



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:16 AM UTC

PDB ID : 4IA6 / pdb_00004ia6
Title : Hydratase from lactobacillus acidophilus in a ligand bound form (LA LAH)
Authors : Khoshnevis, S.; Neumann, P.; Ficner, R.
Deposited on : 2012-12-06
Resolution : 1.80 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

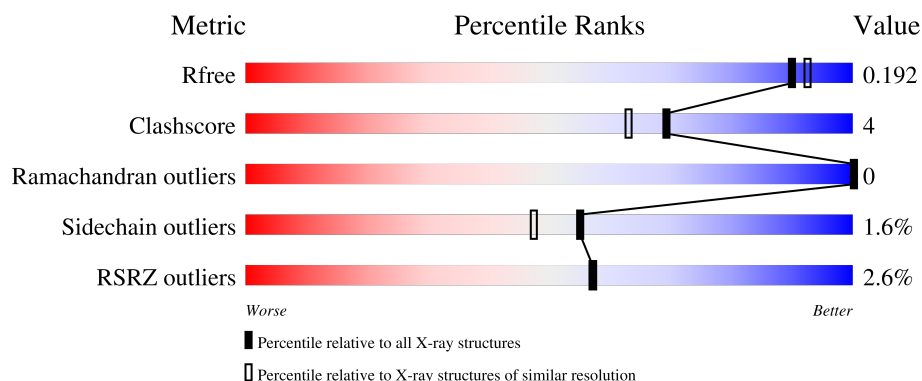
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	591	% 92% 5% ..
1	B	591	4% 87% 7% • 6%

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	MRD	A	601[A]	-	-	X	-
4	GOL	A	607[A]	-	-	-	X
4	GOL	A	607[B]	-	-	-	X

2 Entry composition [i](#)

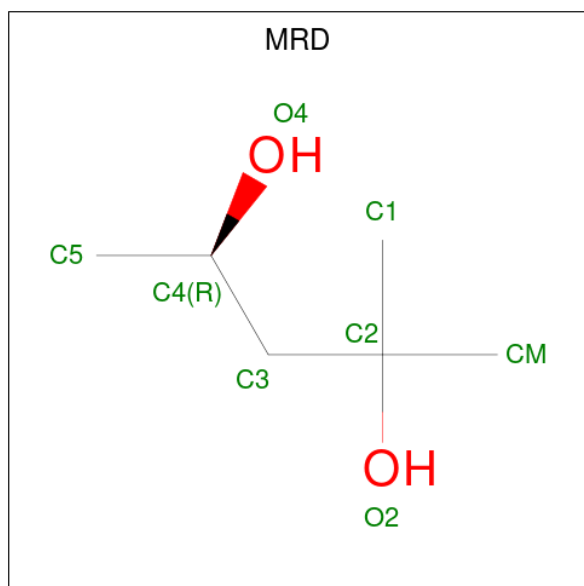
There are 12 unique types of molecules in this entry. The entry contains 10974 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Myosin-crossreactive antigen.

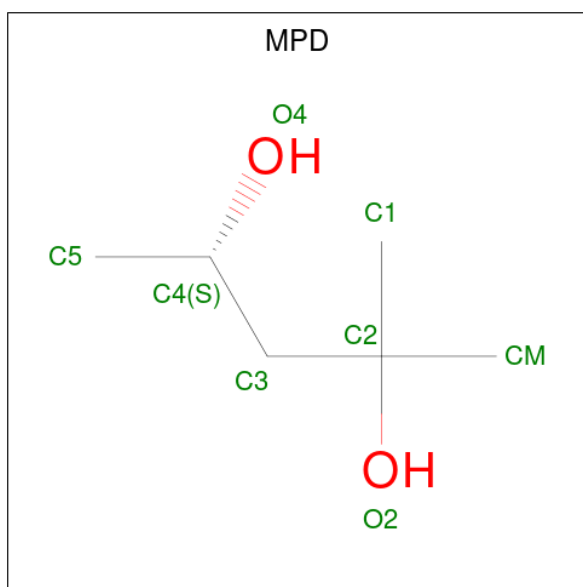
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	579	Total	C	N	O	S	0	8	0
			4750	3031	782	912	25			
1	B	558	Total	C	N	O	S	0	6	0
			4581	2928	753	877	23			

- Molecule 2 is (4R)-2-METHYLPENTANE-2,4-DIOL (CCD ID: MRD) (formula: C₆H₁₄O₂).



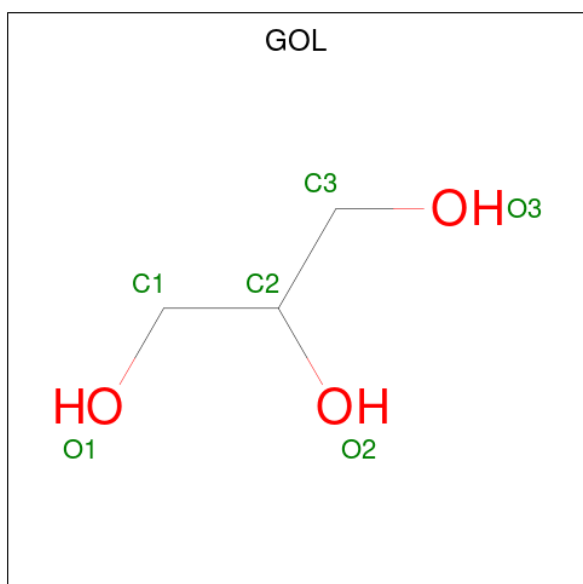
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	1
			8	6	2		

- Molecule 3 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



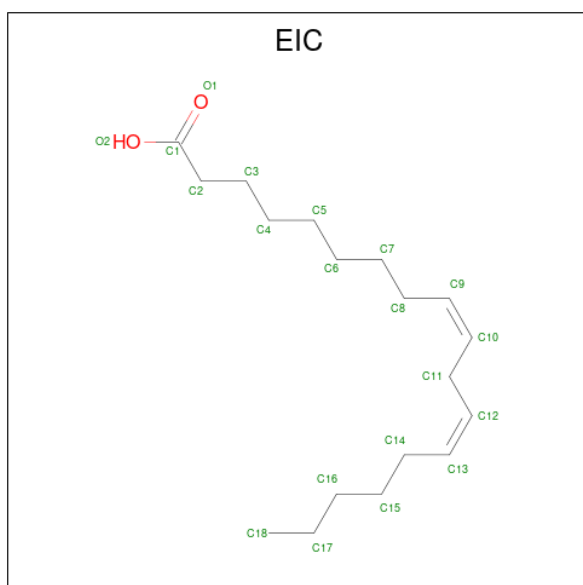
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	1
			8	6	2		
3	A	1	Total	C	O	0	0
			8	6	2		
3	A	1	Total	C	O	0	0
			8	6	2		
3	B	1	Total	C	O	0	0
			8	6	2		
3	B	1	Total	C	O	0	1
			8	6	2		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	1
			12	6	6		
4	A	1	Total	C	O	0	1
			12	6	6		
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		
4	B	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is LINOLEIC ACID (CCD ID: EIC) (formula: $C_{18}H_{32}O_2$).

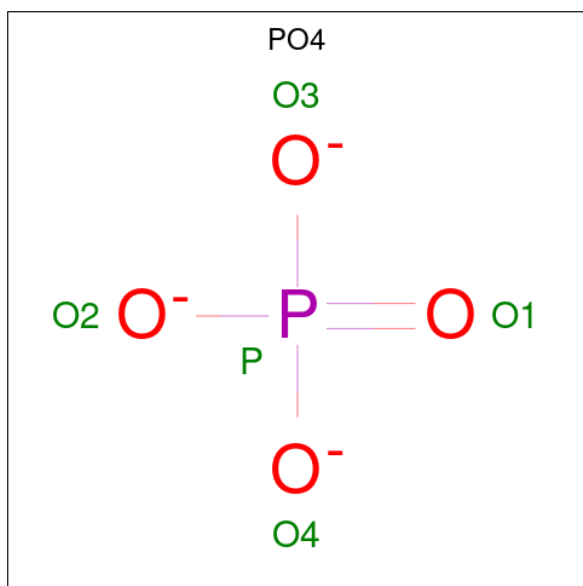


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			20	18	2		

- Molecule 6 is SODIUM ION (CCD ID: NA) (formula: Na).

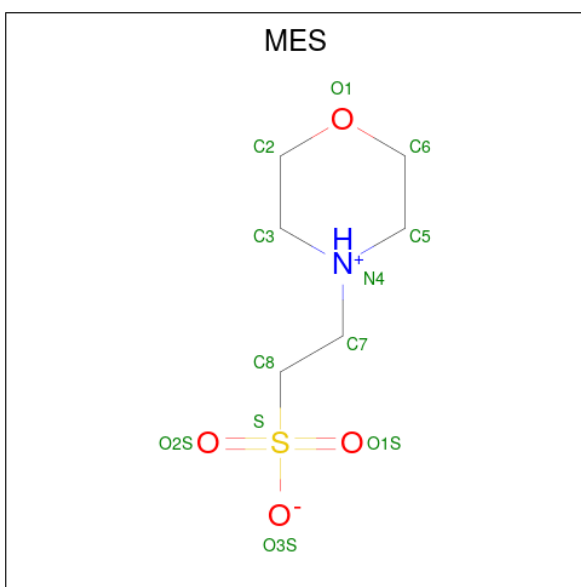
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	2	Total	Na	0	0
			2	2		

- Molecule 7 is PHOSPHATE ION (CCD ID: PO4) (formula: O_4P).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	O	P	0	0
			5	4	1		
7	A	1	Total	O	P	0	0
			5	4	1		
7	B	1	Total	O	P	0	0
			5	4	1		
7	B	1	Total	O	P	0	0
			5	4	1		

- Molecule 8 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (CCD ID: MES) (formula: $C_6H_{13}NO_4S$).

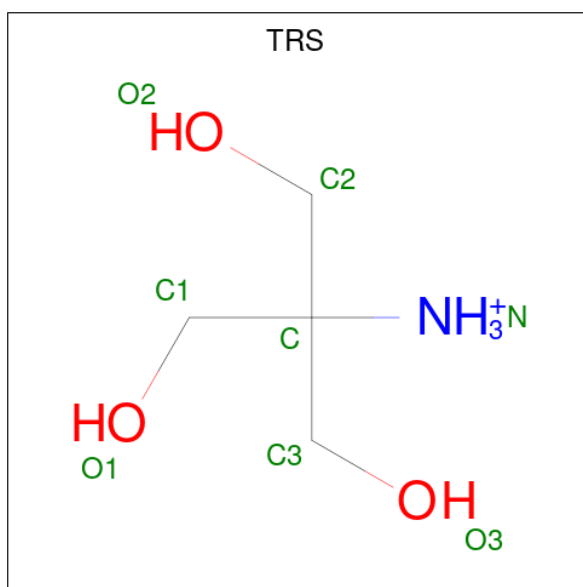


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
8	A	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
8	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		
8	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

- Molecule 9 is POTASSIUM ION (CCD ID: K) (formula: K).

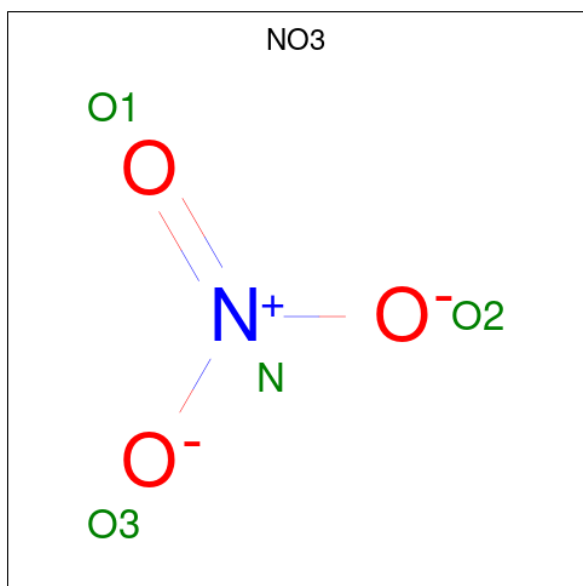
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	1	Total	K	0	0
			1	1		
9	B	1	Total	K	0	0
			1	1		

- Molecule 10 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: C₄H₁₂NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
10	B	1	Total	C	N	O	0	0
			8	4	1	3		

- Molecule 11 is NITRATE ION (CCD ID: NO3) (formula: NO₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	B	1	Total	N	O	0	0
			4	1	3		

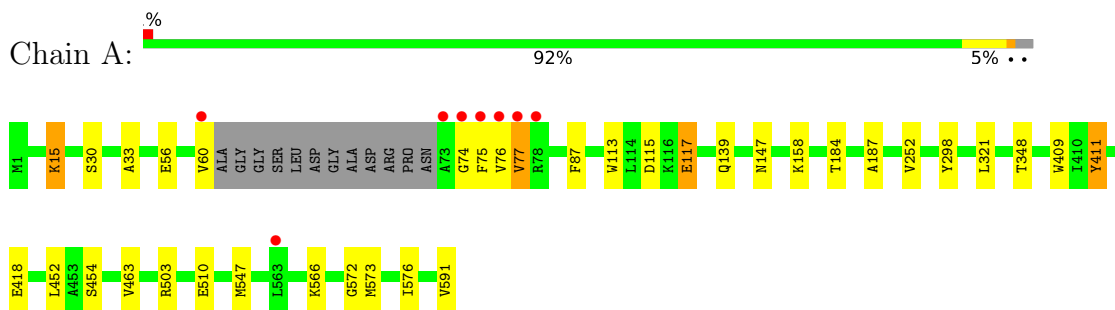
- Molecule 12 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
12	A	700	Total 717	O 717	0	17
12	B	689	Total 714	O 714	0	25

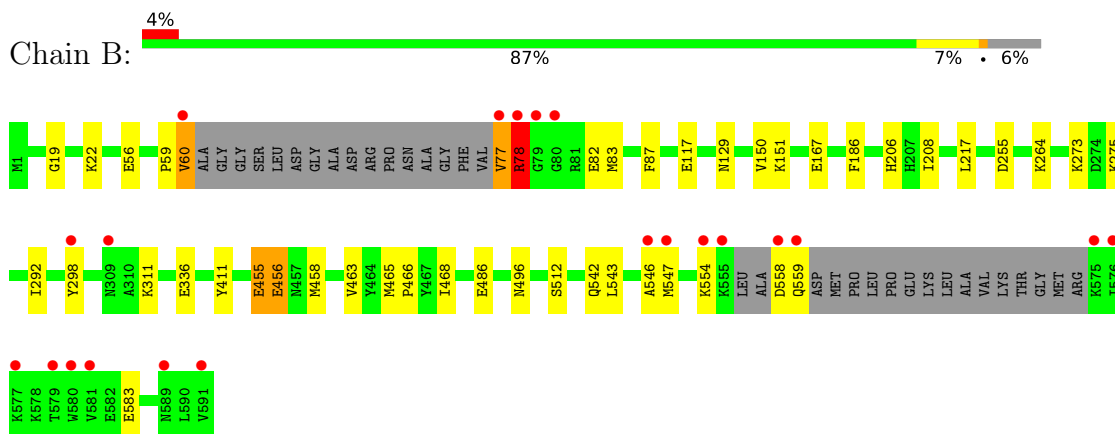
3 Residue-property plots [i](#)

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: Myosin-crossreactive antigen



- Molecule 1: Myosin-crossreactive antigen



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	165.10Å 77.74Å 104.81Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.73 – 1.80 48.73 – 1.80	Depositor EDS
% Data completeness (in resolution range)	97.6 (48.73-1.80) 97.5 (48.73-1.80)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.73 (at 1.78Å)	Xtriage
Refinement program	PHENIX 1.8.1_1168	Depositor
R, R_{free}	0.154 , 0.192 0.155 , 0.192	Depositor DCC
R_{free} test set	6148 reflections (4.93%)	wwPDB-VP
Wilson B-factor (Å ²)	16.4	Xtriage
Anisotropy	0.320	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 55.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10974	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.87% 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: EIC, NO3, NA, MPD, MRD, K, PO4, GOL, MES, TRS

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	0.66	0/4872	0.85	1/6599 (0.0%)
1	B	0.67	0/4698	0.87	2/6365 (0.0%)
All	All	0.67	0/9570	0.86	3/12964 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	78	ARG	N-CA-C	-6.35	105.46	113.72
1	B	150	VAL	N-CA-C	-5.69	104.98	110.72
1	A	74	GLY	N-CA-C	-5.50	107.93	114.48

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	4750	0	4593	31	0
1	B	4581	0	4402	32	0
2	A	8	0	14	6	0
3	A	24	0	42	2	0
3	B	16	0	28	2	0
4	A	48	0	64	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	24	0	32	3	0
5	A	20	0	32	1	0
6	A	2	0	0	0	0
7	A	10	0	0	0	0
7	B	10	0	0	1	0
8	A	12	0	12	0	0
8	B	24	0	24	0	0
9	A	1	0	0	0	0
9	B	1	0	0	0	0
10	B	8	0	12	0	0
11	B	4	0	0	0	0
12	A	717	0	0	9	0
12	B	714	0	0	4	2
All	All	10974	0	9255	66	2

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 4.

All (66) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:411:TYR:HB2	2:A:601[A]:MRD:H5C2	1.59	0.85
1:A:15:LYS:NZ	1:B:117:GLU:OE2	2.15	0.80
1:A:184:THR:O	2:A:601[A]:MRD:HMC1	1.86	0.76
1:B:208[A]:ILE:HG21	1:B:546:ALA:HA	1.67	0.75
1:B:82:GLU:OE2	3:B:601:MPD:HM3	1.88	0.72
1:B:554:LYS:O	1:B:559:GLN:NE2	2.23	0.70
1:A:75:PHE:HE2	1:A:77:VAL:HG22	1.58	0.69
1:A:147[B]:ASN:ND2	12:A:1348:HOH:O	2.26	0.69
2:A:601[A]:MRD:HMC2	2:A:601[A]:MRD:H5C3	1.76	0.68
1:B:456:GLU:H	1:B:456:GLU:CD	2.03	0.66
7:B:612:PO4:O2	12:B:1085:HOH:O	2.14	0.64
1:A:115:ASP:OD1	12:A:1014:HOH:O	2.15	0.63
2:A:601[A]:MRD:HMC3	12:A:1023:HOH:O	1.99	0.61
1:B:554:LYS:HB2	1:B:559:GLN:HG2	1.83	0.60
1:B:82:GLU:HG3	1:B:217:LEU:HD22	1.83	0.60
1:A:75:PHE:CE2	1:A:77:VAL:HG22	2.36	0.59
1:B:186:PHE:HE1	3:B:601:MPD:HM2	1.67	0.58
1:B:273:LYS:HD2	1:B:275:LYS:HE2	1.84	0.58
1:A:76:VAL:HG22	1:A:348:THR:HG23	1.86	0.58
1:A:33:ALA:H	4:A:607[A]:GOL:C1	2.18	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:418:GLU:OE1	12:A:1187:HOH:O	2.18	0.55
1:B:167:GLU:OE2	4:B:605:GOL:H2	2.06	0.55
1:B:311:LYS:NZ	1:B:336:GLU:OE2	2.40	0.55
1:A:113:TRP:O	1:A:117[A]:GLU:HG2	2.08	0.53
1:B:82:GLU:H	1:B:82:GLU:CD	2.19	0.51
1:A:158:LYS:HD3	1:B:583:GLU:HG2	1.93	0.51
1:B:59:PRO:O	1:B:60:VAL:HB	2.08	0.51
1:A:30:SER:OG	1:A:56:GLU:OE1	2.21	0.50
1:A:187:ALA:HB2	3:A:602[B]:MPD:H32	1.94	0.50
1:A:187:ALA:HB2	2:A:601[A]:MRD:H3C1	1.95	0.49
1:B:455:GLU:HG2	12:B:1064:HOH:O	2.13	0.48
1:B:496:ASN:HD22	4:B:609:GOL:H12	1.78	0.48
12:A:942:HOH:O	1:B:117:GLU:HG3	2.14	0.48
1:B:77:VAL:HG22	1:B:78:ARG:N	2.29	0.48
1:A:298:TYR:CD1	1:A:463:VAL:HG22	2.49	0.47
1:B:83[B]:MET:HG2	1:B:87:PHE:CD2	2.49	0.47
1:B:255:ASP:OD2	1:B:264:LYS:NZ	2.36	0.47
1:B:206:HIS:HA	1:B:542:GLN:OE1	2.15	0.46
1:A:411:TYR:HB2	3:A:602[B]:MPD:H11	1.97	0.46
1:A:573:MET:CE	1:A:591:VAL:HG11	2.46	0.46
1:A:76:VAL:HB	1:A:463:VAL:HG21	1.98	0.46
1:B:78:ARG:HB2	12:B:1387:HOH:O	2.16	0.46
1:B:455:GLU:HG2	1:B:455:GLU:H	1.56	0.45
1:B:298:TYR:CD1	1:B:463:VAL:HG22	2.52	0.45
1:A:87:PHE:CG	1:A:510:GLU:HB2	2.51	0.45
1:B:512:SER:OG	4:B:609:GOL:H12	2.16	0.45
1:A:566:LYS:NZ	12:A:1248[B]:HOH:O	2.31	0.44
1:B:292:ILE:HD12	1:B:468:ILE:HD12	2.00	0.43
1:A:454[A]:SER:HB2	4:A:612:GOL:H11	1.99	0.43
1:B:19:GLY:O	1:B:22:LYS:HG2	2.19	0.43
1:A:503:ARG:HE	4:A:606[A]:GOL:H2	1.83	0.43
1:A:139:GLN:NE2	12:A:1255[B]:HOH:O	2.52	0.43
1:B:455:GLU:HA	1:B:458:MET:O	2.19	0.42
1:A:566:LYS:HG3	12:A:1248[A]:HOH:O	2.19	0.42
2:A:601[A]:MRD:H5C1	12:A:732:HOH:O	2.20	0.42
1:B:129:ASN:ND2	12:B:1212:HOH:O	2.43	0.42
1:A:452:LEU:HD23	1:A:452:LEU:HA	1.89	0.42
1:A:572:GLY:O	1:A:576:ILE:HG13	2.20	0.42
1:B:83[B]:MET:HG2	1:B:87:PHE:CE2	2.55	0.41
1:A:576:ILE:HD12	1:A:576:ILE:C	2.46	0.41
1:B:543:LEU:O	1:B:547:MET:HG3	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:33:ALA:H	4:A:607[A]:GOL:H11	1.85	0.41
1:A:76:VAL:HG13	1:A:409:TRP:CZ3	2.56	0.40
5:A:608:EIC:H131	5:A:608:EIC:H161	1.63	0.40
1:A:252:VAL:HB	1:A:321:LEU:HD21	2.04	0.40
1:B:465:MET:HA	1:B:466:PRO:HD2	1.99	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
12:B:1325:HOH:O	12:B:1325:HOH:O[2_465]	2.05	0.15
12:B:1267:HOH:O	12:B:1267:HOH:O[2_465]	2.13	0.07

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	583/591 (99%)	571 (98%)	12 (2%)	0	100	100
1	B	556/591 (94%)	547 (98%)	9 (2%)	0	100	100
All	All	1139/1182 (96%)	1118 (98%)	21 (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	519/518 (100%)	511 (98%)	8 (2%)	57	49
1	B	499/518 (96%)	488 (98%)	11 (2%)	45	34
All	All	1018/1036 (98%)	999 (98%)	19 (2%)	55	41

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	15	LYS
1	A	60	VAL
1	A	77	VAL
1	A	117[A]	GLU
1	A	117[B]	GLU
1	A	411	TYR
1	A	547[A]	MET
1	A	547[B]	MET
1	B	56	GLU
1	B	60	VAL
1	B	77	VAL
1	B	78	ARG
1	B	151	LYS
1	B	411[A]	TYR
1	B	411[B]	TYR
1	B	455	GLU
1	B	456	GLU
1	B	486	GLU
1	B	558	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	337	ASN
1	B	46	GLN
1	B	282	ASN
1	B	459	ASN
1	B	589	ASN

5.3.3 RNA ⓘ

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](#)

Of 32 ligands modelled in this entry, 4 are monoatomic - leaving 28 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$
4	GOL	B	609	-	5,5,5	0.54	0	5,5,5	0.82	0
4	GOL	A	613	-	5,5,5	0.51	0	5,5,5	1.14	0
4	GOL	A	605	-	5,5,5	0.36	0	5,5,5	0.54	0
8	MES	A	615	-	12,12,12	2.12	1 (8%)	15,16,16	2.26	5 (33%)
8	MES	B	602	-	12,12,12	1.86	1 (8%)	15,16,16	2.00	4 (26%)
4	GOL	A	612	-	5,5,5	0.42	0	5,5,5	0.42	0
5	EIC	A	608	-	19,19,19	1.63	4 (21%)	19,19,19	1.10	1 (5%)
10	TRS	B	607	-	7,7,7	0.38	0	9,9,9	0.48	0
7	PO4	A	616	-	4,4,4	0.96	0	6,6,6	0.40	0
3	MPD	A	603	-	7,7,7	0.22	0	9,10,10	0.91	0
11	NO3	B	610	-	1,3,3	3.39	1 (100%)	0,3,3	-	-
3	MPD	B	601	-	7,7,7	0.34	0	9,10,10	0.75	0
7	PO4	A	610	-	4,4,4	0.88	0	6,6,6	0.54	0
4	GOL	A	606[A]	-	5,5,5	0.36	0	5,5,5	0.40	0
3	MPD	B	611[B]	-	7,7,7	0.25	0	9,10,10	0.52	0
4	GOL	A	607[A]	-	5,5,5	0.41	0	5,5,5	0.88	0
4	GOL	B	606	-	5,5,5	0.34	0	5,5,5	0.28	0
4	GOL	A	606[B]	-	5,5,5	0.53	0	5,5,5	0.64	0
7	PO4	B	608	-	4,4,4	0.93	0	6,6,6	0.54	0
2	MRD	A	601[A]	-	7,7,7	0.50	0	9,10,10	0.74	0
3	MPD	A	611	-	7,7,7	0.39	0	9,10,10	0.41	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	MPD	A	602[B]	-	7,7,7	0.31	0	9,10,10	0.17	0
4	GOL	B	604	-	5,5,5	0.35	0	5,5,5	0.53	0
4	GOL	A	604	-	5,5,5	0.43	0	5,5,5	0.40	0
4	GOL	B	605	-	5,5,5	0.33	0	5,5,5	0.47	0
4	GOL	A	607[B]	-	5,5,5	0.29	0	5,5,5	0.61	0
8	MES	B	603	-	12,12,12	2.09	1 (8%)	15,16,16	1.98	5 (33%)
7	PO4	B	612	-	4,4,4	1.08	0	6,6,6	0.79	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	GOL	B	609	-	-	2/4/4/4	-
4	GOL	A	613	-	-	2/4/4/4	-
4	GOL	A	605	-	-	4/4/4/4	-
8	MES	A	615	-	-	4/6/14/14	0/1/1/1
8	MES	B	602	-	-	2/6/14/14	0/1/1/1
4	GOL	A	612	-	-	0/4/4/4	-
5	EIC	A	608	-	-	11/17/17/17	-
10	TRS	B	607	-	-	3/9/9/9	-
3	MPD	A	603	-	-	5/5/5/5	-
3	MPD	B	601	-	-	0/5/5/5	-
4	GOL	A	606[A]	-	-	2/4/4/4	-
3	MPD	B	611[B]	-	-	1/5/5/5	-
4	GOL	A	607[A]	-	-	2/4/4/4	-
4	GOL	B	606	-	-	2/4/4/4	-
4	GOL	A	606[B]	-	-	2/4/4/4	-
2	MRD	A	601[A]	-	-	4/5/5/5	-
3	MPD	A	611	-	-	0/5/5/5	-
3	MPD	A	602[B]	-	-	2/5/5/5	-
4	GOL	B	604	-	-	4/4/4/4	-
4	GOL	A	604	-	-	4/4/4/4	-
4	GOL	B	605	-	-	2/4/4/4	-
4	GOL	A	607[B]	-	-	4/4/4/4	-
8	MES	B	603	-	-	5/6/14/14	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	B	603	MES	C8-S	-6.98	1.67	1.77
8	A	615	MES	C8-S	-6.98	1.67	1.77
8	B	602	MES	C8-S	-6.22	1.68	1.77
5	A	608	EIC	O1-C1	4.92	1.38	1.22
11	B	610	NO3	O1-N	3.39	1.41	1.24
5	A	608	EIC	C10-C9	3.15	1.49	1.31
5	A	608	EIC	C13-C12	3.02	1.48	1.31
5	A	608	EIC	O2-C1	2.08	1.37	1.30

All (15) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	615	MES	C5-N4-C3	5.28	120.22	108.84
8	B	602	MES	C5-N4-C3	4.70	118.97	108.84
8	B	602	MES	C7-N4-C5	3.77	121.28	111.24
8	B	602	MES	O1S-S-C8	3.53	112.06	106.73
8	A	615	MES	C7-N4-C3	3.29	120.02	111.24
8	B	603	MES	C5-N4-C3	3.28	115.91	108.84
8	A	615	MES	C7-N4-C5	3.12	119.55	111.24
8	B	603	MES	O1S-S-C8	3.09	111.40	106.73
8	A	615	MES	C2-C3-N4	-3.01	105.55	110.12
8	B	603	MES	C6-C5-N4	-2.63	106.12	110.12
8	B	603	MES	C7-N4-C3	2.59	118.15	111.24
5	A	608	EIC	C3-C2-C1	-2.54	107.87	114.51
8	A	615	MES	O1S-S-C8	2.44	110.41	106.73
8	B	603	MES	C7-N4-C5	2.22	117.17	111.24
8	B	602	MES	C6-O1-C2	2.05	116.50	109.88

There are no chirality outliers.

All (67) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	601[A]	MRD	C2-C3-C4-O4
2	A	601[A]	MRD	C2-C3-C4-C5
3	A	603	MPD	C2-C3-C4-O4
3	A	603	MPD	C2-C3-C4-C5
4	A	604	GOL	O1-C1-C2-C3
4	A	605	GOL	O1-C1-C2-C3
4	A	606[A]	GOL	O1-C1-C2-C3
4	A	606[B]	GOL	O1-C1-C2-C3
4	A	613	GOL	C1-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
4	B	605	GOL	O1-C1-C2-C3
4	B	606	GOL	O1-C1-C2-C3
4	B	609	GOL	O1-C1-C2-O2
4	B	609	GOL	O1-C1-C2-C3
8	A	615	MES	C8-C7-N4-C3
8	A	615	MES	C7-C8-S-O2S
8	B	602	MES	C8-C7-N4-C5
8	B	603	MES	C8-C7-N4-C3
8	B	603	MES	C7-C8-S-O2S
8	B	603	MES	C7-C8-S-O3S
10	B	607	TRS	C1-C-C2-O2
10	B	607	TRS	C3-C-C2-O2
10	B	607	TRS	N-C-C2-O2
4	A	604	GOL	O1-C1-C2-O2
4	A	613	GOL	O2-C2-C3-O3
4	B	606	GOL	O1-C1-C2-O2
4	A	604	GOL	C1-C2-C3-O3
4	A	605	GOL	C1-C2-C3-O3
4	A	607[A]	GOL	O1-C1-C2-C3
4	A	607[B]	GOL	O1-C1-C2-C3
4	A	607[B]	GOL	C1-C2-C3-O3
4	B	604	GOL	O1-C1-C2-C3
4	B	604	GOL	C1-C2-C3-O3
4	A	604	GOL	O2-C2-C3-O3
4	A	605	GOL	O1-C1-C2-O2
4	A	606[A]	GOL	O1-C1-C2-O2
8	A	615	MES	C7-C8-S-O3S
4	A	606[B]	GOL	O1-C1-C2-O2
4	B	604	GOL	O2-C2-C3-O3
5	A	608	EIC	C11-C10-C9-C8
5	A	608	EIC	C3-C4-C5-C6
8	B	603	MES	C8-C7-N4-C5
5	A	608	EIC	C6-C7-C8-C9
4	A	607[B]	GOL	O1-C1-C2-O2
4	B	604	GOL	O1-C1-C2-O2
4	B	605	GOL	O1-C1-C2-O2
4	A	607[B]	GOL	O2-C2-C3-O3
8	A	615	MES	C7-C8-S-O1S
8	B	603	MES	C7-C8-S-O1S
2	A	601[A]	MRD	CM-C2-C3-C4
3	A	603	MPD	CM-C2-C3-C4
5	A	608	EIC	C1-C2-C3-C4

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Mol	Chain	Res	Type	Atoms
5	A	608	EIC	C15-C16-C17-C18
3	A	602[B]	MPD	C2-C3-C4-C5
3	B	611[B]	MPD	C2-C3-C4-C5
5	A	608	EIC	C4-C5-C6-C7
5	A	608	EIC	O2-C1-C2-C3
5	A	608	EIC	O1-C1-C2-C3
5	A	608	EIC	C10-C11-C12-C13
4	A	605	GOL	O2-C2-C3-O3
8	B	602	MES	C7-C8-S-O2S
5	A	608	EIC	C14-C15-C16-C17
4	A	607[A]	GOL	O1-C1-C2-O2
3	A	603	MPD	O2-C2-C3-C4
3	A	602[B]	MPD	C2-C3-C4-O4
2	A	601[A]	MRD	C1-C2-C3-C4
3	A	603	MPD	C1-C2-C3-C4
5	A	608	EIC	C5-C6-C7-C8

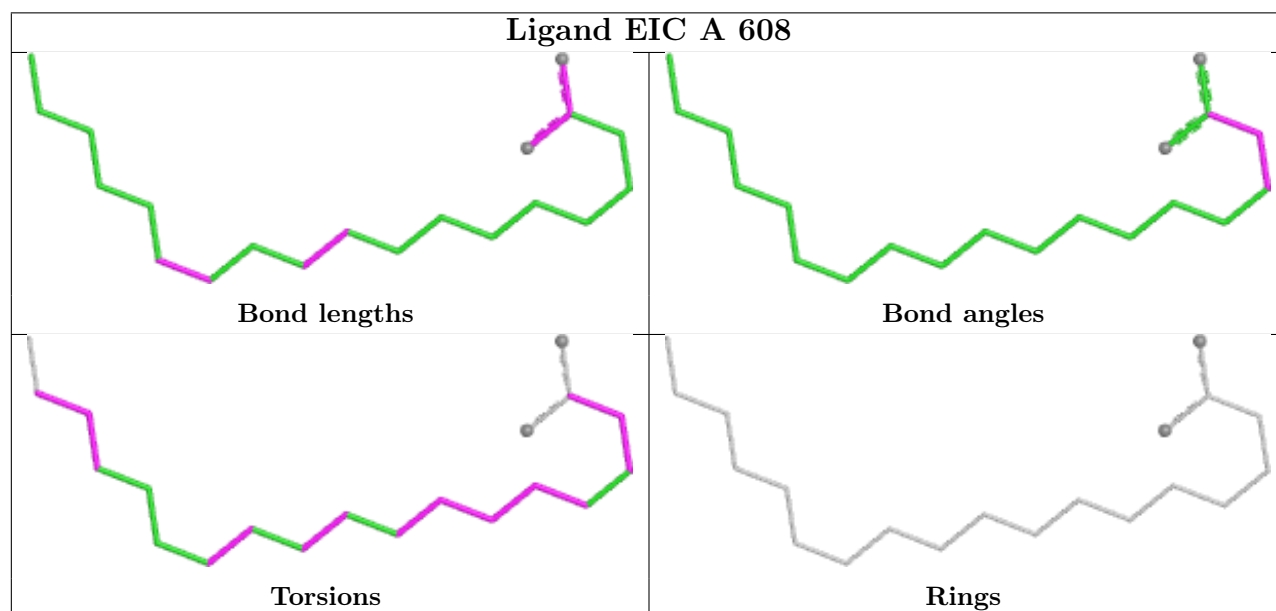
There are no ring outliers.

10 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	609	GOL	2	0
4	A	612	GOL	1	0
5	A	608	EIC	1	0
3	B	601	MPD	2	0
4	A	606[A]	GOL	1	0
4	A	607[A]	GOL	2	0
2	A	601[A]	MRD	6	0
3	A	602[B]	MPD	2	0
4	B	605	GOL	1	0
7	B	612	PO4	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.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	579/591 (97%)	-0.59	8 (1%) 73 73	8, 16, 35, 87	8 (1%)
1	B	558/591 (94%)	-0.52	21 (3%) 44 44	6, 15, 40, 78	8 (1%)
All	All	1137/1182 (96%)	-0.56	29 (2%) 57 57	6, 15, 37, 87	16 (1%)

All (29) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	74	GLY	7.5
1	A	75	PHE	7.1
1	A	77	VAL	4.8
1	A	76	VAL	4.8
1	A	60	VAL	4.6
1	B	77	VAL	4.3
1	B	576	ILE	4.3
1	A	73	ALA	4.0
1	B	309	ASN	3.3
1	B	559	GLN	3.3
1	B	78	ARG	3.2
1	B	546	ALA	3.0
1	B	298	TYR	2.9
1	B	80	GLY	2.8
1	B	575	LYS	2.7
1	A	563	LEU	2.7
1	B	554	LYS	2.7
1	B	547	MET	2.6
1	B	60	VAL	2.6
1	B	555	LYS	2.5
1	A	78	ARG	2.5
1	B	589	ASN	2.5
1	B	580	TRP	2.4
1	B	591	VAL	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	79	GLY	2.2
1	B	558	ASP	2.2
1	B	577	LYS	2.2
1	B	581	VAL	2.2
1	B	579	THR	2.1

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
4	GOL	A	613	6/6	0.67	0.18	22,23,25,33	6
4	GOL	A	604	6/6	0.72	0.20	45,45,47,51	0
7	PO4	A	610	5/5	0.73	0.15	68,70,71,72	5
4	GOL	A	607[A]	6/6	0.74	0.47	28,30,36,37	6
4	GOL	B	604	6/6	0.74	0.18	42,47,50,54	6
4	GOL	A	607[B]	6/6	0.74	0.47	38,42,43,43	6
11	NO3	B	610	4/4	0.74	0.13	45,47,48,49	0
3	MPD	A	602[B]	8/8	0.76	0.14	10,16,17,20	8
5	EIC	A	608	20/20	0.77	0.20	35,54,75,77	0
7	PO4	B	608	5/5	0.78	0.15	43,49,50,50	5
4	GOL	A	605	6/6	0.78	0.19	41,44,46,49	0
8	MES	B	603	12/12	0.79	0.16	38,42,53,55	12
4	GOL	B	605	6/6	0.80	0.14	45,48,49,51	0
8	MES	A	615	12/12	0.81	0.17	32,35,42,43	12
4	GOL	A	606[A]	6/6	0.81	0.18	5,21,23,24	6
4	GOL	A	606[B]	6/6	0.81	0.18	3,21,23,25	6
10	TRS	B	607	8/8	0.82	0.17	44,46,50,50	0
4	GOL	B	606	6/6	0.84	0.16	47,48,48,48	6

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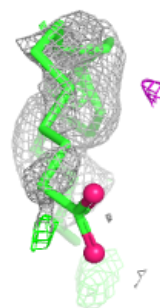
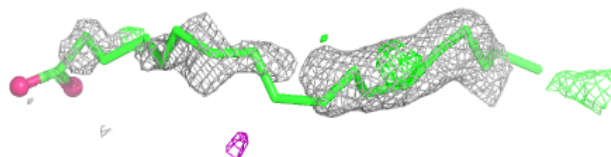
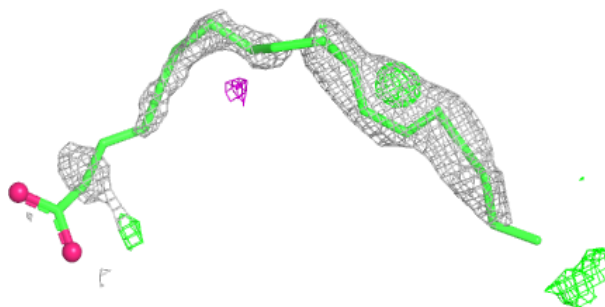
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	MRD	A	601[A]	8/8	0.84	0.12	8,17,18,22	8
7	PO4	A	616	5/5	0.85	0.12	49,51,53,54	5
3	MPD	A	611	8/8	0.89	0.11	18,22,23,24	8
4	GOL	A	612	6/6	0.89	0.12	20,22,27,28	6
3	MPD	B	611[B]	8/8	0.90	0.10	3,11,12,13	8
4	GOL	B	609	6/6	0.91	0.11	21,25,31,33	0
3	MPD	B	601	8/8	0.92	0.09	6,15,17,23	8
3	MPD	A	603	8/8	0.93	0.08	9,19,21,24	8
6	NA	A	614	1/1	0.95	0.06	28,28,28,28	0
7	PO4	B	612	5/5	0.96	0.07	14,14,26,28	5
8	MES	B	602	12/12	0.97	0.08	9,16,24,26	12
6	NA	A	609	1/1	0.99	0.04	22,22,22,22	0
9	K	A	617	1/1	0.99	0.02	15,15,15,15	0
9	K	B	613	1/1	1.00	0.01	11,11,11,11	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 EIC A 608:

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.