



# Full wwPDB X-ray Structure Validation Report ⓘ

May 15, 2020 – 09:23 pm BST

PDB ID : 6OAN  
Title : Structure of DBP in complex with human neutralizing antibody 053054  
Authors : Urusova, D.; Tolia, N.H.  
Deposited on : 2019-03-18  
Resolution : 2.90 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](mailto: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.

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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

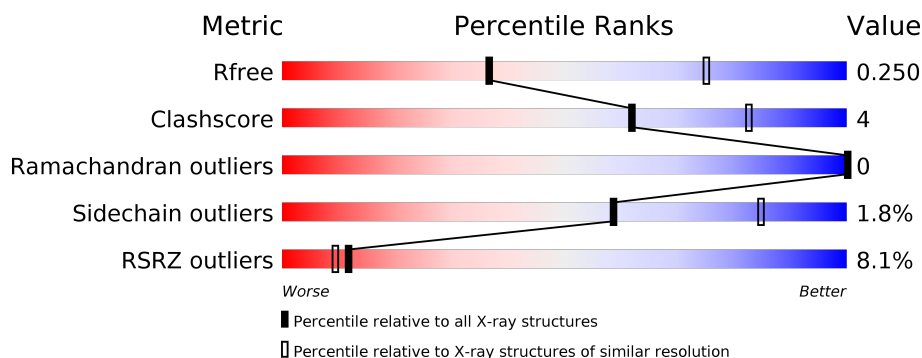
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.90 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	1957 (2.90-2.90)
Clashscore	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)
RSRZ outliers	127900	1906 (2.90-2.90)

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  $\geq 3$ , 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	315	<div> <div>9%</div> <div>70% 10% 19%</div> </div>
1	C	315	<div> <div>13%</div> <div>65% 12% 21%</div> </div>
2	B	266	<div> <div>2%</div> <div>76% 10% 14%</div> </div>
2	D	266	<div> <div>2%</div> <div>78% 8% 14%</div> </div>

## 2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 7744 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 Duffy binding surface protein region II.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	254	Total	C	N	O	S	0	0	0
			2143	1362	380	388	13			
1	C	248	Total	C	N	O	S	0	1	0
			2102	1340	374	375	13			

- Molecule 2 is a protein called Antibody 053054 single chain variable fragment.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	229	Total	C	N	O	S	0	0	0
			1745	1101	291	349	4			
2	D	228	Total	C	N	O	S	0	0	0
			1738	1097	289	348	4			

- Molecule 3 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

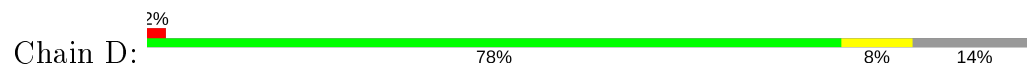
- Molecule 4 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	2	Total	O	0	0
			2	2		
4	B	2	Total	O	0	0
			2	2		
4	C	2	Total	O	0	0
			2	2		





- Molecule 2: Antibody 053054 single chain variable fragment



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	183.48Å 53.95Å 142.78Å 90.00° 113.74° 90.00°	Depositor
Resolution (Å)	19.60 – 2.90 19.60 – 2.90	Depositor EDS
% Data completeness (in resolution range)	99.2 (19.60-2.90) 99.3 (19.60-2.90)	Depositor EDS
$R_{merge}$	0.08	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.29 (at 2.88Å)	Xtriage
Refinement program	PHENIX (1.13_2998: ???)	Depositor
R, $R_{free}$	0.230 , 0.252 0.231 , 0.250	Depositor DCC
$R_{free}$ test set	1395 reflections (4.88%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	70.7	Xtriage
Anisotropy	0.507	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 56.0	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.51$ , $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.93	EDS
Total number of atoms	7744	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.59% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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	0.24	0/2184	0.39	0/2933
1	C	0.25	0/2147	0.40	0/2884
2	B	0.28	0/1791	0.48	0/2454
2	D	0.26	0/1784	0.46	0/2445
All	All	0.25	0/7906	0.43	0/10716

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	A	2143	0	2129	22	0
1	C	2102	0	2089	25	0
2	B	1745	0	1667	14	0
2	D	1738	0	1661	11	0
3	B	5	0	0	0	0
3	D	5	0	0	0	0
4	A	2	0	0	0	0
4	B	2	0	0	0	0
4	C	2	0	0	0	0
All	All	7744	0	7546	67	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 (67) 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:223:ARG:NH2	1:C:302:ASP:OD2	2.23	0.70
1:C:339:ASP:OD1	1:C:345:ARG:NH2	2.25	0.69
1:C:333:ARG:HD3	1:C:338:THR:HG23	1.76	0.66
1:C:274:ARG:NH2	2:D:108:VAL:O	2.23	0.65
1:A:274:ARG:NH2	2:B:108:VAL:O	2.25	0.64
2:D:44:ARG:HB3	2:D:54:ILE:HD11	1.84	0.58
2:B:93:ALA:HA	2:B:124:VAL:HG21	1.87	0.56
1:C:333:ARG:HD3	1:C:338:THR:CG2	2.37	0.55
1:C:405:PRO:HA	1:C:408:VAL:HG12	1.89	0.55
1:A:304:ARG:HG3	1:A:382:ALA:HA	1.89	0.55
1:C:336:PHE:CD1	1:C:346:ARG:HD2	2.42	0.54
2:D:111:PRO:HD2	2:D:235:TRP:CG	2.42	0.54
2:B:44:ARG:HB3	2:B:54:ILE:HD11	1.88	0.54
2:B:198:ARG:HD3	2:B:206:PHE:O	2.08	0.54
1:A:440:ASP:HA	1:A:443:ILE:HG22	1.91	0.53
2:D:92:THR:O	2:D:124:VAL:HG21	2.09	0.53
2:D:31:ASP:OD1	2:D:32:SER:N	2.42	0.53
2:D:12:GLY:HA3	2:D:24:LEU:HD23	1.90	0.53
2:D:8:LEU:HD22	2:D:28:VAL:HG22	1.91	0.53
1:C:221:ARG:NH1	1:C:240:ASP:OD1	2.42	0.52
1:A:405:PRO:HA	1:A:408:VAL:HG12	1.92	0.52
1:C:304:ARG:HG3	1:C:382:ALA:HA	1.91	0.52
1:A:363:TYR:CE2	1:A:367:LYS:HD2	2.45	0.52
1:A:295:TYR:CZ	1:A:376:ILE:HG22	2.45	0.52
2:B:59:TYR:HA	2:B:77:ILE:HD13	1.92	0.52
2:B:111:PRO:HD2	2:B:235:TRP:CG	2.45	0.51
1:C:333:ARG:O	1:C:337:GLY:N	2.44	0.51
1:A:294:ARG:HA	1:A:294:ARG:HH11	1.76	0.50
2:B:205:ARG:NH1	2:B:226:ASP:OD1	2.46	0.48
1:A:471:ILE:HD13	1:A:477:ILE:HG12	1.95	0.48
1:C:363:TYR:OH	2:D:176:GLY:HA3	2.13	0.48
1:C:440:ASP:HA	1:C:443:ILE:HG22	1.94	0.48
1:C:373:PHE:HB3	1:C:375[B]:TRP:CZ3	2.49	0.47
2:D:179:TRP:CD2	2:D:217:LEU:HB2	2.49	0.47
2:B:12:GLY:HA3	2:B:24:LEU:HD23	1.97	0.47
1:C:295:TYR:CZ	1:C:376:ILE:HG22	2.49	0.47
1:C:442:TRP:CE2	1:C:446:LYS:HE3	2.50	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:333:ARG:O	1:C:337:GLY:CA	2.63	0.46
1:A:264:ASP:HB3	1:A:267:PHE:HB3	1.97	0.46
1:C:342:ALA:HA	1:C:345:ARG:HE	1.81	0.46
1:A:411:LEU:HD21	1:A:439:TYR:HB2	1.97	0.46
2:B:191:VAL:HA	2:B:202:ILE:HG13	1.98	0.46
1:C:315:MET:HG2	1:C:347:LYS:HA	1.97	0.45
1:A:353:SER:O	1:A:357:ILE:HG12	2.16	0.45
1:C:363:TYR:CE2	1:C:367:LYS:HD2	2.52	0.45
1:A:275:LYS:HD3	1:A:275:LYS:HA	1.86	0.44
1:C:353:SER:O	1:C:357:ILE:HG12	2.17	0.44
1:C:498:ASP:N	1:C:498:ASP:OD1	2.48	0.44
1:A:219:TYR:CD2	1:A:289:LYS:HE2	2.53	0.44
1:A:284:GLY:HA3	1:A:361:MET:O	2.18	0.43
1:A:249:GLU:HB3	1:A:275:LYS:HB3	2.00	0.43
2:B:10:GLU:OE2	2:B:100:TYR:HA	2.19	0.43
1:A:446:LYS:HA	1:A:446:LYS:HD3	1.78	0.43
1:C:378:LYS:HB2	1:C:381:VAL:HG22	2.00	0.43
2:D:149:LEU:HD11	2:D:234:VAL:HB	2.01	0.42
1:A:219:TYR:HD2	1:A:289:LYS:HE2	1.84	0.42
1:C:271:TYR:CE2	1:C:275:LYS:HE3	2.54	0.42
2:D:205:ARG:NH1	2:D:226:ASP:OD1	2.53	0.42
2:B:179:TRP:CD2	2:B:217:LEU:HB2	2.54	0.41
1:A:347:LYS:O	1:A:351:ASN:ND2	2.39	0.41
2:B:193:TYR:O	2:B:197:ASP:HB2	2.20	0.41
1:A:294:ARG:HD2	1:A:294:ARG:HA	1.80	0.41
1:A:366:LYS:HE3	2:B:194:ASP:OD2	2.20	0.41
1:A:404:LEU:HB3	1:A:405:PRO:HD3	2.01	0.41
1:C:446:LYS:HA	1:C:446:LYS:HD3	1.88	0.41
1:A:264:ASP:OD2	2:B:62:THR:OG1	2.33	0.40
1:C:309:ASP:OD1	1:C:391:ARG:NH2	2.50	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	246/315 (78%)	237 (96%)	9 (4%)	0	100	100
1	C	239/315 (76%)	224 (94%)	15 (6%)	0	100	100
2	B	225/266 (85%)	219 (97%)	6 (3%)	0	100	100
2	D	224/266 (84%)	216 (96%)	8 (4%)	0	100	100
All	All	934/1162 (80%)	896 (96%)	38 (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	232/291 (80%)	230 (99%)	2 (1%)	78	93
1	C	227/291 (78%)	220 (97%)	7 (3%)	40	74
2	B	193/215 (90%)	189 (98%)	4 (2%)	53	81
2	D	193/215 (90%)	191 (99%)	2 (1%)	76	92
All	All	845/1012 (84%)	830 (98%)	15 (2%)	59	85

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	294	ARG
1	A	302	ASP
2	B	28	VAL
2	B	91	VAL
2	B	197	ASP
2	B	234	VAL
1	C	302	ASP
1	C	338	THR
1	C	339	ASP
1	C	369	LEU

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Mol	Chain	Res	Type
1	C	370	LYS
1	C	383	VAL
1	C	494	ILE
2	D	197	ASP
2	D	234	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

### 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](#)

2 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	$\# Z  > 2$
3	SO4	D	301	-	4,4,4	0.14	0	6,6,6	0.06	0
3	SO4	B	301	-	4,4,4	0.14	0	6,6,6	0.09	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

There are no such residues in this entry.

## 5.8 Polymer linkage issues

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	254/315 (80%)	0.53	27 (10%) 6 4	52, 87, 123, 153	0
1	C	248/315 (78%)	0.64	41 (16%) 1 1	30, 87, 123, 173	0
2	B	229/266 (86%)	0.11	4 (1%) 70 69	46, 64, 95, 122	1 (0%)
2	D	228/266 (85%)	0.23	6 (2%) 56 52	49, 68, 90, 105	0
All	All	959/1162 (82%)	0.38	78 (8%) 12 9	30, 77, 117, 173	1 (0%)

All (78) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	434	ASN	9.1
1	C	338	THR	5.8
1	C	409	GLN	5.4
1	A	340	GLU	5.2
1	A	413	GLU	5.0
1	C	440	ASP	4.5
1	C	372	ASN	4.2
1	A	463	ALA	4.1
1	C	408	VAL	4.1
1	C	437	LYS	3.8
1	A	433	GLN	3.8
1	A	370	LYS	3.7
1	C	406	THR	3.6
1	C	232	THR	3.6
1	C	469	ALA	3.5
1	A	441	GLN	3.5
1	A	483	ASP	3.4
1	A	323	GLY	3.3
1	C	435	ALA	3.3
1	A	437	LYS	3.3
1	C	219	TYR	3.2

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	499	GLY	3.2
1	C	468	THR	3.2
1	A	434	ASN	3.1
1	C	334	SER	3.1
1	A	462	ASN	3.1
1	C	323	GLY	3.0
1	C	438	SER	3.0
1	C	268	ARG	2.9
1	A	488	VAL	2.9
1	A	219	TYR	2.9
1	A	338	THR	2.8
1	C	380	ASN	2.7
1	C	370	LYS	2.7
1	C	234	LYS	2.7
1	C	252	ASN	2.6
1	A	484	GLU	2.5
1	A	216	ASN	2.5
2	D	34	ASN	2.5
2	D	17	LYS	2.5
1	A	409	GLN	2.5
1	C	337	GLY	2.5
1	C	344	GLN	2.5
1	C	226	ARG	2.5
1	C	223	ARG	2.4
1	A	381	VAL	2.4
1	C	433	GLN	2.4
1	A	497	ARG	2.4
2	D	146	SER	2.3
1	A	218	ASN	2.3
1	C	218	ASN	2.3
1	A	500	ALA	2.3
1	C	448	ASN	2.3
1	C	445	ARG	2.3
1	A	265	ILE	2.3
1	C	340	GLU	2.2
1	C	383	VAL	2.2
2	B	221	ARG	2.2
2	D	230	TYR	2.2
1	C	485	PHE	2.2
1	C	463	ALA	2.1
2	B	255	GLN	2.1
1	C	497	ARG	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	216	ASN	2.1
1	C	371	GLY	2.1
1	C	470	GLY	2.1
1	C	441	GLN	2.1
1	C	224	ARG	2.1
1	A	225	GLU	2.1
1	A	343	GLN	2.1
1	C	339	ASP	2.1
1	C	501	TYR	2.1
2	B	254	GLY	2.1
1	A	383	VAL	2.1
2	D	147	TYR	2.1
1	A	384	ASN	2.1
2	D	41	ILE	2.0
2	B	17	LYS	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 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, 95<sup>th</sup> 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	301	5/5	0.82	0.35	85,114,120,131	0
3	SO4	B	301	5/5	0.89	0.26	51,51,56,57	5

## 6.5 Other polymers [i](#)

There are no such residues in this entry.