WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB X-ray Structure Validation Summary Report (i)

Jun 23, 2024 – 08:22 PM EDT

PDB ID	:	6Q6F
Title	:	Crystal structure of IDH1 R132H in complex with HMS101
Authors	:	Chaturvedi, A.; Goparaju, R.; Gupta, C.; Kluenemann, T.; Araujo Cruz, M.M.; Kloos, A.; Goerlich, K.; Schottmann, R.; Struys, E.A.; Ganser, A.; Preller, M.; Heuser, M.
Deposited on	:	2018-12-10
Resolution	:	3.30 Å(reported)

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

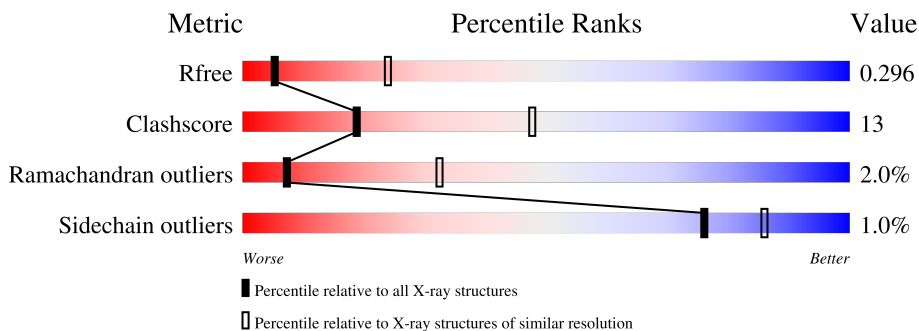|		
MolProbity	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.20.1
EDS	:	2.37.1
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

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 3.30 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	Percentile Ranks	Value
Rfree		0.296
Clashscore		13
Ramachandran outliers		2.0%
Sidechain outliers		1.0%

Worse   *Better*

■ Percentile relative to all X-ray structures

❙ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1149 (3.34-3.26)
Clashscore	141614	1205 (3.34-3.26)
Ramachandran outliers	138981	1183 (3.34-3.26)
Sidechain outliers	138945	1182 (3.34-3.26)

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 <=5%

Mol	Chain	Length	Quality of chain
1	A	414	73% 23% • •
1	B	414	67% 30% • •

2   Entry composition (i)

There are 2 unique types of molecules in this entry. The entry contains 6475 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.
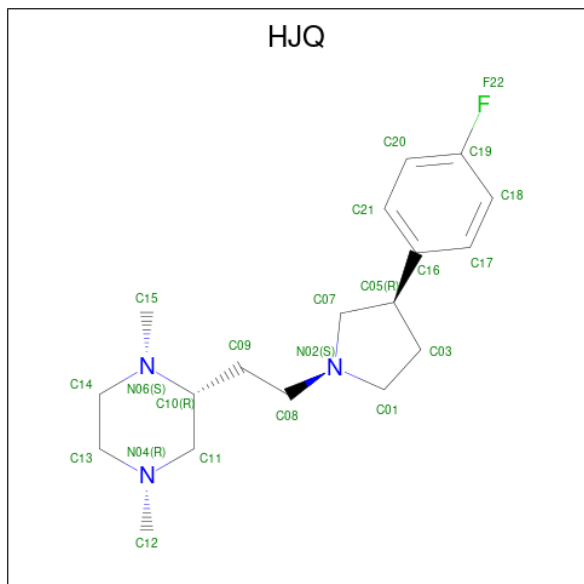
- Molecule 1 is a protein called Isocitrate dehydrogenase [NADP] cytoplasmic.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	402	Total 3188	C 2031	N 541	O 598	S 18	0	0	0
1	B	409	Total 3243	C 2064	N 549	O 612	S 18	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	132	HIS	ARG	engineered mutation	UNP O75874
B	132	HIS	ARG	engineered mutation	UNP O75874

- Molecule 2 is (2 {R})-2-[2-[(3 {R})-3-(4-fluorophenyl)pyrrolidin-1-yl]ethyl]-1,4-dimethyl-piperazine (three-letter code: HJQ) (formula: $C_{18}H_{28}FN_3$) (labeled as "Ligand of Interest" by depositor).


HJQ

| Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 22	C 18	F 1	N 3	0	0
2	B	1	Total 22	C 18	F 1	N 3	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. 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. 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: Isocitrate dehydrogenase [NADP] cytoplasmic
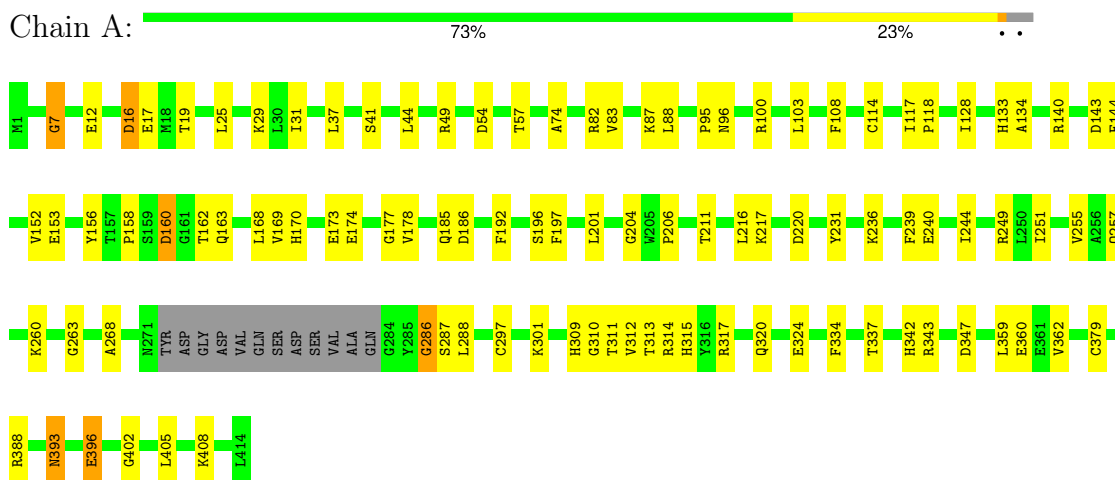
• Molecule 1: Isocitrate dehydrogenase [NADP] cytoplasmic
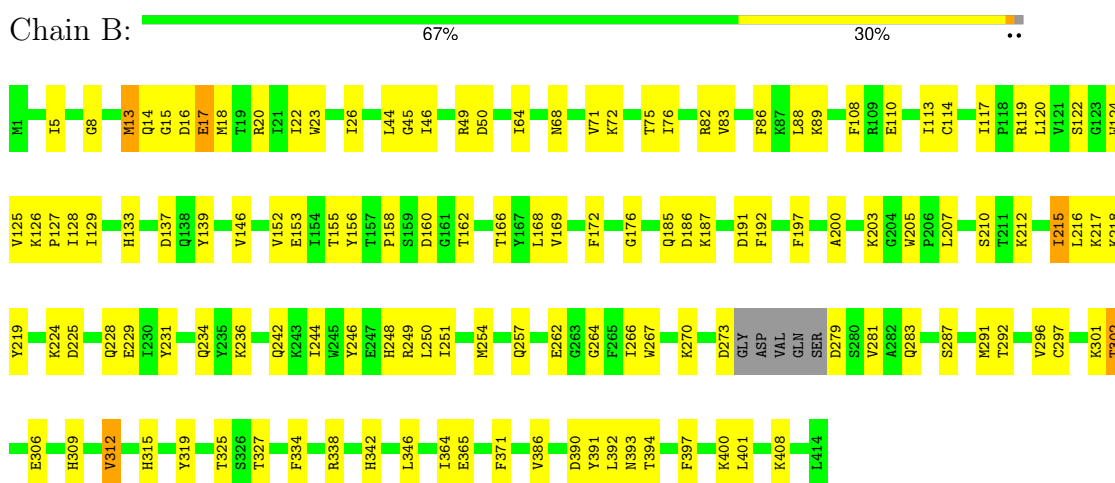
4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α, β, γ	82.40Å 82.40Å 301.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	46.09 – 3.30	Depositor
	46.09 – 2.26	EDS
% Data completeness	95.6 (46.09-3.30)	Depositor
(in resolution range)	50.5 (46.09-2.26)	EDS
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	0.52 (at 2.27Å)	Xtriage
Refinement program	PHENIX 1.13_2998	Depositor
R, R_{free}	0.232 , 0.288	Depositor
	0.235 , 0.296	DCC
R_{free} test set	798 reflections (2.31%)	wwPDB-VP
Wilson B-factor (Å^2)	41.6	Xtriage
Anisotropy	0.154	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.30 , 38.0	EDS
L-test for twinning [2]	$< |L| > = 0.49, < L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.88	EDS
Total number of atoms	6475	wwPDB-VP
Average B, all atoms (Å^2)	79.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.28% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.

[2]Theoretical values of $< |L| >$, $< L^2 >$ 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: HJQ

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	0.59	0/3255	0.76	1/4385 (0.0%)
1	B	0.57	0/3311	0.76	2/4462 (0.0%)
All	All	0.58	0/6566	0.76	3/8847 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	140	ARG	NE-CZ-NH1	-7.71	116.44	120.30
1	B	296	VAL	C-N-CA	-5.25	108.57	121.70
1	B	13	MET	CG-SD-CE	-5.01	92.18	100.20

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	3188	0	3169	74	0
1	B	3243	0	3213	101	0
2	A	22	0	0	2	0
2	B	22	0	0	0	0
All	All	6475	0	6382	169	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 13.

The worst 5 of 169 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:249:ARG:NH1	1:B:257:GLN:HE21	1.75	0.84
1:B:315:HIS:HD1	1:B:327:THR:HG22	1.43	0.83
1:B:46:ILE:HD11	1:B:88:LEU:HD21	1.64	0.78
1:A:324:GLU:OE2	1:A:388:ARG:NH1	2.19	0.75
1:B:76:ILE:HG23	1:B:82:ARG:HH11	1.51	0.75

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	398/414 (96%)	354 (89%)	39 (10%)	5 (1%)	12	40
1	B	405/414 (98%)	350 (86%)	44 (11%)	11 (3%)	5	26
All	All	803/828 (97%)	704 (88%)	83 (10%)	16 (2%)	7	32

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	217	LYS
1	B	281	VAL
1	A	287	SER
1	A	393	ASN
1	B	8	GLY

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	339/350 (97%)	336 (99%)	3 (1%)	78	87
1	B	345/350 (99%)	341 (99%)	4 (1%)	71	83
All	All	684/700 (98%)	677 (99%)	7 (1%)	76	86

5 of 7 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	192	PHE
1	B	302	THR
1	B	393	ASN
1	B	309	HIS
1	A	396	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 10 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	185	GLN
1	B	257	GLN
1	B	320	GLN
1	A	309	HIS
1	A	320	GLN

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 monosaccharides in this entry.

5.6 Ligand geometry ⓘ

2 ligands are 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	HJQ	B	501	-	24,24,24	2.14	4 (16%)	28,33,33	1.88	4 (14%)
2	HJQ	A	501	-	24,24,24	1.76	7 (29%)	28,33,33	1.63	5 (17%)

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	HJQ	B	501	-	-	7/9/31/31	0/3/3/3
2	HJQ	A	501	-	-	7/9/31/31	0/3/3/3

The worst 5 of 11 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	HJQ	C11-C10	6.04	1.62	1.52
2	B	501	HJQ	C10-N06	5.69	1.58	1.47
2	A	501	HJQ	C10-N06	4.53	1.56	1.47
2	B	501	HJQ	C11-N04	2.98	1.51	1.46
2	B	501	HJQ	C20-C19	2.84	1.42	1.37

The worst 5 of 9 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501	HJQ	C11-C10-N06	5.63	117.52	108.60

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	B	501	HJQ	C01-N02-C07	4.79	109.66	104.02
2	B	501	HJQ	C15-N06-C10	4.08	117.60	111.87
2	A	501	HJQ	C12-N04-C11	-3.87	106.17	110.59
2	A	501	HJQ	C13-N04-C11	3.17	113.23	110.06

There are no chirality outliers.

5 of 14 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	501	HJQ	N02-C08-C09-C10
2	A	501	HJQ	C09-C08-N02-C01
2	A	501	HJQ	C08-C09-C10-C11
2	B	501	HJQ	N02-C08-C09-C10
2	B	501	HJQ	C09-C08-N02-C07

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	HJQ	2	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 then 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.

Ligand HJQ B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand HJQ A 501

Bond lengths

Bond angles

Torsions

Rings
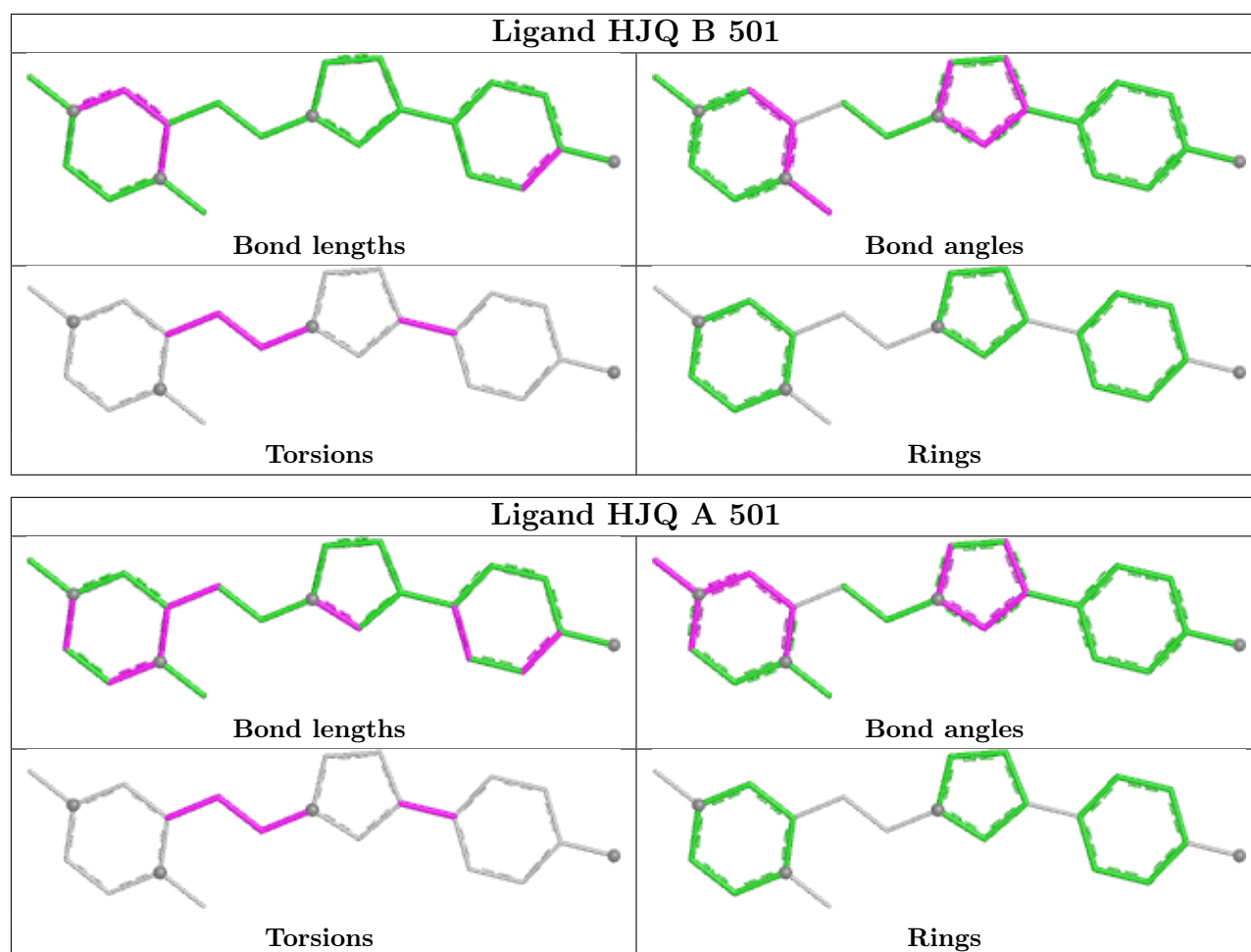
5.7   Other polymers ⓘ

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 ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.3 Carbohydrates ⓘ

Unable to reproduce the depositors R factor - this section is therefore empty.

6.4 Ligands ⓘ

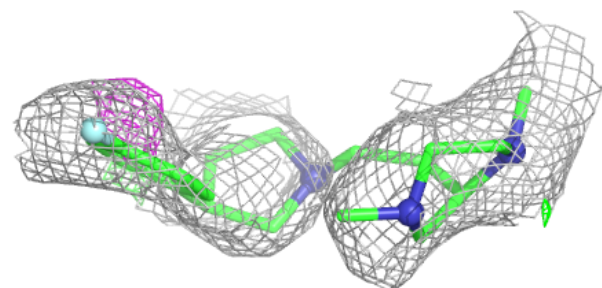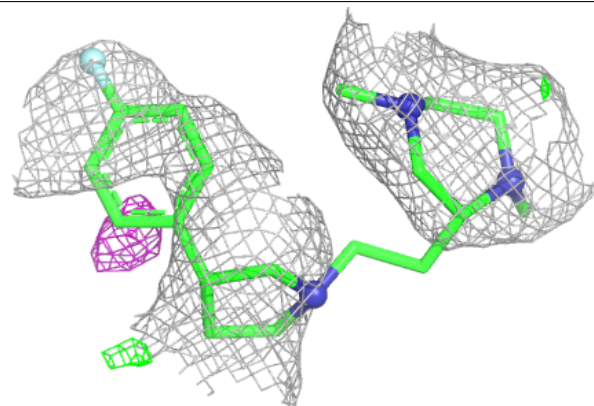Unable to reproduce the depositors R factor - this section is therefore empty.

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.

Electron density around HJQ A 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)
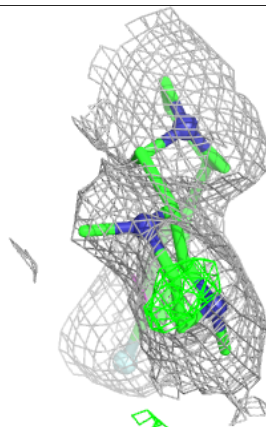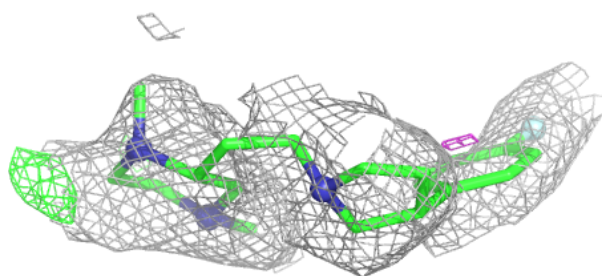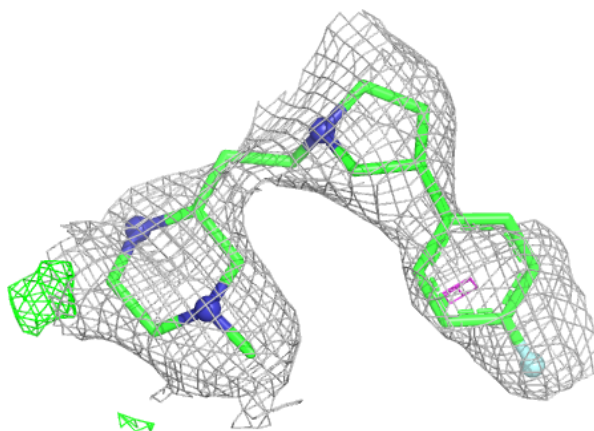
Electron density around HJQ B 501:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

6.5 Other polymers (i)

Unable to reproduce the depositors R factor - this section is therefore empty.