Full wwPDB X-ray Structure Validation Report (i)

Nov 2, 2026 – 03:23 pm GMT

PDB ID	:	9T45 / pdb_00009t45
Title	:	Crystal Structure of the NlpC/P60 Peptidase YkfC C200A Mutant from Bacillus subtilis with Bound Pentapeptide
Authors	:	Voelpel, S.V.; Reiter, O.M.; Stehle, T.
Deposited on	:	2025-10-30
Resolution	:	2.72 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 (i) 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 (i)) were used in the production of this report:

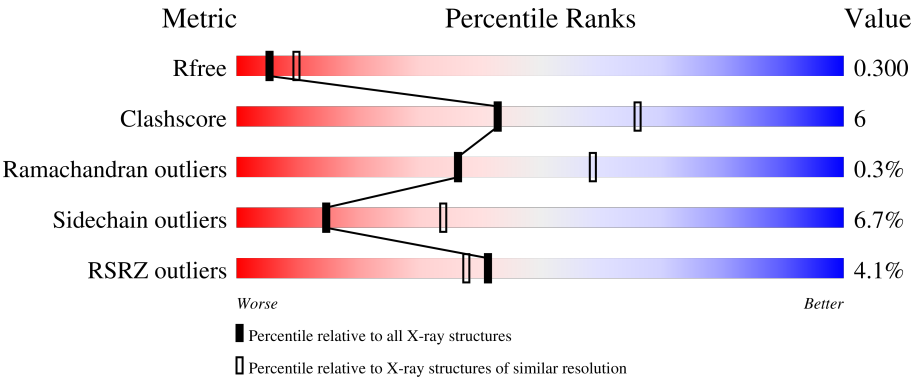
MolProbity	:	4-5-2 with Phenix2.2
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	2.2
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.015 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.51

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 2.72 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	4348 (2.74-2.70)
Clashscore	190562	4665 (2.74-2.70)
Ramachandran outliers	187476	4584 (2.74-2.70)
Sidechain outliers	187428	4585 (2.74-2.70)
RSRZ outliers	180081	4348 (2.74-2.70)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=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	304	5% 80% 19%
1	B	304	3% 81% 16%
1	C	304	3% 80% 19%
1	D	304	5% 78% 20%
2	E	5	60% 40%

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Mol	Chain	Length	Quality of chain
2	F	5	40% 40% 20%
2	G	5	20% 40% 60%
2	H	5	20% 80% 20%

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
3	ZN	A	401	-	-	X	-
3	ZN	C	403	-	-	X	-

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 9643 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 Gamma-D-glutamyl-L-lysine dipeptidyl-peptidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	304	Total	C	N	O	S	0	0	0
			2355	1513	398	432	12			
1	B	304	Total	C	N	O	S	0	1	0
			2379	1526	403	437	13			
1	C	304	Total	C	N	O	S	0	0	0
			2360	1514	401	433	12			
1	D	304	Total	C	N	O	S	0	0	0
			2363	1516	399	436	12			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	200	ALA	CYS	engineered mutation	UNP O35010
A	297	LEU	-	expression tag	UNP O35010
A	298	GLU	-	expression tag	UNP O35010
A	299	HIS	-	expression tag	UNP O35010
A	300	HIS	-	expression tag	UNP O35010
A	301	HIS	-	expression tag	UNP O35010
A	302	HIS	-	expression tag	UNP O35010
A	303	HIS	-	expression tag	UNP O35010
A	304	HIS	-	expression tag	UNP O35010
B	200	ALA	CYS	engineered mutation	UNP O35010
B	297	LEU	-	expression tag	UNP O35010
B	298	GLU	-	expression tag	UNP O35010
B	299	HIS	-	expression tag	UNP O35010
B	300	HIS	-	expression tag	UNP O35010
B	301	HIS	-	expression tag	UNP O35010
B	302	HIS	-	expression tag	UNP O35010
B	303	HIS	-	expression tag	UNP O35010
B	304	HIS	-	expression tag	UNP O35010
C	200	ALA	CYS	engineered mutation	UNP O35010
C	297	LEU	-	expression tag	UNP O35010
C	298	GLU	-	expression tag	UNP O35010

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Chain	Residue	Modelled	Actual	Comment	Reference
C	299	HIS	-	expression tag	UNP O35010
C	300	HIS	-	expression tag	UNP O35010
C	301	HIS	-	expression tag	UNP O35010
C	302	HIS	-	expression tag	UNP O35010
C	303	HIS	-	expression tag	UNP O35010
C	304	HIS	-	expression tag	UNP O35010
D	200	ALA	CYS	engineered mutation	UNP O35010
D	297	LEU	-	expression tag	UNP O35010
D	298	GLU	-	expression tag	UNP O35010
D	299	HIS	-	expression tag	UNP O35010
D	300	HIS	-	expression tag	UNP O35010
D	301	HIS	-	expression tag	UNP O35010
D	302	HIS	-	expression tag	UNP O35010
D	303	HIS	-	expression tag	UNP O35010
D	304	HIS	-	expression tag	UNP O35010

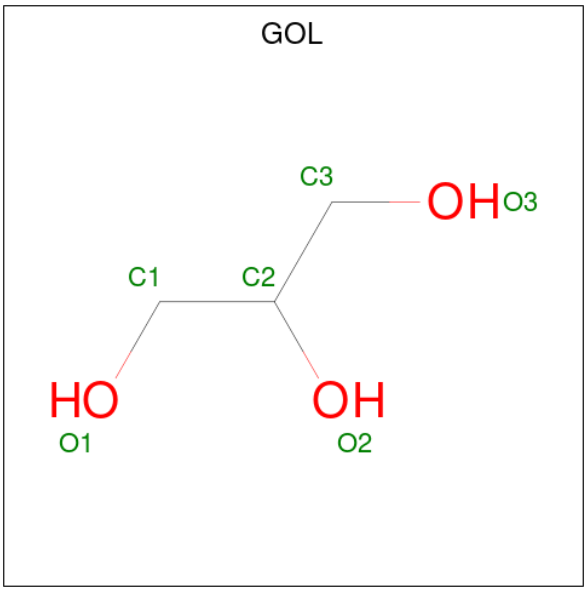
- Molecule 2 is a protein (with D amino acids) called Pentapeptide (ALA-DGL-LYS-DAL-DAL).

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	E	5	Total	C	N	O	0	0	0
			33	20	6	7			
2	F	5	Total	C	N	O	0	0	0
			33	20	6	7			
2	G	5	Total	C	N	O	0	0	0
			33	20	6	7			
2	H	5	Total	C	N	O	0	0	0
			33	20	6	7			

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Zn	0	0
			2	2		
3	B	1	Total	Zn	0	0
			1	1		
3	C	4	Total	Zn	0	0
			4	4		
3	D	1	Total	Zn	0	0
			1	1		

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



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

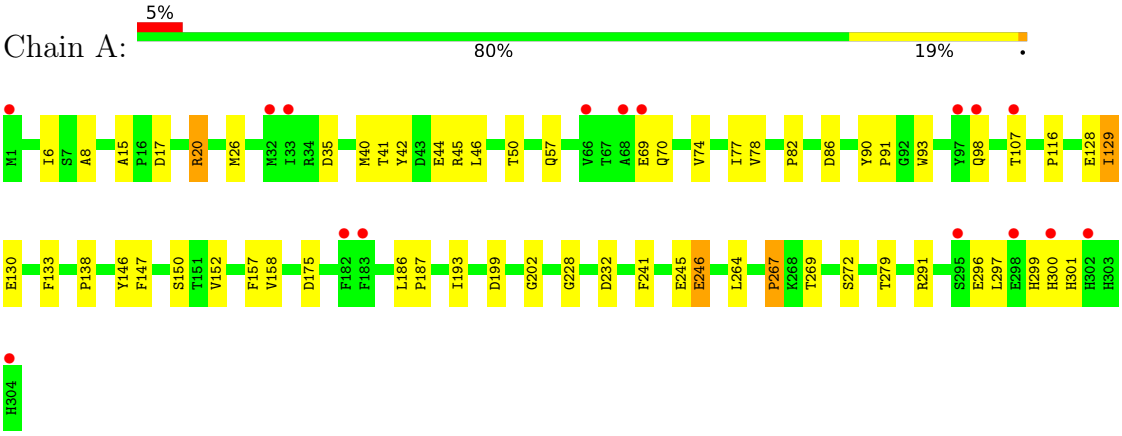
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	8	Total O 8 8	0	0
5	B	7	Total O 7 7	0	0
5	C	15	Total O 15 15	0	0
5	D	8	Total O 8 8	0	0
5	E	1	Total O 1 1	0	0
5	H	1	Total O 1 1	0	0

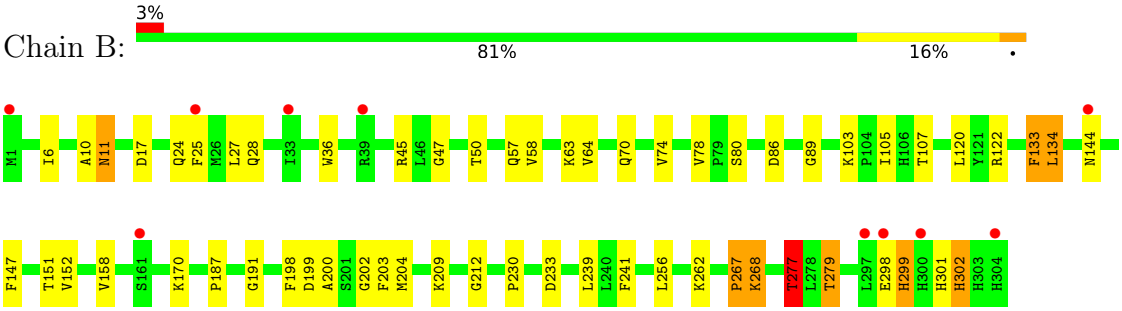
3 Residue-property plots (i)

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.

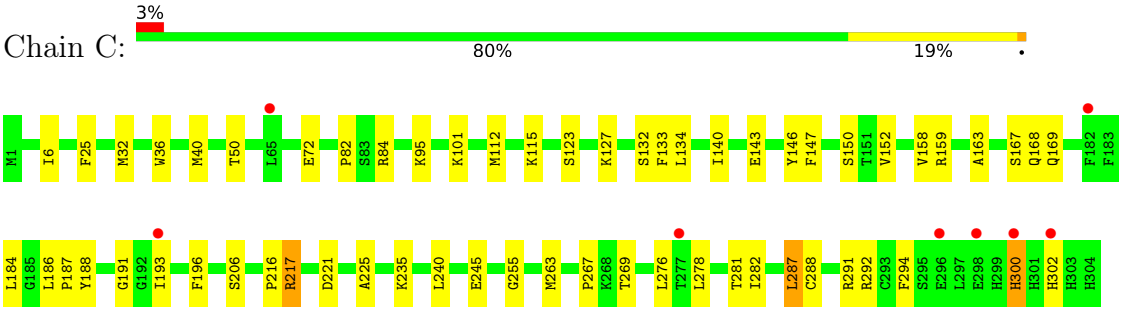
• Molecule 1: Gamma-D-glutamyl-L-lysine dipeptidyl-peptidase



• Molecule 1: Gamma-D-glutamyl-L-lysine dipeptidyl-peptidase

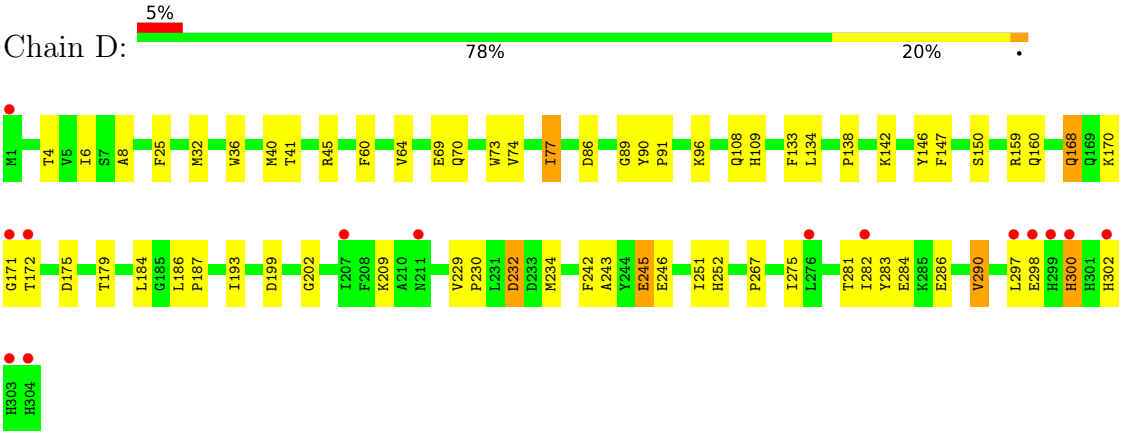


• Molecule 1: Gamma-D-glutamyl-L-lysine dipeptidyl-peptidase



• Molecule 1: Gamma-D-glutamyl-L-lysine dipeptidyl-peptidase

Chain D:



• Molecule 2: Pentapeptide (ALA-DGL-LYS-DAL-DAL)

Chain E:



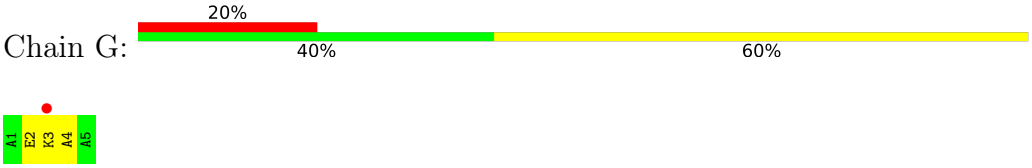
• Molecule 2: Pentapeptide (ALA-DGL-LYS-DAL-DAL)

Chain F:



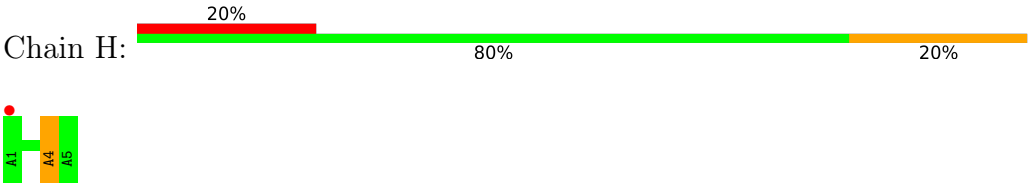
• Molecule 2: Pentapeptide (ALA-DGL-LYS-DAL-DAL)

Chain G:



• Molecule 2: Pentapeptide (ALA-DGL-LYS-DAL-DAL)

Chain H:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α, β, γ	91.47Å 117.95Å 163.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	47.80 – 2.72 47.80 – 2.72	Depositor EDS
% Data completeness (in resolution range)	99.5 (47.80-2.72) 99.7 (47.80-2.72)	Depositor EDS
R_{merge}	0.26	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.21 (at 2.73Å)	Xtriage
Refinement program	PHENIX 1.16_3549	Depositor
R, R_{free}	0.242 , 0.300 0.243 , 0.300	Depositor DCC
R_{free} test set	1531 reflections (3.19%)	wwPDB-VP
Wilson B-factor (Å^2)	65.9	Xtriage
Anisotropy	0.439	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.34 , 42.8	EDS
L-test for twinning[2]	$< \|L\| > = 0.47$, $< L^2 > = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.93	EDS
Total number of atoms	9643	wwPDB-VP
Average B, all atoms (Å^2)	70.0	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 33.92 % 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 7.4079e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: DGL, DAL, ZN, GOL

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	0/2418	0.55	1/3280 (0.0%)
1	B	0.35	0/2442	0.63	4/3309 (0.1%)
1	C	0.32	0/2424	0.57	2/3289 (0.1%)
1	D	0.36	0/2426	0.75	11/3290 (0.3%)
2	E	0.49	0/12	0.74	0/12
2	F	0.48	0/12	0.91	0/12
2	G	0.50	0/12	0.61	0/12
2	H	0.49	0/12	0.75	0/12
All	All	0.34	0/9758	0.63	18/13216 (0.1%)

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
2	E	0	1
2	F	0	1
2	G	0	1
2	H	0	1
All	All	0	4

There are no bond length outliers.

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	133	PHE	CA-C-O	-8.79	111.98	121.56
1	D	232	ASP	N-CA-C	-8.34	103.30	113.97
1	D	171	GLY	N-CA-C	8.27	121.43	112.33
1	B	133	PHE	CA-C-O	-7.30	112.99	121.16

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	D	133	PHE	CA-CB-CG	6.40	120.20	113.80
1	C	123	SER	N-CA-C	-6.37	104.34	111.28
1	B	279	THR	CB-CA-C	5.68	119.37	109.65
1	D	232	ASP	CA-C-N	-5.64	113.46	122.66
1	D	232	ASP	C-N-CA	-5.64	113.46	122.66
1	D	232	ASP	CB-CA-C	5.61	118.50	109.07
1	C	168	GLN	N-CA-C	-5.50	106.42	113.02
1	B	133	PHE	CA-CB-CG	5.44	119.24	113.80
1	D	245	GLU	CB-CA-C	5.21	118.84	111.86
1	D	73	TRP	CA-C-N	-5.18	116.35	123.14
1	D	73	TRP	C-N-CA	-5.18	116.35	123.14
1	B	277	THR	CB-CA-C	5.15	118.93	109.46
1	A	267	PRO	N-CA-C	5.08	122.94	112.47
1	D	4	THR	CB-CA-C	-5.05	100.99	109.48

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	E	4	DAL	Peptide
2	F	4	DAL	Peptide
2	G	4	DAL	Peptide
2	H	4	DAL	Peptide

5.2 Too-close contacts (i)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2355	0	2277	28	3
1	B	2379	0	2311	26	11
1	C	2360	0	2280	31	1
1	D	2363	0	2288	32	2
2	E	33	0	32	1	0
2	F	33	0	32	2	0
2	G	33	0	32	2	0
2	H	33	0	33	1	0
3	A	2	0	0	0	5

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	1	0	0	0	0
3	C	4	0	0	0	2
3	D	1	0	0	0	0
4	A	6	0	8	1	0
5	A	8	0	0	0	0
5	B	7	0	0	0	0
5	C	15	0	0	0	0
5	D	8	0	0	0	0
5	E	1	0	0	0	0
5	H	1	0	0	0	0
All	All	9643	0	9293	117	12

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 6.

All (117) 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:D:229:VAL:HB	1:D:290:VAL:HG22	1.43	0.99
1:B:200:ALA:HB3	2:F:2:DGL:HG2	1.64	0.80
1:B:230:PRO:HG2	1:B:233:ASP:HB2	1.70	0.74
1:D:281:THR:HG23	1:D:283:TYR:H	1.54	0.73
1:B:64:VAL:HG12	1:B:78:VAL:HG12	1.71	0.72
1:D:229:VAL:HB	1:D:290:VAL:CG2	2.20	0.72
1:A:199:ASP:HB3	1:A:202:GLY:H	1.58	0.68
1:B:204:MET:HE1	1:B:256:LEU:HB2	1.76	0.67
1:B:47:GLY:HA2	1:B:50:THR:HG22	1.77	0.67
1:A:6:ILE:HG22	1:A:152:VAL:HG21	1.76	0.66
1:A:138:PRO:HG2	1:A:150:SER:HB3	1.81	0.62
1:A:26:MET:O	1:A:98:GLN:NE2	2.33	0.62
1:C:240:LEU:HD12	1:C:263:MET:HE3	1.84	0.60
1:B:170:LYS:NZ	1:B:212:GLY:O	2.36	0.59
1:A:8:ALA:HB2	1:A:129:ILE:HG21	1.84	0.59
1:B:25:PHE:HB2	1:B:36:TRP:HB2	1.84	0.59
1:D:25:PHE:HB3	1:D:32:MET:HB2	1.85	0.58
1:D:69:GLU:HA	1:D:74:VAL:HG12	1.86	0.57
1:A:57:GLN:HB2	1:A:193:ILE:HG22	1.86	0.57
1:B:6:ILE:HG22	1:B:152:VAL:HG11	1.87	0.56
1:C:300:HIS:HB3	1:C:302:HIS:CD2	2.40	0.56
1:D:252:HIS:CE1	2:H:4:DAL:HB2	2.40	0.56
1:C:167:SER:HB2	1:C:169:GLN:HG2	1.89	0.55

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:186:LEU:HD12	1:A:187:PRO:HD2	1.87	0.55
1:B:262:LYS:NZ	1:B:277:THR:HG22	2.22	0.54
1:B:24:GLN:HA	1:B:27:LEU:HD12	1.89	0.54
1:D:108:GLN:HG2	1:D:109:HIS:H	1.74	0.53
1:B:133:PHE:O	1:B:134:LEU:HB2	2.09	0.53
1:A:129:ILE:HG22	1:A:130:GLU:N	2.23	0.52
1:B:147:PHE:N	1:B:158:VAL:O	2.40	0.52
1:C:140:ILE:HD11	1:C:150:SER:HB2	1.90	0.52
1:B:11:ASN:HA	1:B:57:GLN:HA	1.92	0.52
1:D:242:PHE:HB3	1:D:286:GLU:HG2	1.91	0.51
1:C:6:ILE:HG22	1:C:152:VAL:HG11	1.92	0.51
1:C:188:TYR:OH	2:G:2:DGL:OE1	2.24	0.51
1:A:69:GLU:HA	1:A:74:VAL:HG23	1.92	0.50
1:A:228:GLY:HA2	1:A:291:ARG:HD3	1.93	0.50
1:C:235:LYS:HB3	1:C:292:ARG:NH2	2.25	0.50
1:A:199:ASP:OD2	2:E:2:DGL:N	2.45	0.50
1:C:269:THR:H	2:G:3:LYS:HZ2	1.59	0.50
1:A:146:TYR:HD2	1:A:157:PHE:HB3	1.78	0.49
1:D:229:VAL:HG12	1:D:230:PRO:O	2.12	0.49
1:D:108:GLN:H	1:D:108:GLN:CD	2.20	0.49
1:B:103:LYS:HD3	1:B:103:LYS:HA	1.68	0.48
1:A:82:PRO:HB3	4:A:403:GOL:H11	1.94	0.48
1:A:86:ASP:HB2	1:A:91:PRO:HG3	1.95	0.47
1:D:86:ASP:HB3	1:D:89:GLY:O	2.14	0.47
1:D:138:PRO:HG2	1:D:150:SER:HB3	1.97	0.47
1:D:142:LYS:HE3	1:D:160:GLN:HE22	1.79	0.47
1:A:147:PHE:N	1:A:158:VAL:O	2.47	0.46
1:D:40:MET:HE3	1:D:45:ARG:HE	1.80	0.46
1:C:287:LEU:CD1	1:C:288:CYS:N	2.79	0.46
1:C:36:TRP:O	1:C:40:MET:HB2	2.15	0.46
1:C:147:PHE:N	1:C:158:VAL:O	2.38	0.46
1:D:146:TYR:CE2	1:D:159:ARG:HG2	2.51	0.46
1:C:186:LEU:HD12	1:C:187:PRO:HD2	1.97	0.46
1:A:241:PHE:HE2	1:A:291:ARG:HB2	1.81	0.46
1:B:10:ALA:O	1:B:58:VAL:HG12	2.16	0.45
1:A:245:GLU:C	1:A:246:GLU:HG2	2.42	0.45
1:C:134:LEU:HD11	1:C:206:SER:HA	1.98	0.45
1:D:147:PHE:CE2	1:D:160:GLN:HA	2.51	0.45
1:A:116:PRO:HA	1:A:133:PHE:HB2	1.99	0.45
1:B:199:ASP:HB3	1:B:202:GLY:H	1.82	0.45
1:B:200:ALA:O	1:B:204:MET:HG2	2.16	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:287:LEU:HD13	1:C:288:CYS:N	2.31	0.45
1:D:232:ASP:C	1:D:234:MET:H	2.25	0.45
1:A:128:GLU:O	1:A:129:ILE:HG12	2.16	0.45
1:A:107:THR:HG21	1:A:138:PRO:HB3	1.98	0.45
1:C:255:GLY:HA3	1:C:263:MET:HE2	1.98	0.45
1:A:193:ILE:HD12	1:A:193:ILE:HA	1.89	0.44
1:D:243:ALA:O	1:D:286:GLU:HG3	2.17	0.44
1:C:217:ARG:HD2	1:C:217:ARG:C	2.42	0.44
1:D:77:ILE:HD13	1:D:77:ILE:HA	1.84	0.44
1:D:69:GLU:HG3	1:D:96:LYS:HD2	1.98	0.44
1:B:105:ILE:HG13	1:B:107:THR:HG23	1.99	0.44
1:D:234:MET:HE2	1:D:234:MET:HB3	1.49	0.44
1:D:186:LEU:HD12	1:D:187:PRO:HD2	1.99	0.44
1:B:239:LEU:HB3	1:B:241:PHE:CE1	2.53	0.43
1:B:268:LYS:HE2	2:F:5:DAL:HB3	1.99	0.43
1:A:40:MET:HE3	1:A:45:ARG:HB2	2.00	0.43
1:A:41:THR:HG23	1:A:44:GLU:H	1.84	0.43
1:D:8:ALA:HA	1:D:60:PHE:HB2	1.98	0.43
1:B:45:ARG:HH12	1:B:187:PRO:HB2	1.83	0.43
1:A:42:TYR:CE1	1:A:46:LEU:HD12	2.53	0.43
1:D:134:LEU:HD11	1:D:209:LYS:HB3	2.00	0.43
1:D:199:ASP:HB3	1:D:202:GLY:H	1.84	0.43
1:D:25:PHE:HB2	1:D:36:TRP:HB2	2.01	0.43
1:C:225:ALA:O	1:C:291:ARG:NH2	2.50	0.42
1:C:294:PHE:H	1:C:294:PHE:HD1	1.66	0.42
1:D:142:LYS:HE3	1:D:160:GLN:NE2	2.34	0.42
1:A:20:ARG:NH1	1:A:44:GLU:O	2.52	0.42
1:B:191:GLY:H	1:B:199:ASP:CG	2.28	0.42
1:B:267:PRO:HB2	1:B:268:LYS:H	1.66	0.42
1:C:278:LEU:O	1:C:281:THR:OG1	2.24	0.42
1:C:132:SER:HB2	1:C:196:PHE:CE1	2.55	0.42
1:C:146:TYR:CE1	1:C:159:ARG:HG2	2.55	0.42
1:B:198:PHE:HB3	1:B:203:PHE:HB2	2.02	0.41
1:C:82:PRO:HD2	1:C:216:PRO:HA	2.01	0.41
1:C:291:ARG:HD3	1:C:291:ARG:HA	1.75	0.41
1:C:25:PHE:HB3	1:C:32:MET:HB2	2.02	0.41
1:C:72:GLU:HG3	1:C:95:LYS:HE3	2.02	0.41
1:C:112:MET:O	1:C:163:ALA:HA	2.20	0.41
1:D:175:ASP:O	1:D:179:THR:HG23	2.21	0.41
1:C:127:LYS:HB2	1:C:127:LYS:HE3	1.84	0.41
1:A:90:TYR:HA	1:A:91:PRO:HD3	1.91	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:187:PRO:HA	1:A:272:SER:HA	2.03	0.41
1:D:168:GLN:HE21	1:D:168:GLN:HB3	1.66	0.41
1:D:297:LEU:HD12	1:D:297:LEU:HA	1.87	0.41
1:C:133:PHE:O	1:C:134:LEU:HB2	2.21	0.41
1:C:287:LEU:HD13	1:C:288:CYS:H	1.85	0.40
1:B:86:ASP:HB3	1:B:89:GLY:O	2.21	0.40
1:A:15:ALA:HA	1:A:93:TRP:CD1	2.55	0.40
1:C:147:PHE:HB2	1:C:158:VAL:HG23	2.03	0.40
1:B:120:LEU:HD21	1:B:151:THR:HG21	2.04	0.40
1:C:191:GLY:HA2	1:C:217:ARG:HH12	1.87	0.40
1:D:90:TYR:HA	1:D:91:PRO:HD3	1.96	0.40
1:D:282:ILE:HD12	1:D:282:ILE:H	1.87	0.40

All (12) 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)
1:B:302:HIS:ND1	3:A:401:ZN:ZN[3_445]	1.00	1.20
1:B:302:HIS:CE1	3:A:401:ZN:ZN[3_445]	1.09	1.11
1:B:302:HIS:CG	3:A:401:ZN:ZN[3_445]	1.16	1.04
1:B:302:HIS:NE2	3:A:401:ZN:ZN[3_445]	1.23	0.97
1:B:302:HIS:CD2	3:A:401:ZN:ZN[3_445]	1.29	0.91
1:B:299:HIS:NE2	3:C:403:ZN:ZN[3_445]	1.33	0.87
1:B:299:HIS:CE1	3:C:403:ZN:ZN[3_445]	1.66	0.54
1:A:175:ASP:OD2	1:B:302:HIS:ND1[3_455]	1.78	0.42
1:A:300:HIS:CE1	1:B:302:HIS:CB[3_455]	1.89	0.31
1:A:175:ASP:OD2	1:B:302:HIS:CE1[3_455]	2.05	0.15
1:C:302:HIS:CB	1:D:300:HIS:NE2[2_455]	2.12	0.08
1:B:144:ASN:ND2	1:D:275:ILE:O[4_445]	2.19	0.01

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	302/304 (99%)	285 (94%)	16 (5%)	1 (0%)	36	59
1	B	303/304 (100%)	282 (93%)	20 (7%)	1 (0%)	36	59
1	C	302/304 (99%)	284 (94%)	17 (6%)	1 (0%)	36	59
1	D	302/304 (99%)	278 (92%)	23 (8%)	1 (0%)	36	59
All	All	1209/1216 (99%)	1129 (93%)	76 (6%)	4 (0%)	36	59

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	267	PRO
1	B	267	PRO
1	C	267	PRO
1	D	267	PRO

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	244/257 (95%)	227 (93%)	17 (7%)	14	32
1	B	249/257 (97%)	232 (93%)	17 (7%)	14	33
1	C	246/257 (96%)	232 (94%)	14 (6%)	18	41
1	D	247/257 (96%)	229 (93%)	18 (7%)	13	30
2	E	1/1 (100%)	1 (100%)	0	100	100
2	F	1/1 (100%)	1 (100%)	0	100	100
2	G	1/1 (100%)	1 (100%)	0	100	100
2	H	1/1 (100%)	1 (100%)	0	100	100
All	All	990/1032 (96%)	924 (93%)	66 (7%)	15	34

All (66) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	17	ASP

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Mol	Chain	Res	Type
1	A	20	ARG
1	A	35	ASP
1	A	50	THR
1	A	70	GLN
1	A	77	ILE
1	A	78	VAL
1	A	129	ILE
1	A	232	ASP
1	A	246	GLU
1	A	264	LEU
1	A	269	THR
1	A	279	THR
1	A	296	GLU
1	A	297	LEU
1	A	299	HIS
1	A	301	HIS
1	B	11	ASN
1	B	17	ASP
1	B	28	GLN
1	B	63	LYS
1	B	70	GLN
1	B	74	VAL
1	B	80	SER
1	B	122	ARG
1	B	134	LEU
1	B	209	LYS
1	B	268	LYS
1	B	277	THR
1	B	279	THR
1	B	298	GLU
1	B	299	HIS
1	B	301	HIS
1	B	302	HIS
1	C	50	THR
1	C	84	ARG
1	C	101	LYS
1	C	115	LYS
1	C	143	GLU
1	C	184	LEU
1	C	193	ILE
1	C	217	ARG
1	C	221	ASP

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Mol	Chain	Res	Type
1	C	245	GLU
1	C	276	LEU
1	C	282	ILE
1	C	287	LEU
1	C	300	HIS
1	D	6	ILE
1	D	41	THR
1	D	64	VAL
1	D	70	GLN
1	D	77	ILE
1	D	168	GLN
1	D	170	LYS
1	D	172	THR
1	D	184	LEU
1	D	193	ILE
1	D	245	GLU
1	D	246	GLU
1	D	251	ILE
1	D	284	GLU
1	D	290	VAL
1	D	298	GLU
1	D	300	HIS
1	D	302	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (7) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	70	GLN
1	A	211	ASN
1	B	3	HIS
1	B	28	GLN
1	D	168	GLN
1	D	265	HIS
1	D	301	HIS

5.3.3 RNA

There are no RNA molecules in this entry.

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

12 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	DGL	E	2	2	6,7,9	0.71	0	2,7,11	1.14	0
2	DAL	E	4	2	3,4,5	0.64	0	2,4,6	0.86	0
2	DAL	H	5	2	5,5,5	0.92	0	6,6,6	0.98	0
2	DAL	E	5	2	5,5,5	0.92	0	6,6,6	0.94	0
2	DGL	H	2	2	6,7,9	0.71	0	2,7,11	1.38	0
2	DAL	H	4	2	3,4,5	0.65	0	2,4,6	0.90	0
2	DGL	G	2	2	6,7,9	0.70	0	2,7,11	0.79	0
2	DAL	G	4	2	3,4,5	0.68	0	2,4,6	0.86	0
2	DAL	G	5	2	5,5,5	0.92	0	6,6,6	0.85	0
2	DAL	F	4	2	3,4,5	0.69	0	2,4,6	0.99	0
2	DAL	F	5	2	5,5,5	0.91	0	6,6,6	1.09	1 (16%)
2	DGL	F	2	2	6,7,9	0.71	0	2,7,11	0.75	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	DGL	E	2	2	-	0/4/6/9	-
2	DAL	E	4	2	-	0/0/2/4	-
2	DAL	H	5	2	-	4/4/4/4	-
2	DAL	E	5	2	-	4/4/4/4	-
2	DGL	H	2	2	-	0/4/6/9	-
2	DAL	H	4	2	-	0/0/2/4	-
2	DGL	G	2	2	-	1/4/6/9	-
2	DAL	G	4	2	-	0/0/2/4	-
2	DAL	G	5	2	-	3/4/4/4	-
2	DAL	F	4	2	-	0/0/2/4	-
2	DAL	F	5	2	-	0/4/4/4	-
2	DGL	F	2	2	-	0/4/6/9	-

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	F	5	DAL	C-CA-N	2.23	115.92	107.60

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	H	5	DAL	OXT-C-CA-N
2	H	5	DAL	O-C-CA-CB
2	H	5	DAL	OXT-C-CA-CB
2	E	5	DAL	OXT-C-CA-N
2	E	5	DAL	OXT-C-CA-CB
2	G	5	DAL	O-C-CA-CB
2	G	5	DAL	OXT-C-CA-CB
2	G	5	DAL	OXT-C-CA-N
2	E	5	DAL	O-C-CA-CB
2	E	5	DAL	O-C-CA-N
2	H	5	DAL	O-C-CA-N
2	G	2	DGL	CA-CB-CG-CD

There are no ring outliers.

5 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	E	2	DGL	1	0
2	H	4	DAL	1	0
2	G	2	DGL	1	0
2	F	5	DAL	1	0
2	F	2	DGL	1	0

5.5 Carbohydrates (i)

There are no oligosaccharides in this entry.

5.6 Ligand geometry (i)

Of 9 ligands modelled in this entry, 8 are monoatomic - leaving 1 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	$\#\|Z\| > 2$
4	GOL	A	403	-	5,5,5	0.92	0	5,5,5	1.02	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
4	GOL	A	403	-	-	0/4/4/4	-

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.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	403	GOL	1	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, 95^{th} 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	304/304 (100%)	0.68	16 (5%) 32 28	50, 72, 92, 102	2 (0%)
1	B	304/304 (100%)	0.58	10 (3%) 49 45	43, 68, 89, 102	3 (0%)
1	C	304/304 (100%)	0.59	8 (2%) 57 54	48, 68, 91, 108	2 (0%)
1	D	304/304 (100%)	0.58	14 (4%) 37 34	45, 67, 90, 102	2 (0%)
2	E	2/5 (40%)	0.47	0 100 100	59, 59, 59, 77	0
2	F	2/5 (40%)	1.26	0 100 100	52, 52, 52, 70	0
2	G	2/5 (40%)	1.09	1 (50%) 0 0	57, 57, 57, 77	0
2	H	2/5 (40%)	1.72	1 (50%) 0 0	67, 67, 67, 73	0
All	All	1224/1236 (99%)	0.61	50 (4%) 41 38	43, 69, 91, 108	9 (0%)

All (50) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	302	HIS	5.0
1	C	300	HIS	4.9
1	B	39[A]	ARG	4.6
1	C	298	GLU	4.1
1	B	304	HIS	3.6
1	C	302	HIS	3.5
2	H	1	ALA	3.2
1	A	300	HIS	3.2
1	A	183	PHE	3.1
1	D	211	ASN	3.1
1	D	299	HIS	2.9
1	A	304	HIS	2.9
1	B	298	GLU	2.8
1	A	1	MET	2.7
1	D	304	HIS	2.7
1	A	182	PHE	2.7

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Mol	Chain	Res	Type	RSRZ
1	A	295	SER	2.6
1	B	297	LEU	2.6
1	D	303	HIS	2.6
1	A	298	GLU	2.6
1	C	277	THR	2.5
1	B	25	PHE	2.5
1	C	296	GLU	2.5
1	B	1	MET	2.5
2	G	3	LYS	2.4
1	A	69	GLU	2.4
1	B	300	HIS	2.4
1	A	98	GLN	2.4
1	D	297	LEU	2.4
1	C	182	PHE	2.4
1	D	300	HIS	2.3
1	D	298	GLU	2.3
1	A	302	HIS	2.3
1	A	66	VAL	2.3
1	B	33	ILE	2.2
1	D	282	ILE	2.2
1	D	171	GLY	2.2
1	A	107	THR	2.2
1	D	172	THR	2.2
1	A	32	MET	2.2
1	A	68	ALA	2.2
1	A	97	TYR	2.2
1	D	276	LEU	2.2
1	B	161	SER	2.2
1	C	65	LEU	2.1
1	D	1	MET	2.1
1	B	144	ASN	2.1
1	A	33	ILE	2.1
1	C	193	ILE	2.0
1	D	207	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, 95^{th} 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	DAL	G	5	6/6	0.65	0.20	86,92,97,101	0
2	DAL	E	5	6/6	0.69	0.21	85,102,113,114	0
2	DGL	H	2	8/10	0.69	0.20	53,58,61,74	0
2	DAL	F	5	6/6	0.70	0.21	80,88,109,117	0
2	DGL	F	2	8/10	0.71	0.19	50,53,61,95	0
2	DGL	E	2	8/10	0.72	0.17	56,60,64,82	0
2	DAL	H	5	6/6	0.78	0.18	79,98,100,105	0
2	DGL	G	2	8/10	0.79	0.16	54,65,70,83	0
2	DAL	F	4	5/6	0.87	0.16	61,65,92,108	0
2	DAL	E	4	5/6	0.91	0.19	72,85,91,98	0
2	DAL	G	4	5/6	0.92	0.14	66,71,97,104	0
2	DAL	H	4	5/6	0.95	0.14	66,69,94,119	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, 95^{th} 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	GOL	A	403	6/6	0.88	0.13	62,73,79,83	0
3	ZN	C	403	1/1	0.89	0.13	105,105,105,105	0
3	ZN	D	401	1/1	0.92	0.16	83,83,83,83	0
3	ZN	C	402	1/1	0.92	0.14	66,66,66,66	0
3	ZN	A	401	1/1	0.94	0.06	60,60,60,60	0
3	ZN	A	402	1/1	0.95	0.09	88,88,88,88	0
3	ZN	C	401	1/1	0.95	0.12	62,62,62,62	0
3	ZN	B	401	1/1	0.97	0.11	62,62,62,62	0
3	ZN	C	404	1/1	0.97	0.04	94,94,94,94	0

6.5 Other polymers (i)

There are no such residues in this entry.