Microscope HARDWARE Specifications

Children Entities (choose one)

RasterScanner
Type
HorizontalScanningSpeed
VerticalScanningSpeed

SpinninkDisk
SingleDisk
DiskSpeed

TIRFHardwareModule
ID
Method
Ring
Motorized
PrismRef
AnnotationRef

IS-A

ConfocalScanner-APE
ID
Name
NrOfScanPoint
MaxFrameRate
PointsConfiguration
AnnotationRef

Children Entities (choose one)

AcoustoOptical BeamSplitter

AcoustoOptical Deflector

AcoustoOptical Modulator
Type

AcoustoOptical TuneableFilter

AcoustoOptical Device-APE
ID
Name
AttenuationCoefficient
AttenuationMethod
ContrastRatio
Coating
TuningAccuracy
Polarization
Bragg
TuningResolution
TuningRate
AngleOfIncidence
AngularAperture
Material
Design
Geometry
OperatingTemperature
AnnotationRef

IS-A

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

ElectroOpticalDevice-APE
ID
Name
AttenuationCoefficient
AttenuationMethod
ModulationType
ContrastRatio
Coating
TuningAccuracy
Polarization
TuningResolution
TuningRate
AngleOfIncidence
AngularAperture
Material
OperatingTemperature
OperatingHumidity
WarmUpTime
AnnotationRef

IS-A

Children Entities (choose one)

DeformableMirror
Type
Actuators
ActuatorPitch
ActuatorStroke
ResponseTime

ElectroOptical Modulator
ID
Method

LiquidCrystal TuneableFilter
SelectableBandwidth
MaximumPower

SpatialLightModulator
Type
ModulationMode
ArrayWidth
ArrayHeight
FrameRate

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelengthProfileFile

PockelsCell
HalfWaveVoltage
Material

Instrument

ManufacturerSpecs (extension base)

MicrolensArray
ID
Name
LensletDiameter
LensletPitch
LensletArrangement
LensletShape
LensletType
Coating
Reflectance
SubstrateMaterial
FrontFocalLength
BackFocalLenght
AnnotationRef

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

Children Entities (choose one)

DiffractionGrating
Period
SpatialFrequency
Transmittive
ModulationMode
Ronchi

MaskingPlate
Function
Excitation
ApertureSize
ApertureNr.
ApertureShape
Material

PinHole
MaxDiameter
Shape

OpticalAperture-APE
ID
Name
OuterDiameter
OpticsHolderPosition
AnnotationRef

IS-A

Detector-APE

IS-A

Camera-APE

Children Entities (choose one)

WavefrontSensor
Type
Accuracy
Sensitivity

IS-A

Image ACQUISITION Settings

LightSourceSettings

TO BE MERGED

Image

Microbeam Manipulation
ID
Type
ExperimenterRef
ROIRef
Description [Sub-element]
--
AnnotationRef

Ref

Experiment

Pixels

Channel
Channel
Channel

LighsPath

ConfocalScanner Settings
ID (ConfocalScannerID)
PresetPinholeSize
ScanMode
IntegrationMode
IntegrationMethod
IntegrationNumber
EffectiveZoom
ZoomAreaWidth
ZoomAreaHeight
Descanned
ScanFormat
MultiChannelMode
ScanTime
ConfocalFieldNumber
Rotation
ScanningFrequency

ChildrenEntity (choose one)

AcoustoOptical TuneableFilterSettings

AcoustoOptical BeamSplitterSettings

AcoustoOptical DeflectorSettings

AcoustoOptical ModulatorSettings

AcoustoOptical DeviceSettings-APE
ID (AcoustoOpticalDeviceID)
DiffractionEfficiency
AcousticFrequency
TransmittanceProfileFie [Sub-Element]
ReflectanceProfileFie [Sub-Element]

IS-A

TransmissionWavelength RangeSettings
CutOn
CutOff
Transmittance

ReflectionWavelength RangeSettings
CutOn
CutOff
Reflectance

ElectroOptical DeviceSettings-APE
ID (ElectroOpticalDeviceID)
TransmittanceProfileFie [Sub-Element]
ReflectanceProfileFie [Sub-Element]

IS-A

ChildrenEntity (choose one)

DeformableMirror Settings

ElectroOptical ModulatorSettings

LiquidCrystal TuneableFilterSettings

SpatialLightModulator Settings

TransmissionWavelength RangeSettings
CutOn
CutOff
Transmittance

ReflectionWavelength RangeSettings
CutOn
CutOff
Reflectance

TIRFSettings
ID
HILO
TIRFAngle
TIRFHardwareModuleRef
TIRFLigthPath [Sub-element]
Description [Sub-element]

OpticalAperture Settings-APE
ID (OpticalApertureID)
TransmittanceProfileFie [Sub-Element]
ReflectanceProfileFie [Sub-Element]

IS-A

ChildrenEntity (choose one)

DiffractionGrating Settings
DiffractionEfficiency

MaskingPlateSettings

PinHoleSettings
Aperture

TransmissionWavelength RangeSettings
CutOn
CutOff
Transmittance

ReflectionWavelength RangeSettings
CutOn
CutOff
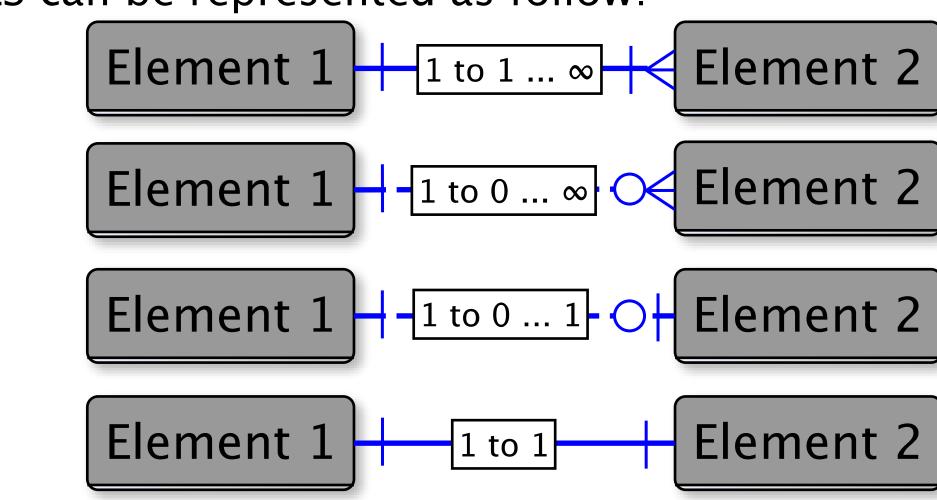Reflectance

Notes

APE, Abstract Parent Entity

AnnotationRef, This element always refers to a Comment/Annotation element as described for Channel. However for simplicity sake most Comment/Annotation elements have been omitted and the AnnotationRef has been inserted in the referring element as an attribute.

[Sub-Element], For semplicity sake, when indicated Sub-Elements are listed within the referring element as an attribute.

ElementRef, For simplicity sake, when indicated ElementRef elements are listed whitin the referring element as attributes.

Attributes listed after a --- separator have been added to the OME Core as part of the proposed revision.
Attributes listed after .... and in parenthesis have been removed as part of the proposed revision.

Blue edges, blue edges represent RELATIONSHIPs between entities. SOLID EDGES are used to connect an Element with a REQUIRED Sub-Element. DASHED EDGED are used to connect an Element with an OPTIONAL Sub-Element.
In addition, different CARDINALITIES can be represented as follow:

Element 1 — 1 to 1 ... ∞ — Element 2

Element 1 — 1 to 0 ... ∞ — Element 2

Element 1 — 1 to 0 ... 1 — Element 2

Element 1 — 1 to 1 — Element 2

Dashed Grey edges, dashed grey edges signifies "Extends" and they should be read as follows:
"Objective" extends "ManufactuerSpecs".
Units are omitted for simplicity sake.

Legend

This is a Entity-Relationship diagrammatic representation of a proposed REVISION of the OME Core data model (blue/red boxes) along side a proposed OME BASIC EXTENSION (grey boxes) developed by members of the Imaging Working Group of the 4D Nucleome consortium and and by members of the BINA Quality Control and Data Management Working Group.

The Entity-Relationship formalism represents information about a real world situation/object (in our case a microscopic INSTRUMENT and an IMAGE acquired using that Instrument) by using three types of model elements:
1) Entities = Boxes;
2) Relationships = lines connecting boxes;
3) Attributes = fields within boxes

When describing a real life situation/object:
1) ENTITIES corresponds to NOUNS = the things we want to collect information about.
2) RELATIONSHIPS corresponds to VERBS = actions/state/occurrence that connect Entities with each other
3) ATTRIBUTES corresponds to ADJECTIVES = the actual information about each Entity we want to collect

In order to interpret the schema please start from either the <INSTRUMENT> or the <IMAGE> elements for the Hardware Specifications and Image Acquisition Settings section respectively. Then follow the blue lines to the connected boxes and think something like:
1) An Instrument has a MicroscopeStand and a LightSource, and might rest on a MicroscopeTable etc.;
2) An Image was produced as part of a specific Experiment, was collected in a specific ImagingEnvironment, was collected using specific MicroscopeSettings etc.

For questions or comments please contact: caterina.strambio@umassmed.edu