



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:03 AM UTC

PDB ID : 6WMZ / pdb_00006wmz
Title : Crystal structure of human SFPQ/NONO complex
Authors : Lee, M.; Bond, C.S.
Deposited on : 2020-04-22
Resolution : 2.85 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

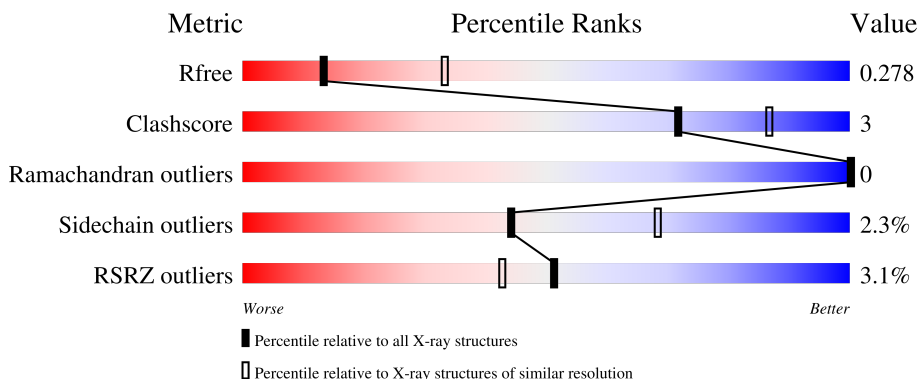
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.85 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	1407 (2.88-2.84)
Clashscore	190562	1446 (2.88-2.84)
Ramachandran outliers	187476	1406 (2.88-2.84)
Sidechain outliers	187428	1407 (2.88-2.84)
RSRZ outliers	180081	1408 (2.88-2.84)

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	388	
1	C	388	
2	B	261	
2	D	261	

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 8954 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 Splicing factor, proline- and glutamine-rich.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	299	Total	C	N	O	S	0	0	0
			2478	1534	455	474	15			
1	C	292	Total	C	N	O	S	0	0	0
			2415	1497	446	459	13			

There are 6 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	211	GLY	-	expression tag	UNP P23246
A	212	ALA	-	expression tag	UNP P23246
A	213	MET	-	expression tag	UNP P23246
C	211	GLY	-	expression tag	UNP P23246
C	212	ALA	-	expression tag	UNP P23246
C	213	MET	-	expression tag	UNP P23246

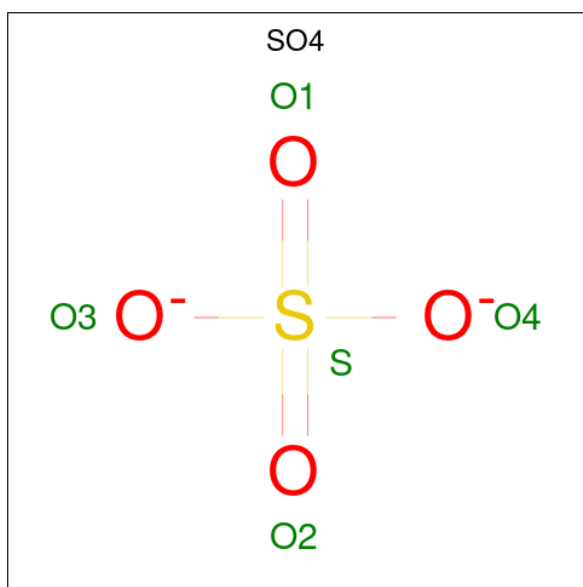
- Molecule 2 is a protein called Non-POU domain-containing octamer-binding protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	240	Total	C	N	O	S	0	0	0
			1955	1231	351	364	9			
2	D	254	Total	C	N	O	S	0	0	0
			2062	1299	370	384	9			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	52	MET	-	initiating methionine	UNP Q15233
D	52	MET	-	initiating methionine	UNP Q15233

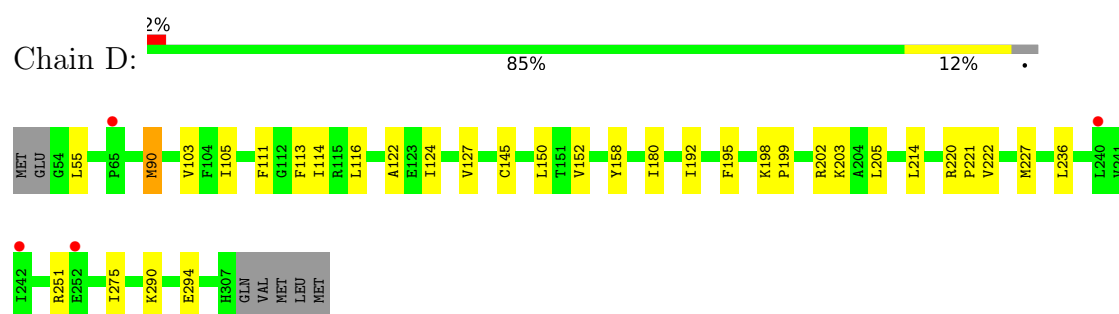
- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	5	Total	O	0	0
			5	5		
4	B	17	Total	O	0	0
			17	17		
4	C	4	Total	O	0	0
			4	4		
4	D	13	Total	O	0	0
			13	13		



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	66.63Å 112.94Å 204.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	63.44 – 2.85 63.44 – 2.85	Depositor EDS
% Data completeness (in resolution range)	99.2 (63.44-2.85) 99.2 (63.44-2.85)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.27 (at 2.86Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.236 , 0.283 0.238 , 0.278	Depositor DCC
R_{free} test set	1827 reflections (4.70%)	wwPDB-VP
Wilson B-factor (Å ²)	59.6	Xtriage
Anisotropy	0.338	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 54.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	8954	wwPDB-VP
Average B, all atoms (Å ²)	76.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 8.84% 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 [i](#)

5.1 Standard geometry [i](#)

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	0.97	0/2518	1.45	1/3367 (0.0%)
1	C	0.99	0/2455	1.46	0/3285
2	B	0.95	0/1993	1.44	0/2675
2	D	0.97	0/2102	1.44	0/2822
All	All	0.97	0/9068	1.45	1/12149 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	382	VAL	N-CA-C	-7.99	98.83	109.30

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	2478	0	2444	19	0
1	C	2415	0	2382	13	0
2	B	1955	0	1948	17	0
2	D	2062	0	2054	22	0
3	D	5	0	0	0	0
4	A	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	17	0	0	0	0
4	C	4	0	0	0	0
4	D	13	0	0	0	0
All	All	8954	0	8828	58	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 3.

All (58) 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:307:ASP:OD1	1:C:358:ARG:NH1	2.27	0.68
1:A:442:PRO:HG2	2:B:267:TYR:CE2	2.33	0.64
2:D:103:VAL:HG22	2:D:114:ILE:HD12	1.81	0.62
2:B:87:GLU:O	2:B:91:ARG:HG3	2.00	0.61
1:C:310:GLU:HA	1:C:328:ILE:HD13	1.84	0.59
2:D:152:VAL:CG1	2:D:222:VAL:CG1	2.83	0.57
2:D:150:LEU:HD12	2:D:195:PHE:HE2	1.71	0.56
2:D:55:LEU:HD22	2:D:124:ILE:HG23	1.87	0.55
1:C:421:LYS:N	1:C:422:PRO:HD2	2.23	0.53
2:D:152:VAL:CG1	2:D:222:VAL:HG11	2.38	0.53
1:C:386:LEU:HD12	2:D:251:ARG:CZ	2.39	0.53
1:C:438:LEU:HD13	1:C:445:VAL:HG21	1.89	0.53
2:D:90:MET:HE2	2:D:105:ILE:HD11	1.91	0.52
1:A:402:VAL:CG2	2:B:236:LEU:HB3	2.40	0.51
2:D:198:LYS:N	2:D:199:PRO:CD	2.74	0.51
1:A:339:LEU:HD12	1:A:345:ALA:HA	1.93	0.51
2:B:150:LEU:HD12	2:B:195:PHE:HE2	1.77	0.50
1:C:469:MET:HG2	2:D:158:TYR:CE2	2.46	0.50
2:D:90:MET:HG3	2:D:105:ILE:HD11	1.94	0.50
2:B:198:LYS:N	2:B:199:PRO:CD	2.75	0.49
1:A:504:GLN:HE22	2:B:288:ASN:HD22	1.59	0.49
2:D:214:LEU:HD23	2:D:221:PRO:HA	1.95	0.49
1:A:463:LEU:HD12	1:A:466:LYS:HD2	1.94	0.48
1:C:326:VAL:HG22	1:C:337:ILE:HG13	1.96	0.47
2:B:70:PHE:O	2:B:115:ARG:HD3	2.14	0.47
2:D:152:VAL:HG13	2:D:222:VAL:CG1	2.45	0.47
2:D:90:MET:HG3	2:D:105:ILE:CD1	2.45	0.46
1:C:553:HIS:O	1:C:557:MET:HG2	2.16	0.46
1:C:305:PRO:CG	1:C:358:ARG:HD2	2.46	0.46
1:C:327:PHE:HB3	1:C:336:PHE:CZ	2.51	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:523:MET:HB3	2:B:267:TYR:CD1	2.52	0.45
1:A:369:HIS:NE2	1:A:417:GLU:HB3	2.32	0.45
1:A:438:LEU:HD11	1:A:445:VAL:HG21	1.99	0.45
2:B:103:VAL:HG22	2:B:114:ILE:HD12	1.99	0.45
1:C:384:ASN:ND2	2:D:236:LEU:C	2.75	0.45
1:A:438:LEU:CD1	1:A:445:VAL:HG21	2.47	0.44
2:B:256:ARG:NH2	2:B:264:GLU:OE2	2.51	0.44
2:D:116:LEU:HD12	2:D:122:ALA:HA	1.99	0.44
1:A:381:TYR:O	1:A:382:VAL:C	2.61	0.44
1:A:478:PRO:HA	2:B:214:LEU:O	2.17	0.43
1:A:497:LEU:HD23	1:A:497:LEU:HA	1.91	0.43
2:D:192:ILE:HG12	2:D:227:MET:HE1	2.00	0.43
2:D:90:MET:HE2	2:D:105:ILE:CD1	2.49	0.43
2:B:220:ARG:O	2:B:220:ARG:HG3	2.18	0.43
2:B:302:ALA:HB1	2:D:113:PHE:CE2	2.53	0.43
2:B:306:GLU:HG2	2:B:306:GLU:O	2.18	0.42
1:A:469:MET:HG2	2:B:158:TYR:CE2	2.55	0.42
1:A:505:ARG:HE	2:B:282:GLN:HE21	1.67	0.42
1:A:421:LYS:HB2	1:A:422:PRO:HD3	2.01	0.42
1:A:482:GLN:O	1:A:485:THR:OG1	2.35	0.41
1:C:442:PRO:HG2	1:C:523:MET:SD	2.61	0.41
1:C:494:TRP:CD2	2:D:220:ARG:HD2	2.56	0.41
2:D:55:LEU:HD22	2:D:124:ILE:CG2	2.51	0.41
2:D:290:LYS:HE3	2:D:294:GLU:OE2	2.21	0.41
2:B:303:ALA:HA	2:D:111:PHE:CZ	2.56	0.40
1:A:558:GLN:O	1:A:562:GLU:HB2	2.21	0.40
1:A:439:THR:HG22	1:A:440:THR:N	2.36	0.40
1:A:304:LEU:HB3	1:A:308:ILE:HD13	2.03	0.40

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	297/388 (76%)	284 (96%)	13 (4%)	0	100	100
1	C	290/388 (75%)	282 (97%)	8 (3%)	0	100	100
2	B	238/261 (91%)	226 (95%)	12 (5%)	0	100	100
2	D	252/261 (97%)	241 (96%)	11 (4%)	0	100	100
All	All	1077/1298 (83%)	1033 (96%)	44 (4%)	0	100	100

There are no Ramachandran outliers to report.

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	264/330 (80%)	260 (98%)	4 (2%)	57	77
1	C	256/330 (78%)	249 (97%)	7 (3%)	39	63
2	B	210/229 (92%)	207 (99%)	3 (1%)	59	78
2	D	221/229 (96%)	213 (96%)	8 (4%)	31	56
All	All	951/1118 (85%)	929 (98%)	22 (2%)	44	68

All (22) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	332	LYS
1	A	486	PHE
1	A	500	MET
1	A	574	ARG
2	B	105	ILE
2	B	164	LEU
2	B	240	LEU
1	C	311	ASP
1	C	462	LYS
1	C	471	GLN
1	C	496	SER
1	C	497	LEU
1	C	547	ARG

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Mol	Chain	Res	Type
1	C	569	GLU
2	D	90	MET
2	D	127	VAL
2	D	145	CYS
2	D	180	ILE
2	D	202	ARG
2	D	203	LYS
2	D	205	LEU
2	D	275	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	492	GLN
1	A	504	GLN
1	A	543	GLN
1	A	564	GLN
2	B	282	GLN
2	B	307	HIS
1	C	329	ASN
1	C	471	GLN
1	C	483	HIS
1	C	567	GLN
2	D	138	GLN
2	D	154	ASN
2	D	246	GLN
2	D	282	GLN
2	D	284	GLN
2	D	305	HIS

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

1 ligand is 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	$\# Z > 2$
3	SO4	D	401	-	4,4,4	0.34	0	6,6,6	0.08	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	A	299/388 (77%)	0.45	11 (3%) 45 35	39, 80, 118, 138	0
1	C	292/388 (75%)	0.44	11 (3%) 44 35	40, 86, 125, 147	0
2	B	240/261 (91%)	0.15	8 (3%) 49 40	31, 58, 115, 135	0
2	D	254/261 (97%)	0.26	4 (1%) 70 64	33, 63, 107, 123	0
All	All	1085/1298 (83%)	0.34	34 (3%) 51 43	31, 74, 119, 147	0

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	317	PHE	3.6
2	B	305	HIS	3.6
2	B	256	ARG	3.0
2	B	100	ALA	2.9
1	A	512	MET	2.8
1	C	370	ALA	2.8
2	D	65	PRO	2.6
2	D	252	GLU	2.6
1	A	543	GLN	2.5
1	C	330	LYS	2.5
1	A	436	PHE	2.5
1	C	334	PHE	2.5
1	A	499	GLU	2.4
2	B	105	ILE	2.4
2	B	258	ALA	2.3
1	C	357	MET	2.3
1	A	578	MET	2.3
1	A	526	ALA	2.2
1	C	336	PHE	2.2
1	C	369	HIS	2.2
1	A	539	LEU	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	313	PHE	2.2
1	A	518	LYS	2.1
1	A	308	ILE	2.1
2	B	300	MET	2.1
1	A	438	LEU	2.1
1	A	437	LEU	2.1
2	D	240	LEU	2.1
1	C	309	THR	2.1
1	C	308	ILE	2.1
2	D	242	ILE	2.1
1	C	537	GLN	2.0
2	B	307	HIS	2.0
2	B	274	LEU	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
3	SO4	D	401	5/5	0.64	0.13	114,120,124,125	0

6.5 Other polymers [i](#)

There are no such residues in this entry.