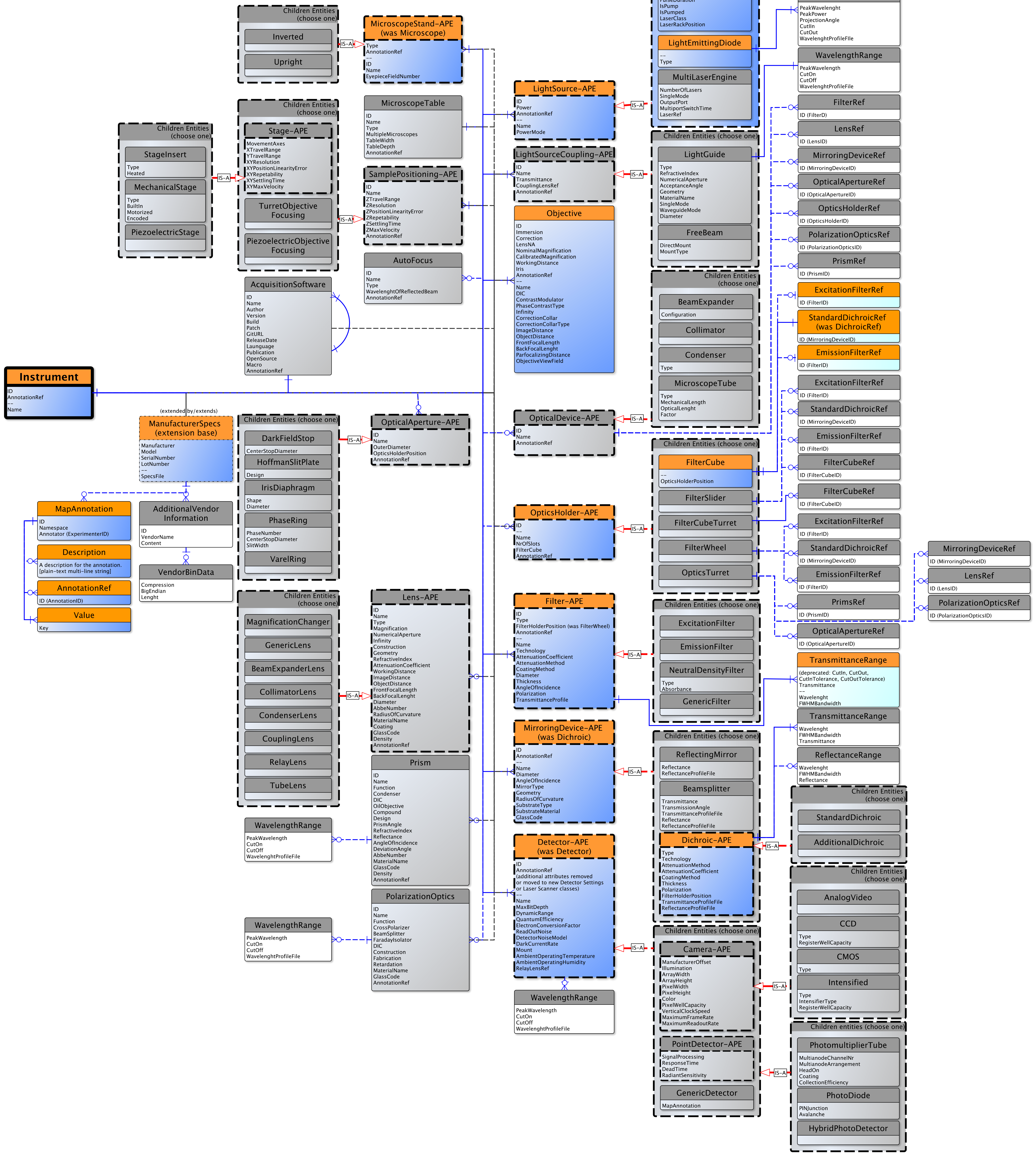
MICROSCOPE Specifications



Instrument
ID
AnnotationRef
--
Name

ManufacturerSpecs (extension base)
Manufacturer
Model
SerialNumber
LotNumber
--
SpecsFile

MapAnnotation
ID
Namespace
Annotator (ExperimenterID)

Description
A description for the annotation.
[plain-text multi-line string]

AnnotationRef
ID (AnnotationID)

Value
Key

AdditionalVendor Information
ID
VendorName
Content

VendorBinData
Compression
BigEndian
Lenght

Children Entities (choose one)
StageInsert: Type, Heated
MechanicalStage: Type, BuiltIn, Motorized, Encoded
PiezoelectricStage

Children Entities (choose one)
Inverted
Upright

MicroscopeStand-APE (was Microscope)
Type
AnnotationRef
--
ID
Name
EyepieceFieldNumber

Children Entities (choose one)
Stage-APE: MovementAxes, XTravelRange, YTravelRange, XYResolution, XYPositionLinearityError, XYRepetability, XYSettlingTime, XYMaxVelocity
TurretObjective Focusing
PiezoelectricObjective Focusing

MicroscopeTable
ID
Name
Type
MultipleMicroscopes
TableWidth
TableDepth
AnnotationRef

SamplePositioning-APE
ID
Name
ZTravelRange
ZResolution
ZPositionLinearityError
ZRepetability
ZSettlingTime
ZMaxVelocity
AnnotationRef

AutoFocus
ID
Name
Type
WavelenghtOfReflectedBeam
AnnotationRef

AcquisitionSoftware
ID
Name
Author
Version
Build
Patch
GitURL
ReleaseDate
Launguage
Publication
OpenSource
Macro
AnnotationRef

Children Entities (choose one)
DarkFieldStop: CenterStopDiameter
HoffmanSlitPlate: Design
IrisDiaphragm: Shape, Diameter
PhaseRing: PhaseNumber, CenterStopDiameter, SlitWidth
VarelRing

OpticalAperture-APE
ID
Name
OuterDiameter
OpticsHolderPosition
AnnotationRef

Children Entities (choose one)
MagnificationChanger
GenericLens
BeamExpanderLens
CollimatorLens
CondenserLens
CouplingLens
RelayLens
TubeLens

Lens-APE
ID
Name
Type
Magnification
NumericalAperture
Infinity
Construction
Geometry
RefractiveIndex
AttenuationCoefficient
WorkingDistance
ImageDistance
ObjectDistance
FrontFocalLength
BackFocalLenght
Diameter
AbbeNumber
RadiusOfCurvature
MaterialName
Coating
GlassCode
Density
AnnotationRef

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

Prism
ID
Name
Function
Condenser
DIC
OilObjective
Compound
Design
PrismAngle
RefractiveIndex
Reflectance
AngleOfIncidence
DeviationAngle
AbbeNumber
MaterialName
GlassCode
Density
AnnotationRef

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

PolarizationOptics
ID
Name
Function
CrossPolarizer
BeamSplitter
FaradayIsolator
DIC
Construction
Fabrication
Retardation
MaterialName
GlassCode
AnnotationRef

LightSource-APE
ID
Power
AnnotationRef
--
Name
PowerMode

LightSourceCoupling-APE
ID
Name
Transmittance
CouplingLensRef
AnnotationRef

Objective
ID
Immersion
Correction
LensNA
NominalMagnification
CalibratedMagnification
WorkingDistance
Iris
AnnotationRef
--
Name
DIC
ContrastModulator
PhaseContrastType
Infinity
CorrectionCollar
CorrectionCollarType
ImageDistance
ObjectDistance
FrontFocalLength
BackFocalLenght
ParfocalizingDistance
ObjectiveViewField

OpticalDevice-APE
ID
Name
AnnotationRef

OpticsHolder-APE
ID
--
Name
NrOfSlots
FilterCube
AnnotationRef

Filter-APE
ID
Type
FilterHolderPosition (was FilterWheel)
AnnotationRef
--
Name
Technology
AttenuationCoefficient
AttenuationMethod
CoatingMethod
Diameter
Thickness
AngleOfIncidence
Polarization
TransmittanceProfile

MirroringDevice-APE (was Dichroic)
ID
AnnotationRef
--
Name
Diameter
AngleOfIncidence
MirrorType
Geometry
RadiusOfCurvature
SubstrateType
SubstrateMaterial
GlassCode

Detector-APE (was Detector)
ID
AnnotationRef
(additional attributes removed or moved to new Detector Settings or Laser Scanner classes)
--
Name
MaxBitDepth
DynamicRange
QuantumEfficiency
ElectronConversionFactor
ReadOutNoise
DetectorNoiseModel
DarkCurrentRate
Mount
AmbientOperatingTemperature
AmbientOperatingHumidity
RelayLensRef

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

Children Entities (choose one)
Arc: Type
Filament: Type
GenericExcitationSource: MapAnnotation
Laser: Type, LaserMedium, Wavelength, FrequencyMultiplication, Tuneable, ContinuousWave (was Pulse), PockelCell, RepetitionRate, --, PulseDuration, IsPump, IsPumped, LaserClass, LaserRackPosition
LightEmittingDiode: --, Type
MultiLaserEngine: NumberOfLasers, SingleMode, OutputPort, MultiportSwitchTime, LaserRef

Children Entities (choose one)
LightGuide: Type, RefractiveIndex, NumericalAperture, AcceptanceAngle, Geometry, MaterialName, SingleMode, WaveguideMode, Diameter
FreeBeam: DirectMount, MountType

Children Entities (choose one)
BeamExpander: Configuration
Collimator
Condenser: Type
MicroscopeTube: Type, MechanicalLength, OpticalLenght, Factor

Children Entities (choose one)
FilterCube: --, OpticsHolderPosition
FilterSlider
FilterCubeTurret
FilterWheel
OpticsTurret

Children Entities (choose one)
ExcitationFilter
EmissionFilter
NeutralDensityFilter: Type, Absorbance
GenericFilter

Children Entities (choose one)
ReflectingMirror: Reflectance, ReflectanceProfileFile
Beamsplitter: Transmittance, TransmissionAngle, TransmittanceProfileFile, Reflectance, ReflectanceProfileFile
Dichroic-APE: Type, Technology, AttenuationMethod, AttenuationCoefficient, CoatingMethod, Thickness, Polarization, FilterHolderPosition, TransmittanceProfileFile, ReflectanceProfileFile

Children Entities (choose one)
Camera-APE: ManufacturerOffset, Illumination, ArrayWidth, ArrayHeight, PixelWidth, PixelHeight, Color, PixelWellCapacity, VerticalClockSpeed, MaximumFrameRate, MaximumReadoutRate
PointDetector-APE: SignalProcessing, ResponseTime, DeadTime, RadiantSensitivity
GenericDetector: MapAnnotation

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

Pump
ID (LightSourceID)

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

LEDModule
PeakWavelenght
PeakPower
ProjectionAngle
CutIIn
CutOut
WavelenghtProfileFIle

WavelengthRange
PeakWavelength
CutOn
CutOff
WavelenghtProfileFile

FilterRef
ID (FilterD)

LensRef
ID (LensID)

MirroringDeviceRef
ID (MirroringDeviceID)

OpticalApertureRef
ID (OpticalApertureID)

OpticsHolderRef
ID (OpticsHolderID)

PolarizationOpticsRef
ID (PolarizationOpticsID)

PrismRef
ID (PrismID)

ExcitationFilterRef
ID (FilterID)

StandardDichroicRef (was DichroicRef)
ID (MirroringDeviceID)

EmissionFilterRef
ID (FilterID)

ExcitationFilterRef
ID (FilterID)

StandardDichroicRef
ID (MirroringDeviceID)

EmissionFilterRef
ID (FilterID)

FilterCubeRef
ID (FilterCubeID)

FilterCubeRef
ID (FilterCubeID)

ExcitationFilterRef
ID (FilterID)

StandardDichroicRef
ID (MirroringDeviceID)

EmissionFilterRef
ID (FilterID)

PrimsRef
ID (PrismID)

OpticalApertureRef
ID (OpticalApertureID)

MirroringDeviceRef
ID (MirroringDeviceID)

LensRef
ID (LensID)

PolarizationOpticsRef
ID (PolarizationOpticsID)

TransmittanceRange
(deprecated: CutIn, CutOut, CutInTolerance, CutOutTolerance)
Transmittance
--
Wavelenght
FWHMBandwidth

TransmittanceRange
Wavelenght
FWHMBandwidth
Transmittance

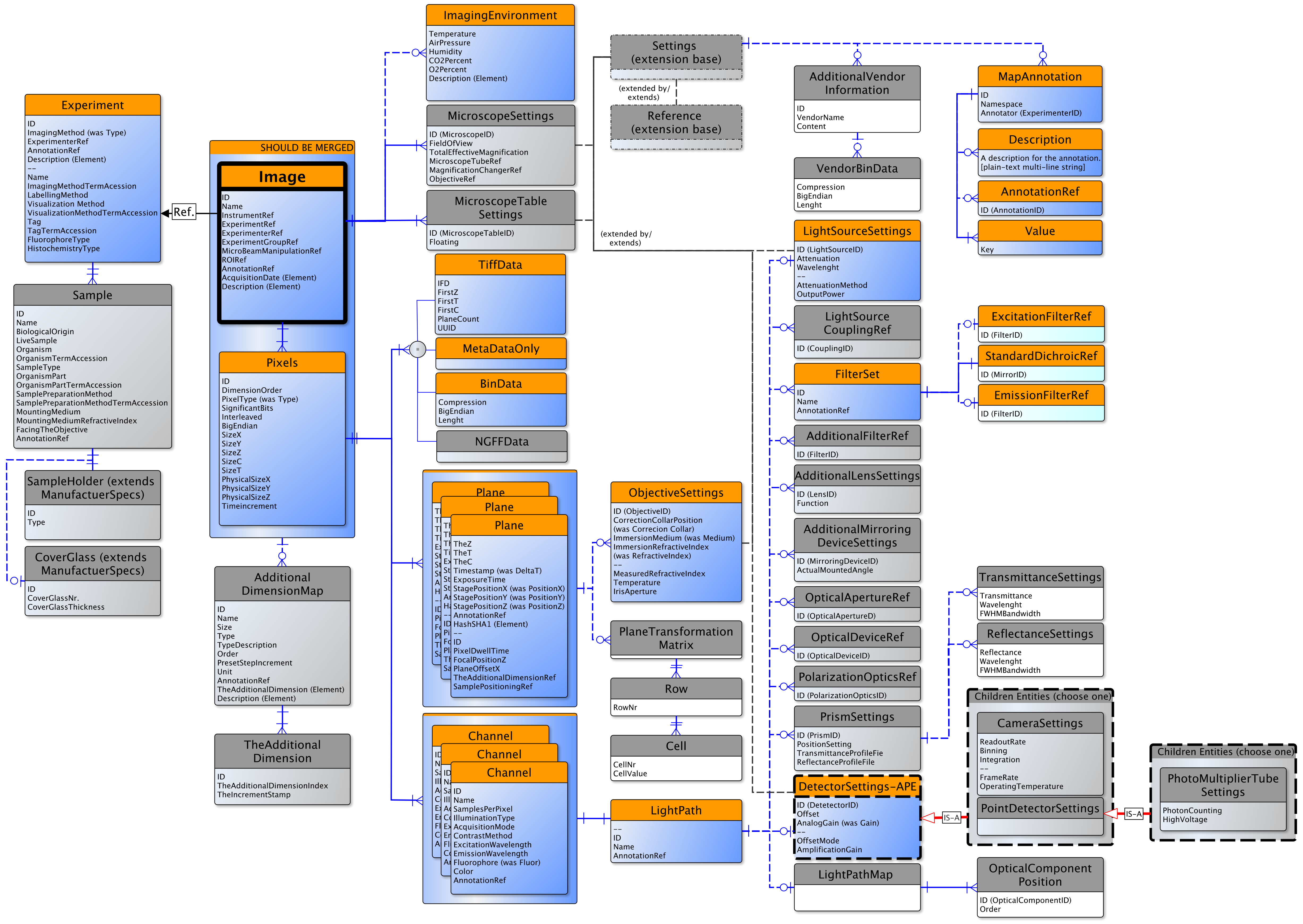
ReflectanceRange
Wavelenght
FWHMBandwidth
Reflectance

Children Entities (choose one)
StandardDichroic
AdditionalDichroic

Children Entities (choose one)
AnalogVideo
CCD: Type, RegisterWellCapacity
CMOS: Type
Intensified: Type, IntensifierType, RegisterWellCapacity

Children entities (choose one)
PhotomultiplierTube: MultianodeChannelNr, MultianodeArrangement, HeadOn, Coating, CollectionEfficiency
PhotoDiode: PINJunction, Avalanche
HybridPhotoDetector

IMAGE ACQUISITION Settings



Experiment
ID
ImagingMethod (was Type)
ExperimenterRef
AnnotationRef
Description (Element)
--
Name
ImagingMethodTermAcession
LabellingMethod
Visualization Method
VisualizationMethodTermAccession
Tag
TagTermAccession
FluorophoreType
HistochemistryType

Sample
ID
Name
BiologicalOrigin
LiveSample
Organism
OrganismTermAccession
SampleType
OrganismPart
OrganismPartTermAccession
SamplePreparationMethod
SamplePreparationMethodTermAccession
MountingMedium
MountingMediumRefractiveIndex
FacingTheObjective
AnnotationRef

SampleHolder (extends ManufactuerSpecs)
ID
Type

CoverGlass (extends ManufactuerSpecs)
ID
CoverGlassNr.
CoverGlassThickness

Image
ID
Name
InstrumentRef
ExperimentRef
ExperimenterRef
ExperimentGroupRef
MicroBeamManipulationRef
ROIRef
AnnotationRef
AcquisitionDate (Element)
Description (Element)

Pixels
ID
DimensionOrder
PixelType (was Type)
SignificantBits
Interleaved
BigEndian
SizeX
SizeY
SizeZ
SizeC
SizeT
PhysicalSizeX
PhysicalSizeY
PhysicalSizeZ
TimeIncrement

Additional DimensionMap
ID
Name
Size
Type
TypeDescription
Order
PresetStepIncrement
Unit
AnnotationRef
TheAdditionalDimension (Element)
Description (Element)

TheAdditional Dimension
ID
TheAdditionalDimensionIndex
TheIncrementStamp

ImagingEnvironment
Temperature
AirPressure
Humidity
CO2Percent
O2Percent
Description (Element)

MicroscopeSettings
ID (MicroscopeID)
FieldOfView
TotalEffectiveMagnification
MicroscopeTubeRef
MagnificationChangerRef
ObjectiveRef

MicroscopeTable Settings
ID (MicroscopeTableID)
Floating

TiffData
IFD
FirstZ
FirstT
FirstC
PlaneCount
UUID

MetaDataOnly

BinData
Compression
BigEndian
Lenght

NGFFData

Plane
TheZ
TheT
TheC
Timestamp (was DeltaT)
ExposureTime
StagePositionX (was PositionX)
StagePositionY (was PositionY)
StagePositionZ (was PositionZ)
AnnotationRef
HashSHA1 (Element)
--
ID
PixelDwellTime
FocalPositionZ
PlaneOffsetX
TheAdditionalDimensionRef
SamplePositioningRef

Channel
ID
Name
SamplesPerPixel
IlluminationType
AcquisitionMode
ContrastMethod
ExcitationWavelength
EmissionWavelength
Fluorophore (was Fluor)
Color
AnnotationRef

ObjectiveSettings
ID (ObjectiveID)
CorrectionCollarPosition
(was Correcion Collar)
ImmersionMedium (was Medium)
ImmersionRefractiveIndex
(was RefractiveIndex)
--
MeasuredRefractiveIndex
Temperature
IrisAperture

PlaneTransformation Matrix

Row
RowNr

Cell
CellNr
CellValue

LightPath
--
ID
Name
AnnotationRef

Settings (extension base)

Reference (extension base)

AdditionalVendor Information
ID
VendorName
Content

VendorBinData
Compression
BigEndian
Lenght

MapAnnotation
ID
Namespace
Annotator (ExperimenterID)

Description
A description for the annotation.
[plain-text multi-line string]

AnnotationRef
ID (AnnotationID)

Value
Key

LightSourceSettings
ID (LightSourceID)
Attenuation
Wavelenght
--
AttenuationMethod
OutputPower

LightSource CouplingRef
ID (CouplingID)

FilterSet
ID
Name
AnnotationRef

ExcitationFilterRef
ID (FilterID)

StandardDichroicRef
ID (MirrorID)

EmissionFilterRef
ID (FilterID)

AdditionalFilterRef
ID (FilterID)

AdditionalLensSettings
ID (LensID)
Function

AdditionalMirroring DeviceSettings
ID (MirroringDeviceID)
ActualMountedAngle

OpticalApertureRef
ID (OpticalApertureD)

OpticalDeviceRef
ID (OpticalDeviceID)

PolarizationOpticsRef
ID (PolarizationOpticsID)

PrismSettings
ID (PrismID)
PositionSetting
TransmittanceProfileFie
ReflectanceProfileFile

TransmittanceSettings
Transmittance
Wavelenght
FWHMBandwidth

ReflectanceSettings
Reflectance
Wavelenght
FWHMBandwidth

DetectorSettings-APE
ID (DetetectorID)
Offset
AnalogGain (was Gain)
--
OffsetMode
AmplificationGain

Children Entities (choose one)
CameraSettings: ReadoutRate, Binning, Integration, --, FrameRate, OperatingTemperature
PointDetectorSettings

Children Entities (choose one)
PhotoMultiplierTube Settings: PhotonCounting, HighVoltage

LightPathMap

OpticalComponent Position
ID (OpticalComponentID)
Order

Notes

Units are omitted for simplicity sake.
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.

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

Legend

This is a graphical representation of a possible extension of the OME data model developed by members of the Imaging Working Group of the 4D Nucleome consortium. The graph utilizes the Entity-Relationship formalism. In this formalism information about a real world situation/thing (in our case a Microscope and an image acquired using that instrument) are represented by three types of model elements:
1) Entities = Boxes; 2) Relationships = lines connecting boxes; 3) Attributes = fields within boxes
When describing a real life situation/thing:
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 read the schema please start from INSTRUMENT and from and IMAGE for the Specifications and Settings section respectively. Then follow the lines to the connected boxes and think something like: 1) An Instrument has a Microscope_Body, might rest on a Microscope_Table, and has a Light_Source etc.; 2) An Image was produced as part of a specific Experiment, was collected in a specific Imaging_Environment, was collected using specific Microscope_Settings etc.