



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 05:59 PM UTC

PDB ID : 6EEM / pdb_00006eem
Title : Crystal structure of Papaver somniferum tyrosine decarboxylase in complex with L-tyrosine
Authors : Torrens-Spence, M.P.; Chiang, Y.; Smith, T.; Vicent, M.A.; Wang, Y.; Weng, J.K.
Deposited on : 2018-08-14
Resolution : 2.61 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

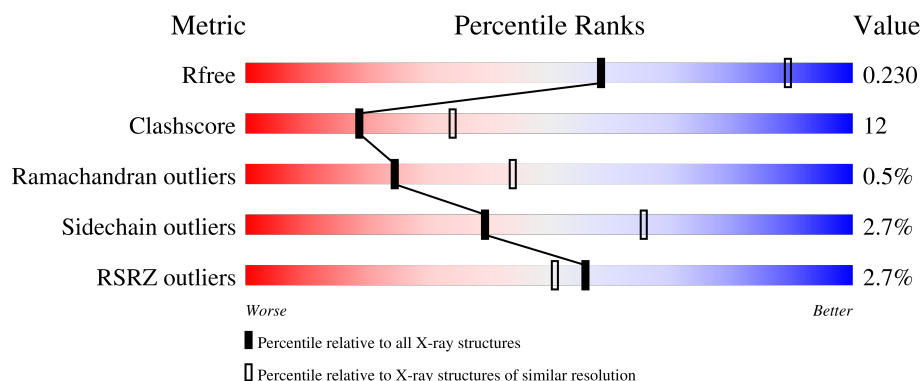
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

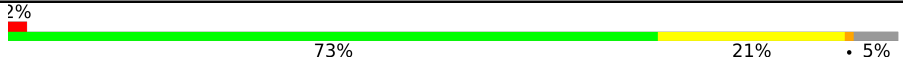
The reported resolution of this entry is 2.61 Å.

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	4951 (2.64-2.60)
Clashscore	190562	5303 (2.64-2.60)
Ramachandran outliers	187476	5217 (2.64-2.60)
Sidechain outliers	187428	5217 (2.64-2.60)
RSRZ outliers	180081	4950 (2.64-2.60)

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	512	 2% 73% 21% • 5%
2	B	512	 3% 73% 21% • 5%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8012 atoms, of which 27 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 Tyrosine/dopa decarboxylase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	487	Total	C	N	O	S	0	3	0
			3828	2450	647	707	24			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	45	LYS	ASN	conflict	UNP O82415
A	202	ASP	ASN	conflict	UNP O82415
A	348	PRO	ALA	conflict	UNP O82415
A	410	ILE	MET	conflict	UNP O82415
A	434	THR	ALA	conflict	UNP O82415
A	456	VAL	ALA	conflict	UNP O82415

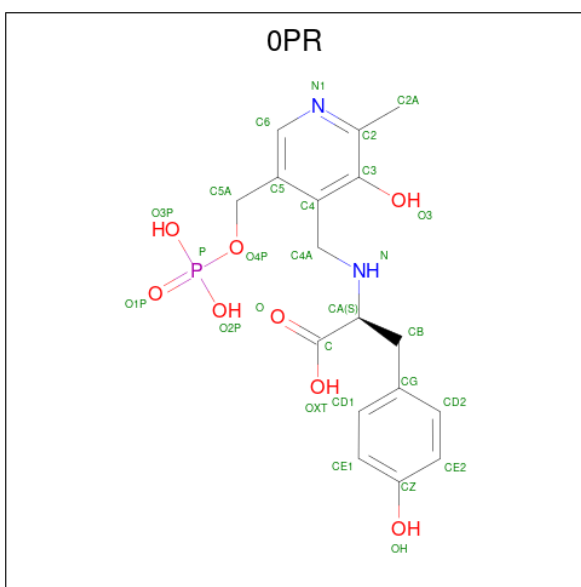
- Molecule 2 is a protein called Tyrosine/dopa decarboxylase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
2	B	488	Total	C	N	O	P	S	0	1	0
			3829	2452	644	708	1	24			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	45	LYS	ASN	conflict	UNP O82415
B	202	ASP	ASN	conflict	UNP O82415
B	348	PRO	ALA	conflict	UNP O82415
B	410	ILE	MET	conflict	UNP O82415
B	434	THR	ALA	conflict	UNP O82415
B	456	VAL	ALA	conflict	UNP O82415

- Molecule 3 is N-({3-hydroxy-2-methyl-5-[(phosphonooxy)methyl]pyridin-4-yl)methyl)-L-tyrosine (CCD ID: 0PR) (formula: C₁₇H₂₁N₂O₈P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	P	
			44	17	16	2	8	1	

- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



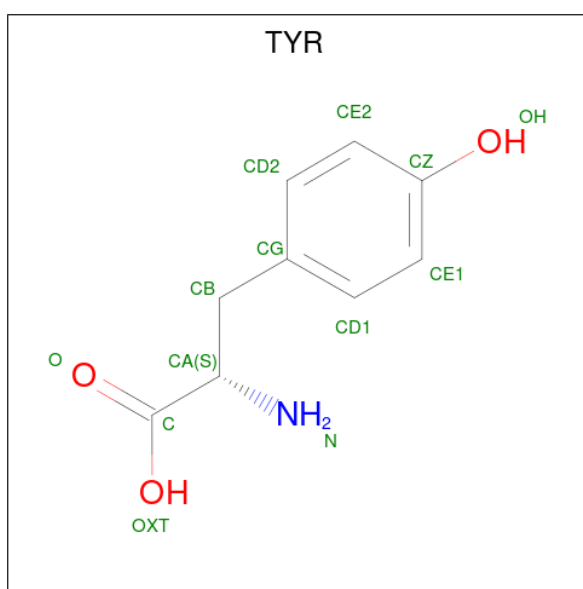
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	O S		
			5	4 1	0	0
4	A	1	Total	O S		
			5	4 1	0	0
4	A	1	Total	O S		
			5	4 1	0	0

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

- Molecule 5 is TYROSINE (CCD ID: TYR) (formula: C₉H₁₁NO₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	H	N	O	0	0
			24	9	11	1	3		

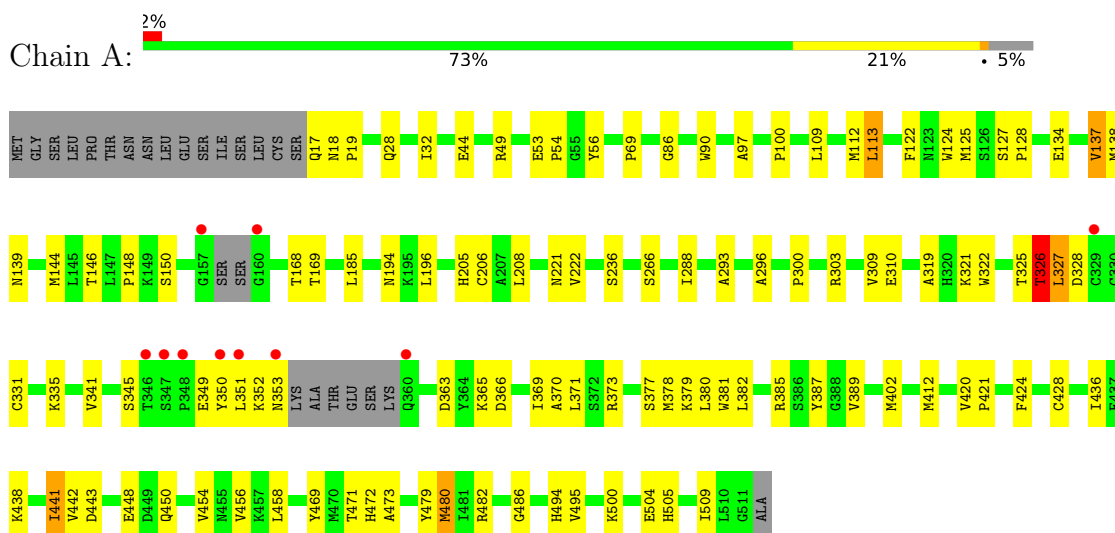
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	130	Total	O	0	0
			130	130		
6	B	122	Total	O	0	0
			122	122		

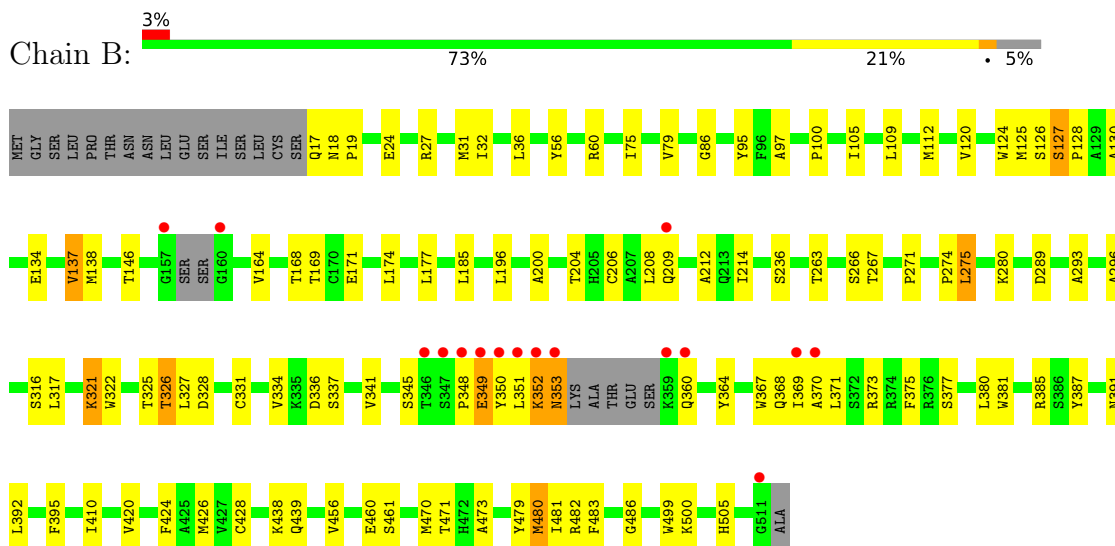
3 Residue-property plots

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: Tyrosine/dopa decarboxylase



• Molecule 2: Tyrosine/dopa decarboxylase



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	122.77Å 122.77Å 167.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	77.03 – 2.61 77.03 – 2.61	Depositor EDS
% Data completeness (in resolution range)	100.0 (77.03-2.61) 100.0 (77.03-2.61)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.05 (at 2.62Å)	Xtriage
Refinement program	PHENIX 1.12_2829	Depositor
R, R_{free}	0.187 , 0.235 0.187 , 0.230	Depositor DCC
R_{free} test set	1979 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	35.2	Xtriage
Anisotropy	0.452	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 37.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8012	wwPDB-VP
Average B, all atoms (Å ²)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.56% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: LLP, SO4, OPR

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	0.21	0/3915	0.39	0/5312
2	B	0.21	0/3894	0.42	0/5282
All	All	0.21	0/7809	0.41	0/10594

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

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	3828	0	3808	104	0
2	B	3829	0	3809	110	0
3	A	28	16	0	2	0
4	A	20	0	0	0	0
4	B	15	0	0	0	0
5	B	13	11	8	1	0
6	A	130	0	0	3	0
6	B	122	0	0	7	0
All	All	7985	27	7625	182	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 12.

All (182) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:349:GLU:HG2	2:B:352:LYS:CE	1.82	1.10
2:B:349:GLU:HG2	2:B:352:LYS:HE3	1.41	1.00
2:B:174:LEU:HD23	2:B:369:ILE:HD11	1.46	0.96
1:A:325:THR:O	1:A:326:THR:HB	1.68	0.93
1:A:32:ILE:HG13	2:B:109:LEU:HD22	1.51	0.92
1:A:327:LEU:HG	1:A:328:ASP:HB3	1.56	0.87
2:B:325:THR:O	2:B:326:THR:HB	1.75	0.86
1:A:112:MET:HG2	2:B:112:MET:SD	2.15	0.85
2:B:17:GLN:HG2	2:B:18:ASN:H	1.44	0.82
2:B:473:ALA:HB3	2:B:480:MET:HE1	1.61	0.81
2:B:266:SER:HB2	2:B:420:VAL:HG21	1.64	0.79
2:B:349:GLU:CG	2:B:352:LYS:HE3	2.12	0.78
1:A:412[B]:MET:HE2	1:A:412[B]:MET:HA	1.64	0.77
1:A:472:HIS:H	2:B:353:ASN:HD21	1.33	0.76
1:A:325:THR:O	1:A:326:THR:CB	2.36	0.73
1:A:436:ILE:HD13	1:A:454:VAL:HG21	1.72	0.72
2:B:100:PRO:HG2	2:B:321:LLP:O	1.89	0.72
1:A:341:VAL:O	1:A:345:SER:HB2	1.92	0.69
1:A:125:MET:HE3	1:A:125:MET:HA	1.75	0.69
1:A:205:HIS:HE1	2:B:371:LEU:HD22	1.58	0.69
1:A:473:ALA:HB3	1:A:480:MET:HE2	1.76	0.68
1:A:146:THR:HG22	1:A:146:THR:O	1.93	0.67
2:B:146:THR:O	2:B:146:THR:HG22	1.95	0.67
2:B:334:VAL:HG12	2:B:336:ASP:H	1.59	0.67
1:A:205:HIS:CE1	2:B:371:LEU:HD22	2.29	0.66
2:B:125:MET:HA	2:B:125:MET:HE3	1.76	0.66
2:B:352:LYS:O	2:B:352:LYS:HG2	1.94	0.66
2:B:174:LEU:HD23	2:B:369:ILE:CD1	2.22	0.66
2:B:137:VAL:CG1	2:B:380:LEU:HD23	2.27	0.65
2:B:349:GLU:HG2	2:B:352:LYS:NZ	2.11	0.64
1:A:100:PRO:HG2	1:A:321:LYS:O	1.97	0.64
2:B:130:ALA:HA	2:B:375:PHE:CE1	2.33	0.64
1:A:505:HIS:O	1:A:509:ILE:HG13	2.00	0.62
1:A:168:THR:HG21	2:B:370:ALA:HB1	1.80	0.61
2:B:473:ALA:HB3	2:B:480:MET:CE	2.30	0.61
2:B:24:GLU:OE2	2:B:27:ARG:NH1	2.34	0.61
1:A:19:PRO:HG3	2:B:395:PHE:CZ	2.37	0.60
1:A:351:LEU:HD12	1:A:351:LEU:O	2.02	0.60
2:B:368:GLN:NE2	2:B:373:ARG:HD2	2.17	0.59
1:A:266:SER:HB2	1:A:420:VAL:HG21	1.84	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:288:ILE:HD12	1:A:309:VAL:HG23	1.85	0.59
2:B:470:MET:HE3	2:B:483:PHE:HD1	1.68	0.59
1:A:222:VAL:O	1:A:222:VAL:HG23	2.01	0.59
2:B:296:ALA:HB2	2:B:322:TRP:CZ3	2.38	0.59
1:A:109:LEU:HD23	1:A:112:MET:HE2	1.85	0.58
1:A:112:MET:HE3	2:B:32:ILE:HG21	1.86	0.58
1:A:86:GLY:O	2:B:128:PRO:HD2	2.03	0.58
2:B:209:GLN:NE2	6:B:706:HOH:O	2.37	0.57
1:A:480:MET:HE3	1:A:480:MET:C	2.30	0.57
1:A:137:VAL:CG1	1:A:380:LEU:HD23	2.34	0.57
1:A:385:ARG:HE	2:B:75:ILE:HG12	1.69	0.57
1:A:363:ASP:HB3	1:A:365:LYS:HZ2	1.70	0.57
1:A:109:LEU:HD22	2:B:32:ILE:HG12	1.87	0.57
1:A:341:VAL:HG13	1:A:366:ASP:HB3	1.87	0.56
2:B:97:ALA:HB1	2:B:471:THR:HG23	1.86	0.56
1:A:326:THR:HG22	1:A:379:LYS:HD3	1.87	0.56
1:A:321:LYS:HE2	3:A:601:OPR:C4A	2.34	0.56
2:B:349:GLU:CD	2:B:352:LYS:HE3	2.31	0.56
1:A:32:ILE:CG1	2:B:109:LEU:HD22	2.28	0.56
1:A:473:ALA:HB3	1:A:480:MET:CE	2.36	0.56
1:A:112:MET:HE3	2:B:32:ILE:CG2	2.35	0.55
2:B:200:ALA:HB2	2:B:208:LEU:CD2	2.37	0.55
2:B:480:MET:HE3	2:B:482:ARG:HG3	1.89	0.55
1:A:370:ALA:HB1	2:B:168:THR:HG21	1.89	0.54
1:A:296:ALA:HB2	1:A:322:TRP:CZ3	2.43	0.54
1:A:369:ILE:HD12	2:B:214:ILE:HD13	1.89	0.54
1:A:134:GLU:HA	1:A:377:SER:HB3	1.90	0.54
1:A:144:MET:HE3	1:A:389:VAL:HG22	1.90	0.54
1:A:349:GLU:O	1:A:349:GLU:HG3	2.07	0.54
2:B:293:ALA:HB1	2:B:424:PHE:CZ	2.44	0.53
2:B:321:LLP:NZ	2:B:321:LLP:H5'1	2.23	0.53
1:A:122:PHE:HB3	1:A:371:LEU:O	2.09	0.53
2:B:200:ALA:HB2	2:B:208:LEU:HD22	1.91	0.53
1:A:112:MET:CE	2:B:32:ILE:HB	2.38	0.53
1:A:303[A]:ARG:O	1:A:303[A]:ARG:HD3	2.09	0.53
2:B:325:THR:O	2:B:326:THR:CB	2.51	0.53
1:A:472:HIS:CD2	2:B:353:ASN:HA	2.43	0.53
1:A:49:ARG:HD3	1:A:469:TYR:CE1	2.44	0.52
2:B:470:MET:HE3	2:B:483:PHE:CD1	2.43	0.52
1:A:293:ALA:HB1	1:A:424:PHE:CZ	2.45	0.52
2:B:470:MET:CE	2:B:483:PHE:HB2	2.40	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:97:ALA:HB1	1:A:471:THR:HG23	1.91	0.52
1:A:113:LEU:HD12	2:B:36:LEU:HD21	1.92	0.52
2:B:317:LEU:C	2:B:317:LEU:HD12	2.35	0.52
2:B:348:PRO:HD2	2:B:351:LEU:HD11	1.91	0.52
1:A:109:LEU:HD22	2:B:32:ILE:CG1	2.39	0.51
1:A:381:TRP:NE1	1:A:385:ARG:HD2	2.24	0.51
1:A:363:ASP:HB3	1:A:365:LYS:NZ	2.25	0.51
2:B:27:ARG:O	2:B:31:MET:HG3	2.11	0.51
2:B:500:LYS:NZ	6:B:711:HOH:O	2.41	0.50
1:A:321:LYS:HE3	3:A:601:OPR:CG	2.41	0.50
1:A:378:MET:HE1	2:B:79:VAL:HG22	1.94	0.50
1:A:412[B]:MET:HE3	6:A:770:HOH:O	2.12	0.50
1:A:350:TYR:CZ	1:A:351:LEU:HD23	2.46	0.49
1:A:124:TRP:CE2	1:A:128:PRO:HB3	2.48	0.49
2:B:341:VAL:O	2:B:345:SER:HB2	2.12	0.49
2:B:134:GLU:HA	2:B:377:SER:HB3	1.95	0.48
1:A:146:THR:HB	1:A:303[A]:ARG:HE	1.78	0.48
1:A:402:MET:HB3	1:A:495:VAL:HG21	1.94	0.48
1:A:438:LYS:N	1:A:438:LYS:HE2	2.28	0.48
2:B:185:LEU:HD21	2:B:196:LEU:HD11	1.96	0.48
1:A:17:GLN:HG3	1:A:18:ASN:H	1.79	0.48
1:A:363:ASP:HA	6:A:703:HOH:O	2.13	0.48
2:B:334:VAL:HG12	2:B:336:ASP:N	2.29	0.48
1:A:441:ILE:HG12	1:A:442:VAL:N	2.29	0.48
1:A:450:GLN:O	1:A:454:VAL:HG23	2.14	0.48
2:B:456:VAL:HG22	2:B:479:TYR:CE2	2.49	0.47
1:A:370:ALA:CB	2:B:168:THR:HG21	2.42	0.47
2:B:169:THR:HB	2:B:321:LLP:OP4	2.14	0.47
1:A:128:PRO:HD2	2:B:86:GLY:O	2.14	0.47
1:A:112:MET:HE3	2:B:32:ILE:HB	1.96	0.47
1:A:500:LYS:O	1:A:504:GLU:HG3	2.15	0.47
2:B:164:VAL:HG23	2:B:364:TYR:CD1	2.50	0.47
2:B:327:LEU:HA	2:B:328:ASP:HA	1.68	0.47
1:A:428:CYS:HB3	1:A:480:MET:SD	2.55	0.47
2:B:360:GLN:HG2	2:B:360:GLN:O	2.15	0.47
2:B:337:SER:HB2	2:B:367:TRP:CH2	2.51	0.46
1:A:134:GLU:CD	1:A:373:ARG:HH22	2.24	0.46
1:A:185:LEU:HD21	1:A:196:LEU:HD11	1.98	0.46
2:B:138:MET:HE1	2:B:331:CYS:HB3	1.97	0.46
2:B:334:VAL:CG1	2:B:336:ASP:H	2.29	0.45
1:A:69:PRO:HG3	2:B:391:ASN:OD1	2.17	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:352:LYS:HB3	2:B:352:LYS:HE2	1.58	0.45
2:B:381:TRP:NE1	2:B:385:ARG:HD2	2.31	0.45
2:B:461:SER:OG	2:B:505:HIS:ND1	2.38	0.45
1:A:138:MET:HE1	1:A:331:CYS:HB3	1.98	0.45
1:A:300:PRO:HA	1:A:303[B]:ARG:HG3	1.99	0.45
2:B:470:MET:HE3	2:B:483:PHE:HB2	1.99	0.45
1:A:28:GLN:O	1:A:32:ILE:HG12	2.17	0.45
1:A:206:CYS:SG	2:B:348:PRO:HG3	2.57	0.45
2:B:56:TYR:O	2:B:60:ARG:HG3	2.17	0.45
2:B:105:ILE:O	2:B:109:LEU:HG	2.17	0.45
2:B:438:LYS:C	2:B:439:GLN:HG3	2.42	0.45
1:A:472:HIS:NE2	2:B:353:ASN:HA	2.32	0.44
2:B:271:PRO:HB2	2:B:274:PRO:HG2	1.99	0.44
2:B:470:MET:HE3	2:B:483:PHE:CB	2.48	0.44
2:B:177:LEU:HD21	2:B:212:ALA:HA	1.99	0.44
1:A:480:MET:HE1	1:A:482:ARG:HG3	1.99	0.44
2:B:480:MET:HG2	2:B:481:ILE:N	2.30	0.44
1:A:113:LEU:HD12	1:A:113:LEU:HA	1.81	0.44
1:A:112:MET:HE3	2:B:32:ILE:CB	2.48	0.43
1:A:327:LEU:HA	1:A:328:ASP:HA	1.50	0.43
2:B:289:ASP:OD2	2:B:321:LLP:N1	2.51	0.43
2:B:236:SER:HB3	6:B:741:HOH:O	2.18	0.43
1:A:471:THR:HB	2:B:353:ASN:ND2	2.34	0.43
2:B:428:CYS:N	6:B:701:HOH:O	2.24	0.43
1:A:456:VAL:HG22	1:A:479:TYR:CZ	2.54	0.42
2:B:263:THR:N	2:B:267:THR:HA	2.34	0.42
2:B:120:VAL:O	2:B:126:SER:HB3	2.19	0.42
1:A:349:GLU:OE2	1:A:352:LYS:HD3	2.19	0.42
1:A:54:PRO:HA	2:B:124:TRP:CZ2	2.53	0.42
1:A:412[B]:MET:HA	1:A:412[B]:MET:CE	2.43	0.42
1:A:222:VAL:O	1:A:222:VAL:CG2	2.67	0.42
2:B:280:LYS:HG2	6:B:758:HOH:O	2.19	0.42
2:B:293:ALA:HB1	2:B:424:PHE:CE1	2.55	0.42
1:A:53[A]:GLU:O	1:A:56:TYR:HB3	2.20	0.42
1:A:137:VAL:HG12	1:A:380:LEU:HD23	2.01	0.42
1:A:326:THR:HG22	1:A:379:LYS:CD	2.48	0.42
1:A:443:ASP:OD2	1:A:448:GLU:OE2	2.38	0.42
1:A:387:TYR:CZ	2:B:19:PRO:HB3	2.55	0.42
2:B:321:LLP:C4'	5:B:601:TYR:HA	2.50	0.42
2:B:95:TYR:CZ	2:B:97:ALA:HB3	2.55	0.42
2:B:350:TYR:CD2	2:B:350:TYR:C	2.98	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:44:GLU:CD	1:A:494:HIS:HE2	2.28	0.41
1:A:148:PRO:HG2	1:A:310:GLU:HA	2.02	0.41
2:B:206:CYS:HB3	6:B:706:HOH:O	2.20	0.41
2:B:387:TYR:O	2:B:391:ASN:HB2	2.21	0.41
1:A:150:SER:HB2	1:A:335:LYS:HG2	2.01	0.41
2:B:460:GLU:HA	2:B:460:GLU:OE1	2.20	0.41
2:B:275:LEU:HD12	2:B:275:LEU:HA	1.90	0.41
1:A:319:ALA:HB1	1:A:325:THR:HG21	2.03	0.41
2:B:171:GLU:HB2	6:B:720:HOH:O	2.21	0.41
1:A:124:TRP:NE1	1:A:128:PRO:HB3	2.35	0.40
1:A:421:PRO:O	6:A:701:HOH:O	2.22	0.40
1:A:194:ASN:O	1:A:221:ASN:ND2	2.54	0.40
1:A:369:ILE:CD1	2:B:214:ILE:HD13	2.50	0.40
2:B:267:THR:HG23	2:B:426:MET:HE2	2.04	0.40
2:B:410:ILE:HG12	2:B:499:TRP:CZ3	2.57	0.40
1:A:319:ALA:HB1	1:A:325:THR:CG2	2.51	0.40
2:B:316:SER:HA	2:B:331:CYS:O	2.21	0.40
1:A:90:TRP:CZ2	2:B:120:VAL:HB	2.57	0.40
1:A:458:LEU:HA	1:A:509:ILE:HD11	2.03	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	484/512 (94%)	459 (95%)	22 (4%)	3 (1%)	21	39
2	B	482/512 (94%)	459 (95%)	21 (4%)	2 (0%)	30	49
All	All	966/1024 (94%)	918 (95%)	43 (4%)	5 (0%)	24	44

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	127	SER
1	A	326	THR
1	A	486	GLY
2	B	486	GLY
2	B	127	SER

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	417/436 (96%)	405 (97%)	12 (3%)	37	63
2	B	415/435 (95%)	405 (98%)	10 (2%)	43	69
All	All	832/871 (96%)	810 (97%)	22 (3%)	39	66

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	113	LEU
1	A	137	VAL
1	A	139	ASN
1	A	169	THR
1	A	208	LEU
1	A	236	SER
1	A	326	THR
1	A	327	LEU
1	A	353	ASN
1	A	382	LEU
1	A	441	ILE
1	A	480	MET
2	B	127	SER
2	B	137	VAL
2	B	204	THR
2	B	275	LEU
2	B	326	THR
2	B	349	GLU
2	B	352	LYS

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Mol	Chain	Res	Type
2	B	353	ASN
2	B	392	LEU
2	B	480	MET

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

Mol	Chain	Res	Type
1	A	94	ASN
1	A	143	GLN
2	B	232	ASN
2	B	353	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

1 non-standard protein/DNA/RNA residue is modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	LLP	B	321	2	23,24,25	2.47	6 (26%)	25,32,34	1.27	4 (16%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	LLP	B	321	2	-	8/16/17/19	0/1/1/1

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	321	LLP	C4-C4'	7.25	1.62	1.46
2	B	321	LLP	C4'-NZ	5.10	1.44	1.27
2	B	321	LLP	C2'-C2	3.66	1.56	1.50
2	B	321	LLP	C6-N1	3.20	1.40	1.34
2	B	321	LLP	C4-C5	-3.19	1.37	1.42
2	B	321	LLP	C5'-C5	2.22	1.56	1.50

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	321	LLP	CE-NZ-C4'	-2.49	110.74	118.72
2	B	321	LLP	C4-C4'-NZ	-2.48	112.62	124.04
2	B	321	LLP	C5-C6-N1	-2.41	119.91	123.83
2	B	321	LLP	C3-C4-C5	2.09	119.95	118.28

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	321	LLP	C4-C4'-NZ-CE
2	B	321	LLP	CG-CD-CE-NZ
2	B	321	LLP	CE-CD-CG-CB
2	B	321	LLP	CA-CB-CG-CD
2	B	321	LLP	C5'-OP4-P-OP2
2	B	321	LLP	C5'-OP4-P-OP3
2	B	321	LLP	C5'-OP4-P-OP1
2	B	321	LLP	C3-C4-C4'-NZ

There are no ring outliers.

1 monomer is involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	321	LLP	5	0

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

9 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
4	SO4	A	603	-	4,4,4	0.24	0	6,6,6	0.14	0
4	SO4	A	602	-	4,4,4	0.25	0	6,6,6	0.21	0
4	SO4	A	604	-	4,4,4	0.25	0	6,6,6	0.06	0
4	SO4	B	604	-	4,4,4	0.23	0	6,6,6	0.12	0
4	SO4	B	602	-	4,4,4	0.24	0	6,6,6	0.11	0
3	OPR	A	601	-	29,29,29	1.71	6 (20%)	38,41,41	1.86	9 (23%)
5	TYR	B	601	-	12,13,13	0.73	1 (8%)	13,17,17	0.75	1 (7%)
4	SO4	A	605	-	4,4,4	0.23	0	6,6,6	0.11	0
4	SO4	B	603	-	4,4,4	0.26	0	6,6,6	0.31	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
5	TYR	B	601	-	-	0/8/8/8	0/1/1/1
3	OPR	A	601	-	-	8/19/19/19	0/2/2/2

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	601	OPR	C4A-N	-4.70	1.33	1.46
3	A	601	OPR	OH-CZ	3.58	1.45	1.37
3	A	601	OPR	C4A-C4	3.18	1.56	1.52
3	A	601	OPR	O3-C3	2.97	1.43	1.36
3	A	601	OPR	CB-CA	2.48	1.60	1.54
5	B	601	TYR	OXT-C	-2.23	1.23	1.30
3	A	601	OPR	C5A-C5	2.13	1.56	1.50

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	601	0PR	C4A-N-CA	7.03	127.03	113.84
3	A	601	0PR	C4A-C4-C5	4.01	124.12	119.75
3	A	601	0PR	CG-CB-CA	3.21	121.90	113.36
5	B	601	TYR	OXT-C-O	-2.52	118.36	124.08
3	A	601	0PR	CB-CA-N	2.40	114.89	110.69
3	A	601	0PR	C5-C6-N1	-2.23	120.20	123.83
3	A	601	0PR	OXT-C-CA	2.22	121.01	113.51
3	A	601	0PR	C4A-C4-C3	-2.15	117.12	119.98
3	A	601	0PR	C2A-C2-C3	-2.12	118.31	120.80
3	A	601	0PR	CB-CG-CD2	-2.10	116.99	120.90

There are no chirality outliers.

All (8) torsion outliers are listed below:

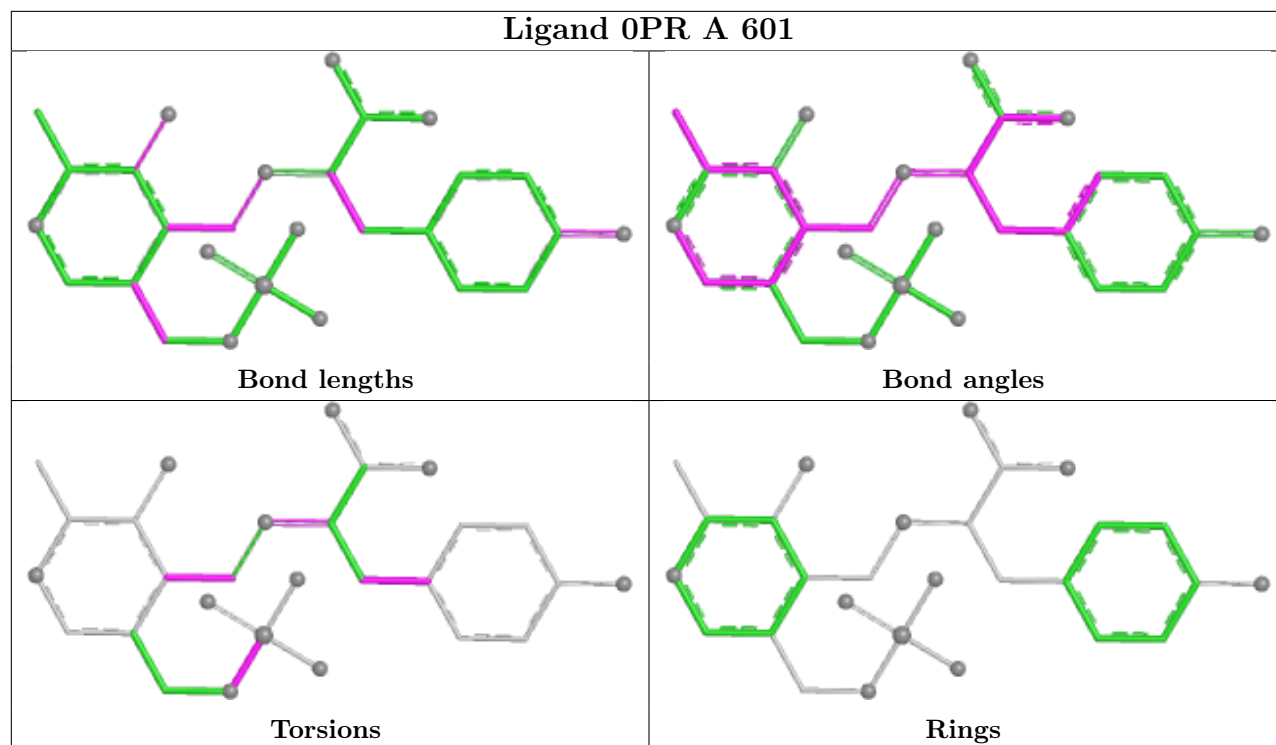
Mol	Chain	Res	Type	Atoms
3	A	601	0PR	C5A-O4P-P-O1P
3	A	601	0PR	C5A-O4P-P-O2P
3	A	601	0PR	C5A-O4P-P-O3P
3	A	601	0PR	CB-CA-N-C4A
3	A	601	0PR	CA-CB-CG-CD1
3	A	601	0PR	CA-CB-CG-CD2
3	A	601	0PR	C-CA-N-C4A
3	A	601	0PR	C5-C4-C4A-N

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	601	0PR	2	0
5	B	601	TYR	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	487/512 (95%)	-0.41	10 (2%) 63 59	15, 32, 65, 179	3 (0%)
2	B	487/512 (95%)	-0.37	16 (3%) 49 44	20, 33, 66, 146	1 (0%)
All	All	974/1024 (95%)	-0.39	26 (2%) 56 51	15, 32, 66, 179	4 (0%)

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	350	TYR	7.1
1	A	350	TYR	6.6
2	B	353	ASN	5.5
1	A	353	ASN	5.4
1	A	351	LEU	4.6
2	B	351	LEU	4.6
1	A	160	GLY	4.5
1	A	157	GLY	4.5
2	B	347	SER	4.0
2	B	359	LYS	3.9
2	B	160	GLY	3.8
2	B	370	ALA	3.7
2	B	346	THR	3.4
2	B	157	GLY	3.3
2	B	349	GLU	3.2
2	B	348	PRO	3.2
1	A	348	PRO	3.0
2	B	511	GLY	3.0
1	A	346	THR	2.8
2	B	352	LYS	2.7
1	A	347	SER	2.5
2	B	360	GLN	2.5
1	A	329	CYS	2.5
1	A	360	GLN	2.3

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Mol	Chain	Res	Type	RSRZ
2	B	369	ILE	2.2
2	B	209	GLN	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	LLP	B	321	24/25	0.95	0.09	24,41,50,53	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

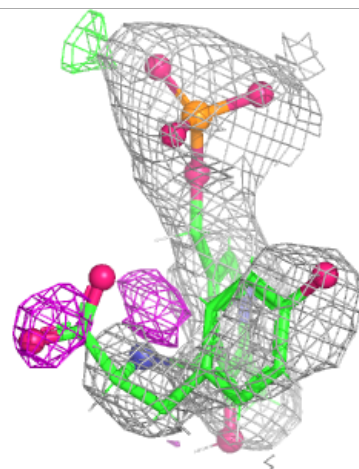
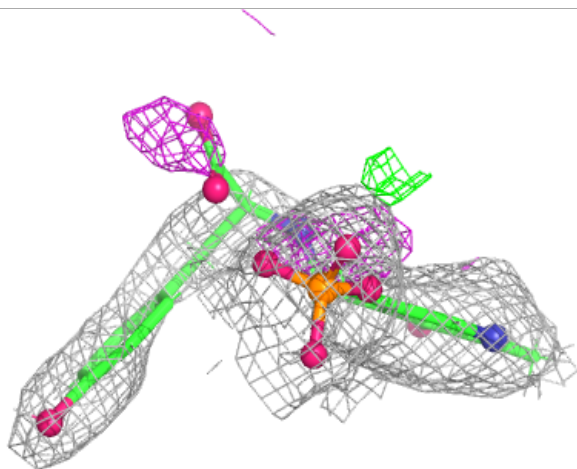
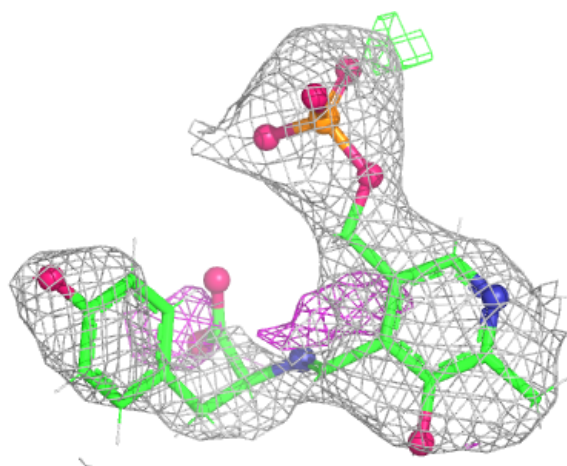
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	SO4	B	604	5/5	0.76	0.22	110,111,113,115	0
4	SO4	A	604	5/5	0.81	0.22	108,110,110,114	0
4	SO4	A	602	5/5	0.85	0.15	82,87,87,89	0
5	TYR	B	601	13/13	0.87	0.21	114,120,142,147	0
3	OPR	A	601	28/28	0.90	0.18	53,81,112,116	0
4	SO4	A	605	5/5	0.91	0.14	117,119,120,123	0
4	SO4	B	602	5/5	0.91	0.10	69,71,79,81	0
4	SO4	A	603	5/5	0.93	0.09	58,59,64,73	0
4	SO4	B	603	5/5	0.95	0.11	39,40,46,47	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 0PR A 601:

$2mF_o-DF_c$ (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.