

## ELECTRONIC SUPPLEMENTARY INFORMATION

to

### **A [Cr<sub>2</sub>Ni] 1D coordination polymer: slow relaxation of magnetization in quasi one-dimensional ferromagnetic chains †**

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### Synthesis of 1.

[Cr<sup>III</sup><sub>3</sub>O(OAc)<sub>6</sub>(H<sub>2</sub>O)<sub>3</sub>]NO<sub>3</sub>·AcOH (0.33 mmol, 232mgs), NiCl<sub>2</sub>·6H<sub>2</sub>O (1.0 mmol, 237 mgs), aibH (1.0 mmol, 103 mgs), 2-OH-naphthaldehyde (1.0 mmol, 172 mgs) and NEt<sub>3</sub> (2.0 mmol) were added in MeOH and the solution was then transferred to a Teflon-lined autoclave and kept at 120 °C for 14 hours. After slow cooling to room temperature single crystals of the {[Cr<sup>III</sup><sub>2</sub>Ni(L)<sub>4</sub>(MeOH)<sub>2</sub>]}<sub>n</sub> (**1**) (L = the dianion of the Schiff base between 2-hydroxynaphthaldehyde and 2-amino-isobutyric acid) formula were obtained in good yield.

C, H, N analysis: Anal. Calcd for C<sub>62</sub>H<sub>60</sub>Cr<sub>2</sub>N<sub>4</sub>NiO<sub>14</sub> (**1**): C, 59.67; H, 4.84; N, 4.49%. Found: C, 59.58; H, 4.71; N 4.43%.

**Table S1** Dimensions of the unique weak intra-ribbon interactions (distances in Å and angles in °) for complex **1**.

D <sup>a</sup> -H...A <sup>b</sup>	H...A <sup>b</sup>	D <sup>a</sup> ...A <sup>b</sup>	<D <sup>a</sup> HA <sup>b</sup>
O1M-H1M...O15A	1.94(4)	2.709(3)	157(4)
C1M-H1M1...O16A [1-x,1-y,1-z]	2.53	3.025(3)	111
C13B-H13E...O1M [1+x,y,z]	2.43	3.373(4)	161
C14B-H14E...O16A [2-x,1-y,1-z]	2.52	3.371(4)	146

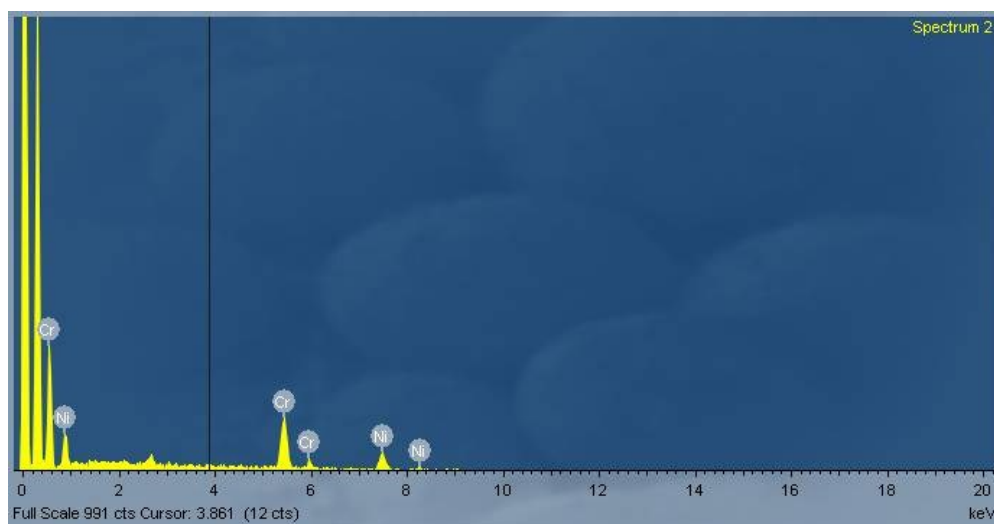
<sup>a</sup> D = donor atom, <sup>b</sup> A = acceptor atom.

**Table S2** Dimensions of the unique weak inter-ribbon interactions (distances in Å and angles in °) for complex **1**.

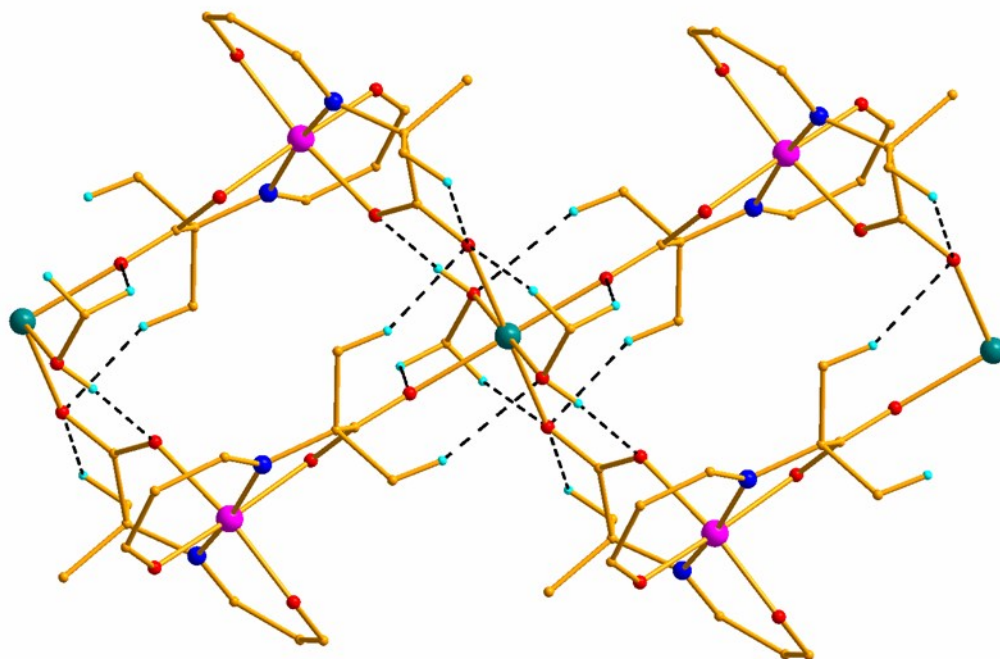
D <sup>a</sup> -H...A <sup>b</sup>	H...A <sup>b</sup>	D <sup>a</sup> ...A <sup>b</sup>	<D <sup>a</sup> HA <sup>b</sup>
C3B-H3B...O2B [1-x,1-y,-z]	2.58	3.347(4)	139

<sup>a</sup> D = donor atom, <sup>b</sup> A = acceptor atom.

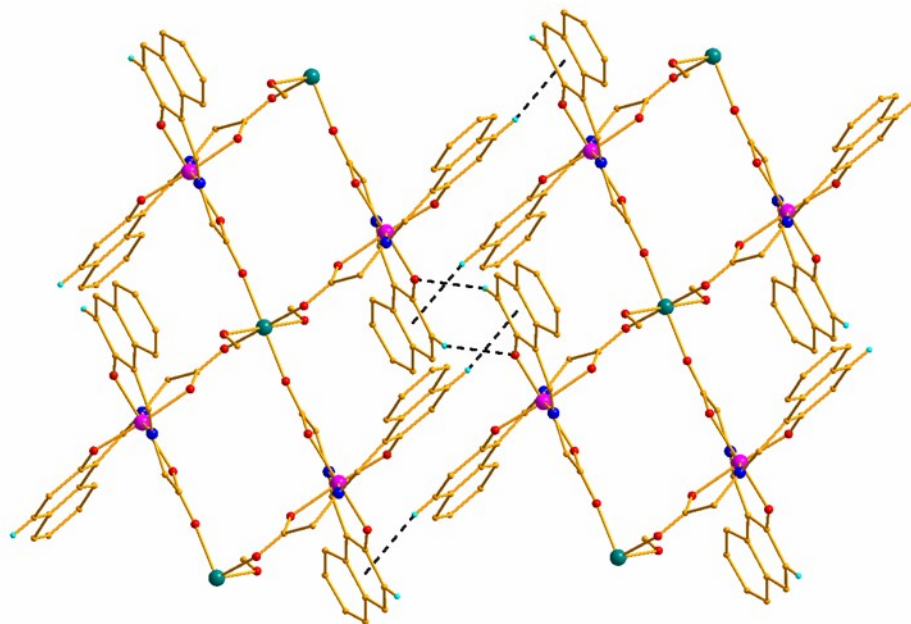
<sup>c</sup> Cg1:  $\pi$  (C1B-C2B-C3B-C4B-C10B-C9B)



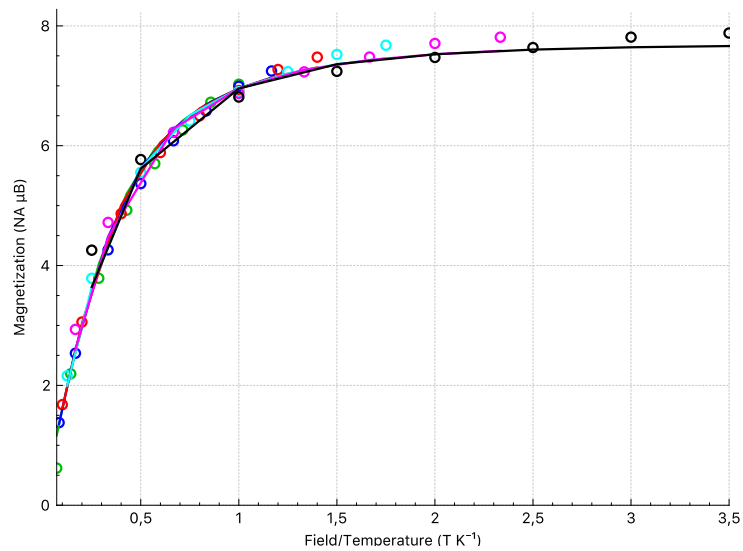
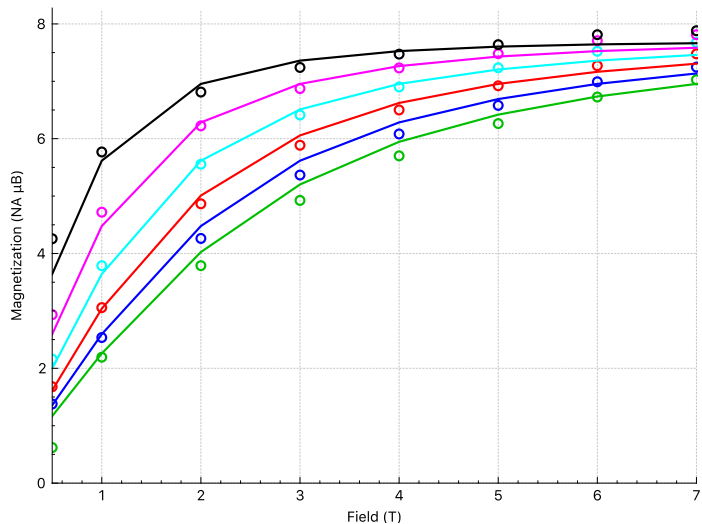
**Fig. S1** EDS analysis of **1**, yielding a Cr : Ni ratio of 1.93, in excellent agreement with the theoretical value of 2.00 expected from the crystal structure.



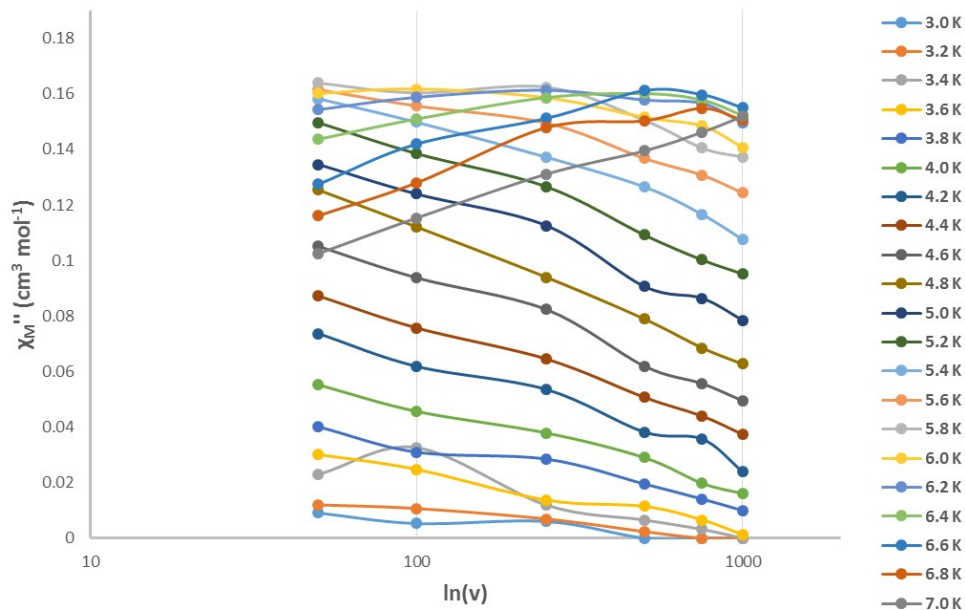
**Fig. S2** The intra-ribbon weak interactions in **1**. Colour code: Cr<sup>III</sup>= violet, Ni<sup>II</sup>= green, O=red, N= blue, C= yellow, H= cyan.



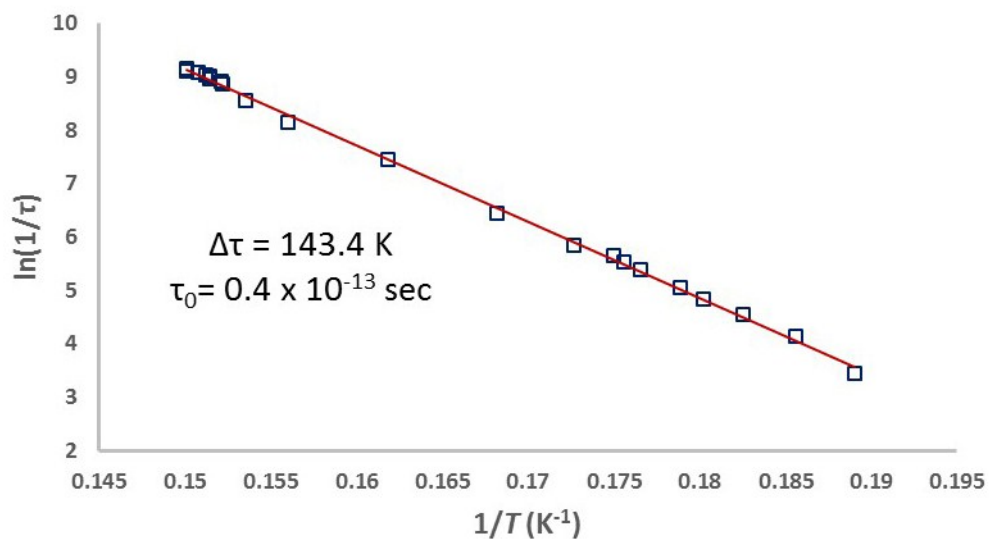
**Fig. S3** The inter-ribbon weak interactions in **1**. Colour code: Cr<sup>III</sup>= violet, Ni<sup>II</sup>= green, O=red, N= blue, C= yellow, H= cyan.



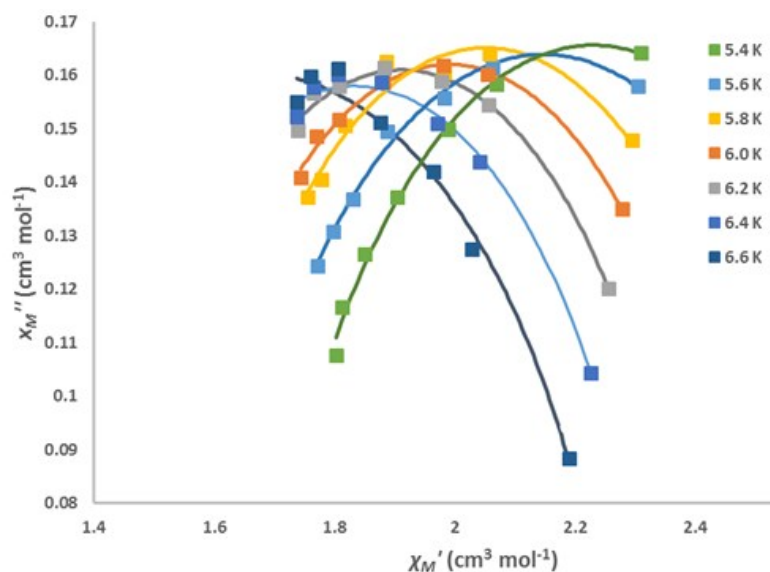
**Fig. S4** Reduced magnetization vs.  $H$  (upper plot) and vs.  $H/T$  for complex **1** in the 1 – 7 T and 2.0 – 7.0 K field and temperature range. The solid lines are the fitting results using the giant model for an  $S=4$  state with  $D=-0.01 \text{ cm}^{-1}$  and  $g=1.93(1)$ .



**Fig. S5** Plot of the out-of-phase  $\chi_M''$  signals for **1** vs.  $\nu$  at the indicated temperatures.



**Fig. S6** Arrhenius plot using the ac data for complex **1**. The solid line is a fit of the data - see the main text for details.



**Fig. S7** Cole-Cole plot for complex **1** in the 5.4-6.6 K temperature range. The solid lines correspond to a distribution of single relaxation processes.

#### GENERAL DETAILS FOR MONTE CARLO STUDY.

The stochastic series expansion (SSE) algorithm<sup>1</sup>, is a generalization of Handscomb's algorithm<sup>2</sup> for the Heisenberg model. While in the original implementation<sup>1</sup> local MC updates were used, Sandvik later developed a cluster update, called the operator-loop update for the SSE representation<sup>3</sup>, which allows for non-local changes of MC configurations. Within this SSE approach one can efficiently simulate models for which the world line loop algorithm suffers from slowing down.

[1] (a) A. W. Sandvik and J. Kurkijarvi, *Phys. Rev.* 1991, B43, 5950 (b) A. W. Sandvik, *J. Phys.* 1992, **A25**, 3667.

[2] D. C. Handscomb, *Proc. Cambridge Phil. Soc.* 1962, **58**, 594; 1964,**60**, 115.

[3] A. W. Sandvik, *Phys. Rev.* 1999, **B59**, R14157