



wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 1, 2022 – 06:33 pm GMT

PDB ID : 6ZJ2
Title : Structure of RcsB from Salmonella enterica serovar Typhimurium bound to promoter rprA in the presence of phosphomimetic BeF3-
Authors : Huesa, J.; Marina, A.; Casino, P.
Deposited on : 2020-06-27
Resolution : 3.38 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 : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.31.3
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0267
CCP4 : 7.1.010 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.3

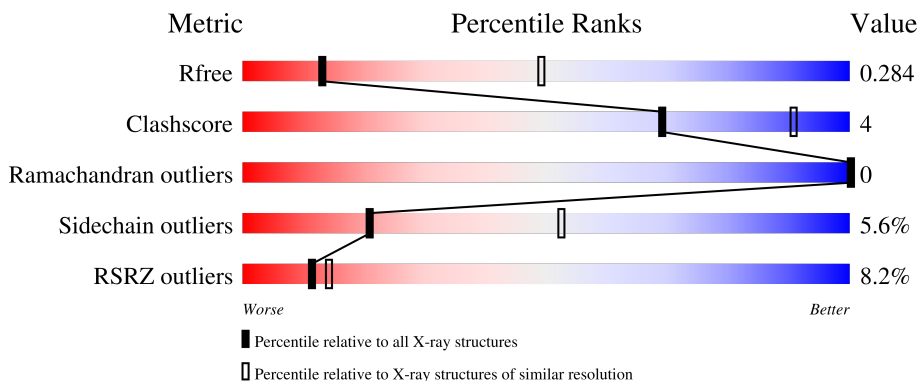
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.38 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	1691 (3.46-3.30)
Clashscore	141614	1762 (3.46-3.30)
Ramachandran outliers	138981	1732 (3.46-3.30)
Sidechain outliers	138945	1731 (3.46-3.30)
RSRZ outliers	127900	1635 (3.46-3.30)

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	216	 81% 11% • 6%
1	B	216	 2% 88% 7% • •
1	C	216	 % 78% 13% 8%
1	D	216	 2% 83% 10% 7%
1	L	216	 13% 69% 7% • 23%

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Mol	Chain	Length	Quality of chain
1	M	216	<p>11% 75% 7% 17%</p>
1	N	216	<p>15% 76% 6% 18%</p>
1	O	216	<p>12% 52% 43%</p>
2	E	23	<p>83% 13%</p>
2	G	23	<p>74% 22%</p>
3	F	23	<p>74% 22%</p>
3	I	23	<p>61% 35%</p>

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 12078 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 Transcriptional regulatory protein RcsB.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	B	208	Total 1462	C 931	N 243	O 286	S 2	0	0	0
1	A	202	Total 1408	C 894	N 236	O 275	S 3	0	0	0
1	D	201	Total 1411	C 900	N 234	O 275	S 2	0	0	0
1	C	198	Total 1381	C 878	N 229	O 271	S 3	0	0	0
1	L	166	Total 1180	C 748	N 196	O 234	S 2	0	0	0
1	M	179	Total 1291	C 827	N 209	O 252	S 3	0	0	0
1	N	178	Total 1254	C 798	N 211	O 243	S 2	0	0	0
1	O	123	Total 875	C 561	N 142	O 171	S 1	0	0	0

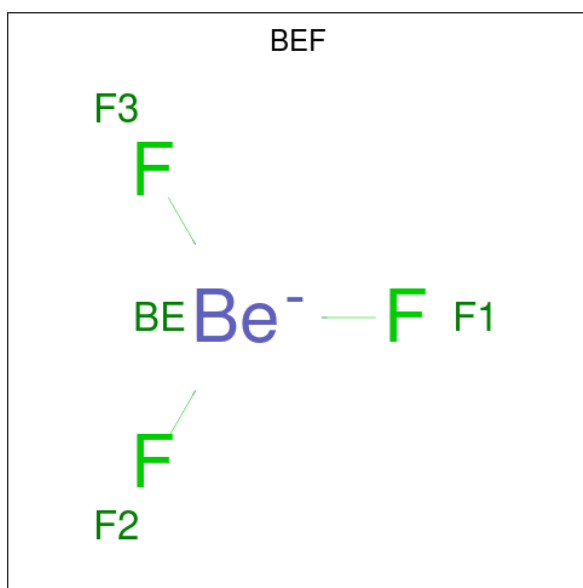
- Molecule 2 is a DNA chain called rprA promoter sequence.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
2	E	22	Total 454	C 216	N 84	O 132	P 22	0	0	0
2	G	22	Total 454	C 216	N 84	O 132	P 22	0	0	0

- Molecule 3 is a DNA chain called DNA (5'-D(P*CP*CP*GP*AP*TP*CP*AP*GP*AP*TP*TP*CP*GP*TP*CP*TP*CP*AP*AP*TP*AP*GP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
3	F	22	Total 448	C 214	N 80	O 132	P 22	0	0	0
3	I	22	Total 448	C 214	N 80	O 132	P 22	0	0	0

- Molecule 4 is BERYLLIUM TRIFLUORIDE ION (three-letter code: BEF) (formula: BeF₃).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	B	1	Total	Be	F	0	0
			4	1	3		
4	A	1	Total	Be	F	0	0
			4	1	3		

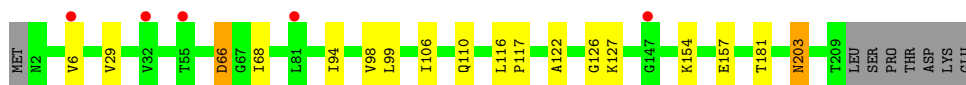
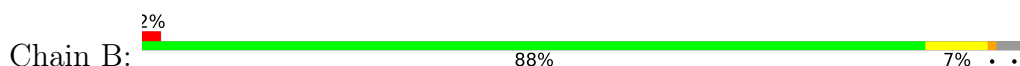
- Molecule 5 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	Mg	0	0
			1	1		
5	A	1	Total	Mg	0	0
			1	1		
5	D	1	Total	Mg	0	0
			1	1		
5	C	1	Total	Mg	0	0
			1	1		

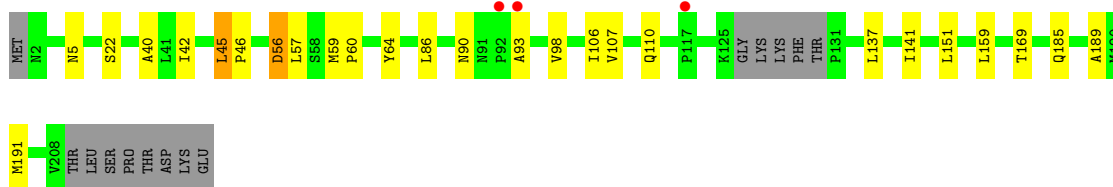
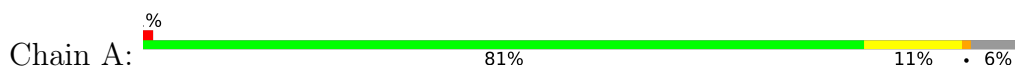
3 Residue-property plots [i](#)

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.

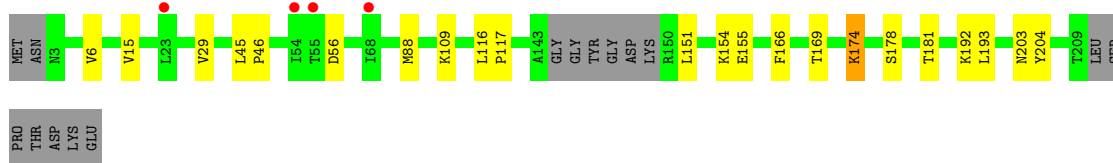
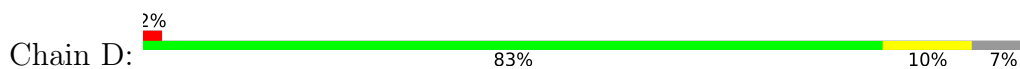
- Molecule 1: Transcriptional regulatory protein RcsB



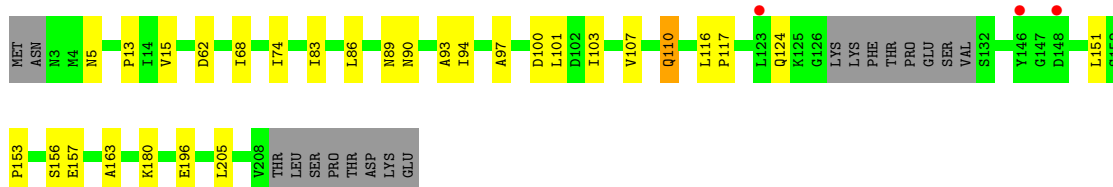
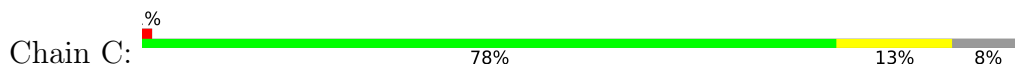
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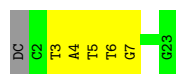


Chain E:  83% 13%



- Molecule 2: rprA promoter sequence

Chain G:  74% 22%



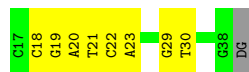
- Molecule 3: DNA (5'-D(P*CP*CP*GP*AP*TP*CP*AP*GP*AP*TP*TP*CP*GP*TP*CP*T P*CP*AP*AP*TP*AP*GP*G)-3')

Chain F:  74% 22%



- Molecule 3: DNA (5'-D(P*CP*CP*GP*AP*TP*CP*AP*GP*AP*TP*TP*CP*GP*TP*CP*T P*CP*AP*AP*TP*AP*GP*G)-3')

Chain I:  61% 35%



4 Data and refinement statistics i

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	69.36Å 111.51Å 146.26Å 90.00° 90.36° 90.00°	Depositor
Resolution (Å)	45.99 – 3.38 45.99 – 3.40	Depositor EDS
% Data completeness (in resolution range)	97.5 (45.99-3.38) 97.5 (45.99-3.40)	Depositor EDS
R_{merge}	0.23	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.90 (at 3.40Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.266 , 0.319 0.268 , 0.284	Depositor DCC
R_{free} test set	1501 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	80.1	Xtrriage
Anisotropy	0.662	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	(Not available) , (Not available)	EDS
L-test for twinning ²	$\langle L \rangle = 0.40$, $\langle L^2 \rangle = 0.22$	Xtrriage
Estimated twinning fraction	0.300 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.87	EDS
Total number of atoms	12078	wwPDB-VP
Average B, all atoms (Å ²)	91.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.92% of the height of the origin peak. No significant pseudotranslation is detected.*

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 [i](#)

5.1 Standard geometry [i](#)

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

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	0.72	0/1427	0.74	0/1952
1	B	0.71	0/1483	0.76	0/2029
1	C	0.72	0/1398	0.74	0/1913
1	D	0.72	0/1429	0.75	0/1957
1	L	0.72	0/1192	0.74	0/1627
1	M	0.71	0/1310	0.73	0/1792
1	N	0.72	0/1269	0.74	0/1737
1	O	0.71	0/891	0.73	0/1229
2	E	0.24	0/509	0.77	0/784
2	G	0.24	0/509	0.73	0/784
3	F	0.26	0/501	0.83	0/770
3	I	0.25	0/501	0.81	0/770
All	All	0.66	0/12419	0.75	0/17344

There are no bond length outliers.

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	1408	0	1312	12	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	1462	0	1386	12	0
1	C	1381	0	1290	14	0
1	D	1411	0	1342	12	0
1	L	1180	0	1148	10	0
1	M	1291	0	1244	5	0
1	N	1254	0	1215	6	0
1	O	875	0	819	5	0
2	E	454	0	249	2	0
2	G	454	0	249	3	0
3	F	448	0	249	4	0
3	I	448	0	249	7	0
4	A	4	0	0	0	0
4	B	4	0	0	0	0
5	A	1	0	0	0	0
5	B	1	0	0	0	0
5	C	1	0	0	0	0
5	D	1	0	0	0	0
All	All	12078	0	10752	85	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 85 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:B:122:ALA:HB1	1:B:127:LYS:O	1.78	0.83
3:F:22:DC:H2''	3:F:23:DA:C8	2.24	0.72
1:C:68:ILE:HG13	1:C:101:LEU:HD11	1.73	0.70
1:D:178:SER:O	1:D:181:THR:HG22	1.91	0.70
3:I:19:DG:H2''	3:I:20:DA:O5'	1.91	0.70

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	198/216 (92%)	184 (93%)	14 (7%)	0	100	100
1	B	206/216 (95%)	192 (93%)	14 (7%)	0	100	100
1	C	192/216 (89%)	182 (95%)	10 (5%)	0	100	100
1	D	197/216 (91%)	179 (91%)	18 (9%)	0	100	100
1	L	160/216 (74%)	156 (98%)	4 (2%)	0	100	100
1	M	175/216 (81%)	167 (95%)	8 (5%)	0	100	100
1	N	174/216 (81%)	167 (96%)	7 (4%)	0	100	100
1	O	121/216 (56%)	117 (97%)	4 (3%)	0	100	100
All	All	1423/1728 (82%)	1344 (94%)	79 (6%)	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	135/189 (71%)	127 (94%)	8 (6%)	19	51
1	B	143/189 (76%)	137 (96%)	6 (4%)	30	60
1	C	133/189 (70%)	125 (94%)	8 (6%)	19	50
1	D	138/189 (73%)	131 (95%)	7 (5%)	24	55
1	L	121/189 (64%)	112 (93%)	9 (7%)	13	42
1	M	133/189 (70%)	126 (95%)	7 (5%)	22	54
1	N	126/189 (67%)	120 (95%)	6 (5%)	25	57
1	O	88/189 (47%)	82 (93%)	6 (7%)	16	46
All	All	1017/1512 (67%)	960 (94%)	57 (6%)	21	52

5 of 57 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	196	GLU
1	O	103	ILE
1	L	157	GLU
1	O	100	ASP
1	N	196	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 13 such sidechains are listed below:

Mol	Chain	Res	Type
1	C	203	ASN
1	L	110	GLN
1	O	44	ASN
1	N	176	ASN
1	N	203	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 6 ligands modelled in this entry, 4 are monoatomic - leaving 2 for Mogul analysis.

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	BEF	B	301	-	0,3,3	-	-	-		
4	BEF	A	301	1	0,3,3	-	-	-		

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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	C	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	C	142:GLY	C	146:TYR	N	5.45

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	202/216 (93%)	-0.21	3 (1%) 73 77	37, 62, 90, 109	0
1	B	208/216 (96%)	-0.21	5 (2%) 59 62	45, 68, 101, 121	0
1	C	198/216 (91%)	-0.12	3 (1%) 73 77	45, 76, 120, 130	0
1	D	201/216 (93%)	-0.18	4 (1%) 65 69	42, 74, 110, 126	0
1	L	166/216 (76%)	0.81	29 (17%) 1 2	83, 119, 179, 191	0
1	M	179/216 (82%)	0.72	24 (13%) 3 4	79, 117, 149, 166	0
1	N	178/216 (82%)	0.65	32 (17%) 1 1	87, 129, 163, 184	0
1	O	123/216 (56%)	0.85	26 (21%) 1 1	85, 126, 140, 150	0
2	E	22/23 (95%)	-0.65	0 100 100	41, 61, 88, 116	0
2	G	22/23 (95%)	-0.60	0 100 100	52, 76, 101, 106	0
3	F	22/23 (95%)	-0.70	0 100 100	46, 65, 86, 128	0
3	I	22/23 (95%)	-0.66	0 100 100	43, 71, 91, 112	0
All	All	1543/1820 (84%)	0.18	126 (8%) 11 14	37, 91, 149, 191	0

The worst 5 of 126 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	O	8	ILE	9.9
1	O	7	ILE	9.3
1	L	65	GLY	8.8
1	L	36	GLU	8.5
1	L	68	ILE	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 [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
4	BEF	B	301	4/4	0.92	0.11	57,58,58,58	0
4	BEF	A	301	4/4	0.94	0.13	81,82,82,83	0
5	MG	C	301	1/1	0.96	0.24	43,43,43,43	0
5	MG	A	302	1/1	0.97	0.19	71,71,71,71	0
5	MG	B	302	1/1	0.97	0.14	72,72,72,72	0
5	MG	D	301	1/1	0.98	0.26	77,77,77,77	0

6.5 Other polymers [i](#)

There are no such residues in this entry.