Static and dynamic magnetic properties of magnetic topological insulator $(MnBi_2Te_4)(Bi_2Te_3)_n$

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First magnetic topological insulators were discovered in the van der Waals materials $MnBi_2Te_4$ and $MnBi_4Te_7$, which belong to the $(MnBi_2Te_4)(Bi_2Te_3)_n(n = 0, 1, 2)$ family[1,2,3]. Both materials $MnBi_2Te_4$ and $MnBi_4Te_7$ were determined as the $A-type$ antiferromagnets with the transition temperature around $T_N = 24K$ and $T_N = 13K$[1,2,3,4]. In order to determine the parameters defining the ordered state of $MnBi_2Te_4$ and $MnBi_4Te_7$, we performed electron spin resonance (ESR) spectroscopy measurements in wide frequency and temperature ranges. Our high-frequency and field ESR measurements at low temperature $T = 4K$ combined with calculation of the AFM resonance modes showed that $MnBi_2Te_4$ is an easy axis type antiferromagnet with a zero field gap Δ AFM $\approx 109GHz$ in the low magnetic field limit. However, the application of the stronger applied external magnetic field $\approx 5T$ to $8T$ we observe a crossover from an antiferromagnetic nature of the resonance modes to a ferromagnetic one. Interestingly similar measurements performed in $MnBi_4Te_7$ show that it is an $easy - axis$ type ferromagnet already in the low magnetic field limit[5]. However in contrast to $MnBi_2Te_4$ the ferromagnetic spin correlations on the time scale of an ESR experiment $(10^{-10} to 10^{-11} s)$ in $MnBi_4Te_7$ persist up to much higher than T_N temperature $T = 30K$[5].

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