



Full wwPDB X-ray Structure Validation Report ⓘ

Dec 9, 2024 – 03:27 pm GMT

PDB ID : 9GDI
Title : HUMAN PI3KDELTA IN COMPLEX WITH ISOCUMARIN INHIBITOR 10
Authors : Pala, D.; Bruno, P.; Capelli, A.M.; Biagetti, M.
Deposited on : 2024-08-05
Resolution : 2.81 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	:	4.02b-467
Mogul	:	1.8.4, CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.003 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.40

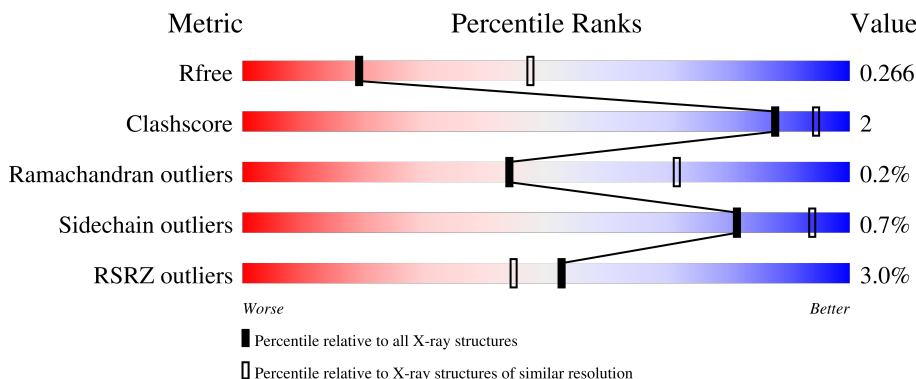
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.81 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}	164625	4293 (2.84-2.80)
Clashscore	180529	4801 (2.84-2.80)
Ramachandran outliers	177936	4739 (2.84-2.80)
Sidechain outliers	177891	4741 (2.84-2.80)
RSRZ outliers	164620	4295 (2.84-2.80)

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	1044	
2	B	170	

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 8947 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.

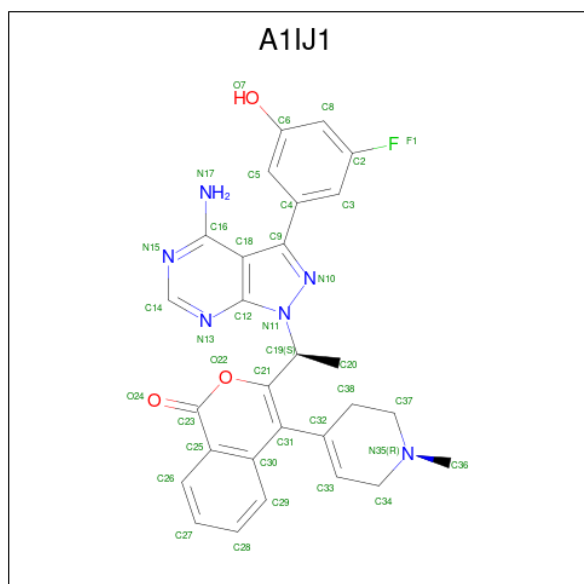
- Molecule 1 is a protein called Phosphatidylinositol 4,5-bisphosphate 3-kinase catalytic subunit delta isoform.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	932	Total	C	N	O	S	677	0	0
			7518	4811	1283	1371	53			

- Molecule 2 is a protein called Phosphatidylinositol 3-kinase regulatory subunit alpha.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	160	Total	C	N	O	S	170	0	0
			1386	862	252	267	5			

- Molecule 3 is 3-[(1S)-1-[4-azanyl-3-(3-fluoranyl-5-oxidanyl-phenyl)pyrazolo[3,4-d]pyrimidin-1-yl]ethyl]-4-(1-methyl-3,6-dihydro-2H-pyridin-4-yl)isochromen-1-one (three-letter code: A1IJ1) (formula: C₂₈H₂₅FN₆O₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	F	N	O	0	0
			38	28	1	6	3		

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total 1	Cl 1	0	0

- Molecule 5 is water.

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

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	90.47Å 108.62Å 142.40Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	86.36 – 2.81 86.36 – 2.81	Depositor EDS
% Data completeness (in resolution range)	99.0 (86.36-2.81) 99.0 (86.36-2.81)	Depositor EDS
R_{merge}	0.04	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.62 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.6.0117	Depositor
R, R_{free}	0.246 , 0.299 0.234 , 0.266	Depositor DCC
R_{free} test set	770 reflections (2.23%)	wwPDB-VP
Wilson B-factor (Å ²)	89.2	Xtriage
Anisotropy	0.446	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 93.3	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	0.94	EDS
Total number of atoms	8947	wwPDB-VP
Average B, all atoms (Å ²)	104.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.55% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: CL, A1IJ1

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	0.51	4/7681 (0.1%)	0.57	0/10382
2	B	0.46	1/1405 (0.1%)	0.60	0/1873
All	All	0.50	5/9086 (0.1%)	0.57	0/12255

All (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	555	TRP	CD2-CE2	5.33	1.47	1.41
2	B	583	TRP	CD2-CE2	5.21	1.47	1.41
1	A	371	TRP	CD2-CE2	5.06	1.47	1.41
1	A	1027	TRP	CD2-CE2	5.05	1.47	1.41
1	A	162	TRP	CD2-CE2	5.01	1.47	1.41

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	7518	0	7510	24	0
2	B	1386	0	1382	5	0
3	A	38	0	0	0	0
4	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
5	A	3	0	0	0	0
5	B	1	0	0	0	0
All	All	8947	0	8892	29	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.

All (29) 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:325:ILE:HD13	1:A:390:LEU:HD21	1.72	0.70
1:A:600:LEU:HD22	1:A:603:LEU:HD11	1.81	0.60
2:B:484:ILE:HG13	2:B:545:LEU:HD23	1.86	0.57
1:A:583:LEU:HD11	1:A:600:LEU:HD11	1.87	0.56
1:A:331:SER:HB2	1:A:470:ALA:HB3	1.90	0.54
1:A:26:LEU:HD13	1:A:62:LEU:HD11	1.91	0.53
1:A:587:PHE:HB3	1:A:592:VAL:HG11	1.89	0.53
1:A:333:VAL:HG11	1:A:341:LEU:HD11	1.90	0.52
1:A:784:LEU:HD12	1:A:823:GLY:HA3	1.92	0.52
1:A:384:LEU:HD13	1:A:425:LEU:HD13	1.92	0.51
1:A:323:PHE:CD1	1:A:384:LEU:HD11	2.45	0.51
1:A:532:TRP:CZ3	1:A:553:THR:HG23	2.46	0.51
1:A:886:THR:HA	1:A:891:ILE:HD12	1.95	0.47
1:A:715:MET:HE1	1:A:751:PHE:CD1	2.50	0.47
2:B:484:ILE:HD12	2:B:549:LEU:HD22	1.96	0.47
1:A:546:LEU:HD13	1:A:571:TRP:CE2	2.49	0.47
1:A:358:VAL:HG11	1:A:376:GLU:O	2.15	0.46
1:A:396:ALA:HB3	1:A:416:CYS:HB3	1.98	0.46
1:A:42:LEU:HD11	1:A:92:VAL:HG21	1.98	0.46
1:A:341:LEU:HG	1:A:365:VAL:HG22	1.99	0.44
1:A:833:THR:HG23	1:A:836:ASN:H	1.82	0.44
1:A:163:LEU:CD2	1:A:240:THR:HG21	2.48	0.43
1:A:750:THR:OG1	1:A:751:PHE:N	2.52	0.43
1:A:811:THR:O	1:A:811:THR:HG22	2.18	0.43
1:A:548:ARG:O	1:A:552:VAL:HG13	2.18	0.42
2:B:581:LEU:HD21	2:B:598:LEU:HD11	2.01	0.42
2:B:449:LEU:HD22	2:B:584:LEU:HD12	2.01	0.42
1:A:479:ALA:HB1	1:A:480:PRO:HD2	2.01	0.41
2:B:480:LYS:CB	2:B:549:LEU:HD13	2.51	0.41

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	914/1044 (88%)	878 (96%)	34 (4%)	2 (0%)	44	71
2	B	158/170 (93%)	154 (98%)	4 (2%)	0	100	100
All	All	1072/1214 (88%)	1032 (96%)	38 (4%)	2 (0%)	44	71

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	174	SER
1	A	768	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	831/927 (90%)	825 (99%)	6 (1%)	81	94
2	B	151/161 (94%)	150 (99%)	1 (1%)	81	94
All	All	982/1088 (90%)	975 (99%)	7 (1%)	81	94

All (7) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	331	SER
1	A	427	ASP
1	A	459	VAL
1	A	696	ASN

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Mol	Chain	Res	Type
1	A	773	SER
1	A	915	PHE
2	B	470	TYR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	170	GLN
1	A	193	ASN
1	A	431	GLN
1	A	906	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 2 ligands modelled in this entry, 1 is 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	$\# Z > 2$
3	A1IJ1	A	1101	-	40,43,43	1.15	2 (5%)	44,64,64	1.86	10 (22%)

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
3	A1IJ1	A	1101	-	-	2/10/26/26	0/6/6/6

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	1101	A1IJ1	C9-N10	-5.06	1.31	1.35
3	A	1101	A1IJ1	N10-N11	2.01	1.40	1.37

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1101	A1IJ1	C9-N10-N11	7.58	111.23	105.17
3	A	1101	A1IJ1	N13-C14-N15	-3.44	123.31	128.68
3	A	1101	A1IJ1	C8-C2-C3	-3.27	119.39	123.52
3	A	1101	A1IJ1	C30-C25-C23	-2.71	118.05	120.96
3	A	1101	A1IJ1	O22-C23-O24	2.64	119.69	116.44
3	A	1101	A1IJ1	C3-C4-C9	-2.63	115.19	120.16
3	A	1101	A1IJ1	C5-C4-C9	2.48	124.84	120.16
3	A	1101	A1IJ1	C33-C34-N35	-2.48	110.42	112.66
3	A	1101	A1IJ1	C38-C37-N35	-2.41	108.42	110.67
3	A	1101	A1IJ1	C26-C25-C23	2.02	122.02	117.85

There are no chirality outliers.

All (2) torsion outliers are listed below:

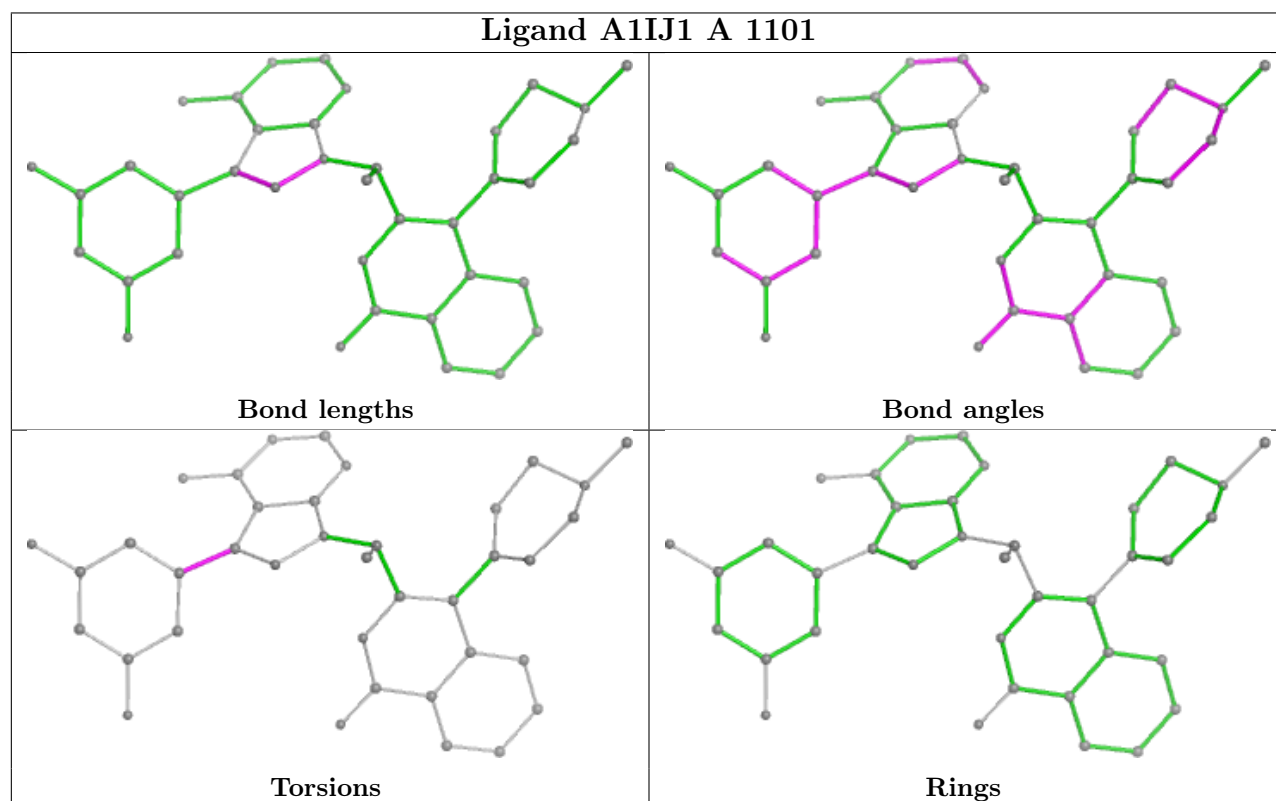
Mol	Chain	Res	Type	Atoms
3	A	1101	A1IJ1	C3-C4-C9-N10
3	A	1101	A1IJ1	C5-C4-C9-N10

There are no ring outliers.

No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be

highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.



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	932/1044 (89%)	0.20	24 (2%) 57 49	36, 88, 148, 249	221 (23%)
2	B	160/170 (94%)	0.15	9 (5%) 31 24	36, 88, 120, 173	50 (31%)
All	All	1092/1214 (89%)	0.19	33 (3%) 52 44	36, 88, 145, 249	271 (24%)

All (33) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	B	440	ASP	3.4
1	A	987	PRO	3.2
1	A	993	LYS	3.2
1	A	234	GLU	3.0
2	B	507	GLU	3.0
1	A	257	CYS	3.0
1	A	925	ILE	2.9
2	B	506	LYS	2.8
1	A	1030	LYS	2.7
1	A	938	PHE	2.7
1	A	854	ALA	2.7
1	A	852	LYS	2.5
1	A	867	ALA	2.5
1	A	185	LEU	2.5
2	B	508	TYR	2.5
1	A	498	SER	2.4
1	A	460	ARG	2.4
2	B	520	GLU	2.4
2	B	512	PHE	2.3
1	A	864	PRO	2.3
2	B	556	TYR	2.2
1	A	228	PHE	2.2
1	A	507	GLU	2.2
1	A	238	ASP	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	570	SER	2.2
1	A	892	GLY	2.1
1	A	539	GLN	2.1
1	A	1029	THR	2.1
1	A	175	ALA	2.1
1	A	853	ASP	2.0
2	B	517	ASN	2.0
2	B	500	THR	2.0
1	A	475	LEU	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](#)

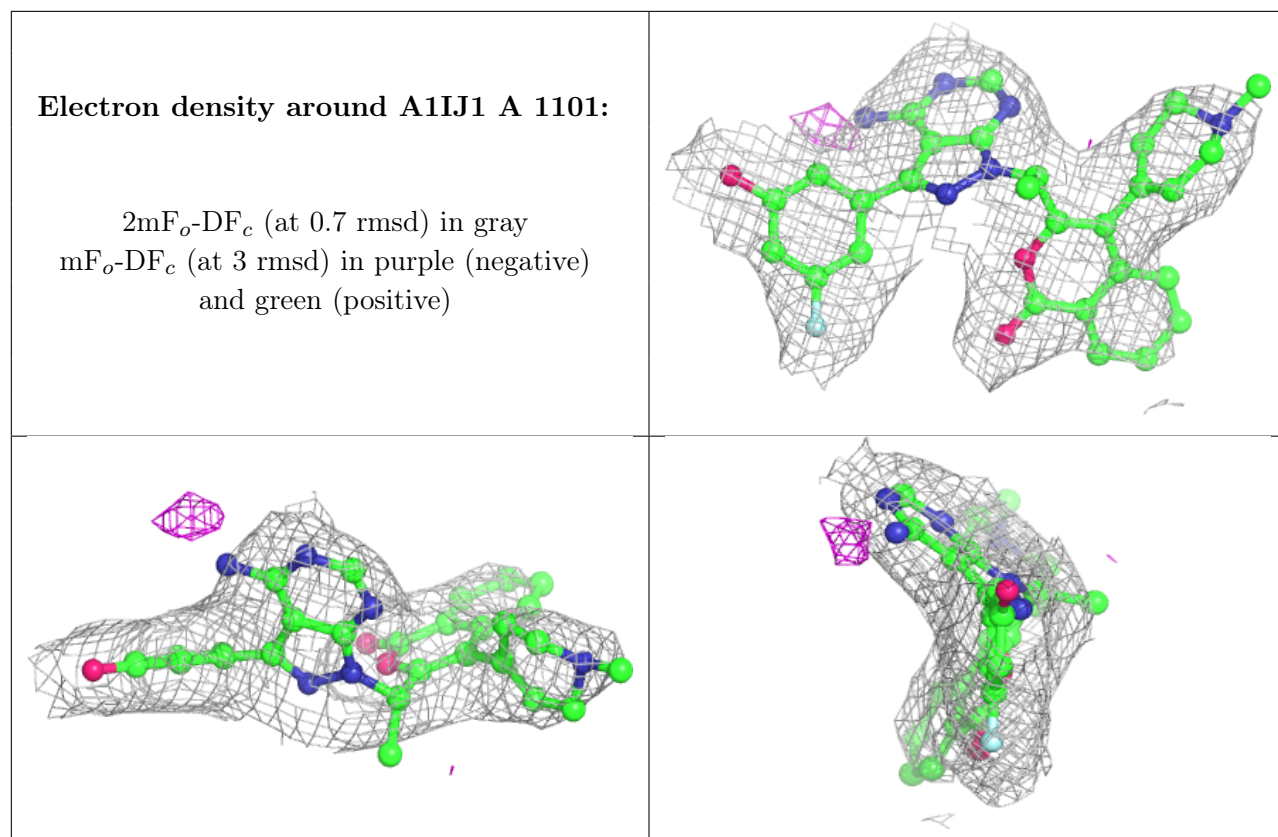
There are no monosaccharides in this entry.

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(\AA^2)	Q<0.9
4	CL	A	1102	1/1	0.91	0.10	108,108,108,108	0
3	A1IJ1	A	1101	38/38	0.92	0.10	56,81,110,116	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.



6.5 Other polymers [i](#)

There are no such residues in this entry.