



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 12:05 AM GMT

PDB ID : 1ZHB  
Title : Crystal Structure Of The Murine Class I Major Histocompatibility Complex Of H-2Db, B2-Microglobulin, and a 9-Residue Peptide Derived from rat dopamine beta-monooxygenase  
Authors : Sandalova, T.; Michaelsson, J.; Harris, R.A.; Odeberg, J.; Schneider, G.; Karre, K.; Achour, A.  
Deposited on : 2005-04-25  
Resolution : 2.70 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](mailto:validation@mail.wwpdb.org)  
A user guide is available at  
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>  
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467  
Mogul : 1.7 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

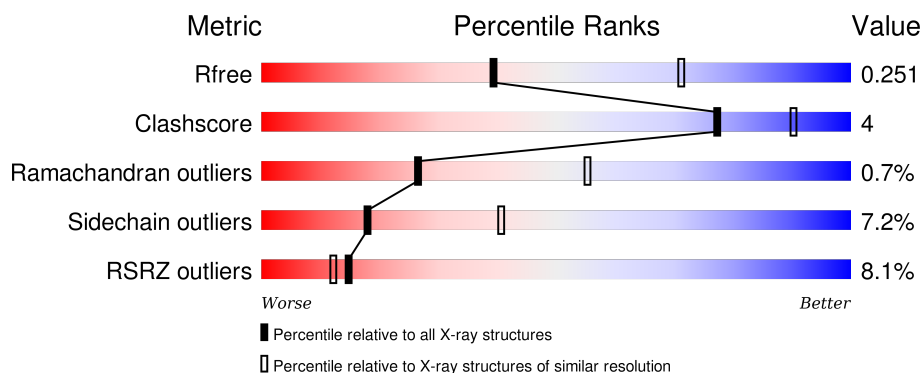
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.70 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))
$R_{free}$	91344	2103 (2.70-2.70)
Clashscore	102246	2422 (2.70-2.70)
Ramachandran outliers	100387	2382 (2.70-2.70)
Sidechain outliers	100360	2382 (2.70-2.70)
RSRZ outliers	91569	2107 (2.70-2.70)

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 on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 2, 1 and 0 types of geometric quality criteria. 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	276	<div> <div>6%</div> <div>86%12%..</div> </div>
1	D	276	<div> <div>13%</div> <div>84%13%..</div> </div>
1	G	276	<div> <div>13%</div> <div>86%11%..</div> </div>
1	J	276	<div> <div>11%</div> <div>84%12%..</div> </div>
2	B	99	<div> <div></div> <div>86%11%.</div> </div>

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Mol	Chain	Length	Quality of chain
2	E	99	 2% 85% 13%
2	H	99	 4% 86% 12%
2	K	99	 % 84% 16%
3	C	9	 78% 22%
3	F	9	 100%
3	I	9	 78% 22%
3	L	9	 89% 11%

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 12661 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, D-B alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	273	Total	C	N	O	S	0	0	0
			2244	1418	397	420	9			
1	D	273	Total	C	N	O	S	0	0	0
			2244	1418	397	420	9			
1	G	273	Total	C	N	O	S	0	0	0
			2244	1418	397	420	9			
1	J	273	Total	C	N	O	S	0	0	0
			2244	1418	397	420	9			

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

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	99	Total	C	N	O	S	0	0	0
			820	524	138	151	7			
2	E	99	Total	C	N	O	S	0	0	0
			820	524	138	151	7			
2	H	99	Total	C	N	O	S	0	0	0
			820	524	138	151	7			
2	K	99	Total	C	N	O	S	0	0	0
			820	524	138	151	7			

- Molecule 3 is a protein called 9-mer peptide from Dopamine beta-monooxygenase.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	C	9	Total	C	N	O	0	0	0
			74	51	11	12			
3	F	9	Total	C	N	O	0	0	0
			74	51	11	12			
3	I	9	Total	C	N	O	0	0	0
			74	51	11	12			
3	L	9	Total	C	N	O	0	0	0
			74	51	11	12			

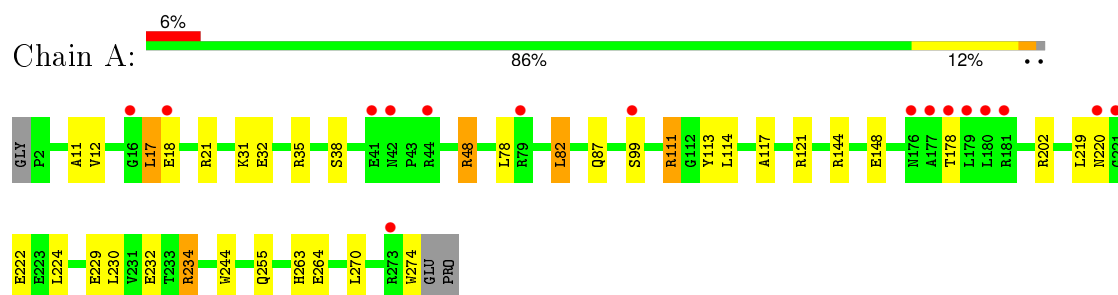
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	21	Total 21	O 21	0	0
4	B	7	Total 7	O 7	0	0
4	C	2	Total 2	O 2	0	0
4	D	16	Total 16	O 16	0	0
4	E	9	Total 9	O 9	0	0
4	F	1	Total 1	O 1	0	0
4	G	15	Total 15	O 15	0	0
4	H	10	Total 10	O 10	0	0
4	J	19	Total 19	O 19	0	0
4	K	7	Total 7	O 7	0	0
4	L	2	Total 2	O 2	0	0

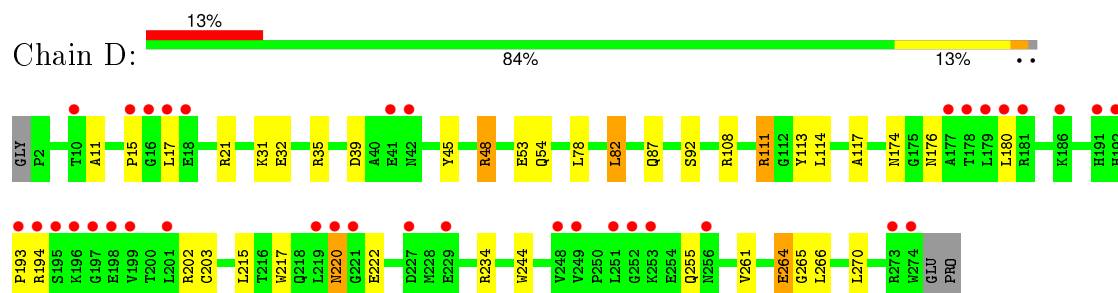
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

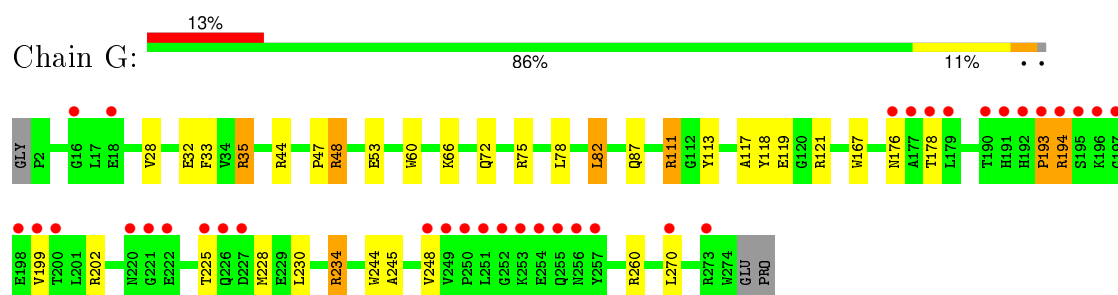
- Molecule 1: H-2 class I histocompatibility antigen, D-B alpha chain



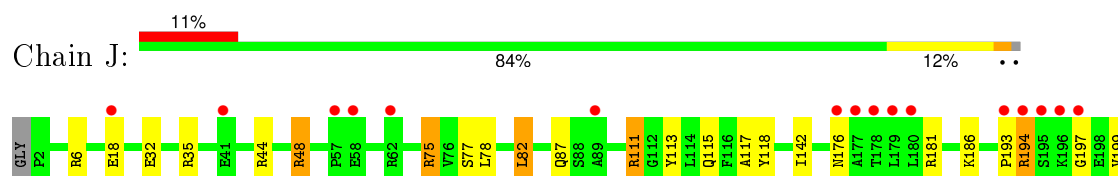
- Molecule 1: H-2 class I histocompatibility antigen, D-B alpha chain

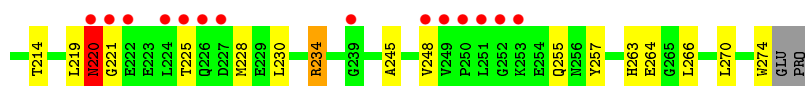


- Molecule 1: H-2 class I histocompatibility antigen, D-B alpha chain

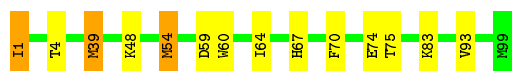
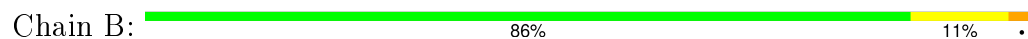


- Molecule 1: H-2 class I histocompatibility antigen, D-B alpha chain

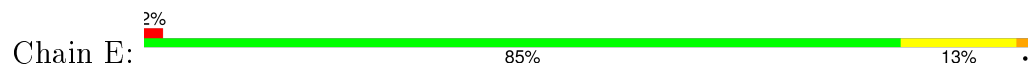




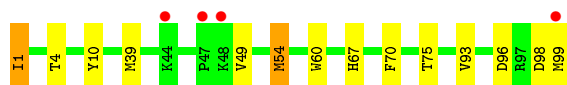
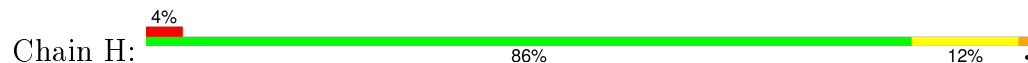
- Molecule 2: Beta-2-microglobulin



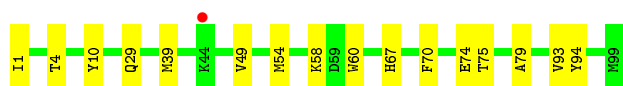
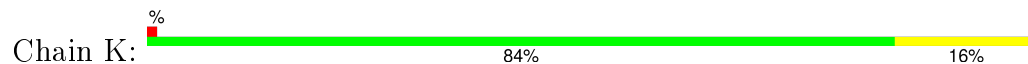
- Molecule 2: Beta-2-microglobulin



- Molecule 2: Beta-2-microglobulin



- Molecule 2: Beta-2-microglobulin



- Molecule 3: 9-mer peptide from Dopamine beta-monooxygenase



- Molecule 3: 9-mer peptide from Dopamine beta-monooxygenase




There are no outlier residues recorded for this chain.

- Molecule 3: 9-mer peptide from Dopamine beta-monooxygenase



- Molecule 3: 9-mer peptide from Dopamine beta-monoxygenase

Chain L:  89% 11%





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	92.06 Å 122.72 Å 99.40 Å 90.00° 103.00° 90.00°	Depositor
Resolution (Å)	24.92 – 2.70 24.91 – 2.70	Depositor EDS
% Data completeness (in resolution range)	100.0 (24.92-2.70) 93.4 (24.91-2.70)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	0.08	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	0.90 (at 2.68 Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.225 , 0.262 0.240 , 0.251	Depositor DCC
$R_{free}$ test set	2230 reflections (4.20%)	DCC
Wilson B-factor (Å <sup>2</sup> )	47.0	Xtriage
Anisotropy	0.378	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 37.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.30$	Xtriage
Outliers	2 of 55472 reflections (0.004%)	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	12661	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 18.34% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.375 respectively for untwinned datasets, and 0.333, 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	0.71	1/2310 (0.0%)	0.74	1/3136 (0.0%)
1	D	0.66	0/2310	0.74	0/3136
1	G	0.68	0/2310	0.73	1/3136 (0.0%)
1	J	0.64	0/2310	0.70	0/3136
2	B	0.78	1/846 (0.1%)	0.73	0/1147
2	E	0.71	0/846	0.68	0/1147
2	H	0.72	0/846	0.70	0/1147
2	K	0.72	0/846	0.70	0/1147
3	C	0.67	0/76	0.80	0/102
3	F	0.81	0/76	0.77	0/102
3	I	0.76	0/76	0.89	0/102
3	L	0.89	0/76	0.90	0/102
All	All	0.69	2/12928 (0.0%)	0.73	2/17540 (0.0%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	74	GLU	CG-CD	6.10	1.61	1.51
1	A	232	GLU	CG-CD	5.54	1.60	1.51

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	G	121	ARG	NE-CZ-NH1	5.85	123.22	120.30
1	A	234	ARG	NE-CZ-NH1	5.62	123.11	120.30

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	2244	0	2118	14	0
1	D	2244	0	2118	16	0
1	G	2244	0	2118	21	0
1	J	2244	0	2118	20	0
2	B	820	0	796	6	0
2	E	820	0	796	6	0
2	H	820	0	796	13	0
2	K	820	0	796	6	0
3	C	74	0	78	0	0
3	F	74	0	78	0	0
3	I	74	0	78	2	0
3	L	74	0	78	1	0
4	A	21	0	0	0	0
4	B	7	0	0	0	0
4	C	2	0	0	0	0
4	D	16	0	0	0	0
4	E	9	0	0	0	0
4	F	1	0	0	0	0
4	G	15	0	0	0	0
4	H	10	0	0	0	0
4	J	19	0	0	1	0
4	K	7	0	0	0	0
4	L	2	0	0	0	0
All	All	12661	0	11968	90	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.

The worst 5 of 90 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:D:264:GLU:O	1:D:266:LEU:N	2.12	0.82
2:B:39:MET:HE1	2:B:67:HIS:HA	1.67	0.77
2:H:96:ASP:CB	2:H:99:MET:C	2.56	0.74
2:H:96:ASP:HB3	2:H:99:MET:C	2.09	0.73

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:35:ARG:HD2	1:G:48:ARG:HD2	1.73	0.71

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	271/276 (98%)	259 (96%)	11 (4%)	1 (0%)	39	69
1	D	271/276 (98%)	253 (93%)	15 (6%)	3 (1%)	17	42
1	G	271/276 (98%)	256 (94%)	13 (5%)	2 (1%)	26	55
1	J	271/276 (98%)	258 (95%)	9 (3%)	4 (2%)	13	32
2	B	97/99 (98%)	92 (95%)	5 (5%)	0	100	100
2	E	97/99 (98%)	95 (98%)	2 (2%)	0	100	100
2	H	97/99 (98%)	94 (97%)	3 (3%)	0	100	100
2	K	97/99 (98%)	95 (98%)	2 (2%)	0	100	100
3	C	7/9 (78%)	6 (86%)	0	1 (14%)	0	0
3	F	7/9 (78%)	6 (86%)	1 (14%)	0	100	100
3	I	7/9 (78%)	5 (71%)	2 (29%)	0	100	100
3	L	7/9 (78%)	6 (86%)	1 (14%)	0	100	100
All	All	1500/1536 (98%)	1425 (95%)	64 (4%)	11 (1%)	26	55

5 of 11 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	G	193	PRO
1	G	194	ARG
1	A	17	LEU
1	D	265	GLY

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Mol	Chain	Res	Type
3	C	6	TYR

### 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	232/234 (99%)	216 (93%)	16 (7%)	19	43
1	D	232/234 (99%)	216 (93%)	16 (7%)	19	43
1	G	232/234 (99%)	219 (94%)	13 (6%)	26	54
1	J	232/234 (99%)	215 (93%)	17 (7%)	17	39
2	B	94/94 (100%)	84 (89%)	10 (11%)	8	19
2	E	94/94 (100%)	86 (92%)	8 (8%)	13	30
2	H	94/94 (100%)	87 (93%)	7 (7%)	17	39
2	K	94/94 (100%)	86 (92%)	8 (8%)	13	30
3	C	7/7 (100%)	6 (86%)	1 (14%)	4	10
3	F	7/7 (100%)	7 (100%)	0	100	100
3	I	7/7 (100%)	7 (100%)	0	100	100
3	L	7/7 (100%)	7 (100%)	0	100	100
All	All	1332/1340 (99%)	1236 (93%)	96 (7%)	18	41

5 of 96 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	E	1	ILE
1	G	48	ARG
2	K	1	ILE
2	E	2	GLN
2	E	70	PHE

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 25 such sidechains are listed below:

Mol	Chain	Res	Type
1	G	87	GLN
1	G	192	HIS
2	K	67	HIS
1	G	97	GLN
1	G	220	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 carbohydrates 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 [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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	273/276 (98%)	0.31	16 (5%) 26 24	28, 45, 84, 89	0
1	D	273/276 (98%)	0.66	36 (13%) 4 4	28, 45, 84, 90	0
1	G	273/276 (98%)	0.58	35 (12%) 5 4	28, 45, 84, 90	0
1	J	273/276 (98%)	0.47	30 (10%) 7 5	30, 45, 84, 91	0
2	B	99/99 (100%)	-0.04	0 100 100	34, 45, 54, 59	0
2	E	99/99 (100%)	0.12	2 (2%) 68 69	34, 45, 54, 60	0
2	H	99/99 (100%)	0.19	4 (4%) 42 41	33, 45, 54, 63	0
2	K	99/99 (100%)	-0.00	1 (1%) 84 85	34, 45, 55, 60	0
3	C	9/9 (100%)	0.32	0 100 100	33, 35, 39, 39	0
3	F	9/9 (100%)	0.33	0 100 100	33, 36, 39, 40	0
3	I	9/9 (100%)	0.27	0 100 100	33, 35, 39, 39	0
3	L	9/9 (100%)	0.83	0 100 100	33, 36, 40, 40	0
All	All	1524/1536 (99%)	0.39	124 (8%) 15 12	28, 45, 83, 91	0

The worst 5 of 124 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	G	178	THR	10.9
1	D	177	ALA	9.4
1	D	194	ARG	8.7
1	D	178	THR	8.4
1	G	177	ALA	7.9

### 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

There are no carbohydrates in this entry.

### 6.4 Ligands

There are no ligands in this entry.

### 6.5 Other polymers

There are no such residues in this entry.