

Manual for the MAPS software package

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Currently it is VERY rudimentary and NOT at all complete.

1. Preface:

The MAPS software package is intended for use with X-ray fluorescence datasets acquired at different beam lines at APS. It was started by SV while a postdoc at the APS 2-ID-E beamline, and slowly grew from there. MdJ joined the efforts to improve the software and add in desirable features. BL and JM have provided critical feedback, suggestions and 'beta-testing'. However, please note that this is not an 'official' software package, and it is maintained mostly in the authors' free time. The authors' welcome feedback and will try to respond quickly in case there are problems. Please send any comments you might have to above email address.

2. Installation

The MAPS software package is written in IDL, a programming language that is well suited to image processing and visualization, and is available across platforms (MS Windows, Mac, Unix). IDL is available from ITT Visual Information Solutions (they have acquired RSI, Inc.) as a full developer version as well as a run time version (IDL virtual machine). The latter is free of charge. IDL can be downloaded from ITT (<http://www.ittvis.com/>), the virtual machine is at, <http://www.ittvis.com/idlvm/> or more directly <http://www.ittvis.com/download/download.asp?urlProductCode=13>

The MAPS software package is also available, both as a source code version that only works with the full version of IDL, as well as a runtime version that works with the virtual machine. Usually, a copy of the MAPS package resides on our anonymous ftp server, at: <ftp.xor.aps.anl.gov>
login: anonymous
password: your email address
then cd into `pub/user2ide/maps_distribution`
the 'runtime_maps' directory contains everything that is needed for the runtime version, the 'maps_single_dir' contains the sources for those who use the full version of IDL.

After installing IDL, place the library files (xrf_library.csv, henke.xdr, compound.dat) into the IDL library path, which should point to something like (on a windows machine) C:\rsi\IDL63\lib\

Please note, it is CRITICALLY important that IDL, the above mentioned MAPS libraries, the MAPS executable, as well as the data, all reside in directories that do NOT contain any white space or wild card characters (such as *, etc). This means, it is NOT a good idea to place the files into directories like 'C:\Documents and Settings'.

3. Getting started:

Runtime:

For users of the runtime version, one can start MAPS by opening the file called

maps.sav

by either double clicking, or by starting the IDL runtime and then opening the maps.sav file.

Developer version:

When using the full version of IDL, one first starts IDL, makes sure that the IDL path includes the directory where maps was put (if the path needs to be changed, it may be necessary to close and re-open IDL to make sure it updates it internally). Then, at the IDL prompt, type

maps

and return. If MAPS crashes, one can reset the idl session by typing the shortcut:

@ret

(followed again by return).

Again, please make sure that there are no spaces in either the IDL path, or application directories.

All:

After starting MAPS, two windows will pop up. In Fig. 1 the initialization window is shown.

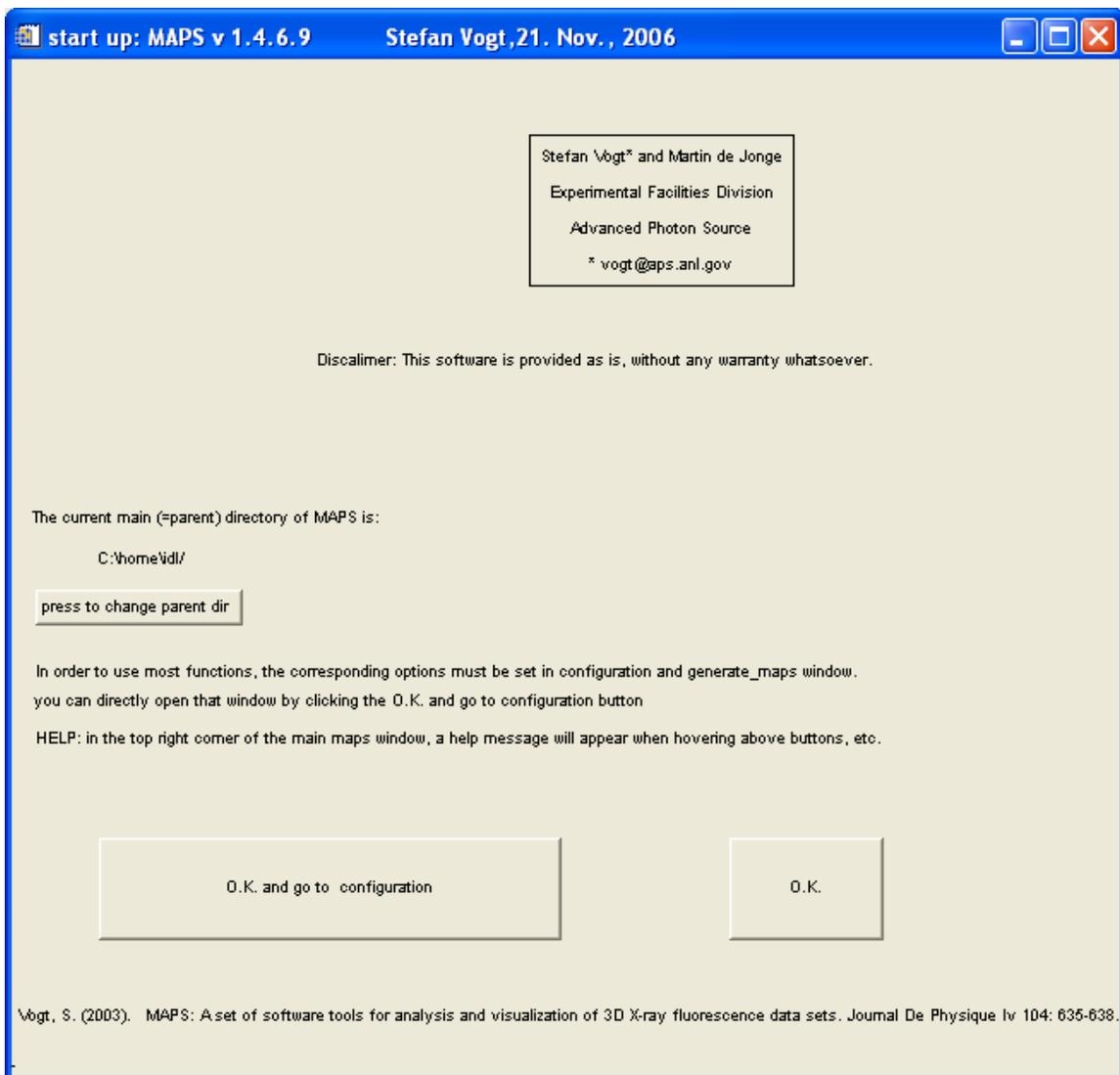


Fig. 1: Initialization window of MAPS.

The initialization window can be used to change the main (parent) directory to where the data resides. It is strongly recommended that the following directory/file structure is followed: define as a parent directory the directory above the mda directory. Within this directory, typically the img.dat, rois, output subdirectories reside. The mda directory contains typically the 'raw' acquired data. The img.dat directory contains the processed data files, the rois directory is the best place where to save spatial rois the user of this software can define to extract average spectra from specific areas of the acquired data sets. Output is the directory where MAPS will place most automatically generated output. An image with such a typical directory structure is shown in Fig. 2.

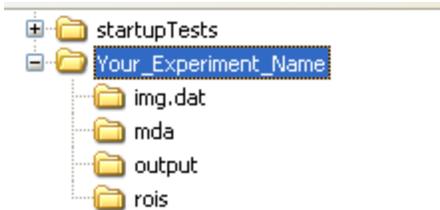


Fig.2: Typical suggested directory structure.

In this example here one would use the ‘press to change directory’ button to change into the Your_Experiment_Name directory, and then press the O.K. button. Please note, that there is a built in help for most of the buttons of the user interface. When hovering with the mouse over a button, text messages will appear on the main MAPS screen.

3. The Main MAPS window / interface:

The Main MAPS window is the place to load scans, and open up specific tools to visualize or work with your data. A Picture of the layout can be seen in Fig. 3.



Fig.3: The main MAPS window. The first pull down menu (displayed here with the text ROI sum) allows you to choose (where applicable) the processing that was done to map elemental content. Typical choices include ROI sum, background subtracted, fitted, etc. The second pull down menu (displayed here with DS-IC) allows one to choose quantification & normalization with the down stream ion-chamber (DS-IC, after the sample), the upstream ion-chamber (US-IC, in front of the sample), current (synchrotron current), or ‘1’, which will display the elemental content in counts/s in the multi element window. The third pull down menu (empty in this Fig), will display the currently loaded file(s), you can switch from one to another by pulling the menu down, and choosing a new file, or by using the ‘<’ and ‘>’ buttons to browse through the files.

On the right hand side (right of the ‘scan info’ place holder) text will appear to provide some additional information on buttons over which the mouse is hovering.

Under the **File** menu data files can be loaded into MAPS.

Open XRF image will allow you to read one, or several (select using the left mouse button keeping ctrl pressed to select specifics, or use mouse click while pressing shift to select all between the two clicks, or use ctrl+A to select all) img.dat files. As indicated above, these files contain processed data generated from the original mda files. It is suggested that these should usually be used (when available) to visualize the data, as this provides the largest functionality of the software. These files do NOT contain the full spectra, those remain within the mda files. To operate on full spectra, one usually

defines area of interest using the img.dat files, and then MAPS will search for the correct mda file to extract the spectra from.

Open mda file will allow one to read in a raw mda file directly. The functionality of MAPS is somewhat limited using this option, but it can be useful, e.g., to read in a file immediately after (or even during) the scan acquisition, when there is no time to convert mda files to img.dat.

Open fly scans (all dets) will open a 'fly scan' such that differential phase contrast is already calculated, etc. As opposed to the DPC only version, all detectors are read in, which significantly increases memory requirements, but allows one to also view the single channel analyzers, for X-ray fluorescence overviews. Please note, this is still experimental.

Open fly scans (DPC only) will open a 'fly scan' such that differential phase contrast is already calculated, etc. Only a small subset of the acquired detectors is shown. Please note, this is still experimental.

Under the **viewing** menu, tools can be chosen to visualize the data from the files that have been loaded.

The **Multi element view** tool allows you to display an arbitrary number of detectors or elemental maps. The tool is updating, so that it will automatically update when a new file is loaded, display choice are changed, etc, with the exception of when a new color scale is chosen. In that case, one has to manually press the update button.

The first pull down menu of the main MAPS window (see Fig. 3), allows you to choose (where applicable) the processing that was done to map elemental content. Typical choices include ROI sum, background subtracted, fitted, etc. If the data has been fitted on a per pixel basis, fitted is the recommended option.