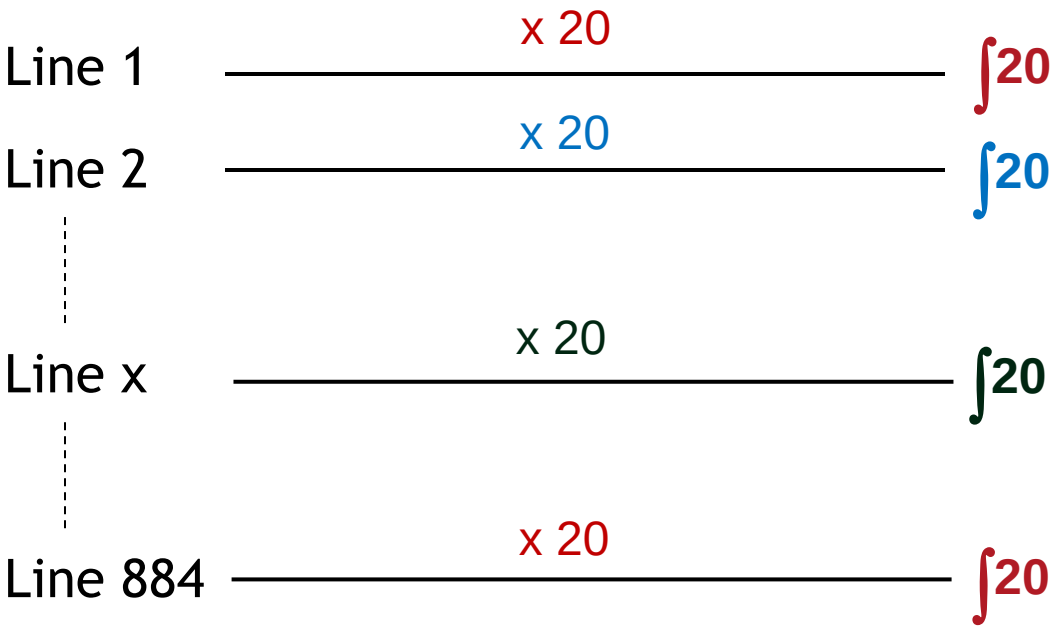
Number of Integration = 128

Number of Integration = 256

FEI

Scanning Strategy

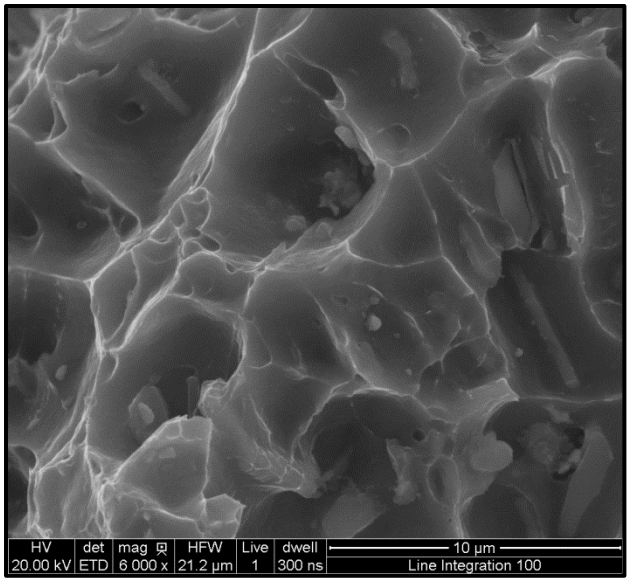
- Line Integration N=20, Pixel resolution 1024x884

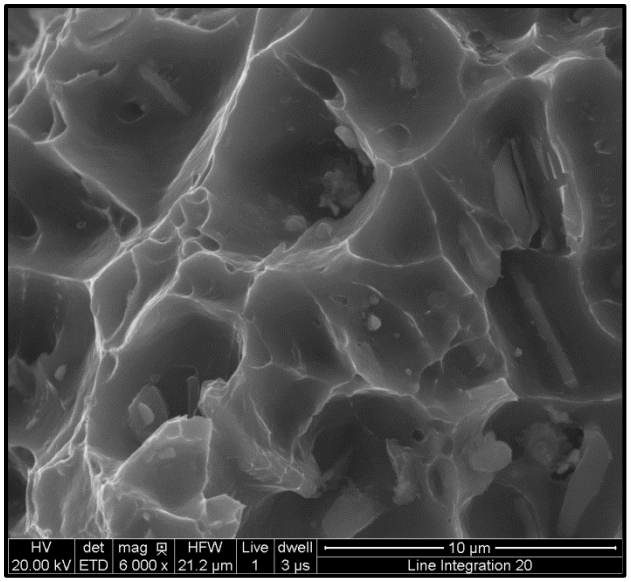


Line Integration

Dwell time 100ns

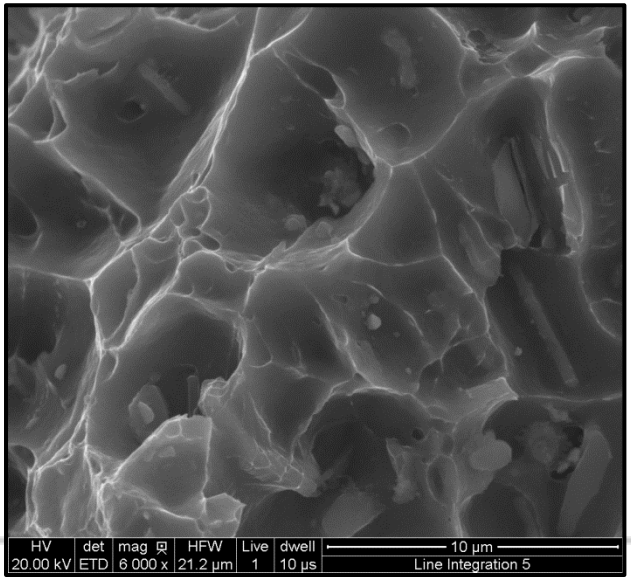
Dwell time
300ns
LI 100

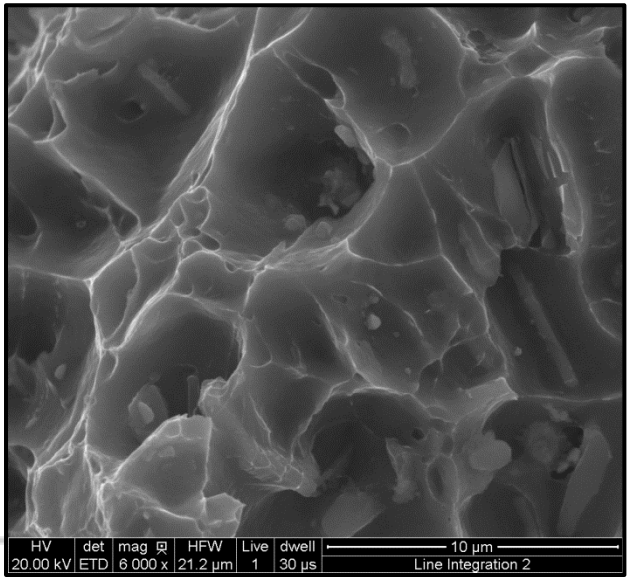




Dwell time
3µs
LI 20

Dwell time
10µs
LI 5



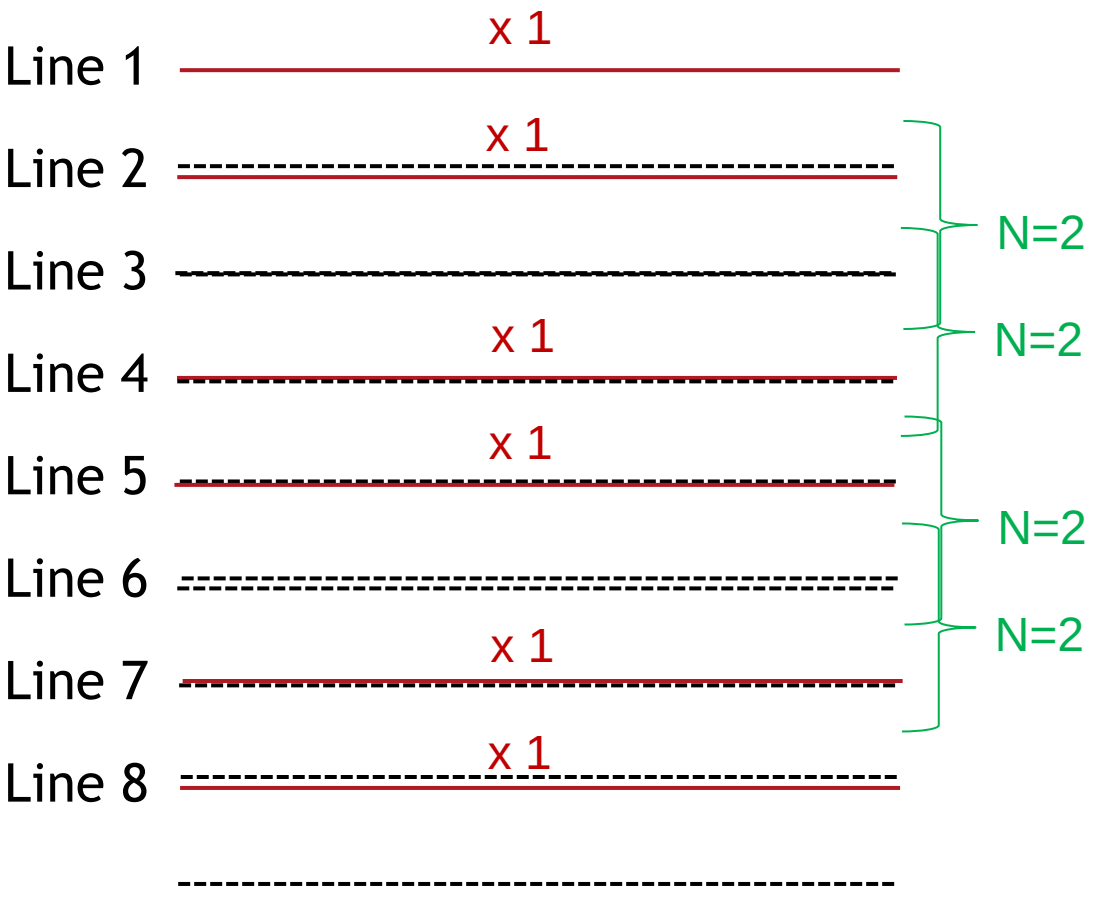


Dwell time
30µs
LI 2

FEI

Scanning Strategy

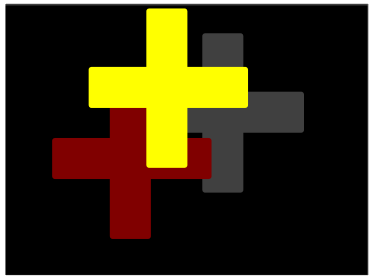
Scan Interlace N=2, Pixel resolution 1024x884 (Only for dwell time <200ns)

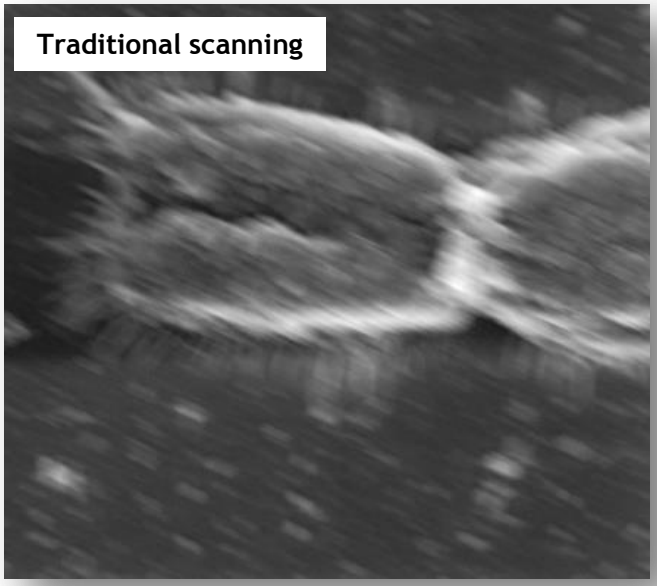


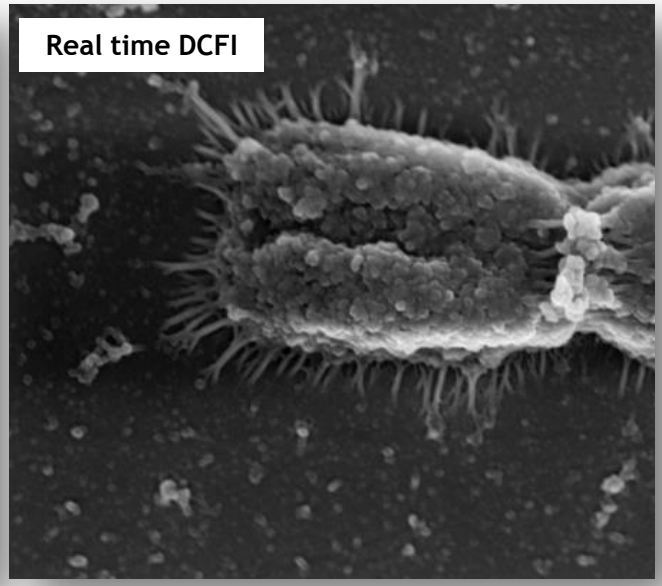
FEI

Scanning Strategy

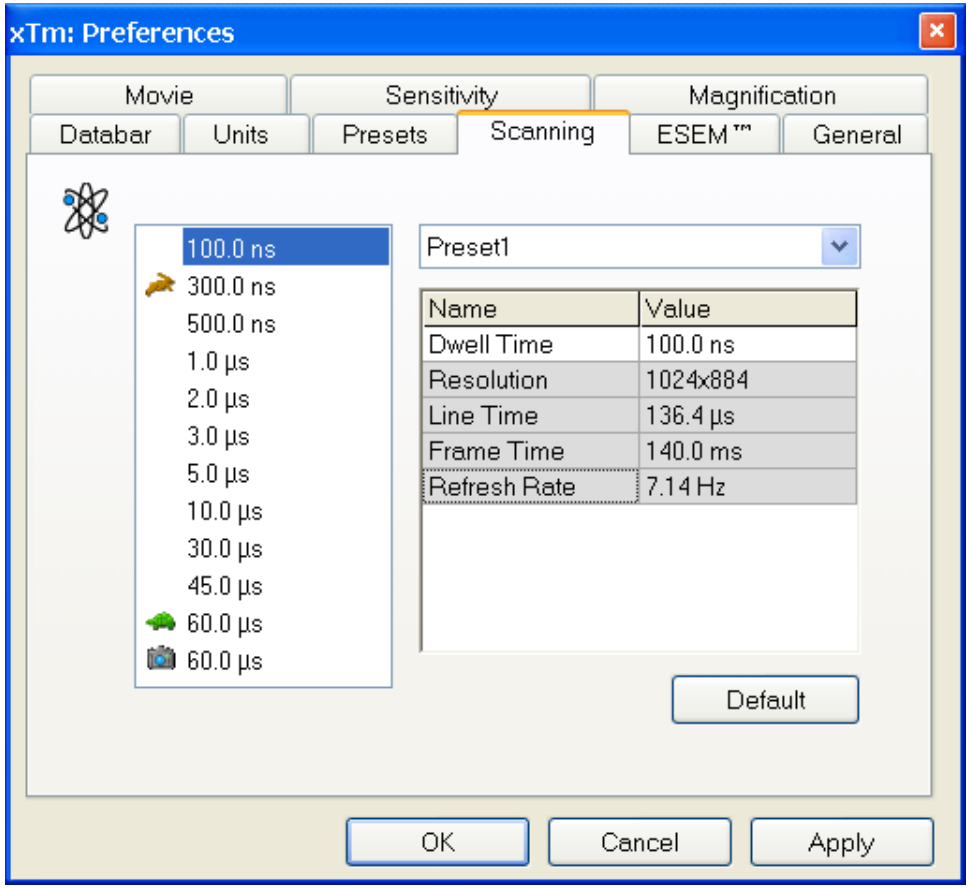
- Minimize artifacts such as charging and drift
- Faster time to optimized image
- Including:
  - **FEI Smartscan™** (256-frame average or integration, Line Integration, Scan Interlacing, Scan Presets)
  - New advanced imaging mode: **DCFI** (Drift Compensated Frame Integration)





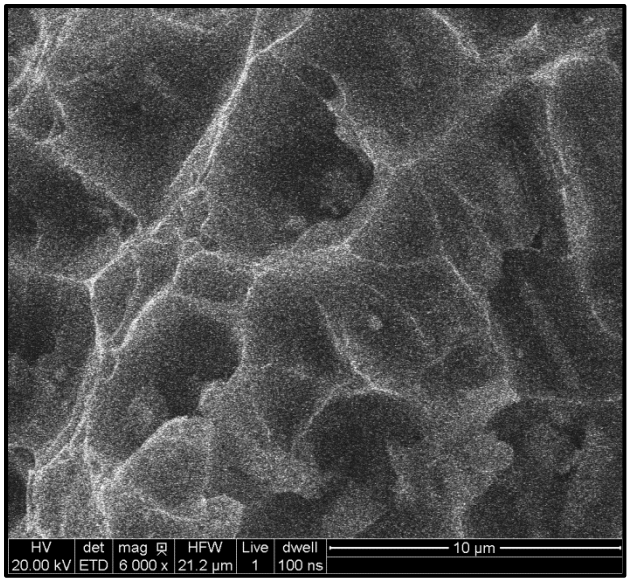


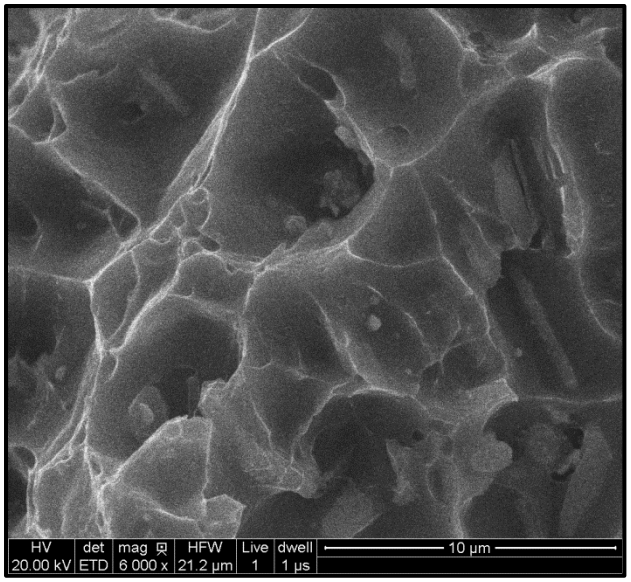
Dwell times


xTm: Preferences
Movie
Sensitivity
Magnification
Databar
Units
Presets
Scanning
ESEM™
General
100.0 ns
300.0 ns
500.0 ns
1.0 µs
2.0 µs
3.0 µs
5.0 µs
10.0 µs
30.0 µs
45.0 µs
60.0 µs
60.0 µs
Preset1
Name
Value
Dwell Time
100.0 ns
Resolution
1024x884
Line Time
136.4 µs
Frame Time
140.0 ms
Refresh Rate
7.14 Hz
Default
OK
Cancel
Apply

Influence of Dwell time

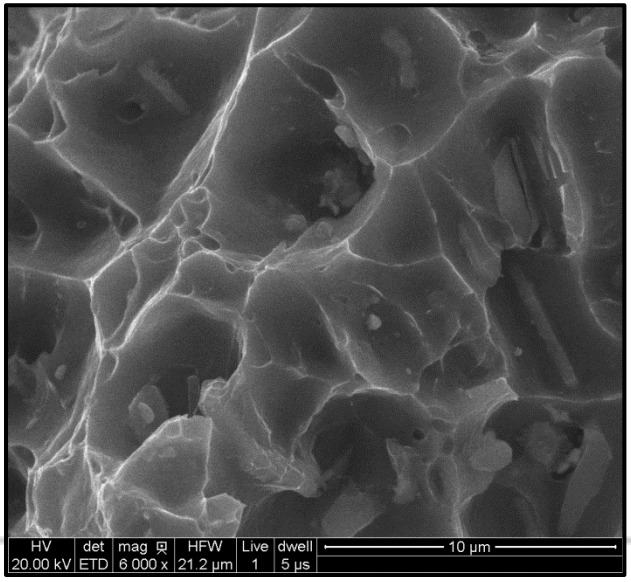
Dwell time 100ns

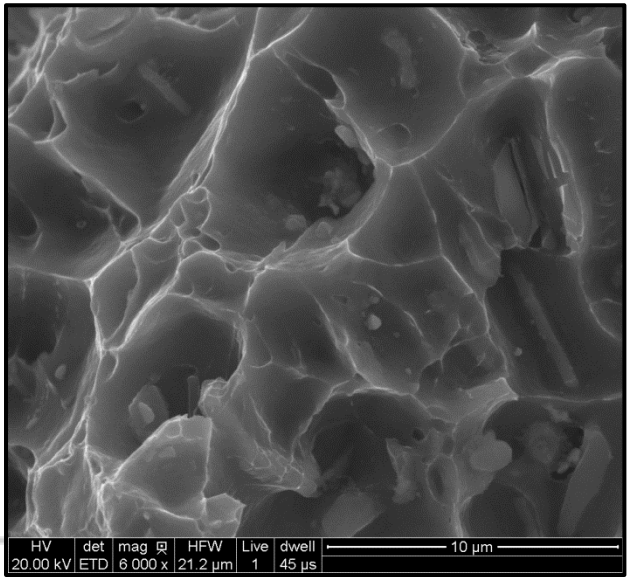




Dwell time 1µs

Dwell time 5µs

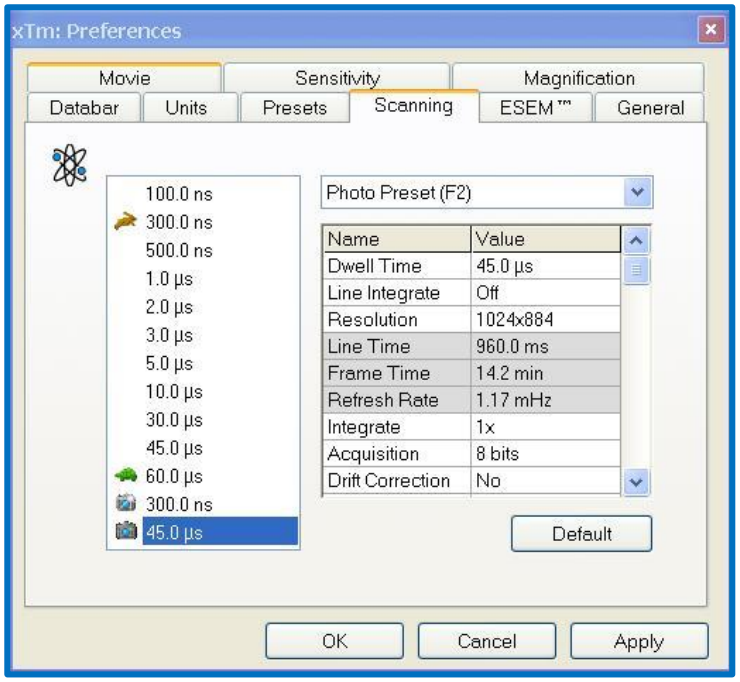




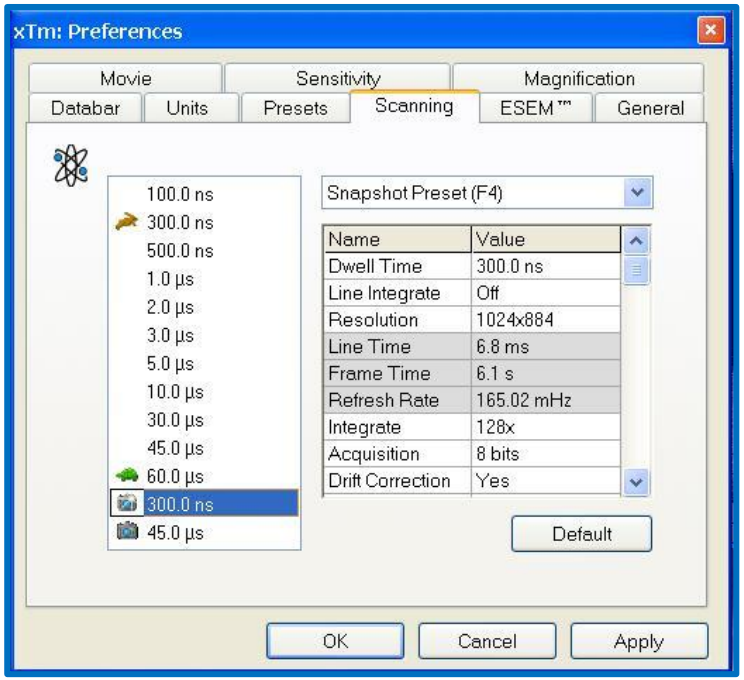
Dwell time 45µs

FEI

Photo snapshots



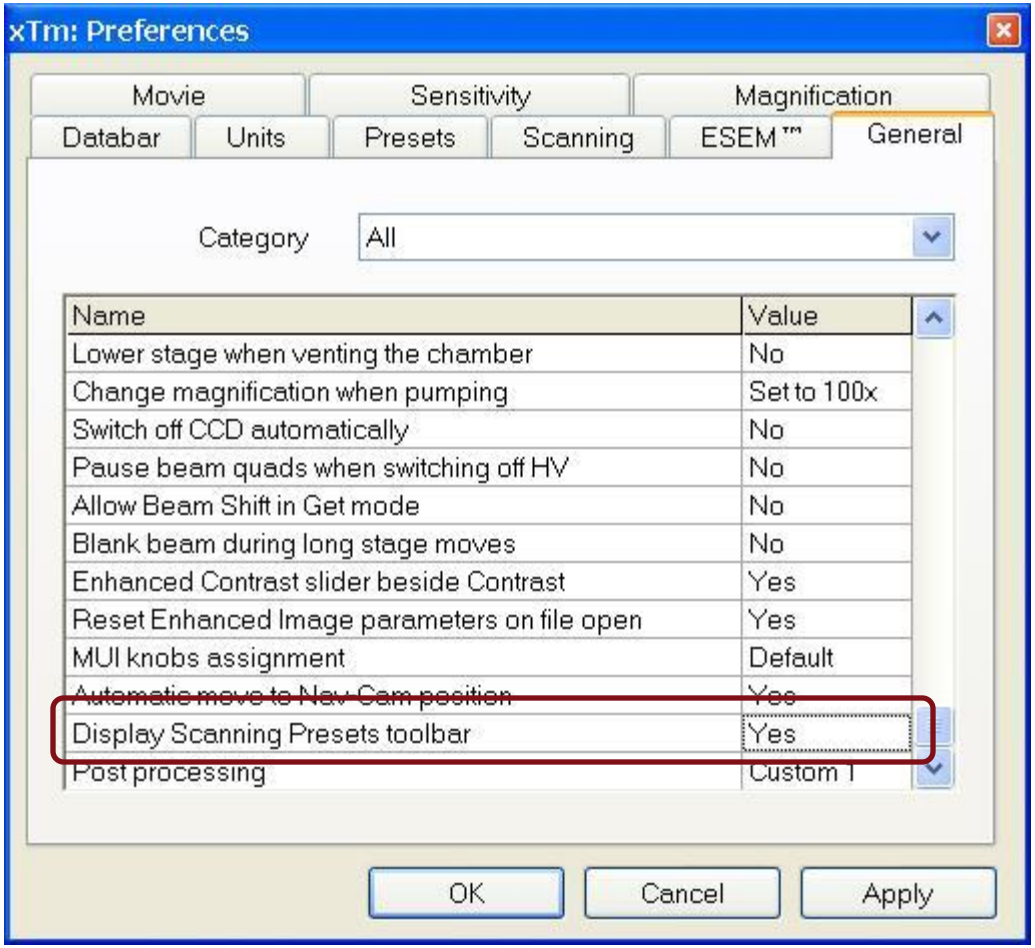
F2 photo snapshot



F4 photo snapshot

F4 available on Quanta
F2 and F4 available on Quanta FEG

FEI SmartSCAN™



Scanning Strategy

Detetectors	ETD	BSED/GAD/vCD/DBS	LFD/GSED
Slow scan	Dwell time 60us	Dwell time 60us	Dwell time 60us
Drift Corrected Frame Integration (i.e. DCFI)	100ns/300ns No of Integration=256	3us/5us/10us No of Integration= 16/8/4	3us/5us/10us No of Integration= 16/8/4
Line Integration	3us Line Integration N=20	3us/5us Line Integration N=20	3us/5us, Line Integration N=20
To set Contrast Brightness	Dwell time 3us	Dwell time 3us	Dwell time 3us

FEI SmartSCAN™

1

Basic Setup	
Name	ETD_Navigation
Resolution	512x442
Dwell Time	300.0 ns
Bit Depth	8 bit
Filter Setup	
Scan Interlace	1
Line Integration	1
Frame Average	4
Frame Time	111.1 ms
Image Acquisition	
Integrate	1
Drift Correction	No
Continuous Scai	No
Action	None
Acquisition Time	444.6 ms

Navigation

2

Basic Setup	
Name	ETD - DCFI
Resolution	1024x884
Dwell Time	300.0 ns
Bit Depth	8 bit
Filter Setup	
Scan Interlace	4
Line Integration	1
Frame Average	1
Frame Time	308.9 ms
Image Acquisition	
Integrate	256
Drift Correction	Yes
Continuous Scai	No
Action	None
Acquisition Time	1.3 min

DCFI

3

Basic Setup	
Name	Slow scan
Resolution	1024x884
Dwell Time	45.0 µs
Bit Depth	8 bit
Filter Setup	
Scan Interlace	1
Line Integration	1
Frame Average	1
Frame Time	42.9 s
Image Acquisition	
Integrate	1
Drift Correction	No
Continuous Scai	No
Action	None
Acquisition Time	42.9 s

Slow scan

4

Basic Setup	
Name	LFD BSED - DCFI
Resolution	1024x884
Dwell Time	3.0 µs
Bit Depth	8 bit
Filter Setup	
Scan Interlace	1
Line Integration	1
Frame Average	1
Frame Time	2.9 s
Image Acquisition	
Integrate	16
Drift Correction	Yes
Continuous Scai	No
Action	None
Acquisition Time	46.6 s

Navigation

5

Basic Setup	
Name	Line Integration
Resolution	1024x884
Dwell Time	3.0 µs
Bit Depth	8 bit
Filter Setup	
Scan Interlace	1
Line Integration	20
Frame Average	1
Frame Time	58.3 s
Image Acquisition	
Integrate	1
Drift Correction	No
Continuous Scai	No
Action	None
Acquisition Time	58.3 s

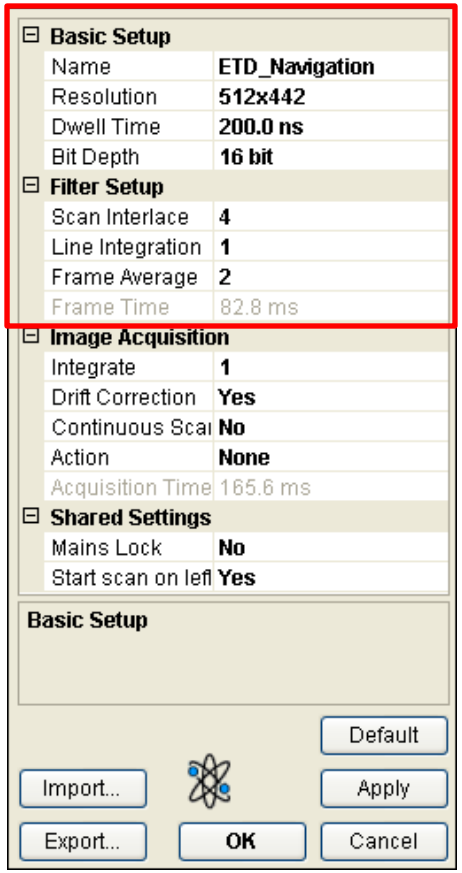
Line Integration

6

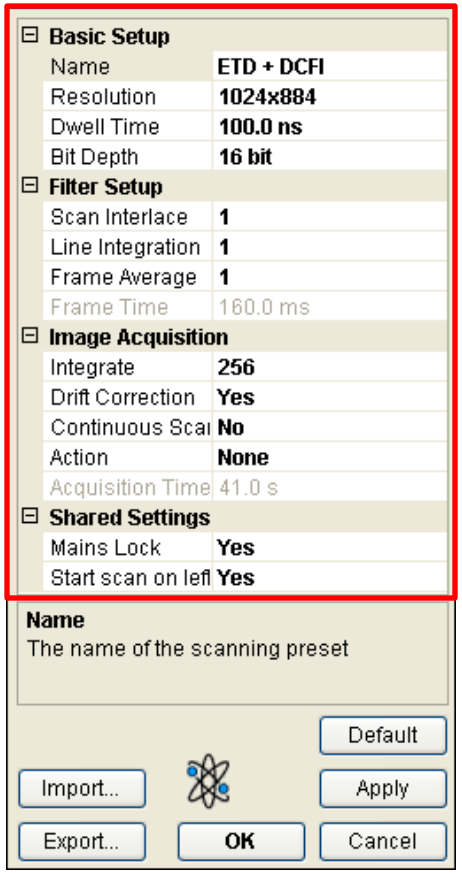
Basic Setup	
Name	Contrast Brightness
Resolution	1024x884
Dwell Time	3.0 µs
Bit Depth	8 bit
Filter Setup	
Scan Interlace	1
Line Integration	1
Frame Average	1
Frame Time	2.9 s
Image Acquisition	
Integrate	16
Drift Correction	Yes
Continuous Scai	No
Action	None
Acquisition Time	46.6 s

Contrast Brightness

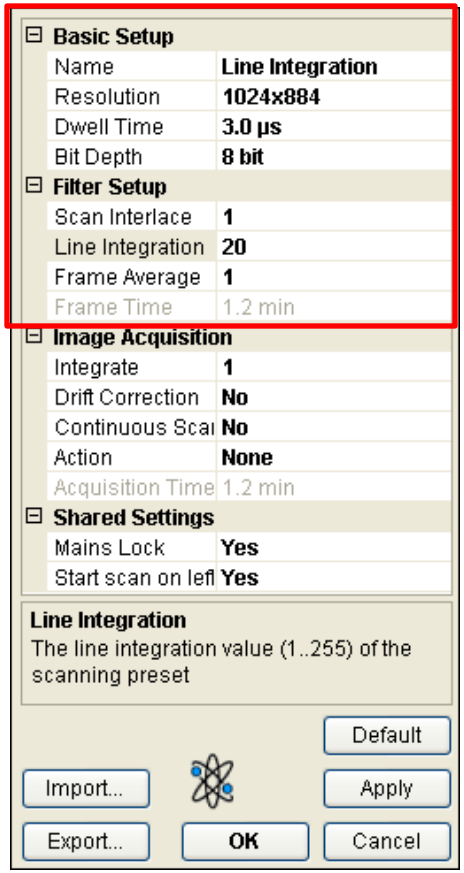
ETD



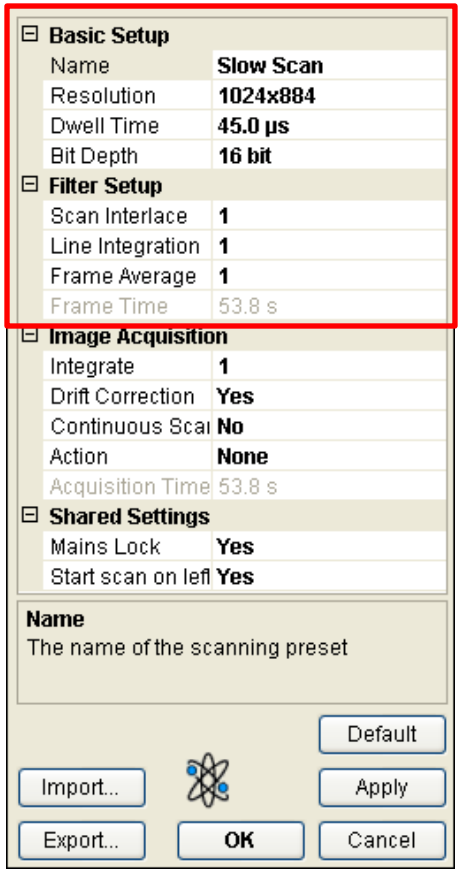
Navigation



DCFI



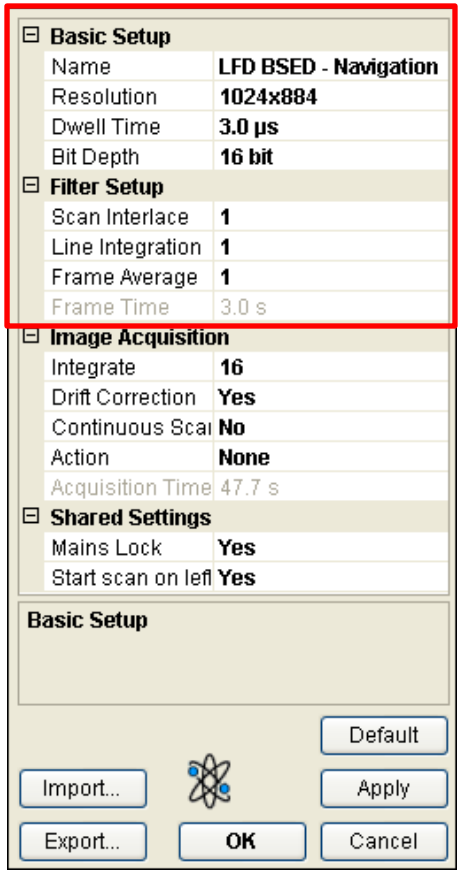
Line Integration



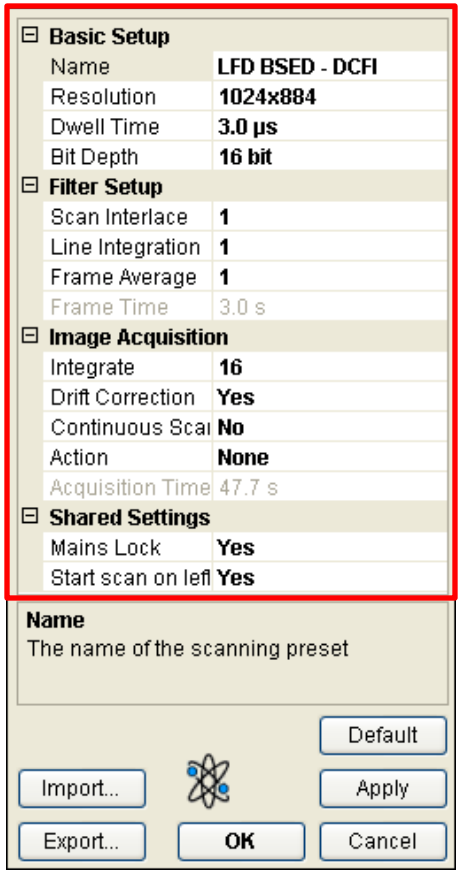
Slow scan

FEI

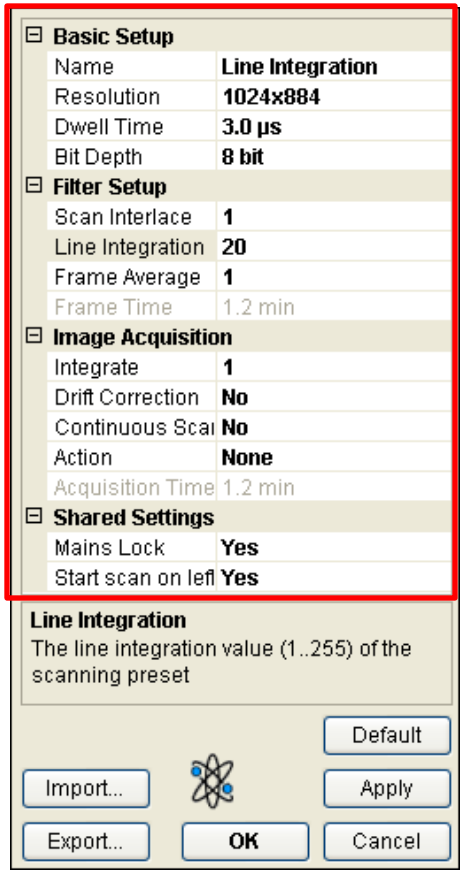
LFD/GSED/BSED/vCD/DBS



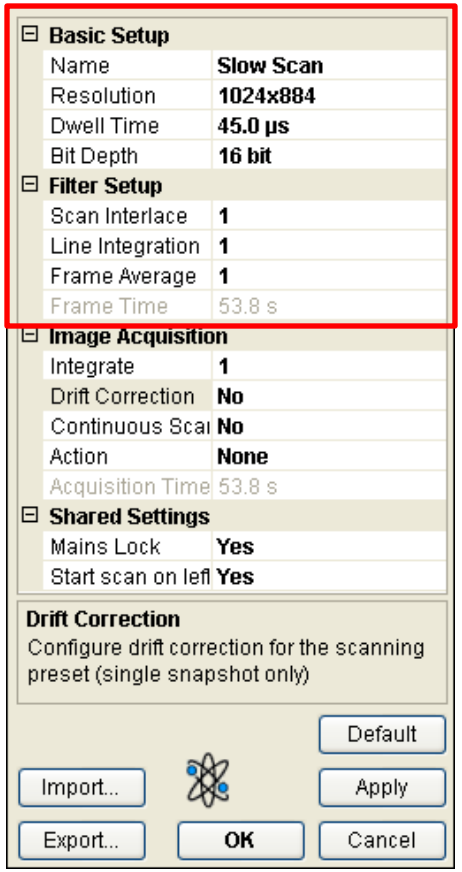
Navigation



DCFI



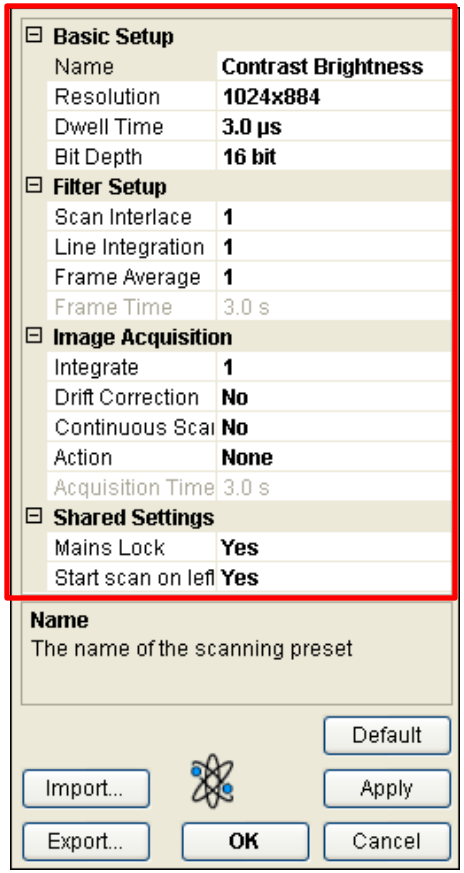
Line Integration



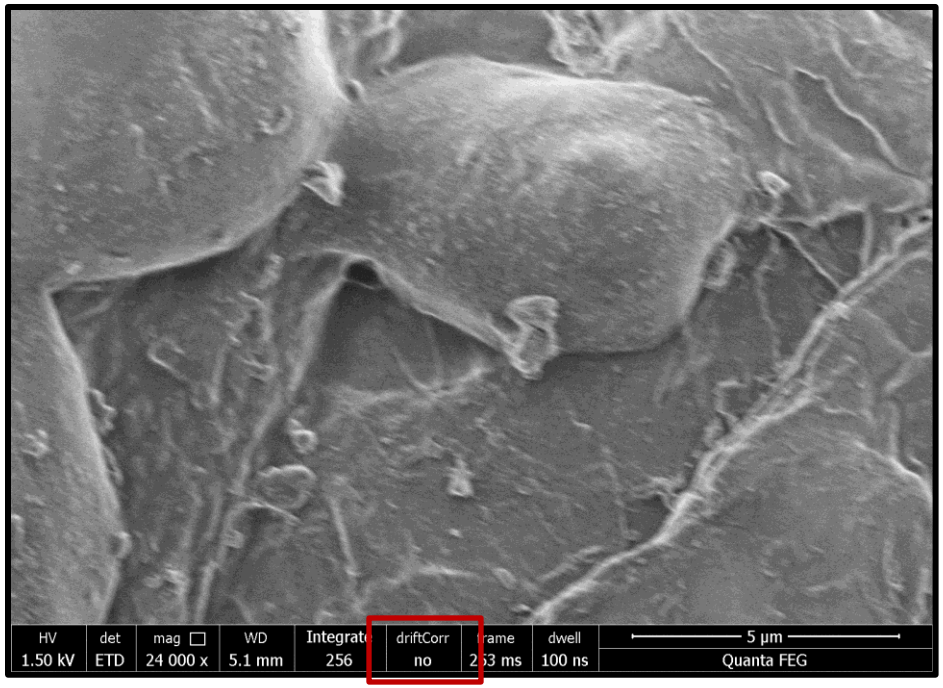
Slow scan

FEI

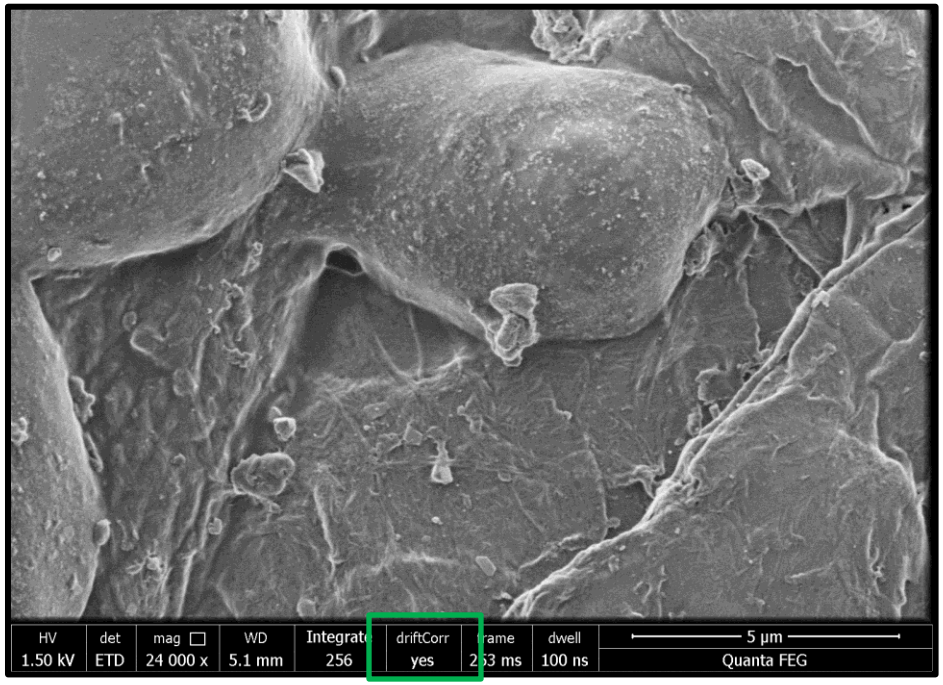
All detectors for Contrast/Brightness



ETD – Scanning strategy



DCFI OFF



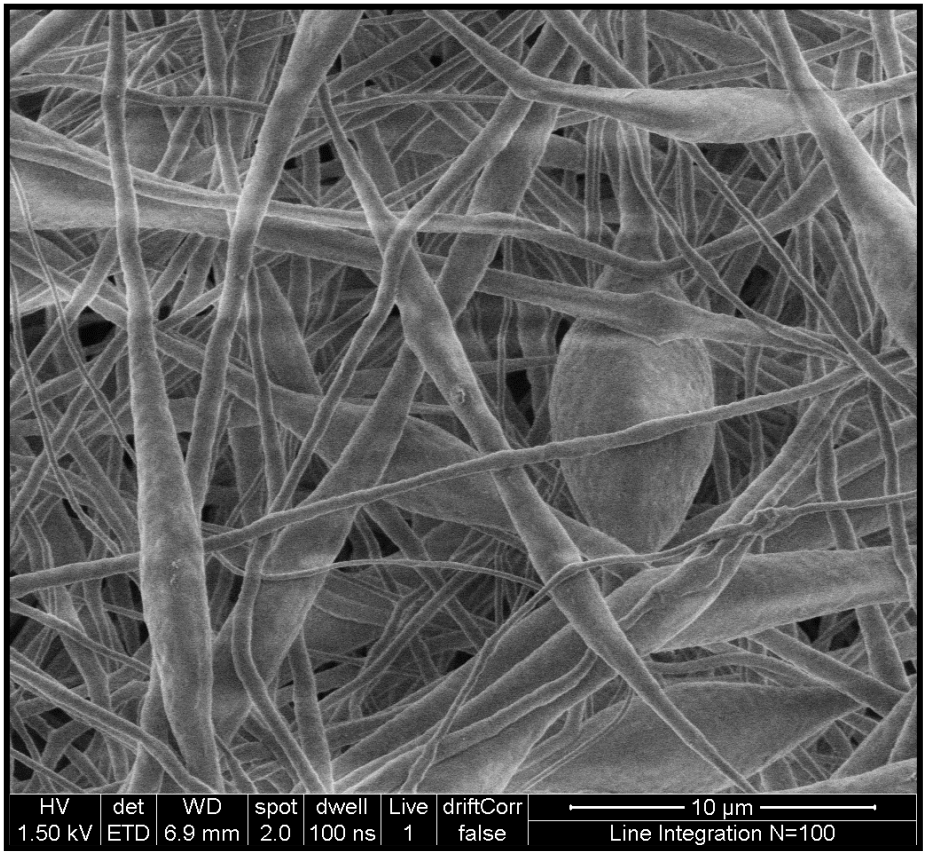
DCFI ON

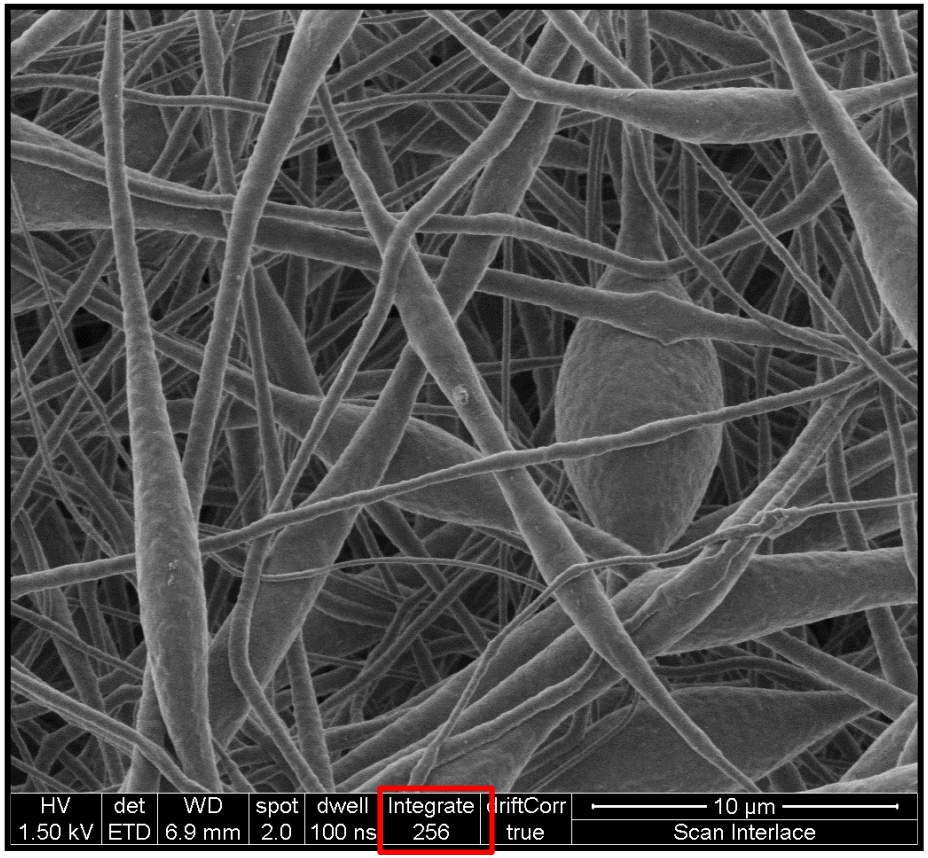
FEI

Line Integration vs. Frame Integration

Non conductive specimen
in High Vacuum mode

Dwell time = 100ns



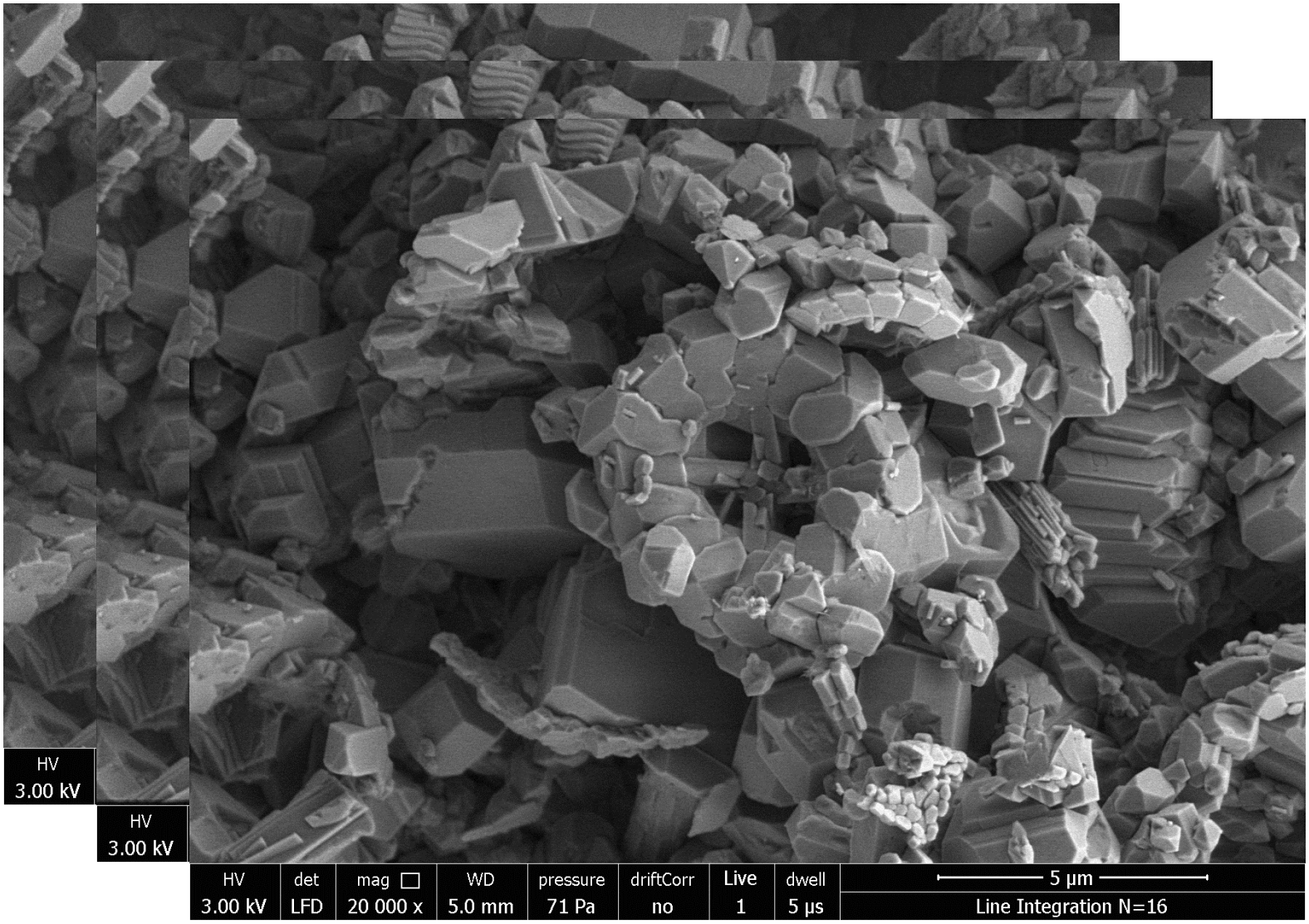


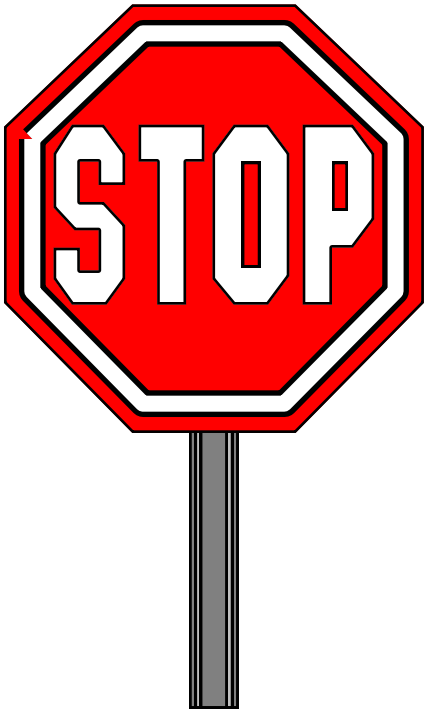
Line Integration N=100

DCFI N=256

FEI

LFD – Scanning strategy





End of Module