Full wwPDB X-ray Structure Validation Report (i)

Aug 23, 2026 – 09:11 am BST

PDB ID	:	8C35 / pdb_00008c35
Title	:	Dark state 2.1 Angstrom crystal structure of H132A variant of cobalamin binding domain belonging to a light-dependent transcription regulator TtCarH
Authors	:	Poddar, H.; Leys, D.
Deposited on	:	2022-12-23
Resolution	:	2.10 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*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

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

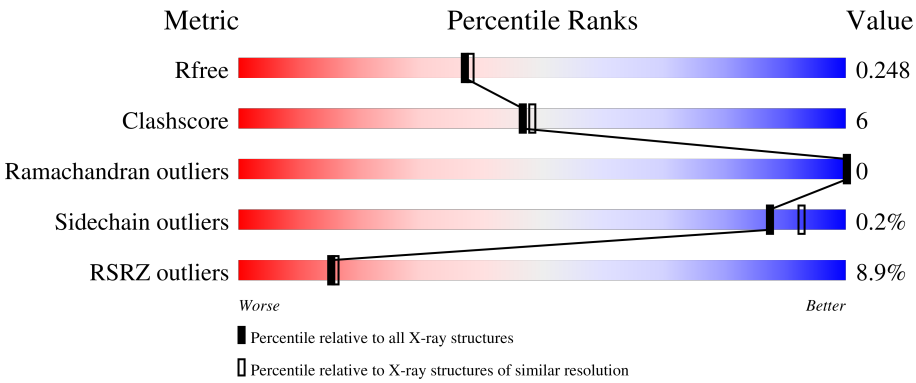
MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.50

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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))
R_{free}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (2.10-2.10)

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 of the lower bar indicate the fraction of residues that contain outliers for >=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 <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	215	3% 84% 6% 10%
1	B	215	3% 75% 14% 10%
1	C	215	13% 86% • 11%
1	D	215	13% 82% 7% 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	B12	A	301	X	-	-	-
2	B12	B	301	X	-	-	-
2	B12	C	301	X	-	-	-
2	B12	D	301	X	-	-	-

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 6690 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 protein called Probable transcriptional regulator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	194	1458	932	263	261	2	0	0	0
1	B	194	1463	938	264	259	2	0	0	0
1	C	192	1441	923	261	255	2	0	0	0
1	D	193	1460	937	263	258	2	0	1	0

There are 32 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	132	ALA	HIS	engineered mutation	UNP Q746J7
A	286	GLY	-	expression tag	UNP Q746J7
A	287	HIS	-	expression tag	UNP Q746J7
A	288	HIS	-	expression tag	UNP Q746J7
A	289	HIS	-	expression tag	UNP Q746J7
A	290	HIS	-	expression tag	UNP Q746J7
A	291	HIS	-	expression tag	UNP Q746J7
A	292	HIS	-	expression tag	UNP Q746J7
B	132	ALA	HIS	engineered mutation	UNP Q746J7
B	286	GLY	-	expression tag	UNP Q746J7
B	287	HIS	-	expression tag	UNP Q746J7
B	288	HIS	-	expression tag	UNP Q746J7
B	289	HIS	-	expression tag	UNP Q746J7
B	290	HIS	-	expression tag	UNP Q746J7
B	291	HIS	-	expression tag	UNP Q746J7
B	292	HIS	-	expression tag	UNP Q746J7
C	132	ALA	HIS	engineered mutation	UNP Q746J7
C	286	GLY	-	expression tag	UNP Q746J7
C	287	HIS	-	expression tag	UNP Q746J7
C	288	HIS	-	expression tag	UNP Q746J7
C	289	HIS	-	expression tag	UNP Q746J7

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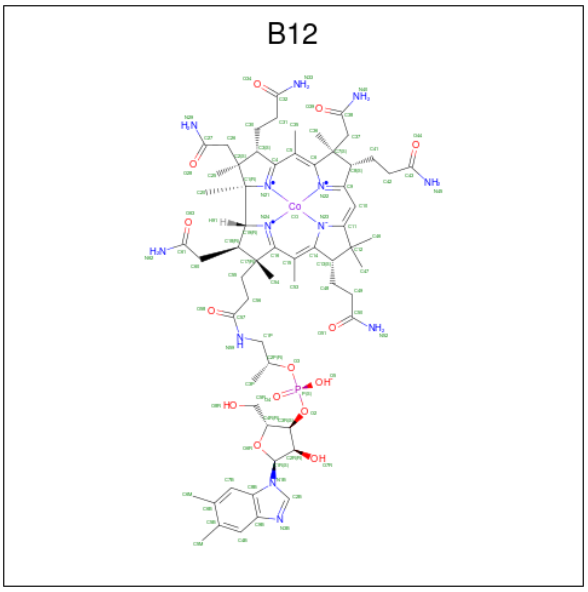
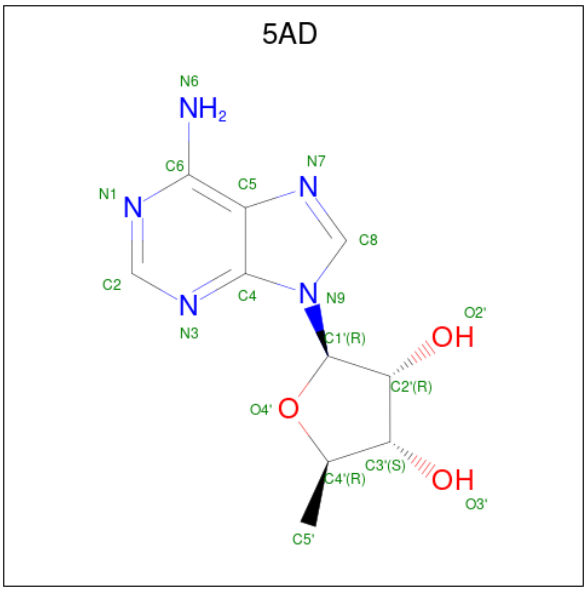
Chain	Residue	Modelled	Actual	Comment	Reference
C	290	HIS	-	expression tag	UNP Q746J7
C	291	HIS	-	expression tag	UNP Q746J7
C	292	HIS	-	expression tag	UNP Q746J7
D	132	ALA	HIS	engineered mutation	UNP Q746J7
D	286	GLY	-	expression tag	UNP Q746J7
D	287	HIS	-	expression tag	UNP Q746J7
D	288	HIS	-	expression tag	UNP Q746J7
D	289	HIS	-	expression tag	UNP Q746J7
D	290	HIS	-	expression tag	UNP Q746J7
D	291	HIS	-	expression tag	UNP Q746J7
D	292	HIS	-	expression tag	UNP Q746J7

- Molecule 2 is COBALAMIN (CCD ID: B12) (formula: $C_{62}H_{89}CoN_{13}O_{14}P$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
			Total	C	Co	N	O	P		
2	A	1	91	62	1	13	14	1	0	0
2	B	1	91	62	1	13	14	1	0	0
2	C	1	91	62	1	13	14	1	0	0
2	D	1	91	62	1	13	14	1	0	0

- Molecule 3 is 5'-DEOXYADENOSINE (CCD ID: 5AD) (formula: $C_{10}H_{13}N_5O_3$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
3	A	1	18	10	5	3	0	0
			Total	C	N	O		
3	B	1	18	10	5	3	0	0
			Total	C	N	O		
3	C	1	18	10	5	3	0	0
			Total	C	N	O		
3	D	1	18	10	5	3	0	0

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	102	102	102	0	0
			Total	O		
4	B	101	101	101	0	0
			Total	O		
4	C	109	109	109	0	0
			Total	O		
4	D	120	120	120	0	0

3 Residue-property plots (i)

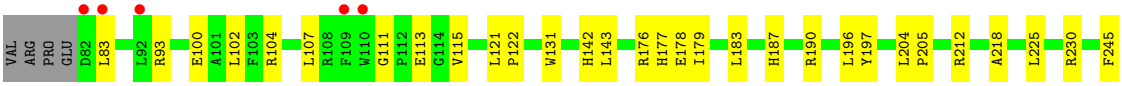
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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. A red dot above a residue indicates a poor fit to the electron density (RSRZ > 2). 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.

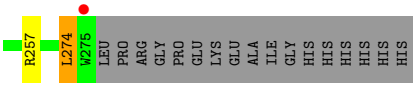
• Molecule 1: Probable transcriptional regulator

Chain A:

• Molecule 1: Probable transcriptional regulator

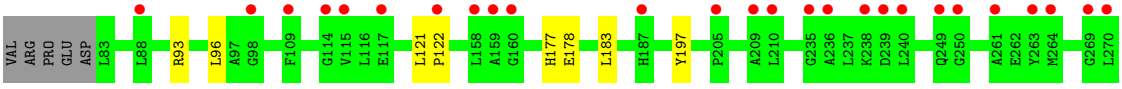
Chain B:

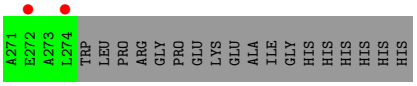




• Molecule 1: Probable transcriptional regulator

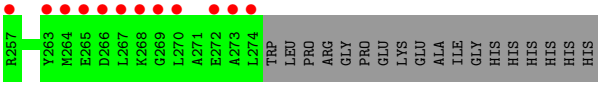
Chain C:





• Molecule 1: Probable transcriptional regulator

Chain D:


R257
Y263
M264
E265
D266
L267
K268
G269
L270
A271
E272
A273
L274
TRP
LEU
PRO
ARG
GLY
PRO
GLU
LYS
GLU
ALA
ILE
GLY
HIS
HIS
HIS
HIS
HIS
HIS

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	63.92Å 69.97Å 204.56Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	51.19 – 2.10 51.19 – 2.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (51.19-2.10) 100.0 (51.19-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.27 (at 2.10Å)	Xtriage
Refinement program	REFMAC 5.8.0403	Depositor
R, R_{free}	0.186 , 0.223 0.220 , 0.248	Depositor DCC
R_{free} test set	2722 reflections (4.99%)	wwPDB-VP
Wilson B-factor (Å^2)	35.9	Xtriage
Anisotropy	0.350	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.36 , 47.3	EDS
L-test for twinning[2]	$< \|L\| > = 0.50$, $< L^2 > = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	6690	wwPDB-VP
Average B, all atoms (Å^2)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.71% of the height of the origin peak. No significant pseudotranslation is detected.*

[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

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: 5AD, B12

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	0.61	0/1489	0.92	0/2023
1	B	0.64	0/1496	0.98	0/2034
1	C	0.64	0/1472	0.92	0/2000
1	D	0.62	0/1496	0.90	0/2034
All	All	0.63	0/5953	0.93	0/8091

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand.A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1
1	B	0	1
1	C	0	1
1	D	0	2
All	All	0	5

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	93	ARG	Sidechain
1	B	93	ARG	Sidechain
1	C	93	ARG	Sidechain
1	D	213	ARG	Sidechain
1	D	93	ARG	Sidechain

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	1458	0	1494	10	0
1	B	1463	0	1498	26	0
1	C	1441	0	1484	5	0
1	D	1460	0	1498	9	0
2	A	91	0	87	8	0
2	B	91	0	87	12	0
2	C	91	0	87	7	0
2	D	91	0	87	6	0
3	A	18	0	12	2	0
3	B	18	0	12	1	0
3	C	18	0	12	0	0
3	D	18	0	12	0	0
4	A	102	0	0	1	0
4	B	101	0	0	3	0
4	C	109	0	0	1	0
4	D	120	0	0	0	0
All	All	6690	0	6370	72	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 6.

All (72) 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)
2:A:301:B12:H362	2:A:301:B12:H351	1.39	1.02
2:D:301:B12:H362	2:D:301:B12:H351	1.59	0.84
2:C:301:B12:H362	2:C:301:B12:H351	1.62	0.82
1:B:113:GLU:OE2	1:B:190:ARG:HD3	1.80	0.81
2:D:301:B12:H552	2:D:301:B12:H531	1.65	0.78
1:A:254:GLU:HG2	4:A:482:HOH:O	1.88	0.73
2:C:301:B12:H552	2:C:301:B12:H531	1.69	0.72
2:A:301:B12:H351	2:A:301:B12:C36	2.19	0.72
2:A:301:B12:H531	2:A:301:B12:H552	1.71	0.72
1:D:121:LEU:HD21	1:D:183:LEU:HD11	1.73	0.71
2:B:301:B12:H362	2:B:301:B12:H351	1.73	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:113:GLU:OE2	1:B:190:ARG:CD	2.42	0.67
2:B:301:B12:H552	2:B:301:B12:H531	1.75	0.67
1:B:121:LEU:HD21	1:B:183:LEU:HD11	1.80	0.64
2:B:301:B12:O28	2:B:301:B12:H3	1.99	0.62
1:B:187:HIS:CD2	1:B:190:ARG:HH21	2.20	0.60
2:D:301:B12:H531	2:D:301:B12:C55	2.31	0.60
2:B:301:B12:H531	2:B:301:B12:C55	2.32	0.58
2:C:301:B12:H531	2:C:301:B12:C55	2.34	0.58
2:C:301:B12:H482	2:C:301:B12:H533	1.86	0.58
2:A:301:B12:H531	2:A:301:B12:C55	2.33	0.58
1:B:178:GLU:HB2	1:B:197:TYR:OH	2.03	0.57
2:A:301:B12:H362	2:A:301:B12:C35	2.24	0.56
1:B:187:HIS:HD2	1:B:190:ARG:HH21	1.53	0.55
1:D:177:HIS:CE1	2:D:301:B12:N22	2.75	0.55
2:B:301:B12:H301	2:B:301:B12:H353	1.89	0.55
1:B:143:LEU:HD12	4:B:445:HOH:O	2.07	0.54
1:B:111:GLY:O	1:B:115:VAL:HG23	2.10	0.52
1:D:178:GLU:HB2	1:D:197:TYR:OH	2.10	0.52
1:B:177:HIS:CE1	2:B:301:B12:N22	2.78	0.52
2:C:301:B12:H203	2:C:301:B12:H301	1.92	0.51
1:A:96:LEU:HD11	1:B:196:LEU:HD23	1.93	0.51
1:B:245:PHE:CE2	1:B:274:LEU:HG	2.45	0.51
1:A:177:HIS:CE1	2:A:301:B12:N22	2.79	0.50
1:B:212:ARG:HH11	1:B:212:ARG:HG2	1.77	0.50
1:B:218:ALA:HB2	1:B:274:LEU:HD21	1.92	0.49
1:C:96:LEU:HD11	1:D:196:LEU:HD23	1.94	0.49
2:B:301:B12:H253	2:B:301:B12:H311	1.95	0.49
1:A:198:LEU:O	1:B:142:HIS:HB3	2.14	0.48
2:C:301:B12:H351	2:C:301:B12:C36	2.39	0.48
1:C:178:GLU:HB2	1:C:197:TYR:OH	2.14	0.47
1:B:257:ARG:NH1	4:B:406:HOH:O	2.47	0.47
2:D:301:B12:H482	2:D:301:B12:H533	1.96	0.47
1:A:131:TRP:CZ2	3:A:302:5AD:H8	2.50	0.46
1:B:225:LEU:CD2	2:B:301:B12:H312	2.46	0.46
2:B:301:B12:H621	2:B:301:B12:H18	1.64	0.46
1:C:177:HIS:CE1	2:C:301:B12:N22	2.83	0.46
1:B:176:ARG:H	2:B:301:B12:H452	1.63	0.46
1:A:143:LEU:HD23	1:A:143:LEU:C	2.41	0.46
1:B:179:ILE:HB	2:B:301:B12:O58	2.15	0.46
1:A:178:GLU:HB2	1:A:197:TYR:OH	2.16	0.46
1:A:131:TRP:CD2	3:A:302:5AD:H3'	2.51	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:107:LEU:HA	1:B:115:VAL:HG21	1.99	0.45
1:C:121:LEU:HD21	1:C:183:LEU:HD11	1.99	0.45
1:B:121:LEU:HB2	1:B:122:PRO:HD3	1.99	0.44
2:A:301:B12:O28	2:A:301:B12:H3	2.17	0.43
1:B:131:TRP:CD2	3:B:302:5AD:H3'	2.53	0.43
2:A:301:B12:H301	2:A:301:B12:H203	1.99	0.43
1:D:121:LEU:HB2	1:D:122:PRO:HD3	2.00	0.43
2:D:301:B12:H203	2:D:301:B12:H301	1.99	0.43
1:B:204:LEU:N	1:B:205:PRO:HD2	2.34	0.42
1:D:160:GLY:O	1:D:189:ARG:HD3	2.19	0.42
1:B:100:GLU:O	1:B:104:ARG:HG2	2.19	0.42
1:B:121:LEU:HD13	2:B:301:B12:H5R2	2.01	0.42
1:A:184:ALA:HA	1:A:267:LEU:HD22	2.02	0.42
1:B:83:LEU:HD22	1:B:102:LEU:HD22	2.01	0.41
1:B:230:ARG:HG3	4:B:466:HOH:O	2.20	0.41
4:C:494:HOH:O	1:D:143:LEU:HD12	2.21	0.41
1:C:121:LEU:HB2	1:C:122:PRO:HD3	2.01	0.41
1:D:232:LEU:HA	1:D:233:PRO:HD3	1.95	0.41
1:D:100:GLU:O	1:D:104:ARG:HG2	2.20	0.41
1:A:121:LEU:HB3	1:A:122:PRO:HD3	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	192/215 (89%)	189 (98%)	3 (2%)	0	100	100
1	B	192/215 (89%)	190 (99%)	2 (1%)	0	100	100
1	C	190/215 (88%)	186 (98%)	4 (2%)	0	100	100
1	D	192/215 (89%)	189 (98%)	3 (2%)	0	100	100
All	All	766/860 (89%)	754 (98%)	12 (2%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	142/160 (89%)	142 (100%)	0	100	100
1	B	142/160 (89%)	141 (99%)	1 (1%)	76	83
1	C	140/160 (88%)	140 (100%)	0	100	100
1	D	142/160 (89%)	142 (100%)	0	100	100
All	All	566/640 (88%)	565 (100%)	1 (0%)	87	93

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	274	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	118	HIS
1	A	249	GLN
1	B	153	GLN
1	B	187	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry (i)

8 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	B12	C	301	1	93,101,101	1.36	12 (12%)	146,166,166	1.88	29 (19%)
2	B12	D	301	1	93,101,101	1.28	11 (11%)	146,166,166	1.96	25 (17%)
3	5AD	C	302	-	20,20,20	0.32	0	27,30,30	0.74	1 (3%)
3	5AD	D	302	-	20,20,20	0.48	0	27,30,30	0.53	0
2	B12	A	301	1	93,101,101	1.51	11 (11%)	146,166,166	1.84	24 (16%)
2	B12	B	301	1	93,101,101	1.33	10 (10%)	146,166,166	1.96	26 (17%)
3	5AD	B	302	-	20,20,20	0.32	0	27,30,30	0.50	0
3	5AD	A	302	-	20,20,20	0.42	0	27,30,30	0.57	0

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	B12	C	301	1	1/1/36/38	19/56/223/223	0/3/11/11
2	B12	D	301	1	1/1/36/38	13/56/223/223	0/3/11/11
3	5AD	C	302	-	-	0/4/20/20	0/3/3/3
3	5AD	D	302	-	-	0/4/20/20	0/3/3/3
2	B12	A	301	1	1/1/36/38	14/56/223/223	0/3/11/11
2	B12	B	301	1	1/1/36/38	14/56/223/223	0/3/11/11
3	5AD	B	302	-	-	0/4/20/20	0/3/3/3
3	5AD	A	302	-	-	0/4/20/20	0/3/3/3

All (44) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	B12	C19-N24	-5.68	1.38	1.48
2	A	301	B12	C8B-C9B	5.10	1.48	1.40
2	A	301	B12	C14-N23	-4.96	1.28	1.35
2	B	301	B12	C8B-C9B	4.37	1.47	1.40
2	C	301	B12	C8B-C9B	4.35	1.47	1.40
2	B	301	B12	C9-N22	4.19	1.41	1.30
2	D	301	B12	C8B-C9B	4.18	1.47	1.40
2	A	301	B12	C16-C15	-4.01	1.33	1.44
2	D	301	B12	C9-N22	3.94	1.40	1.30
2	D	301	B12	C16-C15	-3.86	1.33	1.44
2	C	301	B12	C14-N23	-3.85	1.30	1.35
2	C	301	B12	C19-N24	-3.75	1.41	1.48
2	B	301	B12	C14-N23	-3.73	1.30	1.35
2	A	301	B12	C6B-C5B	3.71	1.50	1.40
2	C	301	B12	C16-C15	-3.65	1.34	1.44
2	A	301	B12	C2B-N3B	3.64	1.38	1.31
2	D	301	B12	C14-N23	-3.59	1.30	1.35
2	C	301	B12	C9-N22	3.52	1.39	1.30
2	C	301	B12	C8B-N1B	-3.49	1.32	1.39
2	B	301	B12	C16-C15	-3.41	1.35	1.44
2	A	301	B12	C8B-N1B	-3.31	1.32	1.39
2	B	301	B12	C8B-N1B	-3.30	1.32	1.39
2	D	301	B12	C6B-C5B	3.09	1.48	1.40
2	A	301	B12	C14-C15	2.93	1.50	1.38
2	D	301	B12	C8B-N1B	-2.92	1.33	1.39
2	B	301	B12	C6B-C5B	2.91	1.48	1.40
2	C	301	B12	C6B-C5B	2.90	1.48	1.40
2	B	301	B12	C19-N24	-2.80	1.43	1.48
2	B	301	B12	C10-C9	2.80	1.47	1.39
2	D	301	B12	O3-C2P	-2.65	1.38	1.45
2	D	301	B12	C9B-N3B	-2.64	1.34	1.39
2	C	301	B12	O3-C2P	-2.58	1.38	1.45
2	B	301	B12	C2B-N3B	2.56	1.36	1.31
2	A	301	B12	C9-N22	2.51	1.37	1.30
2	D	301	B12	C19-N24	-2.41	1.44	1.48
2	A	301	B12	O3-C2P	-2.36	1.39	1.45
2	C	301	B12	C9B-N3B	-2.36	1.35	1.39
2	B	301	B12	O6R-C1R	2.33	1.47	1.42
2	D	301	B12	C14-C15	2.28	1.48	1.38
2	C	301	B12	O34-C32	-2.16	1.17	1.24
2	C	301	B12	C10-C11	-2.10	1.31	1.38
2	D	301	B12	C11-N23	-2.10	1.33	1.37
2	C	301	B12	O58-C57	-2.04	1.19	1.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	301	B12	C9B-N3B	-2.02	1.36	1.39

All (105) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	301	B12	C1-C19-N24	8.99	116.35	106.24
2	D	301	B12	C2P-C1P-N59	-8.74	100.04	112.93
2	D	301	B12	C20-C1-C19	-8.50	101.17	109.36
2	D	301	B12	C1-C19-N24	8.41	115.70	106.24
2	C	301	B12	C1-C19-N24	8.13	115.38	106.24
2	C	301	B12	C20-C1-C19	-7.42	102.20	109.36
2	A	301	B12	C2P-C1P-N59	-7.19	102.33	112.93
2	A	301	B12	C1-C19-C18	7.19	133.69	121.88
2	B	301	B12	C18-C19-N24	6.87	112.77	102.31
2	A	301	B12	C1-C19-N24	6.78	113.87	106.24
2	D	301	B12	C18-C19-N24	6.65	112.42	102.31
2	A	301	B12	C20-C1-C19	-6.56	103.03	109.36
2	C	301	B12	C18-C19-N24	6.51	112.22	102.31
2	C	301	B12	C2P-C1P-N59	-6.29	103.67	112.93
2	A	301	B12	C18-C19-N24	5.97	111.40	102.31
2	B	301	B12	C20-C1-C19	-5.68	103.88	109.36
2	C	301	B12	C1-C19-C18	5.66	131.18	121.88
2	A	301	B12	C9B-C8B-N1B	5.55	107.69	105.35
2	B	301	B12	C2P-C1P-N59	-5.35	105.05	112.93
2	D	301	B12	C1-C19-C18	5.31	130.59	121.88
2	B	301	B12	C26-C2-C1	4.93	117.68	110.01
2	B	301	B12	C1-C19-C18	4.73	129.65	121.88
2	D	301	B12	O3-C2P-C1P	-4.69	97.55	106.92
2	B	301	B12	C8B-C9B-N3B	-4.68	104.80	109.97
2	B	301	B12	C30-C3-C4	4.41	119.89	109.63
2	B	301	B12	C8B-N1B-C2B	4.32	110.40	106.37
2	C	301	B12	C13-C14-N23	4.15	114.75	109.10
2	B	301	B12	O6R-C4R-C5R	4.11	118.10	109.21
2	B	301	B12	C9B-N3B-C2B	3.88	109.06	104.44
2	B	301	B12	C13-C14-N23	3.87	114.37	109.10
2	B	301	B12	C2-C3-C4	3.79	105.94	101.63
2	D	301	B12	C60-C18-C19	3.65	124.16	114.62
2	C	301	B12	O6R-C1R-N1B	-3.54	101.08	108.06
2	B	301	B12	N1B-C2B-N3B	-3.52	109.11	113.91
2	C	301	B12	C2-C1-C19	3.46	124.06	118.60
2	D	301	B12	C13-C14-N23	3.42	113.76	109.10
2	B	301	B12	C55-C56-C57	-3.36	103.90	111.23

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	D	301	B12	C26-C2-C1	3.35	115.23	110.01
2	C	301	B12	C13-C14-C15	-3.35	119.20	124.32
2	D	301	B12	C8B-C9B-N3B	-3.31	106.31	109.97
2	D	301	B12	C8B-N1B-C2B	3.22	109.37	106.37
2	C	301	B12	C12-C11-C10	-3.18	119.23	123.37
2	D	301	B12	C9B-N3B-C2B	3.18	108.22	104.44
2	A	301	B12	C8B-C9B-N3B	-3.17	106.47	109.97
2	C	301	B12	C8B-N1B-C2B	3.14	109.30	106.37
2	D	301	B12	C2-C1-C19	2.99	123.33	118.60
2	B	301	B12	C9B-C8B-N1B	2.98	106.61	105.35
2	A	301	B12	C3P-C2P-C1P	2.98	117.17	111.39
2	A	301	B12	C12-C11-C10	-2.97	119.50	123.37
2	B	301	B12	C60-C18-C19	2.91	122.22	114.62
2	B	301	B12	C13-C14-C15	-2.91	119.87	124.32
2	D	301	B12	C18-C17-C16	2.87	104.15	100.67
2	A	301	B12	C2R-C1R-N1B	2.87	120.56	113.30
2	C	301	B12	O5-P-O4	2.86	126.40	112.24
2	D	301	B12	C19-C1-N21	2.84	105.08	102.16
2	C	301	B12	C60-C18-C19	2.84	122.03	114.62
2	D	301	B12	O63-C61-C60	2.78	126.73	120.87
2	B	301	B12	C2-C1-N21	2.76	105.61	101.77
2	C	301	B12	C17-C16-N24	-2.75	106.91	111.15
2	B	301	B12	C25-C2-C1	-2.74	109.65	113.78
2	C	301	B12	C18-C17-C16	2.70	103.95	100.67
2	B	301	B12	C4B-C9B-N3B	2.69	135.12	130.51
2	D	301	B12	C13-C14-C15	-2.65	120.28	124.32
2	C	301	B12	N1B-C2B-N3B	-2.64	110.31	113.91
2	A	301	B12	C54-C17-C18	2.61	116.84	112.98
2	B	301	B12	C12-C11-C10	-2.59	119.99	123.37
2	D	301	B12	N1B-C2B-N3B	-2.57	110.39	113.91
2	D	301	B12	C12-C11-C10	-2.56	120.04	123.37
2	B	301	B12	C60-C61-N62	2.51	122.24	116.21
2	A	301	B12	C31-C32-N33	2.49	124.26	116.51
2	A	301	B12	C26-C2-C1	2.48	113.87	110.01
2	C	301	B12	C9B-N3B-C2B	2.47	107.39	104.44
2	A	301	B12	C7-C37-C38	-2.47	106.83	114.25
2	C	301	B12	C8B-C9B-N3B	-2.46	107.25	109.97
2	A	301	B12	C13-C12-C11	-2.45	98.19	100.97
2	C	301	B12	C12-C11-N23	2.43	115.21	111.83
2	C	301	B12	C4B-C9B-N3B	2.35	134.55	130.51
2	C	301	B12	C31-C32-N33	2.35	123.82	116.51
2	D	301	B12	P-O2-C3R	-2.34	110.90	119.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	301	B12	O5-P-O2	2.33	115.99	106.78
2	A	301	B12	C60-C18-C19	2.29	120.61	114.62
2	C	301	B12	O2-P-O4	-2.28	100.89	109.47
2	C	301	B12	C3R-C2R-C1R	2.28	104.94	99.89
2	A	301	B12	C13-C14-N23	2.27	112.19	109.10
2	C	301	B12	C1-C2-C3	-2.24	98.73	101.60
2	C	301	B12	C5-C6-N22	-2.24	120.46	123.88
3	C	302	5AD	C5'-C4'-C3'	-2.24	113.35	115.70
2	D	301	B12	C20-C1-N21	-2.22	106.63	110.27
2	B	301	B12	C5R-C4R-C3R	-2.22	107.77	114.85
2	A	301	B12	C2R-C3R-C4R	2.22	107.16	103.22
2	A	301	B12	C2-C1-C19	2.19	122.06	118.60
2	A	301	B12	C4B-C9B-N3B	2.18	134.25	130.51
2	B	301	B12	C31-C30-C3	2.18	121.01	114.73
2	D	301	B12	C17-C16-N24	-2.15	107.83	111.15
2	A	301	B12	C36-C7-C37	2.14	114.33	110.80
2	C	301	B12	C56-C57-N59	2.13	120.01	116.42
2	D	301	B12	C4B-C9B-N3B	2.13	134.16	130.51
2	A	301	B12	C19-C1-N21	2.12	104.34	102.16
2	D	301	B12	C3R-C2R-C1R	2.09	104.52	99.89
2	D	301	B12	C2-C1-N21	2.07	104.65	101.77
2	C	301	B12	C2R-C1R-N1B	2.06	118.52	113.30
2	C	301	B12	O34-C32-N33	-2.04	116.93	122.50
2	B	301	B12	C3R-C2R-C1R	2.04	104.41	99.89
2	C	301	B12	C4B-C9B-C8B	-2.04	118.19	120.15
2	A	301	B12	C49-C48-C13	-2.02	108.90	114.73

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	301	B12	C19
2	B	301	B12	C19
2	C	301	B12	C19
2	D	301	B12	C19

All (60) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	301	B12	N59-C1P-C2P-C3P
2	A	301	B12	N59-C1P-C2P-O3
2	A	301	B12	C3P-C2P-O3-P
2	A	301	B12	C3R-O2-P-O5

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Mol	Chain	Res	Type	Atoms
2	B	301	B12	C18-C60-C61-O63
2	B	301	B12	C18-C60-C61-N62
2	B	301	B12	N59-C1P-C2P-C3P
2	B	301	B12	N59-C1P-C2P-O3
2	C	301	B12	C18-C60-C61-O63
2	C	301	B12	C18-C60-C61-N62
2	C	301	B12	N59-C1P-C2P-C3P
2	C	301	B12	N59-C1P-C2P-O3
2	C	301	B12	C1P-C2P-O3-P
2	C	301	B12	C3P-C2P-O3-P
2	C	301	B12	C3R-O2-P-O5
2	C	301	B12	C2R-C1R-N1B-C8B
2	D	301	B12	N59-C1P-C2P-C3P
2	D	301	B12	N59-C1P-C2P-O3
2	D	301	B12	C1P-C2P-O3-P
2	D	301	B12	C3P-C2P-O3-P
2	D	301	B12	C2P-O3-P-O2
2	D	301	B12	O6R-C1R-N1B-C8B
2	C	301	B12	O6R-C4R-C5R-O8R
2	C	301	B12	C3R-C4R-C5R-O8R
2	B	301	B12	O6R-C4R-C5R-O8R
2	B	301	B12	C3R-C4R-C5R-O8R
2	D	301	B12	C3R-O2-P-O3
2	A	301	B12	C2R-C1R-N1B-C8B
2	A	301	B12	O6R-C1R-N1B-C8B
2	B	301	B12	O6R-C1R-N1B-C8B
2	C	301	B12	O6R-C1R-N1B-C8B
2	D	301	B12	C2R-C1R-N1B-C8B
2	B	301	B12	C3R-O2-P-O3
2	C	301	B12	C2P-O3-P-O2
2	C	301	B12	C3R-O2-P-O3
2	B	301	B12	C2R-C1R-N1B-C8B
2	C	301	B12	C30-C31-C32-N33
2	C	301	B12	C30-C31-C32-O34
2	A	301	B12	C3R-O2-P-O4
2	B	301	B12	C2P-O3-P-O5
2	C	301	B12	C3R-O2-P-O4
2	D	301	B12	C3R-O2-P-O5
2	D	301	B12	C30-C31-C32-N33
2	A	301	B12	C1P-C2P-O3-P
2	A	301	B12	C3R-O2-P-O3
2	D	301	B12	C30-C31-C32-O34

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Mol	Chain	Res	Type	Atoms
2	A	301	B12	C2P-O3-P-O2
2	C	301	B12	C55-C56-C57-O58
2	C	301	B12	C2P-O3-P-O5
2	A	301	B12	C30-C31-C32-N33
2	A	301	B12	C55-C56-C57-O58
2	B	301	B12	C55-C56-C57-O58
2	D	301	B12	C55-C56-C57-O58
2	A	301	B12	C55-C56-C57-N59
2	B	301	B12	C55-C56-C57-N59
2	B	301	B12	C19-C18-C60-C61
2	C	301	B12	C55-C56-C57-N59
2	D	301	B12	C55-C56-C57-N59
2	A	301	B12	C30-C31-C32-O34
2	B	301	B12	C17-C18-C60-C61

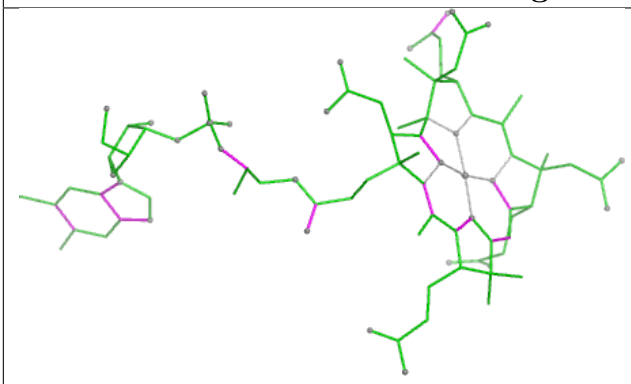
There are no ring outliers.

6 monomers are involved in 36 short contacts:

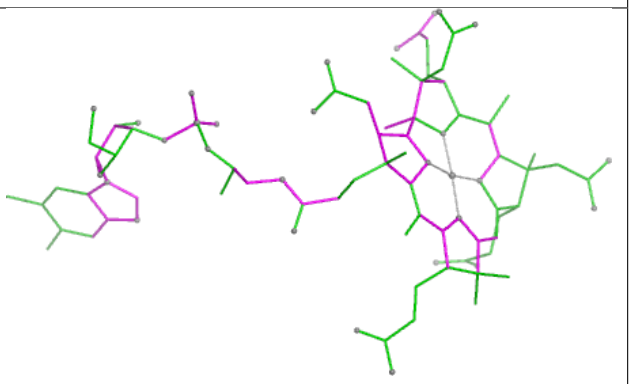
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	301	B12	7	0
2	D	301	B12	6	0
2	A	301	B12	8	0
2	B	301	B12	12	0
3	B	302	5AD	1	0
3	A	302	5AD	2	0

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 then 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.

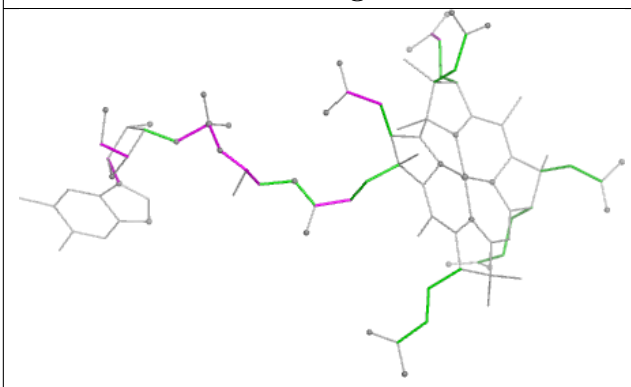
Ligand B12 C 301



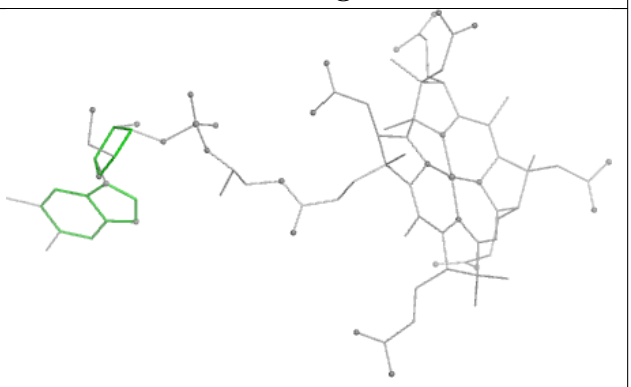
Bond lengths



Bond angles

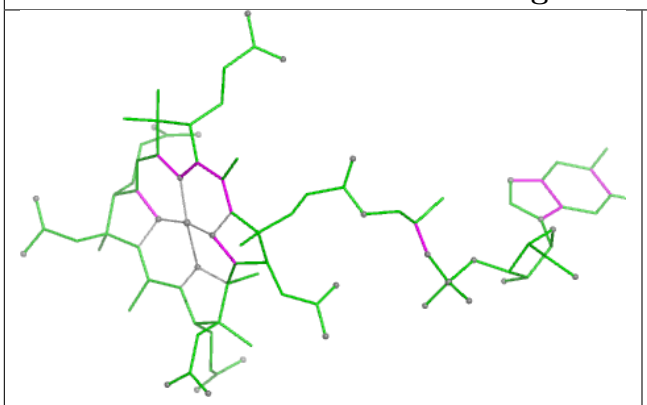


Torsions

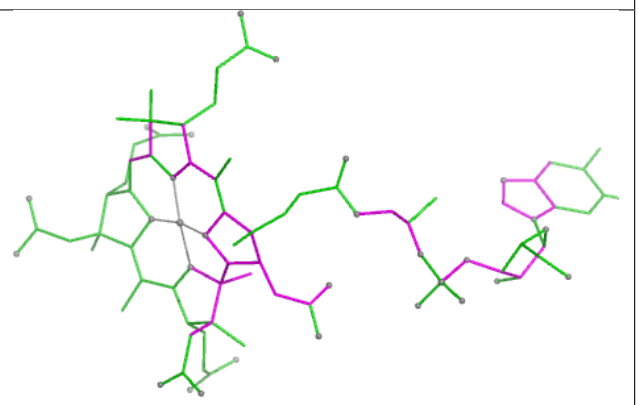


Rings

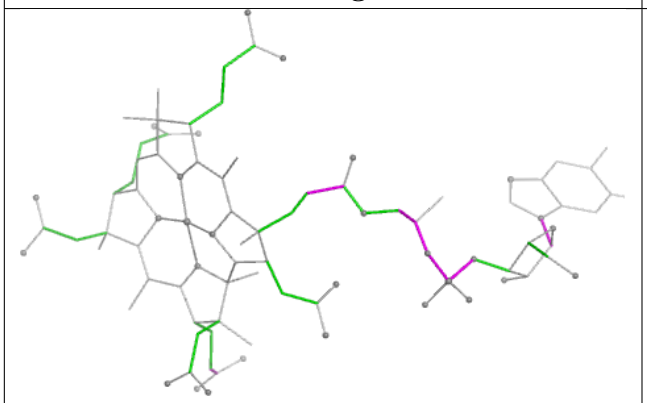
Ligand B12 D 301



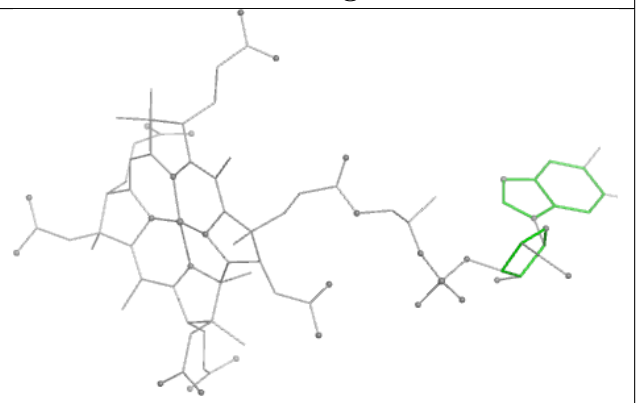
Bond lengths



Bond angles

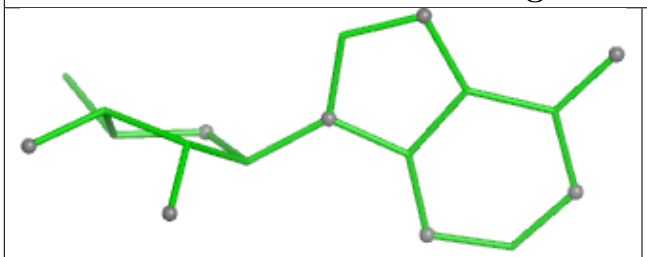


Torsions

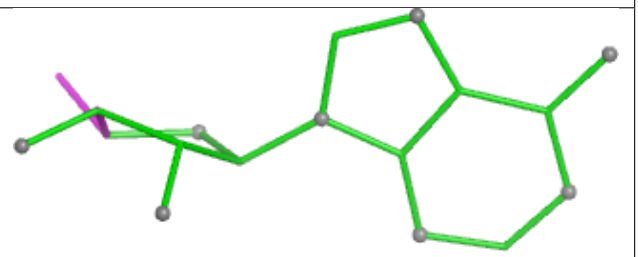


Rings

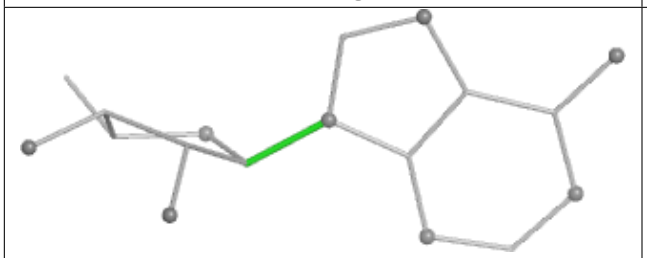
Ligand 5AD C 302



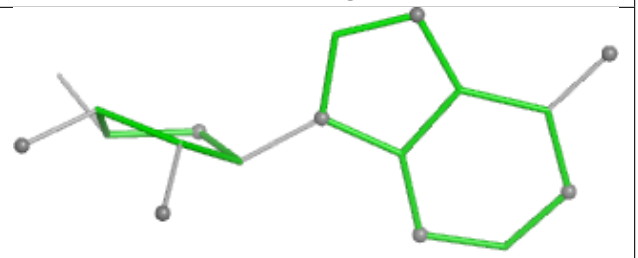
Bond lengths



Bond angles

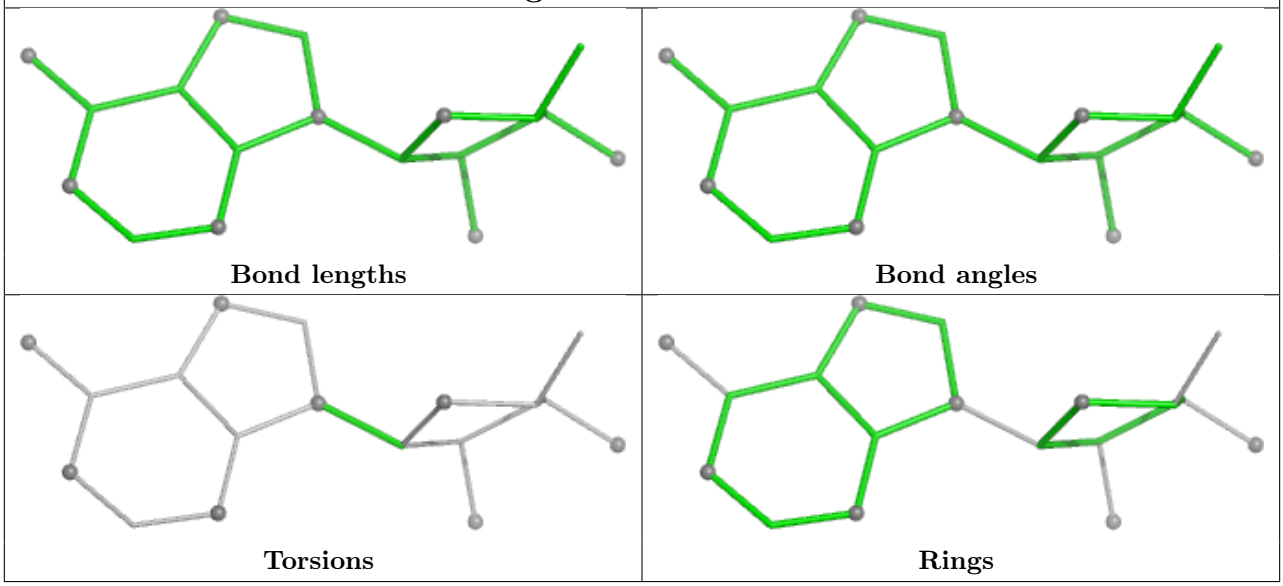


Torsions

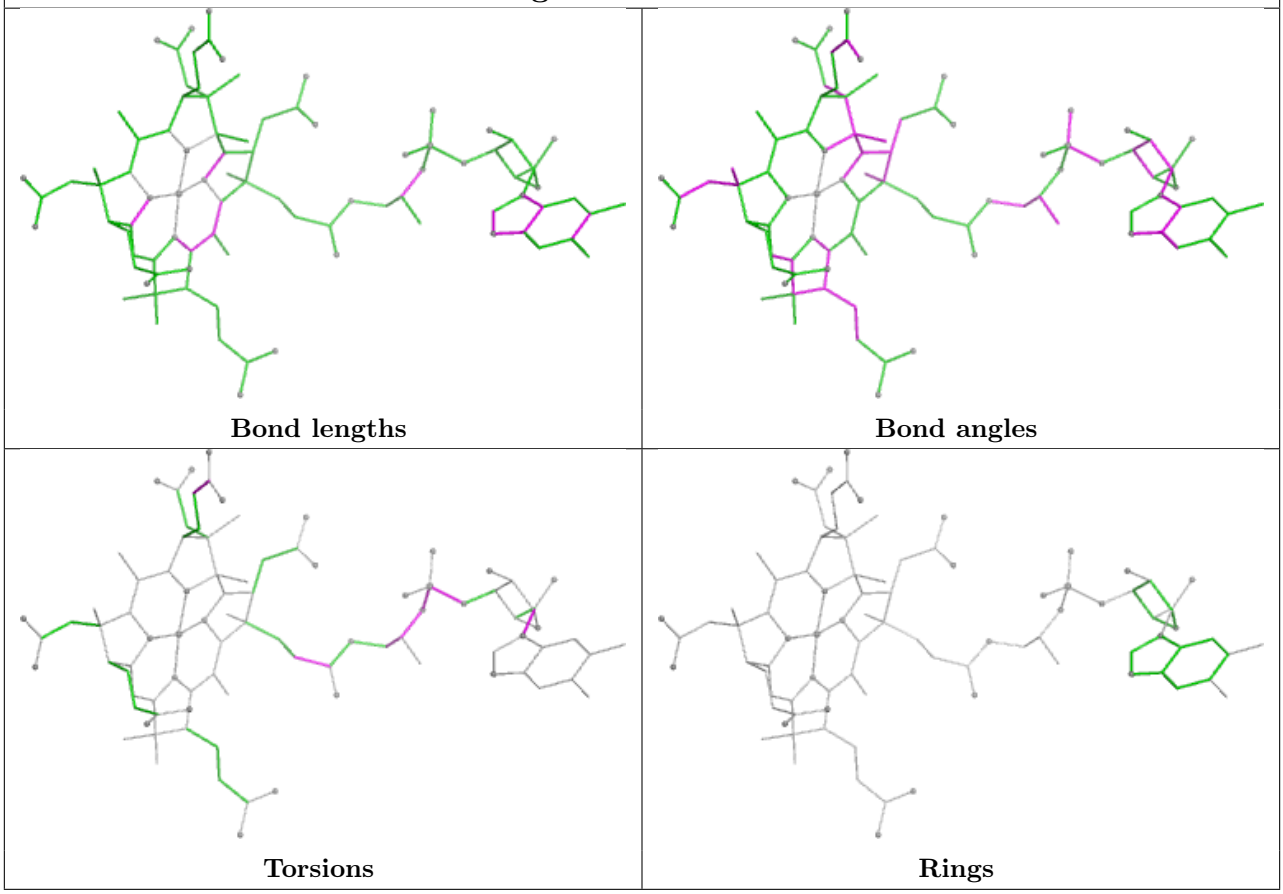


Rings

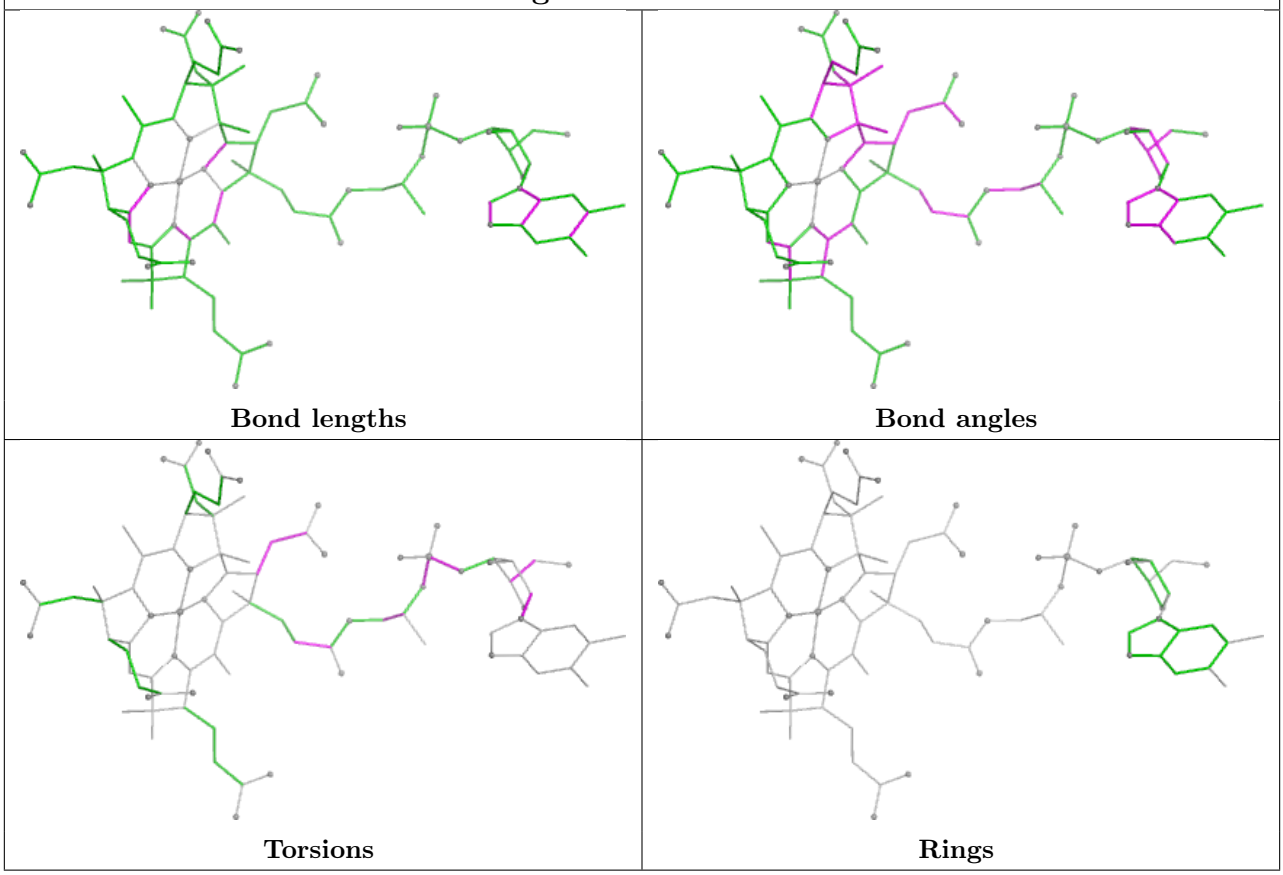
Ligand 5AD D 302



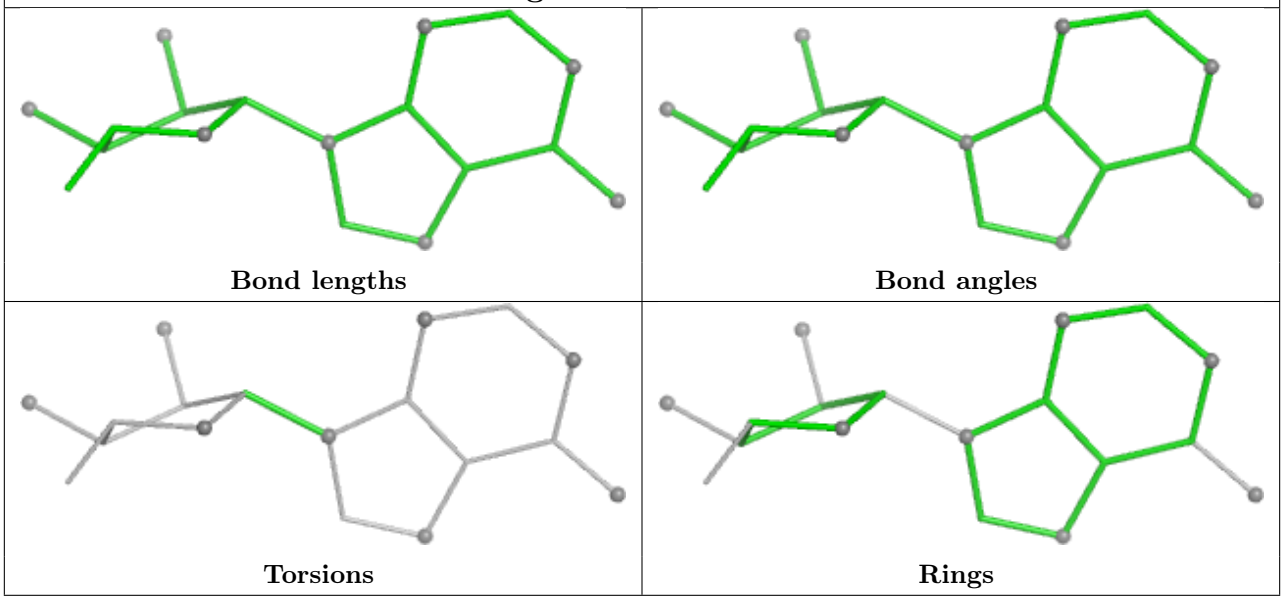
Ligand B12 A 301



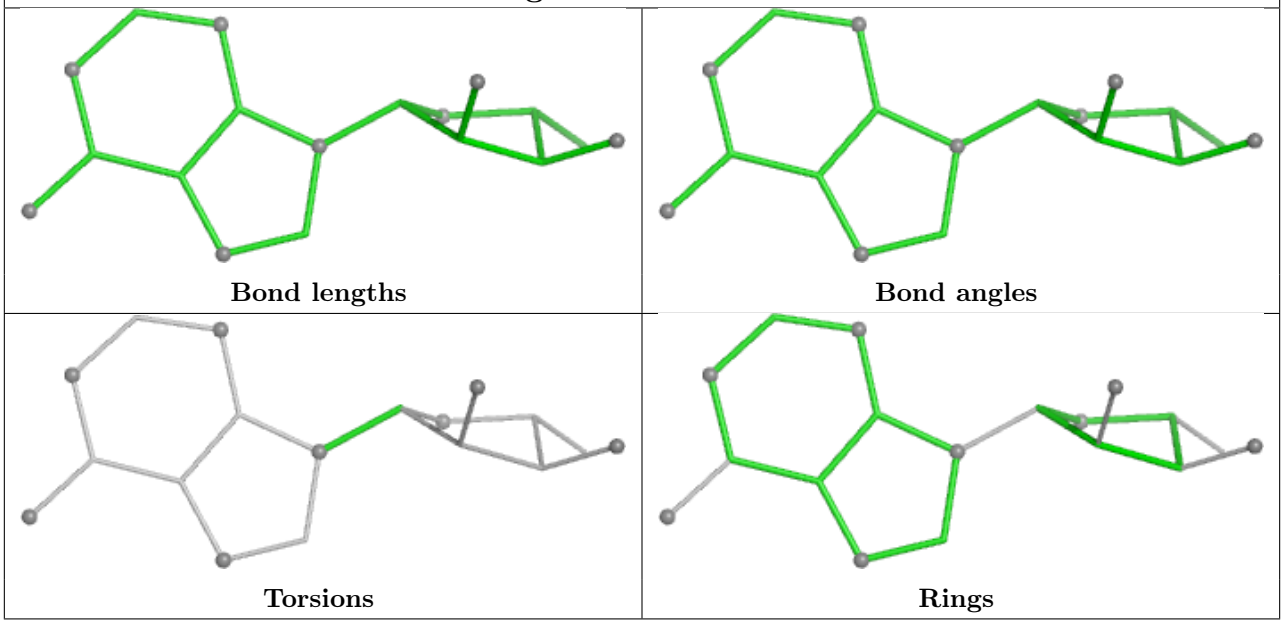
Ligand B12 B 301



Ligand 5AD B 302



Ligand 5AD A 302



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 (i)

6.1 Protein, DNA and RNA chains (i)

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	194/215 (90%)	0.47	6 (3%)	51	54	28, 44, 74, 96	0
1	B	194/215 (90%)	0.52	6 (3%)	51	54	28, 44, 71, 83	0
1	C	192/215 (89%)	0.81	28 (14%)	6	6	27, 42, 68, 84	0
1	D	193/215 (89%)	0.89	29 (15%)	5	5	27, 40, 62, 92	1 (0%)
All	All	773/860 (89%)	0.67	69 (8%)	15	16	27, 43, 71, 96	1 (0%)

All (69) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	275	TRP	6.7
1	D	263	TYR	4.9
1	D	266	ASP	4.5
1	C	236	ALA	4.5
1	D	269	GLY	4.3
1	D	188	LEU	4.2
1	B	110	TRP	4.0
1	D	103	PHE	3.7
1	D	114	GLY	3.7
1	B	109	PHE	3.4
1	D	210	LEU	3.3
1	A	274	LEU	3.2
1	C	239	ASP	3.2
1	D	267	LEU	3.2
1	C	98	GLY	3.1
1	D	270	LEU	3.1
1	C	209	ALA	3.0
1	C	250	GLY	2.9
1	C	272	GLU	2.8
1	D	173	PRO	2.8
1	C	159	ALA	2.8

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Mol	Chain	Res	Type	RSRZ
1	C	270	LEU	2.8
1	C	114	GLY	2.8
1	B	82	ASP	2.7
1	D	272	GLU	2.7
1	C	117	GLU	2.7
1	A	239	ASP	2.7
1	D	274	LEU	2.7
1	D	273	ALA	2.6
1	D	268	LYS	2.6
1	D	115	VAL	2.6
1	C	238	LYS	2.6
1	C	158	LEU	2.5
1	C	249	GLN	2.5
1	D	156	LEU	2.5
1	D	86	GLY	2.5
1	D	163	PRO	2.4
1	C	160	GLY	2.4
1	C	264	MET	2.4
1	C	187	HIS	2.4
1	A	268	LYS	2.4
1	D	83	LEU	2.4
1	C	269	GLY	2.4
1	A	230	ARG	2.4
1	D	264	MET	2.4
1	D	132	ALA	2.3
1	C	274	LEU	2.3
1	C	235	GLY	2.3
1	A	257	ARG	2.3
1	B	83	LEU	2.3
1	D	257	ARG	2.3
1	C	88	LEU	2.3
1	D	82	ASP	2.2
1	C	263	TYR	2.2
1	D	117	GLU	2.2
1	D	265	GLU	2.2
1	C	205	PRO	2.2
1	D	90	ALA	2.1
1	D	96	LEU	2.1
1	D	213	ARG	2.1
1	C	122	PRO	2.1
1	C	115	VAL	2.1
1	C	109	PHE	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	92	LEU	2.1
1	C	210	LEU	2.1
1	A	270	LEU	2.0
1	C	240	LEU	2.0
1	D	250	GLY	2.0
1	C	261	ALA	2.0

6.2 Non-standard residues in protein, DNA, RNA chains (i)

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

6.3 Carbohydrates (i)

There are no oligosaccharides in this entry.

6.4 Ligands (i)

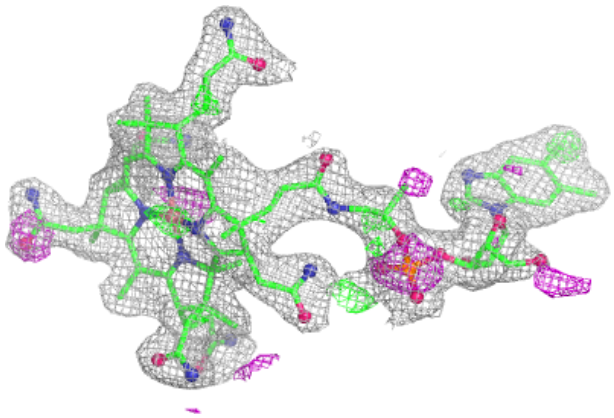
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

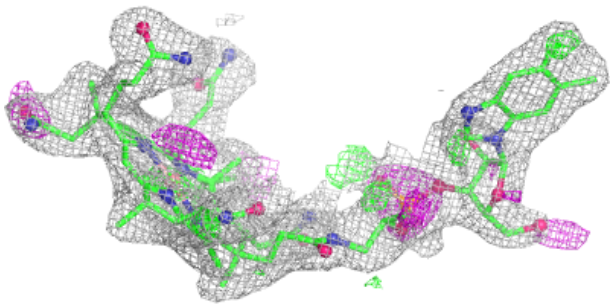
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
2	B12	B	301	91/91	0.90	0.13	31,42,60,78	0
3	5AD	B	302	18/18	0.90	0.09	42,49,53,53	0
3	5AD	D	302	18/18	0.92	0.10	40,43,48,50	0
3	5AD	C	302	18/18	0.93	0.15	29,35,39,41	0
2	B12	C	301	91/91	0.93	0.11	30,38,53,69	0
3	5AD	A	302	18/18	0.94	0.07	33,36,38,39	0
2	B12	D	301	91/91	0.94	0.10	28,41,52,61	0
2	B12	A	301	91/91	0.96	0.08	30,38,56,69	0

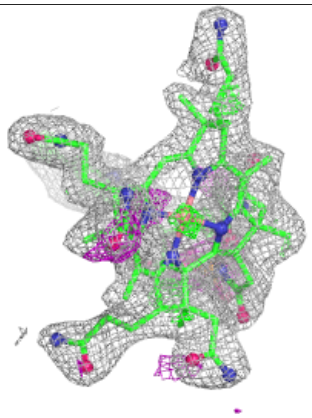
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around B12 B 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

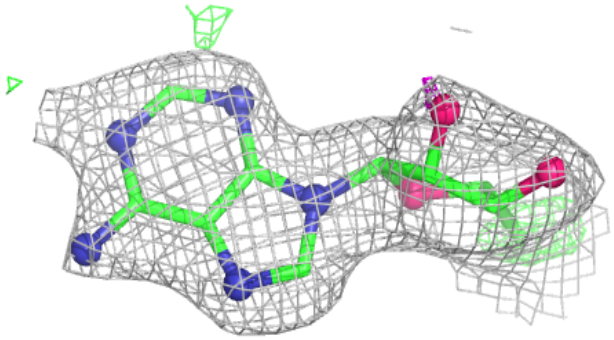


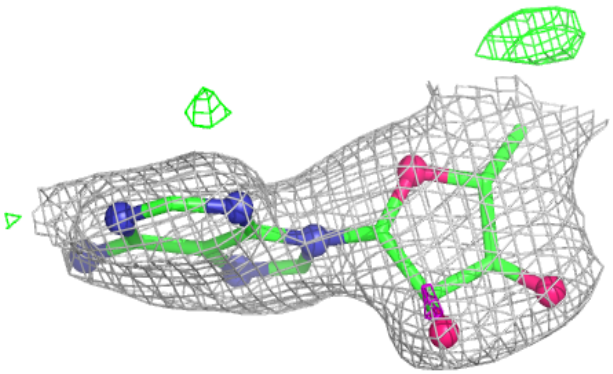


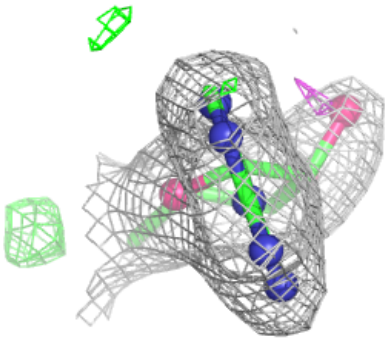


Electron density around 5AD B 302:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

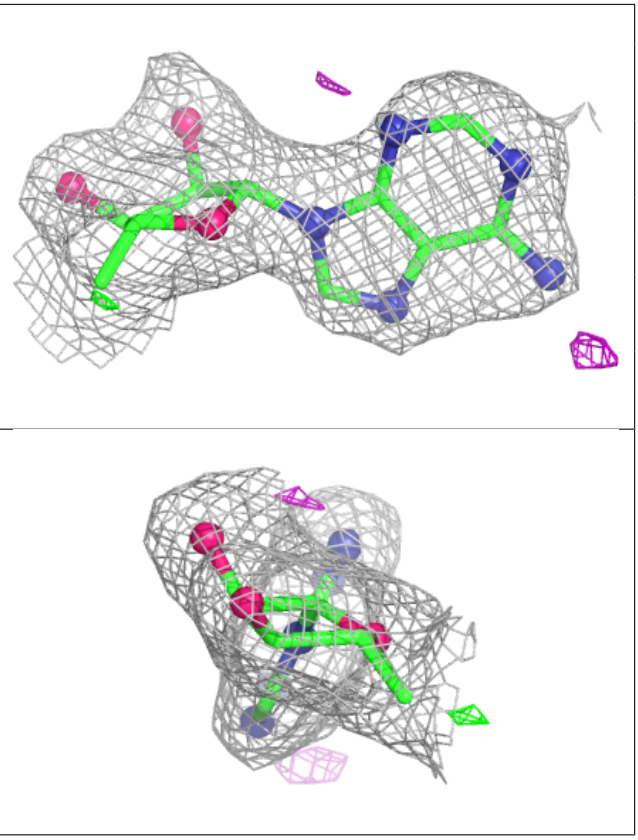






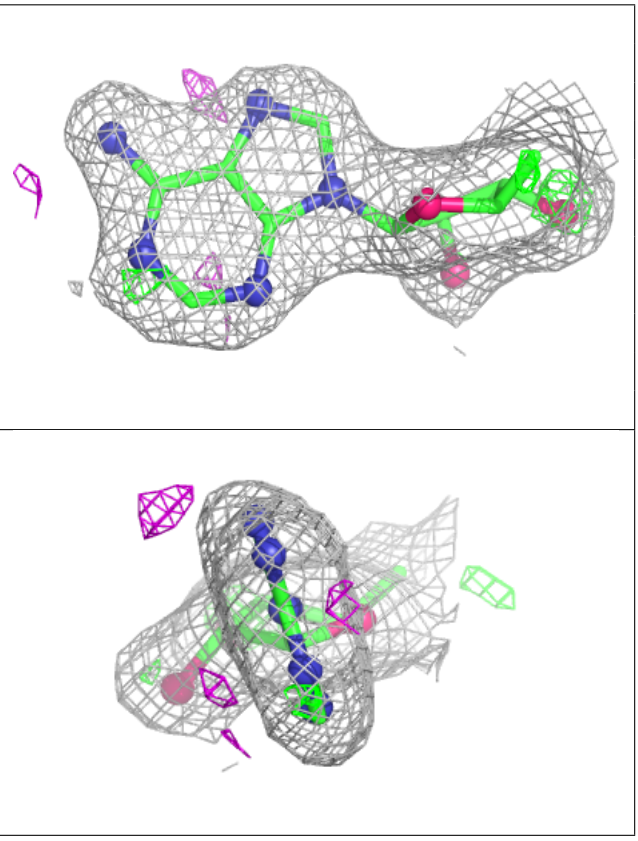
Electron density around 5AD D 302:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



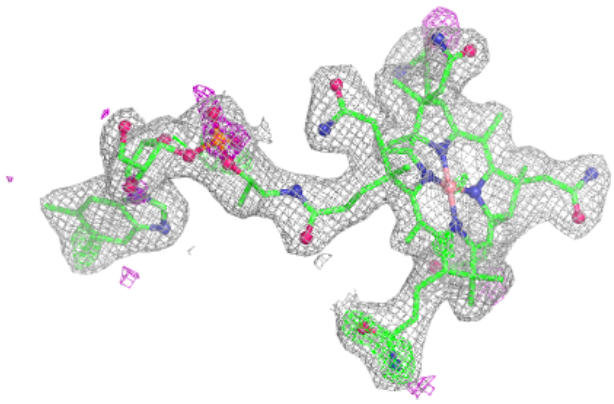
Electron density around 5AD C 302:

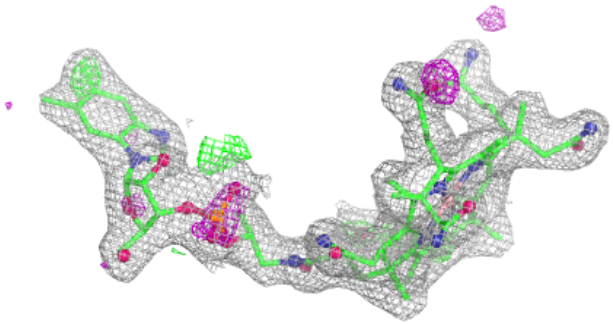
$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

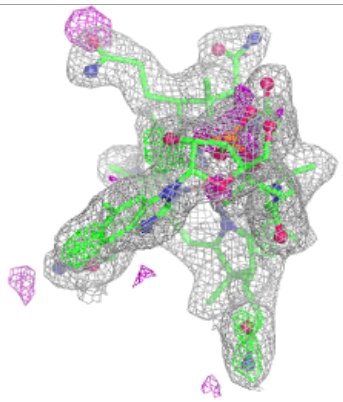


Electron density around B12 C 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

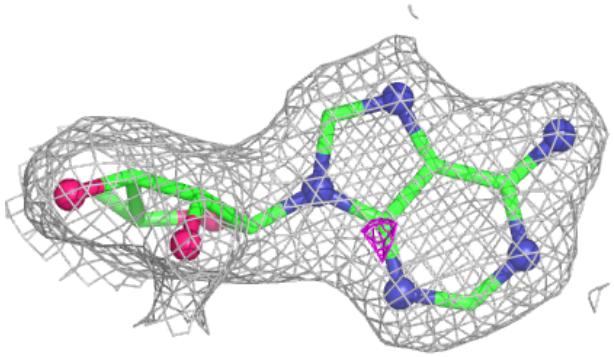


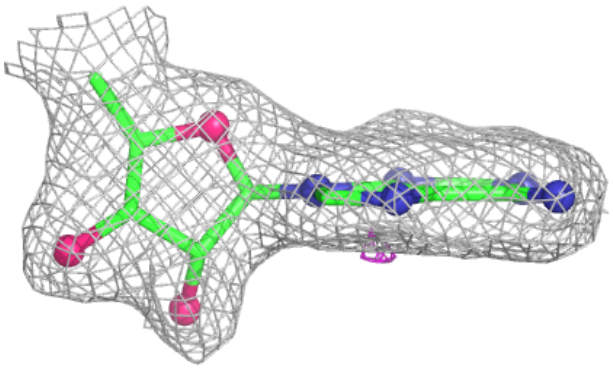


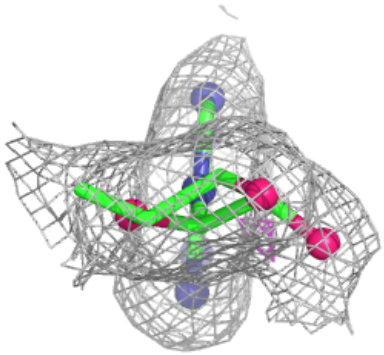


Electron density around 5AD A 302:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

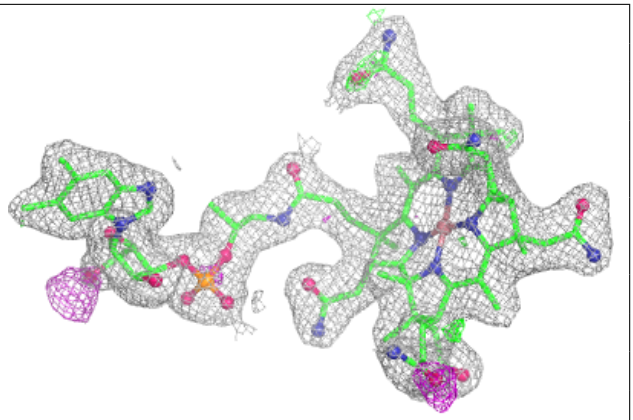


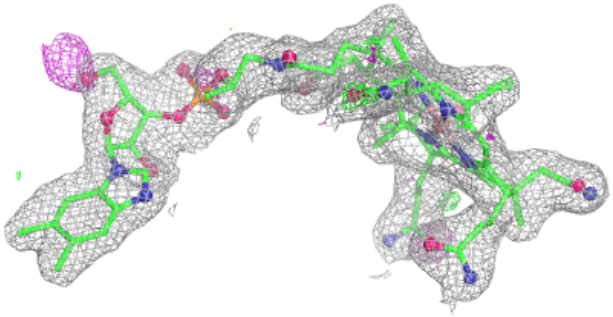


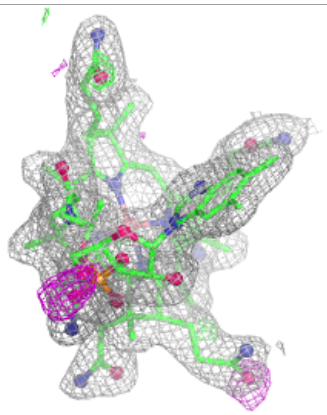


Electron density around B12 D 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

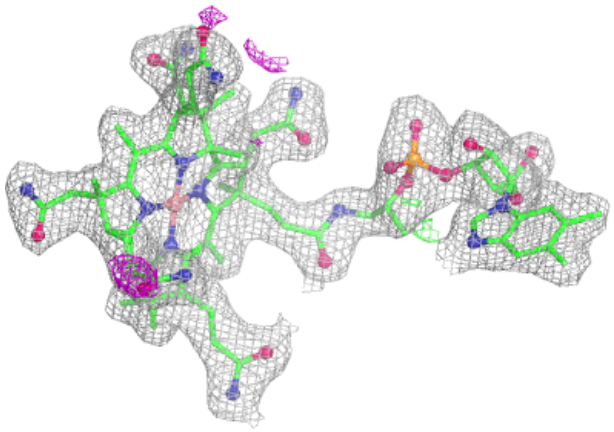


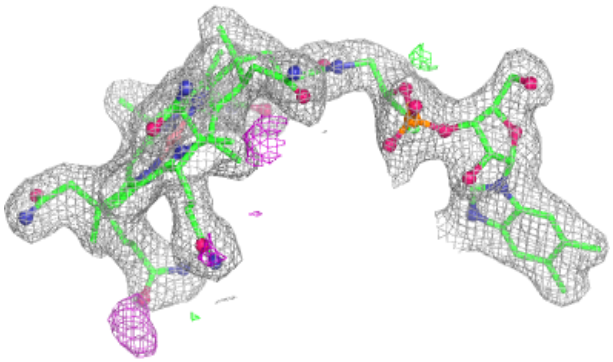


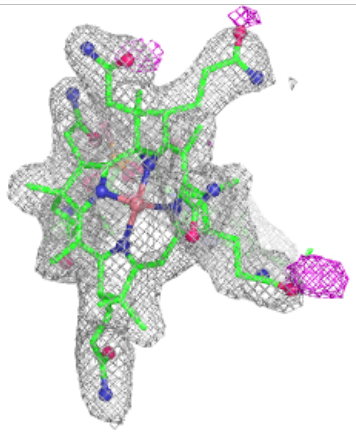


Electron density around B12 A 301:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)







6.5 Other polymers (i)

There are no such residues in this entry.