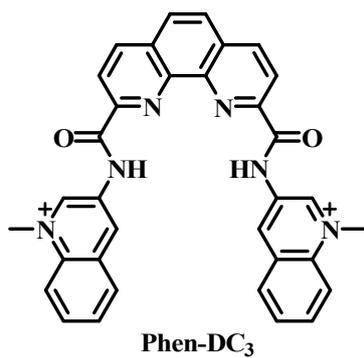
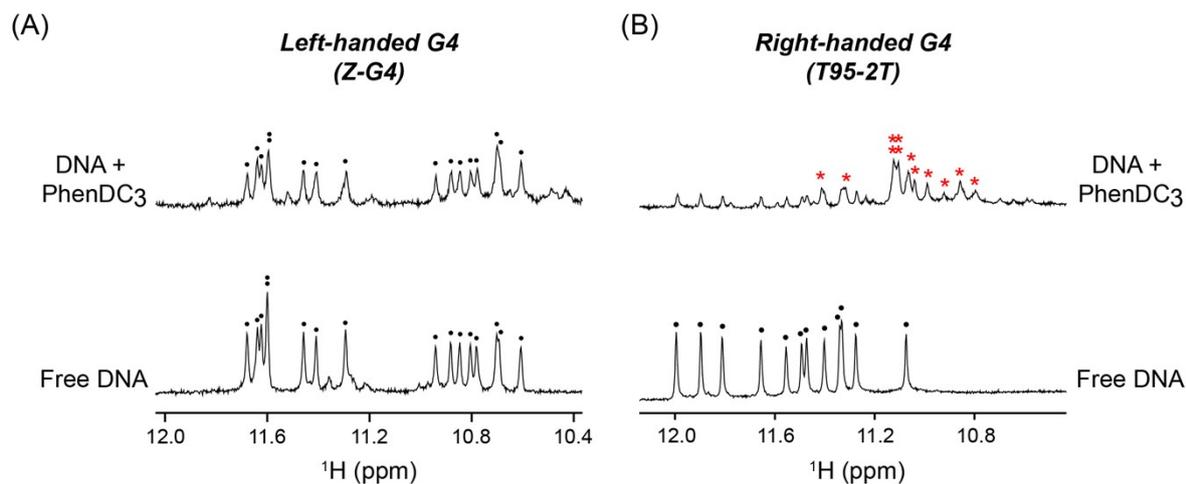




## Supplementary Figures

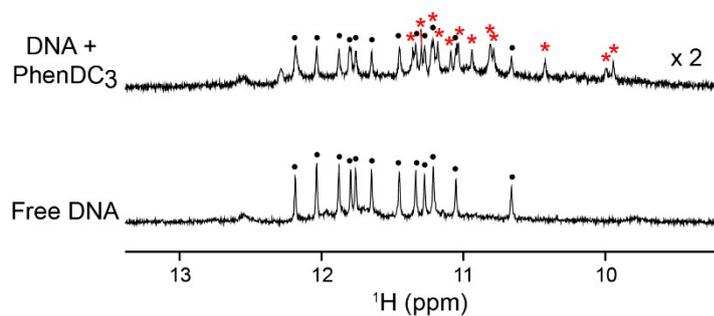


**Figure S1:** Chemical structure of PhenDC<sub>3</sub>

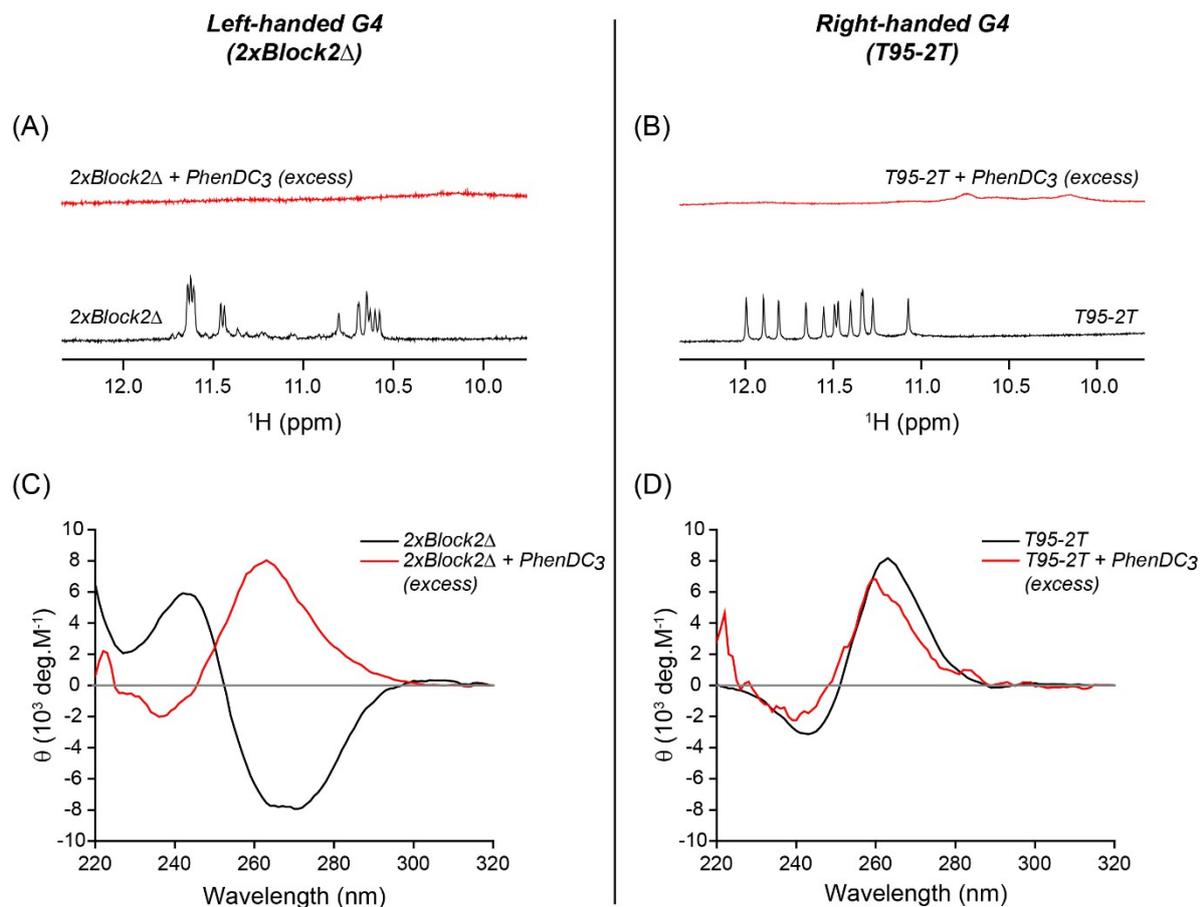


**Figure S2:** 1D <sup>1</sup>H NMR spectra showing (A) Non-binding of ligand PhenDC<sub>3</sub> to left-handed G4 (Z-G4) indicated by the unchanged spectrum and nonappearance of new peaks corresponding to complex formation upon titration of PhenDC<sub>3</sub> and (B) Binding of PhenDC<sub>3</sub> to parallel right-handed G4 (T95-2T), indicated by the gradual disappearance and appearance of the peaks corresponding to free form and complex form respectively. The black solid circles indicate the peaks corresponding to the G4 structure in its free form. The new set of peaks corresponding to the complex form of T95-2T with PhenDC<sub>3</sub> are marked with red asterisks. 2 μl of c.a. 20 mM solution of PhenDC<sub>3</sub> was added to the NMR tube containing 400 μl of 100 μM DNA samples.

**Non-parallel right-handed G4  
(HT)**

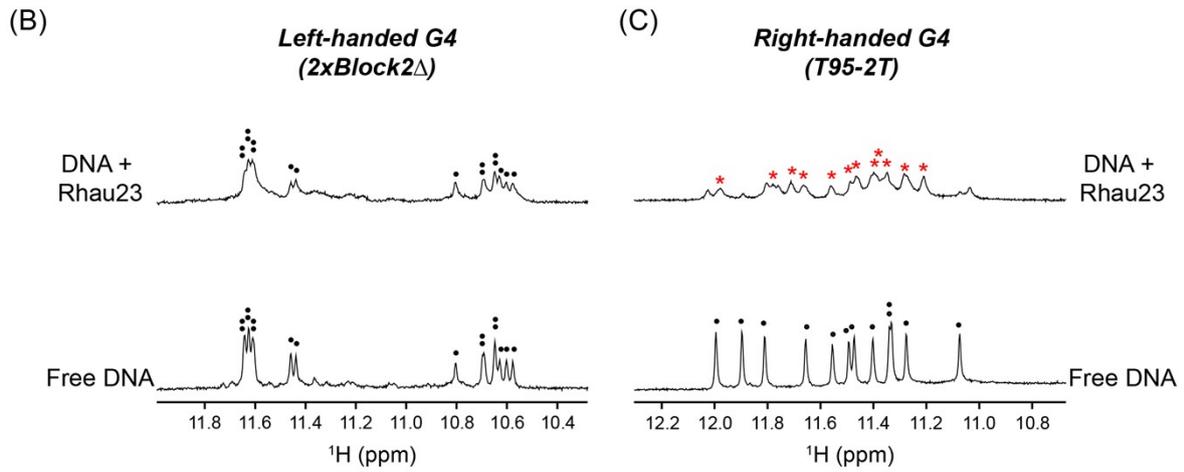


**Figure S3:** 1D <sup>1</sup>H NMR spectra showing binding of PhenDC<sub>3</sub> to non-parallel right-handed G4 (HT), indicated by the partial disappearance and appearance of the peaks corresponding to free form and complex form respectively. The black solid circles indicate the peaks corresponding to the G4 structure in its free form. The new set of peaks corresponding to the complex form of HT with PhenDC<sub>3</sub> are marked with red asterisks. 2 μl of c.a. 20 mM solution of PhenDC<sub>3</sub> was added to the NMR tube containing 400 μl of 100 μM DNA samples.



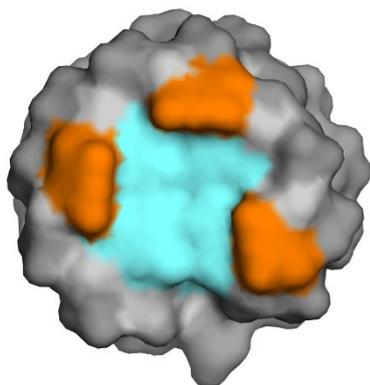
**Figure S4:** 1D  $^1\text{H}$  NMR spectra of the sequence (A) *2xBlock2Δ* and (B) *T95-2T*, with excess of the ligand PhenDC<sub>3</sub>. CD spectra of the sequence (C) *2xBlock2Δ* and (D) *T95-2T*, with and without excess of the ligand PhenDC<sub>3</sub> demonstrating conformational transformation of left-handed G4 structure of *2xBlock2Δ* to parallel right-handed G4 on addition of ligand in excess whereas the parallel right-handed G4, *T95-2T* retains its structural conformation. 8  $\mu\text{l}$  of  $\sim 20$  mM solution of PhenDC<sub>3</sub> was added to the NMR tube containing 400  $\mu\text{l}$  of 100  $\mu\text{M}$  DNA samples.

(A) **Rhau23** : N<sub>term</sub>-HPGHLKGREIGMWYAKKQGQKNK-C<sub>term</sub>

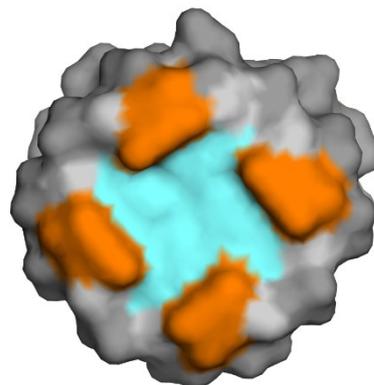


**Figure S5:** (A) 23 amino acids peptide sequence of Rhau23. 1D <sup>1</sup>H NMR spectra showing (B) Non-binding of Rhau23 peptide to left-handed G4 (*2xBlock2Δ*) indicated by the unchanged spectrum and nonappearance of new peaks corresponding to complex formation and (C) Binding of Rhau23 to parallel right-handed G4 (*T95-2T*), indicated by the gradual disappearance and appearance of the peaks corresponding to free form and complex form respectively. The black solid circles indicate the peaks corresponding to the G4 structure in its free form. The new set of peaks corresponding to the complex form of T95-2T with Rhau23 are marked with red asterisks. 4.8 μl of c.a. 20 mM solution of Rhau23 peptide was added to the NMR tube containing 400 μl of 100 μM DNA samples.

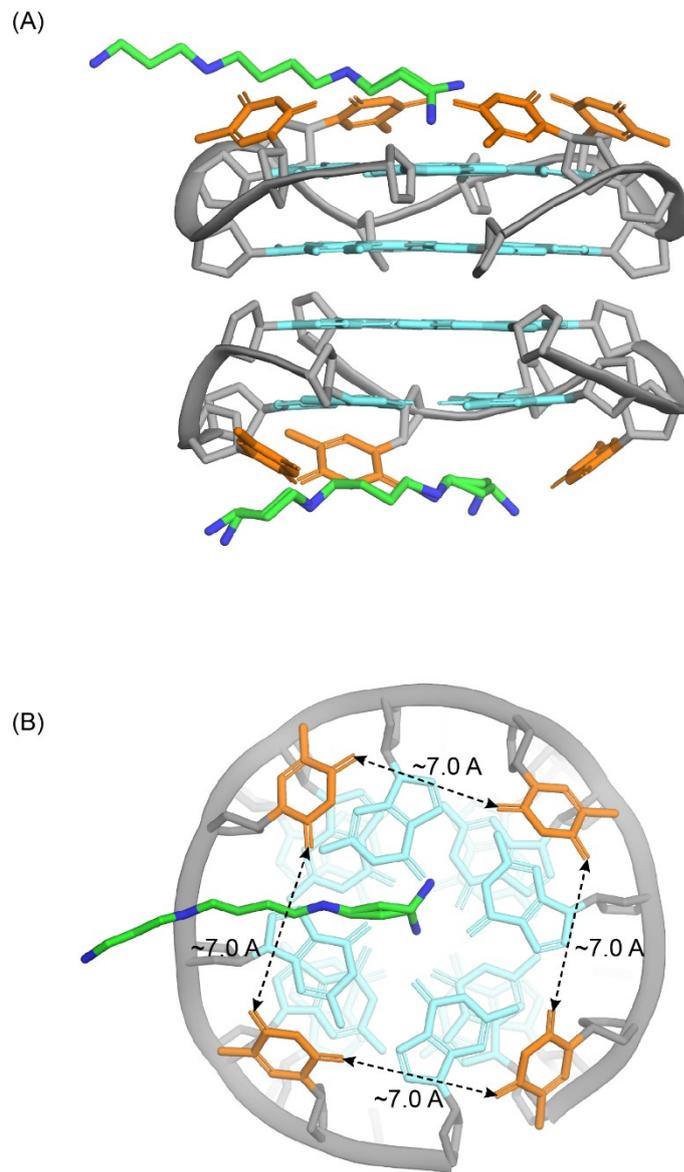
Three T-cappings



Four T-cappings



**Figure S6:** Surface representation of the crystal structure of a reported left-handed G4 structure exhibiting three T-cappings on one of the outer tetrads and four T-cappings on the other tetrad.



**Figure S7:** Crystal structure of a reported left-handed G4 (pdb id: 7D5D) where spermine used in the process of crystallization of the DNA samples were found to be stacked on top of the exposed tetrads. Spermine being a linear molecule was able to reside in the cavity between the capping thymines, providing a potential approach to target left-handed G4s. The distance between the closest points of the adjacent capping thymines were measured to be c.a. 7.0 Å.