



Full wwPDB X-ray Structure Validation Report ⓘ

May 16, 2020 – 02:45 pm BST

PDB ID : 6KLA
Title : Crystal structure of human c-KIT kinase domain in complex with compound 15a
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Deposited on : 2019-07-30
Resolution : 2.11 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 following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.11
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

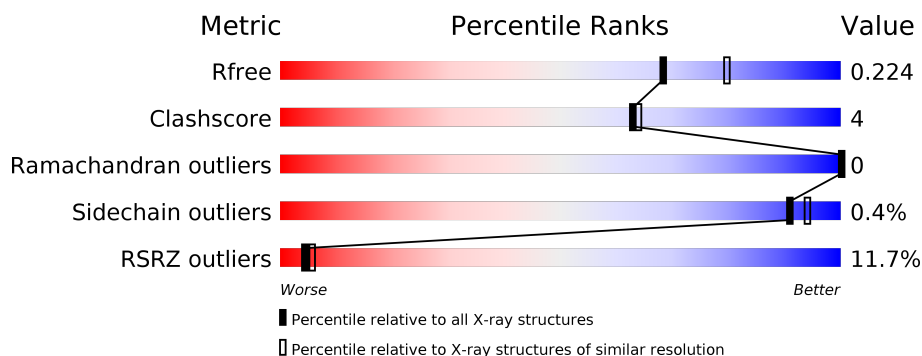
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.11 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}	130704	5197 (2.10-2.10)
Clashscore	141614	5710 (2.10-2.10)
Ramachandran outliers	138981	5647 (2.10-2.10)
Sidechain outliers	138945	5648 (2.10-2.10)
RSRZ outliers	127900	5083 (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 ≥ 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	331	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 2504 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.

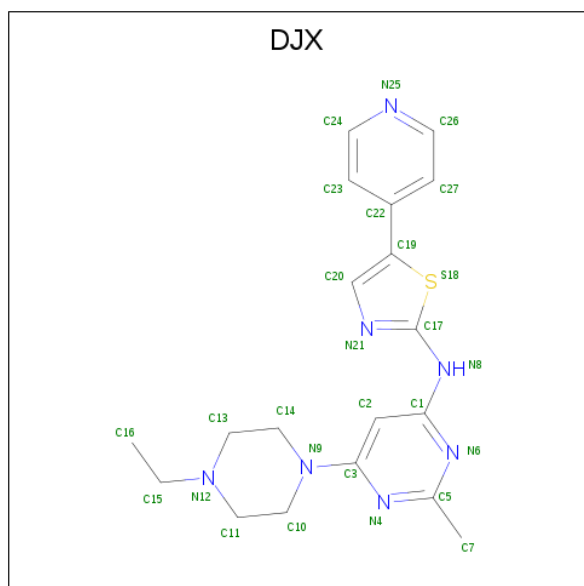
- Molecule 1 is a protein called Mast/stem cell growth factor receptor Kit.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	309	Total	C	N	O	S	0	1	0
			2430	1566	405	441	18			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	752	THR	-	linker	UNP P10721
A	753	SER	-	linker	UNP P10721

- Molecule 2 is N-[6-(4-ethylpiperazin-1-yl)-2-methyl-pyrimidin-4-yl]-5-pyridin-4-yl-1,3-thiazol-2-amine (three-letter code: DJX) (formula: C₁₉H₂₃N₇S) (labeled as "Ligand of Interest" by author).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	S	0	0
			27	19	7	1		

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	47	Total	O	0	0
			47	47		

- Molecule 1: Mast/stem cell growth factor receptor Kit



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	63.20 Å 63.20 Å 196.14 Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.48 – 2.11 29.48 – 2.11	Depositor EDS
% Data completeness (in resolution range)	98.3 (29.48-2.11) 98.3 (29.48-2.11)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.26 (at 2.12 Å)	Xtriage
Refinement program	PHENIX dev_2621	Depositor
R, R_{free}	0.183 , 0.224 0.186 , 0.224	Depositor DCC
R_{free} test set	1996 reflections (8.52%)	wwPDB-VP
Wilson B-factor (Å ²)	46.3	Xtriage
Anisotropy	0.565	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 55.5	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	0.97	EDS
Total number of atoms	2504	wwPDB-VP
Average B, all atoms (Å ²)	64.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.43% 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: DJX

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	0.41	0/2492	0.54	0/3377

There are no bond length outliers.

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	2430	0	2384	20	0
2	A	27	0	0	1	0
3	A	47	0	0	1	0
All	All	2504	0	2384	21	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 4.

All (21) 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:833:VAL:HG11	1:A:875:VAL:HG11	1.77	0.67

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:870:TYR:HB3	1:A:873:MET:HE3	1.76	0.65
1:A:871:PRO:HD3	1:A:889:MET:HE1	1.84	0.59
1:A:899:MET:HE1	1:A:902:ILE:HD12	1.90	0.54
1:A:899:MET:HE3	1:A:924:ILE:HG12	1.89	0.52
1:A:887:PHE:O	1:A:888:ARG:HD3	2.14	0.48
1:A:556:GLN:HG2	1:A:810:ASP:OD1	2.13	0.48
1:A:900:TYR:CE1	1:A:904:LYS:HD2	2.49	0.48
1:A:899:MET:HG2	1:A:927:GLN:HE22	1.79	0.47
1:A:593:LYS:HG2	3:A:1134:HOH:O	2.16	0.46
1:A:893:GLU:HG2	1:A:894:HIS:CE1	2.52	0.44
1:A:899:MET:CE	1:A:899:MET:HA	2.48	0.43
1:A:679:LEU:HD21	1:A:683:ARG:HH11	1.84	0.43
1:A:818:LYS:HE2	1:A:830:ARG:HH21	1.84	0.43
1:A:647:LEU:O	1:A:786:LYS:HE2	2.18	0.42
1:A:891:SER:HB2	1:A:900:TYR:CG	2.55	0.42
1:A:870:TYR:H	1:A:889:MET:HE1	1.84	0.42
2:A:1001:DJX:S18	2:A:1001:DJX:N6	2.93	0.41
1:A:613:LYS:HB2	1:A:613:LYS:HE3	1.68	0.41
1:A:870:TYR:H	1:A:889:MET:CE	2.34	0.41
1:A:612:ILE:HG13	1:A:618:MET:HE1	2.03	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	306/331 (92%)	300 (98%)	6 (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	257/289 (89%)	256 (100%)	1 (0%)	91	94

All (1) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	830	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	894	HIS

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	DJX	A	1001	-	26,30,30	3.35	9 (34%)	31,41,41	2.65	16 (51%)

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	DJX	A	1001	-	-	1/12/24/24	0/4/4/4

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1001	DJX	C14-N9	-8.89	1.32	1.46
2	A	1001	DJX	C10-N9	-8.82	1.32	1.46
2	A	1001	DJX	C17-N8	5.41	1.46	1.36
2	A	1001	DJX	C11-N12	-5.04	1.33	1.46
2	A	1001	DJX	C13-N12	-4.99	1.33	1.46
2	A	1001	DJX	C1-N8	3.71	1.45	1.38
2	A	1001	DJX	C3-N9	3.54	1.44	1.37
2	A	1001	DJX	C11-C10	-3.31	1.38	1.51
2	A	1001	DJX	C14-C13	-3.30	1.38	1.51

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	DJX	C14-C13-N12	4.97	120.84	110.64
2	A	1001	DJX	C11-N12-C13	4.76	119.55	108.83
2	A	1001	DJX	C10-C11-N12	4.75	120.39	110.64
2	A	1001	DJX	C14-N9-C10	4.56	121.58	111.52
2	A	1001	DJX	C11-C10-N9	4.27	118.99	110.70
2	A	1001	DJX	C13-C14-N9	4.02	118.52	110.70
2	A	1001	DJX	C5-N4-C3	4.01	120.52	116.00
2	A	1001	DJX	C11-N12-C15	3.46	120.44	110.84
2	A	1001	DJX	C13-N12-C15	3.31	120.01	110.84
2	A	1001	DJX	N4-C3-N9	2.97	119.89	116.55
2	A	1001	DJX	C19-C20-N21	2.63	114.36	109.09
2	A	1001	DJX	C26-N25-C24	2.31	122.29	116.85

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	1001	DJX	C7-C5-N4	2.19	120.58	117.15
2	A	1001	DJX	C17-N8-C1	-2.16	121.60	128.52
2	A	1001	DJX	C2-C3-N9	-2.13	119.76	122.29
2	A	1001	DJX	N6-C5-N4	-2.03	121.98	125.72

There are no chirality outliers.

All (1) torsion outliers are listed below:

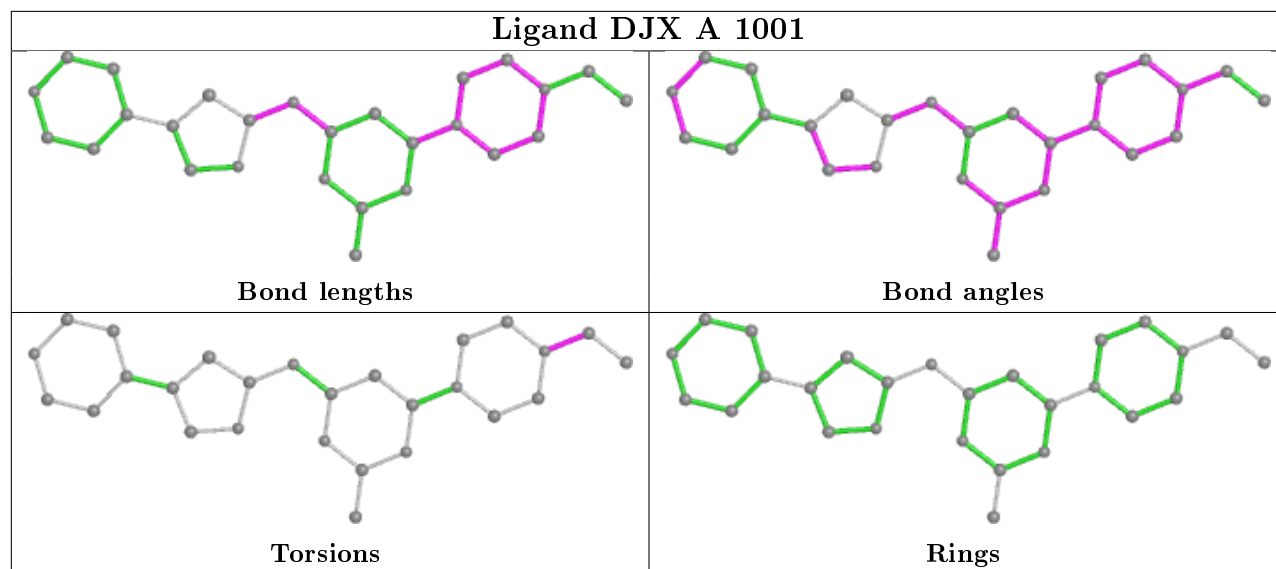
Mol	Chain	Res	Type	Atoms
2	A	1001	DJX	C16-C15-N12-C13

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	1001	DJX	1	0

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	309/331 (93%)	0.50	36 (11%) 4 6	38, 59, 106, 144	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	828	ASN	6.3
1	A	793	LEU	5.8
1	A	565	GLY	5.6
1	A	567	ASN	4.8
1	A	566	ASN	4.7
1	A	827	GLY	4.1
1	A	563	ILE	3.6
1	A	808	ILE	3.5
1	A	794	ALA	3.5
1	A	879	PHE	3.4
1	A	795	ALA	3.4
1	A	688	SER	3.4
1	A	809	CYS	3.2
1	A	615	ASP	3.2
1	A	876	ASP	3.1
1	A	798	ILE	3.1
1	A	687	ASP	3.1
1	A	856	GLY	3.1
1	A	835	TRP	3.0
1	A	859	LEU	3.0
1	A	614	SER	2.8
1	A	829	ALA	2.8
1	A	758	GLU	2.8
1	A	872	GLY	2.7
1	A	880	TYR	2.6
1	A	811	PHE	2.6
1	A	854	SER	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	568	TYR	2.6
1	A	797	ASN	2.5
1	A	887	PHE	2.4
1	A	776	VAL	2.3
1	A	810	ASP	2.3
1	A	564	ASN	2.2
1	A	858	PHE	2.1
1	A	855	TYR	2.0
1	A	790	HIS	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](#)

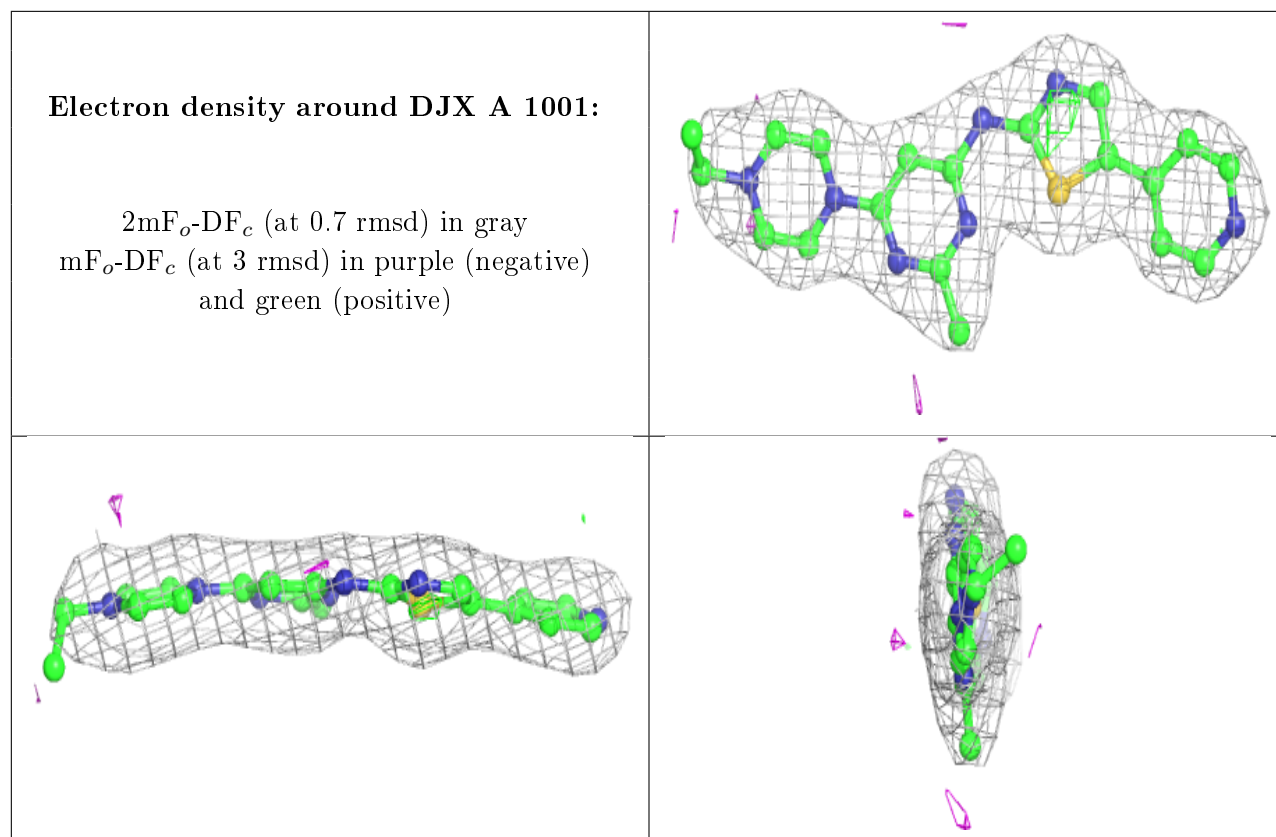
There are no carbohydrates in this entry.

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. 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
2	DJX	A	1001	27/27	0.94	0.12	33,44,69,76	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.