

# Import and replay of pulse descriptor words made easy

The R&S®Pulse Sequencer software offers an interface to import lists of pulse descriptor words (PDW). Users can define their specific PDW format in the software before importing the PDW list. The R&S®Pulse Sequencer software automatically uploads the interpreted PDW lists on the R&S®SMW200A to generate the most agile radar signals.

## Your task

Often radar engineers want to replay previously stored signals from radar scenarios to verify the radar receiver's performance in the lab. Stored signals can originate from live recordings of real-world scenarios or from scenarios generated by simulation software. Since these radar scenarios can have a duration of minutes, e.g. to record or model a

moving emitter, the resulting file sizes can easily reach into the gigabyte range when stored as classic ARB waveform files. ARB waveform files are a good solution to record scenarios with all details and maximum signal information content.

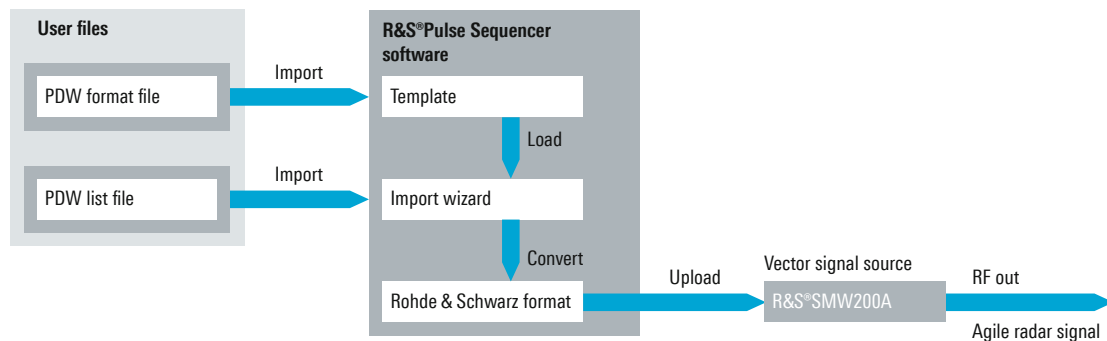
To minimize the memory requirements of the signal files, radar receivers and simulation software store radar scenarios as lists of PDWs. The PDWs describe all pulse parameters such as pulse duration, pulse top power level and carrier frequency together with a timestamp defining the pulse start time.

The PDWs can also contain information about the modulation on pulse (MOP) used. Now, radar engineers need a mechanism to convert the previously stored PDWs back into a real radar RF signal.

## T&M solution

The R&S®SMW200A equipped with the R&S®SMW-K300 and R&S®SMW-K501/-K502 options together with the R&S®Pulse Sequencer software enables radar engineers to generate the most agile radar signals as defined by their PDW lists. Users can create PDW format files, which describe the specific formats of the PDW lists, to provide their specific format to the software. The PDW format files enable radar engineers to import their PDW lists directly without spending valuable time reformatting them.

## Concept of importing and replaying PDW lists



The user only has to import the PDW list and provide the R&S®Pulse Sequencer software with a PDW format description of the PDW list. The user can easily modify example PDW format files to meet his specific format requirements. The R&S®Pulse Sequencer software is therefore not limited to specific known formats, but can be tailored to the required PDW formats.

The R&S®Pulse Sequencer software maps the imported PDW lists onto the Rohde&Schwarz proprietary format as specified by the PDW format files and uploads them to the R&S®SMW200A vector signal generator. The R&S®SMW200A generator's powerful baseband hardware interprets the uploaded files of the converted PDW lists and generates the defined radar signals.

### PDW format file

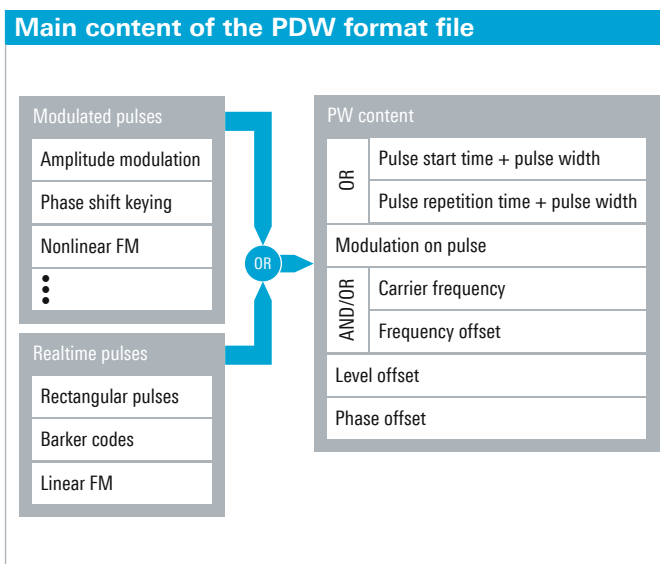
The PDW format file (template) describes the overall format structure of the user's PDW list and contains pulse information such as the time, frequency and MOP format. The time format can either be given as an absolute or relative timestamp. The timestamp defines the start time of a pulse. Optionally, only the pulse repetition time together with the pulse width can be provided instead of the timestamp. The frequency can be given as an absolute frequency value (carrier frequency), as a frequency offset relative to any carrier frequency, or as a combination of both. The PDW format file can also contain information specifying the pulse level offset and pulse start phase. An overview of the main content of the PDW format file is shown in the figure at the right.

### Realtime replay of pulses defined by PDWs

PDW lists that only contain unmodulated rectangular pulses, Barker coded pulses or pulses with linear frequency modulation (LFM) can be generated in realtime. The R&S®Pulse Sequencer software calculates a sequencing list that contains all interpreted PDWs with any offsets. The sequencing list is uploaded on the R&S®SMW200A and replayed on the configured carrier frequency. Any level offsets (e.g. to model antenna patterns), frequency offsets (e.g. for hopping scenarios) and pulse width changes are applied in realtime. The R&S®SMW200A generates the pulses at the point in time defined by the PDW timestamps. Users can achieve a maximum pulse density of up to 3.3 million pulses per second with the R&S®SMW-K502 option.

### Replay of modulated pulses defined by PDWs

As a unique feature, the R&S®Pulse Sequencer software can replay PDWs that describe modulated pulses. Several modulation formats such as amplitude modulation, phase shift keying and nonlinear frequency modulation (NLFM) are supported. The format of the modulation can also be defined in the PDW format file. The R&S®Pulse Sequencer software interprets the defined pulses in the PDW lists and calculates unique waveform segments for each modulated pulse. The waveform segments are referenced



in a sequencing list, which is also calculated by the R&S®Pulse Sequencer software. Pulse breaks are achieved by assigning a timestamp to each waveform segment. No I/Q samples are needed to fill the pulse pauses. The sequencing list references the calculated waveform segments and contains all applicable offset values and the timestamps. Again, all offsets are applied in realtime. The waveform segments together with the sequencing list are automatically uploaded on the R&S®SMW200A and replayed on the carrier frequency defined in the PDWs. Users can achieve a maximum pulse density of 1 million pulses/s with the R&S®SMW-K502 option when using I/Q segments.

Thanks to the flexibility of the software's import mechanism, PDWs describing unmodulated pulses mixed with PDWs describing pulses with MOP can be easily imported and replayed together. This saves radar engineers lots of time and they can fully concentrate on proper testing of their radar receivers and components. The replay of PDWs is faster and easier than ever before.

### Key facts

- Quick and simple import and replay of PDW lists
- Replay of agile radar signals within 2 GHz bandwidth with the R&S®SMW200A
- User-definable PDW format files for the greatest possible flexibility of PDW list import
- Replay of PDWs with and without MOPs

### See also

<https://www.rohde-schwarz.com/product/pulse-sequencer>

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