



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 8, 2018 – 04:56 pm GMT

PDB ID : 5HYS  
Title : Structure of IgE complexed with omalizumab  
Authors : Pennington, L.F.; Tarchevskaya, S.S.; Sathiyamoorthy, K.; Jardetzky, T.S.  
Deposited on : 2016-02-01  
Resolution : 2.50 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:

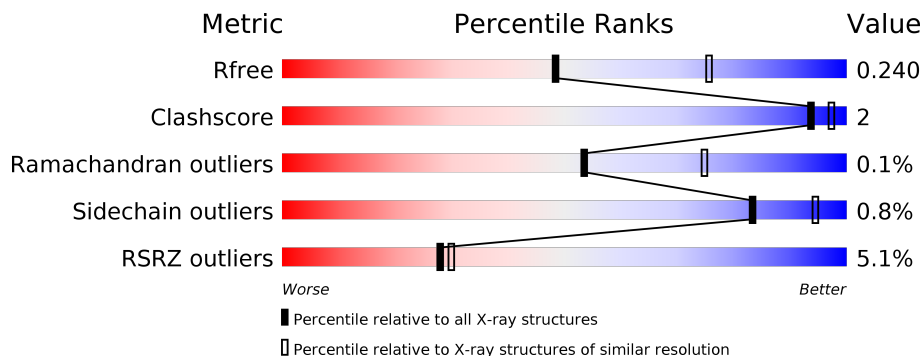
MolProbity : 4.02b-467  
Mogul : 1.7.3 (157068), CSD as539be (2018)  
Xtriage (Phenix) : 1.13  
EDS : trunk30967  
Percentile statistics : 20171227.v01 (using entries in the PDB archive December 27th 2017)  
Refmac : 5.8.0158  
CCP4 : 7.0 (Gargrove)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk30967

# 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 2.50 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))
$R_{free}$	111664	4155 (2.50-2.50)
Clashscore	122126	4827 (2.50-2.50)
Ramachandran outliers	120053	4735 (2.50-2.50)
Sidechain outliers	120020	4737 (2.50-2.50)
RSRZ outliers	108989	4058 (2.50-2.50)

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. 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	222	 4% 96%
1	C	222	 3% 93% 7%
1	E	222	 7% 93%
1	H	222	 3% 95% 5%
2	B	218	 97%
2	D	218	 97%

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Mol	Chain	Length	Quality of chain
2	F	218	
2	L	218	
3	G	230	
3	I	230	
3	J	230	
3	K	230	

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
4	SO4	D	305	-	-	X	-

## 2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 20626 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 Epididymis luminal protein 214.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	H	222	1667	1054	283	325	5	0	0	0
1	A	222	1667	1054	283	325	5	0	0	0
1	C	222	1667	1054	283	325	5	0	0	0
1	E	218	1639	1038	278	318	5	0	0	0

- Molecule 2 is a protein called Uncharacterized protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	L	217	1675	1045	277	348	5	0	0	0
2	B	217	1675	1045	277	348	5	0	0	0
2	D	217	1675	1045	277	348	5	0	0	0
2	F	215	1662	1038	275	344	5	0	0	0

- Molecule 3 is a protein called Ig epsilon chain C region.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	G	214	1693	1058	314	314	7	0	0	0
3	I	213	1685	1054	312	312	7	0	0	0
3	J	214	1693	1058	314	314	7	0	0	0
3	K	213	1685	1054	312	312	7	0	0	0

There are 48 discrepancies between the modelled and reference sequences:

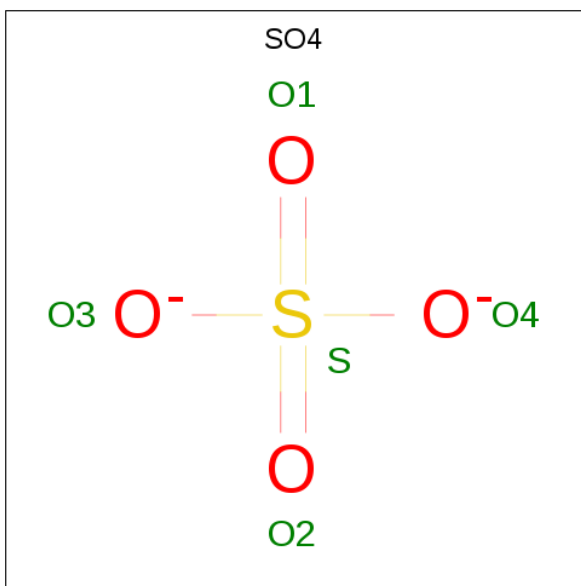
Chain	Residue	Modelled	Actual	Comment	Reference
G	325	ALA	-	expression tag	UNP P01854
G	326	ASP	-	expression tag	UNP P01854
G	327	PRO	-	expression tag	UNP P01854
G	328	ALA	CYS	engineered mutation	UNP P01854
G	335	CYS	GLY	engineered mutation	UNP P01854
G	548	ALA	-	expression tag	UNP P01854
G	549	ALA	-	expression tag	UNP P01854
G	550	ASP	-	expression tag	UNP P01854
G	551	ASP	-	expression tag	UNP P01854
G	552	ASP	-	expression tag	UNP P01854
G	553	ASP	-	expression tag	UNP P01854
G	554	LYS	-	expression tag	UNP P01854
I	325	ALA	-	expression tag	UNP P01854
I	326	ASP	-	expression tag	UNP P01854
I	327	PRO	-	expression tag	UNP P01854
I	328	ALA	CYS	engineered mutation	UNP P01854
I	335	CYS	GLY	engineered mutation	UNP P01854
I	548	ALA	-	expression tag	UNP P01854
I	549	ALA	-	expression tag	UNP P01854
I	550	ASP	-	expression tag	UNP P01854
I	551	ASP	-	expression tag	UNP P01854
I	552	ASP	-	expression tag	UNP P01854
I	553	ASP	-	expression tag	UNP P01854
I	554	LYS	-	expression tag	UNP P01854
J	325	ALA	-	expression tag	UNP P01854
J	326	ASP	-	expression tag	UNP P01854
J	327	PRO	-	expression tag	UNP P01854
J	328	ALA	CYS	engineered mutation	UNP P01854
J	335	CYS	GLY	engineered mutation	UNP P01854
J	548	ALA	-	expression tag	UNP P01854
J	549	ALA	-	expression tag	UNP P01854
J	550	ASP	-	expression tag	UNP P01854
J	551	ASP	-	expression tag	UNP P01854
J	552	ASP	-	expression tag	UNP P01854
J	553	ASP	-	expression tag	UNP P01854
J	554	LYS	-	expression tag	UNP P01854
K	325	ALA	-	expression tag	UNP P01854
K	326	ASP	-	expression tag	UNP P01854
K	327	PRO	-	expression tag	UNP P01854
K	328	ALA	CYS	engineered mutation	UNP P01854
K	335	CYS	GLY	engineered mutation	UNP P01854
K	548	ALA	-	expression tag	UNP P01854

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Chain	Residue	Modelled	Actual	Comment	Reference
K	549	ALA	-	expression tag	UNP P01854
K	550	ASP	-	expression tag	UNP P01854
K	551	ASP	-	expression tag	UNP P01854
K	552	ASP	-	expression tag	UNP P01854
K	553	ASP	-	expression tag	UNP P01854
K	554	LYS	-	expression tag	UNP P01854

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



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	H	1	Total O S 5 4 1	0	0
4	H	1	Total O S 5 4 1	0	0
4	H	1	Total O S 5 4 1	0	0
4	H	1	Total O S 5 4 1	0	0
4	L	1	Total O S 5 4 1	0	0
4	L	1	Total O S 5 4 1	0	0
4	L	1	Total O S 5 4 1	0	0
4	L	1	Total O S 5 4 1	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	A	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	B	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	C	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	D	1	Total	O	S	0	0
			5	4	1		
4	E	1	Total	O	S	0	0
			5	4	1		
4	E	1	Total	O	S	0	0
			5	4	1		
4	F	1	Total	O	S	0	0
			5	4	1		
4	F	1	Total	O	S	0	0
			5	4	1		

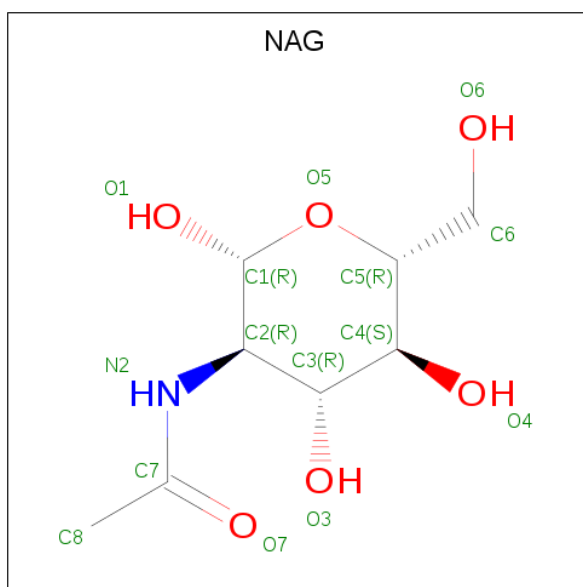
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	F	1	Total 5	O 4	S 1	0	0
4	F	1	Total 5	O 4	S 1	0	0
4	F	1	Total 5	O 4	S 1	0	0
4	G	1	Total 5	O 4	S 1	0	0
4	G	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	I	1	Total 5	O 4	S 1	0	0
4	J	1	Total 5	O 4	S 1	0	0
4	J	1	Total 5	O 4	S 1	0	0
4	J	1	Total 5	O 4	S 1	0	0
4	J	1	Total 5	O 4	S 1	0	0
4	K	1	Total 5	O 4	S 1	0	0
4	K	1	Total 5	O 4	S 1	0	0
4	K	1	Total 5	O 4	S 1	0	0
4	K	1	Total 5	O 4	S 1	0	0
4	K	1	Total 5	O 4	S 1	0	0

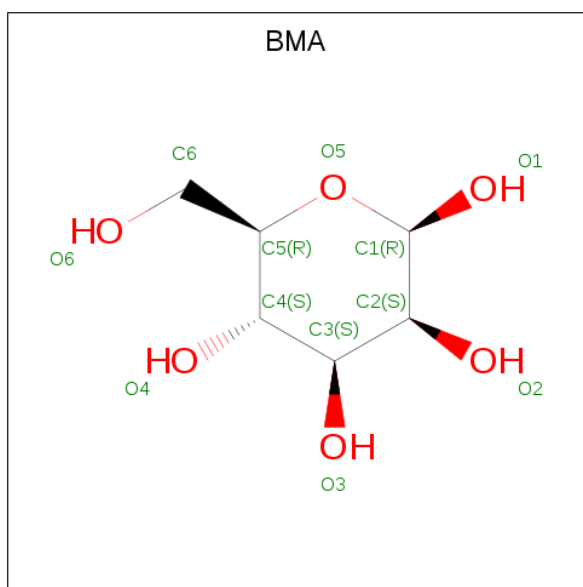
- Molecule 5 is N-ACETYL-D-GLUCOSAMINE (three-letter code: NAG) (formula: C<sub>8</sub>H<sub>15</sub>NO<sub>6</sub>).





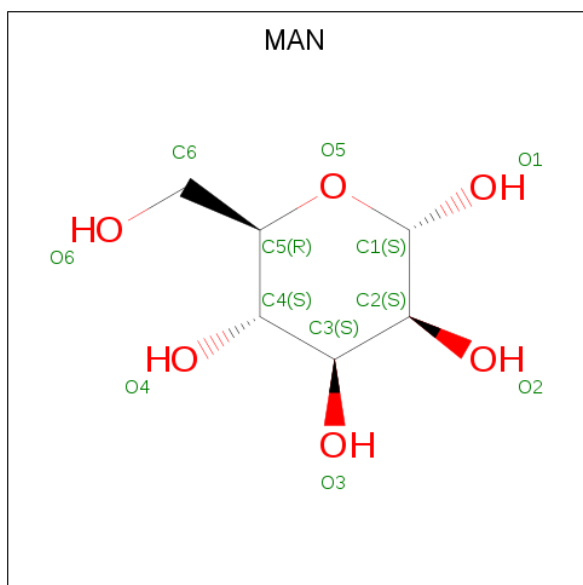
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	G	1	Total 14	8	1	5	0	0
5	G	1	Total 14	8	1	5	0	0
5	I	1	Total 14	8	1	5	0	0
5	I	1	Total 14	8	1	5	0	0
5	J	1	Total 14	8	1	5	0	0
5	J	1	Total 14	8	1	5	0	0
5	K	1	Total 14	8	1	5	0	0
5	K	1	Total 14	8	1	5	0	0

- Molecule 6 is BETA-D-MANNOSE (three-letter code: BMA) (formula: C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	G	1	Total C O 11 6 5	0	0
6	I	1	Total C O 11 6 5	0	0
6	J	1	Total C O 11 6 5	0	0
6	K	1	Total C O 11 6 5	0	0

- Molecule 7 is ALPHA-D-MANNOSE (three-letter code: MAN) (formula:  $C_6H_{12}O_6$ ).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
7	G	1	Total C O 11 6 5	0	0
7	G	1	Total C O 11 6 5	0	0
7	I	1	Total C O 11 6 5	0	0
7	I	1	Total C O 11 6 5	0	0
7	J	1	Total C O 11 6 5	0	0
7	J	1	Total C O 11 6 5	0	0
7	K	1	Total C O 11 6 5	0	0
7	K	1	Total C O 11 6 5	0	0

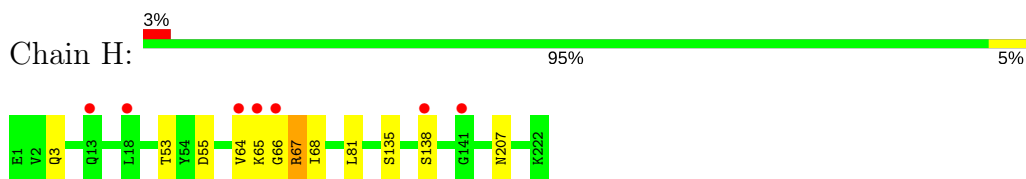
- Molecule 8 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
8	H	6	Total O 6 6	0	0
8	L	14	Total O 14 14	0	0
8	A	4	Total O 4 4	0	0
8	B	10	Total O 10 10	0	0
8	C	3	Total O 3 3	0	0
8	D	6	Total O 6 6	0	0
8	E	3	Total O 3 3	0	0
8	F	6	Total O 6 6	0	0
8	G	1	Total O 1 1	0	0
8	I	2	Total O 2 2	0	0
8	J	4	Total O 4 4	0	0

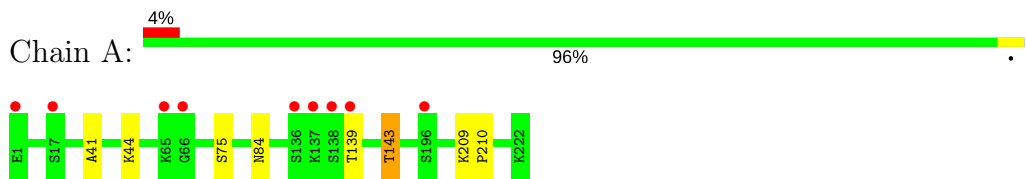
### 3 Residue-property plots [i](#)

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.

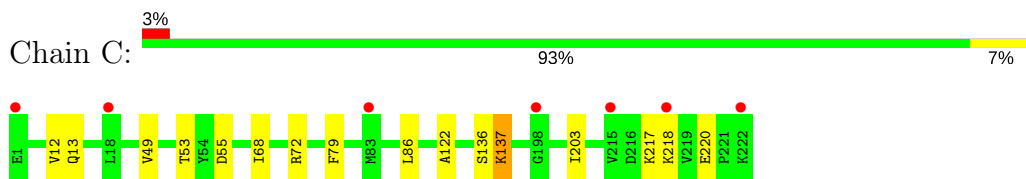
- Molecule 1: Epididymis luminal protein 214



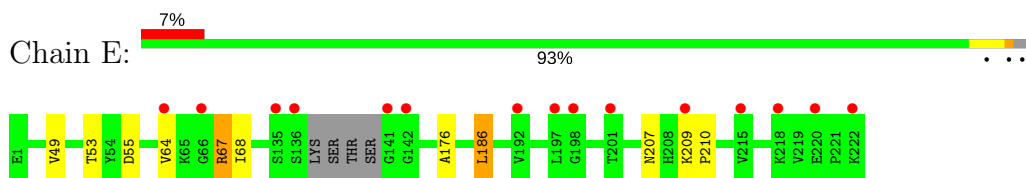
- Molecule 1: Epididymis luminal protein 214



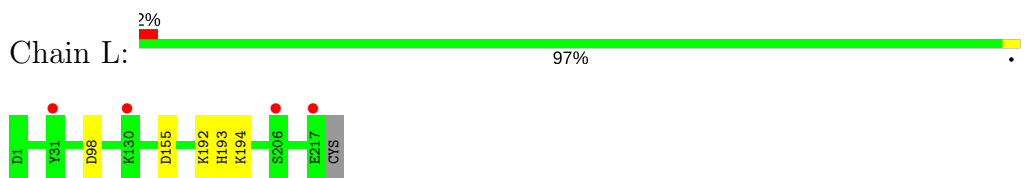
- Molecule 1: Epididymis luminal protein 214



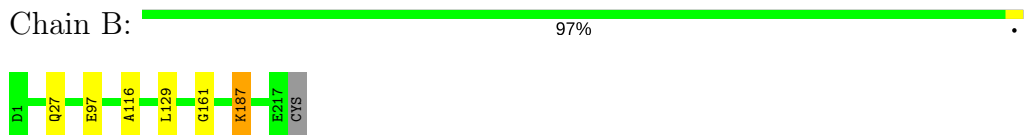
- Molecule 1: Epididymis luminal protein 214



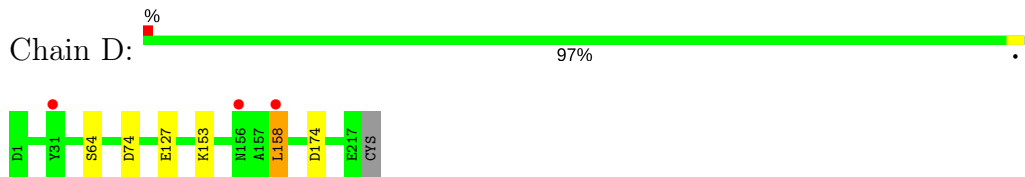
- Molecule 2: Uncharacterized protein



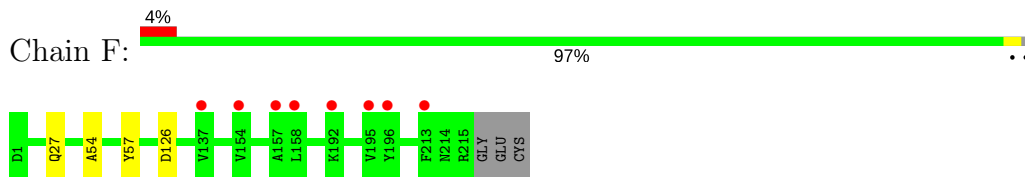
- Molecule 2: Uncharacterized protein



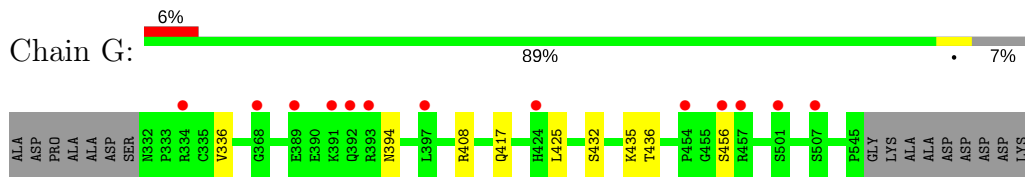
• Molecule 2: Uncharacterized protein



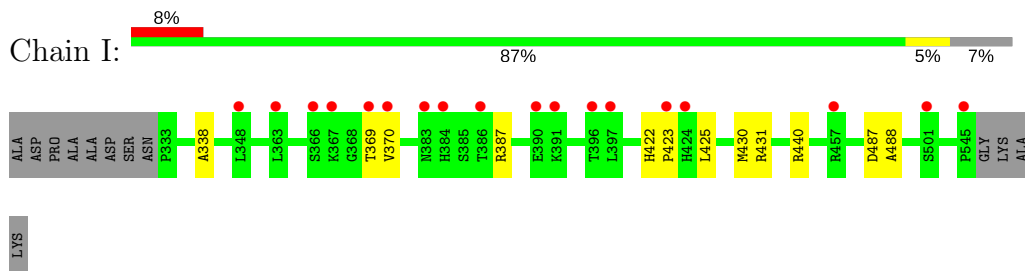
• Molecule 2: Uncharacterized protein



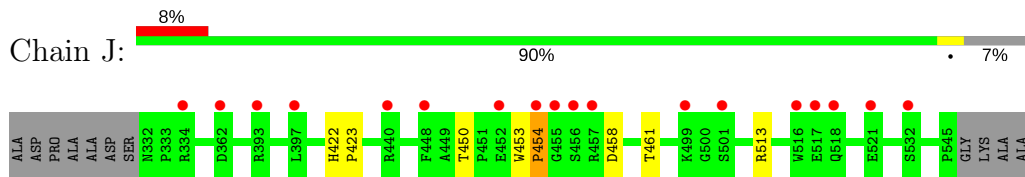
• Molecule 3: Ig epsilon chain C region



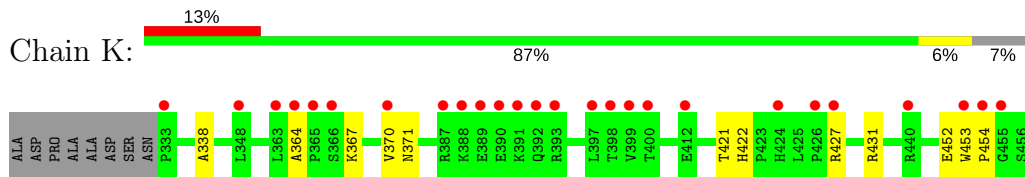
• Molecule 3: Ig epsilon chain C region



• Molecule 3: Ig epsilon chain C region



• Molecule 3: Ig epsilon chain C region



S501	
S532	
V543	
N544	
P545	
GLY	
LYS	
ALA	
ALA	
ASP	
ASP	
ASP	
ASP	
LYS	

## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	100.10Å 107.14Å 151.04Å 90.00° 95.18° 90.00°	Depositor
Resolution (Å)	37.61 – 2.50 37.61 – 2.50	Depositor EDS
% Data completeness (in resolution range)	97.8 (37.61-2.50) 97.8 (37.61-2.50)	Depositor EDS
$R_{merge}$	0.11	Depositor
$R_{sym}$	0.12	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.72 (at 2.51Å)	Xtrriage
Refinement program	PHENIX 1.9_1692	Depositor
R, $R_{free}$	0.221 , 0.239 0.222 , 0.240	Depositor DCC
$R_{free}$ test set	1512 reflections (1.41%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	61.9	Xtrriage
Anisotropy	0.243	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 53.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	20626	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	71.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.74% 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, BMA, NAG, MAN

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	0.28	0/1712	0.42	0/2336
1	C	0.31	0/1712	0.47	0/2336
1	E	0.26	0/1683	0.43	0/2296
1	H	0.36	0/1712	0.48	0/2336
2	B	0.24	0/1712	0.43	0/2325
2	D	0.23	0/1712	0.41	0/2325
2	F	0.23	0/1699	0.41	0/2308
2	L	0.30	0/1712	0.43	0/2325
3	G	0.23	0/1737	0.43	0/2366
3	I	0.23	0/1729	0.45	0/2354
3	J	0.25	0/1737	0.45	0/2366
3	K	0.24	0/1729	0.44	0/2354
All	All	0.27	0/20586	0.44	0/28027

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 [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	1667	0	1618	4	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	C	1667	0	1620	9	0
1	E	1639	0	1589	5	0
1	H	1667	0	1620	6	0
2	B	1675	0	1600	4	0
2	D	1675	0	1600	4	0
2	F	1662	0	1590	2	0
2	L	1675	0	1600	2	0
3	G	1693	0	1673	6	0
3	I	1685	0	1668	8	0
3	J	1693	0	1673	4	0
3	K	1685	0	1669	8	0
4	A	15	0	0	0	0
4	B	20	0	0	1	0
4	C	20	0	0	0	0
4	D	30	0	0	3	0
4	E	10	0	0	0	0
4	F	25	0	0	1	0
4	G	10	0	0	0	0
4	H	20	0	0	0	0
4	I	25	0	0	0	0
4	J	20	0	0	0	0
4	K	25	0	0	1	0
4	L	20	0	0	0	0
5	G	28	0	24	1	0
5	I	28	0	24	0	0
5	J	28	0	24	0	0
5	K	28	0	24	0	0
6	G	11	0	8	0	0
6	I	11	0	8	0	0
6	J	11	0	8	0	0
6	K	11	0	8	0	0
7	G	22	0	20	1	0
7	I	22	0	20	0	0
7	J	22	0	20	0	0
7	K	22	0	20	0	0
8	A	4	0	0	0	0
8	B	10	0	0	2	0
8	C	3	0	0	1	0
8	D	6	0	0	0	0
8	E	3	0	0	0	0
8	F	6	0	0	0	0
8	G	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
8	H	6	0	0	0	0
8	I	2	0	0	2	0
8	J	4	0	0	0	0
8	L	14	0	0	1	0
All	All	20626	0	19728	61	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 2.

The worst 5 of 61 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)
7:G:604:MAN:HO2	7:G:604:MAN:HO6	1.11	0.97
1:C:122:ALA:O	8:C:401:HOH:O	2.08	0.72
2:B:116:ALA:O	8:B:401:HOH:O	2.08	0.71
4:D:305:SO4:O2	3:G:408:ARG:NH2	2.24	0.70
2:L:98:ASP:OD1	8:L:401:HOH:O	2.10	0.69

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	220/222 (99%)	217 (99%)	3 (1%)	0	100	100
1	C	220/222 (99%)	216 (98%)	3 (1%)	1 (0%)	31	51
1	E	214/222 (96%)	209 (98%)	5 (2%)	0	100	100
1	H	220/222 (99%)	217 (99%)	3 (1%)	0	100	100
2	B	215/218 (99%)	209 (97%)	6 (3%)	0	100	100
2	D	215/218 (99%)	209 (97%)	6 (3%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	F	213/218 (98%)	207 (97%)	6 (3%)	0	100	100
2	L	215/218 (99%)	210 (98%)	5 (2%)	0	100	100
3	G	212/230 (92%)	205 (97%)	6 (3%)	1 (0%)	31	51
3	I	211/230 (92%)	205 (97%)	6 (3%)	0	100	100
3	J	212/230 (92%)	205 (97%)	6 (3%)	1 (0%)	31	51
3	K	211/230 (92%)	204 (97%)	7 (3%)	0	100	100
All	All	2578/2680 (96%)	2513 (98%)	62 (2%)	3 (0%)	53	75

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	G	456	SER
3	J	454	PRO
1	C	137	LYS

### 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	186/186 (100%)	184 (99%)	2 (1%)	76	91
1	C	186/186 (100%)	185 (100%)	1 (0%)	90	97
1	E	182/186 (98%)	179 (98%)	3 (2%)	65	86
1	H	186/186 (100%)	183 (98%)	3 (2%)	65	86
2	B	191/192 (100%)	189 (99%)	2 (1%)	78	92
2	D	191/192 (100%)	189 (99%)	2 (1%)	78	92
2	F	190/192 (99%)	189 (100%)	1 (0%)	90	97
2	L	191/192 (100%)	189 (99%)	2 (1%)	78	92
3	G	190/200 (95%)	190 (100%)	0	100	100
3	I	189/200 (94%)	188 (100%)	1 (0%)	90	97
3	J	190/200 (95%)	190 (100%)	0	100	100

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
3	K	189/200 (94%)	188 (100%)	1 (0%)	90	97
All	All	2261/2312 (98%)	2243 (99%)	18 (1%)	83	94

5 of 18 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	B	187	LYS
1	C	220	GLU
1	E	207	ASN
1	A	143	THR
2	B	27	GLN

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

Mol	Chain	Res	Type
3	I	424	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](#)

68 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	$\# Z  > 2$
4	SO4	A	301	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	A	302	-	4,4,4	0.17	0	6,6,6	0.08	0
4	SO4	A	303	1	4,4,4	0.13	0	6,6,6	0.47	0
4	SO4	B	301	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	B	302	-	4,4,4	0.17	0	6,6,6	0.07	0
4	SO4	B	303	-	4,4,4	0.15	0	6,6,6	0.10	0
4	SO4	B	304	-	4,4,4	0.16	0	6,6,6	0.10	0
4	SO4	C	301	-	4,4,4	0.16	0	6,6,6	0.06	0
4	SO4	C	302	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	C	303	-	4,4,4	0.17	0	6,6,6	0.07	0
4	SO4	C	304	-	4,4,4	0.17	0	6,6,6	0.09	0
4	SO4	D	301	-	4,4,4	0.14	0	6,6,6	0.09	0
4	SO4	D	302	-	4,4,4	0.17	0	6,6,6	0.06	0
4	SO4	D	303	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	D	304	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	D	305	-	4,4,4	0.15	0	6,6,6	0.12	0
4	SO4	D	306	-	4,4,4	0.17	0	6,6,6	0.09	0
4	SO4	E	301	-	4,4,4	0.17	0	6,6,6	0.08	0
4	SO4	E	302	-	4,4,4	0.15	0	6,6,6	0.07	0
4	SO4	F	301	-	4,4,4	0.17	0	6,6,6	0.08	0
4	SO4	F	302	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	F	303	-	4,4,4	0.16	0	6,6,6	0.10	0
4	SO4	F	304	-	4,4,4	0.17	0	6,6,6	0.07	0
4	SO4	F	305	3,2	4,4,4	0.32	0	6,6,6	0.35	0
5	NAG	G	601	3,5	14,14,15	0.34	0	17,19,21	0.48	0
5	NAG	G	602	5,6	14,14,15	0.24	0	17,19,21	0.50	0
6	BMA	G	603	5,7	11,11,12	0.89	1 (9%)	15,15,17	1.26	1 (6%)
7	MAN	G	604	6	11,11,12	0.93	1 (9%)	15,15,17	1.67	2 (13%)
7	MAN	G	605	6	11,11,12	0.83	1 (9%)	15,15,17	0.87	1 (6%)
4	SO4	G	606	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	G	607	-	4,4,4	0.15	0	6,6,6	0.09	0
4	SO4	H	301	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	H	302	-	4,4,4	0.15	0	6,6,6	0.10	0
4	SO4	H	303	-	4,4,4	0.17	0	6,6,6	0.10	0
4	SO4	H	304	-	4,4,4	0.16	0	6,6,6	0.07	0
5	NAG	I	601	3,5	14,14,15	0.17	0	17,19,21	0.56	0
5	NAG	I	602	5,6	14,14,15	0.39	0	17,19,21	0.45	0
6	BMA	I	603	5,7	11,11,12	0.75	0	15,15,17	0.80	0
7	MAN	I	604	6	11,11,12	0.93	0	15,15,17	2.04	4 (26%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
7	MAN	I	605	6	11,11,12	0.58	0	15,15,17	1.19	2 (13%)
4	SO4	I	606	-	4,4,4	0.15	0	6,6,6	0.10	0
4	SO4	I	607	-	4,4,4	0.17	0	6,6,6	0.09	0
4	SO4	I	608	-	4,4,4	0.17	0	6,6,6	0.09	0
4	SO4	I	609	-	4,4,4	0.17	0	6,6,6	0.07	0
4	SO4	I	610	-	4,4,4	0.17	0	6,6,6	0.07	0
5	NAG	J	601	3,5	14,14,15	0.25	0	17,19,21	0.52	0
5	NAG	J	602	5,6	14,14,15	0.27	0	17,19,21	0.47	0
6	BMA	J	603	5,7	11,11,12	0.71	0	15,15,17	0.79	0
7	MAN	J	604	6	11,11,12	0.78	1 (9%)	15,15,17	0.95	1 (6%)
7	MAN	J	605	6	11,11,12	0.80	1 (9%)	15,15,17	0.90	1 (6%)
4	SO4	J	606	-	4,4,4	0.16	0	6,6,6	0.11	0
4	SO4	J	607	-	4,4,4	0.15	0	6,6,6	0.28	0
4	SO4	J	608	-	4,4,4	0.17	0	6,6,6	0.08	0
4	SO4	J	609	-	4,4,4	0.19	0	6,6,6	0.24	0
5	NAG	K	601	3,5	14,14,15	0.31	0	17,19,21	0.52	0
5	NAG	K	602	5,6	14,14,15	0.28	0	17,19,21	0.45	0
6	BMA	K	603	5,7	11,11,12	0.72	0	15,15,17	0.93	0
7	MAN	K	604	6	11,11,12	0.87	1 (9%)	15,15,17	1.69	3 (20%)
7	MAN	K	605	6	11,11,12	0.79	1 (9%)	15,15,17	0.91	1 (6%)
4	SO4	K	606	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	K	607	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	K	608	-	4,4,4	0.16	0	6,6,6	0.08	0
4	SO4	K	609	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	K	610	-	4,4,4	0.42	0	6,6,6	0.29	0
4	SO4	L	301	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	L	302	-	4,4,4	0.16	0	6,6,6	0.09	0
4	SO4	L	303	-	4,4,4	0.16	0	6,6,6	0.07	0
4	SO4	L	304	-	4,4,4	0.16	0	6,6,6	0.07	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	SO4	A	301	-	-	0/0/0/0	0/0/0/0
4	SO4	A	302	-	-	0/0/0/0	0/0/0/0
4	SO4	A	303	1	-	0/0/0/0	0/0/0/0
4	SO4	B	301	-	-	0/0/0/0	0/0/0/0
4	SO4	B	302	-	-	0/0/0/0	0/0/0/0

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
4	SO4	B	303	-	-	0/0/0/0	0/0/0/0
4	SO4	B	304	-	-	0/0/0/0	0/0/0/0
4	SO4	C	301	-	-	0/0/0/0	0/0/0/0
4	SO4	C	302	-	-	0/0/0/0	0/0/0/0
4	SO4	C	303	-	-	0/0/0/0	0/0/0/0
4	SO4	C	304	-	-	0/0/0/0	0/0/0/0
4	SO4	D	301	-	-	0/0/0/0	0/0/0/0
4	SO4	D	302	-	-	0/0/0/0	0/0/0/0
4	SO4	D	303	-	-	0/0/0/0	0/0/0/0
4	SO4	D	304	-	-	0/0/0/0	0/0/0/0
4	SO4	D	305	-	-	0/0/0/0	0/0/0/0
4	SO4	D	306	-	-	0/0/0/0	0/0/0/0
4	SO4	E	301	-	-	0/0/0/0	0/0/0/0
4	SO4	E	302	-	-	0/0/0/0	0/0/0/0
4	SO4	F	301	-	-	0/0/0/0	0/0/0/0
4	SO4	F	302	-	-	0/0/0/0	0/0/0/0
4	SO4	F	303	-	-	0/0/0/0	0/0/0/0
4	SO4	F	304	-	-	0/0/0/0	0/0/0/0
4	SO4	F	305	3,2	-	0/0/0/0	0/0/0/0
5	NAG	G	601	3,5	-	0/6/23/26	0/1/1/1
5	NAG	G	602	5,6	-	0/6/23/26	0/1/1/1
6	BMA	G	603	5,7	-	0/2/19/22	0/1/1/1
7	MAN	G	604	6	-	0/2/19/22	1/1/1/1
7	MAN	G	605	6	-	0/2/19/22	0/1/1/1
4	SO4	G	606	-	-	0/0/0/0	0/0/0/0
4	SO4	G	607	-	-	0/0/0/0	0/0/0/0
4	SO4	H	301	-	-	0/0/0/0	0/0/0/0
4	SO4	H	302	-	-	0/0/0/0	0/0/0/0
4	SO4	H	303	-	-	0/0/0/0	0/0/0/0
4	SO4	H	304	-	-	0/0/0/0	0/0/0/0
5	NAG	I	601	3,5	-	0/6/23/26	0/1/1/1
5	NAG	I	602	5,6	-	0/6/23/26	0/1/1/1
6	BMA	I	603	5,7	-	0/2/19/22	0/1/1/1
7	MAN	I	604	6	-	0/2/19/22	0/1/1/1
7	MAN	I	605	6	-	0/2/19/22	0/1/1/1
4	SO4	I	606	-	-	0/0/0/0	0/0/0/0
4	SO4	I	607	-	-	0/0/0/0	0/0/0/0
4	SO4	I	608	-	-	0/0/0/0	0/0/0/0
4	SO4	I	609	-	-	0/0/0/0	0/0/0/0
4	SO4	I	610	-	-	0/0/0/0	0/0/0/0
5	NAG	J	601	3,5	-	0/6/23/26	0/1/1/1
5	NAG	J	602	5,6	-	0/6/23/26	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	BMA	J	603	5,7	-	0/2/19/22	0/1/1/1
7	MAN	J	604	6	-	0/2/19/22	0/1/1/1
7	MAN	J	605	6	-	0/2/19/22	0/1/1/1
4	SO4	J	606	-	-	0/0/0/0	0/0/0/0
4	SO4	J	607	-	-	0/0/0/0	0/0/0/0
4	SO4	J	608	-	-	0/0/0/0	0/0/0/0
4	SO4	J	609	-	-	0/0/0/0	0/0/0/0
5	NAG	K	601	3,5	-	0/6/23/26	0/1/1/1
5	NAG	K	602	5,6	-	0/6/23/26	0/1/1/1
6	BMA	K	603	5,7	-	0/2/19/22	0/1/1/1
7	MAN	K	604	6	-	0/2/19/22	1/1/1/1
7	MAN	K	605	6	-	0/2/19/22	0/1/1/1
4	SO4	K	606	-	-	0/0/0/0	0/0/0/0
4	SO4	K	607	-	-	0/0/0/0	0/0/0/0
4	SO4	K	608	-	-	0/0/0/0	0/0/0/0
4	SO4	K	609	-	-	0/0/0/0	0/0/0/0
4	SO4	K	610	-	-	0/0/0/0	0/0/0/0
4	SO4	L	301	-	-	0/0/0/0	0/0/0/0
4	SO4	L	302	-	-	0/0/0/0	0/0/0/0
4	SO4	L	303	-	-	0/0/0/0	0/0/0/0
4	SO4	L	304	-	-	0/0/0/0	0/0/0/0

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	G	605	MAN	O5-C1	-2.33	1.39	1.43
7	J	605	MAN	O5-C1	-2.31	1.40	1.43
6	G	603	BMA	O5-C1	-2.26	1.40	1.43
7	K	605	MAN	O5-C1	-2.23	1.40	1.43
7	J	604	MAN	O5-C1	-2.21	1.40	1.43

The worst 5 of 16 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	I	604	MAN	O2-C2-C3	-2.91	104.52	110.19
7	J	605	MAN	O2-C2-C3	-2.48	105.35	110.19
7	G	605	MAN	O2-C2-C3	-2.44	105.44	110.19
7	K	605	MAN	O2-C2-C3	-2.42	105.46	110.19
7	I	605	MAN	O2-C2-C3	-2.39	105.53	110.19

There are no chirality outliers.

There are no torsion outliers.



All (2) ring outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	G	604	MAN	C1-C2-C3-C4-C5-O5
7	K	604	MAN	C1-C2-C3-C4-C5-O5

7 monomers are involved in 8 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	B	303	SO4	1	0
4	D	304	SO4	1	0
4	D	305	SO4	2	0
4	F	303	SO4	1	0
5	G	601	NAG	1	0
7	G	604	MAN	1	0
4	K	610	SO4	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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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	222/222 (100%)	0.40	9 (4%) 37 40	49, 62, 83, 116	0
1	C	222/222 (100%)	0.35	7 (3%) 47 51	53, 70, 85, 106	0
1	E	218/222 (98%)	0.42	15 (6%) 17 17	48, 70, 104, 128	0
1	H	222/222 (100%)	0.17	7 (3%) 47 51	46, 58, 85, 96	0
2	B	217/218 (99%)	0.09	0 100 100	43, 57, 79, 100	0
2	D	217/218 (99%)	0.25	3 (1%) 75 77	48, 65, 94, 105	0
2	F	215/218 (98%)	0.37	8 (3%) 41 44	46, 63, 103, 111	0
2	L	217/218 (99%)	0.02	4 (1%) 68 71	43, 55, 79, 110	0
3	G	214/230 (93%)	0.51	13 (6%) 21 22	56, 71, 108, 127	0
3	I	213/230 (92%)	0.62	18 (8%) 11 11	56, 76, 112, 120	0
3	J	214/230 (93%)	0.65	18 (8%) 11 11	47, 75, 110, 154	0
3	K	213/230 (92%)	0.85	31 (14%) 2 2	62, 81, 123, 137	0
All	All	2604/2680 (97%)	0.39	133 (5%) 28 30	43, 68, 102, 154	0

The worst 5 of 133 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	E	141	GLY	9.4
3	J	455	GLY	9.0
3	K	365	PRO	6.9
1	C	1	GLU	5.9
3	I	363	LEU	5.9

### 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(Å <sup>2</sup> )	Q<0.9
4	SO4	F	305	5/5	0.41	0.40	82,83,93,103	5
7	MAN	G	605	11/12	0.72	0.25	112,127,134,134	0
4	SO4	D	305	5/5	0.74	0.22	95,102,104,111	0
4	SO4	A	303	5/5	0.75	0.26	62,69,71,72	5
7	MAN	J	605	11/12	0.76	0.24	126,138,143,148	0
7	MAN	I	605	11/12	0.77	0.21	123,130,141,142	0
4	SO4	G	607	5/5	0.81	0.23	62,63,66,67	5
4	SO4	D	306	5/5	0.81	0.28	60,60,64,65	5
4	SO4	I	608	5/5	0.81	0.23	98,98,113,113	0
7	MAN	K	605	11/12	0.83	0.19	124,135,139,145	0
7	MAN	I	604	11/12	0.84	0.18	96,103,105,107	0
4	SO4	L	304	5/5	0.85	0.24	113,113,122,123	0
4	SO4	B	304	5/5	0.85	0.16	97,99,106,112	0
7	MAN	J	604	11/12	0.85	0.22	120,126,130,142	0
4	SO4	J	608	5/5	0.85	0.16	91,98,102,103	0
6	BMA	I	603	11/12	0.86	0.15	93,99,107,114	0
4	SO4	K	610	5/5	0.86	0.24	59,61,68,89	5
4	SO4	I	610	5/5	0.86	0.24	92,94,105,114	0
7	MAN	K	604	11/12	0.87	0.14	93,99,104,108	0
4	SO4	C	303	5/5	0.87	0.19	95,101,102,102	0
4	SO4	J	607	5/5	0.88	0.15	98,98,101,105	0
4	SO4	C	304	5/5	0.89	0.19	108,115,118,118	0
4	SO4	A	302	5/5	0.89	0.16	87,89,96,111	0
4	SO4	J	609	5/5	0.89	0.15	91,92,101,103	0
4	SO4	K	609	5/5	0.90	0.20	94,100,105,109	0
4	SO4	D	303	5/5	0.90	0.15	95,101,102,104	0
4	SO4	L	303	5/5	0.90	0.14	115,117,124,133	0
4	SO4	F	303	5/5	0.90	0.16	101,106,111,115	0
6	BMA	K	603	11/12	0.90	0.16	97,100,110,116	0
4	SO4	C	301	5/5	0.91	0.16	93,97,103,106	0
5	NAG	J	601	14/15	0.91	0.22	85,88,94,100	0
5	NAG	J	602	14/15	0.91	0.16	83,86,93,96	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
4	SO4	F	301	5/5	0.91	0.12	83,84,89,94	0
4	SO4	E	301	5/5	0.91	0.14	74,79,87,88	0
5	NAG	K	601	14/15	0.91	0.19	96,103,105,106	0
4	SO4	E	302	5/5	0.92	0.17	70,73,79,81	5
4	SO4	D	302	5/5	0.92	0.14	72,76,94,96	0
4	SO4	K	608	5/5	0.92	0.15	93,93,98,101	0
4	SO4	F	304	5/5	0.92	0.25	89,91,106,109	0
5	NAG	I	601	14/15	0.92	0.16	92,95,99,100	0
4	SO4	D	304	5/5	0.92	0.20	96,98,106,113	0
7	MAN	G	604	11/12	0.92	0.10	89,90,96,97	0
6	BMA	J	603	11/12	0.93	0.17	93,102,116,117	0
4	SO4	K	607	5/5	0.93	0.15	79,87,95,98	0
4	SO4	B	303	5/5	0.93	0.24	100,104,106,116	0
4	SO4	L	302	5/5	0.93	0.18	83,83,93,109	0
5	NAG	I	602	14/15	0.94	0.16	86,92,94,95	0
4	SO4	F	302	5/5	0.94	0.17	100,107,111,121	0
4	SO4	I	606	5/5	0.94	0.11	84,90,95,99	0
6	BMA	G	603	11/12	0.94	0.10	84,88,97,104	0
4	SO4	A	301	5/5	0.94	0.18	96,96,99,101	0
5	NAG	G	602	14/15	0.94	0.20	82,84,88,91	0
4	SO4	H	304	5/5	0.95	0.15	97,98,105,106	0
4	SO4	H	302	5/5	0.95	0.12	74,74,81,82	0
4	SO4	B	302	5/5	0.95	0.10	90,96,103,104	0
4	SO4	I	609	5/5	0.95	0.10	83,92,96,97	0
4	SO4	C	302	5/5	0.95	0.18	86,89,94,102	0
4	SO4	L	301	5/5	0.95	0.11	71,75,77,78	0
4	SO4	D	301	5/5	0.95	0.09	85,91,92,92	0
4	SO4	I	607	5/5	0.95	0.17	79,80,83,85	0
5	NAG	K	602	14/15	0.95	0.17	90,96,99,99	0
4	SO4	J	606	5/5	0.96	0.11	67,81,82,89	0
5	NAG	G	601	14/15	0.96	0.14	86,90,94,97	0
4	SO4	H	301	5/5	0.96	0.09	77,77,82,87	0
4	SO4	K	606	5/5	0.97	0.12	76,77,83,85	0
4	SO4	G	606	5/5	0.97	0.11	76,80,82,84	0
4	SO4	B	301	5/5	0.98	0.10	63,73,79,84	0
4	SO4	H	303	5/5	0.98	0.10	62,72,78,83	0

## 6.5 Other polymers [\(i\)](#)

There are no such residues in this entry.