



# Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 02:27 am BST

PDB ID : 1CVX  
Title : CRYSTAL STRUCTURE OF POLYAMIDE DIMER (IMPYHPPYBE-TADP)<sub>2</sub> BOUND TO B-DNA DECAMER CCAGATCTGG  
Authors : Kielkopf, C.L.; Bremer, R.E.; White, S.; Baird, E.E.; Dervan, P.B.; Rees, D.C.  
Deposited on : 1999-08-24  
Resolution : 2.27 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

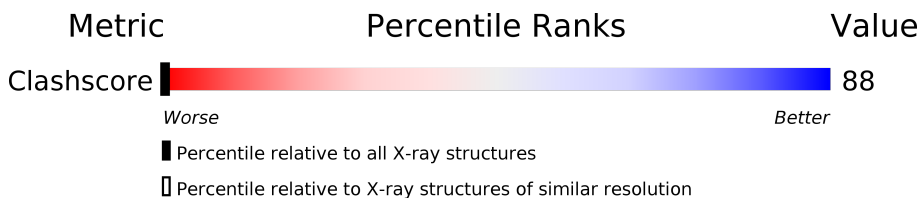
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.27 Å.


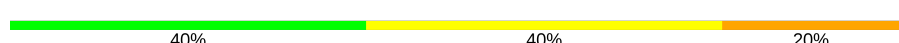
Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	141614	7711 (2.30-2.26)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions  $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	10	
1	B	10	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	HP2	B	11	-	-	X	-

## 2 Entry composition [i](#)

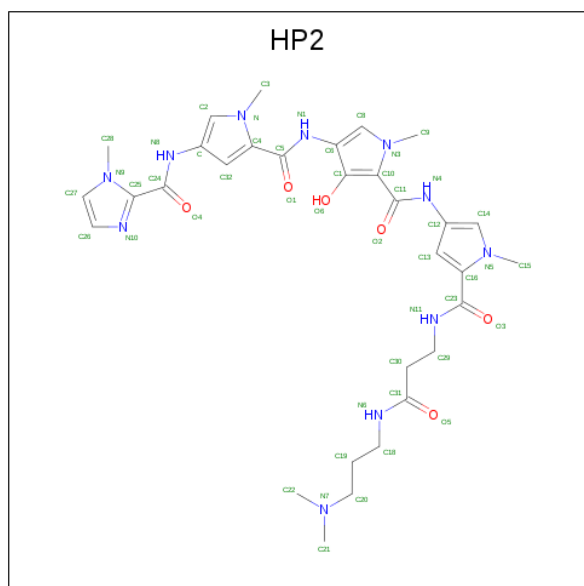
There are 3 unique types of molecules in this entry. The entry contains 540 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a DNA chain called 5'-D(\*CP\*CP\*AP\*GP\*AP\*TP\*CP\*TP\*GP\*G)-3'.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	A	10	Total 202	C 97	N 38	O 58	P 9	0	0	0
1	B	10	Total 202	C 97	N 38	O 58	P 9	0	0	0

- Molecule 2 is HYDROXYPYRROLE-IMIDAZOLE-PYRROLE POLYAMIDE (three-letter code: HP2) (formula: C<sub>31</sub>H<sub>41</sub>N<sub>11</sub>O<sub>6</sub>).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
2	A	1	Total 58	C 38	N 13	O 7	0	1
2	B	1	Total 48	C 31	N 11	O 6	0	0

- Molecule 3 is water.


<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>		<b>ZeroOcc</b>	<b>AltConf</b>
3	A	20	Total 20	O 20	0	0
3	B	10	Total 10	O 10	0	0

### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

- Molecule 1: 5'-D(\*CP\*CP\*AP\*GP\*AP\*TP\*CP\*TP\*GP\*G)-3'

Chain A: 



- Molecule 1: 5'-D(\*CP\*CP\*AP\*GP\*AP\*TP\*CP\*TP\*GP\*G)-3'

Chain B: 



## 4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	34.20Å 34.20Å 46.10Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	17.00 – 2.27	Depositor
% Data completeness (in resolution range)	(Not available) (17.00-2.27)	Depositor
$R_{merge}$	0.02	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	CNS	Depositor
R, $R_{free}$	0.237 , 0.238	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	540	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	70.0	wwPDB-VP

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: HP2

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 5$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z  >5	RMSZ	# Z  >5
1	A	1.77	3/226 (1.3%)	1.55	5/347 (1.4%)
1	B	1.42	2/226 (0.9%)	1.13	0/347
All	All	1.61	5/452 (1.1%)	1.35	5/694 (0.7%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	1	DC	N1-C2	-9.92	1.30	1.40
1	A	1	DC	C3'-O3'	-6.16	1.35	1.44
1	B	7	DC	O3'-P	-5.22	1.54	1.61
1	B	8	DT	C3'-O3'	-5.17	1.37	1.44
1	A	1	DC	C4-N4	5.00	1.38	1.33

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	2	DC	C3'-C2'-C1'	-7.05	94.04	102.50
1	A	8	DT	O4'-C1'-C2'	-6.00	101.10	105.90
1	A	4	DG	O4'-C1'-N9	5.79	112.05	108.00
1	A	1	DC	N1-C2-O2	-5.06	115.86	118.90
1	A	2	DC	O4'-C1'-N1	-5.06	104.46	108.00

There are no chirality outliers.

There are no planarity outliers.

### 5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen

atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	202	0	114	30	0
1	B	202	0	114	30	0
2	A	58	0	34	4	0
2	B	48	0	40	28	0
3	A	20	0	0	5	0
3	B	10	0	0	5	0
All	All	540	0	302	68	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 88.

All (68) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:10:DG:N3	2:B:11:HP2:H223	1.74	1.03
1:B:6:DT:H2''	1:B:7:DC:H5''	1.41	1.02
1:A:4:DG:N7	3:A:48:HOH:O	2.05	0.88
1:A:1:DC:H6	1:A:1:DC:O5'	1.56	0.87
1:B:6:DT:H2''	1:B:7:DC:C5'	2.04	0.87
1:B:8:DT:H5'	2:B:11:HP2:C11	2.09	0.82
1:B:8:DT:H4'	3:B:40:HOH:O	1.80	0.80
1:A:9:DG:N3	2:A:12[B]:HP2:H292	1.98	0.78
1:A:9:DG:N3	2:A:12[A]:HP2:H292	1.98	0.78
1:B:6:DT:C2'	1:B:7:DC:H5''	2.16	0.76
1:B:5:DA:OP1	3:B:29:HOH:O	2.04	0.74
1:B:8:DT:H73	3:B:71:HOH:O	1.90	0.70
1:B:10:DG:C2	2:B:11:HP2:H223	2.30	0.65
1:A:5:DA:H5'	3:A:27:HOH:O	1.96	0.64
1:B:9:DG:H1'	2:B:11:HP2:H291	1.79	0.63
3:A:23:HOH:O	2:B:11:HP2:H301	2.01	0.61
1:B:10:DG:H21	2:B:11:HP2:H212	1.66	0.60
1:B:7:DC:O4'	2:B:11:HP2:C1	2.50	0.60
1:B:6:DT:H4'	2:B:11:HP2:C2	2.31	0.60
1:B:7:DC:H2''	1:B:8:DT:O5'	2.01	0.58
1:B:8:DT:H4'	2:B:11:HP2:C14	2.34	0.57
2:B:11:HP2:H14	2:B:11:HP2:O2	2.04	0.57
1:A:1:DC:HO5'	1:A:1:DC:H6	0.73	0.56
1:B:9:DG:C1'	2:B:11:HP2:H291	2.36	0.56
2:B:11:HP2:C14	3:B:40:HOH:O	2.54	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:6:DT:H2''	1:A:7:DC:H5'	1.91	0.53
1:A:1:DC:C6	1:A:1:DC:O5'	2.43	0.52
1:B:8:DT:H4'	2:B:11:HP2:C12	2.40	0.52
1:B:9:DG:H21	2:B:11:HP2:H222	1.75	0.52
1:B:9:DG:N2	2:B:11:HP2:H222	2.25	0.52
1:B:7:DC:H4'	2:B:11:HP2:C8	2.39	0.51
1:A:9:DG:C2	2:A:12[A]:HP2:H292	2.45	0.51
1:B:8:DT:C4'	2:B:11:HP2:C12	2.89	0.50
1:A:9:DG:C2	2:A:12[B]:HP2:H292	2.47	0.50
2:B:11:HP2:O2	2:B:11:HP2:C14	2.60	0.49
1:A:10:DG:N3	3:A:37:HOH:O	2.35	0.48
1:A:5:DA:C5'	3:A:27:HOH:O	2.58	0.48
1:B:6:DT:H2''	1:B:7:DC:H5'	1.93	0.47
2:B:11:HP2:H281	2:B:11:HP2:O4	2.15	0.47
1:B:7:DC:C6	1:B:7:DC:H5'	2.52	0.45
1:B:8:DT:O2	2:B:11:HP2:H13	2.17	0.45
1:B:10:DG:N3	2:B:11:HP2:C22	2.63	0.44
1:A:6:DT:H2''	1:A:7:DC:C5'	2.47	0.44
2:B:11:HP2:H31	2:B:11:HP2:O1	2.18	0.43
1:A:1:DC:N4	1:B:9:DG:O6	2.51	0.43
1:B:9:DG:N3	2:B:11:HP2:H291	2.33	0.43
1:B:8:DT:O4'	2:B:11:HP2:C12	2.67	0.43
2:B:11:HP2:H153	3:B:40:HOH:O	2.18	0.42
1:B:7:DC:O4'	2:B:11:HP2:C6	2.67	0.41
2:B:11:HP2:C2	2:B:11:HP2:O4	2.65	0.41
1:B:7:DC:H6	1:B:7:DC:H5'	1.85	0.41
2:B:11:HP2:O1	2:B:11:HP2:H8	2.21	0.40
1:A:7:DC:H2''	1:A:8:DT:O5'	2.22	0.40

There are no symmetry-related clashes.

### 5.3 Torsion angles [i](#)

#### 5.3.1 Protein backbone [i](#)

There are no protein molecules in this entry.

#### 5.3.2 Protein sidechains [i](#)

There are no protein molecules in this entry.

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

3 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with  $|Z| > 2$  is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
2	HP2	B	11	-	44,51,51	2.44	7 (15%)	42,72,72	2.06	9 (21%)
2	HP2	A	12[B]	-	44,51,51	4.24	16 (36%)	42,72,72	2.87	18 (42%)
2	HP2	A	12[A]	-	44,51,51	4.23	16 (36%)	42,72,72	2.73	16 (38%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HP2	B	11	-	-	4/21/41/41	0/4/4/4
2	HP2	A	12[B]	-	-	6/21/41/41	0/4/4/4
2	HP2	A	12[A]	-	-	5/21/41/41	0/4/4/4

All (39) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	11	HP2	C25-C24	-12.94	1.42	1.53
2	A	12[B]	HP2	C2-C	10.57	1.49	1.38
2	A	12[A]	HP2	C2-C	10.57	1.49	1.38
2	A	12[B]	HP2	C25-C24	-10.47	1.44	1.53
2	A	12[A]	HP2	C25-C24	-10.47	1.44	1.53
2	A	12[B]	HP2	C13-C12	9.24	1.47	1.39
2	A	12[A]	HP2	C13-C12	9.24	1.47	1.39
2	A	12[B]	HP2	C4-N	9.08	1.55	1.36
2	A	12[A]	HP2	C4-N	9.08	1.55	1.36
2	A	12[B]	HP2	C8-C6	8.99	1.47	1.38
2	A	12[A]	HP2	C8-C6	8.99	1.47	1.38
2	A	12[B]	HP2	O3-C23	8.11	1.39	1.23
2	A	12[A]	HP2	O3-C23	8.11	1.39	1.23
2	A	12[B]	HP2	C32-C	7.61	1.46	1.39
2	A	12[A]	HP2	C32-C	7.61	1.46	1.39
2	A	12[B]	HP2	O2-C11	-6.05	1.11	1.23
2	A	12[A]	HP2	O2-C11	-6.05	1.11	1.23
2	B	11	HP2	C-N8	-5.77	1.30	1.41
2	A	12[B]	HP2	C32-C4	5.38	1.46	1.39
2	A	12[A]	HP2	C32-C4	5.38	1.46	1.39
2	A	12[B]	HP2	C13-C16	5.23	1.46	1.39
2	A	12[A]	HP2	C13-C16	5.23	1.46	1.39
2	A	12[B]	HP2	C14-C12	-4.66	1.33	1.38
2	A	12[A]	HP2	C14-C12	-4.66	1.33	1.38
2	A	12[B]	HP2	C23-N11	-3.81	1.25	1.33
2	A	12[A]	HP2	C23-N11	-3.81	1.25	1.33
2	A	12[B]	HP2	C16-N5	-3.00	1.30	1.36
2	A	12[A]	HP2	C16-N5	-3.00	1.30	1.36
2	A	12[B]	HP2	C29-N11	2.95	1.52	1.46
2	A	12[A]	HP2	C29-N11	2.95	1.52	1.46
2	B	11	HP2	C8-C6	2.80	1.41	1.38
2	A	12[B]	HP2	O4-C24	2.76	1.28	1.23
2	A	12[A]	HP2	O4-C24	2.76	1.28	1.23
2	B	11	HP2	C14-C12	2.62	1.41	1.38
2	A	12[B]	HP2	C25-N10	2.20	1.40	1.34
2	A	12[A]	HP2	C25-N10	2.20	1.40	1.34
2	B	11	HP2	C13-C16	2.12	1.41	1.39
2	B	11	HP2	C16-N5	2.08	1.40	1.36
2	B	11	HP2	C32-C4	-2.07	1.36	1.39

All (43) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	12[B]	HP2	C29-C30-C31	8.97	127.30	112.36
2	A	12[A]	HP2	C29-C30-C31	8.12	125.88	112.36
2	B	11	HP2	C29-C30-C31	7.02	124.05	112.36
2	A	12[B]	HP2	C29-N11-C23	6.15	136.10	122.08
2	A	12[A]	HP2	C29-N11-C23	6.15	136.10	122.08
2	A	12[B]	HP2	C8-N3-C10	-5.93	102.30	108.66
2	A	12[A]	HP2	C8-N3-C10	-5.93	102.30	108.66
2	B	11	HP2	C-N8-C24	-5.41	112.52	126.58
2	A	12[A]	HP2	C18-N6-C31	4.72	131.59	122.84
2	A	12[B]	HP2	C30-C31-N6	4.47	123.94	116.42
2	A	12[B]	HP2	C12-N4-C11	-4.39	115.17	126.58
2	A	12[A]	HP2	C12-N4-C11	-4.39	115.17	126.58
2	B	11	HP2	C25-C24-N8	4.34	118.40	113.69
2	A	12[B]	HP2	C28-N9-C25	3.92	131.94	126.39
2	A	12[A]	HP2	C28-N9-C25	3.92	131.94	126.39
2	A	12[B]	HP2	C18-N6-C31	3.85	129.99	122.84
2	A	12[B]	HP2	C25-C24-N8	3.66	117.67	113.69
2	A	12[A]	HP2	C25-C24-N8	3.66	117.67	113.69
2	A	12[B]	HP2	O3-C23-N11	3.63	129.84	122.61
2	A	12[A]	HP2	O3-C23-N11	3.63	129.84	122.61
2	A	12[B]	HP2	C19-C20-N7	3.44	123.09	113.79
2	A	12[A]	HP2	C19-C20-N7	3.24	122.56	113.79
2	B	11	HP2	C28-N9-C25	3.14	130.84	126.39
2	B	11	HP2	C14-N5-C16	-3.12	105.34	108.65
2	A	12[B]	HP2	C2-N-C4	-3.11	105.35	108.65
2	A	12[A]	HP2	C2-N-C4	-3.11	105.35	108.65
2	A	12[B]	HP2	C27-N9-C25	-3.09	105.05	108.56
2	A	12[A]	HP2	C27-N9-C25	-3.09	105.05	108.56
2	A	12[B]	HP2	O5-C31-C30	-3.07	116.39	122.02
2	A	12[B]	HP2	O2-C11-N4	2.95	130.45	123.71
2	A	12[A]	HP2	O2-C11-N4	2.95	130.45	123.71
2	B	11	HP2	C8-N3-C10	-2.91	105.53	108.66
2	A	12[B]	HP2	C6-N1-C5	-2.85	119.12	126.93
2	A	12[A]	HP2	C6-N1-C5	-2.85	119.12	126.93
2	A	12[A]	HP2	C19-C18-N6	-2.73	104.39	112.21
2	B	11	HP2	C12-N4-C11	-2.52	120.03	126.58
2	B	11	HP2	C2-N-C4	-2.33	106.18	108.65
2	A	12[B]	HP2	C14-C12-C13	2.29	107.17	106.05
2	A	12[A]	HP2	C14-C12-C13	2.29	107.17	106.05
2	A	12[B]	HP2	C30-C29-N11	2.29	116.52	111.90
2	B	11	HP2	C19-C20-N7	2.09	119.45	113.79
2	A	12[B]	HP2	C2-C-C32	2.04	107.05	106.05
2	A	12[A]	HP2	C2-C-C32	2.04	107.05	106.05

There are no chirality outliers.

All (15) torsion outliers are listed below:

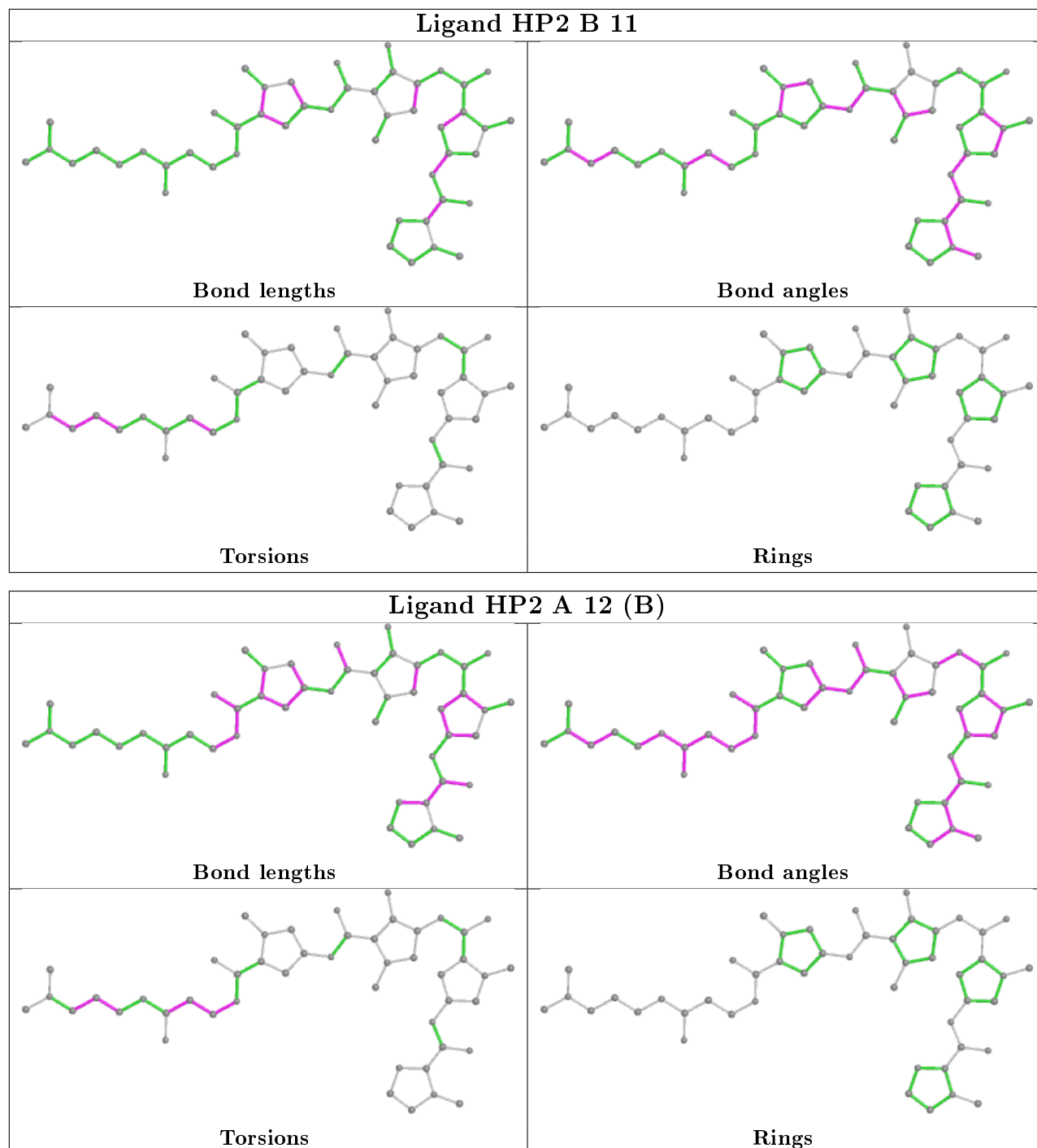
Mol	Chain	Res	Type	Atoms
2	A	12[B]	HP2	N11-C29-C30-C31
2	A	12[A]	HP2	N6-C18-C19-C20
2	A	12[A]	HP2	N11-C29-C30-C31
2	A	12[B]	HP2	C30-C29-N11-C23
2	A	12[A]	HP2	C30-C29-N11-C23
2	A	12[B]	HP2	N6-C18-C19-C20
2	A	12[B]	HP2	C18-C19-C20-N7
2	B	11	HP2	C18-C19-C20-N7
2	B	11	HP2	C19-C20-N7-C22
2	A	12[A]	HP2	C19-C20-N7-C22
2	A	12[B]	HP2	C29-C30-C31-N6
2	A	12[A]	HP2	C19-C20-N7-C21
2	A	12[B]	HP2	C29-C30-C31-O5
2	B	11	HP2	N11-C29-C30-C31
2	B	11	HP2	N6-C18-C19-C20

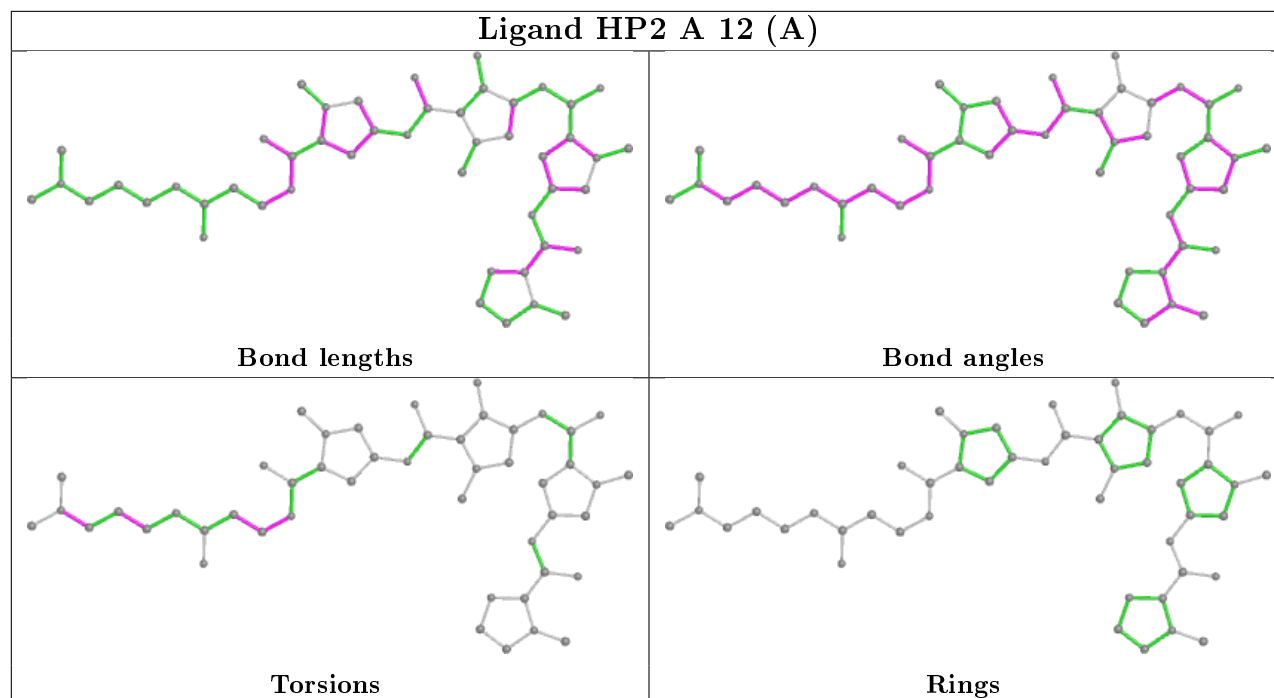
There are no ring outliers.

3 monomers are involved in 32 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	11	HP2	28	0
2	A	12[B]	HP2	2	0
2	A	12[A]	HP2	2	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.





## 5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [\(i\)](#)

There are no chain breaks in this entry.

## 6 Fit of model and data

### 6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

### 6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.