



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 04:19 PM UTC

PDB ID : 5RA9 / pdb_00005ra9
Title : PanDDA analysis group deposition Form1 MAP kinase p38-alpha – Fragment
N08051b in complex with MAP kinase p38-alpha
Authors : De Nicola, G.F.; Nichols, C.E.
Deposited on : 2020-03-04
Resolution : 1.68 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

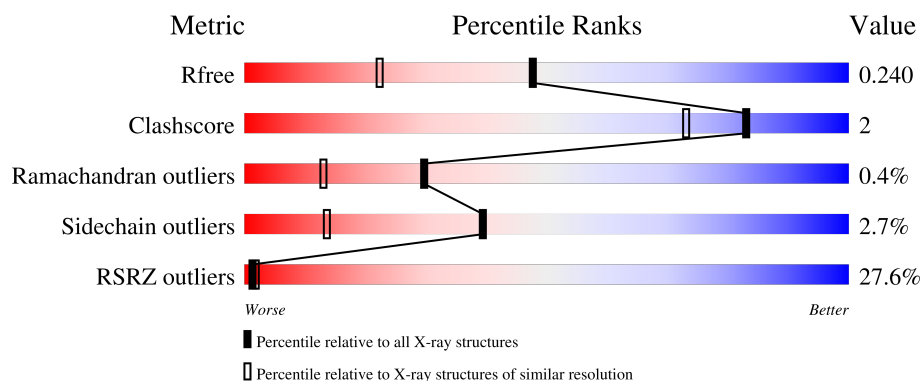
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.68 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	1054 (1.68-1.68)
Clashscore	190562	1078 (1.68-1.68)
Ramachandran outliers	187476	1068 (1.68-1.68)
Sidechain outliers	187428	1067 (1.68-1.68)
RSRZ outliers	180081	1055 (1.68-1.68)

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	360	27% 88% 8%

2 Entry composition [i](#)

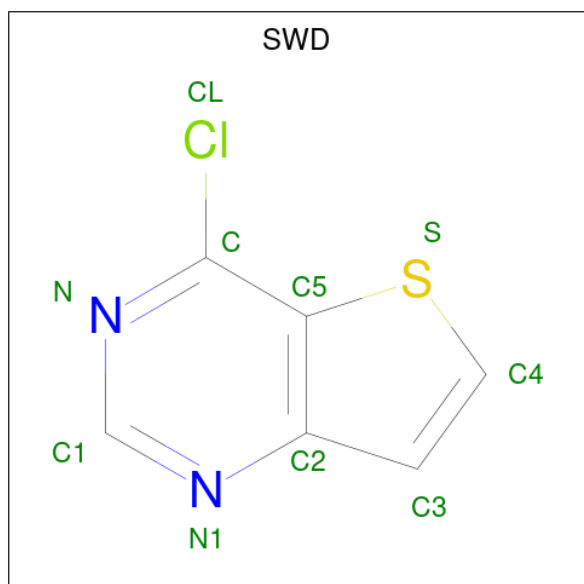
There are 7 unique types of molecules in this entry. The entry contains 3030 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Mitogen-activated protein kinase 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	348	Total	C	N	O	S	0	3	0
			2777	1781	465	516	15			

- Molecule 2 is 4-chloranylthieno[3,2-d]pyrimidine (CCD ID: SWD) (formula: C₆H₃ClN₂S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	Cl	N	S	0	0
			10	6	1	2	1		

- Molecule 3 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	5	Total 5	Cl 5	0 0

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

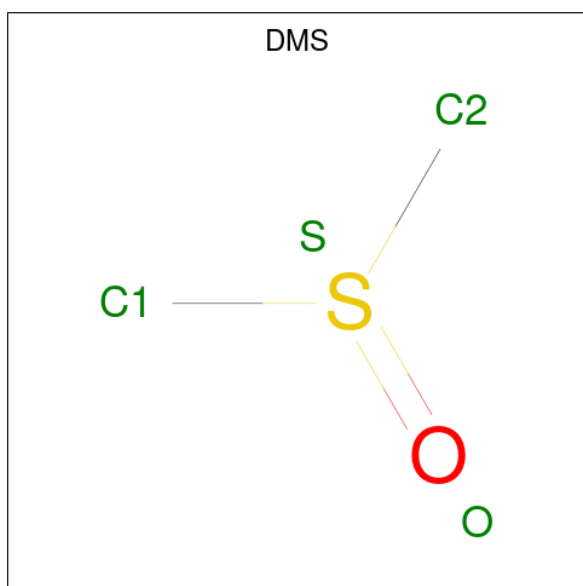
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 6 is DIMETHYL SULFOXIDE (CCD ID: DMS) (formula: C₂H₆OS).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
6	A	1	Total	C	O	S	0	0
			4	2	1	1		

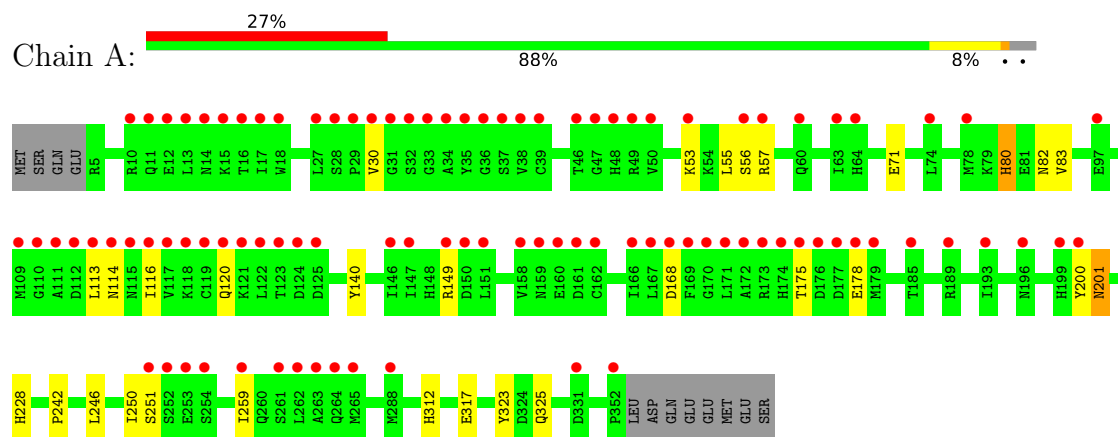
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	228	Total	O	0	0
			228	228		

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: Mitogen-activated protein kinase 14



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	45.92Å 86.50Å 126.67Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.76 – 1.68 29.76 – 1.68	Depositor EDS
% Data completeness (in resolution range)	99.6 (29.76-1.68) 99.7 (29.76-1.68)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.80 (at 1.68Å)	Xtriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.184 , 0.201 (Not available) , 0.240	Depositor DCC
R_{free} test set	2912 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å ²)	24.1	Xtriage
Anisotropy	0.026	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 44.2	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	0.92	EDS
Total number of atoms	3030	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.84% 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: CL, MG, SO4, DMS, SWD

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	1.29	5/2844 (0.2%)	1.24	3/3870 (0.1%)

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	140	TYR	C-O	6.26	1.31	1.24
1	A	83	VAL	C-O	6.24	1.30	1.24
1	A	228	HIS	CE1-NE2	5.43	1.38	1.32
1	A	80	HIS	CE1-NE2	5.23	1.37	1.32
1	A	57	ARG	N-CA	5.09	1.50	1.46

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	250	ILE	CA-C-N	5.19	127.75	120.28
1	A	250	ILE	C-N-CA	5.19	127.75	120.28
1	A	114	ASN	CB-CA-C	-5.00	102.81	110.81

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	2777	0	2697	13	0
2	A	10	0	0	1	0
3	A	5	0	0	0	0
4	A	1	0	0	0	0
5	A	5	0	0	0	0
6	A	4	0	6	0	0
7	A	228	0	0	1	0
All	All	3030	0	2703	13	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 2.

All (13) 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:A:80:HIS:HD2	1:A:82:ASN:H	1.35	0.73
1:A:201:ASN:HD22	1:A:201:ASN:C	1.97	0.72
1:A:80:HIS:CD2	1:A:82:ASN:H	2.09	0.70
1:A:71:GLU:OE2	2:A:401:SWD:N1	2.35	0.60
1:A:53:LYS:HE2	1:A:55:LEU:HD23	1.86	0.58
1:A:312:HIS:HD2	1:A:317:GLU:OE2	1.93	0.51
1:A:53:LYS:HE2	1:A:55:LEU:CD2	2.41	0.50
1:A:242:PRO:HG2	1:A:259:ILE:HG21	1.93	0.49
1:A:201:ASN:HB2	7:A:654:HOH:O	2.16	0.45
1:A:323:TYR:CE2	1:A:325:GLN:HG2	2.52	0.45
1:A:175:THR:HG23	1:A:178:GLU:H	1.84	0.42
1:A:200:TYR:C	1:A:200:TYR:CD1	2.97	0.41
1:A:242:PRO:HB3	1:A:246:LEU:HD23	2.04	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	A	230/360 (64%)	226 (98%)	3 (1%)	1 (0%)	30	13

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	168	ASP

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	295/319 (92%)	287 (97%)	8 (3%)	39	13

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	30	VAL
1	A	56	SER
1	A	113	LEU
1	A	116	ILE
1	A	120	GLN
1	A	149	ARG
1	A	201	ASN
1	A	251	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	77	HIS
1	A	80	HIS
1	A	120	GLN
1	A	128	GLN
1	A	201	ASN
1	A	202	GLN
1	A	272	ASN

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Mol	Chain	Res	Type
1	A	310	GLN
1	A	312	HIS

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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 9 ligands modelled in this entry, 6 are monoatomic - leaving 3 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	$\# Z > 2$
2	SWD	A	401	-	10,11,11	2.56	5 (50%)	8,15,15	1.78	2 (25%)
5	SO4	A	408	-	4,4,4	0.26	0	6,6,6	0.35	0
6	DMS	A	409	-	3,3,3	0.20	0	3,3,3	0.09	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SWD	A	401	-	-	-	0/2/2/2

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	SWD	C-CL	-6.57	1.62	1.74
2	A	401	SWD	C-N	2.69	1.35	1.32
2	A	401	SWD	C1-N	2.19	1.37	1.33
2	A	401	SWD	C5-S	-2.14	1.70	1.73
2	A	401	SWD	C2-C3	2.08	1.45	1.42

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	SWD	C2-C5-S	3.02	113.86	110.75
2	A	401	SWD	C1-N-C	-2.80	112.73	116.37

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	401	SWD	1	0

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	A	348/360 (96%)	2.58	96 (27%) ⓘ ⓘ	3, 22, 43, 64	69 (19%)

All (96) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	263	ALA	20.0
1	A	17	ILE	17.3
1	A	13	LEU	16.7
1	A	30	VAL	16.5
1	A	147	ILE	15.8
1	A	29	PRO	15.7
1	A	166	ILE	15.6
1	A	48	HIS	15.4
1	A	47	GLY	15.3
1	A	175	THR	15.2
1	A	177	ASP	14.9
1	A	50	VAL	14.9
1	A	146	ILE	14.8
1	A	39	CYS	14.8
1	A	28	SER	14.0
1	A	46	THR	14.0
1	A	14	ASN	14.0
1	A	74	LEU	14.0
1	A	38	VAL	13.7
1	A	16	THR	13.6
1	A	11	GLN	13.5
1	A	151	LEU	13.5
1	A	167	LEU	12.7
1	A	10	ARG	12.5
1	A	176	ASP	12.0
1	A	49	ARG	11.9
1	A	116	ILE	11.7

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Mol	Chain	Res	Type	RSRZ
1	A	119	CYS	11.7
1	A	78[A]	MET	11.2
1	A	12	GLU	11.2
1	A	122	LEU	10.9
1	A	15	LYS	10.8
1	A	262	LEU	10.7
1	A	173	ARG	10.4
1	A	169	PHE	10.4
1	A	149	ARG	10.3
1	A	117	VAL	10.2
1	A	172	ALA	9.9
1	A	37	SER	9.9
1	A	189	ARG	9.9
1	A	33	GLY	9.8
1	A	53	LYS	9.6
1	A	35	TYR	9.4
1	A	113	LEU	9.1
1	A	123	THR	9.0
1	A	174	HIS	8.8
1	A	118	LYS	8.7
1	A	168	ASP	8.4
1	A	150	ASP	8.2
1	A	120	GLN	7.9
1	A	124	ASP	7.7
1	A	115	ASN	7.7
1	A	264	GLN	7.5
1	A	261	SER	7.5
1	A	31	GLY	7.5
1	A	125[A]	ASP	7.4
1	A	111	ALA	7.4
1	A	114	ASN	7.3
1	A	32	SER	7.3
1	A	171	LEU	7.0
1	A	121	LYS	7.0
1	A	170	GLY	7.0
1	A	34	ALA	6.9
1	A	265	MET	6.9
1	A	288[A]	MET	6.6
1	A	112	ASP	6.5
1	A	36	GLY	6.5
1	A	110	GLY	6.3
1	A	199	HIS	5.6

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Mol	Chain	Res	Type	RSRZ
1	A	185	THR	4.7
1	A	109	MET	4.4
1	A	252	SER	4.1
1	A	56	SER	4.1
1	A	162	CYS	4.0
1	A	352	PRO	4.0
1	A	63	ILE	3.6
1	A	27	LEU	3.4
1	A	160	GLU	3.4
1	A	159	ASN	3.4
1	A	200	TYR	3.2
1	A	158	VAL	3.1
1	A	259	ILE	3.0
1	A	196	ASN	3.0
1	A	57	ARG	2.9
1	A	251	SER	2.9
1	A	331	ASP	2.8
1	A	64	HIS	2.7
1	A	97	GLU	2.7
1	A	254	SER	2.5
1	A	253	GLU	2.5
1	A	161	ASP	2.5
1	A	178	GLU	2.3
1	A	179	MET	2.3
1	A	60	GLN	2.3
1	A	18	TRP	2.1
1	A	193	ILE	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(Å ²)	Q<0.9
2	SWD	A	401	10/10	0.71	0.26	21,23,24,29	10
4	MG	A	407	1/1	0.75	0.13	19,19,19,19	1
3	CL	A	404	1/1	0.84	0.25	62,62,62,62	0
6	DMS	A	409	4/4	0.84	0.25	73,79,80,86	0
5	SO4	A	408	5/5	0.85	0.17	50,51,59,63	0
3	CL	A	406	1/1	0.98	0.07	33,33,33,33	0
3	CL	A	403	1/1	0.98	0.09	42,42,42,42	0
3	CL	A	402	1/1	0.98	0.21	42,42,42,42	0
3	CL	A	405	1/1	0.98	0.21	39,39,39,39	0

6.5 Other polymers [i](#)

There are no such residues in this entry.