



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 07:07 PM UTC

PDB ID : 4K4I / pdb_00004k4i
Title : Ternary crystal structures of a human DNA POLYMERASE LAMBDA IN COMPLEX WITH DNA AND (-)FTC-TP.
Authors : Vyas, R.; Suo, Z.
Deposited on : 2013-04-12
Resolution : 2.25 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 4-5-2 with Phenix2.0
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

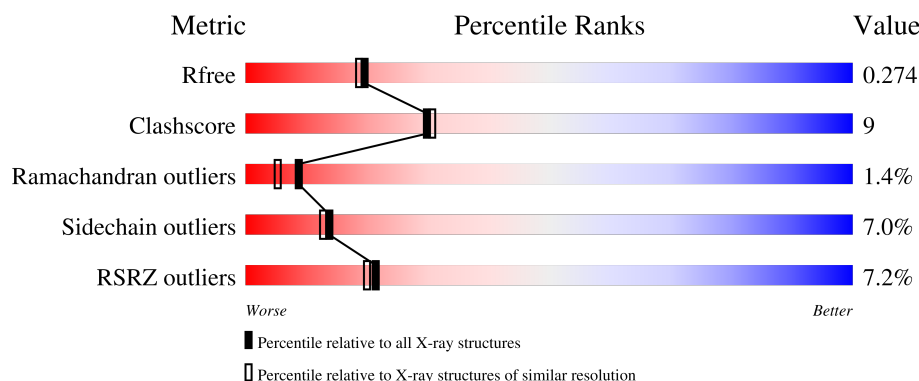
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 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	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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 $\leq 5\%$. 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	340	7% 77% 16% • •
1	E	340	12% 73% 20% • •
1	I	340	5% 81% 13% • •
1	M	340	6% 75% 16% 5% • •
2	B	11	64% 27% 9%

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Mol	Chain	Length	Quality of chain
2	F	11	 73%27%
2	J	11	 91%9%
2	N	11	 73%18%9%
3	C	6	 67%33%
3	G	6	 83%17%
3	K	6	 17%83%17%
3	O	6	 100%
4	D	4	 25%75%
4	H	4	 100%
4	L	4	 100%
4	P	4	 100%

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
8	CAC	M	606	-	X	-	-

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 12760 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 DNA polymerase lambda.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	333	Total	C	N	O	S	0	3	0
			2649	1663	489	485	12			
1	E	329	Total	C	N	O	S	0	0	0
			2589	1626	474	477	12			
1	I	325	Total	C	N	O	S	0	0	0
			2574	1617	473	473	11			
1	M	329	Total	C	N	O	S	0	1	0
			2592	1628	474	478	12			

There are 36 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	244	MET	-	expression tag	UNP Q9UGP5
A	576	LEU	-	expression tag	UNP Q9UGP5
A	577	GLU	-	expression tag	UNP Q9UGP5
A	578	HIS	-	expression tag	UNP Q9UGP5
A	579	HIS	-	expression tag	UNP Q9UGP5
A	580	HIS	-	expression tag	UNP Q9UGP5
A	581	HIS	-	expression tag	UNP Q9UGP5
A	582	HIS	-	expression tag	UNP Q9UGP5
A	583	HIS	-	expression tag	UNP Q9UGP5
E	244	MET	-	expression tag	UNP Q9UGP5
E	576	LEU	-	expression tag	UNP Q9UGP5
E	577	GLU	-	expression tag	UNP Q9UGP5
E	578	HIS	-	expression tag	UNP Q9UGP5
E	579	HIS	-	expression tag	UNP Q9UGP5
E	580	HIS	-	expression tag	UNP Q9UGP5
E	581	HIS	-	expression tag	UNP Q9UGP5
E	582	HIS	-	expression tag	UNP Q9UGP5
E	583	HIS	-	expression tag	UNP Q9UGP5
I	244	MET	-	expression tag	UNP Q9UGP5
I	576	LEU	-	expression tag	UNP Q9UGP5
I	577	GLU	-	expression tag	UNP Q9UGP5

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Chain	Residue	Modelled	Actual	Comment	Reference
I	578	HIS	-	expression tag	UNP Q9UGP5
I	579	HIS	-	expression tag	UNP Q9UGP5
I	580	HIS	-	expression tag	UNP Q9UGP5
I	581	HIS	-	expression tag	UNP Q9UGP5
I	582	HIS	-	expression tag	UNP Q9UGP5
I	583	HIS	-	expression tag	UNP Q9UGP5
M	244	MET	-	expression tag	UNP Q9UGP5
M	576	LEU	-	expression tag	UNP Q9UGP5
M	577	GLU	-	expression tag	UNP Q9UGP5
M	578	HIS	-	expression tag	UNP Q9UGP5
M	579	HIS	-	expression tag	UNP Q9UGP5
M	580	HIS	-	expression tag	UNP Q9UGP5
M	581	HIS	-	expression tag	UNP Q9UGP5
M	582	HIS	-	expression tag	UNP Q9UGP5
M	583	HIS	-	expression tag	UNP Q9UGP5

- Molecule 2 is a DNA chain called DNA (5'-D(*CP*GP*GP*CP*GP*GP*TP*AP*CP*TP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	11	Total	C	N	O	P	0	0	0
			225	107	43	65	10			
2	F	11	Total	C	N	O	P	0	0	0
			225	107	43	65	10			
2	J	11	Total	C	N	O	P	0	0	0
			225	107	43	65	10			
2	N	11	Total	C	N	O	P	0	0	0
			225	107	43	65	10			

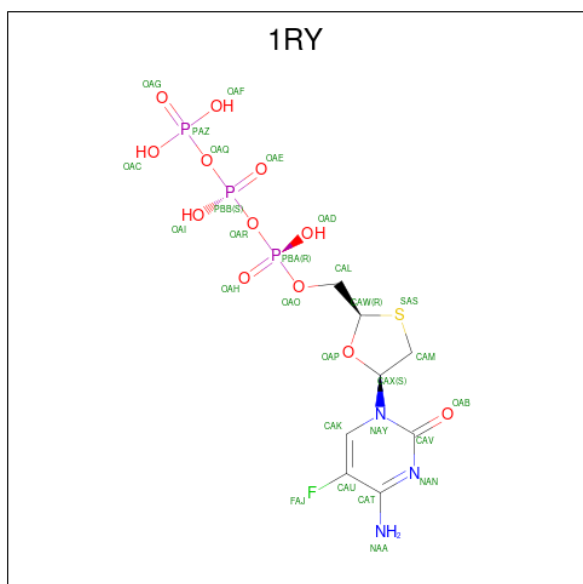
- Molecule 3 is a DNA chain called DNA (5'-D(*CP*AP*GP*TP*AP*C)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	6	Total	C	N	O	P	0	0	0
			119	58	23	33	5			
3	G	6	Total	C	N	O	P	0	0	0
			119	58	23	33	5			
3	K	6	Total	C	N	O	P	0	0	0
			119	58	23	33	5			
3	O	6	Total	C	N	O	P	0	0	0
			119	58	23	33	5			

- Molecule 4 is a DNA chain called DNA (5'-D(P*GP*CP*CP*G)-3').

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	4	Total 83	C 38	N 16	O 25	P 4	0	0	0
4	H	4	Total 83	C 38	N 16	O 25	P 4	0	0	0
4	L	4	Total 83	C 38	N 16	O 25	P 4	0	0	0
4	P	4	Total 83	C 38	N 16	O 25	P 4	0	0	0

- Molecule 5 is [[(2R,5S)-5-(4-azanyl-5-fluoranyl-2-oxidanylidene-pyrimidin-1-yl)-1,3-oxathiolan-2-yl]methoxy-oxidanyl-phosphoryl] phosphono hydrogen phosphate (CCD ID: 1RY) (formula: C₈H₁₃FN₃O₁₂P₃S).



Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
5	A	1	Total	C	F	N	O	P	S	0	0
			28	8	1	3	12	3	1		
5	E	1	Total	C	F	N	O	P	S	0	0
			28	8	1	3	12	3	1		
5	I	1	Total	C	F	N	O	P	S	0	0
			28	8	1	3	12	3	1		
5	M	1	Total	C	F	N	O	P	S	0	0
			28	8	1	3	12	3	1		

- Molecule 6 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	6	Total	Ca	0	0
			6	6		

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	B	1	Total 1	Ca 1	0	0
6	E	5	Total 5	Ca 5	0	0
6	F	1	Total 1	Ca 1	0	0
6	I	3	Total 3	Ca 3	0	0
6	J	1	Total 1	Ca 1	0	0
6	K	1	Total 1	Ca 1	0	0
6	M	4	Total 4	Ca 4	0	0
6	N	1	Total 1	Ca 1	0	0

- Molecule 7 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2$).



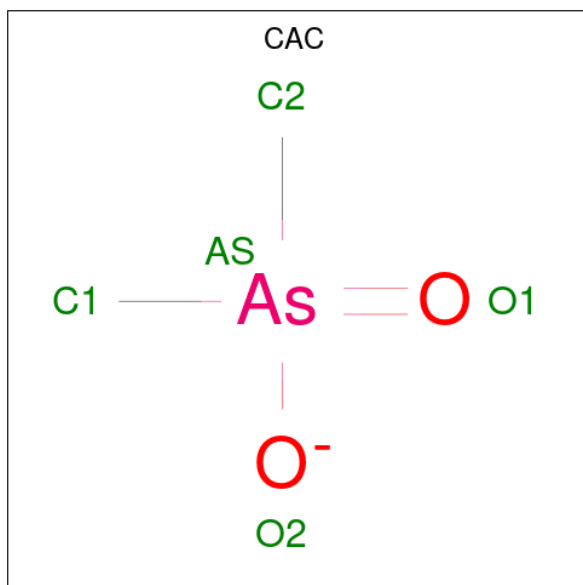
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total 4	C 2	O 2	0	0
7	B	1	Total 4	C 2	O 2	0	0
7	E	1	Total 4	C 2	O 2	0	0

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	F	1	Total	C	O	0	0
			4	2	2		
7	I	1	Total	C	O	0	0
			4	2	2		
7	M	1	Total	C	O	0	0
			4	2	2		

- Molecule 8 is CACODYLATE ION (CCD ID: CAC) (formula: $C_2H_6AsO_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	E	1	Total	As	C	O	0	0
			5	1	2	2		
8	M	1	Total	As	C	O	0	0
			5	1	2	2		

- Molecule 9 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	A	129	Total	O	0	0
			129	129		
9	B	20	Total	O	0	0
			20	20		
9	C	13	Total	O	0	0
			13	13		
9	E	78	Total	O	0	0
			78	78		

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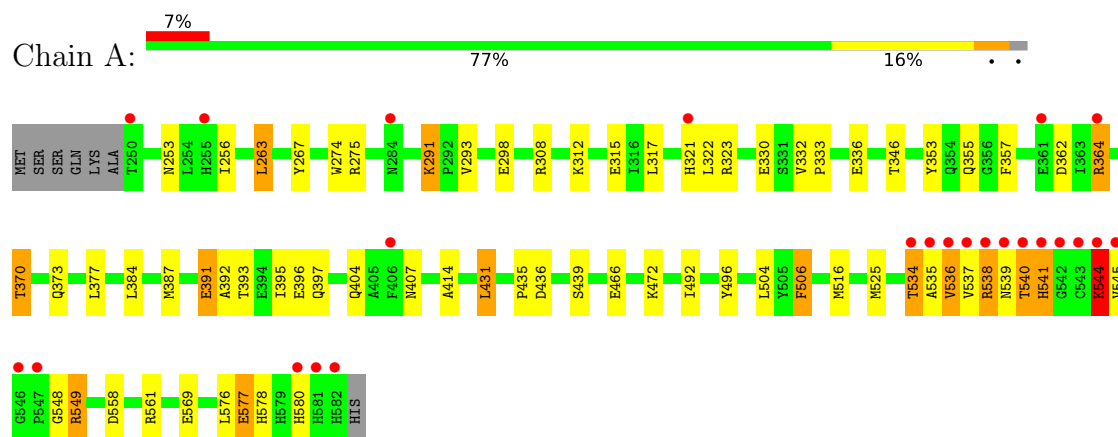
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
9	F	9	Total 9	O 9	0	0
9	G	2	Total 2	O 2	0	0
9	H	2	Total 2	O 2	0	0
9	I	76	Total 76	O 76	0	0
9	J	4	Total 4	O 4	0	0
9	K	9	Total 9	O 9	0	0
9	M	124	Total 124	O 124	0	0
9	N	8	Total 8	O 8	0	0
9	O	3	Total 3	O 3	0	0
9	P	2	Total 2	O 2	0	0

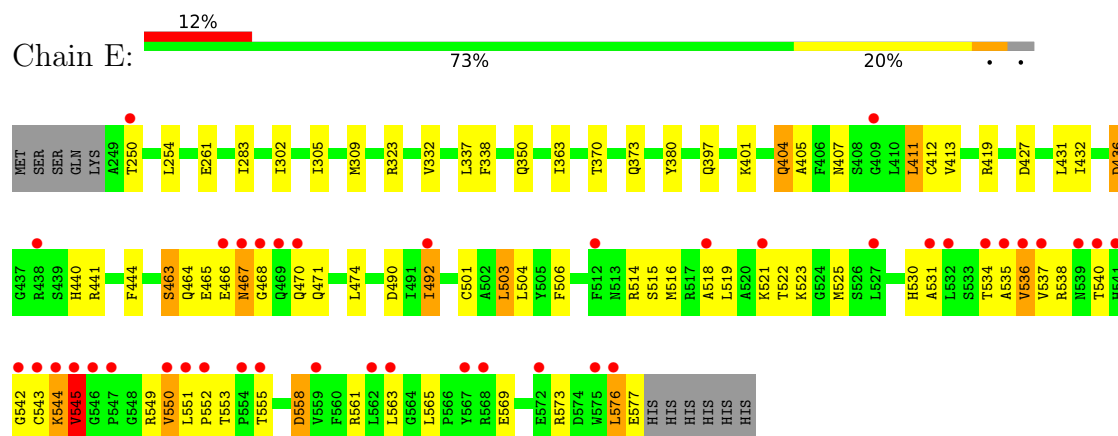
3 Residue-property plots [i](#)

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 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.

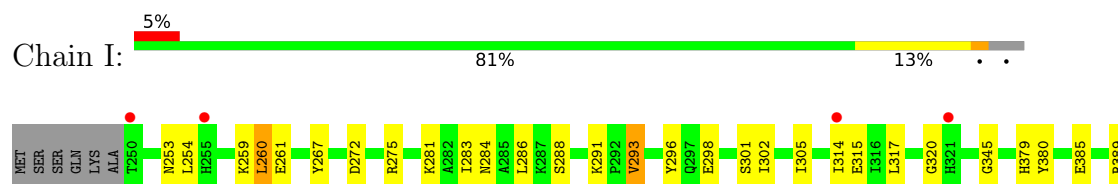
- Molecule 1: DNA polymerase lambda



- Molecule 1: DNA polymerase lambda

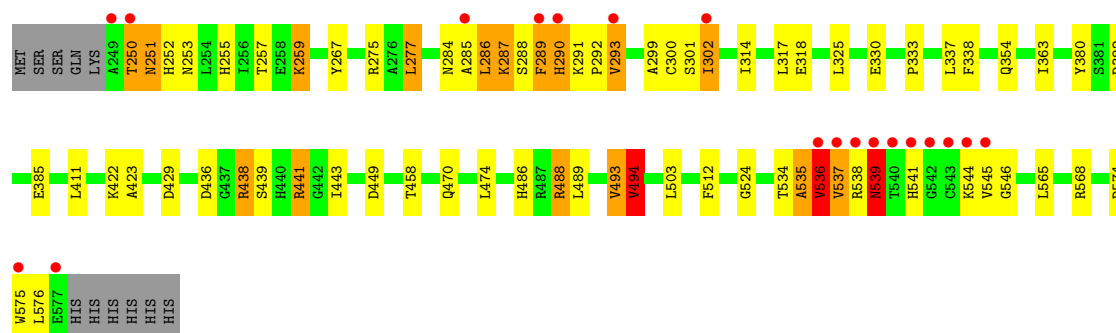
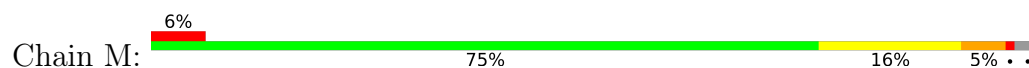


- Molecule 1: DNA polymerase lambda





- Molecule 1: DNA polymerase lambda



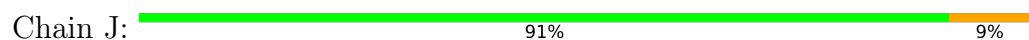
- Molecule 2: DNA (5'-D(*CP*GP*GP*CP*GP*GP*TP*AP*CP*TP*G)-3')



- Molecule 2: DNA (5'-D(*CP*GP*GP*CP*GP*GP*TP*AP*CP*TP*G)-3')



- Molecule 2: DNA (5'-D(*CP*GP*GP*CP*GP*GP*TP*AP*CP*TP*G)-3')



- Molecule 2: DNA (5'-D(*CP*GP*GP*CP*GP*GP*TP*AP*CP*TP*G)-3')



- Molecule 3: DNA (5'-D(*CP*AP*GP*TP*AP*C)-3')





- Molecule 3: DNA (5'-D(*CP*AP*GP*TP*AP*C)-3')

Chain G: 83% 17%



- Molecule 3: DNA (5'-D(*CP*AP*GP*TP*AP*C)-3')

Chain K: 17% 83% 17%



- Molecule 3: DNA (5'-D(*CP*AP*GP*TP*AP*C)-3')

Chain O: 100%

There are no outlier residues recorded for this chain.

- Molecule 4: DNA (5'-D(P*GP*CP*CP*G)-3')

Chain D: 25% 75%



- Molecule 4: DNA (5'-D(P*GP*CP*CP*G)-3')

Chain H: 100%

There are no outlier residues recorded for this chain.

- Molecule 4: DNA (5'-D(P*GP*CP*CP*G)-3')

Chain L: 100%

There are no outlier residues recorded for this chain.

- Molecule 4: DNA (5'-D(P*GP*CP*CP*G)-3')

Chain P: 100%

There are no outlier residues recorded for this chain.

4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	194.44Å 97.58Å 105.15Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	45.03 – 2.25 45.03 – 2.25	Depositor EDS
% Data completeness (in resolution range)	99.9 (45.03-2.25) 99.9 (45.03-2.25)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.97 (at 2.24Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.212 , 0.274 0.216 , 0.274	Depositor DCC
R_{free} test set	4788 reflections (5.01%)	wwPDB-VP
Wilson B-factor (Å ²)	32.5	Xtriage
Anisotropy	0.202	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 36.6	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	12760	wwPDB-VP
Average B, all atoms (Å ²)	38.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.97% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CAC, CA, 1RY, ACT

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	1.18	2/2716 (0.1%)	1.12	8/3666 (0.2%)
1	E	1.04	1/2642 (0.0%)	1.06	4/3566 (0.1%)
1	I	0.99	2/2628 (0.1%)	1.02	0/3546
1	M	1.18	5/2648 (0.2%)	1.15	8/3574 (0.2%)
2	B	0.51	0/252	1.15	3/388 (0.8%)
2	F	0.42	0/252	1.01	0/388
2	J	0.50	0/252	0.95	1/388 (0.3%)
2	N	0.48	0/252	0.97	1/388 (0.3%)
3	C	0.65	0/133	1.23	3/203 (1.5%)
3	G	0.47	0/133	1.04	2/203 (1.0%)
3	K	0.46	0/133	1.12	2/203 (1.0%)
3	O	0.55	0/133	0.91	0/203
4	D	0.50	0/92	0.94	0/138
4	H	0.56	0/92	0.86	0/138
4	L	0.46	0/92	0.88	0/138
4	P	0.51	0/92	0.90	0/138
All	All	1.03	10/12542 (0.1%)	1.08	32/17268 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	M	0	1

The worst 5 of 10 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	332	VAL	CA-CB	6.71	1.57	1.54
1	M	429	ASP	CG-OD2	5.85	1.36	1.25

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	463	SER	CA-C	5.80	1.59	1.52
1	M	429	ASP	CB-CG	5.57	1.66	1.52
1	I	345	GLY	C-O	5.44	1.29	1.24

The worst 5 of 32 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	6	DC	C2'-C3'-O3'	8.27	123.91	111.50
2	B	8	DA	C2'-C3'-O3'	7.24	122.36	111.50
1	M	494	VAL	N-CA-CB	-7.20	101.13	111.21
1	A	336	GLU	N-CA-C	-6.93	103.81	111.36
3	K	1	DC	C5'-C4'-O4'	6.53	119.20	109.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	M	290	HIS	Peptide

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	2649	0	2639	57	0
1	E	2589	0	2590	61	0
1	I	2574	0	2566	26	0
1	M	2592	0	2595	53	0
2	B	225	0	125	1	0
2	F	225	0	125	4	0
2	J	225	0	125	1	0
2	N	225	0	125	2	0
3	C	119	0	68	0	0
3	G	119	0	69	0	0
3	K	119	0	69	0	0
3	O	119	0	69	0	0
4	D	83	0	45	2	0
4	H	83	0	45	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	L	83	0	45	0	0
4	P	83	0	45	0	0
5	A	28	0	11	0	0
5	E	28	0	11	0	0
5	I	28	0	11	0	0
5	M	28	0	12	1	0
6	A	6	0	0	0	0
6	B	1	0	0	0	0
6	E	5	0	0	0	0
6	F	1	0	0	0	0
6	I	3	0	0	0	0
6	J	1	0	0	0	0
6	K	1	0	0	0	0
6	M	4	0	0	0	0
6	N	1	0	0	0	0
7	A	4	0	3	0	0
7	B	4	0	3	0	0
7	E	4	0	3	1	0
7	F	4	0	3	0	0
7	I	4	0	3	0	0
7	M	4	0	3	0	0
8	E	5	0	0	0	0
8	M	5	0	0	3	0
9	A	129	0	0	13	0
9	B	20	0	0	0	0
9	C	13	0	0	0	0
9	E	78	0	0	7	0
9	F	9	0	0	0	0
9	G	2	0	0	0	0
9	H	2	0	0	0	0
9	I	76	0	0	1	0
9	J	4	0	0	1	0
9	K	9	0	0	0	0
9	M	124	0	0	4	0
9	N	8	0	0	1	0
9	O	3	0	0	0	0
9	P	2	0	0	0	0
All	All	12760	0	11408	202	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 9.

The worst 5 of 202 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:387:MET:HE1	1:A:395:ILE:HD12	1.40	1.03
1:E:397:GLN:HG3	9:E:770:HOH:O	1.58	1.01
1:M:535:ALA:HB1	1:M:536:VAL:HG23	1.38	1.01
1:M:536:VAL:H	1:M:537:VAL:HA	1.23	1.01
1:E:521:LYS:NZ	2:F:4:DC:OP1	2.03	0.90

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	334/340 (98%)	313 (94%)	17 (5%)	4 (1%)	10	7
1	E	327/340 (96%)	296 (90%)	25 (8%)	6 (2%)	6	3
1	I	321/340 (94%)	308 (96%)	12 (4%)	1 (0%)	36	40
1	M	328/340 (96%)	306 (93%)	15 (5%)	7 (2%)	5	2
All	All	1310/1360 (96%)	1223 (93%)	69 (5%)	18 (1%)	9	5

5 of 18 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	538	ARG
1	M	251	ASN
1	M	289	PHE
1	M	290	HIS
1	M	536	VAL

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	284/287 (99%)	268 (94%)	16 (6%)	19	20
1	E	276/287 (96%)	256 (93%)	20 (7%)	13	12
1	I	275/287 (96%)	259 (94%)	16 (6%)	18	19
1	M	277/287 (96%)	250 (90%)	27 (10%)	8	6
All	All	1112/1148 (97%)	1033 (93%)	79 (7%)	14	12

5 of 79 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	M	293	VAL
1	M	493	VAL
1	M	314	ILE
1	M	441	ARG
1	M	541	HIS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 29 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	486	HIS
1	M	464	GLN
1	I	270	GLN
1	M	355	GLN
1	I	253	ASN

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 oligosaccharides in this entry.

5.6 Ligand geometry

Of 35 ligands modelled in this entry, 23 are monoatomic - leaving 12 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
5	1RY	I	601	6	28,29,29	2.43	7 (25%)	40,45,45	2.14	7 (17%)
7	ACT	I	605	-	3,3,3	0.81	0	3,3,3	1.29	0
7	ACT	A	608	-	3,3,3	0.76	0	3,3,3	1.96	1 (33%)
7	ACT	M	607	-	3,3,3	0.99	0	3,3,3	0.66	0
5	1RY	M	601	6	28,29,29	2.05	8 (28%)	40,45,45	2.11	13 (32%)
5	1RY	A	601	6	28,29,29	2.00	8 (28%)	40,45,45	1.69	8 (20%)
8	CAC	E	607	-	2,4,4	3.07	2 (100%)	4,6,6	1.57	1 (25%)
7	ACT	F	102	-	3,3,3	0.99	0	3,3,3	0.72	0
5	1RY	E	601	6	28,29,29	2.25	8 (28%)	40,45,45	1.80	7 (17%)
7	ACT	B	102	-	3,3,3	0.75	0	3,3,3	0.87	0
7	ACT	E	608	-	3,3,3	0.69	0	3,3,3	1.03	0
8	CAC	M	606	-	2,4,4	3.44	2 (100%)	4,6,6	2.68	2 (50%)

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
5	1RY	I	601	6	-	5/22/31/31	0/2/2/2
5	1RY	M	601	6	-	6/22/31/31	0/2/2/2
5	1RY	A	601	6	-	3/22/31/31	0/2/2/2
5	1RY	E	601	6	-	5/22/31/31	0/2/2/2

The worst 5 of 35 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	I	601	1RY	OAB-CAV	7.62	1.37	1.23
5	I	601	1RY	PBA-OAR	6.85	1.66	1.59

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	E	601	1RY	OAB-CAV	6.43	1.35	1.23
5	E	601	1RY	CAT-CAU	-6.14	1.37	1.42
5	M	601	1RY	PBB-OAQ	5.85	1.65	1.59

The worst 5 of 39 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	I	601	1RY	FAJ-CAU-CAT	9.86	124.37	118.09
5	E	601	1RY	OAD-PBA-OAR	6.99	126.16	107.27
5	M	601	1RY	OAP-CAX-NAY	6.95	120.19	107.86
5	A	601	1RY	OAB-CAV-NAN	-5.21	114.12	122.33
5	M	601	1RY	OAB-CAV-NAN	-4.82	114.74	122.33

There are no chirality outliers.

5 of 19 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	601	1RY	PBB-OAQ-PAZ-OAF
5	E	601	1RY	PBB-OAQ-PAZ-OAF
5	I	601	1RY	PBB-OAQ-PAZ-OAC
5	I	601	1RY	PBB-OAQ-PAZ-OAF
5	M	601	1RY	OAO-CAL-CAW-OAP

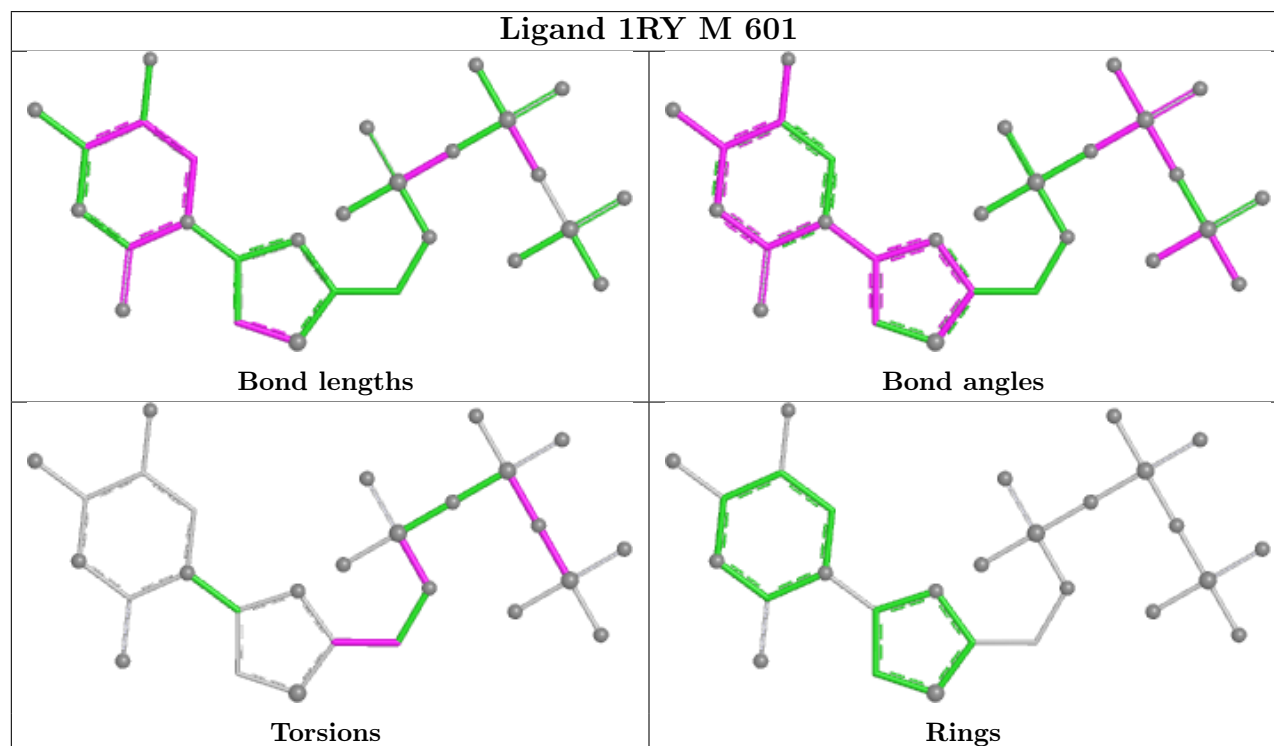
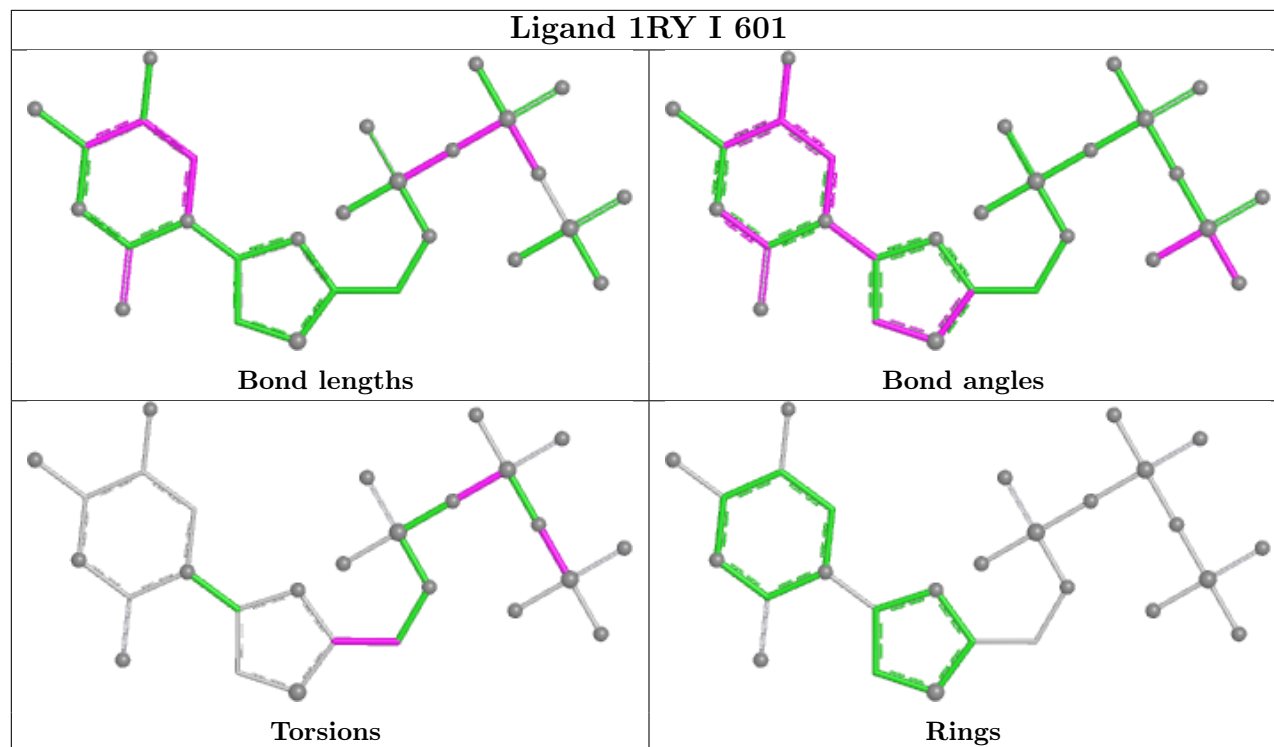
There are no ring outliers.

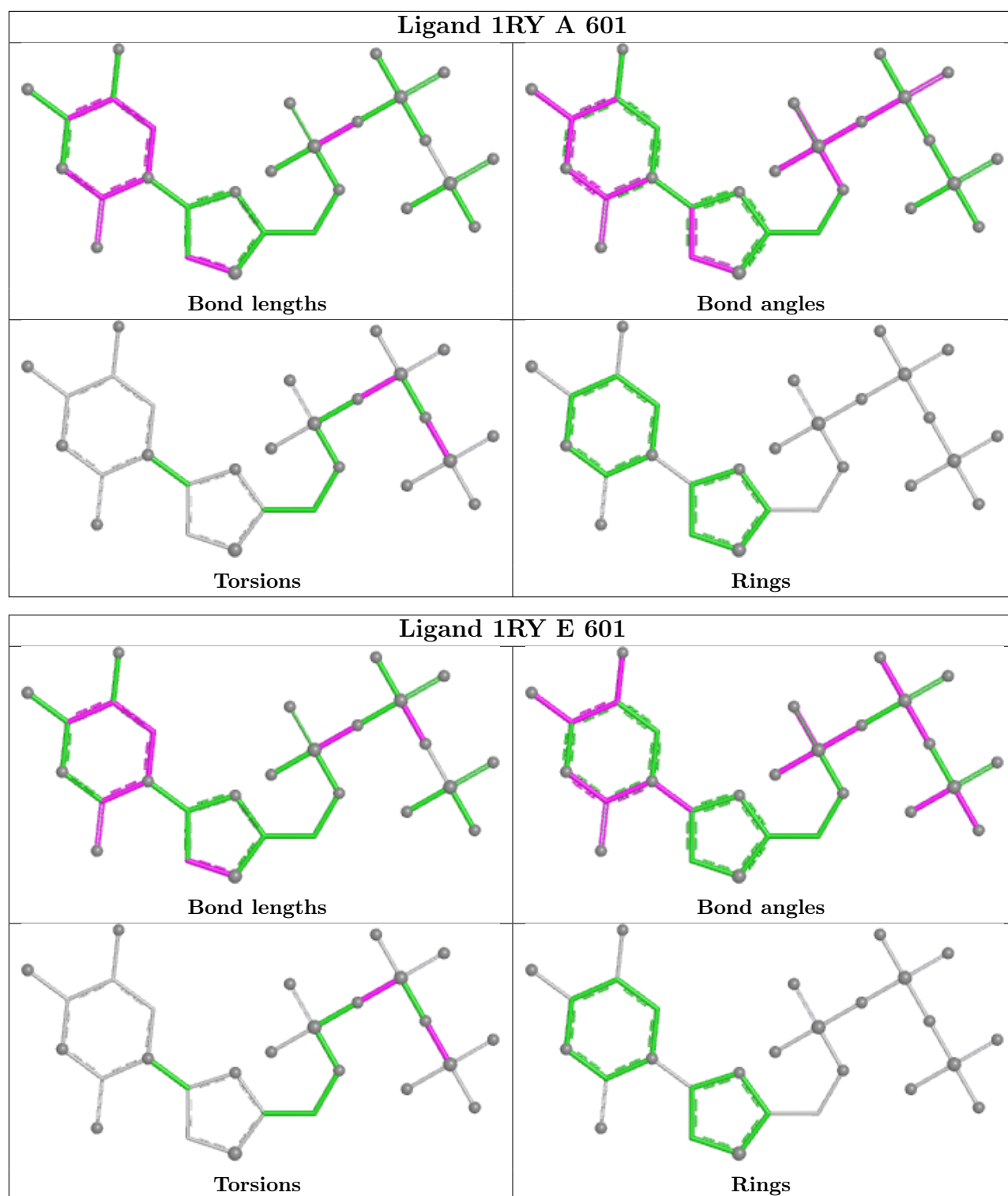
3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	M	601	1RY	1	0
7	E	608	ACT	1	0
8	M	606	CAC	3	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 ⓘ

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	333/340 (97%)	0.32	24 (7%)	21	20	13, 32, 69, 132	3 (0%)
1	E	329/340 (96%)	0.64	41 (12%)	8	7	20, 37, 75, 127	0
1	I	325/340 (95%)	0.36	16 (4%)	35	34	19, 37, 63, 95	0
1	M	329/340 (96%)	0.31	19 (5%)	29	27	15, 32, 56, 112	1 (0%)
2	B	11/11 (100%)	-0.73	0	100	100	21, 25, 42, 46	0
2	F	11/11 (100%)	0.24	0	100	100	36, 43, 55, 60	0
2	J	11/11 (100%)	-0.21	0	100	100	33, 35, 42, 43	0
2	N	11/11 (100%)	-0.55	0	100	100	22, 29, 40, 44	0
3	C	6/6 (100%)	-0.84	0	100	100	20, 24, 37, 39	0
3	G	6/6 (100%)	-0.08	0	100	100	28, 32, 57, 68	0
3	K	6/6 (100%)	0.02	1 (16%)	4	3	23, 25, 64, 69	0
3	O	6/6 (100%)	-0.56	0	100	100	24, 28, 47, 50	0
4	D	4/4 (100%)	-0.38	0	100	100	33, 35, 37, 39	0
4	H	4/4 (100%)	-0.63	0	100	100	28, 32, 33, 37	0
4	L	4/4 (100%)	0.00	0	100	100	36, 38, 44, 46	0
4	P	4/4 (100%)	-0.48	0	100	100	32, 36, 41, 44	0
All	All	1400/1444 (96%)	0.36	101 (7%)	21	20	13, 35, 66, 132	4 (0%)

The worst 5 of 101 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	545	VAL	6.2
1	E	467	ASN	6.2
1	A	537	VAL	5.8
1	A	536	VAL	5.5
1	I	580	HIS	5.1

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 oligosaccharides 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($\text{\AA}^2$)	Q<0.9
8	CAC	E	607	5/5	0.30	0.35	132,134,146,155	0
7	ACT	M	607	4/4	0.56	0.22	55,55,57,61	0
7	ACT	B	102	4/4	0.67	0.21	48,49,49,57	0
7	ACT	A	608	4/4	0.74	0.20	41,41,45,51	0
6	CA	K	101	1/1	0.77	0.11	64,64,64,64	0
7	ACT	E	608	4/4	0.81	0.17	54,55,57,58	0
6	CA	M	605	1/1	0.82	0.18	61,61,61,61	0
7	ACT	F	102	4/4	0.84	0.17	43,48,48,50	0
6	CA	E	604	1/1	0.85	0.10	64,64,64,64	0
6	CA	M	604	1/1	0.86	0.10	49,49,49,49	0
6	CA	J	101	1/1	0.86	0.10	58,58,58,58	0
8	CAC	M	606	5/5	0.87	0.18	74,77,82,88	0
6	CA	A	602	1/1	0.89	0.28	33,33,33,33	0
6	CA	I	604	1/1	0.89	0.14	64,64,64,64	0
6	CA	M	602	1/1	0.89	0.16	65,65,65,65	0
7	ACT	I	605	4/4	0.90	0.12	39,43,45,49	0
6	CA	B	101	1/1	0.90	0.08	66,66,66,66	0
6	CA	E	606	1/1	0.91	0.11	62,62,62,62	0
6	CA	N	101	1/1	0.91	0.08	58,58,58,58	0
6	CA	A	606	1/1	0.92	0.12	29,29,29,29	0
5	1RY	I	601	28/28	0.93	0.10	41,52,65,66	0
6	CA	A	607	1/1	0.93	0.11	59,59,59,59	0
6	CA	A	603	1/1	0.94	0.18	53,53,53,53	0
6	CA	E	605	1/1	0.94	0.27	39,39,39,39	0
5	1RY	M	601	28/28	0.95	0.07	23,32,43,47	0
6	CA	A	604	1/1	0.95	0.10	37,37,37,37	0
6	CA	I	603	1/1	0.95	0.08	38,38,38,38	0

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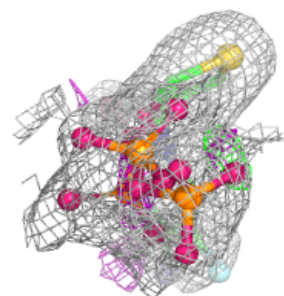
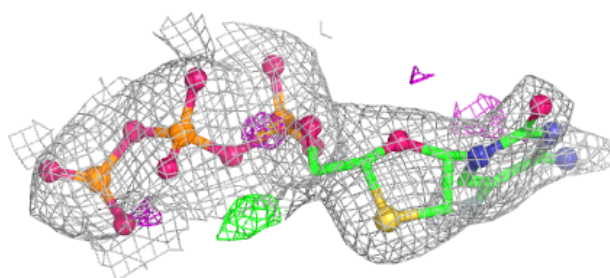
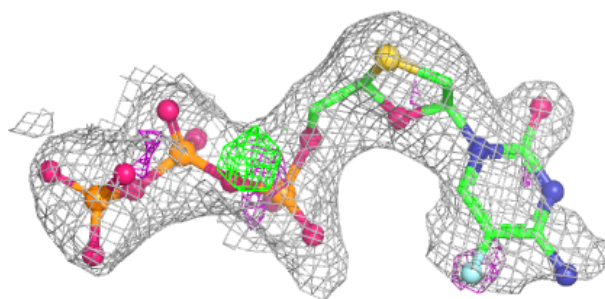
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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	CA	M	603	1/1	0.96	0.14	42,42,42,42	0
6	CA	F	101	1/1	0.96	0.05	47,47,47,47	0
6	CA	E	603	1/1	0.96	0.13	50,50,50,50	0
6	CA	I	602	1/1	0.97	0.21	35,35,35,35	0
6	CA	A	605	1/1	0.98	0.05	21,21,21,21	0
5	1RY	E	601	28/28	0.98	0.06	23,32,36,40	0
5	1RY	A	601	28/28	0.98	0.05	18,20,23,24	0
6	CA	E	602	1/1	0.99	0.04	30,30,30,30	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.

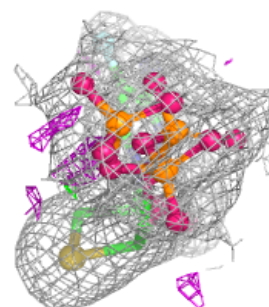
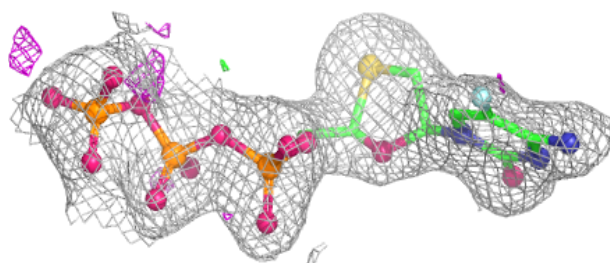
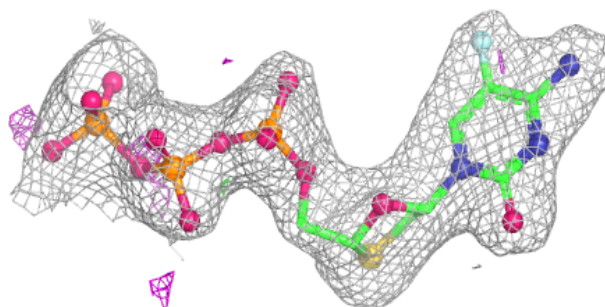
Electron density around 1RY I 601:

2mF_o-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

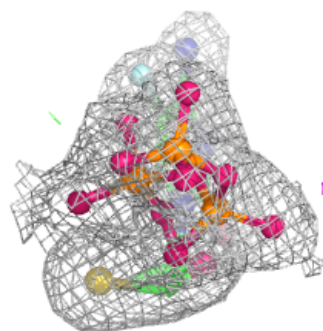
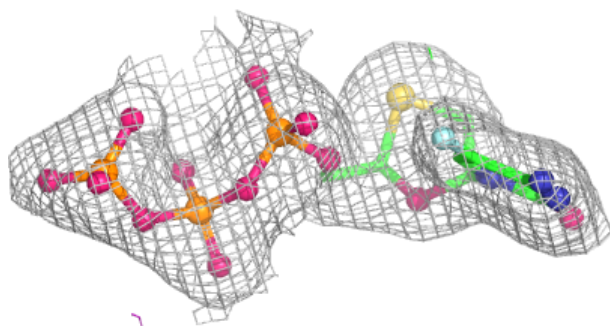
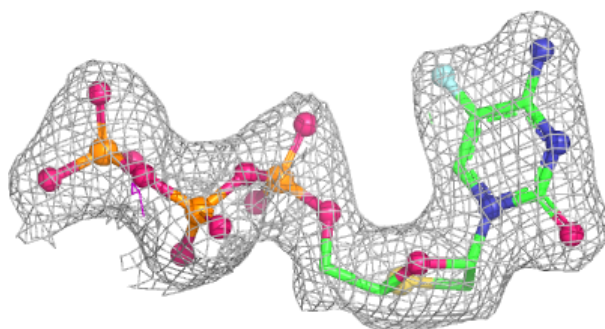


Electron density around 1RY M 601:

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

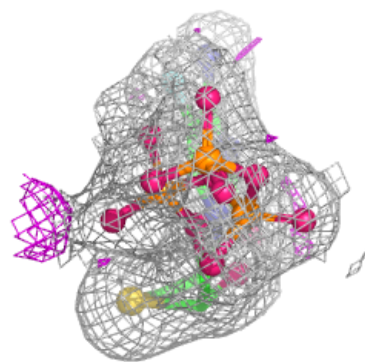
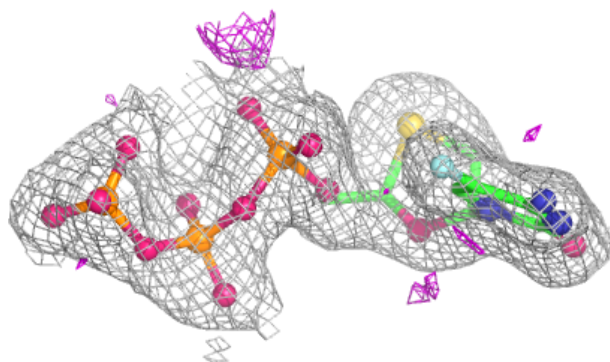
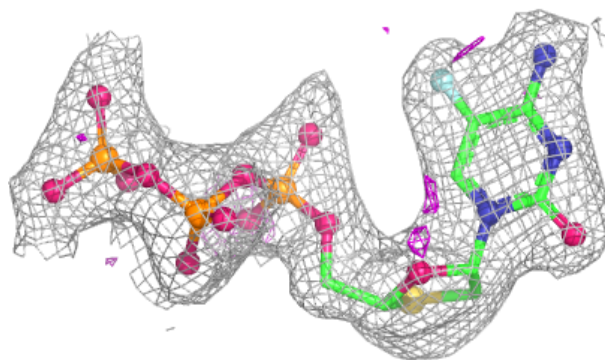
**Electron density around 1RY E 601:**

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



Electron density around 1RY A 601:

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



6.5 Other polymers [i](#)

There are no such residues in this entry.