

# TESCAN STREAM FILE FORMAT

VERSION 1.0

## WHAT IS TESCAN STREAM FILE FORMAT

Tescan Stream File (TSF) format is a text-based file and consists of commands, allowing to generate arbitrary scanning pattern. This format use ".tsf" extension.

By using Tescan Stream File format it is easy to achieve simple automation when planning scanning procedures.

## WHAT IT IS USED FOR?

- New scanning path strategies development - alternatives to ZIG-ZAG, RLE, ...
- Smart scanning strategies development - to overcome sample charging effects
- 3D structure growth using GIS - plasmonic structures preparation
- Support for specific university research

## HOW TO USE IT?

- Python and SharkSEM Advanced must be installed
- It is necessary to create a simple python script that loads a TSF data and use function for SEM `ScStream()` and for FIB `FibScStream()`
- Image acquisition is supported
- More detailed specification and error handling description is in SharkSEM documentation
- In SharkSEM package there are few samples of TSF and python script examples.

The example below shows how Tescan Stream File might look like.

## TSF COMMANDS - SYNTAX DESCRIPTON

- TSF must contain a [HEADER] at the beginning and then a [BODY] part
- TSF is case insensitive
- Empty lines are allowed
- Comments are allowed. After the "#" symbol, the remaining part of the line is ignored
- Each command must be on a separate line
- Whitespaces are allowed around numbers and around commands
- Number of arguments of the appropriate command must be exact
- TSF must contain at least one LINE() command

### [HEADER]

Marks the beginning of the file header.

- The header must contain only the TescanStreamFileVersion command
- Command must be on first line of TSF

## [BODY]

Marks the beginning of the file body part. Here the actual scanning routine is specified.

- The file body part must contain only these commands: [BLANK\(\)](#), [UNBLANK\(\)](#), [LOOP\(\)](#), [ENDLOOP\(\)](#), [LINE\(\)](#)

## TESCANSTREAMFILEVERSION

Indicates the current version of Tescan Stream File.

- Must be used only in file header.
- As the example below shows, correct syntax is: TescanStreamFileVersion="v".
- v – Number value depends on the current version. Argument must be specified.

## BLANK()

Sets following [LINE\(\)](#) commands to be blanked.

- Can be used anytime and anywhere in file [\[BODY\]](#)

## UNBLANK()

Sets following [LINE\(\)](#) commands to be unblanked.

- Can be used anytime and anywhere in file [\[BODY\]](#)

## LOOP()

Marks the beginning of the loop section.

- Every [LOOP\(\)](#), must be ended with [ENDLOOP\(\)](#)
- All commands between LOOP(n) and [ENDLOOP\(\)](#) will be repeated n-times.
- Loop nesting is allowed
- As the example below shows, correct syntax is: [LOOP\(n\)](#)
- n – positive integer in range 1 to 1048576, determines number of cycles.  
Argument must be specified.

## ENDLOOP()

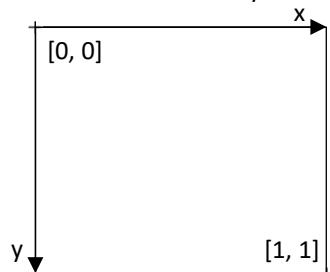
Marks the ending of the loop section.

- Every [LOOP\(\)](#), must be ended with [ENDLOOP\(\)](#)
- Cannot use [ENDLOOP\(\)](#) without any cycle scope opened by [LOOP\(\)](#) before

## LINE()

Performs a scan path.

- Scene coordinate system:



- The range of scene coordinates is from 0 to 1, related to the currently set field of view (FoV)
- The actual scale is related to the current magnification
- All arguments must be specified
- As the example below shows, correct syntax is: LINE(*x1, y1, x2, y2, n\_points, dwell*)
- x1, y1* – start position
- x2, y2* – end position
- n\_points* – number of points in the line in range 1 to 16777216. If *n\_points == 1* start and end position must be equivalent.
- dwell* – dwell time [ns]. Number value must be in range 20 to 1000000000

## TECHNICAL PARAMETERS

- Default blunker state is blanked and its position depends on the position after previous scanning.
- Maximum number of rows for TSF is approximately 10,000,000. However, it depends on how busy the microscope is and layout of the commands
- Regarding the accuracy of the coordinates, keep in mind that a 16-bit DAC is used for scanning. This means that the maximum theoretical sampling is 1/65536
- Maximum number of different dwell times in single TSF file is 124
- When using image acquisition remember that intensity data are returned only from all unblanked points of LINE() commands. Blanked lines are ignored.
- Change from blanked to fully unblank beam is not instantaneous and take roughly 60 ns.
- Note that, performing high frequency blanking-unblanking cycles could be performed only in short burst. The maximal burst frequency is 5 MHz, where the average frequency should not exceed 400 kHz, i.e., in continuous mode the maximal number of pulses in a second should not exceed 400 000.

TSF EXAMPLEAN EXAMPLE OF SIMPLE TSF DIRECTED BEAM PATHING.

