



wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 5, 2026 – 10:56 AM JST

PDB ID : 5YSH / pdb_00005ysh
Title : Diol dehydratase - alpha/T172A mutant complexed with AdoCbl, aerobically-prepared crystal
Authors : Shibata, N.
Deposited on : 2017-11-14
Resolution : 1.90 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 1.8.5 (274361), 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

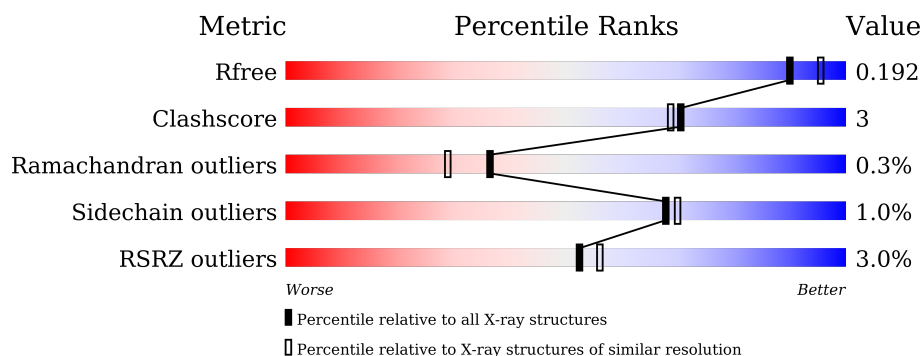
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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 $\leq 5\%$. 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	554	95% • •
1	D	554	94% 5% •
1	G	554	94% 5% •
1	J	554	92% 7% •
2	B	200	24% 70% 17% • 12%
2	E	200	2% 80% 8% 12%

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Mol	Chain	Length	Quality of chain
2	H	200	
2	K	200	
3	C	137	
3	F	137	
3	I	137	
3	L	137	

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
7	5AD	A	605	-	X	-	-

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 28331 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 Diol dehydrase alpha subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	551	Total	C	N	O	S	0	4	0
			4218	2632	729	827	30			
1	D	550	Total	C	N	O	S	0	3	0
			4205	2625	725	825	30			
1	G	550	Total	C	N	O	S	0	3	0
			4205	2625	726	824	30			
1	J	551	Total	C	N	O	S	0	2	0
			4207	2625	727	825	30			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	172	ALA	THR	engineered mutation	UNP Q59470
D	172	ALA	THR	engineered mutation	UNP Q59470
G	172	ALA	THR	engineered mutation	UNP Q59470
J	172	ALA	THR	engineered mutation	UNP Q59470

- Molecule 2 is a protein called Diol dehydrase beta subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	177	Total	C	N	O	S	0	2	0
			1364	863	246	253	2			
2	E	176	Total	C	N	O	S	0	2	0
			1363	862	245	254	2			
2	H	180	Total	C	N	O	S	0	1	0
			1377	871	249	255	2			
2	K	167	Total	C	N	O	S	0	0	0
			1280	810	230	238	2			

There are 84 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	25	MET	-	expression tag	UNP Q59471
B	26	SER	-	expression tag	UNP Q59471
B	27	SER	-	expression tag	UNP Q59471
B	28	HIS	-	expression tag	UNP Q59471
B	29	HIS	-	expression tag	UNP Q59471
B	30	HIS	-	expression tag	UNP Q59471
B	31	HIS	-	expression tag	UNP Q59471
B	32	HIS	-	expression tag	UNP Q59471
B	33	HIS	-	expression tag	UNP Q59471
B	34	SER	-	expression tag	UNP Q59471
B	35	ALA	-	expression tag	UNP Q59471
B	36	ALA	-	expression tag	UNP Q59471
B	37	LEU	-	expression tag	UNP Q59471
B	38	GLU	-	expression tag	UNP Q59471
B	39	VAL	-	expression tag	UNP Q59471
B	40	LEU	-	expression tag	UNP Q59471
B	41	PHE	-	expression tag	UNP Q59471
B	42	GLN	-	expression tag	UNP Q59471
B	43	GLY	-	expression tag	UNP Q59471
B	44	PRO	-	expression tag	UNP Q59471
B	45	GLY	-	expression tag	UNP Q59471
E	25	MET	-	expression tag	UNP Q59471
E	26	SER	-	expression tag	UNP Q59471
E	27	SER	-	expression tag	UNP Q59471
E	28	HIS	-	expression tag	UNP Q59471
E	29	HIS	-	expression tag	UNP Q59471
E	30	HIS	-	expression tag	UNP Q59471
E	31	HIS	-	expression tag	UNP Q59471
E	32	HIS	-	expression tag	UNP Q59471
E	33	HIS	-	expression tag	UNP Q59471
E	34	SER	-	expression tag	UNP Q59471
E	35	ALA	-	expression tag	UNP Q59471
E	36	ALA	-	expression tag	UNP Q59471
E	37	LEU	-	expression tag	UNP Q59471
E	38	GLU	-	expression tag	UNP Q59471
E	39	VAL	-	expression tag	UNP Q59471
E	40	LEU	-	expression tag	UNP Q59471
E	41	PHE	-	expression tag	UNP Q59471
E	42	GLN	-	expression tag	UNP Q59471
E	43	GLY	-	expression tag	UNP Q59471
E	44	PRO	-	expression tag	UNP Q59471
E	45	GLY	-	expression tag	UNP Q59471
H	25	MET	-	expression tag	UNP Q59471

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Chain	Residue	Modelled	Actual	Comment	Reference
H	26	SER	-	expression tag	UNP Q59471
H	27	SER	-	expression tag	UNP Q59471
H	28	HIS	-	expression tag	UNP Q59471
H	29	HIS	-	expression tag	UNP Q59471
H	30	HIS	-	expression tag	UNP Q59471
H	31	HIS	-	expression tag	UNP Q59471
H	32	HIS	-	expression tag	UNP Q59471
H	33	HIS	-	expression tag	UNP Q59471
H	34	SER	-	expression tag	UNP Q59471
H	35	ALA	-	expression tag	UNP Q59471
H	36	ALA	-	expression tag	UNP Q59471
H	37	LEU	-	expression tag	UNP Q59471
H	38	GLU	-	expression tag	UNP Q59471
H	39	VAL	-	expression tag	UNP Q59471
H	40	LEU	-	expression tag	UNP Q59471
H	41	PHE	-	expression tag	UNP Q59471
H	42	GLN	-	expression tag	UNP Q59471
H	43	GLY	-	expression tag	UNP Q59471
H	44	PRO	-	expression tag	UNP Q59471
H	45	GLY	-	expression tag	UNP Q59471
K	25	MET	-	expression tag	UNP Q59471
K	26	SER	-	expression tag	UNP Q59471
K	27	SER	-	expression tag	UNP Q59471
K	28	HIS	-	expression tag	UNP Q59471
K	29	HIS	-	expression tag	UNP Q59471
K	30	HIS	-	expression tag	UNP Q59471
K	31	HIS	-	expression tag	UNP Q59471
K	32	HIS	-	expression tag	UNP Q59471
K	33	HIS	-	expression tag	UNP Q59471
K	34	SER	-	expression tag	UNP Q59471
K	35	ALA	-	expression tag	UNP Q59471
K	36	ALA	-	expression tag	UNP Q59471
K	37	LEU	-	expression tag	UNP Q59471
K	38	GLU	-	expression tag	UNP Q59471
K	39	VAL	-	expression tag	UNP Q59471
K	40	LEU	-	expression tag	UNP Q59471
K	41	PHE	-	expression tag	UNP Q59471
K	42	GLN	-	expression tag	UNP Q59471
K	43	GLY	-	expression tag	UNP Q59471
K	44	PRO	-	expression tag	UNP Q59471
K	45	GLY	-	expression tag	UNP Q59471

- Molecule 3 is a protein called Diol dehydrase gamma subunit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	136	Total	C	N	O	S	0	2	0
			1098	686	194	214	4			
3	F	136	Total	C	N	O	S	0	1	0
			1095	683	195	213	4			
3	I	136	Total	C	N	O	S	0	1	0
			1092	682	194	212	4			
3	L	136	Total	C	N	O	S	0	0	0
			1087	678	194	212	3			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	37	MET	-	expression tag	UNP Q59472
F	37	MET	-	expression tag	UNP Q59472
I	37	MET	-	expression tag	UNP Q59472
L	37	MET	-	expression tag	UNP Q59472

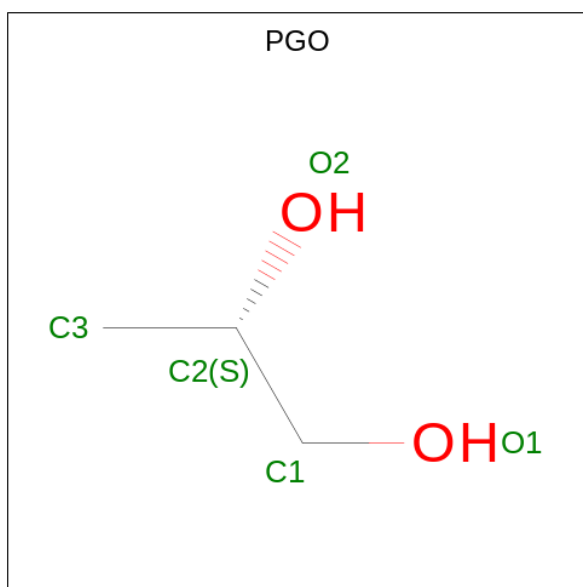
- Molecule 4 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		
4	D	1	Total	Ca	0	0
			1	1		
4	G	1	Total	Ca	0	0
			1	1		
4	J	1	Total	Ca	0	0
			1	1		

- Molecule 5 is POTASSIUM ION (CCD ID: K) (formula: K).

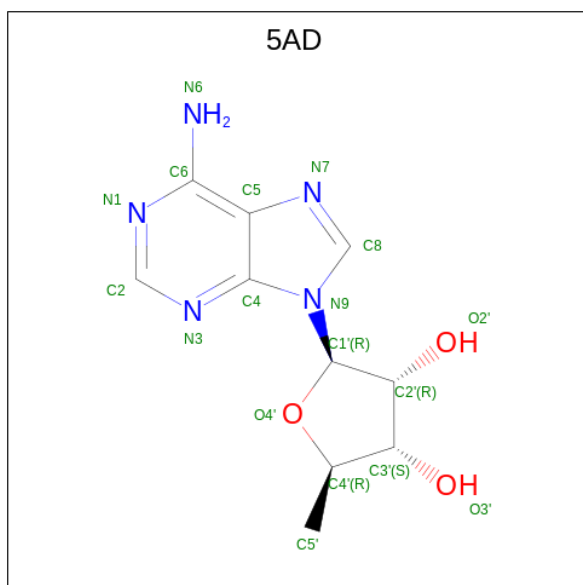
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	K	0	0
			2	2		
5	D	2	Total	K	0	0
			2	2		
5	G	2	Total	K	0	0
			2	2		
5	J	2	Total	K	0	0
			2	2		

- Molecule 6 is S-1,2-PROPANEDIOL (CCD ID: PGO) (formula: C₃H₈O₂).



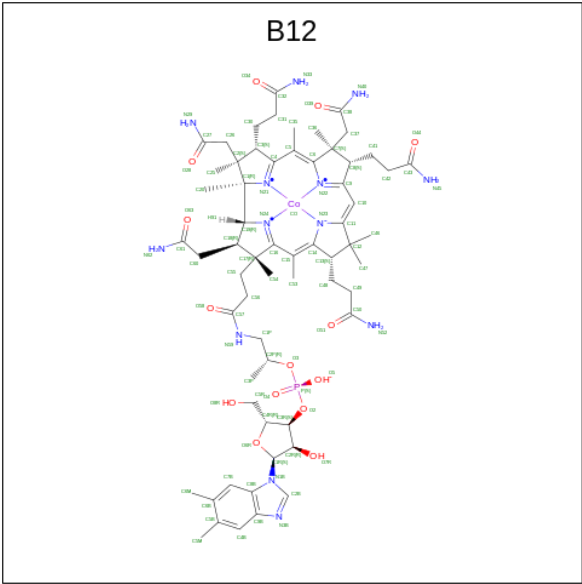
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			5	3	2		
6	D	1	Total	C	O	0	0
			5	3	2		
6	G	1	Total	C	O	0	0
			5	3	2		
6	J	1	Total	C	O	0	0
			5	3	2		

- Molecule 7 is 5'-DEOXYADENOSINE (CCD ID: 5AD) (formula: $C_{10}H_{13}N_5O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	A	1	Total C N 11 6 5	0	0
7	D	1	Total C N 11 6 5	0	0
7	G	1	Total C N 11 6 5	0	0
7	J	1	Total C N 11 6 5	0	0

- Molecule 8 is COBALAMIN (CCD ID: B12) (formula: C₆₂H₈₉CoN₁₃O₁₄P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	B	1	Total C Co N O P 91 62 1 13 14 1	0	0
8	E	1	Total C Co N O P 91 62 1 13 14 1	0	0
8	H	1	Total C Co N O P 91 62 1 13 14 1	0	0
8	K	1	Total C Co N O P 91 62 1 13 14 1	0	0

- Molecule 9 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	253	Total O 253 253	0	0
9	B	24	Total O 24 24	0	0

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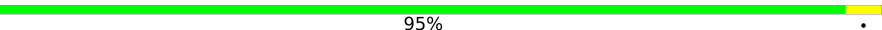
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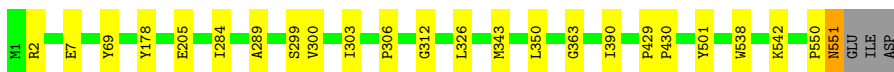
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	C	41	Total 41	O 41	0	0
9	D	388	Total 388	O 388	0	0
9	E	56	Total 56	O 56	0	0
9	F	102	Total 102	O 102	0	0
9	G	208	Total 208	O 208	0	0
9	H	34	Total 34	O 34	0	0
9	I	28	Total 28	O 28	0	0
9	J	151	Total 151	O 151	0	0
9	K	10	Total 10	O 10	0	0
9	L	5	Total 5	O 5	0	0

3 Residue-property plots [i](#)

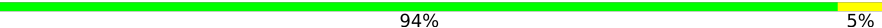
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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.

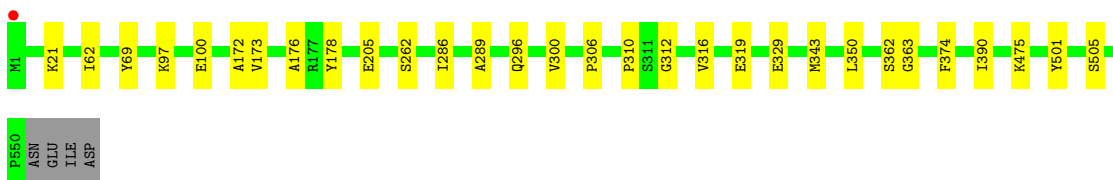
- Molecule 1: Diol dehydrase alpha subunit

Chain A:  95% ..

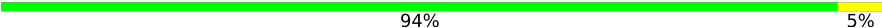


- Molecule 1: Diol dehydrase alpha subunit

Chain D:  94% 5% .



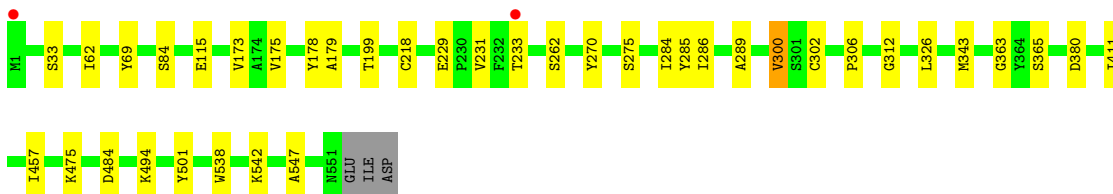
- Molecule 1: Diol dehydrase alpha subunit

Chain G:  94% 5% .

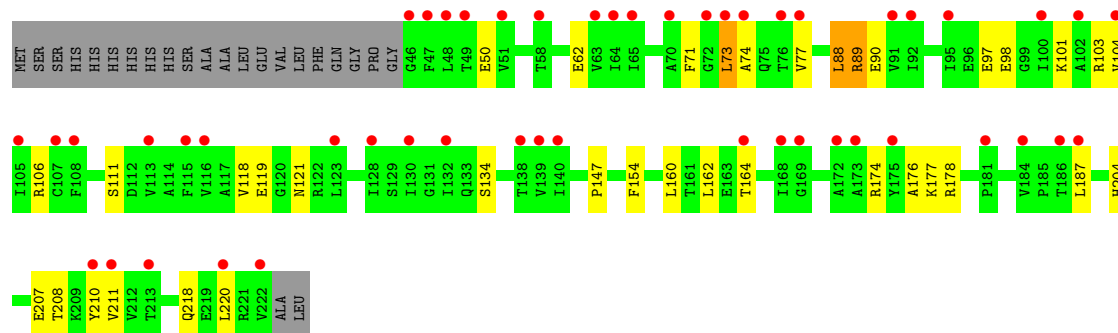


- Molecule 1: Diol dehydrase alpha subunit

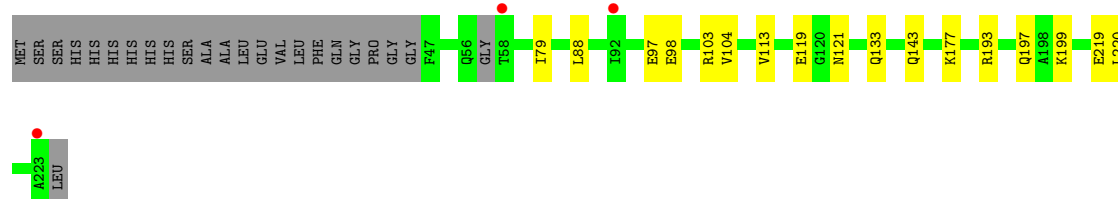
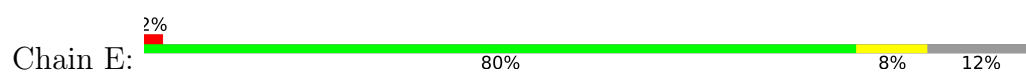
Chain J:  92% 7% .



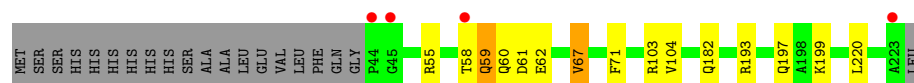
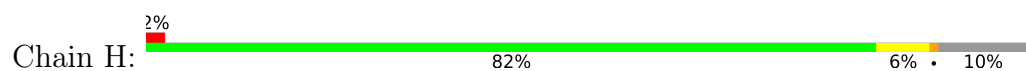
- Molecule 2: Diol dehydrase beta subunit



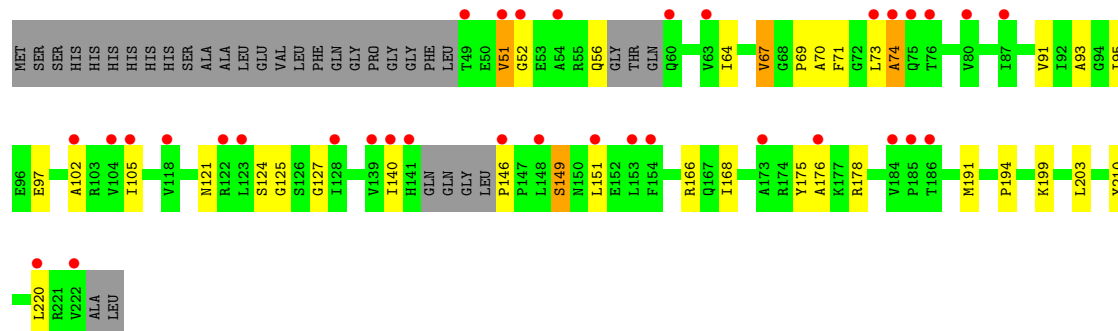
• Molecule 2: Diol dehydrase beta subunit



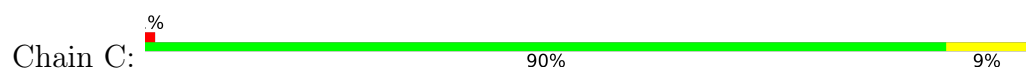
• Molecule 2: Diol dehydrase beta subunit



• Molecule 2: Diol dehydrase beta subunit

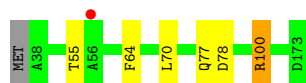
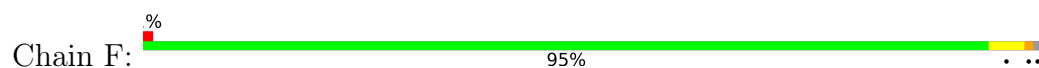


• Molecule 3: Diol dehydrase gamma subunit

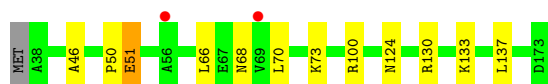
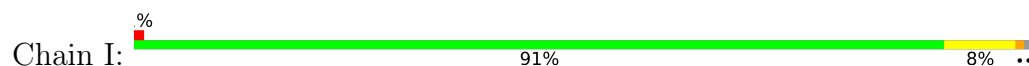




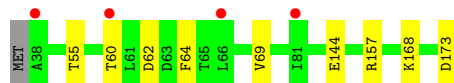
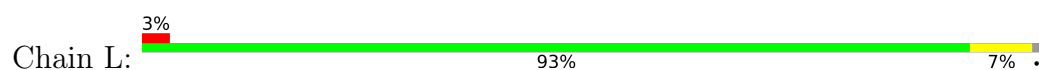
- Molecule 3: Diol dehydrase gamma subunit



- Molecule 3: Diol dehydrase gamma subunit



- Molecule 3: Diol dehydrase gamma subunit



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	70.33Å 110.49Å 115.48Å 92.69° 95.97° 105.44°	Depositor
Resolution (Å)	49.00 – 1.90 49.00 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (49.00-1.90) 95.4 (49.00-1.90)	Depositor EDS
R_{merge}	0.11	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.25 (at 1.90Å)	Xtriage
Refinement program	PHENIX (1.10.1 _2155: ???)	Depositor
R, R_{free}	0.164 , 0.191 0.164 , 0.192	Depositor DCC
R_{free} test set	2000 reflections (0.77%)	wwPDB-VP
Wilson B-factor (Å ²)	24.2	Xtriage
Anisotropy	0.248	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 43.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	28331	wwPDB-VP
Average B, all atoms (Å ²)	45.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.88% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ 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: CA, B12, PGO, 5AD, K

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	0.38	0/4302	0.56	0/5825
1	D	0.47	0/4286	0.61	0/5803
1	G	0.29	0/4286	0.50	0/5803
1	J	0.26	0/4285	0.47	0/5802
2	B	0.25	0/1392	0.45	0/1883
2	E	0.29	0/1384	0.49	0/1872
2	H	0.23	0/1403	0.43	0/1898
2	K	0.20	0/1299	0.41	0/1755
3	C	0.29	0/1119	0.47	0/1511
3	F	0.37	0/1110	0.56	0/1499
3	I	0.22	0/1110	0.44	0/1499
3	L	0.20	0/1102	0.39	0/1489
All	All	0.33	0/27078	0.51	0/36639

There are no bond length outliers.

There are no bond angle outliers.

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	4218	0	4165	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	4205	0	4150	20	0
1	G	4205	0	4152	16	0
1	J	4207	0	4150	24	0
2	B	1364	0	1421	27	0
2	E	1363	0	1411	9	0
2	H	1377	0	1432	9	0
2	K	1280	0	1331	20	0
3	C	1098	0	1111	6	0
3	F	1095	0	1104	6	0
3	I	1092	0	1105	8	0
3	L	1087	0	1096	8	0
4	A	1	0	0	0	0
4	D	1	0	0	0	0
4	G	1	0	0	0	0
4	J	1	0	0	0	0
5	A	2	0	0	0	0
5	D	2	0	0	0	0
5	G	2	0	0	0	0
5	J	2	0	0	0	0
6	A	5	0	6	0	0
6	D	5	0	6	0	0
6	G	5	0	6	0	0
6	J	5	0	6	0	0
7	A	11	0	4	1	0
7	D	11	0	4	1	0
7	G	11	0	4	1	0
7	J	11	0	4	2	0
8	B	91	0	88	6	0
8	E	91	0	88	7	0
8	H	91	0	88	8	0
8	K	91	0	88	9	0
9	A	253	0	0	2	0
9	B	24	0	0	1	0
9	C	41	0	0	0	0
9	D	388	0	0	1	0
9	E	56	0	0	1	0
9	F	102	0	0	0	0
9	G	208	0	0	0	0
9	H	34	0	0	0	0
9	I	28	0	0	1	0
9	J	151	0	0	1	0
9	K	10	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
9	L	5	0	0	0	0
All	All	28331	0	27020	185	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 3.

The worst 5 of 185 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)
8:E:1601:B12:H552	8:E:1601:B12:H531	1.68	0.73
1:A:350:LEU:HD12	1:D:350:LEU:HD12	1.73	0.71
2:H:67:VAL:HG13	2:H:71:PHE:HB3	1.73	0.71
3:C:38:ALA:N	3:C:91:SER:HG	1.87	0.71
3:F:100:ARG:HA	3:F:100:ARG:HE	1.58	0.69

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	553/554 (100%)	533 (96%)	18 (3%)	2 (0%)	30	22
1	D	551/554 (100%)	534 (97%)	15 (3%)	2 (0%)	30	22
1	G	551/554 (100%)	536 (97%)	13 (2%)	2 (0%)	30	22
1	J	551/554 (100%)	533 (97%)	16 (3%)	2 (0%)	30	22
2	B	177/200 (88%)	172 (97%)	5 (3%)	0	100	100
2	E	174/200 (87%)	167 (96%)	7 (4%)	0	100	100
2	H	179/200 (90%)	175 (98%)	3 (2%)	1 (1%)	21	13
2	K	161/200 (80%)	153 (95%)	6 (4%)	2 (1%)	10	4

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	136/137 (99%)	134 (98%)	2 (2%)	0	100	100
3	F	135/137 (98%)	132 (98%)	3 (2%)	0	100	100
3	I	135/137 (98%)	133 (98%)	2 (2%)	0	100	100
3	L	134/137 (98%)	130 (97%)	4 (3%)	0	100	100
All	All	3437/3564 (96%)	3332 (97%)	94 (3%)	11 (0%)	36	29

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	H	60	GLN
2	K	51	VAL
2	K	74	ALA
1	A	300	VAL
1	D	300	VAL

5.3.2 Protein sidechains ⓘ

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	453/452 (100%)	450 (99%)	3 (1%)	76	78
1	D	451/452 (100%)	449 (100%)	2 (0%)	84	87
1	G	451/452 (100%)	449 (100%)	2 (0%)	84	87
1	J	451/452 (100%)	448 (99%)	3 (1%)	76	78
2	B	148/164 (90%)	142 (96%)	6 (4%)	27	19
2	E	147/164 (90%)	145 (99%)	2 (1%)	59	59
2	H	148/164 (90%)	145 (98%)	3 (2%)	48	46
2	K	139/164 (85%)	136 (98%)	3 (2%)	45	42
3	C	117/116 (101%)	116 (99%)	1 (1%)	70	73
3	F	116/116 (100%)	114 (98%)	2 (2%)	53	52
3	I	116/116 (100%)	115 (99%)	1 (1%)	70	73
3	L	115/116 (99%)	115 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	2852/2928 (97%)	2824 (99%)	28 (1%)	68 70

5 of 28 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	F	77	GLN
2	K	220	LEU
1	G	501	TYR
1	J	501	TYR
1	G	178	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 33 such sidechains are listed below:

Mol	Chain	Res	Type
1	J	182	ASN
1	J	479	GLN
2	K	150	ASN
2	E	56	GLN
1	D	513	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 24 ligands modelled in this entry, 12 are monoatomic - leaving 12 for Mogul analysis.

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
6	PGO	D	604	4	3,4,4	0.84	0	1,4,4	1.58	0
6	PGO	J	604	4	3,4,4	0.44	0	1,4,4	0.75	0
8	B12	H	1601	-	93,101,101	1.68	11 (11%)	146,166,166	1.58	23 (15%)
7	5AD	A	605	-	12,12,20	2.07	4 (33%)	17,17,30	2.79	9 (52%)
7	5AD	D	605	-	12,12,20	2.14	5 (41%)	17,17,30	2.68	7 (41%)
6	PGO	A	604	4	3,4,4	0.58	0	1,4,4	0.84	0
8	B12	K	1601	5	93,101,101	1.79	11 (11%)	146,166,166	1.51	21 (14%)
7	5AD	G	605	-	12,12,20	2.06	4 (33%)	17,17,30	2.66	8 (47%)
8	B12	B	1601	-	93,101,101	1.72	9 (9%)	146,166,166	1.53	21 (14%)
8	B12	E	1601	-	93,101,101	1.63	10 (10%)	146,166,166	1.51	22 (15%)
6	PGO	G	604	4	3,4,4	0.46	0	1,4,4	0.51	0
7	5AD	J	605	-	12,12,20	2.06	4 (33%)	17,17,30	2.50	8 (47%)

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
6	PGO	D	604	4	-	1/2/2/2	-
6	PGO	J	604	4	-	1/2/2/2	-
8	B12	H	1601	-	-	9/56/223/223	0/3/11/11
7	5AD	A	605	-	-	-	0/2/2/3
7	5AD	D	605	-	-	-	0/2/2/3
6	PGO	A	604	4	-	1/2/2/2	-
8	B12	K	1601	5	-	11/56/223/223	0/3/11/11
7	5AD	G	605	-	-	-	0/2/2/3
8	B12	B	1601	-	-	6/56/223/223	0/3/11/11
8	B12	E	1601	-	-	7/56/223/223	0/3/11/11
6	PGO	G	604	4	-	1/2/2/2	-
7	5AD	J	605	-	-	-	0/2/2/3

The worst 5 of 58 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	K	1601	B12	C19-N24	-11.43	1.27	1.48
8	B	1601	B12	C19-N24	-10.79	1.28	1.48
8	H	1601	B12	C19-N24	-10.37	1.29	1.48
8	E	1601	B12	C19-N24	-9.70	1.30	1.48
8	E	1601	B12	C8B-C9B	5.84	1.50	1.40

The worst 5 of 119 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	605	5AD	C5-C4-N3	-6.79	117.89	126.75
7	D	605	5AD	C5-C4-N3	-6.69	118.02	126.75
7	G	605	5AD	C5-C4-N3	-6.57	118.18	126.75
8	H	1601	B12	C8B-C9B-N3B	-6.53	102.76	109.97
8	B	1601	B12	C8B-C9B-N3B	-6.36	102.95	109.97

There are no chirality outliers.

5 of 37 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
8	K	1601	B12	C7-C37-C38-O39
8	K	1601	B12	C7-C37-C38-N40
8	K	1601	B12	C2-C3-C30-C31
8	E	1601	B12	C1-C2-C26-C27
8	E	1601	B12	C25-C2-C26-C27

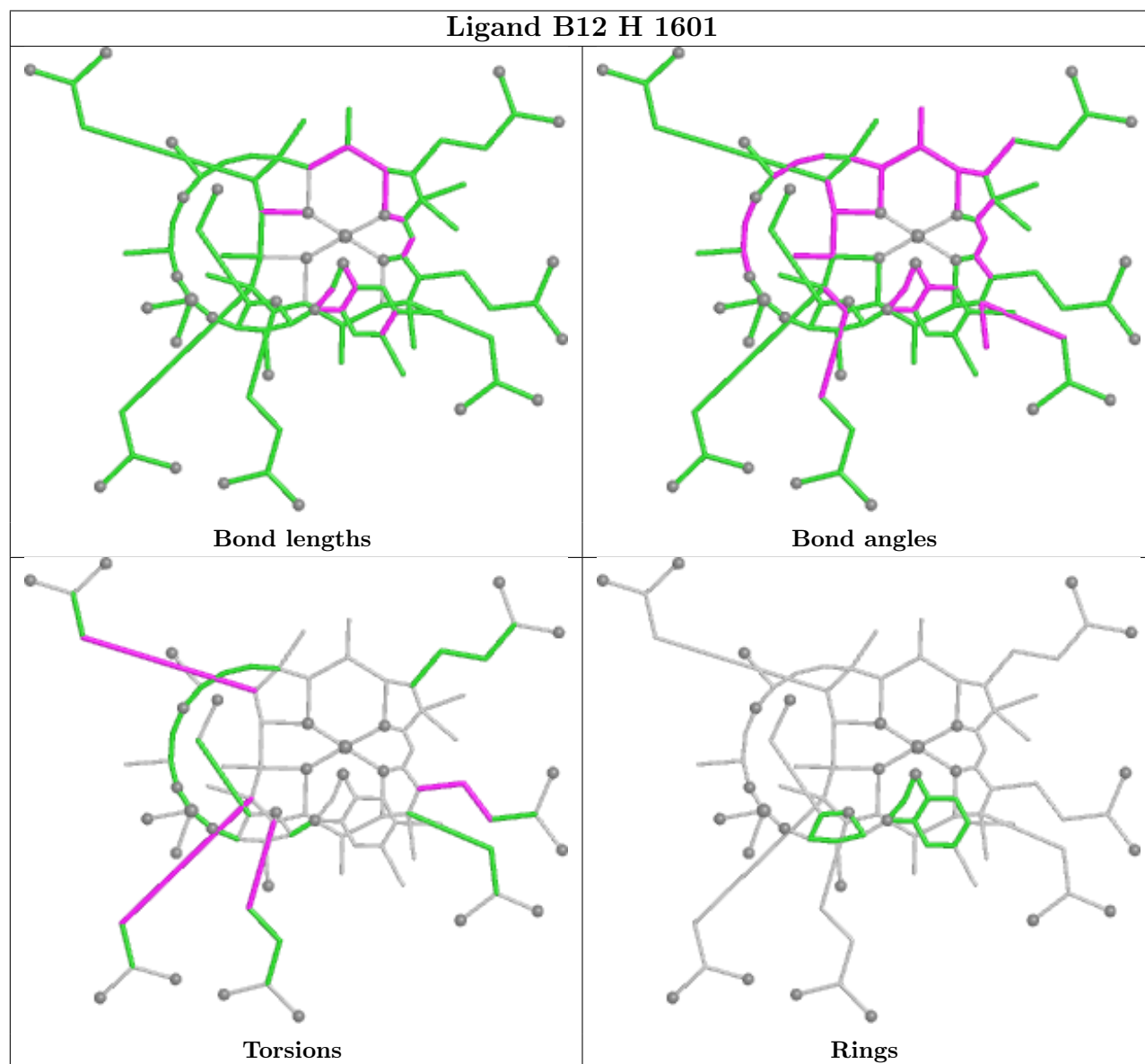
There are no ring outliers.

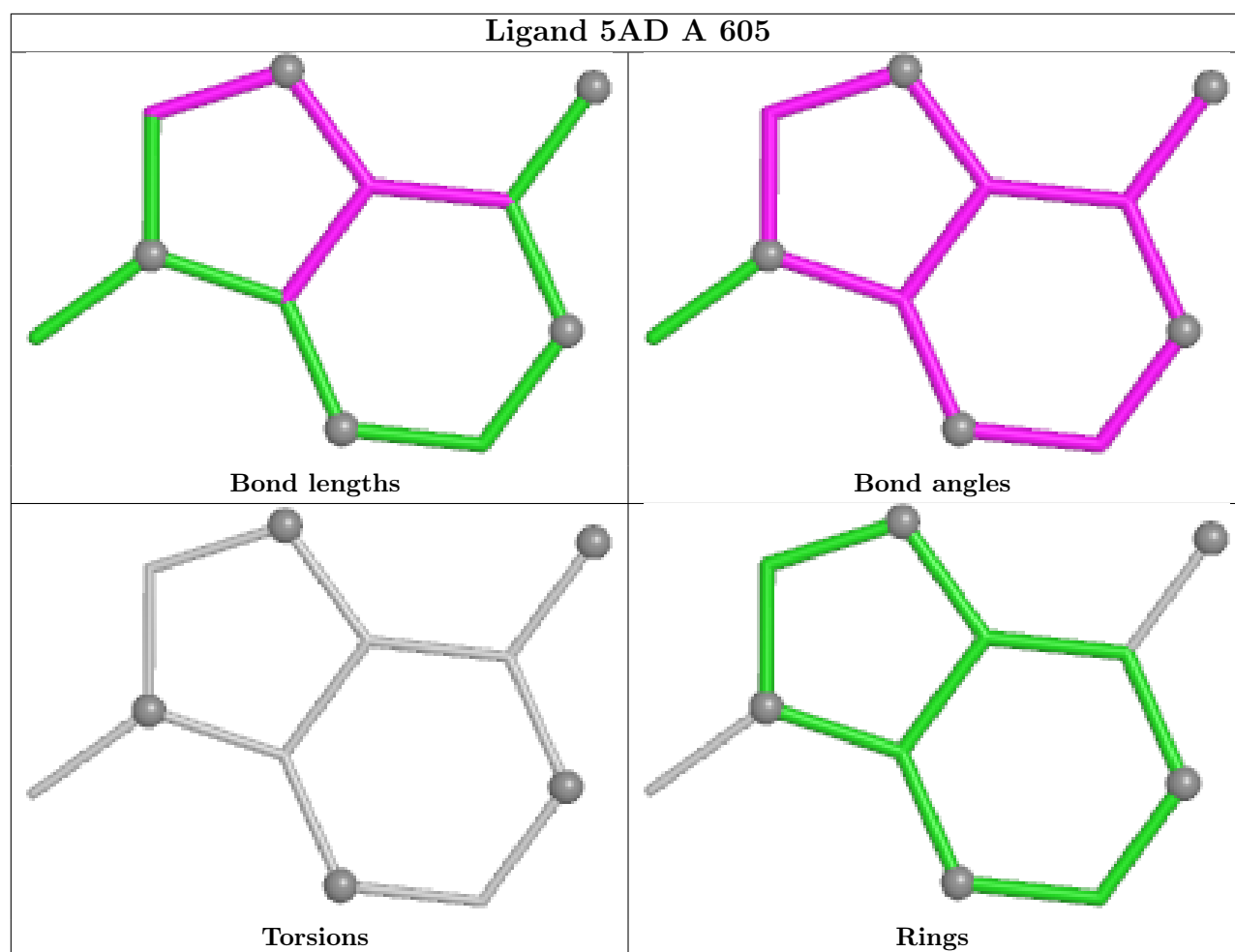
8 monomers are involved in 31 short contacts:

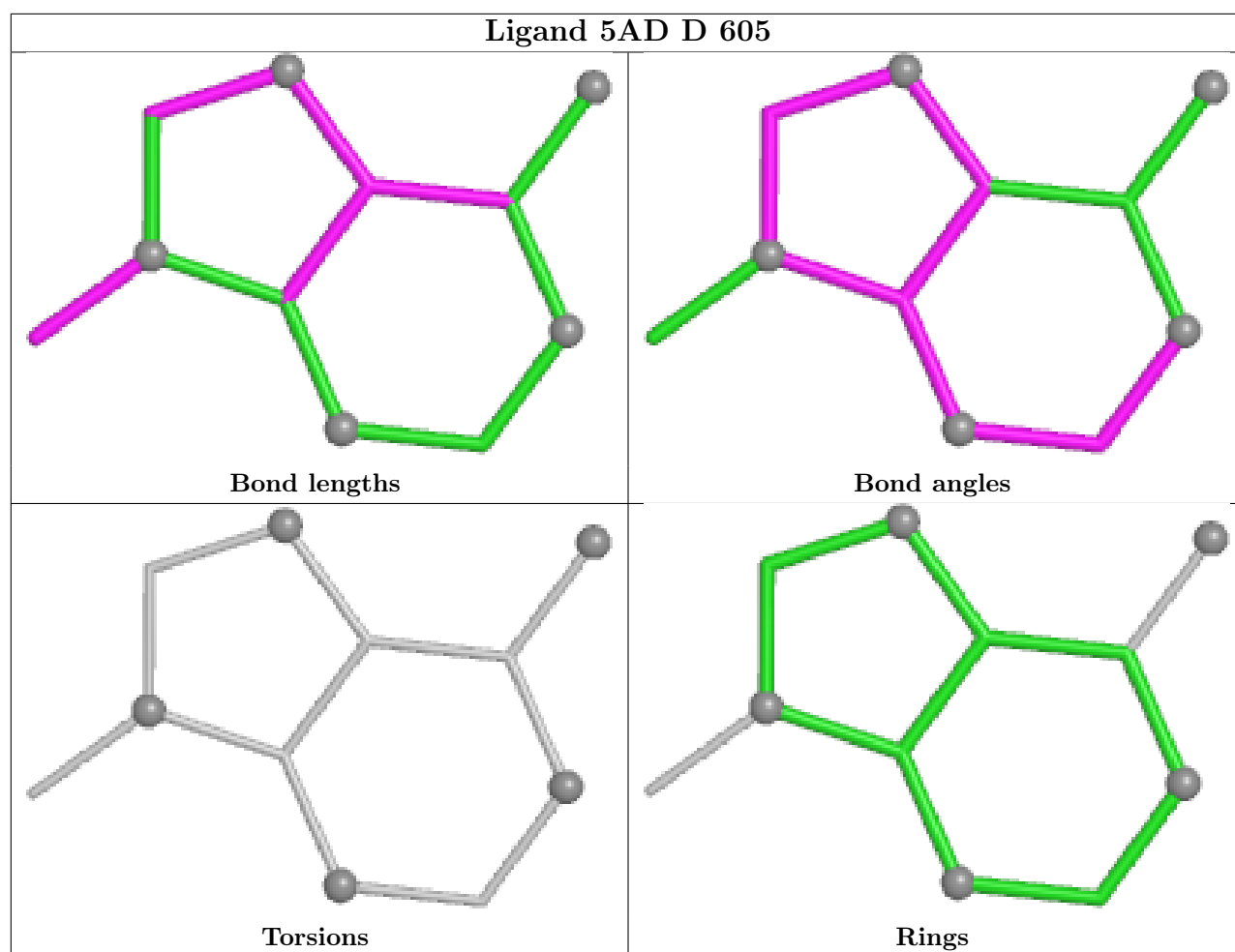
Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	H	1601	B12	8	0
7	A	605	5AD	1	0
7	D	605	5AD	1	0
8	K	1601	B12	9	0
7	G	605	5AD	1	0
8	B	1601	B12	6	0
8	E	1601	B12	7	0
7	J	605	5AD	2	0

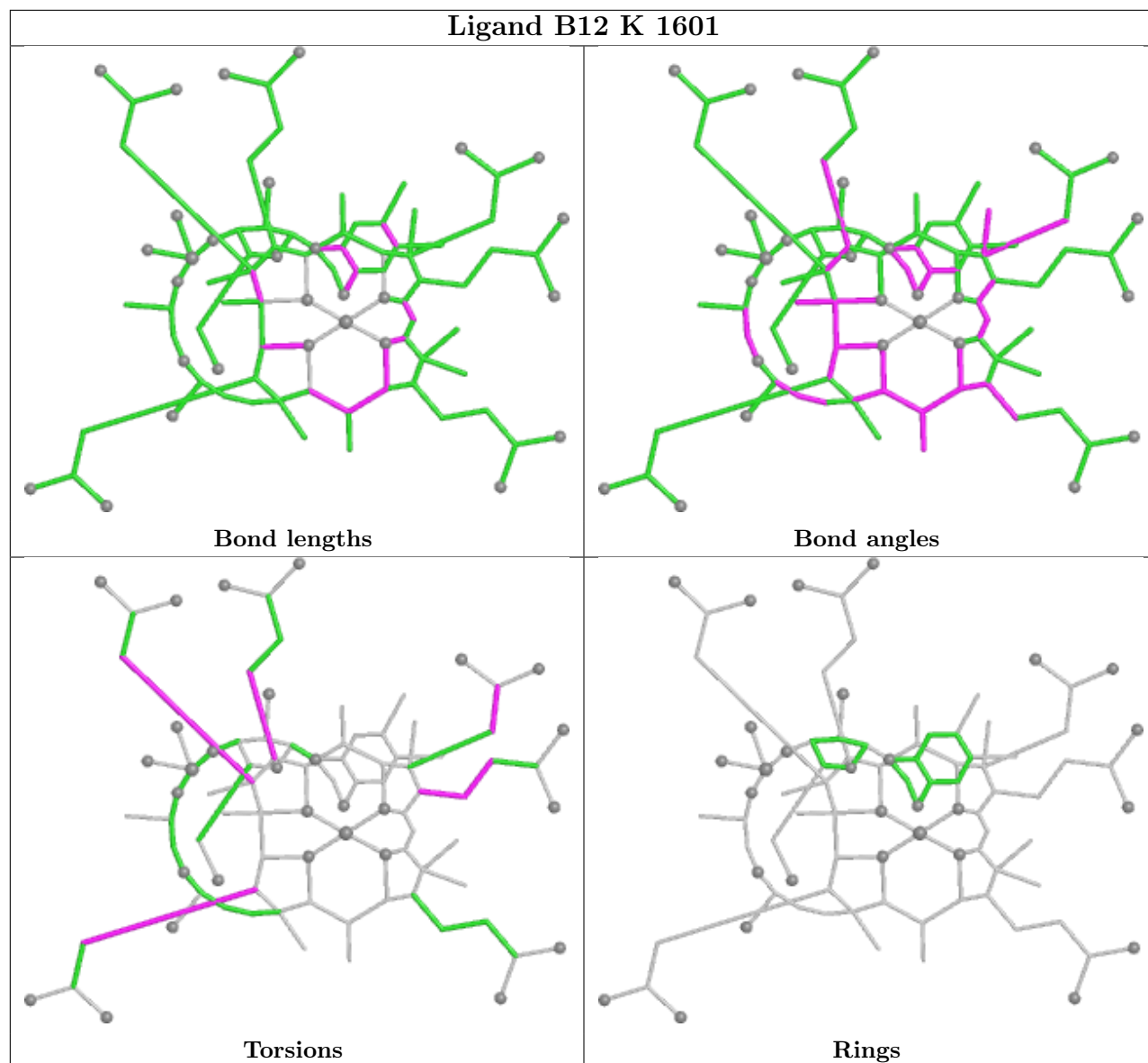
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is

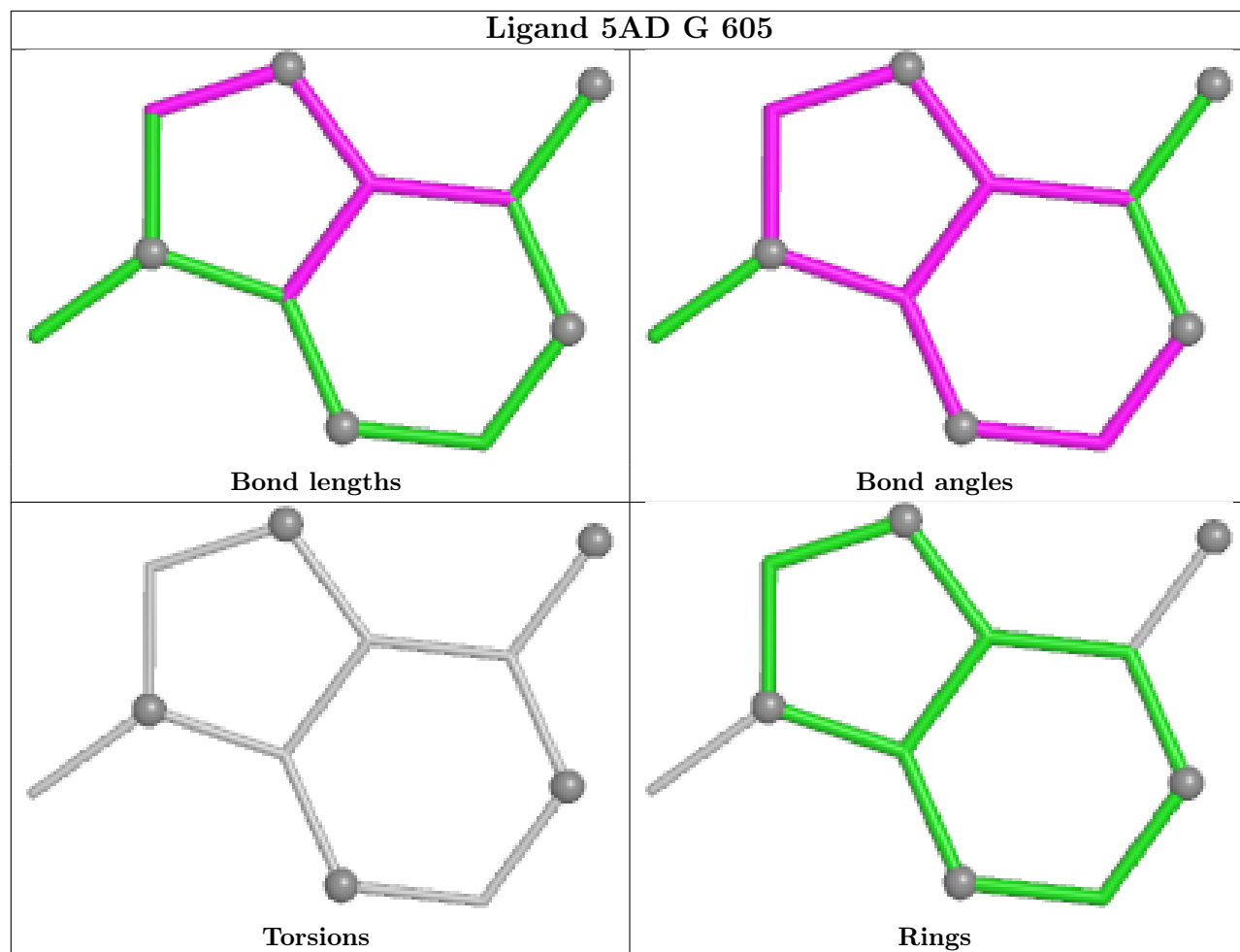
within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question 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.

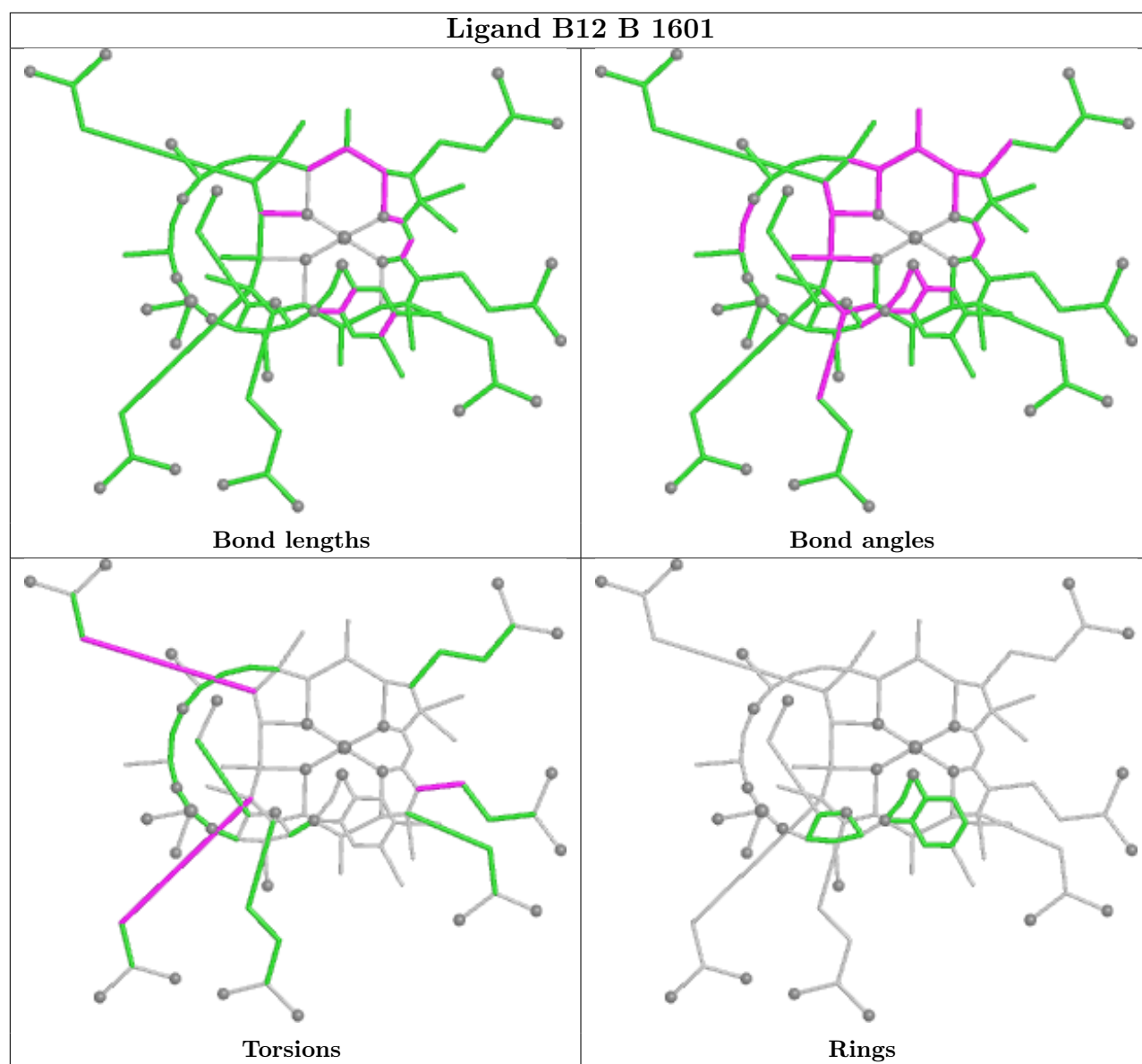


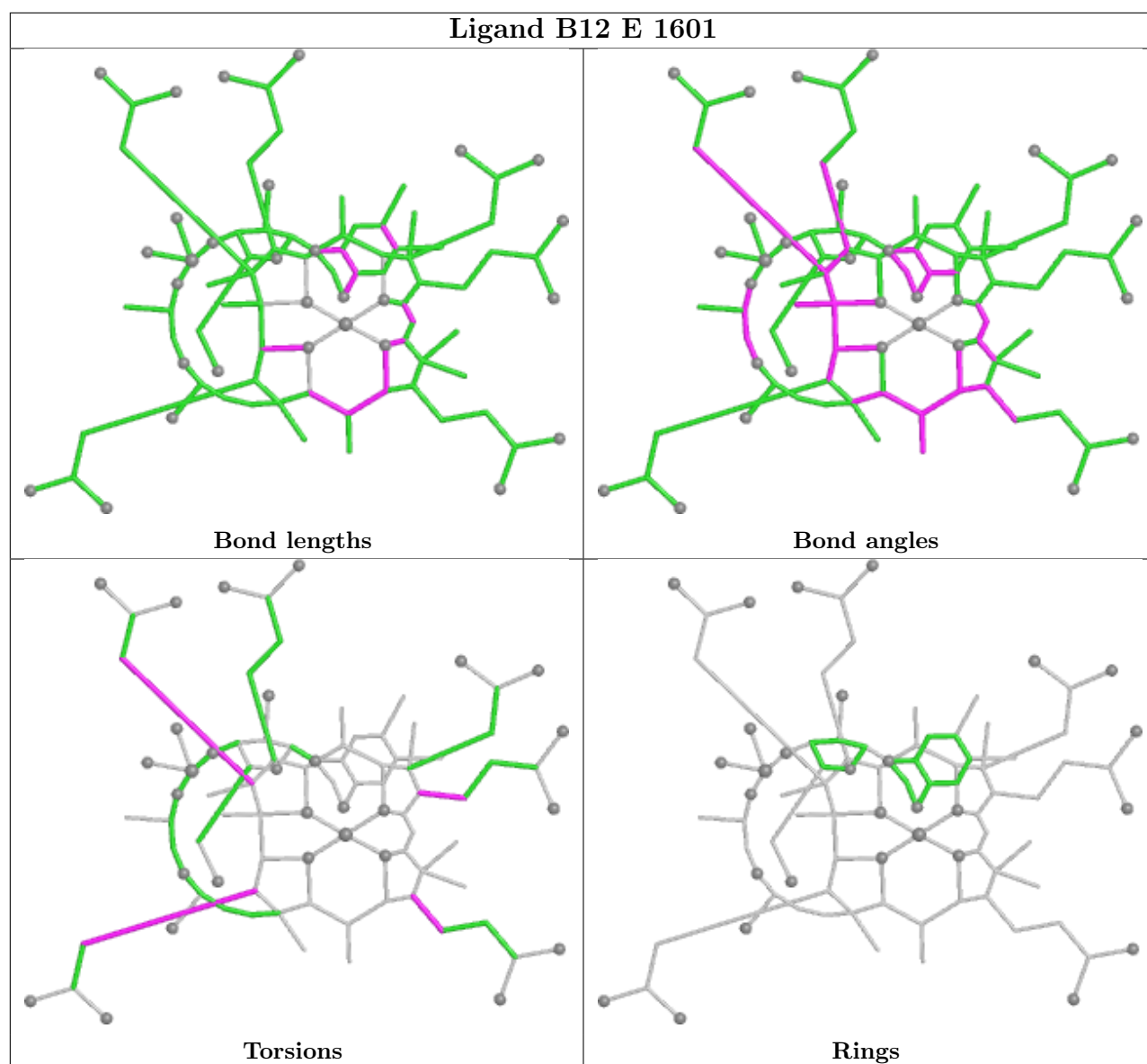


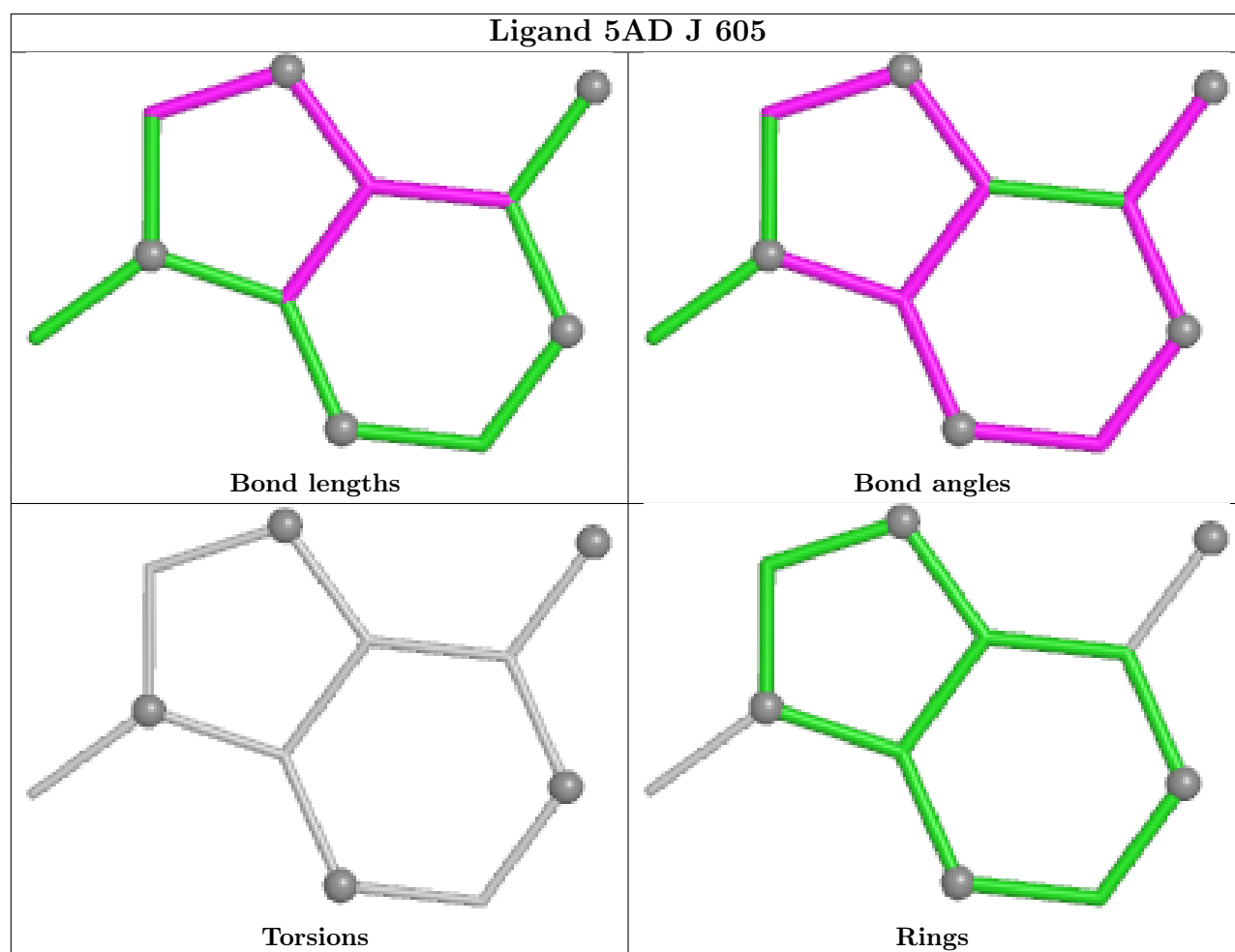












5.7 Other polymers [i](#)

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 [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	551/554 (99%)	-0.43	0 100 100	11, 31, 55, 90	4 (0%)
1	D	550/554 (99%)	-0.72	1 (0%) 91 92	8, 21, 44, 89	4 (0%)
1	G	550/554 (99%)	-0.21	1 (0%) 91 92	17, 36, 66, 91	3 (0%)
1	J	551/554 (99%)	0.07	2 (0%) 88 90	21, 47, 72, 91	3 (0%)
2	B	177/200 (88%)	1.52	49 (27%) 1 1	35, 73, 98, 111	2 (1%)
2	E	176/200 (88%)	0.31	3 (1%) 69 72	24, 48, 71, 112	2 (1%)
2	H	180/200 (90%)	0.40	4 (2%) 62 66	34, 57, 86, 136	1 (0%)
2	K	167/200 (83%)	1.41	34 (20%) 3 2	55, 94, 119, 131	0
3	C	136/137 (99%)	0.09	1 (0%) 84 86	25, 45, 66, 78	3 (2%)
3	F	136/137 (99%)	-0.35	1 (0%) 84 86	14, 33, 51, 66	1 (0%)
3	I	136/137 (99%)	0.31	2 (1%) 72 75	27, 54, 83, 100	2 (1%)
3	L	136/137 (99%)	0.89	4 (2%) 53 57	53, 74, 97, 110	0
All	All	3446/3564 (96%)	0.01	102 (2%) 52 56	8, 41, 89, 136	25 (0%)

The worst 5 of 102 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	44	PRO	3.7
2	B	123	LEU	3.7
2	B	222	VAL	3.6
2	B	47	PHE	3.6
2	H	45	GLY	3.6

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 ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

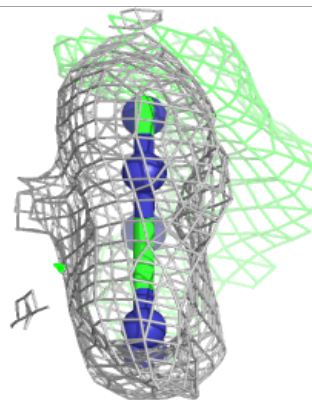
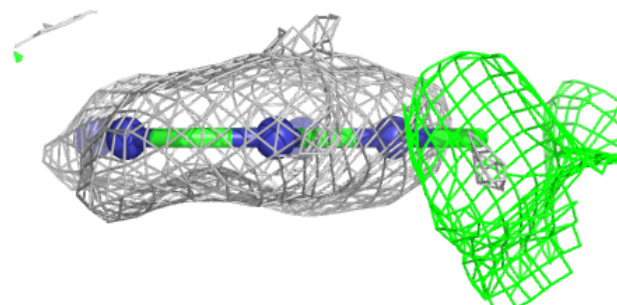
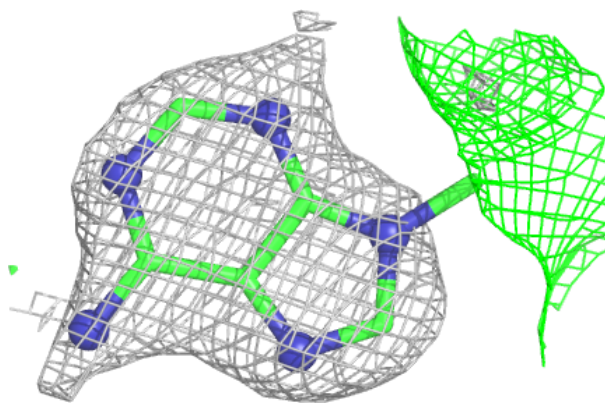
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
7	5AD	J	605	11/18	0.76	0.16	60,64,72,79	0
7	5AD	G	605	11/18	0.78	0.13	36,46,54,59	0
6	PGO	J	604	5/5	0.84	0.20	35,53,61,64	0
7	5AD	A	605	11/18	0.84	0.11	36,37,50,60	0
7	5AD	D	605	11/18	0.85	0.11	25,35,48,52	0
6	PGO	G	604	5/5	0.87	0.15	30,33,49,53	0
6	PGO	A	604	5/5	0.92	0.12	24,25,43,48	0
6	PGO	D	604	5/5	0.93	0.13	18,19,35,42	0
5	K	J	602	1/1	0.95	0.08	34,34,34,34	0
5	K	J	603	1/1	0.95	0.08	54,54,54,54	0
8	B12	K	1601	91/91	0.95	0.11	61,70,75,79	0
8	B12	B	1601	91/91	0.96	0.08	34,42,50,57	0
8	B12	H	1601	91/91	0.97	0.07	29,36,45,55	0
5	K	G	603	1/1	0.97	0.07	36,36,36,36	0
8	B12	E	1601	91/91	0.98	0.06	18,26,34,36	0
4	CA	G	601	1/1	0.98	0.07	26,26,26,26	0
4	CA	J	601	1/1	0.98	0.06	32,32,32,32	0
4	CA	D	601	1/1	0.99	0.13	6,6,6,6	0
5	K	A	602	1/1	0.99	0.02	27,27,27,27	0
5	K	A	603	1/1	0.99	0.05	35,35,35,35	0
5	K	D	602	1/1	0.99	0.02	22,22,22,22	0
5	K	D	603	1/1	0.99	0.07	27,27,27,27	0
5	K	G	602	1/1	0.99	0.04	30,30,30,30	0
4	CA	A	601	1/1	0.99	0.03	20,20,20,20	0

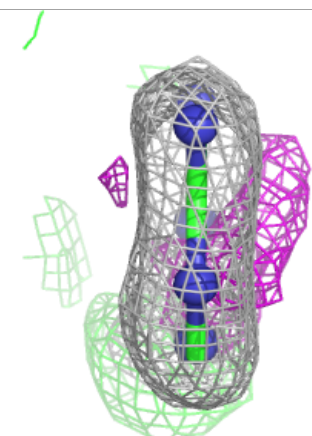
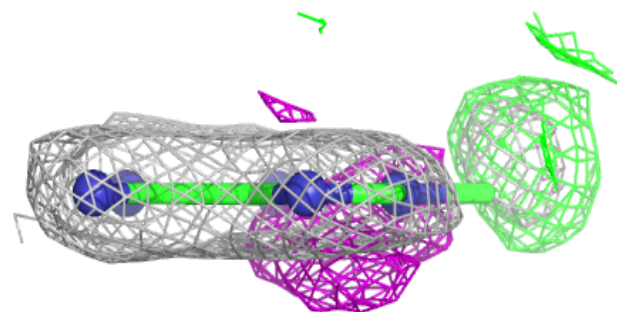
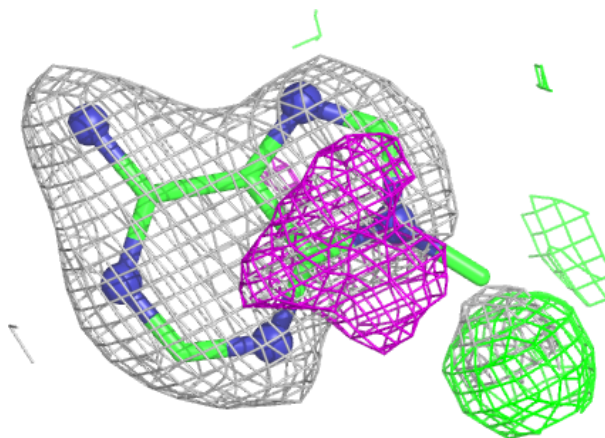
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around 5AD J 605:

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

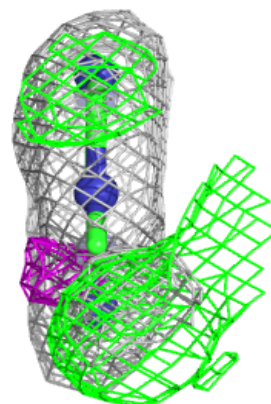
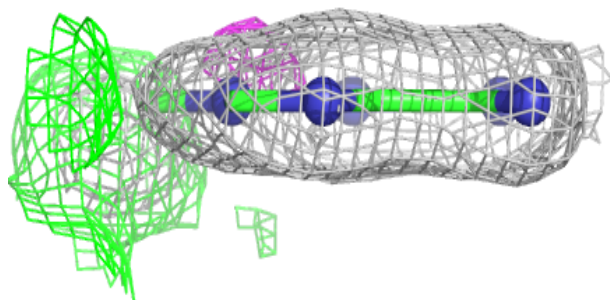
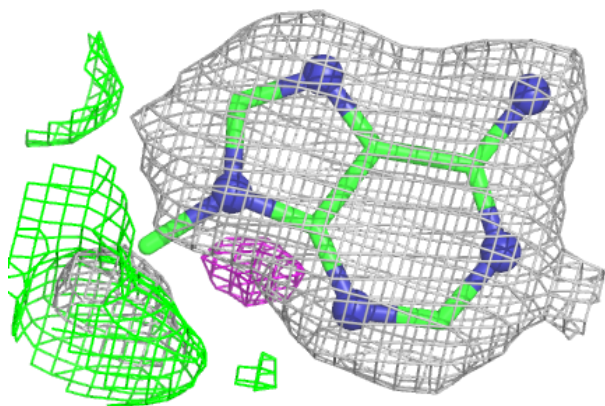
**Electron density around 5AD G 605:**

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



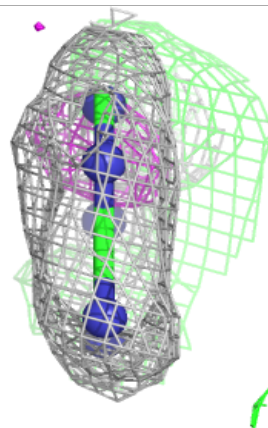
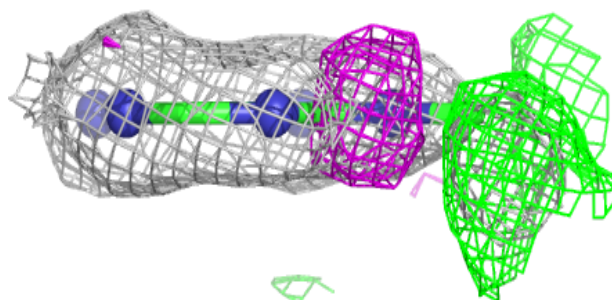
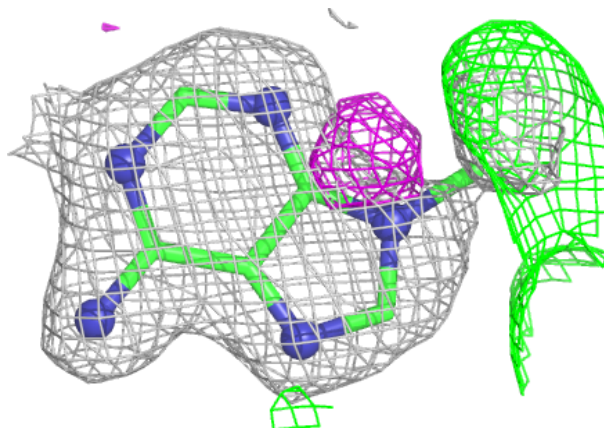
Electron density around 5AD A 605:

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



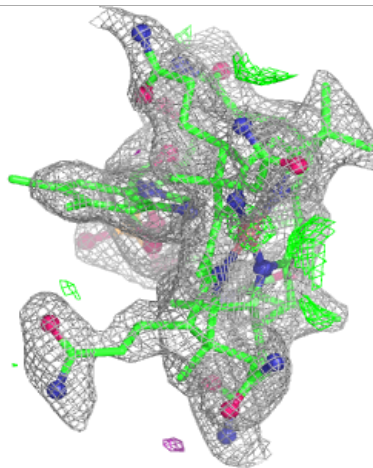
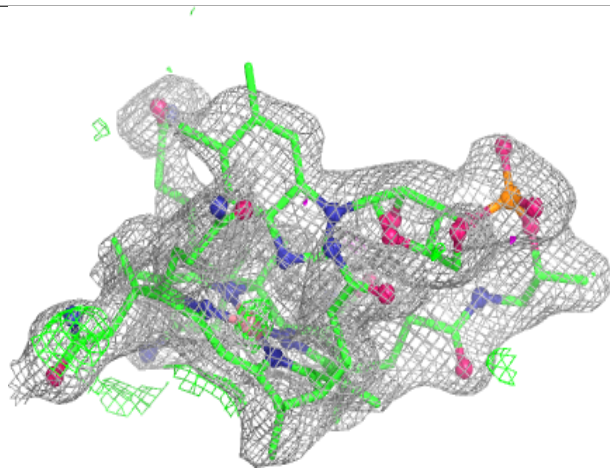
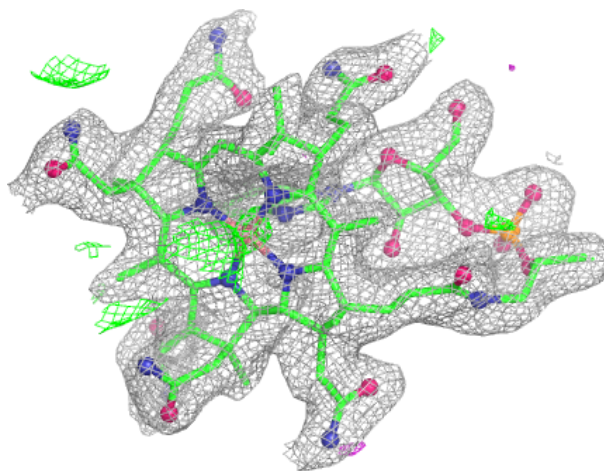
Electron density around 5AD D 605:

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



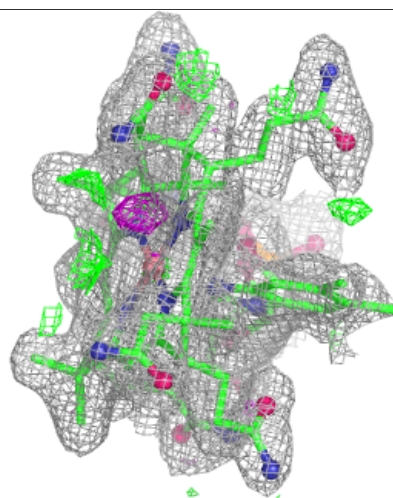
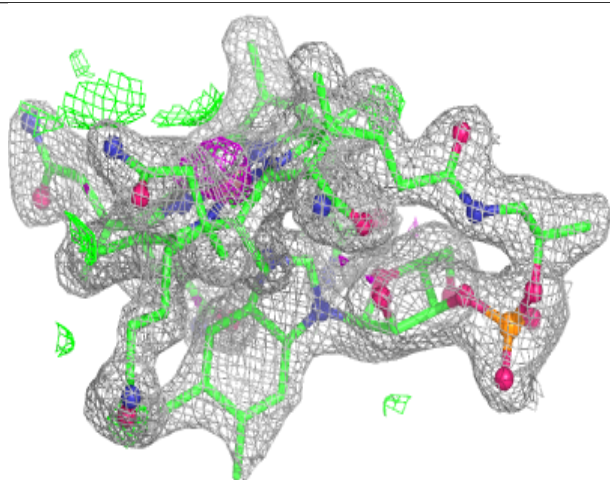
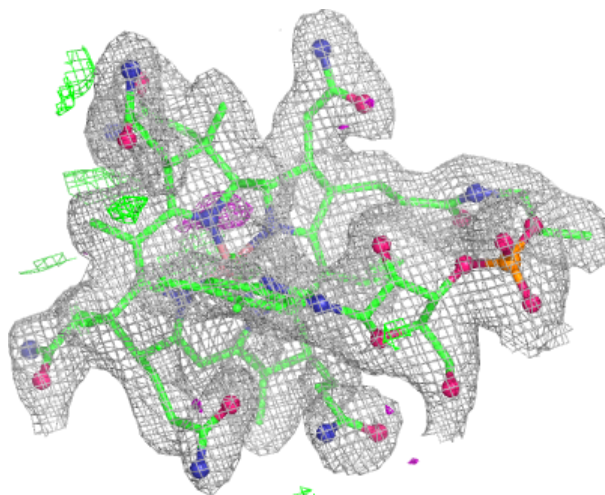
Electron density around B12 K 1601:

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



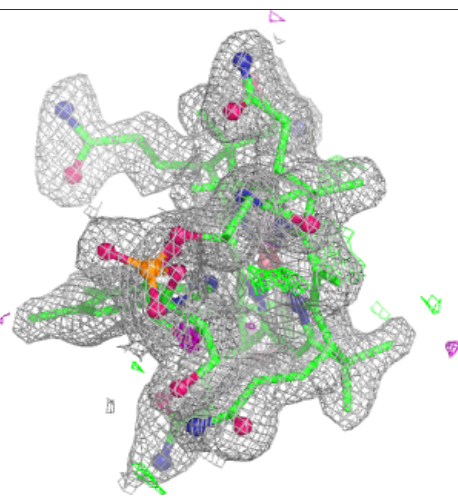
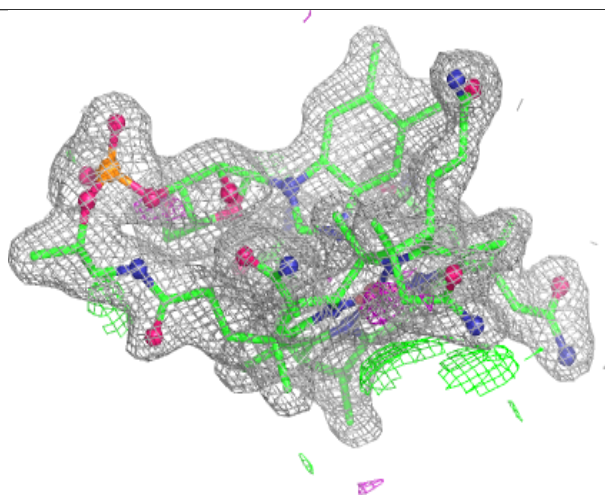
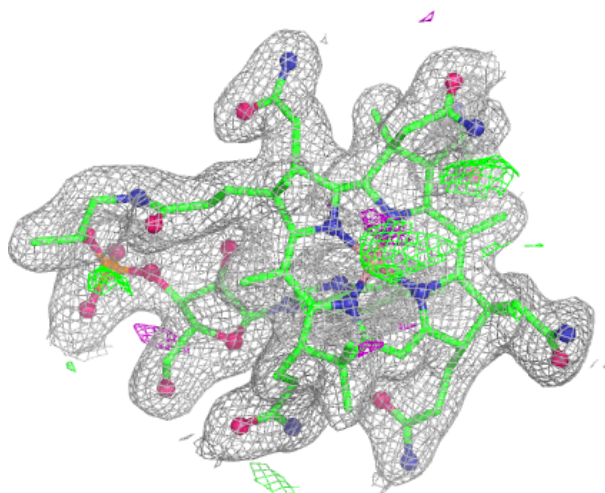
Electron density around B12 B 1601:

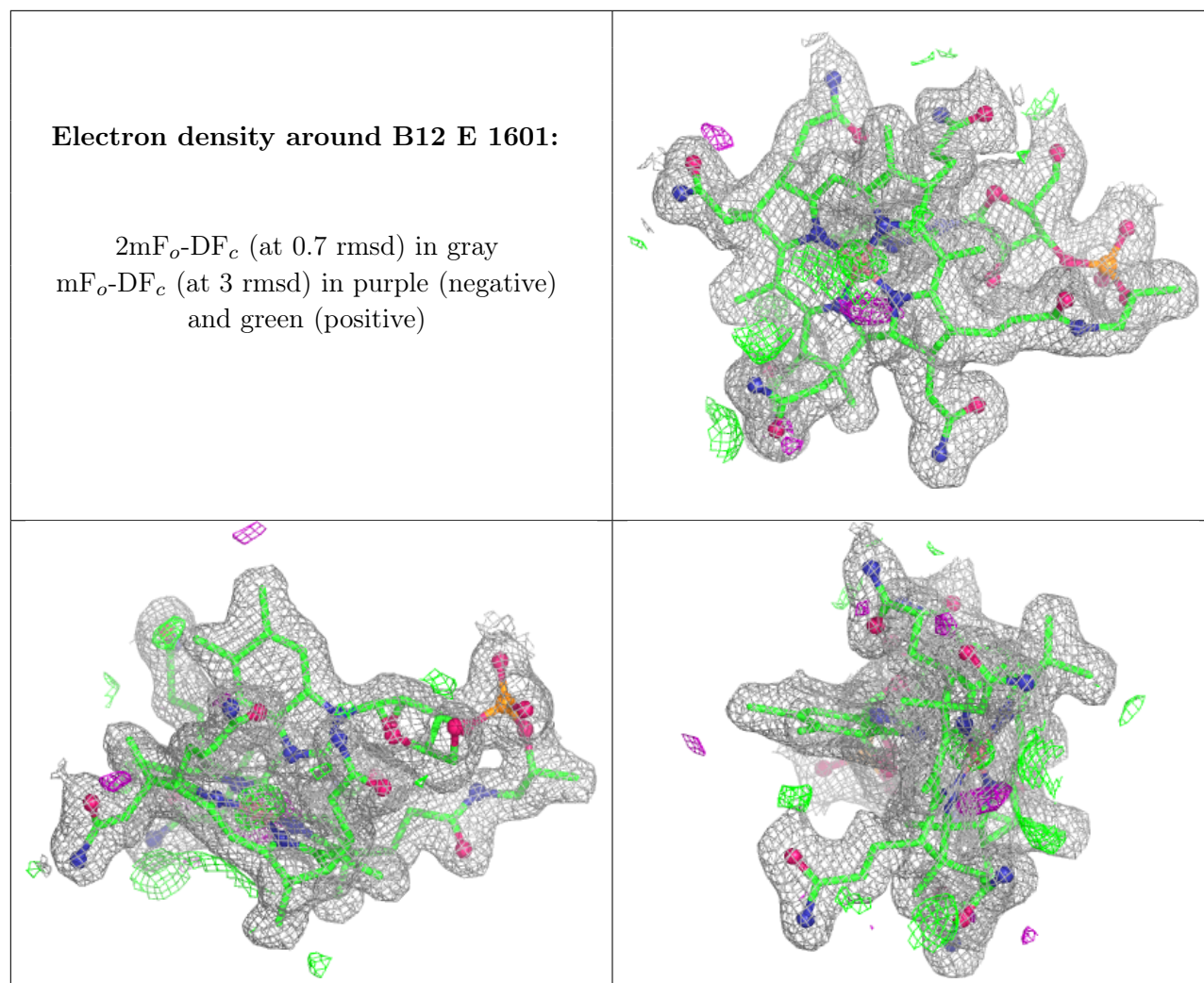
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around B12 H 1601:

$2mF_o-DF_c$ (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.