



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 07:45 AM UTC

PDB ID : 3N6O / pdb_00003n6o
Title : Crystal structure of the GEF and P4M domain of DrrA/SidM from Legionella pneumophila
Authors : Schoebel, S.; Blankenfeldt, W.; Goody, R.S.; Itzen, A.
Deposited on : 2010-05-26
Resolution : 2.50 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

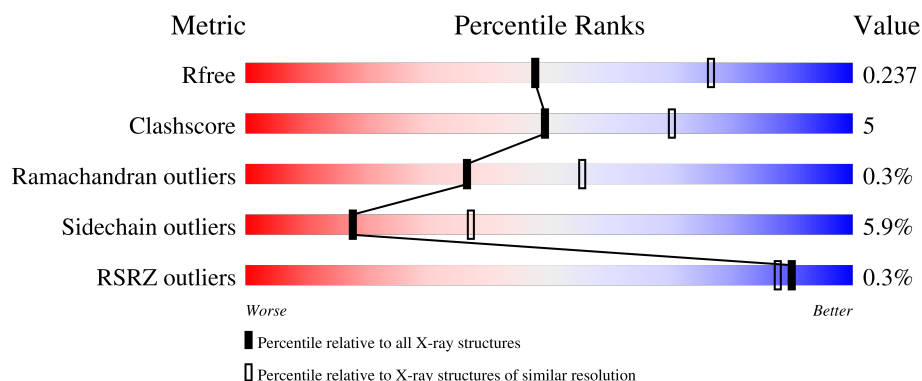
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Ramachandran outliers	187476	6378 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

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	311	 85% 11% . .
1	B	311	 84% 11% . .

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 4966 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 guanine nucleotide exchange factor.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	303	Total	C	N	O	S	0	0	0
			2385	1491	408	475	11			
1	B	301	Total	C	N	O	S	0	1	0
			2367	1480	403	473	11			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	337	GLY	-	expression tag	UNP Q5ZSQ3
A	338	HIS	-	expression tag	UNP Q5ZSQ3
A	339	MET	-	expression tag	UNP Q5ZSQ3
B	337	GLY	-	expression tag	UNP Q5ZSQ3
B	338	HIS	-	expression tag	UNP Q5ZSQ3
B	339	MET	-	expression tag	UNP Q5ZSQ3

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

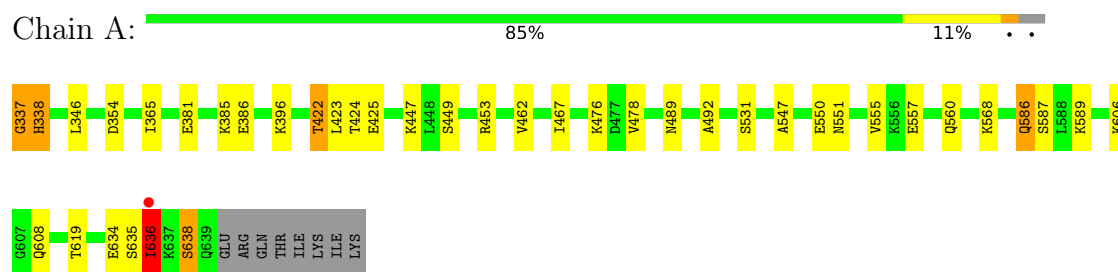
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	108	Total O 108 108	0	0
3	B	66	Total O 66 66	0	0

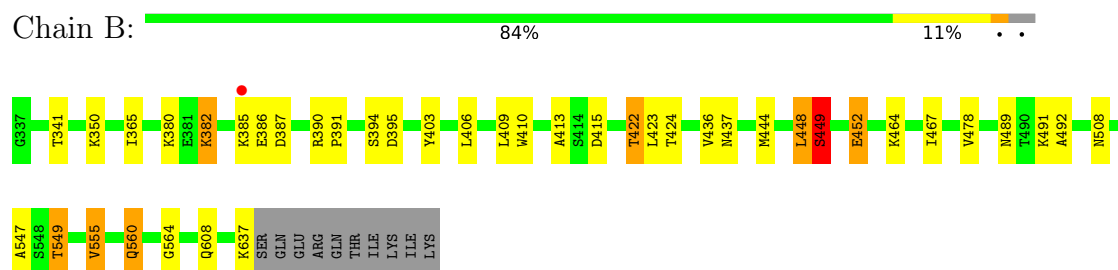
3 Residue-property plots

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: guanine nucleotide exchange factor



- Molecule 1: guanine nucleotide exchange factor



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	74.96Å 75.38Å 130.97Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	19.90 – 2.50 19.90 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.8 (19.90-2.50) 99.7 (19.90-2.50)	Depositor EDS
R_{merge}	0.28	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.09 (at 2.50Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, R_{free}	0.170 , 0.236 0.176 , 0.237	Depositor DCC
R_{free} test set	1291 reflections (4.91%)	wwPDB-VP
Wilson B-factor (Å ²)	30.9	Xtriage
Anisotropy	0.290	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 34.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	0.000 for k,h,-l	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	4966	wwPDB-VP
Average B, all atoms (Å ²)	45.0	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 39.47 % 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 3.1578e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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

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	1.09	3/2419 (0.1%)	1.00	2/3248 (0.1%)
1	B	0.98	0/2404	1.02	4/3231 (0.1%)
All	All	1.04	3/4823 (0.1%)	1.01	6/6479 (0.1%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	636	ILE	CA-CB	5.35	1.61	1.54
1	A	365	ILE	CA-CB	-5.34	1.48	1.54
1	A	381	GLU	C-O	-5.05	1.17	1.24

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	382	LYS	N-CA-C	-9.85	95.10	110.36
1	A	337	GLY	N-CA-C	-9.70	85.17	113.30
1	A	338	HIS	N-CA-C	5.36	116.66	108.52
1	B	436	VAL	N-CA-C	-5.32	105.35	110.72
1	B	382	LYS	CA-C-N	-5.04	111.91	121.54
1	B	382	LYS	C-N-CA	-5.04	111.91	121.54

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	337	GLY	Peptide

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	2385	0	2400	21	0
1	B	2367	0	2369	31	0
2	A	20	0	0	0	0
2	B	20	0	0	0	0
3	A	108	0	0	8	1
3	B	66	0	0	2	1
All	All	4966	0	4769	52	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 (52) 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:422:THR:HG21	3:B:121:HOH:O	1.73	0.88
1:A:422:THR:HG21	3:A:35:HOH:O	1.82	0.80
1:B:365:ILE:HD13	1:B:467:ILE:HA	1.66	0.77
1:A:386:GLU:OE1	3:A:174:HOH:O	2.04	0.75
1:A:422:THR:HG22	1:A:424:THR:H	1.52	0.74
1:B:422:THR:HG22	1:B:424:THR:H	1.54	0.72
1:A:568:LYS:NZ	3:A:131:HOH:O	2.23	0.71
1:B:413:ALA:HB3	1:B:437:ASN:HD22	1.54	0.71
1:B:547:ALA:H	1:B:608:GLN:HE21	1.40	0.69
1:B:410:TRP:HA	1:B:437:ASN:HD21	1.58	0.68
1:B:365:ILE:CD1	1:B:467:ILE:HD13	2.23	0.68
1:B:549:THR:HG21	1:B:560:GLN:HA	1.74	0.68
1:B:365:ILE:HD13	1:B:467:ILE:HD13	1.78	0.66
1:A:547:ALA:H	1:A:608:GLN:HE21	1.43	0.64
1:B:549:THR:OG1	1:B:555:VAL:HG11	1.97	0.64

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:489:ASN:HD22	1:B:492:ALA:H	1.43	0.64
1:B:448:LEU:O	1:B:449:SER:HB3	1.99	0.62
1:A:422:THR:HG22	1:A:424:THR:N	2.17	0.60
1:B:422:THR:HG22	1:B:424:THR:N	2.18	0.59
1:A:619:THR:HG21	3:A:131:HOH:O	2.05	0.55
1:A:547:ALA:H	1:A:608:GLN:NE2	2.04	0.54
1:B:547:ALA:H	1:B:608:GLN:NE2	2.07	0.53
1:B:448:LEU:O	1:B:452:GLU:OE2	2.26	0.53
1:B:380:LYS:O	1:B:382:LYS:O	2.27	0.52
1:A:422:THR:CG2	1:A:424:THR:H	2.20	0.52
1:A:619:THR:CG2	3:A:131:HOH:O	2.58	0.51
1:B:422:THR:CG2	1:B:424:THR:H	2.23	0.51
1:A:489:ASN:HD22	1:A:492:ALA:H	1.56	0.51
1:A:385:LYS:HD2	3:A:174:HOH:O	2.11	0.50
1:B:448:LEU:HD23	3:B:107:HOH:O	2.11	0.50
1:B:406:LEU:HD13	1:B:444:MET:HG3	1.95	0.49
1:B:387:ASP:HB3	1:B:390:ARG:NH2	2.29	0.48
1:A:396:LYS:O	1:A:447:LYS:NZ	2.34	0.47
1:A:550:GLU:O	1:A:551:ASN:HB2	2.15	0.47
1:A:635:SER:O	1:A:636:ILE:HD12	2.15	0.46
1:B:350:LYS:NZ	1:B:395:ASP:OD1	2.48	0.46
1:A:638:SER:HB3	3:A:151:HOH:O	2.15	0.46
1:B:413:ALA:HB3	1:B:437:ASN:ND2	2.28	0.46
1:A:586:GLN:HG3	1:A:587:SER:N	2.32	0.45
1:A:462:VAL:HG13	1:A:467:ILE:HD11	1.98	0.45
1:B:387:ASP:HB3	1:B:390:ARG:HH22	1.82	0.45
1:B:444:MET:HE3	1:B:448:LEU:HD22	1.99	0.44
1:B:365:ILE:HD11	1:B:467:ILE:HD13	2.00	0.44
1:B:489:ASN:HD21	1:B:491:LYS:HB2	1.83	0.43
1:B:564:GLY:HA2	1:B:608:GLN:HE22	1.83	0.43
1:A:425:GLU:HG3	3:A:102:HOH:O	2.18	0.43
1:B:403:TYR:OH	1:B:448:LEU:CD1	2.67	0.42
1:B:415:ASP:OD1	1:B:464:LYS:NZ	2.47	0.42
1:A:346:LEU:HD23	1:A:346:LEU:HA	1.80	0.42
1:B:489:ASN:ND2	1:B:492:ALA:H	2.12	0.42
1:B:391:PRO:O	1:B:394:SER:HB2	2.20	0.42
1:A:354:ASP:CG	1:A:396:LYS:HZ3	2.27	0.41

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)
3:A:140:HOH:O	3:B:96:HOH:O[3_445]	2.16	0.04

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	301/311 (97%)	294 (98%)	6 (2%)	1 (0%)	36	55
1	B	300/311 (96%)	290 (97%)	9 (3%)	1 (0%)	36	55
All	All	601/622 (97%)	584 (97%)	15 (2%)	2 (0%)	36	55

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	638	SER
1	B	449	SER

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	263/272 (97%)	247 (94%)	16 (6%)	17	35
1	B	260/272 (96%)	245 (94%)	15 (6%)	18	38
All	All	523/544 (96%)	492 (94%)	31 (6%)	18	37

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	338	HIS
1	A	422	THR
1	A	423	LEU
1	A	449	SER
1	A	453	ARG
1	A	476	LYS
1	A	478	VAL
1	A	531	SER
1	A	555	VAL
1	A	557	GLU
1	A	560	GLN
1	A	586	GLN
1	A	589	LYS
1	A	606	LYS
1	A	634	GLU
1	A	636	ILE
1	B	341	THR
1	B	385	LYS
1	B	386	GLU
1	B	409	LEU
1	B	422	THR
1	B	423	LEU
1	B	448	LEU
1	B	449	SER
1	B	452	GLU
1	B	478	VAL
1	B	508	ASN
1	B	549	THR
1	B	555	VAL
1	B	560	GLN
1	B	637	LYS

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	489	ASN
1	A	495	ASN
1	A	502	GLN
1	A	608	GLN
1	B	407	GLN
1	B	437	ASN
1	B	473	GLN
1	B	489	ASN

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Mol	Chain	Res	Type
1	B	608	GLN

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](#)

8 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	$\# Z > 2$
2	SO4	B	6	-	4,4,4	0.57	0	6,6,6	0.69	0
2	SO4	B	8	-	4,4,4	0.49	0	6,6,6	0.43	0
2	SO4	A	3	-	4,4,4	0.28	0	6,6,6	0.44	0
2	SO4	A	7	-	4,4,4	0.42	0	6,6,6	0.43	0
2	SO4	B	4	-	4,4,4	0.26	0	6,6,6	0.56	0
2	SO4	A	5	-	4,4,4	0.56	0	6,6,6	0.52	0
2	SO4	A	1	-	4,4,4	0.20	0	6,6,6	0.77	0
2	SO4	B	2	-	4,4,4	0.37	0	6,6,6	0.44	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	303/311 (97%)	-0.57	1 (0%) 90 87	25, 38, 66, 112	0
1	B	301/311 (96%)	-0.41	1 (0%) 90 87	23, 44, 77, 99	1 (0%)
All	All	604/622 (97%)	-0.49	2 (0%) 90 87	23, 40, 72, 112	1 (0%)

All (2) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	636	ILE	3.6
1	B	385	LYS	2.1

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	SO4	B	8	5/5	0.96	0.09	62,64,72,75	0
2	SO4	B	6	5/5	0.97	0.12	47,50,58,69	0
2	SO4	A	7	5/5	0.97	0.08	48,50,58,60	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SO4	A	5	5/5	0.98	0.07	43,53,57,64	0
2	SO4	B	4	5/5	0.99	0.04	40,40,41,47	0
2	SO4	A	1	5/5	0.99	0.04	27,32,36,36	0
2	SO4	A	3	5/5	0.99	0.03	31,32,36,40	0
2	SO4	B	2	5/5	1.00	0.03	34,35,36,40	0

6.5 Other polymers [i](#)

There are no such residues in this entry.