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Specim

Technical note TN-0009

Problem	What is the size of imaged line	**Date**	18 March 2005
Author(s)	EHE	Ver	1.0

Size of imaged line, spatial and spectral resolution

Length (L_i) and width (W_i) of the scene line imaged at a time is determined by the slit length (L_s) and width (W_s), lens focal length (f) and distance between target and lens (D):

$$L_i = L_s D/f, \quad \text{and} \tag{1a}$$

$$W_i = W_s D/f \tag{1b}$$

In standard ImSpector slit length is 9.8 mm and widths of 13, 25, 50, 80 and 150 μm are readily available. The ImSpector Enhanced series slits are 13 and 30 um and the length is 12-14 mm depending on model. Magnification of the spectrograph optics is 1. Thus, if the CCD size is smaller than the slit length, the CCD dimension instead of the slit length determines the length of imaged line.

Table 1. Scene line length (L_i) and width (W_i) and field of view (θ) with different lens local lengths (f) and distances between target and lens (D). 2/3" (8.8 mm) detector and 80μm slit (with other slits, W_i is directly proportional to slit width).

D (m)	f = 24mm L_i (mm)	f = 24mm W_i (mm)	f = 16mm L_i (mm)	f = 16mm W_i (mm)	f = 8mm L_i (mm)	f = 8mm W_i (mm)
0.3	110	1.0	165	1.5	330	3
0.5	183	1.7	275	2.5	550	5
1.0	367	3.3	550	5.0	1100	10
	θ = ±10 degrees		θ = ±15 degrees		θ = ±29 degrees	

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Spatial resolution along the image line is determined by the camera pixel size and point spread size of the optics (Rms spot size <60µm in the standard ImSpector, corresponding to MTF of 15 line-pairs/ mm), whichever is larger. With a 2/3" detector, having 8.8 mm dimension, the point spread size limited resolution is $8800/30 \approx 300$ points. The number of pixels always determines spatial sampling.