Nexus 470

The following table shows which beamsplitter –detector combinations perform best and which are compatible.

	BEAMSPLITTER				
	Near-IR			Mid-IR+	
Detector	Quartz	CaF2	XT-KBr	KBr	Csl
DTGS (KBr window)**	X	OK	Best	Best	OK
DTGS (csl window)	X	X	OK	OK	Best
MCT-A	OK	OK	Best	Best	OK
MCT-B	OK	OK	Best	Best	OK
InSb	OK	Best	OK	X	X
PbSe	OK	Best	OK	X	X
InGaAs	OK	Best	OK	X	X

Best = Optimum beamsplitter-detector combination
OK = Compatible beamsplitter-detector combination
X = Incompatible beamsplitter-detector combination

- A ZnSe beamspitter may also be used as a mid-IR beamsplitter in extremely humid environments.
- Valid for room temperature and thermoelectrically cooled versions.

The next table lists the spectral ranges of compatible beamsplitter-detector combinations.

Light Range	***Beamsplitter***	***Detector***	***Spectral Range***	***Source***
Near-IR	CaF_2	MCT-A±	11,700 – 1,200*	Ever-Glo, white light
Near-IR	CaF_2	MCT-B±	11,700 - 1,200*	Ever-Glo, white light
Near-IR	CaF_2	InSb±	11,500 - 1,850+	Ever-Glo, white light
Near-IR	CaF_2	PbSe	13,000 - 2,000+	Ever-Glo, white light
Near-IR	CaF_2	PbS TEC (with SahIR)	10,000 - 4,200*	Ever-Glo, white light
Near-IR	CaF_2	InGaAs	12,000 - 3,800	Ever-Glo, white light

Near-IR	XT-KBr	MCT-At	11,000 - 600*	Ever-Glo, white light
Near-IR	XT-KBr	MCT-B	11.000 - 400*	Ever-Glo, white light
Near-IR	XT-KBr	Insbt.	11,000 - 1,850*	Ever-Glo, white light
Near-IR	XT-KBr	PbSe	11,000 - 2,000*	Ever-Glo, white light
Near-IR	XT-KBr	DTGS-KBr	11,000 - 375*	Ever-Glo, white light
Near-IR	XT-KBr	DTGS TEC	11,000 - 375*	Ever-Glo, white light
Near-IR	XT-KBr	InGaAs	12,000 - 3,800	Ever-Glo, white light

mid-IR	KBr	DTGS-KBr	7,400 - 350	Ever-Glo
mid-IR	KBr	MCT-A	7,400 - 600	Ever-Glo
mid-IR	KBr	MCT-B	7,400 - 400	Ever-Glo
mid-IR	KBr	DTGS TEC	7,100 - 350	Ever-Glo
mid-IR	KBr	DTGS-CsI	6,400 - 350	Ever-Glo
mid-IR	CsI	DTGS-CsI	6,400 - 200	Ever-Glo
mid-IR	CsI	MCT-A	6,400 - 600	Ever-Glo
mid-IR	CsI	MCT-B	6,400 - 400	Ever-Glo
mid-IR	ZnSe	DTGS-KGr	4,000 - 650	Ever-Glo
mid-IR	ZnSe	MCT-A	4,000 - 650	Ever-Glo
mid-IR	ZnSe	MCT-B	4,000 - 650	Ever-Glo
mid-IR	ZnSe	DTGS TEC	4,000 - 650	Ever-Glo
mid-IR	ZnSe	DTGS-CsI	4,000 - 650	Ever-Glo

Notes:

* This spectral range reflects the combination of the ranges of the Ever-Glo and white light sources, as well as the limits of the beamsplitter-detector combination. The range achieved using one of these sources will not be as broad as the total range shown.

These detectors must be cooled with liquid nitrogen before use

InSb detctors will not produce a signal under intense light. During installation and alignment, start with the D energy screen.

Csl beamsplitters are extremely hygroscopic (sensitive to moisture)

Optimizing the performance of your detector

Nexus 470 detectors can be optimized to produce a more linear response and greater photometric accuracy, or to increase the signal-to-noise ratio. You can achieve these improvements in performance by adjusting the amount of infrared energy that reached the detector.

Improving linearity and photometric accuracy

Some detectors (including PbSe, Si, MCT-A and InSb detectors) are highly sensitive and can become saturated or produce a distorted (non-linear and photometrically inaccurate) signal if the light energy is not reduced before it reaches the detector element.

Look at the low-end region of a single-beam spectrum (below the low-end cutoff); you should see a straight line very near 0. As a rule of thumb, the distance from 0 to the baseline should be less than 1% of the spectrum's maximum intensity value. If the detector is saturated, you will see false energy in the low-end region. The baseline might be far above zero.

Note:

The maximum intensity of a mid-IR single-beam spectrum is typically found near 2,000 cm -1

The distorted signal may cause problems with photometric accuracy. For good quantitative data, the sample and background interferograms should be about the same size. Scattering samples and very dense samples produce very small signals that can result in distorted quantitative data if the background signal is very large.

Check the low-end region or the background and sample interferograms. If you see a substantial difference in their size, photometric accuracy could be a problem.

To solve these problems, Nexus 470 spectrometers allow the following options for modifying the infrared beam:

+ Install a bandwidth-limiting filter
+ Install an energy screen

In spectrometer Help topics view “setting up experiements” for instructions on installing filters and energy screens.

In some cases, system performance improves if you use a filter or screen. The filter or screen that you should use for your application depends on the samples being measured and other experimental conditions. Try using various filters or screens to determine which give the best results for your application.

When to use Bandwidth-limiting filters

Use bandwidth-limiting filters to improve the signal-to-noise ratio of the data and also prevent detector saturation by allowing only energy in your particular area of interest to pass to the detector element.

In spectrometer Help Topics view “Installing an optic filter” in the “Setting up experiments” book for instructions on installing filters.

When to use energy screens
Depending on the types of detectors you use, your system may include a set of four energy screens. These metal screens help prevent detector saturation and signal distortion by blocking out a portion of the energy at all frequencies of the infrared beam. If your experiments deal with information from a broad range of frequencies, these screens may be the most effective means of reducing the light level.

The energy screens are labeled A, B, C and D. The following table shows the percentage of the infrared energy that each screen passes. It also lists the detectors typically used with each screen, as a starting point for correcting linearity problems.

Screen	% Transmitted	Detectors Typically Used with Screen
none	100	DTGS, MCT-B
A	30	MCT-A
B	10	PbSe, InSb. InGaAs
C	3	
D	1	

* These arc nominal values that may vary due to diffraction and detector variations

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