

Spectrum 100 and 400 Series Right-hand External Beam Option

Spectrum 100 and 400 Series instruments can be fitted with a Right-hand External Beam Option.

The Right-hand External Beam Option includes: a right-hand beam moveable mirror fitted within in the spectrometer, a KBr window, and an external accessory bracket fitted in the handhold on the right of the instrument. The bracket allows you to attach and use a pre-amplifier and detector of your choice.



Figure 1 Handhold with external accessory bracket fitted

This document describes how to:

- Fit a different window in the right-hand external beam port.
- Connect a third-party pre-amplifier and detector to the instrument.
- Configure Spectrum or Spectrum Express software to use a third-party external detector.
- Use Spectrum or Spectrum Express software to select the accessory.

NOTE: The Right-hand External Beam Option is installed, in the first instance, by a PerkinElmer Service Engineer, who will install the external accessory bracket in the handhold on the right of the instrument (if not already fitted) and any internal parts required. This external accessory bracket should not be removed.



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Produced in the UK.

Disclaimers

PerkinElmer Ltd. offers no guarantee regarding the operation or performance of any third-party pre-amplifiers and detectors used in conjunction with the Spectrum Series Right-hand External Beam Option.



When used in conjunction with the Right-hand External Beam Option, the Spectrum or Spectrum Express software cannot provide protection to the detector. In particular, you should be aware that certain detectors may be damaged by the high energy from the NIR source. Always fit an appropriate beam attenuator.

Warnings and Safety Information

Electrical safety

Fitting the external beam port window requires you to open the main cover of the spectrometer.



Switch off the mains power supply to the spectrometer, wait 60 seconds, and disconnect the power cable before you open the cover of the spectrometer. This makes sure that you are safe from electrical shock and laser radiation.

Any pre-amplifier attached to the Right-hand External Beam Option can obtain power from the instrument; no separate power supply is required. However, the instrument has no provision for powering any other component. If necessary, you must provide a separate power supply, and ensure that the arrangement meets all the applicable safety standards.

CAUTION

You must ensure that any third-party accessories attached to the Right-hand External Beam Option are earthed appropriately. The external accessory bracket provides adequate earthing for any third-party pre-amplifier attached to it.

External electromagnetic interference and electromagnetic compatibility

The Right-hand External Beam Option is supplied for use as an experimental test bed. The user-configurable nature of this product means that PerkinElmer cannot guarantee the level of immunity to external electromagnetic interference (EMI) or the possibility that the product may itself cause interference to other nearby equipment. It is therefore the responsibility of the user to consider Electromagnetic Compatibility (EMC) issues when selecting a suitable site for the system and to install any additional EMC protection that may be required for that location.

Radiation emitted by the Spectrum instrument source

CAUTION

The Spectrum instrument's NIR source is a quartz halogen bulb that emits ultraviolet, visible and infrared radiation. The majority of this energy is in the infrared region. Do not stare into the beam produced by this bulb. For further safety and warning information see the Spectrum 100 Series User's Guide (L1050021) or Spectrum 400 Series User's Guide (L1050056). These are distributed as .pdf files on the Spectrum Manuals CD (L1050002).

Humidity

CAUTION

Never remove the window in the external beam and leave this port open to atmosphere. If the spectrometer is fitted with KBr optics, do not exchange the window if the humidity is >45% relative humidity.

The humidity sensitive optics will be damaged if subjected to a relative humidity in excess of the specified level.

Contamination

CAUTION

Be careful not to touch, or otherwise contaminate, sensitive optical components such as the parabolic mirror assembly.

These precision optical devices are easily scratched and may not be easy to clean.

Safe handling



WARNING

The spectrometer is a heavy precision instrument, so two people are required for safe handling.

For information about moving your spectrometer, refer to the Spectrum 100 Series User's Guide (L1050021) or Spectrum 400 Series User's Guide (L1050056). These are distributed as .pdf files on the Spectrum Manuals CD (L1050002).

Fitting a Different Window to the Right-hand External Beam Port

Before you begin, make sure you have read and understood the *Warnings and Safety Information* beginning on page 2.

1. Switch off the spectrometer, and then remove the power cable.
2. Undo the locks on the front of the spectrometer, and then open the main cover.
For detailed instructions, refer to the *Advanced Maintenance* section of the *Spectrum 100 Series User's Guide* (L1050021) or *Spectrum 400 Series User's Guide* (L1050056). These are distributed as .pdf files on the *Spectrum Manuals CD* (L1050002).
3. Using the hexagonal wrench supplied, slacken and remove the M2.5 screws securing the right-hand external beam port cover to the main cover.
4. Remove the beam port cover and seal. Retain for further use.
5. Ensure the seal is fitted to the window and is correctly seated (Figure 2).

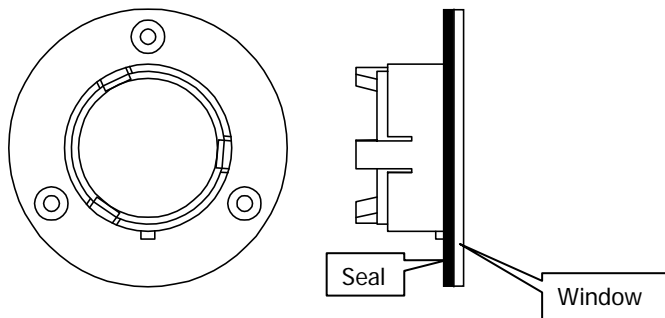


Figure 2 Seal fitted to window

6. Fit the window to the main cover from the outside in.
Ensure the seal is fully seated and the key on the window lines up with the notch in the main cover.

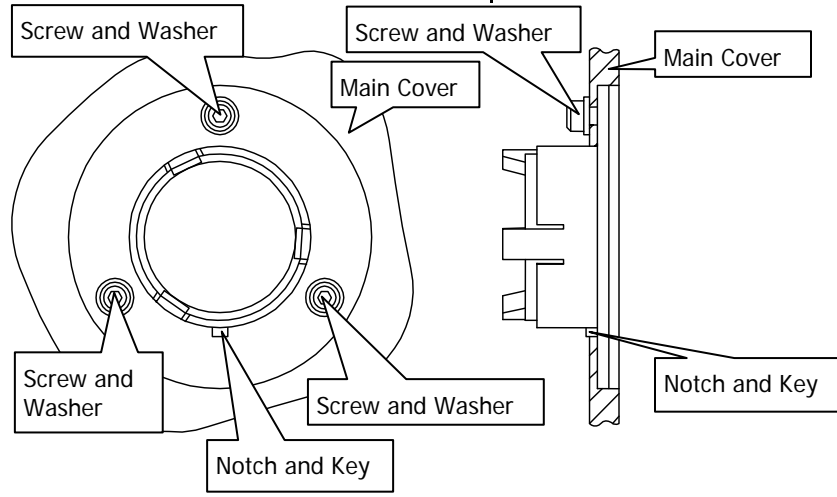


Figure 3 Window installed in main cover

7. Secure the window to the main cover by fitting the screws and washers and tightening the screws using the hexagonal wrench (Figure 3).
8. Close and secure the main cover.
9. Plug in and switch on the instrument.

Fitting a Third-party Pre-amplifier and Detector to the Instrument

CAUTION

*You **MUST** ensure that you have switched off the spectrometer and disconnected it from the mains supply before you fit any third-party pre-amplifier and detector to the instrument.*

The EXT.R socket on the instrument is a 15-Way High Density D-type. The connection is NOT hot swappable.

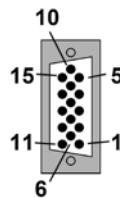


Figure 4 EXT.R socket

The following table details the functionality of the pins. To connect a third-party external detector, present an analog differential signal to pins 10 and 11.

Pin number	Function	Notes
1	Accessory Bus Reset	System reset, normally 5 V but 0 V pulse on spectrometer power up. Output.
2	0 VL	0 V return for digital circuitry.
3	Accessory Bus Clock	30 7200 Hz TTL compatible signal for Accessory Bus microcontroller clock drive. Do not pull more than ± 2 mA from this pin. Output.
4	Accessory Bus Abort	Accessory abort to prematurely finish Accessory Bus command. Output.
5	Accessory Bus serial transmit (from spectrometer to external)	TTL compatible serial signal running at 4800, n, 8, 1. Output.
6	Accessory Bus serial receive (from external to spectrometer)	TTL compatible serial signal running at 4800, n, 8, 1. Input.
7	0 VL	0 V return for digital circuitry.
8	5 VL	5 V supply for digital circuitry. Do not pull more than 1 A from this pin. Output.
9	0 VA	0 V analog return for analog circuitry.
10	EXTDET+	External differential positive analog detector signal. ± 11 V full scale. Input. See Note 1.
11	EXTDET-	External differential negative analog detector signal. ± 11 V full scale. Input. See Note 1.
12	0 VA	0 V analog return for analog circuitry.
13	+12 VA	+12 V analog for any analog circuitry. Do not pull more than 100 mA from this pin.
14	-12 VA	-12 V analog for any analog circuitry. Do not sink more than 100 mA into this pin.
15	TRIG_IN (NOT IMPLEMENTED, LEAVE DISCONNECTED)	Trigger in. Not implemented at the present time. Input.

NOTE:

The differential input signal has a maximum positive value when EXTDET+ is at +11 V and EXTDET- is at -11 V. It has a maximum negative value when EXTDET+ is at -11V and EXTDET- is at +11 V. The input impedance is 100 K Ω on each input with reference to 0 VA.

Optical arrangement

The optical arrangement for an external detector is shown below.

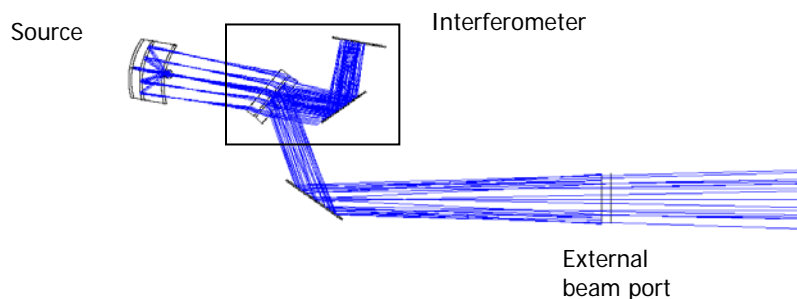


Figure 5 Optical Arrangement for an External Detector

The beam diverges at an approximately 3° half-cone angle.

Configuring Spectrum or Spectrum Express Software to Use a Third-party External Detector

Right-hand External Beam Option is supported by the following software:

- Spectrum version 6.3.5 (or later) for the Spectrum 400 Series Spectrometers and Spectrum 100 Series Spectrometers.
- Spectrum Express version 1.3.1 (or later), for the Spectrum 100 Series Spectrometers.

This section describes how to create a modified instrument configuration file for use with a third-party external detector.

NOTE: It is not necessary to power the instrument to complete this procedure.

1. Browse to C:\pel_apps\bin\

The instrument configuration file is named C*****.cfg, where ***** is the five-digit serial number of the instrument.

The spectrometer serial number is located on its base casting, in the sample compartment, under the sample accessory baseplate.

2. Copy the appropriate C*****.cfg file and save it as, for example, C*****.intdet

NOTE: Make sure you save this backup of the original instrument configuration file.

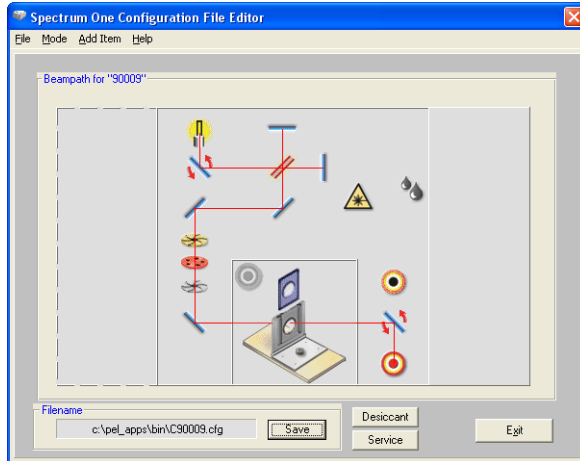
3. Browse to C:\Program Files\PerkinElmer\ServiceIR

CAUTION

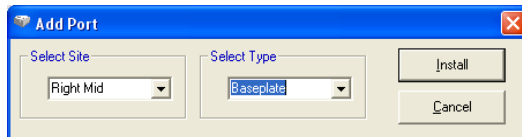
The ServiceIR folder contains a number of utilities, many of which are for use solely by a PerkinElmer Service Engineer.

If used incorrectly, some utilities could damage the instrument.

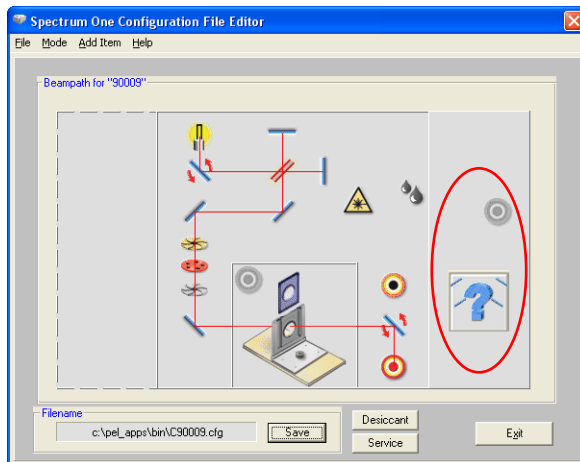
- Double-click **S1_Config.exe**.
The Configuration File Editor utility opens.




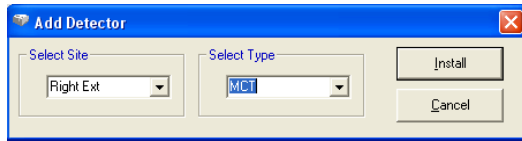
- Click **Load** in the File menu, and then select the instrument serial number.
The configuration file is opened for editing.
- Right-click in the external accessory area to the right of the beampath diagram.
The Add Port dialog is displayed.





- Select **Right Mid** in the Select Site pane, select **Baseplate** in the Select Type pane, and then click **Install**.
The Add Port dialog closes and the external accessory area in the Configuration File Editor is refreshed.



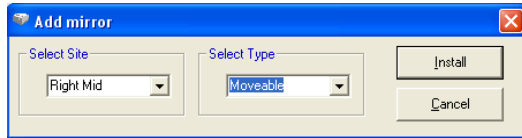
8. Right-click  in the right external accessory area.
The Add Detector dialog is displayed.



9. Select **Right Ext** in the Select Site pane.
10. Select the detector type in the Select Type pane, and then click **Install**.
For information on the options available to you, see *Choosing the correct detector type* on page 10.

The Add Detector dialog closes and  becomes .

11. Right click .
The Add mirror dialog is displayed.



12. Select **Moveable** in the Select Type pane, and then click **Install**.
The Add mirror dialog closes.
13. Click **Save**.
The configuration file is updated.
14. Click **Exit**.

Choosing the correct detector type

You should use the Select Type drop-down on the Add Detector dialog to choose the detector type you want to use. If you decide to use a PerkinElmer detector, you will find the drop-down includes all the detector types appropriate to your instrument. Select the one you require.

If you are using a third-party detector, you should select the appropriate Custom option. The default settings for the Custom options are shown below.

Detector type	Default settings		
	Wavenumber range	Detector settle time	Scan speed
Custom MIR	15000 – 370	15 secs	0.2 cm/s
Custom NIR	15000 – 1250	15 secs	0.2 cm/s
Custom FIR	720 – 30	15 secs	1.0 cm/s

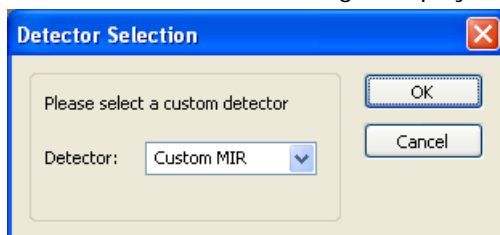
See *Adjusting the default Custom detector settings* on page 10 for details of how to adjust these default settings to suit your specific detector.

Adjusting the default custom detector settings

To adjust the default custom detector settings to suit your requirements for the external detector, follow the steps described below.

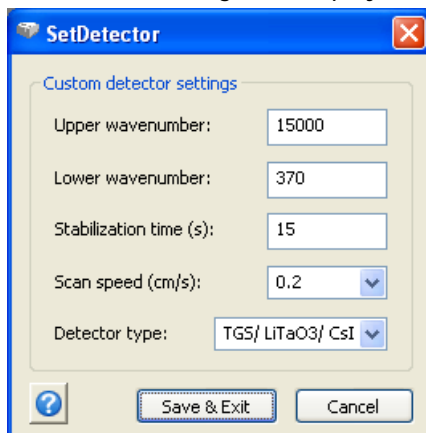
NOTE: It is your responsibility to ensure that the settings you provide are appropriate to your detector type.

1. Browse to C:\Program Files\PerkinElmer\ServiceIR
2. Launch the program SetDetector.exe.
The PerkinElmer Login dialog is displayed.
3. Enter your login details.
The Detector Selection dialog is displayed.



4. Select the custom detector type you want to work on from the drop-down list, and then click **OK**.

The current settings are displayed on the SetDetector dialog.



5. Change the values to suit your detector.

Upper wavenumber / Lower wavenumber	<p>Defines the upper and lower limit for the useable range of the detector.</p> <p>Different detector types are designed to operate in different wavenumber ranges. For further information, see the Detectors topic in the Spectrum online help.</p>
Stabilization time	<p>The time required, in seconds, for the detector to settle after the infrared beam is directed onto it; that is, after the beampath is changed to use the external detector.</p>
Scan speed	<p>The default scan speed to be used when this detector is selected.</p> <p>The standard setting for each detector provides the best signal-to-noise ratio in a reasonable collection time.</p> <p>For further information, see the Scan Speed topic in the Spectrum online help.</p>
Detector type	<p>Select the detector type. Options include:</p> <ul style="list-style-type: none"> • MCT • INGAAS • PAS • TGS, LiTa03, CsI, etc. (used for all other detector types)

6. When you are finished, select **Save and Exit** or **Cancel**, as appropriate.

Re-instating the configuration file

Should you ever need to revert to the standard instrument configuration file, follow the steps described below.

1. Browse to C:\pel_apps\bin\
 The instrument configuration file is named C*****.cfg, where ***** is the five-digit serial number of the instrument.
 The spectrometer serial number is located on its base casting, in the sample compartment, under the sample accessory baseplate.
2. Copy the appropriate C*****.cfg file, and save it as, for example C*****.extdet

NOTE: Make sure that you save this backup of the external detector configuration file.

3. Rename C*****.intdet (the backup of your original internal detector configuration file) as C*****.cfg

NOTE: If a backup of the original configuration file was not made, uninstall the instrument and then re-install it using the configuration disk supplied with the instrument.

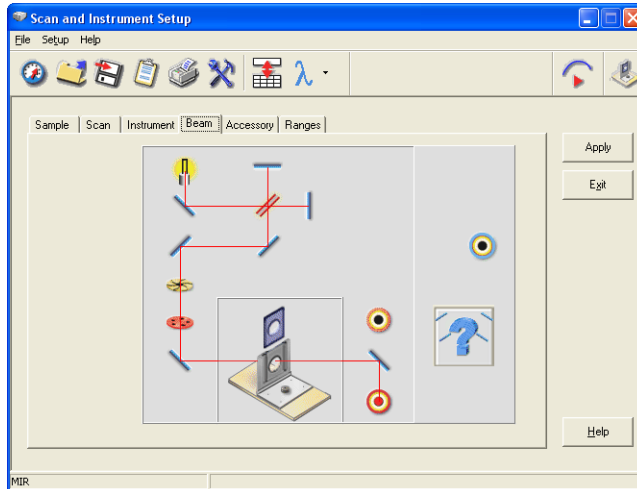
Selecting the Third-party Detector using Spectrum or Spectrum Express Software



Before you begin, make sure that:

- The required version of Spectrum or Spectrum Express software is installed and configured. See *Configuring Spectrum or Spectrum Express Software to Use a Third-party External Detector* on page 7.
- The instrument is powered and has been allowed to stabilize.

To select the external detector in Spectrum software:

1. Start Spectrum, select the **Setup** menu and then click **Instrument**.
 The Scan and Instrument Setup dialog is displayed, showing the Instrument tab.
2. Select the **Beam** tab.

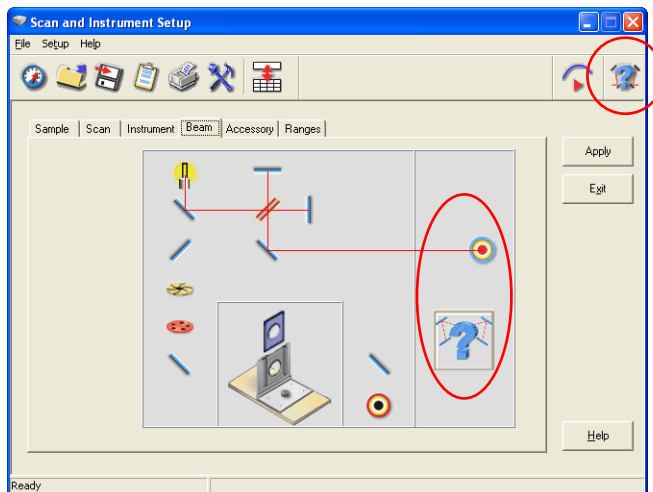



3. In the external detector area, click the  symbol, so that it becomes .

NOTE: If an NIR source is being used and the detector type is not either a Custom type or NIR, a warning message is displayed informing you that the detector may be damaged by the NIR beam.

You should only select the **Yes** option, to continue, if an attenuator has been fitted in the beam or you are confident that the detector can withstand the infrared energy that will be directed at it.

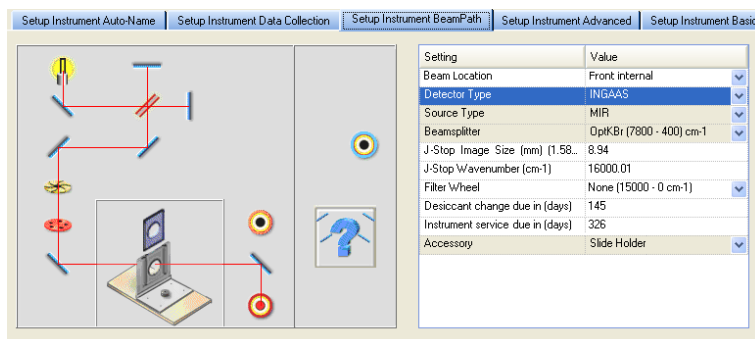
The external detector is selected.



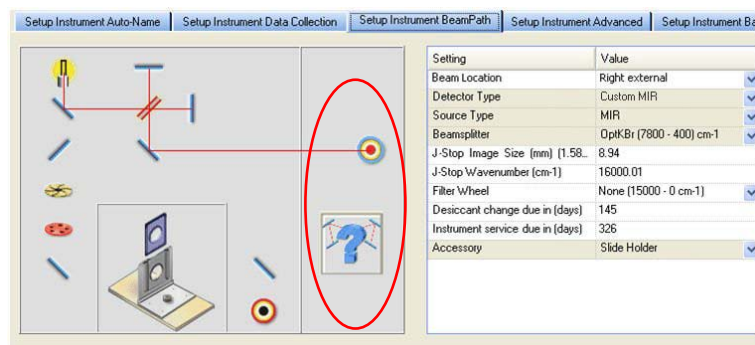
The Right-hand External Beam Option is indicated by the baseplate icon  at the top right of the Scan and Instrument Setup dialog.

To select the external detector in Spectrum Express software:

1. Start Spectrum Express, select the **Setup** menu and then click **Instrument**.
2. Select the **Setup Instrument BeamPath** tab.




3. Select **Right external** as the **Beam Location** from the drop-down list. The external detector is selected.




NOTE: The **Beam Location** field is displayed in the settings table only when an external detector is configured.


Optimizing Performance

This section describes how to monitor the energy and provide optimum levels of performance.

1. Start Spectrum, select the Setup menu and then click **Instrument**.
2. Ensure that the external detector is selected on the beam path tab.
3. If you have Spectrum software, click the “monitor – energy” icon  on the Scan and Instrument Setup dialog to display the signal level detected.
The Display tab is displayed.

OR

If you have Spectrum Express software, switch to **Monitor** by clicking  on the Measurement toolbar, and then click **Energy** to display the signal detected.
The Live tab is displayed.

4. Adjust the optical arrangement of your equipment so as to maximize the energy level detected.
5. Click the “monitor – interferogram” icon  on the Scan and Instrument Setup dialog, and then adjust the height of the interferogram with attenuation or pre-amplifier gain adjustment to give a signal with a peak of about 0.7 units.
If the interferogram is inverted, the peak should be about -0.7 units.