



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 08:53 PM GMT

PDB ID : 1MJJ  
Title : HIGH RESOLUTION CRYSTAL STRUCTURE OF THE COMPLEX OF  
THE FAB FRAGMENT OF ESTEROLYTIC ANTIBODY MS6-12 AND A  
TRANSITION-STATE ANALOG  
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Deposited on : 2002-08-28  
Resolution : 2.10 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  
<http://wwpdb.org/validation/2016/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 (RC4), CSD as536be (2015)  
Xtriage (Phenix) : 1.9-1692  
EDS : rb-20026688  
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : trunk26865

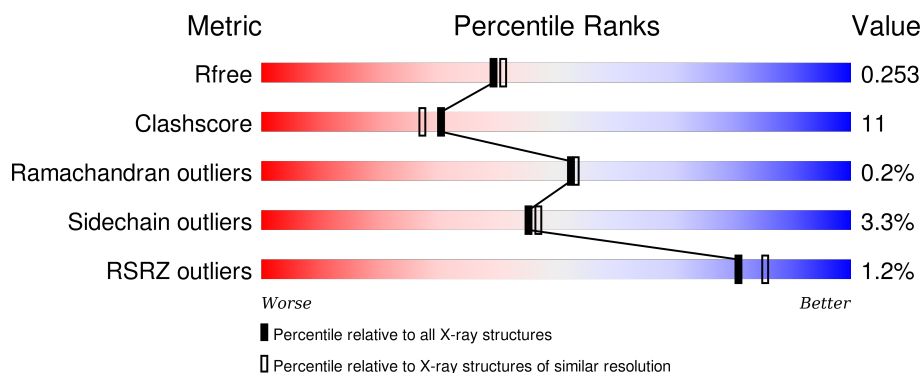
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	91344	3939 (2.10-2.10)
Clashscore	102246	4460 (2.10-2.10)
Ramachandran outliers	100387	4413 (2.10-2.10)
Sidechain outliers	100360	4414 (2.10-2.10)
RSRZ outliers	91569	3948 (2.10-2.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments on the lower bar indicate the fraction of residues that contain outliers for  $\geq 3$ , 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	219	 83% 16% •
1	L	219	 3% 73% 24% ••
2	B	227	 74% 18% • 7%
2	H	227	 70% 21% • 7%

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
3	SO4	B	2002	-	-	-	X

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 7570 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 IMMUNOGLOBULIN MS6-12.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	218	Total	C	N	O	S	0	0	0
			1693	1060	288	338	7			
1	L	216	Total	C	N	O	S	0	0	0
			1676	1051	285	333	7			

- Molecule 2 is a protein called IMMUNOGLOBULIN MS6-12.

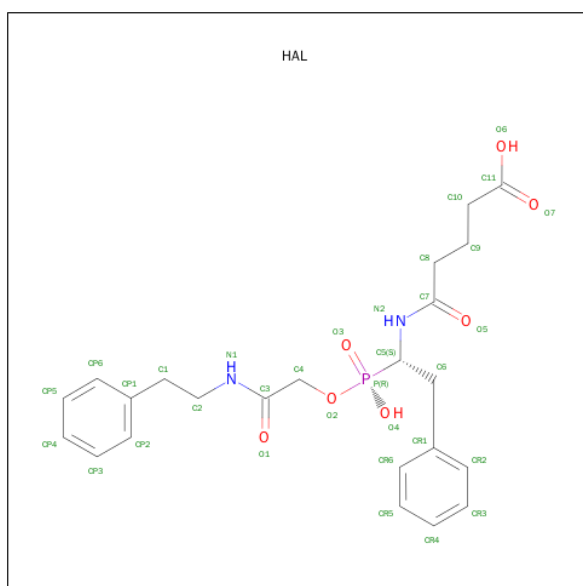
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	211	Total	C	N	O	S	0	0	0
			1609	1030	260	313	6			
2	H	210	Total	C	N	O	S	0	0	0
			1598	1024	256	312	6			

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



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

- Molecule 4 is N-{{2-([1-(4-CARBOXYBUTANOYL)AMINO]-2-PHENYLETHYL)-HYDROXYPHOSPHINYL)OXY}ACETYL}-2-PHENYLETHYLAMINE (three-letter code: HAL) (formula: C<sub>23</sub>H<sub>29</sub>N<sub>2</sub>O<sub>7</sub>P).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	1	Total C N O P 33 23 2 7 1	0	0
4	H	1	Total C N O P 33 23 2 7 1	0	0

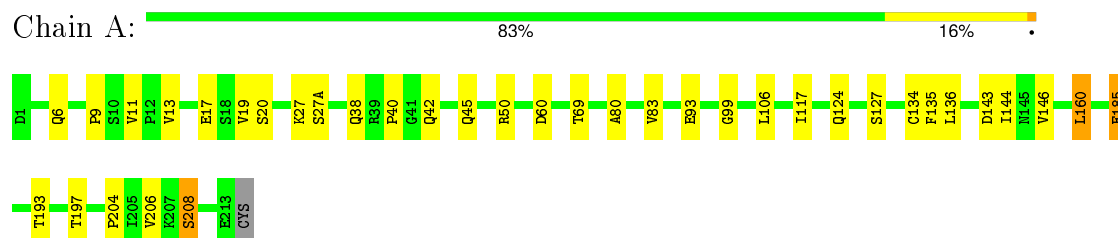
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	278	Total O 278 278	0	0
5	B	291	Total O 291 291	0	0
5	H	209	Total O 209 209	0	0
5	L	135	Total O 135 135	0	0

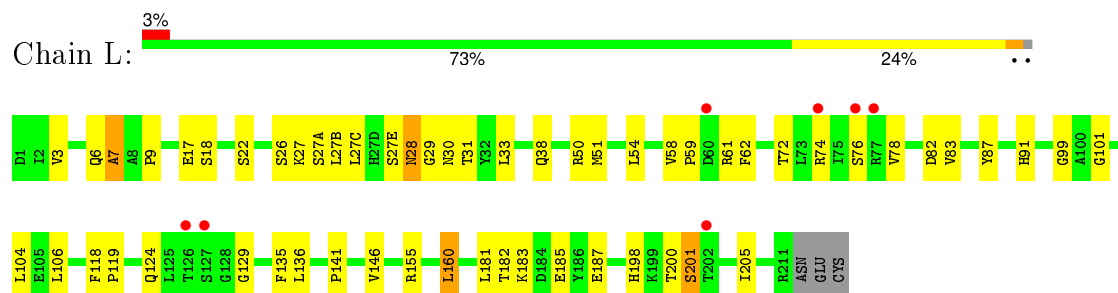
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

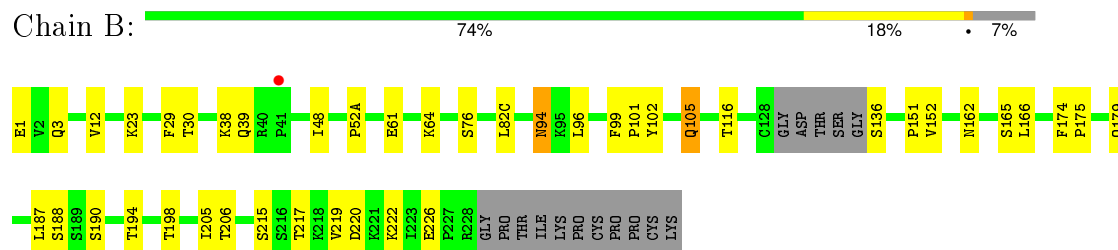
#### • Molecule 1: IMMUNOGLOBULIN MS6-12



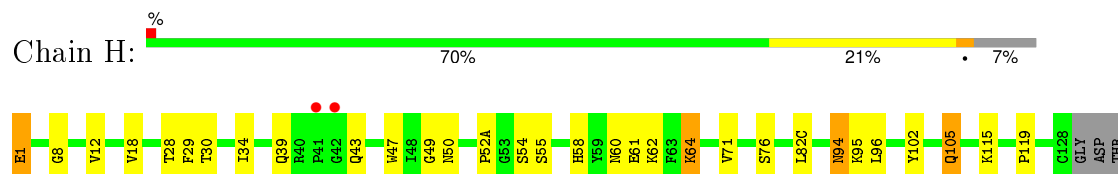
#### • Molecule 1: IMMUNOGLOBULIN MS6-12



#### • Molecule 2: IMMUNOGLOBULIN MS6-12



#### • Molecule 2: IMMUNOGLOBULIN MS6-12



SER	GLY	S136	S137	Y147	P151	L154	N162	S165	L166	F174	P175	Q179	L187	S190	V191	H192	V193	W199	P200	T205	T206	H212	S215	S216	T217	P227	ARG	GLY	PRO	THR	ILE	LYS	PRO	CYS	PRO	PRO	CYS	LYS
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## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	75.28 Å 93.84 Å 142.80 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.10 10.01 – 2.00	Depositor EDS
% Data completeness (in resolution range)	(Not available) (10.00-2.10) 78.3 (10.01-2.00)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.55 (at 2.01 Å)	Xtriage
Refinement program	CNS	Depositor
R, $R_{free}$	0.178 , 0.256 0.177 , 0.253	Depositor DCC
$R_{free}$ test set	2541 reflections (5.05%)	DCC
Wilson B-factor (Å <sup>2</sup> )	18.9	Xtriage
Anisotropy	0.542	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 75.2	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	3 of 53464 reflections (0.006%)	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7570	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	25.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 25.32 % of the origin peak, indicating pseudo translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo translational symmetry is equal to 3.2413e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

<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, 0.375 respectively for untwinned datasets, and 0.333, 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: PCA, HAL, 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	0.49	0/1733	0.77	1/2355 (0.0%)
1	L	0.45	0/1716	0.73	0/2332
2	B	0.51	0/1648	0.78	0/2259
2	H	0.47	0/1637	0.77	1/2245 (0.0%)
All	All	0.48	0/6734	0.76	2/9191 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	160	LEU	CA-CB-CG	5.26	127.39	115.30
2	H	1	PCA	O-C-N	-5.13	114.49	122.70

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	1693	0	1633	29	0
1	L	1676	0	1621	43	0
2	B	1609	0	1571	40	0
2	H	1598	0	1558	40	0
3	A	5	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	B	10	0	0	0	0
4	A	33	0	27	0	0
4	H	33	0	27	2	0
5	A	278	0	0	9	0
5	B	291	0	0	8	0
5	H	209	0	0	2	0
5	L	135	0	0	4	0
All	All	7570	0	6437	144	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 11.

The worst 5 of 144 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:L:38:GLN:HE22	2:H:39:GLN:HE22	1.24	0.85
1:A:11:VAL:HG11	5:A:2176:HOH:O	1.77	0.84
1:A:38:GLN:HE22	2:B:39:GLN:HE22	1.27	0.80
1:L:7:ALA:HA	5:L:340:HOH:O	1.82	0.79
2:H:12:VAL:HG21	2:H:82(C):LEU:HD13	1.64	0.79

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	216/219 (99%)	210 (97%)	6 (3%)	0	100	100
1	L	214/219 (98%)	203 (95%)	9 (4%)	2 (1%)	21	15
2	B	207/227 (91%)	201 (97%)	6 (3%)	0	100	100
2	H	206/227 (91%)	197 (96%)	9 (4%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
All	All	843/892 (94%)	811 (96%)	30 (4%)	2 (0%)	52	53

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	L	201	SER
1	L	7	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	193/194 (100%)	188 (97%)	5 (3%)	54	58
1	L	191/194 (98%)	185 (97%)	6 (3%)	47	50
2	B	182/195 (93%)	176 (97%)	6 (3%)	45	47
2	H	181/195 (93%)	173 (96%)	8 (4%)	35	33
All	All	747/778 (96%)	722 (97%)	25 (3%)	45	47

5 of 25 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	L	22	SER
1	L	27(E)	SER
2	H	166	LEU
1	L	27(C)	LEU
1	L	28	ASN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 20 such sidechains are listed below:

Mol	Chain	Res	Type
1	L	6	GLN
1	L	28	ASN
2	H	43	GLN

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Mol	Chain	Res	Type
2	B	162	ASN
2	B	203	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues 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	PCA	B	1	2	7,8,9	1.34	1 (14%)	9,10,12	1.65	3 (33%)
2	PCA	H	1	2	7,8,9	1.34	1 (14%)	9,10,12	1.68	3 (33%)

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
2	PCA	B	1	2	-	0/0/11/13	0/1/1/1
2	PCA	H	1	2	-	0/0/11/13	0/1/1/1

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	1	PCA	CB-CG	3.07	1.60	1.53
2	H	1	PCA	CB-CG	3.08	1.60	1.53

The worst 5 of 6 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	1	PCA	O-C-CA	-3.18	117.05	125.44
2	B	1	PCA	O-C-CA	-3.09	117.27	125.44
2	H	1	PCA	OE-CD-CG	-2.02	122.30	126.81
2	B	1	PCA	OE-CD-CG	-2.00	122.33	126.81
2	H	1	PCA	CG-CD-N	2.11	115.62	108.04

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	B	1	PCA	2	0
2	H	1	PCA	1	0

## 5.5 Carbohydrates

There are no carbohydrates in this entry.

## 5.6 Ligand geometry

5 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	HAL	A	1001	-	30,34,34	6.95	3 (10%)	30,44,44	1.04	2 (6%)
3	SO4	A	2001	-	4,4,4	0.18	0	6,6,6	0.19	0
3	SO4	B	2002	-	4,4,4	0.24	0	6,6,6	0.14	0
3	SO4	B	2003	-	4,4,4	0.21	0	6,6,6	0.11	0
4	HAL	H	1002	-	30,34,34	7.44	3 (10%)	30,44,44	1.10	2 (6%)

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	HAL	A	1001	-	-	0/30/32/32	0/2/2/2
3	SO4	A	2001	-	-	0/0/0/0	0/0/0/0
3	SO4	B	2002	-	-	0/0/0/0	0/0/0/0
3	SO4	B	2003	-	-	0/0/0/0	0/0/0/0
4	HAL	H	1002	-	-	0/30/32/32	0/2/2/2

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	H	1002	HAL	P-C5	-40.32	1.46	1.84
4	A	1001	HAL	P-C5	-37.62	1.49	1.84
4	H	1002	HAL	P-O4	-3.68	1.47	1.56
4	A	1001	HAL	P-O4	-3.25	1.48	1.56
4	H	1002	HAL	P-O2	2.68	1.60	1.57

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	H	1002	HAL	O3-P-C5	-4.31	106.52	114.29
4	A	1001	HAL	O3-P-C5	-4.03	107.03	114.29
4	A	1001	HAL	O2-P-O3	-2.70	108.46	115.01
4	H	1002	HAL	O2-P-O3	-2.58	108.75	115.01

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	H	1002	HAL	2	0

## 5.7 Other polymers ⓘ

There are no such residues in this entry.

## 5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

## 6 Fit of model and data [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	218/219 (99%)	-0.56	0 100 100	10, 20, 36, 50	0
1	L	216/219 (98%)	-0.04	7 (3%) 51 60	15, 29, 55, 67	0
2	B	210/227 (92%)	-0.58	1 (0%) 91 93	9, 18, 32, 45	0
2	H	209/227 (92%)	-0.43	2 (0%) 84 87	11, 21, 38, 55	0
All	All	853/892 (95%)	-0.40	10 (1%) 81 85	9, 21, 44, 67	0

The worst 5 of 10 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	H	41	PRO	3.6
1	L	202	THR	2.7
1	L	60	ASP	2.5
2	H	42	GLY	2.5
1	L	77	ARG	2.3

### 6.2 Non-standard residues in protein, DNA, RNA chains [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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	PCA	H	1	8/9	0.82	0.21	-	19,20,23,27	0
2	PCA	B	1	8/9	0.87	0.17	-	24,27,29,32	0

### 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	SO4	B	2002	5/5	0.89	0.24	5.35	66,66,71,81	0
3	SO4	A	2001	5/5	0.95	0.17	0.71	51,52,64,66	0
4	HAL	H	1002	33/33	0.96	0.10	0.46	10,20,30,32	0
4	HAL	A	1001	33/33	0.97	0.08	-0.50	3,16,29,34	0
3	SO4	B	2003	5/5	0.98	0.24	-	47,56,60,65	0

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

There are no such residues in this entry.