



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 06:32 AM UTC

PDB ID : 5WAY / pdb_00005way
Title : MgaSpn protein, Mga regulator from Streptococcus pneumoniae
Authors : Osipiuk, J.
Deposited on : 2017-06-27
Resolution : 2.09 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

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>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

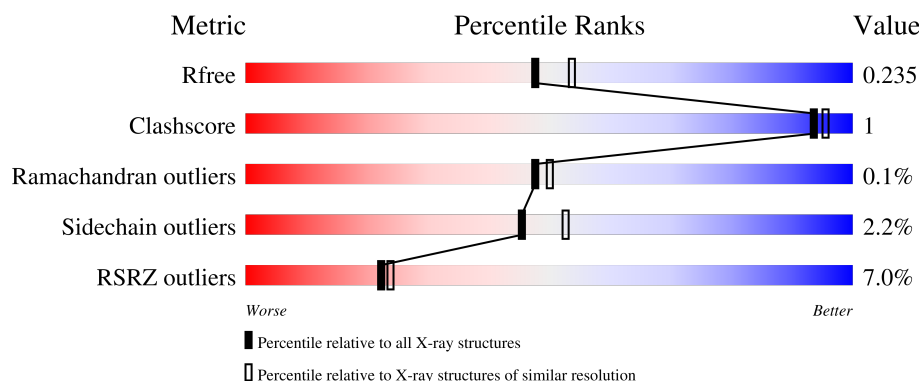
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

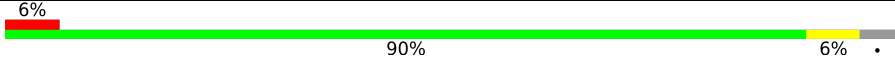
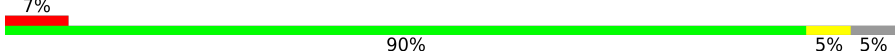
The reported resolution of this entry is 2.09 Å.

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}	180053	6658 (2.10-2.10)
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)
RSRZ outliers	180081	6662 (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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 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	501	
1	B	501	

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	GOL	B	601	-	X	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8338 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 Transcriptional activator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	482	Total	C	N	O	S	0	3	0
			4072	2649	654	749	20			
1	B	477	Total	C	N	O	S	0	1	0
			4031	2626	647	738	20			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	494	ALA	-	expression tag	UNP A0A0I9KAN0
A	495	GLY	-	expression tag	UNP A0A0I9KAN0
A	496	HIS	-	expression tag	UNP A0A0I9KAN0
A	497	HIS	-	expression tag	UNP A0A0I9KAN0
A	498	HIS	-	expression tag	UNP A0A0I9KAN0
A	499	HIS	-	expression tag	UNP A0A0I9KAN0
A	500	HIS	-	expression tag	UNP A0A0I9KAN0
A	501	HIS	-	expression tag	UNP A0A0I9KAN0
B	494	ALA	-	expression tag	UNP A0A0I9KAN0
B	495	GLY	-	expression tag	UNP A0A0I9KAN0
B	496	HIS	-	expression tag	UNP A0A0I9KAN0
B	497	HIS	-	expression tag	UNP A0A0I9KAN0
B	498	HIS	-	expression tag	UNP A0A0I9KAN0
B	499	HIS	-	expression tag	UNP A0A0I9KAN0
B	500	HIS	-	expression tag	UNP A0A0I9KAN0
B	501	HIS	-	expression tag	UNP A0A0I9KAN0

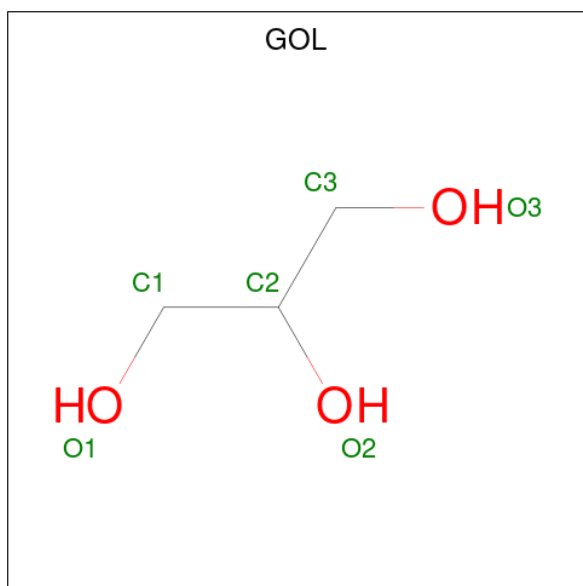
- Molecule 2 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	K	0	0
			1	1		

- Molecule 3 is NICKEL (II) ION (CCD ID: NI) (formula: Ni).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total Ni 1 1	0	0

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total C O 6 3 3	0	0

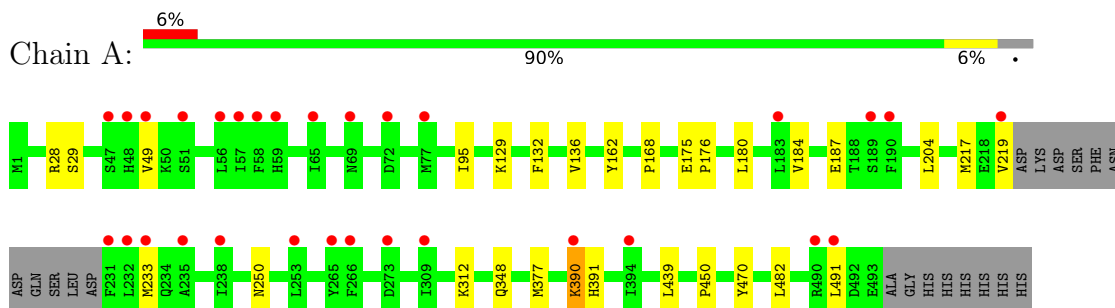
- Molecule 5 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	131	Total O 131 131	0	0
5	B	96	Total O 96 96	0	0

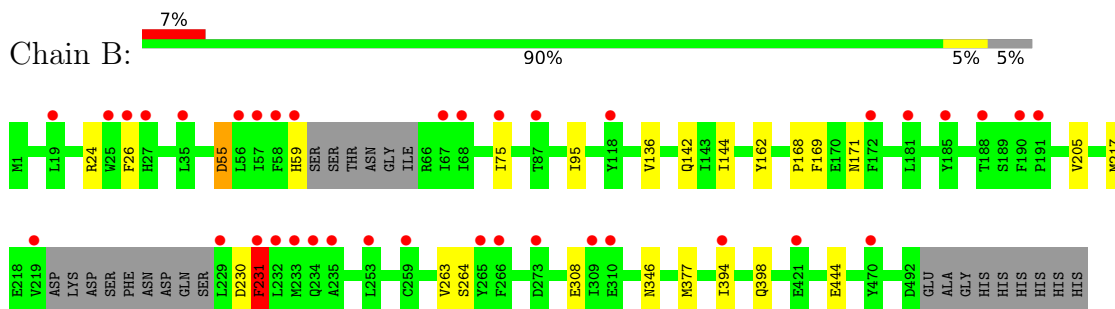
3 Residue-property plots

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: Transcriptional activator



• Molecule 1: Transcriptional activator



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	80.12Å 106.26Å 100.21Å 90.00° 101.76° 90.00°	Depositor
Resolution (Å)	49.51 – 2.09 49.51 – 2.09	Depositor EDS
% Data completeness (in resolution range)	98.1 (49.51-2.09) 98.1 (49.51-2.09)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.04 (at 2.08Å)	Xtriage
Refinement program	REFMAC 5.8.0069	Depositor
R, R_{free}	0.193 , 0.232 0.200 , 0.235	Depositor DCC
R_{free} test set	4813 reflections (4.96%)	wwPDB-VP
Wilson B-factor (Å ²)	46.3	Xtriage
Anisotropy	0.370	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.31 , 32.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8338	wwPDB-VP
Average B, all atoms (Å ²)	63.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.93% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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: K, GOL, NI

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	0.71	1/4182 (0.0%)	0.82	0/5644
1	B	0.67	0/4134	0.82	0/5578
All	All	0.69	1/8316 (0.0%)	0.82	0/11222

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	450	PRO	CA-C	5.08	1.57	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	4072	0	4006	9	0
1	B	4031	0	3964	14	0
2	A	1	0	0	0	0
3	A	1	0	0	0	0
4	B	6	0	8	0	0
5	A	131	0	0	1	0
5	B	96	0	0	2	0
All	All	8338	0	7978	22	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 1.

All (22) 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:B:230:ASP:O	1:B:231:PHE:C	2.54	0.50
1:A:180:LEU:O	1:A:184:VAL:HG23	2.12	0.50
1:B:394:ILE:H	1:B:394:ILE:HD12	1.79	0.46
1:B:169:PHE:CE2	1:B:205:VAL:HG11	2.52	0.45
1:A:129:LYS:HA	1:A:132:PHE:O	2.18	0.43
1:B:24:ARG:HD2	1:B:26:PHE:CE2	2.53	0.43
1:A:162:TYR:CD2	1:A:168:PRO:HG3	2.54	0.43
1:B:55:ASP:OD1	1:B:55:ASP:N	2.52	0.43
1:B:263:VAL:HG23	1:B:264:SER:N	2.34	0.42
1:B:308:GLU:HG3	1:B:308:GLU:O	2.19	0.42
1:A:377:MET:HA	1:A:377:MET:HE2	2.00	0.42
1:B:377:MET:HA	1:B:377:MET:HE2	2.01	0.42
1:B:398:GLN:HA	5:B:724:HOH:O	2.19	0.42
1:A:175:GLU:HB2	1:A:176:PRO:HD3	2.02	0.41
1:A:348:GLN:NE2	5:A:802:HOH:O	2.43	0.41
1:A:470:TYR:OH	1:B:75:ILE:HG22	2.21	0.41
1:B:142:GLN:HG3	1:B:144:ILE:HG12	2.03	0.40
1:A:95:ILE:HD13	1:A:136:VAL:HG11	2.03	0.40
1:A:390:LYS:HB3	1:A:391:HIS:CD2	2.55	0.40
1:B:95:ILE:HD13	1:B:136:VAL:HG11	2.03	0.40
1:B:162:TYR:CD2	1:B:168:PRO:HG3	2.57	0.40
1:B:346:ASN:ND2	5:B:703:HOH:O	2.48	0.40

There are no symmetry-related clashes.

5.3 Torsion angles ⓘ

5.3.1 Protein backbone ⓘ

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	481/501 (96%)	468 (97%)	13 (3%)	0	100	100
1	B	472/501 (94%)	457 (97%)	14 (3%)	1 (0%)	43	44
All	All	953/1002 (95%)	925 (97%)	27 (3%)	1 (0%)	48	50

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	231	PHE

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	467/481 (97%)	453 (97%)	14 (3%)	36	41
1	B	461/481 (96%)	455 (99%)	6 (1%)	61	69
All	All	928/962 (96%)	908 (98%)	20 (2%)	45	53

All (20) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	28	ARG
1	A	29	SER
1	A	49	VAL
1	A	187	GLU
1	A	204	LEU
1	A	217	MET
1	A	219	VAL
1	A	233	MET
1	A	250	ASN
1	A	312	LYS
1	A	390	LYS
1	A	439	LEU
1	A	482	LEU
1	A	491	LEU
1	B	55	ASP

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Mol	Chain	Res	Type
1	B	59	HIS
1	B	171	ASN
1	B	217	MET
1	B	231	PHE
1	B	444	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	59	HIS
1	A	63	ASN
1	A	171	ASN
1	A	300	GLN
1	A	348	GLN
1	A	395	ASN
1	A	398	GLN
1	B	22	HIS
1	B	48	HIS
1	B	133	GLN
1	B	142	GLN
1	B	179	GLN
1	B	267	GLN
1	B	314	ASN
1	B	328	GLN
1	B	395	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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\# Z > 2$
4	GOL	B	601	-	5,5,5	1.56	1 (20%)	5,5,5	2.05	4 (80%)

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	GOL	B	601	-	-	4/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	B	601	GOL	O1-C1	2.16	1.51	1.42

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	B	601	GOL	O3-C3-C2	2.59	122.02	110.38
4	B	601	GOL	O2-C2-C1	2.29	118.64	109.18
4	B	601	GOL	O1-C1-C2	2.10	119.82	110.38
4	B	601	GOL	O2-C2-C3	-2.04	100.72	109.18

There are no chirality outliers.

All (4) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	B	601	GOL	O1-C1-C2-C3
4	B	601	GOL	C1-C2-C3-O3
4	B	601	GOL	O2-C2-C3-O3

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Mol	Chain	Res	Type	Atoms
4	B	601	GOL	O1-C1-C2-O2

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, 95th 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 ²)	Q < 0.9
1	A	482/501 (96%)	0.41	30 (6%)	26 28	31, 55, 99, 117	3 (0%)
1	B	477/501 (95%)	0.56	37 (7%)	19 20	35, 61, 110, 129	1 (0%)
All	All	959/1002 (95%)	0.48	67 (6%)	22 24	31, 58, 105, 129	4 (0%)

All (67) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	190	PHE	5.4
1	B	229	LEU	4.7
1	B	266	PHE	4.6
1	B	219	VAL	4.6
1	A	231	PHE	4.6
1	B	231	PHE	4.4
1	A	219	VAL	3.6
1	B	27	HIS	3.6
1	B	191	PRO	3.5
1	A	47	SER	3.4
1	A	190	PHE	3.4
1	B	25	TRP	3.4
1	A	265	TYR	3.3
1	B	59	HIS	3.2
1	B	75	ILE	3.1
1	B	181	LEU	3.1
1	A	309	ILE	3.1
1	A	266	PHE	3.0
1	B	394	ILE	3.0
1	A	58	PHE	3.0
1	B	265	TYR	3.0
1	A	72	ASP	2.9
1	A	183	LEU	2.9
1	B	68	ILE	2.9

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Mol	Chain	Res	Type	RSRZ
1	B	172	PHE	2.9
1	B	253	LEU	2.8
1	A	65	ILE	2.8
1	A	59	HIS	2.7
1	A	232	LEU	2.7
1	B	26	PHE	2.7
1	B	470	TYR	2.7
1	A	491	LEU	2.6
1	B	309	ILE	2.6
1	B	188	THR	2.5
1	B	58	PHE	2.5
1	A	77	MET	2.5
1	A	235	ALA	2.5
1	B	233	MET	2.5
1	B	56	LEU	2.5
1	A	394	ILE	2.5
1	B	67	ILE	2.5
1	B	232	LEU	2.4
1	A	49	VAL	2.4
1	A	51	SER	2.4
1	B	87	THR	2.4
1	A	238	ILE	2.4
1	B	35	LEU	2.3
1	B	235	ALA	2.3
1	A	233	MET	2.3
1	A	189	SER	2.2
1	B	57	ILE	2.2
1	B	259	CYS	2.2
1	A	57	ILE	2.2
1	A	273	ASP	2.2
1	A	56	LEU	2.2
1	B	310	GLU	2.2
1	A	253	LEU	2.2
1	A	69	ASN	2.2
1	A	390	LYS	2.1
1	B	19	LEU	2.1
1	B	273	ASP	2.1
1	B	118	TYR	2.1
1	A	48	HIS	2.1
1	B	234	GLN	2.0
1	B	185	TYR	2.0
1	B	421	GLU	2.0

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Mol	Chain	Res	Type	RSRZ
1	A	490	ARG	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 oligosaccharides 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, 95th 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 ²)	Q<0.9
4	GOL	B	601	6/6	0.91	0.14	44,46,50,51	0
2	K	A	701	1/1	0.98	0.06	46,46,46,46	0
3	NI	A	702	1/1	1.00	0.02	48,48,48,48	0

6.5 Other polymers [i](#)

There are no such residues in this entry.