

After installing the analyzer mechanics or after a system bakeout VG Scienta recommends performing a startup routine for the analyzer. The instrument manual describes this procedure in detail but in this technical note we have gathered some important points for a safe quick start of the spectrometer. Below the VG Scienta R4000 analyzer with a MCP/CCD detector is taken as an example, but the routine is the same also for the R3000 analyzer.

Pre Start-Up Check List

Before startup the following check-list should be completed:

- Make sure the High Voltage rack is switched off.
- The vacuum in the analyzer and analysis chamber is better than 1×10^{-5} mbar.
- Connect or re-connect the camera and filterboxes to the instrument. Make sure that each filterbox is connected to its corresponding feedthrough.
- Check that the SES software is set for the correct High Voltage settings (Low or High Pass).

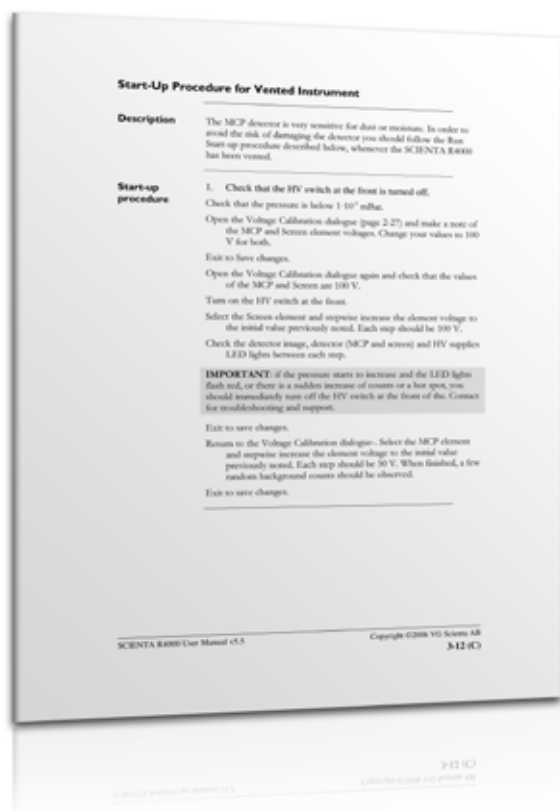


Figure 1: Detailed descriptions of the start-up procedure are found in the spectrometer user manual.

Detector Start-up

Section 3-12 of the R4000 user manual describes how the detector voltage should be ramped up in the instrument

start-up. As noted in the manual, the detector is a sensitive part of the instrument and VG Scienta recommends ramping the detector after system has been vented or baked.

The detector is ramped using the Voltage calibration menu (SES main window/Calibration/Voltages...) as follows:

- Set the MCP and Screen voltage to 100 V each in the voltage calibration menu.
- Switch the instrument High Voltage on
- Carefully ramp the screen up to 3600 V in steps of 100 V. Continuously check that there is no lit red LED on the High Voltage rack, no pressure bursts in the analysis chamber and no glowing objects on the real time detector monitor.
- Carefully ramp the MCP to 1500 V in the manor described above.

High/Low pass energy settings

A measurement can be performed in either High or Low pass energy mode. UPS spectra is best run in low pass mode and XPS spectra should be run in high pass mode. In order to run a high pass [low pass] measurement the SES software needs to be set to high pass [low pass] and the electronics rack needs to be connected in the high pass [low pass] configuration. Consult the manual section 3-10(B) and 4-1 on how to change between the different modes of operation.

Caution!

The High Voltage rack should be switched off when changing between High Pass and Low Pass settings.

Set Analyzer Slit

A large spectrometer slit is often useful for focusing and aligning the sample. The 0.3 curved slit is a good starting point for many applications. If the studied features are very intense a smaller slit can be chosen. The slit list is displayed in section 4-2 of the R4000 user manual and section 3-13 (C) describes how to configure a measurement.

Initiate Photon Source

Position a sample (solid or gas) in front of the analyzer. If necessary the view port on the analyzer dome can be used for initial alignment. As a second step the voltage calibration set-up menu is used to verify that the sample is correctly aligned. The Left and Up deflectors are efficient tools in positioning the sample. Follow the link to download an example movie from the [VG Scienta web site](http://www.vg-scienta.com).

Define measurement in SES

The R4000 user manual describes how to define and execute a measurement using the SES software. Section 2-41 (E) describes the sequence editor and section 2-46 (E) gives guidance to the region editor (Fig. 2).

When setting up a measurement in the Region Editor there is a choice between Kinetic or Binding energy mode. Selecting the kinetic energy mode means that the data is displayed on the kinetic energy scale and hence there is no need to set an excitation energy in the Region Editor. However, if the data should be displayed on a binding energy scale the binding energy mode is selected and in this case the excitation energy needs to be defined so that the kinetic to binding energy conversion is correct. Once all desired measurement regions have been set-up and marked active (green check mark in the Sequence Manager) the measurement sequence is ready for execution.

The Scienta 2D Detector

VG Scienta analyzers are equipped with 2D detectors that can measure the energy, spatial, angular and intensity distributions of photoelectrons. Note that in order to record spatial or angular information the detector has to be set up for more than one slice. See section 2-15(C) in the R4000 user manual.

Calibration of the Detector

The measured full width half maximum (FWHM) will depend on spectrometer settings but also on broadening contributions from the photon bandwidth, intrinsic lifetime broadening, sample temperature and Doppler broadening. However, if the FWHM differs much between swept and fix mode run it is time to calibrate the detector (see section 2-35(B) in the R4000 users manual). In the VG Scienta test stations we use the Xe 5p3/2 spectrum for calibration in transmission mode and an angular device for calibration of the angular modes. Other samples can however also be used for calibration measurements: polycrystalline silver, for testing XPS, and the surface state of Au(111), for testing ARPES are examples.

If you have further questions please contact VG Scienta: service@vgscienta.com

Figure 2: Region editor in the SES software.

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