



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 13, 2024 – 11:04 AM EDT

PDB ID : 4JE8
Title : Crystal structure of a human-like mitochondrial peptide deformylase in complex with Met-Ala-Ser
Authors : Fieulaine, S.; Meinnel, T.; Giglione, C.
Deposited on : 2013-02-26
Resolution : 2.40 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 : 4.02b-467
Xtriage (Phenix) : 1.20.1
EDS : 2.36.2
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

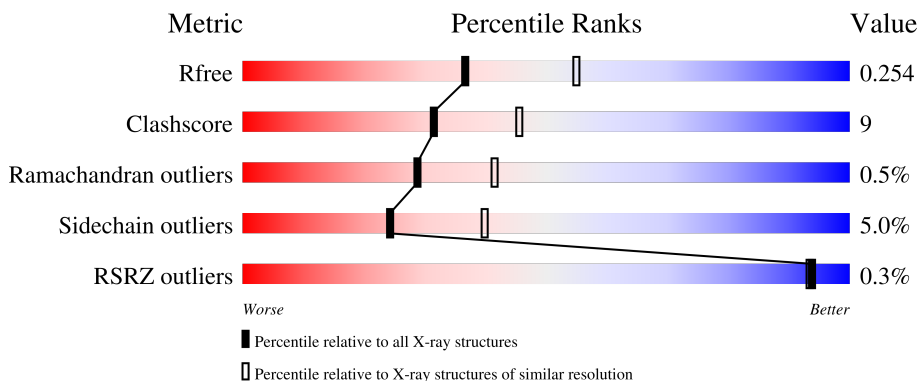
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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}	130704	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	197	
1	B	197	
2	D	3	
2	E	3	

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3264 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 Peptide deformylase 1A, chloroplastic/mitochondrial.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	192	1501	947	264	281	9	0	0	0
1	B	189	1466	926	254	277	9	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	1	MET	-	expression tag	UNP Q9FV53
A	47	CYS	GLY	engineered mutation	UNP Q9FV53
A	112	GLU	LEU	engineered mutation	UNP Q9FV53
A	191	SER	-	expression tag	UNP Q9FV53
A	192	HIS	-	expression tag	UNP Q9FV53
A	193	HIS	-	expression tag	UNP Q9FV53
A	194	HIS	-	expression tag	UNP Q9FV53
A	195	HIS	-	expression tag	UNP Q9FV53
A	196	HIS	-	expression tag	UNP Q9FV53
A	197	HIS	-	expression tag	UNP Q9FV53
B	1	MET	-	expression tag	UNP Q9FV53
B	47	CYS	GLY	engineered mutation	UNP Q9FV53
B	112	GLU	LEU	engineered mutation	UNP Q9FV53
B	191	SER	-	expression tag	UNP Q9FV53
B	192	HIS	-	expression tag	UNP Q9FV53
B	193	HIS	-	expression tag	UNP Q9FV53
B	194	HIS	-	expression tag	UNP Q9FV53
B	195	HIS	-	expression tag	UNP Q9FV53
B	196	HIS	-	expression tag	UNP Q9FV53
B	197	HIS	-	expression tag	UNP Q9FV53

- Molecule 2 is a protein called tripeptide Met-Ala-Ser.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	3	Total	C	N	O	S	0	0	0
			19	11	3	4	1			
2	E	3	Total	C	N	O	S	0	0	0
			19	11	3	4	1			

- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Zn	0	0
			1	1		
3	B	1	Total	Zn	0	0
			1	1		

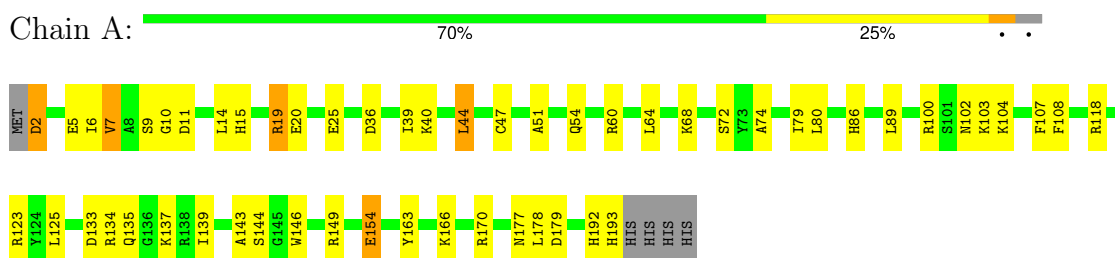
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	135	Total	O	0	0
			135	135		
4	B	120	Total	O	0	0
			120	120		
4	D	1	Total	O	0	0
			1	1		
4	E	1	Total	O	0	0
			1	1		

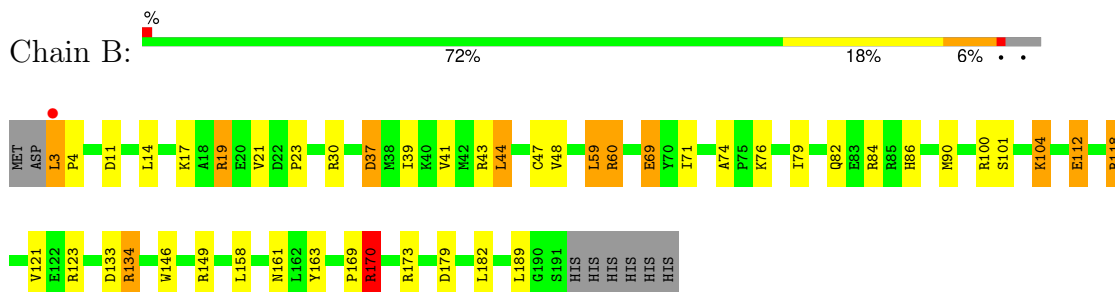
3 Residue-property plots

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 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: Peptide deformylase 1A, chloroplasic/mitochondrial



- Molecule 1: Peptide deformylase 1A, chloroplasic/mitochondrial



- Molecule 2: tripeptide Met-Ala-Ser



- Molecule 2: tripeptide Met-Ala-Ser



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	51.55Å 74.71Å 109.76Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.68 – 2.40 46.66 – 2.40	Depositor EDS
% Data completeness (in resolution range)	100.0 (46.68-2.40) 100.0 (46.66-2.40)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.08	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.41 (at 2.39Å)	Xtrriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.174 , 0.251 0.191 , 0.254	Depositor DCC
R_{free} test set	860 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	35.8	Xtrriage
Anisotropy	1.058	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 47.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	3264	wwPDB-VP
Average B, all atoms (Å ²)	44.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.66% 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:
ZN

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	1.41	10/1529 (0.7%)	1.24	10/2071 (0.5%)
1	B	1.43	5/1492 (0.3%)	1.43	22/2023 (1.1%)
2	D	0.84	0/18	1.16	0/22
2	E	1.32	0/18	1.12	0/22
All	All	1.42	15/3057 (0.5%)	1.34	32/4138 (0.8%)

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	3	LEU	C-N	18.74	1.69	1.34
1	B	69	GLU	CD-OE2	7.14	1.33	1.25
1	B	17	LYS	CD-CE	6.01	1.66	1.51
1	A	107	PHE	CE2-CZ	5.99	1.48	1.37
1	A	7	VAL	CA-CB	5.63	1.66	1.54
1	B	118	ARG	CZ-NH1	-5.51	1.25	1.33
1	A	103	LYS	CE-NZ	5.48	1.62	1.49
1	A	100	ARG	CZ-NH2	5.44	1.40	1.33
1	B	134	ARG	CG-CD	-5.44	1.38	1.51
1	A	154	GLU	CD-OE1	5.37	1.31	1.25
1	A	118	ARG	CG-CD	5.34	1.65	1.51
1	A	51	ALA	C-O	5.33	1.33	1.23
1	A	108	PHE	CE1-CZ	-5.17	1.27	1.37
1	A	103	LYS	CD-CE	5.16	1.64	1.51
1	A	154	GLU	CB-CG	5.12	1.61	1.52

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	118	ARG	NE-CZ-NH1	19.67	130.13	120.30
1	B	118	ARG	NE-CZ-NH2	-15.03	112.79	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	170	ARG	NE-CZ-NH1	13.51	127.06	120.30
1	B	118	ARG	CD-NE-CZ	8.35	135.28	123.60
1	B	3	LEU	O-C-N	7.94	136.19	121.10
1	B	133	ASP	CB-CG-OD1	7.71	125.24	118.30
1	A	19	ARG	NE-CZ-NH1	7.43	124.02	120.30
1	A	44	LEU	CB-CG-CD2	-7.21	98.74	111.00
1	B	3	LEU	C-N-CD	7.11	143.34	128.40
1	B	173	ARG	NE-CZ-NH1	7.07	123.84	120.30
1	A	134	ARG	NE-CZ-NH2	-6.84	116.88	120.30
1	A	100	ARG	NE-CZ-NH1	-6.53	117.04	120.30
1	A	80	LEU	CA-CB-CG	6.29	129.78	115.30
1	B	112	GLU	OE1-CD-OE2	-6.24	115.81	123.30
1	B	179	ASP	CB-CG-OD2	-6.23	112.70	118.30
1	B	170	ARG	NE-CZ-NH2	-6.22	117.19	120.30
1	B	37	ASP	CB-CG-OD1	6.20	123.88	118.30
1	B	118	ARG	CG-CD-NE	-6.20	98.79	111.80
1	A	192	HIS	O-C-N	6.01	132.31	122.70
1	A	103	LYS	CD-CE-NZ	5.94	125.36	111.70
1	A	2	ASP	CB-CG-OD2	-5.80	113.08	118.30
1	B	14	LEU	CB-CG-CD1	-5.78	101.18	111.00
1	B	84	ARG	NE-CZ-NH1	5.72	123.16	120.30
1	B	44	LEU	CA-CB-CG	5.72	128.45	115.30
1	B	60	ARG	NE-CZ-NH2	5.60	123.10	120.30
1	A	118	ARG	NE-CZ-NH2	5.60	123.10	120.30
1	B	74	ALA	C-N-CD	5.44	139.82	128.40
1	B	74	ALA	N-CA-C	-5.42	96.38	111.00
1	B	59	LEU	CA-CB-CG	5.41	127.75	115.30
1	B	3	LEU	CA-C-N	-5.37	102.08	117.10
1	B	37	ASP	CB-CG-OD2	-5.21	113.61	118.30
1	A	80	LEU	CB-CG-CD1	-5.07	102.37	111.00

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	1501	0	1491	29	0
1	B	1466	0	1451	27	0
2	D	19	0	21	2	0
2	E	19	0	21	2	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	135	0	0	8	0
4	B	120	0	0	5	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
All	All	3264	0	2984	54	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 9.

All (54) 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:B:3:LEU:C	1:B:4:PRO:N	1.69	1.45
1:A:2:ASP:N	4:A:333:HOH:O	1.98	0.96
1:B:3:LEU:C	1:B:4:PRO:CA	2.48	0.81
1:A:10:GLY:H	1:A:15:HIS:HE1	1.26	0.80
1:A:15:HIS:HD2	4:A:346:HOH:O	1.66	0.79
1:A:25:GLU:HG3	4:A:353:HOH:O	1.87	0.74
1:B:3:LEU:CA	1:B:4:PRO:N	2.51	0.74
1:A:154:GLU:OE1	4:A:301:HOH:O	2.06	0.72
1:B:71:ILE:O	1:B:79:ILE:HD11	1.90	0.72
1:A:74:ALA:HB3	1:A:79:ILE:HD11	1.73	0.70
1:A:133:ASP:HB3	1:A:139:ILE:HD13	1.75	0.69
1:A:123:ARG:HG3	1:A:149:ARG:HG3	1.79	0.64
1:B:86:HIS:HD2	4:B:354:HOH:O	1.79	0.63
1:A:179:ASP:OD1	4:A:403:HOH:O	2.16	0.60
1:A:170:ARG:NH1	1:B:161:ASN:HD21	2.01	0.59
1:A:47:CYS:HB2	2:D:1:MET:O	2.02	0.58
1:B:104:LYS:HB3	1:B:123:ARG:O	2.04	0.57
1:B:19:ARG:NH1	4:B:400:HOH:O	2.31	0.57
1:B:11:ASP:OD2	4:B:343:HOH:O	2.17	0.56
1:A:170:ARG:HH11	1:B:161:ASN:HD21	1.55	0.54
1:B:39:ILE:O	1:B:43:ARG:HG3	2.08	0.53
1:B:48:VAL:HG13	2:E:3:SER:HB3	1.92	0.51
1:A:36:ASP:O	1:A:40:LYS:HG3	2.10	0.51
1:B:21:VAL:O	1:B:23:PRO:HD3	2.10	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:169:PRO:O	1:B:170:ARG:HB2	2.12	0.50
1:B:30:ARG:HH21	1:B:59:LEU:HD11	1.76	0.49
1:A:68:LYS:HE3	1:A:86:HIS:CD2	2.47	0.49
1:B:123:ARG:HG3	1:B:149:ARG:HG3	1.94	0.49
1:B:37:ASP:O	1:B:41:VAL:HG23	2.13	0.48
1:A:39:ILE:HD13	1:A:89:LEU:HD21	1.95	0.48
1:B:100:ARG:HH11	1:B:100:ARG:HG2	1.78	0.48
1:B:47:CYS:HB2	2:E:1:MET:O	2.14	0.48
1:A:20:GLU:HG3	1:A:60:ARG:HD3	1.97	0.46
1:B:101:SER:HB2	4:B:386:HOH:O	2.15	0.46
1:A:68:LYS:HE3	1:A:86:HIS:NE2	2.30	0.46
1:A:47:CYS:HA	2:D:3:SER:HB3	1.98	0.46
4:A:346:HOH:O	1:B:170:ARG:HG3	2.16	0.46
1:B:121:VAL:HG21	1:B:163:TYR:HB2	1.96	0.45
1:A:14:LEU:HD21	1:A:54:GLN:HA	1.98	0.45
1:B:112:GLU:CD	1:B:112:GLU:H	2.19	0.45
1:B:182:LEU:HD11	1:B:189:LEU:HG	1.99	0.45
1:A:44:LEU:HD23	4:A:362:HOH:O	2.17	0.44
1:B:90:MET:HB2	1:B:90:MET:HE2	1.67	0.43
1:B:60:ARG:HB3	1:B:158:LEU:HD13	1.99	0.43
1:A:163:TYR:HA	1:A:166:LYS:HG2	2.00	0.43
1:A:170:ARG:HG2	4:B:339:HOH:O	2.17	0.43
1:A:7:VAL:CG1	1:A:11:ASP:HB3	2.49	0.43
1:A:104:LYS:HA	1:A:123:ARG:O	2.19	0.43
1:A:143:ALA:HA	4:A:376:HOH:O	2.18	0.42
1:B:82:GLN:HB3	1:B:146:TRP:CE3	2.55	0.42
1:A:74:ALA:HB3	1:A:79:ILE:CD1	2.47	0.41
1:A:125:LEU:O	1:A:144:SER:HA	2.21	0.41
1:A:146:TRP:CZ3	1:A:149:ARG:HD2	2.56	0.40
1:A:177:ASN:O	1:A:178:LEU:C	2.59	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	190/197 (96%)	183 (96%)	6 (3%)	1 (0%)	29	41
1	B	187/197 (95%)	177 (95%)	9 (5%)	1 (0%)	29	41
2	D	1/3 (33%)	1 (100%)	0	0	100	100
2	E	1/3 (33%)	1 (100%)	0	0	100	100
All	All	379/400 (95%)	362 (96%)	15 (4%)	2 (0%)	29	41

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	76	LYS
1	A	72	SER

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	162/171 (95%)	153 (94%)	9 (6%)	21	34
1	B	157/171 (92%)	150 (96%)	7 (4%)	27	44
2	D	2/2 (100%)	2 (100%)	0	100	100
2	E	2/2 (100%)	2 (100%)	0	100	100
All	All	323/346 (93%)	307 (95%)	16 (5%)	24	40

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	GLU
1	A	6	ILE
1	A	9	SER
1	A	19	ARG
1	A	64	LEU
1	A	102	ASN

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Mol	Chain	Res	Type
1	A	135	GLN
1	A	137	LYS
1	A	193	HIS
1	B	19	ARG
1	B	44	LEU
1	B	69	GLU
1	B	104	LYS
1	B	118	ARG
1	B	134	ARG
1	B	170	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	15	HIS
1	A	102	ASN
1	A	147	GLN
1	B	86	HIS
1	B	135	GLN
1	B	161	ASN

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 monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 2 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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	B	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	B	3:LEU	C	4:PRO	N	1.69

6 Fit of model and data [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	192/197 (97%)	-0.66	0 100 100	13, 36, 71, 108	0
1	B	189/197 (95%)	-0.48	1 (0%) 91 89	15, 48, 87, 103	0
2	D	3/3 (100%)	0.03	0 100 100	37, 37, 40, 45	0
2	E	3/3 (100%)	-0.44	0 100 100	42, 42, 46, 50	0
All	All	387/400 (96%)	-0.57	1 (0%) 94 93	13, 41, 83, 108	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	3	LEU	2.1

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 monosaccharides 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
3	ZN	A	200	1/1	0.97	0.17	35,35,35,35	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
3	ZN	B	200	1/1	0.99	0.14	36,36,36,36	0

6.5 Other polymers [i](#)

There are no such residues in this entry.