

Observation of enhanced spin-spin correlations at triple point in 2D ferromagnetic $\text{Cr}_2\text{X}_2\text{Te}_6$ (X=Si, Ge)

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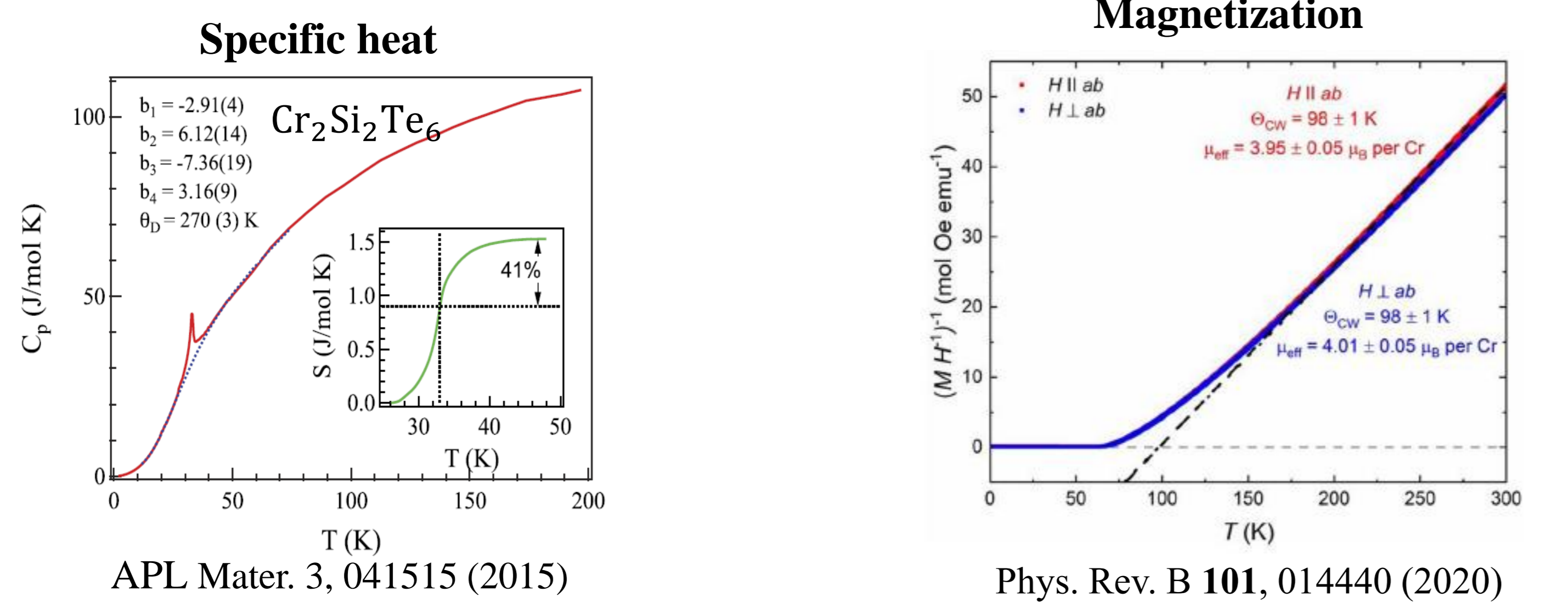
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1. Strong fluctuations in $\text{Cr}_2\text{Si}_2\text{Te}_6$ (CST) and $\text{Cr}_2\text{Ge}_2\text{Te}_6$ (CGT)

Strong fluctuations revealed by several techniques



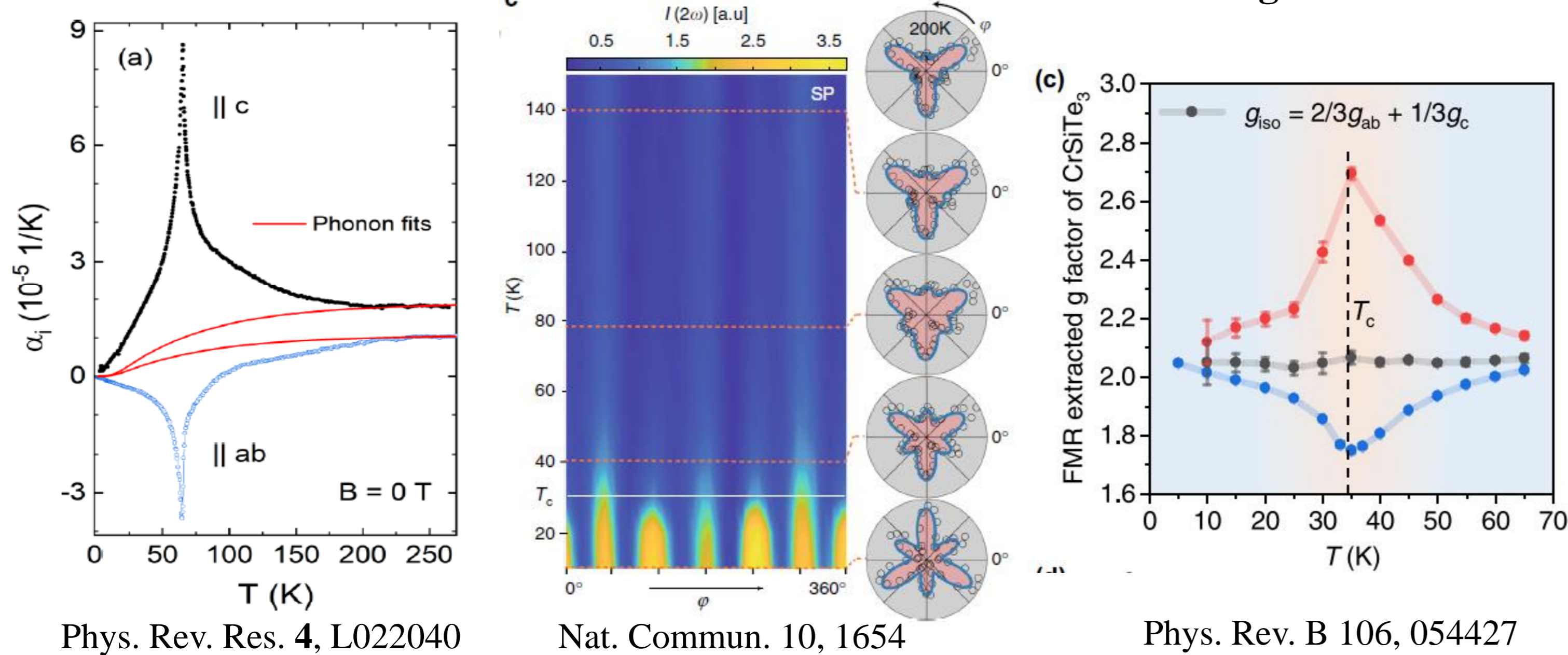
APL Mater. 3, 041515 (2015)

Phys. Rev. B 101, 014440 (2020)

Thermal expansion

Second harmonic generation

Ferromagnetic resonance



Phys. Rev. Res. 4, L022040

Nat. Commun. 10, 1654

Phys. Rev. B 106, 054427

2. ME composite method

More information are expected in ME composite technique

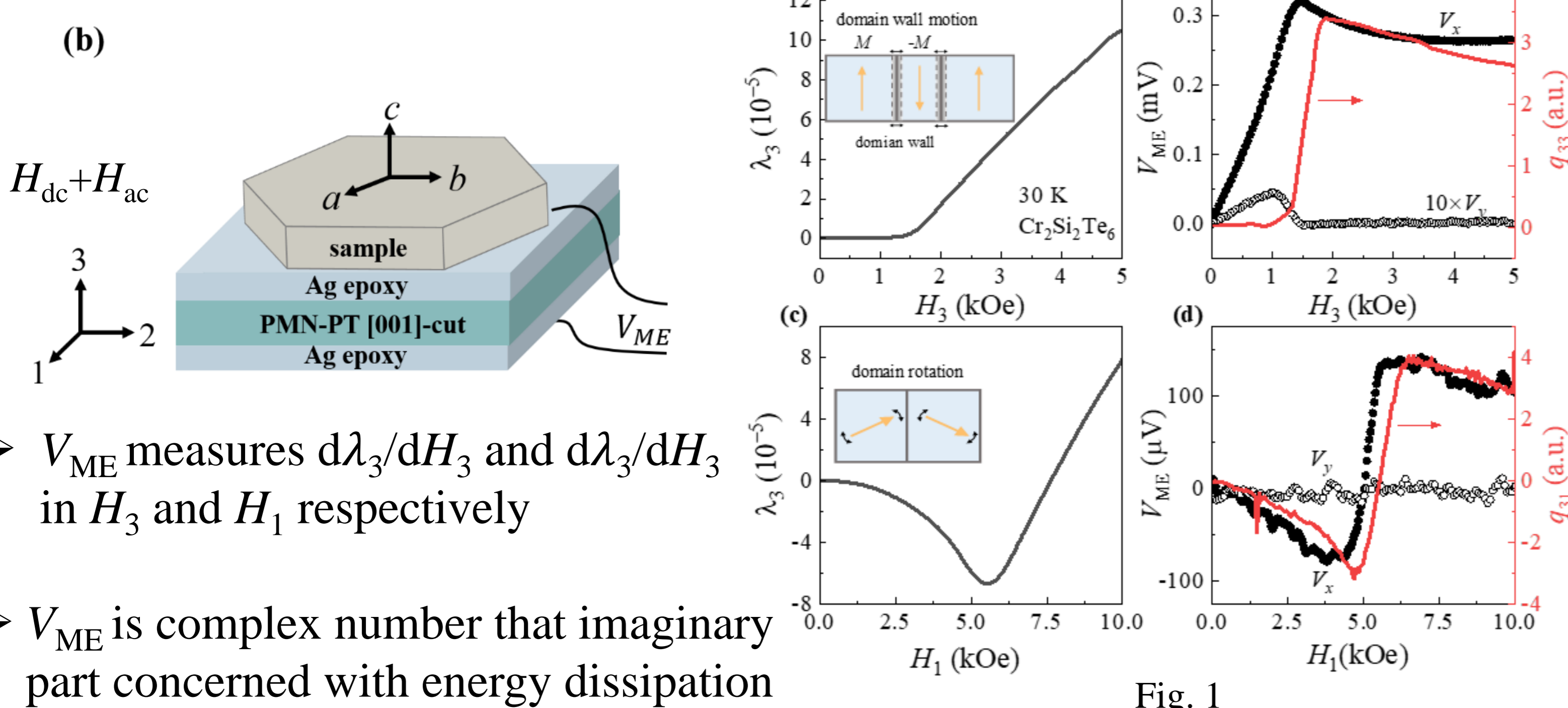


Fig. 1

3. Temperature dependent V_{ME}

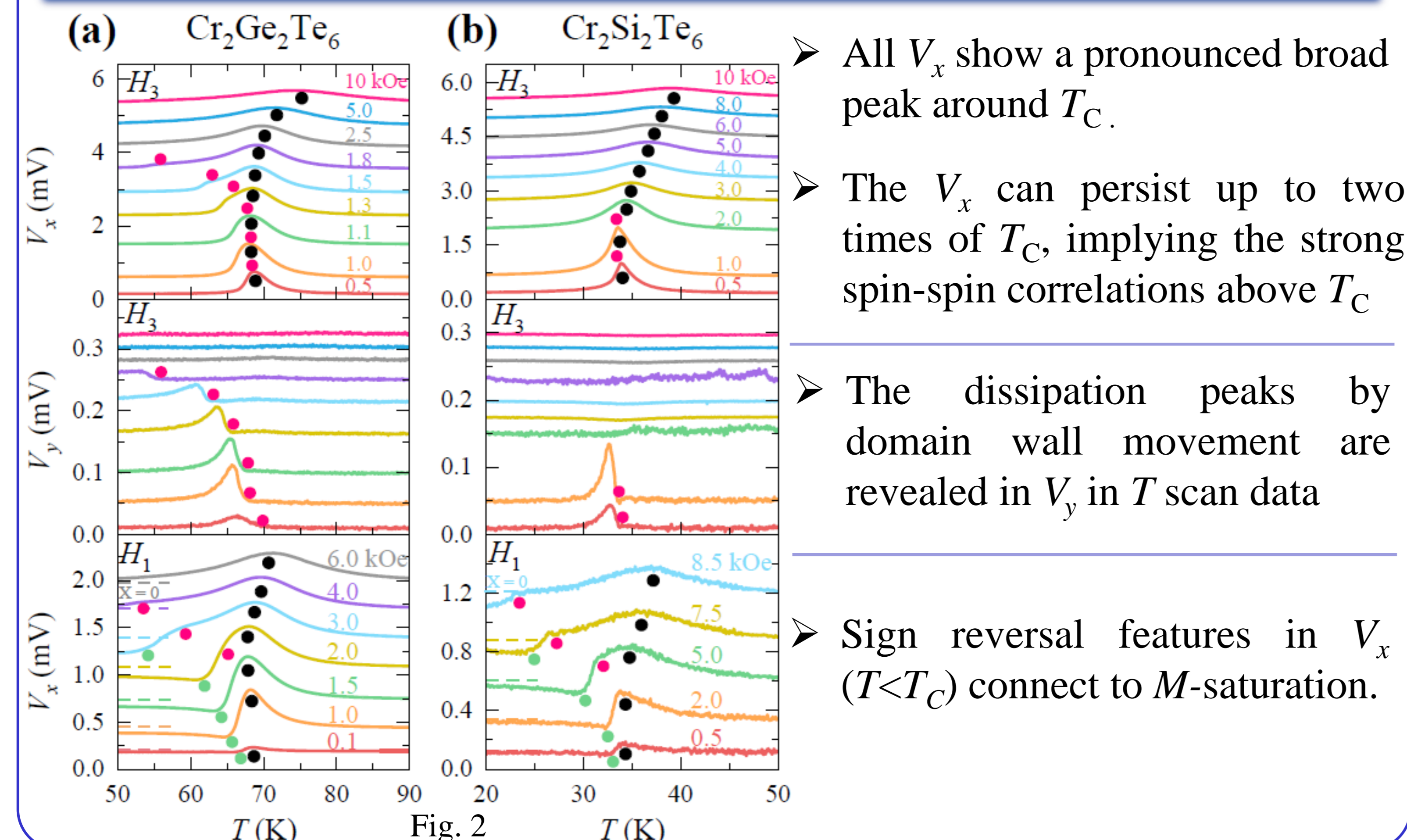


Fig. 2

4. Magnetic field dependent V_{ME}

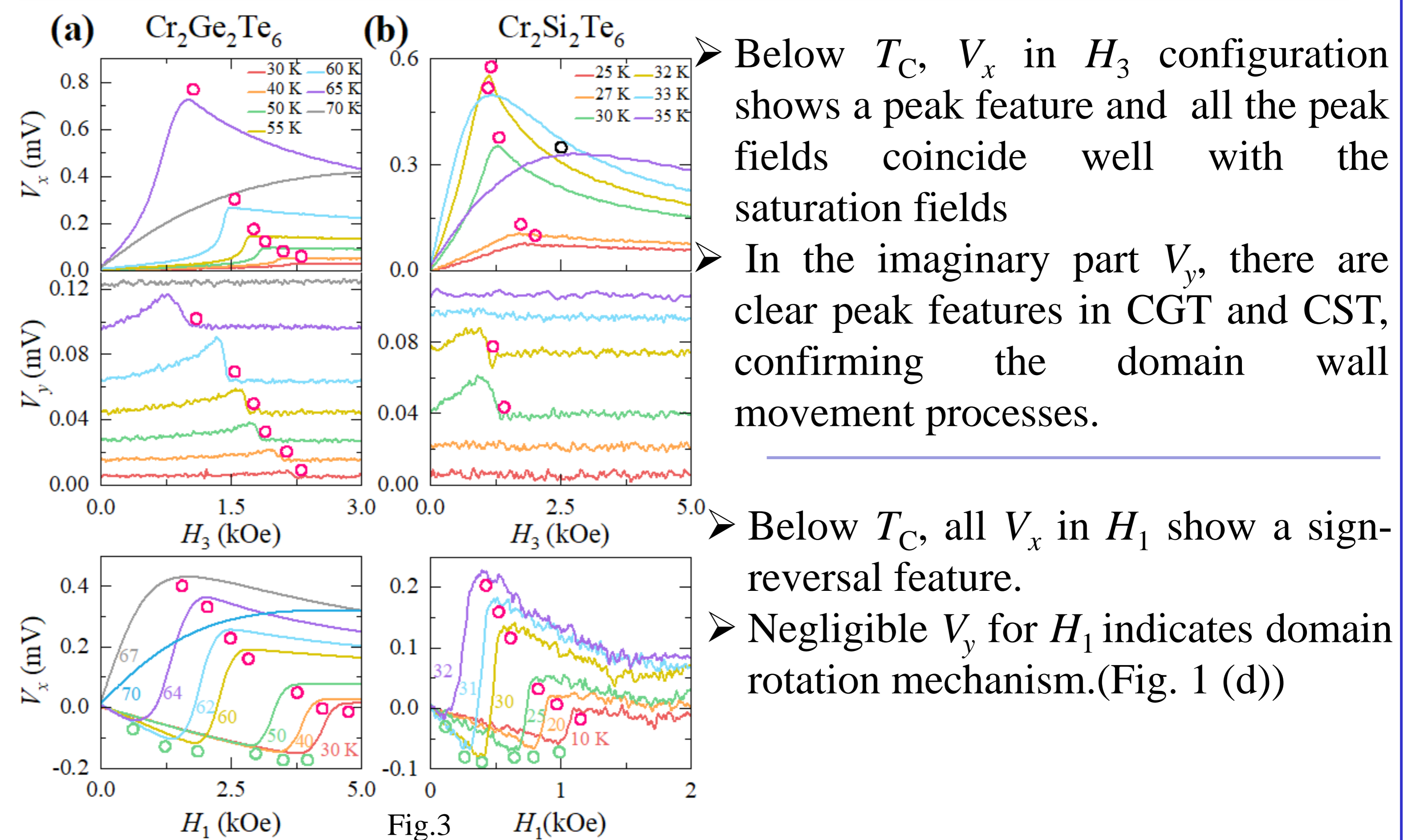


Fig.3

5. Magnetic field dependent half width of V_x -T

The peak behavior of V_x in T scan data can be understood from the perspective of thermodynamics:

$$\frac{\partial \lambda}{\partial H} \approx \rho \frac{T}{T_c} \frac{\partial T_c}{\partial p} \frac{\partial M_s}{\partial T}$$

In Callen's model, $\partial \lambda / \partial H$ is governed by spin-spin correlations that:

$$\frac{\partial \lambda}{\partial H} \approx \langle S_j^z S_f \cdot S_g \rangle$$

The normalized half widths in CST are always larger than that of CGT in the whole field range down to zero field, indicating a stronger fluctuations in CST

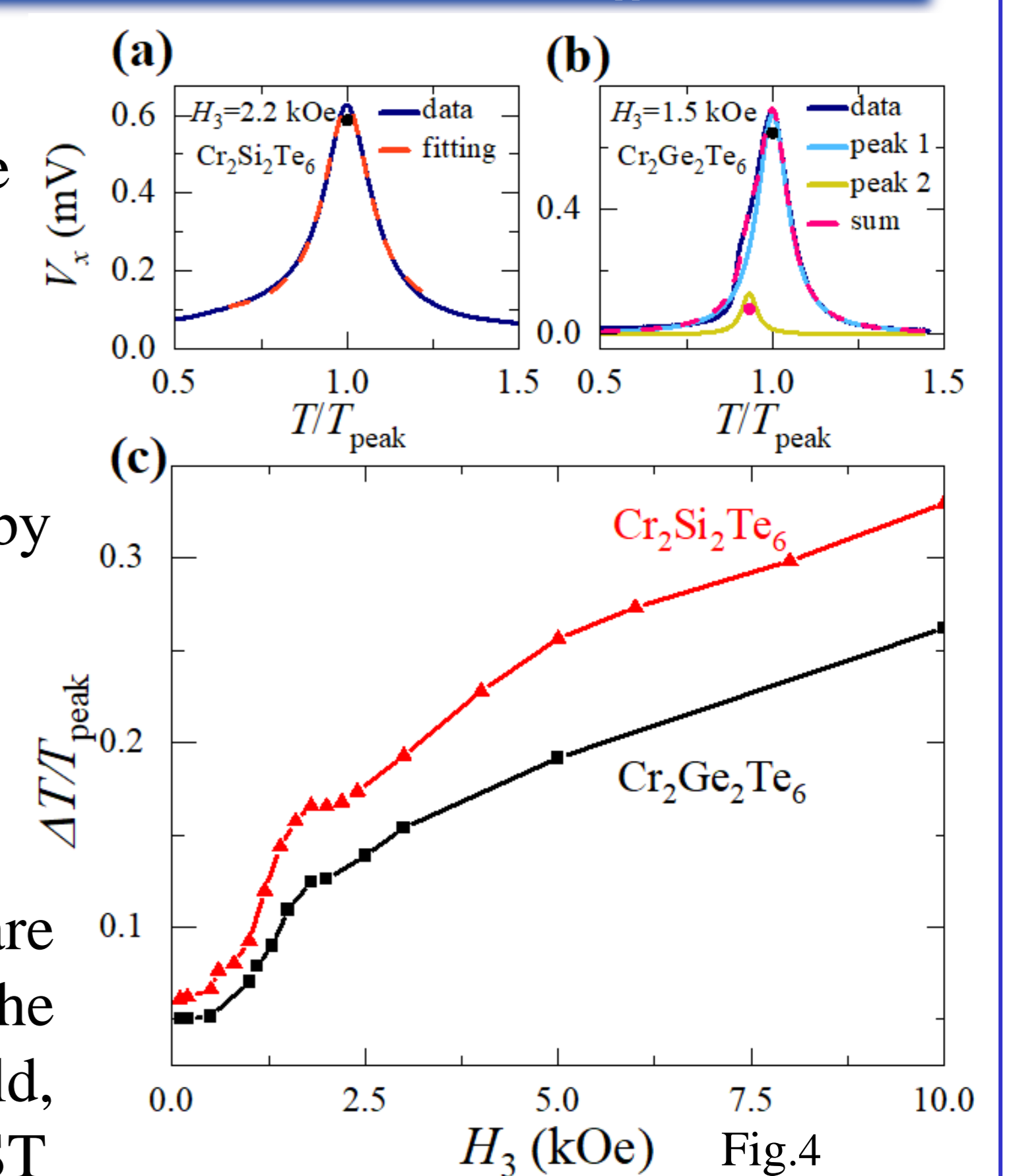


Fig.4

6. Phase diagram

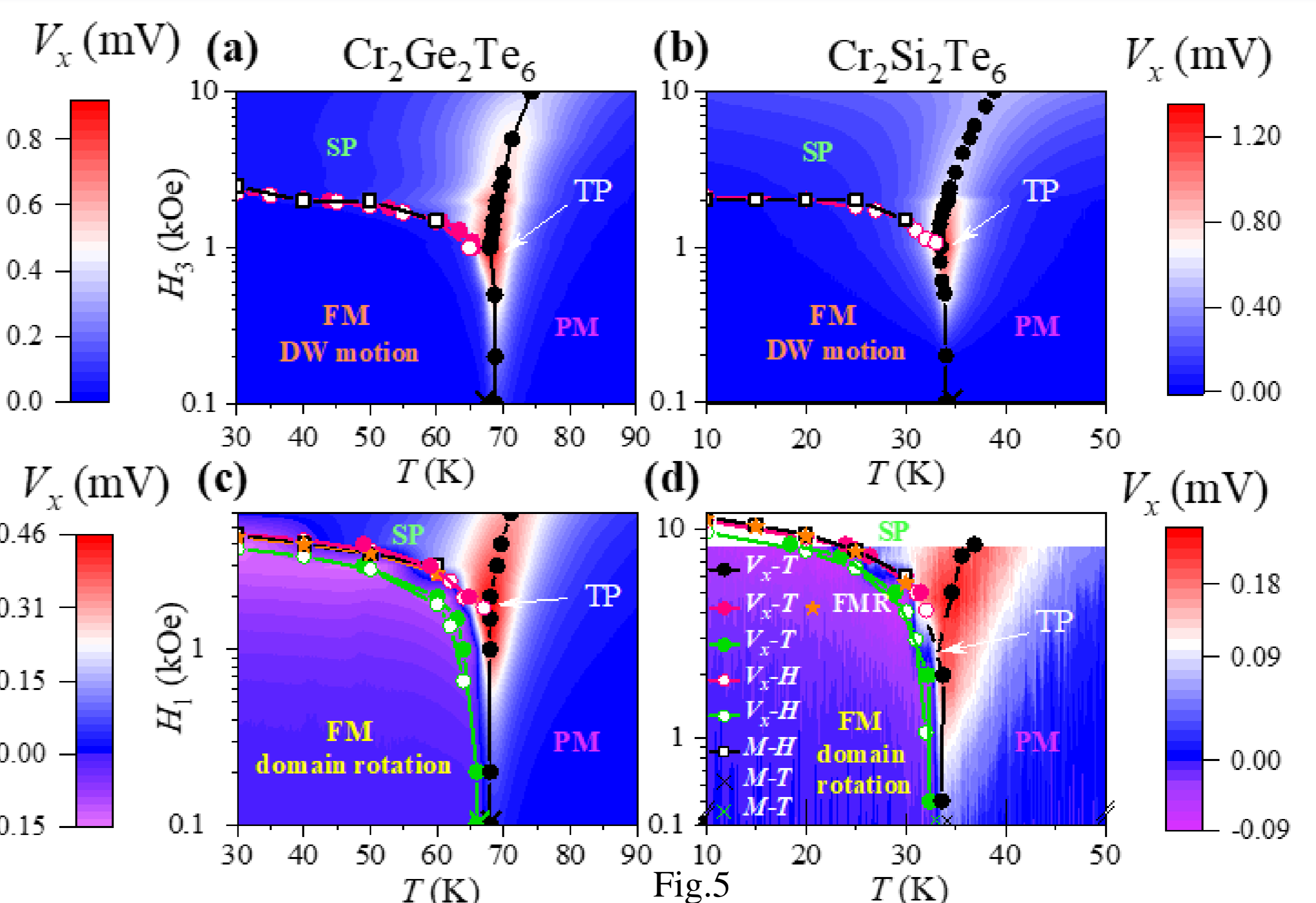


Fig.5

7. Conclusion

- Three boundaries among three phases determined from ME composite technique are in good agreement with other measurements
- Fluctuations in CST are stronger than that in CGT
- Triple points with enhanced spin-spin correlations are found in phase diagram in both compounds



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