Supporting Information for

Microsecond time scale mobility in a solid protein as studied by the ^{15}N $R_{1\rho}$ site-specific NMR relaxation rates.

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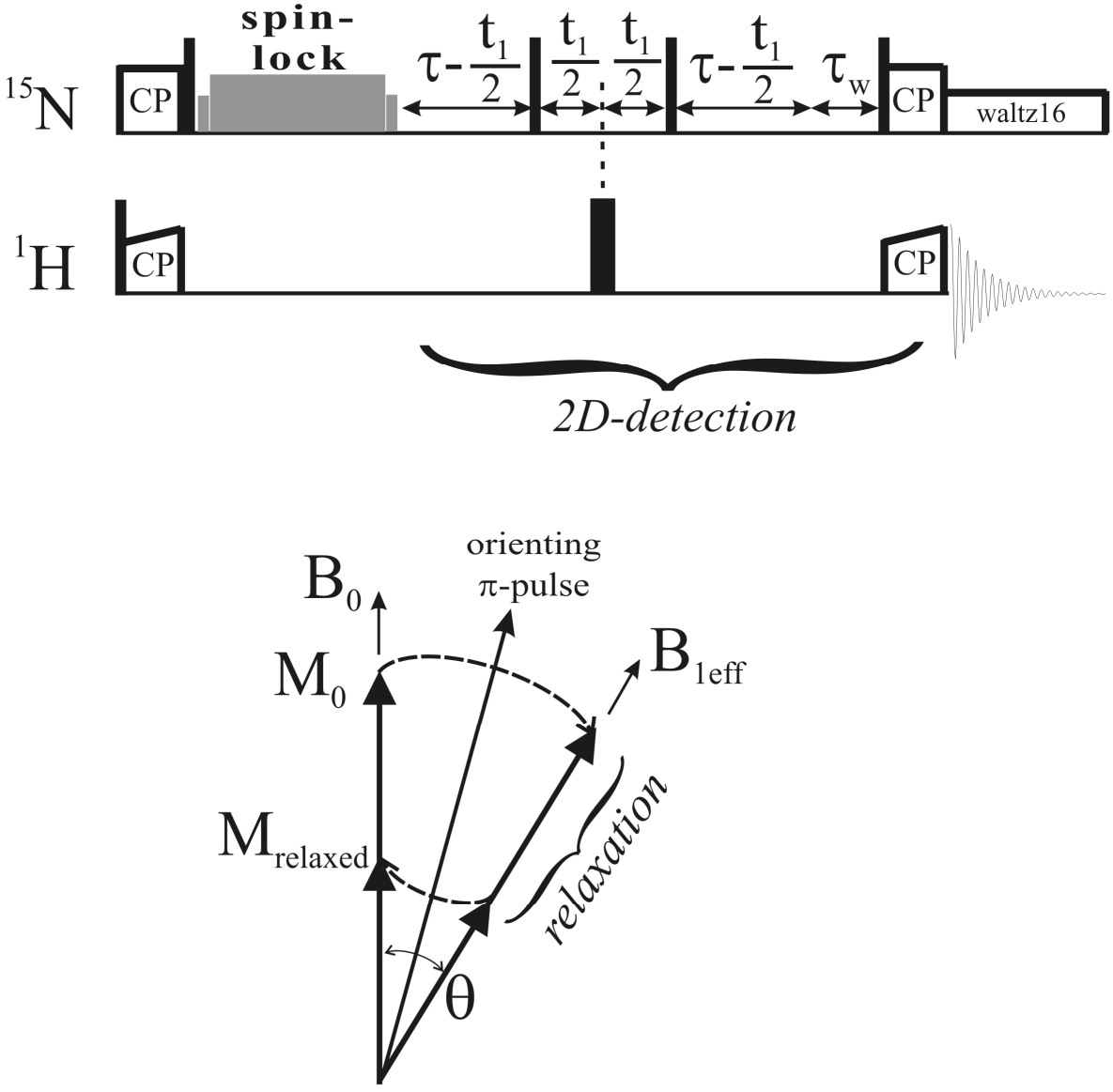

Figure S1. The pulse sequence of the off-resonance $R_{1\rho}$ experiment (top) and the vector scheme illustrating magnetization perturbations during the relaxation section of the sequence (bottom). Off-resonance spin-lock pulse is flanked by two orienting off-resonance π-pulses: the first orienting pulse aligns the magnetization vector along B_{1e} field and the second one gets the magnetization back to B_0 direction. The orienting pulse vector forms the angle θ/2 with the B_0 (and B_{1e} as well) vector.

In the off-resonance experiment, the relaxation rate $R_{1\rho}$ could not be determined for all peaks in the spectrum: the maximum spin-lock pulse length in this experiment was set to 100 ms which was not enough for the accurate determination of the low relaxation rates, see Fig S2. It is likely that increasing the spin-lock pulse up to 200-250 ms would not harm the sample, but we did not attempt finding the limiting value experimentally because of the fear to destroy the too valuable sample. In the on-resonance experiment, the relaxation was generally faster and the relaxation times could be determined for all assigned peaks.

Figure **S2 (a)**

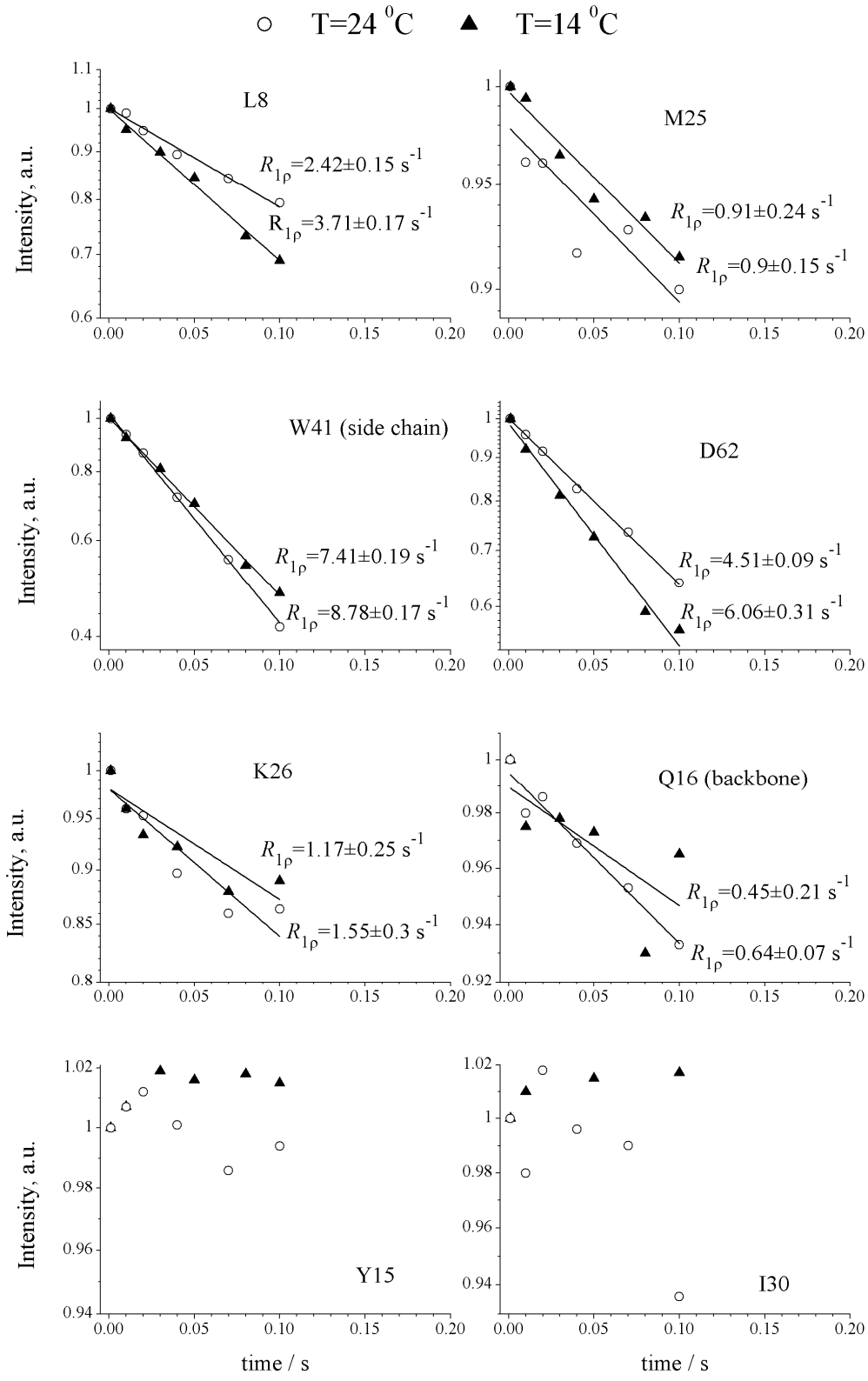
○ T=24 °C ▲ T=14 °C
L8
$R_{1\rho}$=2.42±0.15 s^{-1}
$R_{1\rho}$=3.71±0.17 s^{-1}
M25
$R_{1\rho}$=0.91±0.24 s^{-1}
$R_{1\rho}$=0.9±0.15 s^{-1}
W41 (side chain)
$R_{1\rho}$=7.41±0.19 s^{-1}
$R_{1\rho}$=8.78±0.17 s^{-1}
D62
$R_{1\rho}$=4.51±0.09 s^{-1}
$R_{1\rho}$=6.06±0.31 s^{-1}
K26
$R_{1\rho}$=1.17±0.25 s^{-1}
$R_{1\rho}$=1.55±0.3 s^{-1}
Q16 (backbone)
$R_{1\rho}$=0.45±0.21 s^{-1}
$R_{1\rho}$=0.64±0.07 s^{-1}
Y15
I30
Intensity, a.u.
time / s

Figure **S2 (b)**

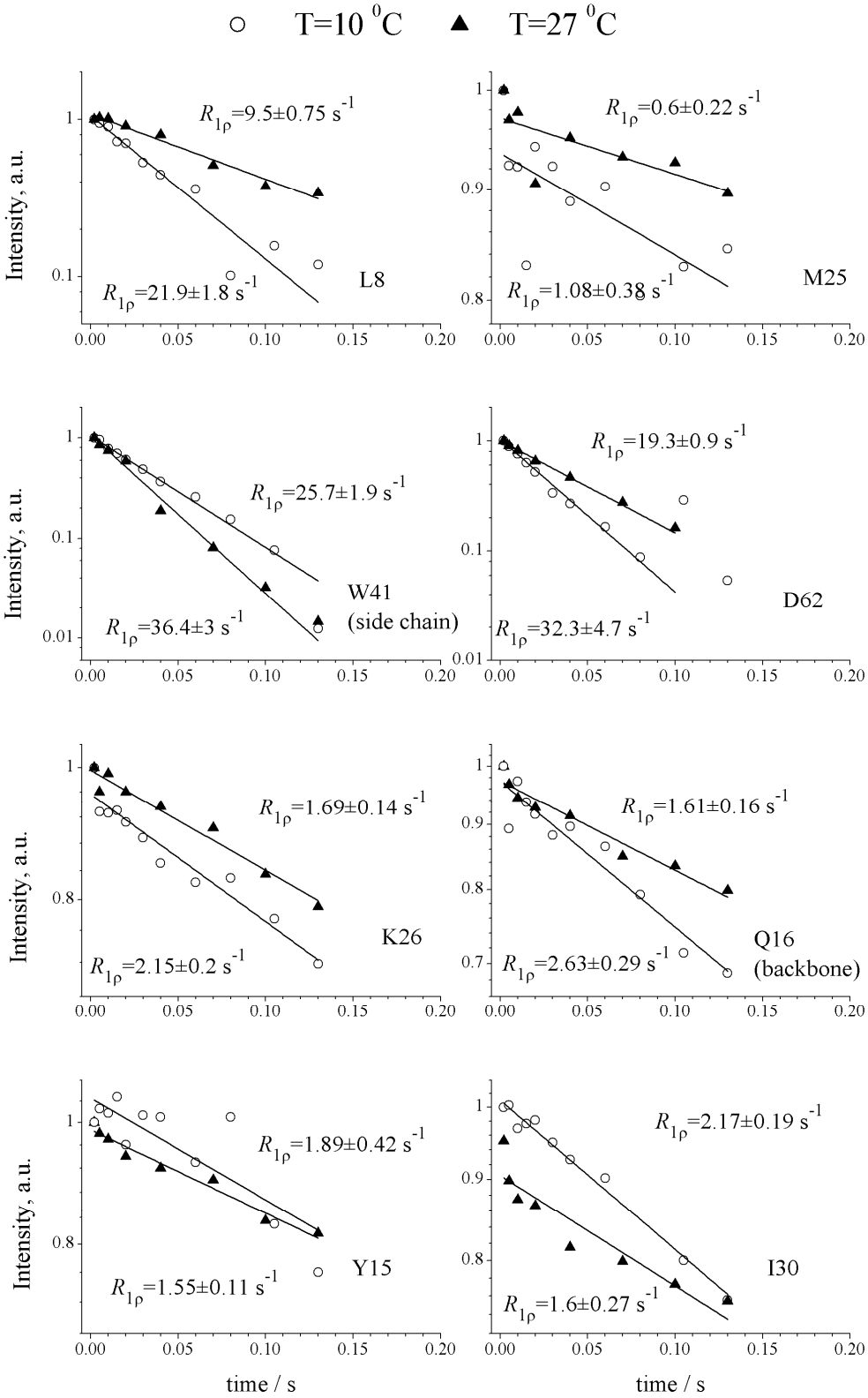

Figure S2. Typical examples of the relaxation decays for the off-resonance (a) and on-resonance (b) $R_{1\rho}$ experiments for selected peaks. Solid lines are the single-exponential fitting curves. For the off-resonance experiment the relaxation rates for some decays (e.g. Y15 and I 30) could not be determined because of the slow relaxation.

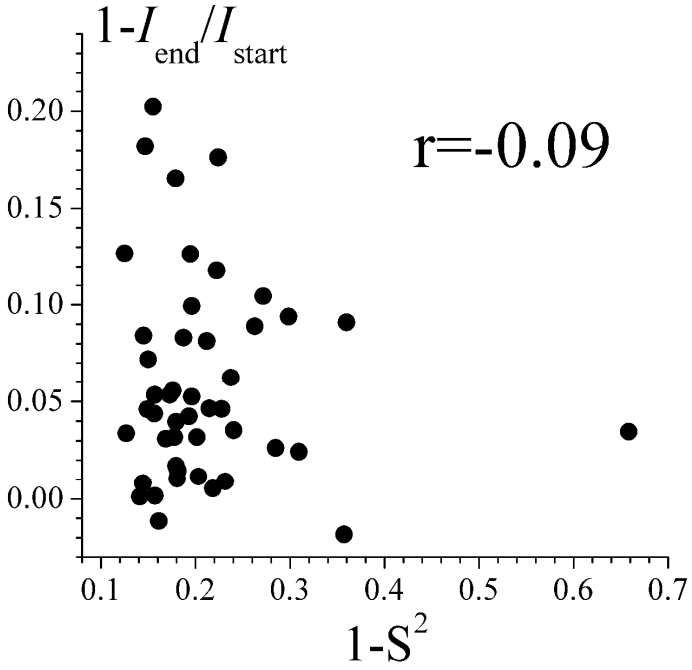

Figure S3. (1-S^2) - (1-I_{end}/I_{start}) correlation map. The data are taken from Fig. 5 (1-S^2) and Fig. 7 (1-I_{end}/I_{start}).