



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 03:01 PM UTC

PDB ID : 4UCX / pdb_00004ucx
Title : Structure of the T18G small subunit mutant of D. fructosovorans NiFe- hydrogenase
Authors : Abou-Hamdan, A.; Ceccaldi, P.; Lebrette, H.; Gutierrez-Sanz, O.; Richaud, P.; Cournac, L.; Guigliarelli, B.; deLacey, A.L.; Leger, C.; Volbeda, A.; Burlat, B.; Dementin, S.
Deposited on : 2014-12-05
Resolution : 1.95 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

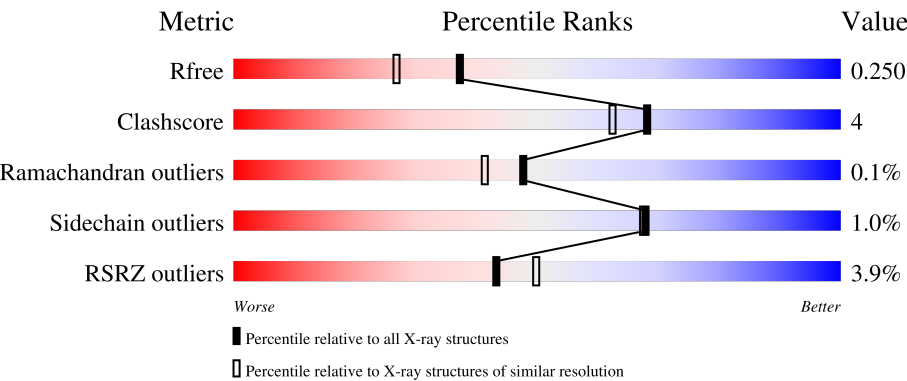
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.95 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	3494 (1.96-1.96)
Clashscore	190562	3612 (1.96-1.96)
Ramachandran outliers	187476	3587 (1.96-1.96)
Sidechain outliers	187428	3587 (1.96-1.96)
RSRZ outliers	180081	3495 (1.96-1.96)

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	264	92%6%.
1	B	264	23% 87%12%.
1	C	264	89%9%.
2	Q	563	89%7%..

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Mol	Chain	Length	Quality of chain
2	R	563	5% 87% 10% .
2	S	563	% 87% 9% ..

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
5	GOL	A	1272	-	-	X	-

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 19169 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 HYDROGENASE (NIFE) SMALL SUBUNIT HYDA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	262	Total	C	N	O	S	0	0	0
			1968	1253	329	371	15			
1	B	262	Total	C	N	O	S	0	2	0
			1968	1254	325	374	15			
1	C	260	Total	C	N	O	S	0	0	0
			1954	1244	326	369	15			

There are 3 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	18	GLY	THR	engineered mutation	UNP P18187
B	18	GLY	THR	engineered mutation	UNP P18187
C	18	GLY	THR	engineered mutation	UNP P18187

- Molecule 2 is a protein called NICKEL-DEPENDENT HYDROGENASE LARGE SUB-UNIT.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	Q	544	Total	C	N	O	S	0	7	0
			4185	2670	722	771	22			
2	R	545	Total	C	N	O	S	0	3	0
			4178	2664	724	768	22			
2	S	544	Total	C	N	O	S	0	2	0
			4159	2650	718	769	22			

There are 45 discrepancies between the modelled and reference sequences:

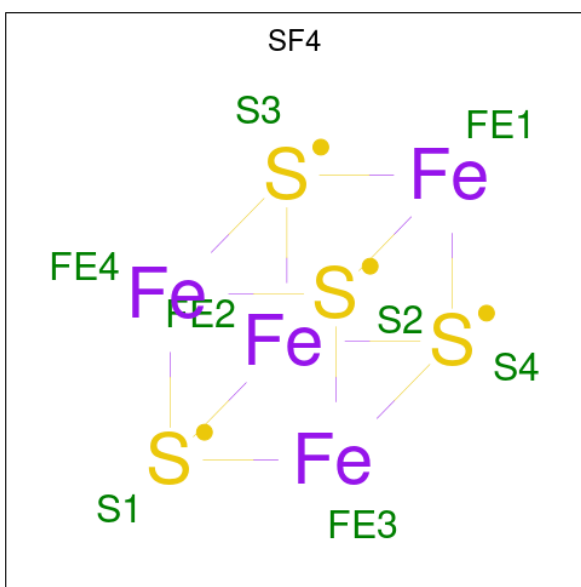
Chain	Residue	Modelled	Actual	Comment	Reference
Q	-13	ALA	-	expression tag	UNP P18188
Q	-12	SER	-	expression tag	UNP P18188
Q	-11	TRP	-	expression tag	UNP P18188
Q	-10	SER	-	expression tag	UNP P18188

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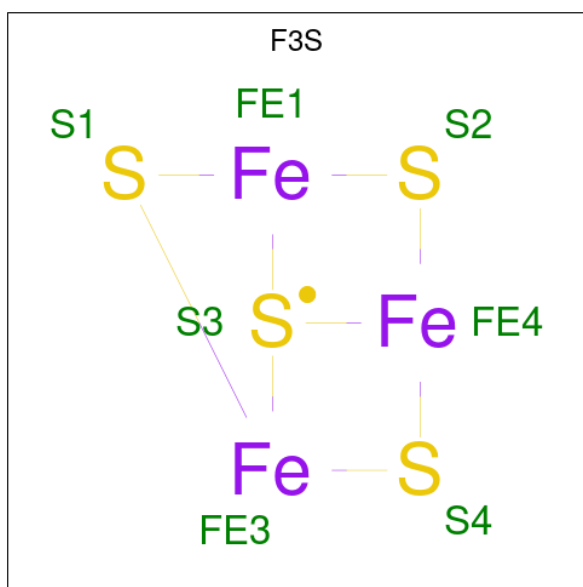
Chain	Residue	Modelled	Actual	Comment	Reference
Q	-9	HIS	-	expression tag	UNP P18188
Q	-8	PRO	-	expression tag	UNP P18188
Q	-7	GLN	-	expression tag	UNP P18188
Q	-6	PHE	-	expression tag	UNP P18188
Q	-5	GLU	-	expression tag	UNP P18188
Q	-4	LYS	-	expression tag	UNP P18188
Q	-3	GLY	-	expression tag	UNP P18188
Q	-2	ALA	-	expression tag	UNP P18188
Q	-1	SER	-	expression tag	UNP P18188
Q	0	GLY	-	expression tag	UNP P18188
Q	1	ALA	-	expression tag	UNP P18188
R	-13	ALA	-	expression tag	UNP P18188
R	-12	SER	-	expression tag	UNP P18188
R	-11	TRP	-	expression tag	UNP P18188
R	-10	SER	-	expression tag	UNP P18188
R	-9	HIS	-	expression tag	UNP P18188
R	-8	PRO	-	expression tag	UNP P18188
R	-7	GLN	-	expression tag	UNP P18188
R	-6	PHE	-	expression tag	UNP P18188
R	-5	GLU	-	expression tag	UNP P18188
R	-4	LYS	-	expression tag	UNP P18188
R	-3	GLY	-	expression tag	UNP P18188
R	-2	ALA	-	expression tag	UNP P18188
R	-1	SER	-	expression tag	UNP P18188
R	0	GLY	-	expression tag	UNP P18188
R	1	ALA	-	expression tag	UNP P18188
S	-13	ALA	-	expression tag	UNP P18188
S	-12	SER	-	expression tag	UNP P18188
S	-11	TRP	-	expression tag	UNP P18188
S	-10	SER	-	expression tag	UNP P18188
S	-9	HIS	-	expression tag	UNP P18188
S	-8	PRO	-	expression tag	UNP P18188
S	-7	GLN	-	expression tag	UNP P18188
S	-6	PHE	-	expression tag	UNP P18188
S	-5	GLU	-	expression tag	UNP P18188
S	-4	LYS	-	expression tag	UNP P18188
S	-3	GLY	-	expression tag	UNP P18188
S	-2	ALA	-	expression tag	UNP P18188
S	-1	SER	-	expression tag	UNP P18188
S	0	GLY	-	expression tag	UNP P18188
S	1	ALA	-	expression tag	UNP P18188

- Molecule 3 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe₄S₄).



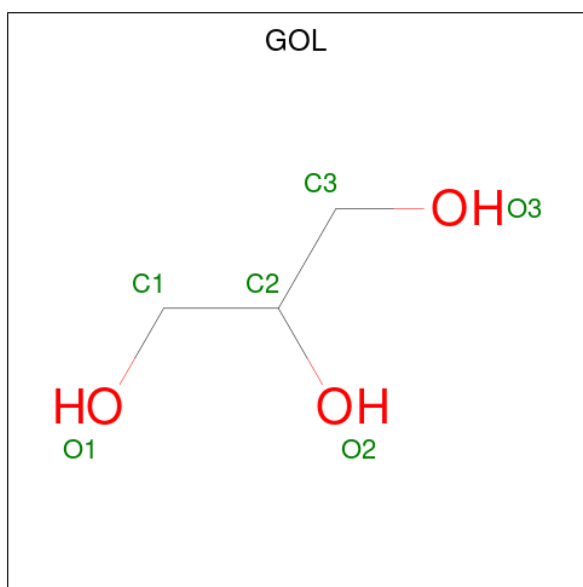
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	Fe	S	0	0
			8	4	4		
3	A	1	Total	Fe	S	0	0
			8	4	4		
3	B	1	Total	Fe	S	0	0
			8	4	4		
3	B	1	Total	Fe	S	0	0
			8	4	4		
3	C	1	Total	Fe	S	0	0
			8	4	4		
3	C	1	Total	Fe	S	0	0
			8	4	4		

- Molecule 4 is FE3-S4 CLUSTER (CCD ID: F3S) (formula: Fe_3S_4).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	Fe	S	0	0
			7	3	4		
4	B	1	Total	Fe	S	0	0
			7	3	4		
4	C	1	Total	Fe	S	0	0
			7	3	4		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



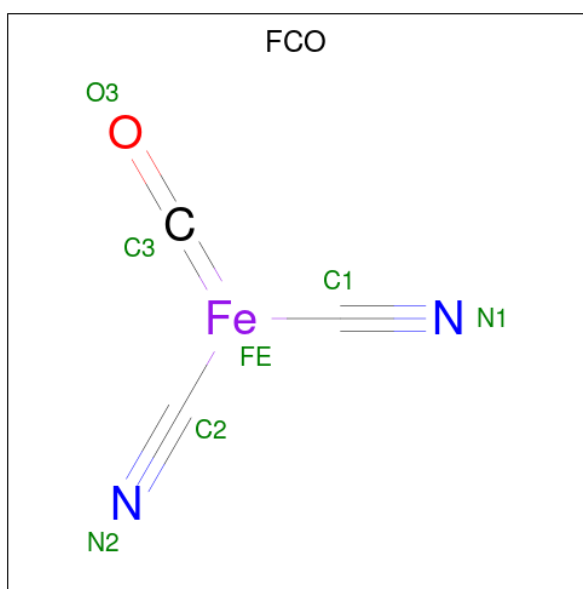
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	C	O	0	0
			6	3	3		
5	A	1	Total	C	O	0	0
			6	3	3		
5	Q	1	Total	C	O	0	0
			6	3	3		
5	Q	1	Total	C	O	0	0
			6	3	3		
5	Q	1	Total	C	O	0	0
			6	3	3		
5	R	1	Total	C	O	0	0
			6	3	3		
5	S	1	Total	C	O	0	0
			6	3	3		
5	S	1	Total	C	O	0	0
			6	3	3		

- Molecule 6 is CARBONMONOXIDE-(DICYANO) IRON (CCD ID: FCO) (formula: $\text{C}_3\text{FeN}_2\text{O}$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	Q	1	Total	C	Fe	N	O	0	0
			7	3	1	2	1		
6	R	1	Total	C	Fe	N	O	0	0
			7	3	1	2	1		
6	S	1	Total	C	Fe	N	O	0	0
			7	3	1	2	1		

- Molecule 7 is NICKEL (II) ION (CCD ID: NI) (formula: Ni).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	Q	1	Total Ni 1 1	0	0
7	R	1	Total Ni 1 1	0	0
7	S	1	Total Ni 1 1	0	0

- Molecule 8 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	Q	2	Total Mg 2 2	0	0
8	R	1	Total Mg 1 1	0	0
8	S	1	Total Mg 1 1	0	0

- Molecule 9 is water.

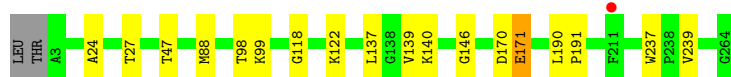
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
9	A	94	Total O 94 94	0	0
9	B	75	Total O 75 75	0	0
9	C	84	Total O 84 84	0	0
9	Q	129	Total O 129 129	0	0
9	R	112	Total O 112 112	0	0
9	S	112	Total O 112 112	0	0

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.

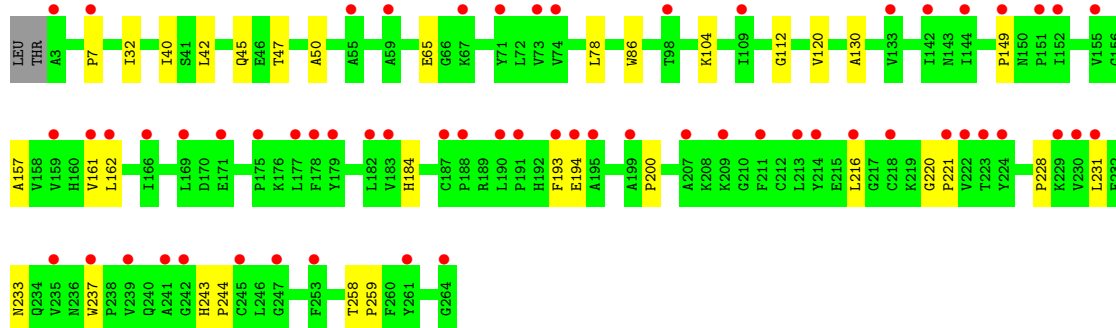
• Molecule 1: HYDROGENASE (NIFE) SMALL SUBUNIT HYDA

Chain A: 



• Molecule 1: HYDROGENASE (NIFE) SMALL SUBUNIT HYDA

Chain B: 



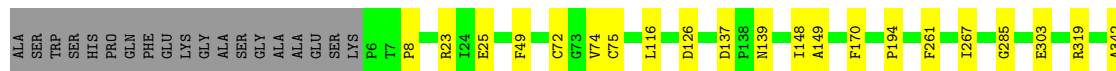
• Molecule 1: HYDROGENASE (NIFE) SMALL SUBUNIT HYDA

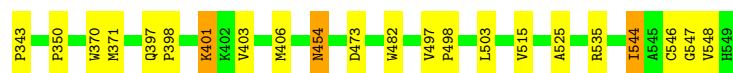
Chain C: 



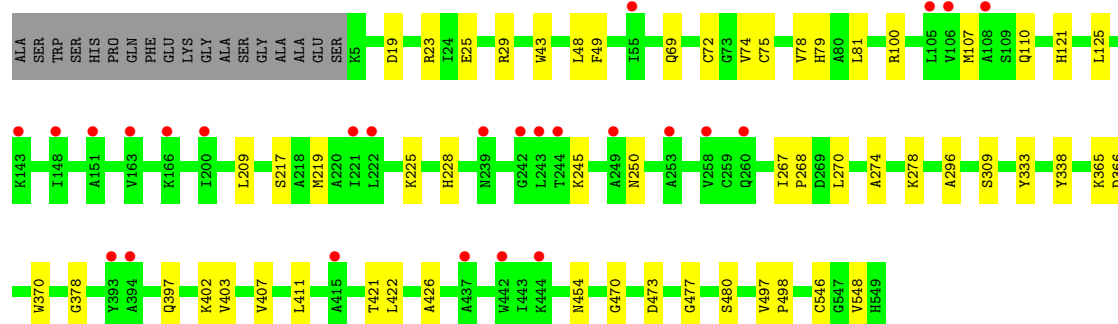
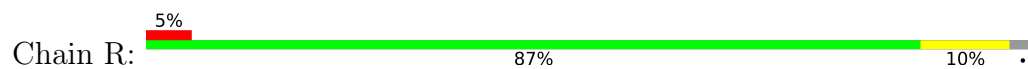
• Molecule 2: NICKEL-DEPENDENT HYDROGENASE LARGE SUBUNIT

Chain Q: 

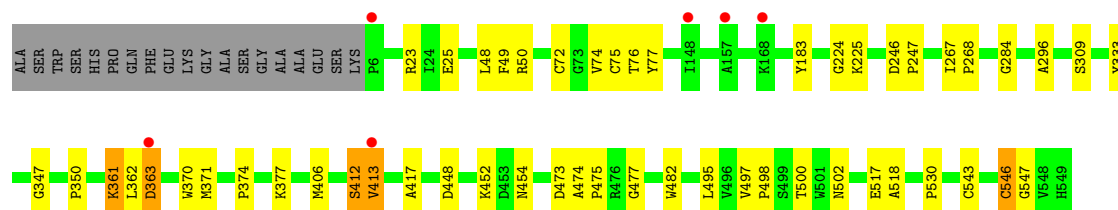
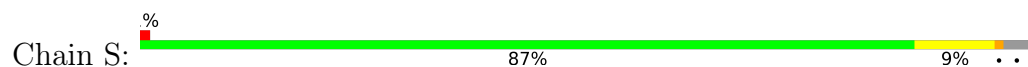




● Molecule 2: NICKEL-DEPENDENT HYDROGENASE LARGE SUBUNIT



● Molecule 2: NICKEL-DEPENDENT HYDROGENASE LARGE SUBUNIT



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	62.60Å 99.27Å 182.08Å 90.00° 92.32° 90.00°	Depositor
Resolution (Å)	25.00 – 1.95 25.00 – 1.95	Depositor EDS
% Data completeness (in resolution range)	99.2 (25.00-1.95) 99.1 (25.00-1.95)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.45 (at 1.95Å)	Xtriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.197 , 0.231 0.218 , 0.250	Depositor DCC
R_{free} test set	8070 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	25.5	Xtriage
Anisotropy	0.870	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 46.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.036 for h,-k,-l	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	19169	wwPDB-VP
Average B, all atoms (Å ²)	40.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.78% 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: CSX, FCO, F3S, NI, MG, GOL, SF4

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	0.87	0/2022	0.92	1/2752 (0.0%)
1	B	0.67	0/2031	0.87	1/2767 (0.0%)
1	C	0.77	0/2008	0.88	0/2735
2	Q	0.83	2/4313 (0.0%)	0.91	4/5854 (0.1%)
2	R	0.70	0/4287	0.91	4/5819 (0.1%)
2	S	0.71	1/4264 (0.0%)	0.87	2/5791 (0.0%)
All	All	0.76	3/18925 (0.0%)	0.89	12/25718 (0.0%)

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	Q	267	ILE	CA-CB	7.91	1.58	1.54
2	Q	194	PRO	CA-C	5.97	1.55	1.51
2	S	477	GLY	N-CA	5.04	1.50	1.44

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	146	GLY	N-CA-C	-7.65	104.68	111.95
2	R	548	VAL	CB-CA-C	-5.74	104.71	111.94
2	S	502	ASN	N-CA-C	5.62	117.49	111.36
1	B	120	VAL	N-CA-C	5.49	116.22	110.62
2	Q	148	ILE	N-CA-C	5.44	116.49	111.81
2	R	397	GLN	CA-C-N	5.41	124.59	118.97
2	R	397	GLN	C-N-CA	5.41	124.59	118.97
2	S	477	GLY	N-CA-C	5.37	118.45	110.60
2	R	245	LYS	N-CA-C	5.33	116.77	111.07
2	Q	548	VAL	CB-CA-C	-5.30	105.46	111.55
2	Q	149	ALA	CA-C-N	-5.15	114.65	119.85
2	Q	149	ALA	C-N-CA	-5.15	114.65	119.85

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	1968	0	1900	14	0
1	B	1968	0	1881	21	0
1	C	1954	0	1884	14	0
2	Q	4185	0	4162	25	0
2	R	4178	0	4152	32	0
2	S	4159	0	4101	35	0
3	A	16	0	0	0	0
3	B	16	0	0	0	0
3	C	16	0	0	0	0
4	A	7	0	0	0	0
4	B	7	0	0	0	0
4	C	7	0	0	1	0
5	A	18	0	24	6	0
5	Q	18	0	24	2	0
5	R	6	0	8	0	0
5	S	12	0	16	0	0
6	Q	7	0	0	0	0
6	R	7	0	0	0	0
6	S	7	0	0	1	0
7	Q	1	0	0	0	0
7	R	1	0	0	0	0
7	S	1	0	0	0	0
8	Q	2	0	0	0	0
8	R	1	0	0	0	0
8	S	1	0	0	0	0
9	A	94	0	0	1	0
9	B	75	0	0	0	0
9	C	84	0	0	0	0
9	Q	129	0	0	1	0
9	R	112	0	0	1	0
9	S	112	0	0	2	0
All	All	19169	0	18152	132	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 4.

All (132) 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:140:LYS:NZ	5:A:1272:GOL:H11	1.66	1.11
2:S:497:VAL:CG1	2:S:498:PRO:HD2	2.02	0.89
1:A:140:LYS:HZ1	5:A:1272:GOL:H11	1.38	0.88
1:A:140:LYS:HZ3	5:A:1272:GOL:H11	1.37	0.86
2:R:121:HIS:HE2	2:R:209:LEU:HG	1.43	0.84
2:S:497:VAL:HG12	2:S:498:PRO:HD2	1.64	0.78
2:S:412:SER:O	2:S:413:VAL:HB	1.88	0.74
2:R:497:VAL:HG12	2:R:498:PRO:HD2	1.73	0.71
2:S:497:VAL:HG13	2:S:498:PRO:HD2	1.73	0.70
2:R:497:VAL:CG1	2:R:498:PRO:HD2	2.23	0.69
1:A:171:GLU:H	1:A:171:GLU:CD	2.01	0.68
2:S:48:LEU:HD21	2:S:50:ARG:HD2	1.80	0.64
2:R:121:HIS:NE2	2:R:209:LEU:HG	2.12	0.63
1:B:40:ILE:HG22	1:B:162:LEU:HD11	1.82	0.60
2:Q:303:GLU:CG	9:Q:2076:HOH:O	2.51	0.58
1:A:140:LYS:NZ	5:A:1272:GOL:C1	2.57	0.57
2:Q:25:GLU:HB2	2:Q:74:VAL:HG21	1.87	0.57
2:S:371:MET:HE2	2:S:547:GLY:HA3	1.87	0.56
2:Q:285:GLY:HA3	5:Q:1563:GOL:H2	1.87	0.55
2:R:49:PHE:HB2	2:R:370:TRP:CD2	2.42	0.55
1:C:14:ASN:HD22	1:C:94:MET:HG2	1.72	0.55
1:C:47:THR:O	2:S:23:ARG:HA	2.07	0.55
2:S:374:PRO:CG	2:S:500:THR:HG22	2.37	0.55
2:S:448:ASP:O	2:S:452:LYS:HD3	2.08	0.54
1:B:157:ALA:O	1:B:161:VAL:HG23	2.08	0.54
2:Q:116[B]:LEU:HD11	2:Q:261:PHE:HE2	1.72	0.54
1:B:184:HIS:ND1	1:B:221:PRO:HG3	2.22	0.54
1:B:47:THR:O	2:R:23:ARG:HA	2.07	0.54
1:B:233:ASN:HB3	2:R:217:SER:HA	1.89	0.53
2:R:43:TRP:CZ2	2:R:365:LYS:HE2	2.44	0.53
2:R:477:GLY:O	2:R:498:PRO:HG3	2.09	0.53
1:B:184:HIS:HB2	1:B:221:PRO:HA	1.91	0.53
2:Q:116[B]:LEU:HD11	2:Q:261:PHE:CE2	2.44	0.53
2:S:267:ILE:HB	2:S:268:PRO:HD3	1.91	0.53
2:R:296:ALA:HA	2:R:309:SER:HA	1.91	0.53
1:C:42:LEU:HD21	1:C:45:GLN:HG3	1.91	0.52
2:R:267:ILE:HB	2:R:268:PRO:HD3	1.92	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:50:ALA:HB2	2:R:125:LEU:HD13	1.93	0.51
1:A:99:LYS:HE2	9:A:2045:HOH:O	2.11	0.50
1:B:228:PRO:HB3	1:B:237:TRP:CZ2	2.47	0.50
5:A:1273:GOL:H11	2:Q:170:PHE:HA	1.94	0.50
2:R:274:ALA:HA	2:R:422[A]:LEU:HD11	1.94	0.49
2:Q:403:VAL:O	2:Q:406:MET:HB3	2.12	0.49
1:B:112:GLY:HA2	1:B:149:PRO:HD3	1.95	0.48
2:R:19:ASP:HB2	2:R:29:ARG:HG3	1.94	0.48
2:S:497:VAL:HG12	2:S:498:PRO:CD	2.37	0.48
1:A:237:TRP:CH2	1:A:239:VAL:HB	2.49	0.48
1:C:14:ASN:ND2	1:C:94:MET:HB3	2.29	0.48
4:C:1266:F3S:S2	2:S:225:LYS:HE2	2.54	0.48
2:R:110:GLN:HB2	2:R:219:MET:CE	2.44	0.48
2:S:75:CSX:N	2:S:75:CSX:OD	2.47	0.48
1:C:40:ILE:HG22	1:C:162:LEU:HD11	1.96	0.48
2:S:25:GLU:HB2	2:S:74:VAL:HG21	1.95	0.47
2:Q:137:ASP:OD1	2:Q:139:ASN:HB2	2.13	0.47
2:R:278:LYS:NZ	2:R:411:LEU:O	2.46	0.47
2:S:543:CYS:SG	2:S:546:CYS:HB2	2.54	0.47
2:S:72:CYS:HB3	2:S:75:CSX:OD	2.14	0.47
1:A:98:THR:HG22	1:A:137:LEU:HD11	1.96	0.47
2:S:49:PHE:HB2	2:S:370:TRP:CD2	2.50	0.47
2:S:495:LEU:HD12	2:S:495:LEU:N	2.29	0.47
1:B:78:LEU:O	1:B:130:ALA:HA	2.15	0.47
1:C:223:THR:OG1	1:C:247:GLY:HA2	2.15	0.47
1:B:193:PHE:HD2	1:B:194:GLU:HG3	1.80	0.46
1:A:47:THR:O	2:Q:23:ARG:HA	2.15	0.46
2:S:284:GLY:HA2	2:S:518:ALA:O	2.16	0.46
2:S:296:ALA:HA	2:S:309:SER:HA	1.96	0.46
2:Q:497:VAL:CG1	2:Q:498:PRO:HD2	2.45	0.46
2:S:361:LYS:HG3	2:S:362:LEU:O	2.16	0.46
1:B:258:THR:HA	1:B:259:PRO:C	2.39	0.46
2:S:246:ASP:HB2	2:S:247:PRO:HD3	1.98	0.46
2:S:377:LYS:NZ	9:S:2074:HOH:O	2.23	0.46
2:R:333:TYR:OH	2:R:378:GLY:HA2	2.16	0.45
2:Q:497:VAL:HG13	2:Q:498:PRO:HD2	1.98	0.45
2:R:81:LEU:HD23	2:R:107:MET:HE2	1.98	0.45
2:Q:49:PHE:HB2	2:Q:370:TRP:CD2	2.52	0.45
1:B:184:HIS:CE1	1:B:221:PRO:HG3	2.52	0.45
1:B:32:ILE:HG21	2:R:209:LEU:HD22	1.97	0.45
2:S:350:PRO:HB2	2:S:482:TRP:CG	2.52	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:R:338:TYR:HA	2:R:366:ASP:O	2.16	0.45
1:B:7:PRO:HG2	1:B:162:LEU:HD13	1.98	0.44
2:S:413:VAL:HG22	2:S:417:ALA:CB	2.47	0.44
1:B:220:GLY:N	1:B:221:PRO:CD	2.80	0.44
2:Q:371:MET:HE2	2:Q:547:GLY:HA3	1.99	0.44
1:B:243:HIS:CG	1:B:244:PRO:HD2	2.53	0.44
1:B:42:LEU:HD21	1:B:45:GLN:HG3	2.00	0.44
1:C:112:GLY:HA2	1:C:149:PRO:HD3	2.00	0.44
1:C:236:ASN:HB3	2:S:224:GLY:O	2.17	0.44
1:B:200:PRO:O	1:B:216:LEU:HD21	2.18	0.43
1:B:32:ILE:CG2	2:R:209:LEU:HD22	2.49	0.43
1:C:184:HIS:HB2	1:C:220:GLY:C	2.43	0.43
2:R:72:CYS:HB3	2:R:75:CSX:OD	2.17	0.43
2:R:75:CSX:O	2:R:78:VAL:HG22	2.18	0.43
2:R:470:GLY:O	2:R:480:SER:HA	2.19	0.43
1:C:258:THR:HA	1:C:259:PRO:C	2.44	0.43
1:A:137:LEU:HB2	1:A:139:VAL:HG22	2.00	0.43
1:A:24:ALA:O	1:A:27:THR:HG22	2.19	0.42
2:R:69:GLN:HA	2:R:79:HIS:HB2	2.02	0.42
1:C:24:ALA:O	1:C:27:THR:HG22	2.20	0.42
2:Q:319:ARG:HH12	5:Q:1563:GOL:H32	1.84	0.42
2:Q:544:ILE:N	2:Q:544:ILE:HD13	2.34	0.42
2:Q:8:PRO:HB2	2:Q:525:ALA:HB2	2.01	0.42
2:S:50:ARG:HD3	9:S:2015:HOH:O	2.19	0.42
2:Q:126:ASP:HB3	2:Q:535:ARG:HG2	2.01	0.42
1:C:145:PRO:HD2	1:C:179:TYR:CZ	2.55	0.42
2:S:183:TYR:CZ	2:S:530:PRO:HD2	2.55	0.42
2:Q:350:PRO:HB2	2:Q:482:TRP:CG	2.55	0.41
1:A:170:ASP:O	5:A:1272:GOL:H32	2.20	0.41
1:A:190:LEU:HB3	1:A:191:PRO:HD3	2.02	0.41
2:Q:401:LYS:HE3	2:Q:401:LYS:HB2	1.39	0.41
2:S:406:MET:SD	2:S:406:MET:C	3.03	0.41
2:Q:397:GLN:HA	2:Q:398:PRO:HD3	1.86	0.41
2:Q:454:ASN:H	2:Q:454:ASN:HD22	1.68	0.41
2:R:497:VAL:HG11	2:R:546:CYS:HB3	2.03	0.41
2:S:497:VAL:CG1	2:S:498:PRO:CD	2.87	0.41
2:Q:342:ALA:HB1	2:Q:343:PRO:HD2	2.01	0.41
2:Q:503:LEU:HD23	2:Q:515:VAL:HG11	2.02	0.41
2:R:100:ARG:HD3	9:R:2038:HOH:O	2.20	0.41
2:R:225:LYS:NZ	2:R:228:HIS:O	2.49	0.41
2:S:76:THR:O	2:S:77:TYR:HB3	2.21	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:S:474:ALA:HB1	2:S:475:PRO:HD2	2.01	0.41
1:C:114:CYS:HA	1:C:119:GLY:HA3	2.03	0.41
2:Q:497:VAL:HG11	2:Q:546:CYS:HB3	2.02	0.41
2:R:25:GLU:HB2	2:R:74:VAL:HG21	2.03	0.41
2:S:75:CSX:CB	6:S:1550:FCO:C2	2.98	0.41
1:B:86:TRP:O	2:R:48:LEU:HA	2.22	0.40
1:C:98:THR:HG22	1:C:137:LEU:HD11	2.03	0.40
2:Q:72:CYS:HB3	2:Q:75:CSX:OD	2.21	0.40
2:R:270:LEU:HD21	2:R:426:ALA:HA	2.02	0.40
2:S:333:TYR:CD2	2:S:347:GLY:HA2	2.55	0.40
2:S:362:LEU:O	2:S:363[A]:ASP:HB3	2.22	0.40
1:A:118:GLY:HA3	1:A:122:LYS:HD2	2.04	0.40
2:R:403:VAL:O	2:R:407:VAL:HG23	2.22	0.40

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	260/264 (98%)	252 (97%)	8 (3%)	0	100	100
1	B	262/264 (99%)	250 (95%)	11 (4%)	1 (0%)	30	21
1	C	258/264 (98%)	248 (96%)	10 (4%)	0	100	100
2	Q	548/563 (97%)	532 (97%)	16 (3%)	0	100	100
2	R	545/563 (97%)	531 (97%)	14 (3%)	0	100	100
2	S	543/563 (96%)	522 (96%)	19 (4%)	2 (0%)	30	21
All	All	2416/2481 (97%)	2335 (97%)	78 (3%)	3 (0%)	48	41

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	S	412	SER
2	S	413	VAL
1	B	231	LEU

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	206/209 (99%)	204 (99%)	2 (1%)	68	67
1	B	204/209 (98%)	202 (99%)	2 (1%)	68	67
1	C	205/209 (98%)	205 (100%)	0	100	100
2	Q	438/447 (98%)	434 (99%)	4 (1%)	70	70
2	R	435/447 (97%)	430 (99%)	5 (1%)	65	64
2	S	429/447 (96%)	422 (98%)	7 (2%)	55	52
All	All	1917/1968 (97%)	1897 (99%)	20 (1%)	68	67

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	88	MET
1	A	171	GLU
1	B	65	GLU
1	B	104	LYS
2	Q	401	LYS
2	Q	454	ASN
2	Q	473	ASP
2	Q	544	ILE
2	R	250	ASN
2	R	402	LYS
2	R	421	THR
2	R	454	ASN
2	R	473	ASP
2	S	361	LYS
2	S	363[A]	ASP
2	S	363[B]	ASP

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Mol	Chain	Res	Type
2	S	454	ASN
2	S	473	ASP
2	S	517	GLU
2	S	546	CYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (23) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	14	ASN
1	A	240	GLN
1	B	234	GLN
1	B	240	GLN
1	C	5	HIS
1	C	14	ASN
1	C	234	GLN
1	C	240	GLN
2	Q	9	GLN
2	Q	241	GLN
2	Q	438	ASN
2	Q	454	ASN
2	Q	509	GLN
2	R	9	GLN
2	R	123	HIS
2	R	139	ASN
2	R	241	GLN
2	R	250	ASN
2	S	47	GLN
2	S	164	GLN
2	S	241	GLN
2	S	454	ASN
2	S	509	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 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	$\# Z > 2$
2	CSX	Q	75	6,7,2	3,6,7	0.80	0	1,6,8	1.69	0
2	CSX	S	75	6,7,2	3,6,7	0.72	0	1,6,8	0.96	0
2	CSX	R	75	6,7,2	3,6,7	0.75	0	1,6,8	0.09	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
2	CSX	Q	75	6,7,2	-	0/2/5/7	-
2	CSX	S	75	6,7,2	-	0/2/5/7	-
2	CSX	R	75	6,7,2	-	0/2/5/7	-

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 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	Q	75	CSX	1	0
2	S	75	CSX	3	0
2	R	75	CSX	2	0

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 28 ligands modelled in this entry, 7 are monoatomic - leaving 21 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	$\# Z > 2$
3	SF4	B	1267	1	0,12,12	-	-	-		
5	GOL	A	1273	-	5,5,5	0.38	0	5,5,5	0.96	0
3	SF4	B	1265	1	0,12,12	-	-	-		
4	F3S	A	1266	1	0,9,9	-	-	-		
3	SF4	C	1265	1	0,12,12	-	-	-		
6	FCO	Q	1550	9,2	0,6,6	-	-	-		
5	GOL	S	1562	-	5,5,5	0.39	0	5,5,5	0.70	0
5	GOL	Q	1563	-	5,5,5	0.37	0	5,5,5	0.28	0
5	GOL	Q	1561	-	5,5,5	0.33	0	5,5,5	0.23	0
6	FCO	R	1550	9,2	0,6,6	-	-	-		
3	SF4	A	1267	1	0,12,12	-	-	-		
3	SF4	C	1267	1	0,12,12	-	-	-		
4	F3S	C	1266	1	0,9,9	-	-	-		
4	F3S	B	1266	1	0,9,9	-	-	-		
5	GOL	Q	1562	-	5,5,5	0.57	0	5,5,5	0.52	0
6	FCO	S	1550	9,2	0,6,6	-	-	-		
5	GOL	R	1563	-	5,5,5	0.34	0	5,5,5	0.20	0
5	GOL	A	1272	-	5,5,5	0.36	0	5,5,5	0.41	0
3	SF4	A	1265	1	0,12,12	-	-	-		
5	GOL	A	1271	-	5,5,5	0.32	0	5,5,5	1.09	0
5	GOL	S	1561	-	5,5,5	0.42	0	5,5,5	0.18	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	GOL	Q	1561	-	-	0/4/4/4	-
3	SF4	B	1267	1	-	-	0/6/5/5
5	GOL	Q	1562	-	-	0/4/4/4	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	GOL	A	1273	-	-	2/4/4/4	-
3	SF4	A	1267	1	-	-	0/6/5/5
3	SF4	B	1265	1	-	-	0/6/5/5
5	GOL	A	1272	-	-	2/4/4/4	-
3	SF4	C	1267	1	-	-	0/6/5/5
4	F3S	A	1266	1	-	-	0/3/3/3
4	F3S	B	1266	1	-	-	0/3/3/3
3	SF4	C	1265	1	-	-	0/6/5/5
4	F3S	C	1266	1	-	-	0/3/3/3
5	GOL	R	1563	-	-	0/4/4/4	-
3	SF4	A	1265	1	-	-	0/6/5/5
5	GOL	Q	1563	-	-	0/4/4/4	-
5	GOL	S	1562	-	-	2/4/4/4	-
5	GOL	A	1271	-	-	0/4/4/4	-
5	GOL	S	1561	-	-	0/4/4/4	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	1272	GOL	C1-C2-C3-O3
5	A	1273	GOL	O1-C1-C2-O2
5	A	1273	GOL	O1-C1-C2-C3
5	S	1562	GOL	O1-C1-C2-C3
5	A	1272	GOL	O2-C2-C3-O3
5	S	1562	GOL	O1-C1-C2-O2

There are no ring outliers.

5 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	1273	GOL	1	0
5	Q	1563	GOL	2	0
4	C	1266	F3S	1	0
6	S	1550	FCO	1	0
5	A	1272	GOL	5	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 ⓘ

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	262/264 (99%)	-0.14	1 (0%) 88 91	18, 28, 42, 58	9 (3%)
1	B	262/264 (99%)	1.40	61 (23%) 2 2	35, 65, 104, 122	6 (2%)
1	C	260/264 (98%)	0.07	1 (0%) 88 91	24, 35, 50, 61	5 (1%)
2	Q	543/563 (96%)	-0.13	0 100 100	16, 29, 41, 54	16 (2%)
2	R	544/563 (96%)	0.65	26 (4%) 35 41	25, 43, 76, 97	14 (2%)
2	S	543/563 (96%)	0.26	6 (1%) 78 83	22, 41, 66, 83	11 (2%)
All	All	2414/2481 (97%)	0.32	95 (3%) 43 50	16, 37, 75, 122	61 (2%)

All (95) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	179	TYR	3.7
1	B	222	VAL	3.7
1	B	144	ILE	3.6
1	B	209	LYS	3.6
1	B	183	VAL	3.4
1	B	191	PRO	3.3
1	B	3	ALA	3.2
1	B	166	ILE	3.1
2	R	243	LEU	3.1
1	B	214	TYR	3.0
1	B	142	ILE	3.0
1	B	161	VAL	3.0
1	B	264	GLY	3.0
1	B	229	LYS	3.0
2	R	163	VAL	2.9
1	B	216	LEU	2.9
1	B	190	LEU	2.9
1	B	177	LEU	2.8
1	B	193	PHE	2.8

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Mol	Chain	Res	Type	RSRZ
1	B	211	PHE	2.8
2	R	393	TYR	2.8
1	B	187	CYS	2.8
1	B	247	GLY	2.7
1	B	59	ALA	2.7
1	C	5	HIS	2.7
1	B	73	VAL	2.7
1	B	155	VAL	2.7
1	B	207	ALA	2.6
1	B	171	GLU	2.6
2	R	394	ALA	2.6
1	B	221	PRO	2.6
2	R	444	LYS	2.6
1	B	175	PRO	2.5
1	B	231	LEU	2.5
2	R	415	ALA	2.5
1	B	71	TYR	2.5
1	B	224	TYR	2.5
1	B	169	LEU	2.5
2	R	221	ILE	2.5
1	B	241	ALA	2.5
1	B	152	ILE	2.5
2	R	200	ILE	2.5
2	R	442	TRP	2.5
1	B	195	ALA	2.5
2	R	253	ALA	2.5
1	B	235	VAL	2.5
1	B	182	LEU	2.4
1	B	188	PRO	2.4
2	S	148	ILE	2.4
1	B	7	PRO	2.4
1	B	133	VAL	2.4
2	S	413	VAL	2.4
2	R	55	ILE	2.4
1	B	199	ALA	2.4
1	B	151	PRO	2.4
1	B	162	LEU	2.3
2	R	222	LEU	2.3
1	A	211	PHE	2.3
2	S	157	ALA	2.3
2	R	143	LYS	2.3
1	B	218	CYS	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	237	TRP	2.3
2	R	105	LEU	2.3
1	B	223	THR	2.3
1	B	178	PHE	2.3
2	R	148	ILE	2.3
1	B	159	VAL	2.3
1	B	230	VAL	2.3
2	R	242	GLY	2.2
1	B	239	VAL	2.2
1	B	98	THR	2.2
2	R	108	ALA	2.2
2	S	363[A]	ASP	2.2
1	B	55	ALA	2.2
2	R	151	ALA	2.2
2	R	249	ALA	2.2
1	B	242	GLY	2.1
2	R	166	LYS	2.1
2	R	244	THR	2.1
1	B	194	GLU	2.1
1	B	245	CYS	2.1
1	B	213	LEU	2.1
2	R	260	GLN	2.1
2	R	437	ALA	2.1
1	B	261	TYR	2.1
2	S	168	LYS	2.1
1	B	149	PRO	2.1
1	B	253	PHE	2.0
2	R	239	ASN	2.0
1	B	74	VAL	2.0
2	R	106	VAL	2.0
2	S	6	PRO	2.0
1	B	67	LYS	2.0
1	B	109	ILE	2.0
2	R	258	VAL	2.0

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

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($\text{\AA}^2$)	Q<0.9
2	CSX	S	75	7/8	0.95	0.07	22,24,27,28	1
2	CSX	R	75	7/8	0.97	0.06	31,32,35,36	1
2	CSX	Q	75	7/8	0.97	0.07	21,22,25,25	1

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($\text{\AA}^2$)	Q<0.9
5	GOL	S	1562	6/6	0.64	0.19	48,52,56,57	6
5	GOL	Q	1563	6/6	0.66	0.13	43,47,51,55	0
5	GOL	A	1271	6/6	0.82	0.11	45,50,52,53	0
5	GOL	R	1563	6/6	0.83	0.12	44,49,50,51	0
5	GOL	A	1272	6/6	0.83	0.12	45,47,49,50	0
5	GOL	A	1273	6/6	0.84	0.10	40,49,51,53	0
5	GOL	Q	1562	6/6	0.88	0.13	33,38,40,41	0
4	F3S	B	1266	7/7	0.93	0.08	66,71,73,75	0
5	GOL	S	1561	6/6	0.93	0.08	33,38,41,42	0
5	GOL	Q	1561	6/6	0.93	0.09	37,40,41,41	0
8	MG	S	1553	1/1	0.94	0.05	24,24,24,24	0
8	MG	Q	1559	1/1	0.95	0.05	47,47,47,47	0
3	SF4	B	1267	8/8	0.95	0.06	44,48,52,52	0
8	MG	R	1553	1/1	0.96	0.05	28,28,28,28	0
3	SF4	B	1265	8/8	0.96	0.06	83,93,97,98	0
3	SF4	A	1267	8/8	0.98	0.04	20,21,24,25	0
7	NI	Q	1551	1/1	0.98	0.03	24,24,24,24	0
8	MG	Q	1553	1/1	0.98	0.04	26,26,26,26	0
3	SF4	C	1267	8/8	0.98	0.04	24,27,28,29	0
3	SF4	A	1265	8/8	0.98	0.04	29,32,33,33	0
4	F3S	C	1266	7/7	0.98	0.04	20,25,27,29	0
4	F3S	A	1266	7/7	0.99	0.03	22,25,26,26	0
7	NI	S	1551	1/1	0.99	0.02	28,28,28,28	0
3	SF4	C	1265	8/8	0.99	0.04	27,29,31,31	0
6	FCO	Q	1550	7/7	0.99	0.05	14,22,24,25	0
6	FCO	R	1550	7/7	0.99	0.06	26,30,30,37	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	FCO	S	1550	7/7	0.99	0.06	23,25,28,28	0
7	NI	R	1551	1/1	1.00	0.03	34,34,34,34	0

6.5 Other polymers [i](#)

There are no such residues in this entry.