



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 18, 2025 – 11:54 PM EDT

PDB ID : 3PHW
Title : OTU Domain of Crimean Congo Hemorrhagic Fever Virus in complex with Ubiquitin
Authors : Akutsu, M.; Ye, Y.; Virdee, S.; Komander, D.
Deposited on : 2010-11-04
Resolution : 2.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.4

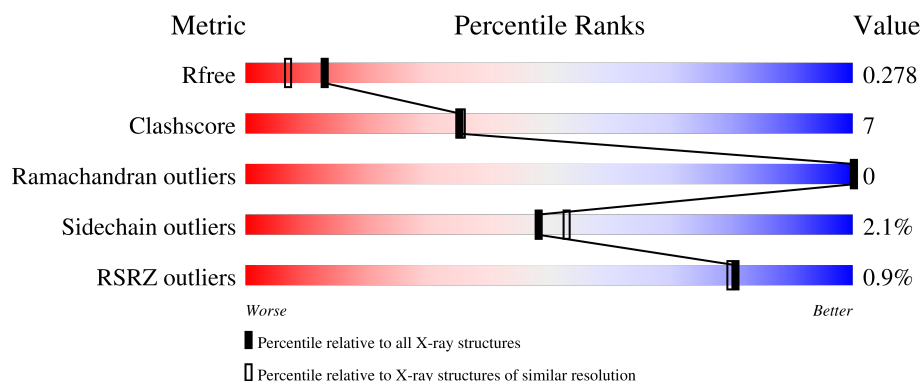
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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}	164625	9409 (2.00-2.00)
Clashscore	180529	10737 (2.00-2.00)
Ramachandran outliers	177936	10628 (2.00-2.00)
Sidechain outliers	177891	10627 (2.00-2.00)
RSRZ outliers	164620	9409 (2.00-2.00)

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	185	<div> <div>0%</div> <div>69%</div> <div>15%</div> <div>16%</div> </div>
1	C	185	<div> <div>0%</div> <div>76%</div> <div>9%</div> <div>15%</div> </div>
1	E	185	<div> <div>2%</div> <div>68%</div> <div>15%</div> <div>16%</div> </div>
1	G	185	<div> <div>0%</div> <div>72%</div> <div>14%</div> <div>13%</div> </div>
2	B	75	<div> <div>85%</div> <div>13%</div> </div>

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Mol	Chain	Length	Quality of chain
2	D	75	 88% 12%
2	F	75	 77% 20% •
2	H	75	 76% 21% •

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8055 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 RNA-directed RNA polymerase L.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	156	Total	C	N	O	S	0	0	0
			1265	809	211	240	5			
1	C	158	Total	C	N	O	S	0	0	0
			1278	815	213	245	5			
1	E	155	Total	C	N	O	S	0	0	0
			1253	799	210	239	5			
1	G	161	Total	C	N	O	S	0	0	0
			1297	826	216	250	5			

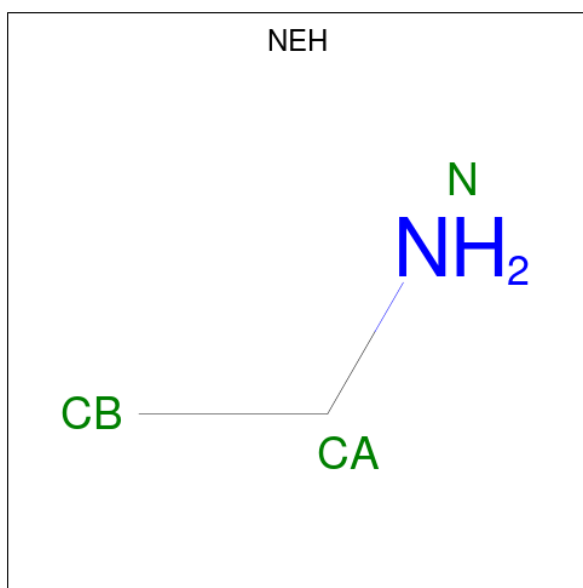
There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-1	GLY	-	expression tag	UNP Q6TQR6
A	0	PRO	-	expression tag	UNP Q6TQR6
C	-1	GLY	-	expression tag	UNP Q6TQR6
C	0	PRO	-	expression tag	UNP Q6TQR6
E	-1	GLY	-	expression tag	UNP Q6TQR6
E	0	PRO	-	expression tag	UNP Q6TQR6
G	-1	GLY	-	expression tag	UNP Q6TQR6
G	0	PRO	-	expression tag	UNP Q6TQR6

- Molecule 2 is a protein called Ubiquitin-40S ribosomal protein S27a.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	75	Total	C	N	O	S	0	0	0
			597	376	104	116	1			
2	D	75	Total	C	N	O	S	0	0	0
			597	376	104	116	1			
2	F	75	Total	C	N	O	S	0	0	0
			597	376	104	116	1			
2	H	75	Total	C	N	O	S	0	0	0
			597	376	104	116	1			

- Molecule 3 is ETHANAMINE (three-letter code: NEH) (formula: C_2H_7N).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	B	1	Total	C	N	0	0
			3	2	1		
3	D	1	Total	C	N	0	0
			3	2	1		
3	F	1	Total	C	N	0	0
			3	2	1		
3	H	1	Total	C	N	0	0
			3	2	1		

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	108	Total	O	0	0
			108	108		
4	B	39	Total	O	0	0
			39	39		
4	C	99	Total	O	0	0
			99	99		
4	D	39	Total	O	0	0
			39	39		
4	E	103	Total	O	0	0
			103	103		
4	F	40	Total	O	0	0
			40	40		
4	G	87	Total	O	0	0
			87	87		

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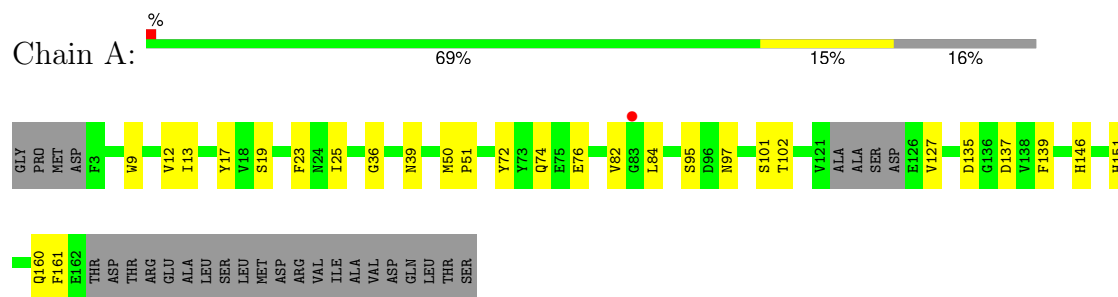
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	47	Total	O	0	0
			47	47		

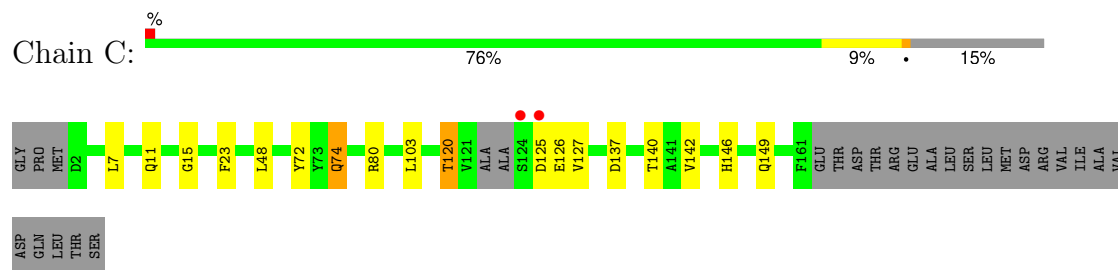
3 Residue-property plots [i](#)

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.

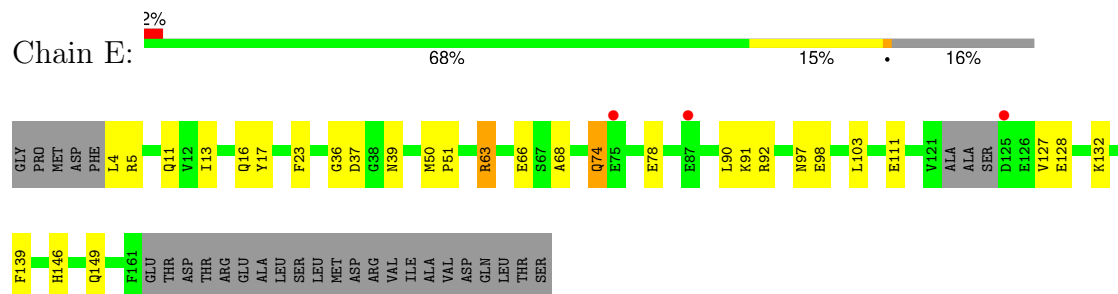
• Molecule 1: RNA-directed RNA polymerase L



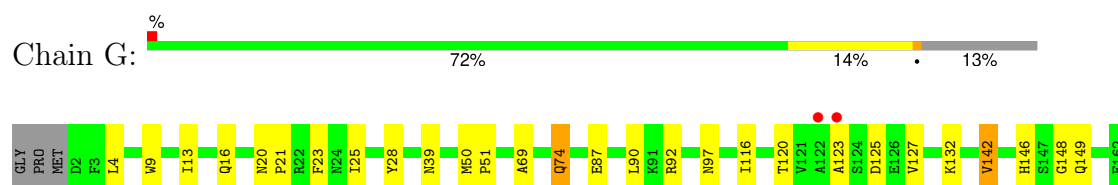
• Molecule 1: RNA-directed RNA polymerase L



• Molecule 1: RNA-directed RNA polymerase L




• Molecule 1: RNA-directed RNA polymerase L




THR
ASP
THR
ARG
GLU
ALA
LEU
SER
LEU
MET
ASP
ARG
VAL
ILE
ALA
VAL
ASP
GLN
LEU
THR
SER

- Molecule 2: Ubiquitin-40S ribosomal protein S27a

Chain B:  85% 13%




- Molecule 2: Ubiquitin-40S ribosomal protein S27a

Chain D:  88% 12%



- Molecule 2: Ubiquitin-40S ribosomal protein S27a

Chain F:  77% 20%



- Molecule 2: Ubiquitin-40S ribosomal protein S27a

Chain H:  76% 21%



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	79.44Å 106.17Å 111.46Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.62 – 2.00 45.62 – 2.00	Depositor EDS
% Data completeness (in resolution range)	90.0 (45.62-2.00) 92.6 (45.62-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.97 (at 2.00Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.4_122)	Depositor
R, R_{free}	0.213 , 0.278 0.214 , 0.278	Depositor DCC
R_{free} test set	3022 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å ²)	17.4	Xtriage
Anisotropy	0.748	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 55.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	0.000 for -h,l,k	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	8055	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 44.70 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 1.4701e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² Theoretical 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: NEH

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	0/1295	0.45	0/1753
1	C	0.31	0/1308	0.46	0/1771
1	E	0.31	0/1282	0.49	0/1736
1	G	0.32	0/1328	0.48	0/1800
2	B	0.29	0/603	0.51	0/811
2	D	0.27	0/603	0.48	0/811
2	F	0.28	0/603	0.47	0/811
2	H	0.29	0/603	0.50	0/811
All	All	0.30	0/7625	0.48	0/10304

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	1265	0	1218	20	0
1	C	1278	0	1225	14	0
1	E	1253	0	1207	24	0
1	G	1297	0	1242	21	0
2	B	597	0	626	7	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	D	597	0	626	6	0
2	F	597	0	626	16	0
2	H	597	0	626	16	0
3	B	3	0	4	0	0
3	D	3	0	4	0	0
3	F	3	0	5	1	0
3	H	3	0	3	0	0
4	A	108	0	0	0	0
4	B	39	0	0	0	0
4	C	99	0	0	4	0
4	D	39	0	0	0	0
4	E	103	0	0	4	0
4	F	40	0	0	0	0
4	G	87	0	0	3	0
4	H	47	0	0	1	0
All	All	8055	0	7412	109	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 7.

The worst 5 of 109 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:E:74:GLN:HE21	1:E:74:GLN:HA	1.49	0.77
1:G:4:LEU:HD23	4:G:357:HOH:O	1.89	0.72
1:G:87:GLU:HG2	4:G:554:HOH:O	1.90	0.71
1:C:11:GLN:HE22	1:C:15:GLY:H	1.38	0.71
1:G:74:GLN:HE21	1:G:74:GLN:HA	1.57	0.69

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	152/185 (82%)	148 (97%)	4 (3%)	0	100	100
1	C	154/185 (83%)	151 (98%)	3 (2%)	0	100	100
1	E	151/185 (82%)	144 (95%)	7 (5%)	0	100	100
1	G	159/185 (86%)	151 (95%)	8 (5%)	0	100	100
2	B	73/75 (97%)	73 (100%)	0	0	100	100
2	D	73/75 (97%)	72 (99%)	1 (1%)	0	100	100
2	F	73/75 (97%)	73 (100%)	0	0	100	100
2	H	73/75 (97%)	72 (99%)	1 (1%)	0	100	100
All	All	908/1040 (87%)	884 (97%)	24 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	136/160 (85%)	135 (99%)	1 (1%)	81	86
1	C	138/160 (86%)	134 (97%)	4 (3%)	37	39
1	E	135/160 (84%)	133 (98%)	2 (2%)	60	66
1	G	139/160 (87%)	136 (98%)	3 (2%)	47	51
2	B	68/68 (100%)	66 (97%)	2 (3%)	37	39
2	D	68/68 (100%)	68 (100%)	0	100	100
2	F	68/68 (100%)	65 (96%)	3 (4%)	24	22
2	H	68/68 (100%)	66 (97%)	2 (3%)	37	39
All	All	820/912 (90%)	803 (98%)	17 (2%)	48	53

5 of 17 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	142	VAL
2	H	52	ASP

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Mol	Chain	Res	Type
1	E	63	ARG
1	E	74	GLN
2	F	5	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 28 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	74	GLN
2	H	60	ASN
2	F	49	GLN
1	G	146	HIS
2	F	40	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](#)

4 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	$\# Z > 2$
3	NEH	D	76	1,2	2,2,2	0.43	0	0,1,1	-	-

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	NEH	F	76	1,2	2,2,2	0.38	0	0,1,1	-	-
3	NEH	H	76	1,2	2,2,2	0.30	0	0,1,1	-	-
3	NEH	B	76	1,2	2,2,2	0.38	0	0,1,1	-	-

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	F	76	NEH	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data ⓘ

6.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 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	156/185 (84%)	-0.11	1 (0%) 85 85	8, 18, 33, 46	0
1	C	158/185 (85%)	-0.15	2 (1%) 74 73	7, 16, 35, 45	0
1	E	155/185 (83%)	-0.03	3 (1%) 66 65	7, 18, 36, 44	0
1	G	161/185 (87%)	-0.09	2 (1%) 76 75	7, 16, 35, 45	0
2	B	75/75 (100%)	-0.05	0 100 100	10, 18, 32, 39	0
2	D	75/75 (100%)	-0.04	0 100 100	12, 20, 34, 40	0
2	F	75/75 (100%)	-0.17	0 100 100	11, 19, 32, 36	0
2	H	75/75 (100%)	-0.03	0 100 100	9, 20, 33, 40	0
All	All	930/1040 (89%)	-0.09	8 (0%) 81 80	7, 18, 35, 46	0

The worst 5 of 8 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	125	ASP	2.8
1	C	125	ASP	2.7
1	C	124	SER	2.7
1	G	122	ALA	2.5
1	E	75	GLU	2.3

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

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

6.3 Carbohydrates ⓘ

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	NEH	H	76	3/3	0.89	0.12	17,17,18,19	0
3	NEH	B	76	3/3	0.91	0.10	20,20,22,22	0
3	NEH	F	76	3/3	0.93	0.08	13,13,15,15	0
3	NEH	D	76	3/3	0.95	0.07	13,13,14,16	0

6.5 Other polymers [i](#)

There are no such residues in this entry.