According to past neutron diffraction measurements [1], delafossite-type oxide CuCrO$_2$ undergoes an antiferromagnetic (AF) transition with $T_N = 26$ K, and exhibits long-range static AF order with a 120° spin structure within the plane including the $c$-axis. In order to clarify the magnetism of CuCrO$_2$, we have performed $\mu^+\text{SR}$ experiments on $\text{CuCr}_{1-x}\text{Mg}_x\text{O}_2$ ($x=0-0.03$) using the $\pi E$ (Dolly spectrometer) beam line at PSI.

Figure 1 shows the $T$ dependences of (a) the weak transverse field (wTF) $A_{TF}$ for the $x=0$ and the $x=0.03$ samples, and (b) $\mu^+$-spin precession frequency obtained from the zero field (ZF) $\mu^+\text{SR}$ spectrum for CuCrO$_2$. The $A_{TF}(T)$ curves for both samples exhibit a abrupt decrease at $T_N = 26$ K with decreasing $T$, i.e. the Mg$^{2+}$ substitution for Cr does not alter the magnitude of $T_N$. The ZF $\mu^+$SR measurements however indicate that spontaneous muon-spin precession ($\sim 50$ MHz at $T \to 0$ K) is clearly observed for the $x=0$ sample below $T_N$, whereas the absence of static order for the $x=0.03$ sample even at the lowest $T$ (1.8 K) measured.

Fig. 1: $T$ dependences of (a) $A_{TF}$ for $x = 0$ and $x = 0.03$, (b) $\mu^+$ spin precession frequencies of ZF $\mu^+\text{SR}$ spectra for $x = 0$.