



wwPDB X-ray Structure Validation Summary Report ⓘ

Apr 18, 2026 – 03:07 PM UTC

PDB ID : 3LOB / pdb_00003lob
Title : Crystal Structure of Flock House Virus calcium mutant
Authors : Johnson, J.E.; Banerjee, M.; Speir, J.A.; Huang, R.
Deposited on : 2010-02-03
Resolution : 3.60 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

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:

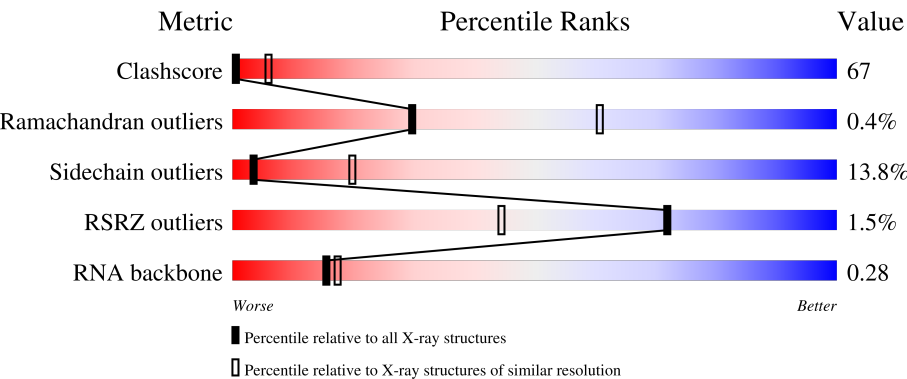
MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (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 3.60 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))
Clashscore	190562	1827 (3.70-3.50)
Ramachandran outliers	187476	1773 (3.70-3.50)
Sidechain outliers	187428	1772 (3.70-3.50)
RSRZ outliers	180081	1745 (3.70-3.50)
RNA backbone	3983	1014 (4.14-3.06)

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	363	
1	B	363	
1	C	363	
2	D	44	
2	E	44	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
2	F	44	7%32%59%
3	R	8	25%38%38%12%12%

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 7299 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 Coat protein beta.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	312	Total	C	N	O	S	0	0	0
			2333	1487	387	449	10			
1	B	306	Total	C	N	O	S	0	0	0
			2291	1460	380	441	10			
1	C	309	Total	C	N	O	S	0	0	0
			2313	1473	384	446	10			

There are 15 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	161	ASN	ASP	engineered mutation	UNP P12870
A	221	ASN	ASP	engineered mutation	UNP P12870
A	249	ASN	ASP	engineered mutation	UNP P12870
A	251	GLN	GLU	engineered mutation	UNP P12870
A	257	GLN	GLU	engineered mutation	UNP P12870
B	161	ASN	ASP	engineered mutation	UNP P12870
B	221	ASN	ASP	engineered mutation	UNP P12870
B	249	ASN	ASP	engineered mutation	UNP P12870
B	251	GLN	GLU	engineered mutation	UNP P12870
B	257	GLN	GLU	engineered mutation	UNP P12870
C	161	ASN	ASP	engineered mutation	UNP P12870
C	221	ASN	ASP	engineered mutation	UNP P12870
C	249	ASN	ASP	engineered mutation	UNP P12870
C	251	GLN	GLU	engineered mutation	UNP P12870
C	257	GLN	GLU	engineered mutation	UNP P12870

- Molecule 2 is a protein called Coat protein gamma.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	D	4	Total	C	N	O	0	0	0
			30	20	5	5			

Continued on next page...

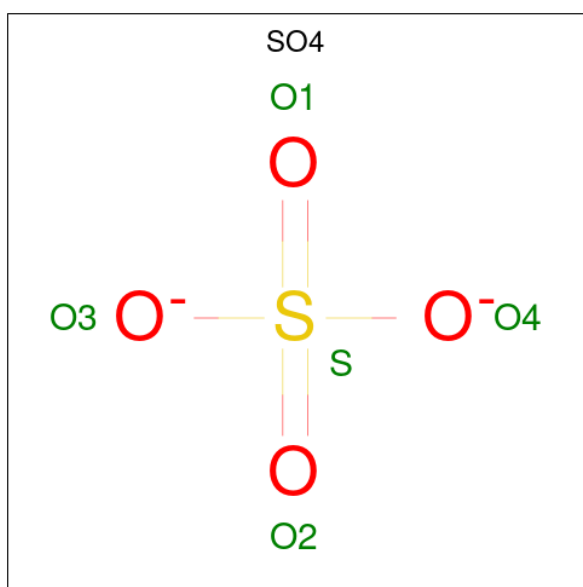
Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	E	4	Total	C	N	O		0	0	0
			36	22	8	6				
2	F	18	Total	C	N	O	S	0	0	0
			135	86	24	24	1			

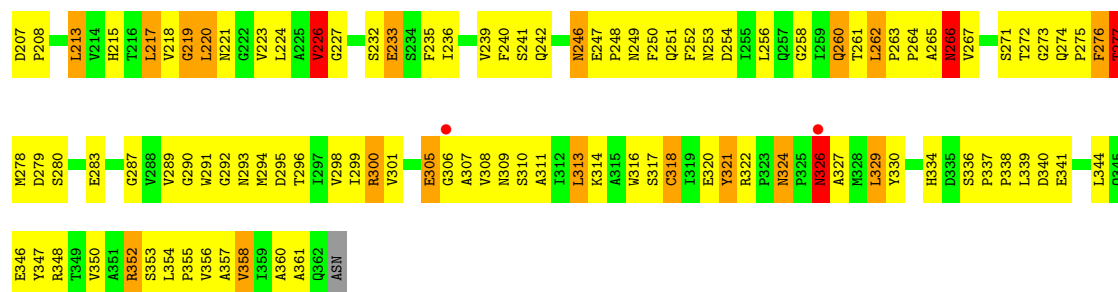
- Molecule 3 is a RNA chain called RNA (5'-R(*UP*UP*U*AP*UP*CP*UP*(P))-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	R	7	Total	C	N	O	P	0	0	0
			136	64	18	49	5			

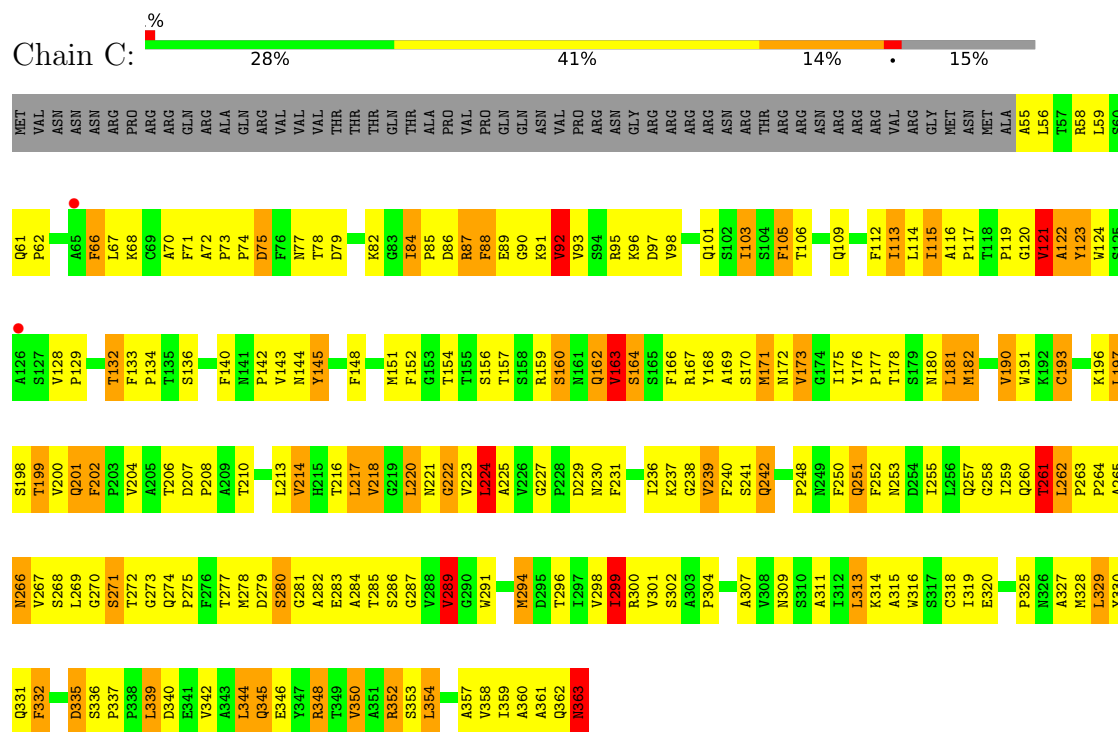
- Molecule 4 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



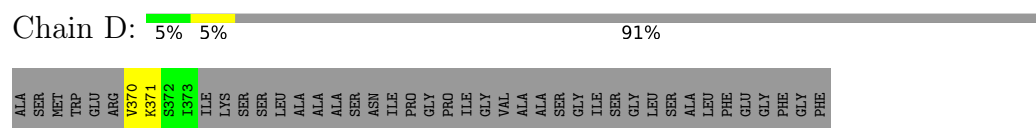
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		



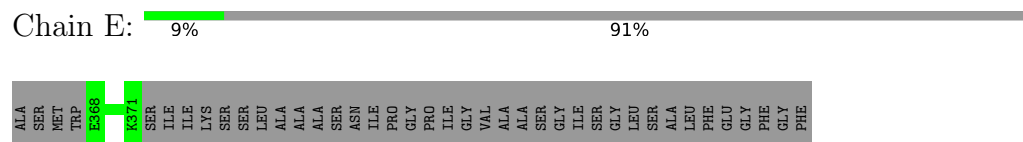
• Molecule 1: Coat protein beta



• Molecule 2: Coat protein gamma

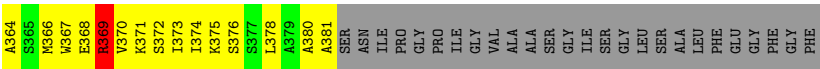


• Molecule 2: Coat protein gamma

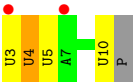


• Molecule 2: Coat protein gamma





• Molecule 3: RNA (5'-R(*UP*UP*U*AP*UP*CP*UP*(P))-3')



4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	477.09Å 404.93Å 476.19Å 90.00° 90.63° 90.00°	Depositor
Resolution (Å)	40.00 – 3.60 40.00 – 3.60	Depositor EDS
% Data completeness (in resolution range)	31.5 (40.00-3.60) 30.5 (40.00-3.60)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.03 (at 3.57Å)	Xtriage
Refinement program	CNS 1.2	Depositor
R, R_{free}	0.347 , (Not available) 0.373 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	wwPDB-VP
Wilson B-factor (Å ²)	96.2	Xtriage
Anisotropy	0.294	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.29 , 0.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.45$, $\langle L^2 \rangle = 0.27$	Xtriage
Estimated twinning fraction	0.038 for -h,-k,l	Xtriage
F_o, F_c correlation	0.34	EDS
Total number of atoms	7299	wwPDB-VP
Average B, all atoms (Å ²)	182.0	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 43.20 % 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 1.8259e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

¹ Intensities estimated from amplitudes.

² 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4

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	0.82	14/2396 (0.6%)	1.18	21/3281 (0.6%)
1	B	0.75	8/2353 (0.3%)	1.16	21/3221 (0.7%)
1	C	0.82	6/2375 (0.3%)	1.23	24/3250 (0.7%)
2	D	0.67	0/29	0.74	0/37
2	E	0.64	0/35	0.61	0/44
2	F	0.56	0/136	1.21	1/181 (0.6%)
3	R	0.43	0/149	0.61	0/227
All	All	0.79	28/7473 (0.4%)	1.18	67/10241 (0.7%)

The worst 5 of 28 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	C	92	VAL	CA-CB	-9.35	1.45	1.55
1	C	163	VAL	CA-CB	-8.93	1.45	1.55
1	C	251	GLN	CD-OE1	5.46	1.33	1.23
1	A	253	ASN	CG-OD1	5.45	1.33	1.23
1	C	345	GLN	CD-OE1	5.31	1.33	1.23

The worst 5 of 67 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	160	SER	N-CA-C	10.93	123.19	111.28
1	A	87	ARG	N-CA-C	-9.36	101.08	111.28
1	C	75	ASP	N-CA-C	9.24	121.35	111.28
1	A	161	ASN	N-CA-C	9.17	121.27	111.28
2	F	369	ARG	N-CA-C	-8.87	102.47	113.28

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	2333	0	2274	378	0
1	B	2291	0	2236	258	0
1	C	2313	0	2251	362	0
2	D	30	0	37	1	0
2	E	36	0	40	0	0
2	F	135	0	145	21	0
3	R	136	0	76	6	0
4	A	5	0	0	0	0
4	B	10	0	0	0	0
4	C	10	0	0	0	0
All	All	7299	0	7059	955	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 67.

The worst 5 of 955 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:261:THR:C	1:C:262:LEU:HD23	1.36	1.47
1:B:74:PRO:HD3	1:B:316:TRP:CH2	1.50	1.44
1:A:282:ALA:HB3	1:A:285:THR:CG2	1.50	1.41
1:A:88:PHE:HE1	1:A:336:SER:CB	1.37	1.37
1:B:184:PHE:CE1	1:B:236:ILE:HD12	1.61	1.34

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	308/363 (85%)	285 (92%)	19 (6%)	4 (1%)	9	39
1	B	304/363 (84%)	285 (94%)	19 (6%)	0	100	100
1	C	307/363 (85%)	290 (94%)	17 (6%)	0	100	100
2	D	2/44 (4%)	1 (50%)	1 (50%)	0	100	100
2	E	2/44 (4%)	2 (100%)	0	0	100	100
2	F	16/44 (36%)	16 (100%)	0	0	100	100
All	All	939/1221 (77%)	879 (94%)	56 (6%)	4 (0%)	30	61

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	90	GLY
1	A	143	VAL
1	A	26	PRO
1	A	203	PRO

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	259/305 (85%)	228 (88%)	31 (12%)	5	24
1	B	254/305 (83%)	219 (86%)	35 (14%)	3	20
1	C	256/305 (84%)	214 (84%)	42 (16%)	2	14
2	D	4/31 (13%)	4 (100%)	0	100	100
2	E	4/31 (13%)	4 (100%)	0	100	100
2	F	14/31 (45%)	13 (93%)	1 (7%)	13	40
All	All	791/1008 (78%)	682 (86%)	109 (14%)	3	20

5 of 109 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	313	LEU
1	C	106	THR
1	C	329	LEU
1	B	321	TYR
1	B	358	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 14 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	249	ASN
1	B	260	GLN
1	C	334	HIS
1	C	249	ASN
1	C	260	GLN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
3	R	5/8 (62%)	1 (20%)	0

All (1) RNA backbone outliers are listed below:

Mol	Chain	Res	Type
3	R	4	U

There are no RNA pucker outliers to report.

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](#)

5 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. 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 $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
4	SO4	A	364	-	4,4,4	0.39	0	6,6,6	0.13	0
4	SO4	C	400	-	4,4,4	0.39	0	6,6,6	0.10	0
4	SO4	C	364	-	4,4,4	0.41	0	6,6,6	0.16	0
4	SO4	B	500	-	4,4,4	0.24	0	6,6,6	0.05	0
4	SO4	B	364	-	4,4,4	0.40	0	6,6,6	0.11	0

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	312/363 (85%)	0.11	7 (2%) 62 36	134, 176, 237, 297	0
1	B	306/363 (84%)	0.10	3 (0%) 79 54	135, 174, 214, 243	0
1	C	309/363 (85%)	0.05	2 (0%) 85 64	126, 170, 212, 258	0
2	D	4/44 (9%)	1.37	0 100 100	213, 220, 226, 259	0
2	E	4/44 (9%)	1.16	0 100 100	218, 238, 242, 246	0
2	F	18/44 (40%)	0.18	0 100 100	198, 239, 271, 274	0
3	R	7/8 (87%)	1.83	2 (28%) 1 1	313, 321, 348, 349	0
All	All	960/1229 (78%)	0.11	14 (1%) 72 44	126, 175, 237, 349	0

The worst 5 of 14 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	R	3	U	3.9
1	A	28	GLN	3.5
1	B	306	GLY	3.0
1	B	326	ASN	2.9
1	A	284	ALA	2.6

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](#)

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	SO4	C	364	5/5	0.89	0.23	265,265,265,265	0
4	SO4	B	500	5/5	0.96	0.17	50,50,50,50	0
4	SO4	B	364	5/5	0.97	0.11	186,186,186,186	0
4	SO4	C	400	5/5	0.97	0.13	210,210,210,210	0
4	SO4	A	364	5/5	0.98	0.12	200,200,200,200	0

6.5 Other polymers [i](#)

There are no such residues in this entry.