



# Full wwPDB X-ray Structure Validation Report ⓘ

Aug 22, 2023 – 05:54 PM EDT

PDB ID : 3C8J  
Title : The crystal structure of natural killer cell receptor Ly49C  
Authors : Deng, L.; Mariuzza, R.A.  
Deposited on : 2008-02-12  
Resolution : 2.60 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](mailto: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>.

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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  
Xtriage (Phenix) : 1.13  
EDS : 2.35  
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) : 2.35

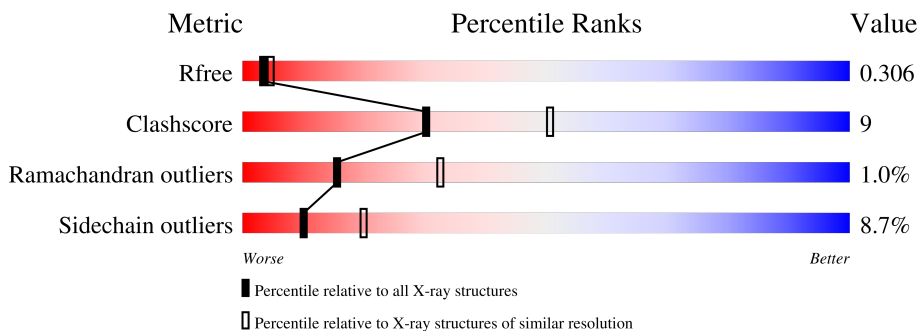
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)

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  $\geq 3$ , 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	203	48% (green), 12% (yellow), . (orange), 37% (grey)
1	B	203	48% (green), 10% (yellow), . (orange), 38% (grey)
1	C	203	43% (green), 18% (yellow), . (orange), 38% (grey)
1	D	203	42% (green), 18% (yellow), . (orange), 36% (grey)

## 2 Entry composition i

There are 2 unique types of molecules in this entry. The entry contains 4346 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 Natural killer cell receptor Ly49C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	127	1054	687	175	181	11	0	0	0
1	B	126	1050	684	174	181	11	0	0	0
1	C	126	1050	684	174	181	11	0	0	0
1	D	130	1082	701	181	189	11	0	0	0

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	60	MET	-	initiating methionine	UNP Q61198
A	62	SER	VAL	SEE REMARK 999	UNP Q61198
A	74	THR	ILE	SEE REMARK 999	UNP Q61198
A	?	-	HIS	SEE REMARK 999	UNP Q61198
A	116	GLY	ARG	engineered mutation	UNP Q61198
A	119	HIS	-	SEE REMARK 999	UNP Q61198
A	171	GLY	SER	engineered mutation	UNP Q61198
A	193	GLY	GLU	engineered mutation	UNP Q61198
A	223	LYS	ARG	engineered mutation	UNP Q61198
B	60	MET	-	initiating methionine	UNP Q61198
B	62	SER	VAL	SEE REMARK 999	UNP Q61198
B	74	THR	ILE	SEE REMARK 999	UNP Q61198
B	?	-	HIS	variant	UNP Q61198
B	116	GLY	ARG	engineered mutation	UNP Q61198
B	119	HIS	-	SEE REMARK 999	UNP Q61198
B	171	GLY	SER	engineered mutation	UNP Q61198
B	193	GLY	GLU	engineered mutation	UNP Q61198
B	223	LYS	ARG	engineered mutation	UNP Q61198
C	60	MET	-	initiating methionine	UNP Q61198
C	62	SER	VAL	SEE REMARK 999	UNP Q61198
C	74	THR	ILE	SEE REMARK 999	UNP Q61198

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Chain	Residue	Modelled	Actual	Comment	Reference
C	?	-	HIS	SEE REMARK 999	UNP Q61198
C	116	GLY	ARG	engineered mutation	UNP Q61198
C	119	HIS	-	SEE REMARK 999	UNP Q61198
C	171	GLY	SER	engineered mutation	UNP Q61198
C	193	GLY	GLU	engineered mutation	UNP Q61198
C	223	LYS	ARG	engineered mutation	UNP Q61198
D	60	MET	-	initiating methionine	UNP Q61198
D	62	SER	VAL	SEE REMARK 999	UNP Q61198
D	74	THR	ILE	SEE REMARK 999	UNP Q61198
D	?	-	HIS	SEE REMARK 999	UNP Q61198
D	116	GLY	ARG	engineered mutation	UNP Q61198
D	119	HIS	-	SEE REMARK 999	UNP Q61198
D	171	GLY	SER	engineered mutation	UNP Q61198
D	193	GLY	GLU	engineered mutation	UNP Q61198
D	223	LYS	ARG	engineered mutation	UNP Q61198

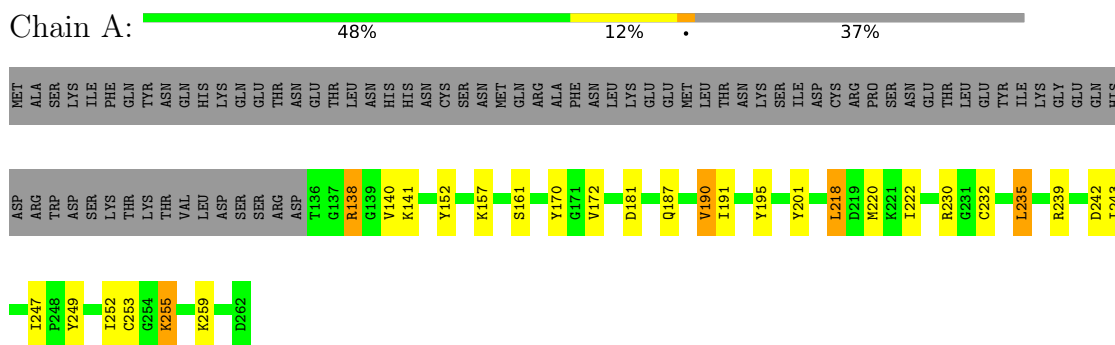
- Molecule 2 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	20	Total O 20 20	0	0
2	B	44	Total O 44 44	0	0
2	C	12	Total O 12 12	0	0
2	D	34	Total O 34 34	0	0

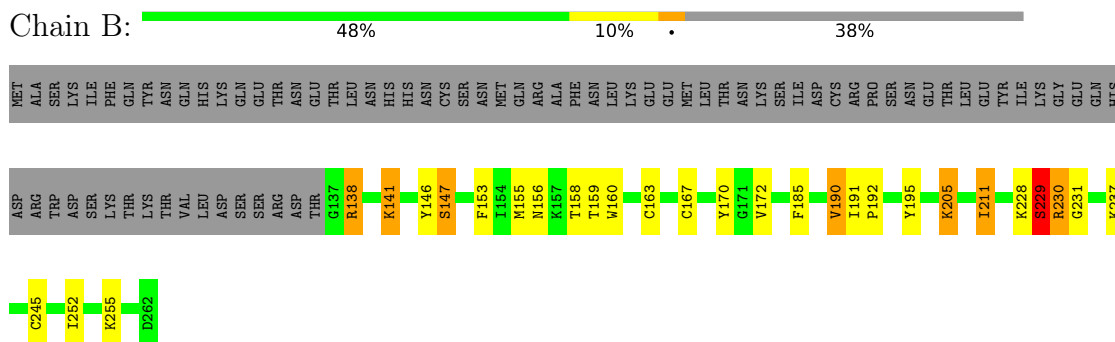
### 3 Residue-property plots

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. 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. 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.

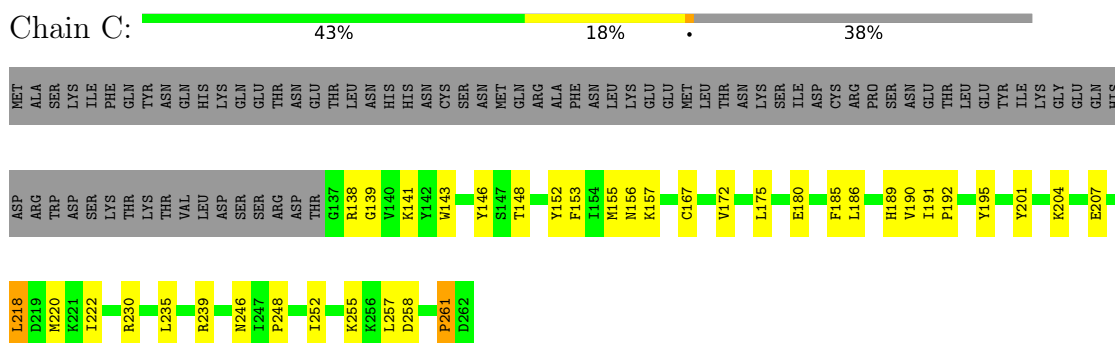
- Molecule 1: Natural killer cell receptor Ly49C



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MET ALA SER LYS ILE PHE GLN TYR ASN GLN HIS LYS GLN THR ASN THR LEU ASN HIS ASN CYS SER ASN MET GLN ARG ALA PHE ASN LEU LYS GLU MET LEU THR ASN LYS SER ILE ASP CYS ARG PRO SER ASN GLU THR LEU TYR ILE LYS GLN HIS

ASP ARG TRP SER LYS THR LYS THR VAL LEU ASP SER S133 R134 D135 T136 R138 G139 V140 K141 C145 Y146 S147 T148 K149 C150 F153 M156 K157 T158 S161 G162 C163 M166 C167 Q168 H169 V172 P173 I174 K184 F185 L186 Q187 R188 H189 V190 M194 Y195

L199 I211 K221 M226 F227 K228 S229 R230 V233 F234 L235 S236 K237 M246 I247 P248 C251 I252 D258 D262

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	69.10Å 94.89Å 104.19Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.60 41.60 – 2.40	Depositor EDS
% Data completeness (in resolution range)	93.5 (30.00-2.60) 92.4 (41.60-2.40)	Depositor EDS
$R_{merge}$	0.06	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.13 (at 2.39Å)	Xtrriage
Refinement program	REFMAC 5.2.0003	Depositor
R, $R_{free}$	0.198 , 0.263 0.261 , 0.306	Depositor DCC
$R_{free}$ test set	1276 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	47.0	Xtrriage
Anisotropy	0.268	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.31 , 36.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.31$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	4346	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	60.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.33% 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, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	0.58	0/1085	0.68	0/1457
1	B	0.70	0/1081	0.88	1/1450 (0.1%)
1	C	0.92	2/1081 (0.2%)	0.69	2/1450 (0.1%)
1	D	0.57	0/1113	0.75	2/1493 (0.1%)
All	All	0.71	2/4360 (0.0%)	0.75	5/5850 (0.1%)

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	207	GLU	CD-OE2	19.24	1.46	1.25
1	C	207	GLU	CD-OE1	16.75	1.44	1.25

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	207	GLU	OE1-CD-OE2	6.67	131.30	123.30
1	D	148	THR	O-C-N	-6.26	112.68	122.70
1	D	146	TYR	CB-CG-CD2	5.75	124.45	121.00
1	C	148	THR	O-C-N	-5.54	113.84	122.70
1	B	147	SER	CB-CA-C	5.17	119.93	110.10

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	1054	0	1038	14	0
1	B	1050	0	1036	19	0
1	C	1050	0	1036	20	1
1	D	1082	0	1065	29	1
2	A	20	0	0	1	0
2	B	44	0	0	2	0
2	C	12	0	0	1	0
2	D	34	0	0	6	0
All	All	4346	0	4175	78	1

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 (78) 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:135:ASP:HA	2:D:297:HOH:O	1.48	1.14
1:D:138:ARG:HB3	1:D:156:ASN:HD21	1.24	1.01
1:D:136:THR:OG1	1:D:137:GLY:N	1.96	0.91
1:D:190:VAL:O	1:D:237:LYS:HE2	1.74	0.88
1:C:139:GLY:H	1:C:156:ASN:HD21	1.33	0.77
1:B:205:LYS:HB2	2:B:275:HOH:O	1.86	0.76
1:D:138:ARG:HB3	1:D:156:ASN:ND2	2.01	0.74
1:D:136:THR:HG1	1:D:137:GLY:H	1.37	0.70
1:B:190:VAL:O	1:B:237:LYS:HE2	1.92	0.69
1:D:188:ARG:HD3	2:D:319:HOH:O	1.94	0.67
1:D:251:CYS:HB2	2:D:300:HOH:O	1.95	0.66
1:D:188:ARG:CD	2:D:319:HOH:O	2.45	0.64
1:B:158:THR:HG23	1:B:159:THR:O	1.98	0.63
1:C:172:VAL:HG13	1:C:255:LYS:HB2	1.81	0.62
1:D:167:CYS:HB3	1:D:172:VAL:O	2.00	0.61
1:C:167:CYS:HB3	1:C:172:VAL:O	2.00	0.61
1:B:138:ARG:HH21	1:D:184:LYS:HD2	1.65	0.60
1:C:139:GLY:H	1:C:156:ASN:ND2	2.01	0.58
1:C:153:PHE:CE1	1:C:189:HIS:HE1	2.22	0.58
1:B:228:LYS:O	1:B:229:SER:HB3	2.05	0.57
1:C:139:GLY:N	1:C:156:ASN:HD21	1.99	0.57
1:B:153:PHE:HB3	1:B:155:MET:CE	2.36	0.56
1:A:195:TYR:HB3	1:A:252:ILE:HG13	1.89	0.55
1:B:167:CYS:HB3	1:B:172:VAL:O	2.07	0.55
1:D:133:SER:O	1:D:134:ARG:HG3	2.07	0.54
1:D:166:ASN:O	1:D:169:HIS:HB3	2.08	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:141:LYS:HE2	1:A:170:TYR:CZ	2.44	0.53
1:C:201:TYR:CE2	1:C:230:ARG:HG2	2.45	0.52
1:B:153:PHE:HB3	1:B:155:MET:HE1	1.90	0.52
1:C:143:TRP:HB3	1:C:152:TYR:HD1	1.74	0.52
1:A:152:TYR:HB2	1:A:253:CYS:HB2	1.93	0.51
1:B:228:LYS:O	1:B:229:SER:CB	2.56	0.51
1:D:174:ILE:HG22	1:D:211:ILE:HD12	1.93	0.51
1:D:229:SER:OG	1:D:230:ARG:N	2.43	0.50
1:C:218:LEU:HB3	1:C:222:ILE:HD12	1.94	0.50
1:A:201:TYR:CE2	1:A:230:ARG:HG2	2.47	0.50
1:B:141:LYS:HE2	1:B:170:TYR:CZ	2.47	0.49
1:C:156:ASN:ND2	2:C:265:HOH:O	2.45	0.49
1:A:218:LEU:HB3	1:A:222:ILE:HD12	1.94	0.48
1:B:172:VAL:HG13	1:B:255:LYS:HB2	1.95	0.47
1:A:235:LEU:HD12	1:A:235:LEU:C	2.35	0.47
1:D:158:THR:O	1:D:248:PRO:HA	2.15	0.47
1:D:139:GLY:O	1:D:141:LYS:HE2	2.15	0.46
1:D:199:LEU:HD23	1:D:233:VAL:HG21	1.97	0.46
1:D:163:CYS:HB2	2:D:300:HOH:O	2.14	0.46
1:C:146:TYR:CD1	1:C:185:PHE:CE1	3.04	0.46
1:D:186:LEU:O	1:D:190:VAL:HB	2.16	0.46
1:C:175:LEU:HD21	1:C:186:LEU:CD1	2.46	0.46
1:D:194:ASN:HB3	1:D:234:PHE:CD1	2.52	0.45
1:B:138:ARG:NH2	1:D:184:LYS:HD2	2.31	0.45
1:D:145:CYS:HA	1:D:150:CYS:HA	1.99	0.45
1:B:211:ILE:HA	2:B:276:HOH:O	2.16	0.45
1:B:231:GLY:HA2	1:B:245:CYS:SG	2.57	0.44
1:C:155:MET:CE	1:C:195:TYR:HE2	2.31	0.44
1:A:187:GLN:HE22	1:A:239:ARG:HA	1.81	0.44
1:C:143:TRP:HB3	1:C:152:TYR:CD1	2.52	0.44
1:B:146:TYR:O	1:B:147:SER:C	2.52	0.44
1:B:191:ILE:O	1:B:192:PRO:C	2.56	0.44
1:A:157:LYS:HA	1:A:249:TYR:O	2.17	0.44
1:D:153:PHE:CE2	1:D:190:VAL:HG23	2.53	0.44
1:A:232:CYS:O	1:A:242:ASP:HA	2.18	0.43
1:A:243:ILE:HG12	1:A:247:ILE:HD12	1.99	0.43
1:B:195:TYR:HB3	1:B:252:ILE:HG13	1.99	0.43
1:D:226:ASN:O	1:D:228:LYS:HG2	2.18	0.43
1:A:172:VAL:HG13	1:A:255:LYS:HB3	2.00	0.43
1:B:146:TYR:CD1	1:B:185:PHE:CE1	3.06	0.43
1:A:181:ASP:CG	1:C:138:ARG:HD2	2.39	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:175:LEU:HD21	1:C:186:LEU:HD13	2.01	0.42
1:C:261:PRO:HG2	1:D:150:CYS:SG	2.60	0.42
1:A:140:VAL:HA	2:A:263:HOH:O	2.19	0.42
1:A:190:VAL:HG13	1:A:191:ILE:O	2.20	0.42
1:D:133:SER:C	1:D:134:ARG:HG3	2.40	0.42
1:B:160:TRP:O	1:B:163:CYS:HB3	2.20	0.42
1:C:195:TYR:HB3	1:C:252:ILE:HG13	2.01	0.41
1:C:157:LYS:HB3	1:C:248:PRO:HB2	2.03	0.41
1:C:191:ILE:O	1:C:192:PRO:C	2.57	0.41
1:D:195:TYR:HB3	1:D:252:ILE:HG13	2.03	0.41
1:D:184:LYS:HE2	2:D:294:HOH:O	2.21	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:239:ARG:NH2	1:D:228:LYS:O[2_875]	1.85	0.35

## 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	125/203 (62%)	114 (91%)	10 (8%)	1 (1%)	19 39
1	B	124/203 (61%)	117 (94%)	5 (4%)	2 (2%)	9 19
1	C	124/203 (61%)	111 (90%)	12 (10%)	1 (1%)	19 39
1	D	128/203 (63%)	116 (91%)	11 (9%)	1 (1%)	19 39
All	All	501/812 (62%)	458 (91%)	38 (8%)	5 (1%)	15 32

All (5) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	138	ARG
1	B	229	SER
1	B	230	ARG
1	D	134	ARG
1	C	261	PRO

### 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	114/188 (61%)	106 (93%)	8 (7%)	15	30
1	B	114/188 (61%)	106 (93%)	8 (7%)	15	30
1	C	114/188 (61%)	104 (91%)	10 (9%)	10	19
1	D	118/188 (63%)	104 (88%)	14 (12%)	5	9
All	All	460/752 (61%)	420 (91%)	40 (9%)	10	20

All (40) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	138	ARG
1	A	161	SER
1	A	190	VAL
1	A	218	LEU
1	A	220	MET
1	A	235	LEU
1	A	255	LYS
1	A	259	LYS
1	B	138	ARG
1	B	141	LYS
1	B	156	ASN
1	B	190	VAL
1	B	205	LYS
1	B	211	ILE
1	B	229	SER
1	B	230	ARG
1	C	141	LYS

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Mol	Chain	Res	Type
1	C	180	GLU
1	C	190	VAL
1	C	204	LYS
1	C	218	LEU
1	C	220	MET
1	C	235	LEU
1	C	246	ASN
1	C	257	LEU
1	C	258	ASP
1	D	136	THR
1	D	141	LYS
1	D	161	SER
1	D	163	CYS
1	D	184	LYS
1	D	190	VAL
1	D	211	ILE
1	D	221	LYS
1	D	226	ASN
1	D	230	ARG
1	D	235	LEU
1	D	246	ASN
1	D	258	ASP
1	D	262	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (17) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	187	GLN
1	A	194	ASN
1	B	166	ASN
1	B	168	GLN
1	B	194	ASN
1	B	213	ASN
1	C	156	ASN
1	C	166	ASN
1	C	168	GLN
1	C	187	GLN
1	C	189	HIS
1	C	194	ASN
1	C	246	ASN
1	D	156	ASN
1	D	189	HIS

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Mol	Chain	Res	Type
1	D	194	ASN
1	D	246	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](#)

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

Unable to reproduce the depositors R factor - this section is therefore empty.

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

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.3 Carbohydrates

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.4 Ligands

Unable to reproduce the depositors R factor - this section is therefore empty.

### 6.5 Other polymers

Unable to reproduce the depositors R factor - this section is therefore empty.