



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 18, 2026 – 04:04 AM UTC

PDB ID : 4ZMC / pdb_00004zmc
Title : Crystal structure of the PmFTN variant E130A soaked in iron (5 min)
Authors : Pfaffen, S.; Murphy, M.E.P.
Deposited on : 2015-05-02
Resolution : 1.90 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

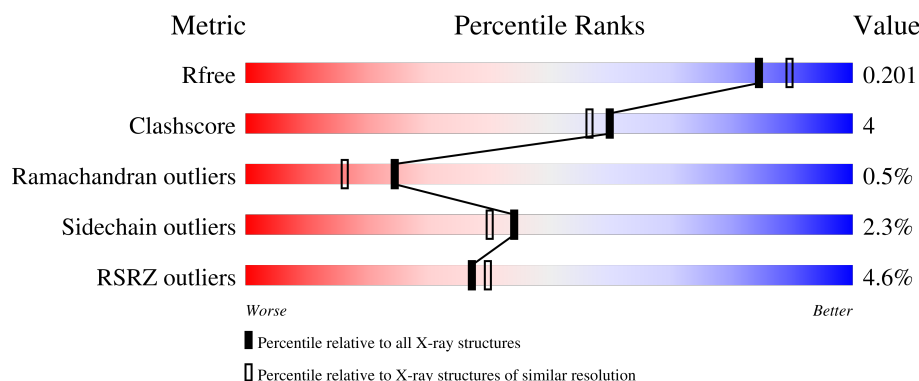
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.90 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	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (1.90-1.90)

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	168	5% 86% 6% • 7%
1	B	168	4% 87% 7% • 6%
1	C	168	4% 85% 8% • 7%
1	D	168	4% 85% 8% • 6%
1	E	168	5% 83% 9% • 6%

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Mol	Chain	Length	Quality of chain
1	F	168	5% 83% 8% • 6%
1	G	168	6% 82% 10% •• 5%
1	H	168	2% 85% 6% • 8%

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 11207 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 Ferritin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	157	Total	C	N	O	S	0	5	0
			1280	802	216	256	6			
1	D	158	Total	C	N	O	S	0	5	0
			1290	810	216	258	6			
1	B	158	Total	C	N	O	S	0	4	0
			1282	806	214	256	6			
1	C	157	Total	C	N	O	S	0	7	0
			1298	811	220	261	6			
1	E	158	Total	C	N	O	S	0	5	0
			1290	810	215	259	6			
1	F	158	Total	C	N	O	S	0	5	0
			1286	808	215	257	6			
1	G	159	Total	C	N	O	S	0	7	0
			1314	826	219	263	6			
1	H	155	Total	C	N	O	S	0	6	0
			1279	799	216	258	6			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	GLY	-	expression tag	UNP B6DMH6
A	130	ALA	GLU	engineered mutation	UNP B6DMH6
D	0	GLY	-	expression tag	UNP B6DMH6
D	130	ALA	GLU	engineered mutation	UNP B6DMH6
B	0	GLY	-	expression tag	UNP B6DMH6
B	130	ALA	GLU	engineered mutation	UNP B6DMH6
C	0	GLY	-	expression tag	UNP B6DMH6
C	130	ALA	GLU	engineered mutation	UNP B6DMH6
E	0	GLY	-	expression tag	UNP B6DMH6
E	130	ALA	GLU	engineered mutation	UNP B6DMH6
F	0	GLY	-	expression tag	UNP B6DMH6
F	130	ALA	GLU	engineered mutation	UNP B6DMH6
G	0	GLY	-	expression tag	UNP B6DMH6

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Chain	Residue	Modelled	Actual	Comment	Reference
G	130	ALA	GLU	engineered mutation	UNP B6DMH6
H	0	GLY	-	expression tag	UNP B6DMH6
H	130	ALA	GLU	engineered mutation	UNP B6DMH6

- Molecule 2 is FE (III) ION (CCD ID: FE) (formula: Fe).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total Fe 1 1	0	0
2	D	1	Total Fe 1 1	0	0
2	C	1	Total Fe 1 1	0	0
2	E	1	Total Fe 1 1	0	0
2	F	1	Total Fe 1 1	0	0
2	G	1	Total Fe 1 1	0	0
2	H	1	Total Fe 1 1	0	0

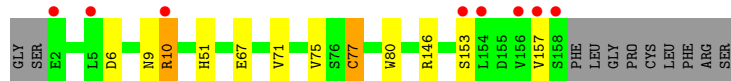
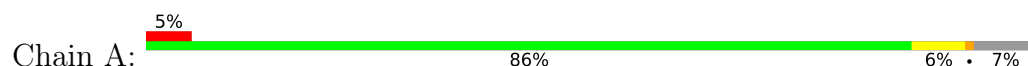
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	106	Total O 106 106	0	0
3	D	121	Total O 121 121	0	0
3	B	102	Total O 102 102	0	0
3	C	119	Total O 119 119	0	0
3	E	110	Total O 110 110	0	0
3	F	93	Total O 93 93	0	0
3	G	119	Total O 119 119	0	0
3	H	111	Total O 111 111	0	0

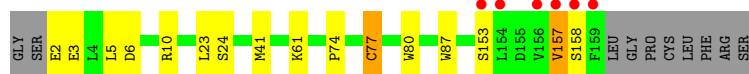
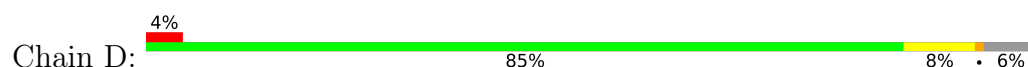
3 Residue-property plots [i](#)

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.

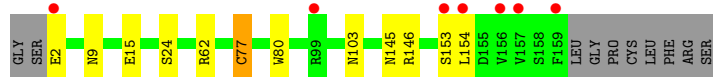
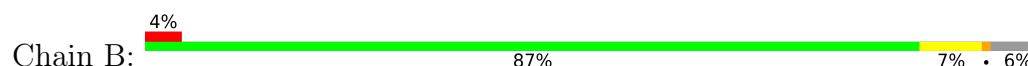
- Molecule 1: Ferritin



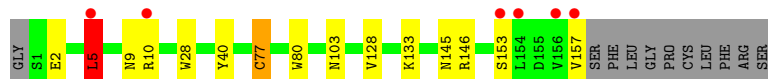
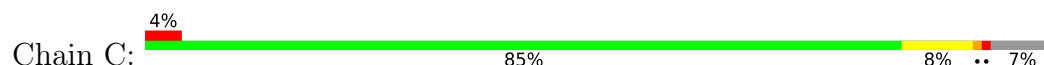
- Molecule 1: Ferritin



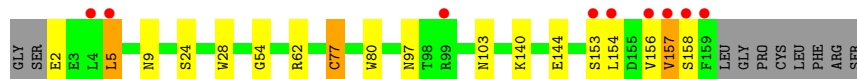
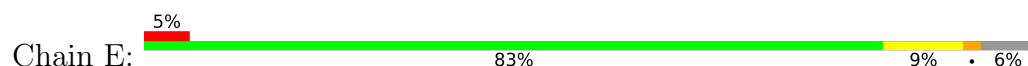
- Molecule 1: Ferritin



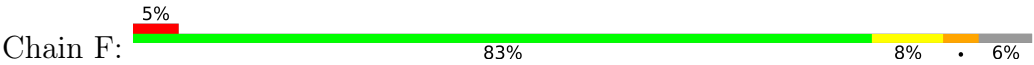
- Molecule 1: Ferritin



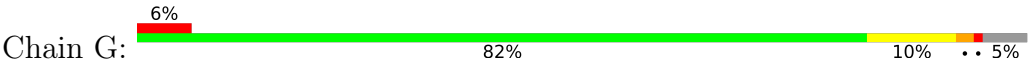
- Molecule 1: Ferritin



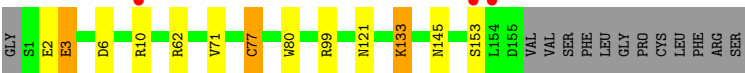
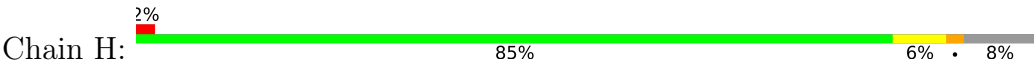
- Molecule 1: Ferritin



● Molecule 1: Ferritin



● Molecule 1: Ferritin



4 Data and refinement statistics

Property	Value	Source
Space group	P 2 3	Depositor
Cell constants a, b, c, α , β , γ	174.98Å 174.98Å 174.98Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.53 – 1.90 48.53 – 1.90	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.53-1.90) 100.0 (48.53-1.90)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.11	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.20 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.169 , 0.208 (Not available) , 0.201	Depositor DCC
R_{free} test set	7020 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	28.1	Xtriage
Anisotropy	0.000	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 41.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.037 for l,-k,h	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	11207	wwPDB-VP
Average B, all atoms (Å ²)	31.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 12.83% 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: FE, YCM

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	1.22	0/1289	1.13	4/1753 (0.2%)
1	B	1.23	0/1288	1.15	2/1752 (0.1%)
1	C	1.18	0/1303	1.14	4/1772 (0.2%)
1	D	1.25	2/1296 (0.2%)	1.15	1/1763 (0.1%)
1	E	1.21	0/1296	1.11	5/1763 (0.3%)
1	F	1.23	2/1296 (0.2%)	1.14	5/1763 (0.3%)
1	G	1.26	1/1320 (0.1%)	1.09	4/1796 (0.2%)
1	H	1.30	2/1284 (0.2%)	1.11	1/1745 (0.1%)
All	All	1.24	7/10372 (0.1%)	1.13	26/14107 (0.2%)

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	H	121	ASN	C-O	-6.81	1.18	1.24
1	H	71	VAL	CA-C	-6.66	1.47	1.53
1	F	71	VAL	N-CA	-6.34	1.41	1.46
1	G	75	VAL	N-CA	5.42	1.51	1.46
1	D	74	PRO	N-CA	5.32	1.53	1.47
1	D	23	LEU	C-O	5.09	1.30	1.24
1	F	27	ILE	N-CA	-5.08	1.40	1.46

All (26) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	9	ASN	N-CA-C	7.23	120.08	111.33
1	D	153	SER	N-CA-C	7.13	120.09	111.82
1	H	153	SER	N-CA-C	6.68	119.39	111.71
1	C	103	ASN	CB-CA-C	-6.42	100.80	110.88
1	G	64	ILE	N-CA-C	-6.24	101.37	107.55
1	A	153	SER	N-CA-C	6.19	119.00	111.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	156	VAL	N-CA-C	-6.00	105.87	111.45
1	E	97	ASN	N-CA-C	-5.89	104.86	111.28
1	A	71	VAL	CA-C-N	-5.76	114.33	120.03
1	A	71	VAL	C-N-CA	-5.76	114.33	120.03
1	E	2	GLU	CA-C-N	5.76	127.93	120.44
1	E	2	GLU	C-N-CA	5.76	127.93	120.44
1	B	103	ASN	CB-CA-C	-5.72	101.90	110.88
1	E	103	ASN	CB-CA-C	-5.67	101.97	110.88
1	C	9	ASN	CB-CA-C	-5.67	101.39	110.79
1	G	152	ARG	CB-CA-C	-5.55	101.25	110.68
1	C	5	LEU	N-CA-C	5.35	117.11	111.28
1	A	9	ASN	CB-CA-C	-5.30	102.00	110.79
1	G	75	VAL	CB-CA-C	-5.27	105.67	110.63
1	E	54	GLY	N-CA-C	-5.16	106.17	112.77
1	F	2	GLU	CA-C-N	5.11	127.08	120.44
1	F	2	GLU	C-N-CA	5.11	127.08	120.44
1	F	12	VAL	N-CA-C	-5.10	105.52	110.42
1	F	103	ASN	CB-CA-C	-5.08	102.91	110.88
1	C	128	VAL	N-CA-C	-5.07	105.76	110.53
1	B	9	ASN	N-CA-C	5.06	117.46	111.33

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1280	0	1209	8	0
1	B	1282	0	1211	9	0
1	C	1298	0	1225	12	0
1	D	1290	0	1216	10	0
1	E	1290	0	1214	12	0
1	F	1286	0	1212	10	0
1	G	1314	0	1244	20	0
1	H	1279	0	1203	10	0
2	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
2	G	1	0	0	0	0
2	H	1	0	0	0	0
3	A	106	0	0	2	0
3	B	102	0	0	4	0
3	C	119	0	0	4	0
3	D	121	0	0	2	0
3	E	110	0	0	0	0
3	F	93	0	0	2	0
3	G	119	0	0	3	0
3	H	111	0	0	1	0
All	All	11207	0	9734	87	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 (87) 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:6[B]:ASP:OD2	1:A:10[B]:ARG:NH2	1.86	1.06
1:D:6:ASP:HB3	1:D:10:ARG:NH2	1.87	0.88
1:G:153:SER:HB2	1:G:154:LEU:HD12	1.60	0.81
1:G:24[A]:SER:OG	1:G:77[A]:YCM:HD2	1.79	0.80
1:H:77[B]:YCM:O	1:H:77[B]:YCM:HD3	1.84	0.78
1:H:77[B]:YCM:O	1:H:77[B]:YCM:CD	2.34	0.76
1:H:77[B]:YCM:O	1:H:77[B]:YCM:OZ1	2.03	0.75
1:G:152:ARG:O	1:G:156:VAL:HG13	1.89	0.73
1:G:94:GLU:HG3	1:G:134[A]:ILE:CD1	2.19	0.72
1:G:77[A]:YCM:O	3:G:301:HOH:O	2.09	0.68
1:G:146:ARG:NH1	3:G:302:HOH:O	2.26	0.68
1:B:146:ARG:NH1	3:B:203:HOH:O	2.29	0.65
1:C:10[A]:ARG:HH11	1:C:10[A]:ARG:HG2	1.59	0.65
1:H:77[B]:YCM:O	1:H:77[B]:YCM:CE	2.46	0.64
1:C:146:ARG:NH1	3:C:301:HOH:O	2.31	0.63
1:B:145[B]:ASN:ND2	3:B:205:HOH:O	2.33	0.61
1:D:2:GLU:CG	1:D:5:LEU:HG	2.31	0.61
1:C:5:LEU:HD12	1:C:5:LEU:O	2.00	0.61
1:E:153:SER:OG	1:E:154:LEU:HD12	2.02	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:146:ARG:NH1	3:A:302:HOH:O	2.36	0.59
1:G:145[A]:ASN:ND2	3:G:306:HOH:O	2.36	0.59
1:G:77[A]:YCM:HA	1:G:80:TRP:CE3	2.39	0.57
1:C:10[A]:ARG:HG2	1:C:10[A]:ARG:NH1	2.17	0.55
1:C:77[B]:YCM:HA	1:C:80:TRP:CE3	2.42	0.55
1:E:157:VAL:HG22	1:F:157:VAL:HG11	1.86	0.55
1:D:6:ASP:HB3	1:D:10:ARG:HH21	1.71	0.54
1:D:157:VAL:HG22	1:G:157:VAL:HG11	1.90	0.53
1:B:77[B]:YCM:HA	1:B:80:TRP:CE3	2.44	0.53
1:G:6[B]:ASP:OD1	1:G:10:ARG:NH1	2.42	0.53
1:A:77[B]:YCM:HA	1:A:80:TRP:CE3	2.43	0.53
1:F:77[B]:YCM:HA	1:F:80:TRP:CE3	2.44	0.52
1:H:133:LYS:O	1:H:133:LYS:HE3	2.09	0.52
1:E:5:LEU:HD12	1:E:9:ASN:ND2	2.25	0.52
1:C:40:TYR:OH	1:C:133:LYS:HE3	2.10	0.51
1:E:154:LEU:HD12	1:E:154:LEU:N	2.26	0.50
1:B:24[B]:SER:O	1:B:77[B]:YCM:OZ1	2.30	0.50
1:C:28:TRP:HB2	1:C:77[B]:YCM:HD2	1.93	0.50
1:E:153:SER:C	1:E:154:LEU:HD12	2.37	0.50
1:E:5:LEU:HD12	1:E:9:ASN:HD22	1.77	0.50
1:H:77[A]:YCM:HA	1:H:80:TRP:CE3	2.47	0.49
1:G:10:ARG:HG2	1:G:10:ARG:HH21	1.77	0.48
1:G:10:ARG:HH21	1:G:10:ARG:CG	2.27	0.48
1:A:67:GLU:OE2	1:E:77[A]:YCM:CE	2.61	0.48
1:H:3:GLU:O	1:H:6[B]:ASP:HB3	2.13	0.48
1:G:144:GLU:OE2	1:G:154:LEU:HD22	2.13	0.48
1:D:77[A]:YCM:HA	1:D:80:TRP:CE3	2.48	0.48
1:E:77[B]:YCM:HA	1:E:80:TRP:CE3	2.48	0.48
1:D:24[A]:SER:OG	1:D:77[A]:YCM:NZ2	2.47	0.47
3:C:386:HOH:O	1:H:77[A]:YCM:HD2	2.14	0.47
1:A:77[A]:YCM:HA	1:A:80:TRP:CE3	2.49	0.47
1:B:77[A]:YCM:HA	1:B:80:TRP:CE3	2.50	0.47
1:C:145[B]:ASN:ND2	3:C:304:HOH:O	2.48	0.46
1:F:5:LEU:HB3	3:F:1138:HOH:O	2.14	0.46
1:G:6[B]:ASP:OD2	1:G:10:ARG:NE	2.49	0.46
1:E:140:LYS:O	1:E:144:GLU:HG3	2.15	0.46
1:F:20:GLN:HG3	1:F:71:VAL:HG11	1.97	0.45
1:F:158:SER:O	1:F:159:PHE:HB2	2.16	0.45
1:A:10[A]:ARG:HH11	1:A:10[A]:ARG:HB3	1.81	0.45
1:B:145[A]:ASN:OD1	1:B:145[A]:ASN:C	2.59	0.45
1:E:28:TRP:HB2	1:E:77[B]:YCM:HD2	1.99	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:153:SER:CB	1:G:154:LEU:HD12	2.39	0.45
1:B:15:GLU:OE1	3:B:201:HOH:O	2.21	0.45
1:E:24[B]:SER:O	1:E:77[B]:YCM:OZ1	2.36	0.44
1:G:77[B]:YCM:HA	1:G:80:TRP:CE3	2.52	0.44
1:A:51:HIS:HD2	3:A:391:HOH:O	2.00	0.44
1:C:77[A]:YCM:HD2	3:C:320:HOH:O	2.17	0.44
1:D:5:LEU:HB3	3:D:361:HOH:O	2.18	0.44
1:C:77[A]:YCM:HA	1:C:80:TRP:CE3	2.52	0.43
1:D:61:LYS:NZ	3:D:307:HOH:O	2.52	0.43
1:G:1:SER:O	1:G:5[A]:LEU:HG	2.19	0.43
1:A:77[B]:YCM:HA	1:A:80:TRP:CD2	2.53	0.42
1:F:69:GLN:HG3	3:F:1117:HOH:O	2.18	0.42
1:F:24[A]:SER:OG	1:F:77[A]:YCM:HB2	2.18	0.42
1:G:94:GLU:HG3	1:G:134[A]:ILE:HD12	1.98	0.42
1:F:157:VAL:HG12	1:F:158:SER:N	2.33	0.42
1:H:77[B]:YCM:OZ1	1:H:77[B]:YCM:C	2.65	0.42
1:D:41:MET:HE2	1:D:87:TRP:CH2	2.54	0.42
1:E:156:VAL:HG22	1:F:140:LYS:HE3	2.01	0.42
1:B:77[A]:YCM:HD2	3:B:211:HOH:O	2.20	0.42
1:C:77[B]:YCM:HA	1:C:80:TRP:CD2	2.55	0.42
1:D:2:GLU:HB3	1:D:5:LEU:HD12	2.01	0.41
1:C:10[A]:ARG:NH1	1:C:10[A]:ARG:CG	2.81	0.41
1:B:153:SER:OG	1:B:154:LEU:HD12	2.21	0.41
1:F:156:VAL:O	1:F:157:VAL:C	2.62	0.41
1:H:10[B]:ARG:NH1	3:H:305:HOH:O	2.50	0.41
1:G:154:LEU:HD12	1:G:154:LEU:N	2.37	0.41
1:G:158:SER:OG	1:G:159:PHE:N	2.52	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	158/168 (94%)	156 (99%)	1 (1%)	1 (1%)	21	13
1	B	158/168 (94%)	155 (98%)	3 (2%)	0	100	100
1	C	160/168 (95%)	158 (99%)	2 (1%)	0	100	100
1	D	159/168 (95%)	157 (99%)	1 (1%)	1 (1%)	21	13
1	E	159/168 (95%)	156 (98%)	1 (1%)	2 (1%)	9	3
1	F	159/168 (95%)	155 (98%)	3 (2%)	1 (1%)	21	13
1	G	162/168 (96%)	157 (97%)	4 (2%)	1 (1%)	21	13
1	H	157/168 (94%)	156 (99%)	1 (1%)	0	100	100
All	All	1272/1344 (95%)	1250 (98%)	16 (1%)	6 (0%)	24	16

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	157	VAL
1	E	158	SER
1	G	157	VAL
1	F	157	VAL
1	D	157	VAL
1	A	157	VAL

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	137/142 (96%)	134 (98%)	3 (2%)	45	42
1	B	137/142 (96%)	135 (98%)	2 (2%)	57	56
1	C	139/142 (98%)	135 (97%)	4 (3%)	37	31
1	D	138/142 (97%)	136 (99%)	2 (1%)	59	59
1	E	138/142 (97%)	136 (99%)	2 (1%)	59	59
1	F	138/142 (97%)	133 (96%)	5 (4%)	31	23
1	G	141/142 (99%)	139 (99%)	2 (1%)	59	59

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	H	136/142 (96%)	130 (96%)	6 (4%)	25	17
All	All	1104/1136 (97%)	1078 (98%)	26 (2%)	44	38

All (26) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10[A]	ARG
1	A	10[B]	ARG
1	A	75	VAL
1	D	3	GLU
1	D	158	SER
1	B	2	GLU
1	B	62	ARG
1	C	2	GLU
1	C	5	LEU
1	C	153	SER
1	C	157	VAL
1	E	5	LEU
1	E	62	ARG
1	F	2	GLU
1	F	62	ARG
1	F	81	SER
1	F	156	VAL
1	F	158	SER
1	G	10	ARG
1	G	156	VAL
1	H	2	GLU
1	H	3	GLU
1	H	62	ARG
1	H	99	ARG
1	H	133	LYS
1	H	145	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	14	GLN
1	A	20	GLN
1	C	63	ASN
1	C	126	GLN
1	E	126	GLN

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Mol	Chain	Res	Type
1	F	112	HIS
1	F	126	GLN
1	G	20	GLN
1	H	14	GLN
1	H	69	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
1	YCM	E	77[A]	1	7,9,10	1.05	0	5,10,12	0.76	0
1	YCM	F	77[B]	1	7,9,10	1.92	1 (14%)	5,10,12	0.32	0
1	YCM	G	77[A]	1	7,9,10	3.33	4 (57%)	5,10,12	0.89	0
1	YCM	D	77[A]	1	7,9,10	1.99	1 (14%)	5,10,12	1.40	1 (20%)
1	YCM	A	77[B]	1	4,5,10	2.45	1 (25%)	1,5,12	0.29	0
1	YCM	E	77[B]	1	7,9,10	1.79	1 (14%)	5,10,12	0.87	0
1	YCM	C	77[A]	1	7,9,10	1.36	2 (28%)	5,10,12	0.74	0
1	YCM	H	77[A]	1	7,9,10	1.24	1 (14%)	5,10,12	2.22	1 (20%)
1	YCM	H	77[B]	1	7,9,10	0.76	0	5,10,12	1.00	0
1	YCM	G	77[B]	1	7,9,10	0.69	0	5,10,12	0.70	0
1	YCM	D	77[B]	1	7,9,10	0.98	0	5,10,12	0.83	0
1	YCM	B	77[A]	1	7,9,10	1.13	1 (14%)	5,10,12	0.60	0
1	YCM	B	77[B]	1	7,9,10	1.64	1 (14%)	5,10,12	1.06	0
1	YCM	C	77[B]	1	7,9,10	1.20	1 (14%)	5,10,12	1.21	0
1	YCM	A	77[A]	1	7,9,10	1.98	1 (14%)	5,10,12	1.10	1 (20%)
1	YCM	F	77[A]	1	4,5,10	1.39	1 (25%)	1,5,12	0.21	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
1	YCM	E	77[A]	1	-	1/6/8/10	-
1	YCM	F	77[B]	1	-	2/6/8/10	-
1	YCM	G	77[A]	1	-	2/6/8/10	-
1	YCM	D	77[A]	1	-	2/6/8/10	-
1	YCM	A	77[B]	1	-	1/1/4/10	-
1	YCM	E	77[B]	1	-	3/6/8/10	-
1	YCM	C	77[A]	1	-	3/6/8/10	-
1	YCM	H	77[A]	1	-	1/6/8/10	-
1	YCM	H	77[B]	1	-	1/6/8/10	-
1	YCM	G	77[B]	1	-	0/6/8/10	-
1	YCM	D	77[B]	1	-	2/6/8/10	-
1	YCM	B	77[A]	1	-	1/6/8/10	-
1	YCM	B	77[B]	1	-	1/6/8/10	-
1	YCM	C	77[B]	1	-	2/6/8/10	-
1	YCM	A	77[A]	1	-	1/6/8/10	-
1	YCM	F	77[A]	1	-	0/1/4/10	-

All (16) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	G	77[A]	YCM	CD-SG	7.48	2.00	1.81
1	A	77[A]	YCM	CD-SG	-4.72	1.69	1.81
1	A	77[B]	YCM	CB-SG	4.44	1.90	1.81
1	F	77[B]	YCM	CD-SG	4.24	1.92	1.81
1	D	77[A]	YCM	CB-SG	3.91	1.96	1.81
1	E	77[B]	YCM	CB-SG	3.58	1.94	1.81
1	B	77[B]	YCM	CB-SG	2.82	1.91	1.81
1	G	77[A]	YCM	CB-SG	2.74	1.91	1.81
1	C	77[A]	YCM	CD-SG	-2.70	1.74	1.81
1	G	77[A]	YCM	O-C	2.43	1.29	1.20
1	G	77[A]	YCM	OZ1-CE	2.39	1.31	1.23
1	H	77[A]	YCM	O-C	2.30	1.28	1.20
1	B	77[A]	YCM	CD-SG	-2.29	1.75	1.81
1	C	77[B]	YCM	CB-SG	2.18	1.89	1.81
1	C	77[A]	YCM	CA-N	-2.17	1.42	1.48
1	F	77[A]	YCM	CB-CA	2.15	1.55	1.53

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	H	77[A]	YCM	CE-CD-SG	-4.95	98.19	113.81
1	A	77[A]	YCM	CE-CD-SG	-2.22	106.79	113.81
1	D	77[A]	YCM	CB-CA-C	-2.05	105.24	110.80

There are no chirality outliers.

All (23) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	D	77[A]	YCM	SG-CD-CE-NZ2
1	B	77[A]	YCM	C-CA-CB-SG
1	B	77[B]	YCM	CE-CD-SG-CB
1	C	77[A]	YCM	C-CA-CB-SG
1	C	77[A]	YCM	CE-CD-SG-CB
1	E	77[A]	YCM	SG-CD-CE-NZ2
1	E	77[B]	YCM	SG-CD-CE-NZ2
1	F	77[B]	YCM	SG-CD-CE-NZ2
1	G	77[A]	YCM	SG-CD-CE-NZ2
1	H	77[A]	YCM	CE-CD-SG-CB
1	F	77[B]	YCM	CA-CB-SG-CD
1	E	77[B]	YCM	CA-CB-SG-CD
1	C	77[A]	YCM	N-CA-CB-SG
1	A	77[A]	YCM	CE-CD-SG-CB
1	D	77[A]	YCM	CE-CD-SG-CB
1	D	77[B]	YCM	CE-CD-SG-CB
1	C	77[B]	YCM	CE-CD-SG-CB
1	E	77[B]	YCM	CE-CD-SG-CB
1	H	77[B]	YCM	CE-CD-SG-CB
1	A	77[B]	YCM	N-CA-CB-SG
1	D	77[B]	YCM	SG-CD-CE-OZ1
1	G	77[A]	YCM	CA-CB-SG-CD
1	C	77[B]	YCM	SG-CD-CE-NZ2

There are no ring outliers.

15 monomers are involved in 31 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	E	77[A]	YCM	1	0
1	F	77[B]	YCM	1	0
1	G	77[A]	YCM	3	0
1	D	77[A]	YCM	2	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	77[B]	YCM	2	0
1	E	77[B]	YCM	3	0
1	C	77[A]	YCM	2	0
1	H	77[A]	YCM	2	0
1	H	77[B]	YCM	5	0
1	G	77[B]	YCM	1	0
1	B	77[A]	YCM	2	0
1	B	77[B]	YCM	2	0
1	C	77[B]	YCM	3	0
1	A	77[A]	YCM	1	0
1	F	77[A]	YCM	1	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 7 ligands modelled in this entry, 7 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [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	156/168 (92%)	0.05	8 (5%)	33	36	11, 28, 48, 73	4 (2%)
1	B	157/168 (93%)	0.09	7 (4%)	38	40	10, 30, 53, 86	3 (1%)
1	C	156/168 (92%)	0.08	6 (3%)	44	47	10, 28, 45, 77	6 (3%)
1	D	157/168 (93%)	-0.06	6 (3%)	44	47	9, 25, 47, 78	4 (2%)
1	E	157/168 (93%)	0.08	9 (5%)	29	31	11, 28, 53, 81	4 (2%)
1	F	157/168 (93%)	0.19	8 (5%)	33	36	12, 29, 51, 89	4 (2%)
1	G	158/168 (94%)	-0.00	10 (6%)	26	27	9, 25, 55, 77	6 (3%)
1	H	154/168 (91%)	-0.08	3 (1%)	66	70	9, 26, 42, 61	5 (3%)
All	All	1252/1344 (93%)	0.04	57 (4%)	37	40	9, 28, 50, 89	36 (2%)

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	156	VAL	7.6
1	C	157	VAL	7.3
1	F	157	VAL	5.7
1	B	157	VAL	5.1
1	A	157	VAL	5.0
1	F	159	PHE	5.0
1	G	5[A]	LEU	4.8
1	F	156	VAL	4.6
1	A	156	VAL	4.5
1	D	157	VAL	4.3
1	B	156	VAL	4.2
1	D	156	VAL	4.2
1	A	158	SER	4.2
1	E	157	VAL	4.1
1	G	157	VAL	4.1
1	G	156	VAL	4.0

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Mol	Chain	Res	Type	RSRZ
1	G	154	LEU	3.9
1	E	99	ARG	3.5
1	E	156	VAL	3.4
1	E	159	PHE	3.4
1	G	153	SER	3.4
1	H	153	SER	3.4
1	E	154	LEU	3.3
1	A	10[A]	ARG	3.0
1	D	159	PHE	3.0
1	E	5	LEU	3.0
1	C	5	LEU	2.9
1	G	159	PHE	2.8
1	F	5	LEU	2.7
1	C	153	SER	2.7
1	B	159	PHE	2.7
1	B	154	LEU	2.7
1	H	10[A]	ARG	2.6
1	A	5	LEU	2.6
1	E	158	SER	2.6
1	A	153	SER	2.6
1	G	1	SER	2.5
1	H	154	LEU	2.5
1	A	2	GLU	2.5
1	D	153	SER	2.4
1	D	154	LEU	2.4
1	B	2	GLU	2.4
1	C	154	LEU	2.3
1	B	153	SER	2.3
1	F	158	SER	2.3
1	F	2	GLU	2.3
1	B	99	ARG	2.2
1	E	153	SER	2.2
1	F	126	GLN	2.2
1	C	10[A]	ARG	2.2
1	G	78	ALA	2.2
1	D	158	SER	2.2
1	A	154	LEU	2.2
1	F	78	ALA	2.1
1	G	158	SER	2.1
1	E	4	LEU	2.1
1	G	79	GLU	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(Å ²)	Q<0.9
1	YCM	G	77[A]	10/11	0.66	0.21	21,29,37,38	10
1	YCM	G	77[B]	10/11	0.66	0.21	30,34,38,40	10
1	YCM	H	77[A]	10/11	0.70	0.20	23,32,35,40	10
1	YCM	H	77[B]	10/11	0.70	0.20	31,34,40,41	10
1	YCM	F	77[A]	6/11	0.72	0.21	37,39,43,46	6
1	YCM	F	77[B]	10/11	0.72	0.21	28,34,41,45	10
1	YCM	D	77[A]	10/11	0.82	0.16	21,31,33,34	10
1	YCM	D	77[B]	10/11	0.82	0.16	22,26,28,29	10
1	YCM	E	77[A]	10/11	0.86	0.18	32,35,38,40	10
1	YCM	E	77[B]	10/11	0.86	0.18	33,36,41,41	10
1	YCM	B	77[A]	10/11	0.87	0.17	34,36,40,42	10
1	YCM	B	77[B]	10/11	0.87	0.17	30,34,36,37	10
1	YCM	C	77[A]	10/11	0.87	0.16	27,32,34,34	10
1	YCM	C	77[B]	10/11	0.87	0.16	25,32,33,34	10
1	YCM	A	77[A]	10/11	0.88	0.13	22,27,32,32	10
1	YCM	A	77[B]	6/11	0.88	0.13	33,34,35,39	6

6.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

6.4 Ligands ⓘ

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	FE	F	201	1/1	0.84	0.15	36,36,36,36	1
2	FE	A	201	1/1	0.85	0.19	36,36,36,36	1
2	FE	H	201	1/1	0.87	0.18	36,36,36,36	1
2	FE	D	201	1/1	0.91	0.14	38,38,38,38	1
2	FE	G	201	1/1	0.92	0.17	38,38,38,38	1
2	FE	E	201	1/1	0.94	0.13	43,43,43,43	1

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	FE	C	201	1/1	0.94	0.12	40,40,40,40	1

6.5 Other polymers [i](#)

There are no such residues in this entry.