



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 05:47 PM UTC

PDB ID : 7BG1 / pdb_00007bg1
Title : Structure of anti-FLAG M2 Fab domain remodeled based on proteomic sequencing
Authors : Pronker, M.F.; Snijder, J.
Deposited on : 2021-01-05
Resolution : 1.86 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 ⓘ 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

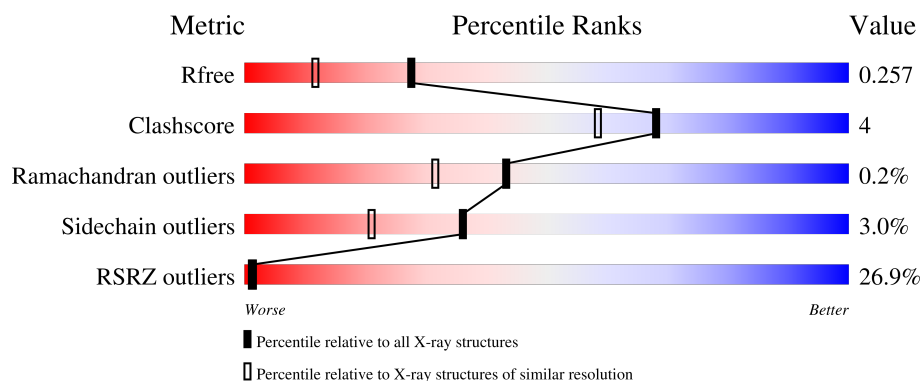
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.86 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}	180053	3428 (1.86-1.86)
Clashscore	190562	3579 (1.86-1.86)
Ramachandran outliers	187476	3553 (1.86-1.86)
Sidechain outliers	187428	3553 (1.86-1.86)
RSRZ outliers	180081	3429 (1.86-1.86)

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	H	222	17% 86% 9% 5%
2	L	220	35% 81% 14% 5%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	CL	H	302	-	-	X	-

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3497 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.

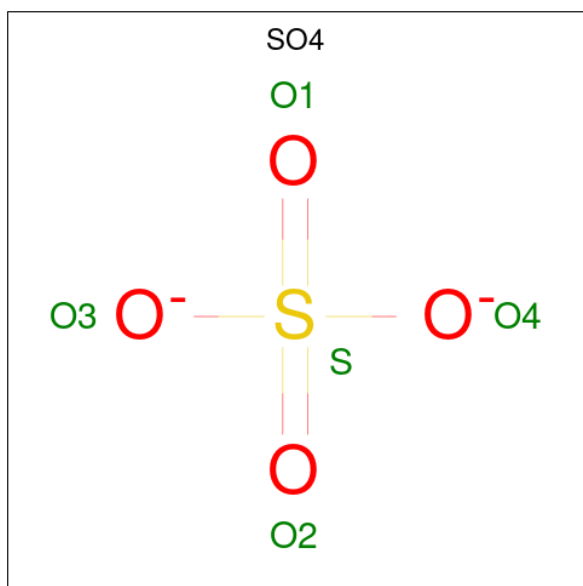
- Molecule 1 is a protein called anti-FLAG M2 heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	H	210	Total	C	N	O	S	0	0	0
			1600	1016	259	318	7			

- Molecule 2 is a protein called anti-FLAG M2 light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	L	210	Total	C	N	O	S	0	0	0
			1636	1028	276	326	6			

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	H	1	Total	O	S	0	0
			5	4	1		
3	L	1	Total	O	S	0	0
			5	4	1		

- Molecule 4 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	H	1	Total 1	Cl 1	0	0

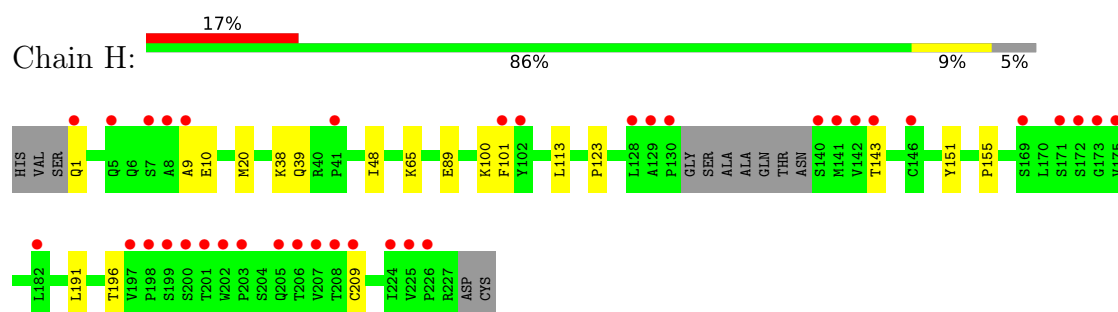
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	H	143	Total 143	O 143	0	0
5	L	107	Total 107	O 107	0	0

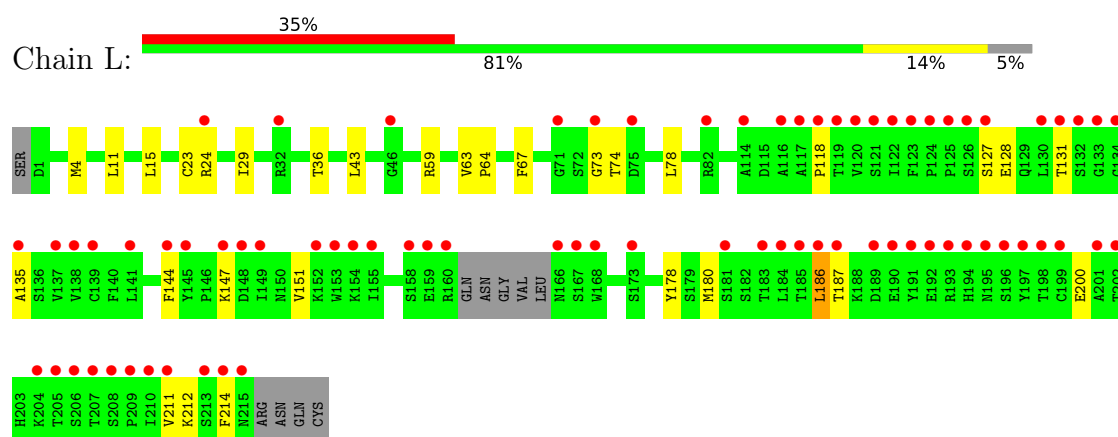
3 Residue-property plots [i](#)

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: anti-FLAG M2 heavy chain



- Molecule 2: anti-FLAG M2 light chain



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	87.36Å 133.76Å 41.48Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	41.52 – 1.86 41.52 – 1.86	Depositor EDS
% Data completeness (in resolution range)	95.7 (41.52-1.86) 95.7 (41.52-1.86)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.12 (at 1.86Å)	Xtriage
Refinement program	PHENIX 1.17.1 _3660	Depositor
R, R_{free}	0.217 , 0.255 0.218 , 0.257	Depositor DCC
R_{free} test set	2008 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å ²)	30.7	Xtriage
Anisotropy	0.071	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 56.5	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3497	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.13% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: SO4, 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	H	0.19	0/1645	0.44	0/2252
2	L	0.15	0/1674	0.39	0/2270
All	All	0.17	0/3319	0.41	0/4522

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

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	H	1600	0	1543	10	0
2	L	1636	0	1583	14	0
3	H	5	0	0	0	0
3	L	5	0	0	0	0
4	H	1	0	0	2	0
5	H	143	0	0	1	0
5	L	107	0	0	0	0
All	All	3497	0	3126	23	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.

All (23) 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:H:20:MET:HE1	1:H:113:LEU:HB2	1.83	0.61
2:L:200:GLU:HG2	2:L:211:VAL:HG22	1.85	0.57
2:L:151:VAL:HG21	2:L:180:MET:HE1	1.85	0.57
1:H:101:PHE:N	4:H:302:CL:CL	2.75	0.54
2:L:135:ALA:HB3	2:L:186:LEU:HD12	1.92	0.52
1:H:38:LYS:HB2	1:H:48:ILE:HD11	1.92	0.52
2:L:127:SER:O	2:L:131:THR:HG23	2.14	0.47
1:H:9:ALA:HB2	1:H:155:PRO:HD2	1.96	0.47
2:L:128:GLU:OE2	2:L:128:GLU:N	2.42	0.46
1:H:1:GLN:N	5:H:401:HOH:O	2.33	0.46
2:L:59:ARG:HG2	2:L:63:VAL:HB	1.99	0.45
1:H:123:PRO:HB3	1:H:151:TYR:HB3	1.98	0.45
1:H:100:LYS:N	4:H:302:CL:CL	2.85	0.45
1:H:143:THR:HG22	1:H:196:THR:OG1	2.18	0.43
2:L:212:LYS:HD3	2:L:212:LYS:HA	1.74	0.43
2:L:24:ARG:HA	2:L:74:THR:O	2.18	0.43
1:H:39:GLN:NE2	2:L:43:LEU:HD21	2.34	0.42
2:L:4:MET:HE3	2:L:23:CYS:SG	2.60	0.41
2:L:64:PRO:HG2	2:L:67:PHE:CE1	2.54	0.41
2:L:29:ILE:HG13	2:L:36:THR:HG23	2.02	0.41
1:H:20:MET:HE1	1:H:113:LEU:HD22	2.01	0.41
2:L:118:PRO:HB3	2:L:144:PHE:CD2	2.56	0.41
2:L:147:LYS:HD2	2:L:178:TYR:CE1	2.57	0.40

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	H	206/222 (93%)	202 (98%)	4 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	L	206/220 (94%)	200 (97%)	5 (2%)	1 (0%)	24	13
All	All	412/442 (93%)	402 (98%)	9 (2%)	1 (0%)	43	31

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	L	73	GLY

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	H	180/189 (95%)	175 (97%)	5 (3%)	38	23
2	L	188/197 (95%)	182 (97%)	6 (3%)	34	19
All	All	368/386 (95%)	357 (97%)	11 (3%)	36	21

All (11) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	H	10	GLU
1	H	65	LYS
1	H	89	GLU
1	H	191	LEU
1	H	209	CYS
2	L	11	LEU
2	L	15	LEU
2	L	78	LEU
2	L	186	LEU
2	L	187	THR
2	L	214	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	H	39	GLN
1	H	43	GLN
2	L	195	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 3 ligands modelled in this entry, 1 is 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	$\# Z > 2$
3	SO4	H	301	-	4,4,4	0.26	0	6,6,6	0.15	0
3	SO4	L	301	-	4,4,4	0.23	0	6,6,6	0.07	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

6.1 Protein, DNA and RNA chains

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	H	210/222 (94%)	0.78	37 (17%) 4 3	21, 36, 80, 112	0
2	L	210/220 (95%)	1.50	76 (36%) 1 0	23, 52, 121, 142	0
All	All	420/442 (95%)	1.14	113 (26%) 1 1	21, 42, 108, 142	0

All (113) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	L	214	PHE	6.0
2	L	73	GLY	5.5
2	L	155	ILE	5.2
2	L	118	PRO	4.7
1	H	1	GLN	4.6
1	H	129	ALA	4.5
2	L	117	ALA	4.5
2	L	186	LEU	4.4
1	H	143	THR	4.3
1	H	102	TYR	4.3
2	L	168	TRP	4.3
1	H	197	VAL	4.2
2	L	122	ILE	4.2
2	L	197	TYR	4.2
1	H	202	TRP	4.2
2	L	184	LEU	4.2
2	L	130	LEU	4.0
2	L	215	ASN	4.0
1	H	7	SER	3.9
2	L	153	TRP	3.9
1	H	8	ALA	3.9
2	L	124	PRO	3.8
2	L	139	CYS	3.8
2	L	134	GLY	3.7

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Mol	Chain	Res	Type	RSRZ
2	L	206	SER	3.7
2	L	120	VAL	3.7
2	L	137	VAL	3.7
2	L	199	CYS	3.7
2	L	209	PRO	3.7
1	H	142	VAL	3.6
2	L	131	THR	3.6
2	L	189	ASP	3.5
2	L	202	THR	3.5
2	L	160	ARG	3.4
1	H	225	VAL	3.3
2	L	191	TYR	3.3
2	L	211	VAL	3.3
1	H	41	PRO	3.3
2	L	187	THR	3.3
1	H	101	PHE	3.2
2	L	127	SER	3.2
2	L	145	TYR	3.2
1	H	130	PRO	3.2
1	H	175	VAL	3.2
1	H	141	MET	3.2
2	L	141	LEU	3.1
2	L	198	THR	3.1
1	H	198	PRO	3.1
1	H	208	THR	3.1
2	L	213	SER	3.1
2	L	135	ALA	3.0
1	H	140	SER	3.0
2	L	183	THR	3.0
2	L	148	ASP	2.9
1	H	203	PRO	2.9
2	L	123	PHE	2.9
2	L	201	ALA	2.9
2	L	190	GLU	2.9
1	H	182	LEU	2.9
2	L	207	THR	2.8
1	H	200	SER	2.8
2	L	210	ILE	2.8
2	L	46	GLY	2.8
2	L	132	SER	2.8
1	H	206	THR	2.8
1	H	199	SER	2.7

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Mol	Chain	Res	Type	RSRZ
2	L	192	GLU	2.7
2	L	194	HIS	2.7
2	L	193	ARG	2.7
2	L	159	GLU	2.7
2	L	114	ALA	2.6
2	L	167	SER	2.6
2	L	204	LYS	2.6
2	L	149	ILE	2.6
2	L	133	GLY	2.6
2	L	166	ASN	2.6
2	L	195	ASN	2.6
1	H	146	CYS	2.5
2	L	119	THR	2.5
2	L	24	ARG	2.5
2	L	208	SER	2.5
1	H	207	VAL	2.5
1	H	226	PRO	2.5
2	L	154	LYS	2.4
1	H	201	THR	2.4
2	L	205	THR	2.4
2	L	125	PRO	2.4
1	H	205	GLN	2.4
2	L	158	SER	2.4
1	H	169	SER	2.3
1	H	172	SER	2.3
2	L	32	ARG	2.3
1	H	224	ILE	2.3
2	L	82	ARG	2.3
1	H	173	GLY	2.2
2	L	126	SER	2.2
2	L	181	SER	2.2
2	L	185	THR	2.2
1	H	128	LEU	2.2
2	L	147	LYS	2.2
2	L	152	LYS	2.2
1	H	171	SER	2.2
2	L	144	PHE	2.2
2	L	138	VAL	2.2
1	H	209	CYS	2.2
2	L	116	ALA	2.2
2	L	71	GLY	2.1
1	H	5	GLN	2.1

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Mol	Chain	Res	Type	RSRZ
1	H	9	ALA	2.1
2	L	121	SER	2.0
2	L	196	SER	2.0
2	L	75	ASP	2.0
2	L	173	SER	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 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($\text{\AA}^2$)	Q<0.9
4	CL	H	302	1/1	0.79	0.24	83,83,83,83	0
3	SO4	L	301	5/5	0.89	0.11	57,64,65,68	0
3	SO4	H	301	5/5	0.89	0.11	49,50,56,61	0

6.5 Other polymers [i](#)

There are no such residues in this entry.