



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 15, 2026 – 12:38 AM UTC

PDB ID : 4P24 / pdb_00004p24
Title : pore forming toxin
Authors : Sugawara, T.; Yamashita, D.; Tanaka, Y.; Tanaka, I.; Yao, M.
Deposited on : 2014-03-01
Resolution : 3.10 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

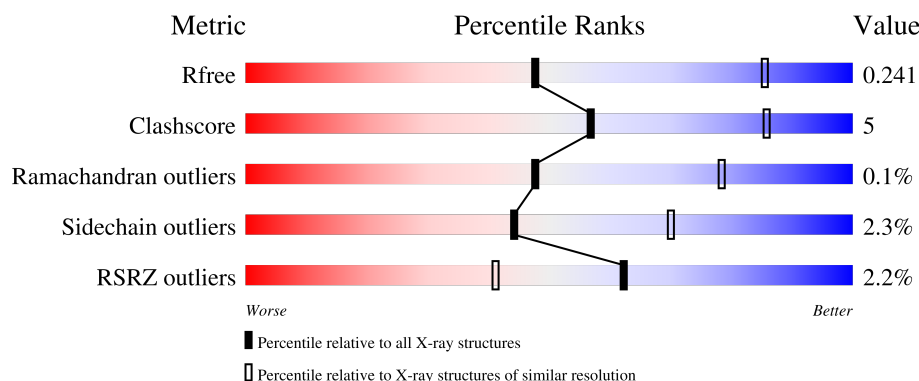
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.10 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	1456 (3.10-3.10)
Clashscore	190562	1539 (3.10-3.10)
Ramachandran outliers	187476	1467 (3.10-3.10)
Sidechain outliers	187428	1467 (3.10-3.10)
RSRZ outliers	180081	1456 (3.10-3.10)

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	302	2% 86% 10% ..
1	B	302	3% 84% 12% .
1	C	302	3% 83% 12% ..
1	D	302	% 83% 12% ..
1	E	302	3% 84% 11% ..

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Mol	Chain	Length	Quality of chain
1	F	302	2% 86% 10% .
1	G	302	2% 82% 14% ..

2 Entry composition [i](#)

There are 2 unique types of molecules in this entry. The entry contains 32256 atoms, of which 15927 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 Alpha-hemolysin.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	292	Total	C	H	N	O	S	0	0	0
			4575	1458	2253	395	462	7			
1	B	291	Total	C	H	N	O	S	0	0	0
			4564	1455	2248	394	460	7			
1	C	291	Total	C	H	N	O	S	0	0	0
			4564	1455	2248	394	460	7			
1	D	292	Total	C	H	N	O	S	0	0	0
			4578	1459	2254	396	462	7			
1	E	291	Total	C	H	N	O	S	0	0	0
			4564	1455	2248	394	460	7			
1	F	290	Total	C	H	N	O	S	0	0	0
			4550	1451	2241	393	458	7			
1	G	292	Total	C	H	N	O	S	0	0	0
			4575	1458	2253	395	462	7			

There are 77 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q99UU6
A	179	ALA	TRP	engineered mutation	UNP Q99UU6
A	200	ALA	ARG	engineered mutation	UNP Q99UU6
A	294	LEU	-	expression tag	UNP Q99UU6
A	295	GLU	-	expression tag	UNP Q99UU6
A	296	HIS	-	expression tag	UNP Q99UU6
A	297	HIS	-	expression tag	UNP Q99UU6
A	298	HIS	-	expression tag	UNP Q99UU6
A	299	HIS	-	expression tag	UNP Q99UU6
A	300	HIS	-	expression tag	UNP Q99UU6
A	301	HIS	-	expression tag	UNP Q99UU6
B	0	MET	-	initiating methionine	UNP Q99UU6
B	179	ALA	TRP	engineered mutation	UNP Q99UU6
B	200	ALA	ARG	engineered mutation	UNP Q99UU6
B	294	LEU	-	expression tag	UNP Q99UU6

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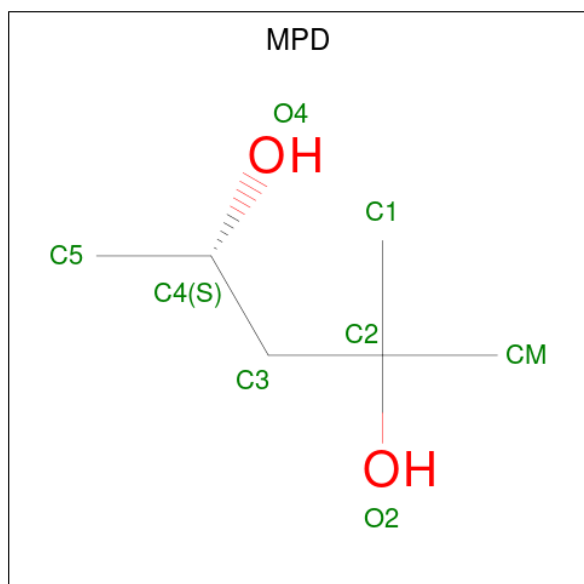
Chain	Residue	Modelled	Actual	Comment	Reference
B	295	GLU	-	expression tag	UNP Q99UU6
B	296	HIS	-	expression tag	UNP Q99UU6
B	297	HIS	-	expression tag	UNP Q99UU6
B	298	HIS	-	expression tag	UNP Q99UU6
B	299	HIS	-	expression tag	UNP Q99UU6
B	300	HIS	-	expression tag	UNP Q99UU6
B	301	HIS	-	expression tag	UNP Q99UU6
C	0	MET	-	initiating methionine	UNP Q99UU6
C	179	ALA	TRP	engineered mutation	UNP Q99UU6
C	200	ALA	ARG	engineered mutation	UNP Q99UU6
C	294	LEU	-	expression tag	UNP Q99UU6
C	295	GLU	-	expression tag	UNP Q99UU6
C	296	HIS	-	expression tag	UNP Q99UU6
C	297	HIS	-	expression tag	UNP Q99UU6
C	298	HIS	-	expression tag	UNP Q99UU6
C	299	HIS	-	expression tag	UNP Q99UU6
C	300	HIS	-	expression tag	UNP Q99UU6
C	301	HIS	-	expression tag	UNP Q99UU6
D	0	MET	-	initiating methionine	UNP Q99UU6
D	179	ALA	TRP	engineered mutation	UNP Q99UU6
D	200	ALA	ARG	engineered mutation	UNP Q99UU6
D	294	LEU	-	expression tag	UNP Q99UU6
D	295	GLU	-	expression tag	UNP Q99UU6
D	296	HIS	-	expression tag	UNP Q99UU6
D	297	HIS	-	expression tag	UNP Q99UU6
D	298	HIS	-	expression tag	UNP Q99UU6
D	299	HIS	-	expression tag	UNP Q99UU6
D	300	HIS	-	expression tag	UNP Q99UU6
D	301	HIS	-	expression tag	UNP Q99UU6
E	0	MET	-	initiating methionine	UNP Q99UU6
E	179	ALA	TRP	engineered mutation	UNP Q99UU6
E	200	ALA	ARG	engineered mutation	UNP Q99UU6
E	294	LEU	-	expression tag	UNP Q99UU6
E	295	GLU	-	expression tag	UNP Q99UU6
E	296	HIS	-	expression tag	UNP Q99UU6
E	297	HIS	-	expression tag	UNP Q99UU6
E	298	HIS	-	expression tag	UNP Q99UU6
E	299	HIS	-	expression tag	UNP Q99UU6
E	300	HIS	-	expression tag	UNP Q99UU6
E	301	HIS	-	expression tag	UNP Q99UU6
F	0	MET	-	initiating methionine	UNP Q99UU6
F	179	ALA	TRP	engineered mutation	UNP Q99UU6

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Chain	Residue	Modelled	Actual	Comment	Reference
F	200	ALA	ARG	engineered mutation	UNP Q99UU6
F	294	LEU	-	expression tag	UNP Q99UU6
F	295	GLU	-	expression tag	UNP Q99UU6
F	296	HIS	-	expression tag	UNP Q99UU6
F	297	HIS	-	expression tag	UNP Q99UU6
F	298	HIS	-	expression tag	UNP Q99UU6
F	299	HIS	-	expression tag	UNP Q99UU6
F	300	HIS	-	expression tag	UNP Q99UU6
F	301	HIS	-	expression tag	UNP Q99UU6
G	0	MET	-	initiating methionine	UNP Q99UU6
G	179	ALA	TRP	engineered mutation	UNP Q99UU6
G	200	ALA	ARG	engineered mutation	UNP Q99UU6
G	294	LEU	-	expression tag	UNP Q99UU6
G	295	GLU	-	expression tag	UNP Q99UU6
G	296	HIS	-	expression tag	UNP Q99UU6
G	297	HIS	-	expression tag	UNP Q99UU6
G	298	HIS	-	expression tag	UNP Q99UU6
G	299	HIS	-	expression tag	UNP Q99UU6
G	300	HIS	-	expression tag	UNP Q99UU6
G	301	HIS	-	expression tag	UNP Q99UU6

- Molecule 2 is (4S)-2-METHYL-2,4-PENTANEDIOL (CCD ID: MPD) (formula: C₆H₁₄O₂).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	0
			22	6	14	2		

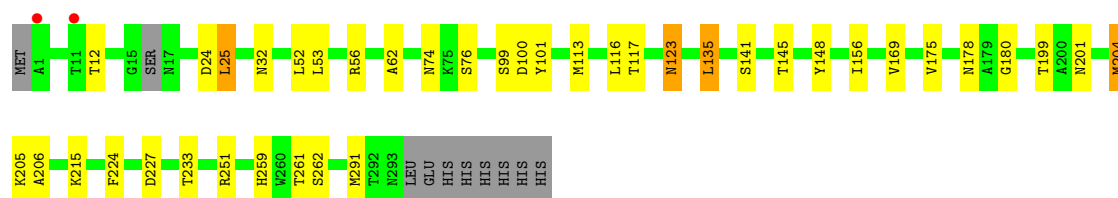
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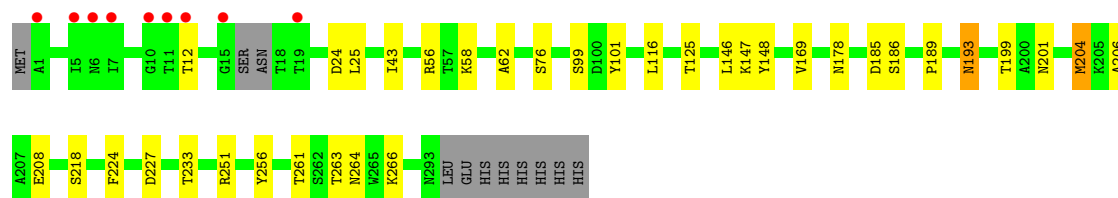
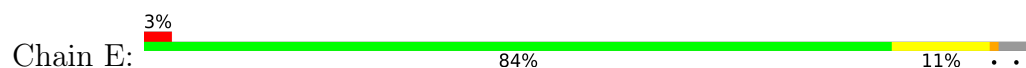
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	H	O	0	0
			22	6	14	2		
2	A	1	Total	C	H	O	0	0
			22	6	14	2		
2	B	1	Total	C	H	O	0	0
			22	6	14	2		
2	C	1	Total	C	H	O	0	0
			22	6	14	2		
2	C	1	Total	C	H	O	0	0
			22	6	14	2		
2	D	1	Total	C	H	O	0	0
			22	6	14	2		
2	D	1	Total	C	H	O	0	0
			22	6	14	2		
2	E	1	Total	C	H	O	0	0
			22	6	14	2		
2	F	1	Total	C	H	O	0	0
			22	6	14	2		
2	F	1	Total	C	H	O	0	0
			22	6	14	2		
2	G	1	Total	C	H	O	0	0
			22	6	14	2		
2	G	1	Total	C	H	O	0	0
			22	6	14	2		

- Molecule 1: Alpha-hemolysin

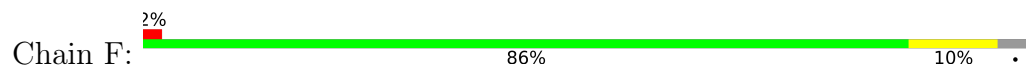




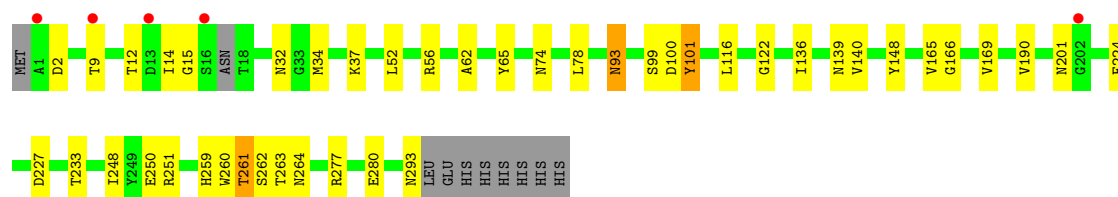
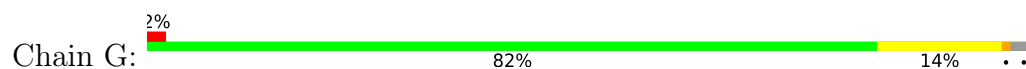
• Molecule 1: Alpha-hemolysin



• Molecule 1: Alpha-hemolysin



• Molecule 1: Alpha-hemolysin



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	170.06Å 170.06Å 202.86Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.60 – 3.10 48.60 – 3.10	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.60-3.10) 99.9 (48.60-3.10)	Depositor EDS
R_{merge}	0.21	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.07 (at 3.12Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.4_1496)	Depositor
R, R_{free}	0.219 , 0.244 0.221 , 0.241	Depositor DCC
R_{free} test set	2725 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	66.1	Xtriage
Anisotropy	0.160	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 24.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	32256	wwPDB-VP
Average B, all atoms (Å ²)	66.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.36% 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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.31	0/2371	0.66	0/3207
1	B	0.29	0/2365	0.62	0/3199
1	C	0.30	0/2365	0.63	0/3199
1	D	0.30	0/2373	0.63	0/3210
1	E	0.30	0/2365	0.63	0/3199
1	F	0.30	0/2358	0.61	0/3189
1	G	0.31	0/2371	0.65	0/3207
All	All	0.30	0/16568	0.63	0/22410

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [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	2322	2253	2252	25	0
1	B	2316	2248	2247	28	0
1	C	2316	2248	2247	25	0
1	D	2324	2254	2253	26	0
1	E	2316	2248	2247	23	0
1	F	2309	2241	2240	19	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	G	2322	2253	2252	29	0
2	A	24	42	42	2	0
2	B	8	14	14	0	0
2	C	16	28	28	0	0
2	D	16	28	28	2	0
2	E	8	14	14	0	0
2	F	16	28	28	2	0
2	G	16	28	28	0	0
All	All	16329	15927	15920	148	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 5.

All (148) 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:F:198:LYS:NZ	1:F:208:GLU:O	2.13	0.82
1:C:148:TYR:OH	1:D:178:ASN:ND2	2.17	0.78
1:E:56:ARG:NH2	1:E:227:ASP:OD1	2.18	0.77
1:E:186:SER:O	1:E:193:ASN:ND2	2.19	0.76
2:D:402:MPD:H53	2:D:402:MPD:H12	1.68	0.74
1:D:62:ALA:O	1:D:251:ARG:NH1	2.25	0.69
1:C:123:ASN:OD1	1:C:135:LEU:N	2.25	0.69
1:F:199:THR:OG1	1:F:209:ASN:OD1	2.11	0.68
1:D:56:ARG:NH2	1:D:227:ASP:OD1	2.26	0.68
1:A:37:LYS:NZ	1:G:99:SER:OG	2.26	0.67
1:A:62:ALA:O	1:A:251:ARG:NH1	2.28	0.66
1:F:180:GLY:O	2:F:402:MPD:O2	2.14	0.65
1:G:62:ALA:O	1:G:251:ARG:NH1	2.30	0.65
1:G:56:ARG:NH2	1:G:227:ASP:OD1	2.31	0.64
1:F:32:ASN:O	1:F:251:ARG:NH2	2.30	0.63
1:A:178:ASN:OD1	1:G:148:TYR:OH	2.17	0.63
1:G:93:ASN:OD1	1:G:93:ASN:N	2.31	0.63
1:G:32:ASN:O	1:G:251:ARG:NH2	2.29	0.62
1:B:198:LYS:NZ	1:B:208:GLU:O	2.20	0.62
1:C:205:LYS:HG3	1:C:208:GLU:HG3	1.82	0.62
1:A:113:MET:HE3	1:B:145:THR:HG21	1.82	0.61
1:B:148:TYR:OH	1:C:178:ASN:OD1	2.19	0.60
1:E:148:TYR:OH	1:F:178:ASN:OD1	2.19	0.59
1:D:53:LEU:HD21	1:D:291:MET:HE2	1.84	0.59
1:E:185:ASP:OD2	1:F:215:LYS:NZ	2.37	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:62:ALA:O	1:B:251:ARG:NH1	2.37	0.57
1:D:32:ASN:O	1:D:251:ARG:NH2	2.35	0.57
1:D:148:TYR:OH	1:E:178:ASN:OD1	2.22	0.57
1:F:62:ALA:O	1:F:251:ARG:NH1	2.38	0.56
1:F:94:GLU:OE1	1:F:240:LYS:NZ	2.36	0.56
1:B:12:THR:HG22	1:C:43:ILE:HD11	1.89	0.55
1:A:32:ASN:O	1:A:251:ARG:NH2	2.35	0.54
1:G:280:GLU:CD	1:G:293:ASN:HD21	2.15	0.54
1:C:135:LEU:HD23	1:C:136:ILE:N	2.23	0.54
1:A:123:ASN:HD21	1:B:135:LEU:HD11	1.73	0.53
1:E:62:ALA:O	1:E:251:ARG:NH1	2.42	0.53
1:A:179:ALA:HA	2:A:402:MPD:H53	1.90	0.53
1:C:117:THR:OG1	1:C:141:SER:OG	2.27	0.53
1:A:156:ILE:HB	1:A:168:LYS:HG3	1.91	0.52
1:G:201:ASN:O	1:G:201:ASN:ND2	2.43	0.52
1:A:99:SER:HB2	1:A:233:THR:HG23	1.91	0.52
1:C:261:THR:O	1:C:262:SER:OG	2.20	0.52
1:D:169:VAL:HG21	1:D:224:PHE:CZ	2.44	0.52
1:E:189:PRO:O	1:E:266:LYS:NZ	2.43	0.51
1:C:169:VAL:HG21	1:C:224:PHE:CZ	2.45	0.51
1:G:169:VAL:HG21	1:G:224:PHE:CZ	2.46	0.51
1:F:280:GLU:OE2	1:F:293:ASN:ND2	2.43	0.51
1:C:62:ALA:O	1:C:251:ARG:NH1	2.42	0.51
1:E:263:THR:HG23	1:E:264:ASN:OD1	2.10	0.51
1:C:185:ASP:OD2	1:D:215:LYS:NZ	2.33	0.51
1:E:199:THR:OG1	1:E:204:MET:HE1	2.11	0.51
1:G:280:GLU:OE2	1:G:293:ASN:ND2	2.35	0.51
1:D:53:LEU:HD21	1:D:291:MET:CE	2.41	0.51
1:G:99:SER:HB2	1:G:233:THR:HG23	1.93	0.51
1:A:261:THR:O	1:A:262:SER:OG	2.24	0.50
1:D:100:ASP:OD2	1:E:58:LYS:NZ	2.40	0.50
1:E:12:THR:HG22	1:F:43:ILE:HD11	1.93	0.50
1:F:76:SER:HB2	1:F:206:ALA:HB3	1.94	0.50
1:E:76:SER:HB2	1:E:206:ALA:HB3	1.92	0.50
1:B:250:GLU:OE2	1:B:277:ARG:NE	2.44	0.50
1:E:261:THR:O	1:E:261:THR:OG1	2.29	0.49
1:C:76:SER:HB2	1:C:206:ALA:HB3	1.94	0.49
1:A:156:ILE:HD12	1:B:218:SER:CB	2.43	0.49
1:D:52:LEU:CD2	1:D:233:THR:HG22	2.43	0.49
1:A:99:SER:CB	1:A:233:THR:HG23	2.43	0.48
1:B:51:LYS:NZ	1:B:286:TRP:O	2.42	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:113:MET:CE	1:B:145:THR:HG21	2.44	0.48
1:D:180:GLY:O	2:D:402:MPD:H13	2.14	0.48
1:D:76:SER:HB2	1:D:206:ALA:HB3	1.96	0.48
1:G:261:THR:O	1:G:262:SER:OG	2.25	0.47
1:A:261:THR:OG1	1:A:264:ASN:OD1	2.32	0.47
1:F:169:VAL:HG21	1:F:224:PHE:CZ	2.48	0.47
1:A:43:ILE:HD11	1:G:12:THR:HG22	1.97	0.47
1:E:99:SER:HB2	1:E:233:THR:HG23	1.95	0.47
1:G:99:SER:CB	1:G:233:THR:HG23	2.45	0.47
1:B:261:THR:O	1:B:262:SER:OG	2.24	0.47
1:G:14:ILE:CD1	1:G:52:LEU:HD11	2.45	0.47
1:A:123:ASN:OD1	1:B:135:LEU:HD11	2.15	0.47
1:G:65:TYR:CE2	1:G:78:LEU:HD21	2.51	0.46
2:A:401:MPD:O4	2:A:401:MPD:H11	2.15	0.46
1:A:280:GLU:CD	1:A:293:ASN:HD21	2.24	0.46
1:G:14:ILE:HD13	1:G:52:LEU:HD11	1.98	0.46
1:A:156:ILE:HD12	1:B:218:SER:HB3	1.98	0.46
1:B:99:SER:HB2	1:B:233:THR:HG23	1.98	0.46
1:B:123:ASN:HD21	1:B:135:LEU:HD23	1.81	0.46
1:D:156:ILE:HD12	1:E:218:SER:HB3	1.98	0.46
1:B:32:ASN:O	1:B:251:ARG:NH2	2.38	0.45
1:D:261:THR:O	1:D:262:SER:OG	2.24	0.45
1:A:56:ARG:NH2	1:A:227:ASP:OD1	2.49	0.45
1:G:52:LEU:CD2	1:G:233:THR:HG22	2.46	0.45
1:D:12:THR:HG22	1:E:43:ILE:HD11	1.98	0.45
1:E:169:VAL:HG21	1:E:224:PHE:CZ	2.51	0.45
1:G:100:ASP:OD1	1:G:101:TYR:N	2.46	0.45
1:G:260:TRP:O	1:G:262:SER:N	2.50	0.44
1:C:118:TYR:HB3	1:C:140:VAL:HG12	2.00	0.44
1:A:24:ASP:O	1:A:25:LEU:HD13	2.17	0.44
1:D:74:ASN:O	1:D:259:HIS:HA	2.17	0.44
1:D:99:SER:HB2	1:D:233:THR:HG23	1.99	0.44
1:G:34:MET:HE1	1:G:250:GLU:HA	2.00	0.44
1:D:123:ASN:HB3	1:D:135:LEU:HD11	1.99	0.44
1:B:52:LEU:CD2	1:B:233:THR:HG22	2.48	0.44
1:F:70:GLU:OE2	1:F:205:LYS:NZ	2.33	0.44
1:B:169:VAL:HG21	1:B:224:PHE:CZ	2.53	0.43
1:D:199:THR:OG1	1:D:204:MET:HE1	2.18	0.43
1:C:118:TYR:CB	1:C:140:VAL:HG12	2.48	0.43
1:D:156:ILE:HD12	1:E:218:SER:CB	2.48	0.43
1:G:139:ASN:OD1	1:G:140:VAL:N	2.51	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:146:LEU:HD13	1:F:181:PRO:HD3	2.00	0.43
1:F:188:ASN:O	1:F:192:GLY:N	2.43	0.43
1:A:123:ASN:HB3	1:A:135:LEU:HB3	2.01	0.43
1:C:113:MET:CE	1:D:145:THR:HG21	2.49	0.43
1:B:123:ASN:HD22	1:C:135:LEU:HD11	1.84	0.43
1:A:94:GLU:O	1:A:163:LYS:NZ	2.47	0.43
1:G:190:VAL:HG12	1:G:264:ASN:ND2	2.33	0.42
1:A:65:TYR:CE1	1:A:78:LEU:HD21	2.55	0.42
1:B:67:VAL:HG22	1:B:210:PHE:CD2	2.54	0.42
1:B:191:TYR:C	1:B:266:LYS:HG3	2.45	0.42
1:A:12:THR:HG22	1:B:43:ILE:HD11	2.00	0.42
1:B:165:VAL:HG22	1:B:166:GLY:N	2.35	0.42
1:C:2:ASP:HB2	1:C:9:THR:HA	2.01	0.42
1:C:123:ASN:OD1	1:C:135:LEU:HB3	2.20	0.42
1:G:122:GLY:HA2	1:G:136:ILE:HD13	2.02	0.42
1:C:110:LYS:HD3	1:D:175:VAL:HG23	2.02	0.42
1:E:99:SER:OG	1:F:37:LYS:HE2	2.20	0.42
1:G:263:THR:HG23	1:G:264:ASN:OD1	2.20	0.42
1:F:14:ILE:HG22	1:F:14:ILE:O	2.20	0.42
1:D:113:MET:CE	1:E:147:LYS:HE2	2.50	0.42
1:F:191:TYR:CE1	1:F:200:ALA:HB1	2.55	0.42
1:G:2:ASP:HB2	1:G:9:THR:HA	2.01	0.42
1:G:74:ASN:O	1:G:259:HIS:HA	2.20	0.42
1:B:66:ARG:C	1:B:78:LEU:HD12	2.45	0.42
1:B:259:HIS:CE1	1:B:266:LYS:HB3	2.56	0.41
1:E:24:ASP:O	1:E:25:LEU:HD13	2.21	0.41
2:F:401:MPD:HM3	2:F:401:MPD:O4	2.20	0.41
1:G:248:ILE:HG21	1:G:277:ARG:CZ	2.50	0.41
1:A:123:ASN:ND2	1:B:135:LEU:HD11	2.34	0.41
1:C:139:ASN:OD1	1:C:140:VAL:N	2.53	0.41
1:E:193:ASN:O	1:E:256:TYR:OH	2.37	0.41
1:B:125:THR:HG22	1:C:135:LEU:HD12	2.02	0.41
1:C:135:LEU:HD23	1:C:135:LEU:C	2.46	0.41
1:F:37:LYS:NZ	1:F:39:PHE:HB2	2.35	0.41
1:D:117:THR:OG1	1:D:141:SER:OG	2.38	0.41
1:B:31:GLU:OE1	1:B:31:GLU:N	2.46	0.40
1:C:184:ARG:NH1	1:C:254:ASP:OD2	2.51	0.40
1:C:29:ASP:OD2	1:C:32:ASN:ND2	2.49	0.40
1:C:165:VAL:HG22	1:C:166:GLY:N	2.37	0.40
1:D:24:ASP:O	1:D:25:LEU:HD13	2.21	0.40
1:G:165:VAL:HG22	1:G:166:GLY:N	2.37	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	288/302 (95%)	274 (95%)	14 (5%)	0	100	100
1	B	287/302 (95%)	274 (96%)	13 (4%)	0	100	100
1	C	287/302 (95%)	276 (96%)	11 (4%)	0	100	100
1	D	288/302 (95%)	275 (96%)	13 (4%)	0	100	100
1	E	287/302 (95%)	276 (96%)	11 (4%)	0	100	100
1	F	286/302 (95%)	276 (96%)	10 (4%)	0	100	100
1	G	288/302 (95%)	273 (95%)	13 (4%)	2 (1%)	18	49
All	All	2011/2114 (95%)	1924 (96%)	85 (4%)	2 (0%)	48	78

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	261	THR
1	G	15	GLY

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	256/266 (96%)	249 (97%)	7 (3%)	39	67
1	B	255/266 (96%)	252 (99%)	3 (1%)	63	78

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	C	255/266 (96%)	246 (96%)	9 (4%)	32	62
1	D	256/266 (96%)	248 (97%)	8 (3%)	35	64
1	E	255/266 (96%)	248 (97%)	7 (3%)	39	67
1	F	254/266 (96%)	251 (99%)	3 (1%)	63	78
1	G	256/266 (96%)	252 (98%)	4 (2%)	55	75
All	All	1787/1862 (96%)	1746 (98%)	41 (2%)	44	70

All (41) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	25	LEU
1	A	46	LYS
1	A	115	THR
1	A	117	THR
1	A	125	THR
1	A	168	LYS
1	A	239	SER
1	B	101	TYR
1	B	258	LEU
1	B	259	HIS
1	C	37	LYS
1	C	92	ASP
1	C	101	TYR
1	C	109	THR
1	C	125	THR
1	C	204	MET
1	C	205	LYS
1	C	242	GLN
1	C	261	THR
1	D	25	LEU
1	D	101	TYR
1	D	116	LEU
1	D	123	ASN
1	D	135	LEU
1	D	201	ASN
1	D	204	MET
1	D	205	LYS
1	E	101	TYR
1	E	116	LEU
1	E	125	THR

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Mol	Chain	Res	Type
1	E	193	ASN
1	E	201	ASN
1	E	204	MET
1	E	208	GLU
1	F	190	VAL
1	F	201	ASN
1	F	208	GLU
1	G	37	LYS
1	G	93	ASN
1	G	101	TYR
1	G	116	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	201	ASN
1	A	293	ASN
1	B	121	ASN
1	B	123	ASN
1	C	87	GLN
1	D	177	GLN
1	D	178	ASN
1	E	193	ASN
1	F	194	GLN
1	F	201	ASN
1	F	259	HIS
1	F	293	ASN
1	G	201	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry

13 ligands are modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	MPD	A	403	-	7,7,7	0.37	0	9,10,10	0.90	0
2	MPD	A	402	-	7,7,7	0.29	0	9,10,10	0.44	0
2	MPD	B	401	-	7,7,7	0.34	0	9,10,10	0.27	0
2	MPD	F	402	-	7,7,7	0.30	0	9,10,10	0.66	0
2	MPD	E	401	-	7,7,7	0.30	0	9,10,10	0.43	0
2	MPD	D	401	-	7,7,7	0.34	0	9,10,10	0.57	0
2	MPD	G	402	-	7,7,7	0.33	0	9,10,10	0.34	0
2	MPD	A	401	-	7,7,7	0.33	0	9,10,10	0.45	0
2	MPD	C	401	-	7,7,7	0.31	0	9,10,10	0.38	0
2	MPD	G	401	-	7,7,7	0.32	0	9,10,10	0.17	0
2	MPD	F	401	-	7,7,7	0.34	0	9,10,10	0.62	0
2	MPD	D	402	-	7,7,7	0.36	0	9,10,10	0.85	0
2	MPD	C	402	-	7,7,7	0.29	0	9,10,10	0.54	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	MPD	A	403	-	-	2/5/5/5	-
2	MPD	A	402	-	-	4/5/5/5	-
2	MPD	B	401	-	-	2/5/5/5	-
2	MPD	F	402	-	-	4/5/5/5	-
2	MPD	E	401	-	-	2/5/5/5	-
2	MPD	D	401	-	-	3/5/5/5	-
2	MPD	G	402	-	-	3/5/5/5	-
2	MPD	A	401	-	-	3/5/5/5	-
2	MPD	C	401	-	-	2/5/5/5	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	MPD	G	401	-	-	2/5/5/5	-
2	MPD	F	401	-	-	2/5/5/5	-
2	MPD	D	402	-	-	2/5/5/5	-
2	MPD	C	402	-	-	1/5/5/5	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (32) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	401	MPD	C2-C3-C4-C5
2	A	402	MPD	C2-C3-C4-O4
2	A	402	MPD	C2-C3-C4-C5
2	A	403	MPD	C2-C3-C4-C5
2	D	401	MPD	C2-C3-C4-O4
2	D	402	MPD	C2-C3-C4-C5
2	F	401	MPD	C2-C3-C4-O4
2	D	401	MPD	O2-C2-C3-C4
2	F	401	MPD	O2-C2-C3-C4
2	A	403	MPD	C2-C3-C4-O4
2	G	402	MPD	CM-C2-C3-C4
2	B	401	MPD	C2-C3-C4-C5
2	C	402	MPD	C2-C3-C4-C5
2	D	401	MPD	C2-C3-C4-C5
2	E	401	MPD	C2-C3-C4-C5
2	F	402	MPD	C2-C3-C4-C5
2	A	401	MPD	O2-C2-C3-C4
2	A	402	MPD	O2-C2-C3-C4
2	F	402	MPD	O2-C2-C3-C4
2	G	401	MPD	O2-C2-C3-C4
2	G	402	MPD	O2-C2-C3-C4
2	A	401	MPD	C2-C3-C4-O4
2	B	401	MPD	C2-C3-C4-O4
2	C	401	MPD	C2-C3-C4-O4
2	D	402	MPD	C2-C3-C4-O4
2	F	402	MPD	C2-C3-C4-O4
2	A	402	MPD	CM-C2-C3-C4
2	C	401	MPD	C1-C2-C3-C4
2	E	401	MPD	C1-C2-C3-C4

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Mol	Chain	Res	Type	Atoms
2	F	402	MPD	CM-C2-C3-C4
2	G	401	MPD	C1-C2-C3-C4
2	G	402	MPD	C1-C2-C3-C4

There are no ring outliers.

5 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	402	MPD	1	0
2	F	402	MPD	1	0
2	A	401	MPD	1	0
2	F	401	MPD	1	0
2	D	402	MPD	2	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

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	292/302 (96%)	-0.08	7 (2%)	59	38	40, 60, 104, 125	0
1	B	291/302 (96%)	0.01	8 (2%)	56	35	40, 65, 113, 124	0
1	C	291/302 (96%)	-0.03	8 (2%)	56	35	36, 59, 106, 132	0
1	D	292/302 (96%)	-0.16	2 (0%)	84	68	38, 58, 108, 131	0
1	E	291/302 (96%)	0.01	9 (3%)	51	30	42, 64, 110, 124	0
1	F	290/302 (96%)	-0.04	5 (1%)	69	48	42, 63, 112, 136	0
1	G	292/302 (96%)	-0.02	5 (1%)	69	48	39, 62, 106, 132	0
All	All	2039/2114 (96%)	-0.05	44 (2%)	62	41	36, 61, 111, 136	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	6	ASN	5.3
1	E	11	THR	4.2
1	F	15	GLY	4.0
1	A	7	ILE	3.7
1	E	7	ILE	3.7
1	C	7	ILE	3.5
1	C	15	GLY	3.3
1	G	16	SER	3.2
1	B	72	GLY	3.1
1	F	1	ALA	3.0
1	A	202	GLY	3.0
1	E	15	GLY	3.0
1	F	11	THR	3.0
1	B	15	GLY	2.9
1	A	11	THR	2.9
1	G	9	THR	2.9
1	A	5	ILE	2.8

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Mol	Chain	Res	Type	RSRZ
1	D	1	ALA	2.7
1	C	73	ALA	2.7
1	B	12	THR	2.6
1	B	5	ILE	2.6
1	B	7	ILE	2.6
1	B	1	ALA	2.6
1	C	6	ASN	2.5
1	C	293	ASN	2.4
1	E	19	THR	2.4
1	C	1	ALA	2.4
1	E	12	THR	2.4
1	G	202	GLY	2.3
1	A	1	ALA	2.3
1	B	123	ASN	2.3
1	E	6	ASN	2.3
1	D	11	THR	2.3
1	G	13	ASP	2.3
1	C	12	THR	2.2
1	F	5	ILE	2.2
1	B	73	ALA	2.2
1	G	1	ALA	2.2
1	F	13	ASP	2.2
1	A	9	THR	2.2
1	E	1	ALA	2.1
1	E	5	ILE	2.0
1	E	10	GLY	2.0
1	C	5	ILE	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

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	MPD	D	401	8/8	0.72	0.30	87,107,111,121	0
2	MPD	A	403	8/8	0.78	0.28	88,109,127,130	0
2	MPD	G	401	8/8	0.78	0.24	93,117,139,139	0
2	MPD	F	401	8/8	0.79	0.28	90,108,126,129	0
2	MPD	A	401	8/8	0.79	0.24	83,100,117,117	0
2	MPD	C	402	8/8	0.80	0.28	92,111,143,143	0
2	MPD	C	401	8/8	0.81	0.22	97,123,128,139	0
2	MPD	D	402	8/8	0.81	0.26	83,100,127,127	0
2	MPD	F	402	8/8	0.84	0.26	87,111,126,133	0
2	MPD	E	401	8/8	0.86	0.24	102,123,136,137	0
2	MPD	G	402	8/8	0.86	0.18	89,112,130,135	0
2	MPD	A	402	8/8	0.88	0.26	93,111,121,126	0
2	MPD	B	401	8/8	0.91	0.20	101,121,131,136	0

6.5 Other polymers [i](#)

There are no such residues in this entry.