



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 07:17 PM UTC

PDB ID : 6R1B / pdb_00006r1b
Title : Crystal structure of UgpB from Mycobacterium tuberculosis in complex with glycerophosphocholine
Authors : Fenn, J.; Nepravishta, R.; Guy, C.S.; Harrison, J.; Angulo, J.; Cameron, A.D.; Fullam, E.
Deposited on : 2019-03-14
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

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	:	2022.3.0, CSD as543be (2022)
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	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

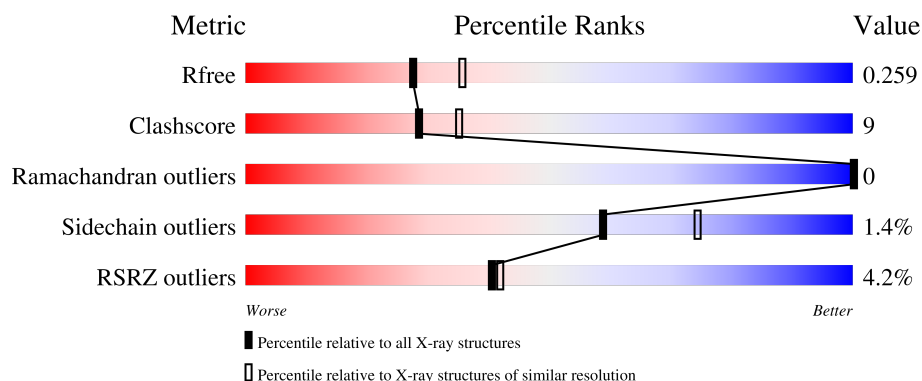
1 Overall quality at a glance

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))
R_{free}	180053	9078 (2.30-2.26)
Clashscore	190562	9802 (2.30-2.26)
Ramachandran outliers	187476	9690 (2.30-2.26)
Sidechain outliers	187428	9691 (2.30-2.26)
RSRZ outliers	180081	9085 (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 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	394	2% 84% 16%
2	B	395	3% 84% 15%
3	C	384	7% 74% 26%
4	D	382	6% 80% 19%

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 12337 atoms, of which 32 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 Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	394	Total	C	N	O	S	0	0	0
			3033	1931	526	574	2			

- Molecule 2 is a protein called Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	395	Total	C	N	O	S	0	0	0
			3037	1933	527	575	2			

- Molecule 3 is a protein called Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	384	Total	C	N	O	S	0	0	0
			2951	1881	513	555	2			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	?	-	ASP	deletion	UNP A0A0U0RXC0
C	?	-	ALA	deletion	UNP A0A0U0RXC0
C	?	-	SER	deletion	UNP A0A0U0RXC0
C	?	-	GLU	deletion	UNP A0A0U0RXC0
C	?	-	ARG	deletion	UNP A0A0U0RXC0
C	?	-	HIS	deletion	UNP A0A0U0RXC0
C	?	-	TYR	deletion	UNP A0A0U0RXC0
C	?	-	LEU	deletion	UNP A0A0U0RXC0
C	?	-	ALA	deletion	UNP A0A0U0RXC0
C	?	-	ASP	deletion	UNP A0A0U0RXC0
C	?	-	ASN	deletion	UNP A0A0U0RXC0
C	?	-	PRO	deletion	UNP A0A0U0RXC0

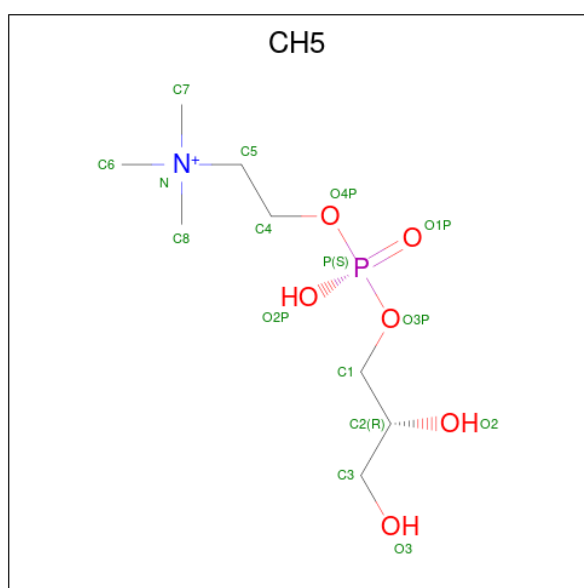
- Molecule 4 is a protein called Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	382	Total	C	N	O	S	0	0	0
			2932	1870	508	553	1			

There are 12 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	?	-	ASP	deletion	UNP A0A0U0RXC0
D	?	-	ALA	deletion	UNP A0A0U0RXC0
D	?	-	SER	deletion	UNP A0A0U0RXC0
D	?	-	GLU	deletion	UNP A0A0U0RXC0
D	?	-	ARG	deletion	UNP A0A0U0RXC0
D	?	-	HIS	deletion	UNP A0A0U0RXC0
D	?	-	TYR	deletion	UNP A0A0U0RXC0
D	?	-	LEU	deletion	UNP A0A0U0RXC0
D	?	-	ALA	deletion	UNP A0A0U0RXC0
D	?	-	ASP	deletion	UNP A0A0U0RXC0
D	?	-	ASN	deletion	UNP A0A0U0RXC0
D	?	-	PRO	deletion	UNP A0A0U0RXC0

- Molecule 5 is 2-(((R)-2,3-DIHYDROXYPROPYL)PHOSPHORYLOXY)-N,N,N-TRIMETHYLETHANAMINIUM (CCD ID: CH5) (formula: C₈H₂₁NO₆P) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			16	8	1	6	1		

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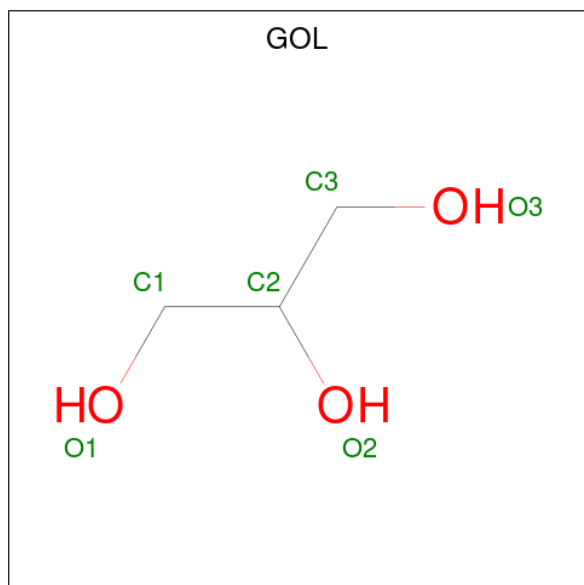
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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	P	0	0
			16	8	1	6	1		
5	C	1	Total	C	N	O	P	0	0
			16	8	1	6	1		
5	D	1	Total	C	N	O	P	0	0
			16	8	1	6	1		

- Molecule 6 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	1	Total	Mg	0	0
			1	1		
6	B	2	Total	Mg	0	0
			2	2		
6	C	1	Total	Mg	0	0
			1	1		
6	D	1	Total	Mg	0	0
			1	1		

- Molecule 7 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	A	1	Total	C	H	O	0	0
			14	3	8	3		
7	B	1	Total	C	H	O	0	0
			14	3	8	3		

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Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
7	B	1	Total	C	H	O	0	0
			14	3	8	3		
7	C	1	Total	C	H	O	0	0
			14	3	8	3		

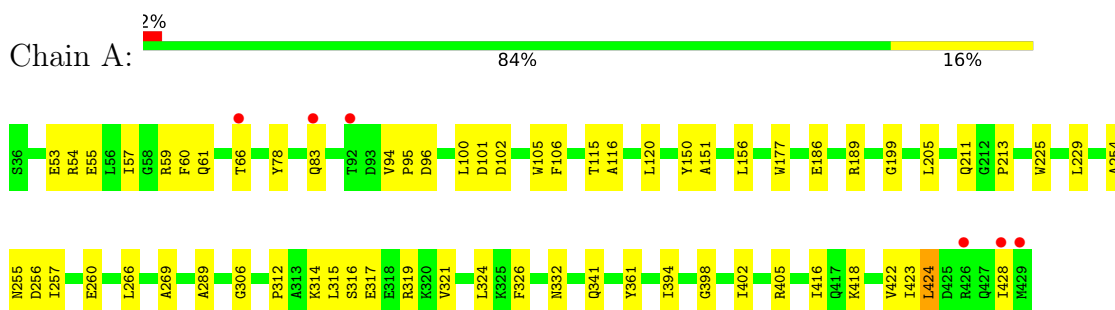
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	89	Total	O	0	0
			89	89		
8	B	83	Total	O	0	0
			83	83		
8	C	32	Total	O	0	0
			32	32		
8	D	55	Total	O	0	0
			55	55		

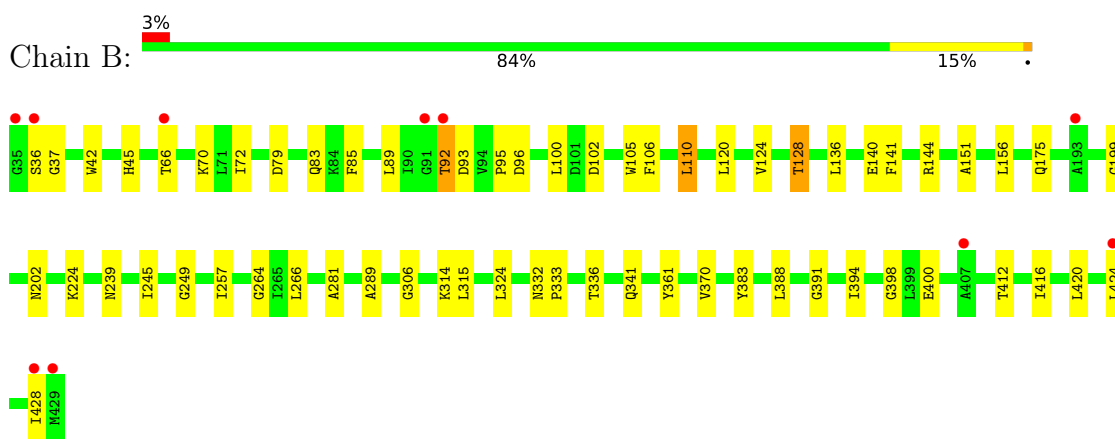
3 Residue-property plots [i](#)

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.

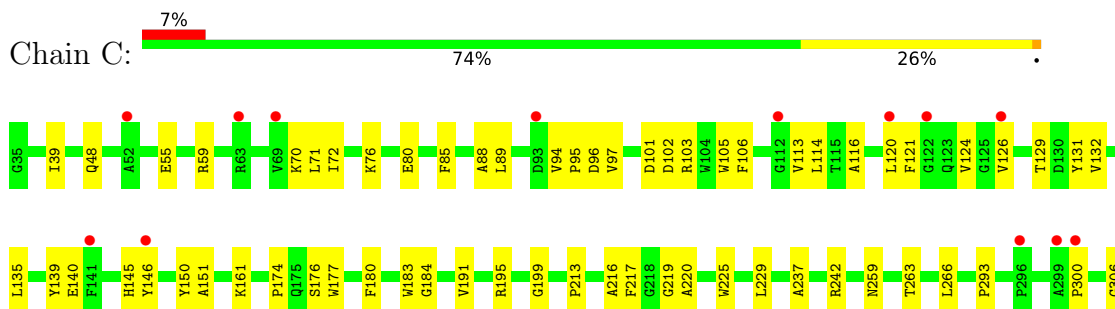
- Molecule 1: Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB

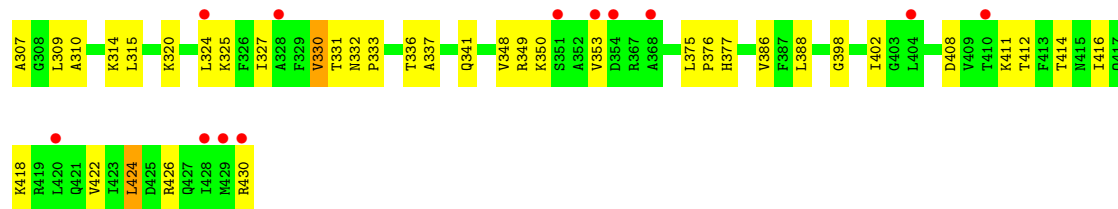


- Molecule 2: Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB

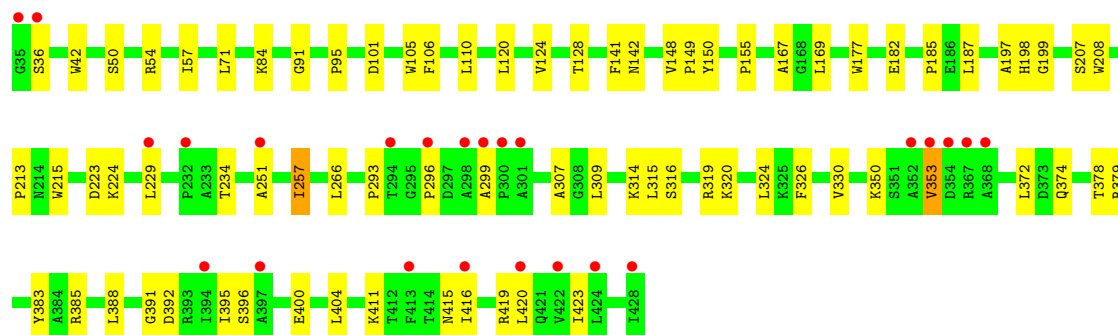
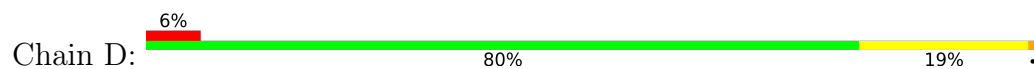


- Molecule 3: Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB





● Molecule 4: Putative Sn-glycerol-3-phosphate-binding lipoprotein UgpB



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	46.11Å 169.86Å 213.31Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	38.69 – 2.27 38.69 – 2.27	Depositor EDS
% Data completeness (in resolution range)	99.1 (38.69-2.27) 93.6 (38.69-2.27)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.55 (at 2.27Å)	Xtriage
Refinement program	PHENIX 1.12_2829, PHENIX 1.12_2829	Depositor
R, R_{free}	0.206 , 0.256 0.209 , 0.259	Depositor DCC
R_{free} test set	4040 reflections (4.61%)	wwPDB-VP
Wilson B-factor (Å ²)	38.2	Xtriage
Anisotropy	0.318	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 50.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	12337	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 28.97 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.6805e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: GOL, MG, CH5, MLZ

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	0.24	0/3105	0.43	0/4237
2	B	0.25	0/3109	0.44	0/4242
3	C	0.20	0/3019	0.38	0/4116
4	D	0.21	0/3000	0.38	0/4092
All	All	0.23	0/12233	0.41	0/16687

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	3033	0	2913	39	0
2	B	3037	0	2916	41	0
3	C	2951	0	2846	76	0
4	D	2932	0	2824	53	0
5	A	16	0	20	0	0
5	B	16	0	20	0	0
5	C	16	0	20	1	0
5	D	16	0	20	0	0
6	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	B	2	0	0	0	0
6	C	1	0	0	0	0
6	D	1	0	0	0	0
7	A	6	8	8	0	0
7	B	12	16	16	0	0
7	C	6	8	8	1	0
8	A	89	0	0	3	0
8	B	83	0	0	5	0
8	C	32	0	0	2	0
8	D	55	0	0	0	0
All	All	12305	32	11611	208	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 9.

All (208) 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)
4:D:169:LEU:HD11	4:D:187:LEU:HD21	1.50	0.94
3:C:398:GLY:HA3	3:C:416:ILE:HD11	1.57	0.86
3:C:70:LYS:HE2	3:C:72:ILE:HD11	1.57	0.85
1:A:120:LEU:HB3	1:A:324:LEU:HD22	1.58	0.85
3:C:120:LEU:HB3	3:C:324:LEU:HD22	1.64	0.79
2:B:199:GLY:HA3	2:B:266:LEU:HD13	1.64	0.78
1:A:96:ASP:HA	1:A:315:LEU:HD11	1.66	0.76
3:C:76:LYS:HG2	3:C:80:GLU:OE1	1.87	0.74
2:B:424:LEU:O	2:B:428:ILE:HG12	1.87	0.74
2:B:79:ASP:O	2:B:83:GLN:HG2	1.89	0.72
4:D:169:LEU:CD1	4:D:187:LEU:HD21	2.19	0.70
3:C:131:TYR:CE2	3:C:349:ARG:HD3	2.27	0.70
3:C:121:PHE:HE1	3:C:324:LEU:HD11	1.57	0.69
3:C:121:PHE:HD1	3:C:324:LEU:HD21	1.58	0.68
3:C:94:VAL:HB	3:C:95:PRO:HD2	1.78	0.66
3:C:124:VAL:CG1	3:C:325:LYS:HG3	2.25	0.66
1:A:120:LEU:HB3	1:A:324:LEU:CD2	2.25	0.66
4:D:229:LEU:HA	4:D:234:THR:HG21	1.78	0.66
3:C:176:SER:HA	3:C:293:PRO:HB3	1.77	0.65
2:B:245:ILE:O	2:B:249:GLY:HA2	1.96	0.64
2:B:391:GLY:HA2	2:B:420:LEU:HD21	1.80	0.64
3:C:377:HIS:NE2	8:C:603:HOH:O	2.31	0.63
1:A:186:GLU:OE1	1:A:189:ARG:NH2	2.32	0.63

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
3:C:97:VAL:HG13	3:C:327:ILE:HD11	1.81	0.62
4:D:315:LEU:O	4:D:320:LYS:HE3	2.00	0.61
3:C:121:PHE:CE1	3:C:324:LEU:HD11	2.36	0.60
3:C:70:LYS:HE2	3:C:72:ILE:CD1	2.30	0.60
3:C:129:THR:O	3:C:350:LYS:NZ	2.25	0.60
3:C:315:LEU:O	3:C:320:LYS:HE3	2.02	0.60
3:C:124:VAL:HG13	3:C:325:LYS:HG3	1.84	0.59
4:D:326:PHE:O	4:D:330:VAL:HG13	2.03	0.59
2:B:175:GLN:OE1	4:D:91:GLY:HA3	2.03	0.59
3:C:105:TRP:CZ2	3:C:139:TYR:HA	2.37	0.58
1:A:229:LEU:HD13	1:A:416:ILE:HG22	1.84	0.58
3:C:191:VAL:O	3:C:195:ARG:NH1	2.36	0.58
3:C:426:ARG:HB3	3:C:430:ARG:HD3	1.87	0.57
4:D:187:LEU:HB2	4:D:197:ALA:HB1	1.86	0.57
3:C:131:TYR:HD2	3:C:348:VAL:O	1.88	0.57
3:C:337:ALA:O	3:C:341:GLN:HG3	2.05	0.57
4:D:385:ARG:HG3	4:D:392:ASP:OD2	2.05	0.56
2:B:156:LEU:HD13	2:B:289:ALA:HB1	1.88	0.56
2:B:391:GLY:HA2	2:B:420:LEU:CD2	2.35	0.56
1:A:398:GLY:O	1:A:402:ILE:HG13	2.05	0.56
4:D:36:SER:HA	4:D:319:ARG:NH1	2.21	0.55
4:D:388:LEU:HG	4:D:423:ILE:HG21	1.88	0.55
3:C:70:LYS:CE	3:C:72:ILE:HD11	2.32	0.55
2:B:85:PHE:O	2:B:89:LEU:HG	2.06	0.55
4:D:374:GLN:O	4:D:378:THR:HG23	2.07	0.55
4:D:42:TRP:CH2	4:D:84:LYS:HG2	2.40	0.55
4:D:57:ILE:CD1	4:D:71:LEU:HB2	2.36	0.55
4:D:229:LEU:HD13	4:D:416:ILE:HG22	1.89	0.54
3:C:120:LEU:CB	3:C:324:LEU:HD22	2.37	0.54
4:D:124:VAL:HG12	4:D:124:VAL:O	2.07	0.54
1:A:317:GLU:O	1:A:321:VAL:HG23	2.08	0.54
3:C:217:PHE:HB2	3:C:237:ALA:HB2	1.90	0.54
3:C:330:VAL:HG12	3:C:331:THR:HG23	1.90	0.54
2:B:110:LEU:HD11	2:B:141:PHE:CE1	2.43	0.53
2:B:224:LYS:O	2:B:383:TYR:HB2	2.08	0.53
3:C:102:ASP:OD1	3:C:102:ASP:N	2.41	0.53
3:C:121:PHE:CD1	3:C:126:VAL:HG21	2.43	0.53
4:D:148:VAL:HG13	4:D:149:PRO:HD2	1.89	0.53
4:D:208:TRP:HB2	4:D:385:ARG:NH2	2.24	0.53
3:C:199:GLY:HA3	3:C:266:LEU:HD13	1.90	0.53
4:D:207:SER:HB3	4:D:396:SER:OG	2.09	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:110:LEU:HD11	2:B:141:PHE:CZ	2.45	0.52
1:A:177:TRP:CZ2	1:A:213:PRO:HG3	2.45	0.52
3:C:85:PHE:O	3:C:89:LEU:HG	2.10	0.52
4:D:42:TRP:CZ3	4:D:84:LYS:HG2	2.45	0.52
3:C:414:THR:HG22	3:C:418:LYS:HE2	1.91	0.52
3:C:151:ALA:O	3:C:306:GLY:HA3	2.10	0.52
4:D:141:PHE:CE2	4:D:142:ASN:HB2	2.45	0.52
1:A:405:ARG:NH2	8:A:603:HOH:O	2.43	0.51
3:C:408:ASP:HB3	3:C:411:LYS:HG2	1.93	0.51
4:D:141:PHE:CD2	4:D:142:ASN:HB2	2.45	0.51
4:D:391:GLY:HA2	4:D:420:LEU:CD2	2.40	0.51
2:B:289:ALA:O	2:B:370:VAL:HG21	2.11	0.51
2:B:202:ASN:HB2	2:B:400:GLU:OE1	2.11	0.51
1:A:257:ILE:HD11	1:A:269:ALA:HB1	1.94	0.50
2:B:92:THR:OG1	2:B:93:ASP:N	2.43	0.50
1:A:156:LEU:HD13	1:A:289:ALA:HB1	1.93	0.50
3:C:332:ASN:O	3:C:336:THR:HG22	2.11	0.50
3:C:418:LYS:O	3:C:422:VAL:HG23	2.12	0.50
4:D:316:SER:O	4:D:320:LYS:HG3	2.12	0.50
2:B:314:LYS:HG2	8:B:623:HOH:O	2.09	0.50
3:C:132:VAL:CG1	3:C:135:LEU:HG	2.41	0.50
3:C:332:ASN:HA	3:C:349:ARG:NH1	2.27	0.50
2:B:124:VAL:HG12	2:B:124:VAL:O	2.11	0.49
4:D:314:LYS:O	4:D:314:LYS:HG3	2.12	0.49
1:A:95:PRO:O	1:A:312:PRO:HG2	2.13	0.49
3:C:124:VAL:HG11	3:C:325:LYS:HG3	1.93	0.49
3:C:259:ASN:O	3:C:263:THR:HG23	2.11	0.49
1:A:100:LEU:HA	8:A:643:HOH:O	2.11	0.49
4:D:177:TRP:CE2	4:D:213:PRO:HB3	2.47	0.49
2:B:70:LYS:HG2	2:B:72:ILE:HD11	1.94	0.49
4:D:50:SER:O	4:D:54:ARG:HG3	2.13	0.49
1:A:199:GLY:HA3	1:A:266:LEU:HD13	1.95	0.49
4:D:400:GLU:HG2	4:D:404:LEU:HD12	1.93	0.49
3:C:348:VAL:O	3:C:348:VAL:HG23	2.13	0.48
4:D:155:PRO:HD3	4:D:208:TRP:CZ2	2.48	0.48
3:C:300:PRO:HB3	3:C:377:HIS:O	2.13	0.48
3:C:332:ASN:HB2	3:C:333:PRO:CD	2.44	0.48
2:B:281:ALA:O	3:C:48:GLN:HB3	2.14	0.48
1:A:54:ARG:NH2	8:A:604:HOH:O	2.44	0.48
1:A:394:ILE:HG22	1:A:416:ILE:HG13	1.96	0.48
3:C:114:LEU:HD22	3:C:310:ALA:HB1	1.96	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:424:LEU:O	1:A:428:ILE:HG13	2.13	0.48
4:D:199:GLY:HA3	4:D:266:LEU:HD13	1.95	0.48
2:B:140:GLU:HA	2:B:144:ARG:O	2.14	0.48
3:C:225:TRP:HB3	3:C:424:LEU:HD21	1.94	0.48
3:C:388:LEU:HD13	3:C:424:LEU:HD12	1.96	0.48
1:A:225:TRP:O	1:A:424:LEU:HD11	2.14	0.48
3:C:120:LEU:HB3	3:C:324:LEU:CD2	2.39	0.48
1:A:254:ALA:HB1	1:A:260:GLU:OE1	2.14	0.48
2:B:96:ASP:HA	2:B:315:LEU:HD11	1.96	0.47
3:C:71:LEU:O	3:C:72:ILE:HD13	2.15	0.47
3:C:124:VAL:HG13	3:C:325:LYS:HE3	1.94	0.47
3:C:174:PRO:CB	3:C:180:PHE:HB2	2.44	0.47
3:C:219:GLY:O	3:C:220:ALA:HB2	2.14	0.47
4:D:224:LYS:O	4:D:383:TYR:HB2	2.14	0.47
3:C:103:ARG:HG2	3:C:386:VAL:HA	1.97	0.47
4:D:326:PHE:CZ	4:D:330:VAL:HG11	2.50	0.47
3:C:39:ILE:HG23	3:C:96:ASP:CB	2.45	0.47
3:C:216:ALA:HB1	7:C:503:GOL:H31	1.97	0.47
1:A:316:SER:OG	1:A:319:ARG:HG3	2.14	0.47
2:B:45:HIS:NE2	8:B:601:HOH:O	2.34	0.46
2:B:341:GLN:HG2	2:B:361:TYR:CG	2.50	0.46
2:B:388:LEU:C	2:B:388:LEU:HD23	2.39	0.46
3:C:229:LEU:HD12	3:C:229:LEU:H	1.81	0.46
3:C:333:PRO:HD3	3:C:349:ARG:NH2	2.31	0.46
1:A:255:ASN:HB3	1:A:256:ASP:H	1.64	0.46
4:D:187:LEU:HB2	4:D:197:ALA:CB	2.45	0.46
4:D:215:TRP:CZ3	4:D:379:ARG:HB3	2.51	0.46
2:B:128:THR:HG22	2:B:136:LEU:CD2	2.46	0.46
3:C:353:VAL:HG12	3:C:353:VAL:O	2.16	0.46
4:D:101:ASP:HA	4:D:307:ALA:HA	1.97	0.46
4:D:105:TRP:CG	4:D:106:PHE:N	2.84	0.46
4:D:150:TYR:HB2	4:D:309:LEU:HG	1.97	0.46
2:B:239:ASN:ND2	8:B:603:HOH:O	2.44	0.45
4:D:223:ASP:O	4:D:224:LYS:HB2	2.15	0.45
2:B:151:ALA:O	2:B:306:GLY:HA3	2.16	0.45
4:D:177:TRP:CE2	4:D:293:PRO:HG2	2.51	0.45
2:B:36:SER:OG	2:B:37:GLY:N	2.50	0.45
3:C:315:LEU:HB2	3:C:320:LYS:HE3	1.97	0.45
1:A:394:ILE:CG2	1:A:416:ILE:HG13	2.47	0.45
2:B:42:TRP:CD1	2:B:95:PRO:HB3	2.51	0.45
2:B:102:ASP:OD1	2:B:102:ASP:N	2.47	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:332:ASN:OD1	1:A:332:ASN:C	2.60	0.45
1:A:418:LYS:O	1:A:422:VAL:HG23	2.16	0.45
3:C:375:LEU:N	3:C:376:PRO:HD2	2.32	0.45
4:D:101:ASP:HA	4:D:307:ALA:CB	2.46	0.45
1:A:105:TRP:CG	1:A:106:PHE:N	2.85	0.45
3:C:177:TRP:NE1	3:C:213:PRO:HB3	2.32	0.45
4:D:124:VAL:O	4:D:124:VAL:CG1	2.64	0.44
4:D:198:HIS:O	4:D:251:ALA:HA	2.16	0.44
1:A:57:ILE:O	1:A:61:GLN:HG3	2.16	0.44
1:A:53:GLU:HG2	1:A:150:TYR:OH	2.18	0.44
1:A:115:THR:HG22	1:A:116:ALA:O	2.18	0.44
2:B:332:ASN:HB2	2:B:333:PRO:CD	2.48	0.44
4:D:229:LEU:HD13	4:D:416:ILE:CG2	2.47	0.44
4:D:57:ILE:HD12	4:D:71:LEU:HB2	1.99	0.44
1:A:94:VAL:HG11	1:A:314:LYS:HD2	1.99	0.44
1:A:205:LEU:HD12	1:A:205:LEU:HA	1.83	0.44
1:A:102:ASP:N	1:A:102:ASP:OD1	2.51	0.43
2:B:412:THR:O	2:B:416:ILE:HG13	2.18	0.43
3:C:116:ALA:HB2	3:C:146:TYR:CE1	2.53	0.43
3:C:242:ARG:HG3	3:C:402:ILE:HG22	2.00	0.43
2:B:100:LEU:HA	8:B:647:HOH:O	2.18	0.43
3:C:55:GLU:O	3:C:59:ARG:HG3	2.19	0.43
3:C:150:TYR:HB2	3:C:309:LEU:HG	2.01	0.43
2:B:120:LEU:HB3	2:B:324:LEU:HD23	2.00	0.43
1:A:60:PHE:CE1	1:A:326:PHE:HA	2.53	0.43
5:C:501:CH5:H81	8:C:619:HOH:O	2.18	0.43
2:B:199:GLY:O	2:B:257:ILE:HD11	2.19	0.43
1:A:120:LEU:HD13	1:A:120:LEU:HA	1.80	0.43
3:C:121:PHE:CD1	3:C:324:LEU:HD21	2.46	0.43
3:C:150:TYR:CD1	3:C:309:LEU:HD11	2.54	0.43
4:D:199:GLY:O	4:D:257:ILE:HD11	2.18	0.43
2:B:394:ILE:HG22	2:B:416:ILE:HG23	2.01	0.43
3:C:88:ALA:HB1	3:C:94:VAL:HG12	2.01	0.43
2:B:332:ASN:O	2:B:336:THR:HG22	2.18	0.43
3:C:314:LYS:HG3	3:C:314:LYS:O	2.19	0.43
1:A:55:GLU:O	1:A:59:ARG:HG3	2.18	0.42
2:B:105:TRP:CG	2:B:106:PHE:N	2.88	0.42
4:D:296:PRO:HD2	4:D:299:ALA:HB3	2.01	0.42
2:B:398:GLY:HA3	2:B:416:ILE:HD11	2.00	0.42
1:A:78:TYR:CG	1:A:101:ASP:HB3	2.54	0.42
3:C:140:GLU:HB2	3:C:145:HIS:NE2	2.34	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:177:TRP:CE2	1:A:213:PRO:HG3	2.55	0.41
3:C:333:PRO:HD3	3:C:349:ARG:CZ	2.50	0.41
2:B:388:LEU:HD22	2:B:420:LEU:HD22	2.02	0.41
4:D:42:TRP:CD1	4:D:95:PRO:HB3	2.55	0.41
4:D:411:LYS:N	4:D:411:LYS:HD2	2.35	0.41
1:A:341:GLN:HG2	1:A:361:TYR:CG	2.55	0.41
3:C:101:ASP:HA	3:C:307:ALA:HA	2.02	0.41
3:C:105:TRP:CG	3:C:106:PHE:N	2.89	0.41
1:A:151:ALA:O	1:A:306:GLY:HA3	2.21	0.41
4:D:391:GLY:O	4:D:395:ILE:HG13	2.21	0.41
1:A:94:VAL:CG1	1:A:314:LYS:HD2	2.51	0.41
4:D:120:LEU:HB3	4:D:324:LEU:HD22	2.03	0.41
4:D:167:ALA:HB3	4:D:169:LEU:HG	2.03	0.41
4:D:415:ASN:O	4:D:419:ARG:HG3	2.21	0.41
3:C:411:LYS:HG3	3:C:412:THR:N	2.35	0.41
4:D:182:GLU:O	4:D:185:PRO:HD2	2.21	0.40
2:B:264:GLY:HA2	8:B:637:HOH:O	2.22	0.40
3:C:132:VAL:HG11	3:C:135:LEU:HG	2.04	0.40
3:C:225:TRP:CE3	3:C:424:LEU:HD11	2.57	0.40
4:D:350:LYS:O	4:D:353:VAL:HG22	2.22	0.40
3:C:183:TRP:O	3:C:184:GLY:C	2.64	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	391/394 (99%)	383 (98%)	8 (2%)	0	100	100
2	B	392/395 (99%)	377 (96%)	15 (4%)	0	100	100
3	C	379/384 (99%)	363 (96%)	16 (4%)	0	100	100
4	D	377/382 (99%)	360 (96%)	17 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	1539/1555 (99%)	1483 (96%)	56 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	305/305 (100%)	300 (98%)	5 (2%)	55	71
2	B	305/305 (100%)	301 (99%)	4 (1%)	61	76
3	C	296/296 (100%)	293 (99%)	3 (1%)	68	81
4	D	294/294 (100%)	289 (98%)	5 (2%)	53	70
All	All	1200/1200 (100%)	1183 (99%)	17 (1%)	59	74

All (17) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	66	THR
1	A	83	GLN
1	A	211	GLN
1	A	423	ILE
1	A	424	LEU
2	B	66	THR
2	B	92	THR
2	B	110	LEU
2	B	128	THR
3	C	113	VAL
3	C	330	VAL
3	C	424	LEU
4	D	110	LEU
4	D	128	THR
4	D	257	ILE
4	D	353	VAL
4	D	372	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	365	ASN
2	B	48	GLN
2	B	421	GLN
3	C	255	ASN
3	C	427	GLN
4	D	107	HIS
4	D	255	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
4	MLZ	D	161	4	8,9,10	0.83	0	4,9,11	0.65	0
3	MLZ	C	161	3	8,9,10	0.81	1 (12%)	4,9,11	0.58	0
2	MLZ	B	161	2	8,9,10	0.75	0	4,9,11	0.61	0
1	MLZ	A	161	1	8,9,10	0.71	0	4,9,11	0.75	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
4	MLZ	D	161	4	-	2/7/8/10	-
3	MLZ	C	161	3	-	1/7/8/10	-
2	MLZ	B	161	2	-	2/7/8/10	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
1	MLZ	A	161	1	-	2/7/8/10	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	C	161	MLZ	O-C	2.00	1.27	1.20

There are no bond angle outliers.

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	161	MLZ	O-C-CA-CB
2	B	161	MLZ	O-C-CA-CB
2	B	161	MLZ	CD-CE-NZ-CM
3	C	161	MLZ	O-C-CA-CB
4	D	161	MLZ	O-C-CA-CB
4	D	161	MLZ	CA-CB-CG-CD
1	A	161	MLZ	C-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 13 ligands modelled in this entry, 5 are monoatomic - leaving 8 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
7	GOL	B	505	-	5,5,5	0.88	0	5,5,5	1.13	1 (20%)
7	GOL	A	503	-	5,5,5	1.20	0	5,5,5	0.92	0
5	CH5	D	501	-	15,15,15	0.37	0	19,21,21	0.47	0
7	GOL	B	504	-	5,5,5	1.04	0	5,5,5	0.95	0
5	CH5	B	501	-	15,15,15	0.52	0	19,21,21	0.34	0
7	GOL	C	503	-	5,5,5	1.11	0	5,5,5	1.06	0
5	CH5	C	501	-	15,15,15	0.66	0	19,21,21	0.35	0
5	CH5	A	501	-	15,15,15	0.44	0	19,21,21	0.33	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
7	GOL	B	505	-	-	0/4/4/4	-
7	GOL	A	503	-	-	2/4/4/4	-
5	CH5	D	501	-	-	1/16/16/16	-
7	GOL	B	504	-	-	2/4/4/4	-
5	CH5	B	501	-	-	0/16/16/16	-
7	GOL	C	503	-	-	2/4/4/4	-
5	CH5	C	501	-	-	0/16/16/16	-
5	CH5	A	501	-	-	0/16/16/16	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	B	505	GOL	C3-C2-C1	-2.04	104.32	111.80

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	B	504	GOL	O1-C1-C2-C3
7	C	503	GOL	C1-C2-C3-O3
7	A	503	GOL	O1-C1-C2-O2
7	A	503	GOL	O1-C1-C2-C3
7	B	504	GOL	O1-C1-C2-O2
7	C	503	GOL	O2-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
5	D	501	CH5	C1-O3P-P-O1P

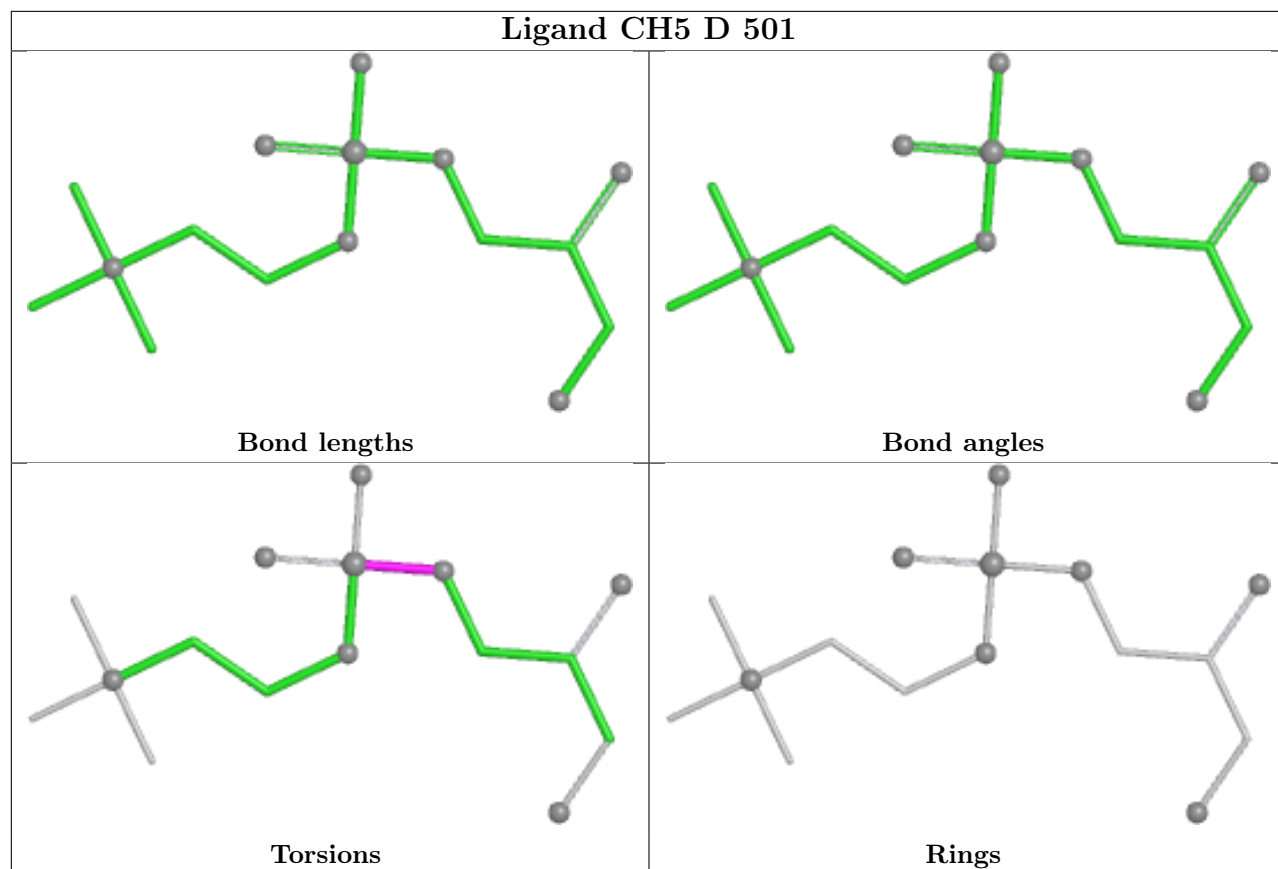
There are no ring outliers.

2 monomers are involved in 2 short contacts:

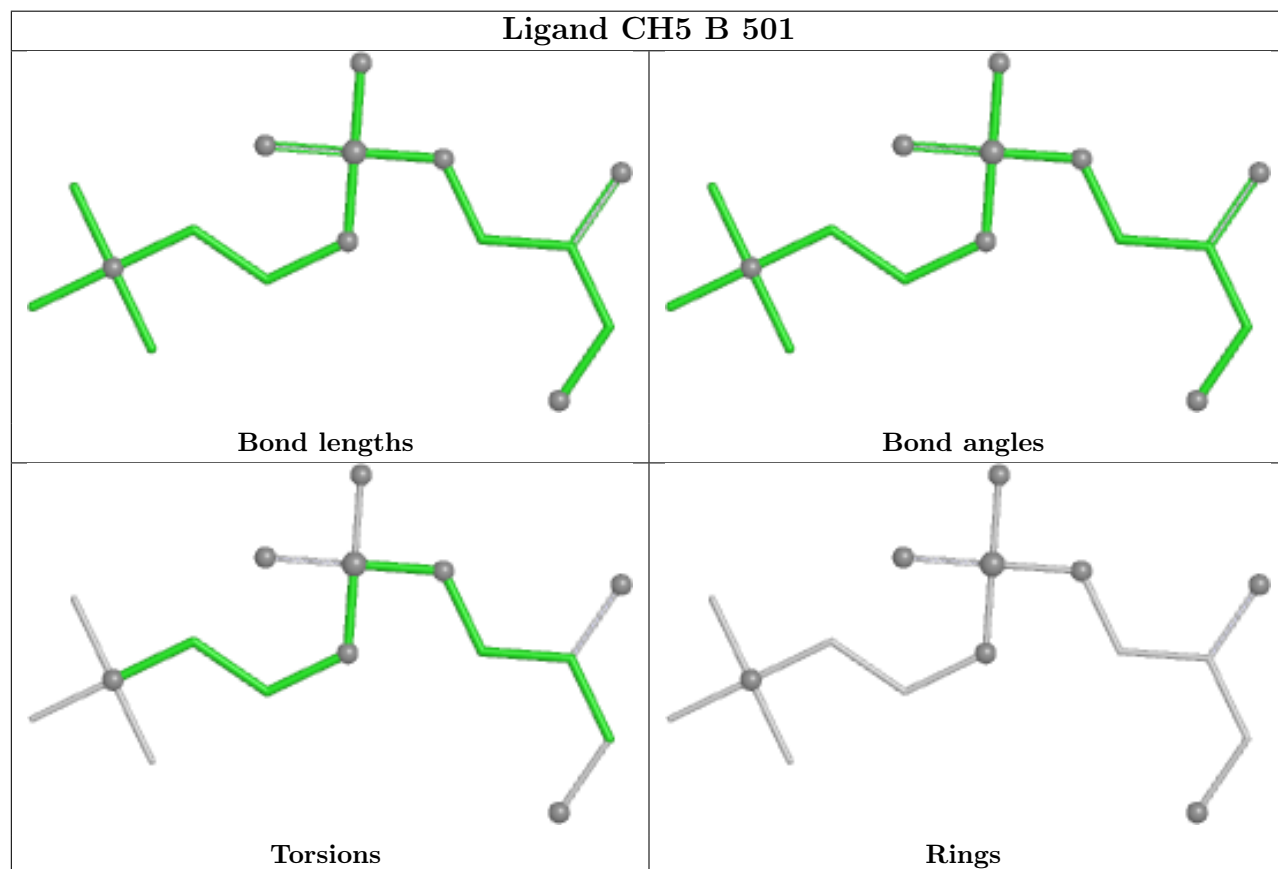
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	C	503	GOL	1	0
5	C	501	CH5	1	0

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.

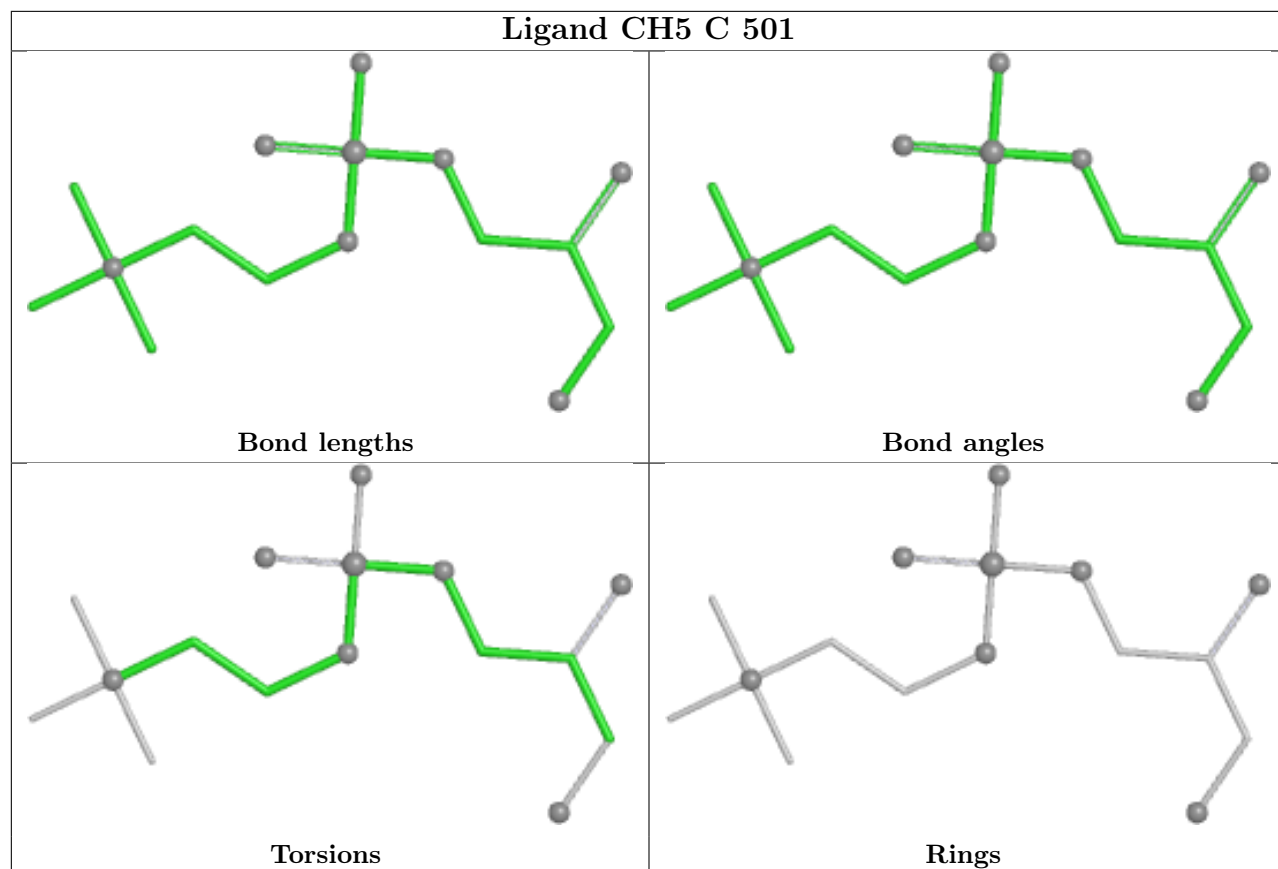
Ligand CH5 D 501



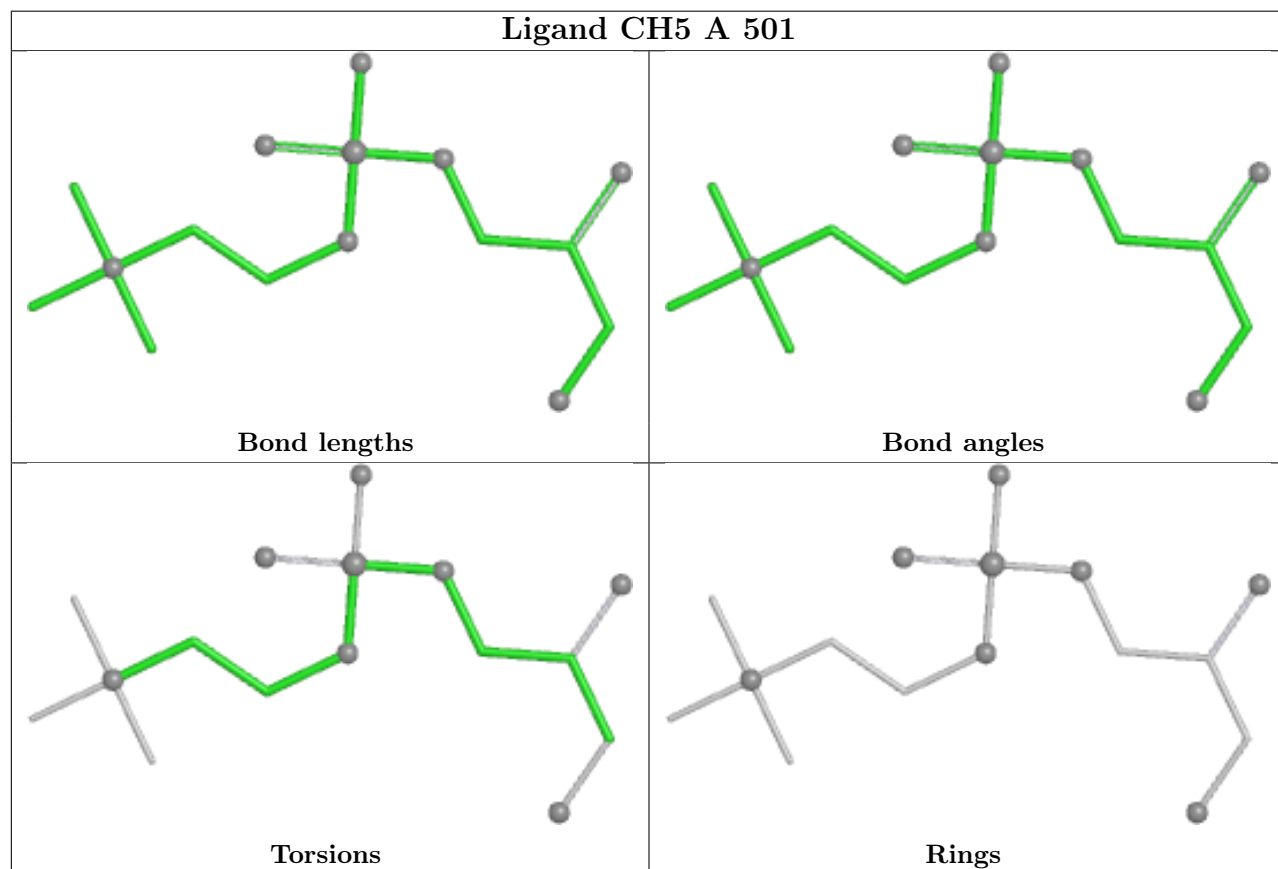
Ligand CH5 B 501



Ligand CH5 C 501



Ligand CH5 A 501



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
3	C	1
4	D	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	354:ASP	C	367:ARG	N	15.75
1	D	354:ASP	C	367:ARG	N	15.35

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	393/394 (99%)	0.12	6 (1%) 72 73	30, 44, 69, 93	0
2	B	394/395 (99%)	0.21	10 (2%) 58 60	31, 44, 69, 112	0
3	C	383/384 (99%)	0.71	25 (6%) 25 26	33, 62, 100, 122	0
4	D	381/382 (99%)	0.64	24 (6%) 26 27	31, 58, 90, 115	0
All	All	1551/1555 (99%)	0.42	65 (4%) 40 42	30, 50, 87, 122	0

All (65) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
4	D	368	ALA	4.7
4	D	35	GLY	4.4
3	C	368	ALA	4.2
3	C	353	VAL	3.7
3	C	429	MET	3.3
4	D	296	PRO	3.3
4	D	428	ILE	3.2
3	C	120	LEU	3.1
3	C	126	VAL	3.1
4	D	416	ILE	3.0
3	C	63	ARG	3.0
3	C	430	ARG	3.0
2	B	36	SER	3.0
3	C	428	ILE	3.0
3	C	93	ASP	2.9
1	A	92	THR	2.9
2	B	35	GLY	2.9
2	B	424	LEU	2.9
4	D	422	VAL	2.9
2	B	92	THR	2.9
4	D	36	SER	2.8

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Mol	Chain	Res	Type	RSRZ
4	D	294	THR	2.8
3	C	354	ASP	2.7
3	C	299	ALA	2.7
4	D	352	ALA	2.7
2	B	407	ALA	2.7
4	D	353	VAL	2.7
2	B	428	ILE	2.7
3	C	122	GLY	2.6
2	B	429	MET	2.6
2	B	193	ALA	2.5
4	D	298	ALA	2.5
2	B	66	THR	2.4
3	C	296	PRO	2.4
4	D	232	PRO	2.4
3	C	404	LEU	2.4
4	D	424	LEU	2.4
3	C	300	PRO	2.4
4	D	413	PHE	2.4
3	C	410	THR	2.3
4	D	394	ILE	2.3
1	A	428	ILE	2.3
4	D	229	LEU	2.3
4	D	300	PRO	2.3
3	C	146	TYR	2.3
3	C	52	ALA	2.3
3	C	351	SER	2.2
4	D	354	ASP	2.2
1	A	429	MET	2.2
3	C	141	PHE	2.2
4	D	301	ALA	2.2
3	C	324	LEU	2.2
3	C	420	LEU	2.2
1	A	66	THR	2.2
4	D	299	ALA	2.2
4	D	397	ALA	2.2
4	D	420	LEU	2.1
2	B	91	GLY	2.1
4	D	367	ARG	2.1
1	A	83	GLN	2.1
3	C	69	VAL	2.1
3	C	112	GLY	2.1
1	A	426	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
4	D	251	ALA	2.0
3	C	328	ALA	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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	MLZ	B	161	10/11	0.92	0.10	37,41,43,44	0
1	MLZ	A	161	10/11	0.94	0.09	30,36,46,47	0
3	MLZ	C	161	10/11	0.94	0.10	35,40,52,53	0
4	MLZ	D	161	10/11	0.94	0.09	45,50,53,55	0

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
6	MG	C	502	1/1	0.69	0.33	82,82,82,82	0
6	MG	B	502	1/1	0.79	0.27	66,66,66,66	0
6	MG	B	503	1/1	0.82	0.28	72,72,72,72	0
7	GOL	C	503	6/6	0.91	0.10	48,58,61,63	0
7	GOL	B	504	6/6	0.92	0.14	45,59,67,71	0
5	CH5	C	501	16/16	0.94	0.10	34,41,51,54	0
5	CH5	D	501	16/16	0.95	0.09	36,41,44,45	0
5	CH5	A	501	16/16	0.95	0.08	27,33,38,38	0
5	CH5	B	501	16/16	0.96	0.08	27,33,37,39	0
7	GOL	B	505	6/6	0.96	0.05	36,44,49,53	0
7	GOL	A	503	6/6	0.96	0.07	37,47,55,63	0
6	MG	A	502	1/1	0.98	0.09	51,51,51,51	0

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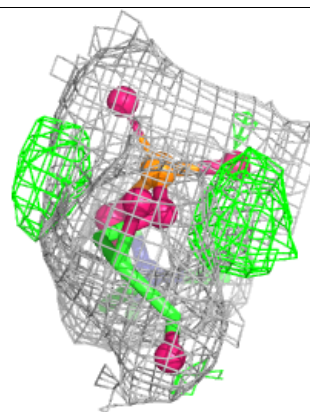
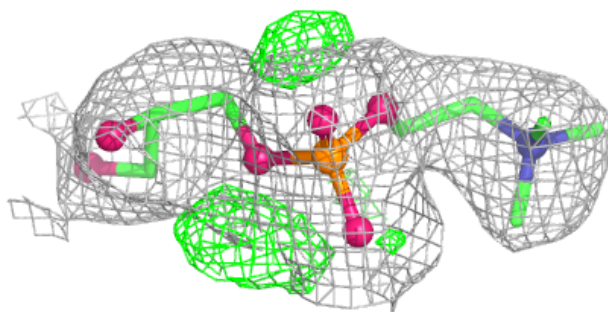
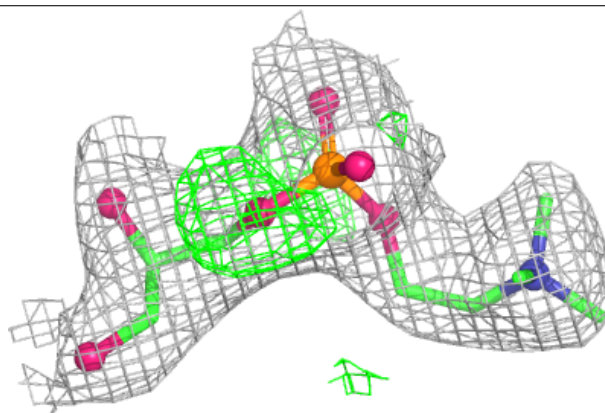
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	MG	D	502	1/1	0.99	0.07	40,40,40,40	0

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.

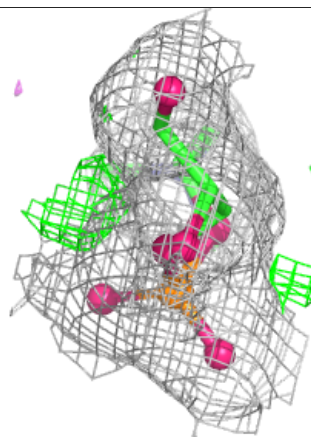
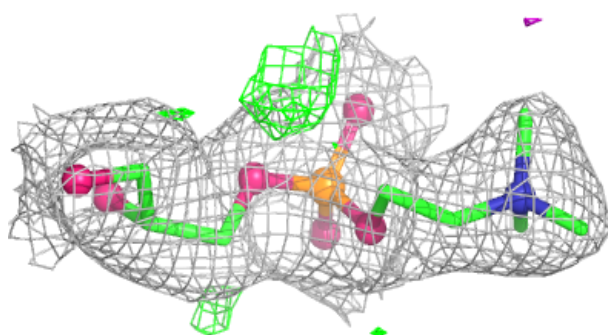
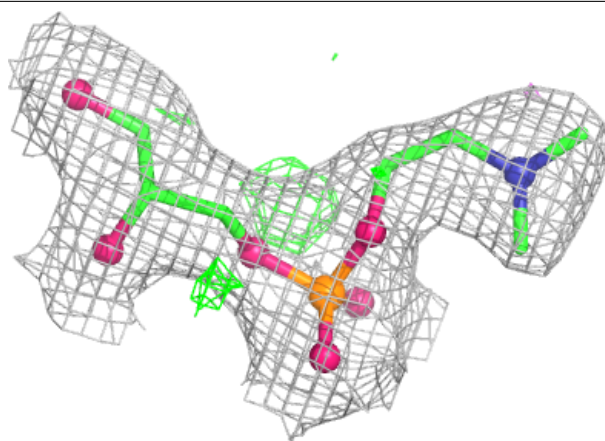
Electron density around CH5 C 501:

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

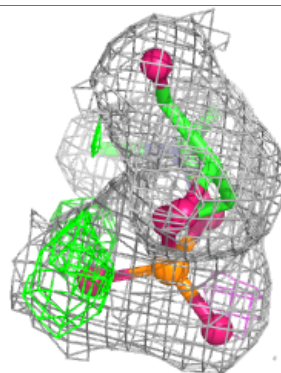
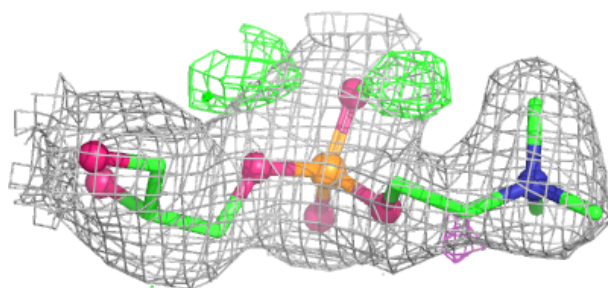
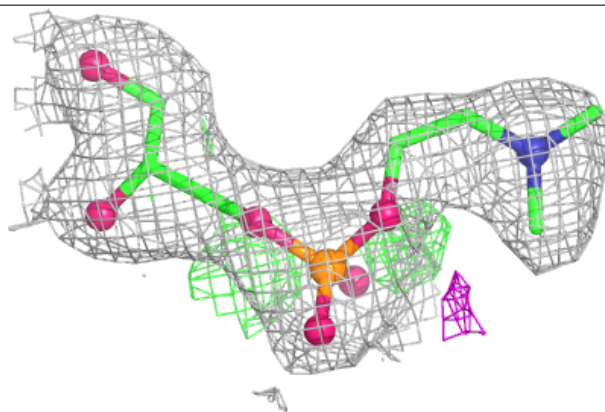


Electron density around CH5 D 501:

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

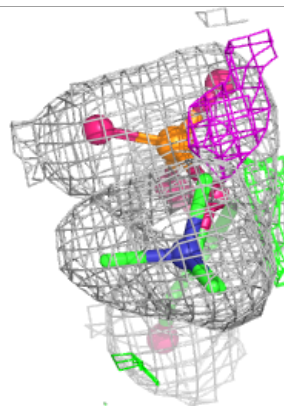
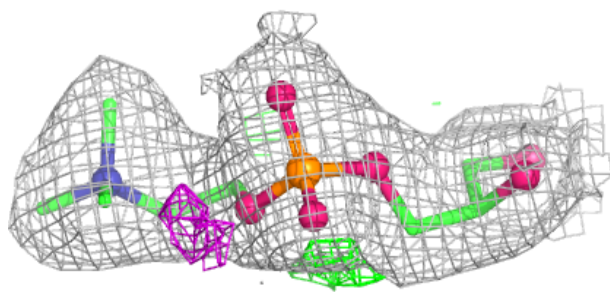
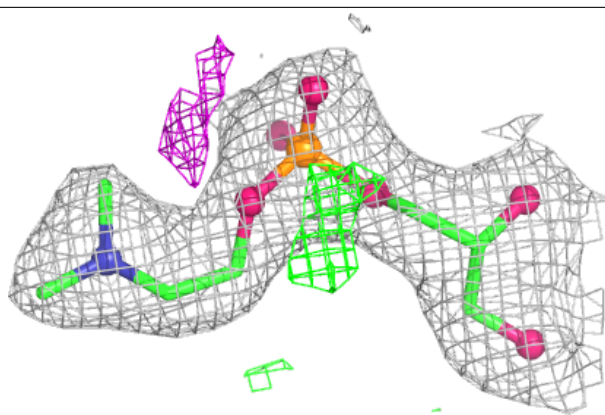
**Electron density around CH5 A 501:**

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



Electron density around CH5 B 501:

$2mF_o-DF_c$ (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.