



# wwPDB X-ray Structure Validation Summary Report ⓘ

Aug 24, 2020 – 02:52 PM BST

PDB ID : 5DA8  
Title : Crystal structure of chaperonin GroEL from  
Authors : Chang, C.; Marshall, N.; Feldmann, B.; Joachimiak, A.; Midwest Center for  
Structural Genomics (MCSG)  
Deposited on : 2015-08-19  
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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	:	2.13
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)	:	2.13

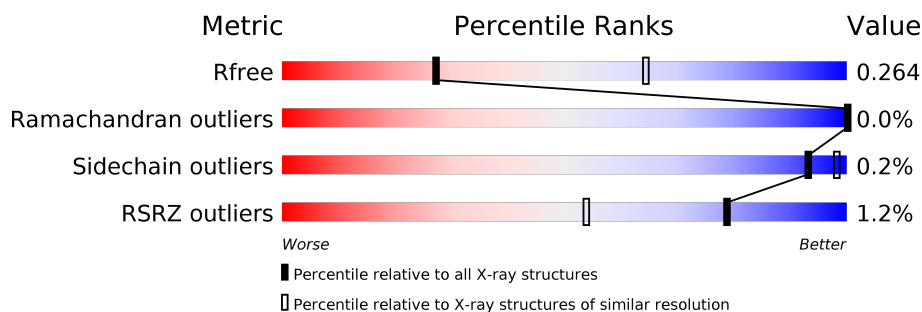
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.00 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.



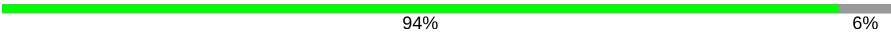














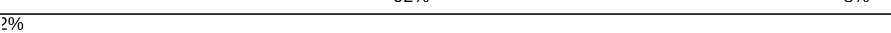
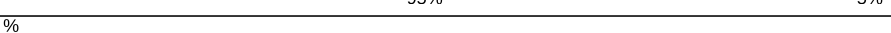
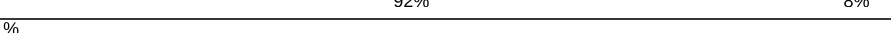
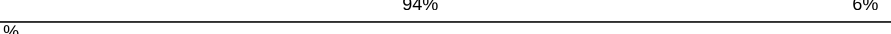
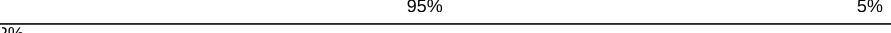
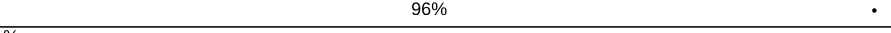
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	130704	2092 (3.00-3.00)
Ramachandran outliers	138981	2333 (3.00-3.00)
Sidechain outliers	138945	2336 (3.00-3.00)
RSRZ outliers	127900	1990 (3.00-3.00)

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	545	<div><div></div><div>91%8%</div></div>
1	B	545	<div><div></div><div>95%5%</div></div>
1	C	545	<div><div>%</div><div>88%12%</div></div>
1	D	545	<div><div>%</div><div>95%5%</div></div>
1	E	545	<div><div>%</div><div>93%7%</div></div>
1	F	545	<div><div></div><div>91%9%</div></div>
1	G	545	<div><div>%</div><div>91%8%</div></div>

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Mol	Chain	Length	Quality of chain
1	H	545	
1	I	545	
1	J	545	
1	K	545	
1	L	545	
1	M	545	
1	N	545	
1	O	545	
1	P	545	
1	Q	545	
1	R	545	
1	S	545	
1	T	545	
1	U	545	
1	V	545	
1	W	545	
1	X	545	
1	Y	545	
1	Z	545	
1	a	545	
1	b	545	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	SO4	K	601	-	-	-	X
4	MG	Q	601	-	-	-	X

## 2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 99552 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 60 kDa chaperonin.

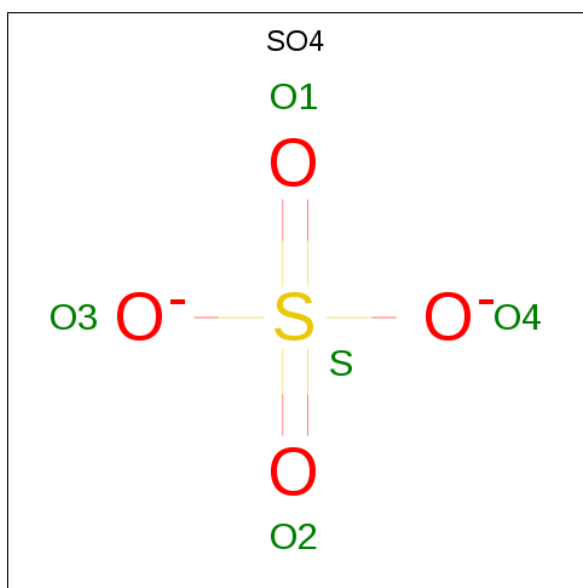
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	499	Total	C	N	O	S	0	0	0
			3601	2242	631	720	8			
1	B	519	Total	C	N	O	S	0	0	0
			3706	2296	655	745	10			
1	C	478	Total	C	N	O	S	0	0	0
			3335	2066	591	670	8			
1	D	517	Total	C	N	O	S	0	0	0
			3721	2316	654	743	8			
1	E	509	Total	C	N	O	S	0	0	0
			3631	2254	641	727	9			
1	F	497	Total	C	N	O	S	0	0	0
			3560	2201	630	720	9			
1	G	499	Total	C	N	O	S	0	0	0
			3500	2168	621	703	8			
1	H	515	Total	C	N	O	S	0	0	0
			3766	2342	659	757	8			
1	I	512	Total	C	N	O	S	0	0	0
			3697	2298	646	745	8			
1	J	507	Total	C	N	O	S	0	0	0
			3525	2175	624	719	7			
1	K	433	Total	C	N	O	S	0	0	0
			2968	1831	536	597	4			
1	L	484	Total	C	N	O	S	0	0	0
			3309	2033	591	679	6			
1	M	463	Total	C	N	O	S	0	0	0
			3247	2012	577	651	7			
1	N	511	Total	C	N	O	S	0	0	0
			3603	2232	638	725	8			
1	O	492	Total	C	N	O	S	0	0	0
			3451	2131	609	704	7			
1	P	522	Total	C	N	O	S	0	0	0
			3780	2350	661	760	9			

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	Q	502	Total	C	N	O	S	0	0	0
			3585	2229	633	715	8			
1	R	502	Total	C	N	O	S	0	0	0
			3576	2218	628	722	8			
1	S	512	Total	C	N	O	S	0	0	0
			3677	2286	646	737	8			
1	T	497	Total	C	N	O	S	0	0	0
			3494	2163	617	707	7			
1	U	518	Total	C	N	O	S	0	0	0
			3718	2315	648	746	9			
1	V	500	Total	C	N	O	S	0	0	0
			3575	2215	626	725	9			
1	W	517	Total	C	N	O	S	0	0	0
			3661	2269	647	737	8			
1	X	504	Total	C	N	O	S	0	0	0
			3581	2218	637	721	5			
1	Y	512	Total	C	N	O	S	0	0	0
			3695	2298	647	741	9			
1	Z	518	Total	C	N	O	S	0	0	0
			3703	2294	654	746	9			
1	a	522	Total	C	N	O	S	0	0	0
			3743	2324	658	752	9			
1	b	423	Total	C	N	O	S	0	0	0
			2961	1831	525	598	7			

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



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
2	A	1	Total O S 5 4 1	0	0
2	B	1	Total O S 5 4 1	0	0
2	C	1	Total O S 5 4 1	0	0
2	D	1	Total O S 5 4 1	0	0
2	E	1	Total O S 5 4 1	0	0
2	F	1	Total O S 5 4 1	0	0
2	G	1	Total O S 5 4 1	0	0
2	J	1	Total O S 5 4 1	0	0
2	K	1	Total O S 5 4 1	0	0
2	L	1	Total O S 5 4 1	0	0
2	M	1	Total O S 5 4 1	0	0
2	N	1	Total O S 5 4 1	0	0
2	P	1	Total O S 5 4 1	0	0
2	R	1	Total O S 5 4 1	0	0
2	T	1	Total O S 5 4 1	0	0
2	U	1	Total O S 5 4 1	0	0
2	V	1	Total O S 5 4 1	0	0
2	Y	1	Total O S 5 4 1	0	0
2	Z	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

- Molecule 3 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	P	1	Total Ca 1 1	0	0
3	G	1	Total Ca 1 1	0	0
3	J	1	Total Ca 1 1	0	0
3	Q	1	Total Ca 1 1	0	0
3	K	1	Total Ca 1 1	0	0
3	a	1	Total Ca 1 1	0	0
3	B	1	Total Ca 1 1	0	0
3	I	1	Total Ca 1 1	0	0
3	V	1	Total Ca 1 1	0	0
3	Z	1	Total Ca 1 1	0	0
3	A	1	Total Ca 1 1	0	0
3	T	1	Total Ca 1 1	0	0
3	U	1	Total Ca 1 1	0	0
3	O	1	Total Ca 1 1	0	0
3	R	1	Total Ca 1 1	0	0
3	Y	1	Total Ca 1 1	0	0
3	F	1	Total Ca 1 1	0	0
3	M	1	Total Ca 1 1	0	0

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	Q	1	Total Mg 1 1	0	0
4	H	1	Total Mg 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	V	1	Total 1	Mg 1	0	0
4	T	1	Total 1	Mg 1	0	0
4	R	1	Total 1	Mg 1	0	0
4	S	1	Total 1	Mg 1	0	0
4	M	1	Total 1	Mg 1	0	0

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	3	Total 3	O 3	0	0
5	B	2	Total 2	O 2	0	0
5	C	1	Total 1	O 1	0	0
5	D	2	Total 2	O 2	0	0
5	E	2	Total 2	O 2	0	0
5	F	2	Total 2	O 2	0	0
5	H	1	Total 1	O 1	0	0
5	I	3	Total 3	O 3	0	0
5	J	3	Total 3	O 3	0	0
5	L	3	Total 3	O 3	0	0
5	N	2	Total 2	O 2	0	0
5	O	3	Total 3	O 3	0	0
5	P	2	Total 2	O 2	0	0
5	Q	3	Total 3	O 3	0	0

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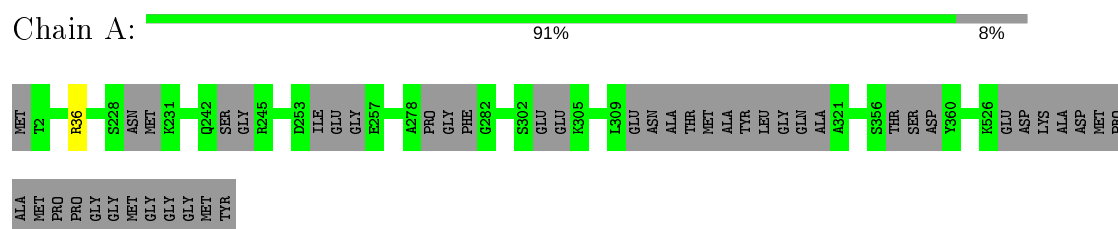
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	R	1	Total 1	O 1	0	0
5	S	3	Total 3	O 3	0	0
5	U	1	Total 1	O 1	0	0
5	V	2	Total 2	O 2	0	0
5	W	2	Total 2	O 2	0	0
5	X	5	Total 5	O 5	0	0
5	Y	3	Total 3	O 3	0	0
5	Z	1	Total 1	O 1	0	0
5	a	1	Total 1	O 1	0	0
5	b	2	Total 2	O 2	0	0

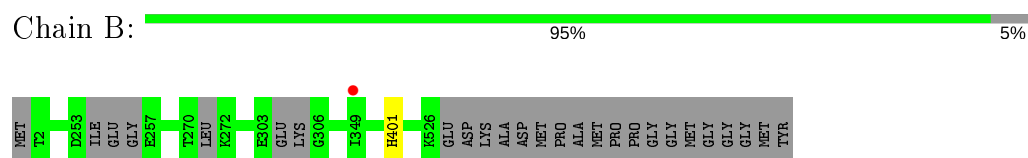
### 3 Residue-property plots [i](#)

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.

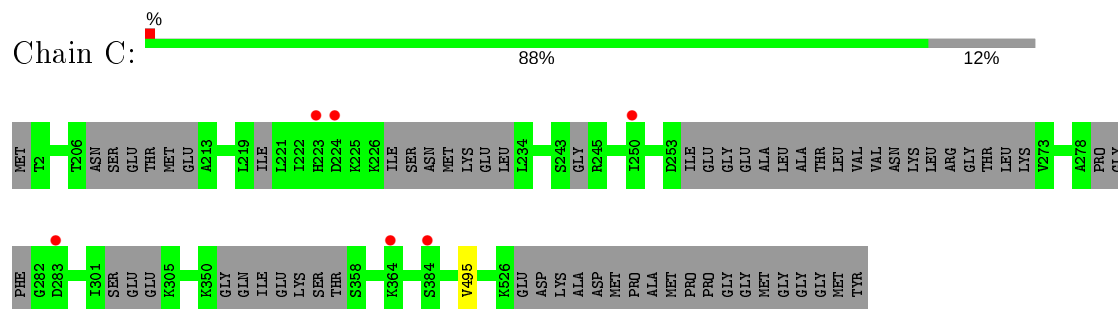
- Molecule 1: 60 kDa chaperonin



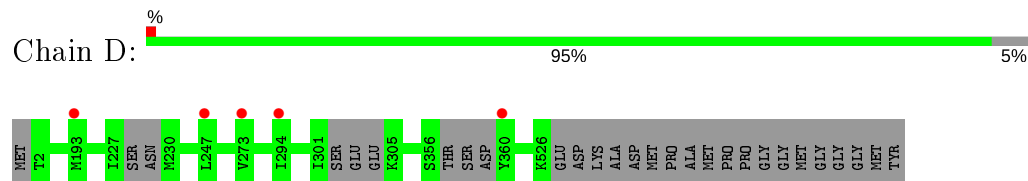
- Molecule 1: 60 kDa chaperonin



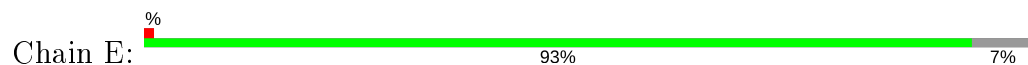
- Molecule 1: 60 kDa chaperonin

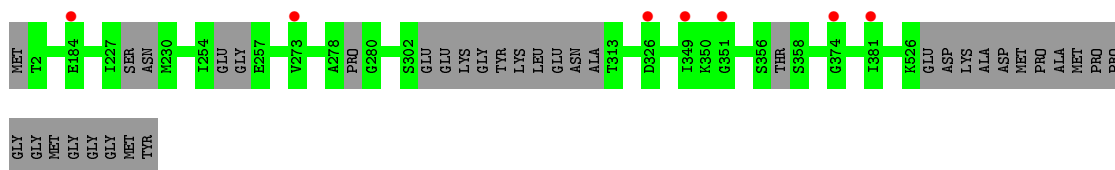


- Molecule 1: 60 kDa chaperonin



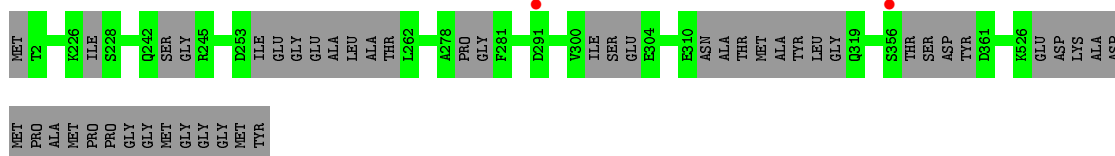
- Molecule 1: 60 kDa chaperonin





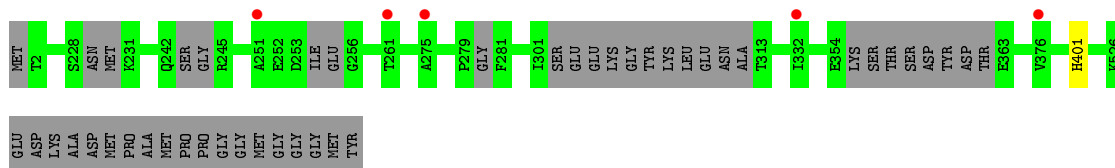
- Molecule 1: 60 kDa chaperonin

Chain F: 91% 9%



- Molecule 1: 60 kDa chaperonin

Chain G: 91% 8%



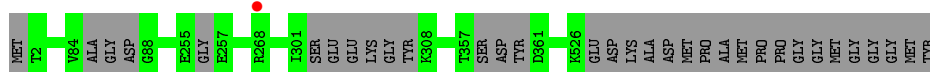
- Molecule 1: 60 kDa chaperonin

Chain H: 94% 6%



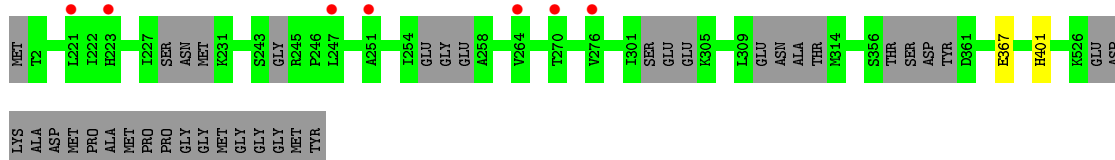
- Molecule 1: 60 kDa chaperonin

Chain I: 94% 6%

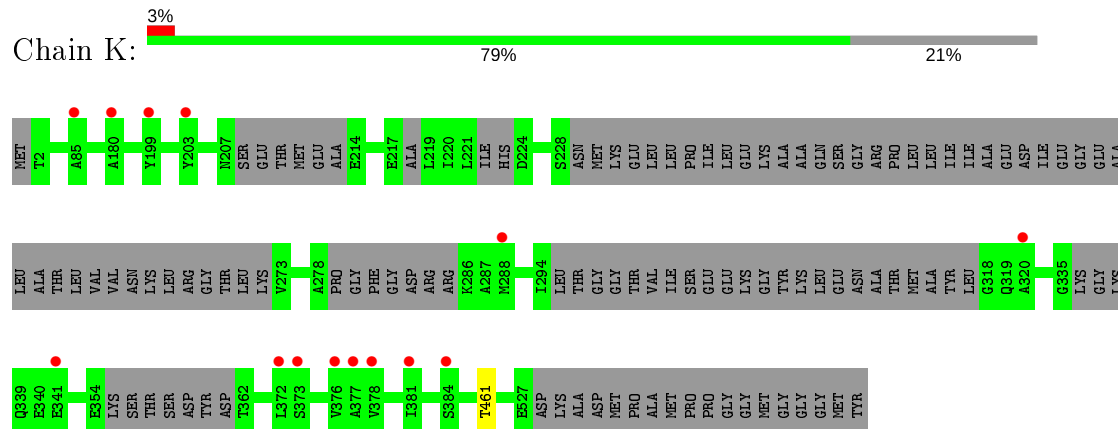


- Molecule 1: 60 kDa chaperonin

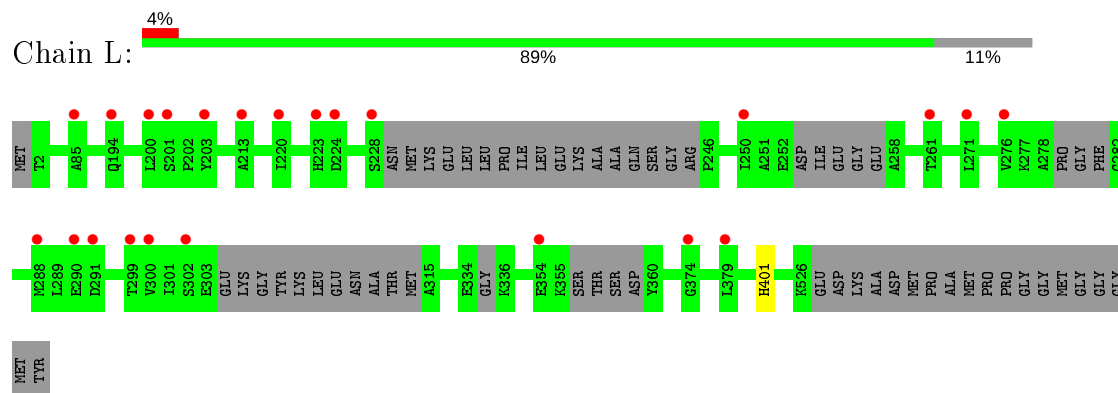
Chain J: 93% 7%



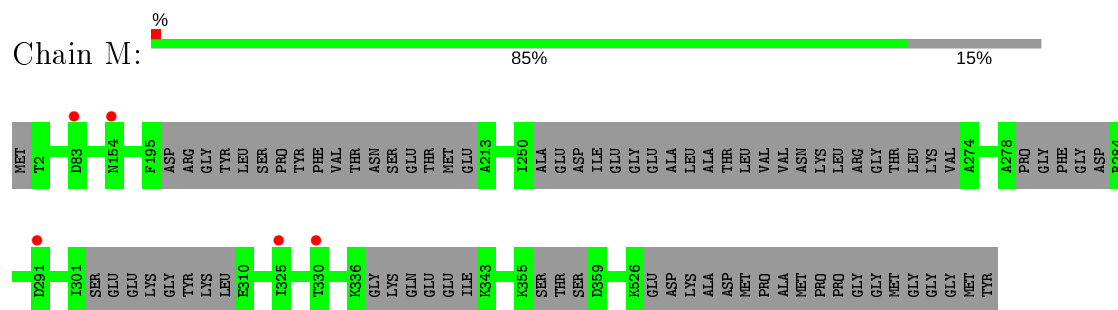
- Molecule 1: 60 kDa chaperonin



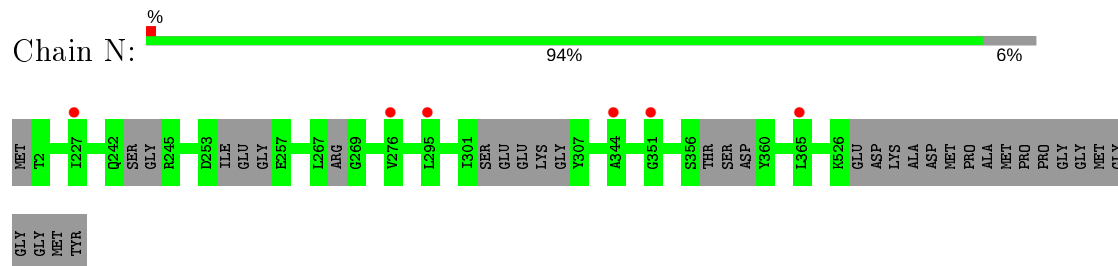
- Molecule 1: 60 kDa chaperonin



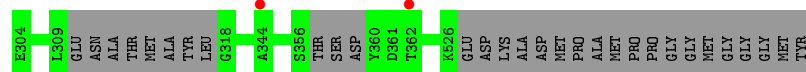
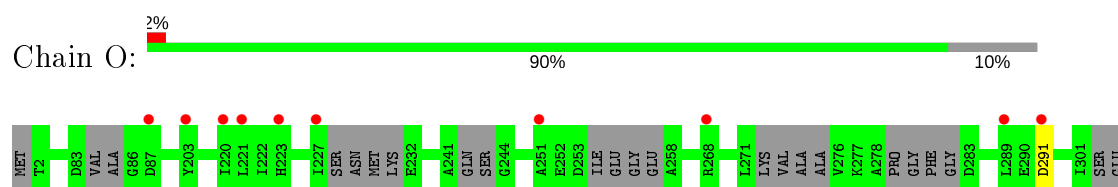
- Molecule 1: 60 kDa chaperonin



- Molecule 1: 60 kDa chaperonin



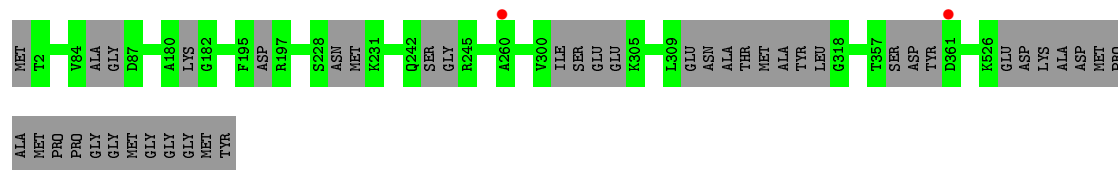
- Molecule 1: 60 kDa chaperonin



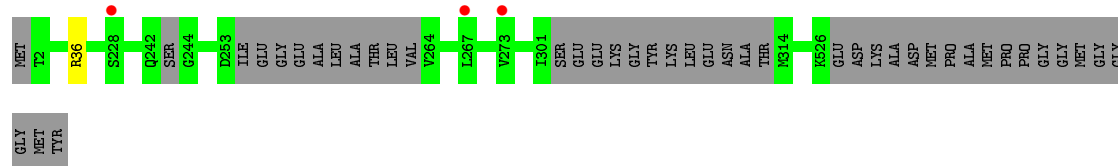
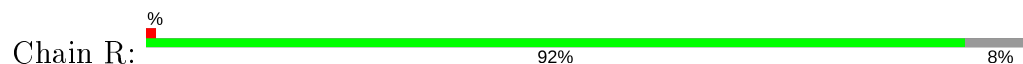
- Molecule 1: 60 kDa chaperonin



- Molecule 1: 60 kDa chaperonin



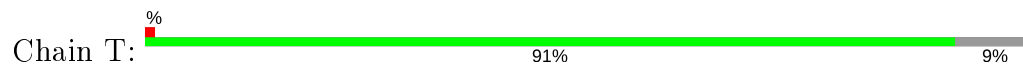
- Molecule 1: 60 kDa chaperonin



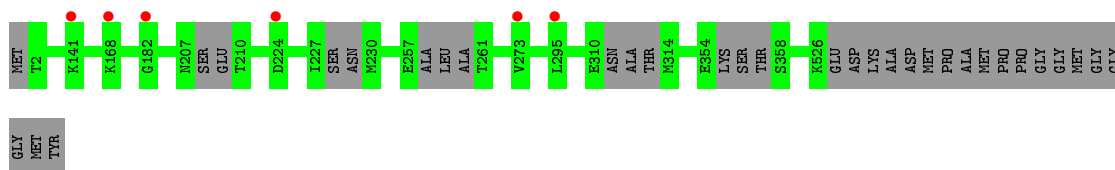
- Molecule 1: 60 kDa chaperonin



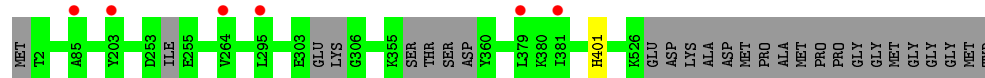
- Molecule 1: 60 kDa chaperonin



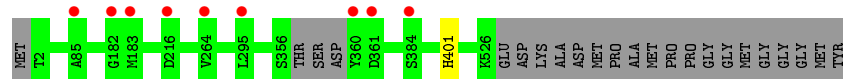




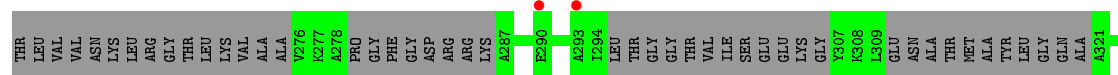
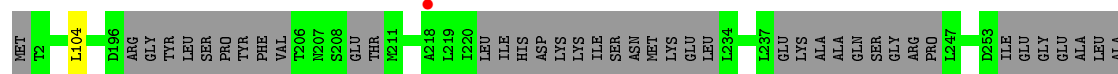
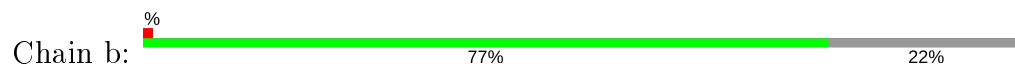
- Molecule 1: 60 kDa chaperonin



- Molecule 1: 60 kDa chaperonin



- Molecule 1: 60 kDa chaperonin



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	139.00Å 159.78Å 228.82Å 75.46° 90.51° 91.22°	Depositor
Resolution (Å)	48.60 – 3.00 49.65 – 3.00	Depositor EDS
% Data completeness (in resolution range)	95.9 (48.60-3.00) 95.9 (49.65-3.00)	Depositor EDS
$R_{merge}$	0.05	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.77 (at 3.01Å)	Xtriage
Refinement program	PHENIX (1.10_2155: ???)	Depositor
R, $R_{free}$	0.230 , 0.263 0.231 , 0.264	Depositor DCC
$R_{free}$ test set	18192 reflections (4.98%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	53.7	Xtriage
Anisotropy	0.082	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.28 , 48.7	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	0.008 for h,-k,-l	Xtriage
$F_o, F_c$ correlation	0.89	EDS
Total number of atoms	99552	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	60.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.63% 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: MG, CA, 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	0.23	0/3615	0.40	0/4880
1	B	0.23	0/3727	0.41	0/5041
1	C	0.23	0/3344	0.40	0/4527
1	D	0.23	0/3742	0.41	0/5062
1	E	0.23	0/3647	0.41	0/4933
1	F	0.23	0/3574	0.41	0/4827
1	G	0.23	0/3514	0.42	0/4756
1	H	0.23	0/3785	0.40	0/5106
1	I	0.23	0/3715	0.41	0/5024
1	J	0.23	0/3541	0.41	0/4799
1	K	0.23	0/2974	0.41	0/4025
1	L	0.23	0/3319	0.40	0/4501
1	M	0.23	0/3257	0.40	0/4407
1	N	0.23	0/3620	0.41	0/4902
1	O	0.23	0/3462	0.41	0/4684
1	P	0.23	0/3803	0.41	0/5142
1	Q	0.23	0/3600	0.41	0/4862
1	R	0.23	0/3595	0.41	0/4867
1	S	0.23	0/3697	0.42	1/5001 (0.0%)
1	T	0.23	0/3508	0.43	1/4751 (0.0%)
1	U	0.23	0/3739	0.42	0/5062
1	V	0.23	0/3591	0.42	0/4854
1	W	0.23	0/3679	0.42	1/4981 (0.0%)
1	X	0.23	0/3597	0.40	0/4865
1	Y	0.23	0/3715	0.41	0/5017
1	Z	0.23	0/3723	0.42	0/5039
1	a	0.23	0/3766	0.42	0/5099
1	b	0.22	0/2965	0.40	0/4007
All	All	0.23	0/99814	0.41	3/135021 (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	J	0	1
1	T	0	1
All	All	0	2

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	S	279	PRO	N-CA-CB	6.36	110.93	103.30
1	W	279	PRO	N-CA-CB	6.24	110.78	103.30
1	T	279	PRO	N-CA-CB	6.05	110.56	103.30

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	J	367	GLU	Peptide
1	T	243	SER	Peptide

## 5.2 Too-close contacts [i](#)

Due to software issues we are unable to calculate clashes - this section is therefore empty.

## 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	483/545 (89%)	472 (98%)	11 (2%)	0	<b>100</b> <b>100</b>

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	511/545 (94%)	496 (97%)	15 (3%)	0	100	100
1	C	460/545 (84%)	448 (97%)	12 (3%)	0	100	100
1	D	509/545 (93%)	497 (98%)	12 (2%)	0	100	100
1	E	497/545 (91%)	479 (96%)	18 (4%)	0	100	100
1	F	481/545 (88%)	468 (97%)	13 (3%)	0	100	100
1	G	485/545 (89%)	467 (96%)	18 (4%)	0	100	100
1	H	501/545 (92%)	489 (98%)	12 (2%)	0	100	100
1	I	502/545 (92%)	490 (98%)	12 (2%)	0	100	100
1	J	493/545 (90%)	477 (97%)	16 (3%)	0	100	100
1	K	415/545 (76%)	399 (96%)	16 (4%)	0	100	100
1	L	470/545 (86%)	456 (97%)	14 (3%)	0	100	100
1	M	449/545 (82%)	434 (97%)	15 (3%)	0	100	100
1	N	499/545 (92%)	480 (96%)	19 (4%)	0	100	100
1	O	472/545 (87%)	449 (95%)	23 (5%)	0	100	100
1	P	516/545 (95%)	497 (96%)	19 (4%)	0	100	100
1	Q	484/545 (89%)	469 (97%)	15 (3%)	0	100	100
1	R	494/545 (91%)	475 (96%)	19 (4%)	0	100	100
1	S	502/545 (92%)	485 (97%)	15 (3%)	2 (0%)	34	72
1	T	485/545 (89%)	466 (96%)	19 (4%)	0	100	100
1	U	510/545 (94%)	498 (98%)	12 (2%)	0	100	100
1	V	484/545 (89%)	465 (96%)	19 (4%)	0	100	100
1	W	509/545 (93%)	476 (94%)	32 (6%)	1 (0%)	47	82
1	X	488/545 (90%)	469 (96%)	19 (4%)	0	100	100
1	Y	500/545 (92%)	486 (97%)	14 (3%)	0	100	100
1	Z	510/545 (94%)	487 (96%)	23 (4%)	0	100	100
1	a	518/545 (95%)	497 (96%)	21 (4%)	0	100	100
1	b	401/545 (74%)	386 (96%)	15 (4%)	0	100	100
All	All	13628/15260 (89%)	13157 (96%)	468 (3%)	3 (0%)	100	100

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	S	279	PRO

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Mol	Chain	Res	Type
1	W	279	PRO
1	S	278	ALA

### 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	360/427 (84%)	359 (100%)	1 (0%)	92	97
1	B	358/427 (84%)	357 (100%)	1 (0%)	92	97
1	C	310/427 (73%)	309 (100%)	1 (0%)	92	97
1	D	367/427 (86%)	367 (100%)	0	100	100
1	E	353/427 (83%)	353 (100%)	0	100	100
1	F	347/427 (81%)	347 (100%)	0	100	100
1	G	331/427 (78%)	330 (100%)	1 (0%)	92	97
1	H	381/427 (89%)	381 (100%)	0	100	100
1	I	369/427 (86%)	369 (100%)	0	100	100
1	J	328/427 (77%)	327 (100%)	1 (0%)	92	97
1	K	266/427 (62%)	265 (100%)	1 (0%)	91	97
1	L	299/427 (70%)	298 (100%)	1 (0%)	92	97
1	M	307/427 (72%)	307 (100%)	0	100	100
1	N	343/427 (80%)	343 (100%)	0	100	100
1	O	324/427 (76%)	323 (100%)	1 (0%)	92	97
1	P	378/427 (88%)	378 (100%)	0	100	100
1	Q	349/427 (82%)	349 (100%)	0	100	100
1	R	347/427 (81%)	346 (100%)	1 (0%)	92	97
1	S	362/427 (85%)	361 (100%)	1 (0%)	92	97
1	T	332/427 (78%)	332 (100%)	0	100	100
1	U	366/427 (86%)	363 (99%)	3 (1%)	81	93
1	V	345/427 (81%)	345 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	W	348/427 (82%)	348 (100%)	0	100	100
1	X	340/427 (80%)	340 (100%)	0	100	100
1	Y	362/427 (85%)	362 (100%)	0	100	100
1	Z	359/427 (84%)	358 (100%)	1 (0%)	92	97
1	a	368/427 (86%)	367 (100%)	1 (0%)	92	97
1	b	279/427 (65%)	278 (100%)	1 (0%)	91	97
All	All	9578/11956 (80%)	9562 (100%)	16 (0%)	93	98

5 of 16 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	O	291	ASP
1	R	36	ARG
1	U	259	LEU
1	L	401	HIS
1	Z	401	HIS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	M	507	ASN

### 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 ⓘ

There are no monosaccharides in this entry.

## 5.6 Ligand geometry

Of 46 ligands modelled in this entry, 25 are monoatomic - leaving 21 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	$\# Z  > 2$
2	SO4	N	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	V	602	-	4,4,4	0.14	0	6,6,6	0.08	0
2	SO4	L	601	-	4,4,4	0.13	0	6,6,6	0.06	0
2	SO4	G	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	J	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	R	602	-	4,4,4	0.15	0	6,6,6	0.06	0
2	SO4	M	602	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	U	601	-	4,4,4	0.13	0	6,6,6	0.06	0
2	SO4	P	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	T	602	-	4,4,4	0.14	0	6,6,6	0.06	0
2	SO4	a	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	Z	601	-	4,4,4	0.13	0	6,6,6	0.06	0
2	SO4	Y	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	D	601	-	4,4,4	0.15	0	6,6,6	0.07	0
2	SO4	C	601	-	4,4,4	0.14	0	6,6,6	0.08	0
2	SO4	F	601	-	4,4,4	0.15	0	6,6,6	0.04	0
2	SO4	E	601	-	4,4,4	0.14	0	6,6,6	0.06	0
2	SO4	b	601	-	4,4,4	0.14	0	6,6,6	0.07	0
2	SO4	A	601	-	4,4,4	0.14	0	6,6,6	0.05	0
2	SO4	B	601	-	4,4,4	0.13	0	6,6,6	0.07	0
2	SO4	K	601	-	4,4,4	0.13	0	6,6,6	0.07	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, 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	499/545 (91%)	-0.21	0 100 100	18, 51, 104, 115	0
1	B	519/545 (95%)	-0.25	1 (0%) 95 87	14, 44, 104, 121	0
1	C	478/545 (87%)	-0.13	6 (1%) 77 51	18, 52, 103, 127	0
1	D	517/545 (94%)	-0.11	5 (0%) 82 59	18, 58, 110, 129	0
1	E	509/545 (93%)	-0.12	7 (1%) 75 49	20, 66, 110, 123	0
1	F	497/545 (91%)	-0.21	2 (0%) 92 79	16, 46, 102, 122	0
1	G	499/545 (91%)	-0.16	5 (1%) 82 59	19, 59, 113, 125	0
1	H	515/545 (94%)	-0.20	0 100 100	18, 60, 102, 111	0
1	I	512/545 (93%)	-0.28	1 (0%) 95 87	17, 52, 97, 116	0
1	J	507/545 (93%)	-0.11	7 (1%) 75 49	18, 63, 116, 133	0
1	K	433/545 (79%)	-0.04	14 (3%) 47 20	20, 54, 121, 138	0
1	L	484/545 (88%)	-0.03	23 (4%) 30 11	21, 53, 125, 136	0
1	M	463/545 (84%)	-0.14	5 (1%) 80 56	24, 55, 108, 129	0
1	N	511/545 (93%)	-0.08	6 (1%) 79 54	21, 65, 112, 129	0
1	O	492/545 (90%)	-0.08	12 (2%) 59 30	20, 50, 122, 132	0
1	P	522/545 (95%)	-0.29	1 (0%) 95 87	15, 49, 92, 116	0
1	Q	502/545 (92%)	-0.24	2 (0%) 92 79	11, 44, 110, 134	0
1	R	502/545 (92%)	-0.25	3 (0%) 89 72	11, 37, 106, 125	0
1	S	512/545 (93%)	-0.22	1 (0%) 95 87	15, 61, 100, 118	0
1	T	497/545 (91%)	-0.15	6 (1%) 79 54	23, 62, 98, 111	0
1	U	518/545 (95%)	-0.12	9 (1%) 70 41	24, 74, 106, 124	0
1	V	500/545 (91%)	-0.07	11 (2%) 62 33	15, 49, 119, 139	0
1	W	517/545 (94%)	-0.08	10 (1%) 66 37	14, 55, 119, 127	0
1	X	504/545 (92%)	-0.09	7 (1%) 75 49	15, 61, 125, 144	0

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Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å <sup>2</sup> )	Q<0.9
1	Y	512/545 (93%)	-0.11	6 (1%) 79 54	21, 58, 110, 139	0
1	Z	518/545 (95%)	-0.05	6 (1%) 79 54	25, 75, 113, 124	0
1	a	522/545 (95%)	-0.01	9 (1%) 70 41	27, 74, 111, 126	0
1	b	423/545 (77%)	-0.09	5 (1%) 79 54	19, 49, 119, 136	0
All	All	13984/15260 (91%)	-0.14	170 (1%) 79 54	11, 56, 113, 144	0

The worst 5 of 170 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	W	282	GLY	4.6
1	S	83	ASP	4.4
1	V	335	GLY	4.2
1	a	384	SER	4.0
1	X	373	SER	3.9

## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

## 6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

## 6.4 Ligands ⓘ

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(Å <sup>2</sup> )	Q<0.9
4	MG	Q	601	1/1	0.31	0.53	67,67,67,67	0
4	MG	S	601	1/1	0.48	0.30	54,54,54,54	0
4	MG	M	601	1/1	0.59	0.26	53,53,53,53	0
2	SO4	K	601	5/5	0.61	0.45	42,55,61,61	5
2	SO4	A	601	5/5	0.70	0.36	37,61,63,70	5
3	CA	B	602	1/1	0.71	0.13	77,77,77,77	0
2	SO4	U	601	5/5	0.72	0.27	55,62,75,80	5

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
2	SO4	P	601	5/5	0.74	0.34	29,35,57,64	5
2	SO4	L	601	5/5	0.77	0.29	38,55,60,64	5
2	SO4	T	602	5/5	0.77	0.31	37,47,50,59	5
3	CA	P	602	1/1	0.78	0.14	71,71,71,71	0
2	SO4	Z	601	5/5	0.78	0.38	49,51,72,74	5
4	MG	R	601	1/1	0.79	0.23	34,34,34,34	0
2	SO4	V	602	5/5	0.79	0.34	34,35,45,48	5
3	CA	Y	602	1/1	0.80	0.09	72,72,72,72	0
3	CA	Q	602	1/1	0.80	0.08	78,78,78,78	0
2	SO4	B	601	5/5	0.80	0.33	24,30,35,36	5
2	SO4	E	601	5/5	0.81	0.29	43,47,62,63	5
2	SO4	M	602	5/5	0.81	0.28	54,55,71,77	5
4	MG	V	601	1/1	0.81	0.37	61,61,61,61	0
3	CA	O	601	1/1	0.81	0.09	73,73,73,73	0
2	SO4	C	601	5/5	0.81	0.27	41,46,67,74	5
2	SO4	D	601	5/5	0.82	0.31	33,44,50,50	5
2	SO4	G	601	5/5	0.83	0.29	36,48,56,57	5
2	SO4	Y	601	5/5	0.83	0.27	34,41,58,58	5
2	SO4	J	601	5/5	0.83	0.29	33,42,51,52	5
3	CA	K	602	1/1	0.83	0.07	82,82,82,82	0
3	CA	Z	602	1/1	0.84	0.11	92,92,92,92	0
2	SO4	b	601	5/5	0.84	0.41	62,84,95,96	0
4	MG	H	601	1/1	0.85	0.18	51,51,51,51	0
2	SO4	N	601	5/5	0.86	0.28	41,47,51,54	5
4	MG	T	601	1/1	0.86	0.17	58,58,58,58	0
2	SO4	F	601	5/5	0.86	0.26	25,34,38,38	5
3	CA	J	602	1/1	0.87	0.13	72,72,72,72	0
2	SO4	a	601	5/5	0.88	0.21	50,53,63,69	5
2	SO4	R	602	5/5	0.89	0.29	23,33,34,34	5
3	CA	M	603	1/1	0.90	0.18	78,78,78,78	0
3	CA	G	602	1/1	0.91	0.14	76,76,76,76	0
3	CA	A	602	1/1	0.91	0.09	72,72,72,72	0
3	CA	F	602	1/1	0.92	0.07	77,77,77,77	0
3	CA	a	602	1/1	0.92	0.06	78,78,78,78	0
3	CA	I	601	1/1	0.95	0.09	79,79,79,79	0
3	CA	T	603	1/1	0.95	0.18	69,69,69,69	0
3	CA	R	603	1/1	0.95	0.06	64,64,64,64	0
3	CA	U	602	1/1	0.96	0.11	62,62,62,62	0
3	CA	V	603	1/1	0.97	0.09	70,70,70,70	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.