

# MES detailed release notes

MES 8.2 (15/09/2023) - MESc 4.6.12979

## New features

- Line-by-line switching between lightpaths and patterns
  - combination with FocusPinner
- Image overlay functionality with MESc 4.6 for chronic imaging
- Optimized precalculation (shorter precalculation time)
- MultiPulse generator adjusts the number of repetitions as a function of protocol length time
- 100 kHz per points (SW solution needs optical adjustment)
- Common template at post hoc motion correction
- Sequence numbers at MES ROIs
- Camera and 2p images are matched with haircross
- Automatized adjusting of ROIs after reselecting reference point
- Analysis ROIs
  - Sequence numbers
  - Automatic coloring of new ROIs for better visibility
- FocusPinner
  - Automatic adjustment of ROIs after reselecting reference point
  - Stores dichro state at reference selection, used stored state during reference measurements
  - Reference drift insertion is taken into account when using Frame/Line Sync signals
  - Frame Sync signal
- Warning is displayed if Z-stack laser intensity is significantly higher than current settings
- Tiled Imaging functionality
- Tiled ZStack functionality
- Support for Basler acA5472-17um camera
- Supporting [Suite2p](#) and [FIOLA](#) packages for cell and Ca signal extraction
- Win11 compatibility

## Bugfixes

- Interrupted ZStack can be loaded into image background pool
- Image statistic bug fix
- FocusPinner bugfix at extreme large AO cycles
- Bugfix at PropertyCollector

## Coming soon

- Extension of Raster Scan with Protocol

## MES 8.15 (14/03/2023)

### New features

- loading layers of VolumeScan to background pool is feasible
- Widgets to input sizes of FOV
- Script for unfolding FrameSync data → Github
- Script for transforming points back to microscope coordinate system from finding specified points on image - > Github

### Bugfixes

- FocusPinner at Raster Scan Records bug
- Point Loading to MES from MESC

### Coming soon

- Automatized adjusting of ROIs after reselecting reference point
- Extension of Raster Scan with Protocol

## MES 8.1

### New features

- FPGA-based Real Time Motion Correction ('FocusPinner'): detecting and correcting motion by using a fix number of AO cycles for reference scanning and shifting the target of scanning by compensating in X-Y-Z direction during the scanning of a specific pattern.
  - It makes feasible to
    - scan ribbons, chessboards, points, lines and full field of view with motion correction
    - compensate motion based on intensity of reference drifts (without appearing in measurements)
    - automatic parameter adjusting
    - scan reference drifts with task-specified AO amplitude (i.e. with larger amplitude for the better SNR compared to amplitude in case of imaging)
- Measurement control
  - Point-scan measurement with 1 point, reaching 33 kHz sampling rate (previously at least 4 points should have been selected)
  - Square pixels at all scanning modes
  - Long ('unlimited' duration) recording for all scanning modes including Special scans
  - Line scan tab is removed, Line scans can be performed in Line scan mode under the Special scan tab
  - Traditional and High Speed Raster scan tabs are merged
    - 5-step slider for controlling the number of drifts in one line of a Raster scan

- Drift length setting for Line and Longitudinal ribbon patterns
- Effective bit depth is adjusted automatically (16 bit transfer is used on low resolutions, 8 bit transfer on high resolutions)
- New options for Point --> Pattern transformation: XYZ cross and Chessboard
- MESc-based data storage for all measurement modes leading to improved data saving times at Special scans
- Averaged images per Z-stack layers
- Raster scan with Protocol can be performed by the 'Select whole viewport' option on the Special scan tab
- MetaProtocol delta time edit boxes
- Special scan patterns are displayed in the Focus plane visualization window
- Analysis
  - Line-scan batch analysis is redesigned and extended for 3D Special scan measurements (i.e. Chessboard and Ribbon measurements)
  - Post hoc Motion correction can be saved to new measurement units in case of chessboard, ribbon scanning
  - Batch processing of post hoc motion correction
  - Improved File panel
    - Tree view similar to MESc
    - Opening multiple files are supported
  - Improved data storage based on MESc
    - Data is being streamed to .mesc (HDF5-based) files making it feasible to get and analyse data during measurements (via FemtoAPI)
    - Data is losslessly compressed, 4 compression methods are supported
    - Description of new file structure: [MESc 4.5 filestructure](#)
    - Sample codes for accessing attributes on GitHub: <https://github.com/Femtonics/FemtoAPI/tree/Atlas/Python>
  - Redesigned measurement viewers
    - MultiCube and Snake measurements are treated as volume scans
      - Additional slider for navigation in Z
      - ROI evaluation takes into account the volumetric nature of data
    - Measurement ROIs are always shown in a user-friendly arrangement (according to former Break view)
    - Multiple analysis ROI selection after clicking the New... buttons
    - Analysis ROIs can be moved and adjusted easily, their color can be changed
    - Pixel values and coordinates are shown below the corresponding image while moving the cursor
    - Inverse coordinate matching is implemented
      - A cursor indicates the corresponding position on the frame image while moving the cursor on the Background image
      - Overlapping ROIs are supported
    - Points can be selected both on the frame and on the Background image
    - Improved zooming functions on images and axes
  - Points
    - Point group 0 (with fixed colors) is removed
    - Points can be colored arbitrarily, point groups have an adjustable default color
    - Context menu on images for adding new Points
- TIFF export became compliant with OME-TIFF

- MES starts MESc on startup
- Matlab R2020b and R2021a are supported

## Bugfixes

- Fixed black image when stopping the camera
- Improved alignment of scanning drifts with the guideline in Longitudinal ribbon and Line scanning
- Number of pixels during one AO cycle is now variable in Special scans
- Vertical artefact during HSAFS is removed
- Only completed frames are saved at the end of the measurements (without fragmentary data)
- Electrophysiology recording fixed in case of downsampling
- Optimized protocol calculations (fixing the slow response of Protocol editor windows in case of long measurements)
- Better resizing of measurement viewers
- Turning on the dF/F visualization in measurement viewers doesn't hide the physical channels
- Histogram and Image statistics windows ignore the empty areas of Special scan images
- Store button on the Live camera window always stores the current image
- Prevent twisting of Z directional ribbons

## Known issues

- File format change:
  - .mes files made with MES 7 or lower cannot be opened in MES 8 (only .mesc files can be opened, .mes files cannot be converted into the new format)
  - .mesc files made with MES 7 HSAFS mode can be opened in MES 8
- Compatible with MESc 4.5.1 (recommended) and 4.5.0 (update mandatory from 4.0.1 or earlier versions)
- Compatible (via MESc) with FemtoAPI 2.0.0
- Special scan measurements can be viewed and analyzed in MES, full frame measurements in MESc
- MES measurement viewers open slowly
- Command line access changed due to extensive refactoring of the backend
- MES supports .mescroi files in JSON format (old .mescroi files in XML format can be converted to the new format in MESc)
- Metaprotocol files (.Mprot) made with MES 6 or lower cannot be opened in MES 8
- Protocol editor: Crop beginning is hidden (fixed at 0)
- Electrophysiology module is not working
- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values. The Scan optimum number in the Info panel indicates if the parameter combination is optimal (turns to green) and suggests settings for reaching the optimum.

## Coming soon

- Multilayer

## MES 8.0

### New features

- Measurement control
  - Square pixels at all scanning modes
  - Long ('unlimited' duration) recording for all scanning modes including Special scans
  - Line scan tab is removed, Line scans can be performed in Line scan mode under the Special scan tab
  - Traditional and High Speed Raster scan tabs are merged
    - 5-step slider for controlling the number of drifts in one line of a Raster scan
  - Drift length setting for Line and Longitudinal ribbon patterns
  - Effective bit depth is adjusted automatically (16 bit transfer is used on low resolutions, 8 bit transfer on high resolutions)
  - New options for Point --> Pattern transformation: XYZ cross and Chessboard
  - MESSc-based data storage for all measurement modes leading to improved data saving times at Special scans
  - Averaged images per Z-stack layers
  - Raster scan with Protocol can be performed by the 'Select whole viewport' option on the Special scan tab
  - MetaProtocol delta time edit boxes
  - Special scan patterns are displayed in the Focus plane visualization window
- Analysis
  - Improved File panel
    - Tree view similar to MESSc
    - Opening multiple files are supported
  - Improved data storage based on MESSc
    - Data is being streamed to .mesc (HDF5-based) files making it feasible to get and analyse data during measurements (via FemtoAPI)
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- Metaprotocol files (.Mprot) made with MES 6 or lower cannot be opened in MES 8
- Protocol editor: Crop beginning is hidden (fixed at 0)
- Batch analysis functions are scheduled in MES 8.1
- Electrophysiology module is not working
- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values. The Scan optimum number in

the Info panel indicates if the parameter combination is optimal (turns to green) and suggests settings for reaching the optimum.

### Coming soon

- Multilayer

### MES 7.4 hotfix release 2 (07/12/2021, revision 10310)

#### New features

- Background Image Pool: maximum number of images increased to 600
- Matlab R2017b-R2020b is supported

#### Bugfixes

- User password creation fixed for Matlab R2018a and higher releases
- Camera histogram bugfix
- Gamma angle visualization was inverted
- Protocol: scanner pattern channel tolerates equal time points with different values
- Z-stack Change axis parameters: bugfix for Z movement

#### Known issues

- Measurements made with MES 7.4 cannot be opened on versions older than 7.2 (but all older measurements can be opened in 7.4)
- Electrophysiology module is not working
- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values. The Scan optimum number in the Info panel indicates if the parameter combination is optimal (turns to green) and suggests settings for reaching the optimum.
- Compatible with MESC 4.0.1 (used in HSFS record mode)

### MES 7.4 hotfix release 1 (21/06/2021, revision 9626)

#### New features

- Ribbon numbers at immediate window
- Ribbon numbers at background window
- Export Ribbon numbers to metadata.txt
- Improved performance at protocol loading
- Matlab R2017b-R2020b is supported

#### Known issues

- Measurements made with MES 7.4 cannot be opened on versions older than 7.2 (but all older measurements can be opened in 7.4)
- Electrophysiology module is not working

- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values. The Scan optimum number in the Info panel indicates if the parameter combination is optimal (turns to green) and suggests settings for reaching the optimum.
- Compatible with MESc 4.0.1 (used in HSFS record mode)

## MES 7.4 (12/05/2021)

### New features

- Metaprotocol loop mode
- Metaprotocol Objective arm movements should be specified as delta values
- Focusing panel can be used to select Z levels for Z-stacks when the viewport is horizontal
- Added support for recent Alcor laser modelsPropertyCollect: option to recursively discover folders

### Bugfixes

- Devices outside configured limits are moved into range at startup
- HSFS Record saves background image into the Background Pool
- Flickering in Live mode during Z movements
- Bugfix for Green lamp warning for in vivo-in vitro setups
- Bugfix for deleting channels from a measurement
- FoldedFrame viewer Export video channel selection
- User password creation fixed for Matlab R2018a and higher releases

### Known issues

- Measurements made with MES 7.4 cannot be opened on versions older than 7.2 (but all older measurements can be opened in 7.4)
- Electrophysiology module is not working
- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values. The Scan optimum number in the Info panel indicates if the parameter combination is optimal (turns to green) and suggests settings for reaching the optimum.
- Matlab R2019a-R2020b is only partially tested
- Compatible with MESc 4.0.1 (used in HSFS record mode)

## MES 7.3 (06/10/2020)

### New features

- Thermal stabilization
- Cumulative time of thermal stabilization in Help / Setup diagnostic menu point
- Safety for FOV setting
- Warning for green lamp



- Histogram button in Live window
- Undo button on Protocol editor and Protocol channel (Level two) editor

### Bugfixes

- Binning ruined the calibration
- Long channel names were not displayed well in protocol editor

### User experience

- Simplified mode
  - Hardware state panel does not appear
  - Camera tab: camera and Settings panel does not appear
  - GDD fine tuning does not appear
- Wavelength slider: only integers are accepted
- Unified MES manual
- Users can choose between save options

## MES 7.2 (06/07/2020)

### New features

- Advanced PhotoStim GUI
  - Several channels can be handled simultaneously
  - Photostimulation and scanning can be performed alternately with the frequency of a fixed pattern
  - Total time can be set (it adjusts Frequency and last value of Time automatically)
  - Settings are saved to Protocol and are loaded when opening GUI
  - Stimulation can be synchronized to the beginning of a frame
  - the value of laser amplitude and time difference in protocol will be automatically adjusted when changing their values (without regeneration of protocol)
- Reset button for protocol channels
- Pattern Copy/Paste buttons in Special scan mode
- Automatic adjustment of PMT gating signal (length of automatic restart can be set in configuration)

### Bugfixes

- Image background pool bugfix
- Correction of limits of LUT in case of Capture
- Scan sync signal bugfixes

### Known issues

- Measurements made with MES 7.2 cannot be opened on previous versions (but all older measurements can be opened in 7.2)
- electrophysiology module is not working
- FixWithStage is not working for rotated viewpoints (warns about it)

- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values.
- Matlab R2019a-R2020a is only partially tested

## MES 7.1 (08/05/2020)

### New features

- Warning signal when PMT signal level is too high
- Direction of gamma Euler angle is reversed to match the convention used for alpha and beta
- Suggested optimal alpha and FastZ values are displayed in the Info panel
- Special/Line scan patterns can be dragged with Shift + Click
- High-speed AO recording can be used in the MetaProtocol
- SocketModule support
- UncageMapping support
- Loading settings of saved measurements improved - Load/Load multiple settings window
- Maximum length of LineMagic line is set to 300 um

### User experience

- Global cursor is displayed on FOV Visualization window as well
- SampleStage button on Focusing panel
- Improved position loading functionality
- Improved TIFF export with metadata.txt
- During measurements GUI elements that have no effect are disabled
- Limits of AO Z is a function of the objective calibration

### Stability

- Improved stability with main electronic and peripheral electronic system (increased stability during HW state setting and MetaProtocol runs)
- Improved stability of camera

### Bugfixes

- Direction of gamma Euler angle is reversed to match the convention used for alpha and beta
- TIFF export bugfixes and significant speedup, export process can be cancelled
- FoldedFrame Export movie bugfix
- Kombiplxer-related timer handling bugfixes - increased stability during HW state setting and MetaProtocol runs
- Background pool bugfixes
- Protocol saving issue with 'image' type channel
- Line scan Rectangle selection bugfix
- SampleStage also prompts for confirmation of large movements
- Z-stack viewer Stack movie bugfix
- Image statistics and histogram bugfixes

- Cell3DFinder subselect feature bugfix
- Special/Line scan pattern selection works only on image area
- Raster scan Record mode bugfixes (record time)
- Opening the PDF manual is not blocking the GUI
- Flickering issue of Live window
- LUT is available at the first start of Live imaging in Live window

### Known issues

- Measurements made with MES 7.1 cannot be opened on previous versions (but all older measurements can be opened in 7.1)
- electrophysiology module is not working
- FixWithStage is not working for rotated viewports (warns about it)
- Maximal field of view in the Hi-speed raster scan mode can be achieved with a nontrivial combination of Rotation XY and FastZ values.
- Matlab R2019a-R2020a is only partially tested

### MES 7.0 (03/06/2019)

#### New features

- High-speed scanning at 40Hz at a resolution of 510×510 pixels on a FOV of 500×500 μm
- Imaging plane can be rotated with AO technique without any physical constraint according to all three Euler angles
- Scanning plane can be extended to a volume as an alternative of Bessel beam technology
- With special scanning modes the activity of a cell and its dendrites can be followed in 3D (multiline, ribbon, snake, chessboard and cube scanning) fitting the drifting direction according to the actual viewport axes
- Acousto-optical drift scanning with special surface and volume elements can be used for reducing motion artefacts (3D Anti-Motion technology)
- Photostimulation enhancements
- Automatic cell detection
- A set of measurement parameters can be changed during measurement:
  - Rotation and translation of the imaging plane
  - Width and height of the imaging plane, keeping the aspect ratio (zoom in/out)
  - FastZ focus
  - AO level
  - Display average
  - Distance between layers in Volume scan mode

#### User experience

- Improved visualization for Z-stacks and rotated planes in Raster Scan mode
- Display average on High Speed Frame Scan, Volume Scan and Special Scan modes
- Simplified GUI for Z-stacks

#### Stability

- Femtonics Log Collection System for preventing and diagnosing issues

### Compatibility

- This software branch supports Femtonics galvo systems no longer

## MES 6.6 (only for galvo systems) (30/07/2022)

### New features

- Prior stage is supported
- Acquisition frame rate of camera recording can be set
- MATLAB r2007b, 2016a-2020b are supported

### Stability

- Multi-channel pulse generator bugfix when using Pattern 3-16

## MES 6.5 hotfix release 2 (only for galvo system) (02/12/2021, revision 10286)

### New features

- Advanced PhotoStim GUI (supported for Matlab R2014b and above)
  - Several channels can be handled simultaneously
  - Photostimulation and scanning can be performed alternately with the frequency of a fixed pattern
  - Total time can be set (it adjusts Frequency and last value of Time automatically)
  - Settings are saved to Protocol and are loaded when opening GUI
  - Stimulation can be synchronized to the beginning of a frame

### User experience

- PropertyCollect: option to recursively discover folders
- Reset button for protocol channels
- Undo button on Protocol editor and Protocol channel (Level two) editor

### Stability

- Bugfix for deleting channels from a measurement
- User password creation fixed for Matlab R2018a and higher releases
- Bugfix for loading Z-stacks into the Background Image Pool
- Bugfix for overwriting opened files

## MES 6.5 hotfix release 1 (only for galvo system) (16/03/2021, revision 9208)

### User experience

- Detailed error messages in Matlab console during measurements

### Stability

- Bugfix for Green lamp warning for in vivo-in vitro setups
- WavelengthTuning bugfix to support Matlab R2007b
- Bugfix for supporting Advantech devices other than ObjectiveArm and FastZ

## MES 6.5 (only for galvo systems) (17/12/2020)

### New features

- Metaprotocol loop mode
- Metaprotocol Objective arm should be specified relative to Zero
- Support tickets can be submitted directly from MES (Help/Submit support issue...)
- Automatic horizontal/vertical arrangement of PMT sliders removed: 'View/Vertical PMT sliders' controls slider orientation

### Stability

- Z-stack viewer Stack movie
- Background pool flickering
- LUT limit checks
- Focusing panel hotkeys
- Camera: Binning adjusts calibration
- Devices outside configured limits are moved into range at startup
- FoldedFrame viewer Export video channel selection
- Camera switch device error on HW state change
- Switching measurement tabs during Z-stack

## MES 6.4 (only for galvo systems) (29/04/2020)

### Stability

- Improved stability of electronic system
- Improved stability of camera
- Bugfixes
  - Eliminated instability at hardware state changing and starting Z-stacks
  - Improved point management and background pool handling at Virtual Z-stacks
  - Camera video recording

### User experience

- SampleStage button on Focusing panel
- Improved position loading functionality
- Improved TIFF export

### New features

- Warning signal when PMT signal level is too high

## MES 6.3 (19/09/2019)

### User experience

- Highlighting Virtual coordinates (on setups with tilting objective unit)
- Fixed hotkeys for Adjuster window used in Line scan and ROI selection
- User friendly DoCallback module settings
- Emergency function stops all configured handwheel axes
- Minimum LUT range to prevent amplifying the noise: LUT window/Functions/Set LUT ranges

### Stability

- Fixed bugs at homing
- Fixed freezes and errors during Curve analysis export function
- Shutter handling fix on SMART systems (shutter checkbox appeared with no shutter configured)

### New features

- "Elbow" support for tilting objectives

## MES 6.2 (17/12/2018)

### New features

- Controlling motorized tilting objective
  - Redesigned Focusing GUI with controls for Femtonics X/Y stage and motorized tilting objective unit
  - A visual guide can be opened from the Focusing panel to help better understand the available handwheel modes
  - New Virtual mode for focusing and navigating with a tilted objective
  - More detailed movement range limiting allowing for a wider tilting range
- Photostimulation
  - Usage of several patterns at AO special scanning modes to perform photostimulation
- The Behaviour importer module now handles velocity data (.vlg files) recorded with Femtonics Gramophone devices
- CurveGenerator window to insert user specified curves to selected channels in protocol window
- Electrophysiology measurement can be performed in camera mode without scanning

### New analysis features

- Improved and faster motion correction algorithm for Femto3D AcoustoOptic microscopes' chessboard scanned measurement units
  - With more intuitive parameter set

- Units can be transformed to the same reference image
- Motion correction batch process can be called from command line as well
- Offset curves in X and Y direction are saved into .mat files
- See also [Translational Motion correction batch](#)

## User experience

- 3D visualization and navigation
  - Simplified GUI and new visualization mode for Femto3D AcoustoOptic (AO), and Piezo objective positioner specific 3D scanning features in the cases of Femto2D and FemtoSmart systems
  - Navigation commands (step left/right/up/down/Z-up/Z-down, zoom in, zoom out, fixed and free zoom) work in reference of the actual viewport, even in rotated cases
  - Protocol editor shortcuts for setting the most relevant parameters
  - Rotation controls moved to Navigation panel
  - In case of rotated planes the (0,0) coordinates are shown at the center of FOV
  - Fast Z-stack gives a warning if the selected values aren't reachable with the AO focus or piezo
- Improved features in Folded Frame viewer
  - The borders of Folded Frame fields can be made visible in the viewer window of the measurement unit
  - The borders of user selected ROIs (i.e. which pixels belong to the selection) can now be visualized
  - The recalculation of curves from user selected ROIs can now be turned off with the checkbox above the graph
  - Advanced ROI selection and adjustment in FF viewer (ROIs can now be adjusted on a one-by-one basis)
- Z-stack mode chooser in synchron with handwheel modes
- Warning 1 week before license expiry
- Line scan: warns when less than 4 pixels are selected (to avoid kpm2 error)
- Redesigned InfoView window
- The 4D scan settings panel can not be closed when 4D scanning is enabled
- Settings menu items
  - the different settings will no longer be saved with a separate menu item
  - the windows that are closed with Save button will save the settings immediately (or close the application)

## Stability

- Improved stability for camera handling
- KGOLE object ungrouping image quality loss fixed

## MES 6.1 (27/06/2018)

### New features

- Sine pattern generator for the protocol editor window (open source)

## User experience

- Resolved flickering bug during Live scan

## Stability

- Reduced distortions in full field scanning
- Bugfix at protocol input synchron field
- Support for recent PES firmware version

## MES 6.0 (09/05/2018)

### New features

- Improved translational motion correction
- Batch process for translational & non-rigid motion correction module
- Binning option in camera control
- Configurable PMT warm-up time
- Improved 4D scan window in rollercoaster module
- Simplified control for 3D anti-motion scanning modes
- Speed mode button for AO raster scan and Z-stack
- Application for automatic sender of log and setting files (troubleshooting)
- Improved Look Up Table GUI with support of full numeric pad shortcuts and display names of colormap
- The last edited LUT channel is saved and next time it is automatically selected
- Auto button also sets the middle slider on LUT window
- GUI: separate views for simplified and full functionality
- Orthoslicer module functionality is integrated into the standard MES release

## User experience

- New 'Simplified view' switch affecting raster scan, Z-stack, Line scan and AO line scan
- Vertical PMT voltage sliders, PMT voltage sliders of unused PMTs are hidden
- Arbitrary names for Laser and PMT voltage sliders can be set in Service Tools
- Progress bar for longer calculations at curve analysis
- Optimized handwheel smoothness
- Save image (a.k.a. „Photo“) button now moved to the Immediate window top left corner

## Stability

- Curve analysis window at partial filter
- Curve analysis window FWHM for negative peaks and spectrogram
- Importing abf files
- Various bugfixes
- Support for MATLAB 2017b

## MES 5.0

### New features



- Electrophysiology importer supports Intan RHD format
- Electrophysiology importer supports CNT format

### User experience

- Auto LUT for camera
- Improved protocol structure and GUI
- Multi ROI broken view for FoldedFrame measurements

### Stability

- New camera driver and interface
- Automatic packaging and sending debug data to Femtonics if requested
- Support for MATLAB 2015b

## MES 4.6

### New features

- 4D scanning with rollercoaster
- DoCallback module: endless possibilities
- dGpR module: new R compensated dG/G calculation mode
- AO scanning: support for v5 AO driver cards
- Improvements to Cell3DFinder module: finding cells with nuclear exclusion
- Load arbitrary curves into protocol and use them for output generation during line scans
- Metaprotocol handles devices and can capture images and z-stacks at multiple positions
- Support to Sutter MP285 stages
- New module: bpodimporter imports signals from the BPOD behavioral control device.
- Support for tilting objective
- Intrinsic imaging and VisStim (visual stimulation) support
- Support for holographic stimulation
- Support for PClamp 10.6., ABF 2.03 and Windows 10 for Electrophysiology importer
- New module MCTeleClient performing MultiClamp700B telegraphing.

### User experience

- Global cursor helps identifying same locations on different images.
- FoldedFrame can draw more flexible regions: transverse direction is calculated per ROI.
- Improvement for software-controlled beam coupling adjustment (uncage upgrade - laserintapt module)
- AutoROI function on FoldedFrame (XYT) viewer window
- Point to line setting dialog: it is possible to configure multiple patterns to replicate
- Multiple Immediate windows supported: real time parallel display of multiple channels

### Stability

- Bidirectional scanning correction on the main GUI
- New device drivers for PES, LuigsNeumann and APT- increased stability

## MES 4.5

### New features

- Support to export data to large HDF5 files
- Spectrogram calculation in curve analysis
- Form XYT measurement unit from time lapse images captured by metaprotocol
- Motion artefact correction function for galvo XY or XYZ images.
- Improved point management GUI: multiple separate point groups
- Improvements to PipetteManipulation module: supports hardware other than LuigsNeumann

### User experience

- Curve analysis display preferences
- Bulk XYZ and XYT export to multiTIFF
- Adjuster GUI helps fine positioning selections in 3D
- Image statistics calculates histogram
- Convenient PMT enable button