



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 4, 2026 – 11:14 PM UTC

PDB ID : 8JRK / pdb_00008jrk
Title : Crystal structure of the bat MHC II molecule at 2.3 Å resolution
Authors : Wang, S.
Deposited on : 2023-06-17
Resolution : 2.30 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:

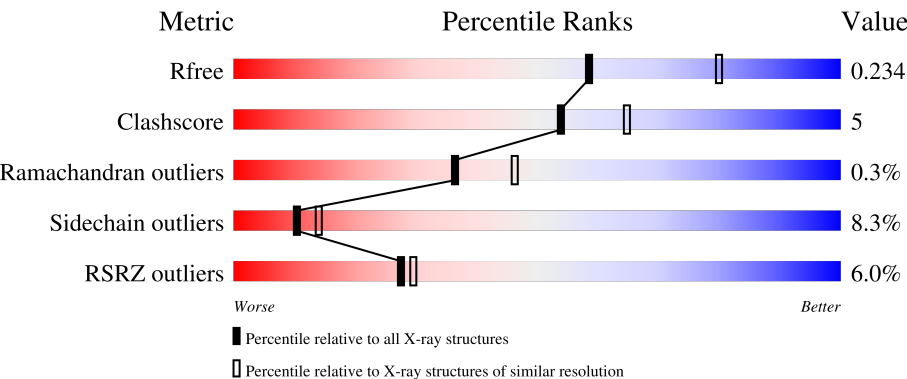
MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)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

1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.30 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	6319 (2.30-2.30)
Clashscore	190562	6919 (2.30-2.30)
Ramachandran outliers	187476	6854 (2.30-2.30)
Sidechain outliers	187428	6854 (2.30-2.30)
RSRZ outliers	180081	6325 (2.30-2.30)

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	182	82%14%..
1	C	182	80%17%..
2	B	190	12%

77%14%.7%

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Mol	Chain	Length	Quality of chain
3	F	13	8% 92% 8%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 6234 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 HLA class II histocompatibility antigen, DR alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	177	Total	C	N	O	S	0	0	0
			1454	946	228	272	8			
1	C	178	Total	C	N	O	S	0	0	0
			1465	955	229	273	8			

- Molecule 2 is a protein called MHC class II histocompatibility antigen, DR-1 beta chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	176	Total	C	N	O	S	0	0	0
			1431	904	253	268	6			
2	D	178	Total	C	N	O	S	0	0	0
			1447	913	258	270	6			

- Molecule 3 is a protein called ASN-ASP-ILE-LEU-SER-ARG-LEU-ASP-PRO-PRO-GLU-A LA-SER.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	E	12	Total	C	N	O	0	0	0
			93	57	16	20			
3	F	13	Total	C	N	O	0	0	0
			99	60	17	22			

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	69	Total	O	0	0
			69	69		
4	B	37	Total	O	0	0
			37	37		
4	E	6	Total	O	0	0
			6	6		
4	C	78	Total	O	0	0
			78	78		

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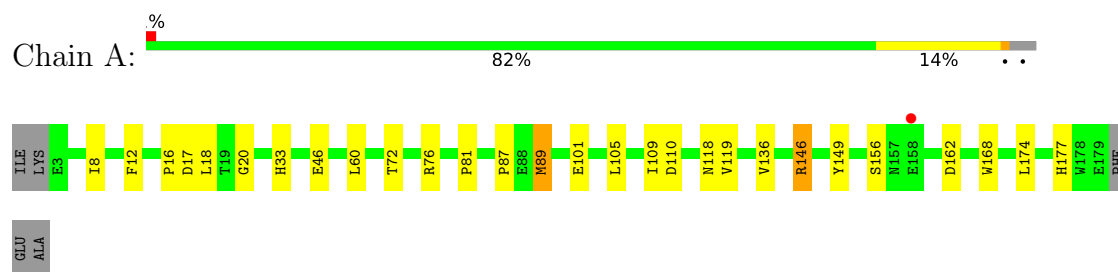
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	D	51	Total	O	0	0
			51	51		
4	F	4	Total	O	0	0
			4	4		

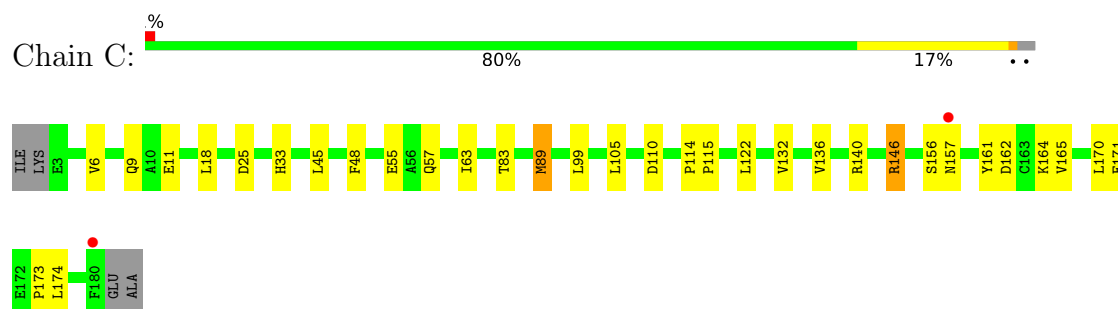
3 Residue-property plots [i](#)

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.

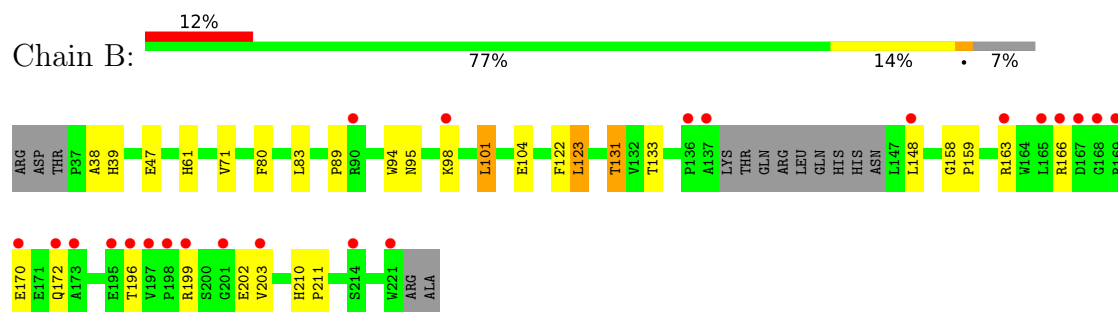
- Molecule 1: HLA class II histocompatibility antigen, DR alpha chain



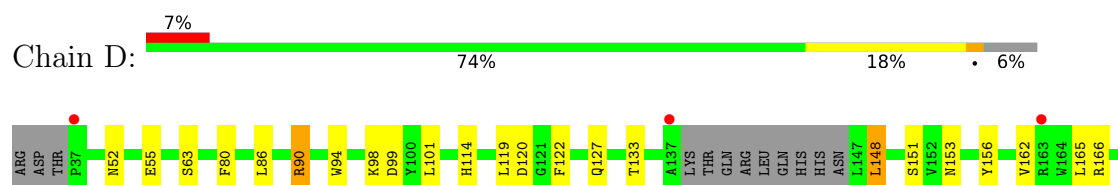
- Molecule 1: HLA class II histocompatibility antigen, DR alpha chain

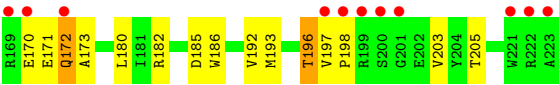


- Molecule 2: MHC class II histocompatibility antigen, DR-1 beta chain

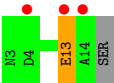
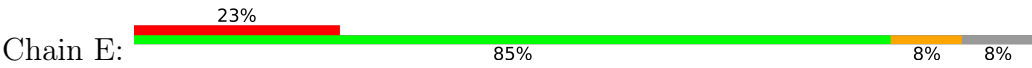


- Molecule 2: MHC class II histocompatibility antigen, DR-1 beta chain

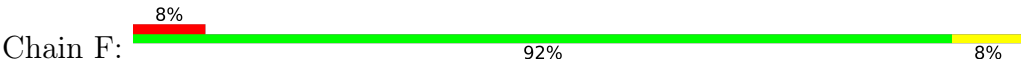




● Molecule 3: ASN-ASP-ILE-LEU-SER-ARG-LEU-ASP-PRO-PRO-GLU-ALA-SER



● Molecule 3: ASN-ASP-ILE-LEU-SER-ARG-LEU-ASP-PRO-PRO-GLU-ALA-SER



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	91.95Å 91.95Å 214.11Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	48.11 – 2.30 48.11 – 2.30	Depositor EDS
% Data completeness (in resolution range)	100.0 (48.11-2.30) 100.0 (48.11-2.30)	Depositor EDS
R_{merge}	0.17	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	7.14 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.207 , 0.257 (Not available) , 0.234	Depositor DCC
R_{free} test set	2128 reflections (5.10%)	wwPDB-VP
Wilson B-factor (Å ²)	18.4	Xtriage
Anisotropy	0.122	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 24.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	6234	wwPDB-VP
Average B, all atoms (Å ²)	21.0	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 20.27 % 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 9.0146e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

5.1 Standard geometry

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	1.02	0/1499	1.32	1/2038 (0.0%)
1	C	1.11	2/1511 (0.1%)	1.32	4/2054 (0.2%)
2	B	1.00	0/1470	1.32	1/1998 (0.1%)
2	D	1.02	0/1486	1.32	3/2019 (0.1%)
3	E	1.10	0/94	1.43	0/128
3	F	0.97	0/100	1.35	0/136
All	All	1.04	2/6160 (0.0%)	1.32	9/8373 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	173	PRO	C-O	-7.07	1.15	1.23
1	C	161	TYR	C-O	-5.60	1.17	1.23

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	131	THR	CB-CA-C	5.75	119.51	110.19
1	C	55	GLU	CA-C-N	5.64	128.15	120.54
1	C	55	GLU	C-N-CA	5.64	128.15	120.54
1	A	118	ASN	CB-CA-C	5.61	119.93	110.79
1	C	83	THR	CB-CA-C	5.30	118.48	109.84
1	C	25	ASP	CA-CB-CG	5.25	117.85	112.60
2	D	120	ASP	N-CA-C	-5.15	107.07	113.19
2	D	182	ARG	CB-CA-C	5.12	118.19	109.84
2	D	99	ASP	CA-CB-CG	5.11	117.70	112.60

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	1454	0	1385	18	0
1	C	1465	0	1394	16	0
2	B	1431	0	1348	14	0
2	D	1447	0	1366	16	0
3	E	93	0	89	1	0
3	F	99	0	94	0	0
4	A	69	0	0	0	0
4	B	37	0	0	0	0
4	C	78	0	0	3	0
4	D	51	0	0	0	0
4	E	6	0	0	0	0
4	F	4	0	0	0	0
All	All	6234	0	5676	57	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 5.

All (57) 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:C:89:MET:CE	1:C:174:LEU:HG	2.06	0.86
2:D:90:ARG:HH11	2:D:90:ARG:HG3	1.51	0.73
1:C:57:GLN:HG3	4:C:220:HOH:O	1.91	0.70
2:B:61:HIS:HD2	2:B:104:GLU:OE1	1.76	0.69
1:A:89:MET:HE1	1:A:174:LEU:O	1.95	0.67
1:A:17:ASP:OD1	2:B:39:HIS:HD2	1.79	0.66
1:A:89:MET:HE3	1:A:174:LEU:HG	1.77	0.66
1:A:76:ARG:CZ	2:B:89:PRO:HG2	2.28	0.63
2:D:90:ARG:HH11	2:D:90:ARG:CG	2.14	0.61
1:C:140:ARG:HG2	1:C:146:ARG:HD3	1.82	0.60
1:A:17:ASP:OD1	2:B:39:HIS:CD2	2.55	0.59
2:D:90:ARG:HD2	2:D:94:TRP:CZ2	2.38	0.58
1:A:89:MET:CE	1:A:174:LEU:HG	2.32	0.58
1:A:162:ASP:OD1	1:A:177:HIS:HB3	2.05	0.55
2:B:61:HIS:CD2	2:B:104:GLU:OE1	2.61	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:196:THR:HG22	2:D:198:PRO:HD3	1.93	0.50
1:A:110:ASP:OD1	1:A:146:ARG:HD2	2.12	0.50
1:C:140:ARG:CG	1:C:146:ARG:HD3	2.42	0.50
1:C:110:ASP:OD1	1:C:146:ARG:HD2	2.12	0.48
1:C:89:MET:HE2	1:C:174:LEU:HG	1.95	0.48
1:A:72:THR:HG21	3:E:13:GLU:CD	2.39	0.47
2:D:162:VAL:HG11	2:D:192:VAL:HG21	1.96	0.47
1:C:170:LEU:HD22	4:C:211:HOH:O	2.15	0.47
2:D:151:SER:OG	2:D:153:ASN:ND2	2.39	0.47
1:C:89:MET:HE3	1:C:174:LEU:HG	1.94	0.46
1:C:114:PRO:HB2	1:C:115:PRO:HD2	1.97	0.46
2:D:165:LEU:HD12	2:D:205:THR:HB	1.98	0.46
2:D:127:GLN:HA	2:D:156:TYR:O	2.15	0.46
1:A:119:VAL:HG21	1:A:149:TYR:CE1	2.51	0.46
1:C:132:VAL:HB	4:C:246:HOH:O	2.16	0.46
2:D:185:ASP:O	2:D:186:TRP:HB2	2.16	0.46
1:C:165:VAL:CG1	1:C:174:LEU:HB3	2.46	0.45
2:D:80:PHE:CE2	2:D:94:TRP:CE3	3.04	0.45
2:D:172:GLN:CD	2:D:173:ALA:H	2.26	0.44
2:B:80:PHE:CD1	2:B:94:TRP:HE3	2.36	0.43
1:A:33:HIS:CG	1:A:136:VAL:HG11	2.53	0.43
2:B:210:HIS:CD2	2:B:211:PRO:HD2	2.53	0.43
1:C:9:GLN:NE2	1:C:11:GLU:OE2	2.52	0.43
2:D:80:PHE:CD2	2:D:94:TRP:CE3	3.07	0.43
1:A:16:PRO:HD2	2:B:39:HIS:CD2	2.53	0.43
2:D:101:LEU:HD23	2:D:101:LEU:HA	1.81	0.43
1:C:33:HIS:CG	1:C:136:VAL:HG11	2.54	0.42
2:D:114:HIS:CD2	2:D:114:HIS:C	2.97	0.42
2:D:148:LEU:HD12	2:D:148:LEU:HA	1.92	0.42
1:C:89:MET:HE1	1:C:174:LEU:O	2.20	0.42
2:D:52:ASN:HD22	2:D:52:ASN:N	2.18	0.42
1:C:45:LEU:HD12	1:C:48:PHE:CZ	2.55	0.42
1:C:122:LEU:HB2	1:C:162:ASP:HB2	2.02	0.41
2:B:123:LEU:HD23	2:B:123:LEU:HA	1.85	0.41
1:A:168:TRP:CZ3	2:B:39:HIS:CE1	3.09	0.41
2:B:101:LEU:HD23	2:B:101:LEU:HA	1.87	0.41
2:B:158:GLY:N	2:B:159:PRO:CD	2.83	0.41
1:A:110:ASP:OD1	1:A:146:ARG:CD	2.69	0.40
1:A:8:ILE:HG12	2:B:47:GLU:HG2	2.02	0.40
1:A:12:PHE:O	1:A:20:GLY:HA2	2.20	0.40
1:A:87:PRO:HB2	1:A:109:ILE:HG23	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:81:PRO:HB3	2:B:38:ALA:HB1	2.03	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	175/182 (96%)	174 (99%)	1 (1%)	0	100	100
1	C	176/182 (97%)	171 (97%)	5 (3%)	0	100	100
2	B	172/190 (90%)	159 (92%)	12 (7%)	1 (1%)	21	27
2	D	174/190 (92%)	168 (97%)	5 (3%)	1 (1%)	21	27
3	E	10/13 (77%)	10 (100%)	0	0	100	100
3	F	11/13 (85%)	11 (100%)	0	0	100	100
All	All	718/770 (93%)	693 (96%)	23 (3%)	2 (0%)	36	46

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	122	PHE
2	D	122	PHE

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	161/165 (98%)	153 (95%)	8 (5%)	22	33
1	C	162/165 (98%)	151 (93%)	11 (7%)	14	20
2	B	156/169 (92%)	139 (89%)	17 (11%)	6	7
2	D	157/169 (93%)	140 (89%)	17 (11%)	6	7
3	E	11/12 (92%)	10 (91%)	1 (9%)	9	11
3	F	12/12 (100%)	11 (92%)	1 (8%)	10	14
All	All	659/692 (95%)	604 (92%)	55 (8%)	10	14

All (55) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	18	LEU
1	A	46	GLU
1	A	60	LEU
1	A	89	MET
1	A	101	GLU
1	A	105	LEU
1	A	146	ARG
1	A	156	SER
2	B	71	VAL
2	B	83	LEU
2	B	95	ASN
2	B	98	LYS
2	B	101	LEU
2	B	123	LEU
2	B	131	THR
2	B	133	THR
2	B	148	LEU
2	B	163	ARG
2	B	166	ARG
2	B	170	GLU
2	B	172	GLN
2	B	196	THR
2	B	199	ARG
2	B	202	GLU
2	B	203	VAL
3	E	13	GLU
1	C	6	VAL
1	C	18	LEU
1	C	63	ILE
1	C	89	MET

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Mol	Chain	Res	Type
1	C	99	LEU
1	C	105	LEU
1	C	146	ARG
1	C	156	SER
1	C	157	ASN
1	C	164	LYS
1	C	171	GLU
2	D	55	GLU
2	D	63	SER
2	D	86	LEU
2	D	90	ARG
2	D	98	LYS
2	D	119	LEU
2	D	133	THR
2	D	148	LEU
2	D	166	ARG
2	D	170	GLU
2	D	171	GLU
2	D	172	GLN
2	D	180	LEU
2	D	193	MET
2	D	196	THR
2	D	197	VAL
2	D	203	VAL
3	F	3	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (21) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	57	GLN
1	A	62	ASN
1	A	177	HIS
2	B	39	HIS
2	B	43	GLN
2	B	61	HIS
2	B	97	GLN
2	B	125	HIS
2	B	153	ASN
2	B	172	GLN
2	B	207	HIS
3	E	3	ASN
1	C	78	ASN

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Mol	Chain	Res	Type
1	C	118	ASN
1	C	157	ASN
2	D	52	ASN
2	D	125	HIS
2	D	153	ASN
2	D	172	GLN
2	D	209	GLN
3	F	3	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 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

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	177/182 (97%)	-0.23	1 (0%) 85 86	8, 16, 35, 53	0
1	C	178/182 (97%)	-0.21	2 (1%) 78 79	7, 15, 33, 49	0
2	B	176/190 (92%)	0.43	23 (13%) 7 8	7, 18, 77, 107	0
2	D	178/190 (93%)	0.22	14 (7%) 18 20	8, 18, 63, 83	0
3	E	12/13 (92%)	0.42	3 (25%) 2 2	13, 15, 41, 46	0
3	F	13/13 (100%)	0.19	1 (7%) 19 21	13, 15, 38, 44	0
All	All	734/770 (95%)	0.06	44 (5%) 27 29	7, 17, 54, 107	0

All (44) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	197	VAL	6.8
2	B	197	VAL	6.4
2	B	198	PRO	6.3
2	B	169	ARG	6.3
2	D	200	SER	6.2
2	B	199	ARG	4.4
2	B	167	ASP	4.2
2	D	137	ALA	4.2
2	B	172	GLN	4.2
2	B	196	THR	4.2
2	D	169	ARG	4.1
2	D	198	PRO	4.0
2	B	168	GLY	4.0
2	D	172	GLN	4.0
2	D	223	ALA	4.0
2	D	199	ARG	3.8
2	B	221	TRP	3.6
3	E	14	ALA	3.6
2	D	201	GLY	3.5

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Mol	Chain	Res	Type	RSRZ
2	B	170	GLU	3.5
2	D	37	PRO	3.4
1	C	157	ASN	3.4
2	D	221	TRP	3.4
2	B	173	ALA	3.2
2	D	222	ARG	3.1
2	B	148	LEU	3.0
2	B	203	VAL	3.0
2	B	201	GLY	3.0
1	C	180	PHE	2.9
2	D	170	GLU	2.9
2	B	165	LEU	2.8
2	B	214	SER	2.7
3	E	4	ASP	2.7
2	B	166	ARG	2.6
1	A	158	GLU	2.6
3	E	13	GLU	2.6
2	B	137	ALA	2.6
2	D	163	ARG	2.4
2	B	90	ARG	2.3
3	F	15	SER	2.3
2	B	136	PRO	2.2
2	B	163	ARG	2.1
2	B	98	LYS	2.0
2	B	195	GLU	2.0

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.