



# Full wwPDB X-ray Structure Validation Report

Feb 28, 2014 – 12:57 AM GMT

PDB ID : 3KF7  
Title : Crystal Structure of Human p38alpha Complexed With a Triazolopyrimidine compound  
Authors : Shieh, H.-S.; Williams, J.M.; Stegeman, R.A.; Xing, L.; Jerome, K.D.  
Deposited on : 2009-10-27  
Resolution : 2.00 Å(reported)

This is a full wwPDB validation report for a publicly released PDB entry.  
We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)  
A user guide is available at <http://wwpdb.org/ValidationPDFNotes.html>

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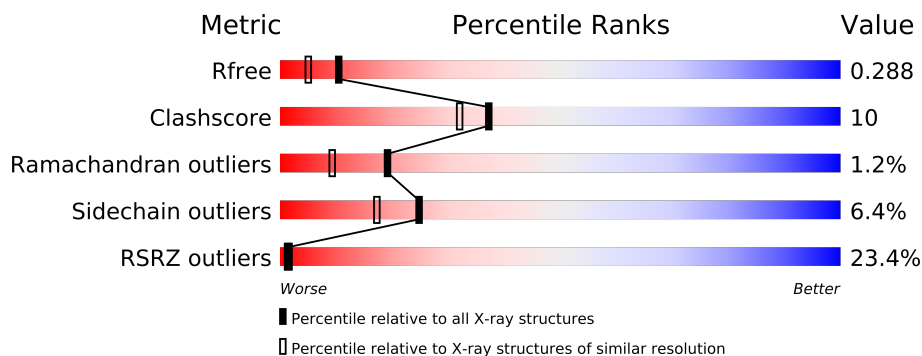
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467  
Mogul : 1.15 2013  
Xtriage (Phenix) : dev-1323  
EDS : stable22639  
Percentile statistics : 21963  
Refmac : 5.8.0049  
CCP4 : 6.3.0 (Settle)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)  
Validation Pipeline (wwPDB-VP) : stable22683

# 1 Overall quality at a glance

The reported resolution of this entry is 2.00 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))
$R_{free}$	66092	4888 (2.00-2.00)
Clashscore	79885	6188 (2.00-2.00)
Ramachandran outliers	78287	6102 (2.00-2.00)
Sidechain outliers	78261	6100 (2.00-2.00)
RSRZ outliers	66119	4890 (2.00-2.00)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	360	

## 2 Entry composition i

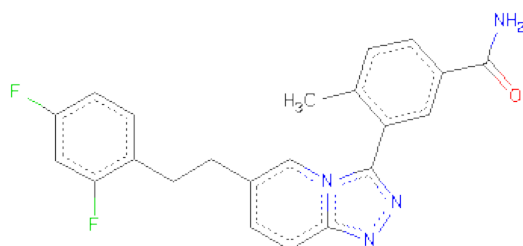
There are 3 unique types of molecules in this entry. The entry contains 2890 atoms, of which 0 are hydrogen and 0 are deuterium.

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 Mitogen-activated protein kinase 14.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	337	Total	C	N	O	S	0	0	0
			2715	1743	464	496	12			

- Molecule 2 is 3-{6-[2-(2,4-DIFLUOROPHENYL)ETHYL][1,2,4]TRIAZOLO[4,3-A]PYRIDIN-3-YL}-4-METHYLBENZAMIDE (three-letter code: L9G) (formula: C<sub>22</sub>H<sub>18</sub>F<sub>2</sub>N<sub>4</sub>O).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	F	N	O	0	0
			29	22	2	4	1		

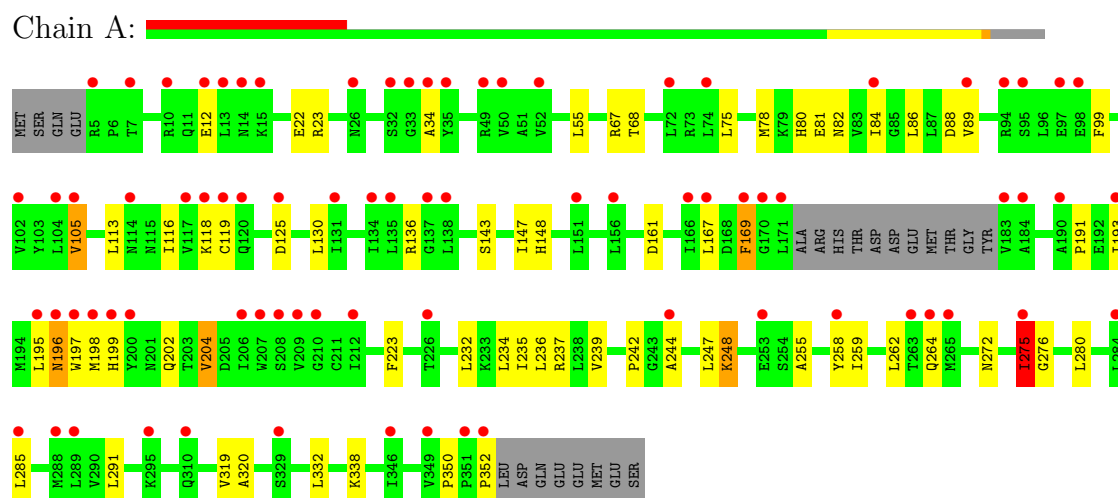
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	146	Total	O	0	0
			146	146		

### 3 Residue-property plots

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: Mitogen-activated protein kinase 14



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	65.07Å 74.33Å 77.62Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	24.81 – 2.00 20.89 – 2.00	Depositor EDS
% Data completeness (in resolution range)	97.6 (24.81-2.00) 97.7 (20.89-2.00)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	0.04	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.97 (at 2.01Å)	Xtriage
Refinement program	REFMAC 5.5.0102	Depositor
R, $R_{free}$	0.233 , 0.274 0.250 , 0.288	Depositor DCC
$R_{free}$ test set	1288 reflections (5.36%)	DCC
Wilson B-factor (Å <sup>2</sup> )	42.1	Xtriage
Anisotropy	0.035	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.41 , 40.4	EDS
Estimated twinning fraction	0.023 for -h,l,k	Xtriage
L-test for twinning	$\langle  L  \rangle = 0.48$ , $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 25330 reflections	Xtriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	2890	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	30.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.82% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: L9G

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	0.52	0/2778	0.63	0/3771

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

### 5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	2715	0	2713	55	0
2	A	29	0	18	0	0
3	A	146	0	0	3	0
All	All	2890	0	2731	55	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 10.

All (55) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:86:LEU:HD13	1:A:89:VAL:CG2	2.01	0.91

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:275:ILE:HD13	1:A:276:GLY:H	1.42	0.83
1:A:234:LEU:O	1:A:237:ARG:HG3	1.79	0.82
1:A:86:LEU:HD13	1:A:89:VAL:HG23	1.62	0.80
1:A:195:LEU:HD21	1:A:255:ALA:CB	2.13	0.78
1:A:232:LEU:HD23	1:A:236:LEU:HD22	1.68	0.75
1:A:232:LEU:CD2	1:A:236:LEU:HD22	2.17	0.74
1:A:193:ILE:HD11	1:A:204:VAL:CG2	2.17	0.73
1:A:275:ILE:CD1	1:A:276:GLY:H	2.02	0.72
1:A:80:HIS:HD2	1:A:82:ASN:H	1.38	0.71
1:A:80:HIS:CD2	1:A:82:ASN:H	2.11	0.69
1:A:148:HIS:CD2	1:A:169:PHE:HA	2.33	0.63
1:A:143:SER:HB2	1:A:319:VAL:HG13	1.81	0.62
1:A:193:ILE:HD11	1:A:204:VAL:HG22	1.80	0.61
1:A:86:LEU:HD13	1:A:89:VAL:HG21	1.83	0.61
1:A:193:ILE:HD11	1:A:204:VAL:HG21	1.82	0.61
1:A:195:LEU:HD21	1:A:255:ALA:HB1	1.82	0.60
1:A:195:LEU:HD11	1:A:255:ALA:CB	2.32	0.60
1:A:143:SER:CB	1:A:319:VAL:HG13	2.32	0.59
1:A:244:ALA:O	1:A:248:LYS:HD2	2.03	0.58
1:A:191:PRO:HG3	1:A:291:LEU:HD12	1.86	0.57
1:A:350:PRO:HB2	1:A:352:PRO:HD2	1.85	0.57
1:A:88:ASP:HB3	1:A:105:VAL:HG13	1.86	0.57
1:A:78:MET:HG3	1:A:169:PHE:CE1	2.39	0.57
1:A:272:ASN:O	1:A:275:ILE:HG23	2.06	0.55
1:A:242:PRO:HG2	1:A:259:ILE:HG21	1.87	0.54
1:A:81:GLU:CG	1:A:136:ARG:HH22	2.21	0.54
1:A:99:PHE:O	1:A:338:LYS:HE3	2.11	0.51
1:A:275:ILE:CD1	1:A:276:GLY:N	2.73	0.50
1:A:67:ARG:NH1	1:A:68:THR:OG1	2.45	0.50
1:A:195:LEU:HD11	1:A:255:ALA:HB2	1.94	0.49
1:A:197:TRP:CE2	1:A:199:HIS:HB2	2.47	0.49
1:A:196:ASN:ND2	3:A:617:HOH:O	2.45	0.49
1:A:143:SER:OG	1:A:319:VAL:HG13	2.14	0.47
1:A:81:GLU:HG3	1:A:136:ARG:HH22	1.80	0.47
1:A:84:ILE:HG21	1:A:167:LEU:HD23	1.97	0.47
1:A:84:ILE:CG2	1:A:167:LEU:HD23	2.45	0.47
1:A:242:PRO:HG2	1:A:259:ILE:HD13	1.97	0.46
1:A:195:LEU:O	1:A:195:LEU:HD13	2.16	0.46
1:A:244:ALA:O	1:A:248:LYS:CD	2.65	0.45
1:A:258:TYR:CE1	1:A:262:LEU:HD21	2.51	0.45
1:A:148:HIS:CD2	1:A:169:PHE:CA	3.00	0.45
1:A:84:ILE:HG21	1:A:167:LEU:CD2	2.46	0.45

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:147:ILE:HG12	1:A:202:GLN:HG2	2.00	0.44
1:A:197:TRP:CZ2	1:A:199:HIS:HB2	2.53	0.44
1:A:55:LEU:HD12	1:A:68:THR:HG23	1.99	0.43
1:A:223:PHE:CE2	1:A:235:ILE:HA	2.53	0.43
1:A:195:LEU:HD21	1:A:255:ALA:CA	2.49	0.43
1:A:272:ASN:ND2	3:A:616:HOH:O	2.52	0.43
1:A:247:LEU:HD11	3:A:589:HOH:O	2.18	0.43
1:A:55:LEU:HD13	1:A:67:ARG:HH11	1.84	0.42
1:A:195:LEU:HD21	1:A:255:ALA:HA	2.03	0.41
1:A:239:VAL:HG21	1:A:291:LEU:HD13	2.02	0.41
1:A:75:LEU:HB3	1:A:86:LEU:HG	2.02	0.40
1:A:319:VAL:CG1	1:A:320:ALA:N	2.84	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	333/360 (92%)	314 (94%)	15 (4%)	4 (1%)	19 9

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	275	ILE
1	A	169	PHE
1	A	196	ASN
1	A	34	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	297/320 (93%)	278 (94%)	19 (6%)	25	17

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	12	GLU
1	A	22	GLU
1	A	23	ARG
1	A	105	VAL
1	A	113	LEU
1	A	116	ILE
1	A	118	LYS
1	A	119	CYS
1	A	125	ASP
1	A	130	LEU
1	A	161	ASP
1	A	198	MET
1	A	204	VAL
1	A	248	LYS
1	A	264	GLN
1	A	275	ILE
1	A	280	LEU
1	A	285	LEU
1	A	332	LEU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	64	HIS
1	A	77	HIS
1	A	80	HIS
1	A	120	GLN
1	A	128	GLN
1	A	155	ASN
1	A	196	ASN
1	A	257	ASN
1	A	264	GLN
1	A	272	ASN

### 5.3.3 RNA ⓘ

There are no RNA chains 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 carbohydrates in this entry.

## 5.6 Ligand geometry ⓘ

1 ligand is 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	L9G	A	401	-	32,32,32	2.46	4 (12%)	46,46,46	2.25	9 (19%)

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	L9G	A	401	-	-	0/13/13/13	0/2/4/4

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	L9G	C1-C2	8.53	1.53	1.40
2	A	401	L9G	C4-N3	8.44	1.47	1.39
2	A	401	L9G	C7-N9	-4.26	1.28	1.33
2	A	401	L9G	C2-N3	-4.17	1.33	1.42

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	L9G	C4-C5-C6	6.77	122.64	117.49
2	A	401	L9G	C20-C7-N3	6.60	131.79	126.69
2	A	401	L9G	C6-C1-C2	-6.45	113.03	119.68
2	A	401	L9G	N8-C2-N3	-3.76	107.52	112.92
2	A	401	L9G	C1-C2-N3	3.22	122.20	117.81
2	A	401	L9G	C22-C26-N27	-2.72	114.67	117.77
2	A	401	L9G	O28-C26-N27	2.69	126.48	122.59
2	A	401	L9G	F18-C13-C12	2.14	121.39	117.88
2	A	401	L9G	C24-C23-C22	-2.01	118.36	120.76

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

## 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 ⓘ

### 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	337/360 (93%)	1.35	79 (23%) 1 1	17, 28, 49, 58	0

All (79) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	119	CYS	9.8
1	A	118	LYS	7.4
1	A	352	PRO	6.7
1	A	35	TYR	6.4
1	A	183	VAL	6.0
1	A	34	ALA	6.0
1	A	209	VAL	5.7
1	A	197	TRP	5.4
1	A	195	LEU	5.4
1	A	134	ILE	5.3
1	A	166	ILE	5.0
1	A	135	LEU	4.8
1	A	351	PRO	4.7
1	A	198	MET	4.7
1	A	117	VAL	4.5
1	A	104	LEU	4.3
1	A	13	LEU	4.3
1	A	199	HIS	4.2
1	A	253	GLU	4.1
1	A	138	LEU	4.0
1	A	32	SER	4.0
1	A	258	TYR	4.0
1	A	200	TYR	3.9
1	A	275	ILE	3.9
1	A	97	GLU	3.8
1	A	169	PHE	3.7
1	A	84	ILE	3.6

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Mol	Chain	Res	Type	RSRZ
1	A	120	GLN	3.5
1	A	33	GLY	3.3
1	A	349	VAL	3.3
1	A	131	ILE	3.3
1	A	207	TRP	3.2
1	A	52	VAL	3.2
1	A	26	ASN	3.1
1	A	212	ILE	3.1
1	A	206	ILE	3.1
1	A	10	ARG	3.0
1	A	102	VAL	3.0
1	A	156	LEU	3.0
1	A	94	ARG	3.0
1	A	105	VAL	2.9
1	A	244	ALA	2.9
1	A	263	THR	2.9
1	A	137	GLY	2.8
1	A	285	LEU	2.8
1	A	210	GLY	2.8
1	A	151	LEU	2.7
1	A	190	ALA	2.7
1	A	72	LEU	2.7
1	A	295	LYS	2.6
1	A	170	GLY	2.6
1	A	265	MET	2.6
1	A	329	SER	2.6
1	A	5	ARG	2.5
1	A	289	LEU	2.5
1	A	98	GLU	2.5
1	A	49	ARG	2.5
1	A	284	LEU	2.4
1	A	264	GLN	2.4
1	A	310	GLN	2.4
1	A	288	MET	2.4
1	A	171	LEU	2.4
1	A	12	GLU	2.4
1	A	7	THR	2.4
1	A	184	ALA	2.3
1	A	346	ILE	2.3
1	A	89	VAL	2.3
1	A	208	SER	2.3
1	A	193	ILE	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	226	THR	2.3
1	A	50	VAL	2.2
1	A	196	ASN	2.2
1	A	167	LEU	2.2
1	A	114	ASN	2.2
1	A	125	ASP	2.1
1	A	14	ASN	2.1
1	A	95	SER	2.1
1	A	74	LEU	2.0
1	A	15	LYS	2.0

## 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 carbohydrates 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. 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	RSR	LLDF	B-factors(Å <sup>2</sup> )	Q<0.9
2	L9G	A	401	29/29	0.24	0.76	30,33,42,43	0

## 6.5 Other polymers ⓘ

There are no such residues in this entry.