



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 11:34 AM UTC

PDB ID : 7QP8 / pdb_00007qp8
Title : Crystal structure of Vibrio alkaline phosphatase with bound HEPES
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Deposited on : 2022-01-03
Resolution : 1.70 Å(reported)

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

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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

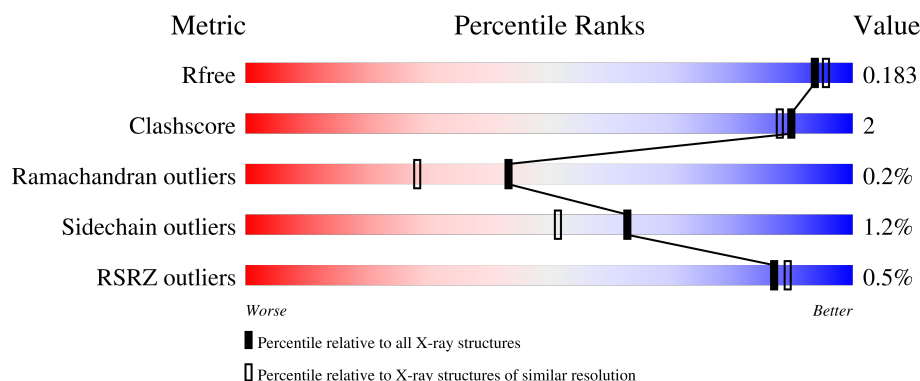
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.70 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	5551 (1.70-1.70)
Clashscore	190562	5924 (1.70-1.70)
Ramachandran outliers	187476	5846 (1.70-1.70)
Sidechain outliers	187428	5846 (1.70-1.70)
RSRZ outliers	180081	5554 (1.70-1.70)

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	531	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, red 1%, orange 1%, yellow 1%, green 89%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> % 89% 5% 5% </div> </div>
1	B	531	<div> <div style="width: 100%; height: 10px; background: linear-gradient(to right, green 89%, yellow 6%, grey 5%);"></div> <div style="display: flex; justify-content: space-between; width: 100%;"> 89% 6% 5% </div> </div>

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
6	EPE	A	611	-	X	-	-

2 Entry composition

There are 8 unique types of molecules in this entry. The entry contains 16801 atoms, of which 7890 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 Alkaline phosphatase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	503	Total	C	H	N	O	S	0	14	0
			7854	2493	3880	680	788	13			
1	B	502	Total	C	H	N	O	S	0	16	0
			7883	2501	3897	683	789	13			

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	503	SER	-	expression tag	UNP Q93P54
A	504	ALA	-	expression tag	UNP Q93P54
A	505	TRP	-	expression tag	UNP Q93P54
A	506	SER	-	expression tag	UNP Q93P54
A	507	HIS	-	expression tag	UNP Q93P54
A	508	PRO	-	expression tag	UNP Q93P54
A	509	GLN	-	expression tag	UNP Q93P54
A	510	PHE	-	expression tag	UNP Q93P54
A	511	GLU	-	expression tag	UNP Q93P54
A	512	LYS	-	expression tag	UNP Q93P54
B	503	SER	-	expression tag	UNP Q93P54
B	504	ALA	-	expression tag	UNP Q93P54
B	505	TRP	-	expression tag	UNP Q93P54
B	506	SER	-	expression tag	UNP Q93P54
B	507	HIS	-	expression tag	UNP Q93P54
B	508	PRO	-	expression tag	UNP Q93P54
B	509	GLN	-	expression tag	UNP Q93P54
B	510	PHE	-	expression tag	UNP Q93P54
B	511	GLU	-	expression tag	UNP Q93P54
B	512	LYS	-	expression tag	UNP Q93P54

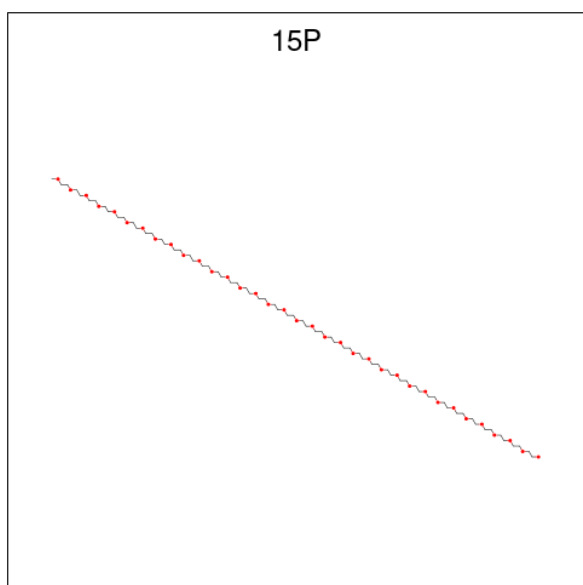
- Molecule 2 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total	Zn	0	0
			2	2		
2	B	2	Total	Zn	0	0
			2	2		

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	3	Total	Mg	0	0
			3	3		
3	B	3	Total	Mg	0	0
			3	3		

- Molecule 4 is POLYETHYLENE GLYCOL (N=34) (CCD ID: 15P) (formula: C₆₉H₁₄₀O₃₅).

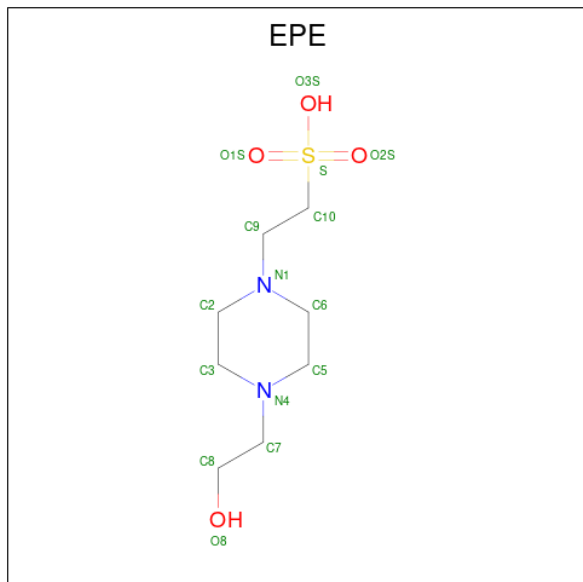


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	H	O	0	0
			50	14	28	8		

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

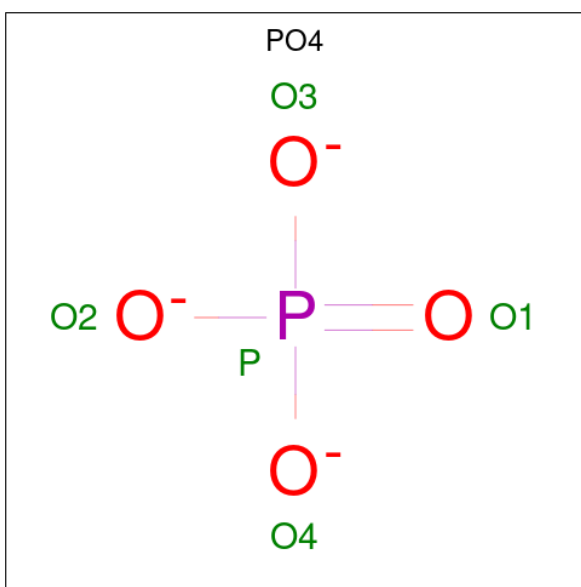
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	2	Total	Cl	0	0
			2	2		
5	B	1	Total	Cl	0	0
			1	1		

- Molecule 6 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (CCD ID: EPE) (formula: $C_8H_{18}N_2O_4S$) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
6	A	1	Total	C	H	N	O	S	0	0
			32	8	17	2	4	1		
6	A	1	Total	C	H	N	O	S	0	0
			32	8	17	2	4	1		
6	A	1	Total	C	H	N	O	S	0	0
			32	8	17	2	4	1		
6	B	1	Total	C	H	N	O	S	0	0
			32	8	17	2	4	1		
6	B	1	Total	C	H	N	O	S	0	0
			32	8	17	2	4	1		

- 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	B	1	Total	O	P	0	0
			5	4	1		

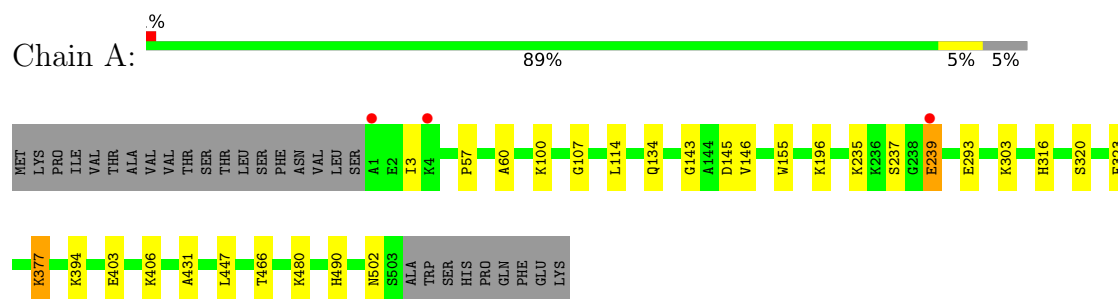
- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	421	Total	O	0	0
			421	421		
8	B	410	Total	O	0	0
			410	410		

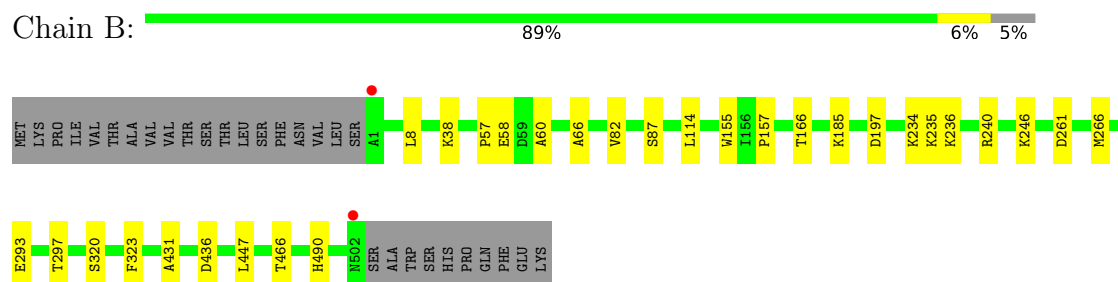
3 Residue-property plots [i](#)

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: Alkaline phosphatase



• Molecule 1: Alkaline phosphatase



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	76.81Å 85.05Å 85.50Å 90.00° 113.90° 90.00°	Depositor
Resolution (Å)	44.10 – 1.70 44.10 – 1.70	Depositor EDS
% Data completeness (in resolution range)	79.7 (44.10-1.70) 74.7 (44.10-1.70)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	0.64 (at 1.70Å)	Xtriage
Refinement program	PHENIX dev_3958	Depositor
R, R_{free}	0.150 , 0.181 0.150 , 0.183	Depositor DCC
R_{free} test set	2015 reflections (1.82%)	wwPDB-VP
Wilson B-factor (Å ²)	23.4	Xtriage
Anisotropy	0.588	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 38.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.014 for h,-k,-h-l	Xtriage
F_o, F_c correlation	0.97	EDS
Total number of atoms	16801	wwPDB-VP
Average B, all atoms (Å ²)	36.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.67% 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: ZN, EPE, CL, 15P, MG, PO4

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	0.18	0/4098	0.34	0/5537
1	B	0.18	0/4108	0.32	0/5551
All	All	0.18	0/8206	0.33	0/11088

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

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	502	ASN	Mainchain

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	3974	3880	3823	14	0
1	B	3986	3897	3853	17	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
3	A	3	0	0	0	0
3	B	3	0	0	0	0
4	A	22	28	29	0	0
5	A	2	0	0	0	0
5	B	1	0	0	0	0
6	A	45	51	51	0	0
6	B	30	34	34	0	0
7	A	5	0	0	0	0
7	B	5	0	0	0	0
8	A	421	0	0	4	0
8	B	410	0	0	5	0
All	All	8911	7890	7790	29	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 2.

All (29) 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:134:GLN:OE1	8:A:701:HOH:O	1.97	0.81
1:A:145:ASP:OD2	8:A:702:HOH:O	2.09	0.69
1:A:303:LYS:NZ	8:A:703:HOH:O	2.23	0.69
1:B:261:ASP:OD2	8:B:701:HOH:O	2.10	0.68
1:B:197[B]:ASP:OD2	8:B:702:HOH:O	2.14	0.65
1:A:100[A]:LYS:NZ	1:A:143:GLY:O	2.30	0.52
1:A:323:PHE:O	1:B:466:THR:HA	2.10	0.52
1:A:403:GLU:OE2	1:A:406:LYS:NZ	2.40	0.52
1:B:157:PRO:HG2	1:B:166:THR:HG21	1.93	0.50
1:B:436:ASP:OD2	8:B:703:HOH:O	2.19	0.50
1:B:114:LEU:HD23	1:B:155:TRP:CZ2	2.47	0.50
1:B:431:ALA:O	1:B:447:LEU:HD21	2.14	0.48
1:A:466:THR:HA	1:B:323:PHE:O	2.13	0.47
1:A:114:LEU:HD23	1:A:155:TRP:CZ2	2.49	0.47
1:B:235:LYS:NZ	1:B:293:GLU:OE2	2.48	0.47
1:B:66:ALA:HB1	1:B:82:VAL:O	2.15	0.46
1:B:8:LEU:O	1:B:266:MET:HA	2.16	0.46
1:B:58:GLU:OE1	1:B:87:SER:OG	2.21	0.45
1:B:234:LYS:HB3	1:B:240:ARG:HG2	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:377:LYS:NZ	8:A:722:HOH:O	2.51	0.44
1:A:235:LYS:NZ	1:A:293:GLU:OE2	2.50	0.44
1:A:107:GLY:HA2	1:A:146:VAL:O	2.19	0.43
1:A:431:ALA:O	1:A:447:LEU:HD21	2.20	0.42
1:B:236:LYS:NZ	8:B:732:HOH:O	2.53	0.41
1:B:246:LYS:HG3	1:B:297:THR:OG1	2.20	0.41
1:B:38:LYS:HE3	8:B:721:HOH:O	2.20	0.41
1:A:57:PRO:HG2	1:A:60:ALA:HB3	2.02	0.41
1:B:57:PRO:HG2	1:B:60:ALA:HB3	2.01	0.41
1:A:3:ILE:HD11	1:A:480:LYS:HD2	2.02	0.41

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	515/531 (97%)	503 (98%)	10 (2%)	2 (0%)	30	16
1	B	516/531 (97%)	505 (98%)	11 (2%)	0	100	100
All	All	1031/1062 (97%)	1008 (98%)	21 (2%)	2 (0%)	43	28

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	239	GLU
1	A	316	HIS

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	430/443 (97%)	423 (98%)	7 (2%)	55	41
1	B	431/443 (97%)	428 (99%)	3 (1%)	76	69
All	All	861/886 (97%)	851 (99%)	10 (1%)	63	51

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	196	LYS
1	A	237	SER
1	A	239	GLU
1	A	320	SER
1	A	377	LYS
1	A	394	LYS
1	A	490	HIS
1	B	185	LYS
1	B	320	SER
1	B	490	HIS

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	279	ASN
1	A	328	ASN
1	A	446	ASN
1	A	500	GLN
1	B	90	ASN
1	B	279	ASN
1	B	446	ASN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 21 ligands modelled in this entry, 13 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	PO4	A	612	2	4,4,4	0.85	0	6,6,6	0.33	0
7	PO4	B	609	2	4,4,4	0.91	0	6,6,6	0.49	0
6	EPE	A	610	-	15,15,15	3.86	7 (46%)	19,20,20	2.72	9 (47%)
6	EPE	A	609	-	15,15,15	3.72	8 (53%)	19,20,20	2.46	11 (57%)
6	EPE	B	608	-	15,15,15	3.84	7 (46%)	19,20,20	2.44	9 (47%)
6	EPE	A	611	-	15,15,15	3.85	7 (46%)	19,20,20	2.73	10 (52%)
4	15P	A	604	-	21,21,103	0.53	0	20,20,102	0.41	0
6	EPE	B	607	-	15,15,15	3.80	8 (53%)	19,20,20	2.52	10 (52%)

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	EPE	A	610	-	-	3/9/19/19	0/1/1/1
6	EPE	A	609	-	-	2/9/19/19	0/1/1/1
6	EPE	B	608	-	-	3/9/19/19	0/1/1/1
6	EPE	A	611	-	-	5/9/19/19	0/1/1/1
4	15P	A	604	-	-	9/19/19/101	-
6	EPE	B	607	-	-	2/9/19/19	0/1/1/1

All (37) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	611	EPE	C2-N1	-6.44	1.29	1.46
6	B	607	EPE	C5-N4	-6.38	1.29	1.46
6	B	608	EPE	C2-N1	-6.37	1.29	1.46
6	A	609	EPE	C5-N4	-6.32	1.29	1.46
6	B	607	EPE	C2-N1	-6.31	1.29	1.46
6	A	611	EPE	C5-N4	-6.31	1.29	1.46
6	A	610	EPE	C2-N1	-6.30	1.29	1.46
6	A	609	EPE	C2-N1	-6.27	1.30	1.46
6	A	610	EPE	C5-N4	-6.23	1.30	1.46
6	B	608	EPE	C5-N4	-6.14	1.30	1.46
6	A	611	EPE	C3-N4	-6.00	1.30	1.46
6	A	610	EPE	C3-N4	-5.92	1.30	1.46
6	A	610	EPE	C6-N1	-5.82	1.31	1.46
6	B	608	EPE	C6-N1	-5.78	1.31	1.46
6	B	607	EPE	C6-N1	-5.76	1.31	1.46
6	A	609	EPE	C3-N4	-5.74	1.31	1.46
6	B	608	EPE	C3-N4	-5.71	1.31	1.46
6	B	607	EPE	C3-N4	-5.70	1.31	1.46
6	A	611	EPE	C6-N1	-5.62	1.31	1.46
6	A	609	EPE	C6-N1	-5.56	1.31	1.46
6	B	608	EPE	C7-N4	-5.51	1.34	1.47
6	B	608	EPE	C9-N1	-5.50	1.34	1.47
6	A	610	EPE	C7-N4	-5.50	1.34	1.47
6	A	610	EPE	C9-N1	-5.48	1.35	1.47
6	A	611	EPE	C9-N1	-5.43	1.35	1.47
6	A	611	EPE	C7-N4	-5.32	1.35	1.47
6	B	607	EPE	C9-N1	-5.19	1.35	1.47
6	A	609	EPE	C7-N4	-5.12	1.35	1.47
6	A	609	EPE	C9-N1	-5.09	1.35	1.47
6	B	607	EPE	C7-N4	-4.92	1.36	1.47
6	B	607	EPE	C10-S	3.10	1.81	1.77
6	B	608	EPE	C10-S	3.02	1.81	1.77
6	A	610	EPE	C10-S	2.92	1.81	1.77
6	A	611	EPE	C10-S	2.89	1.81	1.77
6	B	607	EPE	C6-C5	2.22	1.59	1.51
6	A	609	EPE	C10-S	2.03	1.80	1.77
6	A	609	EPE	C6-C5	2.01	1.58	1.51

All (49) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	608	EPE	O1S-S-C10	5.30	114.73	106.73
6	A	611	EPE	O1S-S-C10	5.10	114.43	106.73

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	A	609	EPE	O2S-S-C10	5.03	114.33	106.73
6	A	610	EPE	O2S-S-C10	4.93	114.18	106.73
6	B	607	EPE	O1S-S-C10	4.90	114.13	106.73
6	B	607	EPE	O2S-S-C10	4.81	114.00	106.73
6	A	611	EPE	O2S-S-C10	4.78	113.95	106.73
6	A	610	EPE	O1S-S-C10	4.72	113.85	106.73
6	B	608	EPE	O2S-S-C10	4.52	113.56	106.73
6	A	610	EPE	C6-N1-C2	4.51	118.56	108.84
6	A	610	EPE	C3-C2-N1	4.48	119.69	110.65
6	A	611	EPE	C6-N1-C2	4.34	118.18	108.84
6	B	607	EPE	O3S-S-C10	4.16	114.14	106.00
6	A	609	EPE	O1S-S-C10	4.14	112.99	106.73
6	B	608	EPE	O3S-S-C10	4.13	114.09	106.00
6	A	611	EPE	O3S-S-C10	4.13	114.08	106.00
6	A	610	EPE	O3S-S-C10	3.85	113.53	106.00
6	A	609	EPE	O3S-S-C10	3.72	113.29	106.00
6	A	611	EPE	C3-C2-N1	3.62	117.94	110.65
6	B	608	EPE	C3-C2-N1	3.18	117.05	110.65
6	B	607	EPE	O3S-S-O1S	-3.01	103.87	111.40
6	A	609	EPE	C3-C2-N1	2.91	116.52	110.65
6	A	609	EPE	C6-N1-C2	2.90	115.08	108.84
6	A	611	EPE	O2S-S-O1S	-2.90	104.40	113.82
6	B	608	EPE	O2S-S-O1S	-2.85	104.54	113.82
6	B	607	EPE	O3S-S-O2S	-2.83	104.33	111.40
6	B	608	EPE	O3S-S-O2S	-2.82	104.34	111.40
6	A	611	EPE	O3S-S-O1S	-2.81	104.36	111.40
6	B	608	EPE	O3S-S-O1S	-2.78	104.44	111.40
6	A	611	EPE	O3S-S-O2S	-2.77	104.46	111.40
6	A	610	EPE	O3S-S-O1S	-2.76	104.50	111.40
6	A	609	EPE	O3S-S-O2S	-2.74	104.54	111.40
6	B	607	EPE	C3-C2-N1	2.73	116.16	110.65
6	A	610	EPE	O2S-S-O1S	-2.73	104.94	113.82
6	B	607	EPE	O2S-S-O1S	-2.63	105.26	113.82
6	A	610	EPE	O3S-S-O2S	-2.63	104.82	111.40
6	B	608	EPE	C7-N4-C5	2.62	118.21	111.24
6	A	609	EPE	O3S-S-O1S	-2.54	105.04	111.40
6	A	611	EPE	C7-N4-C5	2.54	118.00	111.24
6	A	609	EPE	O2S-S-O1S	-2.48	105.77	113.82
6	A	611	EPE	C5-C6-N1	2.46	115.61	110.65
6	A	609	EPE	C5-C6-N1	2.45	115.58	110.65
6	A	609	EPE	C7-N4-C5	2.42	117.69	111.24
6	B	607	EPE	C7-N4-C5	2.32	117.44	111.24

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	607	EPE	C5-C6-N1	2.22	115.13	110.65
6	A	610	EPE	C2-C3-N4	2.15	115.00	110.65
6	B	607	EPE	C6-N1-C2	2.10	113.37	108.84
6	A	609	EPE	C2-C3-N4	2.09	114.86	110.65
6	B	608	EPE	C2-C3-N4	2.00	114.69	110.65

There are no chirality outliers.

All (24) torsion outliers are listed below:

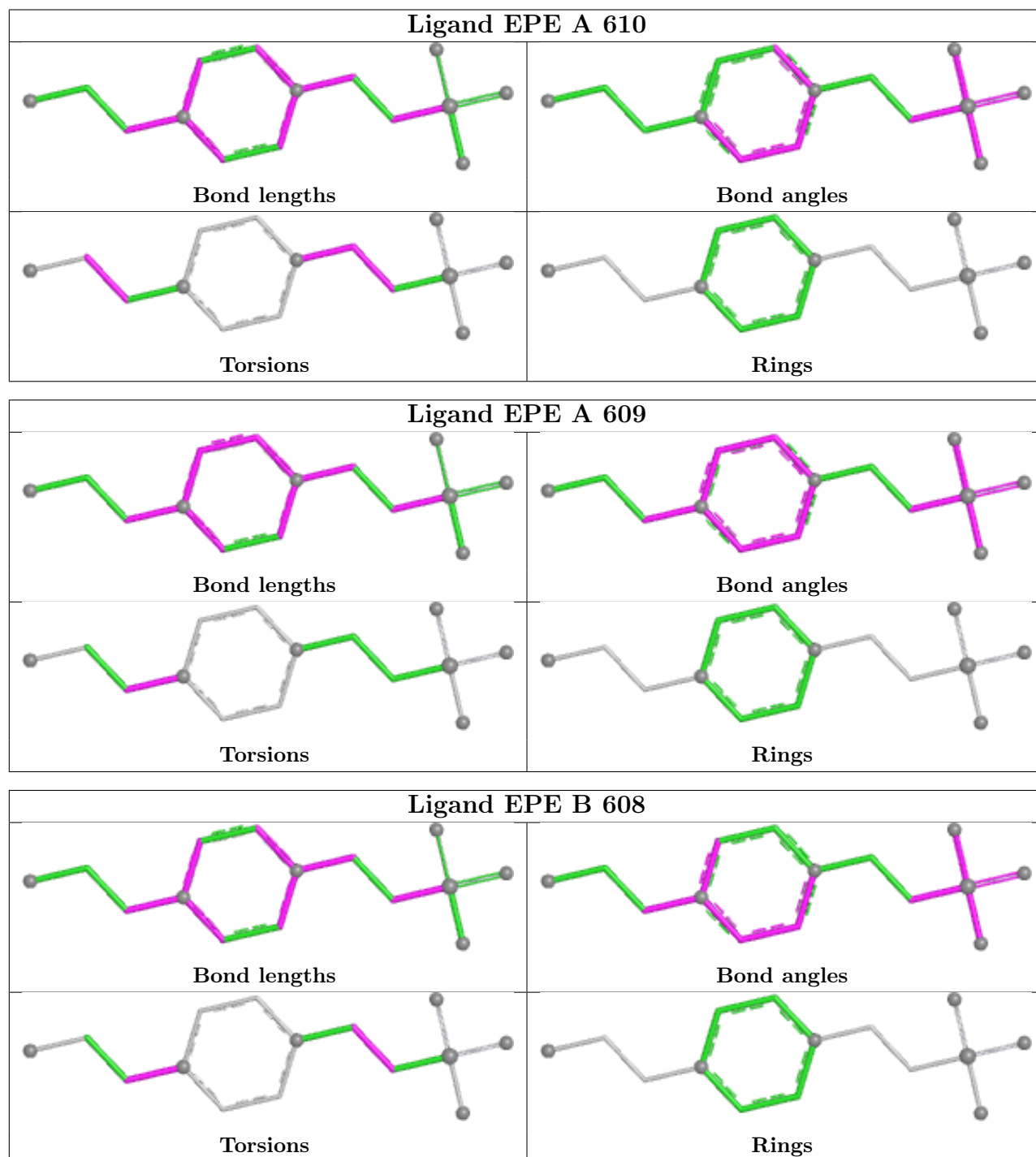
Mol	Chain	Res	Type	Atoms
6	A	611	EPE	C9-C10-S-O1S
6	B	607	EPE	C8-C7-N4-C5
6	B	608	EPE	S-C10-C9-N1
6	A	610	EPE	N4-C7-C8-O8
6	A	609	EPE	C8-C7-N4-C5
6	A	611	EPE	C8-C7-N4-C5
6	B	608	EPE	C8-C7-N4-C5
4	A	604	15P	O1-C3-C4-O2
4	A	604	15P	O2-C5-C6-O3
4	A	604	15P	O5-C10-C9-O4
6	A	611	EPE	C9-C10-S-O3S
6	A	610	EPE	S-C10-C9-N1
6	B	608	EPE	C8-C7-N4-C3
4	A	604	15P	C3-C4-O2-C5
6	A	610	EPE	C10-C9-N1-C6
4	A	604	15P	O3-C7-C8-O4
6	A	611	EPE	C8-C7-N4-C3
6	A	611	EPE	C9-C10-S-O2S
6	A	609	EPE	C8-C7-N4-C3
4	A	604	15P	C5-C6-O3-C7
4	A	604	15P	C4-C3-O1-C2
4	A	604	15P	C10-C9-O4-C8
4	A	604	15P	C8-C7-O3-C6
6	B	607	EPE	C8-C7-N4-C3

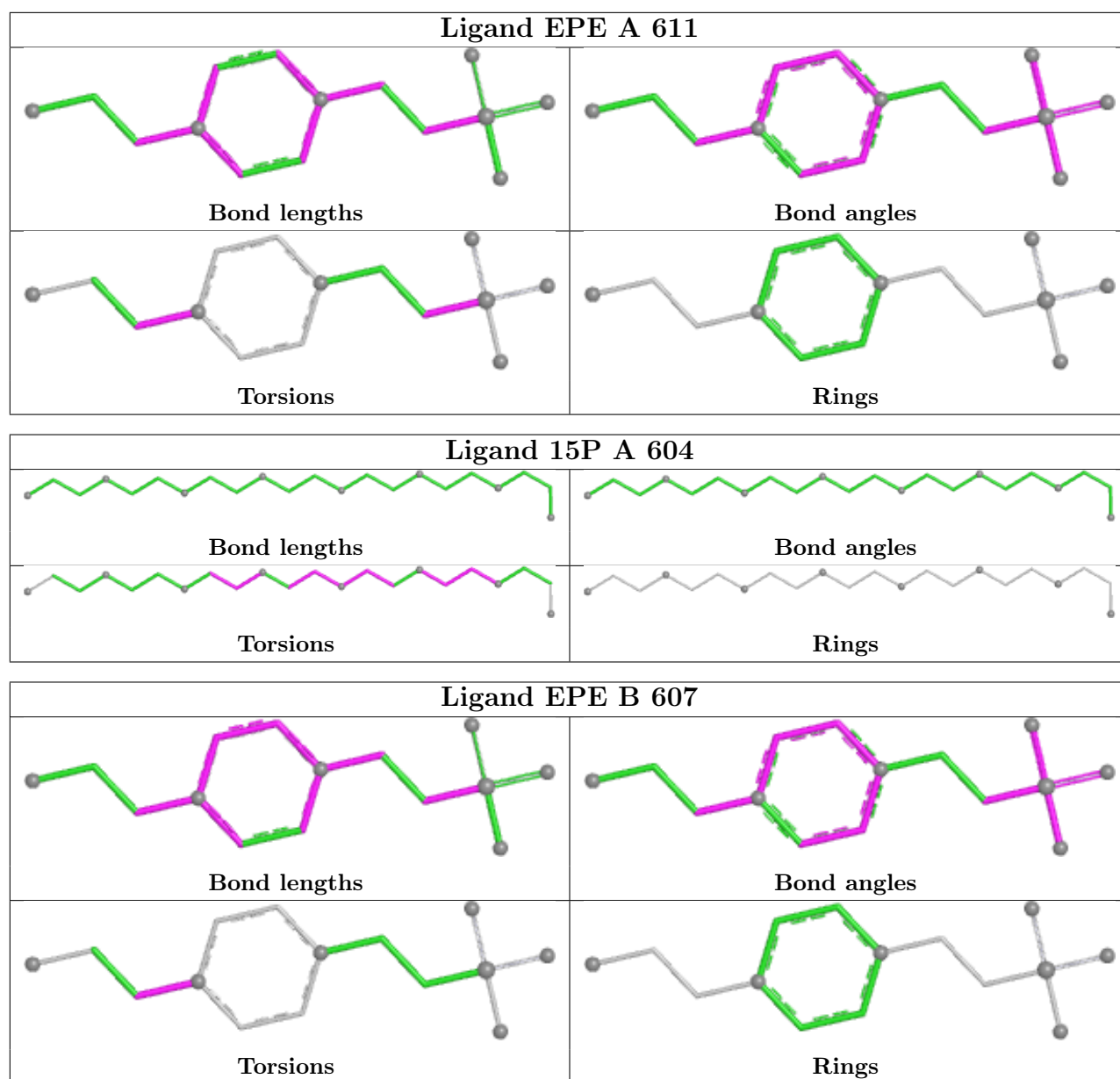
There are no ring outliers.

No monomer is involved in short contacts.

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	503/531 (94%)	-0.31	3 (0%) 85 88	14, 33, 50, 63	8 (1%)
1	B	502/531 (94%)	-0.27	2 (0%) 88 90	13, 34, 49, 66	10 (1%)
All	All	1005/1062 (94%)	-0.29	5 (0%) 87 89	13, 33, 50, 66	18 (1%)

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	239	GLU	3.5
1	A	4[A]	LYS	3.0
1	A	1	ALA	2.9
1	B	1	ALA	2.2
1	B	502	ASN	2.2

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](#)

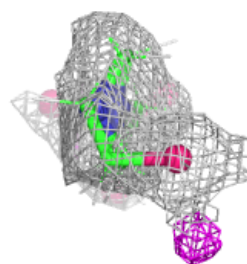
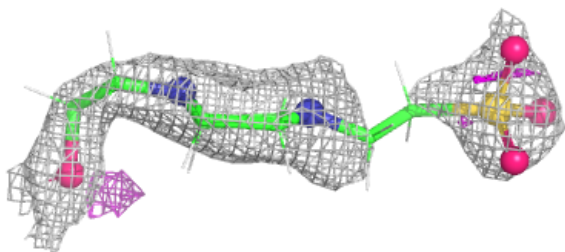
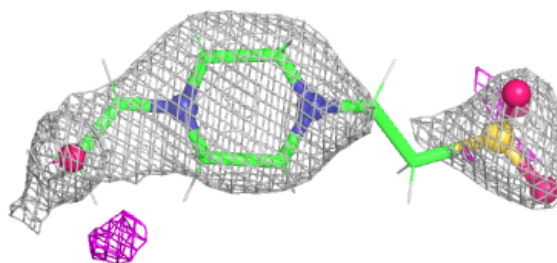
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	EPE	A	611	15/15	0.77	0.15	80,96,104,106	0
4	15P	A	604	22/104	0.81	0.17	83,100,113,114	0
6	EPE	A	610	15/15	0.91	0.12	60,73,75,75	0
6	EPE	B	608	15/15	0.91	0.13	58,72,77,77	0
6	EPE	A	609	15/15	0.94	0.09	34,43,47,48	0
6	EPE	B	607	15/15	0.95	0.09	39,49,53,53	0
3	MG	A	606	1/1	0.95	0.06	69,69,69,69	0
5	CL	A	608	1/1	0.96	0.08	59,59,59,59	0
3	MG	B	605	1/1	0.97	0.05	30,30,30,30	0
3	MG	A	605	1/1	0.97	0.06	31,31,31,31	0
7	PO4	B	609	5/5	0.98	0.06	28,28,29,29	0
2	ZN	B	601	1/1	0.99	0.03	28,28,28,28	0
3	MG	A	603	1/1	0.99	0.02	22,22,22,22	0
3	MG	B	603	1/1	0.99	0.02	24,24,24,24	0
5	CL	B	606	1/1	0.99	0.03	34,34,34,34	0
7	PO4	A	612	5/5	0.99	0.04	24,25,25,25	0
3	MG	B	604	1/1	0.99	0.02	32,32,32,32	0
2	ZN	B	602	1/1	1.00	0.03	26,26,26,26	0
2	ZN	A	602	1/1	1.00	0.01	25,25,25,25	0
5	CL	A	607	1/1	1.00	0.04	32,32,32,32	0
2	ZN	A	601	1/1	1.00	0.02	24,24,24,24	0

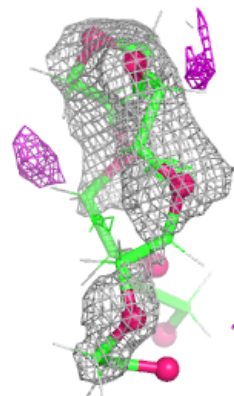
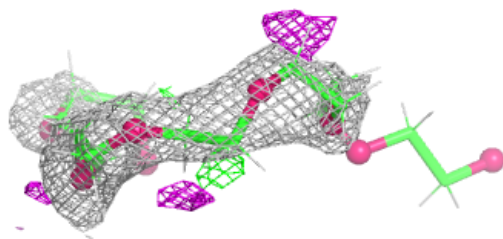
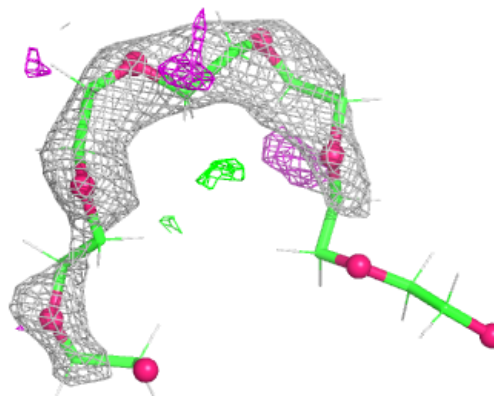
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation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

Electron density around EPE A 611:

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

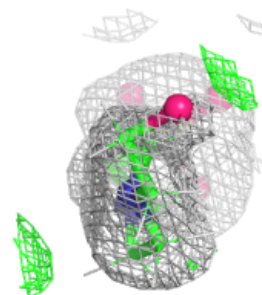
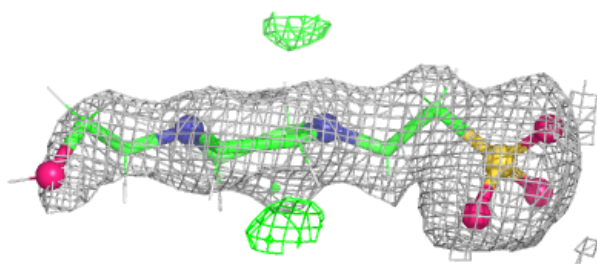
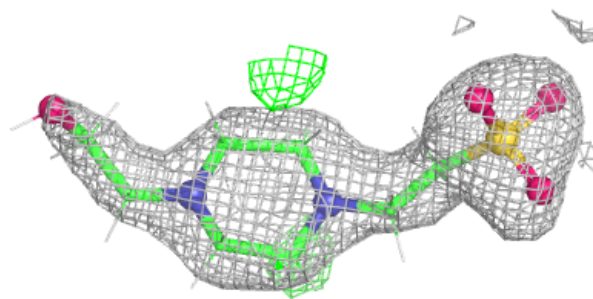
**Electron density around 15P A 604:**

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

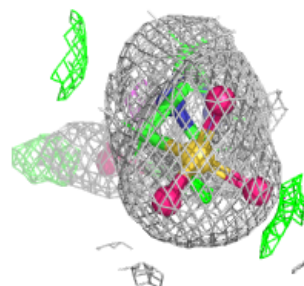
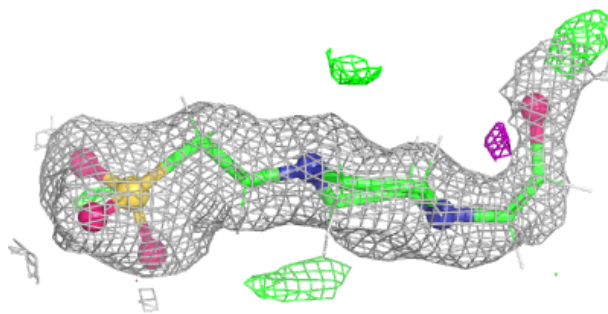
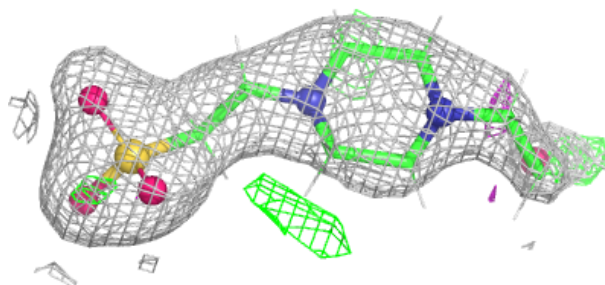


Electron density around EPE A 610:

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

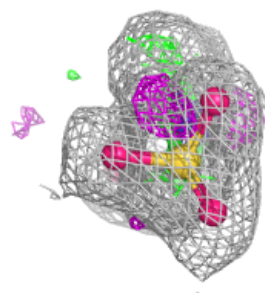
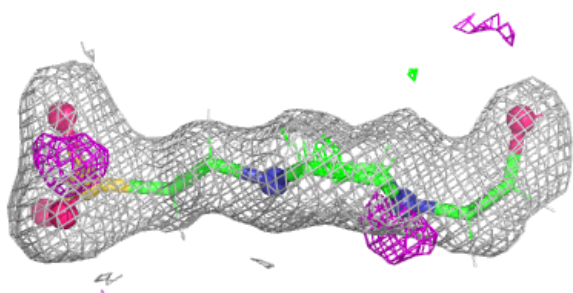
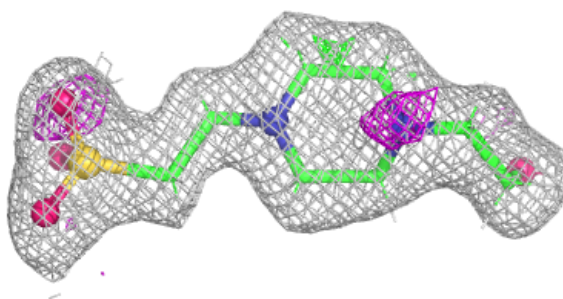
**Electron density around EPE B 608:**

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

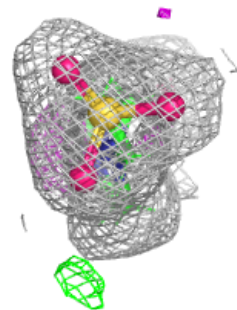
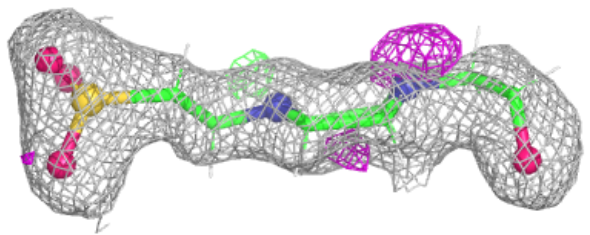
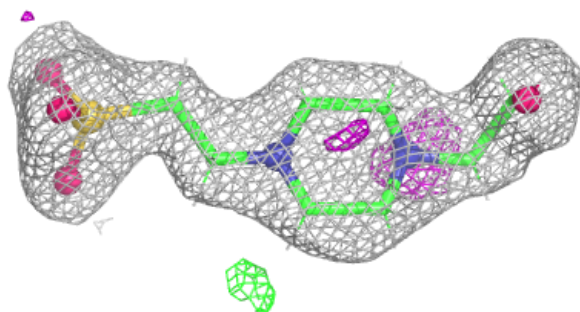


Electron density around EPE A 609:

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

**Electron density around EPE B 607:**

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



6.5 Other polymers ⓘ

There are no such residues in this entry.