



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 12:50 PM UTC

PDB ID : 1A6Z / pdb_00001a6z
Title : HFE (HUMAN) HEMOCHROMATOSIS PROTEIN
Authors : Lebron, J.A.; Bennett, M.J.; Vaughn, D.E.; Chirino, A.J.; Snow, P.M.;
Mintier, G.A.; Feder, J.N.; Bjorkman, P.J.
Deposited on : 1998-03-04
Resolution : 2.60 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
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

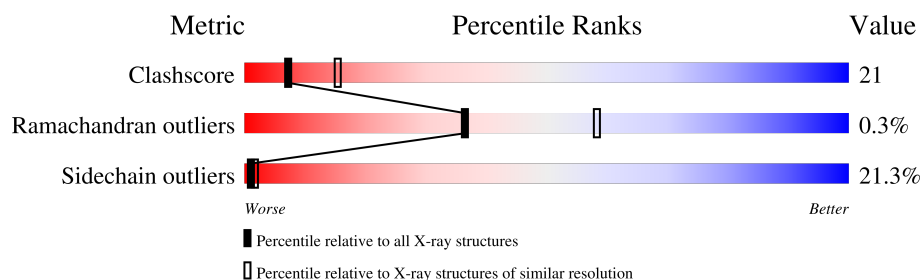
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
Clashscore	190562	4347 (2.60-2.60)
Ramachandran outliers	187476	4277 (2.60-2.60)
Sidechain outliers	187428	4277 (2.60-2.60)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	275	
1	C	275	
2	B	99	
2	D	99	

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 6099 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 HFE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	272	Total	C	N	O	S	0	0	0
			2217	1409	386	410	12			
1	C	272	Total	C	N	O	S	0	0	0
			2217	1409	386	410	12			

- Molecule 2 is a protein called BETA-2-MICROGLOBULIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total	C	N	O	S	0	0	0
			821	522	138	158	3			
2	D	99	Total	C	N	O	S	0	0	0
			821	522	138	158	3			

- Molecule 3 is water.

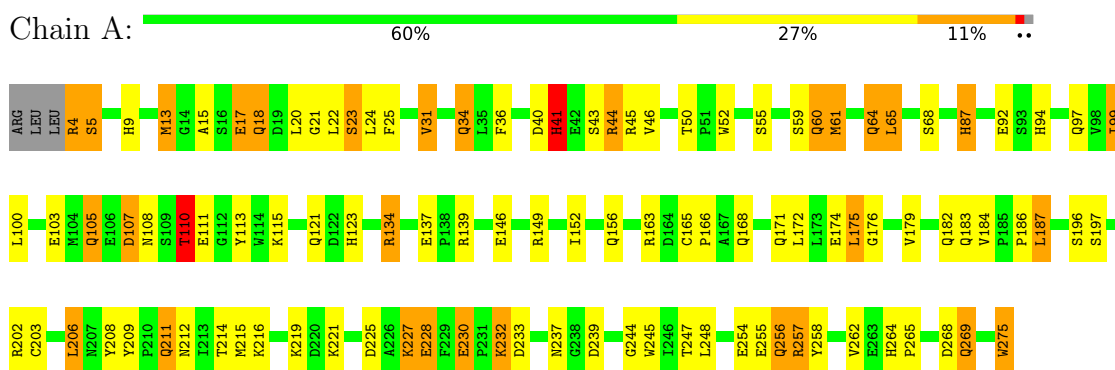
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	10	Total	O	0	0
			10	10		
3	B	2	Total	O	0	0
			2	2		
3	C	8	Total	O	0	0
			8	8		
3	D	3	Total	O	0	0
			3	3		

3 Residue-property plots

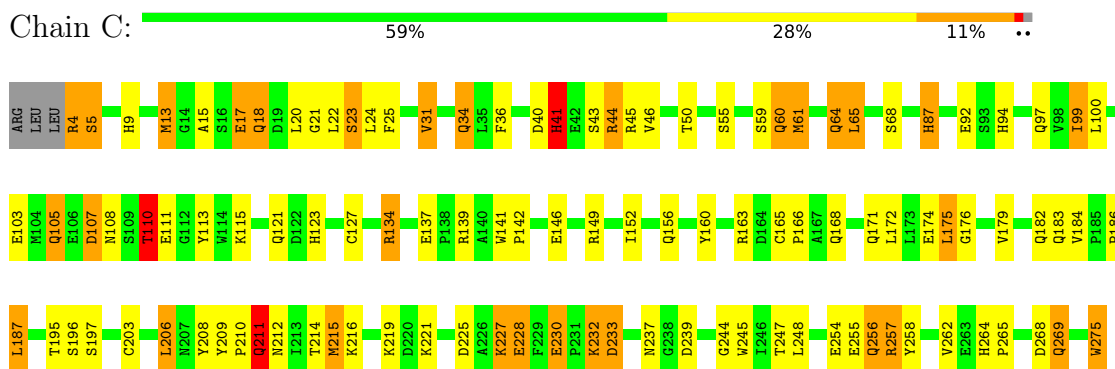
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

Note EDS was not executed.

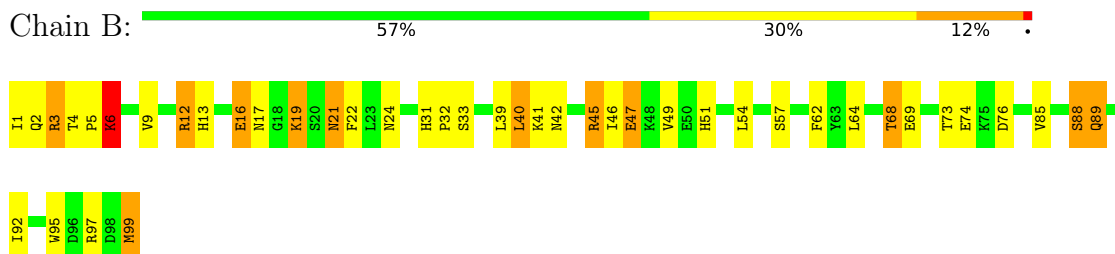
- Molecule 1: HFE



- Molecule 1: HFE



- Molecule 2: BETA-2-MICROGLOBULIN



- Molecule 2: BETA-2-MICROGLOBULIN

Chain D:

51%

39%

9%



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.80Å 100.10Å 147.60Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	15.00 – 2.60	Depositor
% Data completeness (in resolution range)	98.5 (15.00-2.60)	Depositor
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR 3.857	Depositor
R, R_{free}	0.233 , 0.277	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	6099	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.50	0/2285	0.91	8/3112 (0.3%)
1	C	0.50	1/2285 (0.0%)	0.90	7/3112 (0.2%)
2	B	0.47	0/844	0.89	3/1144 (0.3%)
2	D	0.46	0/844	0.89	4/1144 (0.3%)
All	All	0.49	1/6258 (0.0%)	0.90	22/8512 (0.3%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	215	MET	SD-CE	-5.16	1.66	1.79

All (22) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	237	ASN	N-CA-C	-8.01	96.91	109.72
1	A	41	HIS	N-CA-C	-7.70	103.85	113.55
1	C	41	HIS	N-CA-C	-7.58	104.00	113.55
1	A	237	ASN	N-CA-C	-7.56	97.92	109.95
2	B	6	LYS	N-CA-C	-6.78	98.65	109.76
1	C	206	LEU	N-CA-C	6.55	120.36	109.95
2	D	6	LYS	N-CA-C	-6.50	99.09	109.76
1	A	206	LEU	N-CA-C	6.28	119.77	109.72
1	A	187	LEU	N-CA-C	-6.05	99.33	108.96
1	A	211	GLN	N-CA-C	5.95	118.72	111.82
1	C	211	GLN	N-CA-C	5.91	118.67	111.82
2	B	69	GLU	N-CA-C	-5.80	101.90	110.48
1	C	187	LEU	N-CA-C	-5.67	99.94	108.96
2	D	69	GLU	N-CA-C	-5.60	102.19	110.48
1	A	110	THR	N-CA-C	5.47	118.98	110.17
1	C	87	HIS	N-CA-C	-5.43	105.47	113.61
1	A	87	HIS	N-CA-C	-5.37	105.56	113.61
2	B	76	ASP	N-CA-C	5.33	117.95	109.96
1	C	110	THR	N-CA-C	5.29	118.69	110.17

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	15	ALA	N-CA-C	5.16	117.79	110.10
2	D	76	ASP	N-CA-C	5.16	117.70	109.96
1	A	52	TRP	N-CA-C	5.16	118.83	112.54

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	2217	0	2071	93	0
1	C	2217	0	2071	97	0
2	B	821	0	772	33	0
2	D	821	0	772	36	0
3	A	10	0	0	0	0
3	B	2	0	0	2	0
3	C	8	0	0	2	0
3	D	3	0	0	3	0
All	All	6099	0	5686	244	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 21.

All (244) 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:175:LEU:HD13	1:A:175:LEU:H	1.32	0.94
2:B:88:SER:HB2	2:B:89:GLN:HE21	1.33	0.93
2:D:88:SER:HB2	2:D:89:GLN:HE21	1.35	0.91
1:C:175:LEU:HD13	1:C:175:LEU:H	1.34	0.90
1:A:17:GLU:HB3	1:A:20:LEU:HB3	1.57	0.87
1:C:17:GLU:HB3	1:C:20:LEU:HB3	1.58	0.86
1:C:24:LEU:HD23	1:C:25:PHE:H	1.40	0.85
1:A:24:LEU:HD23	1:A:25:PHE:H	1.41	0.84
1:C:24:LEU:HD23	1:C:25:PHE:N	1.96	0.80

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:24:LEU:HD23	1:A:25:PHE:N	1.98	0.78
1:C:61:MET:HE2	1:C:64:GLN:HE22	1.50	0.76
2:B:12:ARG:HB2	2:B:22:PHE:HB2	1.68	0.76
1:A:105:GLN:HA	1:A:105:GLN:HE21	1.52	0.74
1:A:61:MET:HE2	1:A:64:GLN:HE22	1.50	0.74
1:C:105:GLN:HE21	1:C:105:GLN:HA	1.49	0.74
2:D:12:ARG:HB2	2:D:22:PHE:HB2	1.70	0.74
1:C:105:GLN:HA	1:C:105:GLN:NE2	2.06	0.71
1:A:175:LEU:HD13	1:A:175:LEU:N	2.05	0.71
1:A:268:ASP:HB2	1:A:269:GLN:HE21	1.58	0.69
1:C:175:LEU:HD13	1:C:175:LEU:N	2.07	0.69
1:C:13:MET:HE3	2:D:62:PHE:HE1	1.57	0.68
1:C:268:ASP:HB2	1:C:269:GLN:HE21	1.59	0.68
1:A:230:GLU:CD	1:A:230:GLU:H	2.00	0.68
1:C:5:SER:HB3	1:C:105:GLN:NE2	2.08	0.68
1:A:105:GLN:HA	1:A:105:GLN:NE2	2.08	0.67
1:A:44:ARG:HH11	1:A:44:ARG:HB3	1.60	0.67
2:D:6:LYS:HG2	3:D:101:HOH:O	1.94	0.67
1:C:61:MET:HE2	1:C:64:GLN:NE2	2.09	0.67
1:C:215:MET:HE1	1:C:244:GLY:C	2.19	0.67
1:A:5:SER:HB3	1:A:105:GLN:NE2	2.09	0.66
1:A:215:MET:HE1	1:A:244:GLY:C	2.20	0.66
1:C:44:ARG:HB3	1:C:44:ARG:HH11	1.59	0.66
1:C:110:THR:HG21	1:C:166:PRO:HG3	1.78	0.66
1:A:61:MET:HE2	1:A:64:GLN:NE2	2.08	0.66
1:C:13:MET:HE3	2:D:62:PHE:CE1	2.31	0.66
1:C:9:HIS:ND1	3:C:277:HOH:O	2.28	0.66
1:A:65:LEU:HD12	1:A:168:GLN:HE21	1.61	0.66
1:C:105:GLN:HE21	1:C:105:GLN:CA	2.10	0.65
1:A:225:ASP:HB2	1:A:227:LYS:HE3	1.79	0.65
1:C:65:LEU:HD12	1:C:168:GLN:HE21	1.61	0.65
1:A:110:THR:HG21	1:A:166:PRO:HG3	1.79	0.64
2:D:9:VAL:CG2	2:D:95:TRP:HA	2.28	0.64
1:A:105:GLN:HE21	1:A:105:GLN:CA	2.11	0.64
1:C:225:ASP:HB2	1:C:227:LYS:HE3	1.79	0.64
1:C:230:GLU:CD	1:C:230:GLU:H	2.05	0.63
1:C:31:VAL:HG12	1:C:36:PHE:CD2	2.35	0.62
1:A:165:CYS:HB3	1:A:166:PRO:HD3	1.80	0.62
1:A:172:LEU:HA	1:A:175:LEU:HD21	1.81	0.62
1:C:172:LEU:HA	1:C:175:LEU:HD21	1.81	0.61
2:B:9:VAL:CG2	2:B:95:TRP:HA	2.30	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:92:GLU:HB3	1:A:94:HIS:NE2	2.17	0.60
1:A:13:MET:HE2	2:B:54:LEU:HD23	1.84	0.60
1:A:17:GLU:CB	1:A:20:LEU:HB3	2.32	0.60
1:A:31:VAL:HG12	1:A:36:PHE:CD2	2.38	0.59
1:C:165:CYS:HB3	1:C:166:PRO:HD3	1.84	0.59
1:C:92:GLU:HB3	1:C:94:HIS:NE2	2.18	0.58
2:D:39:LEU:HD12	2:D:68:THR:OG1	2.04	0.57
1:A:230:GLU:CD	1:A:230:GLU:N	2.61	0.57
2:B:40:LEU:HD12	2:B:45:ARG:HA	1.85	0.57
1:C:219:LYS:HE2	1:C:257:ARG:NH2	2.19	0.57
1:C:215:MET:HE1	1:C:245:TRP:N	2.21	0.56
1:A:24:LEU:O	1:A:25:PHE:HB2	2.03	0.56
2:B:3:ARG:HG2	2:B:3:ARG:HH11	1.71	0.56
1:C:174:GLU:C	1:C:176:GLY:H	2.14	0.56
2:D:9:VAL:HG21	2:D:95:TRP:HA	1.88	0.56
1:A:107:ASP:O	1:A:108:ASN:HB2	2.06	0.55
1:A:219:LYS:HE2	1:A:257:ARG:NH2	2.21	0.55
2:D:40:LEU:HD12	2:D:45:ARG:HA	1.87	0.55
2:D:41:LYS:HD2	3:D:100:HOH:O	2.05	0.55
1:A:174:GLU:C	1:A:176:GLY:H	2.15	0.55
1:C:18:GLN:C	1:C:20:LEU:H	2.13	0.55
1:C:230:GLU:CD	1:C:230:GLU:N	2.65	0.55
1:C:24:LEU:O	1:C:25:PHE:HB2	2.05	0.55
1:A:4:ARG:O	1:A:4:ARG:HG2	2.07	0.55
1:C:215:MET:HE3	1:C:232:LYS:HB3	1.89	0.54
1:A:215:MET:HE3	1:A:232:LYS:HB3	1.89	0.54
1:A:43:SER:OG	1:A:45:ARG:HG2	2.08	0.54
1:A:202:ARG:HH21	2:B:99:MET:HE3	1.72	0.54
1:C:31:VAL:HG12	1:C:36:PHE:HD2	1.69	0.54
1:A:18:GLN:C	1:A:20:LEU:H	2.14	0.54
1:C:107:ASP:O	1:C:108:ASN:HB2	2.08	0.54
1:A:163:ARG:O	1:A:166:PRO:HD2	2.08	0.53
2:B:9:VAL:HG21	2:B:95:TRP:HA	1.89	0.53
2:B:39:LEU:HD12	2:B:68:THR:OG1	2.08	0.53
1:C:215:MET:HG2	1:C:262:VAL:HG22	1.91	0.53
2:D:13:HIS:HB2	2:D:21:ASN:HD21	1.72	0.53
1:A:31:VAL:HG12	1:A:36:PHE:HD2	1.73	0.53
1:A:61:MET:HE1	1:A:171:GLN:HB3	1.91	0.53
1:C:13:MET:HE2	2:D:54:LEU:HD23	1.91	0.53
2:D:31:HIS:CD2	2:D:32:PRO:HA	2.44	0.53
1:C:43:SER:OG	1:C:45:ARG:HG2	2.09	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:4:ARG:HD3	1:C:4:ARG:N	2.23	0.52
2:B:3:ARG:HG2	2:B:3:ARG:NH1	2.24	0.52
1:A:4:ARG:HD3	1:A:4:ARG:N	2.24	0.52
1:A:215:MET:HE1	1:A:245:TRP:N	2.24	0.52
1:C:17:GLU:CB	1:C:20:LEU:HB3	2.33	0.52
2:B:88:SER:HB2	2:B:89:GLN:NE2	2.14	0.52
1:C:15:ALA:O	1:C:23:SER:HB3	2.09	0.52
1:A:215:MET:HG2	1:A:262:VAL:HG22	1.90	0.52
2:B:31:HIS:CD2	2:B:32:PRO:HA	2.44	0.52
1:A:34:GLN:HG3	1:A:209:TYR:OH	2.10	0.52
1:A:55:SER:O	1:A:59:SER:HB3	2.10	0.51
1:A:174:GLU:HB3	1:A:175:LEU:HD13	1.91	0.51
2:B:13:HIS:HB2	2:B:21:ASN:HD21	1.73	0.51
2:D:45:ARG:HH11	2:D:47:GLU:HG3	1.76	0.51
1:C:127:CYS:SG	3:C:282:HOH:O	2.59	0.51
1:A:13:MET:HE3	2:B:62:PHE:HE1	1.74	0.51
2:B:41:LYS:O	2:B:42:ASN:HB2	2.11	0.51
1:C:4:ARG:O	1:C:4:ARG:HG2	2.09	0.51
1:C:64:GLN:HG2	1:C:65:LEU:N	2.26	0.51
1:A:36:PHE:HA	1:A:50:THR:HG23	1.93	0.51
1:A:99:ILE:HG22	1:A:115:LYS:HB2	1.91	0.51
1:A:15:ALA:O	1:A:23:SER:HB3	2.11	0.50
2:B:6:LYS:HG2	3:B:100:HOH:O	2.11	0.50
1:C:99:ILE:HG22	1:C:115:LYS:HB2	1.92	0.50
1:C:97:GLN:OE1	2:D:31:HIS:HE1	1.93	0.50
2:B:45:ARG:HH11	2:B:47:GLU:HG3	1.76	0.50
1:C:55:SER:O	1:C:59:SER:HB3	2.11	0.50
2:D:41:LYS:O	2:D:42:ASN:HB2	2.12	0.50
2:B:4:THR:OG1	2:B:5:PRO:HD2	2.12	0.49
1:C:174:GLU:HB3	1:C:175:LEU:HD13	1.93	0.49
1:A:64:GLN:HG2	1:A:65:LEU:N	2.26	0.49
1:C:34:GLN:HG3	1:C:209:TYR:OH	2.13	0.48
1:C:36:PHE:HA	1:C:50:THR:HG23	1.96	0.48
1:C:61:MET:HE1	1:C:171:GLN:HB3	1.93	0.48
1:C:227:LYS:HB2	1:C:227:LYS:NZ	2.28	0.48
2:D:88:SER:HB2	2:D:89:GLN:NE2	2.17	0.48
1:C:17:GLU:HB3	1:C:20:LEU:O	2.14	0.48
2:D:3:ARG:HG2	2:D:3:ARG:HH11	1.78	0.48
1:C:13:MET:CE	2:D:54:LEU:HG	2.43	0.48
2:D:4:THR:OG1	2:D:5:PRO:HD2	2.14	0.47
2:B:13:HIS:NE2	3:B:101:HOH:O	2.34	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:GLU:HB3	1:A:20:LEU:O	2.14	0.47
2:D:78:TYR:OH	3:D:100:HOH:O	2.19	0.47
1:C:163:ARG:O	1:C:166:PRO:HD2	2.14	0.47
1:A:202:ARG:NH2	2:B:99:MET:HE3	2.29	0.47
1:C:44:ARG:HH11	1:C:44:ARG:CB	2.26	0.47
1:C:239:ASP:C	1:C:239:ASP:OD1	2.57	0.47
1:A:13:MET:HE3	2:B:62:PHE:CE1	2.50	0.47
1:C:25:PHE:HB3	1:C:41:HIS:HB2	1.97	0.47
2:B:54:LEU:HA	2:B:64:LEU:HD13	1.97	0.47
1:A:172:LEU:O	1:A:175:LEU:HD22	2.15	0.46
1:C:9:HIS:HB3	1:C:113:TYR:OH	2.14	0.46
1:C:174:GLU:C	1:C:176:GLY:N	2.72	0.46
1:A:264:HIS:CG	1:A:265:PRO:HD2	2.50	0.46
2:D:3:ARG:HG2	2:D:3:ARG:NH1	2.29	0.46
2:D:49:VAL:HA	2:D:68:THR:HG23	1.98	0.46
1:A:174:GLU:C	1:A:176:GLY:N	2.73	0.46
1:C:87:HIS:HE1	1:C:123:HIS:CE1	2.34	0.46
1:A:256:GLN:H	1:A:256:GLN:HG3	1.47	0.46
1:C:172:LEU:HA	1:C:175:LEU:CD2	2.45	0.46
1:C:256:GLN:H	1:C:256:GLN:HG3	1.42	0.46
1:A:9:HIS:HB3	1:A:113:TYR:OH	2.15	0.46
1:C:21:GLY:O	1:C:22:LEU:HB2	2.16	0.46
1:A:172:LEU:HA	1:A:175:LEU:CD2	2.45	0.46
1:A:100:LEU:HD12	1:A:100:LEU:C	2.41	0.45
1:A:87:HIS:HE1	1:A:123:HIS:CE1	2.35	0.45
1:A:13:MET:CE	2:B:54:LEU:HG	2.46	0.45
1:C:92:GLU:OE1	1:C:92:GLU:HA	2.17	0.45
1:C:225:ASP:O	1:C:228:GLU:HB2	2.16	0.45
1:A:65:LEU:HD12	1:A:168:GLN:NE2	2.31	0.45
1:A:227:LYS:HB2	1:A:227:LYS:NZ	2.31	0.45
1:A:239:ASP:C	1:A:239:ASP:OD1	2.59	0.45
2:D:45:ARG:NH1	2:D:47:GLU:HG3	2.32	0.45
2:B:17:ASN:OD1	2:B:73:THR:C	2.60	0.45
1:A:97:GLN:OE1	2:B:31:HIS:HE1	2.01	0.44
2:B:1:ILE:HG13	2:B:2:GLN:N	2.32	0.44
1:A:21:GLY:O	1:A:22:LEU:HB2	2.16	0.44
1:A:245:TRP:CD1	1:A:245:TRP:C	2.95	0.44
2:D:54:LEU:HA	2:D:64:LEU:HD13	1.98	0.44
1:A:163:ARG:C	1:A:166:PRO:HD2	2.43	0.44
1:C:264:HIS:CG	1:C:265:PRO:HD2	2.52	0.44
1:A:44:ARG:HH11	1:A:44:ARG:CB	2.27	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:17:GLU:OE1	1:A:17:GLU:HA	2.18	0.44
2:B:9:VAL:HG23	2:B:95:TRP:HA	2.00	0.44
1:C:172:LEU:O	1:C:175:LEU:HD22	2.18	0.44
1:C:100:LEU:HD12	1:C:100:LEU:C	2.42	0.44
1:C:186:PRO:HB3	1:C:208:TYR:HB3	1.98	0.44
1:A:225:ASP:O	1:A:228:GLU:HB2	2.18	0.44
1:C:245:TRP:CD1	1:C:245:TRP:C	2.95	0.44
1:A:25:PHE:HB3	1:A:41:HIS:HB2	1.99	0.43
1:A:134:ARG:HB3	1:A:134:ARG:CZ	2.48	0.43
2:D:10:TYR:N	2:D:10:TYR:CD1	2.86	0.43
2:D:33:SER:HB2	2:D:54:LEU:HD21	2.00	0.43
2:D:45:ARG:HD2	2:D:47:GLU:OE2	2.18	0.43
1:A:92:GLU:HA	1:A:92:GLU:OE1	2.18	0.43
1:A:255:GLU:HB3	1:A:275:TRP:CD2	2.53	0.43
2:B:49:VAL:HA	2:B:68:THR:HG23	1.99	0.43
2:D:9:VAL:HG23	2:D:95:TRP:HA	1.97	0.43
1:C:134:ARG:HB3	1:C:134:ARG:CZ	2.47	0.43
1:A:203:CYS:O	1:A:245:TRP:HA	2.19	0.43
1:C:255:GLU:HB3	1:C:275:TRP:CD2	2.54	0.43
1:A:146:GLU:HG3	1:C:149:ARG:NH1	2.34	0.43
1:A:186:PRO:HB3	1:A:208:TYR:HB3	1.99	0.43
2:B:45:ARG:NH1	2:B:47:GLU:HG3	2.33	0.43
1:C:5:SER:CB	1:C:105:GLN:NE2	2.81	0.43
1:A:22:LEU:HB3	1:A:23:SER:H	1.71	0.43
1:C:18:GLN:C	1:C:20:LEU:N	2.77	0.43
1:C:152:ILE:O	1:C:156:GLN:HG3	2.19	0.43
1:C:13:MET:HE2	2:D:54:LEU:CD2	2.49	0.42
2:D:17:ASN:OD1	2:D:73:THR:C	2.62	0.42
1:A:248:LEU:HD21	1:A:258:TYR:CD2	2.53	0.42
2:B:16:GLU:O	2:B:19:LYS:HB2	2.19	0.42
1:C:5:SER:CB	1:C:105:GLN:HE22	2.33	0.42
2:B:41:LYS:HB2	2:B:46:ILE:HD11	2.01	0.42
1:C:65:LEU:HD12	1:C:168:GLN:NE2	2.30	0.42
1:A:227:LYS:H	1:A:227:LYS:HG3	1.67	0.42
1:A:61:MET:HE1	1:A:171:GLN:OE1	2.19	0.42
1:C:233:ASP:O	1:C:244:GLY:HA2	2.20	0.42
1:C:248:LEU:HD21	1:C:258:TYR:CD2	2.55	0.42
2:D:51:HIS:HA	2:D:65:LEU:O	2.19	0.42
1:C:15:ALA:O	1:C:23:SER:CB	2.68	0.42
1:C:175:LEU:N	1:C:175:LEU:HD22	2.35	0.42
1:C:17:GLU:OE1	1:C:17:GLU:HA	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:163:ARG:C	1:C:166:PRO:HD2	2.45	0.42
1:A:60:GLN:H	1:A:60:GLN:HG3	1.58	0.41
1:A:268:ASP:C	1:A:269:GLN:HG3	2.45	0.41
2:B:33:SER:HB2	2:B:54:LEU:HD21	2.02	0.41
2:B:51:HIS:HD2	2:B:51:HIS:O	2.03	0.41
1:C:22:LEU:HB3	1:C:23:SER:H	1.69	0.41
1:A:149:ARG:NH1	1:C:146:GLU:HG3	2.35	0.41
2:D:25:CYS:HB2	2:D:39:LEU:HD21	2.01	0.41
1:A:15:ALA:O	1:A:23:SER:CB	2.68	0.41
1:C:40:ASP:HB3	1:C:43:SER:OG	2.20	0.41
1:A:5:SER:HB3	1:A:105:GLN:HE22	1.85	0.41
1:A:152:ILE:O	1:A:156:GLN:HG3	2.21	0.41
1:A:257:ARG:HE	1:A:257:ARG:HB3	1.67	0.41
1:C:141:TRP:N	1:C:142:PRO:CD	2.83	0.41
1:C:211:GLN:HE21	1:C:211:GLN:HB2	1.62	0.41
1:A:5:SER:CB	1:A:105:GLN:NE2	2.82	0.41
1:A:5:SER:CB	1:A:105:GLN:HE22	2.34	0.41
1:C:61:MET:HE1	1:C:171:GLN:OE1	2.21	0.41
2:D:1:ILE:HG13	2:D:2:GLN:N	2.36	0.41
2:D:51:HIS:HD2	2:D:51:HIS:O	2.04	0.41
1:A:18:GLN:C	1:A:20:LEU:N	2.77	0.41
1:A:43:SER:CB	1:A:45:ARG:HG2	2.51	0.41
1:C:203:CYS:O	1:C:245:TRP:HA	2.20	0.41
1:A:40:ASP:HB3	1:A:43:SER:OG	2.21	0.40
1:C:160:TYR:CD2	1:C:160:TYR:C	3.00	0.40
1:C:5:SER:HB3	1:C:105:GLN:HE22	1.82	0.40
1:C:268:ASP:C	1:C:269:GLN:HG3	2.46	0.40
1:C:60:GLN:H	1:C:60:GLN:HG3	1.56	0.40
1:C:209:TYR:HA	1:C:210:PRO:C	2.47	0.40
2:D:55:SER:HB3	2:D:63:TYR:CZ	2.57	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

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

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

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	270/275 (98%)	247 (92%)	22 (8%)	1 (0%)	30	51
1	C	270/275 (98%)	247 (92%)	22 (8%)	1 (0%)	30	51
2	B	97/99 (98%)	89 (92%)	8 (8%)	0	100	100
2	D	97/99 (98%)	88 (91%)	9 (9%)	0	100	100
All	All	734/748 (98%)	671 (91%)	61 (8%)	2 (0%)	36	58

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	18	GLN
1	C	18	GLN

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	235/249 (94%)	185 (79%)	50 (21%)	1	2
1	C	235/249 (94%)	184 (78%)	51 (22%)	1	2
2	B	92/94 (98%)	73 (79%)	19 (21%)	1	2
2	D	92/94 (98%)	73 (79%)	19 (21%)	1	2
All	All	654/686 (95%)	515 (79%)	139 (21%)	1	2

All (139) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	ARG
1	A	5	SER
1	A	13	MET
1	A	17	GLU
1	A	23	SER
1	A	31	VAL

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Mol	Chain	Res	Type
1	A	34	GLN
1	A	41	HIS
1	A	44	ARG
1	A	46	VAL
1	A	60	GLN
1	A	61	MET
1	A	64	GLN
1	A	65	LEU
1	A	68	SER
1	A	99	ILE
1	A	103	GLU
1	A	105	GLN
1	A	107	ASP
1	A	110	THR
1	A	111	GLU
1	A	121	GLN
1	A	134	ARG
1	A	137	GLU
1	A	139	ARG
1	A	175	LEU
1	A	179	VAL
1	A	182	GLN
1	A	183	GLN
1	A	184	VAL
1	A	187	LEU
1	A	196	SER
1	A	197	SER
1	A	206	LEU
1	A	211	GLN
1	A	212	ASN
1	A	214	THR
1	A	216	LYS
1	A	221	LYS
1	A	227	LYS
1	A	228	GLU
1	A	230	GLU
1	A	232	LYS
1	A	233	ASP
1	A	247	THR
1	A	254	GLU
1	A	256	GLN
1	A	257	ARG

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Mol	Chain	Res	Type
1	A	269	GLN
1	A	275	TRP
2	B	3	ARG
2	B	6	LYS
2	B	12	ARG
2	B	16	GLU
2	B	19	LYS
2	B	21	ASN
2	B	24	ASN
2	B	40	LEU
2	B	45	ARG
2	B	47	GLU
2	B	57	SER
2	B	68	THR
2	B	74	GLU
2	B	85	VAL
2	B	88	SER
2	B	89	GLN
2	B	92	ILE
2	B	97	ARG
2	B	99	MET
1	C	4	ARG
1	C	5	SER
1	C	13	MET
1	C	17	GLU
1	C	23	SER
1	C	31	VAL
1	C	34	GLN
1	C	41	HIS
1	C	44	ARG
1	C	46	VAL
1	C	60	GLN
1	C	61	MET
1	C	64	GLN
1	C	65	LEU
1	C	68	SER
1	C	99	ILE
1	C	103	GLU
1	C	105	GLN
1	C	107	ASP
1	C	110	THR
1	C	111	GLU

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Mol	Chain	Res	Type
1	C	121	GLN
1	C	134	ARG
1	C	137	GLU
1	C	139	ARG
1	C	175	LEU
1	C	179	VAL
1	C	182	GLN
1	C	183	GLN
1	C	184	VAL
1	C	187	LEU
1	C	195	THR
1	C	196	SER
1	C	197	SER
1	C	206	LEU
1	C	211	GLN
1	C	212	ASN
1	C	214	THR
1	C	216	LYS
1	C	221	LYS
1	C	227	LYS
1	C	228	GLU
1	C	230	GLU
1	C	232	LYS
1	C	233	ASP
1	C	247	THR
1	C	254	GLU
1	C	256	GLN
1	C	257	ARG
1	C	269	GLN
1	C	275	TRP
2	D	3	ARG
2	D	6	LYS
2	D	12	ARG
2	D	16	GLU
2	D	19	LYS
2	D	21	ASN
2	D	24	ASN
2	D	40	LEU
2	D	45	ARG
2	D	47	GLU
2	D	57	SER
2	D	68	THR

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Mol	Chain	Res	Type
2	D	74	GLU
2	D	85	VAL
2	D	88	SER
2	D	89	GLN
2	D	92	ILE
2	D	97	ARG
2	D	99	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (29) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	9	HIS
1	A	64	GLN
1	A	67	GLN
1	A	105	GLN
1	A	121	GLN
1	A	123	HIS
1	A	156	GLN
1	A	157	ASN
1	A	168	GLN
1	A	182	GLN
1	A	211	GLN
1	A	269	GLN
2	B	31	HIS
2	B	42	ASN
2	B	51	HIS
2	B	89	GLN
1	C	64	GLN
1	C	67	GLN
1	C	105	GLN
1	C	123	HIS
1	C	168	GLN
1	C	182	GLN
1	C	211	GLN
1	C	269	GLN
2	D	8	GLN
2	D	31	HIS
2	D	42	ASN
2	D	51	HIS
2	D	89	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.