**Critical tests for reconstruction of distance distributions from DEER data**

Files exist in ASCII format (*testx.dat* for time-domain data, first column time in ns, second column amplitude; *testx\_theor.distr* for the input distribution, first column distance in nm, second column probability) and in Bruker Elexsys format (*DEER\_testx.DTA* and *DEER\_testx.DSC*). If the ASCII data are loaded into DeerAnalysis, the input distance distribution is shown in cyan color for comparison). Files *testx.mat* in Matlab format contain additional information on noise level, modulation depth, and background parameters.

Tests 1 to 5 have exactly exponential background and a time increment of 8 ns. Test 6 has a time increment of 16 ns. For all test data sets, zero time is at 128 ns.

**Test 1**

High-quality data of a structured distance distribution: How well can the shape be reconstructed?

**Test 2**

Superposition of a moderately narrow and a broad distribution. Is the broad contribution safely detected? Does the broad contribution split into several peaks?

**Test 3**

Superposition of two structured distance distributions with very different amplitude. Can the weak component be detected? How well are shapes represented?

**Test 4**

Superposition of an asymmetric distribution near 4.5 nm and of a weak, rather narrow peak at 2.07 nm. Is the asymmetric shape of the main peak revealed? Is the minor peak safely detected? Is the distance of the minor peak correct?

**Test 5**

Very noisy data for a structured distance distribution. Can the structure be revealed? Are there spurious peaks?

**Test 6**

Noisy data for a narrow, but structured 4.5 nm peaks with 2.2-dimensional background. Is the peak unduly broadened? Are there spurious noise peaks or peaks from wrong background correction?