



Full wwPDB X-ray Structure Validation Report ⓘ

May 18, 2020 – 12:25 am BST

PDB ID : 1ZVD
Title : Regulation of Smurf2 Ubiquitin Ligase Activity by Anchoring the E2 to the HECT domain
Authors : Ogunjimi, A.A.; Briant, D.J.; Pece-Barbara, N.; Le Roy, C.; Di Guglielmo, G.M.; Kavsak, P.; Rasmussen, R.K.; Seet, B.T.; Sicheri, F.; Wrana, J.L.
Deposited on : 2005-06-01
Resolution : 2.10 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

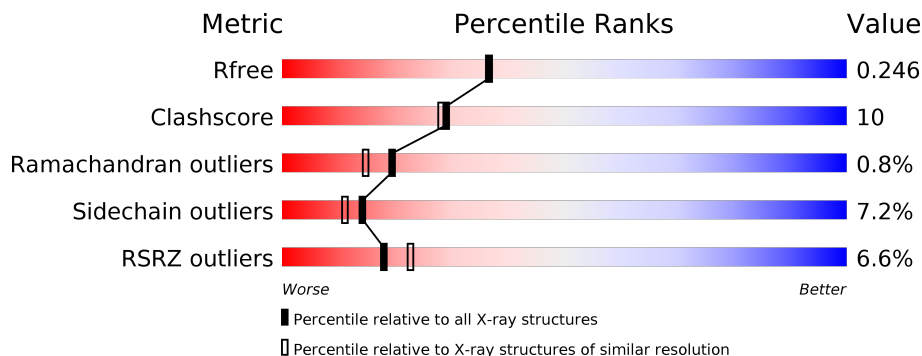
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.10 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	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (2.10-2.10)

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 on 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	380	 6% 77% 17%

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 3313 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.

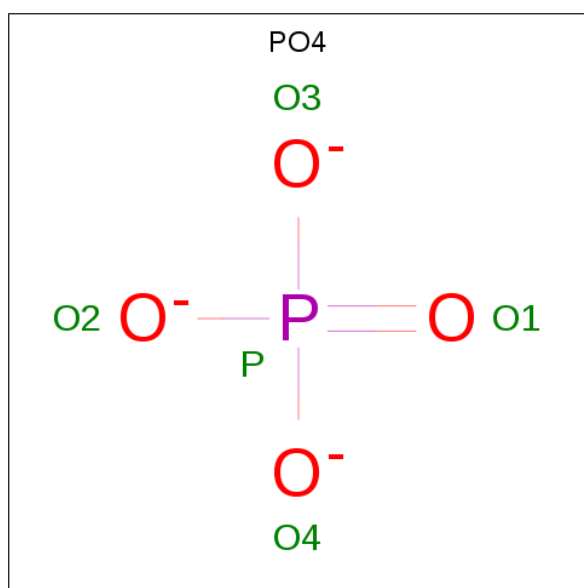
- Molecule 1 is a protein called Smad ubiquitination regulatory factor 2.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	N	O	S	Se			
1	A	373	3124	2013	541	557	6	7	0	5	0

- Molecule 2 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Na	0	0
			1	1		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula: O₄P).



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

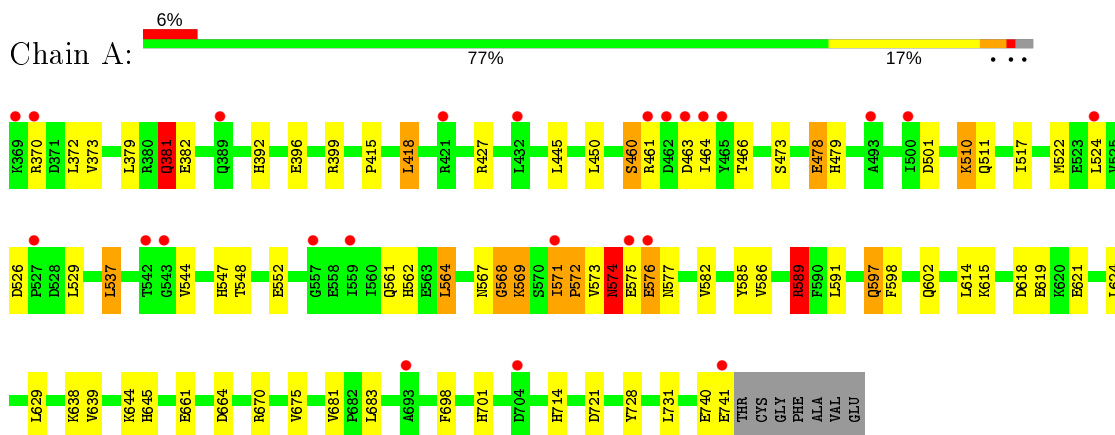
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	183	Total 183	O 183	0	0

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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: Smad ubiquitination regulatory factor 2



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	51.36Å 70.51Å 152.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.57 – 2.10 24.56 – 2.10	Depositor EDS
% Data completeness (in resolution range)	97.8 (24.57-2.10) 97.8 (24.56-2.10)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.58 (at 2.10Å)	Xtrriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.202 , 0.248 0.204 , 0.246	Depositor DCC
R_{free} test set	1631 reflections (5.03%)	wwPDB-VP
Wilson B-factor (Å ²)	29.2	Xtrriage
Anisotropy	0.084	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.38 , 51.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	3313	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.65% 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: NA, PO4

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	1.07	5/3209 (0.2%)	0.93	6/4323 (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 (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	478	GLU	CG-CD	9.02	1.65	1.51
1	A	381	GLN	CG-CD	5.57	1.63	1.51
1	A	396	GLU	CG-CD	5.21	1.59	1.51
1	A	589	ARG	CG-CD	-5.16	1.39	1.51
1	A	728	TYR	CD1-CE1	-5.08	1.31	1.39

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	664	ASP	CB-CG-OD1	6.50	124.15	118.30
1	A	399	ARG	NE-CZ-NH2	-5.75	117.43	120.30
1	A	478	GLU	CA-CB-CG	5.70	125.95	113.40
1	A	670	ARG	NE-CZ-NH2	-5.50	117.55	120.30
1	A	618	ASP	CB-CG-OD2	5.28	123.05	118.30
1	A	564	LEU	CA-CB-CG	5.04	126.90	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	574	ASN	Peptide

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	3124	0	3104	60	0
2	A	1	0	0	0	0
3	A	5	0	0	1	0
4	A	183	0	0	7	0
All	All	3313	0	3104	60	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 10.

All (60) 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:567:ASN:O	1:A:569:LYS:N	1.92	1.01
1:A:597:GLN:H	1:A:597:GLN:HE21	1.13	0.94
1:A:547:HIS:O	1:A:572:PRO:HD2	1.70	0.90
1:A:522:MSE:CE	1:A:526:ASP:HB3	2.05	0.87
1:A:574:ASN:C	1:A:576:GLU:H	1.80	0.81
1:A:548:THR:HA	1:A:572:PRO:HD2	1.69	0.75
1:A:517:ILE:HG22	1:A:586:VAL:HG13	1.69	0.74
1:A:569:LYS:N	1:A:569:LYS:HD3	2.03	0.73
1:A:478:GLU:HG2	4:A:111:HOH:O	1.88	0.73
1:A:574:ASN:O	1:A:576:GLU:N	2.20	0.69
1:A:740:GLU:O	1:A:741:GLU:HB2	1.95	0.66
1:A:597:GLN:HE21	1:A:597:GLN:N	1.93	0.65
1:A:415:PRO:HA	1:A:418:LEU:HD22	1.79	0.65
1:A:522:MSE:HE2	1:A:526:ASP:HB3	1.81	0.63
1:A:568:GLY:C	1:A:569:LYS:HD3	2.21	0.61
1:A:373:VAL:HG23	4:A:61:HOH:O	2.00	0.60
1:A:479:HIS:HE1	4:A:140:HOH:O	1.85	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:552:GLU:HG3	1:A:561:GLN:NE2	2.18	0.59
1:A:548:THR:HA	1:A:572:PRO:CD	2.33	0.58
1:A:740:GLU:O	1:A:741:GLU:CB	2.52	0.58
1:A:548:THR:CA	1:A:572:PRO:HD2	2.33	0.58
1:A:624:LEU:HD22	1:A:629:LEU:HD23	1.86	0.57
1:A:552:GLU:HG3	1:A:561:GLN:HE22	1.70	0.56
1:A:624:LEU:HB3	1:A:683:LEU:HD21	1.86	0.56
1:A:392:HIS:HD2	3:A:1:PO4:O2	1.89	0.55
1:A:370:ARG:HB2	4:A:205:HOH:O	2.06	0.55
1:A:547:HIS:C	1:A:572:PRO:HD2	2.28	0.53
1:A:571:ILE:O	1:A:577:ASN:ND2	2.42	0.52
1:A:460:SER:OG	1:A:466:THR:HB	2.10	0.52
1:A:510:LYS:HB3	1:A:619:GLU:HB3	1.91	0.52
1:A:427:ARG:NH2	4:A:181:HOH:O	2.42	0.51
1:A:381:GLN:OE1	1:A:382:GLU:HG2	2.11	0.50
1:A:522:MSE:CE	1:A:526:ASP:CB	2.84	0.50
1:A:511:GLN:HB3	1:A:598:PHE:CZ	2.46	0.50
1:A:473:SER:OG	1:A:479:HIS:HD2	1.94	0.50
1:A:714:HIS:HE1	1:A:721:ASP:OD2	1.96	0.49
1:A:573:VAL:HG23	1:A:575:GLU:H	1.78	0.48
1:A:547:HIS:O	1:A:572:PRO:CD	2.55	0.47
1:A:524:LEU:HB2	4:A:40:HOH:O	2.13	0.47
1:A:615:LYS:HB2	1:A:615:LYS:NZ	2.30	0.47
1:A:567:ASN:C	1:A:569:LYS:H	2.14	0.46
1:A:372:LEU:HD13	1:A:621:GLU:HB3	1.98	0.46
1:A:731:LEU:C	1:A:731:LEU:HD23	2.36	0.46
1:A:644[A]:LYS:HG2	1:A:701:HIS:ND1	2.31	0.46
1:A:522:MSE:HE1	1:A:526:ASP:HB3	1.91	0.45
1:A:644[A]:LYS:HG2	1:A:645:HIS:HD2	1.82	0.45
1:A:615:LYS:HB2	1:A:615:LYS:HZ2	1.80	0.45
1:A:511:GLN:HG2	1:A:517:ILE:HD11	1.99	0.45
1:A:522:MSE:HE1	1:A:526:ASP:CB	2.47	0.44
1:A:526:ASP:OD2	1:A:589:ARG:NE	2.45	0.44
1:A:638:LYS:NZ	1:A:661:GLU:OE1	2.42	0.44
1:A:615:LYS:NZ	1:A:615:LYS:CB	2.81	0.43
1:A:675:VAL:HG11	1:A:698:PHE:CE1	2.53	0.43
1:A:562:HIS:HD2	4:A:17:HOH:O	2.03	0.42
1:A:591:LEU:HD23	1:A:591:LEU:HA	1.90	0.41
1:A:537:LEU:HD13	1:A:582:VAL:HG21	2.03	0.41
1:A:644[A]:LYS:CG	1:A:645:HIS:HD2	2.33	0.41
1:A:522:MSE:HE2	1:A:529:LEU:HD23	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:574:ASN:C	1:A:576:GLU:N	2.56	0.41
1:A:624:LEU:CD2	1:A:629:LEU:HD23	2.51	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	376/380 (99%)	361 (96%)	12 (3%)	3 (1%)	19 15

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	568	GLY
1	A	463	ASP
1	A	464	ILE

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	340/333 (102%)	316 (93%)	24 (7%)	14 11

All (24) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	379	LEU
1	A	381	GLN
1	A	418	LEU
1	A	445	LEU
1	A	450	LEU
1	A	460	SER
1	A	461	ARG
1	A	501	ASP
1	A	510	LYS
1	A	537	LEU
1	A	544	VAL
1	A	564	LEU
1	A	569	LYS
1	A	571	ILE
1	A	572	PRO
1	A	574	ASN
1	A	576	GLU
1	A	585	TYR
1	A	589	ARG
1	A	597	GLN
1	A	602	GLN
1	A	614	LEU
1	A	639	VAL
1	A	681	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (14) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	392	HIS
1	A	468	GLN
1	A	479	HIS
1	A	498	HIS
1	A	531	ASN
1	A	554	ASN
1	A	562	HIS
1	A	597	GLN
1	A	612	HIS
1	A	645	HIS
1	A	673	GLN
1	A	702	GLN
1	A	708	ASN
1	A	714	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 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	PO4	A	1	-	4,4,4	0.96	0	6,6,6	1.57	2 (33%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
3	A	1	PO4	O2-P-O1	-2.51	101.72	110.89
3	A	1	PO4	O3-P-O2	2.39	115.64	107.97

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
3	A	1	PO4	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	366/380 (96%)	0.16	24 (6%) 18 23	15, 28, 47, 67	0

All (24) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	432	LEU	7.2
1	A	464	ILE	6.7
1	A	465	TYR	5.4
1	A	524	LEU	5.0
1	A	462	ASP	4.9
1	A	461	ARG	4.8
1	A	559	ILE	4.1
1	A	370	ARG	4.1
1	A	389	GLN	3.9
1	A	576	GLU	3.7
1	A	543	GLY	3.7
1	A	421	ARG	3.1
1	A	575	GLU	3.0
1	A	741	GLU	2.9
1	A	542	THR	2.7
1	A	369	LYS	2.7
1	A	527	PRO	2.5
1	A	463	ASP	2.5
1	A	693	ALA	2.3
1	A	571	ILE	2.2
1	A	704	ASP	2.2
1	A	557	GLY	2.1
1	A	500	ILE	2.1
1	A	493	ALA	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 carbohydrates 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(\AA^2)	Q<0.9
2	NA	A	800	1/1	0.99	0.13	13,13,13,13	0
3	PO4	A	1	5/5	0.99	0.07	28,29,33,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.