



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 03:24 AM UTC

PDB ID : 1J93 / pdb_00001j93
Title : Crystal Structure and Substrate Binding Modeling of the Uroporphyrinogen-III Decarboxylase from *Nicotiana tabacum*: Implications for the Catalytic Mechanism
Authors : Martins, B.M.; Grimm, B.; Mock, H.-P.; Huber, R.; Messerschmidt, A.
Deposited on : 2001-05-23
Resolution : 2.30 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)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

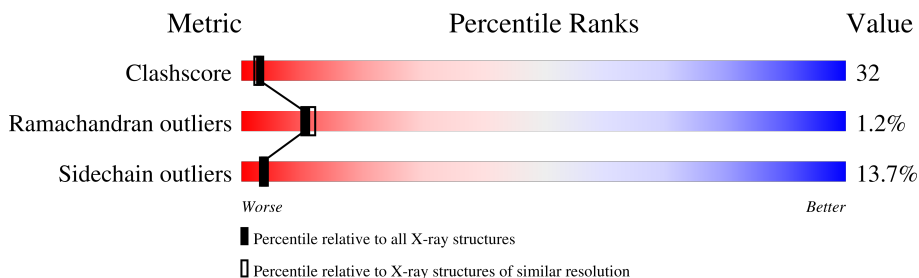
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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))
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)

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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	353	

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	SO4	A	584	-	-	X	-
2	SO4	A	585	-	-	X	-

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2953 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 UROPORPHYRINOGEN DECARBOXYLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	343	2697	1747	458	486	6	10	0	0

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is water.

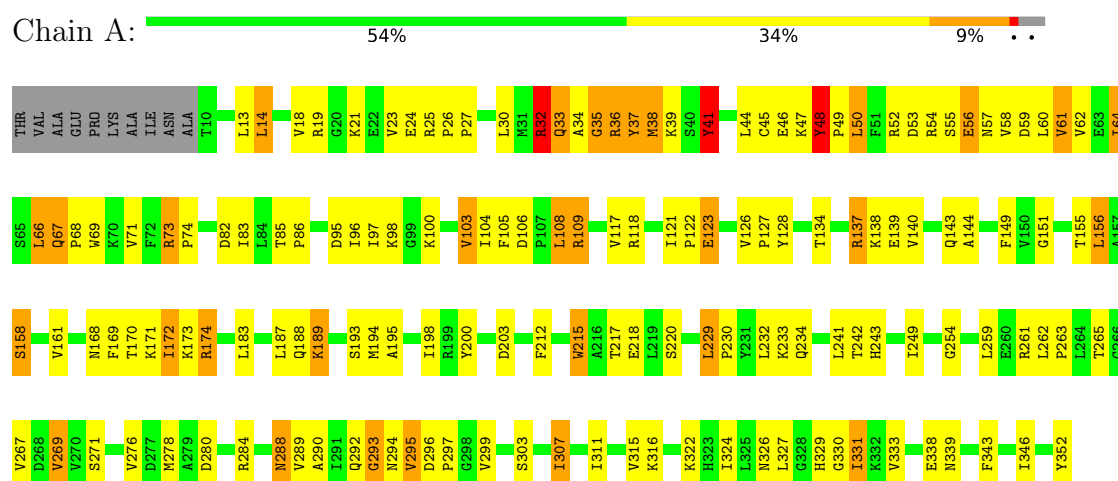
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	231	Total 231	O 231	0	0

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. 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. 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.

Note EDS was not executed.

• Molecule 1: UROPORPHYRINOGEN DECARBOXYLASE



4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 6 2 2	Depositor
Cell constants a, b, c, α , β , γ	158.44Å 158.44Å 67.68Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	18.00 – 2.30	Depositor
% Data completeness (in resolution range)	97.7 (18.00-2.30)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.06	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.209 , 0.256	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	2953	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

5 Model quality

5.1 Standard geometry

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

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	0.53	1/2760 (0.0%)	1.08	20/3741 (0.5%)

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	2

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	48	TYR	N-CA	5.89	1.54	1.46

All (20) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	48	TYR	O-C-N	-20.31	97.97	121.32
1	A	35	GLY	N-CA-C	-11.72	101.78	114.67
1	A	47	LYS	O-C-N	11.28	137.68	122.57
1	A	295	VAL	N-CA-C	8.10	119.91	109.30
1	A	218	GLU	N-CA-C	-7.35	104.31	113.28
1	A	47	LYS	CA-C-N	7.33	139.70	121.80
1	A	47	LYS	C-N-CA	7.33	139.70	121.80
1	A	48	TYR	CA-CB-CG	-6.80	101.66	113.90
1	A	61	VAL	N-CA-C	-6.62	104.40	110.82
1	A	37	TYR	N-CA-C	-6.34	104.74	113.18
1	A	48	TYR	N-CA-C	6.30	123.73	109.81
1	A	232	LEU	N-CA-C	-6.12	104.69	111.36

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	41	TYR	N-CA-C	-5.54	106.36	113.23
1	A	104	ILE	N-CA-C	-5.49	100.67	108.58
1	A	195	ALA	N-CA-C	-5.47	105.23	111.14
1	A	220	SER	N-CA-C	-5.27	103.14	109.83
1	A	288	ASN	N-CA-C	5.15	118.02	111.69
1	A	143	GLN	N-CA-C	-5.09	106.66	112.92
1	A	121	ILE	CA-C-N	5.00	124.44	119.24
1	A	121	ILE	C-N-CA	5.00	124.44	119.24

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	32	ARG	Mainchain
1	A	36	ARG	Mainchain

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	2697	0	2757	172	2
2	A	25	0	0	7	8
3	A	231	0	0	16	0
All	All	2953	0	2757	172	8

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 32.

All (172) 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:49:PRO:O	1:A:53:ASP:HB2	1.22	1.28
1:A:56:GLU:O	1:A:128:TYR:CD2	1.89	1.23
1:A:56:GLU:O	1:A:128:TYR:CE2	1.92	1.22
1:A:50:LEU:CD1	1:A:98:LYS:HE3	1.71	1.21

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:35:GLY:HA2	1:A:67:GLN:OE1	1.48	1.13
1:A:50:LEU:HD11	1:A:98:LYS:CE	1.83	1.07
1:A:57:ASN:ND2	1:A:60:LEU:H	1.54	1.06
1:A:50:LEU:HD11	1:A:98:LYS:HE3	1.04	1.04
1:A:37:TYR:CE2	3:A:455:HOH:O	2.13	0.98
1:A:57:ASN:OD1	1:A:60:LEU:HB3	1.63	0.98
1:A:233:LYS:HE3	2:A:585:SO4:O1	1.64	0.97
1:A:58:VAL:HG22	1:A:128:TYR:HB2	1.47	0.96
1:A:49:PRO:O	1:A:53:ASP:CB	2.13	0.95
1:A:49:PRO:HB2	1:A:52:ARG:HB2	1.47	0.95
1:A:57:ASN:HD21	1:A:60:LEU:N	1.63	0.95
1:A:57:ASN:ND2	1:A:60:LEU:N	2.17	0.93
1:A:35:GLY:HA3	1:A:41:TYR:HB3	1.51	0.92
1:A:233:LYS:CE	2:A:585:SO4:O1	2.18	0.92
1:A:50:LEU:CD1	1:A:98:LYS:CE	2.44	0.91
1:A:233:LYS:NZ	2:A:585:SO4:O1	2.05	0.89
1:A:38:MET:HE2	1:A:67:GLN:HG2	1.56	0.87
1:A:249:ILE:HG23	1:A:269:VAL:HG22	1.57	0.86
1:A:57:ASN:HD21	1:A:60:LEU:CB	1.89	0.85
1:A:32:ARG:HH11	1:A:32:ARG:HG3	1.41	0.83
1:A:48:TYR:O	1:A:49:PRO:C	2.18	0.83
1:A:53:ASP:O	1:A:60:LEU:CD2	2.27	0.83
1:A:49:PRO:CB	1:A:52:ARG:HB2	2.09	0.83
1:A:35:GLY:CA	1:A:41:TYR:HB3	2.08	0.82
1:A:30:LEU:HB3	1:A:331:ILE:HD11	1.62	0.81
1:A:105:PHE:HB2	3:A:476:HOH:O	1.79	0.80
1:A:58:VAL:O	1:A:62:VAL:HG23	1.83	0.79
1:A:58:VAL:CG2	1:A:128:TYR:HB2	2.15	0.76
1:A:35:GLY:C	1:A:41:TYR:HB3	2.11	0.76
1:A:41:TYR:O	1:A:45:CYS:HB2	1.85	0.75
1:A:117:VAL:HB	1:A:189:LYS:HD3	1.67	0.75
1:A:311:ILE:HB	3:A:562:HOH:O	1.85	0.75
1:A:57:ASN:CG	1:A:60:LEU:HB3	2.12	0.74
1:A:53:ASP:O	1:A:60:LEU:HD23	1.88	0.73
1:A:45:CYS:HA	1:A:53:ASP:OD2	1.87	0.73
1:A:123:GLU:O	1:A:127:PRO:HG3	1.89	0.72
1:A:32:ARG:HG3	1:A:32:ARG:NH1	1.99	0.72
1:A:293:GLY:HA3	1:A:326:ASN:N	2.04	0.71
1:A:50:LEU:O	1:A:54:ARG:HG2	1.90	0.71
1:A:64:ILE:HA	1:A:67:GLN:NE2	2.05	0.71
1:A:329:HIS:HD2	3:A:453:HOH:O	1.73	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:134:THR:O	1:A:138:LYS:HG3	1.91	0.69
1:A:50:LEU:CD1	1:A:98:LYS:NZ	2.56	0.69
1:A:53:ASP:O	1:A:60:LEU:HD21	1.92	0.69
1:A:50:LEU:HD13	1:A:98:LYS:HE3	1.75	0.68
1:A:57:ASN:ND2	1:A:60:LEU:CB	2.57	0.68
1:A:62:VAL:O	1:A:66:LEU:HB2	1.94	0.67
1:A:36:ARG:HB2	1:A:41:TYR:CE1	2.32	0.65
1:A:30:LEU:HD21	1:A:343:PHE:CE1	2.32	0.65
1:A:58:VAL:HG22	1:A:128:TYR:CB	2.26	0.64
1:A:194:MET:O	1:A:198:ILE:HG13	1.97	0.64
1:A:229:LEU:HB3	1:A:230:PRO:HD3	1.79	0.64
1:A:292:GLN:O	1:A:293:GLY:O	2.16	0.63
1:A:45:CYS:HA	1:A:53:ASP:CG	2.23	0.63
1:A:333:VAL:HG23	3:A:524:HOH:O	1.98	0.63
1:A:21:LYS:HE3	3:A:516:HOH:O	1.99	0.62
1:A:57:ASN:HD21	1:A:60:LEU:CA	2.13	0.61
1:A:32:ARG:HH11	1:A:32:ARG:CG	2.14	0.61
1:A:56:GLU:C	1:A:128:TYR:CE2	2.76	0.61
1:A:57:ASN:O	1:A:61:VAL:HG23	2.00	0.61
1:A:33:GLN:HB2	1:A:68:PRO:HG3	1.83	0.60
1:A:35:GLY:HA3	1:A:41:TYR:CB	2.29	0.60
1:A:50:LEU:HD13	1:A:98:LYS:CE	2.31	0.60
1:A:60:LEU:O	1:A:64:ILE:HG12	2.01	0.60
1:A:57:ASN:OD1	1:A:60:LEU:CB	2.47	0.59
1:A:57:ASN:HD21	1:A:60:LEU:HB2	1.68	0.59
1:A:242:THR:OG1	1:A:243:HIS:HD2	1.86	0.59
1:A:168:ASN:HB2	2:A:586:SO4:O2	2.03	0.58
1:A:169:PHE:O	1:A:173:LYS:HG3	2.03	0.58
1:A:188:GLN:HE22	1:A:234:GLN:HE22	1.51	0.58
1:A:269:VAL:HB	1:A:290:ALA:HB3	1.85	0.58
1:A:278:MET:HE2	1:A:294:ASN:CB	2.34	0.58
1:A:265:THR:OG1	1:A:267:VAL:HG22	2.03	0.58
1:A:36:ARG:HD3	1:A:41:TYR:CE1	2.39	0.58
1:A:73:ARG:HG2	3:A:529:HOH:O	2.03	0.57
1:A:57:ASN:ND2	1:A:60:LEU:HB3	2.18	0.57
1:A:278:MET:HE2	1:A:294:ASN:HB2	1.87	0.56
1:A:155:THR:HG23	1:A:215:TRP:CD1	2.41	0.56
1:A:64:ILE:HA	1:A:67:GLN:HE21	1.71	0.56
1:A:32:ARG:C	1:A:34:ALA:N	2.63	0.55
1:A:303:SER:O	1:A:307:ILE:HD12	2.07	0.55
1:A:296:ASP:HB3	1:A:299:VAL:HG23	1.88	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:249:ILE:HG12	1:A:269:VAL:HG13	1.88	0.54
1:A:64:ILE:HD12	1:A:67:GLN:HE22	1.72	0.54
1:A:108:LEU:H	1:A:108:LEU:HD23	1.73	0.54
1:A:215:TRP:HE3	1:A:215:TRP:HA	1.73	0.54
1:A:56:GLU:HA	1:A:128:TYR:CE2	2.43	0.54
1:A:259:LEU:HD11	1:A:276:VAL:HG11	1.90	0.53
1:A:233:LYS:NZ	2:A:585:SO4:S	2.76	0.53
1:A:215:TRP:HA	1:A:215:TRP:CE3	2.43	0.53
1:A:49:PRO:HB3	1:A:52:ARG:HD3	1.90	0.53
1:A:327:LEU:CD1	1:A:331:ILE:HD13	2.39	0.53
1:A:288:ASN:O	1:A:322:LYS:HE2	2.09	0.53
1:A:158:SER:HA	1:A:172:ILE:HD13	1.90	0.53
1:A:14:LEU:HA	1:A:27:PRO:HG3	1.92	0.52
1:A:64:ILE:HD12	1:A:67:GLN:NE2	2.24	0.52
1:A:64:ILE:N	1:A:64:ILE:HD13	2.24	0.52
1:A:37:TYR:CD2	3:A:455:HOH:O	2.54	0.52
1:A:327:LEU:HD11	1:A:331:ILE:HD13	1.90	0.52
1:A:18:VAL:CG2	1:A:324:ILE:HD11	2.40	0.52
1:A:315:VAL:HG13	3:A:448:HOH:O	2.10	0.52
1:A:203:ASP:OD1	1:A:243:HIS:HE1	1.94	0.51
1:A:34:ALA:C	1:A:36:ARG:N	2.68	0.51
1:A:36:ARG:HB2	1:A:41:TYR:CD1	2.46	0.51
1:A:36:ARG:HD3	1:A:41:TYR:HE1	1.76	0.50
1:A:217:THR:HB	1:A:254:GLY:O	2.11	0.50
1:A:183:LEU:O	1:A:187:LEU:HG	2.11	0.50
1:A:73:ARG:N	1:A:74:PRO:HD3	2.25	0.49
1:A:32:ARG:C	1:A:34:ALA:H	2.20	0.49
1:A:229:LEU:HD13	1:A:265:THR:HG22	1.94	0.49
1:A:297:PRO:HG2	1:A:329:HIS:HB3	1.94	0.49
1:A:329:HIS:HE1	2:A:584:SO4:S	2.34	0.49
1:A:13:LEU:HD11	1:A:23:VAL:HB	1.95	0.48
1:A:229:LEU:HD12	1:A:229:LEU:O	2.12	0.48
1:A:44:LEU:HD13	1:A:60:LEU:HD12	1.94	0.48
1:A:26:PRO:HB3	1:A:352:TYR:OH	2.13	0.48
1:A:123:GLU:HB3	3:A:573:HOH:O	2.12	0.48
1:A:109:ARG:NH1	1:A:161:VAL:O	2.46	0.48
1:A:293:GLY:HA3	1:A:326:ASN:H	1.76	0.48
1:A:35:GLY:CA	1:A:67:GLN:OE1	2.41	0.48
1:A:33:GLN:CB	1:A:68:PRO:HG3	2.44	0.47
1:A:293:GLY:HA3	1:A:326:ASN:CA	2.44	0.47
1:A:249:ILE:HG12	1:A:269:VAL:CG1	2.45	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:262:LEU:HB2	1:A:263:PRO:HD3	1.97	0.47
1:A:109:ARG:HH22	1:A:171:LYS:HE2	1.80	0.46
1:A:229:LEU:HD12	1:A:229:LEU:C	2.41	0.46
1:A:57:ASN:O	1:A:61:VAL:CG2	2.64	0.45
1:A:44:LEU:O	1:A:53:ASP:OD1	2.35	0.45
1:A:95:ASP:OD1	1:A:96:ILE:N	2.49	0.45
1:A:108:LEU:CD2	1:A:108:LEU:N	2.80	0.45
1:A:122:PRO:HB2	1:A:200:TYR:CG	2.51	0.45
1:A:69:TRP:HA	1:A:74:PRO:HD2	1.98	0.45
1:A:41:TYR:CD1	1:A:41:TYR:C	2.95	0.44
1:A:55:SER:HB3	1:A:82:ASP:H	1.83	0.44
1:A:311:ILE:HD11	1:A:343:PHE:CD2	2.53	0.44
1:A:56:GLU:CA	1:A:128:TYR:CE2	3.01	0.44
1:A:156:LEU:HD12	1:A:156:LEU:HA	1.87	0.44
1:A:24:GLU:HG3	1:A:25:ARG:HG2	2.00	0.43
1:A:280:ASP:O	1:A:284:ARG:HG3	2.18	0.43
1:A:137:ARG:HD2	1:A:137:ARG:HA	1.81	0.43
1:A:34:ALA:C	1:A:36:ARG:H	2.21	0.43
1:A:126:VAL:N	1:A:127:PRO:HD3	2.34	0.43
1:A:100:LYS:HA	1:A:100:LYS:HD2	1.84	0.42
1:A:140:VAL:HG11	1:A:144:ALA:HB3	2.01	0.42
1:A:103:VAL:O	1:A:103:VAL:HG12	2.19	0.42
1:A:97:ILE:HD13	1:A:97:ILE:HA	1.90	0.42
1:A:55:SER:CB	1:A:82:ASP:H	2.33	0.42
1:A:169:PHE:HB3	1:A:172:ILE:CG2	2.50	0.42
1:A:85:THR:HB	1:A:86:PRO:HD3	2.00	0.41
1:A:278:MET:HE2	1:A:294:ASN:HB3	2.01	0.41
1:A:83:ILE:HG23	1:A:149:PHE:CE2	2.55	0.41
1:A:346:ILE:HG21	3:A:562:HOH:O	2.19	0.41
1:A:174:ARG:NH1	3:A:470:HOH:O	2.52	0.41
1:A:331:ILE:H	1:A:331:ILE:HG12	1.54	0.41
1:A:140:VAL:CG1	1:A:144:ALA:HB3	2.50	0.41
1:A:24:GLU:HG2	3:A:457:HOH:O	2.20	0.41
1:A:58:VAL:CG2	1:A:128:TYR:CB	2.91	0.41
1:A:98:LYS:HG3	3:A:553:HOH:O	2.20	0.41
1:A:151:GLY:O	1:A:194:MET:HG3	2.21	0.41
1:A:30:LEU:HB3	1:A:331:ILE:CD1	2.43	0.41
1:A:278:MET:CE	1:A:294:ASN:HB2	2.51	0.41
1:A:293:GLY:CA	1:A:326:ASN:N	2.79	0.41
1:A:329:HIS:CG	1:A:330:GLY:H	2.39	0.41
1:A:212:PHE:HZ	2:A:584:SO4:O4	2.04	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:322:LYS:HE3	3:A:394:HOH:O	2.21	0.40
1:A:138:LYS:NZ	3:A:487:HOH:O	2.54	0.40
1:A:215:TRP:CE3	1:A:215:TRP:CA	3.03	0.40
1:A:338:GLU:HG3	1:A:339:ASN:N	2.36	0.40

All (8) 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)
2:A:585:SO4:O1	2:A:585:SO4:O4[10_665]	0.23	1.97
2:A:585:SO4:O2	2:A:585:SO4:O3[10_665]	0.39	1.81
2:A:585:SO4:S	2:A:585:SO4:O1[10_665]	1.45	0.75
2:A:585:SO4:S	2:A:585:SO4:O3[10_665]	1.50	0.70
2:A:585:SO4:S	2:A:585:SO4:O4[10_665]	1.54	0.66
2:A:585:SO4:S	2:A:585:SO4:O2[10_665]	1.57	0.63
1:A:233:LYS:NZ	2:A:585:SO4:O4[10_665]	1.96	0.24
1:A:233:LYS:CE	2:A:585:SO4:O4[10_665]	2.01	0.19

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	341/353 (97%)	321 (94%)	16 (5%)	4 (1%)	10 12

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	33	GLN
1	A	48	TYR
1	A	293	GLY
1	A	56	GLU

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	292/299 (98%)	252 (86%)	40 (14%)	3 4

All (40) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	14	LEU
1	A	19	ARG
1	A	32	ARG
1	A	38	MET
1	A	39	LYS
1	A	41	TYR
1	A	46	GLU
1	A	50	LEU
1	A	59	ASP
1	A	64	ILE
1	A	66	LEU
1	A	67	GLN
1	A	71	VAL
1	A	73	ARG
1	A	103	VAL
1	A	106	ASP
1	A	108	LEU
1	A	109	ARG
1	A	118	ARG
1	A	123	GLU
1	A	137	ARG
1	A	139	GLU
1	A	156	LEU
1	A	158	SER
1	A	170	THR
1	A	172	ILE
1	A	174	ARG
1	A	189	LYS
1	A	193	SER
1	A	215	TRP

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Mol	Chain	Res	Type
1	A	229	LEU
1	A	241	LEU
1	A	261	ARG
1	A	269	VAL
1	A	271	SER
1	A	289	VAL
1	A	295	VAL
1	A	307	ILE
1	A	316	LYS
1	A	331	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	ASN
1	A	91	ASN
1	A	142	ASN
1	A	188	GLN
1	A	243	HIS
1	A	294	ASN
1	A	329	HIS
1	A	342	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

5 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	$\# Z > 2$
2	SO4	A	587	-	4,4,4	0.81	0	6,6,6	0.46	0
2	SO4	A	586	-	4,4,4	0.82	0	6,6,6	0.50	0
2	SO4	A	585	-	4,4,4	0.80	0	6,6,6	0.46	0
2	SO4	A	588	-	4,4,4	1.28	0	6,6,6	0.51	0
2	SO4	A	584	-	4,4,4	1.12	0	6,6,6	0.41	0

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 15 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	586	SO4	1	0
2	A	585	SO4	4	8
2	A	584	SO4	2	0

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

EDS was not executed - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.