

Optem® FUSION Micro-Imaging Lens System Visible to SWIR (400-1700nm)

Covering the optical, mechanical,
and operational parameters of
FUSION system components.


Now Supports Key Visible, NIR and SWIR wavebands

7th Edition



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How to use this guide

Optem FUSION is a modular Lens System, which can be modified to affect form, function and performance across the Visible (400-700nm), the Near Infrared (NIR – 700-1100nm), and the Short-Wave Infrared (SWIR – 900-1700nm) wavebands. Follow the steps outlined herein to configure an Optem FUSION Lens System to meet your specific optical, functional and physical configuration requirements. Refer to the **Optical Performance Chart** that matches your chosen Fixed-magnification or Zoom configuration (e.g., with or without Objectives, with Standard or Mini Camera Tubes). Following the flow lines in the **FUSION Component Matrix** (p. 4-5), you can identify the components you will require to configure the lens performance you desire.

1 The first step in configuring your Optem FUSION Lens System is to determine whether you require a fixed field-of-view or a zoom system and what your desired operating wavelength will be (from Visible to SWIR). If you require zoom, determine how much zoom range you require, 7:1 or 12.5:1. This decision will direct you to the correct FUSION **Optical Performance chart** (p. 06 - 33).


2 Your second choice is determining what working distance you require for your system. Specify the correct Lower Lens to best fit your working distance requirements. Working distance is the mechanical space between the bottom of the lens system and your specimen. The addition of a ringlight or right-angle module to the bottom of the system will further reduce this working distance. Using the shortest working distance will provide the best resolution for all systems. Choose longer working distances when necessary to increase your desired field-of-view. Working distances for each Lower

Lens is listed just below the Lower Lenses shown across the top of each **Optical Performance chart**. You need to know your intended camera format (chip size) to determine the field-of-view for your lens system. If you do not have a particular camera format in mind, use the numbers in the chart to help you determine the best camera chip size selection for your Optem FUSION Lens System.

3 Navigate from the top of the **Component Matrix** down to the Lower Lenses to identify the components needed to complete your FUSION Lens System. Fixed Magnification systems require the Aperture Module 35-07-20-000 for best performance. The correct aperture diameter is provided in the **Fixed Optical Performance Chart** (p. 07 - 13 and p.32).

These steps above are a general guide in configuring your Lens System. Your application may require choosing components in a different order than detailed herein. In this case, refer to the appropriate **Optical Performance chart** and identify your desired parameters (typically field-of-view at high- and low-end zoom) as it relates to your intended camera format.

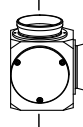
NOTE:

- Now including Optical Performance Charts for FUSION  systems (p. 32-33).
- With the Optem FUSION System, the optical magnification is the product of the magnification of the Lower Lens, Zoom dial setting (if Zoom and the magnification of the Camera Tube. This formula works even when using Qioptiq Microscope Objectives.

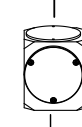
Contact your Qioptiq representative or your Qioptiq dealer for additional help determining your specific requirements.

ACCESSORIES

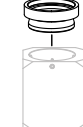
35-07-01-000
50/50 CUBE



35-07-00-000
MIRROR CUBE




35-07-02-000
MIRROR CUBE ADAPTER




NOTE: 35-07-11 USES 65mm WORKING DISTANCE WHEN USED BELOW LOWER LENS. USE THIS COMBINATION WHEN PLACING RIGHT ANGLE BELOW SYSTEM. REMOVE DOVETAIL TO INCREASE WORKING DISTANCE.


35-07-11-000
INLINE MOUNT




35-07-21-000
25.4MM FILTER HOLDER




35-07-20-000
APERTURE SET




35-07-25-000
ADJUSTABLE IRIS



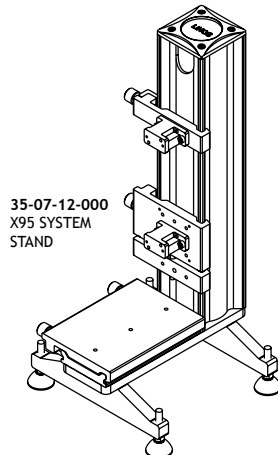
35-07-04-000
FLUORESCENCE CUBE HOLDER UPPER
(NOTE: USES ZEISS TYPE 91029 Cube)




35-03-50-000
TUNABLE LENS FOCUS MODULE
(NOTE: ATTACH DIRECTLY ABOVE LOWER FUNCTION MODULE ONLY)



NOTE: NOT EVERY COMBINATION WILL PRESENT DESIRED RESULTS.




CAMERA




CAMERA MOUNTS


25-60-23-000
EOS CAMERA MOUNT




25-60-24-000
F CAMERA MOUNT



35-08-70-000
C \ CS CAMERA MOUNT




25-60-26-000
4/3 CAMERA MOUNT




CAMERA TUBES


35-08-00-000
CAMERA TUBE
0.4X \ 80 FL




35-08-01-000
CAMERA TUBE
0.5X \ 100 FL




35-08-02-000
CAMERA TUBE
0.6X \ 120 FL




35-08-04-000
CAMERA TUBE
0.8X \ 160 FL



35-08-06-000
CAMERA TUBE
1X \ 200 FL




35-08-11-000
MINI CAMERA TUBE
0.8X \ 160 FL




ACCESSORIES

35-07-10-000
CAMERA TUBE CLAMP




7:1 ZOOM


35-31-10-000
7:1 ZOOM MANUAL



35-31-40-000
7:1 ZOOM MANUAL DETENT




35-31-60-000
7:1 ZOOM STEPPER MOTORIZED



FIXED MAGNIFICATION

35-07-20-000
APERTURE SET
REQUIRED FOR FIXED MAGNIFICATION SYSTEMS



A CONTROL


SWIR

NOTE:

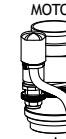
- Products listed in **RED TYPE** Indicate **SWIR** version available.
- For ordering purposes, **VISIBLE** components are identified by a "35" prefix, while **SWIR** components use a "45" e.g. 35-XX-XX-XXX VISIBLE, and 45-YY-YY-YYY SWIR
- All "35-XX" modules are compatible with one another; and all "45-YY" modules are compatible with one another.
- Using "35-XX" and "45-YY" modules with one another is not recommended.
- Non-optics mounts/modules are cross-compatible between VISIBLE and **SWIR**

LOWER FUNCTION MODULES

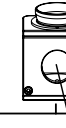
35-03-10-000
15mm FOCUS MANUAL



35-03-30-000
15mm FOCUS STEPPER MOTOR



35-07-03-000
FLUORESCENT CUBE HOLDER LOWER




NOTE: USES ZEISS TYPE 91029 CUBE. USE WITH 35-01-00-000 BASIC LOWER FUNCTION MODULE RECOMMENDED.

B CONTROL


ILLUMINATION

35-01-00-000
BASIC




LOWER LENSES


35-00-11-000
0.4X \ 500 FL




35-00-10-000
0.5X \ 400 FL




35-00-09-000
0.67X \ 300 FL




35-00-08-000
1X \ 200 FL




35-00-06-000
1.25X \ 160 FL



35-00-03-000
2X \ 100 FL

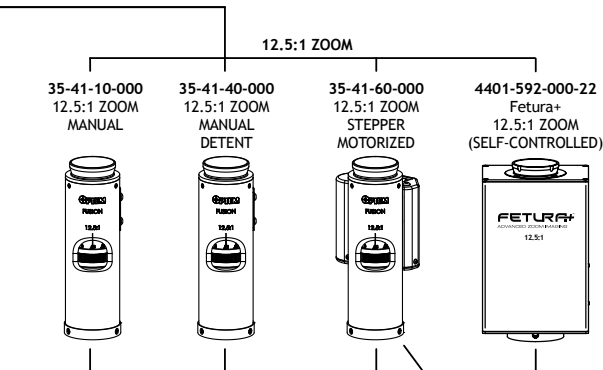
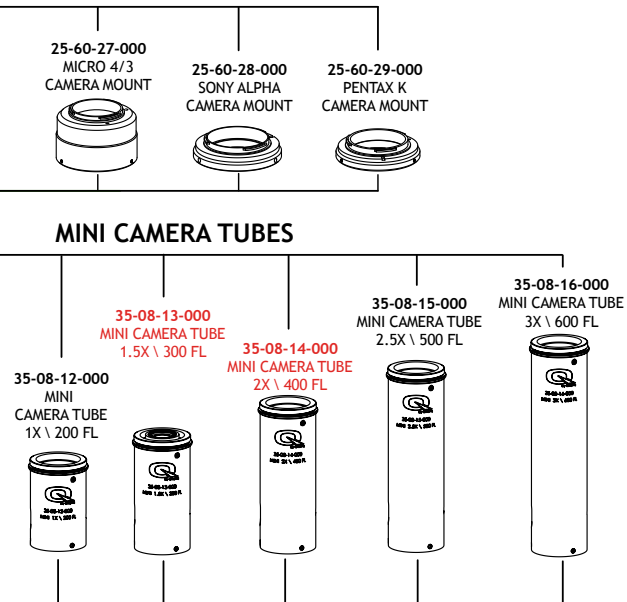


42-30-41-000
INFINITY MACRO LENS



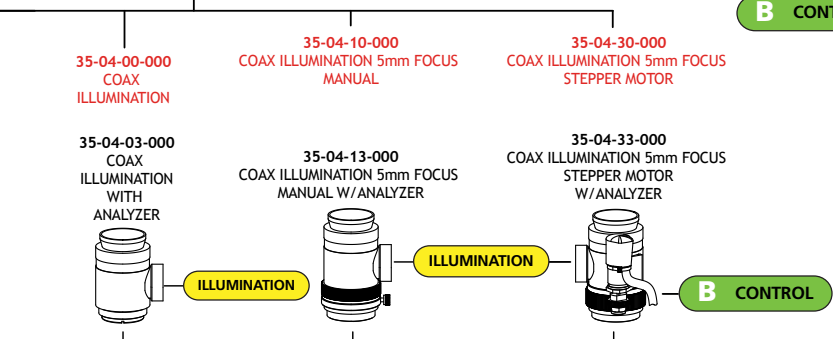
ment Matrix

ILLUMINATION



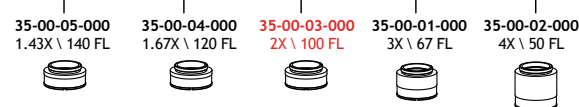
ACCESSORIES

A CONTROL



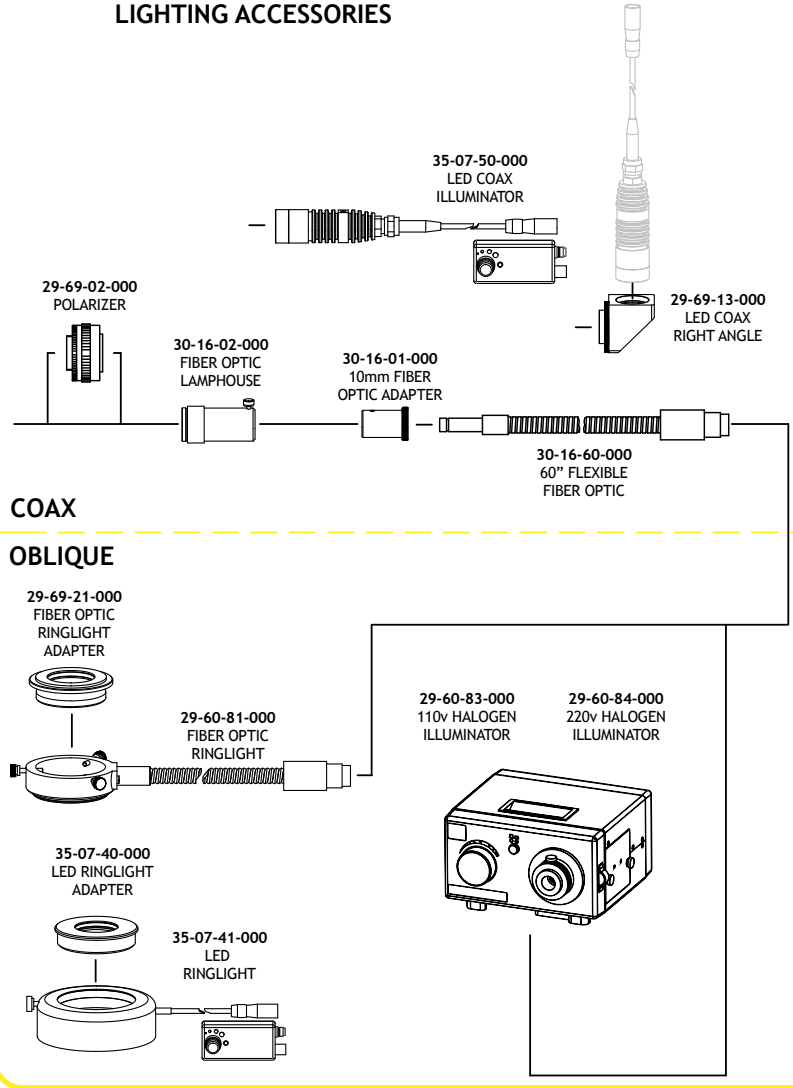
ACCESSORIES

ILLUMINATION

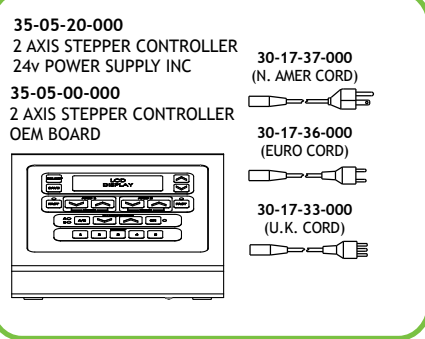


NOTE: COAX ILLUMINATION HAS LIMITED FIELD ILLUMINATION WITH LARGE FOVS.

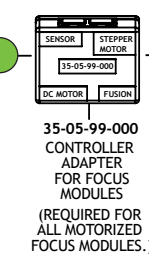
LIGHTING ACCESSORIES



A CONTROL



B CONTROL



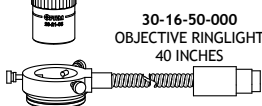
LWD OBJECTIVES

- 28-21-02-001 2X M PLAN APO
- 28-21-05-001 5X M PLAN APO
- 28-21-10-000 10X M PLAN APO
- 28-21-11-001 20X M PLAN APO
- 28-21-50-001 50X M PLAN APO

30-17-03-000
OBJECTIVE ADAPTER

28-20-44-000 5X HI-RES
28-20-45-000 10X HI-RES
28-20-46-000 20X HI-RES

CERTAIN LIMITATIONS APPLY WITH HI-RES OBJECTIVES. SEE BROCHURE FOR DETAILS.



Optical Performance - Fixed Magnification with Lower

Chart 1A

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | | |
|---|-------------------|---|--------|---|---|--------|---|--|--------|---|---|-------|---|-----|
| Max FOV Dia. | | 100 | | | 80 | | | 60 | | | 40 | | | |
| Max Coax FOV Dia. | | 13 | | | 13 | | | 14 | | | 12 | | | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 5mm Stop | FOV (mm) | NA | 0.0050 | | | 0.0063 | | | 0.0083 | | | 0.013 | | |
| | | Res (lp/mm) | 15 | | | 19 | | | 25 | | | 38 | | |
| | | Mag | 0.16 | | | 0.20 | | | 0.27 | | | 0.40 | | |
| | | DOF (mm) | 23 | | | 15 | | | 8.2 | | | 3.6 | | |
| | Cam Format | 1/3" | 23 | x | 30 | 18 | x | 24 | 14 | x | 18 | 9.0 | x | 12 |
| | | 1/2" | 30 | x | 40 | 24 | x | 32 | 18 | x | 24 | 12 | x | 16 |
| | | 2/3" | 41 | x | 55 | 33 | x | 44 | 25 | x | 33 | 17 | x | 22 |
| 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 5mm Stop | FOV (mm) | NA | 0.0050 | | | 0.0063 | | | 0.0083 | | | 0.013 | | |
| | | Res (lp/mm) | 15 | | | 19 | | | 25 | | | 38 | | |
| | | Mag | 0.20 | | | 0.25 | | | 0.33 | | | 0.50 | | |
| | | DOF (mm) | 23 | | | 15 | | | 8.2 | | | 3.6 | | |
| | Cam Format | 1/3" | 18 | x | 24 | 14 | x | 19 | 11 | x | 14 | 7.2 | x | 9.6 |
| | | 1/2" | 24 | x | 32 | 19 | x | 26 | 14 | x | 19 | 9.6 | x | 13 |
| | | 2/3" | 33 | x | 44 | 26 | x | 35 | 20 | x | 26 | 13 | x | 18 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 8mm Stop | FOV (mm) | NA | 0.0080 | | | 0.010 | | | 0.013 | | | 0.020 | | |
| | | Res (lp/mm) | 24 | | | 30 | | | 40 | | | 60 | | |
| | | Mag | 0.24 | | | 0.30 | | | 0.40 | | | 0.60 | | |
| | | DOF (mm) | 8.9 | | | 5.7 | | | 3.2 | | | 1.4 | | |
| | Cam Format | 1/3" | 15 | x | 20 | 12 | x | 16 | 9.0 | x | 12 | 6.0 | x | 8.0 |
| | | 1/2" | 20 | x | 27 | 16 | x | 21 | 12 | x | 16 | 8.0 | x | 11 |
| | | 2/3" | 28 | x | 37 | 22 | x | 29 | 17 | x | 22 | 11 | x | 15 |
| 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 12mm Stop | FOV (mm) | NA | 0.012 | | | 0.015 | | | 0.020 | | | 0.030 | | |
| | | Res (lp/mm) | 36 | | | 45 | | | 60 | | | 90 | | |
| | | Mag | 0.32 | | | 0.40 | | | 0.53 | | | 0.80 | | |
| | | DOF (mm) | 3.9 | | | 2.5 | | | 1.4 | | | 0.63 | | |
| | Cam Format | 1/3" | 11 | x | 15 | 9.0 | x | 12 | 6.8 | x | 9.0 | 4.5 | x | 6.0 |
| | | 1/2" | 15 | x | 20 | 12 | x | 16 | 9.0 | x | 12 | 6.0 | x | 8.0 |
| | | 2/3" | 21 | x | 28 | 17 | x | 22 | 12 | x | 17 | 8.3 | x | 11 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 18mm Stop | FOV (mm) | NA | 0.018 | | | 0.023 | | | 0.030 | | | 0.045 | | |
| | | Res (lp/mm) | 54 | | | 68 | | | 90 | | | 135 | | |
| | | Mag | 0.40 | | | 0.50 | | | 0.67 | | | 1.0 | | |
| | | DOF (mm) | 1.8 | | | 1.1 | | | 0.63 | | | 0.28 | | |
| | Cam Format | 1/3" | 9.0 | x | 12 | 7.2 | x | 9.6 | 5.4 | x | 7.2 | 3.6 | x | 4.8 |
| | | 1/2" | 12 | x | 16 | 9.6 | x | 13 | 7.2 | x | 9.6 | 4.8 | x | 6.4 |
| | | 2/3" | 17 | x | 22 | 13 | x | 18 | 9.9 | x | 13 | 6.6 | x | 8.8 |

-- Useable FOV Limited by Coax illumination (>50% Illumination)

-- FOV Limited by vignetting

Lenses

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm |
|--|--|---|--|---|---|
| 32 | 28 | 24 | 20 | 15 | 10 |
| 12 | 13 | 14 | 15 | 15 | 10 |
| 0.016 | 0.018 | 0.021 | 0.025 | 0.037 | 0.050 |
| 47 | 54 | 63 | 75 | 112 | 150 |
| 0.50 | 0.57 | 0.67 | 0.80 | 1.2 | 1.6 |
| 2.3 | 1.8 | 1.3 | 0.91 | 0.40 | 0.23 |
| 7.2 x 9.6 | 6.3 x 8.4 | 5.4 x 7.2 | 4.5 x 6.0 | 3.0 x 4.0 | 2.3 x 3.0 |
| 9.6 x 13 | 8.4 x 11 | 7.2 x 9.6 | 6.0 x 8.0 | 4.0 x 5.3 | 3.0 x 4.0 |
| 13 x 18 | 12 x 15 | 9.9 x 13 | 8.3 x 11 | 5.5 x 7.3 | 4.1 x 5.5 |
| 0.016 | 0.018 | 0.021 | 0.025 | 0.037 | 0.050 |
| 47 | 54 | 63 | 75 | 112 | 150 |
| 0.63 | 0.71 | 0.83 | 1.0 | 1.5 | 2.0 |
| 2.3 | 1.8 | 1.3 | 0.91 | 0.40 | 0.23 |
| 5.8 x 7.7 | 5.0 x 6.7 | 4.3 x 5.8 | 3.6 x 4.8 | 2.4 x 3.2 | 1.8 x 2.4 |
| 7.7 x 10 | 6.7 x 9.0 | 5.8 x 7.7 | 4.8 x 6.4 | 3.2 x 4.3 | 2.4 x 3.2 |
| 11 x 14 | 9.2 x 12 | 7.9 x 11 | 6.6 x 8.8 | 4.4 x 5.9 | 3.3 x 4.4 |
| 0.025 | 0.029 | 0.033 | 0.040 | 0.060 | 0.080 |
| 75 | 86 | 100 | 120 | 180 | 240 |
| 0.75 | 0.86 | 1.0 | 1.2 | 1.8 | 2.4 |
| 0.91 | 0.69 | 0.51 | 0.35 | 0.16 | 0.089 |
| 4.8 x 6.4 | 4.2 x 5.6 | 3.6 x 4.8 | 3.0 x 4.0 | 2.0 x 2.7 | 1.5 x 2.0 |
| 6.4 x 8.5 | 5.6 x 7.5 | 4.8 x 6.4 | 4.0 x 5.3 | 2.7 x 3.6 | 2.0 x 2.7 |
| 8.8 x 12 | 7.7 x 10 | 6.6 x 8.8 | 5.5 x 7.3 | 3.7 x 4.9 | 2.8 x 3.7 |
| 0.038 | 0.043 | 0.050 | 0.060 | 0.090 | 0.12 |
| 113 | 129 | 150 | 180 | 270 | 360 |
| 1.0 | 1.1 | 1.3 | 1.6 | 2.4 | 3.2 |
| 0.40 | 0.31 | 0.23 | 0.16 | 0.070 | 0.039 |
| 3.6 x 4.8 | 3.2 x 4.2 | 2.7 x 3.6 | 2.3 x 3.0 | 1.5 x 2.0 | 1.1 x 1.5 |
| 4.8 x 6.4 | 4.2 x 5.6 | 3.6 x 4.8 | 3.0 x 4.0 | 2.0 x 2.7 | 1.5 x 2.0 |
| 6.6 x 8.8 | 5.8 x 7.7 | 5.0 x 6.6 | 4.1 x 5.5 | 2.8 x 3.7 | 2.1 x 2.8 |
| 0.056 | 0.064 | 0.075 | 0.090 | 0.13 | 0.18 |
| 169 | 193 | 225 | 270 | 405 | 540 |
| 1.25 | 1.43 | 1.67 | 2.0 | 3.0 | 4.0 |
| 0.18 | 0.14 | 0.10 | 0.070 | 0.031 | 0.018 |
| 2.9 x 3.8 | 2.5 x 3.4 | 2.2 x 2.9 | 1.8 x 2.4 | 1.2 x 1.6 | 0.90 x 1.2 |
| 3.8 x 5.1 | 3.4 x 4.5 | 2.9 x 3.8 | 2.4 x 3.2 | 1.6 x 2.1 | 1.2 x 1.6 |
| 5.3 x 7.0 | 4.6 x 6.2 | 4.0 x 5.3 | 3.3 x 4.4 | 2.2 x 2.9 | 1.7 x 2.2 |

Optical Performance - Fixed Magnification with Lower

Chart 1B

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | | | |
|--|--|---|--------------------|-------|---|-------|-------|--|-------|-------|---|-------|-------|-----|--|
| Max FOV Dia. | | 100 | | | 80 | | | 60 | | | 40 | | | | |
| Max Coax FOV Dia. | | 13 | | | 13 | | | 14 | | | 12 | | | | |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 12mm Stop | FOV (mm) Cam Format | NA | 0.012 | | | 0.015 | | | 0.020 | | | 0.030 | | | |
| | | Res (lp/mm) | 36 | | | 45 | | | 60 | | | 90 | | | |
| | | Mag | 0.60 | | | 0.75 | | | 1.0 | | | 1.5 | | | |
| | | DOF (mm) | 3.9 | | | 2.5 | | | 1.4 | | | 0.63 | | | |
| | | 2/3" | 11 | x | 15 | 8.8 | x | 12 | 6.6 | x | 8.8 | 4.4 | x | 5.9 | |
| | | 1" | 16 | x | 21 | 13 | x | 17 | 9.6 | x | 13 | 6.4 | x | 8.5 | |
| | | 4/3" | 23 | x | 30 | 18 | x | 24 | 14 | x | 18 | 9.0 | x | 12 | |
| | | APS-C | 28 | x | 42 | 22 | x | 33 | 17 | x | 25 | 11 | x | 17 | |
| | 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 18mm Stop | FOV (mm) Cam Format | NA | 0.018 | | | 0.023 | | | 0.030 | | | 0.045 | | |
| | | | Res (lp/mm) | 54 | | | 68 | | | 90 | | | 135 | | |
| Mag | | | 0.80 | | | 1.0 | | | 1.3 | | | 2.0 | | | |
| DOF (mm) | | | 1.8 | | | 1.1 | | | 0.63 | | | 0.28 | | | |
| | | 2/3" | 8.3 | x | 11 | 6.6 | x | 8.8 | 5.0 | x | 6.6 | 3.3 | x | 4.4 | |
| | | 1" | 12 | x | 16 | 9.6 | x | 13 | 7.2 | x | 9.6 | 4.8 | x | 6.4 | |
| | | 4/3" | 17 | x | 23 | 14 | x | 18 | 10 | x | 14 | 6.8 | x | 9.0 | |
| | | APS-C | 21 | x | 31 | 17 | x | 25 | 13 | x | 19 | 8.4 | x | 13 | |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 18mm Stop | | FOV (mm) Cam Format | NA | 0.018 | | | 0.023 | | | 0.030 | | | 0.045 | | |
| | | | Res (lp/mm) | 54 | | | 68 | | | 90 | | | 135 | | |
| | Mag | | 1.0 | | | 1.3 | | | 1.7 | | | 2.5 | | | |
| | DOF (mm) | | 1.8 | | | 1.1 | | | 0.63 | | | 0.28 | | | |
| | | 1" | 9.6 | x | 13 | 7.7 | x | 10 | 5.8 | x | 7.7 | 3.8 | x | 5.1 | |
| | | 4/3" | 14 | x | 18 | 11 | x | 14 | 8.1 | x | 11 | 5.4 | x | 7.2 | |
| | | APS-C | 17 | x | 25 | 13 | x | 20 | 10 | x | 15 | 6.7 | x | 10 | |
| | | 35mm (FULL) | 24 | x | 36 | 19 | x | 29 | 14 | x | 22 | 9.6 | x | 14 | |
| | 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 18mm Stop | FOV (mm) Cam Format | NA | 0.018 | | | 0.023 | | | 0.030 | | | 0.045 | | |
| | | | Res (lp/mm) | 54 | | | 68 | | | 90 | | | 135 | | |
| Mag | | | 1.2 | | | 1.5 | | | 2.0 | | | 3.0 | | | |
| DOF (mm) | | | 1.8 | | | 1.1 | | | 0.63 | | | 0.28 | | | |
| | | 1" | 8.0 | x | 11 | 6.4 | x | 8.5 | 4.8 | x | 6.4 | 3.2 | x | 4.3 | |
| | | 4/3" | 11 | x | 15 | 9.0 | x | 12 | 6.8 | x | 9.0 | 4.5 | x | 6.0 | |
| | | APS-C | 14 | x | 21 | 11 | x | 17 | 8.4 | x | 13 | 5.6 | x | 8.4 | |
| | | 35mm (FULL) | 20 | x | 30 | 16 | x | 24 | 12 | x | 18 | 8.0 | x | 12 | |

- Useable FOV Limited by Coax illumination (>50% Illumination)
- FOV Limited by vignetting

| | Height | x | Width | Diag. |
|--------------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Lenses - Mini Camera Tubes

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm |
|--|--|---|--|---|---|
| 32 | 28 | 24 | 20 | 15 | 10 |
| 12 | 13 | 14 | 15 | 15 | 10 |
| 0.038 | 0.043 | 0.050 | 0.060 | 0.090 | 0.12 |
| 113 | 129 | 150 | 180 | 270 | 360 |
| 1.9 | 2.1 | 2.5 | 3.0 | 4.5 | 6.0 |
| 0.40 | 0.31 | 0.23 | 0.16 | 0.070 | 0.039 |
| 3.5 x 4.7 | 3.1 x 4.1 | 2.6 x 3.5 | 2.2 x 2.9 | 1.5 x 2.0 | 1.1 x 1.5 |
| 5.1 x 6.8 | 4.5 x 6.0 | 3.8 x 5.1 | 3.2 x 4.3 | 2.1 x 2.8 | 1.6 x 2.1 |
| 7.2 x 9.6 | 6.3 x 8.4 | 5.4 x 7.2 | 4.5 x 6.0 | 3.0 x 4.0 | 2.3 x 3.0 |
| 8.9 x 13 | 7.8 x 12 | 6.7 x 10 | 5.6 x 8.4 | 3.7 x 5.6 | 2.8 x 4.2 |
| 0.056 | 0.064 | 0.075 | 0.090 | 0.13 | 0.18 |
| 169 | 193 | 225 | 270 | 405 | 540 |
| 2.5 | 2.9 | 3.3 | 4.0 | 6.0 | 8.0 |
| 0.18 | 0.14 | 0.101 | 0.070 | 0.031 | 0.018 |
| 2.6 x 3.5 | 2.3 x 3.1 | 2.0 x 2.6 | 1.7 x 2.2 | 1.1 x 1.5 | 0.83 x 1.1 |
| 3.8 x 5.1 | 3.4 x 4.5 | 2.9 x 3.8 | 2.4 x 3.2 | 1.6 x 2.1 | 1.2 x 1.6 |
| 5.4 x 7.2 | 4.7 x 6.3 | 4.1 x 5.4 | 3.4 x 4.5 | 2.3 x 3.0 | 1.7 x 2.3 |
| 6.7 x 10 | 5.8 x 8.8 | 5.0 x 7.5 | 4.2 x 6.3 | 2.8 x 4.2 | 2.1 x 3.1 |
| 0.056 | 0.064 | 0.075 | 0.090 | 0.13 | 0.18 |
| 169 | 193 | 225 | 270 | 405 | 540 |
| 3.1 | 3.6 | 4.2 | 5.0 | 7.5 | 10 |
| 0.18 | 0.14 | 0.10 | 0.070 | 0.031 | 0.018 |
| 3.1 x 4.1 | 2.7 x 3.6 | 2.3 x 3.1 | 1.9 x 2.6 | 1.3 x 1.7 | 0.96 x 1.3 |
| 4.3 x 5.8 | 3.8 x 5.0 | 3.2 x 4.3 | 2.7 x 3.6 | 1.8 x 2.4 | 1.4 x 1.8 |
| 5.3 x 8.0 | 4.7 x 7.0 | 4.0 x 6.0 | 3.3 x 5.0 | 2.2 x 3.3 | 1.7 x 2.5 |
| 7.7 x 12 | 6.7 x 10 | 5.8 x 8.6 | 4.8 x 7.2 | 3.2 x 4.8 | 2.4 x 3.6 |
| 0.056 | 0.064 | 0.075 | 0.090 | 0.13 | 0.18 |
| 169 | 193 | 225 | 270 | 405 | 540 |
| 3.8 | 4.3 | 5.0 | 6.0 | 9.0 | 12 |
| 0.18 | 0.14 | 0.10 | 0.070 | 0.031 | 0.018 |
| 2.6 x 3.4 | 2.2 x 3.0 | 1.9 x 2.6 | 1.6 x 2.1 | 1.1 x 1.4 | 0.80 x 1.1 |
| 3.6 x 4.8 | 3.2 x 4.2 | 2.7 x 3.6 | 2.3 x 3.0 | 1.5 x 2.0 | 1.1 x 1.5 |
| 4.5 x 6.7 | 3.9 x 5.9 | 3.3 x 5.0 | 2.8 x 4.2 | 1.9 x 2.8 | 1.4 x 2.1 |
| 6.4 x 9.6 | 5.6 x 8.4 | 4.8 x 7.2 | 4.0 x 6.0 | 2.7 x 4.0 | 2.0 x 3.0 |

Optical Performance - Fixed Magnification with LWD

Chart 1C

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | | | 5X M Plan Apo 28-21-05-001 WD: 41mm | | | 10X M Plan Apo 28-21-10-000 WD: 34mm | | | 20X M Plan Apo 28-21-11-001 WD: 20mm | | | |
|--|------------------------|---|-----|---|---|------|---|--|------|---|--|------|---|------|
| Max FOV Dia. | | 17 | | | 16 | | | 10 | | | 5.4 | | | |
| Max Coax FOV Dia. | | 16 | | | 11 | | | 5.0 | | | 2.6 | | | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 NO Stop | NA | 0.057 | | | 0.14 | | | 0.30 | | | 0.42 | | | |
| | Res (lp/mm) | 170 | | | 420 | | | 900 | | | 1260 | | | |
| | Mag | 0.80 | | | 2.0 | | | 4.0 | | | 8.0 | | | |
| | DOF (mm) | 0.18 | | | 0.029 | | | 0.0063 | | | 0.0032 | | | |
| | FOV (mm) Cam Format | 1/3" | 4.5 | x | 6.0 | 1.8 | x | 2.4 | 0.90 | x | 1.2 | 0.45 | x | 0.60 |
| | | 1/2" | 6.0 | x | 8.0 | 2.4 | x | 3.2 | 1.2 | x | 1.6 | 0.60 | x | 0.80 |
| | | 2/3" | 8.3 | x | 11 | 3.3 | x | 4.4 | 1.7 | x | 2.2 | 0.83 | x | 1.1 |
| 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 NO Stop | NA | 0.057 | | | 0.14 | | | 0.30 | | | 0.42 | | | |
| | Res (lp/mm) | 170 | | | 420 | | | 900 | | | 1260 | | | |
| | Mag | 1.0 | | | 2.5 | | | 5.0 | | | 10 | | | |
| | DOF (mm) | 0.18 | | | 0.029 | | | 0.0063 | | | 0.0032 | | | |
| | FOV (mm) Cam Format | 1/3" | 3.6 | x | 4.8 | 1.4 | x | 1.9 | 0.72 | x | 0.96 | 0.36 | x | 0.48 |
| | | 1/2" | 4.8 | x | 6.4 | 1.9 | x | 2.6 | 0.96 | x | 1.3 | 0.48 | x | 0.64 |
| | | 2/3" | 6.6 | x | 8.8 | 2.6 | x | 3.5 | 1.3 | x | 1.8 | 0.66 | x | 0.88 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 NO Stop | NA | 0.057 | | | 0.14 | | | 0.30 | | | 0.42 | | | |
| | Res (lp/mm) | 170 | | | 420 | | | 900 | | | 1260 | | | |
| | Mag | 1.2 | | | 3.0 | | | 6.0 | | | 12 | | | |
| | DOF (mm) | 0.18 | | | 0.029 | | | 0.0063 | | | 0.0032 | | | |
| | FOV (mm) Cam Format | 1/3" | 3.0 | x | 4.0 | 1.2 | x | 1.6 | 0.60 | x | 0.80 | 0.30 | x | 0.40 |
| | | 1/2" | 4.0 | x | 5.3 | 1.6 | x | 2.1 | 0.80 | x | 1.1 | 0.40 | x | 0.53 |
| | | 2/3" | 5.5 | x | 7.3 | 2.2 | x | 2.9 | 1.1 | x | 1.5 | 0.55 | x | 0.73 |
| 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 NO Stop | NA | 0.057 | | | 0.14 | | | 0.30 | | | 0.42 | | | |
| | Res (lp/mm) | 170 | | | 420 | | | 900 | | | 1260 | | | |
| | Mag | 1.6 | | | 4.0 | | | 8.0 | | | 16 | | | |
| | DOF (mm) | 0.18 | | | 0.029 | | | 0.0063 | | | 0.0032 | | | |
| | FOV (mm) Cam Format | 1/3" | 2.3 | x | 3.0 | 0.90 | x | 1.2 | 0.45 | x | 0.60 | 0.23 | x | 0.30 |
| | | 1/2" | 3.0 | x | 4.0 | 1.2 | x | 1.6 | 0.60 | x | 0.80 | 0.30 | x | 0.40 |
| | | 2/3" | 4.1 | x | 5.5 | 1.7 | x | 2.2 | 0.83 | x | 1.1 | 0.41 | x | 0.55 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 NO Stop | NA | 0.057 | | | 0.14 | | | 0.30 | | | 0.42 | | | |
| | Res (lp/mm) | 170 | | | 420 | | | 900 | | | 1260 | | | |
| | Mag | 2.0 | | | 5.0 | | | 10 | | | 20 | | | |
| | DOF (mm) | 0.18 | | | 0.029 | | | 0.0063 | | | 0.0032 | | | |
| | FOV (mm) Cam Format | 1/3" | 1.8 | x | 2.4 | 0.72 | x | 0.96 | 0.36 | x | 0.48 | 0.18 | x | 0.24 |
| | | 1/2" | 2.4 | x | 3.2 | 0.96 | x | 1.3 | 0.48 | x | 0.64 | 0.24 | x | 0.32 |
| | | 2/3" | 3.3 | x | 4.4 | 1.3 | x | 1.8 | 0.66 | x | 0.88 | 0.33 | x | 0.44 |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

Objectives


| 50X M Plan Apo 28-21-50-001 WD: 13mm | | | 5X HiRes 28-20-44-000 WD: 34mm | | | 10X HiRes 28-20-45-000 WD: 19mm | | | 20X HiRes 28-20-46-000 WD: 13mm | | |
|---|---|-------|---|---|------|--|---|------|--|---|------|
| 2.3 | | | 10 | | | 5.2 | | | 4.5 | | |
| 1.1 | | | 7.0 | | | 2.8 | | | 2.1 | | |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 20 | | | 2.0 | | | 4.0 | | | 8.0 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.18 | x | 0.24 | 1.8 | x | 2.4 | 0.90 | x | 1.2 | 0.45 | x | 0.60 |
| 0.24 | x | 0.32 | 2.4 | x | 3.2 | 1.2 | x | 1.6 | 0.60 | x | 0.80 |
| 0.33 | x | 0.44 | 3.3 | x | 4.4 | 1.7 | x | 2.2 | 0.83 | x | 1.1 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 25 | | | 2.5 | | | 5.0 | | | 10 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.14 | x | 0.19 | 1.4 | x | 1.9 | 0.72 | x | 0.96 | 0.36 | x | 0.48 |
| 0.19 | x | 0.26 | 1.9 | x | 2.6 | 0.96 | x | 1.3 | 0.48 | x | 0.64 |
| 0.26 | x | 0.35 | 2.6 | x | 3.5 | 1.3 | x | 1.8 | 0.66 | x | 0.88 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 30 | | | 3.0 | | | 6.0 | | | 12 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.12 | x | 0.16 | 1.2 | x | 1.6 | 0.60 | x | 0.80 | 0.30 | x | 0.40 |
| 0.16 | x | 0.21 | 1.6 | x | 2.1 | 0.80 | x | 1.1 | 0.40 | x | 0.53 |
| 0.22 | x | 0.29 | 2.2 | x | 2.9 | 1.1 | x | 1.5 | 0.55 | x | 0.73 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 40 | | | 4.0 | | | 8.0 | | | 16 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.090 | x | 0.12 | 0.90 | x | 1.2 | 0.45 | x | 0.60 | 0.23 | x | 0.30 |
| 0.12 | x | 0.16 | 1.2 | x | 1.6 | 0.60 | x | 0.80 | 0.30 | x | 0.40 |
| 0.17 | x | 0.22 | 1.7 | x | 2.2 | 0.83 | x | 1.1 | 0.41 | x | 0.55 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 50 | | | 5.0 | | | 10 | | | 20 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.072 | x | 0.096 | 0.72 | x | 0.96 | 0.36 | x | 0.48 | 0.18 | x | 0.24 |
| 0.096 | x | 0.13 | 0.96 | x | 1.3 | 0.48 | x | 0.64 | 0.24 | x | 0.32 |
| 0.13 | x | 0.18 | 1.3 | x | 1.8 | 0.66 | x | 0.88 | 0.33 | x | 0.44 |


Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - Fixed Magnification with LWD

Chart 1D

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | 5X M Plan Apo 28-21-05-001 WD: 41mm | 10X M Plan Apo 28-21-10-000 WD: 34mm | 20X M Plan Apo 28-21-11-001 WD: 20mm |
|---|-------------------------------|--|--|---|---|
| Max FOV Dia. | | 17 | 16 | 10 | 5.4 |
| Max Coax FOV Dia. | | 16 | 11 | 5.0 | 2.6 |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 NO Stop | NA | 0.057 | 0.14 | 0.30 | 0.42 |
| | Res (lp/mm) | 170 | 420 | 900 | 1260 |
| | Mag | 3.0 | 7.5 | 15 | 30 |
| | DOF (mm) | 0.18 | 0.029 | 0.0063 | 0.0032 |
| | FOV (mm) Cam Format | 2/3" | 2.2 x 2.9 | 0.88 x 1.2 | 0.44 x 0.59 |
| | 1" | 3.2 x 4.3 | 1.3 x 1.7 | 0.64 x 0.85 | 0.32 x 0.43 |
| | 4/3" | 4.5 x 6.0 | 1.8 x 2.4 | 0.90 x 1.2 | 0.45 x 0.60 |
| | APS-C | 5.6 x 8.4 | 2.2 x 3.3 | 1.1 x 1.7 | 0.56 x 0.84 |
| 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 NO Stop | NA | 0.057 | 0.14 | 0.30 | 0.42 |
| | Res (lp/mm) | 170 | 420 | 900 | 1260 |
| | Mag | 4.0 | 10 | 20 | 40 |
| | DOF (mm) | 0.18 | 0.029 | 0.0063 | 0.0032 |
| | FOV (mm) Cam Format | 2/3" | 1.7 x 2.2 | 0.66 x 0.88 | 0.33 x 0.44 |
| | 1" | 2.4 x 3.2 | 0.96 x 1.3 | 0.48 x 0.64 | 0.24 x 0.32 |
| | 4/3" | 3.4 x 4.5 | 1.4 x 1.8 | 0.68 x 0.90 | 0.34 x 0.45 |
| | APS-C | 4.2 x 6.3 | 1.7 x 2.5 | 0.84 x 1.3 | 0.42 x 0.63 |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 NO Stop | NA | 0.057 | 0.14 | 0.30 | 0.42 |
| | Res (lp/mm) | 170 | 420 | 900 | 1260 |
| | Mag | 5.0 | 12.5 | 25 | 50 |
| | DOF (mm) | 0.18 | 0.029 | 0.0063 | 0.0032 |
| | FOV (mm) Cam Format | 1" | 1.9 x 2.6 | 0.77 x 1.0 | 0.38 x 0.51 |
| | 4/3" | 2.7 x 3.6 | 1.1 x 1.4 | 0.54 x 0.72 | 0.27 x 0.36 |
| | APS-C | 3.3 x 5.0 | 1.3 x 2.0 | 0.67 x 1.0 | 0.33 x 0.50 |
| | 35mm(Full) | 4.8 x 7.2 | 1.9 x 2.9 | 1.0 x 1.4 | 0.48 x 0.72 |
| 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 NO Stop | NA | 0.057 | 0.14 | 0.30 | 0.42 |
| | Res (lp/mm) | 170 | 420 | 900 | 1260 |
| | Mag | 6.0 | 15 | 30 | 60 |
| | DOF (mm) | 0.18 | 0.029 | 0.0063 | 0.0032 |
| | FOV (mm) Cam Format | 1" | 1.6 x 2.1 | 0.64 x 0.85 | 0.32 x 0.43 |
| | 4/3" | 2.3 x 3.0 | 0.90 x 1.2 | 0.45 x 0.60 | 0.23 x 0.30 |
| | APS-C | 2.8 x 4.2 | 1.1 x 1.7 | 0.56 x 0.84 | 0.28 x 0.42 |
| | 35mm(Full) | 4.0 x 6.0 | 1.6 x 2.4 | 0.80 x 1.2 | 0.40 x 0.60 |

 -- Useable FOV Limited by Coax illumination (>50% Illumination)

 -- FOV Limited by vignetting

| | Height | x | Width | Diag. |
|--------------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Objectives - Mini Camera Tubes

| 50X M Plan Apo 28-21-50-001 WD: 13mm | | | 5X HiRes 28-20-44-000 WD: 34mm | | | 10X HiRes 28-20-45-000 WD: 19mm | | | 20X HiRes 28-20-46-000 WD: 13mm | | |
|---|---|-------|---|---|------|--|---|------|--|---|------|
| 2.3 | | | 10 | | | 5.2 | | | 4.5 | | |
| 1.1 | | | 7.0 | | | 2.8 | | | 2.1 | | |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 75 | | | 7.5 | | | 15 | | | 30 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.088 | x | 0.12 | 0.88 | x | 1.2 | 0.44 | x | 0.59 | 0.22 | x | 0.29 |
| 0.13 | x | 0.17 | 1.3 | x | 1.7 | 0.64 | x | 0.85 | 0.32 | x | 0.43 |
| 0.18 | x | 0.24 | 1.8 | x | 2.4 | 0.90 | x | 1.2 | 0.45 | x | 0.60 |
| 0.22 | x | 0.33 | 2.2 | x | 3.3 | 1.1 | x | 1.7 | 0.56 | x | 0.84 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 100 | | | 10 | | | 20 | | | 40 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.066 | x | 0.088 | 0.66 | x | 0.88 | 0.33 | x | 0.44 | 0.17 | x | 0.22 |
| 0.096 | x | 0.13 | 0.96 | x | 1.3 | 0.48 | x | 0.64 | 0.24 | x | 0.32 |
| 0.14 | x | 0.18 | 1.4 | x | 1.8 | 0.68 | x | 0.90 | 0.34 | x | 0.45 |
| 0.17 | x | 0.25 | 1.7 | x | 2.5 | 0.84 | x | 1.3 | 0.42 | x | 0.63 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 125 | | | 12.5 | | | 25 | | | 50 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.08 | x | 0.10 | 0.77 | x | 1.0 | 0.38 | x | 0.51 | 0.19 | x | 0.26 |
| 0.11 | x | 0.14 | 1.1 | x | 1.4 | 0.54 | x | 0.72 | 0.27 | x | 0.36 |
| 0.13 | x | 0.20 | 1.3 | x | 2.0 | 0.67 | x | 1.0 | 0.33 | x | 0.50 |
| 0.19 | x | 0.29 | 1.9 | x | 2.9 | 0.96 | x | 1.4 | 0.48 | x | 0.72 |
| 0.55 | | | 0.225 | | | 0.45 | | | 0.60 | | |
| 1650 | | | 675 | | | 1350 | | | 1800 | | |
| 150 | | | 15 | | | 30 | | | 60 | | |
| 0.0019 | | | 0.011 | | | 0.0028 | | | 0.0016 | | |
| 0.064 | x | 0.085 | 0.64 | x | 0.85 | 0.32 | x | 0.43 | 0.16 | x | 0.21 |
| 0.090 | x | 0.12 | 0.90 | x | 1.2 | 0.45 | x | 0.60 | 0.23 | x | 0.30 |
| 0.11 | x | 0.17 | 1.1 | x | 1.7 | 0.56 | x | 0.84 | 0.28 | x | 0.42 |
| 0.16 | x | 0.24 | 1.6 | x | 2.4 | 0.80 | x | 1.2 | 0.40 | x | 0.60 |

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 7:1 Zoom with Lower

Chart 2A

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | |
|---|-------------------------------|---|----------|---|----------|--|----------|---|----------|-----------|
| Max FOV Dia. | | 156 | | 125 | | 94 | | 63 | | |
| Max Coax FOV Dia. | | NR | | NR | | NR | | 19 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 | Res (lp/mm) | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | 14 | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | | Mag | 0.067 | 0.46 | 0.084 | 0.58 | 0.11 | 0.77 | 0.17 | 1.2 |
| | FOV (mm) Cam Format | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 |
| | | 1/3" | 54 x 71 | 7.8 x 10 | 43 x 57 | 6.2 x 8.3 | 32 x 43 | 4.7 x 6.2 | 21 x 29 | 3.1 x 4.1 |
| | | 1/2" | 71 x 95 | 10 x 14 | 57 x 76 | 8.3 x 11 | 43 x 57 | 6.2 x 8.3 | 29 x 38 | 4.1 x 5.5 |
| | | 2/3" | 98 x 131 | 14 x 19 | 79 x 105 | 11 x 15 | 59 x 79 | 8.5 x 11 | 39 x 52 | 5.7 x 7.6 |
| 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 | Res (lp/mm) | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | 14 | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | | Mag | 0.084 | 0.58 | 0.11 | 0.73 | 0.14 | 0.97 | 0.21 | 1.5 |
| | FOV (mm) Cam Format | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 |
| | | 1/3" | 43 x 57 | 6.2 x 8.3 | 34 x 46 | 5.0 x 6.6 | 26 x 34 | 3.7 x 5.0 | 17 x 23 | 2.5 x 3.3 |
| | | 1/2" | 57 x 76 | 8.3 x 11 | 46 x 61 | 6.6 x 8.8 | 34 x 46 | 5.0 x 6.6 | 23 x 30 | 3.3 x 4.4 |
| | | 2/3" | 79 x 105 | 11 x 15 | 63 x 84 | 9.1 x 12 | 47 x 63 | 6.8 x 9.1 | 31 x 42 | 4.6 x 6.1 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 | Res (lp/mm) | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | 14 | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | | Mag | 0.10 | 0.70 | 0.13 | 0.87 | 0.17 | 1.2 | 0.25 | 1.7 |
| | FOV (mm) Cam Format | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 |
| | | 1/3" | 36 x 48 | 5.2 x 6.9 | 29 x 38 | 4.1 x 5.5 | 21 x 29 | 3.1 x 4.1 | 14 x 19 | 2.1 x 2.8 |
| | | 1/2" | 48 x 63 | 6.9 x 9.2 | 38 x 51 | 5.5 x 7.4 | 29 x 38 | 4.1 x 5.5 | 19 x 25 | 2.8 x 3.7 |
| | | 2/3" | 65 x 87 | 9.5 x 13 | 52 x 70 | 7.6 x 10 | 39 x 52 | 5.7 x 7.6 | 26 x 35 | 3.8 x 5.1 |
| 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 | Res (lp/mm) | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | 14 | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | | Mag | 0.13 | 0.93 | 0.17 | 1.2 | 0.22 | 1.5 | 0.34 | 2.3 |
| | FOV (mm) Cam Format | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 |
| | | 1/3" | 27 x 36 | 3.9 x 5.2 | 21 x 29 | 3.1 x 4.1 | 16 x 21 | 2.3 x 3.1 | 11 x 14 | 1.6 x 2.1 |
| | | 1/2" | 36 x 48 | 5.2 x 6.9 | 29 x 38 | 4.1 x 5.5 | 21 x 29 | 3.1 x 4.1 | 14 x 19 | 2.1 x 2.8 |
| | | 2/3" | 49 x 65 | 7.1 x 9.5 | 39 x 52 | 5.7 x 7.6 | 29 x 39 | 4.3 x 5.7 | 20 x 26 | 2.8 x 3.8 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 | Res (lp/mm) | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | 14 | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | | Mag | 0.17 | 1.2 | 0.21 | 1.5 | 0.28 | 1.9 | 0.42 | 2.9 |
| | FOV (mm) Cam Format | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 |
| | | 1/3" | 21 x 29 | 3.1 x 4.1 | 17 x 23 | 2.5 x 3.3 | 13 x 17 | 1.9 x 2.5 | 8.6 x 11 | 1.2 x 1.7 |
| | | 1/2" | 29 x 38 | 4.1 x 5.5 | 23 x 30 | 3.3 x 4.4 | 17 x 23 | 2.5 x 3.3 | 11 x 15 | 1.7 x 2.2 |
| | | 2/3" | 39 x 52 | 5.7 x 7.6 | 31 x 42 | 4.6 x 6.1 | 24 x 31 | 3.4 x 4.6 | 16 x 21 | 2.3 x 3.0 |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

Lens

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm | |
|--|------------|--|------------|---|-------------|--|-------------|---|-------------|---|-------------|
| 50 | | 44 | | 38 | | 31 | | 21 | | 16 | |
| 19 | | 19 | | 18 | | 19 | | 13 | | 9.4 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.21 | 1.5 | 0.24 | 1.7 | 0.28 | 1.9 | 0.34 | 2.3 | 0.50 | 3.5 | 0.67 | 4.6 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 17 x 23 | 2.5 x 3.3 | 15 x 20 | 2.2 x 2.9 | 13 x 17 | 1.9 x 2.5 | 11 x 14 | 1.6 x 2.1 | 7.1 x 9.5 | 1.0 x 1.4 | 5.4 x 7.1 | 0.78 x 1.0 |
| 23 x 30 | 3.3 x 4.4 | 20 x 27 | 2.9 x 3.9 | 17 x 23 | 2.5 x 3.3 | 14 x 19 | 2.1 x 2.8 | 9.5 x 13 | 1.4 x 1.8 | 7.1 x 10 | 1.0 x 1.4 |
| 31 x 42 | 4.6 x 6.1 | 28 x 37 | 4.0 x 5.3 | 24 x 31 | 3.4 x 4.6 | 20 x 26 | 2.8 x 3.8 | 13 x 17 | 1.9 x 2.5 | 10 x 13 | 1.4 x 1.9 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.26 | 1.8 | 0.30 | 2.1 | 0.35 | 2.4 | 0.42 | 2.9 | 0.63 | 4.3 | 0.84 | 5.8 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 14 x 18 | 2.0 x 2.6 | 12 x 16 | 1.7 x 2.3 | 10 x 14 | 1.5 x 2.0 | 8.6 x 11 | 1.24 x 1.7 | 5.7 x 7.6 | 0.83 x 1.1 | 4.3 x 5.7 | 0.62 x 0.83 |
| 18 x 24 | 2.6 x 3.5 | 16 x 21 | 2.3 x 3.1 | 14 x 18 | 2.0 x 2.6 | 11 x 15 | 1.7 x 2.2 | 7.6 x 10 | 1.1 x 1.5 | 5.7 x 7.6 | 0.83 x 1.1 |
| 25 x 34 | 3.6 x 4.9 | 22 x 29 | 3.2 x 4.2 | 19 x 25 | 2.7 x 3.6 | 16 x 21 | 2.3 x 3.0 | 10 x 14 | 1.5 x 2.0 | 7.9 x 10 | 1.1 x 1.5 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.32 | 2.2 | 0.36 | 2.5 | 0.42 | 2.9 | 0.50 | 3.5 | 0.76 | 5.2 | 1.0 | 7.0 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 11 x 15 | 1.7 x 2.2 | 10 x 13 | 1.4 x 1.9 | 8.6 x 11 | 1.2 x 1.7 | 7.1 x 9.5 | 1.0 x 1.4 | 4.8 x 6.4 | 0.69 x 0.92 | 3.6 x 4.8 | 0.52 x 0.69 |
| 15 x 20 | 2.2 x 2.9 | 13 x 18 | 1.9 x 2.6 | 11 x 15 | 1.7 x 2.2 | 9.5 x 13 | 1.4 x 1.8 | 6.4 x 8.5 | 0.92 x 1.2 | 4.8 x 6.3 | 0.69 x 0.92 |
| 21 x 28 | 3.0 x 4.0 | 18 x 24 | 2.7 x 3.5 | 16 x 21 | 2.3 x 3.0 | 13 x 17 | 1.9 x 2.5 | 8.7 x 12 | 1.3 x 1.7 | 6.5 x 8.7 | 0.95 x 1.3 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.42 | 2.9 | 0.48 | 3.3 | 0.56 | 3.9 | 0.67 | 4.6 | 1.0 | 7.0 | 1.3 | 9.3 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 8.6 x 11 | 1.2 x 1.7 | 7.5 x 10 | 1.1 x 1.4 | 6.4 x 8.6 | 0.93 x 1.2 | 5.4 x 7.1 | 0.78 x 1.0 | 3.6 x 4.8 | 0.52 x 0.69 | 2.7 x 3.6 | 0.39 x 0.52 |
| 11 x 15 | 1.7 x 2.2 | 10 x 13 | 1.4 x 1.9 | 8.6 x 11 | 1.2 x 1.7 | 7.1 x 9.5 | 1.0 x 1.4 | 4.8 x 6.4 | 0.69 x 0.92 | 3.6 x 4.8 | 0.52 x 0.69 |
| 16 x 21 | 2.3 x 3.0 | 14 x 18 | 2.0 x 2.7 | 12 x 16 | 1.7 x 2.3 | 9.8 x 13 | 1.4 x 1.9 | 6.6 x 8.7 | 0.95 x 1.3 | 4.9 x 6.5 | 0.71 x 0.95 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.53 | 3.6 | 0.60 | 4.1 | 0.70 | 4.8 | 0.84 | 5.8 | 1.3 | 8.7 | 1.7 | 12 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 6.9 x 9.1 | 0.99 x 1.3 | 6.0 x 8.0 | 0.87 x 1.2 | 5.1 x 6.9 | 0.74 x 0.99 | 4.3 x 5.7 | 0.62 x 0.83 | 2.9 x 3.8 | 0.41 x 0.55 | 2.1 x 2.9 | 0.31 x 0.41 |
| 9.1 x 12 | 1.3 x 1.8 | 8.0 x 11 | 1.2 x 1.5 | 6.9 x 9.1 | 0.99 x 1.3 | 5.7 x 7.6 | 0.83 x 1.1 | 3.8 x 5.1 | 0.55 x 0.74 | 2.9 x 3.8 | 0.41 x 0.55 |
| 13 x 17 | 1.8 x 2.4 | 11 x 15 | 1.6 x 2.1 | 9.4 x 13 | 1.4 x 1.8 | 7.9 x 10 | 1.1 x 1.5 | 5.2 x 7.0 | 0.76 x 1.0 | 3.9 x 5.2 | 0.57 x 0.76 |

Optical Performance - OPTEM 7:1 Zoom with Lower

Chart 2B

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | | |
|--|--|---|--------------------|---|-----------|--|-----------|---|-----------|-------|-------|
| Max FOV Dia. | | 156 | | 125 | | 94 | | 63 | | | |
| Max Coax FOV Dia. | | NR | | NR | | NR | | 19 | | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | | |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 | FOV (mm) Cam Format | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 | |
| | | Res (lp/mm) | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 | |
| | | Mag | 0.25 | 1.7 | 0.32 | 2.2 | 0.42 | 2.9 | 0.63 | 4.4 | |
| | | DOF (mm) | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 | |
| | 2/3" | 26 x 35 | 3.8 x 5.1 | 21 x 28 | 3.0 x 4.0 | 16 x 21 | 2.3 x 3.0 | 10 x 14 | 1.5 x 2.0 | | |
| | 1" | 38 x 51 | 5.5 x 7.4 | 30 x 41 | 4.4 x 5.9 | 23 x 30 | 3.3 x 4.4 | 15 x 20 | 2.2 x 2.9 | | |
| | 4/3" | 54 x 71 | 7.8 x 10 | 43 x 57 | 6.2 x 8.3 | 32 x 43 | 4.7 x 6.2 | 21 x 29 | 3.1 x 4.1 | | |
| | APS-C | 66 x 100 | 10 x 14 | 53 x 80 | 7.7 x 12 | 40 x 60 | 5.8 x 8.7 | 27 x 40 | 3.8 x 5.8 | | |
| | 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 | FOV (mm) Cam Format | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | | Res (lp/mm) | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| Mag | | | 0.34 | 2.3 | 0.42 | 2.9 | 0.56 | 3.9 | 0.84 | 5.8 | |
| DOF (mm) | | | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 | |
| 2/3" | | 20 x 26 | 2.8 x 3.8 | 16 x 21 | 2.3 x 3.0 | 12 x 16 | 1.7 x 2.3 | 7.9 x 10 | 1.1 x 1.5 | | |
| 1" | | 29 x 38 | 4.1 x 5.5 | 23 x 30 | 3.3 x 4.4 | 17 x 23 | 2.5 x 3.3 | 11 x 15 | 1.7 x 2.2 | | |
| 4/3" | | 40 x 54 | 5.8 x 7.8 | 32 x 43 | 4.7 x 6.2 | 24 x 32 | 3.5 x 4.7 | 16 x 21 | 2.3 x 3.1 | | |
| APS-C | | 50 x 75 | 7.2 x 11 | 40 x 60 | 5.8 x 8.7 | 30 x 45 | 4.3 x 6.5 | 20 x 30 | 2.9 x 4.3 | | |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 | | FOV (mm) Cam Format | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | | Res (lp/mm) | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| | Mag | | 0.42 | 2.9 | 0.53 | 3.6 | 0.70 | 4.8 | 1.1 | 7.3 | |
| | DOF (mm) | | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 | |
| | 1" | 23 x 30 | 3.3 x 4.4 | 18 x 24 | 2.6 x 3.5 | 14 x 18 | 2.0 x 2.6 | 9.1 x 12 | 1.3 x 1.8 | | |
| | 4/3" | 32 x 43 | 4.7 x 6.2 | 26 x 34 | 3.7 x 5.0 | 19 x 26 | 2.8 x 3.7 | 13 x 17 | 1.9 x 2.5 | | |
| | APS-C | 40 x 60 | 5.8 x 8.7 | 32 x 48 | 4.6 x 6.9 | 24 x 36 | 3.5 x 5.2 | 16 x 24 | 2.3 x 3.5 | | |
| | 35mm(Full) | 57 x 86 | 8.3 x 12 | 46 x 69 | 6.6 x 9.9 | 34 x 51 | 5.0 x 7.4 | 23 x 34 | 3.3 x 5.0 | | |
| | 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 | FOV (mm) Cam Format | NA | 0.0047 | 0.016 | 0.0059 | 0.019 | 0.0079 | 0.026 | 0.012 | 0.039 |
| | | | Res (lp/mm) | 14 | 47 | 18 | 58 | 24 | 78 | 35 | 116 |
| Mag | | | 0.50 | 3.5 | 0.63 | 4.4 | 0.84 | 5.8 | 1.3 | 8.7 | |
| DOF (mm) | | | 25 | 2.4 | 16 | 1.5 | 9.2 | 0.85 | 4.1 | 0.38 | |
| 1" | | 19 x 25 | 2.8 x 3.7 | 15 x 20 | 2.2 x 2.9 | 11 x 15 | 1.7 x 2.2 | 7.6 x 10 | 1.1 x 1.5 | | |
| 4/3" | | 27 x 36 | 3.9 x 5.2 | 21 x 29 | 3.1 x 4.1 | 16 x 21 | 2.3 x 3.1 | 11 x 14 | 1.6 x 2.1 | | |
| APS-C | | 33 x 50 | 4.8 x 7.2 | 27 x 40 | 3.8 x 5.8 | 20 x 30 | 2.9 x 4.3 | 13 x 20 | 1.9 x 2.9 | | |
| 35mm(Full) | | 48 x 71 | 6.9 x 10 | 38 x 57 | 5.5 x 8.3 | 29 x 43 | 4.1 x 6.2 | 19 x 29 | 2.8 x 4.1 | | |

-- Useable FOV Limited by Coax illumination (>50% Illumination)

-- FOV Limited by vignetting

NR = Not recommended for Coax illumination

| | Height | x | Width | Diag. |
|--------------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Lens - Mini Camera Tubes

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm | |
|--|------------|--|------------|---|-------------|--|-------------|---|-------------|---|-------------|
| 50 | | 44 | | 38 | | 31 | | 21 | | 16 | |
| 19 | | 19 | | 18 | | 19 | | 13 | | 9.4 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 0.79 | 5.4 | 0.90 | 6.2 | 1.1 | 7.3 | 1.3 | 8.7 | 1.9 | 13 | 2.5 | 17 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 8.4 x 11 | 1.2 x 1.6 | 7.3 x 10 | 1.1 x 1.4 | 6.3 x 8.4 | 0.91 x 1.2 | 5.2 x 7.0 | 0.76 x 1.0 | 3.5 x 4.7 | 0.51 x 0.67 | 2.6 x 3.5 | 0.38 x 0.51 |
| 12 x 16 | 1.8 x 2.4 | 11 x 14 | 1.5 x 2.1 | 9.1 x 12 | 1.3 x 1.8 | 7.6 x 10 | 1.1 x 1.5 | 5.1 x 6.8 | 0.74 x 0.98 | 3.8 x 5.1 | 0.55 x 0.74 |
| 17 x 23 | 2.5 x 3.3 | 15 x 20 | 2.2 x 2.9 | 13 x 17 | 1.9 x 2.5 | 11 x 14 | 1.6 x 2.1 | 7.1 x 9.5 | 1.0 x 1.4 | 5.4 x 7.1 | 0.78 x 1.0 |
| 21 x 32 | 3.1 x 4.6 | 19 x 28 | 2.7 x 4.0 | 16 x 24 | 2.3 x 3.5 | 13 x 20 | 1.9 x 2.9 | 8.8 x 13 | 1.3 x 1.9 | 6.6 x 10 | 0.96 x 1.4 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 1.1 | 7.3 | 1.2 | 8.3 | 1.4 | 9.7 | 1.7 | 12 | 2.5 | 17 | 3.4 | 23 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 6.3 x 8.4 | 0.91 x 1.2 | 5.5 x 7.3 | 0.80 x 1.1 | 4.7 x 6.3 | 0.68 x 0.91 | 3.9 x 5.2 | 0.57 x 0.76 | 2.6 x 3.5 | 0.38 x 0.51 | 2.0 x 2.6 | 0.28 x 0.38 |
| 9.1 x 12 | 1.3 x 1.8 | 8.0 x 11 | 1.2 x 1.5 | 6.9 x 9.1 | 0.99 x 1.3 | 5.7 x 7.6 | 0.83 x 1.1 | 3.8 x 5.1 | 0.55 x 0.74 | 2.9 x 3.8 | 0.41 x 0.55 |
| 13 x 17 | 1.9 x 2.5 | 11 x 15 | 1.6 x 2.2 | 9.6 x 13 | 1.4 x 1.9 | 8.0 x 11 | 1.2 x 1.6 | 5.4 x 7.1 | 0.78 x 1.0 | 4.0 x 5.4 | 0.58 x 0.78 |
| 16 x 24 | 2.3 x 3.5 | 14 x 21 | 2.0 x 3.0 | 12 x 18 | 1.7 x 2.6 | 9.9 x 15 | 1.4 x 2.2 | 6.6 x 10 | 0.96 x 1.4 | 5.0 x 7.5 | 0.72 x 1.1 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 1.3 | 9.1 | 1.5 | 10 | 1.8 | 12 | 2.1 | 15 | 3.1 | 22 | 4.2 | 29 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 7.3 x 9.8 | 1.1 x 1.4 | 6.4 x 8.5 | 0.93 x 1.2 | 5.5 x 7.3 | 0.79 x 1.1 | 4.6 x 6.1 | 0.66 x 0.88 | 3.0 x 4.1 | 0.44 x 0.59 | 2.3 x 3.0 | 0.33 x 0.44 |
| 10 x 14 | 1.5 x 2.0 | 9.0 x 12 | 1.3 x 1.7 | 7.7 x 10 | 1.1 x 1.5 | 6.4 x 8.6 | 0.93 x 1.2 | 4.3 x 5.7 | 0.62 x 0.83 | 3.2 x 4.3 | 0.47 x 0.62 |
| 13 x 19 | 1.8 x 2.8 | 11 x 17 | 1.6 x 2.4 | 9.5 x 14 | 1.4 x 2.1 | 8.0 x 12 | 1.2 x 1.7 | 5.3 x 8.0 | 0.77 x 1.2 | 4.0 x 6.0 | 0.58 x 0.87 |
| 18 x 27 | 2.6 x 4.0 | 16 x 24 | 2.3 x 3.5 | 14 x 21 | 2.0 x 3.0 | 11 x 17 | 1.7 x 2.5 | 7.6 x 11 | 1.1 x 1.7 | 5.7 x 8.6 | 0.83 x 1.2 |
| 0.015 | 0.048 | 0.017 | 0.055 | 0.020 | 0.065 | 0.024 | 0.078 | 0.035 | 0.12 | 0.047 | 0.16 |
| 44 | 145 | 51 | 166 | 59 | 194 | 71 | 233 | 106 | 349 | 142 | 465 |
| 1.6 | 11 | 1.8 | 12 | 2.1 | 15 | 2.5 | 17 | 3.8 | 26 | 5.0 | 35 |
| 2.6 | 0.24 | 2.0 | 0.19 | 1.5 | 0.14 | 1.0 | 0.094 | 0.45 | 0.042 | 0.25 | 0.024 |
| 6.1 x 8.1 | 0.88 x 1.2 | 5.3 x 7.1 | 0.77 x 1.0 | 4.6 x 6.1 | 0.66 x 0.88 | 3.8 x 5.1 | 0.55 x 0.74 | 2.5 x 3.4 | 0.37 x 0.49 | 1.9 x 2.5 | 0.28 x 0.37 |
| 8.6 x 11 | 1.2 x 1.7 | 7.5 x 10 | 1.1 x 1.4 | 6.4 x 8.6 | 0.93 x 1.2 | 5.4 x 7.1 | 0.78 x 1.0 | 3.6 x 4.8 | 0.52 x 0.69 | 2.7 x 3.6 | 0.39 x 0.52 |
| 11 x 16 | 1.5 x 2.3 | 9.3 x 14 | 1.3 x 2.0 | 8.0 x 12 | 1.2 x 1.7 | 6.6 x 10 | 0.96 x 1.4 | 4.4 x 6.6 | 0.64 x 0.96 | 3.3 x 5.0 | 0.48 x 0.72 |
| 15 x 23 | 2.2 x 3.3 | 13 x 20 | 1.9 x 2.9 | 11 x 17 | 1.7 x 2.5 | 9.5 x 14 | 1.4 x 2.1 | 6.4 x 9.5 | 0.92 x 1.4 | 4.8 x 7.1 | 0.69 x 1.0 |

Optical Performance - OPTEM 7:1 Zoom with LWD

Chart 2C

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | | 5X M Plan Apo 28-21-05-001 WD: 41mm | | 10X M Plan Apo 28-21-10-000 WD: 34mm | | |
|--|--|--|-----------|--|-----------|---|------------|-------------|
| Max FOV Dia. | | 14 | | 6.9 | | 3.2 | | |
| Max Coax FOV Dia. | | 11 | | 6.5 | | 2.2 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 | NA Res (lp/mm) Mag DOF (mm) | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 | |
| | | 71 | 170 | 177 | 420 | 354 | 900 | |
| | | 0.34 | 2.3 | 0.84 | 5.8 | 1.7 | 12 | |
| | | 1.0 | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 11 x 14 | 1.6 x 2.1 | 4.3 x 5.7 | 0.62 x 0.83 | 2.1 x 2.9 | 0.31 x 0.41 |
| | | 1/2" | 14 x 19 | 2.1 x 2.8 | 5.7 x 7.6 | 0.83 x 1.1 | 2.9 x 3.8 | 0.41 x 0.55 |
| | | 2/3" | 20 x 26 | 2.8 x 3.8 | 7.9 x 10 | 1.1 x 1.5 | 3.9 x 5.2 | 0.57 x 0.76 |
| | 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 | NA Res (lp/mm) Mag DOF (mm) | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | 71 | 170 | 177 | 420 | 354 | 900 |
| | | | 0.42 | 2.9 | 1.1 | 7.3 | 2.1 | 15 |
| 1.0 | | | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| FOV (mm) Cam Format | | 1/3" | 8.6 x 11 | 1.2 x 1.7 | 3.4 x 4.6 | 0.50 x 0.66 | 1.7 x 2.3 | 0.25 x 0.33 |
| | | 1/2" | 11 x 15 | 1.7 x 2.2 | 4.6 x 6.1 | 0.66 x 0.88 | 2.3 x 3.0 | 0.33 x 0.44 |
| | | 2/3" | 16 x 21 | 2.3 x 3.0 | 6.3 x 8.4 | 0.91 x 1.2 | 3.1 x 4.2 | 0.46 x 0.61 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 | | NA Res (lp/mm) Mag DOF (mm) | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | 71 | 170 | 177 | 420 | 354 | 900 |
| | | | 0.50 | 3.5 | 1.3 | 8.7 | 2.5 | 17 |
| | 1.0 | | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 7.1 x 9.5 | 1.0 x 1.4 | 2.9 x 3.8 | 0.41 x 0.55 | 1.4 x 1.9 | 0.21 x 0.28 |
| | | 1/2" | 9.5 x 13 | 1.4 x 1.8 | 3.8 x 5.1 | 0.55 x 0.74 | 1.9 x 2.5 | 0.28 x 0.37 |
| | | 2/3" | 13 x 17 | 1.9 x 2.5 | 5.2 x 7.0 | 0.76 x 1.0 | 2.6 x 3.5 | 0.38 x 0.51 |
| | 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 | NA Res (lp/mm) Mag DOF (mm) | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | 71 | 170 | 177 | 420 | 354 | 900 |
| | | | 0.67 | 4.6 | 1.7 | 12 | 3.4 | 23 |
| 1.0 | | | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| FOV (mm) Cam Format | | 1/3" | 5.4 x 7.1 | 0.78 x 1.0 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 |
| | | 1/2" | 7.1 x 9.5 | 1.0 x 1.4 | 2.9 x 3.8 | 0.41 x 0.55 | 1.4 x 1.9 | 0.21 x 0.28 |
| | | 2/3" | 9.8 x 13 | 1.4 x 1.9 | 3.9 x 5.2 | 0.57 x 0.76 | 2.0 x 2.6 | 0.28 x 0.38 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 | | NA Res (lp/mm) Mag DOF (mm) | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | 71 | 170 | 177 | 420 | 354 | 900 |
| | | | 0.84 | 5.8 | 2.1 | 15 | 4.2 | 29 |
| | 1.0 | | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 4.3 x 5.7 | 0.62 x 0.83 | 1.7 x 2.3 | 0.25 x 0.33 | 0.86 x 1.1 | 0.12 x 0.17 |
| | | 1/2" | 5.7 x 7.6 | 0.83 x 1.1 | 2.3 x 3.0 | 0.33 x 0.44 | 1.1 x 1.5 | 0.17 x 0.22 |
| | | 2/3" | 7.9 x 10 | 1.1 x 1.5 | 3.1 x 4.2 | 0.46 x 0.61 | 1.6 x 2.1 | 0.23 x 0.30 |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 7:1 Zoom 0.4X and 0.5X Camera Tubes are not recommended for use with a 7:1 Zoom and Microscope Objectives.

Objectives

| 20X M Plan Apo 28-21-11-001 WD: 20mm | | 5X HiRes 28-20-44-000 WD: 34mm | | 10X HiRes 28-20-45-000 WD: 19mm | | 20X HiRes 28-20-46-000 WD: 13mm | |
|---|---------------|---|-------------|--|-------------|--|---------------|
| 1.2 | | 6.4 | | 3.1 | | 1.7 | |
| 0.83 | | 4.9 | | 2.2 | | 1.1 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 3.4 | 23 | 0.84 | 5.8 | 1.7 | 12 | 3.4 | 23 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.00158 |
| 1.1 x 1.4 | 0.16 x 0.21 | 4.3 x 5.7 | 0.62 x 0.83 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 |
| 1.4 x 1.9 | 0.21 x 0.28 | 5.7 x 7.6 | 0.83 x 1.1 | 2.9 x 3.8 | 0.41 x 0.55 | 1.4 x 1.9 | 0.21 x 0.28 |
| 2.0 x 2.6 | 0.28 x 0.38 | 7.9 x 10 | 1.1 x 1.5 | 3.9 x 5.2 | 0.57 x 0.76 | 2.0 x 2.6 | 0.28 x 0.38 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 4.2 | 29 | 1.1 | 7.3 | 2.1 | 15 | 4.2 | 29 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.00158 |
| 0.86 x 1.1 | 0.12 x 0.17 | 3.4 x 4.6 | 0.50 x 0.66 | 1.7 x 2.3 | 0.25 x 0.33 | 0.9 x 1.1 | 0.12 x 0.17 |
| 1.1 x 1.5 | 0.17 x 0.22 | 4.6 x 6.1 | 0.66 x 0.88 | 2.3 x 3.0 | 0.33 x 0.44 | 1.1 x 1.5 | 0.17 x 0.22 |
| 1.6 x 2.1 | 0.23 x 0.30 | 6.3 x 8.4 | 0.91 x 1.2 | 3.1 x 4.2 | 0.46 x 0.61 | 1.6 x 2.1 | 0.23 x 0.30 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 5.0 | 35 | 1.3 | 8.7 | 2.5 | 17 | 5.0 | 35 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.00158 |
| 0.71 x 0.95 | 0.10 x 0.14 | 2.9 x 3.8 | 0.41 x 0.55 | 1.4 x 1.9 | 0.21 x 0.28 | 0.71 x 0.95 | 0.10 x 0.14 |
| 0.95 x 1.3 | 0.14 x 0.18 | 3.8 x 5.1 | 0.55 x 0.74 | 1.9 x 2.5 | 0.28 x 0.37 | 0.95 x 1.3 | 0.14 x 0.18 |
| 1.3 x 1.7 | 0.19 x 0.25 | 5.2 x 7.0 | 0.76 x 1.0 | 2.6 x 3.5 | 0.38 x 0.51 | 1.3 x 1.7 | 0.19 x 0.25 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 6.7 | 46 | 1.7 | 12 | 3.4 | 23 | 6.7 | 46 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.00158 |
| 0.54 x 0.71 | 0.078 x 0.10 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 | 0.54 x 0.71 | 0.078 x 0.10 |
| 0.71 x 0.95 | 0.10 x 0.14 | 2.9 x 3.8 | 0.41 x 0.55 | 1.4 x 1.9 | 0.21 x 0.28 | 0.71 x 0.95 | 0.10 x 0.14 |
| 0.98 x 1.3 | 0.14 x 0.19 | 3.9 x 5.2 | 0.57 x 0.76 | 2.0 x 2.6 | 0.28 x 0.38 | 0.98 x 1.3 | 0.14 x 0.19 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 8.4 | 58 | 2.1 | 15 | 4.2 | 29 | 8.4 | 58 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.00158 |
| 0.43 x 0.57 | 0.062 x 0.083 | 1.7 x 2.3 | 0.25 x 0.33 | 0.86 x 1.1 | 0.12 x 0.17 | 0.43 x 0.57 | 0.062 x 0.083 |
| 0.57 x 0.76 | 0.083 x 0.11 | 2.3 x 3.0 | 0.33 x 0.44 | 1.1 x 1.5 | 0.17 x 0.22 | 0.57 x 0.76 | 0.083 x 0.11 |
| 0.79 x 1.0 | 0.11 x 0.15 | 3.1 x 4.2 | 0.46 x 0.61 | 1.6 x 2.1 | 0.23 x 0.30 | 0.79 x 1.0 | 0.11 x 0.15 |

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 7:1 Zoom with LWD

Chart 2D

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | | 5X M Plan Apo 28-21-05-001 WD: 41mm | | 10X M Plan Apo 28-21-10-000 WD: 34mm | | | |
|---|---|--|-------------|--|-------------|---|-------------|--------|------|
| Max FOV Dia. | | 14 | | 6.9 | | 3.2 | | | |
| Max Coax FOV Dia. | | 11 | | 6.5 | | 2.2 | | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | | |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 | FOV (mm) Cam Format | NA | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 | |
| | | Res (lp/mm) | 71 | 170 | 177 | 420 | 354 | 900 | |
| | | Mag | 1.3 | 8.7 | 3.2 | 22 | 6.30 | 44 | |
| | | DOF (mm) | 1.0 | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| | 2/3" | 5.2 x 7.0 | 0.76 x 1.0 | 2.1 x 2.8 | 0.30 x 0.40 | 1.0 x 1.4 | 0.15 x 0.20 | | |
| | 1" | 7.6 x 10 | 1.1 x 1.5 | 3.0 x 4.1 | 0.44 x 0.59 | 1.5 x 2.0 | 0.22 x 0.29 | | |
| | 4/3" | 11 x 14 | 1.6 x 2.1 | 4.3 x 5.7 | 0.62 x 0.83 | 2.1 x 2.9 | 0.31 x 0.41 | | |
| | APS-C | 13 x 20 | 1.9 x 2.9 | 5.3 x 8.0 | 0.77 x 1.2 | 2.7 x 4.0 | 0.38 x 0.58 | | |
| | 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 | FOV (mm) Cam Format | NA | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | Res (lp/mm) | 71 | 170 | 177 | 420 | 354 | 900 |
| Mag | | | 1.7 | 12 | 4.2 | 29 | 8.4 | 58 | |
| DOF (mm) | | | 1.0 | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| 2/3" | | 3.9 x 5.2 | 0.57 x 0.76 | 1.6 x 2.1 | 0.23 x 0.30 | 0.79 x 1.0 | 0.11 x 0.15 | | |
| 1" | | 5.7 x 7.6 | 0.83 x 1.1 | 2.3 x 3.0 | 0.33 x 0.44 | 1.1 x 1.5 | 0.17 x 0.22 | | |
| 4/3" | | 8.0 x 11 | 1.2 x 1.6 | 3.2 x 4.3 | 0.47 x 0.62 | 1.6 x 2.1 | 0.23 x 0.31 | | |
| APS-C | | 10 x 15 | 1.4 x 2.2 | 4.0 x 6.0 | 0.58 x 0.87 | 2.0 x 3.0 | 0.29 x 0.43 | | |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 | | FOV (mm) Cam Format | NA | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | Res (lp/mm) | 71 | 170 | 177 | 420 | 354 | 900 |
| | Mag | | 2.1 | 15 | 5.3 | 36 | 11 | 73 | |
| | DOF (mm) | | 1.0 | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| | 1" | 4.6 x 6.1 | 0.66 x 0.88 | 1.8 x 2.4 | 0.26 x 0.35 | 0.91 x 1.2 | 0.13 x 0.18 | | |
| | 4/3" | 6.4 x 8.6 | 0.93 x 1.2 | 2.6 x 3.4 | 0.37 x 0.50 | 1.3 x 1.7 | 0.19 x 0.25 | | |
| | APS-C | 8.0 x 12 | 1.2 x 1.7 | 3.2 x 4.8 | 0.46 x 0.69 | 1.6 x 2.4 | 0.23 x 0.35 | | |
| | 35mm(Full) | 11 x 17 | 1.7 x 2.5 | 4.6 x 6.9 | 0.66 x 0.99 | 2.3 x 3.4 | 0.33 x 0.50 | | |
| | 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 | FOV (mm) Cam Format | NA | 0.024 | 0.057 | 0.059 | 0.14 | 0.12 | 0.30 |
| | | | Res (lp/mm) | 71 | 170 | 177 | 420 | 354 | 900 |
| Mag | | | 2.5 | 17 | 6.3 | 44 | 13 | 87 | |
| DOF (mm) | | | 1.0 | 0.18 | 0.16 | 0.029 | 0.041 | 0.0063 | |
| 1" | | 3.8 x 5.1 | 0.55 x 0.74 | 1.5 x 2.0 | 0.22 x 0.29 | 0.76 x 1.0 | 0.11 x 0.15 | | |
| 4/3" | | 5.4 x 7.1 | 0.78 x 1.0 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 | | |
| APS-C | | 6.6 x 10 | 0.96 x 1.4 | 2.7 x 4.0 | 0.38 x 0.58 | 1.3 x 2.0 | 0.19 x 0.29 | | |
| 35mm(Full) | | 10 x 14 | 1.4 x 2.1 | 3.8 x 5.7 | 0.55 x 0.83 | 1.9 x 2.9 | 0.28 x 0.41 | | |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 7:1 Zoom 0.4X and 0.5X Camera Tubes are not recommended for use with a 7:1 Zoom and Microscope Objectives.

| | Height | x | Width | Diag. |
|-------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Objectives - Mini Camera Tubes

| 20X M Plan Apo 28-21-11-001 WD: 20mm | | 5X HiRes 28-20-44-000 WD: 34mm | | 10X HiRes 28-20-45-000 WD: 19mm | | 20X HiRes 28-20-46-000 WD: 13mm | |
|---|---------------|---|-------------|--|-------------|--|---------------|
| 1.2 | | 6.4 | | 3.1 | | 1.7 | |
| 0.83 | | 4.9 | | 2.2 | | 1.1 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 13 | 87 | 3.2 | 22 | 6.3 | 44 | 13 | 87 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.0016 |
| 0.52 x 0.70 | 0.076 x 0.10 | 2.1 x 2.8 | 0.30 x 0.40 | 1.0 x 1.4 | 0.15 x 0.20 | 0.52 x 0.70 | 0.076 x 0.10 |
| 0.76 x 1.0 | 0.11 x 0.15 | 3.0 x 4.1 | 0.44 x 0.59 | 1.5 x 2.0 | 0.22 x 0.29 | 0.76 x 1.02 | 0.11 x 0.15 |
| 1.1 x 1.4 | 0.16 x 0.21 | 4.3 x 5.7 | 0.62 x 0.83 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 |
| 1.3 x 2.0 | 0.19 x 0.29 | 5.3 x 8.0 | 0.77 x 1.2 | 2.7 x 4.0 | 0.38 x 0.58 | 1.3 x 2.0 | 0.19 x 0.29 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 17 | 116 | 4.2 | 29 | 8.4 | 58 | 17 | 116 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.0016 |
| 0.39 x 0.52 | 0.057 x 0.076 | 1.6 x 2.1 | 0.23 x 0.30 | 0.79 x 1.0 | 0.11 x 0.15 | 0.39 x 0.52 | 0.057 x 0.076 |
| 0.57 x 0.76 | 0.083 x 0.11 | 2.3 x 3.0 | 0.33 x 0.44 | 1.1 x 1.5 | 0.17 x 0.22 | 0.57 x 0.76 | 0.083 x 0.11 |
| 0.80 x 1.1 | 0.12 x 0.16 | 3.2 x 4.3 | 0.47 x 0.62 | 1.6 x 2.1 | 0.23 x 0.31 | 0.80 x 1.1 | 0.12 x 0.16 |
| 0.99 x 1.5 | 0.14 x 0.22 | 4.0 x 6.0 | 0.58 x 0.87 | 2.0 x 3.0 | 0.29 x 0.43 | 0.99 x 1.5 | 0.14 x 0.22 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 21 | 145 | 5.3 | 36 | 11 | 73 | 21 | 145 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.0016 |
| 0.46 x 0.61 | 0.066 x 0.088 | 1.8 x 2.4 | 0.26 x 0.35 | 0.91 x 1.2 | 0.13 x 0.18 | 0.46 x 0.61 | 0.066 x 0.088 |
| 0.64 x 0.86 | 0.093 x 0.12 | 2.6 x 3.4 | 0.37 x 0.50 | 1.3 x 1.7 | 0.19 x 0.25 | 0.64 x 0.86 | 0.093 x 0.12 |
| 0.80 x 1.2 | 0.12 x 0.17 | 3.2 x 4.8 | 0.46 x 0.69 | 1.6 x 2.4 | 0.23 x 0.35 | 0.80 x 1.2 | 0.12 x 0.17 |
| 1.1 x 1.7 | 0.17 x 0.25 | 4.6 x 6.9 | 0.66 x 0.99 | 2.3 x 3.4 | 0.33 x 0.50 | 1.1 x 1.7 | 0.17 x 0.25 |
| 0.24 | 0.42 | 0.059 | 0.19 | 0.12 | 0.39 | 0.24 | 0.60 |
| 708 | 1260 | 177 | 581 | 354 | 1163 | 708 | 1800 |
| 25 | 174 | 6.3 | 44 | 13 | 87 | 25 | 174 |
| 0.010 | 0.0032 | 0.16 | 0.015 | 0.041 | 0.0038 | 0.010 | 0.0016 |
| 0.38 x 0.51 | 0.055 x 0.074 | 1.5 x 2.0 | 0.22 x 0.29 | 0.76 x 1.0 | 0.11 x 0.15 | 0.38 x 0.51 | 0.055 x 0.074 |
| 0.54 x 0.71 | 0.078 x 0.10 | 2.1 x 2.9 | 0.31 x 0.41 | 1.1 x 1.4 | 0.16 x 0.21 | 0.54 x 0.71 | 0.078 x 0.10 |
| 0.66 x 1.0 | 0.096 x 0.14 | 2.7 x 4.0 | 0.38 x 0.58 | 1.3 x 2.0 | 0.19 x 0.29 | 0.66 x 1.0 | 0.096 x 0.14 |
| 0.95 x 1.4 | 0.14 x 0.21 | 3.8 x 5.7 | 0.55 x 0.83 | 1.9 x 2.9 | 0.28 x 0.41 | 0.95 x 1.4 | 0.14 x 0.21 |

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3A

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | |
|--|-------------------------------|--|-----------|--|-----------|---|----------|--|----------|-----------|
| Max FOV Dia. | | 145 | | 116 | | 87 | | 58 | | |
| Max Coax FOV Dia. | | NR | | NR | | NR | | 20 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.045 | 0.55 | 0.056 | 0.69 | 0.075 | 0.92 | 0.11 | 1.4 |
| | FOV (mm) Cam Format | DOF (mm) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | | 1/3" | 80 x 107 | 6.5 x 8.7 | 64 x 86 | 5.2 x 7.0 | 48 x 64 | 3.9 x 5.2 | 32 x 43 | 2.6 x 3.5 |
| | | 1/2" | 107 x 143 | 8.7 x 12 | 86 x 114 | 7.0 x 9.3 | 64 x 86 | 5.2 x 7.0 | 43 x 57 | 3.5 x 4.6 |
| | | 2/3" | 147 x 196 | 12 x 16 | 118 x 157 | 9.6 x 13 | 88 x 118 | 7.2 x 9.6 | 59 x 79 | 4.8 x 6.4 |
| 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.056 | 0.69 | 0.070 | 0.86 | 0.093 | 1.2 | 0.14 | 1.7 |
| | FOV (mm) Cam Format | DOF (m m) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | | 1/3" | 64 x 86 | 5.2 x 7.0 | 51 x 69 | 4.2 x 5.6 | 39 x 51 | 3.1 x 4.2 | 26 x 34 | 2.1 x 2.8 |
| | | 1/2" | 86 x 114 | 7.0 x 9.3 | 69 x 91 | 5.6 x 7.4 | 51 x 69 | 4.2 x 5.6 | 34 x 46 | 2.8 x 3.7 |
| | | 2/3" | 118 x 157 | 9.6 x 13 | 94 x 126 | 7.7 x 10 | 71 x 94 | 5.7 x 7.7 | 47 x 63 | 3.8 x 5.1 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.067 | 0.83 | 0.084 | 1.0 | 0.11 | 1.4 | 0.17 | 2.1 |
| | FOV (mm) Cam Format | DOF (mm) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | | 1/3" | 54 x 71 | 4.3 x 5.8 | 43 x 57 | 3.5 x 4.6 | 32 x 43 | 2.6 x 3.5 | 21 x 29 | 1.7 x 2.3 |
| | | 1/2" | 71 x 95 | 5.8 x 7.7 | 57 x 76 | 4.6 x 6.2 | 43 x 57 | 3.5 x 4.6 | 29 x 38 | 2.3 x 3.1 |
| | | 2/3" | 98 x 131 | 8.0 x 11 | 79 x 105 | 6.4 x 8.5 | 59 x 79 | 4.8 x 6.4 | 39 x 52 | 3.2 x 4.3 |
| 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.090 | 1.1 | 0.11 | 1.4 | 0.15 | 1.8 | 0.22 | 2.8 |
| | FOV (mm) Cam Format | DOF (mm) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | | 1/3" | 40 x 54 | 3.3 x 4.3 | 32 x 43 | 2.6 x 3.5 | 24 x 32 | 2.0 x 2.6 | 16 x 21 | 1.3 x 1.7 |
| | | 1/2" | 54 x 71 | 4.3 x 5.8 | 43 x 57 | 3.5 x 4.6 | 32 x 43 | 2.6 x 3.5 | 21 x 29 | 1.7 x 2.3 |
| | | 2/3" | 74 x 98 | 6.0 x 8.0 | 59 x 79 | 4.8 x 6.4 | 44 x 59 | 3.6 x 4.8 | 29 x 39 | 2.4 x 3.2 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.11 | 1.4 | 0.14 | 1.7 | 0.19 | 2.3 | 0.28 | 3.5 |
| | FOV (mm) Cam Format | DOF (mm) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | | 1/3" | 32 x 43 | 2.6 x 3.5 | 26 x 34 | 2.1 x 2.8 | 19 x 26 | 1.6 x 2.1 | 13 x 17 | 1.0 x 1.4 |
| | | 1/2" | 43 x 57 | 3.5 x 4.6 | 34 x 46 | 2.8 x 3.7 | 26 x 34 | 2.1 x 2.8 | 17 x 23 | 1.4 x 1.9 |
| | | 2/3" | 59 x 79 | 4.8 x 6.4 | 47 x 63 | 3.8 x 5.1 | 35 x 47 | 2.9 x 3.8 | 24 x 31 | 1.9 x 2.6 |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

NR = Not recommended for Coax illumination

Fetura+ with Lower Lens

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm | |
|---|------------|---|-------------|--|-------------|---|-------------|--|-------------|--|-------------|
| 46 | | 41 | | 35 | | 29 | | 19 | | 15 | |
| 19 | | 19 | | 17 | | 20 | | 13 | | 9.9 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.14 | 1.7 | 0.16 | 2.0 | 0.19 | 2.3 | 0.22 | 2.8 | 0.34 | 4.1 | 0.45 | 5.5 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 26 x 34 | 2.1 x 2.8 | 23 x 30 | 1.8 x 2.4 | 19 x 26 | 1.6 x 2.1 | 16 x 21 | 1.3 x 1.7 | 11 x 14 | 0.87 x 1.2 | 8.0 x 11 | 0.65 x 0.87 |
| 34 x 46 | 2.8 x 3.7 | 30 x 40 | 2.4 x 3.2 | 26 x 34 | 2.1 x 2.8 | 21 x 29 | 1.7 x 2.3 | 14 x 19 | 1.2 x 1.5 | 11 x 14 | 0.87 x 1.2 |
| 47 x 63 | 3.8 x 5.1 | 41 x 55 | 3.3 x 4.5 | 35 x 47 | 2.9 x 3.8 | 29 x 39 | 2.4 x 3.2 | 20 x 26 | 1.6 x 2.1 | 15 x 20 | 1.2 x 1.6 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.18 | 2.2 | 0.20 | 2.5 | 0.23 | 2.9 | 0.28 | 3.5 | 0.42 | 5.2 | 0.56 | 6.9 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 21 x 27 | 1.7 x 2.2 | 18 x 24 | 1.5 x 1.9 | 15 x 21 | 1.3 x 1.7 | 13 x 17 | 1.0 x 1.4 | 8.6 x 11 | 0.70 x 0.9 | 6.4 x 8.6 | 0.52 x 0.70 |
| 27 x 37 | 2.2 x 3.0 | 24 x 32 | 1.9 x 2.6 | 21 x 27 | 1.7 x 2.2 | 17 x 23 | 1.4 x 1.9 | 11 x 15 | 0.9 x 1.2 | 8.6 x 11 | 0.70 x 0.93 |
| 38 x 50 | 3.1 x 4.1 | 33 x 44 | 2.7 x 3.6 | 28 x 38 | 2.3 x 3.1 | 24 x 31 | 1.9 x 2.6 | 16 x 21 | 1.3 x 1.7 | 12 x 16 | 0.96 x 1.3 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.21 | 2.6 | 0.24 | 3.0 | 0.28 | 3.5 | 0.34 | 4.1 | 0.50 | 6.2 | 0.67 | 8.3 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 17 x 23 | 1.4 x 1.9 | 15 x 20 | 1.2 x 1.6 | 13 x 17 | 1.0 x 1.4 | 11 x 14 | 0.87 x 1.2 | 7.1 x 10 | 0.58 x 0.77 | 5.4 x 7.1 | 0.43 x 0.58 |
| 23 x 30 | 1.9 x 2.5 | 20 x 27 | 1.6 x 2.2 | 17 x 23 | 1.4 x 1.9 | 14 x 19 | 1.2 x 1.5 | 10 x 13 | 0.77 x 1.0 | 7.1 x 9.5 | 0.58 x 0.77 |
| 31 x 42 | 2.6 x 3.4 | 28 x 37 | 2.2 x 3.0 | 24 x 31 | 1.9 x 2.6 | 20 x 26 | 1.6 x 2.1 | 13 x 17 | 1.1 x 1.4 | 9.8 x 13 | 0.80 x 1.1 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.28 | 3.5 | 0.32 | 3.9 | 0.37 | 4.6 | 0.45 | 5.5 | 0.67 | 8 | 0.90 | 11 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 13 x 17 | 1.0 x 1.4 | 11 x 15 | 0.91 x 1.2 | 9.6 x 13 | 0.78 x 1.0 | 8.0 x 11 | 0.65 x 0.87 | 5.4 x 7.1 | 0.44 x 0.58 | 4.0 x 5.4 | 0.33 x 0.43 |
| 17 x 23 | 1.4 x 1.9 | 15 x 20 | 1.2 x 1.6 | 13 x 17 | 1.0 x 1.4 | 11 x 14 | 0.87 x 1.2 | 7.1 x 10 | 0.58 x 0.77 | 5.4 x 7.1 | 0.43 x 0.58 |
| 24 x 31 | 1.9 x 2.6 | 21 x 28 | 1.7 x 2.2 | 18 x 24 | 1.4 x 1.9 | 15 x 20 | 1.2 x 1.6 | 10 x 13 | 0.80 x 1.1 | 7.4 x 9.8 | 0.60 x 0.80 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.35 | 4.3 | 0.40 | 4.9 | 0.47 | 5.8 | 0.56 | 6.9 | 0.84 | 10.3 | 1.1 | 14 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 10 x 14 | 0.83 x 1.1 | 9.0 x 12 | 0.73 x 0.97 | 7.7 x 10 | 0.63 x 0.83 | 6.4 x 8.6 | 0.52 x 0.70 | 4.3 x 5.7 | 0.35 x 0.46 | 3.2 x 4.3 | 0.26 x 0.35 |
| 14 x 18 | 1.1 x 1.5 | 12 x 16 | 0.97 x 1.3 | 10 x 14 | 0.83 x 1.1 | 8.6 x 11 | 0.70 x 0.93 | 5.7 x 7.6 | 0.46 x 0.62 | 4.3 x 5.7 | 0.35 x 0.46 |
| 19 x 25 | 1.5 x 2.0 | 17 x 22 | 1.3 x 1.8 | 14 x 19 | 1.1 x 1.5 | 12 x 16 | 0.96 x 1.3 | 7.9 x 10 | 0.64 x 0.85 | 5.9 x 7.9 | 0.48 x 0.64 |

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3B

| | | 0.4X Lower Lens 35-00-11-000 WD: 490mm EFL: 500mm | | 0.5X Lower Lens 35-00-10-000 WD: 390mm EFL: 400mm | | 0.67X Lower Lens 35-00-09-000 WD: 290mm EFL: 300mm | | 1X Lower Lens 35-00-08-000 WD: 190mm EFL: 200mm | | |
|---|---|--|--------------------|--|-----------------|---|-----------------|--|-----------------|------------|
| Max FOV Dia. | | 145 | | 116 | | 87 | | 58 | | |
| Max Coax FOV Dia. | | NR | | NR | | NR | | 20 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 | |
| | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 | 144 |
| | | Mag | 0.17 | 2.1 | 0.21 | 2.6 | 0.28 | 3.5 | 0.42 | 5.2 |
| | | DOF (mm) | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | FOV (mm) Cam Format | 2/3" | 39 x 52 | 3.2 x 4.3 | 31 x 42 | 2.6 x 3.4 | 24 x 31 | 1.9 x 2.6 | 16 x 21 | 1.3 x 1.7 |
| | | 1" | 57 x 76 | 4.6 x 6.2 | 46 x 61 | 3.7 x 4.9 | 34 x 46 | 2.8 x 3.7 | 23 x 30 | 1.9 x 2.5 |
| | | 4/3" | 80 x 107 | 6.5 x 8.7 | 64 x 86 | 5.2 x 7.0 | 48 x 64 | 3.9 x 5.2 | 32 x 43 | 2.6 x 3.5 |
| | | APS-C | 99 x 149 | 8.1 x 12 | 80 x 120 | 6.5 x 9.7 | 60 x 90 | 4.8 x 7.3 | 40 x 60 | 3.2 x 4.9 |
| | 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 |
| | | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 |
| Mag | | | 0.22 | 2.8 | 0.28 | 3.5 | 0.37 | 4.6 | 0.56 | 6.9 |
| DOF (m m) | | | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| FOV (mm) Cam Format | | 2/3" | 29 x 39 | 2.4 x 3.2 | 24 x 31 | 1.9 x 2.6 | 18 x 24 | 1.4 x 1.9 | 12 x 16 | 0.96 x 1.3 |
| | | 1" | 43 x 57 | 3.5 x 4.6 | 34 x 46 | 2.8 x 3.7 | 26 x 34 | 2.1 x 2.8 | 17 x 23 | 1.4 x 1.9 |
| | | 4/3" | 60 x 80 | 4.9 x 6.5 | 48 x 64 | 3.9 x 5.2 | 36 x 48 | 2.9 x 3.9 | 24 x 32 | 2.0 x 2.6 |
| | | APS-C | 75 x 112 | 6.1 x 9.1 | 60 x 90 | 4.8 x 7.3 | 45 x 67 | 3.6 x 5.5 | 30 x 45 | 2.4 x 3.6 |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 | | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 |
| | | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 |
| | Mag | | 0.28 | 3.5 | 0.35 | 4.3 | 0.47 | 5.8 | 0.70 | 8.6 |
| | DOF (mm) | | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| | FOV (mm) Cam Format | 1" | 34 x 46 | 2.8 x 3.7 | 27 x 37 | 2.2 x 3.0 | 21 x 27 | 1.7 x 2.2 | 14 x 18 | 1.1 x 1.5 |
| | | 4/3" | 48 x 64 | 3.9 x 5.2 | 39 x 51 | 3.1 x 4.2 | 29 x 39 | 2.3 x 3.1 | 19 x 26 | 1.6 x 2.1 |
| | | APS-C | 60 x 90 | 4.8 x 7.3 | 48 x 72 | 3.9 x 5.8 | 36 x 54 | 2.9 x 4.4 | 24 x 36 | 1.9 x 2.9 |
| | | 35mm(Full) | 86 x 129 | 7.0 x 10 | 69 x 103 | 5.6 x 8.3 | 51 x 77 | 4.2 x 6.3 | 34 x 51 | 2.8 x 4.2 |
| | 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 | NA | 0.0036 | 0.019 | 0.0045 | 0.024 | 0.0060 | 0.032 | 0.0090 | 0.048 |
| | | | Res (lp/mm) | 11 | 58 | 14 | 72 | 18 | 96 | 27 |
| Mag | | | 0.34 | 4.1 | 0.42 | 5.2 | 0.56 | 6.9 | 0.84 | 10 |
| DOF (mm) | | | 44 | 1.5 | 28 | 0.98 | 16 | 0.55 | 7.0 | 0.25 |
| FOV (mm) Cam Format | | 1" | 29 x 38 | 2.3 x 3.1 | 23 x 30 | 1.9 x 2.5 | 17 x 23 | 1.4 x 1.9 | 11 x 15 | 0.93 x 1.2 |
| | | 4/3" | 40 x 54 | 3.3 x 4.3 | 32 x 43 | 2.6 x 3.5 | 24 x 32 | 2.0 x 2.6 | 16 x 21 | 1.3 x 1.7 |
| | | APS-C | 50 x 75 | 4.0 x 6.1 | 40 x 60 | 3.2 x 4.9 | 30 x 45 | 2.4 x 3.6 | 20 x 30 | 1.6 x 2.4 |
| | | 35mm(Full) | 71 x 107 | 5.8 x 8.7 | 57 x 86 | 4.6 x 7.0 | 43 x 64 | 3.5 x 5.2 | 29 x 43 | 2.3 x 3.5 |

-- Useable FOV Limited by Coax illumination (>50% Illumination)

-- FOV Limited by vignetting

NR = Not recommended for Coax illumination

| | Height | x | Width | Diag. |
|--------------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Fetura+ with Lower Lens - Mini Camera Tubes

| 1.25X Lower Lens 35-00-06-000 WD: 155mm EFL: 160mm | | 1.43X Lower Lens 35-00-05-000 WD: 135mm EFL: 140mm | | 1.67 Lower Lens 35-00-04-000 WD: 110mm EFL: 120mm | | 2X Lower Lens 35-00-03-000 WD: 95mm EFL: 100mm | | 3X Lower Lens 35-00-01-000 WD: 50mm EFL: 67mm | | 4X Lower Lens 35-00-02-000 WD: 32mm EFL: 50mm | |
|---|-------------|---|-------------|--|-------------|---|-------------|--|-------------|--|-------------|
| 46 | | 41 | | 35 | | 29 | | 19 | | 15 | |
| 19 | | 19 | | 17 | | 20 | | 13 | | 9.9 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.53 | 6.5 | 0.60 | 7.4 | 0.70 | 8.6 | 0.84 | 10 | 1.3 | 16 | 1.7 | 21 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 13 x 17 | 1.0 x 1.4 | 11 x 15 | 0.89 x 1.2 | 9.4 x 13 | 0.77 x 1.0 | 7.9 x 10 | 0.64 x 0.85 | 5.2 x 7.0 | 0.43 x 0.57 | 3.9 x 5.2 | 0.32 x 0.43 |
| 18 x 24 | 1.5 x 2.0 | 16 x 21 | 1.3 x 1.7 | 14 x 18 | 1.1 x 1.5 | 11 x 15 | 0.93 x 1.2 | 7.6 x 10 | 0.62 x 0.82 | 5.7 x 7.6 | 0.46 x 0.62 |
| 26 x 34 | 2.1 x 2.8 | 23 x 30 | 1.8 x 2.4 | 19 x 26 | 1.6 x 2.1 | 16 x 21 | 1.3 x 1.7 | 11 x 14 | 0.87 x 1.2 | 8.0 x 11 | 0.65 x 0.87 |
| 32 x 48 | 2.6 x 3.9 | 28 x 42 | 2.3 x 3.4 | 24 x 36 | 1.9 x 2.9 | 20 x 30 | 1.6 x 2.4 | 13 x 20 | 1.1 x 1.6 | 9.9 x 15 | 0.81 x 1.2 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.70 | 8.6 | 0.80 | 9.9 | 0.93 | 12 | 1.1 | 14 | 1.7 | 21 | 2.2 | 28 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 9.4 x 13 | 0.77 x 1.0 | 8.3 x 11 | 0.67 x 0.89 | 7.1 x 9.4 | 0.57 x 0.77 | 5.9 x 7.9 | 0.48 x 0.64 | 3.9 x 5.2 | 0.32 x 0.43 | 2.9 x 3.9 | 0.24 x 0.32 |
| 14 x 18 | 1.1 x 1.5 | 12 x 16 | 0.97 x 1.3 | 10 x 14 | 0.83 x 1.1 | 8.6 x 11 | 0.70 x 0.93 | 5.7 x 7.6 | 0.46 x 0.62 | 4.3 x 5.7 | 0.35 x 0.46 |
| 19 x 26 | 1.6 x 2.1 | 17 x 23 | 1.4 x 1.8 | 14 x 19 | 1.2 x 1.6 | 12 x 16 | 0.98 x 1.3 | 8.0 x 11 | 0.65 x 0.87 | 6.0 x 8.0 | 0.49 x 0.65 |
| 24 x 36 | 1.9 x 2.9 | 21 x 31 | 1.7 x 2.5 | 18 x 27 | 1.5 x 2.2 | 15 x 22 | 1.2 x 1.8 | 9.9 x 15 | 0.81 x 1.2 | 7.5 x 11 | 0.61 x 0.91 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 0.88 | 11 | 1.0 | 12 | 1.2 | 14 | 1.4 | 17 | 2.1 | 26 | 2.8 | 35 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.09 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 11 x 15 | 0.89 x 1.2 | 9.6 x 13 | 0.78 x 1.0 | 8.2 x 11 | 0.67 x 0.89 | 6.9 x 9.1 | 0.56 x 0.74 | 4.6 x 6.1 | 0.37 x 0.49 | 3.4 x 4.6 | 0.28 x 0.37 |
| 15 x 21 | 1.3 x 1.7 | 14 x 18 | 1.1 x 1.5 | 12 x 15 | 0.94 x 1.3 | 9.6 x 13 | 0.78 x 1.0 | 6.4 x 8.6 | 0.52 x 0.70 | 4.8 x 6.4 | 0.39 x 0.52 |
| 19 x 29 | 1.5 x 2.3 | 17 x 25 | 1.4 x 2.0 | 14 x 22 | 1.2 x 1.7 | 12 x 18 | 0.97 x 1.5 | 8.0 x 12 | 0.65 x 0.97 | 6.0 x 9.0 | 0.48 x 0.73 |
| 27 x 41 | 2.2 x 3.3 | 24 x 36 | 1.9 x 2.9 | 21 x 31 | 1.7 x 2.5 | 17 x 26 | 1.4 x 2.1 | 11 x 17 | 0.93 x 1.4 | 8.6 x 13 | 0.70 x 1.0 |
| 0.011 | 0.060 | 0.013 | 0.069 | 0.015 | 0.080 | 0.018 | 0.096 | 0.027 | 0.14 | 0.036 | 0.19 |
| 34 | 180 | 39 | 206 | 45 | 240 | 54 | 288 | 81 | 432 | 108 | 576 |
| 1.1 | 13 | 1.2 | 15 | 1.4 | 17 | 1.7 | 21 | 2.5 | 31 | 3.4 | 41 |
| 4.5 | 0.16 | 3.4 | 0.12 | 2.5 | 0.089 | 1.8 | 0.062 | 0.78 | 0.027 | 0.44 | 0.015 |
| 9.1 x 12 | 0.74 x 0.99 | 8.0 x 11 | 0.65 x 0.87 | 6.9 x 9.1 | 0.56 x 0.74 | 5.7 x 7.6 | 0.46 x 0.62 | 3.8 x 5.1 | 0.31 x 0.41 | 2.9 x 3.8 | 0.23 x 0.31 |
| 13 x 17 | 1.0 x 1.4 | 11 x 15 | 0.91 x 1.2 | 9.6 x 13 | 0.78 x 1.0 | 8.0 x 11 | 0.65 x 0.87 | 5.4 x 7.1 | 0.44 x 0.58 | 4.0 x 5.4 | 0.33 x 0.43 |
| 16 x 24 | 1.3 x 1.9 | 14 x 21 | 1.1 x 1.7 | 12 x 18 | 0.97 x 1.5 | 9.9 x 15 | 0.81 x 1.2 | 6.6 x 10 | 0.54 x 0.81 | 5.0 x 7.5 | 0.40 x 0.61 |
| 23 x 34 | 1.9 x 2.8 | 20 x 30 | 1.6 x 2.4 | 17 x 26 | 1.4 x 2.1 | 14 x 21 | 1.2 x 1.7 | 9.5 x 14 | 0.77 x 1.2 | 7.1 x 11 | 0.58 x 0.87 |

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3C

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | | 5X M Plan Apo 28-21-05-001 WD: 41mm | | 10X M Plan Apo 28-21-10-000 WD: 34mm | | |
|--|--------------------------------------|--|-----------|--|-----------|---|-----------|-------------|
| Max FOV Dia. | | 14 | | 6.8 | | 3.3 | | |
| Max Coax FOV Dia. | | 11 | | 4.6 | | 2.2 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 0.4X Camera Tube 35-08-00-000 EFL: 80mm Image Circle Dia. (mm) 9.6 | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 | |
| | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 | |
| | Mag | 0.22 | 2.8 | 0.56 | 6.9 | 1.1 | 14 | |
| | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 16 x 21 | 1.3 x 1.7 | 6.4 x 8.6 | 0.52 x 0.70 | 3.2 x 4.3 | 0.26 x 0.35 |
| | | 1/2" | 21 x 29 | 1.7 x 2.3 | 8.6 x 11 | 0.70 x 0.93 | 4.3 x 5.7 | 0.35 x 0.46 |
| | | 2/3" | 29 x 39 | 2.4 x 3.2 | 12 x 16 | 0.96 x 1.3 | 5.9 x 7.9 | 0.48 x 0.64 |
| 0.5X Camera Tube 35-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 | |
| | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 | |
| | Mag | 0.28 | 3.5 | 0.70 | 8.6 | 1.4 | 17 | |
| | DOF (m m) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 13 x 17 | 1.0 x 1.4 | 5.1 x 6.9 | 0.42 x 0.56 | 2.6 x 3.4 | 0.21 x 0.28 |
| | | 1/2" | 17 x 23 | 1.4 x 1.9 | 6.9 x 9.1 | 0.56 x 0.74 | 3.4 x 4.6 | 0.28 x 0.37 |
| | | 2/3" | 24 x 31 | 1.9 x 2.6 | 9.4 x 13 | 0.77 x 1.0 | 4.7 x 6.3 | 0.38 x 0.51 |
| 0.6X Camera Tube 35-08-02-000 EFL: 120mm Image Circle Dia. (mm) 14.4 | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 | |
| | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 | |
| | Mag | 0.34 | 4.1 | 0.84 | 10 | 1.7 | 21 | |
| | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 11 x 14 | 0.87 x 1.2 | 4.3 x 5.7 | 0.35 x 0.46 | 2.1 x 2.9 | 0.17 x 0.23 |
| | | 1/2" | 14 x 19 | 1.2 x 1.5 | 5.7 x 7.6 | 0.46 x 0.62 | 2.9 x 3.8 | 0.23 x 0.31 |
| | | 2/3" | 20 x 26 | 1.6 x 2.1 | 7.9 x 10 | 0.64 x 0.85 | 3.9 x 5.2 | 0.32 x 0.43 |
| 0.8X Camera Tube 35-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 | |
| | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 | |
| | Mag | 0.45 | 5.5 | 1.1 | 14 | 2.2 | 28 | |
| | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 8.0 x 11 | 0.65 x 0.87 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 |
| | | 1/2" | 11 x 14 | 0.87 x 1.2 | 4.3 x 5.7 | 0.35 x 0.46 | 2.1 x 2.9 | 0.17 x 0.23 |
| | | 2/3" | 15 x 20 | 1.2 x 1.6 | 5.9 x 7.9 | 0.48 x 0.64 | 2.9 x 3.9 | 0.24 x 0.32 |
| 1X Camera Tube 35-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 | |
| | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 | |
| | Mag | 0.56 | 6.9 | 1.4 | 17 | 2.8 | 35 | |
| | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 | |
| | FOV (mm) Cam Format | 1/3" | 6.4 x 8.6 | 0.52 x 0.70 | 2.6 x 3.4 | 0.21 x 0.28 | 1.3 x 1.7 | 0.10 x 0.14 |
| | | 1/2" | 8.6 x 11 | 0.70 x 0.93 | 3.4 x 4.6 | 0.28 x 0.37 | 1.7 x 2.3 | 0.14 x 0.19 |
| | | 2/3" | 12 x 16 | 0.96 x 1.3 | 4.7 x 6.3 | 0.38 x 0.51 | 2.4 x 3.1 | 0.19 x 0.26 |

-- Useable FOV Limited by Coax illumination (>50% Illumination)

-- FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 12.5:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 12.5:1 Zoom and Microscope Objectives.

Fetura+ with LWD Objectives

| 20X M Plan Apo 28-21-11-001 WD: 20mm | | 5X HiRes 28-20-44-000 WD: 34mm | | 10X HiRes 28-20-45-000 WD: 19mm | | 20X HiRes 28-20-46-000 WD: 13mm | |
|--|---------------|--------------------------------------|-------------|---------------------------------------|-------------|---------------------------------------|---------------|
| 1.2 | | 6.6 | | 3.2 | | 1.6 | |
| 0.83 | | 5.0 | | 2.3 | | 1.1 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.18 | 0.42 | 0.045 | 0.23 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 2.2 | 28 | 0.56 | 6.9 | 1.1 | 14 | 2.2 | 28 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 1.6 x 2.1 | 0.13 x 0.17 | 6.4 x 8.6 | 0.52 x 0.70 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 |
| 2.1 x 2.9 | 0.17 x 0.23 | 8.6 x 11 | 0.70 x 0.93 | 4.3 x 5.7 | 0.35 x 0.46 | 2.1 x 2.9 | 0.17 x 0.23 |
| 2.9 x 3.9 | 0.24 x 0.32 | 12 x 16 | 0.96 x 1.3 | 5.9 x 7.9 | 0.48 x 0.64 | 2.9 x 3.9 | 0.24 x 0.32 |
| 0.18 | 0.42 | 0.045 | 0.23 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 2.8 | 35 | 0.70 | 8.6 | 1.4 | 17 | 2.8 | 35 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 1.3 x 1.7 | 0.10 x 0.14 | 5.1 x 6.9 | 0.42 x 0.56 | 2.6 x 3.4 | 0.21 x 0.28 | 1.3 x 1.7 | 0.10 x 0.14 |
| 1.7 x 2.3 | 0.14 x 0.19 | 6.9 x 9.1 | 0.56 x 0.74 | 3.4 x 4.6 | 0.28 x 0.37 | 1.7 x 2.3 | 0.14 x 0.19 |
| 2.4 x 3.1 | 0.19 x 0.26 | 9.4 x 13 | 0.77 x 1.0 | 4.7 x 6.3 | 0.38 x 0.51 | 2.4 x 3.1 | 0.19 x 0.26 |
| 0.18 | 0.42 | 0.045 | 0.23 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 3.4 | 41 | 0.84 | 10.4 | 1.7 | 21 | 3.4 | 41 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 1.1 x 1.4 | 0.087 x 0.12 | 4.3 x 5.7 | 0.35 x 0.46 | 2.1 x 2.9 | 0.17 x 0.23 | 1.1 x 1.4 | 0.087 x 0.12 |
| 1.4 x 1.9 | 0.12 x 0.15 | 5.7 x 7.6 | 0.46 x 0.62 | 2.9 x 3.8 | 0.23 x 0.31 | 1.4 x 1.9 | 0.12 x 0.15 |
| 2.0 x 2.6 | 0.16 x 0.21 | 7.9 x 10 | 0.64 x 0.85 | 3.9 x 5.2 | 0.32 x 0.43 | 2.0 x 2.6 | 0.16 x 0.21 |
| 0.18 | 0.42 | 0.045 | 0.23 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 4.5 | 55 | 1.1 | 14 | 2.2 | 28 | 4.5 | 55 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.80 x 1.1 | 0.065 x 0.087 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 | 0.80 x 1.1 | 0.065 x 0.087 |
| 1.1 x 1.4 | 0.087 x 0.12 | 4.3 x 5.7 | 0.35 x 0.46 | 2.1 x 2.9 | 0.17 x 0.23 | 1.1 x 1.4 | 0.087 x 0.12 |
| 1.5 x 2.0 | 0.12 x 0.16 | 5.9 x 7.9 | 0.48 x 0.64 | 2.9 x 3.9 | 0.24 x 0.32 | 1.5 x 2.0 | 0.12 x 0.16 |
| 0.18 | 0.42 | 0.045 | 0.23 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 5.6 | 69 | 1.4 | 17 | 2.8 | 35 | 5.6 | 69 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.64 x 0.86 | 0.052 x 0.070 | 2.6 x 3.4 | 0.21 x 0.28 | 1.3 x 1.7 | 0.10 x 0.14 | 0.64 x 0.86 | 0.052 x 0.070 |
| 0.86 x 1.1 | 0.070 x 0.093 | 3.4 x 4.6 | 0.28 x 0.37 | 1.7 x 2.3 | 0.14 x 0.19 | 0.86 x 1.1 | 0.070 x 0.093 |
| 1.2 x 1.6 | 0.096 x 0.13 | 4.7 x 6.3 | 0.38 x 0.51 | 2.4 x 3.1 | 0.19 x 0.26 | 1.2 x 1.6 | 0.096 x 0.13 |

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - OPTEM 12.5:1 Zoom and Chart 3D

| | | 2X M Plan Apo 28-21-02-001 WD: 34mm | | 5X M Plan Apo 28-21-05-001 WD: 41mm | | 10X M Plan Apo 28-21-10-000 WD: 34mm | | |
|---|------------|--|-----------|--|-----------|---|-----------|--------------|
| Max FOV Dia. | | 14 | | 6.8 | | 3.3 | | |
| Max Coax FOV Dia. | | 11 | | 4.6 | | 2.2 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 1.5X Mini Camera Tube 35-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 | FOV (mm) | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 |
| | | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 |
| | | Mag | 0.84 | 10 | 2.1 | 26 | 4.2 | 52 |
| | | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 |
| | Cam Format | 2/3" | 7.9 x 10 | 0.64 x 0.85 | 3.1 x 4.2 | 0.26 x 0.34 | 1.6 x 2.1 | 0.13 x 0.17 |
| | | 1" | 11 x 15 | 0.93 x 1.2 | 4.6 x 6.1 | 0.37 x 0.49 | 2.3 x 3.0 | 0.19 x 0.25 |
| | | 4/3" | 16 x 21 | 1.3 x 1.7 | 6.4 x 8.6 | 0.52 x 0.70 | 3.2 x 4.3 | 0.26 x 0.35 |
| | | APS-C | 20 x 30 | 1.6 x 2.4 | 8.0 x 12 | 0.65 x 0.97 | 4.0 x 6.0 | 0.32 x 0.49 |
| 2X Mini Camera Tube 35-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 | FOV (mm) | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 |
| | | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 |
| | | Mag | 1.1 | 14 | 2.8 | 35 | 5.6 | 69 |
| | | DOF (m m) | 1.8 | 0.178 | 0.28 | 0.029 | 0.070 | 0.0063 |
| | Cam Format | 2/3" | 5.9 x 7.9 | 0.48 x 0.64 | 2.4 x 3.1 | 0.19 x 0.26 | 1.2 x 1.6 | 0.096 x 0.13 |
| | | 1" | 8.6 x 11 | 0.70 x 0.93 | 3.4 x 4.6 | 0.28 x 0.37 | 1.7 x 2.3 | 0.14 x 0.19 |
| | | 4/3" | 12 x 16 | 0.98 x 1.3 | 4.8 x 6.4 | 0.39 x 0.52 | 2.4 x 3.2 | 0.20 x 0.26 |
| | | APS-C | 15 x 22 | 1.2 x 1.8 | 6.0 x 9.0 | 0.48 x 0.73 | 3.0 x 4.5 | 0.24 x 0.36 |
| 2.5X Mini Camera Tube 35-08-15-000 EFL: 500mm Image Circle Dia. (mm) 44 | FOV (mm) | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 |
| | | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 |
| | | Mag | 1.4 | 17 | 3.5 | 43 | 7.0 | 86 |
| | | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 |
| | Cam Format | 1" | 6.9 x 9.1 | 0.56 x 0.74 | 2.7 x 3.7 | 0.22 x 0.30 | 1.4 x 1.8 | 0.11 x 0.15 |
| | | 4/3" | 9.6 x 13 | 0.78 x 1.0 | 3.9 x 5.1 | 0.31 x 0.42 | 1.9 x 2.6 | 0.16 x 0.21 |
| | | APS-C | 12 x 18 | 0.97 x 1.5 | 4.8 x 7.2 | 0.39 x 0.58 | 2.4 x 3.6 | 0.19 x 0.29 |
| | | 35mm(Full) | 17 x 26 | 1.4 x 2.1 | 6.9 x 10 | 0.56 x 0.83 | 3.4 x 5.1 | 0.28 x 0.42 |
| 3X Mini Camera Tube 35-08-16-000 EFL: 600mm Image Circle Dia. (mm) 44 | FOV (mm) | NA | 0.018 | 0.057 | 0.045 | 0.14 | 0.090 | 0.30 |
| | | Res (lp/mm) | 54 | 170 | 135 | 420 | 270 | 900 |
| | | Mag | 1.7 | 21 | 4.2 | 52 | 8.4 | 104 |
| | | DOF (mm) | 1.8 | 0.18 | 0.28 | 0.029 | 0.070 | 0.0063 |
| | Cam Format | 1" | 5.7 x 7.6 | 0.46 x 0.62 | 2.3 x 3.0 | 0.19 x 0.25 | 1.1 x 1.5 | 0.093 x 0.12 |
| | | 4/3" | 8.0 x 11 | 0.65 x 0.87 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 |
| | | APS-C | 9.9 x 15 | 0.81 x 1.2 | 4.0 x 6.0 | 0.32 x 0.49 | 2.0 x 3.0 | 0.16 x 0.24 |
| | | 35mm(Full) | 14 x 21 | 1.2 x 1.7 | 5.7 x 8.6 | 0.46 x 0.70 | 2.9 x 4.3 | 0.23 x 0.35 |

- Useable FOV Limited by Coax illumination (>50% Illumination)
- FOV Limited by vignetting

50X M Plan Apo is NOT recommended for use with a 12.5:1 Zoom
0.4X and 0.5X Camera Tubes are not recommended for use with
a 12.5:1 Zoom and Microscope Objectives.

| | Height | x | Width | Diag. |
|-------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Fetura+ with LWD Objectives - Mini Camera Tubes

| 20X M Plan Apo 28-21-11-001 WD: 20mm | | 5X HiRes 28-20-44-000 WD: 34mm | | 10X HiRes 28-20-45-000 WD: 19mm | | 20X HiRes 28-20-46-000 WD: 13mm | |
|---|---------------|---|-------------|--|--------------|--|---------------|
| 1.2 | | 6.6 | | 3.2 | | 1.6 | |
| 0.83 | | 5.0 | | 2.3 | | 1.1 | |
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.18 | 0.42 | 0.045 | 0.225 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 8.4 | 104 | 2.1 | 26 | 4.2 | 52 | 8.4 | 104 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.79 x 1.0 | 0.064 x 0.085 | 3.1 x 4.2 | 0.26 x 0.34 | 1.6 x 2.1 | 0.13 x 0.17 | 0.79 x 1.0 | 0.064 x 0.085 |
| 1.1 x 1.5 | 0.093 x 0.12 | 4.6 x 6.1 | 0.37 x 0.49 | 2.3 x 3.0 | 0.19 x 0.25 | 1.1 x 1.5 | 0.093 x 0.12 |
| 1.6 x 2.1 | 0.13 x 0.17 | 6.4 x 8.6 | 0.52 x 0.70 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 |
| 2.0 x 3.0 | 0.16 x 0.24 | 8.0 x 12 | 0.65 x 0.97 | 4.0 x 6.0 | 0.32 x 0.49 | 2.0 x 3.0 | 0.16 x 0.24 |
| 0.18 | 0.42 | 0.045 | 0.225 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 11 | 138 | 2.8 | 35 | 5.6 | 69 | 11 | 138 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.59 x 0.79 | 0.048 x 0.064 | 2.4 x 3.1 | 0.19 x 0.26 | 1.2 x 1.6 | 0.096 x 0.13 | 0.59 x 0.79 | 0.048 x 0.064 |
| 0.86 x 1.1 | 0.070 x 0.093 | 3.4 x 4.6 | 0.28 x 0.37 | 1.7 x 2.3 | 0.14 x 0.19 | 0.86 x 1.1 | 0.070 x 0.093 |
| 1.2 x 1.6 | 0.098 x 0.13 | 4.8 x 6.4 | 0.39 x 0.52 | 2.4 x 3.2 | 0.20 x 0.26 | 1.2 x 1.6 | 0.098 x 0.13 |
| 1.5 x 2.2 | 0.12 x 0.18 | 6.0 x 9.0 | 0.48 x 0.73 | 3.0 x 4.5 | 0.24 x 0.36 | 1.5 x 2.2 | 0.12 x 0.18 |
| 0.18 | 0.42 | 0.045 | 0.225 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 14 | 173 | 3.5 | 43 | 7.0 | 86 | 14 | 173 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.69 x 0.91 | 0.056 x 0.074 | 2.7 x 3.7 | 0.22 x 0.30 | 1.4 x 1.8 | 0.11 x 0.15 | 0.69 x 0.91 | 0.056 x 0.074 |
| 0.96 x 1.3 | 0.078 x 0.10 | 3.9 x 5.1 | 0.31 x 0.42 | 1.9 x 2.6 | 0.16 x 0.21 | 0.96 x 1.3 | 0.078 x 0.10 |
| 1.2 x 1.8 | 0.097 x 0.15 | 4.8 x 7.2 | 0.39 x 0.58 | 2.4 x 3.6 | 0.19 x 0.29 | 1.2 x 1.8 | 0.097 x 0.15 |
| 1.7 x 2.6 | 0.14 x 0.21 | 6.9 x 10 | 0.56 x 0.83 | 3.4 x 5.1 | 0.28 x 0.42 | 1.7 x 2.6 | 0.14 x 0.21 |
| 0.18 | 0.42 | 0.045 | 0.225 | 0.090 | 0.45 | 0.18 | 0.60 |
| 540 | 1260 | 135 | 675 | 270 | 1350 | 540 | 1800 |
| 17 | 207 | 4.2 | 52 | 8.4 | 104 | 17 | 207 |
| 0.018 | 0.0032 | 0.28 | 0.011 | 0.070 | 0.0028 | 0.018 | 0.0016 |
| 0.57 x 0.76 | 0.046 x 0.062 | 2.3 x 3.0 | 0.19 x 0.25 | 1.1 x 1.5 | 0.093 x 0.12 | 0.57 x 0.76 | 0.046 x 0.062 |
| 0.80 x 1.1 | 0.065 x 0.087 | 3.2 x 4.3 | 0.26 x 0.35 | 1.6 x 2.1 | 0.13 x 0.17 | 0.80 x 1.1 | 0.065 x 0.087 |
| 0.99 x 1.5 | 0.081 x 0.12 | 4.0 x 6.0 | 0.32 x 0.49 | 2.0 x 3.0 | 0.16 x 0.24 | 0.99 x 1.5 | 0.081 x 0.12 |
| 1.4 x 2.1 | 0.12 x 0.17 | 5.7 x 8.6 | 0.46 x 0.70 | 2.9 x 4.3 | 0.23 x 0.35 | 1.4 x 2.1 | 0.12 x 0.17 |

Note: Hi Res Objectives are not flat-field and therefore limited by field curvature at lower magnifications with both fixed and zoom systems.

Optical Performance - Infinity Macro Lens with 2X

Chart 4

42-35-41-000

| | | WD: 500mm 0.14X | WD: 400mm 0.17X | WD: 300mm 0.21X | |
|--|------------------------|--------------------|--------------------|--------------------|---------|
| Max FOV Dia. | | 275 | 225 | 175 | |
| Fixed Mag. 1X Camera Tube 35-08-06-000 Image Circle Dia. (mm) 24 18mm Stop | NA | 0.0061 | 0.0075 | 0.0096 | |
| | Res (lp/mm) | 18 | 22 | 29 | |
| | Mag | 0.14 | 0.17 | 0.21 | |
| | DOF (mm) | 15 | 10 | 6.2 | |
| | FOV (mm) Cam Format | 1/3" | 26 x 35 | 22 x 29 | 17 x 23 |
| | | 1/2" | 35 x 47 | 29 x 39 | 23 x 30 |
| | | 2/3" | 49 x 65 | 40 x 53 | 31 x 41 |

| | | 240 | | 200 | | 150 | | |
|--|------------------------|---------|-----------|----------|----------|----------|----------|-----------|
| Max FOV Dia. | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 7:1 Zoom 1X Camera Tube Image Circle Dia. (mm) 24 | NA | 0.0016 | 0.0053 | 0.0020 | 0.0064 | 0.0025 | 0.0083 | |
| | Res (lp/mm) | 4.8 | 16 | 5.9 | 19 | 7.5 | 25 | |
| | Mag | 0.057 | 0.39 | 0.070 | 0.48 | 0.090 | 0.62 | |
| | DOF (mm) | 220 | 20 | 148 | 14 | 90 | 8.3 | |
| | FOV (mm) Cam Format | 1/3" | 63 x 84 | 9.1 x 12 | 52 x 69 | 7.5 x 10 | 40 x 54 | 5.8 x 7.8 |
| | | 1/2" | 84 x 112 | 12 x 16 | 69 x 92 | 10 x 13 | 54 x 71 | 7.8 x 10 |
| | | 2/3" | 116 x 154 | 17 x 22 | 95 x 126 | 14 x 18 | 74 x 98 | 11 x 14 |

| | | 210 | | 175 | | 135 | | |
|---|------------------------|---------|-----------|----------|-----------|-----------|-----------|-----------|
| Max FOV Dia. | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 12:1 Zoom 1X Camera Tube 35-08-06-000 Image Circle Dia. (mm) 24 | NA | 0.0012 | 0.0065 | 0.0015 | 0.0080 | 0.0019 | 0.010 | |
| | Res (lp/mm) | 3.7 | 20 | 4.5 | 24 | 5.8 | 31 | |
| | Mag | 0.038 | 0.47 | 0.046 | 0.57 | 0.060 | 0.74 | |
| | DOF (mm) | 378 | 13 | 255 | 8.9 | 154 | 5.4 | |
| | FOV (mm) Cam Format | 1/3" | 95 x 126 | 7.7 x 10 | 78 x 103 | 6.3 x 8.4 | 60 x 80 | 4.9 x 6.5 |
| | | 1/2" | 126 x 168 | 10 x 14 | 103 x 138 | 8.4 x 11 | 80 x 107 | 6.5 x 8.7 |
| | | 2/3" | 173 x 231 | 14 x 19 | 142 x 190 | 12 x 15 | 111 x 147 | 9.0 x 12 |

 -- FOV Limited by vignetting

1X Camera Tube shown. For other Camera tubes, multiply the magnification in the chart by the Camera tube mag., and divide the FOV values by the Camera tube mag. NA, Resolution, and DOF are not affected by the Camera Tube.

NOTE: Wide Angle Objective is not recommended for use with coaxial Illumination.

The Wide Angle Objective can be focused out to infinity. At WDs greater than 1m, it can be thought of as a video lens.

NOTE: The Camera Tube Magnification will affect the EFL and the f# of the video lens.

| Fixed Mag: | |
|------------|--------------------------|
| EFL: | 73 *CT mag |
| f/#: | 200/Stop Diameter*CT mag |

| 7:1 Zoom: | |
|-----------------|-----------------------|
| EFL (low mag): | 30*CT mag |
| EFL (high mag): | 210*CT mag |
| f#: | (low mag): 18*CT mag |
| f#: | (high mag): 38*CT mag |

Lower Lens

35-00-03-000

| WD: 200mm 0.30X | WD: 150mm 0.38X | WD: 100mm 0.50X | WD: 50mm 0.75X |
|--------------------|--------------------|--------------------|-------------------|
| 125 | 100 | 75 | 50 |
| 0.013 | 0.017 | 0.023 | 0.034 |
| 40 | 51 | 68 | 103 |
| 0.30 | 0.38 | 0.50 | 0.77 |
| 3.1 | 2.0 | 1.1 | 0.48 |
| 12 x 16 | 9.6 x 13 | 7.1 x 9.5 | 4.7 x 6.3 |
| 16 x 21 | 13 x 17 | 9.5 x 13 | 6.3 x 8.4 |
| 22 x 29 | 18 x 23 | 13 x 17 | 8.6 x 11 |

| 110 | | 85 | | 65 | | 43 | |
|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.0035 | 0.012 | 0.0044 | 0.015 | 0.0059 | 0.020 | 0.0090 | 0.030 |
| 11 | 35 | 13 | 44 | 18 | 59 | 27 | 89 |
| 0.13 | 0.87 | 0.16 | 1.1 | 0.21 | 1.5 | 0.32 | 2.2 |
| 45 | 4.2 | 29 | 2.7 | 16 | 1.5 | 6.9 | 0.64 |
| 29 x 38 | 4.1 x 5.5 | 23 x 30 | 3.3 x 4.4 | 17 x 23 | 2.5 x 3.3 | 11 x 15 | 1.6 x 2.2 |
| 38 x 51 | 5.5 x 7.4 | 30 x 41 | 4.4 x 5.9 | 23 x 30 | 3.3 x 4.4 | 15 x 20 | 2.2 x 2.9 |
| 52 x 70 | 7.6 x 10 | 42 x 56 | 6.1 x 8.1 | 31 x 42 | 4.5 x 6.0 | 21 x 27 | 3.0 x 4.0 |

| 95 | | 77 | | 58 | | 38 | |
|----------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag |
| 0.0027 | 0.014 | 0.0034 | 0.018 | 0.0045 | 0.024 | 0.0069 | 0.037 |
| 8.1 | 43 | 10 | 54 | 14 | 73 | 21 | 110 |
| 0.084 | 1.0 | 0.11 | 1.3 | 0.14 | 1.7 | 0.21 | 2.6 |
| 78 | 2.7 | 50 | 1.7 | 28 | 0.97 | 12 | 0.42 |
| 43 x 57 | 3.5 x 4.6 | 34 x 46 | 2.8 x 3.7 | 26 x 34 | 2.1 x 2.8 | 17 x 22 | 1.4 x 1.8 |
| 57 x 76 | 4.6 x 6.2 | 46 x 61 | 3.7 x 4.9 | 34 x 45 | 2.8 x 3.7 | 22 x 30 | 1.8 x 2.4 |
| 79 x 105 | 6.4 x 8.5 | 63 x 84 | 5.1 x 6.8 | 47 x 62 | 3.8 x 5.1 | 31 x 41 | 2.5 x 3.3 |

12.5:1 Zoom:

| | |
|------------------|-------------|
| EFL (low mag): | 20*CT mag |
| EFL (high mag): | 250*CT mag |
| f/#: (low mag): | 15.5*CT mag |
| f/#: (high mag): | 36*CT mag |



Optical Performance - Fixed Magnification SWIR

Chart 5A

| | | 0.5X Lower Lens 45-00-10-000 WD: 390mm EFL: 400mm | | | 1X Lower Lens 45-00-08-000 WD: 190mm EFL: 200mm | | | 1.25X Lower Lens 45-00-06-000 WD: 155mm EFL: 160mm | | | 2X Lower Lens 45-00-03-000 WD: 95mm EFL: 100mm | | | |
|--|--------------------------------------|---|-------|------|---|-------|------|--|-------|------|--|-------|-----|--|
| Max FOV Dia. | | 80 | | | 40 | | | 32 | | | 20 | | | |
| Max Coax FOV Dia. | | 13 | | | 12 | | | 12 | | | 15 | | | |
| 0.5X Camera Tube 45-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 8mm Stop | FOV (mm) Cam Format | NA | 0.010 | | | 0.020 | | | 0.025 | | | 0.040 | | |
| | | Res (lp/mm) | 14 | | | 28 | | | 35 | | | 56 | | |
| | | Mag | 0.25 | | | 0.50 | | | 0.63 | | | 1.0 | | |
| | | DOF (mm) | 11.77 | | | 2.94 | | | 1.88 | | | 0.74 | | |
| | 1/3" | 14.4 | x | 19.2 | 7.2 | x | 9.6 | 5.8 | x | 7.7 | 3.6 | x | 4.8 | |
| | 1/2" | 19.2 | x | 25.6 | 9.6 | x | 12.8 | 7.7 | x | 10.2 | 4.8 | x | 6.4 | |
| 2/3" | 26.4 | x | 35.2 | 13.2 | x | 17.6 | 10.6 | x | 14.1 | 6.6 | x | 8.8 | | |
| 0.8X Camera Tube 45-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 8mm Stop | FOV (mm) Cam Format | NA | 0.010 | | | 0.020 | | | 0.025 | | | 0.040 | | |
| | | Res (lp/mm) | 14 | | | 28 | | | 35 | | | 56 | | |
| | | Mag | 0.40 | | | 0.80 | | | 1.0 | | | 1.6 | | |
| | | DOF (mm) | 11.77 | | | 2.94 | | | 1.88 | | | 0.74 | | |
| | 1/2" | 12.0 | x | 16.0 | 6.0 | x | 8.0 | 4.8 | x | 6.4 | 3.0 | x | 4.0 | |
| | 2/3" | 16.5 | x | 22.0 | 8.3 | x | 11.0 | 6.6 | x | 8.8 | 4.1 | x | 5.5 | |
| 1" | 24.0 | x | 32.0 | 12.0 | x | 16.0 | 9.6 | x | 12.8 | 6.0 | x | 8.0 | | |
| 1.0X Camera Tube 45-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 12mm Stop | FOV (mm) Cam Format | NA | 0.015 | | | 0.030 | | | 0.038 | | | 0.060 | | |
| | | Res (lp/mm) | 21 | | | 42 | | | 52 | | | 84 | | |
| | | Mag | 0.50 | | | 1.00 | | | 1.25 | | | 2.00 | | |
| | | DOF (mm) | 5.23 | | | 1.31 | | | 0.84 | | | 0.33 | | |
| | 2/3" | 13.2 | x | 17.6 | 6.6 | x | 8.8 | 5.3 | x | 7.0 | 3.3 | x | 4.4 | |
| | 1" | 19.2 | x | 25.6 | 9.6 | x | 12.8 | 7.7 | x | 10.2 | 4.8 | x | 6.4 | |
| 4/3" | 27.0 | x | 36.0 | 13.5 | x | 18.0 | 10.8 | x | 14.4 | 6.8 | x | 9.0 | | |
| 1.5X Mini Camera Tube 45-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 12mm Stop | FOV (mm) Cam Format | NA | 0.015 | | | 0.030 | | | 0.038 | | | 0.060 | | |
| | | Res (lp/mm) | 21 | | | 42 | | | 52 | | | 84 | | |
| | | Mag | 0.75 | | | 1.5 | | | 1.9 | | | 3.0 | | |
| | | DOF (mm) | 5.23 | | | 1.31 | | | 0.84 | | | 0.33 | | |
| | 2/3" | 8.8 | x | 11.7 | 4.4 | x | 5.9 | 3.5 | x | 4.7 | 2.2 | x | 2.9 | |
| | 1" | 12.8 | x | 17.1 | 6.4 | x | 8.5 | 5.1 | x | 6.8 | 3.2 | x | 4.3 | |
| 4/3" | 18.0 | x | 24.0 | 9.0 | x | 12.0 | 7.2 | x | 9.6 | 4.5 | x | 6.0 | | |
| 2.0X Mini Camera Tube 45-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 12mm Stop | FOV (mm) Cam Format | NA | 0.015 | | | 0.030 | | | 0.038 | | | 0.060 | | |
| | | Res (lp/mm) | 21 | | | 42 | | | 52 | | | 84 | | |
| | | Mag | 1.00 | | | 2.0 | | | 2.50 | | | 4.0 | | |
| | | DOF (mm) | 5.23 | | | 1.31 | | | 0.84 | | | 0.33 | | |
| | 2/3" | 6.6 | x | 8.8 | 3.3 | x | 4.4 | 2.6 | x | 3.5 | 1.7 | x | 2.2 | |
| | 1" | 9.6 | x | 12.8 | 4.8 | x | 6.4 | 3.8 | x | 5.1 | 2.4 | x | 3.2 | |
| 4/3" | 13.5 | x | 18.0 | 6.8 | x | 9.0 | 5.4 | x | 7.2 | 3.4 | x | 4.5 | | |

-- Useable FOV Limited by Coax illumination (>50% Illumination)

-- FOV Limited by vignetting

Note:

- SWIR Specifications based on primary wavelength of 1177nm
- FUSION SWIR supports operating waveband from 700 - 1700 nm

| | Height | x | Width | Diag. |
|-------------|--------|---|-------|-------|
| 2/3" | 6.6 | x | 8.8 | 11 |
| 1" | 9.6 | x | 12.8 | 16 |
| 4/3" | 13.5 | x | 18 | 22.5 |
| APS-C* | 16.7 | x | 25.1 | 30 |
| 35mm (Full) | 24 | x | 36 | 43.3 |

*Also known as Half Frame 35mm format

Optical Performance - OPTEM 7:1 Zoom SWIR

Chart 5B

| | | 0.5X Lower Lens 45-00-10-000 WD: 390mm EFL: 400mm | | 1X Lower Lens 45-00-08-000 WD: 190mm EFL: 200mm | | 1.25X Lower Lens 45-00-06-000 WD: 155mm EFL: 160mm | | 2X Lower Lens 45-00-03-000 WD: 95mm EFL: 100mm | | |
|---|--------------------------------------|---|----------|---|----------|--|-------------|--|-------------|-----------|
| Max FOV Dia. | | 125 | | 63 | | 50 | | 31 | | |
| Max Coax FOV Dia. | | NR | | 19 | | 19 | | 19 | | |
| | | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | Low Mag | High Mag | |
| 0.5X Camera Tube 45-08-01-000 EFL: 100mm Image Circle Dia. (mm) 12 | NA Res (lp/mm) Mag DOF (mm) | 0.0059 | 0.019 | 0.012 | 0.039 | 0.015 | 0.048 | 0.024 | 0.078 | |
| | | 8 | 26 | 17 | 54 | 21 | 67 | 33 | 109 | |
| | | 0.11 | 0.73 | 0.21 | 1.45 | 0.26 | 1.84 | 0.42 | 2.90 | |
| | | 34 | 3.3 | 8.2 | 0.77 | 5.2 | 0.51 | 2.0 | 0.193 | |
| | FOV (mm) Cam Format | 1/3" | 34 x 46 | 5.0 x 6.6 | 17 x 23 | 2.5 x 3.3 | 14 x 18 | 2.0 x 2.6 | 9 x 11 | 1.2 x 1.7 |
| | | 1/2" | 46 x 61 | 6.6 x 8.8 | 23 x 30 | 3.3 x 4.4 | 18 x 25 | 2.6 x 3.5 | 11 x 15 | 1.7 x 2.2 |
| | | 2/3" | 63 x 84 | 9.1 x 12.1 | 31 x 42 | 4.6 x 6.1 | 25 x 34 | 3.6 x 4.8 | 16 x 21 | 2.3 x 3.0 |
| 0.8X Camera Tube 45-08-04-000 EFL: 160mm Image Circle Dia. (mm) 19.2 | NA Res (lp/mm) Mag DOF (mm) | 0.0059 | 0.019 | 0.012 | 0.039 | 0.015 | 0.048 | 0.024 | 0.078 | |
| | | 8 | 26 | 17 | 54 | 21 | 67 | 33 | 109 | |
| | | 0.17 | 1.17 | 0.34 | 2.30 | 0.42 | 2.90 | 0.67 | 4.60 | |
| | | 34 | 3.3 | 8.2 | 0.77 | 5.2 | 0.51 | 2.0 | 0.193 | |
| | FOV (mm) Cam Format | 1/2" | 29 x 38 | 4.1 x 5.5 | 14 x 19 | 2.1 x 2.8 | 11.4 x 15 | 1.7 x 2.2 | 7.2 x 9.6 | 1.0 x 1.4 |
| | | 2/3" | 39 x 52 | 5.6 x 7.5 | 20 x 26 | 2.9 x 3.8 | 16 x 21 | 2.3 x 3.0 | 9.9 x 13 | 1.4 x 1.9 |
| | | 1" | 57 x 76 | 8.2 x 10.9 | 28 x 38 | 4.2 x 5.6 | 23 x 30 | 3.3 x 4.4 | 14.3 x 19 | 2.1 x 2.8 |
| 1.0X Camera Tube 45-08-06-000 EFL: 200mm Image Circle Dia. (mm) 24 | NA Res (lp/mm) Mag DOF (mm) | 0.0059 | 0.019 | 0.012 | 0.039 | 0.015 | 0.048 | 0.024 | 0.078 | |
| | | 8 | 26 | 17 | 54 | 21 | 67 | 33 | 109 | |
| | | 0.21 | 1.45 | 0.42 | 2.90 | 0.53 | 3.60 | 0.84 | 5.80 | |
| | | 34 | 3.3 | 8.2 | 0.77 | 5.2 | 0.51 | 2.0 | 0.193 | |
| | FOV (mm) Cam Format | 2/3" | 31 x 42 | 4.6 x 6.1 | 16 x 21 | 2.3 x 3.0 | 12.5 x 16.6 | 1.83 x 2.4 | 7.9 x 10.5 | 1.1 x 1.5 |
| | | 1" | 46 x 61 | 6.6 x 8.8 | 23 x 30 | 3.3 x 4.4 | 18.1 x 24 | 2.7 x 3.6 | 11.5 x 15.3 | 1.7 x 2.2 |
| | | 4/3" | 64 x 86 | 9.3 x 12.4 | 32 x 43 | 4.7 x 6.2 | 25 x 34 | 3.8 x 5.0 | 16.1 x 22 | 2.3 x 3.1 |
| 1.5X Mini Camera Tube 45-08-13-000 EFL: 300mm Image Circle Dia. (mm) 36 | NA Res (lp/mm) Mag DOF (mm) | 0.0059 | 0.019 | 0.012 | 0.039 | 0.015 | 0.048 | 0.024 | 0.078 | |
| | | 8 | 26 | 17 | 54 | 21 | 67 | 33 | 109 | |
| | | 0.32 | 2.18 | 0.63 | 4.40 | 0.79 | 5.40 | 1.26 | 8.70 | |
| | | 34 | 3.3 | 8.2 | 0.77 | 5.2 | 0.51 | 2.0 | 0.193 | |
| | FOV (mm) Cam Format | 2/3" | 21 x 28 | 3.0 x 4.0 | 10 x 14 | 1.5 x 2.0 | 8.4 x 11 | 1.2 x 1.6 | 5.2 x 7.0 | 0.8 x 1.0 |
| | | 1" | 30 x 40 | 4.4 x 5.9 | 15 x 20 | 2.2 x 2.9 | 12 x 16 | 1.8 x 2.4 | 7.6 x 10 | 1.1 x 1.5 |
| | | 4/3" | 43 x 57 | 6.2 x 8.3 | 21 x 29 | 3.1 x 4.1 | 17 x 23 | 2.5 x 3.3 | 11 x 14 | 1.6 x 2.1 |
| 2.0X Mini Camera Tube 45-08-14-000 EFL: 400mm Image Circle Dia. (mm) 44 | NA Res (lp/mm) Mag DOF (mm) | 0.0059 | 0.019 | 0.012 | 0.039 | 0.015 | 0.048 | 0.024 | 0.078 | |
| | | 8 | 26 | 17 | 54 | 21 | 67 | 33 | 109 | |
| | | 0.42 | 2.90 | 0.84 | 5.80 | 1.05 | 7.29 | 1.69 | 11.50 | |
| | | 34 | 3.3 | 8.2 | 0.77 | 5.2 | 0.51 | 2.0 | 0.193 | |
| | FOV (mm) Cam Format | 2/3" | 16 x 21 | 2.3 x 3.0 | 7.9 x 10 | 1.1 x 1.5 | 6.3 x 8.4 | 0.9 x 1.2 | 3.9 x 5.2 | 0.6 x 0.8 |
| | | 1" | 23 x 30 | 3.3 x 4.4 | 11 x 15 | 1.7 x 2.2 | 9.1 x 12 | 1.3 x 1.8 | 5.7 x 7.6 | 0.8 x 1.1 |
| | | 4/3" | 32 x 43 | 4.7 x 6.2 | 16 x 21 | 2.3 x 3.1 | 13 x 17 | 1.9 x 2.5 | 8.0 x 11 | 1.2 x 1.6 |

Useable FOV Limited by Coax illumination (>50% Illumination)

FOV Limited by vignetting

FUSION Flexibility...

At the heart of FUSION's extreme versatility, is the simplicity of stacking a variety of modules to affect magnification, function, form and wavelength of the lens system.

Following are the basic required components of a functional FUSION lens assembly. From here, features and accessories are easily swapped in to meet your requirements.

Camera Mount
Mates FUSION with C, CS, F, EOS, 4/3-mount cameras and more

Camera Tube
Modifies magnification to your camera optimizing chip coverage & performance

Core Optical Module
Determines optical function: Fixed, 7:1 or 12.5:1 zoom magnification—motorized or manual

Lower Function Module
Integrates internal focus—motorized or manual—and coaxial LED illumination options

Lower Lens
Modifies taking magnification to affect field of view, NA and working distance

Modular design allows FUSION to evolve quickly and easily

With a simple change-out of a few modules, you can modify FUSION performance, function, form and wavelength to meet the evolving requirements of your system. This streamlines prototyping stages and aids the evolution of your system.



Optem FUSION
Extreme Micro-Imaging Versatility



Your Key to Photonic Innovation...

Qioptiq serves a wide variety of applications across the industrial manufacturing sector. With a rich history of delivering innovative photonic components, modules and instruments to integrators, engineers and OEMs, we also offer custom-tailored photonic solutions to maximize the potential and capabilities of tomorrow's many processes and industrial manufacturing systems.

...and Manufacturing Advancement

For technical information
www.excelitas.com
Inspection@excelitas.com

North America
Toll free: 800-724-4274

Europe
Tel: +49 551 6935-0

Asia Pacific
Tel: +65 6499 7766

