



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 07:17 AM UTC

PDB ID : 2E2U / pdb_00002e2u
Title : Substrate Schiff-base analogue of copper amine oxidase from *Arthrobacter globiformis* formed with 4-hydroxybenzylhydrazine
Authors : Murakawa, T.; Okajima, T.; Taki, M.; Yamamoto, Y.; Hayashi, H.; Tanizawa, K.
Deposited on : 2006-11-17
Resolution : 1.68 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
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

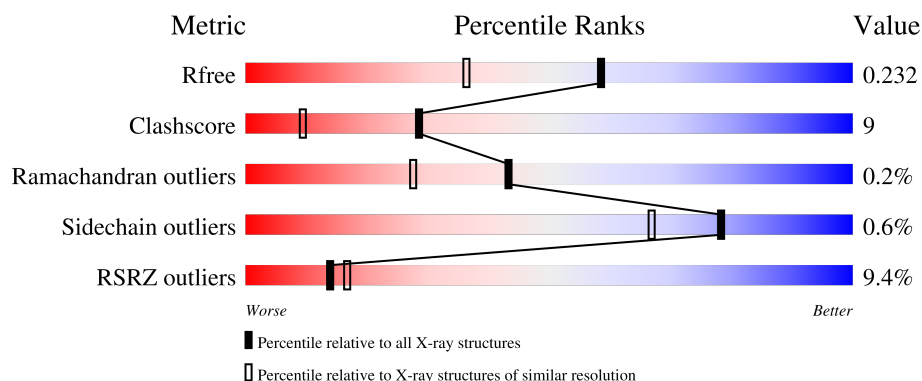
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.68 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	1054 (1.68-1.68)
Clashscore	190562	1078 (1.68-1.68)
Ramachandran outliers	187476	1068 (1.68-1.68)
Sidechain outliers	187428	1067 (1.68-1.68)
RSRZ outliers	180081	1055 (1.68-1.68)

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	628	15% 75% 23% ..
1	B	628	4% 83% 14% ..

2 Entry composition

There are 3 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 Phenylethylamine oxidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	620	Total	C	N	O	S	0	0	0
			4877	3081	857	930	9			
1	B	620	Total	C	N	O	S	0	0	0
			4877	3081	857	930	9			

- Molecule 2 is COPPER (II) ION (CCD ID: CU) (formula: Cu).

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

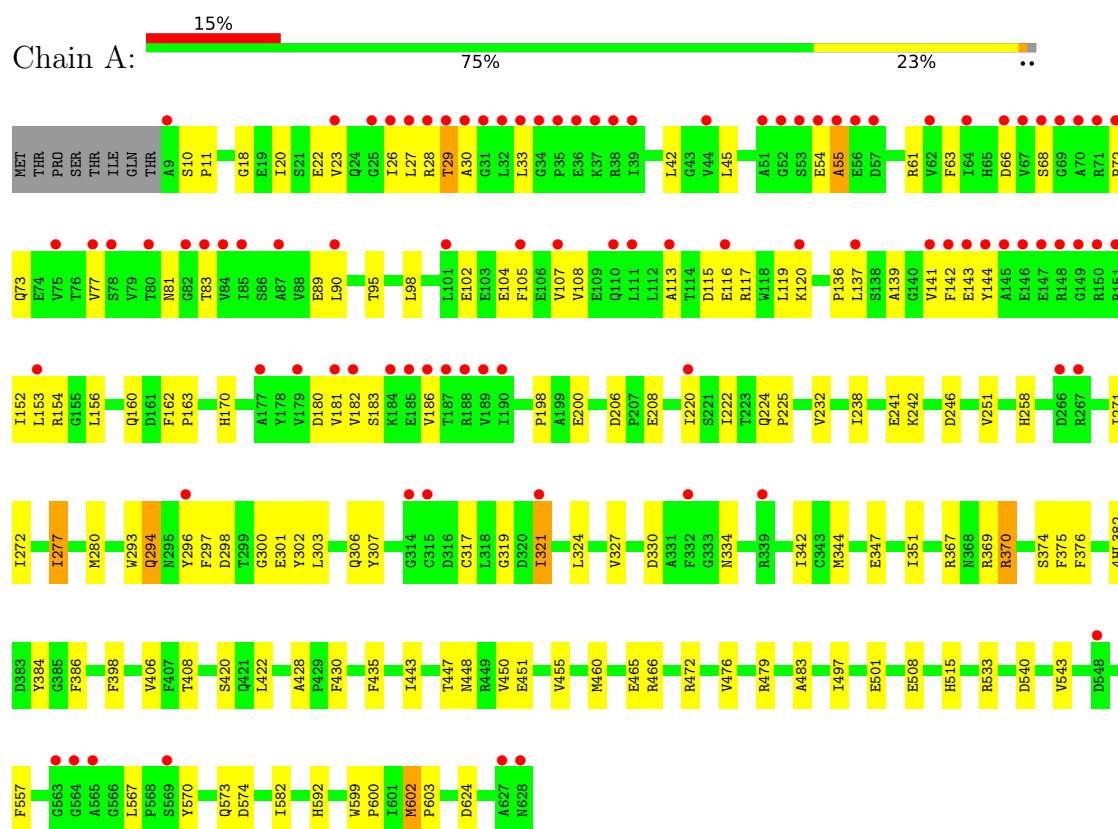
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	553	Total	O	0	0
			553	553		
3	B	665	Total	O	0	0
			665	665		

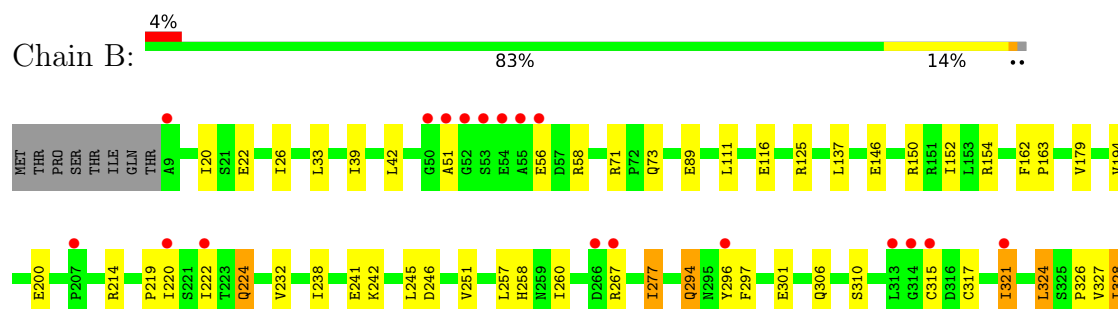
3 Residue-property plots [i](#)

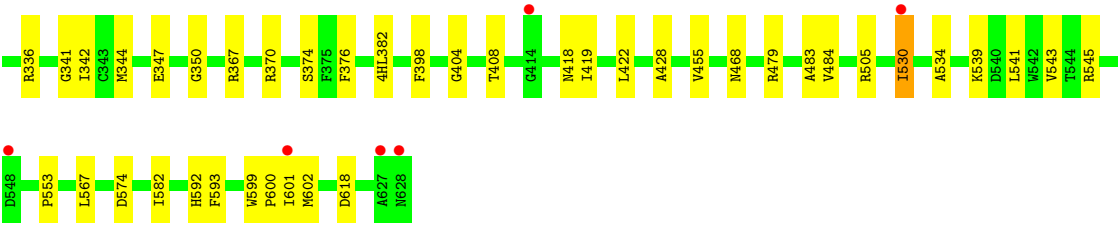
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. 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: Phenylethylamine oxidase



• Molecule 1: Phenylethylamine oxidase





4 Data and refinement statistics

Property	Value	Source
Space group	I 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	157.97Å 63.07Å 184.05Å 90.00° 112.04° 90.00°	Depositor
Resolution (Å)	26.57 – 1.68 26.57 – 1.68	Depositor EDS
% Data completeness (in resolution range)	(Not available) (26.57-1.68) 98.7 (26.57-1.68)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.71 (at 1.68Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.209 , 0.236 0.206 , 0.232	Depositor DCC
R_{free} test set	9456 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	21.8	Xtriage
Anisotropy	0.675	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.39 , 51.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	10974	wwPDB-VP
Average B, all atoms (Å ²)	32.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 79.25 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 5.8196e-07. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: 4HL, CU

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	0.33	0/4975	0.90	11/6774 (0.2%)
1	B	0.35	0/4975	0.90	17/6774 (0.3%)
All	All	0.34	0/9950	0.90	28/13548 (0.2%)

There are no bond length outliers.

All (28) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	602	MET	N-CA-C	7.67	119.44	109.93
1	B	602	MET	N-CA-C	7.09	119.01	110.07
1	B	294	GLN	N-CA-C	6.09	117.92	109.15
1	A	582	ILE	N-CA-C	6.03	117.52	108.96
1	A	540	ASP	N-CA-C	5.96	117.86	111.36
1	B	310	SER	N-CA-C	-5.96	99.48	108.96
1	A	294	GLN	N-CA-C	5.88	117.61	109.15
1	B	455	VAL	N-CA-C	-5.82	102.06	109.80
1	A	374	SER	N-CA-C	5.67	117.40	108.96
1	B	321	ILE	N-CA-C	5.67	117.15	108.71
1	A	408	THR	N-CA-C	5.56	118.31	110.14
1	A	455	VAL	N-CA-C	-5.39	102.62	109.58
1	A	592	HIS	N-CA-C	5.30	117.17	108.52
1	A	321	ILE	N-CA-C	5.28	116.58	108.71
1	B	408	THR	N-CA-C	5.26	117.88	110.14
1	A	300	GLY	N-CA-C	5.23	119.46	112.77
1	A	277	ILE	N-CA-C	-5.18	99.00	106.88
1	B	277	ILE	N-CA-C	-5.18	99.00	106.88
1	B	582	ILE	N-CA-C	5.18	117.07	108.99
1	B	593	PHE	N-CA-C	-5.14	97.57	108.66
1	B	374	SER	N-CA-C	5.12	116.60	108.96
1	B	224	GLN	CA-C-N	5.05	125.08	119.32

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	224	GLN	C-N-CA	5.05	125.08	119.32
1	B	545	ARG	N-CA-C	-5.04	102.23	110.20
1	B	592	HIS	N-CA-C	5.03	116.72	108.52
1	B	324	LEU	N-CA-C	-5.03	101.20	109.40
1	B	154	ARG	CA-C-N	-5.01	118.67	122.33
1	B	154	ARG	C-N-CA	-5.01	118.67	122.33

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	4877	0	4693	109	0
1	B	4877	0	4693	69	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	553	0	0	11	0
3	B	665	0	0	6	0
All	All	10974	0	9386	169	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 9.

All (169) 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:222:ILE:HD12	1:B:222:ILE:HD12	1.54	0.89
1:A:450:VAL:HG22	1:A:497:ILE:HD12	1.58	0.86
1:A:624:ASP:CG	1:B:214:ARG:HD2	2.12	0.74
1:B:328:ILE:HD13	1:B:336:ARG:O	1.88	0.73
1:A:297:PHE:HB2	1:A:301:GLU:HG3	1.71	0.71
1:B:422:LEU:HD11	1:B:428:ALA:HB2	1.74	0.70
1:B:530:ILE:HD13	1:B:530:ILE:O	1.93	0.69
1:B:150:ARG:HB2	1:B:152:ILE:HD11	1.74	0.69

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:162:PHE:HB2	1:A:163:PRO:HD2	1.75	0.68
1:B:418:ASN:C	1:B:419:ILE:HD12	2.19	0.68
1:A:450:VAL:HG22	1:A:497:ILE:CD1	2.23	0.68
1:A:137:LEU:HD13	1:A:296:TYR:OH	1.94	0.68
1:B:326:PRO:HD3	1:B:342:ILE:HD13	1.75	0.67
1:A:460:MET:HE3	1:A:466:ARG:C	2.19	0.67
1:A:422:LEU:HD11	1:A:428:ALA:HB2	1.77	0.67
1:B:56:GLU:HB2	3:B:1195:HOH:O	1.97	0.65
1:B:56:GLU:OE2	1:B:58:ARG:HG2	1.96	0.64
1:B:505:ARG:HD3	1:B:618:ASP:HB3	1.79	0.64
1:A:347:GLU:OE1	1:A:370:ARG:HD3	1.97	0.63
1:A:443:ILE:H	1:A:448:ASN:HD21	1.47	0.63
1:B:294:GLN:HG3	1:B:296:TYR:CZ	2.34	0.62
1:B:599:TRP:CD2	1:B:600:PRO:HA	2.34	0.62
1:A:206:ASP:OD1	1:A:208:GLU:HG2	2.00	0.62
1:A:66:ASP:OD1	1:A:68:SER:HB3	2.01	0.61
1:B:20:ILE:HD12	1:B:327:VAL:HG12	1.82	0.61
1:A:324:LEU:HB2	1:A:342:ILE:HB	1.82	0.61
1:A:73:GLN:HG2	1:A:89:GLU:HA	1.83	0.61
1:A:599:TRP:CD2	1:A:600:PRO:HA	2.37	0.59
1:B:341:GLY:C	1:B:342:ILE:HD12	2.27	0.59
1:A:141:VAL:HG22	1:A:533:ARG:HD2	1.85	0.58
1:A:206:ASP:CG	1:A:208:GLU:HG2	2.29	0.58
1:A:104:GLU:O	1:A:107:VAL:HG22	2.03	0.58
1:A:170:HIS:HD2	1:A:198:PRO:O	1.86	0.58
1:A:246:ASP:HB2	1:A:258:HIS:HB2	1.86	0.58
1:B:22:GLU:O	1:B:26:ILE:HG12	2.04	0.57
1:B:257:LEU:HB3	1:B:260:ILE:HD11	1.86	0.57
1:B:328:ILE:HD13	1:B:328:ILE:H	1.69	0.57
1:A:294:GLN:HG3	1:A:296:TYR:CZ	2.40	0.57
1:B:125:ARG:HG2	1:B:194:VAL:HG23	1.87	0.56
1:B:530:ILE:HD13	1:B:530:ILE:C	2.30	0.56
1:A:277:ILE:HD12	1:A:277:ILE:N	2.21	0.56
1:A:153:LEU:HD12	1:A:181:VAL:HG11	1.89	0.55
1:A:370:ARG:O	1:A:370:ARG:HG2	2.06	0.55
1:A:180:ASP:OD1	1:A:182:VAL:HG22	2.07	0.55
1:B:277:ILE:HD12	1:B:277:ILE:N	2.21	0.55
1:B:342:ILE:HD12	1:B:342:ILE:N	2.22	0.55
1:B:246:ASP:HB2	1:B:258:HIS:HB2	1.89	0.54
1:A:142:PHE:O	1:A:144:TYR:N	2.40	0.54
1:A:105:PHE:HE2	1:A:307:TYR:HH	1.52	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:330:ASP:OD1	1:A:334:ASN:HB2	2.09	0.53
1:A:116:GLU:O	1:A:120:LYS:HG3	2.07	0.53
1:A:472:ARG:HD3	3:A:1604:HOH:O	2.08	0.53
1:A:108:VAL:HB	3:A:1406:HOH:O	2.09	0.53
1:B:51:ALA:HA	3:B:1112:HOH:O	2.09	0.53
1:B:39:ILE:HD12	1:B:39:ILE:N	2.24	0.53
1:A:22:GLU:O	1:A:26:ILE:HG12	2.09	0.53
1:B:146:GLU:O	1:B:150:ARG:HD3	2.09	0.53
1:B:404:GLY:O	1:B:601:ILE:HD12	2.08	0.52
1:B:317:CYS:HB3	1:B:321:ILE:HG12	1.92	0.52
1:A:280:MET:HG3	1:A:435:PHE:CD2	2.45	0.52
1:A:141:VAL:O	1:A:141:VAL:HG23	2.08	0.52
1:A:367:ARG:HD3	1:B:315:CYS:O	2.10	0.52
1:B:111:LEU:HD12	1:B:179:VAL:HG11	1.90	0.52
1:B:277:ILE:HD11	1:B:398:PHE:CE1	2.45	0.52
1:A:42:LEU:C	1:A:42:LEU:HD23	2.35	0.51
1:A:222:ILE:HD12	1:B:222:ILE:CD1	2.34	0.51
1:A:163:PRO:HG2	3:A:1272:HOH:O	2.10	0.51
1:B:71:ARG:HD3	1:B:89:GLU:HG2	1.92	0.50
1:A:220:ILE:HD13	1:B:224:GLN:OE1	2.12	0.50
1:A:321:ILE:N	1:A:321:ILE:HD12	2.26	0.50
1:A:483:ALA:HB1	1:A:543:VAL:HB	1.94	0.50
1:A:10:SER:HB3	3:A:1549:HOH:O	2.12	0.49
1:A:154:ARG:NH2	3:A:1156:HOH:O	2.44	0.49
1:A:280:MET:HE1	1:A:384:TYR:CE2	2.46	0.49
1:B:220:ILE:HD12	1:B:220:ILE:N	2.27	0.49
1:B:245:LEU:HB2	1:B:260:ILE:HD13	1.93	0.49
1:A:324:LEU:HG	1:A:344:MET:HE2	1.94	0.49
1:A:319:GLY:C	1:A:321:ILE:HD12	2.37	0.49
1:B:267:ARG:HG2	1:B:267:ARG:HH11	1.78	0.49
1:B:42:LEU:C	1:B:42:LEU:HD23	2.37	0.49
1:A:28:ARG:C	1:A:30:ALA:H	2.21	0.48
1:B:137:LEU:HD13	1:B:296:TYR:OH	2.13	0.48
1:A:375:PHE:CE1	1:A:386:PHE:HB2	2.49	0.48
1:A:117:ARG:NH2	1:A:186:VAL:HB	2.28	0.48
1:A:222:ILE:CD1	1:B:222:ILE:HD12	2.34	0.48
1:A:102:GLU:HA	1:A:105:PHE:CE2	2.48	0.48
1:B:350:GLY:HA2	1:B:367:ARG:NH2	2.29	0.48
1:A:63:PHE:HB3	1:A:98:LEU:HD22	1.96	0.48
1:A:200:GLU:HB2	3:A:1169:HOH:O	2.14	0.48
1:A:251:VAL:CG2	1:A:306:GLN:HB3	2.44	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:460:MET:HE2	1:A:465:GLU:O	2.15	0.47
1:A:154:ARG:HD2	1:A:293:TRP:CE3	2.49	0.47
1:A:351:ILE:HD12	1:A:351:ILE:N	2.29	0.47
1:B:251:VAL:HG22	1:B:306:GLN:HB2	1.94	0.47
1:A:508:GLU:HG2	3:A:1475:HOH:O	2.13	0.47
1:B:297:PHE:HB2	1:B:301:GLU:HG3	1.96	0.47
1:B:73:GLN:HG2	1:B:89:GLU:HA	1.96	0.47
1:B:483:ALA:HB1	1:B:543:VAL:HB	1.96	0.46
1:B:324:LEU:HB2	1:B:342:ILE:HB	1.97	0.46
1:A:369:ARG:CZ	1:B:220:ILE:HD13	2.46	0.46
1:A:624:ASP:OD1	1:B:214:ARG:HD2	2.16	0.46
1:A:29:THR:HG22	1:A:29:THR:O	2.15	0.46
1:B:219:PRO:C	1:B:220:ILE:HD12	2.40	0.46
1:B:484:VAL:HG12	1:B:539:LYS:HG3	1.97	0.45
1:A:23:VAL:HG13	1:A:77:VAL:HG21	1.97	0.45
1:A:105:PHE:HE2	1:A:307:TYR:OH	1.99	0.45
1:B:33:LEU:HD11	1:B:39:ILE:HD11	1.99	0.45
1:A:18:GLY:HA3	3:A:1636:HOH:O	2.15	0.45
1:A:465:GLU:H	1:A:465:GLU:CD	2.24	0.45
1:A:280:MET:HE1	1:A:298:ASP:OD1	2.16	0.45
1:A:154:ARG:HD2	1:A:293:TRP:CD2	2.51	0.45
1:A:182:VAL:HG23	1:A:183:SER:N	2.32	0.45
1:A:317:CYS:HB3	1:A:321:ILE:HG12	1.99	0.45
1:A:139:ALA:HB1	3:A:1156:HOH:O	2.17	0.44
1:B:553:PRO:HA	1:B:567:LEU:HG	1.99	0.44
1:B:324:LEU:HG	1:B:344:MET:HE2	1.99	0.44
1:B:530:ILE:HD13	1:B:534:ALA:HB3	1.99	0.44
1:A:277:ILE:HD11	1:A:398:PHE:CE1	2.52	0.44
1:A:406:VAL:HG21	1:A:422:LEU:HD11	2.00	0.44
1:A:624:ASP:OD2	1:B:214:ARG:HD2	2.16	0.44
1:B:232:VAL:HG22	1:B:238:ILE:CD1	2.48	0.44
1:B:347:GLU:OE1	1:B:370:ARG:NE	2.44	0.44
1:A:10:SER:HA	1:A:11:PRO:HD3	1.85	0.44
1:A:406:VAL:HG21	1:A:422:LEU:CD1	2.48	0.43
1:B:26:ILE:HD11	3:B:987:HOH:O	2.17	0.43
1:B:162:PHE:HB2	1:B:163:PRO:HD2	2.01	0.43
1:B:245:LEU:CB	1:B:260:ILE:HD13	2.48	0.43
1:A:152:ILE:HG22	1:A:153:LEU:N	2.33	0.43
1:A:479:ARG:HB3	1:A:574:ASP:OD2	2.19	0.43
1:B:484:VAL:CG1	1:B:539:LYS:HG3	2.49	0.43
1:B:200:GLU:HB2	3:B:938:HOH:O	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:28:ARG:HG3	1:A:33:LEU:HD23	2.00	0.42
1:A:294:GLN:HG3	1:A:296:TYR:OH	2.18	0.42
1:A:602:MET:HA	1:A:603:PRO:HD3	1.84	0.42
1:B:479:ARG:HB3	1:B:574:ASP:OD1	2.19	0.42
1:B:194:VAL:CG2	3:B:1211:HOH:O	2.67	0.42
1:B:241:GLU:O	1:B:242:LYS:HB2	2.19	0.42
1:A:27:LEU:HB3	1:A:33:LEU:HB2	2.01	0.42
1:A:271:ILE:HG22	1:A:272:ILE:HG13	2.01	0.42
1:A:420:SER:OG	1:A:430:PHE:HE1	2.02	0.42
1:B:150:ARG:C	1:B:152:ILE:HD12	2.45	0.42
1:A:241:GLU:O	1:A:242:LYS:HB2	2.19	0.42
1:A:81:ASN:O	1:A:83:THR:HG23	2.19	0.42
1:B:116:GLU:HG3	3:B:1336:HOH:O	2.20	0.42
1:A:22:GLU:HA	1:A:22:GLU:OE1	2.20	0.41
1:A:115:ASP:OD1	1:A:117:ARG:HB2	2.20	0.41
1:A:20:ILE:HD12	1:A:327:VAL:HG12	2.03	0.41
1:A:54:GLU:O	1:A:55:ALA:HB3	2.20	0.41
1:A:113:ALA:O	1:A:119:LEU:HD21	2.21	0.41
1:A:451:GLU:HG2	1:A:476:VAL:HG22	2.02	0.41
1:A:515:HIS:HE1	3:A:1149:HOH:O	2.03	0.41
1:A:72:PRO:HG2	1:A:90:LEU:HB2	2.03	0.41
1:A:105:PHE:HB3	3:A:1645:HOH:O	2.20	0.41
1:A:232:VAL:HG22	1:A:238:ILE:CD1	2.51	0.41
1:A:447:THR:HG21	1:A:501:GLU:OE2	2.20	0.41
1:A:45:LEU:HD21	1:A:61:ARG:HB2	2.02	0.41
1:A:162:PHE:CB	1:A:163:PRO:HD2	2.48	0.41
1:A:302:TYR:O	1:A:303:LEU:HB2	2.21	0.41
1:A:160:GLN:HG2	1:A:162:PHE:O	2.20	0.41
1:B:468:ASN:H	1:B:468:ASN:HD22	1.69	0.40
1:A:105:PHE:HA	1:A:136:PRO:HG2	2.03	0.40
1:A:224:GLN:HA	1:A:225:PRO:HD2	1.92	0.40
1:A:95:THR:O	1:A:557:PHE:HB2	2.20	0.40
1:A:443:ILE:H	1:A:448:ASN:ND2	2.18	0.40
1:A:137:LEU:HD22	1:A:296:TYR:CZ	2.57	0.40
1:A:156:LEU:HD23	1:A:156:LEU:HA	1.95	0.40
1:A:570:TYR:HA	1:A:573:GLN:HE21	1.87	0.40
1:B:150:ARG:HB2	1:B:152:ILE:CD1	2.48	0.40
1:A:567:LEU:HD23	1:A:567:LEU:HA	1.95	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	617/628 (98%)	584 (95%)	30 (5%)	3 (0%)	24	8
1	B	617/628 (98%)	593 (96%)	24 (4%)	0	100	100
All	All	1234/1256 (98%)	1177 (95%)	54 (4%)	3 (0%)	43	27

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	143	GLU
1	A	29	THR
1	A	55	ALA

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	513/521 (98%)	511 (100%)	2 (0%)	84	78
1	B	513/521 (98%)	509 (99%)	4 (1%)	73	59
All	All	1026/1042 (98%)	1020 (99%)	6 (1%)	78	67

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	370	ARG
1	A	376	PHE
1	B	328	ILE

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Mol	Chain	Res	Type
1	B	376	PHE
1	B	530	ILE
1	B	541	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	73	GLN
1	A	170	HIS
1	A	340	ASN
1	A	345	HIS
1	A	418	ASN
1	A	448	ASN
1	A	458	GLN
1	A	507	ASN
1	A	515	HIS
1	A	628	ASN
1	B	110	GLN
1	B	217	GLN
1	B	224	GLN
1	B	306	GLN
1	B	340	ASN
1	B	418	ASN
1	B	432	GLN
1	B	458	GLN
1	B	468	ASN
1	B	507	ASN
1	B	519	GLN
1	B	628	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The

Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	4HL	A	382	1	23,24,25	2.43	10 (43%)	21,32,34	1.91	3 (14%)
1	4HL	B	382	1	23,24,25	2.38	11 (47%)	21,32,34	1.92	3 (14%)

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
1	4HL	A	382	1	-	1/10/28/30	0/2/2/2
1	4HL	B	382	1	-	2/10/28/30	0/2/2/2

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	382	4HL	CE2-NX2	6.81	1.42	1.31
1	B	382	4HL	CE2-NX2	6.75	1.42	1.31
1	A	382	4HL	CG-CD1	4.31	1.54	1.49
1	B	382	4HL	CG-CD1	4.16	1.54	1.49
1	A	382	4HL	CE1-CD1	3.14	1.53	1.44
1	B	382	4HL	CE1-CD1	2.97	1.52	1.44
1	A	382	4HL	C1-NX1	2.71	1.49	1.45
1	B	382	4HL	C1-NX1	2.64	1.49	1.45
1	B	382	4HL	CE1-CZ	2.37	1.40	1.36
1	A	382	4HL	CE1-CZ	2.37	1.40	1.36
1	A	382	4HL	C2'-C3'	2.37	1.43	1.38
1	A	382	4HL	C4'-C3'	2.30	1.43	1.38
1	A	382	4HL	C2'-C1'	2.30	1.42	1.38
1	B	382	4HL	CD2-CG	2.30	1.40	1.34
1	B	382	4HL	C2'-C1'	2.25	1.42	1.38
1	B	382	4HL	C2'-C3'	2.25	1.43	1.38
1	A	382	4HL	CD2-CG	2.23	1.40	1.34
1	B	382	4HL	C4'-C3'	2.23	1.43	1.38
1	B	382	4HL	CZ-CE2	-2.20	1.42	1.46
1	A	382	4HL	C5'-C4'	2.14	1.42	1.38
1	B	382	4HL	C5'-C4'	2.08	1.42	1.38

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	382	4HL	CE2-NX2-NX1	6.86	131.67	118.05
1	A	382	4HL	CE2-NX2-NX1	6.70	131.36	118.05
1	B	382	4HL	CD2-CE2-CZ	3.23	121.09	117.44
1	A	382	4HL	CD2-CE2-CZ	3.22	121.08	117.44
1	A	382	4HL	C3'-C1-NX1	3.00	116.56	111.22
1	B	382	4HL	C3'-C1-NX1	2.76	116.14	111.22

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	B	382	4HL	N-CA-CB-CG
1	A	382	4HL	N-CA-CB-CG
1	B	382	4HL	C3'-C1-NX1-NX2

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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	619/628 (98%)	0.76	92 (14%) 5 6	16, 31, 56, 79	0
1	B	619/628 (98%)	0.29	24 (3%) 43 51	17, 27, 41, 76	0
All	All	1238/1256 (98%)	0.52	116 (9%) 14 17	16, 29, 52, 79	0

All (116) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	52	GLY	7.3
1	A	148	ARG	6.6
1	B	51	ALA	6.3
1	A	52	GLY	5.9
1	A	34	GLY	5.7
1	A	51	ALA	5.6
1	A	9	ALA	5.3
1	A	53	SER	5.2
1	A	142	PHE	5.0
1	A	26	ILE	4.9
1	B	628	ASN	4.7
1	A	30	ALA	4.7
1	A	29	THR	4.6
1	A	35	PRO	4.5
1	A	565	ALA	4.2
1	A	145	ALA	4.2
1	A	144	TYR	4.2
1	A	182	VAL	4.2
1	A	33	LEU	4.1
1	B	54	GLU	4.0
1	A	628	ASN	4.0
1	A	107	VAL	3.8
1	B	53	SER	3.8
1	A	105	PHE	3.8

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Mol	Chain	Res	Type	RSRZ
1	A	186	VAL	3.8
1	B	55	ALA	3.8
1	A	141	VAL	3.7
1	A	564	GLY	3.7
1	A	266	ASP	3.7
1	A	56	GLU	3.7
1	A	111	LEU	3.7
1	A	64	ILE	3.6
1	A	68	SER	3.6
1	A	315	CYS	3.5
1	A	84	VAL	3.5
1	A	184	LYS	3.5
1	A	36	GLU	3.4
1	A	82	GLY	3.3
1	A	83	THR	3.3
1	A	189	VAL	3.3
1	A	146	GLU	3.3
1	A	563	GLY	3.2
1	A	548	ASP	3.2
1	B	315	CYS	3.2
1	A	54	GLU	3.2
1	A	314	GLY	3.1
1	A	32	LEU	3.1
1	A	71	ARG	3.1
1	A	80	THR	3.1
1	B	266	ASP	3.0
1	B	627	ALA	3.0
1	A	267	ARG	3.0
1	A	147	GLU	2.9
1	A	149	GLY	2.9
1	A	27	LEU	2.9
1	A	31	GLY	2.9
1	A	90	LEU	2.9
1	A	85	ILE	2.9
1	A	67	VAL	2.8
1	A	113	ALA	2.8
1	A	179	VAL	2.8
1	A	177	ALA	2.8
1	A	44	VAL	2.8
1	A	28	ARG	2.8
1	A	39	ILE	2.8
1	A	70	ALA	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	9	ALA	2.8
1	A	143	GLU	2.8
1	A	187	THR	2.7
1	A	153	LEU	2.7
1	A	55	ALA	2.7
1	B	267	ARG	2.6
1	A	37	LYS	2.6
1	A	69	GLY	2.6
1	B	314	GLY	2.6
1	B	296	TYR	2.6
1	A	220	ILE	2.6
1	A	188	ARG	2.6
1	A	116	GLU	2.6
1	A	150	ARG	2.6
1	A	569	SER	2.5
1	A	296	TYR	2.5
1	A	151	ARG	2.5
1	A	87	ALA	2.5
1	A	190	ILE	2.5
1	A	181	VAL	2.5
1	B	530	ILE	2.5
1	A	25	GLY	2.4
1	A	627	ALA	2.4
1	A	137	LEU	2.4
1	B	56	GLU	2.4
1	B	321	ILE	2.3
1	A	23	VAL	2.3
1	A	339	ARG	2.3
1	A	75	VAL	2.3
1	B	414	GLY	2.2
1	B	548	ASP	2.2
1	A	110	GLN	2.2
1	B	50	GLY	2.2
1	A	72	PRO	2.2
1	A	57	ASP	2.1
1	A	62	VAL	2.1
1	A	77	VAL	2.1
1	B	313	LEU	2.1
1	A	38	ARG	2.1
1	A	78	SER	2.1
1	A	185	GLU	2.1
1	B	220	ILE	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	601	ILE	2.1
1	A	101	LEU	2.1
1	A	332	PHE	2.1
1	A	321	ILE	2.1
1	A	66	ASP	2.0
1	A	120	LYS	2.0
1	B	207	PRO	2.0
1	B	222	ILE	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
1	4HL	A	382	23/24	0.90	0.12	23,35,39,41	0
1	4HL	B	382	23/24	0.92	0.12	20,36,40,42	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
2	CU	B	701	1/1	0.99	0.02	23,23,23,23	0
2	CU	A	701	1/1	1.00	0.02	24,24,24,24	0

6.5 Other polymers [i](#)

There are no such residues in this entry.