



# Full wwPDB X-ray Structure Validation Report ⓘ

Jun 12, 2024 – 12:02 AM EDT

PDB ID : 1WKB  
Title : Crystal Structure of Leucyl-tRNA Synthetase from the Archaeon *Pyrococcus horikoshii* Reveals a Novel Editing Domain Orientation  
Authors : Fukunaga, R.; Yokoyama, S.; RIKEN Structural Genomics/Proteomics Initiative (RSGI)  
Deposited on : 2004-05-30  
Resolution : 2.05 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.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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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 : 2022.3.0, CSD as543be (2022)  
Xtriage (Phenix) : 1.20.1  
EDS : 2.36.2  
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) : 2.36.2

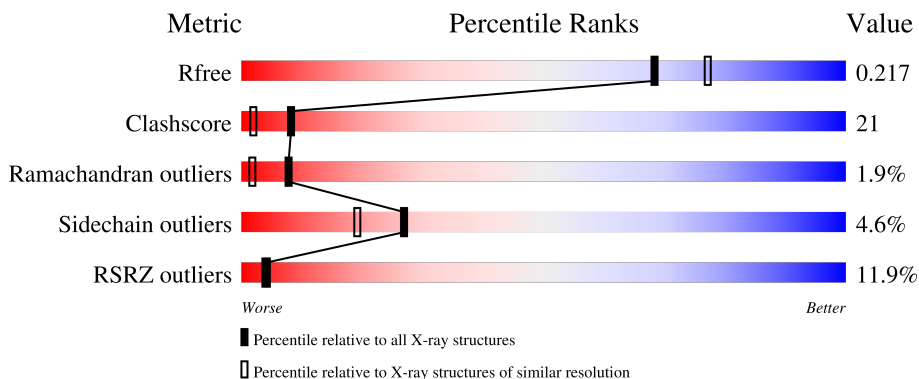
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.05 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	1692 (2.04-2.04)
Clashscore	141614	1773 (2.04-2.04)
Ramachandran outliers	138981	1752 (2.04-2.04)
Sidechain outliers	138945	1752 (2.04-2.04)
RSRZ outliers	127900	1672 (2.04-2.04)

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  $\geq 3$ , 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	810	

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 7475 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 Leucyl-tRNA synthetase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	791	6610	4299	1109	1183	19	0	0	0

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



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

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

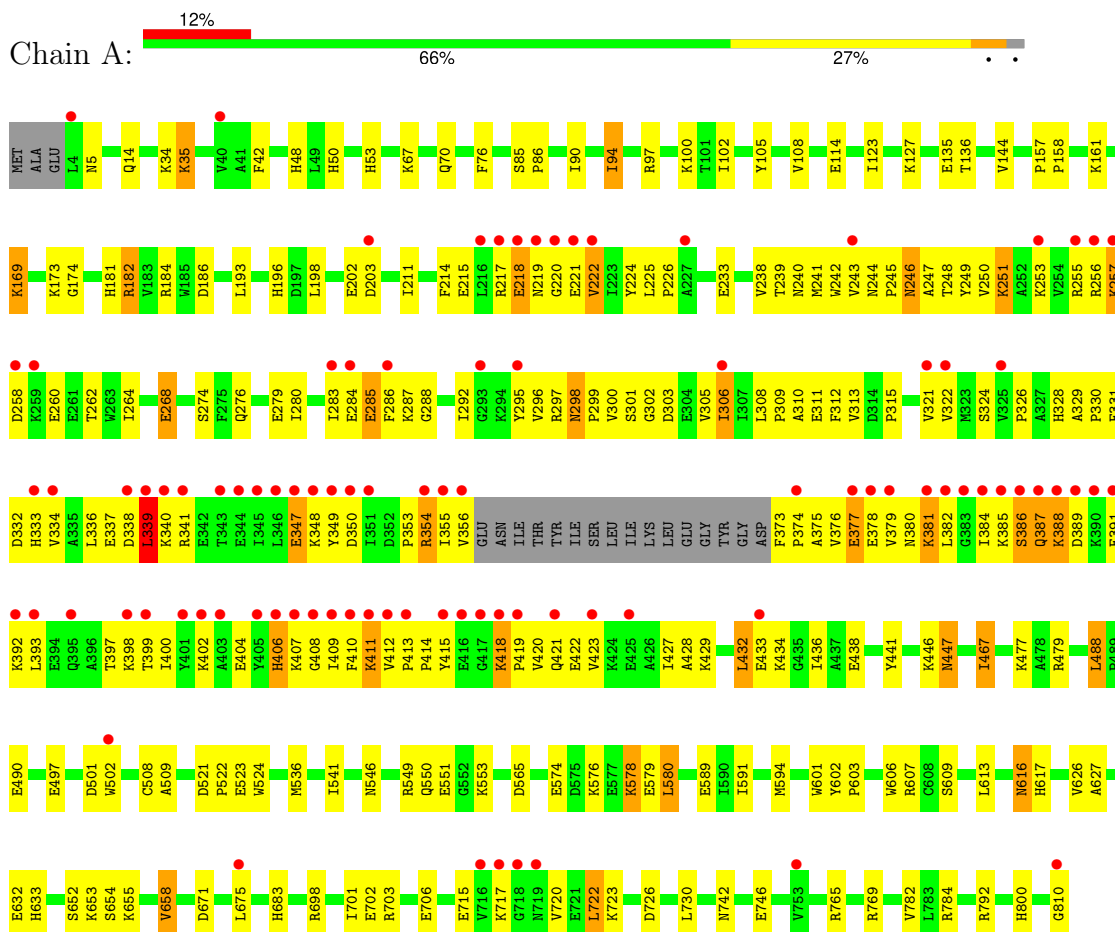
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	825	Total	O	0	0
			825	825		

### 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: Leucyl-tRNA synthetase



## 4 Data and refinement statistics

Property	Value	Source
Space group	H 3	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	186.20Å 186.20Å 91.43Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	28.96 – 2.05 28.96 – 2.05	Depositor EDS
% Data completeness (in resolution range)	98.8 (28.96-2.05) 98.9 (28.96-2.05)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.49 (at 2.04Å)	Xtrriage
Refinement program	CNS 1.1	Depositor
R, $R_{free}$	0.180 , 0.218 0.180 , 0.217	Depositor DCC
$R_{free}$ test set	3752 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	33.0	Xtrriage
Anisotropy	0.037	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.35 , 71.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.014 for h,-h-k,-l	Xtrriage
$F_o, F_c$ correlation	0.96	EDS
Total number of atoms	7475	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	47.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.26% 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 [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	0.55	0/6792	0.69	2/9181 (0.0%)

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

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	251	LYS	N-CA-C	-5.34	96.58	111.00
1	A	467	ILE	N-CA-C	-5.28	96.74	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	105	TYR	Sidechain

### 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	6610	0	6586	280	0
2	A	40	0	0	3	0
3	A	825	0	0	33	0
All	All	7475	0	6586	280	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 21.

All (280) 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:412:VAL:HG12	1:A:414:PRO:HD2	1.36	1.06
1:A:233:GLU:HA	1:A:427:ILE:HD12	1.40	1.00
1:A:546:ASN:O	1:A:550:GLN:HG2	1.67	0.94
1:A:616:ASN:HD22	1:A:617:HIS:H	1.12	0.94
1:A:298:ASN:HD22	1:A:300:VAL:H	1.13	0.94
1:A:50:HIS:H	1:A:53:HIS:HD2	1.13	0.92
1:A:347:GLU:HG3	1:A:348:LYS:HD2	1.48	0.91
1:A:114:GLU:HG3	3:A:1177:HOH:O	1.72	0.90
1:A:447:ASN:HD22	1:A:447:ASN:H	1.24	0.85
1:A:274:SER:HA	1:A:280:ILE:HD13	1.61	0.82
1:A:354:ARG:HH21	1:A:356:VAL:HB	1.43	0.82
1:A:388:LYS:H	1:A:388:LYS:HD2	1.45	0.82
1:A:246:ASN:N	1:A:246:ASN:HD22	1.77	0.82
1:A:298:ASN:ND2	1:A:300:VAL:H	1.77	0.81
1:A:301:SER:O	1:A:303:ASP:N	2.14	0.80
1:A:429:LYS:O	1:A:433:GLU:HG2	1.84	0.78
1:A:50:HIS:H	1:A:53:HIS:CD2	2.02	0.78
1:A:378:GLU:HA	1:A:381:LYS:HZ2	1.49	0.77
1:A:276:GLN:HE22	1:A:441:TYR:H	1.29	0.77
1:A:306:ILE:HD13	1:A:306:ILE:N	2.00	0.76
1:A:404:GLU:O	1:A:420:VAL:HG11	1.86	0.76
1:A:214:PHE:HB3	1:A:296:VAL:HG21	1.68	0.74
1:A:607:ARG:HE	1:A:617:HIS:HE1	1.36	0.73
1:A:248:THR:CG2	1:A:285:GLU:HG3	2.18	0.73
1:A:413:PRO:HB2	1:A:414:PRO:HD3	1.70	0.72
1:A:295:TYR:CZ	1:A:306:ILE:HG23	2.25	0.72
1:A:354:ARG:HG2	1:A:375:ALA:HB1	1.71	0.71
1:A:284:GLU:HB3	1:A:286:PHE:CZ	2.25	0.71
1:A:671:ASP:OD1	1:A:800:HIS:HD2	1.73	0.71
1:A:378:GLU:HA	1:A:381:LYS:NZ	2.04	0.71
1:A:214:PHE:HB3	1:A:296:VAL:CG2	2.21	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:616:ASN:ND2	1:A:617:HIS:H	1.88	0.70
1:A:574:GLU:O	1:A:578:LYS:HE3	1.90	0.70
1:A:238:VAL:HA	1:A:324:SER:O	1.92	0.70
1:A:233:GLU:HA	1:A:427:ILE:CD1	2.21	0.69
1:A:306:ILE:HD13	1:A:306:ILE:H	1.57	0.69
1:A:222:VAL:O	1:A:262:THR:HB	1.93	0.68
1:A:248:THR:HG21	1:A:285:GLU:HG3	1.76	0.68
1:A:182:ARG:H	1:A:182:ARG:HD3	1.59	0.68
1:A:310:ALA:O	1:A:313:VAL:HG12	1.93	0.68
1:A:326:PRO:HG2	1:A:336:LEU:HD11	1.76	0.67
1:A:784:ARG:HH22	1:A:810:GLY:H	1.43	0.67
1:A:354:ARG:C	1:A:354:ARG:HD3	2.15	0.67
1:A:243:VAL:HG13	1:A:249:TYR:CZ	2.30	0.66
1:A:633:HIS:HE1	3:A:967:HOH:O	1.80	0.65
1:A:355:ILE:HG21	1:A:410:PHE:CE1	2.31	0.65
1:A:215:GLU:C	1:A:296:VAL:HG23	2.15	0.65
1:A:769:ARG:HD3	3:A:1066:HOH:O	1.96	0.65
1:A:246:ASN:N	1:A:246:ASN:ND2	2.44	0.65
1:A:253:LYS:CE	1:A:255:ARG:HH22	2.10	0.64
1:A:330:PRO:CG	1:A:400:ILE:HD12	2.28	0.64
1:A:330:PRO:HG3	1:A:400:ILE:HD12	1.78	0.64
1:A:391:GLU:C	1:A:393:LEU:H	2.01	0.64
1:A:378:GLU:HG2	1:A:381:LYS:HD2	1.79	0.64
1:A:490:GLU:OE2	3:A:1677:HOH:O	2.13	0.64
1:A:242:TRP:HB2	1:A:322:VAL:HB	1.79	0.64
1:A:298:ASN:HD22	1:A:298:ASN:C	2.00	0.64
1:A:67:LYS:NZ	1:A:70:GLN:HE22	1.96	0.64
1:A:298:ASN:HD21	1:A:300:VAL:HB	1.63	0.64
1:A:310:ALA:HB1	1:A:312:PHE:CD1	2.33	0.63
1:A:423:VAL:O	1:A:427:ILE:HG13	1.99	0.63
1:A:251:LYS:HB2	1:A:286:PHE:HE2	1.63	0.63
1:A:549:ARG:HD3	3:A:1412:HOH:O	1.98	0.63
1:A:412:VAL:CG1	1:A:414:PRO:HD2	2.23	0.63
1:A:14:GLN:HE21	1:A:800:HIS:CE1	2.18	0.62
1:A:393:LEU:HD13	1:A:393:LEU:O	1.99	0.62
1:A:410:PHE:CD2	1:A:415:TYR:HB2	2.35	0.62
1:A:347:GLU:CG	1:A:348:LYS:H	2.12	0.61
1:A:251:LYS:HB2	1:A:286:PHE:CE2	2.36	0.61
1:A:355:ILE:HG22	1:A:355:ILE:O	2.01	0.61
1:A:333:HIS:ND1	1:A:381:LYS:HG3	2.16	0.61
1:A:354:ARG:HD3	1:A:354:ARG:O	2.00	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:217:ARG:HD3	1:A:218:GLU:N	2.17	0.60
1:A:50:HIS:N	1:A:53:HIS:HD2	1.94	0.60
1:A:35:LYS:HE2	1:A:601:TRP:O	2.02	0.59
1:A:374:PRO:O	1:A:377:GLU:HG3	2.01	0.59
1:A:100:LYS:NZ	1:A:654:SER:HB3	2.17	0.59
1:A:337:GLU:O	1:A:388:LYS:HE3	2.03	0.59
1:A:376:VAL:O	1:A:378:GLU:N	2.37	0.58
1:A:723:LYS:HE3	3:A:1547:HOH:O	2.04	0.58
1:A:384:ILE:O	1:A:385:LYS:HB2	2.02	0.58
1:A:386:SER:O	1:A:387:GLN:HB2	2.04	0.57
1:A:240:ASN:HB2	1:A:308:LEU:HD13	1.85	0.57
1:A:330:PRO:HB2	1:A:397:THR:HG22	1.87	0.57
1:A:334:VAL:HG23	1:A:388:LYS:HA	1.86	0.57
1:A:292:ILE:HG13	1:A:309:PRO:HG3	1.86	0.57
1:A:412:VAL:HG13	1:A:413:PRO:HD2	1.86	0.57
1:A:241:MET:CE	1:A:305:VAL:HG21	2.35	0.57
1:A:381:LYS:HZ1	1:A:400:ILE:HD11	1.69	0.57
1:A:135:GLU:HB2	3:A:1251:HOH:O	2.04	0.57
1:A:388:LYS:HD2	1:A:388:LYS:N	2.17	0.56
1:A:765:ARG:CZ	3:A:1366:HOH:O	2.53	0.56
1:A:310:ALA:HB1	1:A:312:PHE:HD1	1.71	0.56
1:A:218:GLU:O	1:A:220:GLY:N	2.38	0.56
1:A:479:ARG:NH2	1:A:501:ASP:OD1	2.36	0.56
1:A:633:HIS:HD2	3:A:1347:HOH:O	1.89	0.56
1:A:90:ILE:O	1:A:94:ILE:HG23	2.05	0.56
1:A:398:LYS:HG3	1:A:399:THR:N	2.20	0.56
1:A:347:GLU:C	1:A:349:TYR:H	2.08	0.56
1:A:324:SER:OG	1:A:332:ASP:HB3	2.05	0.56
1:A:347:GLU:HG3	1:A:348:LYS:N	2.20	0.56
1:A:347:GLU:CG	1:A:348:LYS:N	2.69	0.56
1:A:420:VAL:HG13	1:A:421:GLN:N	2.21	0.56
1:A:218:GLU:C	1:A:220:GLY:H	2.09	0.56
1:A:274:SER:CA	1:A:280:ILE:HD13	2.32	0.56
1:A:410:PHE:HB3	1:A:415:TYR:O	2.06	0.55
1:A:169:LYS:HE3	1:A:565:ASP:OD1	2.06	0.55
1:A:244:ASN:HD22	1:A:247:ALA:N	2.05	0.55
1:A:298:ASN:ND2	1:A:301:SER:H	2.05	0.55
1:A:400:ILE:O	1:A:404:GLU:HG3	2.07	0.55
1:A:769:ARG:HD3	3:A:1549:HOH:O	2.07	0.54
1:A:477:LYS:HG2	1:A:626:VAL:HB	1.89	0.54
1:A:410:PHE:CE2	1:A:412:VAL:HB	2.42	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:214:PHE:HA	1:A:299:PRO:HD3	1.88	0.54
1:A:354:ARG:NH2	1:A:356:VAL:HB	2.19	0.54
1:A:589:GLU:H	1:A:589:GLU:CD	2.12	0.54
1:A:253:LYS:HE2	1:A:255:ARG:HH22	1.72	0.53
1:A:356:VAL:HG12	1:A:356:VAL:O	2.08	0.53
1:A:574:GLU:HG2	1:A:578:LYS:CE	2.38	0.53
1:A:244:ASN:HB2	1:A:313:VAL:HG13	1.90	0.53
1:A:391:GLU:C	1:A:393:LEU:N	2.59	0.53
1:A:217:ARG:NE	1:A:220:GLY:O	2.40	0.53
1:A:225:LEU:HG	1:A:321:VAL:HG11	1.91	0.53
1:A:347:GLU:HG3	1:A:348:LYS:H	1.70	0.53
1:A:792:ARG:HB2	3:A:1428:HOH:O	2.09	0.53
1:A:447:ASN:HD22	1:A:447:ASN:N	1.99	0.53
1:A:330:PRO:HG3	1:A:381:LYS:HE3	1.89	0.53
1:A:467:ILE:HG13	1:A:508:CYS:HB3	1.91	0.53
1:A:617:HIS:HD2	3:A:915:HOH:O	1.92	0.53
1:A:251:LYS:CB	1:A:286:PHE:HE2	2.21	0.53
1:A:241:MET:HE2	1:A:305:VAL:HG21	1.90	0.52
1:A:268:GLU:HG3	1:A:315:PRO:O	2.09	0.52
1:A:295:TYR:CE1	1:A:306:ILE:HG23	2.44	0.52
1:A:347:GLU:HA	1:A:347:GLU:OE2	2.10	0.52
1:A:196:HIS:HD2	2:A:901:SO4:O3	1.92	0.52
1:A:328:HIS:CE1	1:A:355:ILE:H	2.28	0.52
1:A:35:LYS:NZ	1:A:603:PRO:O	2.40	0.52
1:A:97:ARG:HA	1:A:102:ILE:HD11	1.92	0.52
1:A:14:GLN:HE21	1:A:800:HIS:HE1	1.58	0.52
1:A:765:ARG:O	1:A:769:ARG:HG3	2.10	0.52
1:A:215:GLU:O	1:A:296:VAL:HG23	2.10	0.51
1:A:378:GLU:HA	1:A:381:LYS:CD	2.41	0.51
1:A:703:ARG:HG2	3:A:1665:HOH:O	2.10	0.51
1:A:702:GLU:O	1:A:706:GLU:HG3	2.10	0.51
1:A:373:PHE:N	1:A:374:PRO:CD	2.74	0.51
1:A:502:TRP:HB3	3:A:1672:HOH:O	2.10	0.51
1:A:523:GLU:HG3	3:A:1236:HOH:O	2.09	0.51
1:A:283:ILE:O	1:A:284:GLU:HB2	2.10	0.51
1:A:308:LEU:N	1:A:308:LEU:HD12	2.26	0.51
1:A:347:GLU:CD	1:A:348:LYS:H	2.13	0.50
1:A:108:VAL:HG13	1:A:658:VAL:HG22	1.93	0.50
1:A:550:GLN:HG3	3:A:1708:HOH:O	2.11	0.50
1:A:196:HIS:HE1	3:A:1559:HOH:O	1.94	0.50
1:A:376:VAL:O	1:A:378:GLU:HG3	2.11	0.50

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:607:ARG:HH21	1:A:617:HIS:CE1	2.30	0.50
1:A:233:GLU:CA	1:A:427:ILE:HD12	2.28	0.50
1:A:238:VAL:HG22	3:A:1145:HOH:O	2.12	0.50
1:A:123:ILE:HG22	1:A:127:LYS:HE2	1.93	0.49
1:A:244:ASN:HD22	1:A:247:ALA:H	1.60	0.49
1:A:157:PRO:HB2	1:A:158:PRO:HD3	1.93	0.49
1:A:387:GLN:O	1:A:389:ASP:N	2.45	0.49
1:A:765:ARG:NH2	3:A:1162:HOH:O	2.35	0.49
1:A:217:ARG:NE	1:A:217:ARG:HA	2.27	0.49
1:A:301:SER:C	1:A:303:ASP:H	2.13	0.49
1:A:551:GLU:HB3	1:A:553:LYS:HG3	1.95	0.49
1:A:576:LYS:HA	1:A:579:GLU:HG2	1.95	0.49
1:A:211:ILE:HG12	1:A:438:GLU:O	2.13	0.48
1:A:580:LEU:HB3	1:A:591:ILE:HD13	1.95	0.48
1:A:240:ASN:C	1:A:241:MET:HE2	2.34	0.48
1:A:211:ILE:HG13	1:A:211:ILE:O	2.14	0.48
1:A:250:VAL:O	1:A:264:ILE:HA	2.12	0.48
1:A:245:PRO:HG2	1:A:246:ASN:ND2	2.27	0.48
1:A:386:SER:O	1:A:387:GLN:CB	2.61	0.48
1:A:410:PHE:HB2	1:A:423:VAL:HG21	1.96	0.48
1:A:334:VAL:HG11	1:A:393:LEU:HD21	1.95	0.48
1:A:355:ILE:HA	1:A:411:LYS:HB3	1.96	0.48
1:A:378:GLU:HA	1:A:381:LYS:HD2	1.96	0.48
1:A:338:ASP:O	1:A:339:LEU:HB3	2.14	0.47
1:A:447:ASN:H	1:A:447:ASN:ND2	2.04	0.47
1:A:353:PRO:HD3	3:A:1474:HOH:O	2.15	0.47
1:A:380:ASN:C	1:A:382:LEU:H	2.17	0.47
1:A:418:LYS:HD3	1:A:422:GLU:OE2	2.13	0.47
1:A:398:LYS:NZ	1:A:402:LYS:HE3	2.29	0.47
1:A:423:VAL:HG12	1:A:427:ILE:HD11	1.95	0.47
1:A:384:ILE:O	1:A:384:ILE:HG22	2.15	0.47
1:A:683:HIS:HE1	1:A:746:GLU:O	1.98	0.46
1:A:378:GLU:CA	1:A:381:LYS:HZ2	2.25	0.46
1:A:381:LYS:NZ	1:A:400:ILE:HD11	2.30	0.46
1:A:418:LYS:HE3	1:A:418:LYS:HA	1.97	0.46
1:A:67:LYS:HD3	1:A:70:GLN:HE21	1.81	0.46
1:A:135:GLU:HG3	1:A:136:THR:N	2.30	0.46
1:A:497:GLU:HG2	3:A:1414:HOH:O	2.14	0.46
1:A:245:PRO:HA	1:A:288:GLY:HA3	1.97	0.46
1:A:376:VAL:O	1:A:376:VAL:HG23	2.16	0.46
1:A:186:ASP:HB2	1:A:193:LEU:HD21	1.98	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:341:ARG:HD2	1:A:341:ARG:N	2.31	0.46
1:A:410:PHE:HD2	1:A:415:TYR:HB2	1.80	0.46
1:A:48:HIS:HE1	3:A:1024:HOH:O	1.97	0.46
1:A:295:TYR:HA	1:A:305:VAL:O	2.16	0.46
1:A:100:LYS:HZ3	1:A:654:SER:CB	2.28	0.46
1:A:239:THR:OG1	1:A:240:ASN:ND2	2.49	0.46
1:A:328:HIS:HD2	1:A:404:GLU:OE1	1.99	0.46
1:A:720:VAL:HG23	1:A:722:LEU:HD13	1.98	0.46
1:A:310:ALA:HB1	1:A:312:PHE:CE1	2.52	0.45
1:A:574:GLU:HG2	1:A:578:LYS:HE2	1.99	0.45
1:A:181:HIS:HE1	3:A:1260:HOH:O	2.00	0.45
1:A:242:TRP:O	1:A:243:VAL:HG23	2.17	0.45
1:A:330:PRO:HD2	1:A:397:THR:HG22	1.98	0.45
1:A:446:LYS:HA	3:A:1052:HOH:O	2.17	0.45
1:A:521:ASP:N	1:A:522:PRO:HD3	2.32	0.45
1:A:67:LYS:HZ2	1:A:70:GLN:HE22	1.62	0.45
1:A:742:ASN:ND2	3:A:1015:HOH:O	2.50	0.45
1:A:85:SER:N	1:A:86:PRO:CD	2.80	0.44
1:A:184:ARG:NH2	2:A:906:SO4:O4	2.50	0.44
1:A:279:GLU:C	1:A:280:ILE:HD12	2.37	0.44
1:A:339:LEU:O	1:A:340:LYS:HD3	2.17	0.44
1:A:385:LYS:HD2	1:A:385:LYS:N	2.31	0.44
1:A:467:ILE:HG13	1:A:508:CYS:CB	2.48	0.44
1:A:653:LYS:HB3	1:A:653:LYS:HE3	1.82	0.44
1:A:173:LYS:HE2	1:A:627:ALA:O	2.18	0.44
1:A:280:ILE:HD12	1:A:280:ILE:N	2.33	0.44
1:A:306:ILE:H	1:A:306:ILE:CD1	2.17	0.44
1:A:182:ARG:HD3	1:A:182:ARG:N	2.31	0.44
1:A:312:PHE:CE2	1:A:331:PHE:HB3	2.53	0.44
1:A:268:GLU:H	1:A:268:GLU:HG2	1.32	0.43
1:A:683:HIS:HD2	3:A:1288:HOH:O	2.00	0.43
1:A:549:ARG:NH2	3:A:1271:HOH:O	2.51	0.43
1:A:100:LYS:HZ1	1:A:654:SER:HB3	1.82	0.43
1:A:715:GLU:OE2	1:A:717:LYS:NZ	2.38	0.43
1:A:198:LEU:HB2	1:A:202:GLU:HG3	2.00	0.43
1:A:287:LYS:HB3	1:A:288:GLY:H	1.66	0.43
1:A:419:PRO:O	1:A:423:VAL:HG23	2.19	0.43
1:A:255:ARG:NH2	1:A:260:GLU:HG3	2.34	0.43
1:A:255:ARG:CZ	1:A:260:GLU:HG3	2.49	0.43
1:A:432:LEU:HD12	1:A:432:LEU:HA	1.92	0.43
1:A:652:SER:OG	1:A:655:LYS:HG3	2.19	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:723:LYS:HG3	3:A:1439:HOH:O	2.19	0.43
1:A:488:LEU:HD22	1:A:606:TRP:CH2	2.54	0.43
1:A:698:ARG:O	1:A:702:GLU:HG3	2.18	0.43
1:A:347:GLU:C	1:A:349:TYR:N	2.73	0.42
1:A:420:VAL:CG1	1:A:421:GLN:N	2.82	0.42
1:A:423:VAL:HG12	1:A:427:ILE:CD1	2.49	0.42
1:A:34:LYS:NZ	3:A:1143:HOH:O	2.52	0.42
1:A:703:ARG:NH2	3:A:1366:HOH:O	2.45	0.42
1:A:726:ASP:HB3	1:A:782:VAL:HG21	2.00	0.42
1:A:256:ARG:O	1:A:257:LYS:HB2	2.20	0.42
1:A:299:PRO:HB2	1:A:436:ILE:HG23	2.00	0.42
1:A:356:VAL:C	1:A:409:ILE:O	2.58	0.42
1:A:609:SER:HB2	1:A:613:LEU:HD12	2.00	0.42
1:A:298:ASN:ND2	1:A:298:ASN:C	2.72	0.42
1:A:374:PRO:HG3	1:A:379:VAL:CG2	2.50	0.42
1:A:218:GLU:O	1:A:218:GLU:OE2	2.37	0.42
1:A:298:ASN:HB3	1:A:301:SER:O	2.20	0.42
1:A:509:ALA:HB1	1:A:524:TRP:HB3	2.02	0.42
1:A:348:LYS:HD2	1:A:348:LYS:N	2.35	0.42
1:A:521:ASP:OD2	3:A:1236:HOH:O	2.21	0.42
1:A:541:ILE:HB	1:A:594:MET:HE3	2.02	0.42
1:A:428:ALA:O	1:A:432:LEU:HB2	2.20	0.41
1:A:653:LYS:N	2:A:902:SO4:O3	2.53	0.41
1:A:203:ASP:OD1	1:A:203:ASP:N	2.50	0.41
1:A:174:GLY:HA2	3:A:963:HOH:O	2.21	0.41
1:A:221:GLU:O	1:A:222:VAL:HG13	2.21	0.41
1:A:173:LYS:CE	1:A:627:ALA:O	2.68	0.41
1:A:97:ARG:CA	1:A:102:ILE:HD11	2.50	0.41
1:A:100:LYS:HZ3	1:A:654:SER:HB3	1.84	0.41
1:A:214:PHE:HB3	1:A:296:VAL:HG22	1.99	0.41
1:A:157:PRO:O	1:A:161:LYS:HG2	2.20	0.41
1:A:215:GLU:HB2	1:A:297:ARG:HB3	2.02	0.41
1:A:224:TYR:O	1:A:226:PRO:HD3	2.20	0.41
1:A:329:ALA:HB3	1:A:332:ASP:OD2	2.21	0.41
1:A:374:PRO:HG2	1:A:377:GLU:HA	2.03	0.41
1:A:398:LYS:HZ2	1:A:402:LYS:HE3	1.86	0.41
1:A:632:GLU:HB3	3:A:1064:HOH:O	2.20	0.41
1:A:76:PHE:O	1:A:144:VAL:HA	2.21	0.41
1:A:241:MET:HE3	1:A:305:VAL:HG21	2.02	0.41
1:A:675:LEU:HD23	1:A:701:ILE:HD11	2.03	0.41
1:A:198:LEU:HD12	1:A:202:GLU:HA	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:331:PHE:CD2	1:A:397:THR:HG21	2.55	0.40
1:A:217:ARG:HD3	1:A:218:GLU:H	1.86	0.40
1:A:356:VAL:HG22	1:A:377:GLU:OE1	2.21	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	787/810 (97%)	725 (92%)	47 (6%)	15 (2%)	<b>8</b> <b>2</b>

All (15) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	302	GLY
1	A	339	LEU
1	A	377	GLU
1	A	388	LYS
1	A	219	ASN
1	A	347	GLU
1	A	387	GLN
1	A	406	HIS
1	A	408	GLY
1	A	434	LYS
1	A	386	SER
1	A	257	LYS
1	A	350	ASP
1	A	407	LYS
1	A	222	VAL

### 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	702/718 (98%)	670 (95%)	32 (5%)	27 19

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	ASN
1	A	35	LYS
1	A	42	PHE
1	A	94	ILE
1	A	169	LYS
1	A	182	ARG
1	A	218	GLU
1	A	246	ASN
1	A	258	ASP
1	A	268	GLU
1	A	285	GLU
1	A	298	ASN
1	A	306	ILE
1	A	311	GLU
1	A	339	LEU
1	A	354	ARG
1	A	381	LYS
1	A	392	LYS
1	A	406	HIS
1	A	411	LYS
1	A	418	LYS
1	A	432	LEU
1	A	447	ASN
1	A	488	LEU
1	A	536	MET
1	A	578	LYS
1	A	580	LEU
1	A	602	TYR
1	A	616	ASN
1	A	658	VAL

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Mol	Chain	Res	Type
1	A	722	LEU
1	A	730	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (26) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	5	ASN
1	A	26	ASN
1	A	48	HIS
1	A	53	HIS
1	A	70	GLN
1	A	124	ASN
1	A	166	GLN
1	A	181	HIS
1	A	196	HIS
1	A	240	ASN
1	A	244	ASN
1	A	246	ASN
1	A	276	GLN
1	A	298	ASN
1	A	328	HIS
1	A	387	GLN
1	A	421	GLN
1	A	447	ASN
1	A	544	HIS
1	A	616	ASN
1	A	617	HIS
1	A	633	HIS
1	A	683	HIS
1	A	719	ASN
1	A	742	ASN
1	A	800	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 monosaccharides 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	A	906	-	4,4,4	0.32	0	6,6,6	0.38	0
2	SO4	A	901	-	4,4,4	0.33	0	6,6,6	0.13	0
2	SO4	A	902	-	4,4,4	0.38	0	6,6,6	0.08	0
2	SO4	A	903	-	4,4,4	0.40	0	6,6,6	0.35	0
2	SO4	A	908	-	4,4,4	0.42	0	6,6,6	0.22	0
2	SO4	A	905	-	4,4,4	0.39	0	6,6,6	0.10	0
2	SO4	A	907	-	4,4,4	0.40	0	6,6,6	0.14	0
2	SO4	A	904	-	4,4,4	0.42	0	6,6,6	0.28	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.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	906	SO4	1	0
2	A	901	SO4	1	0
2	A	902	SO4	1	0

## 5.7 Other polymers [i](#)

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	791/810 (97%)	0.35	94 (11%) <b>4</b> <b>4</b>	19, 36, 117, 147	0

All (94) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	222	VAL	9.3
1	A	346	LEU	8.3
1	A	382	LEU	8.1
1	A	386	SER	7.8
1	A	384	ILE	7.6
1	A	351	ILE	7.0
1	A	341	ARG	6.7
1	A	390	LYS	6.7
1	A	385	LYS	6.7
1	A	349	TYR	6.6
1	A	409	ILE	6.6
1	A	810	GLY	6.3
1	A	387	GLN	5.9
1	A	347	GLU	5.8
1	A	4	LEU	5.8
1	A	219	ASN	5.5
1	A	258	ASP	5.5
1	A	411	LYS	5.3
1	A	217	ARG	5.2
1	A	343	THR	5.2
1	A	338	ASP	5.2
1	A	286	PHE	5.2
1	A	218	GLU	5.1
1	A	410	PHE	5.0
1	A	416	GLU	5.0
1	A	399	THR	4.9
1	A	306	ILE	4.8

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<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>	<b>RSRZ</b>
1	A	502	TRP	4.8
1	A	405	TYR	4.7
1	A	339	LEU	4.7
1	A	417	GLY	4.6
1	A	295	TYR	4.6
1	A	381	LYS	4.5
1	A	340	LYS	4.5
1	A	406	HIS	4.5
1	A	221	GLU	4.5
1	A	344	GLU	4.4
1	A	345	ILE	4.4
1	A	293	GLY	4.3
1	A	412	VAL	4.2
1	A	259	LYS	4.0
1	A	413	PRO	4.0
1	A	389	ASP	3.9
1	A	220	GLY	3.9
1	A	391	GLU	3.9
1	A	717	LYS	3.9
1	A	356	VAL	3.8
1	A	379	VAL	3.8
1	A	322	VAL	3.7
1	A	407	LYS	3.7
1	A	421	GLN	3.7
1	A	423	VAL	3.7
1	A	719	ASN	3.7
1	A	348	LYS	3.5
1	A	374	PRO	3.5
1	A	718	GLY	3.4
1	A	377	GLU	3.4
1	A	350	ASP	3.3
1	A	256	ARG	3.3
1	A	392	LYS	3.3
1	A	388	LYS	3.3
1	A	419	PRO	3.2
1	A	321	VAL	3.2
1	A	401	TYR	3.1
1	A	395	GLN	3.1
1	A	283	ILE	3.0
1	A	253	LYS	2.8
1	A	716	VAL	2.8
1	A	203	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	284	GLU	2.7
1	A	378	GLU	2.6
1	A	418	LYS	2.6
1	A	257	LYS	2.6
1	A	433	GLU	2.6
1	A	408	GLY	2.6
1	A	403	ALA	2.5
1	A	334	VAL	2.5
1	A	415	TYR	2.5
1	A	355	ILE	2.5
1	A	398	LYS	2.5
1	A	216	LEU	2.4
1	A	393	LEU	2.4
1	A	227	ALA	2.4
1	A	675	LEU	2.3
1	A	325	VAL	2.3
1	A	383	GLY	2.2
1	A	333	HIS	2.1
1	A	40	VAL	2.1
1	A	425	GLU	2.1
1	A	402	LYS	2.1
1	A	255	ARG	2.0
1	A	354	ARG	2.0
1	A	753	VAL	2.0
1	A	243	VAL	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 monosaccharides 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
2	SO4	A	902	5/5	0.95	0.18	81,85,86,89	0
2	SO4	A	905	5/5	0.95	0.09	75,77,82,84	0
2	SO4	A	903	5/5	0.96	0.17	53,55,61,68	0
2	SO4	A	904	5/5	0.97	0.15	44,46,54,61	0
2	SO4	A	908	5/5	0.97	0.08	46,54,56,60	0
2	SO4	A	907	5/5	0.98	0.10	53,59,65,69	0
2	SO4	A	906	5/5	0.98	0.07	45,49,52,54	0
2	SO4	A	901	5/5	0.99	0.10	42,46,51,53	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.