



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 12, 2017 – 07:37 pm GMT

PDB ID : 2I5F  
Title : Crystal structure of the C-terminal PH domain of pleckstrin in complex with D-myo-Ins(1,2,3,5,6)P5  
Authors : Jackson, S.G.; Haslam, R.J.; Junop, M.S.  
Deposited on : 2006-08-24  
Resolution : 1.35 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](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.

---

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

MolProbity	:	4.02b-467
Mogul	:	1.7.2 (RC1), CSD as538be (2017)
Xtriage (Phenix)	:	1.9-1692
EDS	:	trunk28620
Percentile statistics	:	20161228.v01 (using entries in the PDB archive December 28th 2016)
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)	:	recalc28949

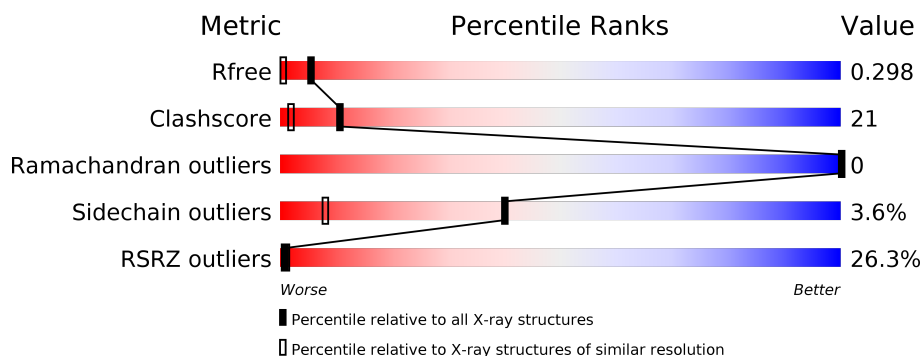
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 1.35 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))
$R_{free}$	100719	1024 (1.38-1.34)
Clashscore	112137	1063 (1.38-1.34)
Ramachandran outliers	110173	1048 (1.38-1.34)
Sidechain outliers	110143	1048 (1.38-1.34)
RSRZ outliers	101464	1025 (1.38-1.34)

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	109	<div> <div>24%</div> <div>64%</div> <div>20%</div> <div>6%</div> <div>9%</div> </div>

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	5IP	A	550	-	-	-	X

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 999 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.

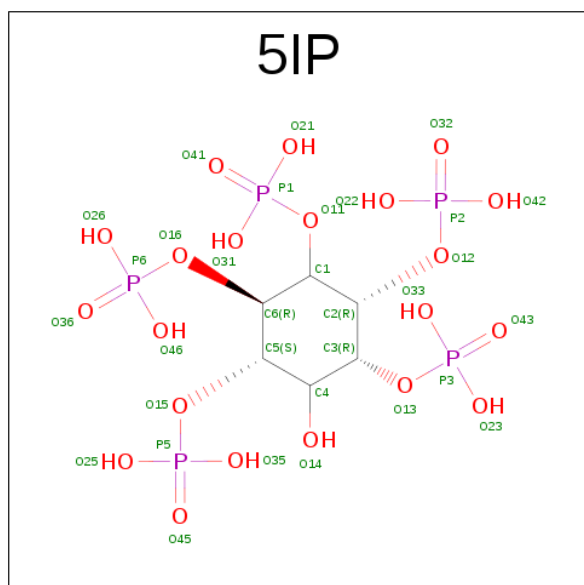
- Molecule 1 is a protein called Pleckstrin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	99	843	547	145	147	4	0	7	0

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	239	GLY	-	CLONING ARTIFACT	UNP P08567
A	240	SER	-	CLONING ARTIFACT	UNP P08567
A	241	PHE	-	CLONING ARTIFACT	UNP P08567
A	242	THR	-	CLONING ARTIFACT	UNP P08567
A	243	GLY	-	CLONING ARTIFACT	UNP P08567

- Molecule 2 is (1R,2R,3R,4R,5S,6S)-6-HYDROXYCYCLOHEXANE-1,2,3,4,5-PENTAYL PENTAKIS[DIHYDROGEN (PHOSPHATE)] (three-letter code: 5IP) (formula:  $C_6H_{17}O_{21}P_5$ ).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	O	P	0	0
			32	6	21	5		

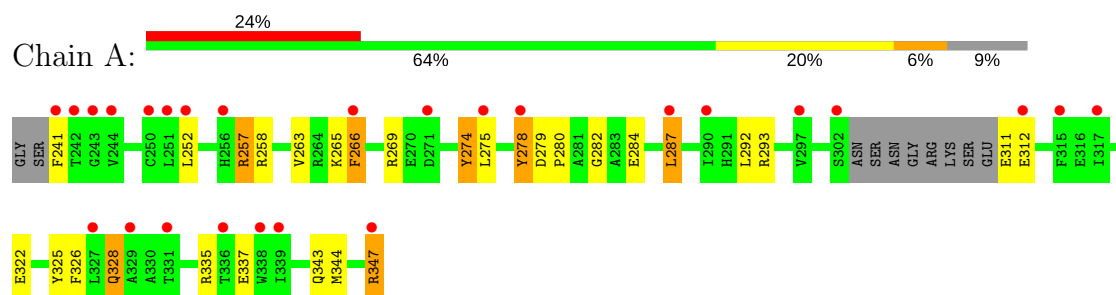
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	124	Total	O	0	0
			124	124		

### 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: Pleckstrin



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	32.15Å 47.70Å 64.06Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	28.70 – 1.35 28.73 – 1.35	Depositor EDS
% Data completeness (in resolution range)	97.7 (28.70-1.35) 97.7 (28.73-1.35)	Depositor EDS
$R_{merge}$	0.04	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.39 (at 1.35Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, $R_{free}$	0.179 , 0.208 0.269 , 0.298	Depositor DCC
$R_{free}$ test set	1083 reflections (4.97%)	DCC
Wilson B-factor (Å <sup>2</sup> )	15.2	Xtriage
Anisotropy	0.042	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.42 , 42.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.50$ , $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	999	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.30% 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: 5IP

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	1.46	8/882 (0.9%)	1.56	16/1186 (1.3%)

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	274	TYR	CE2-CZ	-8.66	1.27	1.38
1	A	322	GLU	CB-CG	7.08	1.65	1.52
1	A	328	GLN	CB-CG	-5.75	1.37	1.52
1	A	337	GLU	CD-OE2	5.72	1.31	1.25
1	A	284	GLU	CG-CD	5.71	1.60	1.51
1	A	335	ARG	CZ-NH2	5.22	1.39	1.33
1	A	335	ARG	NE-CZ	-5.20	1.26	1.33
1	A	328	GLN	CD-NE2	-5.11	1.20	1.32

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	258	ARG	NE-CZ-NH2	-13.97	113.31	120.30
1	A	269	ARG	NE-CZ-NH1	10.69	125.64	120.30
1	A	258	ARG	NE-CZ-NH1	9.89	125.25	120.30
1	A	335	ARG	NE-CZ-NH1	8.47	124.53	120.30
1	A	269	ARG	NE-CZ-NH2	-7.65	116.48	120.30
1	A	266	PHE	CB-CG-CD2	-6.98	115.91	120.80
1	A	287[A]	LEU	CB-CG-CD1	-6.77	99.49	111.00
1	A	287[B]	LEU	CB-CG-CD1	-6.77	99.49	111.00
1	A	278	TYR	CB-CG-CD1	-5.93	117.44	121.00
1	A	278	TYR	CB-CG-CD2	5.79	124.48	121.00
1	A	278	TYR	CG-CD1-CE1	5.49	125.69	121.30
1	A	266	PHE	CB-CG-CD1	5.38	124.56	120.80
1	A	257	ARG	NE-CZ-NH2	-5.34	117.63	120.30

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	293	ARG	NE-CZ-NH2	-5.31	117.64	120.30
1	A	257	ARG	NE-CZ-NH1	5.16	122.88	120.30
1	A	325	TYR	CB-CG-CD1	5.02	124.01	121.00

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	843	0	874	36	0
2	A	32	0	6	2	0
3	A	124	0	0	11	0
All	All	999	0	880	36	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 21.

All (36) 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:A:266:PHE:HD2	1:A:275[B]:LEU:HD11	1.28	0.98
1:A:347:ARG:HG3	1:A:347:ARG:HH11	1.31	0.95
1:A:279:ASP:HB2	3:A:68:HOH:O	1.66	0.93
1:A:344[A]:MET:HG2	3:A:125:HOH:O	1.66	0.93
1:A:280:PRO:HD2	3:A:68:HOH:O	1.73	0.88
1:A:287[B]:LEU:HD11	3:A:4:HOH:O	1.75	0.86
1:A:344[A]:MET:HG2	3:A:95:HOH:O	1.79	0.82
1:A:347:ARG:CG	1:A:347:ARG:HH11	1.93	0.81
1:A:344[A]:MET:CG	3:A:95:HOH:O	2.31	0.79
1:A:257:ARG:HB2	2:A:550:5IP:O45	1.84	0.77
1:A:287[B]:LEU:CD1	3:A:4:HOH:O	2.38	0.70
1:A:278:TYR:HA	1:A:287[B]:LEU:HD13	1.77	0.66
1:A:344[A]:MET:CE	3:A:95:HOH:O	2.43	0.65
1:A:344[A]:MET:HE2	3:A:125:HOH:O	1.97	0.64

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:252:LEU:CD2	1:A:263:VAL:HG22	2.28	0.64
1:A:344[A]:MET:HE3	3:A:95:HOH:O	1.98	0.61
1:A:266:PHE:CD2	1:A:275[B]:LEU:HD11	2.21	0.61
1:A:252:LEU:HD21	1:A:263:VAL:HG22	1.84	0.58
1:A:252:LEU:HD21	1:A:263:VAL:CG2	2.40	0.52
1:A:241:PHE:HE2	1:A:274:TYR:CE1	2.28	0.52
1:A:252:LEU:CD2	1:A:263:VAL:CG2	2.89	0.51
1:A:343:GLN:HE21	1:A:347:ARG:HH21	1.58	0.50
1:A:252:LEU:HD23	1:A:263:VAL:HG22	1.94	0.49
1:A:265[A]:LYS:HE2	1:A:282:GLY:HA3	1.96	0.47
1:A:312:GLU:H	1:A:328:GLN:NE2	2.12	0.47
1:A:347:ARG:NH1	1:A:347:ARG:HG3	2.10	0.47
1:A:280:PRO:CD	3:A:68:HOH:O	2.48	0.44
1:A:252:LEU:HD23	1:A:263:VAL:HA	1.99	0.43
1:A:275[B]:LEU:HB2	1:A:292:LEU:HD11	2.00	0.43
1:A:312:GLU:O	1:A:328:GLN:HG3	2.21	0.41
1:A:257:ARG:HB2	2:A:550:5IP:P5	2.60	0.41

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	102/109 (94%)	100 (98%)	2 (2%)	0	100	100

There are no Ramachandran outliers to report.

### 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	91/92 (99%)	88 (97%)	3 (3%)	43	10

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	311	GLU
1	A	326	PHE
1	A	347	ARG

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

Mol	Chain	Res	Type
1	A	328	GLN

### 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](#)

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	5IP	A	550	-	32,32,32	2.25	9 (28%)	48,53,53	2.93	19 (39%)

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	5IP	A	550	-	-	0/25/49/49	0/1/1/1

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	550	5IP	O15-C5	-3.73	1.30	1.44
2	A	550	5IP	P1-O11	2.39	1.63	1.59
2	A	550	5IP	C2-C1	2.53	1.57	1.52
2	A	550	5IP	C2-C3	2.57	1.57	1.52
2	A	550	5IP	P6-O36	2.70	1.59	1.50
2	A	550	5IP	O14-C4	3.17	1.50	1.43
2	A	550	5IP	P6-O16	3.25	1.65	1.59
2	A	550	5IP	C4-C5	4.10	1.63	1.52
2	A	550	5IP	P5-O25	8.50	1.89	1.54

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	550	5IP	O12-C2-C1	-10.11	84.78	108.68
2	A	550	5IP	O35-P5-O15	-5.78	79.72	106.00
2	A	550	5IP	O13-C3-C4	-3.54	100.40	108.66
2	A	550	5IP	O14-C4-C3	-3.23	102.51	109.87
2	A	550	5IP	O23-P3-O13	-2.32	95.45	106.00
2	A	550	5IP	O26-P6-O46	-2.15	98.92	107.61
2	A	550	5IP	O16-P6-O36	-2.13	100.93	109.26
2	A	550	5IP	O21-P1-O11	-2.09	96.51	106.00
2	A	550	5IP	O11-P1-O41	-2.02	101.35	109.26
2	A	550	5IP	O22-P2-O12	2.39	116.85	106.00
2	A	550	5IP	C2-C1-C6	2.41	115.79	110.46
2	A	550	5IP	O15-P5-O45	2.73	119.94	109.26
2	A	550	5IP	O15-C5-C6	2.82	115.35	108.68
2	A	550	5IP	O13-C3-C2	3.43	116.77	108.68
2	A	550	5IP	O26-P6-O36	3.62	124.67	110.50
2	A	550	5IP	O35-P5-O45	3.65	124.79	110.50

*Continued on next page...*

*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	550	5IP	O11-C1-C2	4.90	120.26	108.68
2	A	550	5IP	C4-C5-C6	6.41	126.49	111.65
2	A	550	5IP	C3-C2-C1	8.06	128.32	110.46

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
2	A	550	5IP	2	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 ⓘ

### 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	99/109 (90%)	1.43	26 (26%) <b>1</b> <b>1</b>	18, 21, 34, 44	0

All (26) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	242	THR	9.1
1	A	244	VAL	5.7
1	A	241	PHE	5.1
1	A	347	ARG	4.6
1	A	251	LEU	3.8
1	A	327	LEU	3.8
1	A	275[A]	LEU	3.6
1	A	315	PHE	3.4
1	A	266	PHE	3.3
1	A	290	ILE	3.0
1	A	317	ILE	3.0
1	A	336	THR	2.8
1	A	287[A]	LEU	2.8
1	A	297	VAL	2.8
1	A	256	HIS	2.7
1	A	278	TYR	2.7
1	A	271	ASP	2.7
1	A	338	TRP	2.7
1	A	312	GLU	2.6
1	A	302	SER	2.4
1	A	250	CYS	2.3
1	A	243	GLY	2.3
1	A	252	LEU	2.3
1	A	329	ALA	2.2
1	A	339	ILE	2.1
1	A	331	THR	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 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(Å <sup>2</sup> )	Q<0.9
2	5IP	A	550	32/32	0.71	0.23	2.75	17,32,39,41	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.