

# R&S® Pulse Sequencer Software Release Notes Software Version 2.0

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# 1 Information on Current Version and History

## 1.1 Version 2.0

Released: Mai 2020

### New Functionality

Topic
Added support for SMW-K302 "Radar Platforms" to simulate emitters on a common platform
Added support for SMW-K309 "2D Map import" to simulate real life georeferenced maps
Added new trace movement based on point and click user interaction. Advanced features such as smoothing are available as well
Added reporting feature for pulse parameters using different templates
Added AOA reporting for individual pulses
Added SCPI recorder feature for recording corresponding SCPI commands from GUI interactions
Added clipping level feature to limit signal power to a certain threshold instead of aborting the calculation if the generators upper limit was violated
Mode editor can now be used as a timeline preview, several helpful info's where added
Double click in the mode editor now directly opens the emitters mode / beam configuration GUI
Reworked several GUI dialogs to improve usability and make things easier to understand
Improved calculation times with random IPM profiles by 400%
Increased maximum allowed movement speed to 6000 m/s
Added support for SMW-B144 RF option
Added support for new 1xxx SMW RF options
Added example repositories for interleaving and movements
Added opacity settings for antennas in 3D previews
Added car vehicle type and icon
Increased maximum value for poly chirp coefficients to -1e32 to +1e32
Added visualization of RAM usage for all signal generators when calculating signals
Added emitter type info's in all dialogs
Changed folder names to human readable format when uploading signals to the generator

### Fixed Issues

Topic
Changed signal generator configuration order in order to suppress unwanted RF Signals before the final trigger
Fixed installer bundle. Last version 1.10 expected R&S Visa installation and aborted installation if not present
Level changes in single sequence scenarios required re calculation
Azimuth and elevation properties where interchanged in Custom Antenna Pattern
Fixed Example Repo "First Steps"

LO coupling did not work for multiple SGTs in master/slave mode
Copying imported waveforms from one repository to another did not work correctly
Internal pulse modulator did only work for ASCII markers (less than 64 transitions) and not for binary markers (More than 64 transitions)
Fixed missing update in DF receiver dialog. The antenna table was not updated if the dialog was open when restarting.
Update of attitude values in point to rx mode for the emitters was missing if the height of the receiver was changed
Position info on 2D Map was wrong. East and north values where confused. North value also had wrong sign and the position info was not absolute, but relative to the receiver
Fixed several OpenGL related issues when running the Pulse Sequencer on a virtual machine or via remote desktop
Fixed combo box behavior. Double click was needed to activate them
Timeout for sanitizing operation was to short which could lead to timeout errors
Settings for FTP block size transmission where empty
Lissajous scan SCPI help for frequency, phase z and Phase x was broken
Unpinned widows could not be displayed full screen
Combo box for position steps added to 2D map for visualization purposes
SCPI for IPM source type was not working. Missing limits as well
Initial selection in multi emitter dialog without having ever selected an emitter in the 2D map did not have an effect
Y labels in PDW viewer where shifted in position each 10 steps
The first PDW was not displayed in the viewer. Also the EOF PDW was shown there and looked like a normal PDW
When using setups with multiple signal generators an error message was thrown if one of them did not have a signal assigned to it
PDW import failed If a values field is present, but a mop does not need this
Rise and fall time markers did not work with multi segment waveform signal generation
Internal pulse modulator cannot be used for multi segment waveforms
Emitter scan duration was not considered in 3D movement preview scaling
Live preview zoom for single emitter scenario 3D preview was missing
Background signals where calculated individually for each DF receiver antenna causing different signals for random signals
Remaining Time estimation fixed for background emitters
Scroll Buttons for Tab Widgets where broken
Background Signals where available for interleaving causing calculation errors.
Non interleaved background signals could not be deployed on the signal generator
Progress during FTP upload was missing
Wrong phase offset applied to waveform items in sequences in DF scenarios
FTP transmissions could not be aborted by the user
Aborting a waveform upload did not reset the volatile storage resulting the SW to think, that the waveform was uploaded
SCPIs for clearing the interleaved results and query the volatile status where missing
SCPI INST:COUNT? Always returned 1, no matter how many signal generators where in the setup
Tooltips of numeric edits where not updated regarding their min and max values
Velocity units (m/s) had wrong unit preservation when entering a new value e.g. 1200 m/s => enter 2 m/s => result was 2000 m/s
Creating a new scenario with open 3D preview dialog, caused the dialog to reject updates until another scenario was selected

<b>Repository manager discard was not working anymore</b>
<b>Don't close the PDW Viewer if IL Results are invalid</b>
<b>Changing Receiver Scan Parameters did not rescale the live preview timings accordingly</b>
<b>GUIs for receiver properties, DF receiver properties and emitter properties where to large. Space was always reserved for the waypoint movement page, even if it was not visible</b>
<b>Changing between signals and groups in PDW viewer did not rescale the preview</b>
<b>Auto scaling of scan times and update rates fixed in DF Receiver 3D preview</b>
<b>Changing the signal in the PDW viewer updated the view twice, leading to longer preview processing times</b>
<b>Fixed slow motion factor and preview times in 3D preview live view</b>
<b>Mode Change Duration was not taken into consideration in preview times and slow motion scaling</b>
<b>Special Case an emitter with only one mode change did not update the 3D preview mode was visualized the total time</b>
<b>Selection and mode / beam combo box updates did not work properly in mode editor</b>
<b>SCPI connection was not completely closed when closing the application which caused the program thread to remain active</b>
<b>Clarified error message when trying to create a profile from a connected instrument when no physical instrument was present</b>
<b>SCPI help for mode editor dialog was missing</b>
<b>Beam azimuth parameter was not visualized in 2D movement preview</b>
<b>Antenna pattern Z-Rotation parameter was not visualized in 2D movement preview</b>
<b>Working with the mode editor dialog during a running calculation could cause a crash</b>

## 1.2 Version 1.10

Released: October 2019

### New Functionality

Topic
Migrated the Pulse Sequencer software to 64 Bit to ease memory requirements
Added selectable interferometer and TDO modes for DF receivers
Added SMW-K545 "RF Ports Alignment" support for hardware setups
Added SMW Master/Slave trigger support for hardware setups
Added SMW LO coupling support for hardware setups
Added multithreading support in waveform generation settings for faster calculation times
Improved calculation time of scenarios with movements by 100%
Improved performance of waveform viewers by 350%
Improved all waveform based calculations by 350%
Increased interleaving calculation speed by 300%
Added RAM buffer setting for faster ARB waveform calculations without buffering to the HDD
Improved table editing. Excel like operation
Improved map GUI. Arbitrary zooming and panning is now possible
Added graphical preview for position steps on the map
Markers can now be generated from MOP plugins
Added pre pulse and post pulse markers for pulses
Added Mode-S interrogator example
Added R&S Visa installer to Pulse Sequencer installer
Changed zoom in PDW viewer to 1,2,5 steps to avoid fractional numbers
Fixed Time Zoom in PDW Viewer. Cursor jumps could happen when zooming
Added undock functionality for MDI windows to support multiple screens
Added smart menu in interleaving dialog. Disable All / Enable All / Reset time offset / Reset Prio All / Reset level offset actions are now available
Repositories are now saved prior to exporting to prevent empty or incomplete archive files

### Fixed Issues

Topic
When using waveforms in DF scenarios, the waveform was only generated for the first antenna.
Changed PDW sync marks for viewer navigation. The previous pattern could also be present in a PDW which caused viewer errors
Fixed 3D previews with mode changes. The first preview did not visualize the first mode correctly
When using position steps, the distance related time delay is no longer taken into consideration. Otherwise a jump from a distant position to a close one, could cause PDW start times overtaking each other between steps and the signal could not be generated
Fixed manual simulation time setting for position steps. Before, each step used the manually set value. The simulation time is now divided by the number of steps
Fixed minimum PRI check based on pulse timing parameters. Previously only the pulse width was taken into account and no rise and fall times were considered

Fixed timing preview of pulse for 10/50/90 modes
MSK MOP was not working
Fixed bug in DME example repository. Reply example used interrogator sequence
Unavailable instrument paths could be selected for signal generation
Fixed zoom in waveform preview. Sometimes the mouse wheel did not trigger a zoom event
Fixed Pos1 key behavior in numeric edits. An unnecessary space character was inserted
Fixed hidden/trapped windows due to dragging them outside the visible area or by changing the size of the main window
Fixed potential crash in emitter collection scenarios. When adding a new emitter, an empty combo box entry could be selected, causing a crash
Every click inside the mode editor triggered a restart of the 3D preview
Fixed potential crash in 2D movement preview, when using the move to start and end buttons
Restricted imported waypoint trajectories to a maximum speed of 600m/s
Clear workspace action in wizard did not work
Fixed ALC configuration in the SMBV100B generator to prevent unwanted measurement pulses
Erroneous SCPI queries caused a VISA timeout, because no response was send
SCENario:CPDW CEMit LOCalized DF:GROup:SElect SCPI did not work
SCPI for PDW import time normalization was missing
SEQuence:ITEM:IPM:MODE SCPI help was missing
SEQuence:ITEM:PULSe SCPI could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:WAYPoint could lead to crash if called with wrong parameters
SCENario:DF:LOCation:WAYPoint:CLEar could lead to crash if called with wrong parameters
SCENario:LOCalized:LOCation:WAYPoint:CLEar could lead to crash if called with wrong params
SCENario:DF:MOVement:VFILe:CLEar could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:VFILe:CLEar could lead to crash if called with wrong parameters
SCENario:CPDW:FREQ could lead to crash if no PDW list is created
SCENario:DF:MOVement:VFILe could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:VFILe could lead to crash if called with wrong parameters
SCENario:DF:MOVement:IMPorT could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:IMPorT could lead to crash if called with wrong parameters
SCENario:DF:MOVement:WAYPoint could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:WAYPoint could lead to crash if called with wrong parameters
SCENario:LOCalized:MOVement:CLEar could lead to crash if called with wrong parameters
SCENario:DF:MOVement:CLEar could lead to crash if called with wrong parameters

## 1.3 Version 1.9

Released: May 2019

### New Functionality

Topic
Added support for SMW-K315 "Pulse on Pulse Simulation" option
Added frequency offset parameter in emitters collection scenario type
Added scan offset parameter in emitters collection scenario type
Custom scan was enhanced to allow individual lobe switching or time based scan traces
Custom scan definitions can now be imported from csv files
PDW import time format can now be used in un normalized mode, which disables normalizing the TOA of the first entry to 0
Emitter parameters such as distance and level are now also displayed in movement preview
Added auto place feature for emitter information labels on 2D map
Added repository export functionality in file menu
Added individual K304, K306 and K22 options in generator profile for each baseband path
Single sequence and emitter scenario GUI now marks currently selected item in drop down menu
Increased interleaving calculation speed by 400%
Fixed simulation time is now shown on map dialog in localized and DF scenarios
Added display of fixed simulation time in scenario GUI when turning on interleaving
Added SGS/SGU 40 GHz support for external RFs
Added combo box in PDW viewer to switch between all signals
Added emitter azimuth and elevation angles info on map
Added dynamic range info depending on emitter and receiver positions on map
Improved table performance. Working with large tables was slow
Improved combo box behavior in tables. Selecting a different combo box with a single click is now possible. Prior the current combo box had to be closed before selecting a different one.
Improved mapping dialog. Maximum number of possible signals added. Assignments that where not possible no longer clear all mapped signals
Added Area Zoom feature in PDW viewer
Range in PDW viewer is now based on time and not on number of PDWs
Implemented antenna scans with different antenna patterns by using mode changes feature. If two modes are adjacent to one another and use the same scan, the scan continues to run with the new antenna pattern without resetting the scan position after the mode change.
Improved live previews for long simulation times. Added slow motion factor and improved signal amplitude preview and resolution.
Added checkbox to disable recalculation of sequences when changing the carrier frequency
Fixed several GUI and layout issues

### Fixed Issues

Topic
Addition of IPM profiles affecting the same parameter did not work
Fixed bug in HW manager. Selection was lost after creating a profile from a connected instrument

Maximum number of interleaved emitters (16) is now based on number of K306 options and no longer a scenario restriction
Fixed group selection in analyze viewer. Depending on the order of the groups the update was not working the first time the viewer was opened
Waypoint traces had an offset depending on the receivers lon/lat position
Fixed crash on Win10 where drag and drop on the 2D map could cause a crash
Fixed crash when unloading and discarding the changes on a map based scenario
Positioning parameters in emitter collection scenario type where not saved in repository
Changing level or frequency offset in collection scenarios did not invalidate volatile storage
Automatic duration setting was selectable in localized and direction finding scenarios using interleaving, causing a mismatch in real signal playtime and fixed duration used for interleaving. All pulses after the fixed value were dropped.
EOF PDW was not shown in PDW viewer and PDW table
Generator sanitize did not work anymore for emitter and PDW list collection scenario types after changing the generator assignment from a single generator to a setup in v1.8
When using mode changes, the progress manager did not display the currently calculated mode
Changing the absolute frequency parameter in PDW list collection scenarios did not trigger a recalculation of the signal
Wideband SMW and SMBVB had wrong maximum clock rate constrain in calculations. 600MHz instead of 520MHz are allowed
When switching between emitters with mode changes and different antenna patterns while the 3D preview is open, the antenna pattern where not updated
When switching between modes where different scans where used, the scan time continued to run. The scan was not reset and thus could create a jump in position
Copying receivers from one repository to another did not work
When using PDW waveforms in a sequence, where the sequence duration was smaller than the waveform caused a calculation error
When using PDW waveforms in a sequence, where the PRI was longer than the waveform caused a calculation error
Added check for extended sequencing option in generator profile when using interleaving to prevent a calculation error
Fixed mapping error in interleaving mode. If a signal was removed from a group and was mapped to a different RF, the upload of the signal failed
Analyze viewer did not display the different groups correctly when using the combo box to switch between them, if they where not mapped in the order the where created
Fixed bug in sequence collection scenarios if no generator profile was selected. SW gives a hint now. When creating a scenario, a generator profile is assigned per default
Fixed 3D previews of DF receivers. Live amplitude display did not scale correctly by taking relative antenna positions into account
3D visualization did not take receiver height into account when scaling the preview
Calculation of overlays of imported waveforms caused an error if the overlay was smaller than the waveform length. Clock rate could not be determined
In workspaces with multiple scenarios with moving emitters, the movement trace preview did not update correctly directly after a software restart
Adding emitters to the 2D map in write protected scenarios could cause a crash
Executing a rollback repository command could cause a crash
PDW viewer did not display the duration of an ARB based PDW
Progress bars did not display a 100% value
Fixed bug when working with separate trigger command mode. Changing between single and continuous mode cleared the volatile storage. A recalculation was required.
Fixed bug when working with separate trigger command mode. Changing between single and continuous mode cleared did not change the trigger mode in the generator when pressing the trigger button.

Fixed bug in scenario GUI where calculation info's where no longer displayed (e.g. fallback from extended sequencing to ARB waveform due to violations)
Fixed bug when calculating the level of interferer signals. Map position was not taken into account
Fixed bug in wizard. Creating a new repository did not work
Fixed GUI bug on 2D map. When changing the emitter position via mouse drag, the mouse focus was sometimes lost, causing the drag operation to abort
Removed all dock widgets. Close operations on detached windows did no longer work
Fixed spectrogram preview in waveform viewer. Window resize did not clear the FFT data
Fixed 'insert before' and 'insert after' table operations. Index shift caused insertion at wrong pos.
Fixed potential crash when reloading a repository from mass storage.
Added error message when applying positive level offsets in PDW based calculations. Fallback to ARB waveform
Fixed bug in analyze viewer. If interleaving groups where not calculated in ascending order, the viewer did not show the results when first opening it.
ARB calculation did not take the correct time for antenna scans when calculating mode changes
MSWV calculation did not take the correct time for antenna scans when calculating mode changes
All map based scenarios did not work with MSW calculation mode. Wrong free space attenuation was assumed.
Fixed Direction finding calculations. Frequency hops are taken into consideration.
Fixed background signal level for DF scenarios. Level was only correct for the first antenna.
Fixed crash when displaying long trajectories in movement scenarios

## 1.4 Version 1.8

Released: February 2019

### New Functionality

Topic
Added R&S SMW-K306 (Multiple Emitters) support for localized emitters scenario type
Added R&S SMW-K306 (Multiple Emitters) support for direction finding scenario type
Added R&S SMW-K306 (Multiple Emitters) grouping feature. Group based interleaving possible.
Added multiple instrument support (assignment) for PDW list collection scenario type
Added multiple instrument support (assignment) for emitters collection scenario type
Increased calculation speed for PDW based signals by 60%
Increased calculation speed for ARB based signals by 100%
Improved the interleaving analyze viewer. Display of a large number of pulses was very slow
Improved the interleaving analyze viewer. As many traces as there are interleaved items can be analyzed at the same time now
Improved PDW viewer performance for large number of PDWs
Added buttons for expand / collapse tree operations
Increased waveform viewer performance by 300% (preview calculation times)
Improved the interleaving analyze viewer to display very large PDW files
Added individual frequency and absolute level values for PDW list collection entries
Added individual absolute level settings for emitter collection entries
Sequence collection GUI adapted to other collection types

### Fixed Issues

Topic
Fixed bug where the level offset in the interleaving parameters was added twice
Fixed bug in interleaving algorithm. Under certain conditions, not all PDWs of the source file were read. Interleaving stopped earlier than the end of the file.
Fixed option display for K304/K306. Option string was displayed only once in baseband options.
Fixed bug where DF calculation results could no longer be saved in the repository storage
Interleaving threshold did not work. Calculation was not looking at total level but only on offset
Fixed bug where toggling of the interleaving checkbox caused the source data to become invalid and had to be recalculated again
Fixed bug where temporary calculation results were not deleted when changing the calculation mode from extended sequencer to ARB. Preview viewer was still displaying the PDW file
Bandwidth checks were performed on the generator clock rate instead of its bandwidth. Signals with too high bandwidth could be calculated without error message, causing aliasing
Pulse modulator was not activated in a slave SMW when a narrowband device used a wideband device as an external RF
Fixed wiring diagram for setups where a narrowband SMW used a wideband SMW as external RF
Fixed bug in DF scenarios using random IPM profiles. Random numbers were generated individually for each emitter/receiver antenna pair. Numbers are now generated once per emitter
Fixed bug in waveform viewer. Zooming out could result in a small negative start time causing an error message
Fixed bug when using scans on receiver antennas. Not the id of the scan was saved as scan, but

the antenna id instead
Fixed bug in 2D preview of a receiver with scans. Antenna orientation was not visualized. All scans started at 0 deg azimuth
Fixed Receiver 3D preview flickering in window.
Fixed Zoom in PDW viewer. Zooming in on the cursor position was not working properly
Fixed Zoom in Mode Editor. Zooming in on the cursor position was not working properly
Fixed Receiver antenna pointing direction in combination with movements. All antennas pointed in the direction of the movement
Fixed bug in direction finding scenario type. The scenario was recalculated every time. Even if nothing had been changed.
Fixed simulation time in emitters collection scenario type. If no signal was present at, or after the end of the configured simulation time, the signal stopped after the last PDW. This resulted in a shorter play time
Fixed missing EOF PDW in emitters collection scenario type. If a signal was present at or after the end of the configured simulation time, the EOF PDW was not generated. Therefore the trigger mode "Auto" on the R&S SMW200A was not working, since the signal was only played once
Fixed bug in gauss antenna calculation. Resolution of CPU and GPU calculations varied, resulting in slightly different patterns
Fixed bug where collection variables in sequence collection scenarios did not work
Fixed GUI bug, where IPM profiles based on variables were not selectable unless a IPM profile was created in the repository
Fixed bug where map GUI showed no data when creating 2D scenarios using SCPI commands
The calculation could not be stopped while interleaving pulses with waveform snippets
Gauss antennas created by using the wizard had wrong HPBW
Fixed SCPI command for removing receiver antennas. Index based and not name based
Fixed bug where it was possible to configure user defined clock rates in extended sequencing output via SCPI. This can lead to corrupted signals
Fixed bug, where the selection did not change when directly clicking emitters on the map
Fixed selection bug in 2D map. Emitters behind a movement trace could no longer be edited using the context menu
Fixed bug in mode editor viewer. Maximum number of modes was limited to 16 instead of 256
Fixed display in mode editor when configuring a large number of emitters. Scrollbars added
Fixed mode editor zoom logic
Fixed insertion of new modes in the mode editor. New modes have a default duration that is dependent on the current zoom factor to make them easier to select and modify
Fixed bug when importing position steps in DF scenarios from a text file. Only the first distance value was imported
Fixed bug for generator play mode in DF scenario type. When switching between continuous and single shot the generator was not updated
Fixed visualization bug a direction finding scenario. The height of the receiver was not visualized. Signal calculation was not affected
Fixed visualization bug for beam frequency offsets. Antenna pattern was not recalculated accordingly. Signal calculation was not affected.
Minimized windows were not send to the taskbar, but closed instead
PDW table did not always display the EOF PDW at the end of the file
Fixed bug where the Pulse Sequencer always tried to disable the internal pulse modulator of the extended sequencer without checking if the K50x option is actually installed on the device

## 1.5 Version 1.7

Released: September 2018

### New Functionality

Topic
Emitter collection scenario type now supports interleaving for simulation of multiple emitters
Interleaving is now a separate calculation step. Source signals do not need to be recalculated when changing the interleaving parameters. This provides a massive speed advantage
Reworked Emitter collection Scenario type. Added mode changes configuration
Added new PDW viewer with unlimited time resolution and multiple parameter view
Added graphical mode changes editor and viewer
Increased calculation speed for PDW based signals by 1000%
Improved interleaving statistics
Improved PDW interleaving analysis. Speed and usability improvements
Added interleaving statistics table
Added filtering options for interleaving analysis
Added a separate repository storage for interleaving results
When importing repository archives the repository is now directly opened
Added time estimate for remaining calculation time
Added R&SSMBV-100B generator support
Added drag and Drop support for importing repository archives
Added Drag & Drop support for opening waveform files
Added the Pulse Sequencer as default program for opening repository archives and R&S waveform files
Added keyboard shortcuts for most common actions
Added support of the internal pulse modulator in the R&S SMW. No more need for external cabling
Added repository export functionality via right mouse button smart menu in tree view
Added visualization of antenna HPBW in 2D movement preview
Added message when opening repositories from previous Pulse Sequencer versions. The user can decide, if he wants to update the database
Restricted mode editor time window to 7200s
Changed all time displays to prevent units such as ks and Gs
Increased number of maximum modes to 32
Disabled reporting feature

### Fixed Issues

Topic
Fixed rounding error when importing PDWs. Lead to omitting the last Pulse causing a gap between total time and real signal duration
Bandwidth and absolute frequency dependencies are now checked prior to interleaving and calculation is directly aborted when violated
Fixed sequence editor delay SCPI. Wrong item index caused limit violation
Fixed crash when calculating a background emitter in a scenario with movements

Fixed bug where the addition of emitters to a digital output caused an error
Fixed bug where the Pulse Sequencer tried to configure analog IQ outputs on external RFs connected to the digital fader outputs
Fixed wrong bandwidth calculation when importing PLFM PDWs
Added missing SCPI for removing all mode changes
Temporary interleaving Files were not removed from C:/temp after calculation
Fixed SCPI conflict for configuring the interleaving delay parameter. Renamed SCPI from SCENario:CPDW:DELay to SCENario:CPDW:LDELay
SCPI for the selection of PDW lists was missing
Interleaving GUI did not display the interleaving parameters after restart. Update problem fixed
Minimum PRI constraint with SMW-K501/2 was missing during interleaving process
Fixed wrong visualization of RX antenna pattern in 3D previews if a track scan was configured
Fixed issue where scenarios containing imported PDWs could not be deleted
Fixed bug where imported PDWs containing absolute TOA information could not be calculated
Signal generator was not automatically set to the resulting frequency after importing PDWs with absolute RF frequency
Fixed bug where the calculation of a set of DF antenna signals was aborted, if one of the antennas does not receive a signal
3D preview did not display antenna pointing correctly for DF receivers
Changing the vehicle icon caused a recalculation of the movement data
Added auto set functionality to position the emitter and receiver for movement scenarios where only one of both uses absolute Lon/Lat position values in waypoint files
Fixed crash if movement duration was set to 0s
Fixed wrong GUI limits when configuring an ARC movement via the GUI line edits and not via mouse dragging on the 2D map
Fixed wrong level calculation for background waveforms in DF scenarios
Attitude was not calculated correctly when configuring perpendicular movements
Fixed potential crash when using special characters in repository names
SCPI control for plugin variables was missing
Fixed list index error in PDW List scenario. Tree position was used instead of independent index
PDW interleaving analysis did not work if number of dropped PDWs was smaller or equal to 1
Fixed the MSEPOCH import template option. Nanoseconds were interpreted as microseconds
Fixed IPM firing order option. Should not be available with time based lists
Fixed potential crash in interleaving analysis when switching from a scenario with more entries to one with fewer
Fixed signal generation check for missing sequence assignments to multiple Modes and Beams. Only the first mode/Beam was checked
Fixed level calibration for external RFs connected via digital interfaces
Fixed calibration procedure. Did not check for analog and digital I/Q output options SMW-K16/K17/K18/K19
SCPI for configuring the antenna polarization was missing
Fixed bug, where the automatic level control of the signal generator was not correctly configured on a second baseband
Fixed bug in reporting feature. If pulses were dropped because their level was below the level threshold, they still appeared in the report with wrong TOA information
Fixed level preview in pulse dialog. Drag markers showed a 10dB offset
Fixed wrong Y axis unit in 3D live preview. Unit is dBm and not dB
Fixed table smart menus in all tables with single selection property. Removed multi select actions
Fixed SCPI command for constant attitude. SCENario:DF:MOVement:ATTitude CONSTant

Fixed SOQPSK default params. Pulse could not be calculated with these settings
Fixed custom envelope preview when modifying the equation
Fixed bug in multi segment waveform evaluation. Pulses with a level below the threshold were counted as segments nevertheless
Fixed bug where the second baseband of a slave device was not set to Table (Off)
Fixed bug when importing PDWs with TOA in TIME format. Milliseconds were cut.
Fixed potential crash in receiver 3D preview.
Run mode single and option use separate trigger command are now available for localized and DF scenarios as well.
Added missing check and error message when trying to calculate an empty sequence.
Added missing checks and error messages for minimum PRI violation and ARB fallback.
Fixed bug in DF scenarios with multiple instruments in master/slave mode. Wrong trigger setting was configured.
Fixed bug in setups with multiple instruments in unsynchronized mode. Not all basebands were triggered.
The pulse width of Barker codes was confused as the chip width in all viewers
Added undo functionality in 2D map when changing the emitter position.
Added zoom functionality for signal level in live previews
Corrected level offset SCPI in Emitter Collection Scenario tape with interleaving. CMEMit:LEVEL instead of CMEMit:OFFSet
Fixed bug, where the entry field for a password for encrypted repositories was hidden by the progress bar
Fixed Auto Time Setting for DF scenarios. The scan duration was not taken into consideration.
Fixed bug where it was possible to drag emitters from other repositories directly onto the 2D map of another repository without copying them into this repository
Fixed several bugs regarding changes made in the movement settings. The movement trace was reset instead of recalculated
Beam frequency offsets were not considered during calculation
Fixed bug in DF scenario where the receiver antenna was not recalculated based on the emitters frequency
Fixed various update problems in 3D previews when visualizing mode changes. Sometimes antennas, scans and positions were not updated correctly
Fixed visualization bug in 2D movement preview for static emitters. Antenna pointing was not displayed correctly
Fixed SCPI help for emitter and receiver visualization icons
Fixed bug where the internal clock rate of the signal generator was taken into consideration for bandwidth calculations and not the actual bandwidth
Fixed bug where a fixed simulation time caused calculation error in combination with mode changes. If the time truncated the mode changes
A just inserted mode was not automatically selected in the mode editor
Fixed bug in the interleaving analysis viewer. The value for visible PDWs was always off by 1. The last PDW was not visualized
PDW viewer was still displaying a PRI value when in interleaving mode, which makes no sense.
Fixed bug where the calculation for a DF scenario was aborted when one of the antennas did not receive a signal. We calculate a zero signal now
Fixed bug in 3D previews, where beam frequency offsets from mode changes were not considered in antenna pattern calculation
Fixed bug in waveform and PDW viewers. When first calculating a PDW file and then a waveform, the viewer still displayed the previously calculated PDW file
Fixed bug where all windows were initially restricted to 80% of screen size. Only after pressing the maximize button, the size could be increased to full screen
Fixed potential crash when rapidly closing windows using the lower tool bar

Fixed wrong bandwidth limit calculation for polynomial chirps. Value was $2\pi$ higher than actual needed value, causing wrong bandwidth restrictions
Fixed visualization bugs for static modes when choosing the auto time setting
Backlobe for custom antenna was not calculated in GPU mode
Fixed potential crash when discarding changes made to a repository when closing the application.
Fixed threshold value in interleaving options. No longer coupled with global threshold parameter.
Threshold value in interleaving options did not work.
MOP plugin parameters were not forwarded to reporting plugin

## 1.6 Version 1.6

Released: February 2018

### New Functionality

Topic
Added dynamic movement profiles for emitters and receivers in combination with R&S SMW-K304
New scenario type PDW List (collection) for direct conversion of imported PDWs to extended sequencing output with R&S SMW-K501/K502
Added priority based multi emitter dropping feature for scenario type PDW List (collection) in combination with R&S SMW-K306
Added position steps feature for localized and direction finding scenarios
Added states feature where emitters can be switched on and off over time for localized and direction finding scenarios
Increased the maximum file size of imported PDWs in the PDW import wizard to 1GByte
Added track scans for moving emitters
Added piecewise linear chirp MOP profile for PDW import
Added custom phase MOP profile for PDW import
Added firing order to list-based IPM profiles
Import of AMMOS IF data streams into waveform objects
Added exponent parameter for cardioid antenna pattern
Added HPBW for azimuth and elevation direction with gaussian and sinc antenna patterns
Increased positioning limits of receiver antennas to $10^7$ m
Increased number of antennas per receiver to 20
New page with storage locations in settings dialog
New smart menu with filter settings for repository tree
Added shortcuts for IPM assignment dialog
Added single trigger option also for localized and direction finding scenarios
Added 2D and 3D visualization of Mode changes over time
Reworked Wizard for easier emitter and sequence definition

### Fixed Issues

Topic
Phase calculation in DF scenario fixed (now using reference plane through DF group origin)
Fixed generator profile bug. Wideband property was not considered in assignment dialog
Fixed bug related to HW setups. The pulse sequencer always tried to connect to all generators, even if they were not used in a scenario
Missing option check in DF scenarios allowed use of generator profiles without SMW-K301 option
Assignment dialog assumed bandwidth of the SMW-B9 option to be 160MHz instead of 2GHz, prevented the addition of 2 emitters with more than 160MHz frequency separation to the same RF
Fixed bug where a generator profile with two basebands but only one RF caused the Pulse Sequencer to not configure the second baseband
Fixed bug, where level, frequency and name of background signals could not be edited any more
Fixed bug, where emitter mode beam frequency offsets were not considered in signal calculation
Fixed bug where the antennas of the receiver were not calculated according to the received

signals frequency
Fixed bug, where the attitude of emitters and the direction of antenna scans was wrong
Fixed GPU calculation bug, where pattern resolution slowed down the live preview
Fixed bug, where the generator dashboard was always scanning the connected generators when the dialog was opened once even if the dialog was closed
Fixed bug, where selecting the "use pulse modulator" option in the HW management dialog did not have an effect on the instrument configuration
Fixed SCPI help in localized scenario receiver settings dialog
Fixed bug where the relative phase mode in the sequence settings only worked, when the pulse had a frequency offset
Fixed 3D scan preview in Emitter dialog. The antenna pattern was no visualized
Fixed bug where the direction finding power level was calculated relative to the receiver origin and not to the actual antenna position
Fixed bug where the K502 output randomly generated waveform snippets, even if the pulse could be generated in real time
Fixed bug in waveform triangular IPM profile where one entry more than needed was generated
Fixed missing updates in assignment dialog when changing parameters of the generator profile
Fixed bug where adding 2 signals to one RF port did not properly configure the stream mapper of a wideband SMW
Fixed bug where omnidirectional antennas where not visualized in DF scenarios
Corrected SCPI help in DF Receiver dialog
Fixed update problem when changing the antenna or scan of an interferer
Fixed bug where the default generator profile created upon the creation of a repository could not be deleted
Fixed bug where plugins could not be used multiple times during an IPM or MOP calculation causing a constant IPM or MOP value
Fixed calculation of distance delay for DF receiver antenna positions. Negative X and Y position offsets where taken as positive numbers
Fixed bug, where the RUN button in sequence based scenarios did not update level and frequency of the generator if value is changed after initial calculation
Fixed dialog windows for high-DPI displays
Fixed shortcuts for creating a new sequence/emitter in sequence and emitters collection scenarios
Fixed bug in localized and direction finding scenarios where signals could not be restored from the repository storage
Fixed 1 sample rounding error in EOF flag for direction finding scenarios
Fixed wrong sequence end time when PDW import was PRI based
CW filler element fixed. I and Q where interchanged
Fixed SCPI help and limits in background emitters dialog
Frequency offsets in emitter beams where not considered in visualization and calculation
New emitter/sequence shortcut button did not work in collection scenarios
Fixed bug in repository storage if using multiple generators. Only data of the 1st one was saved

## 1.7 Version 1.5

Released: Mai 2017

### New Functionality

Topic
Added real-time wideband signal generation in combination with R&S SMW-K502
Added dynamic mode changes for emitters over time in localized and direction finding scenarios
Added level calibration wizard for HW setups
Added MSK MOP profile
Added 4/8/16/32/64 FSK MOP profiles
Added 16/32/64/128/256 QAM MOP profiles
Added 8PSK MOP profile
Added pulse modulator support for R&S SGT100A
Added x axis zoom in MOP preview
Waveform generation duration settings simplified. Auto option added
Absolute receive power dependent on distance will now be visualized in live previews
Added reset option for data sources
Added import/export functionality for HW setups

### Fixed Issues

Topic
Fixed wrong frequency scaling in pulse modulation preview
Optimized FFT preview in MOP preview
Fixed GPU calculation of imported antenna patterns
Fixed bug when switching between emitters with a different number of modes in emitter based scenario types
Fixed crash when working with 100+ data source entries
Fixed bug where no reports were created for single emitter scenarios
Fixed bug in PDW viewer SCPI time control
Changed PDW viewer resolution to ns
Fixed bug where pulse MOP frequency preview was limited to 200MHz
Fixed bug in FSK modulation where the filter was not reset with each new pulse
Fixed bug where changing the RF channel was not working after the signal was calculated

## 1.8 Version 1.4

Released: September 2016

### New Functionality

Topic
Added PDW import feature
IPM profiles now possible for imported waveforms
Added loop variables for use in IPM profiles, enabling sequencing of sequences
Free space attenuation is now calculated for frequency offsets and not only on carrier frequency
Static antenna preview acceleration by GPU support
Added Direction Finding Support for R&S SGT-100A
Added viewer for K501 sequences
Added lying sine antenna scan type
Added custom antenna scan type
Added lissajous antenna scan type
Added binomial IPM profile
Installer now checks correct VISA driver installation
Added SCPI commands for minimizing/maximizing the Pulse Sequencer GUI
Added SCPI commands for querying the Pulse Sequencer message log
Custom Pulse Envelope now also available for K-300 option
IPM profiles can now be specified based on repetitions or time

### Fixed Issues

Topic
Antenna pattern polar plot was not updated when selecting an omnidirectional pattern
Fixed crash when displaying 2D map via a remote desktop due to missing OpenGL support
Fixed potential crash when restoring a workspace with less repositories than the current one
Cosine characteristic for Custom Phased Array antenna was not visualized correctly

## 1.9 Version 1.3

Released: March 2016

### New Functionality

Topic
Added real-time signal generation option in combination with R&S SMW-K501
Added SMW wideband generator profile with 2GHz baseband bandwidth
Added GPU support to speed up antenna calculations
Added piecewise linear chirps to MOP types
Changed connection and trigger scheme of multi instrument setups
Enhanced profile to instrument mapping to hardware management which allows the creation of different hardware setups with multiple instruments
Added pedestal for all phased array current distributions
Added SGS 6GHz external RF source support for SMW200A generator profiles
Added SGS/SGT 3GHz external RF source support for SMW200A generator profiles

### Fixed Issues

Topic
Fixed spectrogram scaling error in waveform viewer
Fixed bug that prevented the use of waveforms as a background signal
Fixed bug that showed wrong connector name in the scenario block diagram
Fixed bugs in antenna polarization
Fixed update problem when modifying background waveforms
RF B was selectable in generator profiles with only a single RF
"Auto away from origin" pointing direction option in DF receivers was disabled when first opening the dialog
Fixed bug, that prevented to calculate background signals on more than two antennas

## 1.10 Version 1.2

Released: January 2016

### New Functionality

Topic
Added new scenario type for direction finding applications
Added receiver models with multiple antennas and individual antenna positioning
Added multiple entities and stream mapper support. Multiple emitters on same RF with SMK-K76
Added background signals (sequences, waveforms) functionality
Added instrument control panel for status overview and remote control of instruments
Changed coordinate system for emitters and receivers to yaw, pitch, roll
Added antenna polarization
Added custom phased array antenna type with array geometry editor
Added cardioid antenna pattern
Sequence supports phase modes (absolute, continuous, memory) for frequency hopping
Frequency setting in scenario dialog allows Hz precision
Added Java Script functionality to GUI
Changed restart() API in IPM plugin
Creation of Save/Recall file can be turned off under waveform generation settings in scenario
Enabled high quality I/Q modulator mode in generator
IPM Steps used with phase return value as modulo 360 value
Added external RF support (SGT, SGS/SGU) for multiple emitters
Emitter position now supports also angular definition
Distance units format now supports also miles, nautical miles and feet
Sequence editor now supports undo/redo functionality
Repository version increased to 2. Compatibility check added.
Generator profile dialog and connection diagram now have a "Show Connector" feature
Added button for emitter properties in 2D Map dialog
Improved warning messages if sequence cannot be generated in 2D map scenario
Renamed 'Instrument Config' to 'Generator Mapping'
Added menu entry in scenario diagram for direct access to generator mapping dialog
Added menu entry in scenario diagram for direct access to reporting directory
Multi-tone waveform added to Waveform/Interferer element
It is now possible to create a generator profile directly from the generator mapping dialog
GUI now scales automatically, when changing the DPI size of the text in the OS settings
Added SCPI command for sanitize
Phased array elements can have an omnidirectional or dipole characteristic
Loop sequence item can now define a variable which can be used for marker generation

## Fixed Issues

Topic
Fixed problems with baseband filter in MOP
Copying sequence to other repository did not copy waveforms used as sequence items
Fixed bug in OQPSK modulation
Phase was not correctly shown in degrees in waveform viewer window
Static phase offset was not correctly applied in pulse modulation
Wrong SCPI help for roll off filter parameter
It was possible to remove all modes and beams of an emitter using SCPI commands
When renaming a tree element, the item was named "Rename" by default when the field was empty
Editing the repetition count in a sequence also affected other sequences
Removing all emitter items in localized scenarios was performed without user confirmation
Interferers could not be set correctly in Multi-Emitter scenario after order was changed in tree
Bit length of data source was not correctly evaluated
Minimum PRI was not correctly applied in first sequence line
First symbol in BPSK had wrong duration
Data sources were reset for each repetition round within a sequence
Long SCPI commands were truncated when copied using SCPI help copy functionality
Fixed bug in FSK modulation
EIRP modification using mouse wheel was not working properly
Emitter Frequency resolution was limited to 3 digits only
Fixed Bug in AM step modulation. Positive level values were clipped to 0
It was possible to drag and drop any tree element item onto the 2D map
Markers were missing when importing a waveform

## 1.11 Version 1.1

Released: April 2015

### New Functionality

Topic
Log is brought to desktop if it was located outside of the visible desktop area and an error occurs
Emitter EIRP GUI parameter changed from dBm to dBW
Value range in IPM U-Distribution increased because 1000 was not enough for frequency offsets
2D Dialog: The distance of emitters can now be set from the GUI
Optimized I/Q waveform generation if level was reduced due to antenna influence (RF generator level decreased accordingly)
TX/RX buffer size can now be set by the user (instrument upload/download)
Added FTP upload and new GUI settings for FTP upload
Modified LAN search to work with direct links PC <-> Instrument (no DNS in network)
Partially defined antenna pattern import now possible
Sequence block diagram is interactive. Features direct access to items as well as context menus
Pulse timing is now visualized in plot
Marker positions are now visualized in plot
Measurement line now shows delta units on y axis
Waveform viewer now also shows frequency at cursor position
New installer based on Windows Installer fixes issues with Windows UAC and 64-bit systems
New version numbering scheme <Major>.<Minor>.<DaysSince2000>.<SecondsSinceMidnight/10>
Support added for FEKO .ffe V3 file formats and Antenna Magnus .tsv files
Added FEKO example project with helix on plane to installer
Network scan in "ZeroConf" networks improved (host resolution omitted)
Added ArrayCalc MATLAB example to installer (for use with free ArrayCalc toolbox)
Creating a new repository from GUI also creates one SMW200 default generator profile
Antenna pattern path is now memorized in import dialog
Import from Ansys HFSS .ffd multi-frequency far field pattern files (only first frequency imported)
Added optimized resampling algorithm for pulse based signals
Added generic import wizard for CSV-based antenna patterns (Magnus, HFSS)
Emitter-based scenarios use antenna scan duration as default when created with an emitter
Creating data source from MOP also assigns the new data source automatically

### Fixed Issues

Topic
Pulses/waves did not compute correctly if sequence was run more than 1 times (emitter scenarios)
Receiver elevation was not visible in dialog because of false scroll bar configuration
First pulse was missing in emitter sequence if 10/50/90 ramping was used
The minimum permissible PRI was wrong with 10/50/90 timing
Due to a rounding problem waveform could be too long by one PRI cycle

Sequence marker and scenario marker could not be controlled independently
Level circles in polar antenna plot were off by 1 dB
Pulse ripple frequency was not evaluated in min. required clock rate
Fixed SGT profile capabilities error. Memory and bandwidth options where not recognized
IPM List Preview auto scale error
Sequence editor crashed when deleting loops with children
SMBV-B50 and SMBV B55 options where not recognized
3D visualization antenna update filter activated to prevent multiple updates
Level and Frequency were not applied if volatile storage was already valid
False antenna 2D plot at phase angle zero
Corrected phased array calculations with $N_x, N_z = 2$ and $\cos^N$ or triangular current distribution
Waveform viewer 'auto play' did not stop if window was minimized
Switching a repository from K301->K300 possible even if advanced features were already used
Fixed update problem in instrument capabilities
Fixed bugs in imported antenna pattern files (also changed the file format)
Fixed wrong timing and zoom issue in 3D emitter plots
Fixed und updated 3D pair view item selection for older GPUs
Fixed line representation in 3D previews for older GPUs
Waveform sequence scenario type had disabled frequency and ref level line edits
Fixed update bug, when deleting a user imported antenna pattern
Fixed crash when issuing a reset via SCPI while 3D scan or live previews are open
Fixed crash in 2D map, when moving emitters outside visible map
Not supported instruments where shown in table for connected instruments
MOP 'Width' restriction was not correct when used with 0/100 pulse definitions
Fixed potential crash during antenna pattern import when index was out of bounds
Application crashed if repository gets unloaded while the 3D preview is open
Back lobe antenna type was constant instead of mirrored in some calculations
Fixed bug in sequence block diagram, which leads to quickly disappearing tooltips
Fixed problem with profile generation from a connected instrument. The generator type combo box disappeared for all other profiles.
When changing the name of a tree element, it was no longer selected, causing wrong SCPI help.
Fixed bug in waveform generation. Last sample was always missing.
Fixed potential crash in sequence editor
All collections did not keep their item order on subsequent load from storage
Data source dialog was not properly set to invalid when data source got removed
BPSK MOP with automatic symbol rate did not work in preview if no data source was assigned
Fixed bug in MOP filters. Removed redundant convolution with rectangular window
Fixed bug in rectangular pulse shaping filter
Fixed SCPI help for MOP filter parameters B*T and Roll Off
Fixed bug in OQPSK implementation
Fixed bug in DQPSK implementation

## 1.12 Version 1.0

Released: January 2015

## 2 Modifications to the Documentation

The current documentation is up-to-date.

## 3 Installing the Software

### 3.1 Uninstall a previous installation

To uninstall a previous version of the Pulse Sequencer software click on the Windows Start button and navigate to Settings -> Control Panel -> Add or Remove Programs. Then select the previously installed version of the Pulse Sequencer to uninstall it.

### 3.2 Install the new software version

R&S Pulse Sequencer requires one of the following operating systems:

Windows 7 (64 Bit)

Windows 8 (64 Bit)

Windows 10 (64 Bit)

It is suggested to uninstall any previous version of the Pulse Sequencer software before installing the new software.

In Windows Explorer double-click the installer executable 'PS-Setup 2.0.x.x.msi' and follow the instructions. Existing Pulse Sequencer installations are automatically updated. This includes example repositories provided by Rohde & Schwarz. Other user data, such as repositories or settings are not affected by the software update.

## 4 Customer Support

### Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz equipment, contact one of our Customer Support Centers. A team of highly qualified engineers provides telephone support and will work with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz equipment.

### Up-to-date information and upgrades

To keep your instrument up-to-date and to be informed about new application notes related to your instrument, please send an e-mail to the Customer Support Center stating your instrument and your wish. We will take care that you will get the right information.

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