



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 12, 2026 – 03:52 PM UTC

PDB ID : 3VHX / pdb_00003vhx
Title : The crystal structure of Arf6-MKLP1 (Mitotic kinesin-like protein 1) complex
Authors : Makyio, H.; Takei, T.; Ohgi, H.; Takahashi, S.; Takatsu, H.; Ueda, T.; Kanaho, Y.; Xie, Y.; Shin, H.W.; Kamikubo, H.; Kataoka, M.; Kawasaki, M.; Kato, R.; Wakatsuki, S.; Nakayama, K.
Deposited on : 2011-09-12
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	:	4-5-2 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

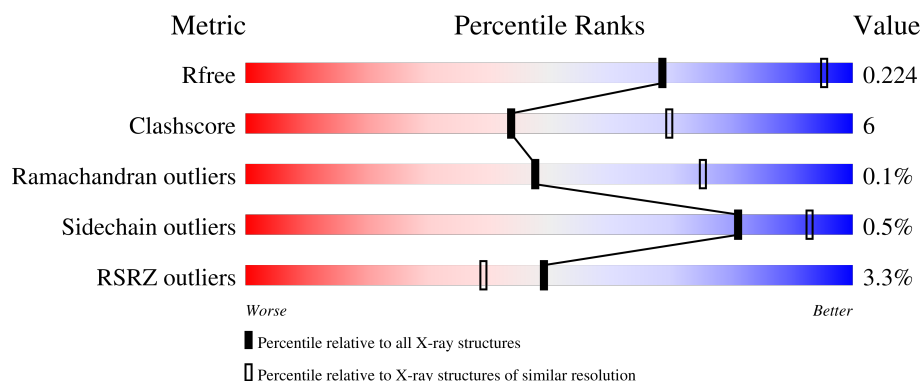
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.81 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}	180053	4591 (2.84-2.80)
Clashscore	190562	5010 (2.84-2.80)
Ramachandran outliers	187476	4916 (2.84-2.80)
Sidechain outliers	187428	4918 (2.84-2.80)
RSRZ outliers	180081	4594 (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	172	9% 85% 9% 6%
1	C	172	83% 12% 6%
1	E	172	80% 15% 6%
1	G	172	9% 86% 8% 6%

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Mol	Chain	Length	Quality of chain
2	B	120	4% 76% 12% • 12%
2	D	120	7% 69% 18% • 12%
2	F	120	2% 70% 15% 15%
2	H	120	2% 68% 6% 27%

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 8659 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 ADP-ribosylation factor 6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	162	Total	C	N	O	S	0	0	0
			1313	835	230	241	7			
1	C	162	Total	C	N	O	S	0	0	0
			1313	835	230	241	7			
1	E	162	Total	C	N	O	S	0	0	0
			1313	835	230	241	7			
1	G	162	Total	C	N	O	S	0	0	0
			1313	835	230	241	7			

There are 40 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	12	MET	-	expression tag	UNP P62331
A	67	LEU	GLN	engineered mutation	UNP P62331
A	176	LEU	-	expression tag	UNP P62331
A	177	GLU	-	expression tag	UNP P62331
A	178	HIS	-	expression tag	UNP P62331
A	179	HIS	-	expression tag	UNP P62331
A	180	HIS	-	expression tag	UNP P62331
A	181	HIS	-	expression tag	UNP P62331
A	182	HIS	-	expression tag	UNP P62331
A	183	HIS	-	expression tag	UNP P62331
C	12	MET	-	expression tag	UNP P62331
C	67	LEU	GLN	engineered mutation	UNP P62331
C	176	LEU	-	expression tag	UNP P62331
C	177	GLU	-	expression tag	UNP P62331
C	178	HIS	-	expression tag	UNP P62331
C	179	HIS	-	expression tag	UNP P62331
C	180	HIS	-	expression tag	UNP P62331
C	181	HIS	-	expression tag	UNP P62331
C	182	HIS	-	expression tag	UNP P62331
C	183	HIS	-	expression tag	UNP P62331
E	12	MET	-	expression tag	UNP P62331

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Chain	Residue	Modelled	Actual	Comment	Reference
E	67	LEU	GLN	engineered mutation	UNP P62331
E	176	LEU	-	expression tag	UNP P62331
E	177	GLU	-	expression tag	UNP P62331
E	178	HIS	-	expression tag	UNP P62331
E	179	HIS	-	expression tag	UNP P62331
E	180	HIS	-	expression tag	UNP P62331
E	181	HIS	-	expression tag	UNP P62331
E	182	HIS	-	expression tag	UNP P62331
E	183	HIS	-	expression tag	UNP P62331
G	12	MET	-	expression tag	UNP P62331
G	67	LEU	GLN	engineered mutation	UNP P62331
G	176	LEU	-	expression tag	UNP P62331
G	177	GLU	-	expression tag	UNP P62331
G	178	HIS	-	expression tag	UNP P62331
G	179	HIS	-	expression tag	UNP P62331
G	180	HIS	-	expression tag	UNP P62331
G	181	HIS	-	expression tag	UNP P62331
G	182	HIS	-	expression tag	UNP P62331
G	183	HIS	-	expression tag	UNP P62331

- Molecule 2 is a protein called Kinesin-like protein KIF23.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	106	Total	C	N	O	S	43	0	0
			835	512	157	162	4			
2	D	106	Total	C	N	O	S	43	0	0
			835	512	157	162	4			
2	F	102	Total	C	N	O	S	83	0	0
			805	496	151	154	4			
2	H	88	Total	C	N	O	S	0	0	0
			689	427	120	138	4			

There are 8 discrepancies between the modelled and reference sequences:

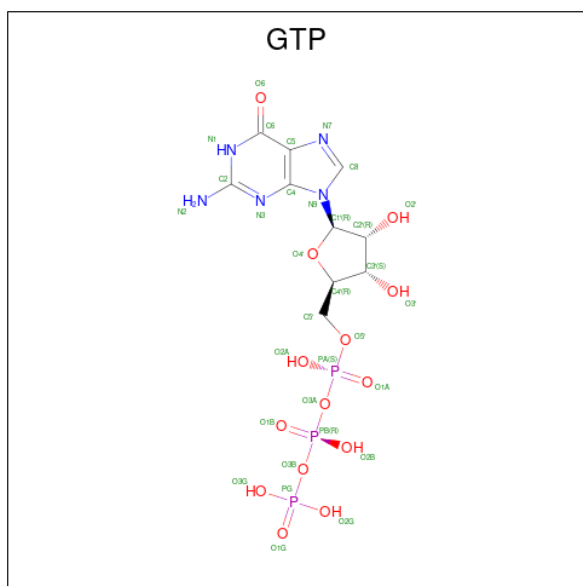
Chain	Residue	Modelled	Actual	Comment	Reference
B	688	GLY	-	expression tag	UNP Q02241
B	689	SER	-	expression tag	UNP Q02241
D	688	GLY	-	expression tag	UNP Q02241
D	689	SER	-	expression tag	UNP Q02241
F	688	GLY	-	expression tag	UNP Q02241
F	689	SER	-	expression tag	UNP Q02241
H	688	GLY	-	expression tag	UNP Q02241

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Chain	Residue	Modelled	Actual	Comment	Reference
H	689	SER	-	expression tag	UNP Q02241

- Molecule 3 is GUANOSINE-5'-TRIPHOSPHATE (CCD ID: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

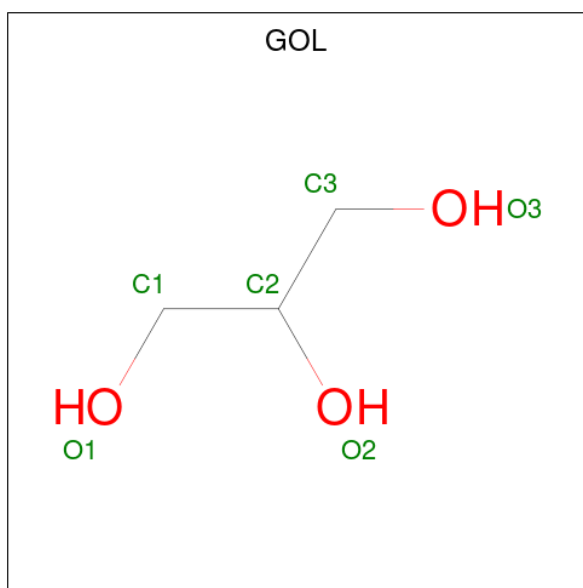


Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			32	10	5	14	3		
3	C	1	Total	C	N	O	P	0	0
			32	10	5	14	3		
3	E	1	Total	C	N	O	P	0	0
			32	10	5	14	3		
3	G	1	Total	C	N	O	P	0	0
			32	10	5	14	3		

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		
4	C	1	Total	Mg	0	0
			1	1		
4	E	1	Total	Mg	0	0
			1	1		
4	G	1	Total	Mg	0	0
			1	1		

- Molecule 5 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	F	1	Total	C	O	0	0
			6	3	3		

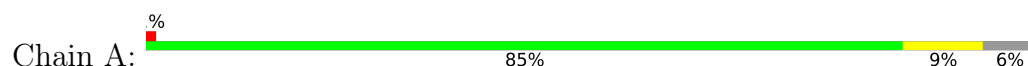
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	8	Total	O	0	0
			8	8		
6	B	7	Total	O	0	0
			7	7		
6	C	28	Total	O	0	0
			28	28		
6	D	12	Total	O	0	0
			12	12		
6	E	22	Total	O	0	0
			22	22		
6	F	17	Total	O	0	0
			17	17		
6	G	3	Total	O	0	0
			3	3		
6	H	8	Total	O	0	0
			8	8		

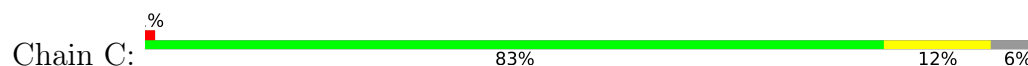
3 Residue-property plots [i](#)

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.

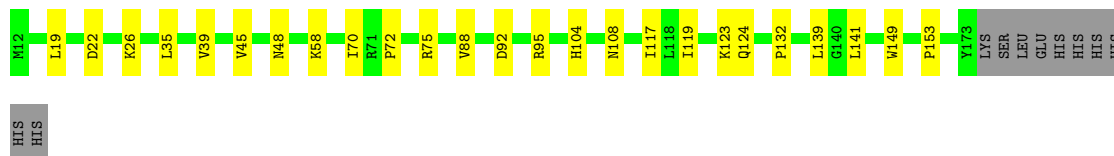
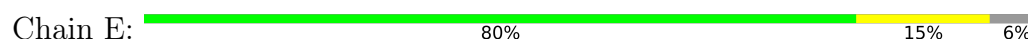
- Molecule 1: ADP-ribosylation factor 6



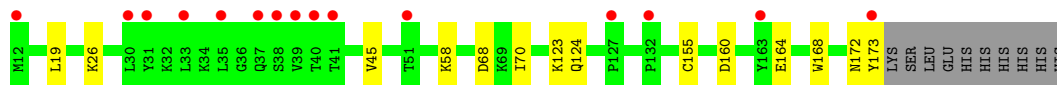
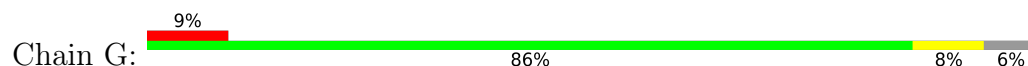
- Molecule 1: ADP-ribosylation factor 6



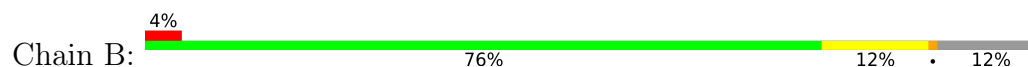
- Molecule 1: ADP-ribosylation factor 6



- Molecule 1: ADP-ribosylation factor 6



- Molecule 2: Kinesin-like protein KIF23



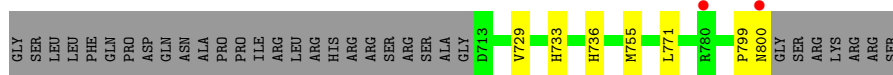
● Molecule 2: Kinesin-like protein KIF23



● Molecule 2: Kinesin-like protein KIF23



● Molecule 2: Kinesin-like protein KIF23



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	45.74Å 174.57Å 76.81Å 90.00° 98.74° 90.00°	Depositor
Resolution (Å)	30.00 – 2.81 30.00 – 2.81	Depositor EDS
% Data completeness (in resolution range)	99.2 (30.00-2.81) 99.2 (30.00-2.81)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.39 (at 2.81Å)	Xtrriage
Refinement program	REFMAC 5.5.0109	Depositor
R, R_{free}	0.201 , 0.232 (Not available) , 0.224	Depositor DCC
R_{free} test set	1466 reflections (5.09%)	wwPDB-VP
Wilson B-factor (Å ²)	51.1	Xtrriage
Anisotropy	0.145	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 49.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	8659	wwPDB-VP
Average B, all atoms (Å ²)	55.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 25.18 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 3.3302e-03. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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: GOL, MG, GTP

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	0.52	1/1339 (0.1%)	0.76	0/1813
1	C	0.57	2/1339 (0.1%)	0.79	0/1813
1	E	0.54	2/1339 (0.1%)	0.81	0/1813
1	G	0.53	1/1339 (0.1%)	0.79	1/1813 (0.1%)
2	B	0.66	3/850 (0.4%)	0.80	0/1147
2	D	0.61	2/850 (0.2%)	0.82	0/1147
2	F	0.52	0/820	0.83	3/1105 (0.3%)
2	H	0.53	1/701 (0.1%)	0.77	2/947 (0.2%)
All	All	0.56	12/8577 (0.1%)	0.80	6/11598 (0.1%)

All (12) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	696	GLN	CD-OE1	5.89	1.34	1.23
1	C	48	ASN	CG-OD1	5.51	1.34	1.23
2	B	787	GLN	CD-OE1	5.36	1.33	1.23
1	A	124	GLN	CD-OE1	5.30	1.33	1.23
2	D	696	GLN	CD-OE1	5.30	1.33	1.23
1	G	124	GLN	CD-OE1	5.30	1.33	1.23
2	D	787	GLN	CD-OE1	5.29	1.33	1.23
2	H	736	HIS	ND1-CE1	5.28	1.37	1.32
2	B	723	ASN	CG-OD1	5.26	1.33	1.23
1	C	124	GLN	CD-OE1	5.25	1.33	1.23
1	E	48	ASN	CG-OD1	5.24	1.33	1.23
1	E	124	GLN	CD-OE1	5.18	1.33	1.23

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	736	HIS	CB-CG-CD2	-6.60	122.62	131.20

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	F	704	ARG	N-CA-C	6.06	120.74	112.68
2	F	719	LYS	CA-C-N	5.91	125.93	119.90
2	F	719	LYS	C-N-CA	5.91	125.93	119.90
2	H	736	HIS	CB-CG-ND1	5.54	131.02	122.70
1	G	68	ASP	N-CA-C	5.21	117.63	111.33

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	1313	0	1318	25	0
1	C	1313	0	1317	11	0
1	E	1313	0	1318	15	0
1	G	1313	0	1318	7	0
2	B	835	0	827	11	0
2	D	835	0	827	14	1
2	F	805	0	805	22	1
2	H	689	0	678	15	0
3	A	32	0	12	1	0
3	C	32	0	12	1	0
3	E	32	0	12	2	0
3	G	32	0	12	1	0
4	A	1	0	0	0	0
4	C	1	0	0	0	0
4	E	1	0	0	0	0
4	G	1	0	0	0	0
5	F	6	0	8	3	0
6	A	8	0	0	0	0
6	B	7	0	0	1	0
6	C	28	0	0	0	0
6	D	12	0	0	0	0
6	E	22	0	0	0	0
6	F	17	0	0	0	0
6	G	3	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
6	H	8	0	0	0	0
All	All	8659	0	8464	101	1

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 6.

All (101) 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)
2:F:733:HIS:CE1	2:H:733:HIS:CE1	2.33	1.17
2:F:733:HIS:NE2	2:H:733:HIS:NE2	1.94	1.12
1:A:14:MET:HE1	1:A:173:TYR:CZ	1.98	0.96
2:F:733:HIS:CE1	2:H:733:HIS:NE2	2.31	0.94
1:A:169:LEU:HD22	1:A:173:TYR:OH	1.73	0.86
2:F:733:HIS:NE2	2:H:733:HIS:CE1	2.40	0.84
2:F:733:HIS:HE1	2:H:733:HIS:CE1	1.96	0.80
2:F:733:HIS:CE1	2:H:733:HIS:HE1	2.01	0.78
1:A:14:MET:CE	1:A:173:TYR:CZ	2.67	0.77
2:F:733:HIS:CE1	2:H:733:HIS:HE2	1.99	0.77
2:F:722:SER:OG	5:F:1:GOL:H32	1.86	0.76
2:H:799:PRO:O	2:H:800:ASN:CG	2.30	0.74
2:D:799:PRO:O	2:D:800:ASN:CG	2.31	0.74
2:F:729:VAL:HG21	2:H:755:MET:HE1	1.70	0.73
2:F:733:HIS:HE2	2:H:733:HIS:HE2	0.75	0.72
2:B:697:ASN:HA	6:B:813:HOH:O	1.90	0.71
2:B:729:VAL:HG21	2:D:755:MET:HE1	1.75	0.67
2:B:755:MET:HE2	2:B:771:LEU:HB3	1.75	0.67
1:A:169:LEU:HB3	1:A:173:TYR:HE2	1.61	0.66
2:F:720:PRO:HB3	5:F:1:GOL:H31	1.78	0.66
1:E:39:VAL:HG11	2:F:701:ILE:HD11	1.77	0.66
2:F:799:PRO:O	2:F:800:ASN:CG	2.39	0.65
1:A:110:ARG:HA	1:A:113:ARG:NE	2.12	0.65
1:A:14:MET:HE1	1:A:173:TYR:OH	1.97	0.65
1:A:14:MET:HE3	1:A:173:TYR:CE1	2.35	0.61
1:A:22:ASP:OD1	1:A:95:ARG:NH2	2.34	0.61
2:D:755:MET:HE2	2:D:771:LEU:HB3	1.83	0.60
2:F:755:MET:HE2	2:F:771:LEU:HB3	1.82	0.60
2:F:790:ASP:HA	2:H:799:PRO:HD3	1.83	0.60
1:A:14:MET:CE	1:A:173:TYR:CE1	2.85	0.60
1:C:39:VAL:HG11	2:D:701:ILE:HD11	1.83	0.60
1:E:123:LYS:HG2	3:E:184:GTP:C6	2.37	0.59

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:169:LEU:O	1:A:173:TYR:CD2	2.56	0.59
2:D:773:LYS:HE3	2:D:790:ASP:OD1	2.03	0.58
1:G:123:LYS:HG2	3:G:184:GTP:C6	2.39	0.57
2:D:700:PRO:O	2:D:780:ARG:HD3	2.05	0.57
1:A:116:ILE:HD11	1:A:173:TYR:CZ	2.41	0.56
2:F:722:SER:CB	5:F:1:GOL:H32	2.36	0.56
1:A:110:ARG:HG3	1:A:113:ARG:CZ	2.36	0.55
2:B:773:LYS:HE3	2:B:790:ASP:OD1	2.07	0.55
1:E:22:ASP:CG	1:E:95:ARG:HH22	2.16	0.53
2:B:755:MET:HE1	2:D:729:VAL:HG21	1.91	0.52
2:F:755:MET:HE1	2:H:729:VAL:HG21	1.91	0.51
1:A:116:ILE:HG12	1:A:173:TYR:CE1	2.46	0.51
1:A:169:LEU:HB3	1:A:173:TYR:CE2	2.44	0.51
2:F:734:VAL:HG12	2:F:737:ALA:HB2	1.92	0.51
2:B:705:HIS:CD2	2:B:706:ARG:HH11	2.29	0.50
2:D:799:PRO:O	2:D:800:ASN:CB	2.60	0.50
2:F:731:GLN:HB2	2:H:733:HIS:CD2	2.47	0.50
1:C:34:LYS:HE2	2:D:781:GLY:O	2.12	0.49
1:A:169:LEU:CB	1:A:173:TYR:HE2	2.24	0.49
1:C:45:VAL:HA	1:C:70:ILE:HD11	1.95	0.48
1:A:169:LEU:O	1:A:173:TYR:HD2	1.96	0.48
1:A:169:LEU:CA	1:A:173:TYR:HE2	2.27	0.48
1:G:172:ASN:O	1:G:173:TYR:C	2.56	0.48
2:D:734:VAL:HG12	2:D:737:ALA:HB2	1.95	0.47
1:A:110:ARG:HA	1:A:113:ARG:HE	1.80	0.47
1:E:19:LEU:C	1:E:26:LYS:HD3	2.39	0.47
1:A:116:ILE:CD1	1:A:173:TYR:CZ	2.98	0.47
1:A:16:ILE:HD11	1:A:169:LEU:HD13	1.95	0.47
1:C:123:LYS:HG2	3:C:184:GTP:C6	2.50	0.46
2:B:734:VAL:HG12	2:B:737:ALA:HB2	1.98	0.46
1:C:22:ASP:CG	1:C:95:ARG:HH22	2.24	0.46
2:B:696:GLN:CG	2:B:697:ASN:N	2.79	0.45
2:D:738:ILE:HD12	2:D:751:CYS:SG	2.57	0.45
1:E:92:ASP:OD2	1:E:95:ARG:HD3	2.16	0.45
1:E:72:PRO:O	1:E:75:ARG:NH1	2.50	0.45
2:F:799:PRO:O	2:F:800:ASN:CB	2.65	0.45
1:A:123:LYS:HG2	3:A:184:GTP:C6	2.52	0.44
1:E:88:VAL:HG21	1:E:139:LEU:HD11	1.99	0.44
1:C:110:ARG:O	1:C:113:ARG:HB2	2.17	0.44
2:B:798:SER:C	2:B:800:ASN:H	2.26	0.44
1:E:104:HIS:O	1:E:108:ASN:ND2	2.51	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:696:GLN:HG2	2:B:697:ASN:N	2.32	0.43
1:E:45:VAL:HA	1:E:70:ILE:HD11	1.99	0.43
1:G:168:TRP:O	1:G:172:ASN:ND2	2.51	0.43
1:E:123:LYS:HG2	3:E:184:GTP:C5	2.53	0.43
2:B:696:GLN:CG	2:B:697:ASN:H	2.32	0.43
1:E:117:ILE:O	1:E:149:TRP:HA	2.17	0.43
1:E:119:ILE:HG13	1:E:141:LEU:HD11	2.00	0.43
1:G:164:GLU:OE1	1:G:164:GLU:N	2.52	0.43
1:A:169:LEU:O	1:A:170:THR:C	2.62	0.42
1:E:22:ASP:OD1	1:E:95:ARG:NH2	2.52	0.42
1:A:22:ASP:CG	1:A:95:ARG:HH22	2.27	0.42
2:D:695:ASP:OD1	2:D:695:ASP:N	2.52	0.42
1:A:89:ASP:CG	1:A:123:LYS:HD2	2.44	0.42
1:C:46:GLY:HA2	2:D:788:PHE:CE2	2.54	0.42
1:G:19:LEU:C	1:G:26:LYS:HD3	2.45	0.42
1:G:45:VAL:HA	1:G:70:ILE:HD11	2.02	0.42
1:E:35:LEU:CD1	2:F:701:ILE:HD12	2.51	0.41
1:C:117:ILE:O	1:C:149:TRP:HA	2.20	0.41
1:C:42:ILE:HG23	1:C:43:PRO:HD2	2.02	0.41
2:D:719:LYS:HG2	2:D:723:ASN:HD22	1.86	0.41
2:F:700:PRO:O	2:F:780:ARG:CD	2.68	0.41
1:A:119:ILE:HG13	1:A:141:LEU:HD11	2.02	0.41
1:G:155:CYS:HB3	1:G:160:ASP:HB2	2.03	0.41
1:C:89:ASP:CG	1:C:123:LYS:HD2	2.45	0.41
2:H:799:PRO:O	2:H:800:ASN:OD1	2.39	0.41
2:H:755:MET:HE2	2:H:771:LEU:HB3	2.02	0.40
1:C:150:TYR:HB2	1:C:168:TRP:CE2	2.56	0.40
1:E:132:PRO:HG3	1:E:153:PRO:HB3	2.04	0.40

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:727:GLU:OE1	2:F:705:HIS:CB[2_454]	1.98	0.22

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	160/172 (93%)	155 (97%)	5 (3%)	0	100	100
1	C	160/172 (93%)	157 (98%)	3 (2%)	0	100	100
1	E	160/172 (93%)	158 (99%)	2 (1%)	0	100	100
1	G	160/172 (93%)	158 (99%)	2 (1%)	0	100	100
2	B	104/120 (87%)	97 (93%)	7 (7%)	0	100	100
2	D	104/120 (87%)	99 (95%)	4 (4%)	1 (1%)	12	36
2	F	100/120 (83%)	97 (97%)	3 (3%)	0	100	100
2	H	86/120 (72%)	86 (100%)	0	0	100	100
All	All	1034/1168 (88%)	1007 (97%)	26 (2%)	1 (0%)	48	75

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	D	705	HIS

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	142/152 (93%)	141 (99%)	1 (1%)	76	91
1	C	142/152 (93%)	141 (99%)	1 (1%)	76	91
1	E	142/152 (93%)	141 (99%)	1 (1%)	76	91
1	G	142/152 (93%)	141 (99%)	1 (1%)	76	91

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	B	92/104 (88%)	92 (100%)	0	100	100
2	D	92/104 (88%)	91 (99%)	1 (1%)	65	86
2	F	89/104 (86%)	89 (100%)	0	100	100
2	H	77/104 (74%)	77 (100%)	0	100	100
All	All	918/1024 (90%)	913 (100%)	5 (0%)	81	93

All (5) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	58	LYS
1	C	58	LYS
2	D	705	HIS
1	E	58	LYS
1	G	58	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (8) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	705	HIS
2	B	784	GLN
2	D	696	GLN
2	D	784	GLN
1	E	60	ASN
2	F	784	GLN
1	G	60	ASN
1	G	133	HIS

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 9 ligands modelled in this entry, 4 are monoatomic - leaving 5 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	GTP	C	184	4	33,34,34	0.90	0	50,54,54	1.55	8 (16%)
3	GTP	E	184	4	33,34,34	0.99	3 (9%)	50,54,54	1.57	8 (16%)
5	GOL	F	1	-	5,5,5	0.27	0	5,5,5	0.75	0
3	GTP	A	184	4	33,34,34	0.92	1 (3%)	50,54,54	1.51	8 (16%)
3	GTP	G	184	4	33,34,34	0.95	2 (6%)	50,54,54	1.59	8 (16%)

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	GTP	C	184	4	-	1/22/38/38	0/3/3/3
3	GTP	E	184	4	-	1/22/38/38	0/3/3/3
5	GOL	F	1	-	-	4/4/4/4	-
3	GTP	A	184	4	-	1/22/38/38	0/3/3/3
3	GTP	G	184	4	-	1/22/38/38	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	G	184	GTP	C2-N3	2.26	1.38	1.33
3	A	184	GTP	C2-N3	2.26	1.38	1.33
3	E	184	GTP	PB-O3A	2.23	1.61	1.59
3	E	184	GTP	C2-N3	2.18	1.38	1.33
3	E	184	GTP	PB-O3B	2.10	1.61	1.59
3	G	184	GTP	PB-O3B	2.08	1.61	1.59

All (32) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	G	184	GTP	C5-C4-N3	-5.03	120.39	128.39
3	C	184	GTP	C5-C4-N3	-4.91	120.58	128.39
3	E	184	GTP	C5-C4-N3	-4.90	120.59	128.39
3	G	184	GTP	C2-N3-C4	4.78	120.53	112.30
3	C	184	GTP	C2-N3-C4	4.72	120.44	112.30
3	E	184	GTP	C2-N3-C4	4.70	120.40	112.30
3	A	184	GTP	C5-C4-N3	-4.64	121.01	128.39
3	A	184	GTP	C2-N3-C4	4.44	119.95	112.30
3	E	184	GTP	N9-C4-N3	3.24	132.44	125.95
3	C	184	GTP	N9-C4-N3	3.21	132.37	125.95
3	G	184	GTP	N9-C4-N3	2.87	131.70	125.95
3	E	184	GTP	C2-N1-C6	-2.85	119.95	125.11
3	E	184	GTP	O6-C6-C5	-2.83	119.07	126.53
3	G	184	GTP	C2-N1-C6	-2.81	120.01	125.11
3	G	184	GTP	C8-N7-C5	2.78	109.22	104.26
3	A	184	GTP	C2-N1-C6	-2.76	120.10	125.11
3	A	184	GTP	N9-C4-N3	2.73	131.41	125.95
3	C	184	GTP	N9-C8-N7	-2.70	108.39	113.40
3	A	184	GTP	N9-C8-N7	-2.69	108.42	113.40
3	G	184	GTP	N9-C8-N7	-2.66	108.48	113.40
3	C	184	GTP	C2-N1-C6	-2.60	120.39	125.11
3	E	184	GTP	N9-C8-N7	-2.58	108.62	113.40
3	A	184	GTP	C8-N7-C5	2.56	108.82	104.26
3	G	184	GTP	C5-C6-N1	2.49	119.60	113.25
3	C	184	GTP	C8-N7-C5	2.45	108.63	104.26
3	E	184	GTP	C5-C6-N1	2.45	119.49	113.25
3	C	184	GTP	C5-C6-N1	2.43	119.43	113.25
3	A	184	GTP	C5-C6-N1	2.42	119.42	113.25
3	C	184	GTP	O6-C6-C5	-2.36	120.31	126.53
3	A	184	GTP	O6-C6-C5	-2.28	120.52	126.53
3	E	184	GTP	C8-N7-C5	2.22	108.22	104.26
3	G	184	GTP	C4-C5-N7	-2.11	107.33	110.67

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	F	1	GOL	O1-C1-C2-O2
5	F	1	GOL	O1-C1-C2-C3
5	F	1	GOL	C1-C2-C3-O3
5	F	1	GOL	O2-C2-C3-O3
3	A	184	GTP	PA-O3A-PB-O2B
3	C	184	GTP	PA-O3A-PB-O2B

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Mol	Chain	Res	Type	Atoms
3	E	184	GTP	PA-O3A-PB-O2B
3	G	184	GTP	PA-O3A-PB-O1B

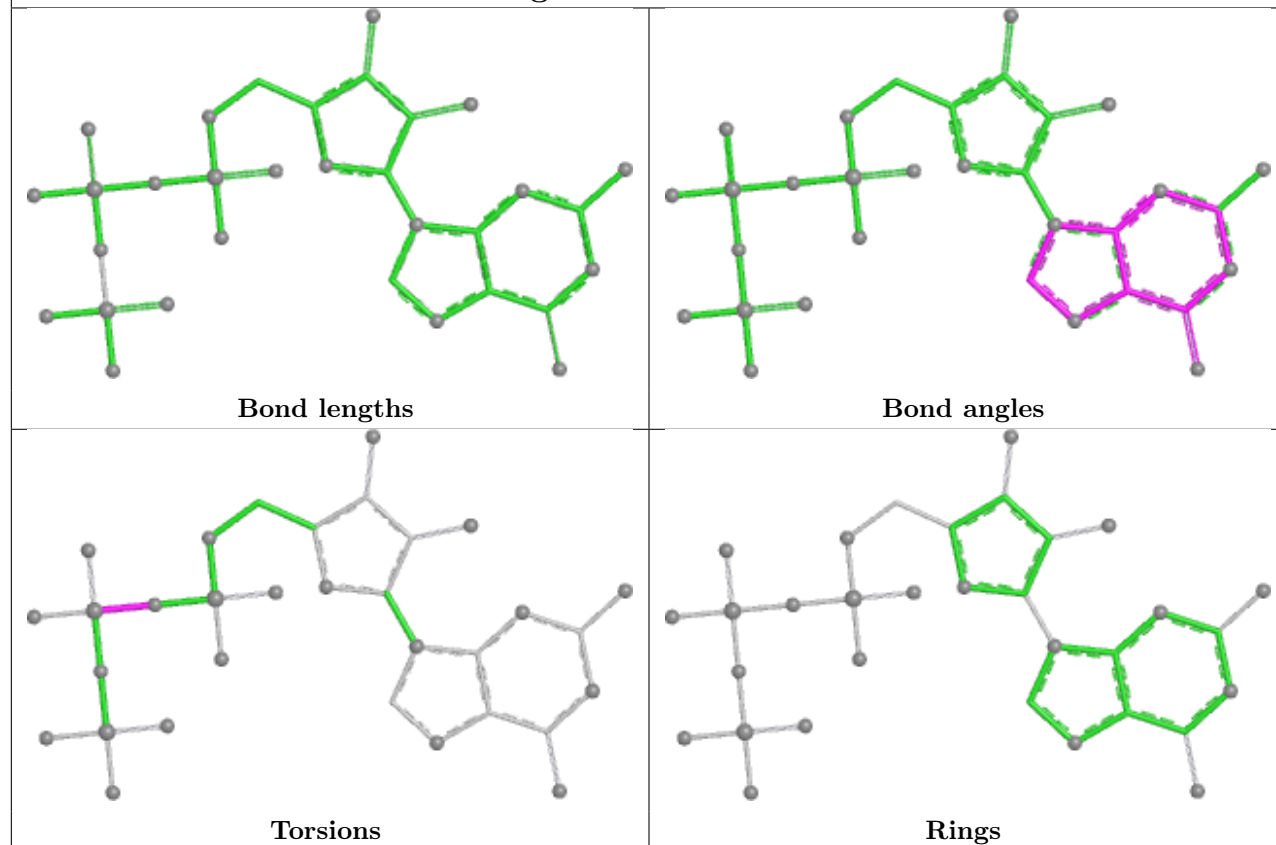
There are no ring outliers.

5 monomers are involved in 8 short contacts:

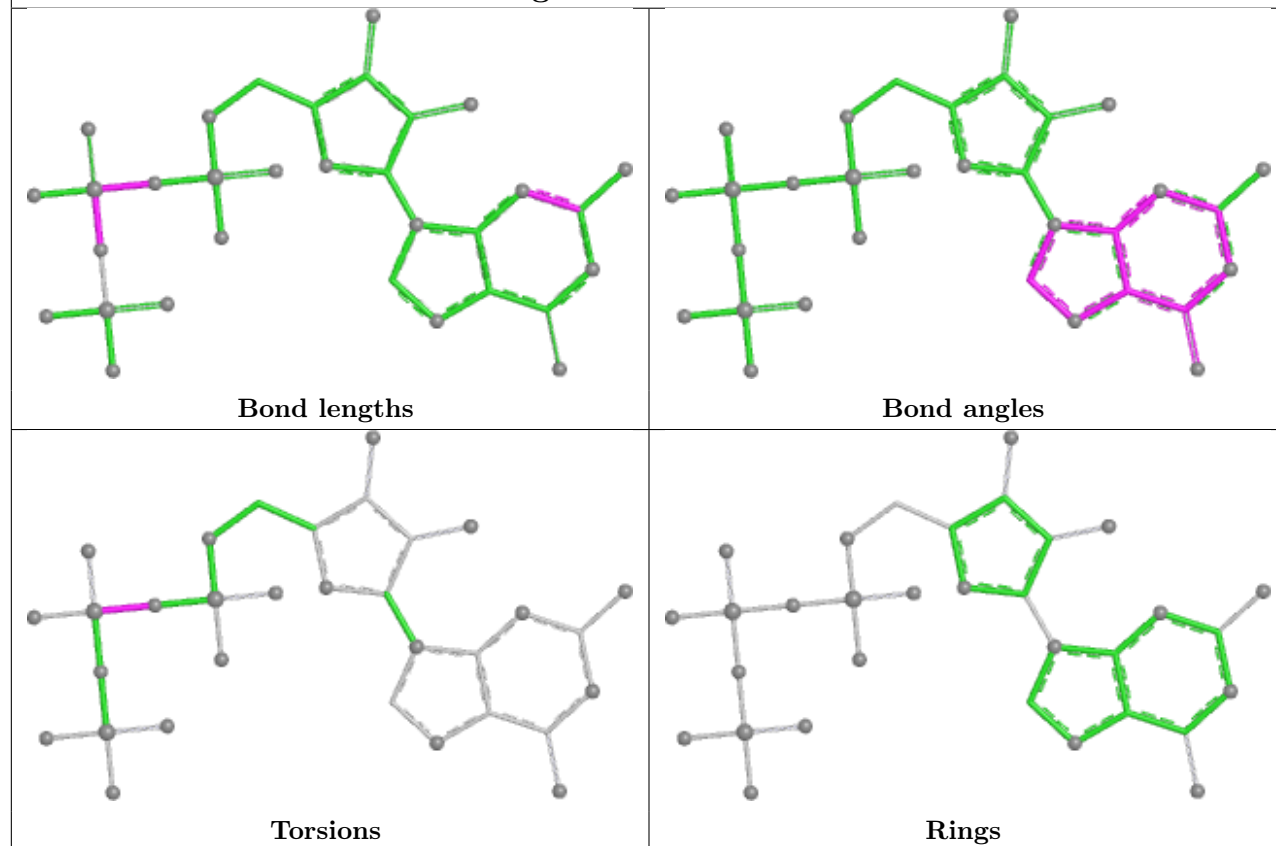
Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	184	GTP	1	0
3	E	184	GTP	2	0
5	F	1	GOL	3	0
3	A	184	GTP	1	0
3	G	184	GTP	1	0

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.

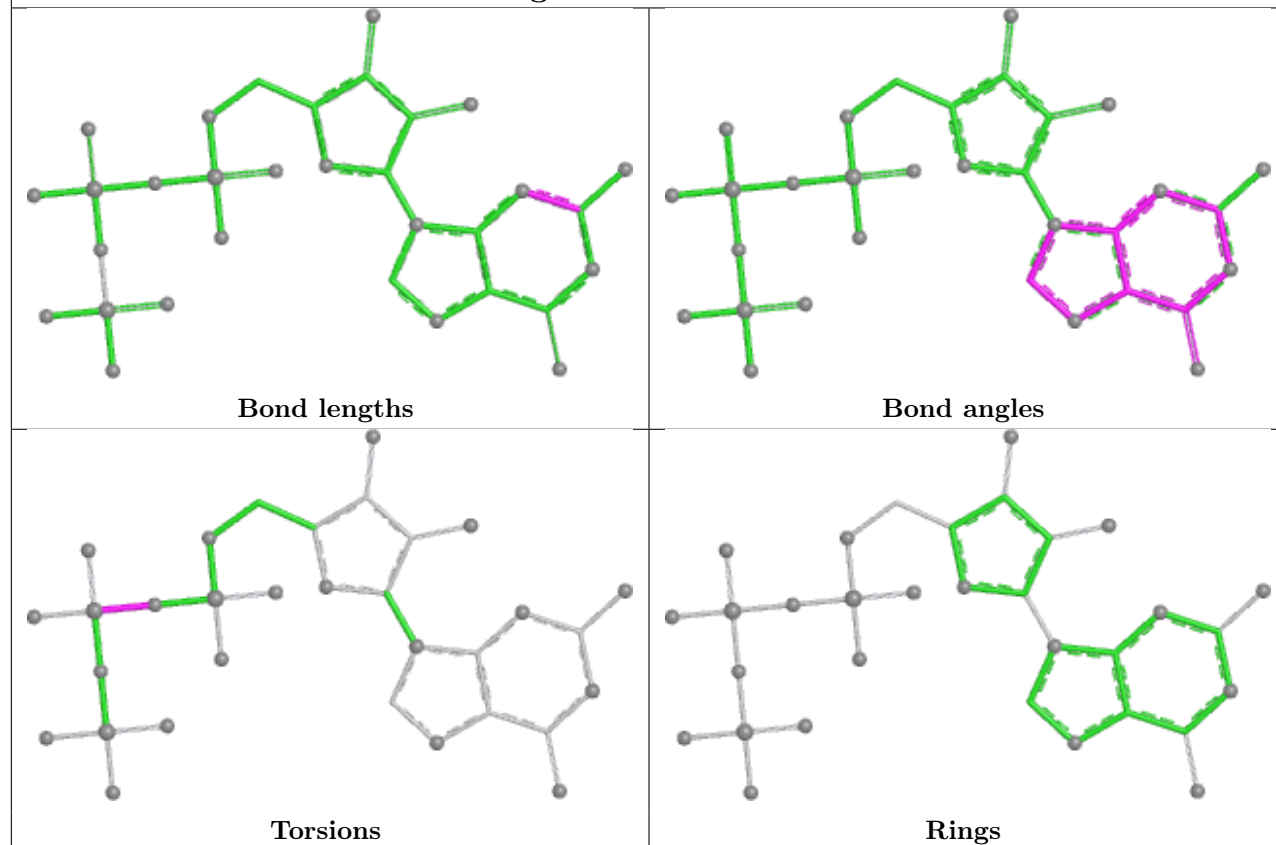
Ligand GTP C 184



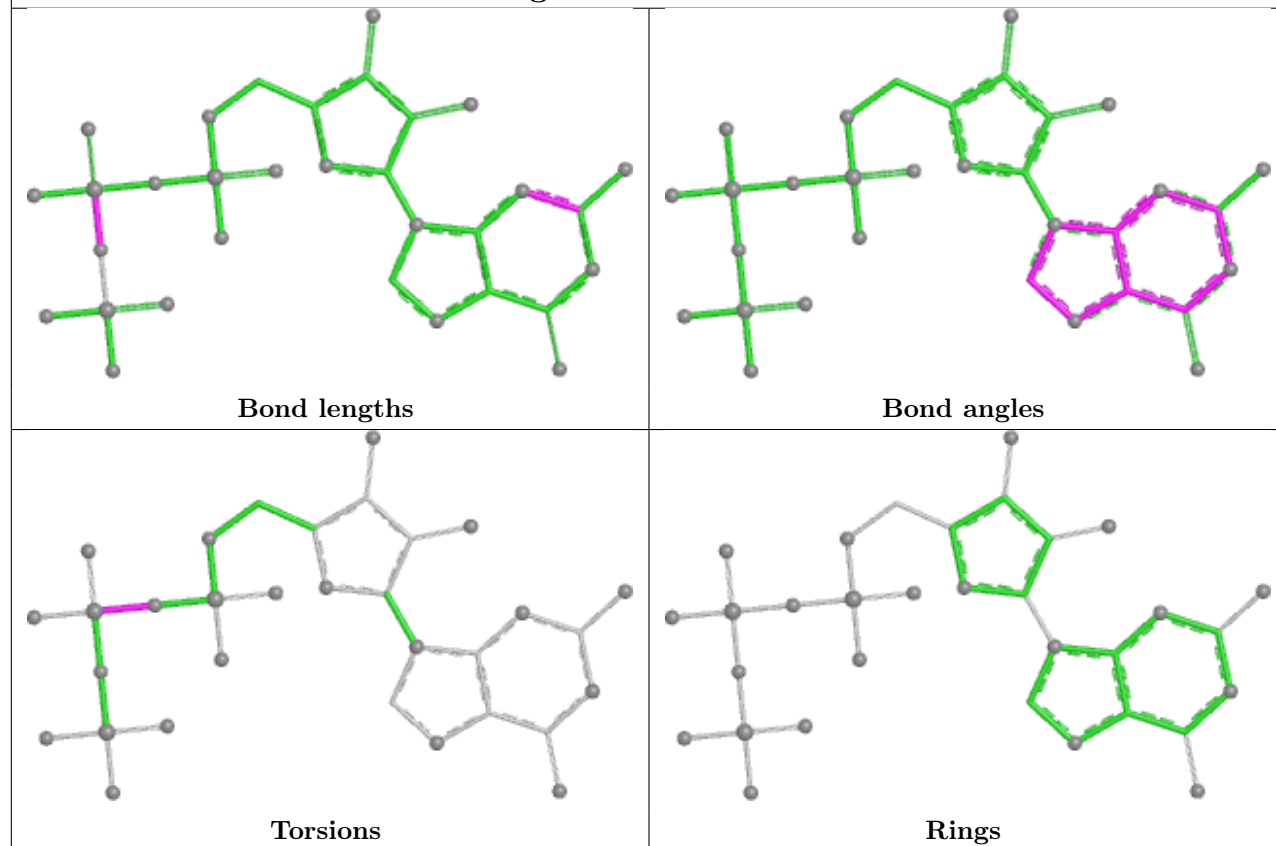
Ligand GTP E 184



Ligand GTP A 184



Ligand GTP G 184



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	162/172 (94%)	-0.12	1 (0%) 85 80	38, 56, 79, 97	0
1	C	162/172 (94%)	-0.23	1 (0%) 85 80	24, 40, 62, 77	0
1	E	162/172 (94%)	-0.28	0 100 100	30, 48, 71, 85	0
1	G	162/172 (94%)	0.75	15 (9%) 14 10	51, 76, 106, 128	0
2	B	100/120 (83%)	0.24	5 (5%) 34 26	25, 58, 102, 118	0
2	D	100/120 (83%)	0.38	8 (8%) 18 13	25, 49, 95, 107	0
2	F	92/120 (76%)	-0.24	2 (2%) 62 52	25, 43, 69, 91	0
2	H	88/120 (73%)	0.26	2 (2%) 61 51	25, 58, 92, 118	0
All	All	1028/1168 (88%)	0.08	34 (3%) 49 39	24, 54, 94, 128	0

All (34) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	173	TYR	7.6
2	H	800	ASN	5.7
2	D	800	ASN	4.9
2	B	800	ASN	4.5
2	F	800	ASN	4.5
2	D	799	PRO	3.9
2	B	799	PRO	3.7
2	D	695	ASP	3.4
2	D	761	LEU	3.0
2	B	705	HIS	2.9
1	G	35	LEU	2.6
2	B	706	ARG	2.6
1	G	127	PRO	2.5
2	D	706	ARG	2.5
1	G	39	VAL	2.5
1	G	132	PRO	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	798	SER	2.4
1	G	37	GLN	2.4
2	B	697	ASN	2.4
1	G	12	MET	2.3
1	G	173	TYR	2.3
1	G	51	THR	2.2
1	G	30	LEU	2.2
2	D	723	ASN	2.2
1	G	40	THR	2.2
2	D	762	ALA	2.2
2	F	699	PRO	2.1
1	G	33	LEU	2.1
1	C	56	ASN	2.1
1	G	38	SER	2.1
1	G	163	TYR	2.1
1	G	31	TYR	2.0
2	H	780	ARG	2.0
1	G	41	THR	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 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.

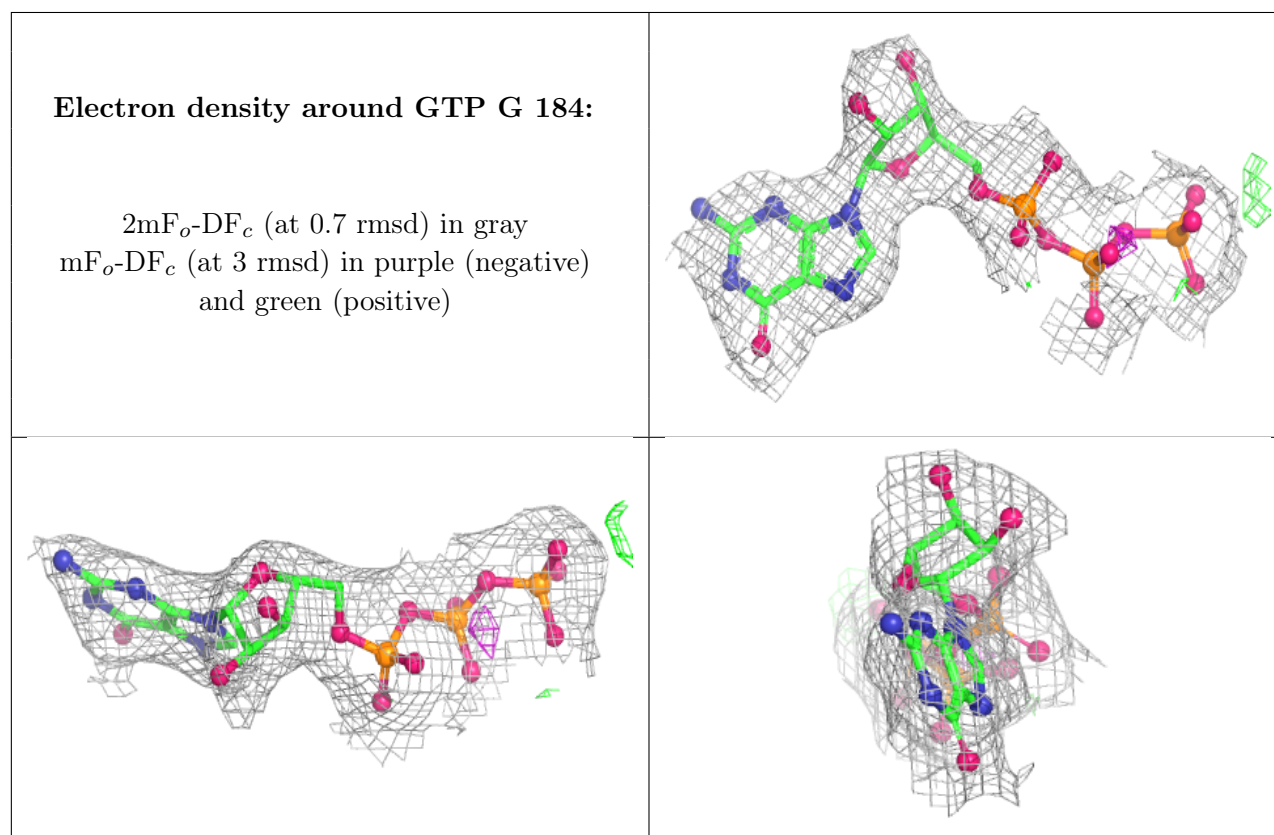
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
5	GOL	F	1	6/6	0.80	0.12	49,51,52,52	0
4	MG	G	185	1/1	0.86	0.11	56,56,56,56	0
3	GTP	G	184	32/32	0.92	0.09	57,71,80,86	0
3	GTP	A	184	32/32	0.96	0.06	41,49,54,58	0
3	GTP	E	184	32/32	0.97	0.06	34,39,44,48	0

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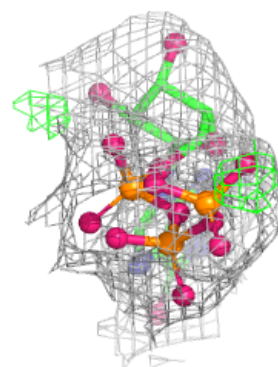
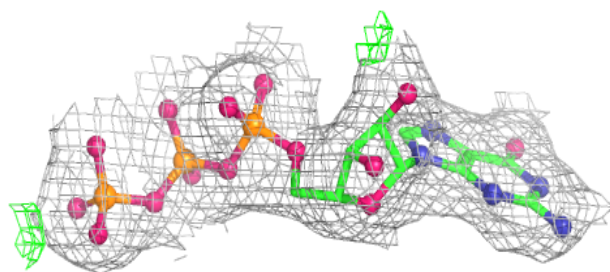
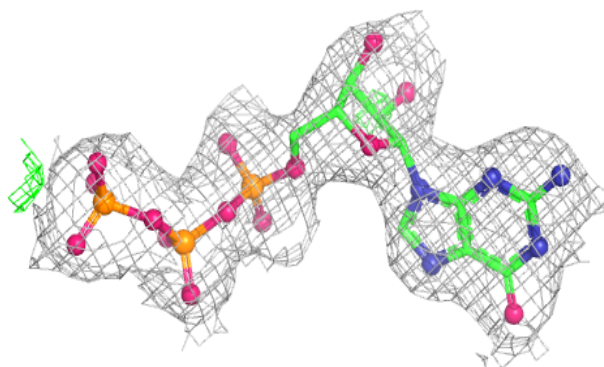
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	MG	A	185	1/1	0.97	0.06	44,44,44,44	0
4	MG	E	185	1/1	0.99	0.03	39,39,39,39	0
3	GTP	C	184	32/32	0.99	0.04	23,29,33,35	0
4	MG	C	185	1/1	0.99	0.02	25,25,25,25	0

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.

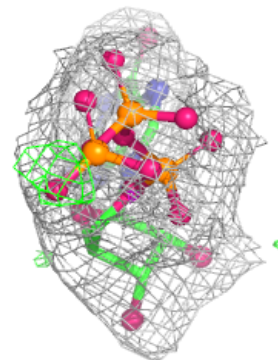
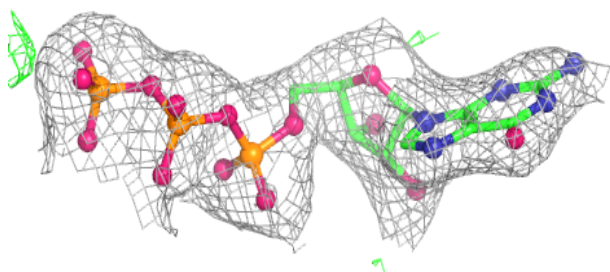
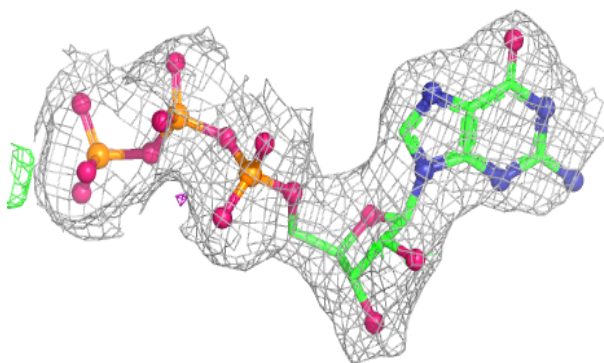


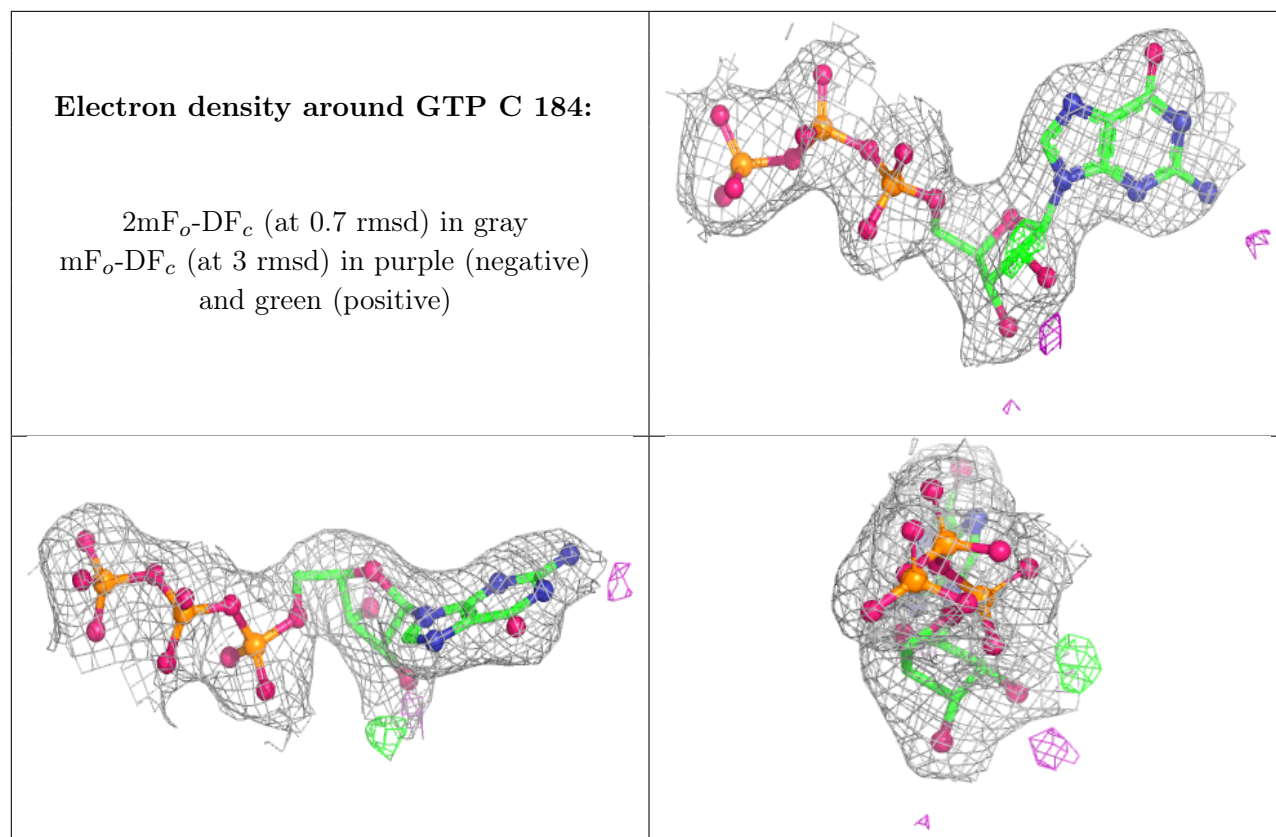
Electron density around GTP A 184:

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

**Electron density around GTP E 184:**

$2mF_o-DF_c$ (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.