



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 29, 2026 – 08:10 PM UTC

PDB ID : 7YGQ / pdb_00007ygq
Title : Crystal structure of SARS main protease in complex with inhibitor YH-53
Authors : Lin, C.; Zhong, F.L.; Zhou, X.L.; Zeng, P.; Zhang, J.; Li, J.
Deposited on : 2022-07-12
Resolution : 2.04 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 : **FAILED**
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

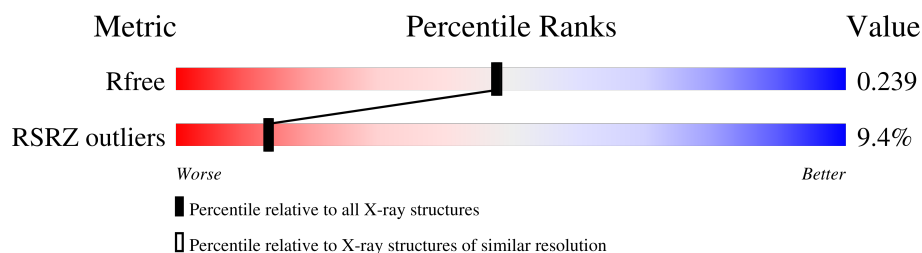
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.04 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}	180053	2260 (2.04-2.04)
RSRZ outliers	180081	2260 (2.04-2.04)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 4527 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.

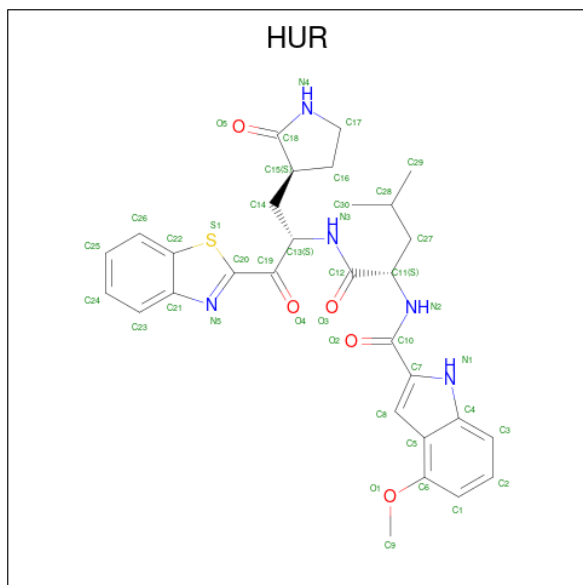
- Molecule 1 is a protein called 3C-like proteinase nsp5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	298	Total	C	N	O	S	0	0	0
			2171	1382	367	402	20			
1	B	298	Total	C	N	O	S	0	0	0
			2224	1410	376	418	20			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	300	GLN	-	expression tag	UNP P0C6U8
B	300	GLN	-	expression tag	UNP P0C6U8

- Molecule 2 is N-[(2S)-1-[[[(2S)-1-(1,3-benzothiazol-2-yl)-1-oxidanylidene-3-[(3S)-2-oxidanylidene-3-oxo-1H-indole-2-carboxamide (CCD ID: HUR) (formula: C₃₀H₃₃N₅O₅S) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total 41	C 30	N 5	O 5	S 1	0	0
2	B	1	Total 41	C 30	N 5	O 5	S 1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	30	Total 30	O 30	0	0
3	B	20	Total 20	O 20	0	0

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3 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	55.06Å 60.59Å 68.30Å 91.20° 102.72° 108.43°	Depositor
Resolution (Å)	31.40 – 2.04 31.40 – 2.04	Depositor EDS
% Data completeness (in resolution range)	92.3 (31.40-2.04) 85.4 (31.40-2.04)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.08 (at 2.03Å)	Xtriage
Refinement program	PHENIX 1.12_2829, PHENIX 1.12_2829	Depositor
R, R_{free}	0.205 , 0.235 0.212 , 0.239	Depositor DCC
R_{free} test set	1889 reflections (3.63%)	wwPDB-VP
Wilson B-factor (Å ²)	34.6	Xtriage
Anisotropy	0.465	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 42.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	4527	wwPDB-VP
Average B, all atoms (Å ²)	46.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.62% 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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

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4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

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4.3.2 Protein sidechains [i](#)

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4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

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	HUR	A	401	-	44,45,45	5.22	15 (34%)	53,64,64	4.49	13 (24%)
2	HUR	B	401	-	44,45,45	4.49	14 (31%)	53,64,64	3.50	16 (30%)

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	HUR	A	401	-	-	4/32/44/44	0/5/5/5
2	HUR	B	401	-	-	6/32/44/44	0/5/5/5

All (29) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	HUR	C19-C20	20.92	1.75	1.48
2	A	401	HUR	O4-C19	19.72	1.56	1.22
2	B	401	HUR	O4-C19	19.19	1.55	1.22
2	B	401	HUR	C19-C20	-11.72	1.33	1.48
2	B	401	HUR	C16-C15	-8.09	1.31	1.54
2	A	401	HUR	C16-C15	-8.06	1.31	1.54
2	B	401	HUR	O5-C18	8.02	1.38	1.23
2	A	401	HUR	O5-C18	7.56	1.37	1.23
2	A	401	HUR	C15-C18	6.76	1.68	1.52
2	B	401	HUR	C15-C18	6.73	1.68	1.52
2	B	401	HUR	C17-N4	5.39	1.57	1.46
2	A	401	HUR	C17-N4	5.33	1.57	1.46
2	A	401	HUR	C20-S1	-5.17	1.68	1.75
2	B	401	HUR	C20-S1	-5.06	1.68	1.75
2	B	401	HUR	C10-N2	5.03	1.44	1.34
2	B	401	HUR	C12-N3	4.95	1.44	1.34
2	A	401	HUR	C10-N2	4.94	1.44	1.34
2	B	401	HUR	C7-N1	-4.87	1.31	1.38
2	A	401	HUR	C12-N3	4.85	1.44	1.34
2	B	401	HUR	C5-C4	-4.82	1.36	1.41
2	A	401	HUR	C5-C4	-4.70	1.37	1.41
2	A	401	HUR	C7-N1	-4.66	1.31	1.38
2	B	401	HUR	C16-C17	3.85	1.58	1.53

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	401	HUR	C16-C17	3.84	1.58	1.53
2	A	401	HUR	O3-C12	-2.92	1.17	1.23
2	B	401	HUR	O2-C10	-2.81	1.18	1.23
2	A	401	HUR	O2-C10	-2.78	1.18	1.23
2	B	401	HUR	O3-C12	-2.68	1.18	1.23
2	A	401	HUR	O1-C6	2.10	1.40	1.37

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	401	HUR	O4-C19-C20	19.32	140.17	118.92
2	A	401	HUR	C22-S1-C20	14.01	98.20	88.92
2	B	401	HUR	C22-S1-C20	13.30	97.73	88.92
2	A	401	HUR	O5-C18-C15	-13.13	111.02	126.21
2	B	401	HUR	O5-C18-C15	-12.98	111.19	126.21
2	A	401	HUR	O5-C18-N4	-11.51	109.67	125.76
2	B	401	HUR	O5-C18-N4	-11.07	110.28	125.76
2	A	401	HUR	S1-C20-N5	-7.74	106.28	116.17
2	B	401	HUR	S1-C20-N5	-7.23	106.93	116.17
2	B	401	HUR	C16-C15-C18	4.20	108.64	102.87
2	B	401	HUR	O4-C19-C20	-3.97	114.56	118.92
2	A	401	HUR	C17-N4-C18	-3.88	105.57	113.79
2	A	401	HUR	C4-C5-C8	-3.80	105.07	106.90
2	B	401	HUR	C17-N4-C18	-3.68	105.97	113.79
2	A	401	HUR	C5-C4-N1	3.61	109.81	107.46
2	A	401	HUR	C21-C22-S1	-3.59	104.44	109.75
2	A	401	HUR	C16-C15-C18	3.58	107.78	102.87
2	B	401	HUR	C21-C22-S1	-3.44	104.66	109.75
2	A	401	HUR	C26-C22-S1	3.36	135.27	127.36
2	B	401	HUR	C26-C22-S1	3.27	135.06	127.36
2	A	401	HUR	C3-C4-C5	-3.16	120.16	122.66
2	A	401	HUR	C21-N5-C20	3.07	116.69	109.84
2	B	401	HUR	C21-N5-C20	2.82	116.13	109.84
2	B	401	HUR	O1-C6-C1	-2.65	119.83	124.30
2	B	401	HUR	C5-C4-N1	2.63	109.18	107.46
2	B	401	HUR	O1-C6-C5	2.58	119.82	115.23
2	B	401	HUR	C9-O1-C6	-2.50	113.84	117.51
2	B	401	HUR	C4-C5-C8	-2.47	105.71	106.90
2	B	401	HUR	C3-C4-C5	-2.47	120.70	122.66

There are no chirality outliers.

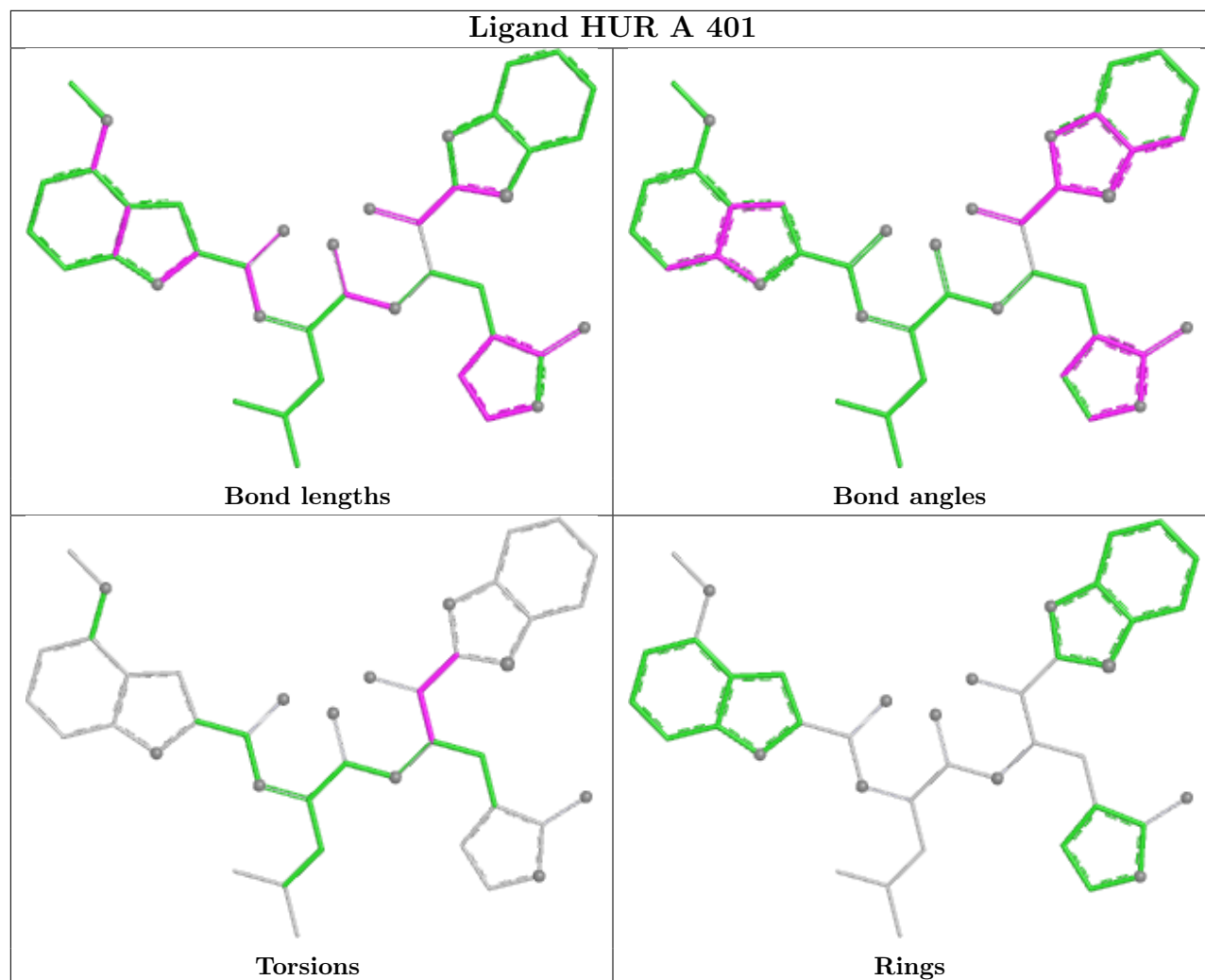
All (10) torsion outliers are listed below:

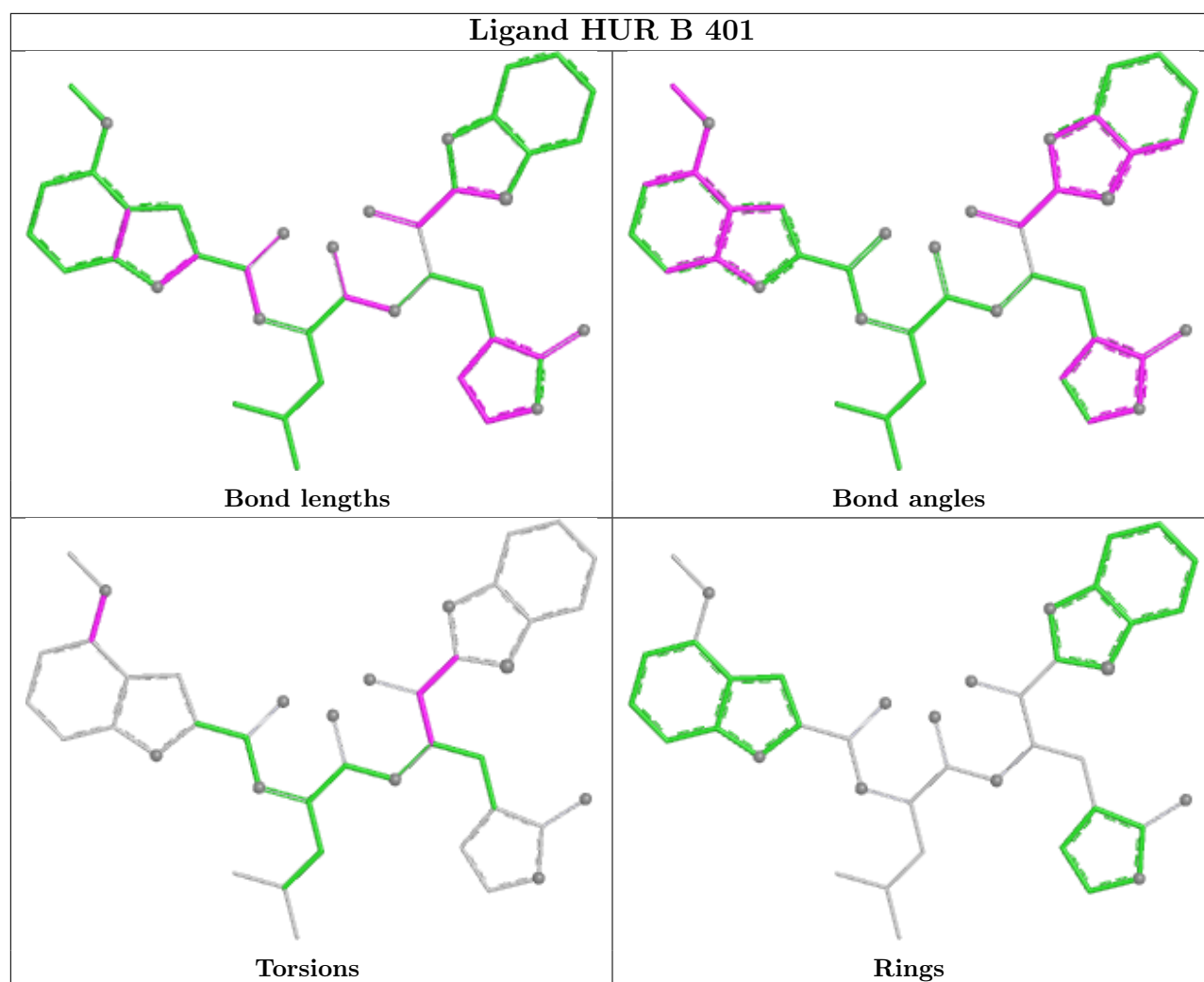
Mol	Chain	Res	Type	Atoms
2	A	401	HUR	N3-C13-C19-C20
2	A	401	HUR	N3-C13-C19-O4
2	A	401	HUR	O4-C19-C20-N5
2	A	401	HUR	O4-C19-C20-S1
2	B	401	HUR	N3-C13-C19-O4
2	B	401	HUR	O4-C19-C20-N5
2	B	401	HUR	O4-C19-C20-S1
2	B	401	HUR	C5-C6-O1-C9
2	B	401	HUR	C1-C6-O1-C9
2	B	401	HUR	C14-C13-C19-O4

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.





4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data ⓘ

5.1 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	298/299 (99%)	0.83	33 (11%)	10 10	27, 47, 67, 76	0
1	B	298/299 (99%)	0.71	23 (7%)	19 20	33, 45, 64, 78	0
All	All	596/598 (99%)	0.77	56 (9%)	14 14	27, 46, 66, 78	0

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	46	ALA	5.5
1	B	48	ASP	3.8
1	B	78	ILE	3.8
1	B	47	GLU	3.8
1	A	48	ASP	3.7
1	B	154	TYR	3.6
1	A	258	GLY	3.2
1	B	49	MET	3.2
1	A	3	PHE	3.1
1	B	64	HIS	3.1
1	B	3	PHE	3.0
1	A	73	VAL	3.0
1	A	227	LEU	2.9
1	B	75	LEU	2.8
1	A	243	THR	2.8
1	A	249	ILE	2.8
1	A	121	SER	2.8
1	A	255	ALA	2.7
1	A	154	TYR	2.7
1	A	190	THR	2.7
1	B	24	THR	2.7
1	A	47	GLU	2.7
1	B	291	PHE	2.7
1	A	215	GLY	2.7

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Mol	Chain	Res	Type	RSRZ
1	B	76	ARG	2.7
1	A	294	PHE	2.6
1	B	72	ASN	2.5
1	A	298	ARG	2.5
1	B	50	LEU	2.5
1	A	220	LEU	2.5
1	B	277	ASN	2.5
1	A	216	ASP	2.4
1	A	280	THR	2.4
1	A	259	ILE	2.4
1	A	230	PHE	2.4
1	B	45	THR	2.4
1	A	2	GLY	2.3
1	A	253	LEU	2.3
1	A	278	GLY	2.3
1	A	277	ASN	2.3
1	B	207	TRP	2.2
1	A	222	ARG	2.2
1	B	66	PHE	2.2
1	A	279	ARG	2.2
1	B	73	VAL	2.2
1	A	223	PHE	2.1
1	B	143	GLY	2.1
1	A	224	THR	2.1
1	A	247	VAL	2.1
1	A	93	THR	2.1
1	A	233	VAL	2.1
1	B	77	VAL	2.1
1	A	139	SER	2.1
1	B	121	SER	2.1
1	B	89	LEU	2.0
1	A	257	THR	2.0

5.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.3 Carbohydrates [i](#)

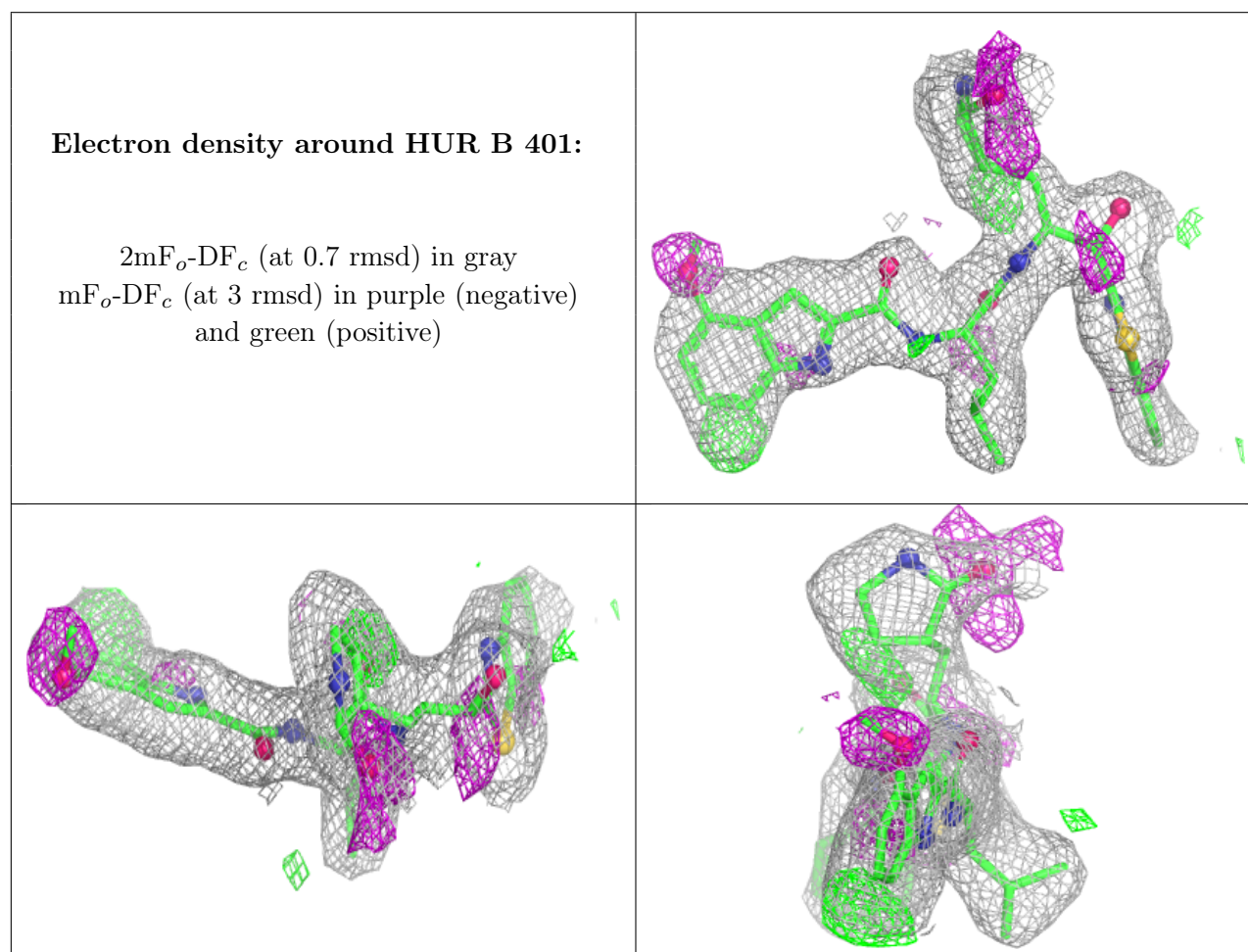
There are no oligosaccharides in this entry.

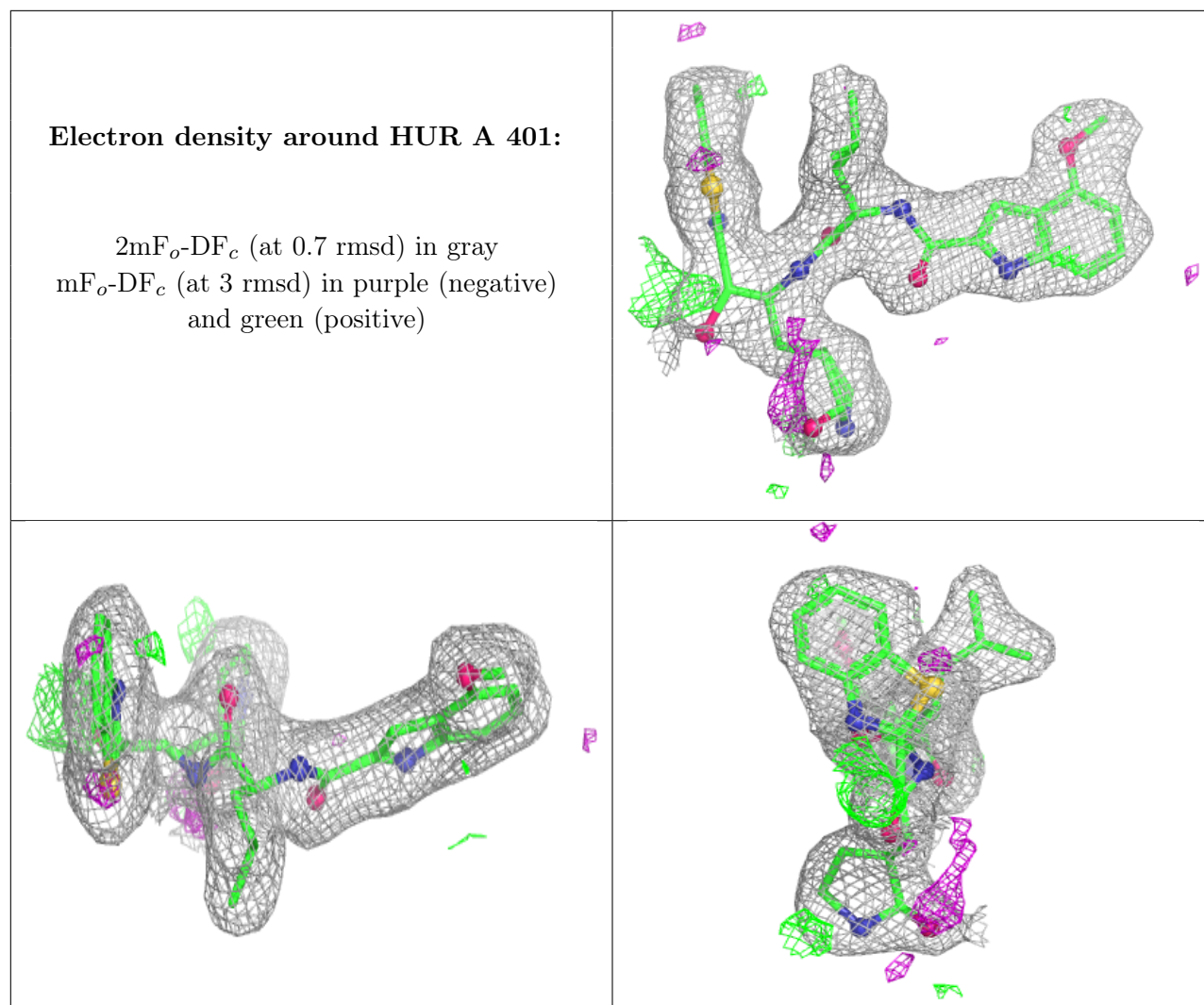
5.4 Ligands ⓘ

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. 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(Å ²)	Q<0.9
2	HUR	B	401	41/41	0.87	0.14	35,47,58,63	0
2	HUR	A	401	41/41	0.93	0.10	33,44,48,51	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.





5.5 Other polymers ⓘ

There are no such residues in this entry.