

SNRS - Foil Shaping Fit from calibrated LTD datasets

Author: F.Mauger

Date: 2021-05-29

The SNRS package contains some tools to build a realistic geometry model for a given source strip based on a fit of *laser tracker* data build from the raw LTD dataset (DocDb #5400).

This work applies to strips 3 (LAPP-ITEP-3), 8 (LAPP-ITEP 2), 9 (ITEP-11), 14 (ITEP-10), 15 (ITEP-9), 20 (ITEP-8), 21 (ITEP-7), 22 (ITEP-6), 23 (ITEP-5), 24 (ITEP-4), 25 (ITEP-3), 26 (ITEP-2), 27 (ITEP-1), 28 (LAPP-ITEP-21), 31 (LAPP-ITEP-1), 32 (LAPP-ITEP-5), 33 (LAPP-ITEP-6) and 34 (LAPP-ITEP-4) with meshes of 10x100 tiles.

Strip 2 (LAPP-ITEP 7) has not been processed.

Programs:

- `snrs-build-fsf` :
 - processing of the calibrated LTD datasets,
 - fitting an elliptic model for each ITEP-style strip,
 - post-processing (smoothing) of the fit data,
 - generating 3D-meshes for each source strip and associated surrounding mylar films.
- `build-fsf.bash` : wrapper scripts to automate the launch of the `snrs-build-fsf` executable for a set of selected source strips

Building FSF datasets

1. Preparing the setup:

Define the path to the working SNRS data base directory from and where high-level data files will be loaded and stored:

```
$ export SNRS_DATA_DIR="/data/SuperNEMO/snrs_data"
```

2. Run the FSF algorithm on a selection of source strips:

```
$ ./scripts/build-fsf.bash
```

3. Generated FSF datasets are stored in \${SNRS_DATA_DIR}/geometry/source_foils/fsf:

```
$ cat ${SNRS_DATA_DIR}/geometry/source_foils/fsf/processed-strips.list  
$ find ${SNRS_DATA_DIR}/geometry/source_foils/fsf -maxdepth 1 -name "strip-*" -exec basename {} \;  
...  
strip-34-pad-0-shaping.report  
strip-34-pad-0-shaped.dat  
strip-34-pad-0-tessellated.dat
```

Description of the generated files (example for strip 34) :

- strip-34-pad-0-shaping.report is a CSV formatted ASCII file which contains the result of the fit for the strip (for now, only elliptical fit is available)
- strip-34-pad-0-shaped.dat is a ASCII file which contains the data (in a specific format) that describe the geometry of the source pad after fitting
- strip-34-pad-0-tessellated.dat is a ASCII file which contains the data (in a specific format known by Bayeux >=3.5) that describe the tessellated shape of the source pad.

4. Publishing the mesh datasets:

The SNRS package provides some specific actions to:

- build the 3D mesh datasets,
- install them in the source directory for the official release.

```
$ make snrsBuildFsfDataset
```

- The mesh datasets for selenium source foil and mylar films are stored in: resources/data/geometry/source_foils/fsf.
- The geometry models are defined in: resources/config/snemo/demonstrator/geometry/GeometryModels/source_module/realistic/strips_itep_like.geom.

5. Generate documentation:

```
$ make docBuildFsf
```

Datasets per individual source strip

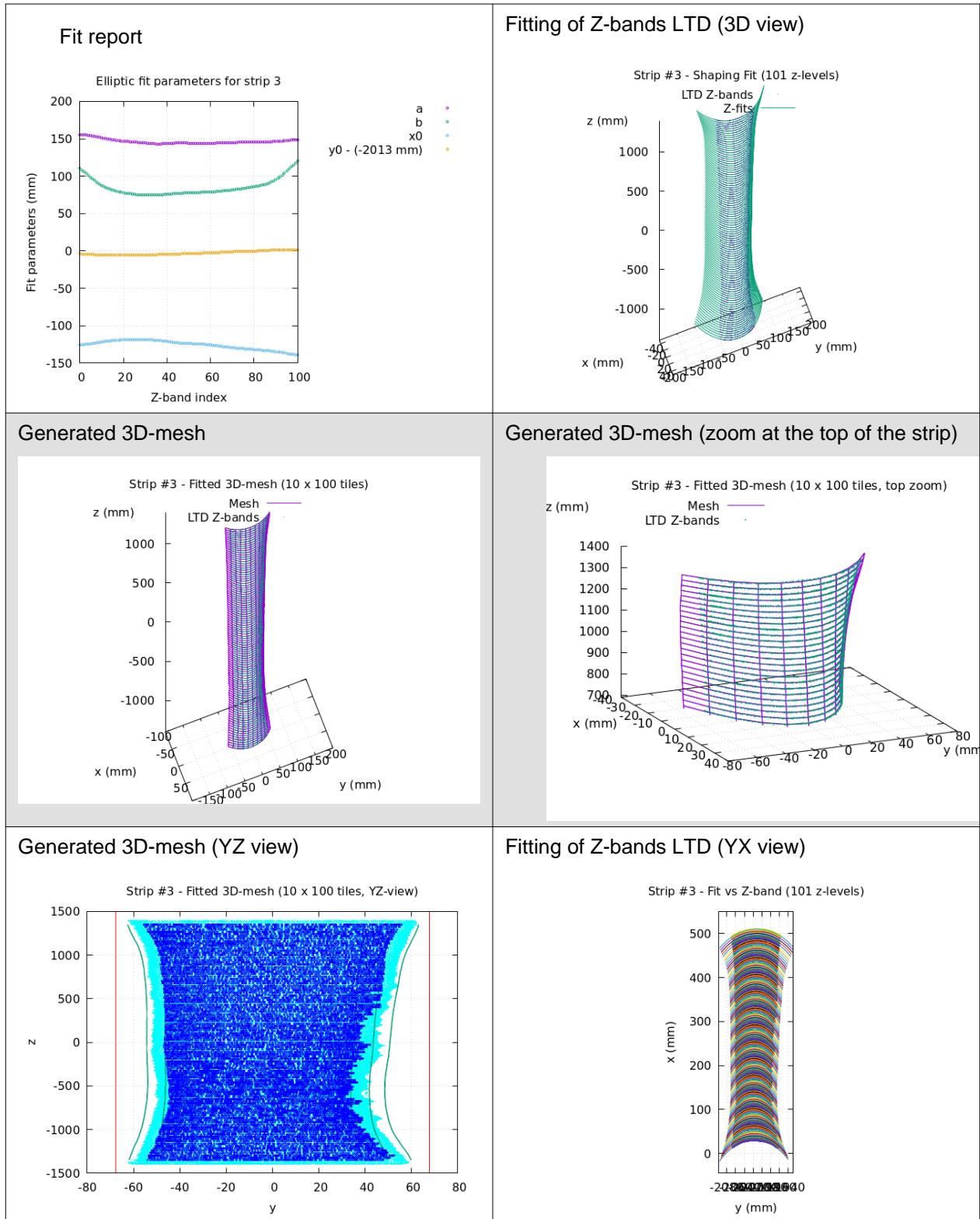
- Plot data (CSV ASCII format) and images files are generated in the `SNRS_DATA_DIR/geometry/source_foils/fsf/images/` directory and addressed through a symbolic link.

- Report on elliptic fit :

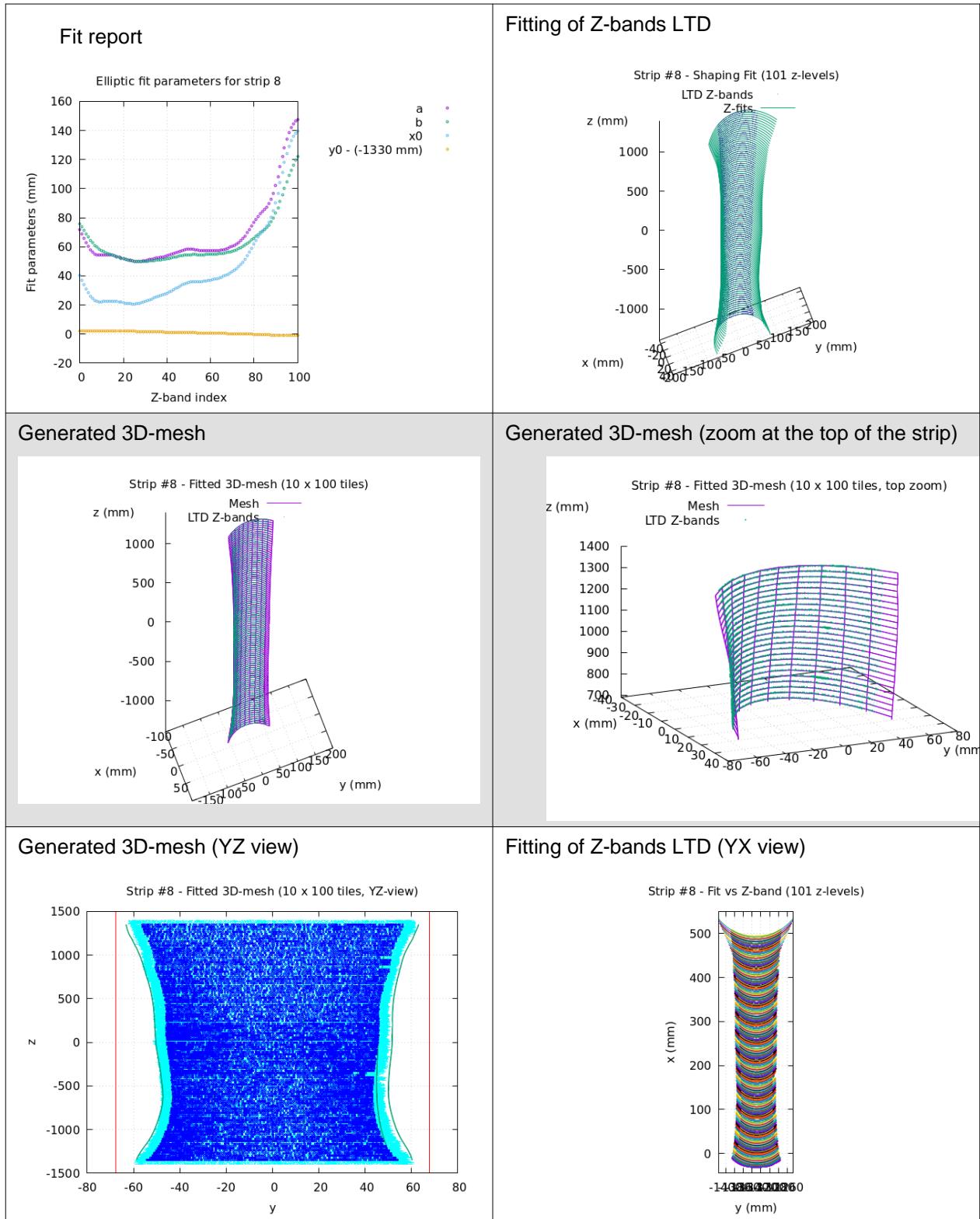
The top-left graph shows the evolution of the four parameters a , b , $x0$ and $y0$ depending on the Z-band (0 : bottom, 100 : top).

- the a and $x0$ parameters are necessarily strongly correlated.
- the $y0$ parameter represents ideally the position of the central vertical axis of the strip at Z coordinate. It is shown here biased by the theoretical position of the vertical axis of the strip. In principle, it should display a horizontal line but the real positions of the strips show some significant vertical shift for most strips.

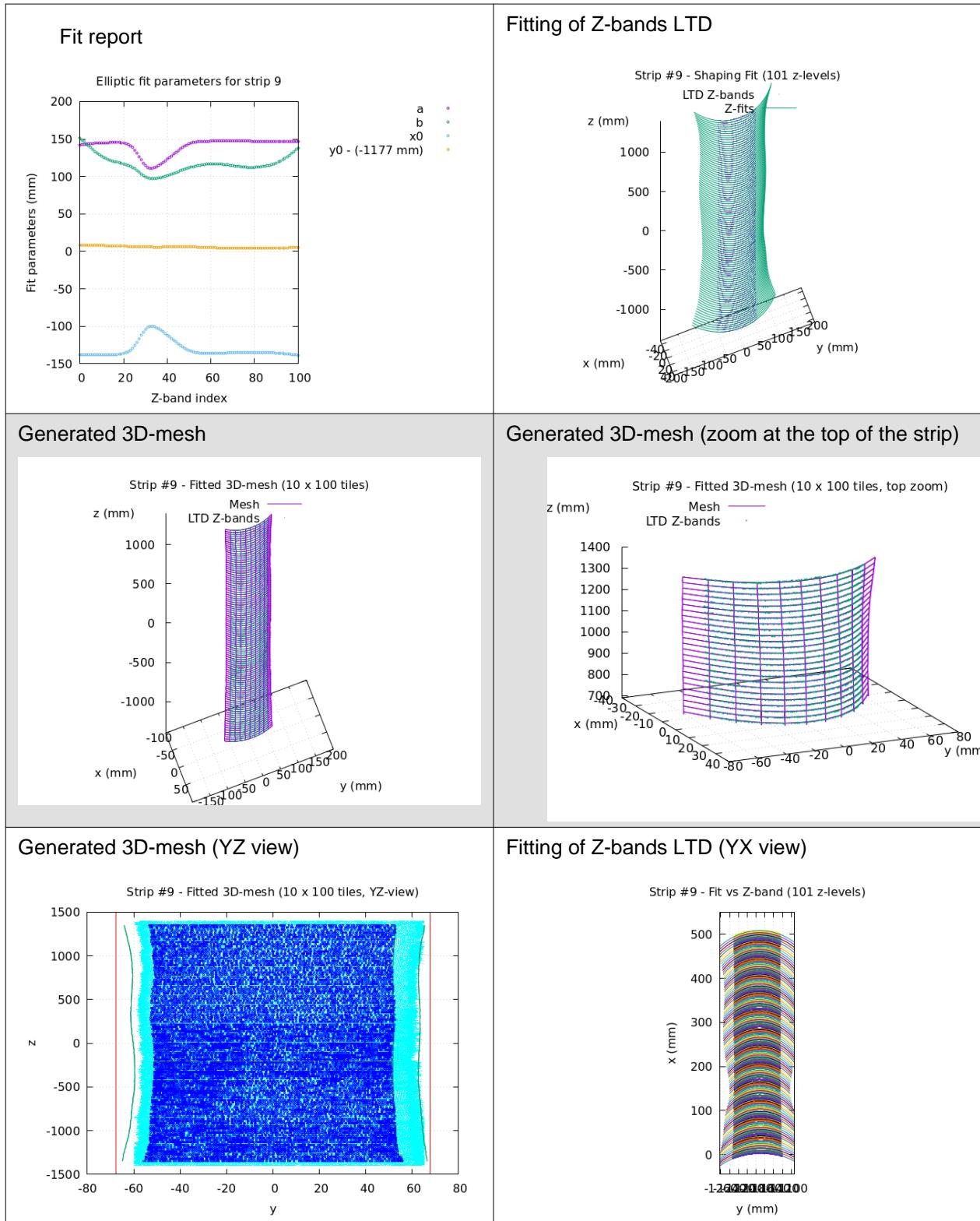
Strip 3



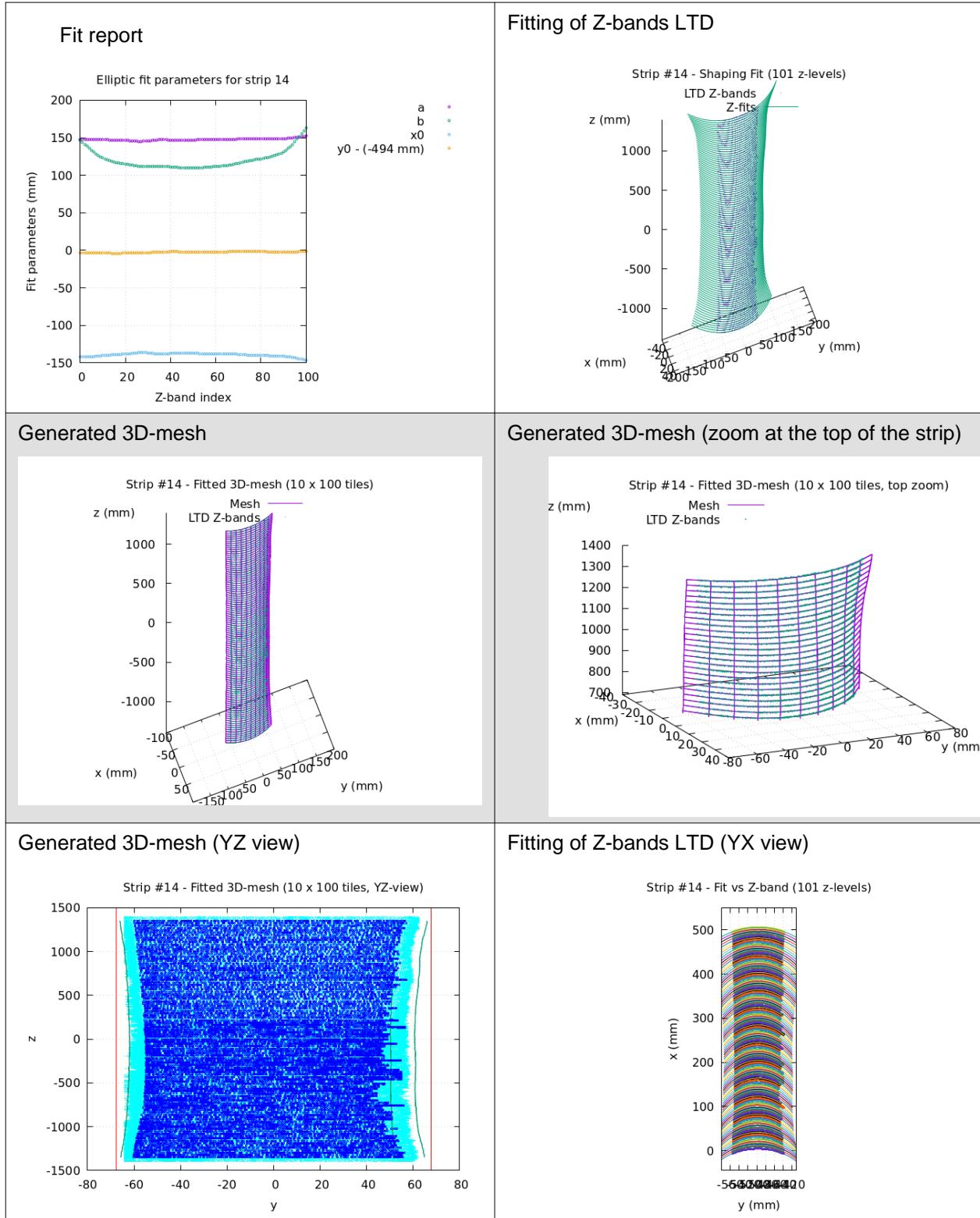
Strip 8



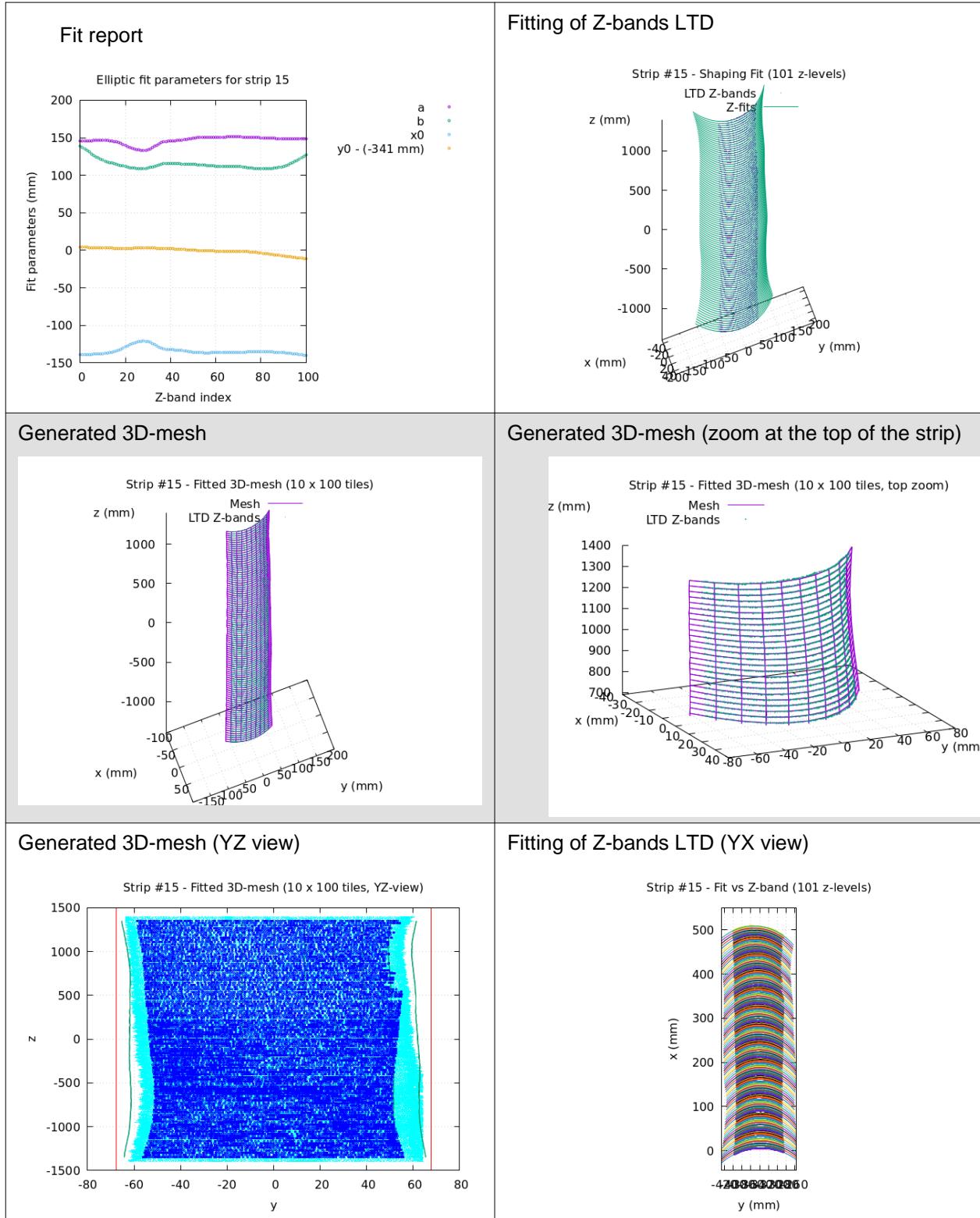
Strip 9



Strip 14

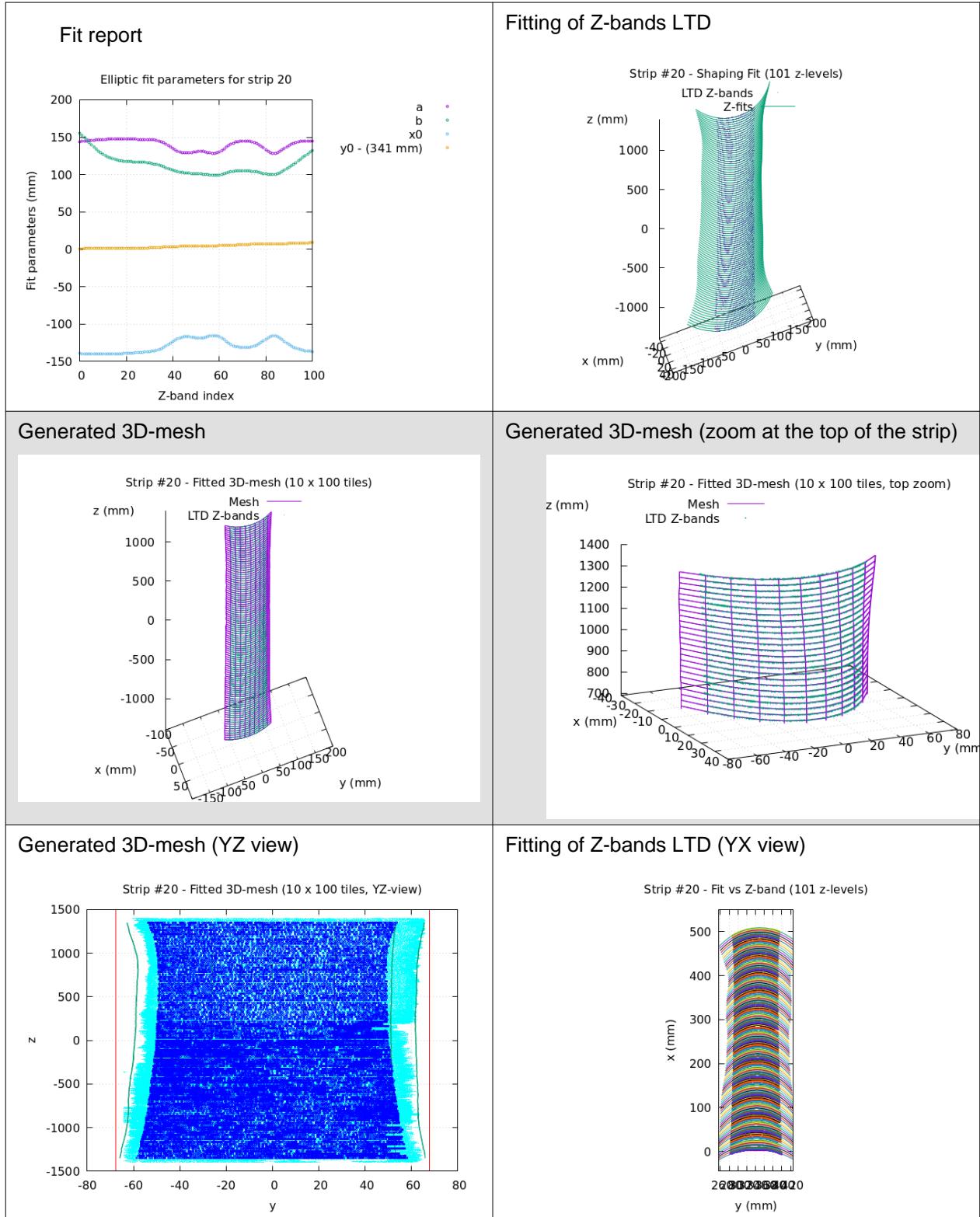


Strip 15

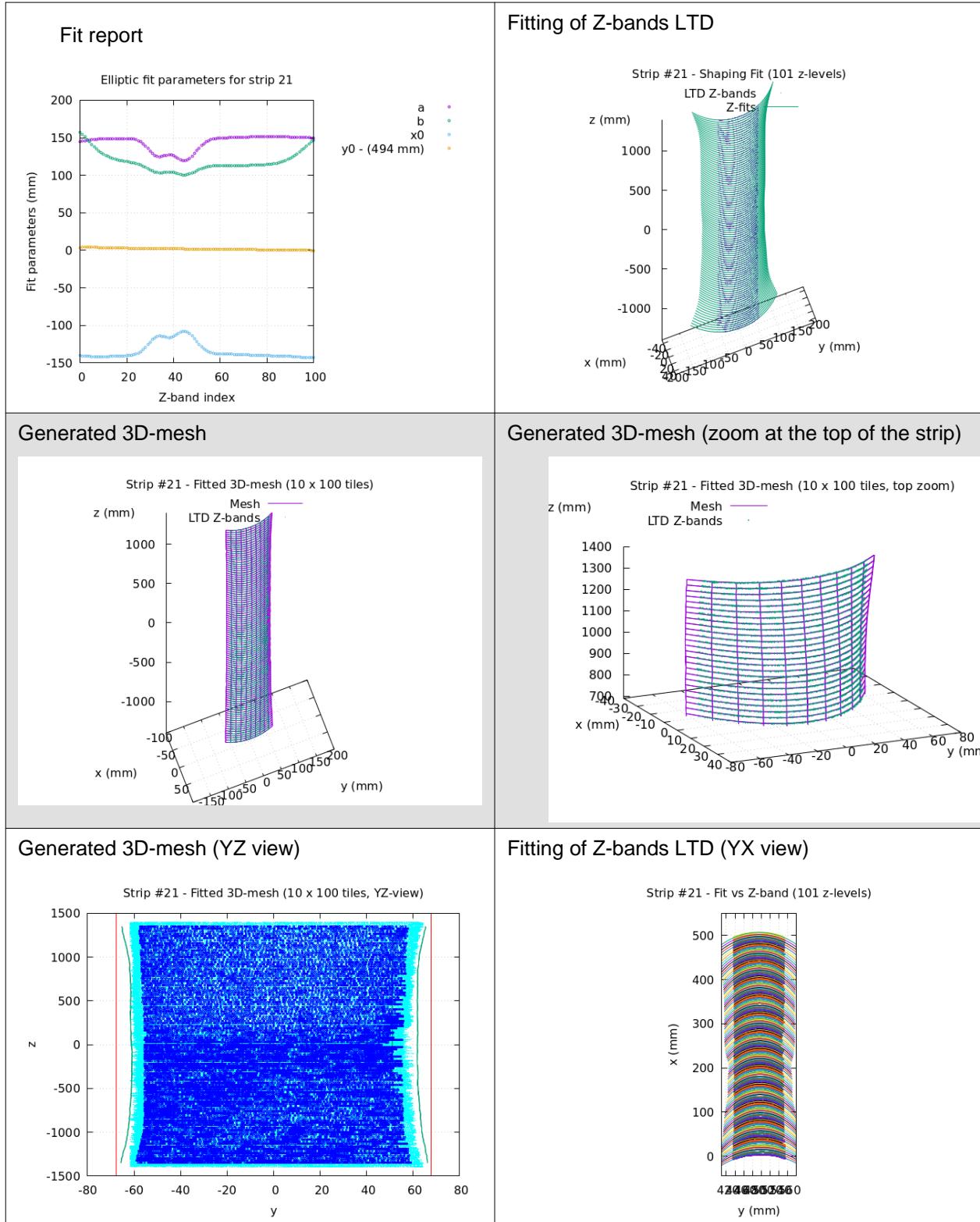


Strip 15 is strongly deformed and has been installed in a special way to avoid contact with the field wires of the first planes of tracker cells on both sides of the source frame. One consequence is a rather large shift of the vertical axis (yellow curve above).

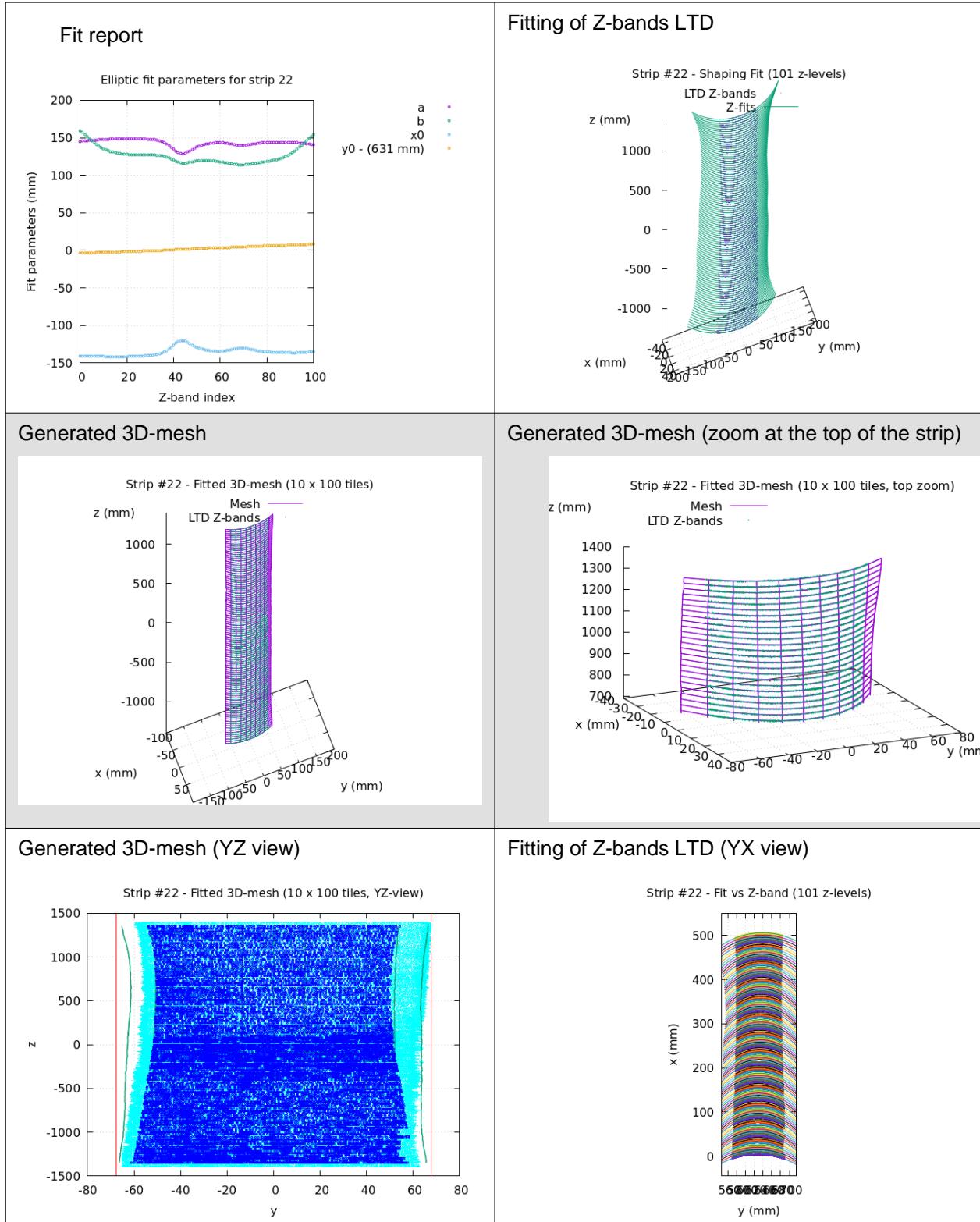
Strip 20



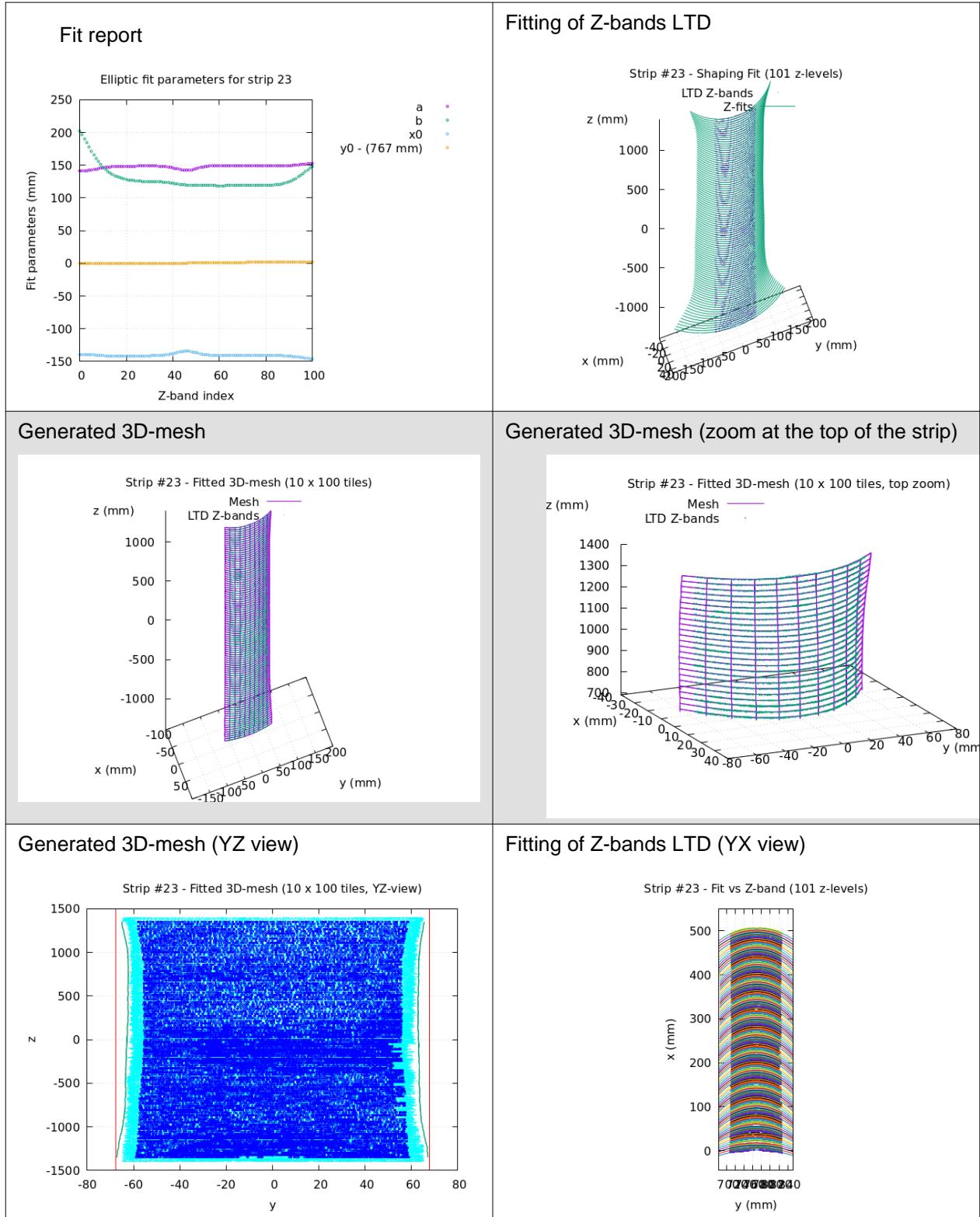
Strip 21



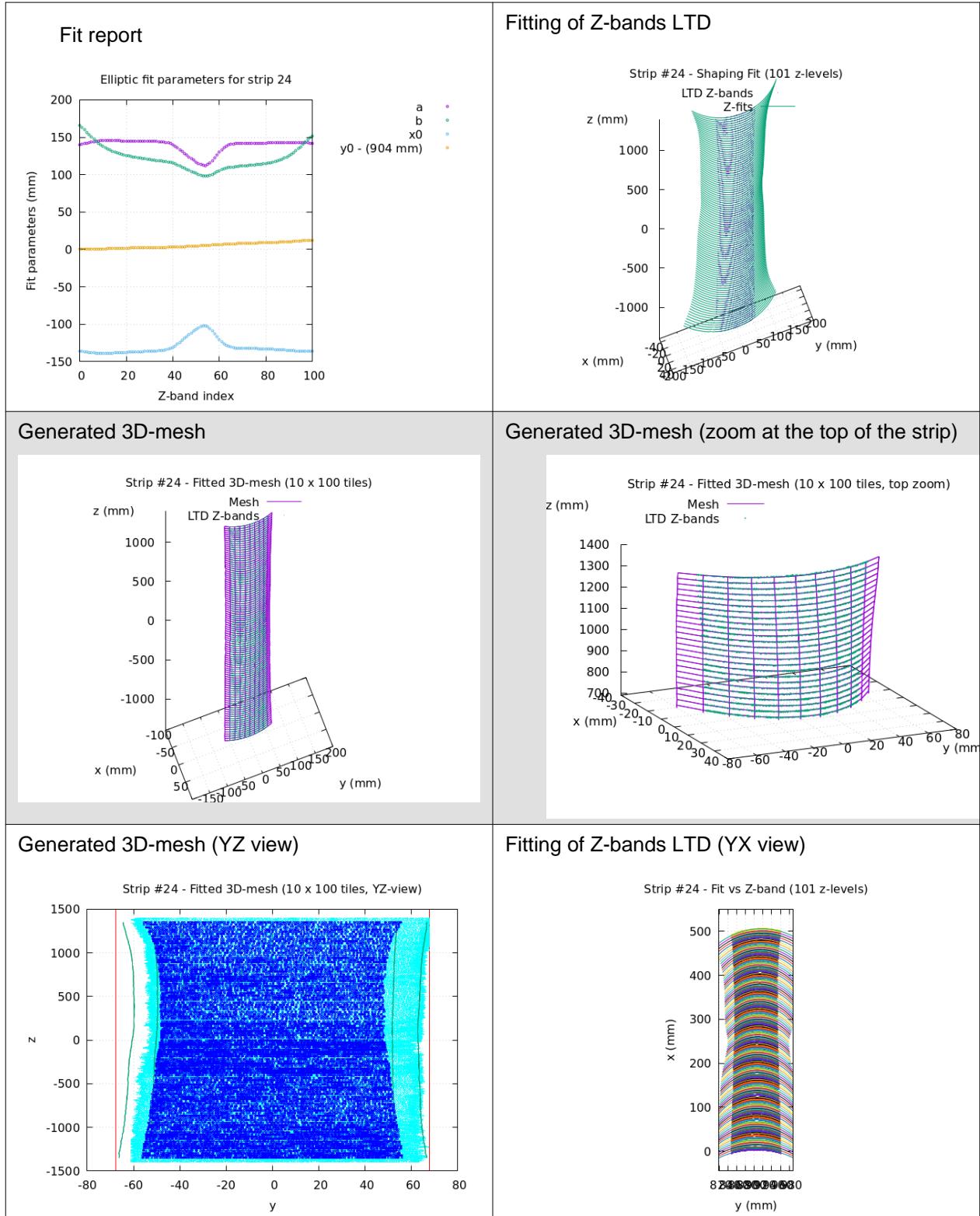
Strip 22



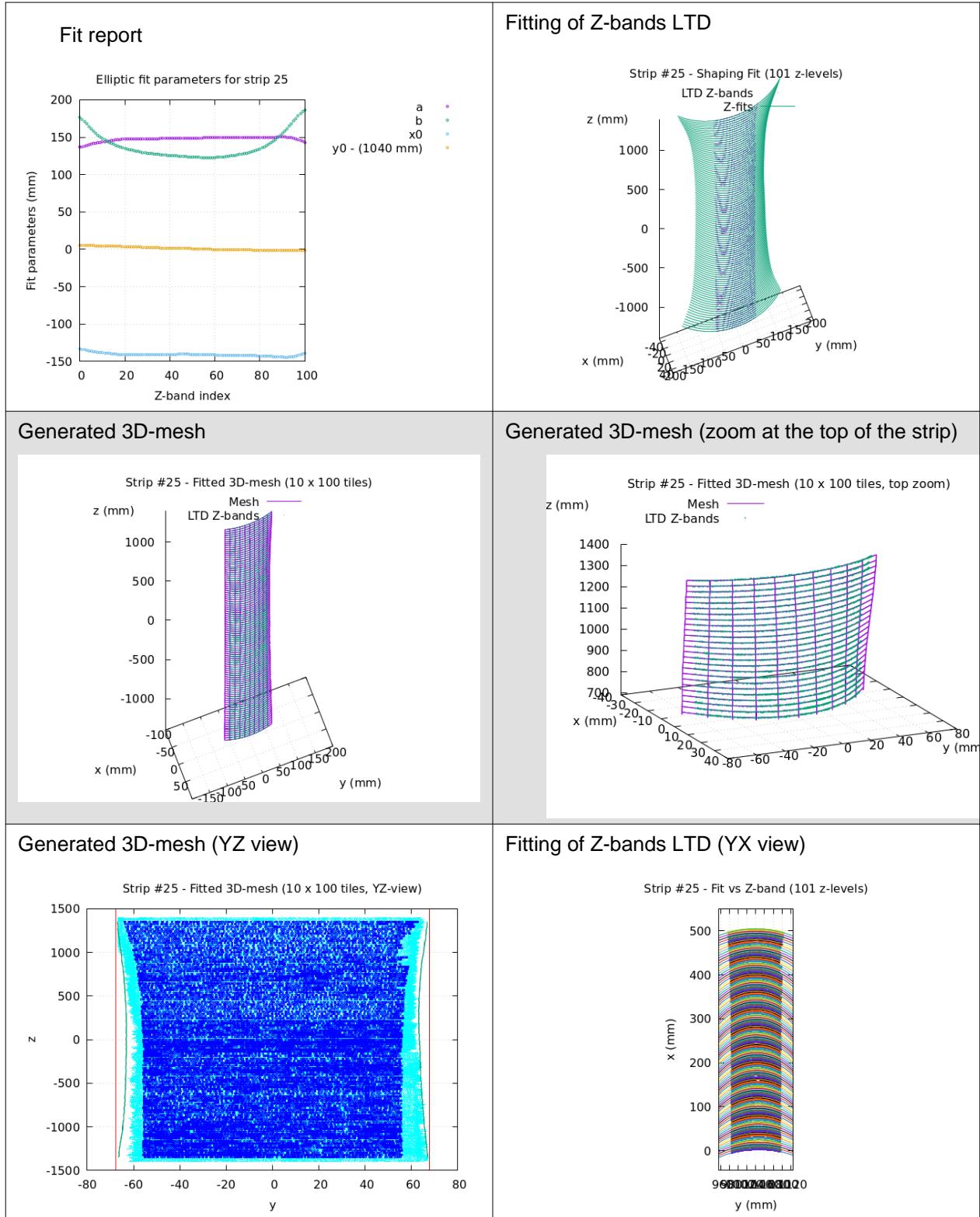
Strip 23



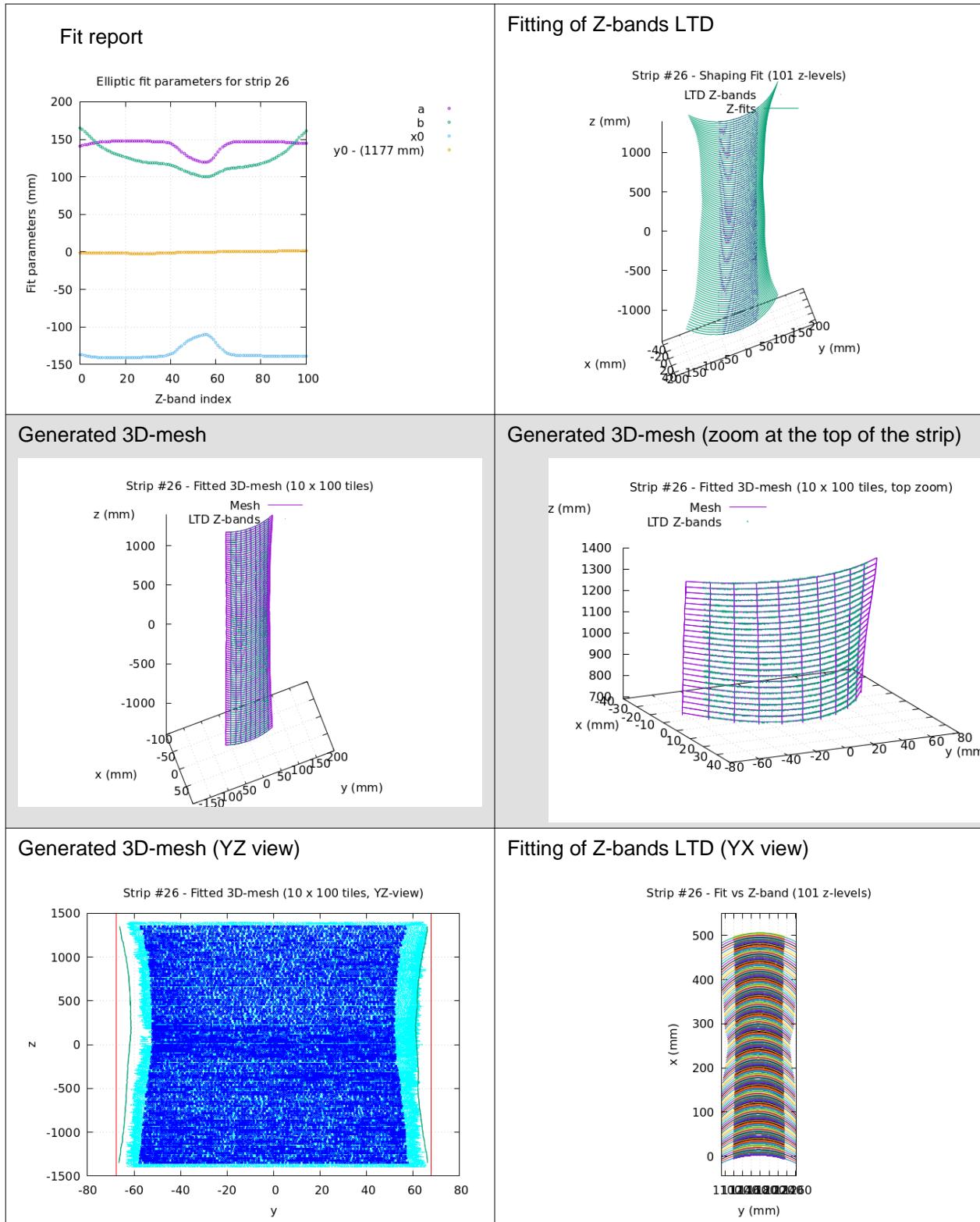
Strip 24



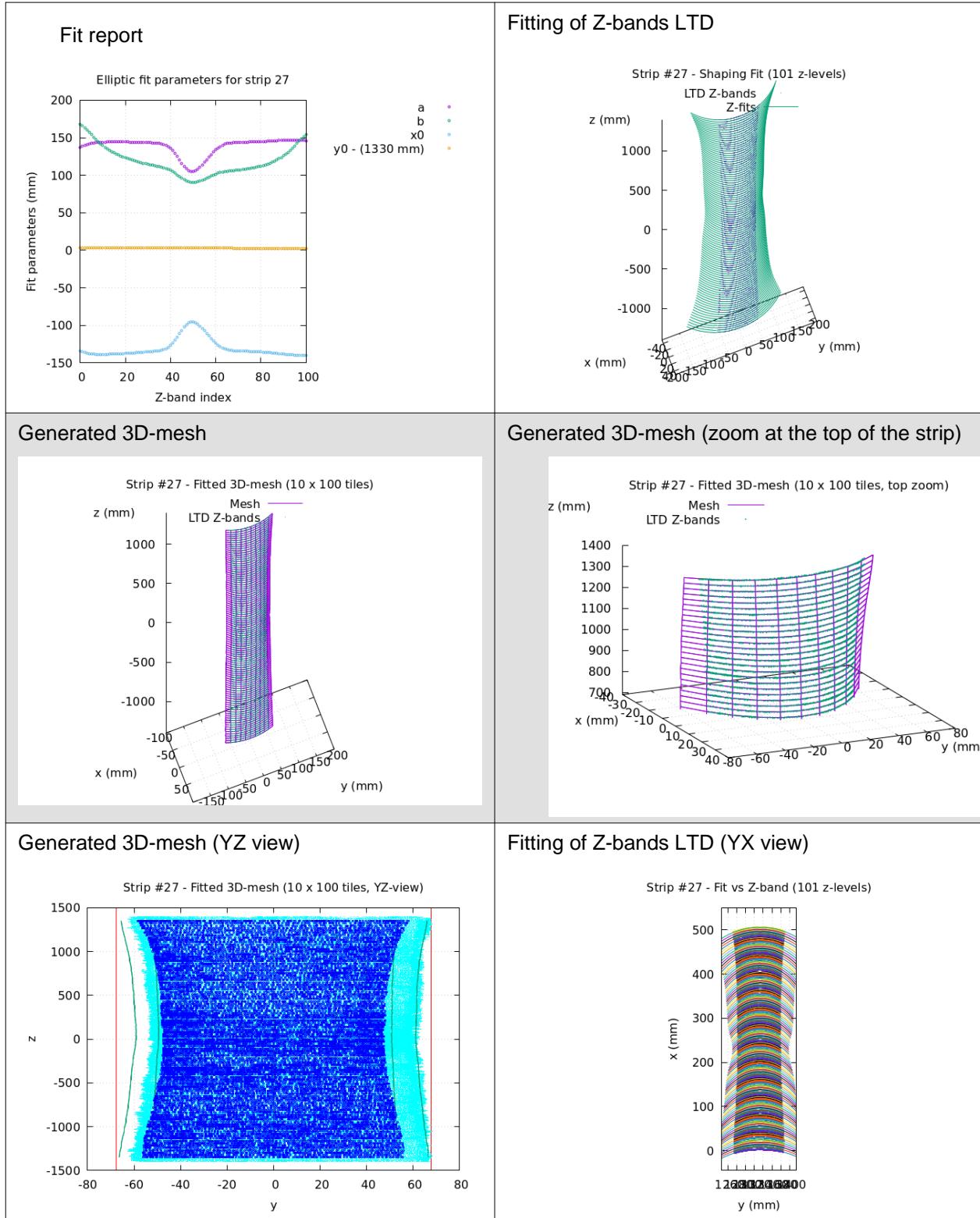
Strip 25



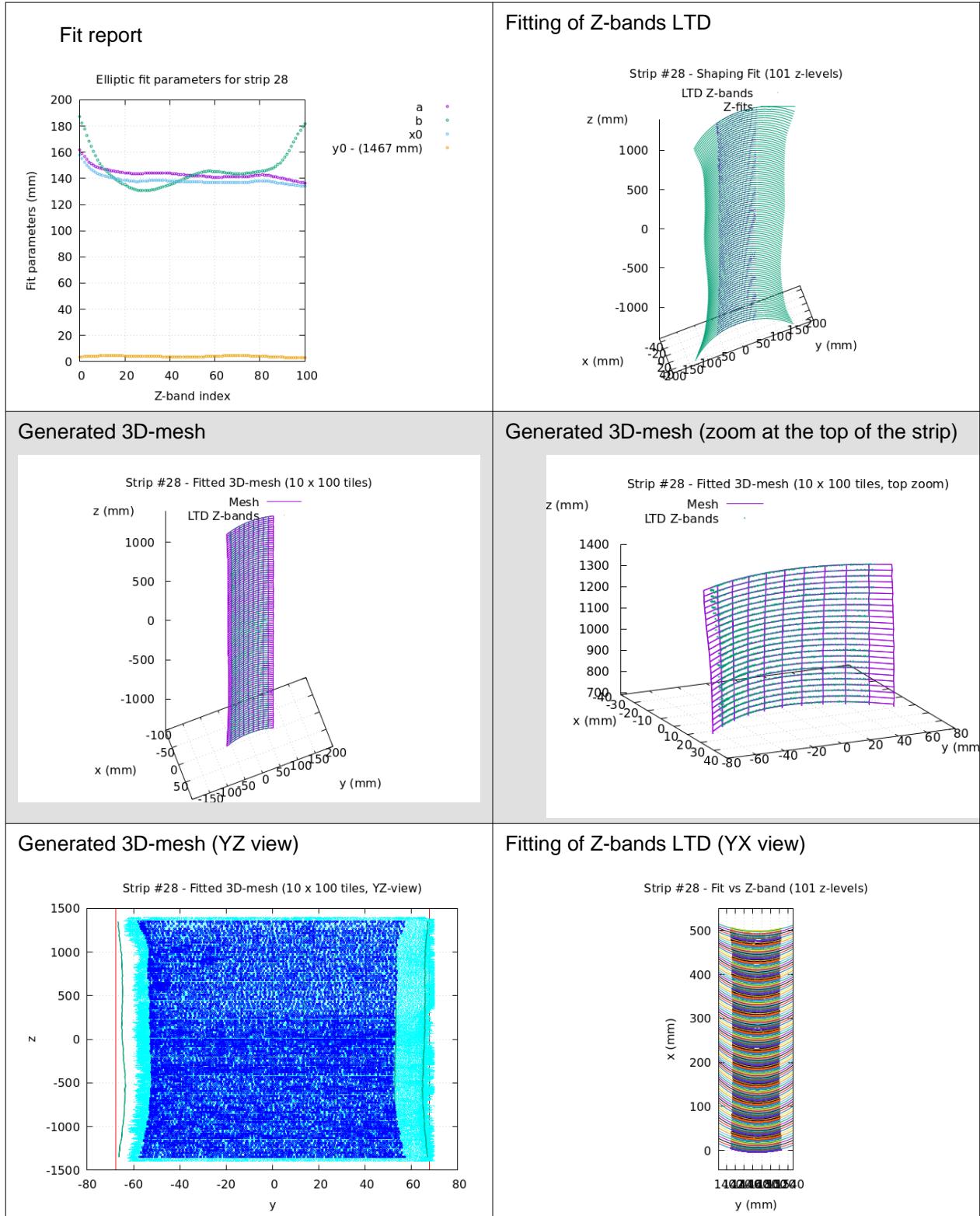
Strip 26



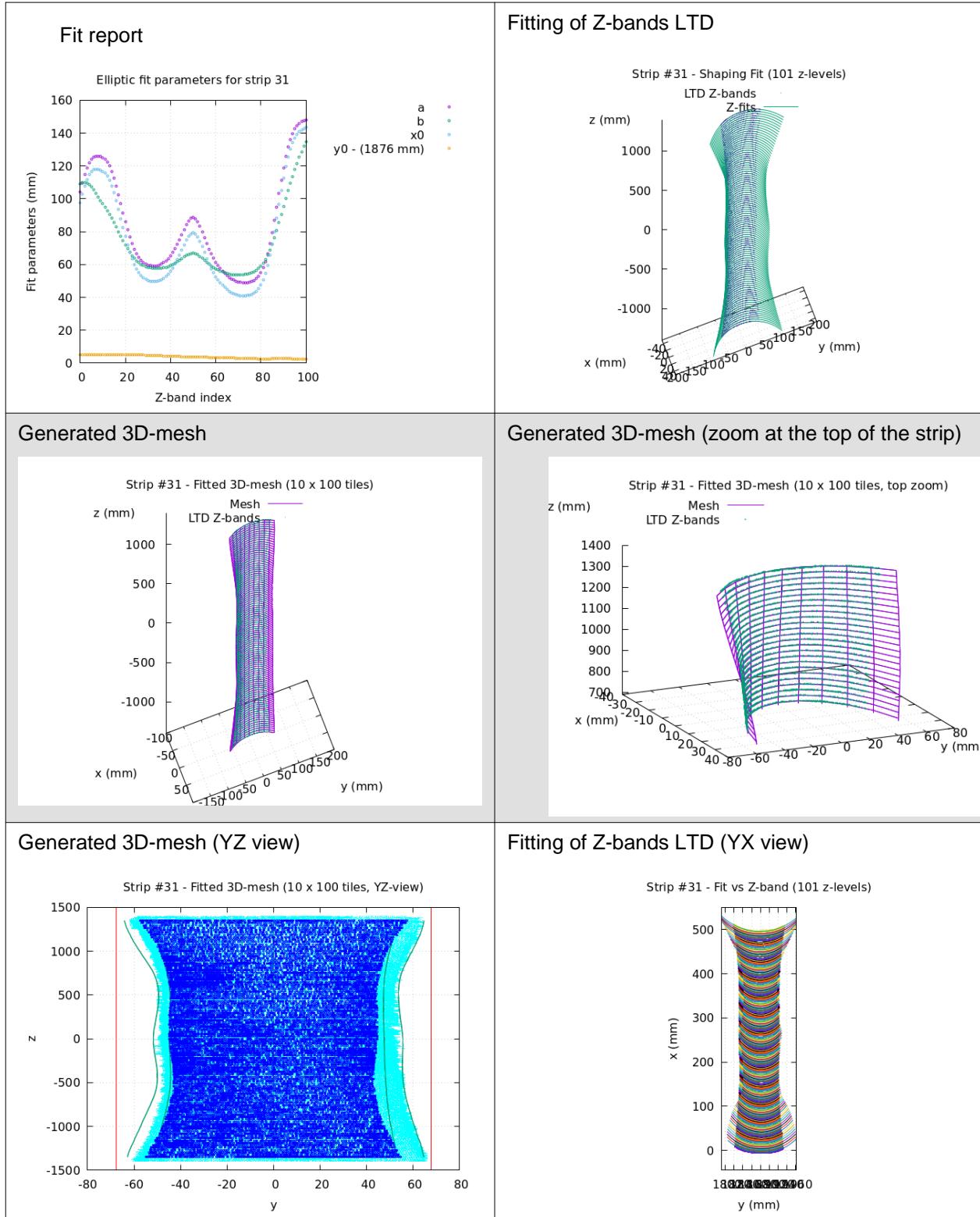
Strip 27



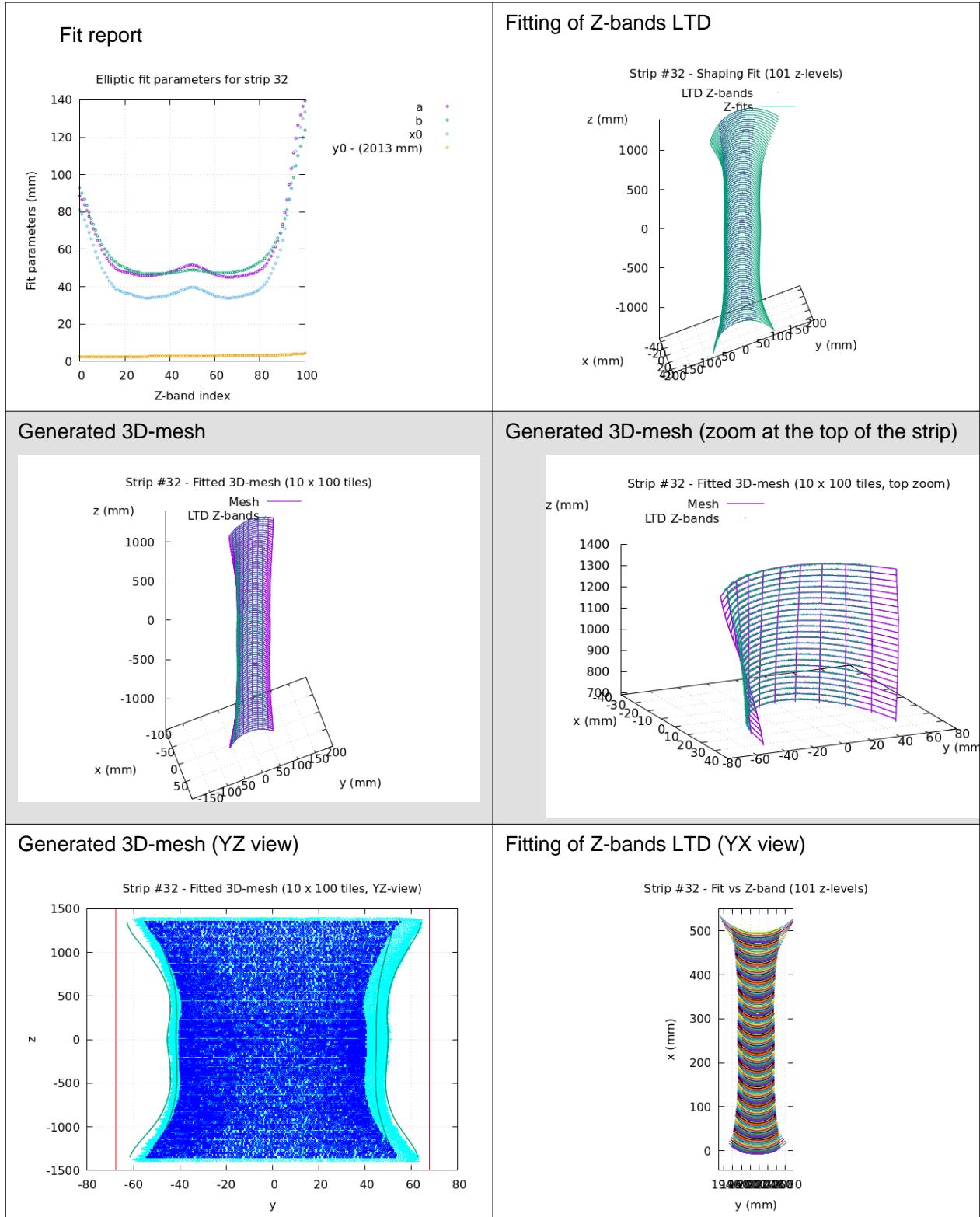
Strip 28



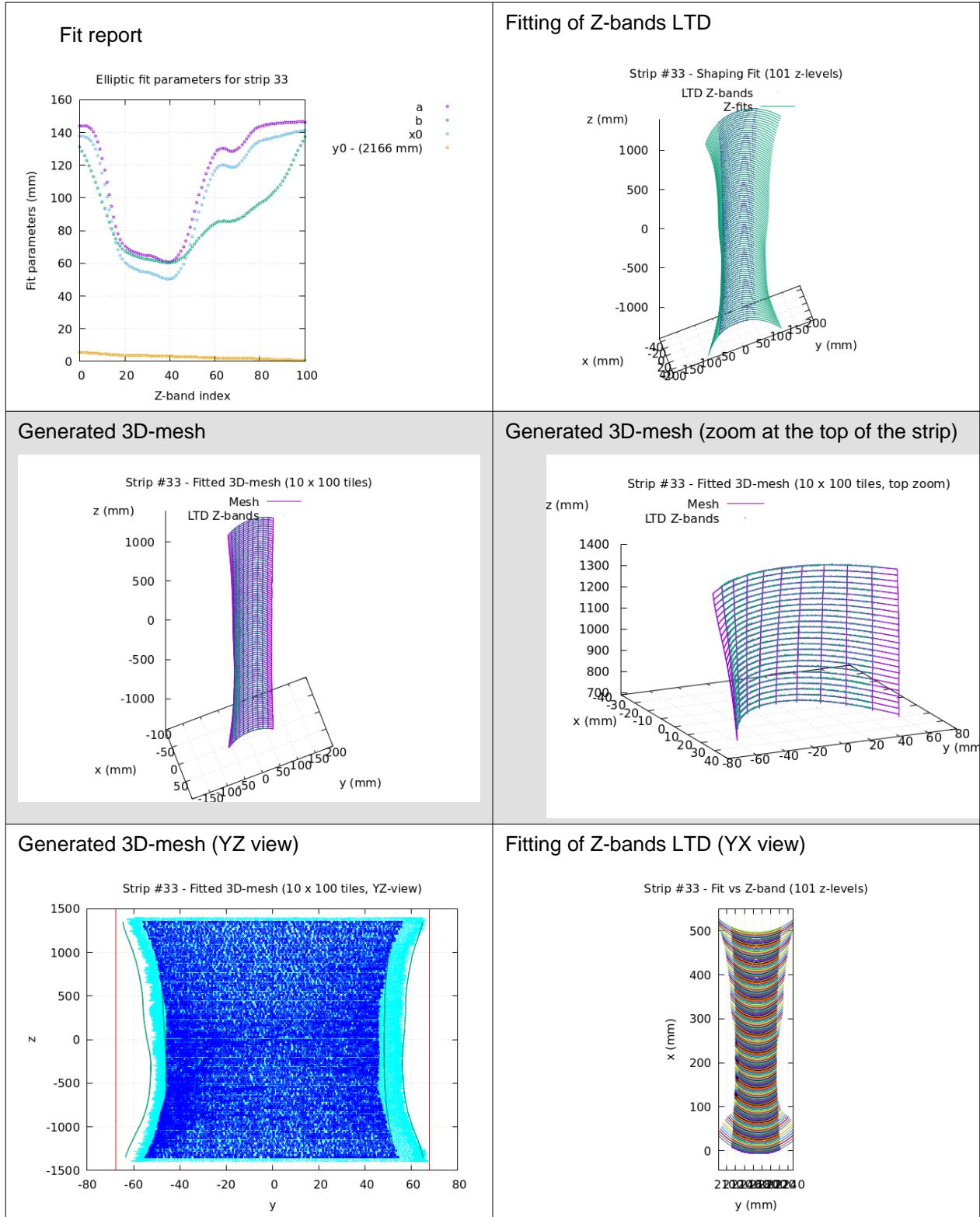
Strip 31



Strip 32



Strip 33



Strip 34

