Full wwPDB X-ray Structure Validation Report (i)

Sep 3, 2023 – 07:09 PM EDT

PDB ID	:	3S9D
Title	:	binary complex between IFNa2 and IFNAR2
Authors	:	Thomas, C.; Garcia, K.C.
Deposited on	:	2011-06-01
Resolution	:	2.00 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 (i) 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 (1)) were used in the production of this report:

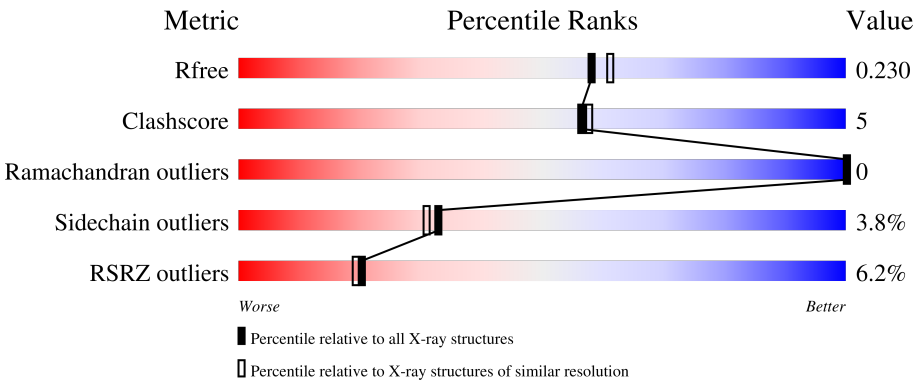
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.35
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.35

1 Overall quality at a glance (i)

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}	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	168	5% 65% 11% 24%
1	C	168	9% 48% 20% • 31%
2	B	199	5% 83% 7% • 10%
2	D	199	3% 81% 11% • 7%

2 Entry composition (i)

There are 4 unique types of molecules in this entry. The entry contains 5393 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 Interferon alpha-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	127	1068	687	178	193	10	5	6	0
1	C	116	938	605	155	170	8	0	3	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	ALA	-	cloning artifact	UNP P01563
A	-1	ASP	-	cloning artifact	UNP P01563
A	0	PRO	-	cloning artifact	UNP P01563
A	23	ARG	LYS	conflict	UNP P01563
A	57	ALA	HIS	engineered mutation	UNP P01563
A	58	ALA	GLU	engineered mutation	UNP P01563
A	61	ALA	GLN	engineered mutation	UNP P01563
C	-2	ALA	-	cloning artifact	UNP P01563
C	-1	ASP	-	cloning artifact	UNP P01563
C	0	PRO	-	cloning artifact	UNP P01563
C	23	ARG	LYS	conflict	UNP P01563
C	57	ALA	HIS	engineered mutation	UNP P01563
C	58	ALA	GLU	engineered mutation	UNP P01563
C	61	ALA	GLN	engineered mutation	UNP P01563

- Molecule 2 is a protein called Interferon alpha/beta receptor 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	180	1495	972	237	272	14	0	9	0
2	D	186	1531	993	242	285	11	0	8	0

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	7	ALA	-	cloning artifact	UNP P48551
B	8	ASP	-	cloning artifact	UNP P48551
B	9	PRO	-	cloning artifact	UNP P48551
D	7	ALA	-	cloning artifact	UNP P48551
D	8	ASP	-	cloning artifact	UNP P48551
D	9	PRO	-	cloning artifact	UNP P48551

- Molecule 3 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	Cl		
3	D	1	1	1	0	0

- Molecule 4 is water.

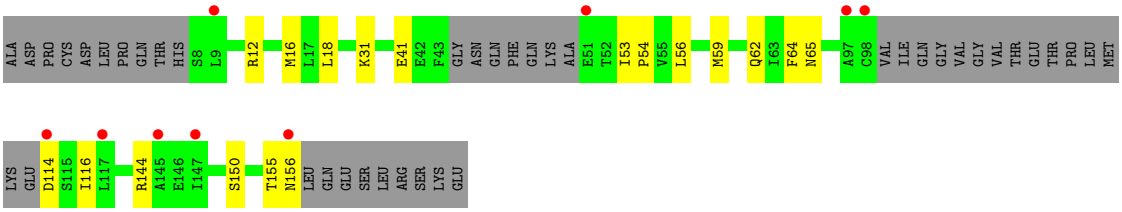
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
			Total	O		
4	A	68	68	68	0	0
			Total	O		
4	B	130	130	130	0	0
			Total	O		
4	C	37	37	37	0	0
			Total	O		
4	D	125	125	125	0	0

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.

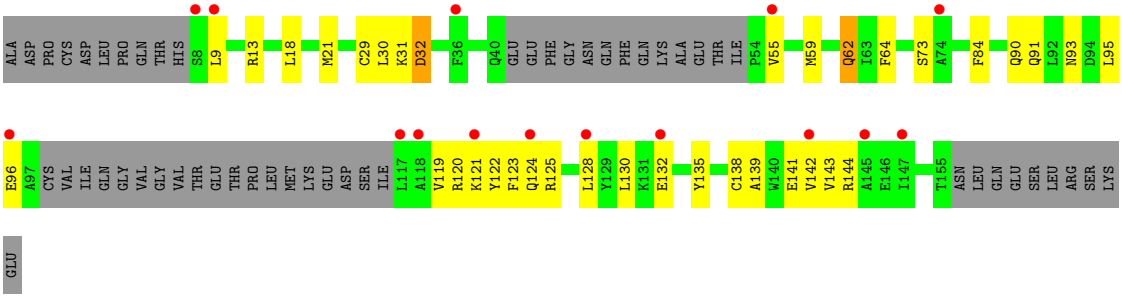
• Molecule 1: Interferon alpha-2

Chain A:



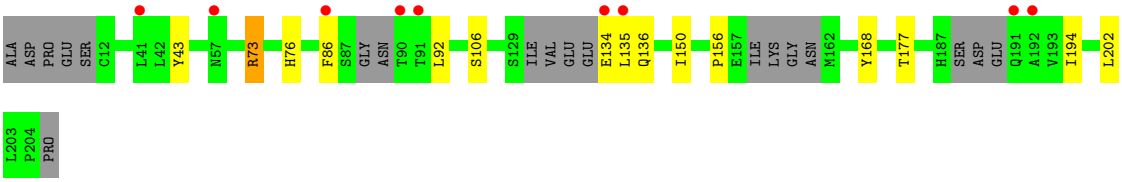
• Molecule 1: Interferon alpha-2

Chain C:



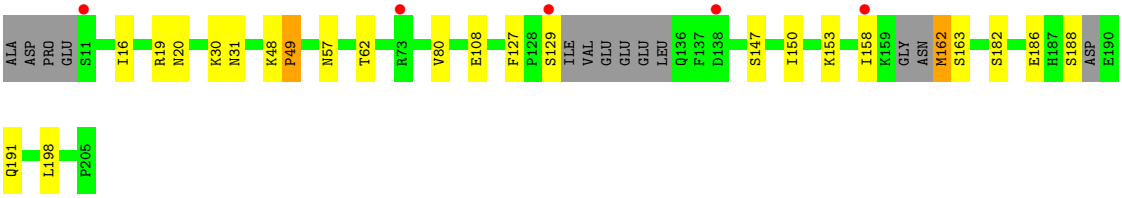
• Molecule 2: Interferon alpha/beta receptor 2

Chain B:



• Molecule 2: Interferon alpha/beta receptor 2

Chain D:


ALA
ASP
PRO
GLU
S11
I16
R19
N20
K30
N31
K48
P49
N57
T62
R73
V80
E108
F127
P128
S129
ILE
VAL
GLU
GLU
GLU
LEU
Q136
F137
D138
S147
I150
K153
I158
K159
GLY
ASN
M162
S163
S182
E186
H187
S188
ASP
E190
Q191
L198
P205

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	84.65Å 62.01Å 88.08Å 90.00° 92.68° 90.00°	Depositor
Resolution (Å)	19.90 – 2.00 19.90 – 2.00	Depositor EDS
% Data completeness (in resolution range)	99.2 (19.90-2.00) 99.3 (19.90-2.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.05	Depositor
$< I/\sigma(I) >$ [1]	2.56 (at 2.01Å)	Xtriage
Refinement program	PHENIX	Depositor
R, R_{free}	0.204 , 0.233 0.199 , 0.230	Depositor DCC
R_{free} test set	3069 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å^2)	31.2	Xtriage
Anisotropy	0.147	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 61.5	EDS
L-test for twinning[2]	$< \|L\| > = 0.49$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	0.011 for l,k,-h 0.029 for h,-k,-l 0.023 for l,-k,h	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	5393	wwPDB-VP
Average B, all atoms (Å^2)	37.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.47% of the height of the origin peak. No significant pseudotranslation is detected.*

[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 (i)

5.1 Standard geometry (i)

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

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	0/1099	0.50	0/1477
1	C	0.67	0/962	0.50	0/1297
2	B	0.77	1/1543 (0.1%)	0.60	0/2092
2	D	0.76	1/1589 (0.1%)	0.61	0/2155
All	All	0.71	2/5193 (0.0%)	0.57	0/7021

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	43	TYR	CD1-CE1	-6.55	1.29	1.39
2	D	186	GLU	CB-CG	-5.19	1.42	1.52

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	1068	0	1064	8	0
1	C	938	0	909	20	0
2	B	1495	0	1461	9	0
2	D	1531	0	1519	15	0
3	D	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	68	0	0	1	1
4	B	130	0	0	0	1
4	C	37	0	0	0	0
4	D	125	0	0	3	0
All	All	5393	0	4953	50	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 5.

All (50) 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)
2:B:134:GLU:HA	2:B:134:GLU:OE1	1.89	0.71
1:C:139:ALA:O	1:C:143:VAL:HG23	1.94	0.68
1:C:130:LEU:HB3	1:C:135:TYR:CE1	2.31	0.65
1:A:65:ASN:ND2	4:A:230:HOH:O	2.29	0.65
1:C:121:LYS:O	1:C:125:ARG:HG3	2.02	0.58
1:A:156:ASN:HD22	2:B:76:HIS:HE1	1.49	0.58
1:C:90:GLN:O	1:C:90:GLN:HG3	2.05	0.55
1:C:31:LYS:HG3	1:C:32:ASP:OD2	2.08	0.53
2:D:30:LYS:HG2	2:D:31:ASN:ND2	2.22	0.53
1:A:12:ARG:O	1:A:16[A]:MET:HG3	2.09	0.52
2:D:158:ILE:HD13	2:D:162:MET:CE	2.39	0.52
1:C:62:GLN:HG2	1:C:123:PHE:CG	2.44	0.52
2:B:134:GLU:HG3	2:B:135:LEU:H	1.75	0.52
1:C:30:LEU:HD21	2:D:80[B]:VAL:HG11	1.92	0.51
1:A:56:LEU:O	1:A:59:MET:HB3	2.11	0.50
1:C:119:VAL:O	1:C:122:TYR:HB3	2.11	0.50
2:D:127:PHE:CE1	2:D:158:ILE:HD11	2.48	0.49
2:B:177:THR:C	2:B:202:LEU:HD13	2.34	0.48
1:C:130:LEU:HD21	1:C:143:VAL:HG21	1.94	0.48
1:C:9:LEU:HD21	1:C:13:ARG:NH1	2.27	0.48
2:D:19:ARG:O	2:D:20:ASN:HB2	2.13	0.47
2:D:182:SER:HB2	2:D:198:LEU:HD23	1.96	0.47
2:D:158:ILE:HD13	2:D:162:MET:HE2	1.96	0.47
2:B:92:LEU:HD22	2:B:92:LEU:N	2.30	0.47
1:A:53:ILE:HB	1:A:54:PRO:HD3	1.96	0.47
2:D:129:SER:HA	2:D:163:SER:OG	2.16	0.46
1:C:29[B]:CYS:SG	1:C:142:VAL:HG23	2.55	0.46
2:B:156:PRO:HG3	2:B:168:TYR:CD1	2.51	0.45
2:D:153:LYS:HG2	4:D:207:HOH:O	2.15	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:18:LEU:O	1:C:144:ARG:HD2	2.15	0.45
2:D:20:ASN:N	4:D:211:HOH:O	2.49	0.45
2:D:191:GLN:HB3	4:D:307:HOH:O	2.16	0.45
2:D:48:LYS:HA	2:D:49:PRO:HD3	1.86	0.44
1:C:21:MET:HE1	1:C:84:PHE:HB2	2.00	0.43
1:C:93:ASN:O	1:C:96:GLU:HB3	2.19	0.43
2:B:73:ARG:HA	2:B:73:ARG:HD2	1.45	0.43
1:C:121:LYS:O	1:C:124:GLN:HB2	2.19	0.43
1:A:18:LEU:O	1:A:144:ARG:HD2	2.18	0.43
2:B:106:SER:HB2	2:B:194:ILE:HD11	2.01	0.42
1:C:29[B]:CYS:SG	1:C:138:CYS:O	2.78	0.42
1:A:41:GLU:H	1:A:41:GLU:CD	2.23	0.42
1:A:59:MET:CE	1:A:150[B]:SER:HB2	2.49	0.42
2:D:188:SER:OG	2:D:191:GLN:HB2	2.19	0.42
1:C:141:GLU:OE2	1:C:141:GLU:HA	2.19	0.41
2:D:16:ILE:HG23	2:D:16:ILE:O	2.21	0.41
1:C:120:ARG:O	1:C:124:GLN:HG3	2.21	0.40
1:C:128:LEU:O	1:C:132:GLU:HG3	2.21	0.40
2:D:19:ARG:HG2	2:D:108:GLU:HG3	2.03	0.40
1:C:91:GLN:O	1:C:95:LEU:HG	2.22	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)
4:A:332:HOH:O	4:B:320:HOH:O[2_656]	2.14	0.06

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	127/168 (76%)	127 (100%)	0	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	C	113/168 (67%)	111 (98%)	2 (2%)	0	100	100
2	B	178/199 (89%)	177 (99%)	1 (1%)	0	100	100
2	D	186/199 (94%)	182 (98%)	4 (2%)	0	100	100
All	All	604/734 (82%)	597 (99%)	7 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	117/151 (78%)	110 (94%)	7 (6%)	19	14
1	C	99/151 (66%)	92 (93%)	7 (7%)	14	10
2	B	175/188 (93%)	171 (98%)	4 (2%)	50	53
2	D	182/188 (97%)	175 (96%)	7 (4%)	33	31
All	All	573/678 (84%)	548 (96%)	25 (4%)	33	25

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	LYS
1	A	62	GLN
1	A	64	PHE
1	A	114	ASP
1	A	116	ILE
1	A	155[A]	THR
1	A	155[B]	THR
2	B	73	ARG
2	B	136	GLN
2	B	150[A]	ILE
2	B	150[B]	ILE
1	C	32	ASP
1	C	55	VAL

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Mol	Chain	Res	Type
1	C	59	MET
1	C	62	GLN
1	C	64	PHE
1	C	73[A]	SER
1	C	73[B]	SER
2	D	49	PRO
2	D	57	ASN
2	D	62	THR
2	D	147	SER
2	D	150[A]	ILE
2	D	150[B]	ILE
2	D	162	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	156	ASN
1	C	20	GLN
2	D	31	ASN
2	D	176	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)

Of 1 ligands modelled in this entry, 1 is 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 (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, 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	127/168 (75%)	0.34	9 (7%)	16	15	19, 35, 60, 70	0
1	C	116/168 (69%)	0.81	15 (12%)	3	3	27, 47, 67, 74	0
2	B	180/199 (90%)	0.26	9 (5%)	28	28	20, 31, 53, 80	0
2	D	186/199 (93%)	0.29	5 (2%)	54	53	20, 33, 55, 71	0
All	All	609/734 (82%)	0.39	38 (6%)	20	19	19, 34, 62, 80	0

All (38) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	9	LEU	5.0
1	C	55	VAL	4.4
1	C	118	ALA	3.6
1	C	9	LEU	3.6
1	A	98	CYS	3.4
2	B	86[A]	PHE	3.3
2	B	134	GLU	3.3
2	D	138	ASP	3.2
1	C	74	ALA	3.1
1	C	8	SER	3.1
2	D	73	ARG	3.1
1	A	97	ALA	3.1
2	D	158	ILE	3.0
1	C	128	LEU	2.9
2	B	191	GLN	2.8
2	B	57	ASN	2.8
1	C	147	ILE	2.8
1	C	96	GLU	2.7
2	B	91	THR	2.7
2	B	90	THR	2.6
1	C	117	LEU	2.6

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Mol	Chain	Res	Type	RSRZ
1	C	142	VAL	2.5
1	C	145	ALA	2.5
2	B	192	ALA	2.4
1	A	147	ILE	2.4
2	B	41	LEU	2.4
2	D	11	SER	2.4
1	A	117	LEU	2.3
1	A	145	ALA	2.3
1	C	124	GLN	2.3
1	A	114	ASP	2.3
1	A	156	ASN	2.3
1	C	132	GLU	2.2
1	C	36	PHE	2.2
2	D	129	SER	2.1
2	B	135	LEU	2.1
1	C	121	LYS	2.1
1	A	51	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 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	CL	D	1	1/1	0.98	0.13	36,36,36,36	0

6.5 Other polymers (i)

There are no such residues in this entry.