Full wwPDB X-ray Structure Validation Report ⓘ

Oct 31, 2023 – 01:23 PM EDT

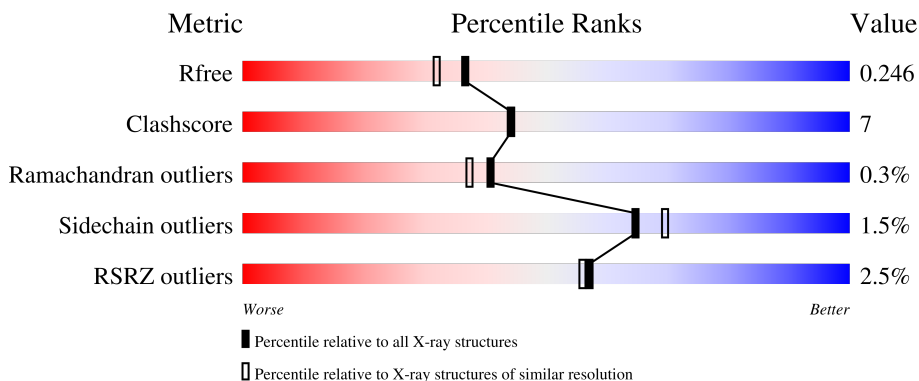|		
PDB ID	:	3P9L
Title	:	Crystal Structure of H2-Kb in complex with the chicken ovalbumin epitope OVA
Authors	:	Wesselingh, R.; Gras, S.; Guillonneau, C.; Turner, S.J.; Rossjohn, J.
Deposited on	:	2010-10-18
Resolution	:	2.00 Å(reported)

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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	Percentile Ranks	Value
Rfree		0.246
Clashscore		7
Ramachandran outliers		0.3%
Sidechain outliers		1.5%
RSRZ outliers		2.5%

Worse *Better*

▮ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	8085 (2.00-2.00)
Clashscore	141614	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)
RSRZ outliers	127900	7900 (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 <=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	278	3% / 83% / 15% •
1	D	278	3% / 88% / 10% •
2	B	99	2% / 88% / 12%
2	E	99	87% / 13%
3	C	8	100%

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Mol	Chain	Length	Quality of chain
3	F	8	100%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 7398 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 H-2 class I histocompatibility antigen, K-B alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	278	Total 2299	C 1451	N 405	O 433	S 10	6	5	0
1	D	278	Total 2344	C 1475	N 419	O 440	S 10	2	9	0

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total 858	C 547	N 147	O 156	S 8	1	4	0
2	E	99	Total 830	C 530	N 140	O 153	S 7	1	1	0

- Molecule 3 is a protein called Ovalbumin epitope, SIINFEKL.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	8	Total 68	C 45	N 10	O 13	0	0	0
3	F	8	Total 68	C 45	N 10	O 13	0	0	0

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	B	1	Total 1	Ca 1	0	0
4	D	1	Total 1	Ca 1	0	0
4	E	1	Total 1	Ca 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	309	Total 309	O 309	0	0
5	B	150	Total 150	O 150	0	0
5	C	12	Total 12	O 12	0	0
5	D	319	Total 319	O 319	0	0
5	E	125	Total 125	O 125	0	0
5	F	13	Total 13	O 13	0	0

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: H-2 class I histocompatibility antigen, K-B alpha chain
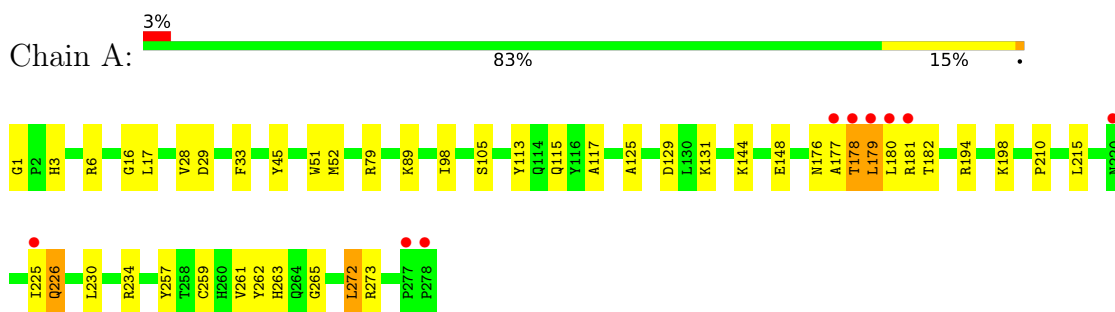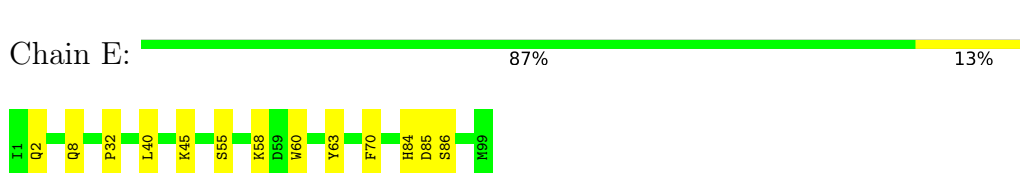

- Molecule 1: H-2 class I histocompatibility antigen, K-B alpha chain
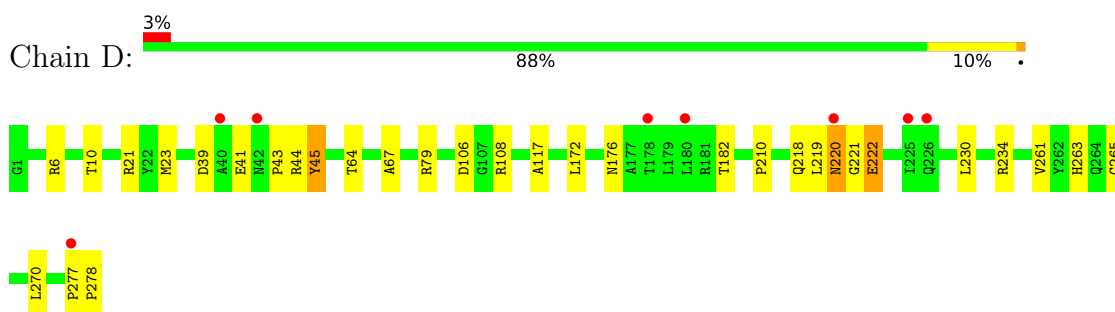
- Molecule 2: Beta-2-microglobulin
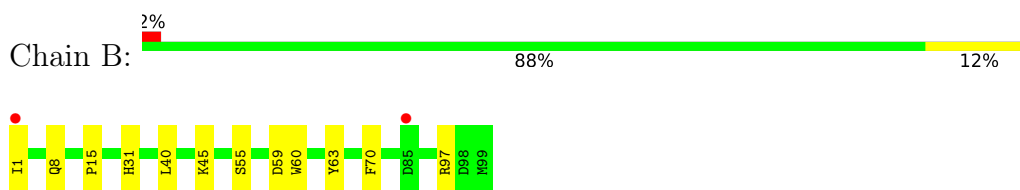
- Molecule 2: Beta-2-microglobulin

- Molecule 3: Ovalbumin epitope, SIINFEKL

Chain C:

100%

There are no outlier residues recorded for this chain.

• Molecule 3: Ovalbumin epitope, SIINFEKL

Chain F:

100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	66.99Å 90.41Å 89.74Å 90.00° 111.71° 90.00°	Depositor
Resolution (Å)	31.04 – 2.00 45.21 – 2.00	Depositor EDS
% Data completeness (in resolution range)	91.4 (31.04-2.00) 98.2 (45.21-2.00)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	2.68 (at 2.00Å)	Xtriage
Refinement program	REFMAC, PHENIX 1.6.1_357	Depositor
R, R_{free}	0.186 , 0.243 0.197 , 0.246	Depositor DCC
R_{free} test set	3331 reflections (5.05%)	wwPDB-VP
Wilson B-factor (Å^2)	23.2	Xtriage
Anisotropy	0.618	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.31 , 48.1	EDS
L-test for twinning[2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.000 for h,-k,-h-l	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	7398	wwPDB-VP
Average B, all atoms (Å^2)	26.0	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 43.12 % 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 1.8473e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5   Model quality ⓘ

5.1   Standard geometry ⓘ

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

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	0.34	0/2370	0.53	0/3221
1	D	0.36	0/2412	0.52	0/3274
2	B	0.36	0/884	0.53	0/1194
2	E	0.35	0/856	0.54	0/1160
3	C	0.40	0/68	0.48	0/88
3	F	0.32	0/68	0.46	0/88
All	All	0.35	0/6658	0.53	0/9025

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 ⓘ

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	2299	0	2185	44	0
1	D	2344	0	2230	28	0
2	B	858	0	840	9	0
2	E	830	0	809	9	0
3	C	68	0	74	0	0
3	F	68	0	74	0	0
4	B	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	1	0	0	0	0
4	E	1	0	0	0	0
5	A	309	0	0	4	0
5	B	150	0	0	2	0
5	C	12	0	0	0	0
5	D	319	0	0	4	0
5	E	125	0	0	1	0
5	F	13	0	0	0	0
All	All	7398	0	6212	84	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.

All (84) 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:178:THR:HG23	1:A:181:ARG:HH21	1.32	0.91
1:D:44[B]:ARG:HD3	1:D:64:THR:HG21	1.59	0.84
1:A:263:HIS:CD2	1:A:265:GLY:H	1.98	0.81
1:A:263:HIS:HD2	1:A:265:GLY:H	1.30	0.77
1:D:263:HIS:CD2	1:D:265:GLY:H	2.04	0.74
1:A:98:ILE:HG22	1:A:113:TYR:CE1	2.22	0.74
1:A:178:THR:CG2	1:A:181:ARG:HH21	2.01	0.74
1:A:29:ASP:HB2	1:A:179:LEU:HG	1.70	0.72
1:A:178:THR:HG23	1:A:181:ARG:NH2	2.05	0.72
1:D:263:HIS:HD2	1:D:265:GLY:H	1.40	0.68
1:A:3:HIS:HD2	1:A:29:ASP:OD2	1.78	0.66
1:A:29:ASP:OD2	1:A:179:LEU:HD23	1.97	0.65
1:D:41:GLU:HA	1:D:41:GLU:OE1	1.96	0.65
2:E:58:LYS:HG3	5:E:692:HOH:O	1.97	0.64
1:A:98:ILE:HG22	1:A:113:TYR:HE1	1.64	0.63
2:B:40:LEU:HD23	2:B:45[A]:LYS:HA	1.81	0.62
1:A:225:ILE:O	1:A:226:GLN:HB2	1.99	0.62
2:B:40:LEU:HD23	2:B:45[B]:LYS:HA	1.81	0.62
1:D:44[A]:ARG:HD2	1:D:64:THR:HG21	1.81	0.62
1:A:89:LYS:HE3	5:A:325:HOH:O	2.01	0.61
2:E:84:HIS:HD2	2:E:86:SER:OG	1.82	0.61
2:E:32:PRO:O	2:E:84:HIS:HE1	1.85	0.58
2:B:55:SER:HB2	2:B:63:TYR:CZ	2.39	0.58
1:A:259:CYS:HB3	1:A:272:LEU:HD13	1.86	0.58
1:A:234:ARG:HH11	2:B:8:GLN:NE2	2.02	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:210:PRO:O	1:D:263:HIS:HE1	1.87	0.57
1:D:106:ASP:OD2	1:D:108[B]:ARG:HD3	2.05	0.56
1:D:21[A]:ARG:HE	1:D:23[A]:MET:HE2	1.70	0.56
1:D:21[A]:ARG:HE	1:D:23[A]:MET:CE	2.18	0.56
1:A:129:ASP:O	1:A:131:LYS:HG3	2.06	0.56
1:A:98:ILE:CG2	1:A:113:TYR:HE1	2.19	0.56
2:E:2:GLN:HE22	2:E:85:ASP:HB3	1.70	0.55
2:B:1:ILE:HB	5:B:103:HOH:O	2.07	0.55
1:D:117:ALA:HB2	2:E:60:TRP:CE2	2.42	0.55
1:A:176:ASN:C	1:A:178:THR:H	2.10	0.54
1:A:79:ARG:HD3	5:A:890:HOH:O	2.07	0.54
1:A:98:ILE:CG2	1:A:113:TYR:CE1	2.91	0.53
2:E:55:SER:HB2	2:E:63:TYR:CZ	2.43	0.53
1:A:178:THR:HG22	1:A:179:LEU:HD13	1.90	0.53
2:E:40:LEU:HD23	2:E:45:LYS:HA	1.91	0.53
1:A:117:ALA:HB2	2:B:60:TRP:CE2	2.44	0.52
1:A:178:THR:HG22	1:A:179:LEU:CD1	2.40	0.52
1:A:144:LYS:HE3	1:A:148:GLU:OE2	2.09	0.52
1:A:115[A]:GLN:HG2	1:A:125:ALA:HB1	1.92	0.51
1:D:234:ARG:HH11	2:E:8:GLN:NE2	2.08	0.50
2:B:15:PRO:HG3	2:B:97[B]:ARG:HB2	1.94	0.50
1:D:219:LEU:O	1:D:222:GLU:HG3	2.13	0.49
1:D:172:LEU:O	1:D:176:ASN:HB2	2.13	0.49
1:A:98:ILE:HG22	1:A:113:TYR:CD1	2.47	0.49
1:A:28:VAL:HG23	1:A:33:PHE:CE1	2.48	0.49
1:A:176:ASN:CG	1:A:177:ALA:H	2.17	0.48
1:A:179:LEU:HD13	1:A:179:LEU:N	2.29	0.48
1:D:6[B]:ARG:HD3	5:D:812:HOH:O	2.14	0.47
1:A:177:ALA:HA	1:A:180:LEU:HD12	1.96	0.47
1:D:10[B]:THR:HG23	5:D:563:HOH:O	2.15	0.47
1:D:79:ARG:NH2	5:D:748:HOH:O	2.45	0.47
1:A:262:TYR:CD1	1:D:108[B]:ARG:HG3	2.50	0.47
1:D:218:GLN:OE1	1:D:221:GLY:HA2	2.16	0.46
1:A:230:LEU:HD12	1:A:230:LEU:C	2.36	0.45
1:D:43:PRO:O	1:D:44[B]:ARG:NH1	2.49	0.45
1:A:257:TYR:O	1:A:273:ARG:HG2	2.16	0.45
1:D:210:PRO:HB2	5:D:867:HOH:O	2.16	0.45
1:A:6:ARG:NH1	5:A:876:HOH:O	2.48	0.45
1:A:215:LEU:HD22	1:A:261:VAL:HG22	1.99	0.45
1:D:45:TYR:HE1	1:D:67:ALA:HB2	1.82	0.45
1:D:182:THR:HG23	1:D:182:THR:O	2.16	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:ASN:O	1:A:177:ALA:HB3	2.18	0.44
2:E:2:GLN:NE2	2:E:85:ASP:HB3	2.32	0.44
1:A:1:GLY:HA3	1:A:105:SER:HA	1.99	0.44
1:A:262:TYR:CG	1:D:108[A]:ARG:HD3	2.53	0.44
1:A:6:ARG:HG3	5:A:279:HOH:O	2.17	0.43
2:B:31:HIS:ND1	5:B:707:HOH:O	2.37	0.42
1:A:176:ASN:CG	1:A:177:ALA:N	2.72	0.42
1:D:261:VAL:HB	1:D:270:LEU:HB2	2.02	0.42
1:A:16:GLY:O	1:A:17:LEU:HD23	2.21	0.41
1:D:277:PRO:HA	1:D:278:PRO:HD2	1.96	0.41
1:A:194:ARG:HB2	1:A:198:LYS:O	2.21	0.41
1:A:51:TRP:CZ3	1:A:52:MET:HG2	2.56	0.41
1:D:220:ASN:HB2	1:D:221:GLY:H	1.61	0.41
1:A:210:PRO:O	1:A:263:HIS:HE1	2.03	0.41
1:D:182:THR:O	1:D:182:THR:CG2	2.69	0.41
1:A:1:GLY:HA2	1:A:3:HIS:ND1	2.36	0.40
2:B:59:ASP:O	2:B:60:TRP:HB2	2.21	0.40
1:D:21[A]:ARG:NH1	1:D:39:ASP:OD2	2.55	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	281/278 (101%)	272 (97%)	8 (3%)	1 (0%)	34	30
1	D	285/278 (102%)	275 (96%)	9 (3%)	1 (0%)	34	30
2	B	101/99 (102%)	99 (98%)	2 (2%)	0	100	100
2	E	98/99 (99%)	96 (98%)	2 (2%)	0	100	100
3	C	6/8 (75%)	6 (100%)	0	0	100	100
3	F	6/8 (75%)	6 (100%)	0	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles
All	All	777/770 (101%)	754 (97%)	21 (3%)	2 (0%)	41 37

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	226	GLN
1	D	220	ASN

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	241/236 (102%)	236 (98%)	5 (2%)	53	57
1	D	245/236 (104%)	242 (99%)	3 (1%)	71	76
2	B	98/94 (104%)	97 (99%)	1 (1%)	76	81
2	E	95/94 (101%)	94 (99%)	1 (1%)	73	78
3	C	8/8 (100%)	8 (100%)	0	100	100
3	F	8/8 (100%)	8 (100%)	0	100	100
All	All	695/676 (103%)	685 (99%)	10 (1%)	65	72

All (10) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	45	TYR
1	A	178	THR
1	A	179	LEU
1	A	182	THR
1	A	272	LEU
2	B	70	PHE
1	D	45	TYR
1	D	222	GLU
1	D	230	LEU
2	E	70	PHE

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	3	HIS
1	A	65	GLN
1	A	127	ASN
1	A	263	HIS
2	B	8	GLN
1	D	127	ASN
1	D	263	HIS
1	D	264	GLN
2	E	2	GLN
2	E	8	GLN
2	E	29	GLN
2	E	38	GLN
2	E	84	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 3 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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	278/278 (100%)	-0.17	9 (3%)	47	46	12, 23, 52, 76	12 (4%)
1	D	278/278 (100%)	-0.18	8 (2%)	51	50	13, 22, 45, 59	13 (4%)
2	B	99/99 (100%)	-0.38	2 (2%)	65	63	14, 23, 42, 65	1 (1%)
2	E	99/99 (100%)	-0.42	0	100	100	14, 23, 41, 53	4 (4%)
3	C	8/8 (100%)	-0.41	0	100	100	13, 17, 23, 26	0
3	F	8/8 (100%)	-0.28	0	100	100	17, 21, 27, 29	0
All	All	770/770 (100%)	-0.23	19 (2%)	57	56	12, 23, 45, 76	30 (3%)

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	225	ILE	7.1
1	A	179	LEU	6.6
1	A	225	ILE	6.3
1	A	181	ARG	4.7
1	A	180	LEU	4.3
1	D	277	PRO	4.1
1	A	178	THR	3.8
1	D	220	ASN	3.4
1	A	278	PRO	3.4
1	A	220[A]	ASN	3.4
1	D	40	ALA	3.4
1	A	277	PRO	3.3
1	D	226	GLN	3.1
1	D	180	LEU	3.1
1	D	42	ASN	2.5
2	B	1	ILE	2.4
1	D	178	THR	2.3
2	B	85	ASP	2.1
1	A	177	ALA	2.0

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 ⓘ

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
4	CA	D	279	1/1	0.62	0.12	74,74,74,74	0
4	CA	E	100	1/1	0.91	0.07	53,53,53,53	0
4	CA	B	100	1/1	0.93	0.06	48,48,48,48	0

6.5   Other polymers ⓘ

There are no such residues in this entry.