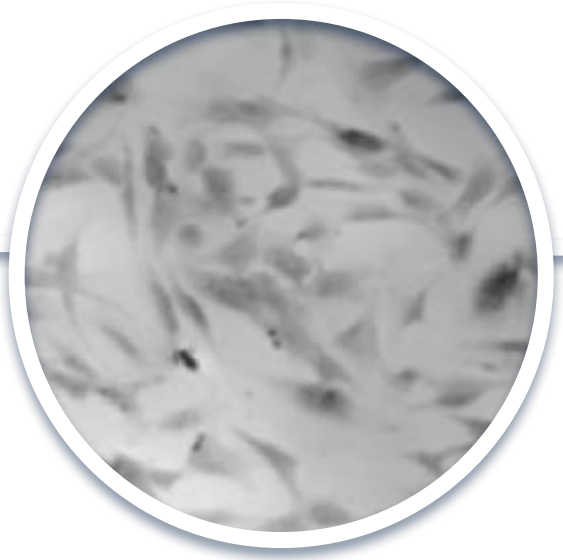
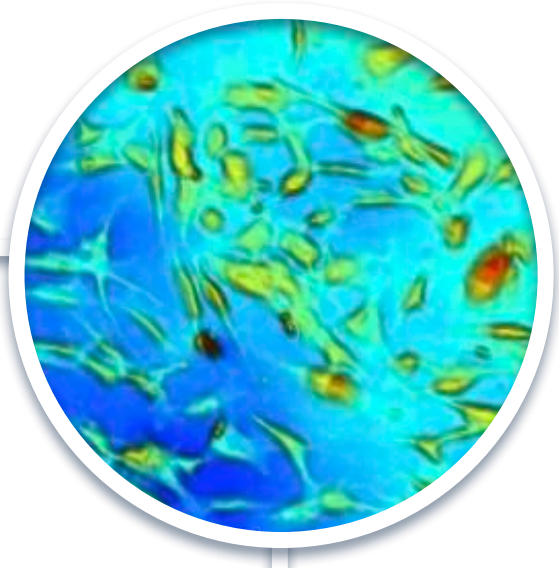
OVIZIO IMAGING SYSTEMS

CELL COUNTING WORKSHOP
NIST

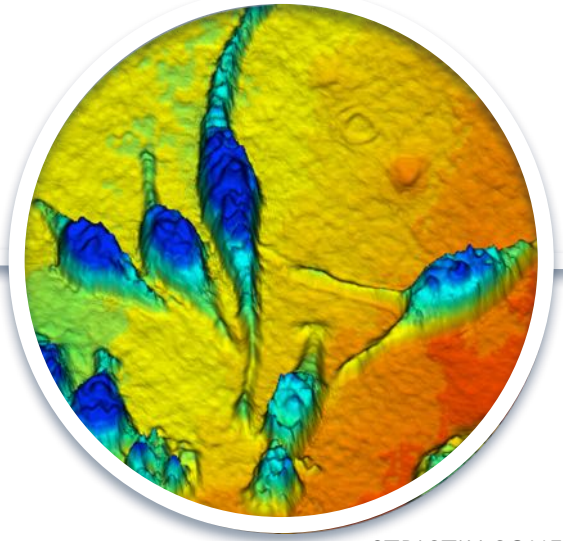
Philip Mathuis April 10, 2017

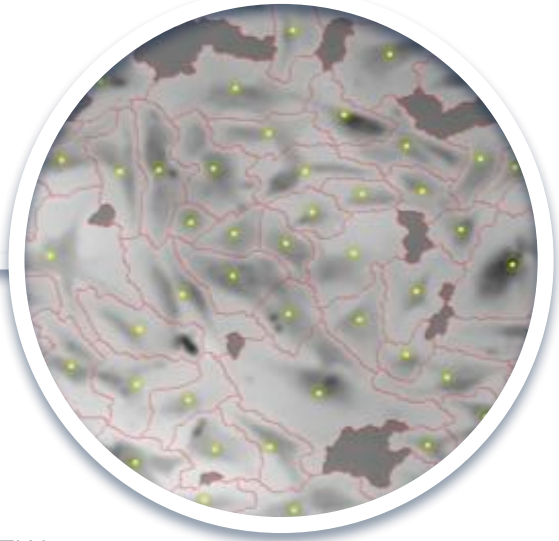
FROM IMAGE TO ACTION





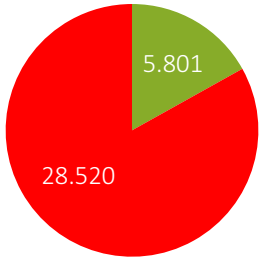
ANALYZE
IDENTIFY
COUNT
VIABILITY





BACKGROUND

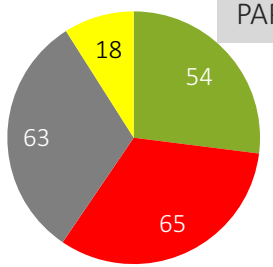
BEACHHEAD MARKET BIOPROCESSING



TOTAL MARKET: 1,1 B$
GROWTH RATE: 6%

SUSPENSION UNITS
ADHERENT UNITS

DIAGNOSTICS UPSIDE



PAP SMEARS IN UNITS

EUROPE
USA
ASIA
ROW

TOTAL MARKET: 3,46B$
TOTAL # OF TESTS: 200 M
COST PER SMEAR: 18 – 30$
GROWTH RATE: 4%

PEOPLE AND ECOSYSTEM

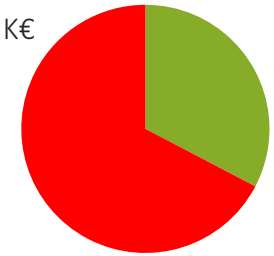
16 OVIZIO

RESEARCH ECOSYSTEM

FUNDING

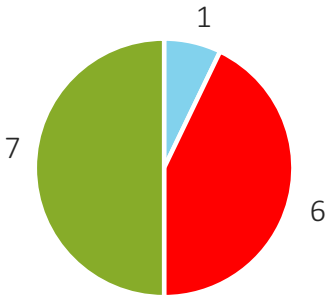
15.211 K€

4.700 K€



GRANTS
EQUITY

PATENTS



ULB GRANTED
OVIZIO FILED
OVIZIO GRANTED

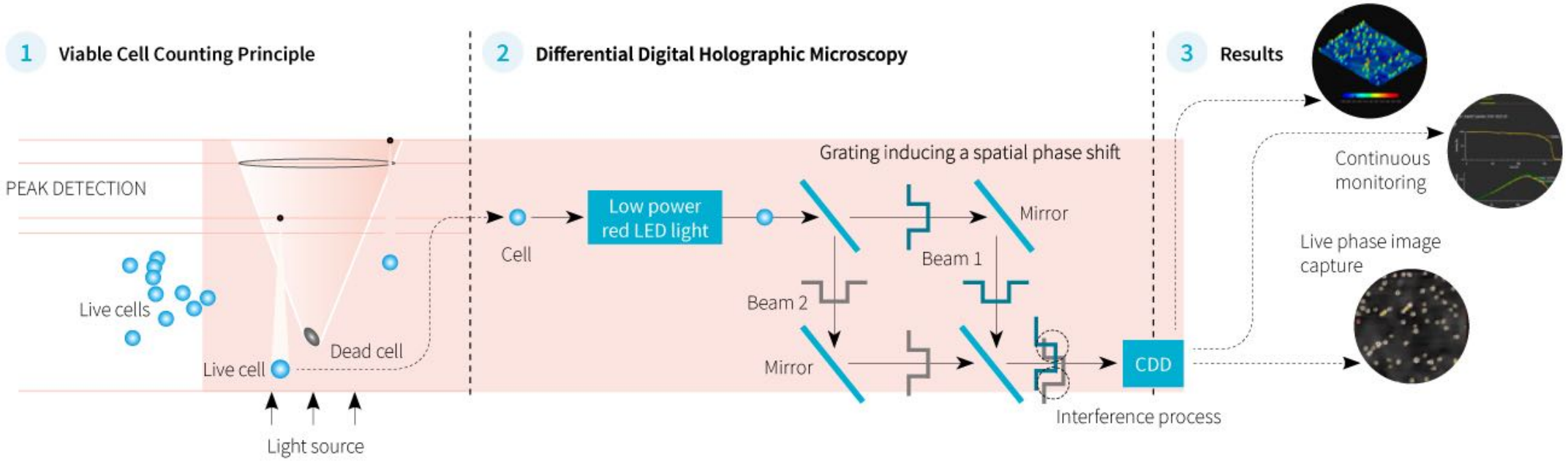
PARTNERS

APPLIKON
PALL LIFE SCIENCES

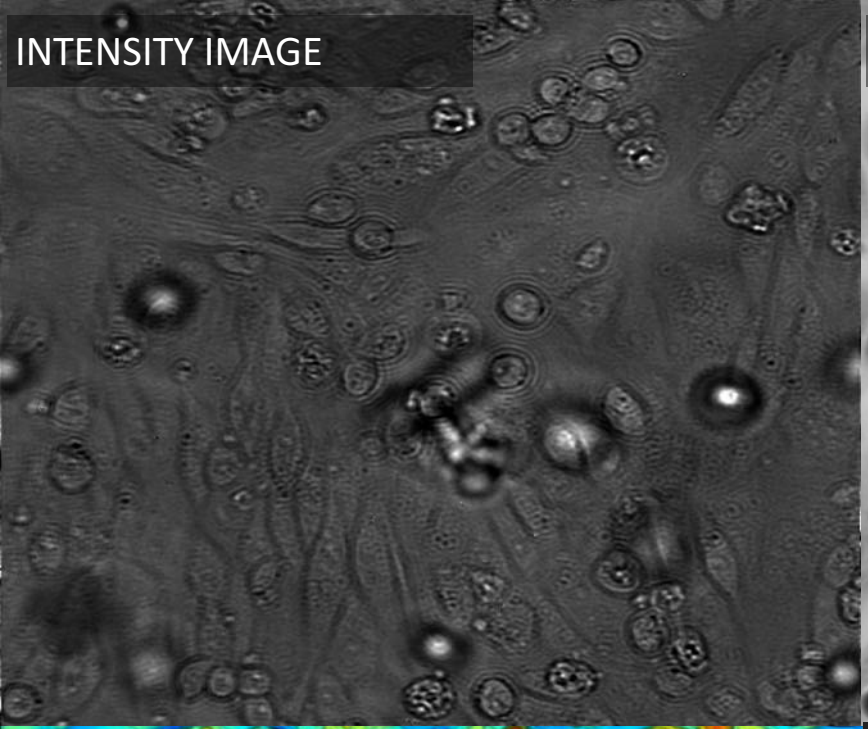
OTHER

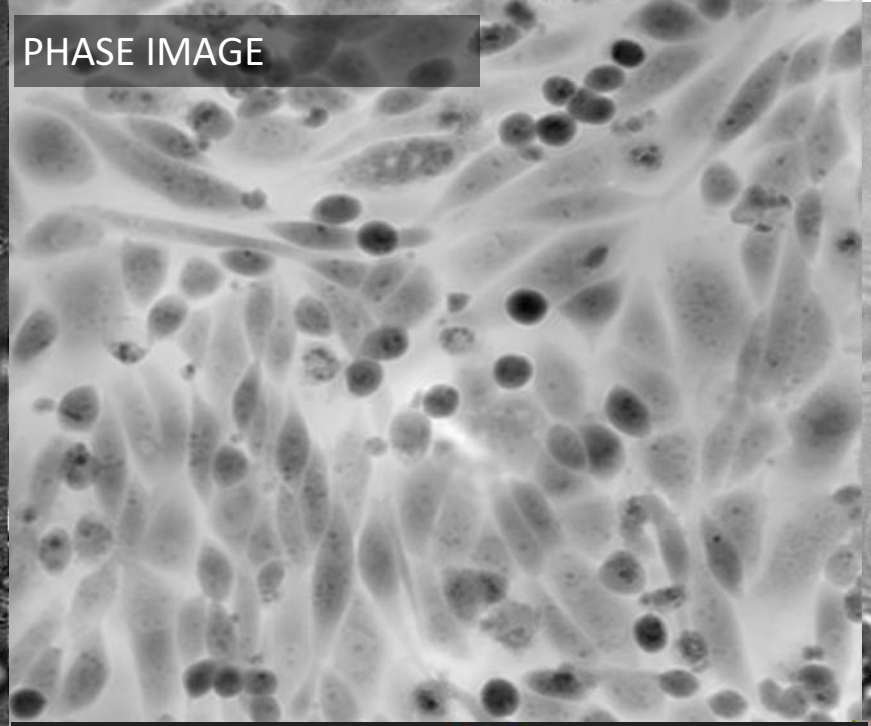
FOUNDED IN DEC 2009
SPIN-OFF ULB
ISO 13485 IN PROGRESS

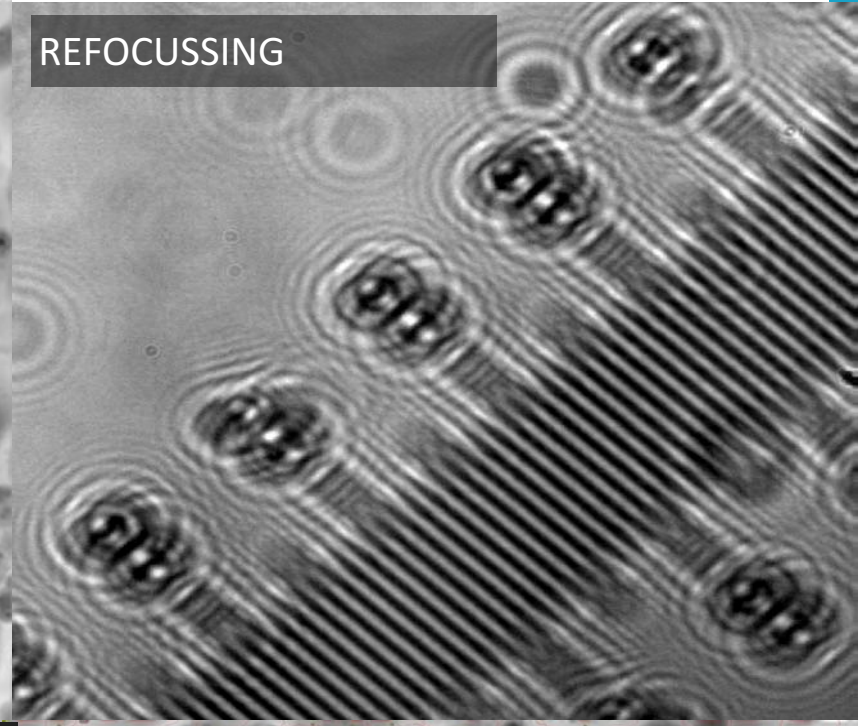
DDHM **technology**

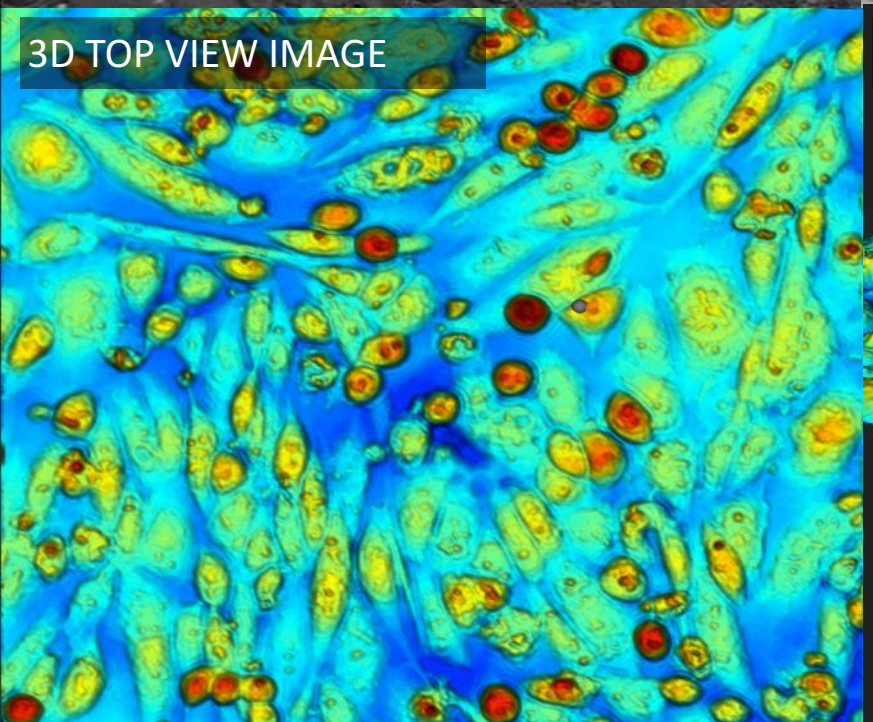


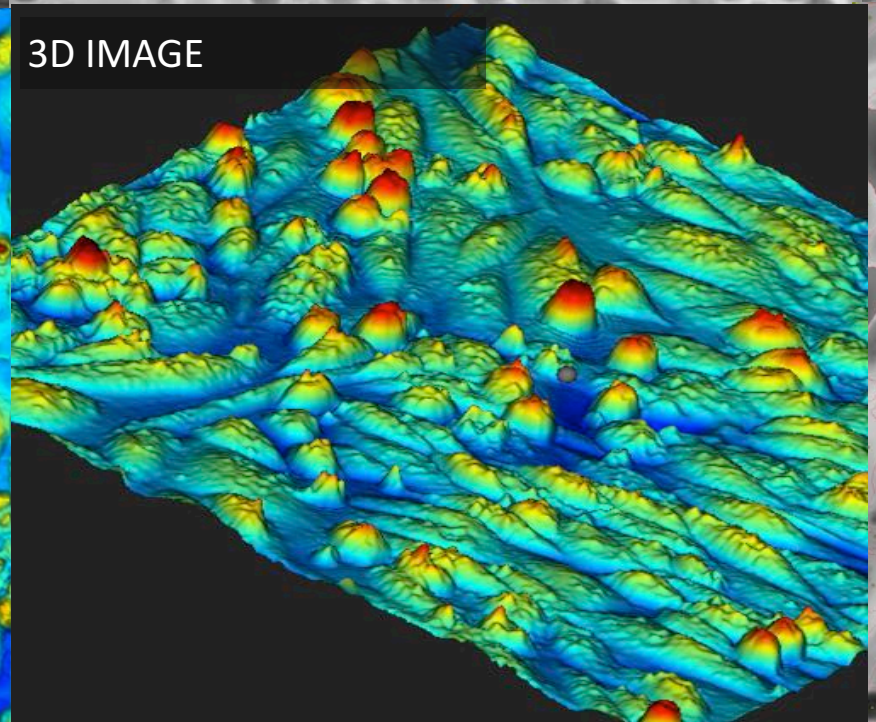
Patented viability method
Invented by prof. Frank Dubois ULB (patent US 7,362,449 & ep1631788)

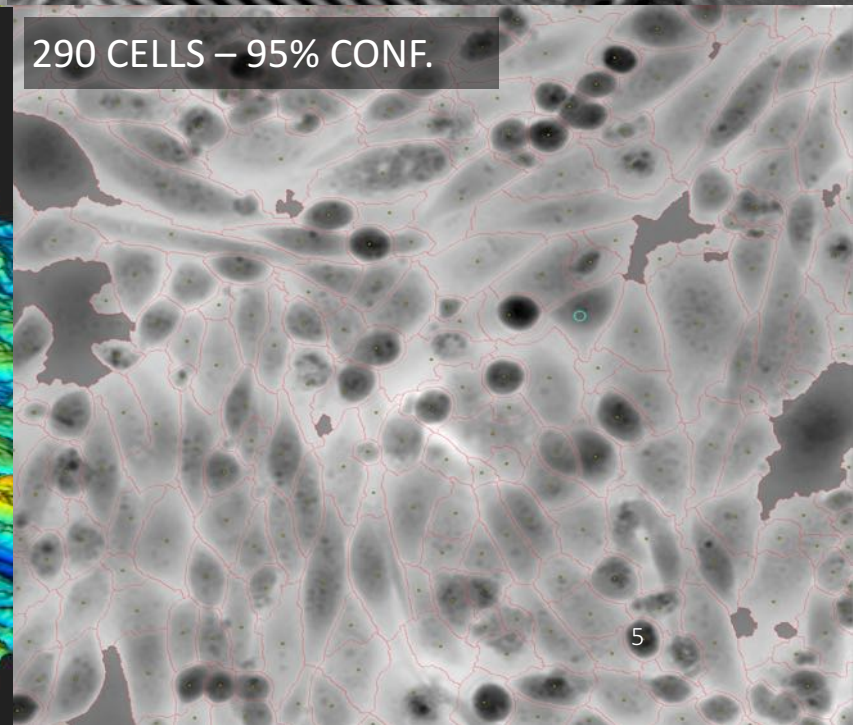

INTENSITY IMAGE


PHASE IMAGE

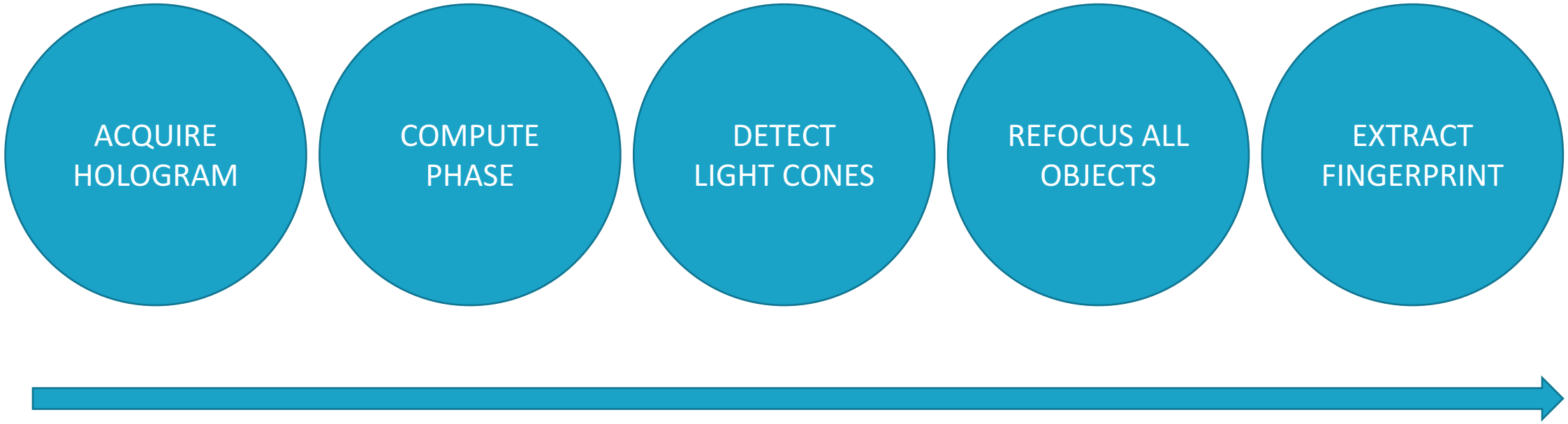

REFOCUSSING


3D TOP VIEW IMAGE


3D IMAGE

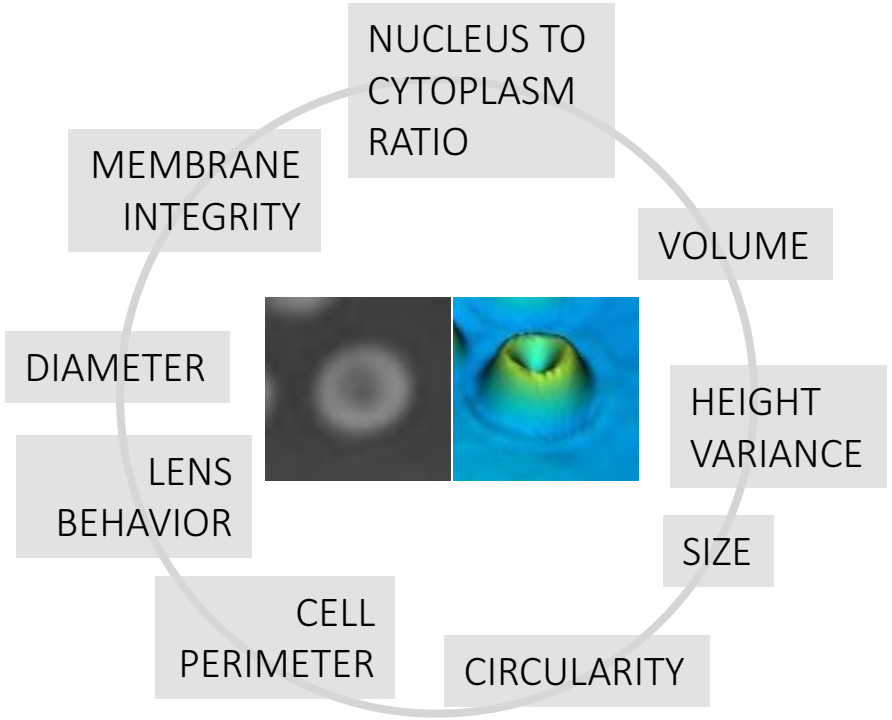

290 CELLS – 95% CONF.

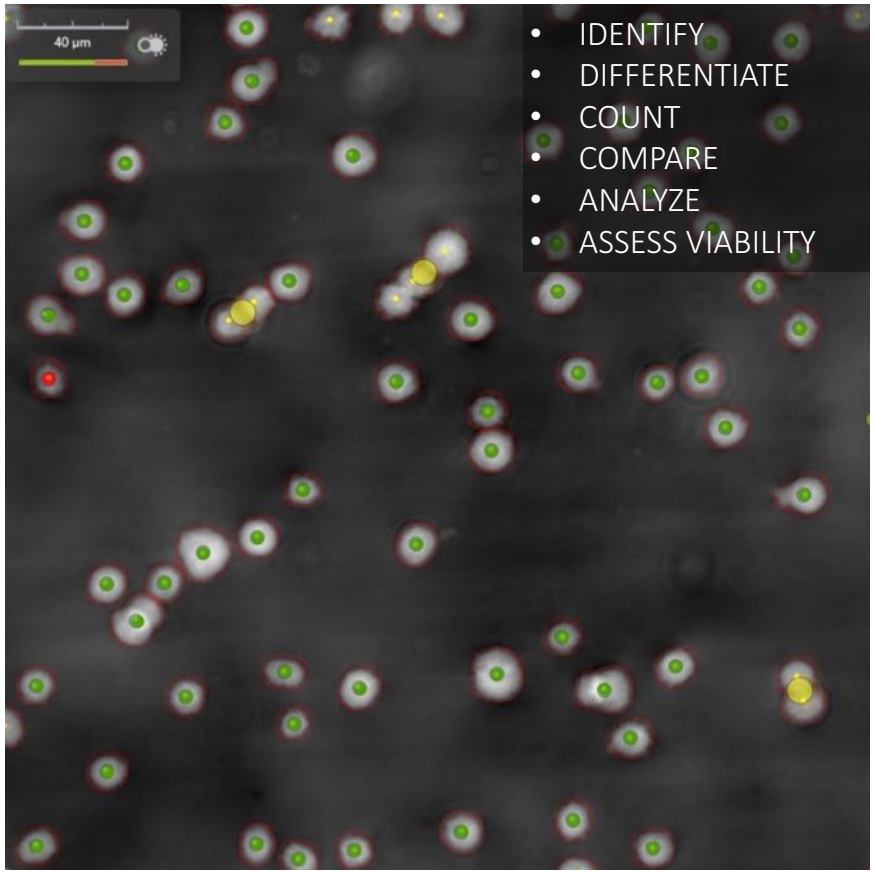
HOW DO WE ANALYZE IMAGES



HOLOGRAPHIC FINGERPRINT FOR CELLS

PARAMETERS
SYSTEM
MORPHOLOGY
OPTICAL
PHASE TEXTURE
INTENSITY TEXTURE





74 PARAMETERS ARE RECORDED PER CELL – MACHINE LEARNING

MACHINE LEARNING METHODOLOGY

STEP 1
LEARNING SET CREATION

100 % LIVING CELL

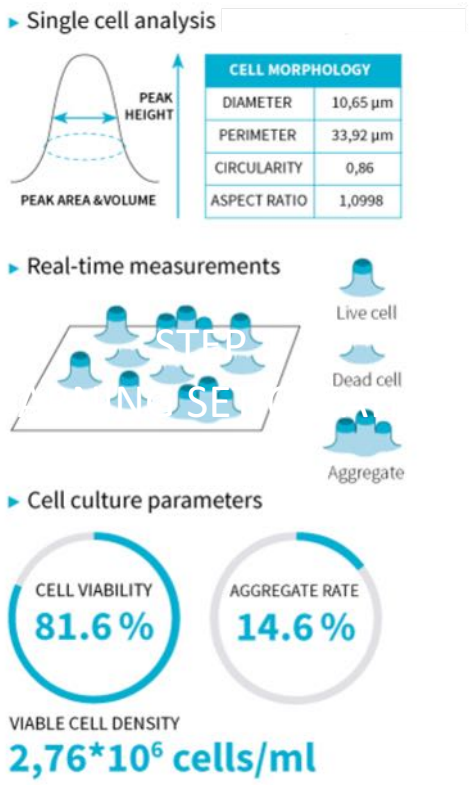
100% DEAD CELLS

STEP 2
SYSTEM TRAINING

FEED SYSTEM WITH
KNOWN MIXTURES

FROM 100% TO 0%
IN STEPS OF 10

STEP 3
PREDICTION



BENEFITS OF **AUTOMATION**

- INCREASED CONTROL
- TIME GAIN AND TRACEABILITY OF RESULTS
- INCREASED REPRODUCIBILITY
- DRASTIC REDUCTION OF MANUAL OPERATIONS
- REDUCED INVESTMENT AND FTE COST – FAST ROI

Live | Display | Experiments | Configuration

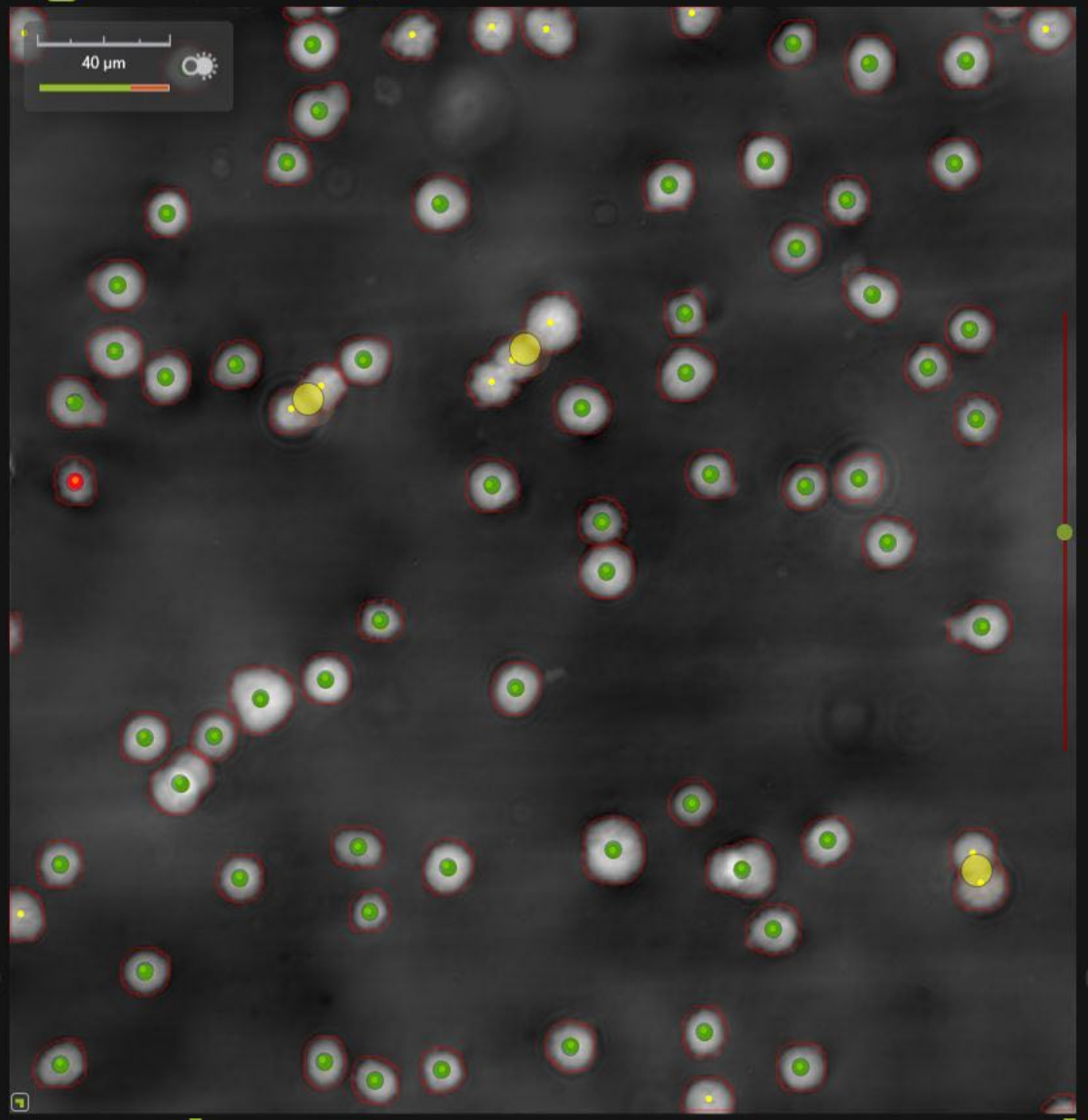
20160105 DG CHO
BC20151215002 JBA

Sort

065h35 065h05 064h35 064h05
063h35 063h05 062h35 062h05
061h35 061h05 060h35 060h05
059h35 059h05 058h35 058h05
057h35 057h05 056h35 056h05

056h05
Creation Date 08/01/2016 02:13:33
Height (px) 2048
Width (px) 2048
Description

056h05 | 056h05 0



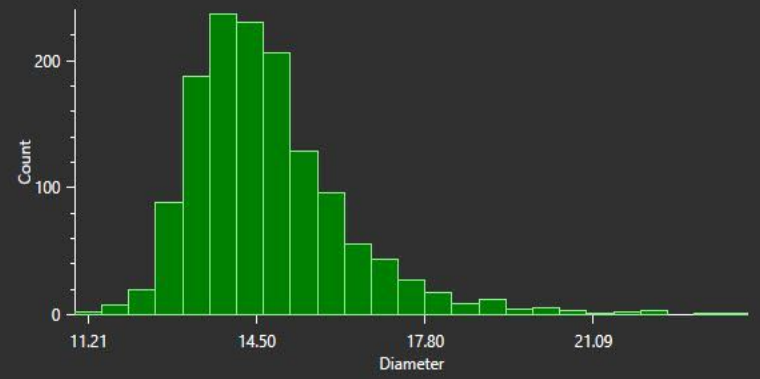
6 / 30
01:20 / 26:20

Channels | Measures | Browser | Object detection

Viability 95.8%
Minimum 90.6%
Maximum 100.0%

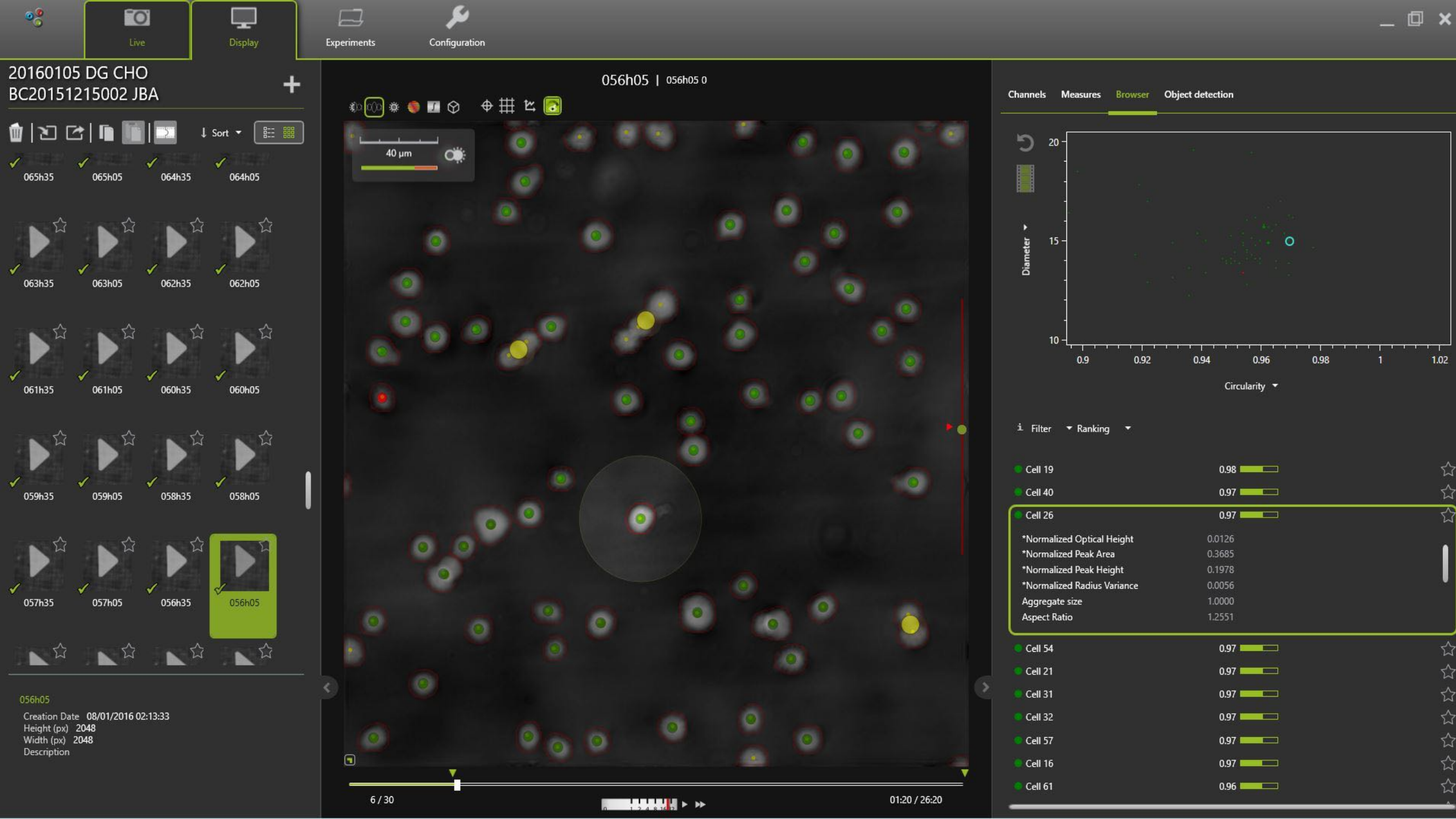
Viable Cell Density 4.36 * 10^6 cells/ml
Minimum 3.79 * 10^6 cells/ml
Maximum 4.87 * 10^6 cells/ml

Diameter	15.14
Minimum	11.21
Maximum	24.38
Standard Deviation	1.60



Advanced

Total Cell Density	4.55 * 10^6 cells/ml
Total cell count	1388 cells in 25 images
Viable cells	1330 cells
Dead cells	58 cells
Rejected events	307 events
Aggregate Rate	8.7%


Live
Display
Experiments
Configuration
20160105 DG CHO
BC20151215002 JBA
Sort
065h35
065h05
064h35
064h05
063h35
063h05
062h35
062h05
061h35
061h05
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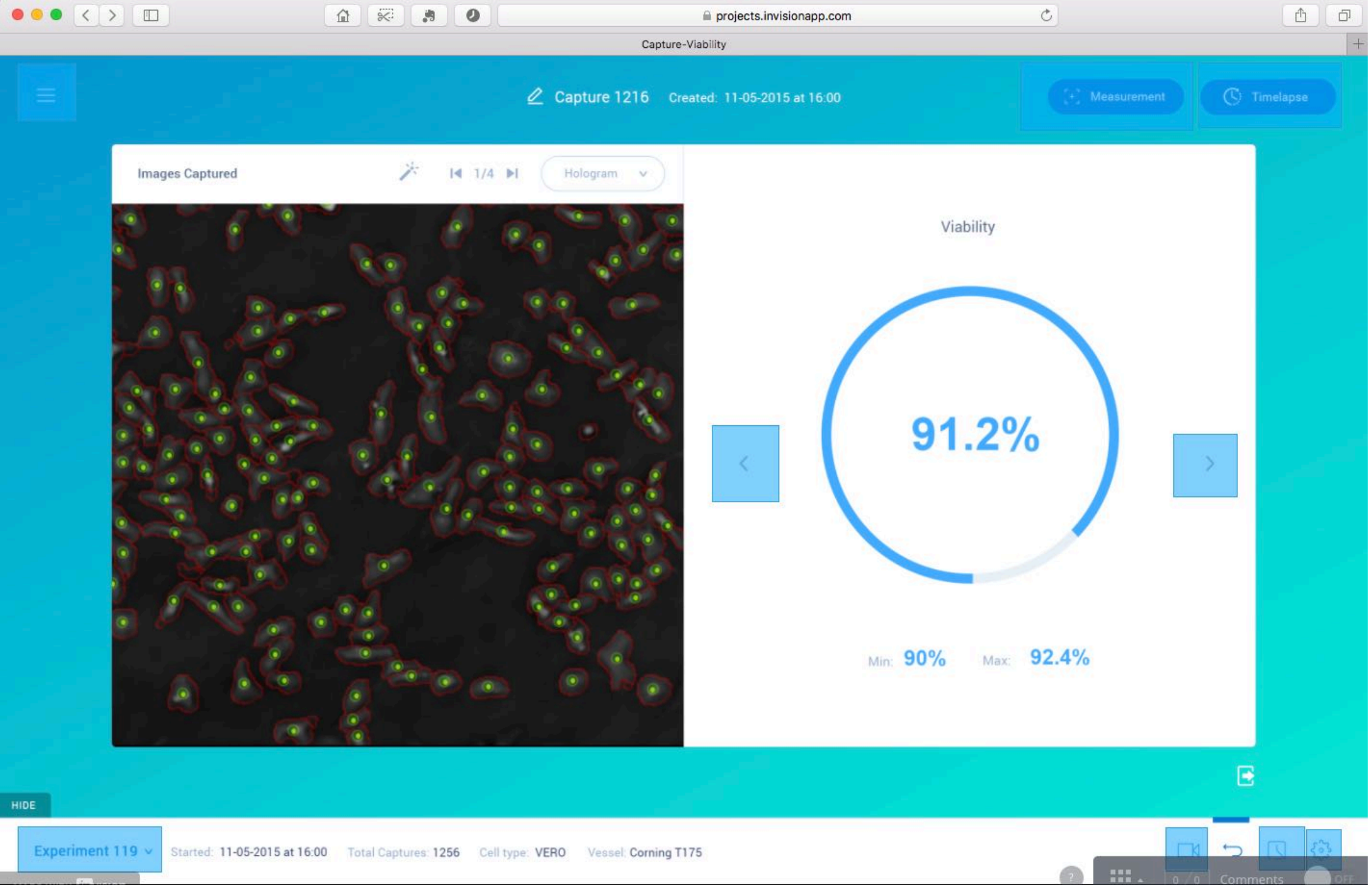
059h35
059h05
058h35
058h05
057h35
057h05
056h35
056h05
056h05
Creation Date 08/01/2016 02:13:33
Height (px) 2048
Width (px) 2048
Description
056h05 | 056h05 0
40 µm
6 / 30
01:20 / 26:20
Channels
Measures
Browser
Object detection
Diameter
Circularity
Filter
Ranking
Cell 19 0.98
Cell 40 0.97
Cell 26 0.97
*Normalized Optical Height 0.0126
*Normalized Peak Area 0.3685
*Normalized Peak Height 0.1978
*Normalized Radius Variance 0.0056
Aggregate size 1.0000
Aspect Ratio 1.2551
Cell 54 0.97
Cell 21 0.97
Cell 31 0.97
Cell 32 0.97
Cell 57 0.97
Cell 16 0.97
Cell 61 0.96


projects.invisionapp.com
Capture-Viability
Capture 1216
Created: 11-05-2015 at 16:00
Measurement
Timelapse
Images Captured
1/4
Hologram
Viability
91.2%
Min: 90%
Max: 92.4%
HIDE
Experiment 119
Started: 11-05-2015 at 16:00
Total Captures: 1256
Cell type: VERO
Vessel: Corning T175
Comments

CONTINUOUS MONITORING

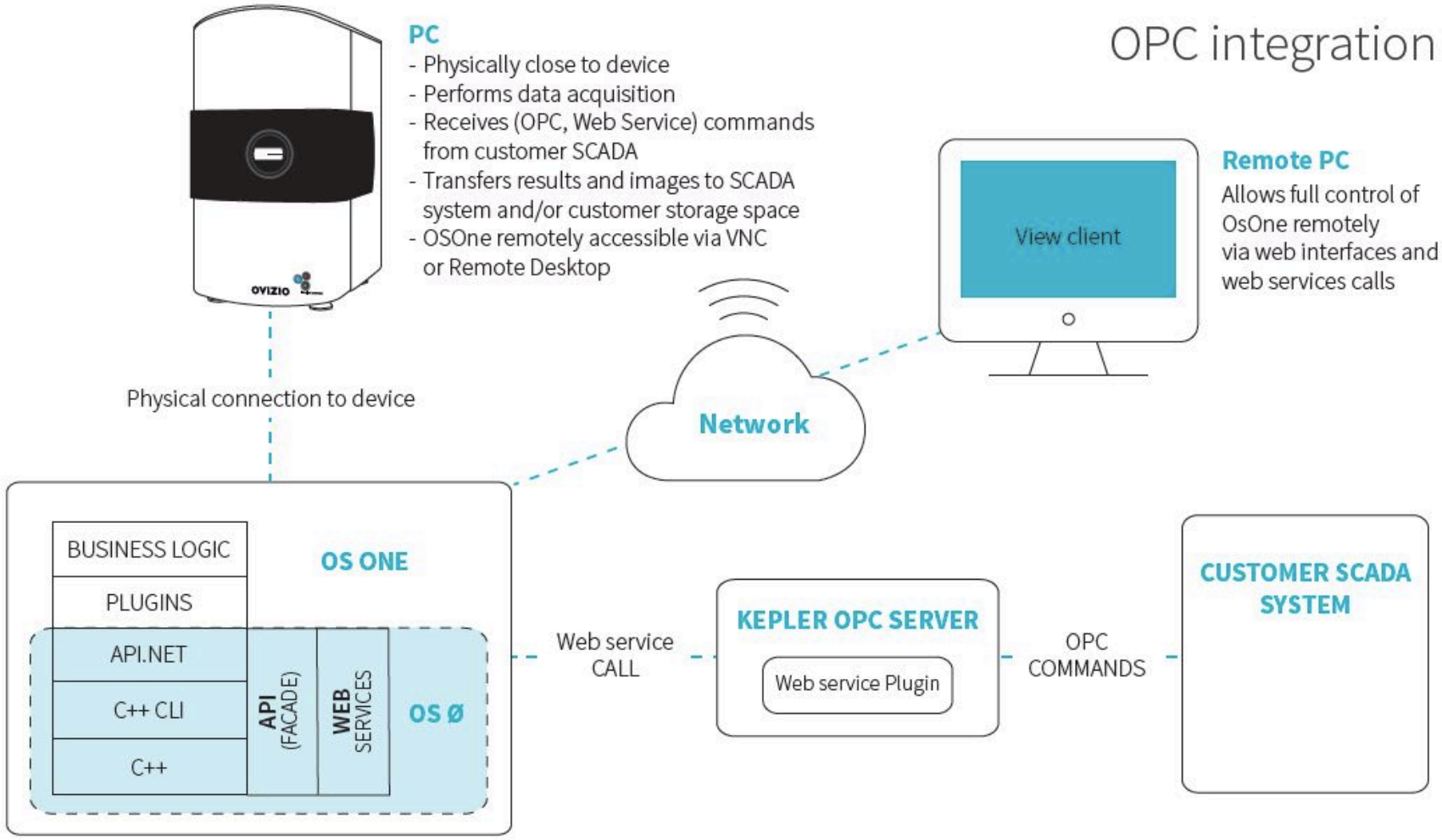
STATISTICAL RELEVANCE

ILINE F: 6000 IMAGES PER DAY

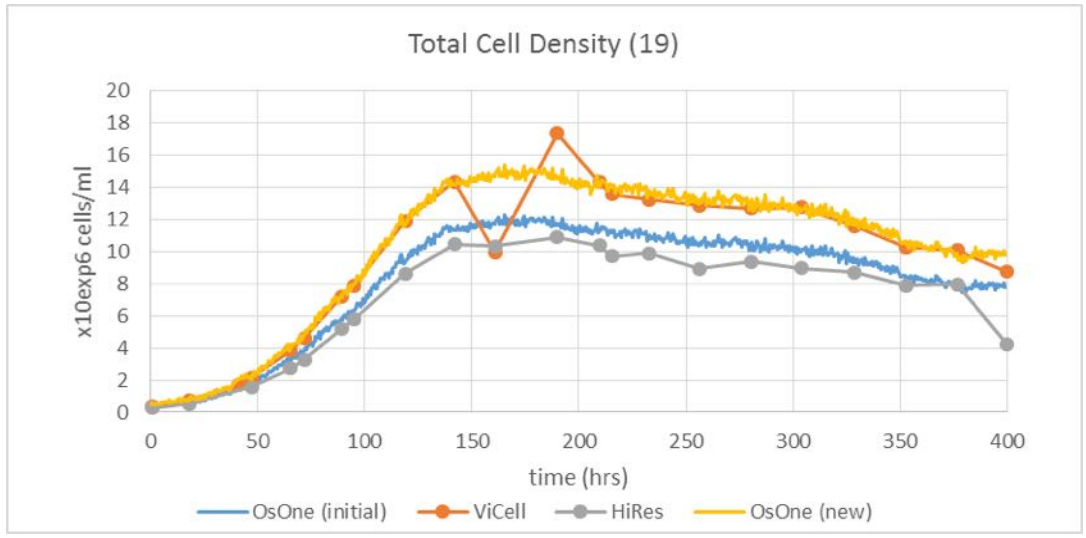
CELL COUNTER: 50-100 IMAGES PER SAMPLE

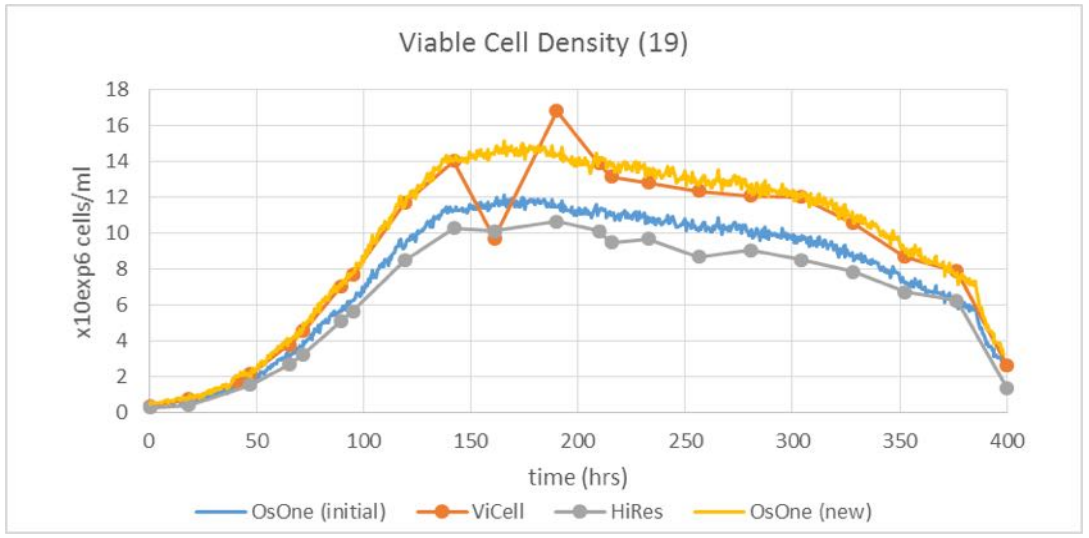
NO DILLUTION REQUIRED

OPC **Integration**

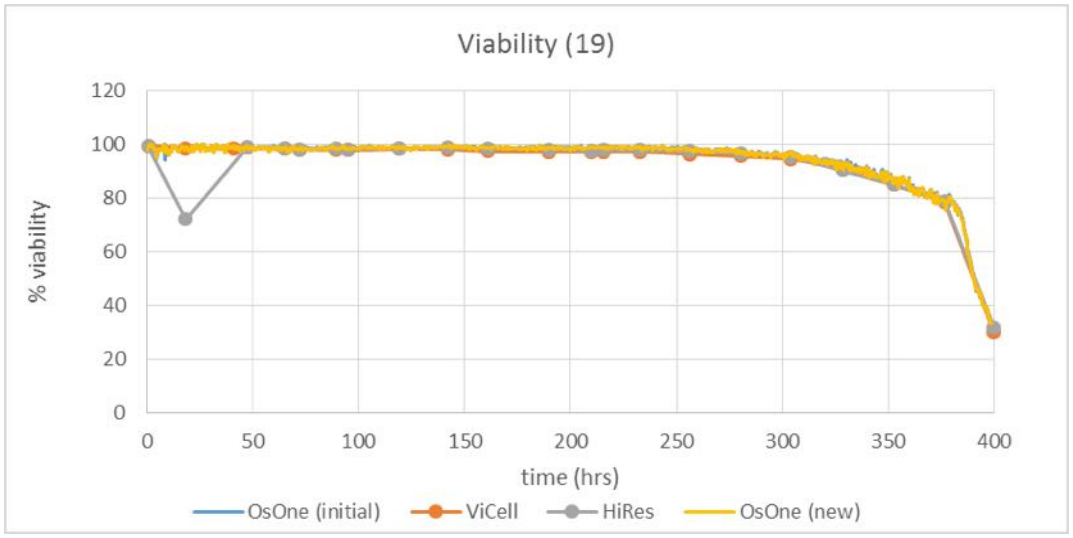


TECHNOLOGY COMPARED

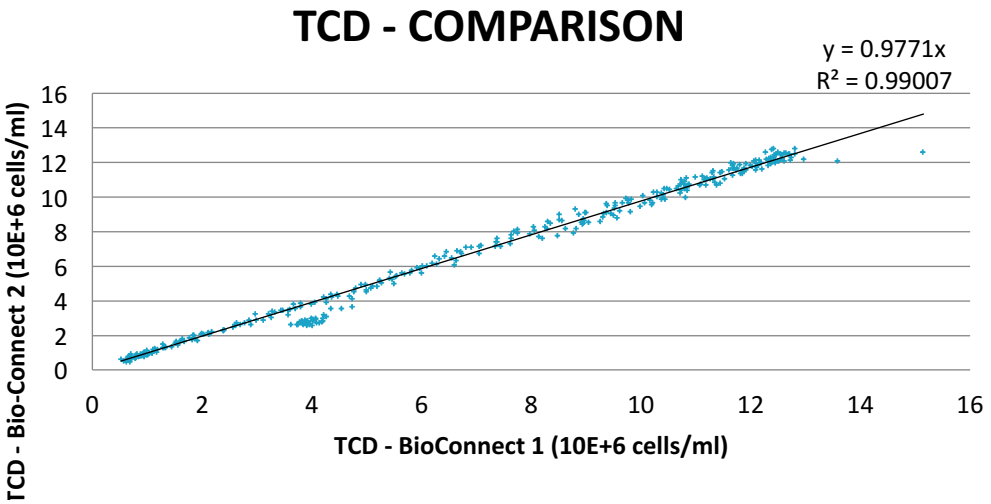


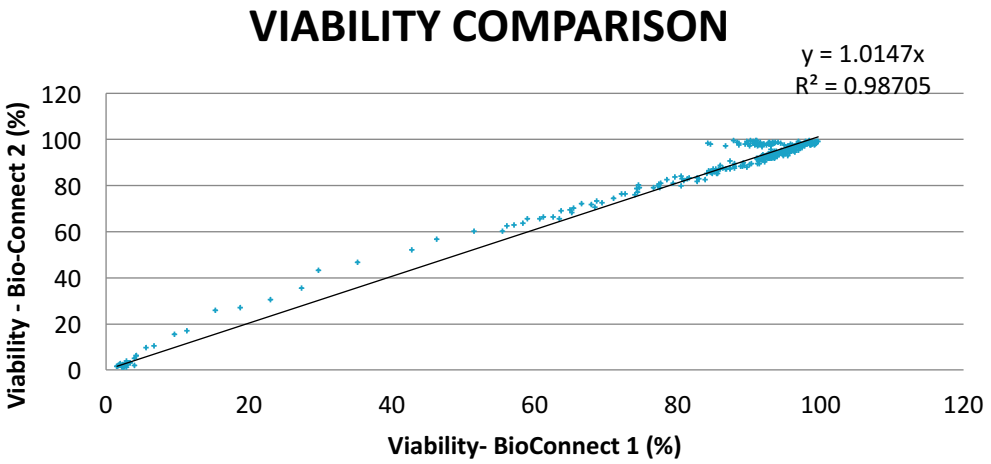


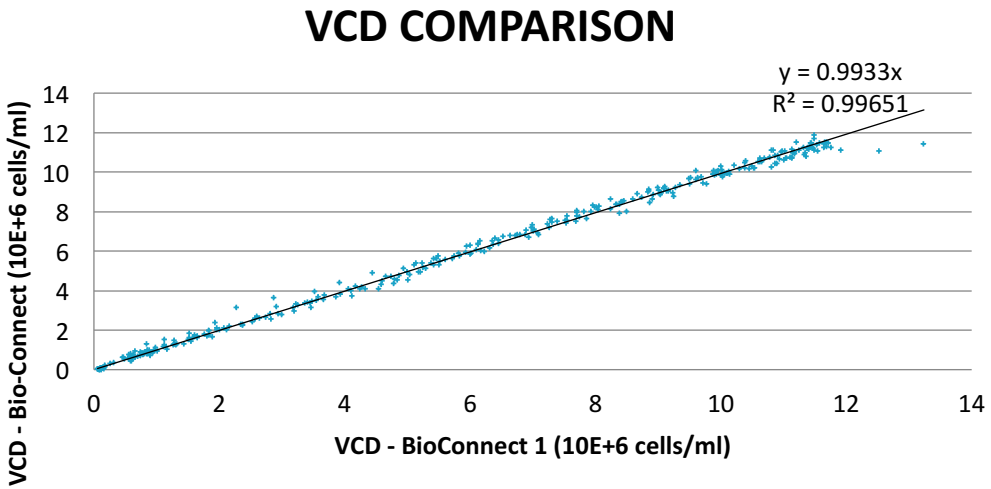
R= 0,968

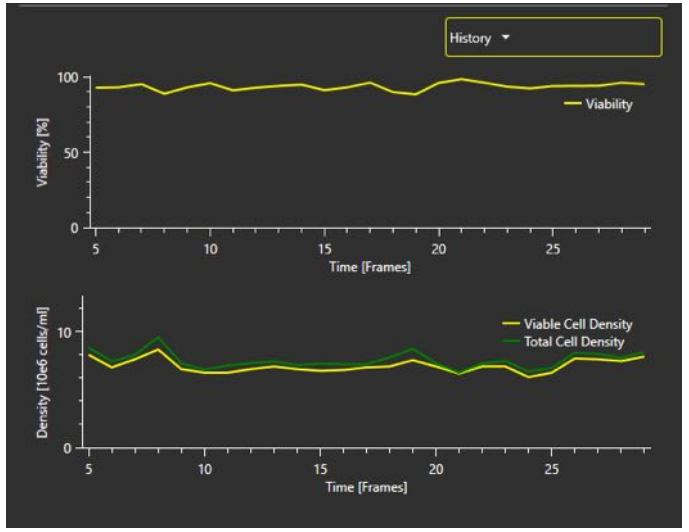


VARIABILITY-TCD



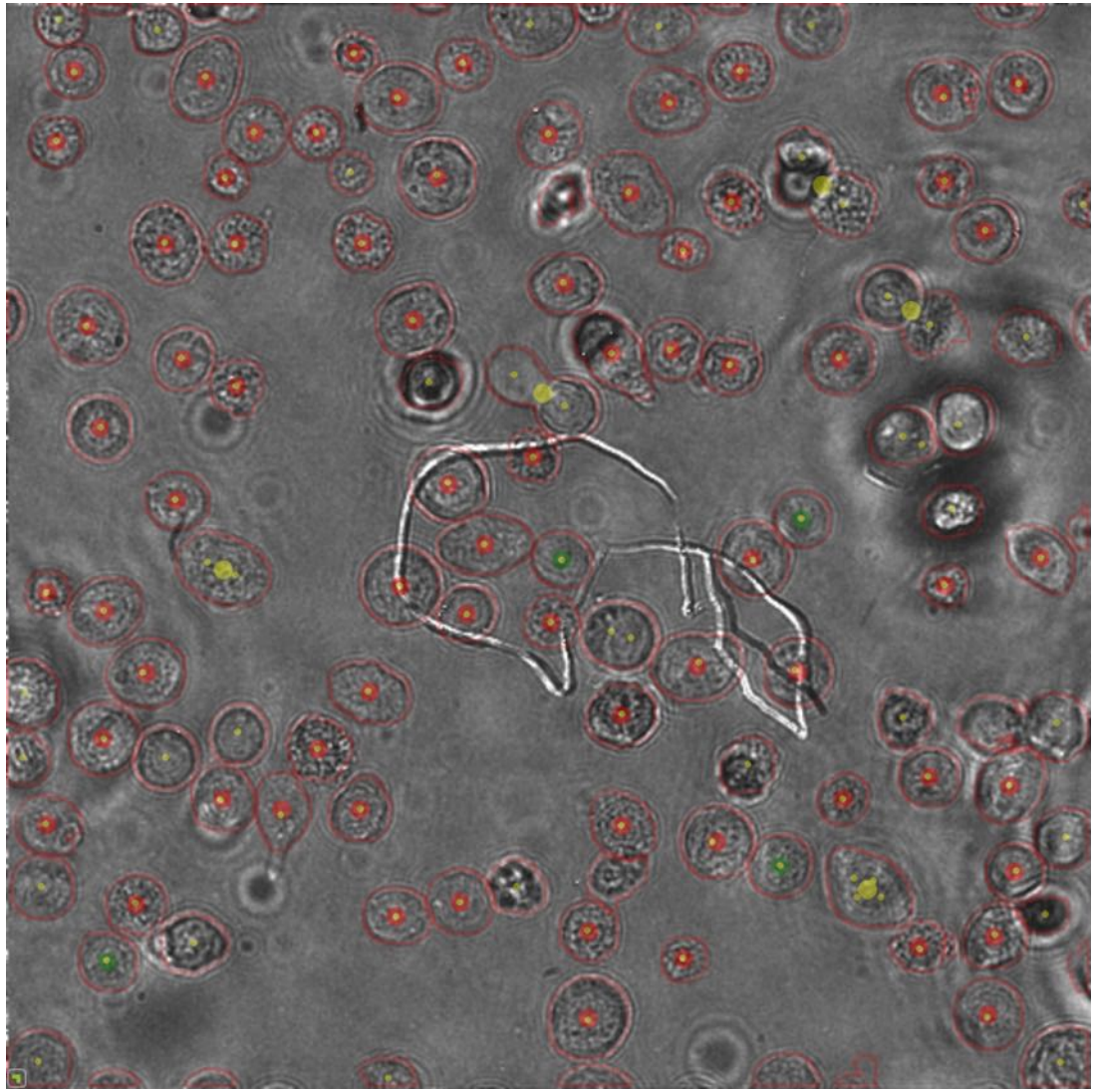


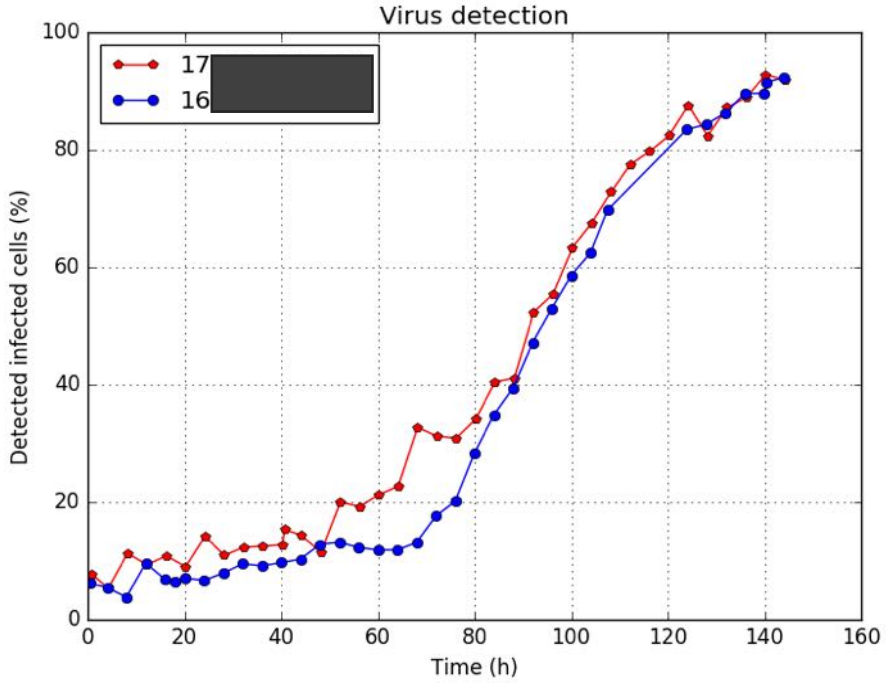




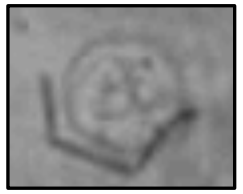
IN SAMPLE

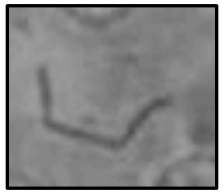
CASE STUDY: VIRAL LOAD MEASUREMENT



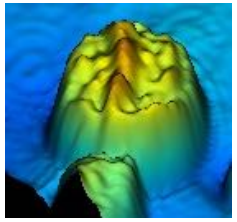


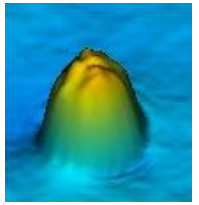
INFECTED CELL





PROTEIN EXPRESSION





NON-INFECTED CELL

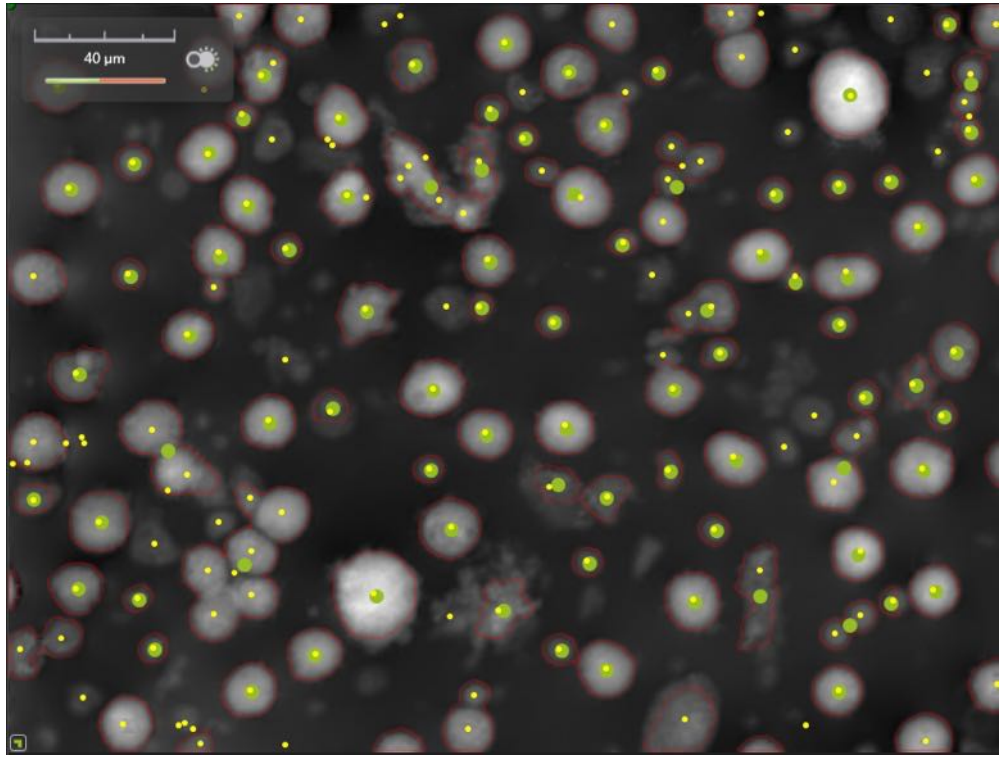
CASE STUDY – DISCRIMINATE CELL TYPES

- US CUSTOMER
- IMMUNOTHERAPY
- ENHANCED DENDRITIC CELLS
- 6 – DAY PROCESS

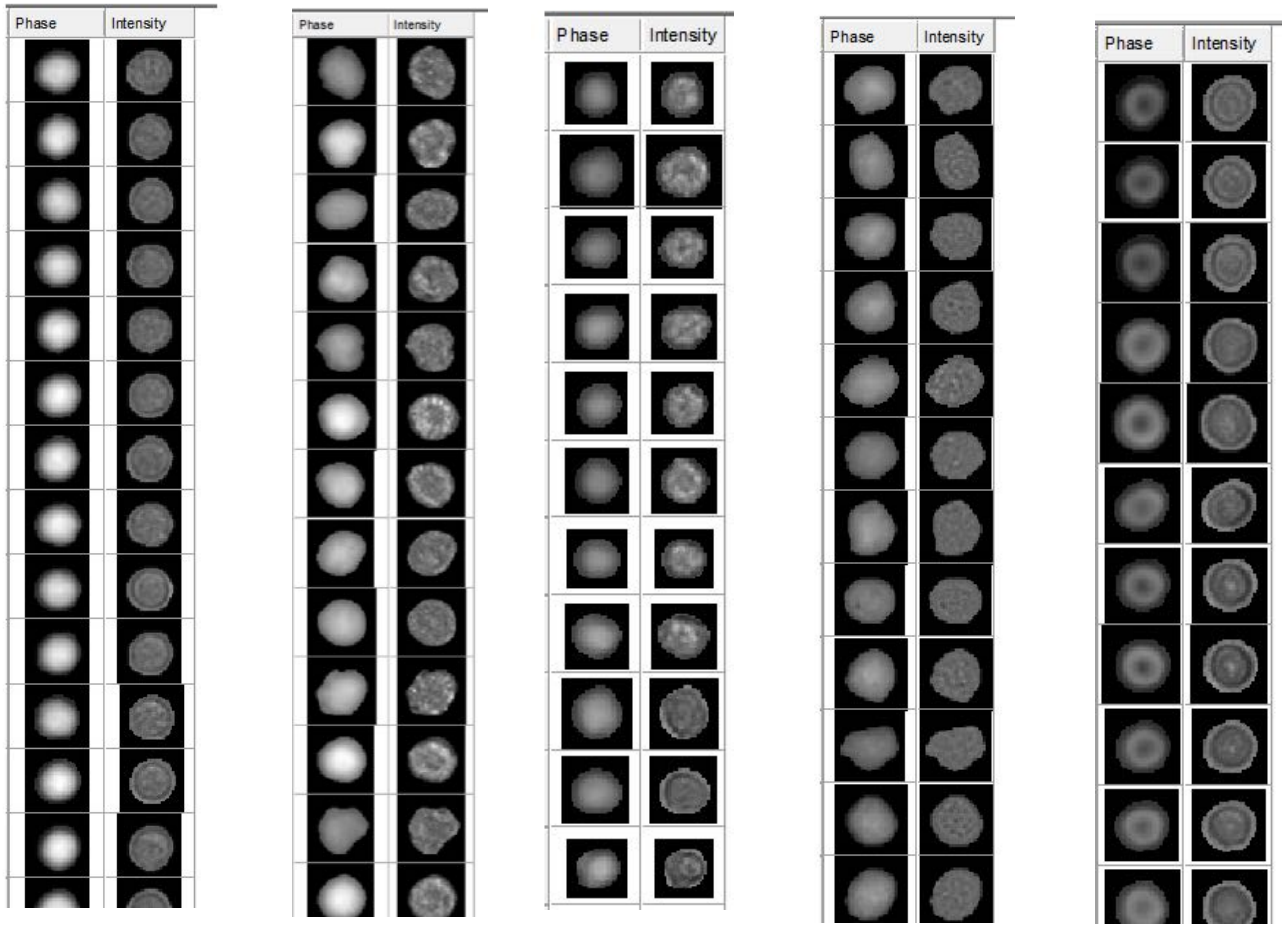
- IN-PROCESS COUNTING OF VIABLE CELL DENSITY OF:
  - RED BLOOD CELLS
  - GRANULOCYTES
  - LYMPHOCYTES
  - DENDRITIC CELLS
- NO LOSS OF SAMPLE VOLUME

CRITICAL PARAMETERS HERE ARE TO MONITOR CELL CHARACTERISTICS

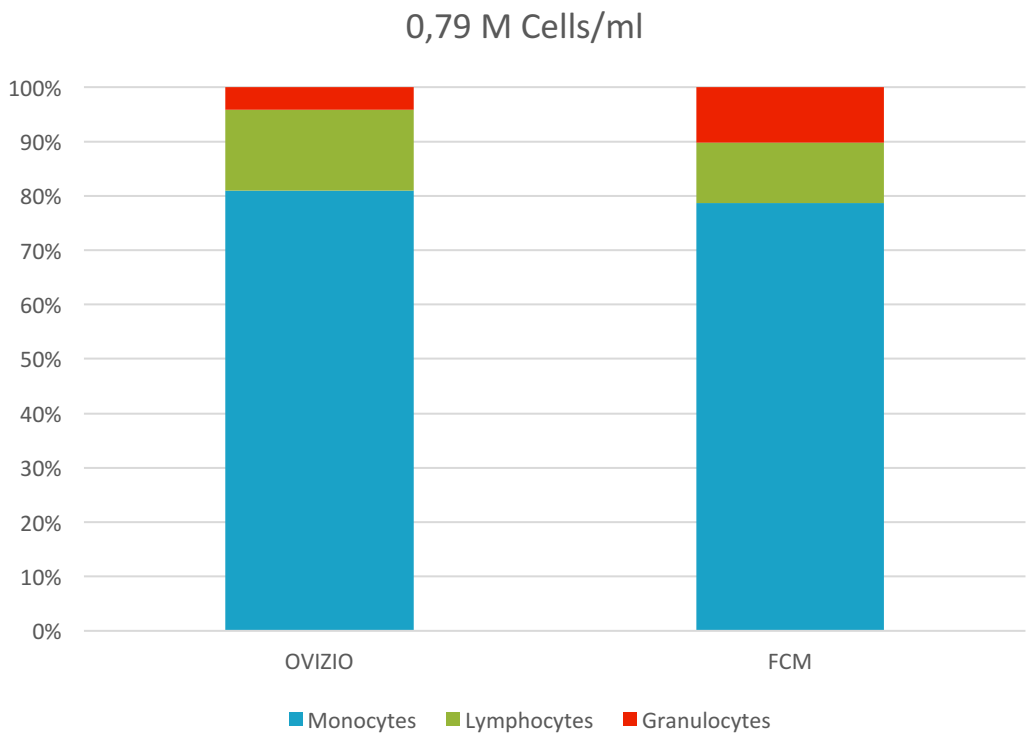
CELL THERAPY CLOSED MANUFACTURING SYSTEM DENDRIDIC CELLS

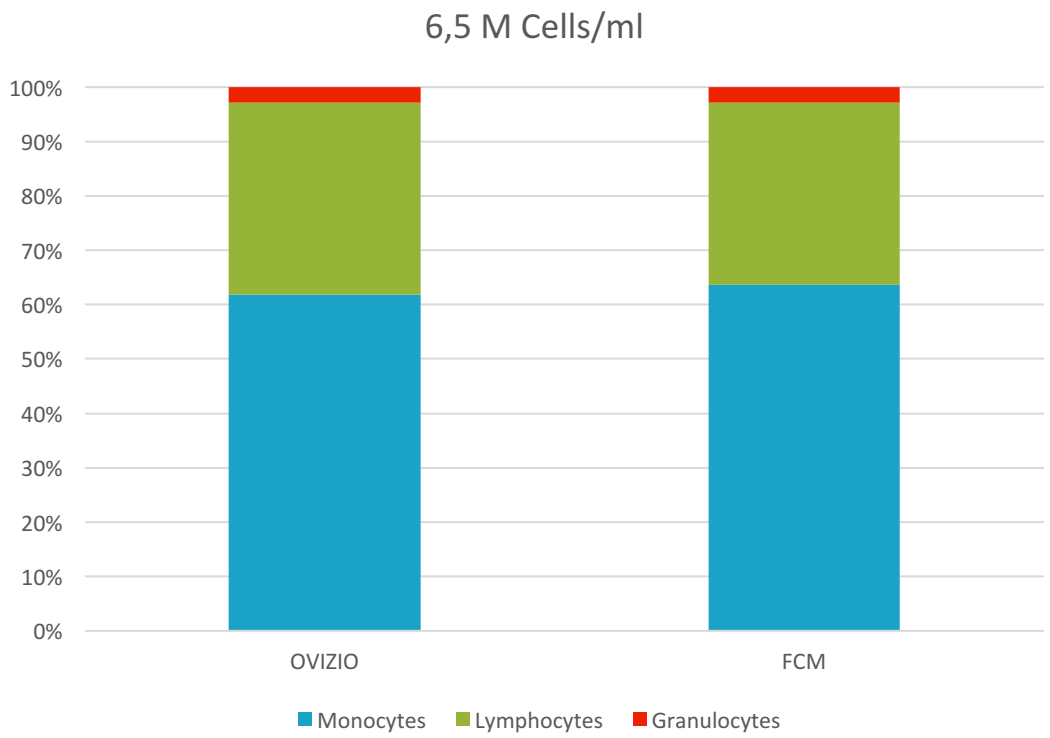


MONOCYTES MDC's LYMPHOCYTES GRANULOCYTES RBC'S



CASE STUDY – RESULTS COUNT



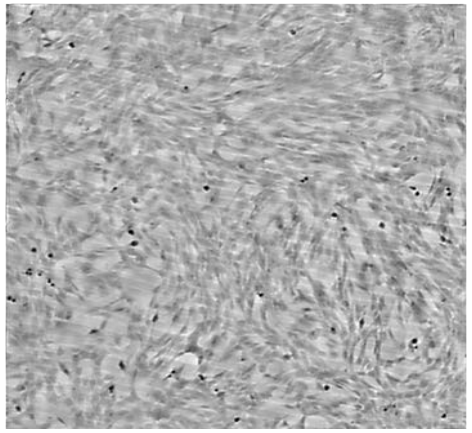


MULTI LAYER RECIPIENTS

MSC CELLS – XP10

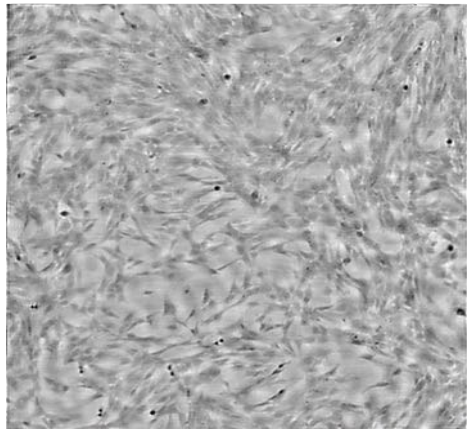
MULTIPLATE OBSERVATION

Plate 1



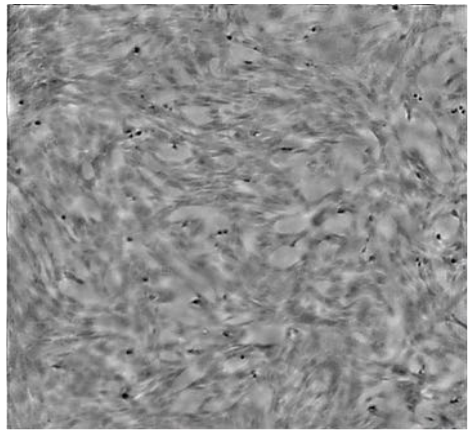
XP10_Day5_plate 1

Plate 3



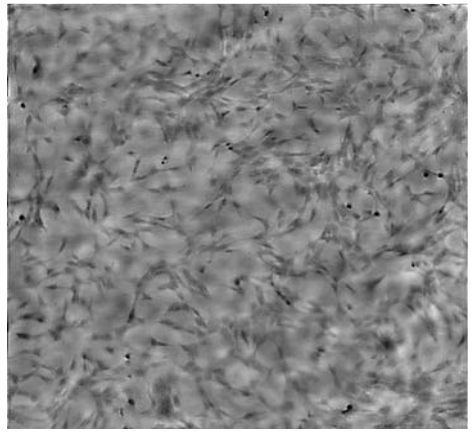
XP10_Day5_plate 3

Plate 6



XP10_Day5_plate 6

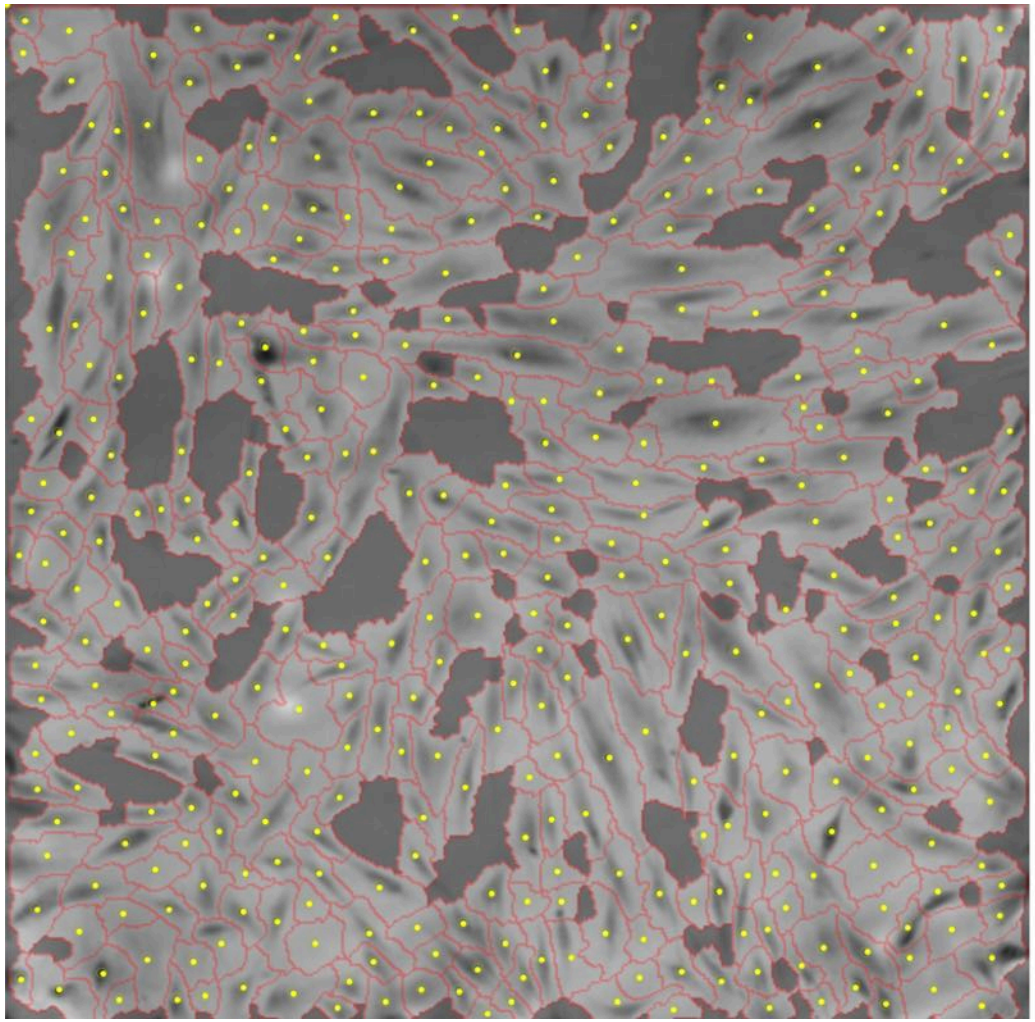
Plate 8

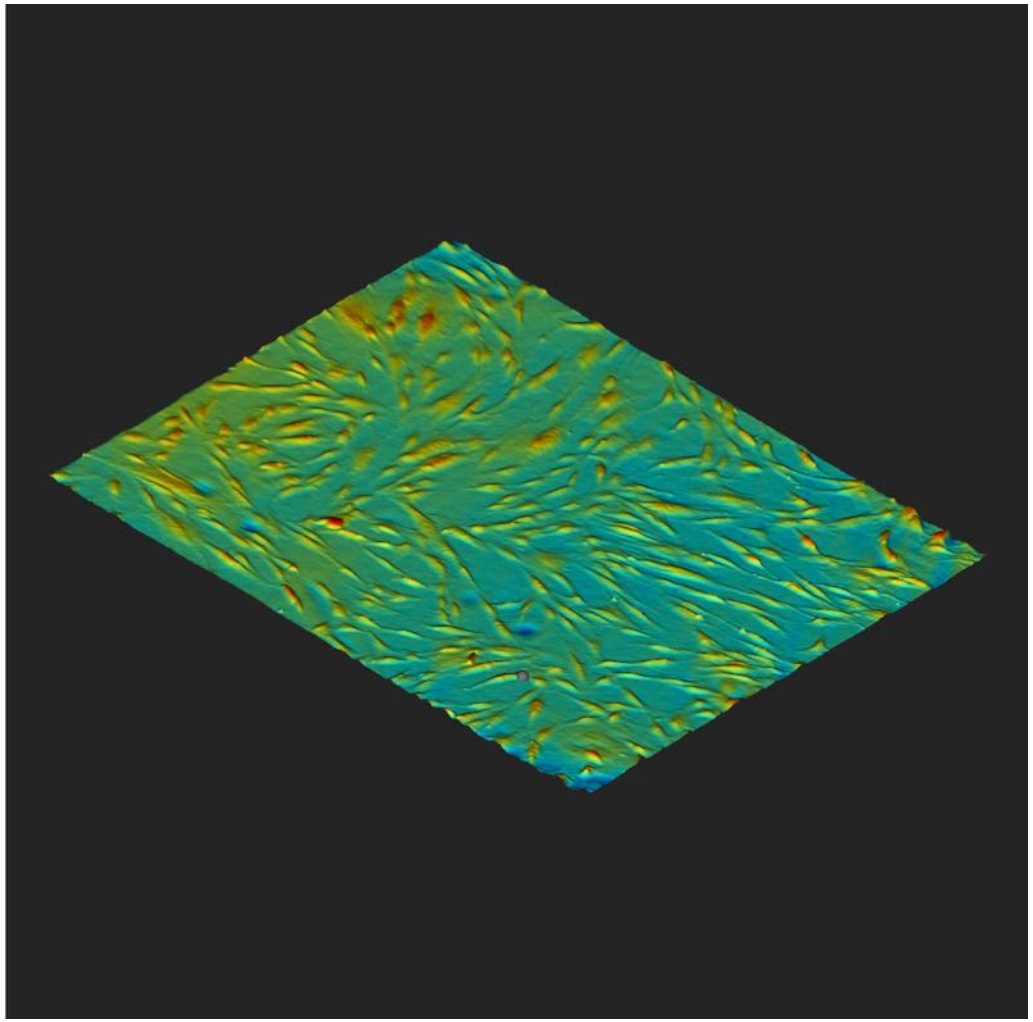


XP10_Day5_plate 8

CLIENT TEST: AUTOMATED CONFLUENCY

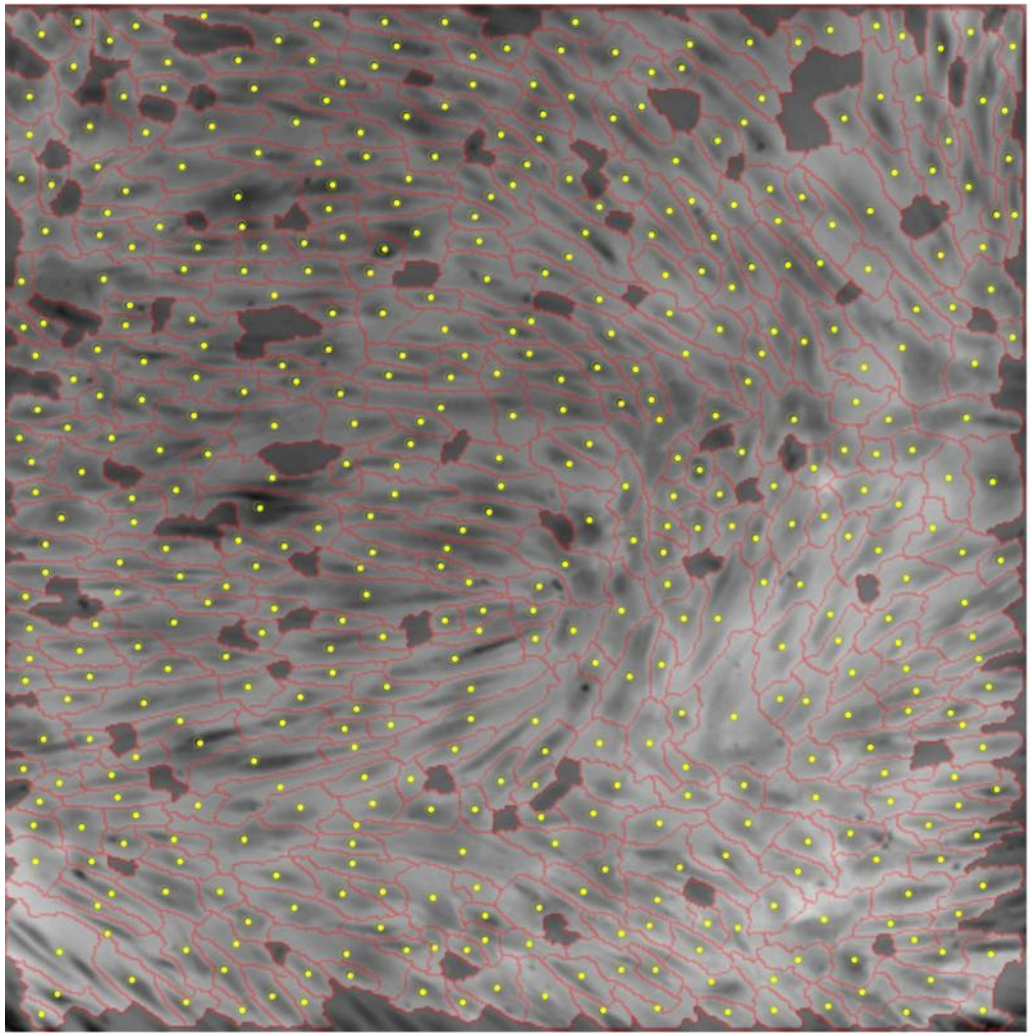
20130205 Client MSC Stem Cells –**70%**

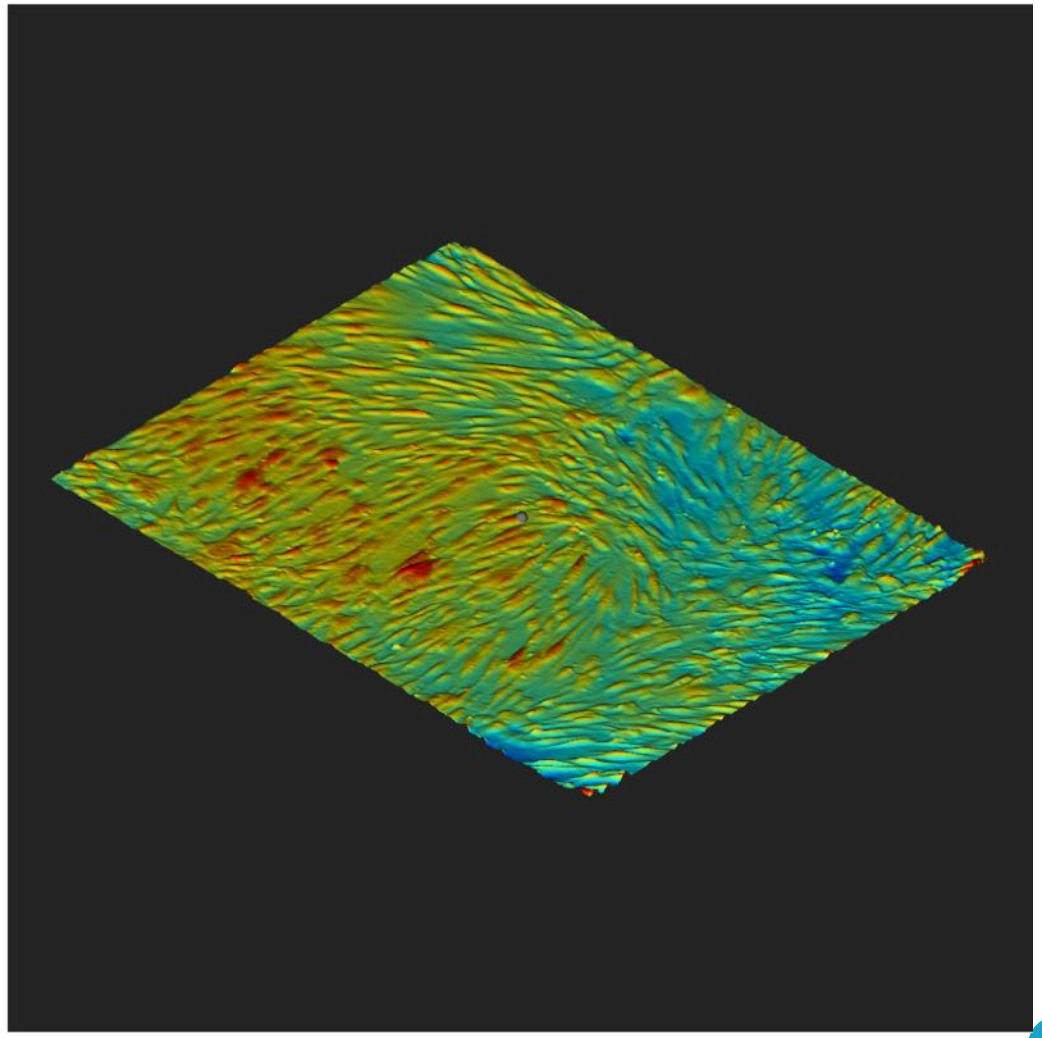




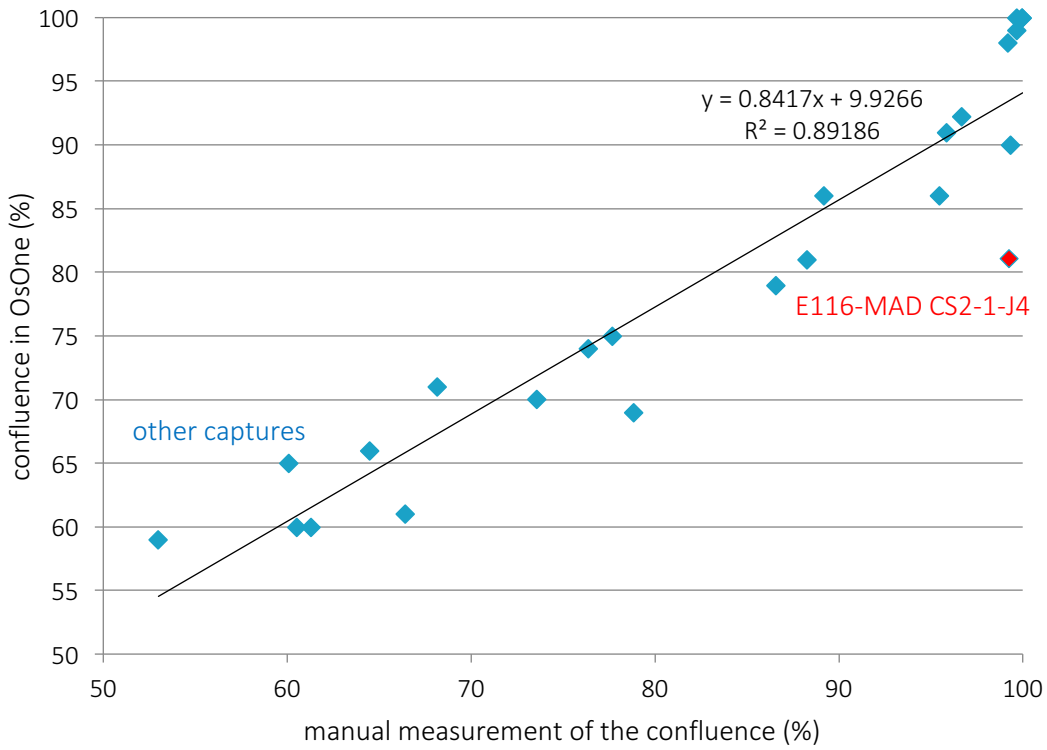
CLIENT TEST: AUTOMATED CONFLUENCY

20130205 Client MSC Stem Cells –**90%**





OVIZIO VS MANUAL MEASUREMENT



CONFLUENCE MEASUREMENTS MATCH THE ESTIMATIONS OF A HUMAN OPERATOR CLOSELY. CONFLUENCE IS THE PARAMETER OF MAIN IMPORTANCE AT THIS STAGE.

OVIZIO IMAGING SYSTEMS

THANK YOU FOR YOUR ATTENTION!

We would love to continue the discussion with you…

IF YOU WANT TO TRY OUR SYSTEMS SEND MAIL TO:
info@ovizio.com