WORLDWIDE wwPDB PROTEIN DATA BANK

wwPDB EM Validation Summary Report (i)

Nov 17, 2022 – 01:59 AM EST

PDB ID	:	7M2W
EMDB ID	:	EMD-23635
Title	:	Engineered disulfide cross-linked closed conformation of the Yeast gamma-TuRC(SS)
Authors	:	Brilot, A.F.; Lyon, A.S.; Zelter, A.; Viswanath, S.; Maxwell, A.; MacCoss, M.J.; Muller, E.G.; Sali, A.; Davis, T.N.; Agard, D.A.
Deposited on	:	2021-03-17
Resolution	:	3.00 Å(reported)

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

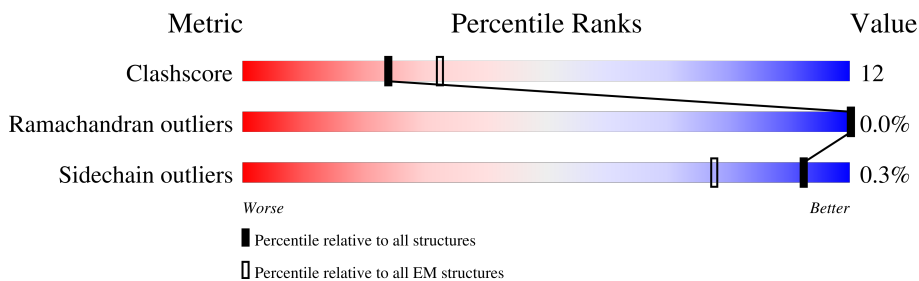|		
EMDB validation analysis	:	0.0.1.dev43
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	FAILED
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.31.2

1   Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.00 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
Clashscore		12
Ramachandran outliers		0.0%
Sidechain outliers		0.3%

Worse ... *Better*

▮ Percentile relative to all structures
▯ Percentile relative to all EM structures

Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the 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	473	66% 30% •
1	B	473	64% 29% 7%
1	C	473	68% 26% 6%
1	D	473	62% 32% 5%
2	E	823	62% 24% 14%
2	G	823	64% 22% 13%
3	F	846	60% 20% 20%
3	H	846	58% 22% 20%
4	K	220	36% 7% 57%

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Mol	Chain	Length	Quality of chain
4	U	220	17% · 81%
4	X	220	18% · 81%
4	Y	220	38% 5% 57%

2 Entry composition ⓘ

There are 5 unique types of molecules in this entry. The entry contains 39366 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, 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 Tubulin gamma chain.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	B	441	Total	C	N	O	S	0	0
			3450	2159	585	688	18		
1	A	453	Total	C	N	O	S	0	0
			3547	2218	599	711	19		
1	C	445	Total	C	N	O	S	0	0
			3481	2176	589	698	18		
1	D	447	Total	C	N	O	S	0	0
			3500	2189	591	701	19		

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	58	CYS	SER	engineered mutation	UNP P53378
B	288	CYS	GLY	engineered mutation	UNP P53378
A	58	CYS	SER	engineered mutation	UNP P53378
A	288	CYS	GLY	engineered mutation	UNP P53378
C	58	CYS	SER	engineered mutation	UNP P53378
C	288	CYS	GLY	engineered mutation	UNP P53378
D	58	CYS	SER	engineered mutation	UNP P53378
D	288	CYS	GLY	engineered mutation	UNP P53378

- Molecule 2 is a protein called Spindle pole body component SPC97.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	E	707	Total	C	N	O	S	0	0
			5899	3796	991	1083	29		
2	G	712	Total	C	N	O	S	0	0
			5935	3819	997	1090	29		

- Molecule 3 is a protein called Spindle pole body component SPC98.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	F	674	Total 5569	C 3601	N 920	O 1032	S 16	0	0
3	H	674	Total 5569	C 3601	N 920	O 1032	S 16	0	0

- Molecule 4 is a protein called Spindle pole body component 110.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	U	42	Total 352	C 215	N 61	O 76		0	0
4	K	95	Total 792	C 488	N 142	O 160	S 2	0	0
4	X	42	Total 352	C 215	N 61	O 76		0	0
4	Y	95	Total 792	C 488	N 142	O 160	S 2	0	0

- Molecule 5 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: $C_{10}H_{16}N_5O_{14}P_3$).

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

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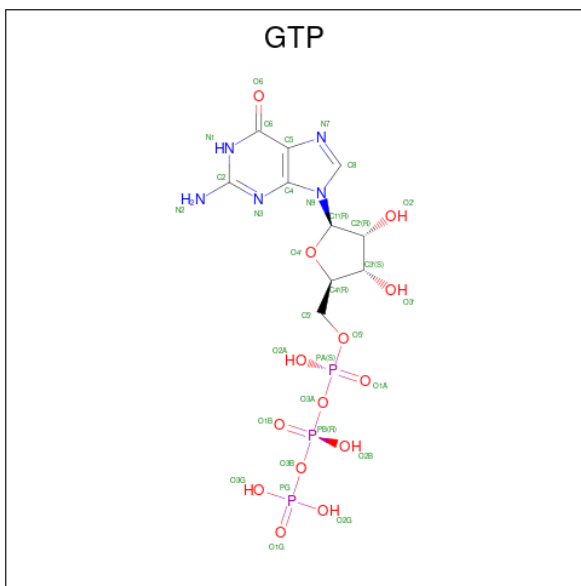
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
5	D	1	32	10	5	14	3	0

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: Tubulin gamma chain

Chain B:

• Molecule 1: Tubulin gamma chain

Chain A:

• Molecule 1: Tubulin gamma chain

Chain C: 68%   26%   6%

MET GLY G3 E4 L8 Q9 Q12 H16 V17 G18 K19 F20 E28 H29 G35 L36 S37 T44 D48 D49 P52 N57 C58 R59 N60 K61 F62 T63 P64 M69 P73 S74 V75 I76 T82 F86 T92 W93 V94 G102 N107 D110

R114 N115 Q116 I119 K122 K125 F133 E134 Q137 L138 L139 V142 A143 G144 S148 A157 R161 I166 T169 Y170 P174 T187 L191 R192 R193 F204 D205 N206 L209 I212 K215 T227 N228 I231 I234 I235 S236 S237 V238

S241 I242 R243 Y249 Y256 S257 T258 L259 I260 L265 L268 F272 T273 P274 D278 TYR ILE HIS ASP ILE A285 H286 K287 C288 H289 L296 T308 A309 M310 T314 E327 Q330 L338 R341 I342 K343 F344 P345 S346 W347 S360 Q366

E369 N370 L377 V383 N392 T393 F394 D395 K396 V397 F398 A402 F403 L404 N418 V419 E422 F423 V430 Q431 M434 E435 D436 Y437 L446 D447 D448 V449 D452 D453 GLU ASN MET VAL GLY GLU LEU GLU GLU ASP LEU ASP ALA ASP GLY ASP HIS LYS LEU VAL

• Molecule 1: Tubulin gamma chain

Chain D: 62%   32%   5%

M1 E4 I5 L8 Q9 C13 H16 V17 G18 K19 H29 D34 E45 R46 P52 F53 F54 R55 F62 T63 P64 I67 S71 I76 T82 F83 F86 F87 D88 P89 R90 N91 T92 W93 V94 A95 W105 A106 I111 N115 K125 E126

F133 Q137 L138 L139 H140 S141 V142 A143 G144 G145 T146 G147 S148 G149 L150 G151 L155 L155 A157 R161 Y162 K165 I166 L167 T168 T169 Y170 S171 V172 F173 S177 V180 V181 V182 Y185 N186 L189 R192 I195 E196 D197 S198 D199 F204 L209 I212

K215 V216 Q225 H226 T227 N228 I231 I235 I242 R243 F244 P245 S246 Y247 S250 S251 M252 S253 S254 I255 Y256 S257 T258 L259 I260 P261 P270 T273 P274 F275 D278 Y279 ILE HIS ASP ASP ILE ALA H286 K287 C288 H289 Y292 D293 V294 M295 L296 D297 L298

S302 L305 T308 A309 M310 T314 N317 V318 E327 A334 M335 T336 K337 L338 Q339 Q340 W347 S348 S349 M352 S360 P361 Y362 L363 N368 E369 N370 E371 S381 C391 N392 T393 F394 D395 K396 V397 F398 Y407 D411 L412 F423 S426 R427

V430 L433 Y437 E441 Y445 L446 V449 D453 GLU ASN MET VAL GLY GLU LEU GLU GLU ASP LEU ASP ALA ASP GLY ASP HIS LYS LEU VAL

• Molecule 2: Spindle pole body component SPC97

Chain E: 62%   24%   14%

M1 D8 E11 L12 Y15 T16 N17 N18 I19 P20 L21 P30 L31 W32 S33 T34 L38 S42 L43 E44 S47 R53 V54 Q55 E56 G69 Y77 F78 N79 E91 F92 K93 I94 F102 F105 S106 I109 V110 R111 K114 T120 Y123

D128 T129 S130 F131 G132 M133 V134 L135 Q136 R160 D161 N167 Q175 I176 I177 N178 E179 N183 K184 E187 E195 R198 E199 Q210 GLU ASP PHE ASN ASN PHE MET ASP SER MET LYS N222 S225 L226 M231 V232 A233 T237 V238 Y239 I247 I250 F261

I255 N258 L268 D278 Y279 C280 W286 E298 F299 M300 E306 GLY LYS THR ASP ASN ILE PHE ASP THR ARG ASP R318 Q323 Y324 F325 I326 R327 L331 L332 K341 N342 L343 M347 L348 R349 T350 G351 L352 L353 L354 K355 V356 V357 R358 I366 I378

E386 G387 L390 F405 K420 Q423 Q424 I425 F426 L427 G428 Y429 L436 L439 T440 M443 T447 Y450 K460 Q463 N464 F465 L467 E468 R469 N473 Q480 L481 L482 M483 E489 Q493 S496 P503 GLU VAL PRO GLU ASN ASN SER

ALA ASN ASP ASP SER ASP PRO LEU MET HIS ALA ASN ASN PHE LYS MET ASN ALA ILE LEU PHE ASP GLU LEU SER LYS GLU ARG THR GLY ALA TYR HIS GLY SER ASN LEU GLU LEU TYR THR PRO LYS SER **A556 I557 Y558** F562 D563 I564 **N565 I566** I572 I573 I574 T577

C578 M579 **I580 K581** Y582 Q583 **L586** Y594 H595 **S596 R597** D605 L606 T609 W612 **Y617 S618** H619 **T620** V621 K622 R623 R624 **I625** V626 R627 **A628** T629 R630 V631 L632 H638 F639 T642 Y646 **Q649 N650** V651 I652 E655 **L659** E660 **K661** C662 Y663 **L668 A669**

V670 **Q673 N674 L676** E677 I683 R687 **I699 F700** F706 I710 K716 **L720** D721 P722 V723 E726 LYS HIS LYS SER GLY MET MET LYS THR LEU ASN GLU GLY LEU TYR ARG THR ASN ASN GLY GLY GLN GLU ASP VAL **G751** L760 K763 L764 I765 E766

N770 **I774** L786 **F791** ASP PHE TYR ASP SER SER VAL ASP **A801 A802 G803** I804 **E805 R806** V807 I811 **P814** ARG SER ALA SER SER SER GLN ARG

• Molecule 2: Spindle pole body component SPC97

Chain G: 64%   22%   13%

M1 E2 E5 D8 E11 **Y15 T16** I19 P30 **L31 W32 S33** T34 K37 E56 V60 **L67 I68 G69 L70** E71 **R76 Y77 F78 N79 D80** P86 K96 K97 S101 F105 I109 T120 R121 **A122 Y123** M133 V134 L135 L154

L158 Q175 N183 K184 I196 I200 R203 Q207 **Q210** GLU ASP PHE ASN ASN PHE MET ASP SER MET LYS N222 M231 V232 D235 **T236** T237 V238 V241 G244 I247 K254 E257 G260 L271 **C280 T281 M282** W286 Q289 **G290** I291

E298 F299 Y302 D303 D304 **L305 E306** GLY LYS THR ASP ASN ILE PHE ASP THR ARG ASP R318 Q323 Y324 F325 I326 C335 D336 S337 L348 G351 K355 L361 **Q362** I363 I378 F381 L384 F409 V418 Q423 F426 L427 L436 T440

L446 **T447 K448** N452 A456 D459 L462 Q463 N464 **F465** L467 E468 R469 N473 **L481 L482** D487 P492 L499 Q500 I501 **V505** PRO GLU ASN ASN SER ALA ASN ASP ASP SER ASP PRO LEU MET HIS ALA ASN ASN PHE LYS ASN MET ASN ALA ILE LEU PHE

ASP GLU LEU SER LYS GLU ARG THR GLY ALA TYR HIS GLY SER ASN LEU GLU LEU TYR **T552** I557 **K561 F562** L570 **N571** I572 I573 K581 **Y582** L592 H595 S596 E601 T602 W603 S611 R615 **G616 Y617 S618** H619 **T620** V621 K622 R623 R624 V631 L632 M636

N637 H638 F639 **I640 K641** M644 E645 Y646 **F647** N648 Q649 N650 V651 I652 E655 **L659** E660 **K661** C662 Y663 **Q673 N674** E675 I683 **M684** T685 S690 **D691** L692 I693 P694 L695 **Q696** L697 **Q698** I699 F700 D701 I702 V703 F706 I710 K711 **Y725** GLU LYS HIS LYS SER GLY MET

MET LYS THR LEU ASN GLU GLY LEU TYR ARG THR ASN ASN GLY GLY GLN GLU ASP VAL **G751** L760 **I761** Q762 **K763** L764 I765 S773 **I774** F775 R776 K777 I780 N781 F782 E785 L786 **F791** ASP PHE TYR ASP SER SER VAL ASP **A801** I804 **E805** R806 V807 L808 **Y809** S810 I811

V812 P813 P814 ARG SER ALA SER ALA SER SER GLN ARG

• Molecule 3: Spindle pole body component SPC98

Chain F: 60%   20%   20%

MET GLU LEU GLU PRO THR LEU PHE GLY ILE ILE GLU LYS PHE ASP ALA LEU ALA PRO GLN LEU LEU SER GLN ASN SER HIS LEU LEU GLN THR PHE VAL SER ASP SER VAL ASN LEU LEU LEU ARG SER ARG SER THR LYS SER ALA THR GLN LEU GLY PRO LEU ILE ASP PHE TYR LYS LEU GLN GLN LEU SER GLU ASP SER PRO

GLU THR THR ILE MET TRP HIS LYS ILE LYS GLU LYS PHE ASP ALA ALA LEU PHE GLY ILE ILE GLN ASN THR ASP ASP MET VAL LYS TYR LEU PHE VAL PHE GLN LEU SER LEU LEU PRO SER ASN TYR ARG ALA LYS ILE VAL GLN LYS LYS SER GLY LEU ASN MET GLU ASN LEU ALA ASN HIS GLU

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• Molecule 3: Spindle pole body component SPC98

Chain H:　　58%　　22%　　20%

• Molecule 4: Spindle pole body component 110

Chain U: 17%   81%

MET ASP GLU ALA SER HIS LEU PRO ASN GLY SER LEU LYS ASN MET GLU PHE THR PRO VAL GLY PHE ILE LYS SER LYS ARG ASN THR THR GLN THR GLN VAL VAL SER PRO THR LYS VAL PRO ASN ALA ASN ASN ASP GLU GLU GLY GLY PRO VAL LYS LYS ARG GLN ARG ARG SER

ILE ASP ASP THR ILE ASP SER SER THR ARG LEU PHE SER GLU ALA SER GLN PHE ASP ASP SER PHE PRO GLU ILE LYS ALA ASN ILE PRO PRO SER PRO ARG GLY ASN ASP LYS ARG ARG ASN LEU ILE ASP GLU LEU LYS LYS ASP VAL PRO MET SER GLN PRO LEU LYS

GLU GLN GLU VAL ARG GLU HIS GLN MET LYS LYS GLU GLU ARG PHE ASP ALA ALA LEU GLU LEU SER LEU LEU GLY LYS ARG HIS ILE THR THR TYR ALA ASN SER ASP ASP ILE SER ASN LYS GLU LEU TYR ILE ASN **E164** **R176** **N180** **N184** **E191** **K205** GLU LEU ASP ALA LYS ASN

LYS ILE VAL ASN SER ARG LYS VAL ASP

● Molecule 4: Spindle pole body component 110

Chain K: 36%   7%   57%

MET ASP GLU ALA SER HIS LEU PRO ASN GLY SER LEU LYS ASN MET GLU PHE THR PRO VAL GLY PHE ILE LYS SER LYS ARG ASN THR THR GLN THR GLN VAL VAL SER PRO THR LYS VAL PRO ASN ALA ASN ASN GLY ASP GLU GLU GLY GLY PRO VAL LYS LYS ARG GLN ARG ARG SER

ILE ASP ASP THR ILE ASP SER SER THR ARG LEU PHE SER GLU ALA SER GLN PHE ASP ASP SER PHE PRO GLU ILE LYS ALA ASN ILE PRO PRO SER PRO ARG GLY ASN VAL ASP LYS SER ARG ARG ASN LEU ILE ASP LEU LYS LYS **D112** **P118** **L119** **K120** **E121** **Q122** **E123** **V124**

R125 **E126** **K130** **D135** **L138** **E139** **N157** **K158** **E159** **I165** **H170** **E178** **E206** LEU ASP ALA LYS ASN LYS VAL ILE VAL ASN SER ARG LYS VAL ASP

● Molecule 4: Spindle pole body component 110

Chain X: 18%   81%

MET ASP GLU ALA SER HIS LEU PRO ASN GLY SER LEU LEU LYS ASN MET GLU PHE THR PRO VAL GLY PHE ILE LYS SER LYS ARG ASN THR THR GLN THR GLN VAL VAL SER PRO THR LYS VAL PRO ASN ALA ASN ASN GLY ASP GLU GLU GLY GLY PRO VAL LYS LYS ARG GLN ARG ARG SER

ILE ASP ASP THR ILE ASP SER SER THR ARG LEU PHE SER GLU ALA SER GLN PHE ASP ASP SER PHE PRO GLU ILE LYS ALA ASN ILE PRO PRO SER PRO ARG GLY ASN VAL ASP LYS SER ARG ARG ASN LEU ILE ASP LEU LYS LYS ASP VAL PRO MET SER GLN PRO LEU LYS

GLU GLN GLU VAL ARG GLU HIS GLN MET LYS LYS GLU GLU ARG PHE ASP ALA ALA LEU GLU LEU SER LYS LEU LEU GLY LYS ARG HIS ILE THR THR TYR ALA ASN SER ASP ASP ILE SER ASN LYS GLU LEU TYR ILE ASN **E164** **R176** **K205** GLU LEU ASP ALA LYS ASN LYS ILE VAL ASN SER ARG

LYS VAL ASP

● Molecule 4: Spindle pole body component 110

Chain Y: 38%   5%   57%

MET ASP GLU ALA SER HIS LEU PRO ASN GLY SER LEU LEU ASN LYS ASN MET GLU PHE THR PRO VAL GLY PHE ILE LYS SER LYS ARG ASN THR THR GLN THR GLN VAL VAL SER PRO THR LYS VAL PRO ASN ALA ASN ASN GLY ASP GLU GLU GLY GLY PRO VAL LYS LYS ARG GLN ARG ARG SER

ILE ASP ASP THR ILE ASP SER SER THR ARG LEU PHE SER GLU ALA SER GLN PHE ASP ASP SER PHE PRO GLU ILE LYS ALA ASN ILE PRO PRO SER PRO ARG GLY ASN VAL ASP SER ARG ARG ASN LEU ILE ASP LEU LYS LYS **D112** **R125** **R136** **L142** **R146**

4 Experimental information ⓘ

Property	Value	Source
EM reconstruction method	HELICAL	Depositor
Imposed symmetry	HELICAL, twist=0°, rise=0.1 Å, axial sym=C1	Depositor
Number of segments used	148911	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION; Final reconstruction in cis-TEM	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose $(e^-/\text{Å}^2)$	72	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	47214	Depositor
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: 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	0.26	0/3622	0.43	0/4920
1	B	0.26	0/3522	0.43	0/4782
1	C	0.26	0/3553	0.43	0/4825
1	D	0.27	0/3573	0.45	0/4851
2	E	0.27	0/6015	0.42	1/8119 (0.0%)
2	G	0.27	0/6052	0.43	0/8170
3	F	0.28	0/5688	0.42	0/7688
3	H	0.28	0/5688	0.42	0/7688
4	K	0.73	0/800	0.71	0/1069
4	U	0.99	0/353	0.76	1/471 (0.2%)
4	X	0.60	0/353	0.85	1/471 (0.2%)
4	Y	0.66	0/800	0.95	4/1069 (0.4%)
All	All	0.32	0/40019	0.46	7/54123 (0.0%)

There are no bond length outliers.

The worst 5 of 7 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
4	X	176	ARG	NE-CZ-NH1	7.71	124.15	120.30
4	U	176	ARG	NE-CZ-NH1	6.62	123.61	120.30
4	Y	125	ARG	NE-CZ-NH1	6.16	123.38	120.30
4	Y	146	ARG	NE-CZ-NH1	5.50	123.05	120.30
4	Y	136	ARG	NE-CZ-NH1	5.32	122.96	120.30

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	3547	0	3398	109	0
1	B	3450	0	3315	102	0
1	C	3481	0	3336	85	0
1	D	3500	0	3354	129	0
2	E	5899	0	5954	174	0
2	G	5935	0	5996	138	0
3	F	5569	0	5588	123	0
3	H	5569	0	5588	138	0
4	K	792	0	788	16	0
4	U	352	0	347	4	0
4	X	352	0	347	0	0
4	Y	792	0	788	40	0
5	A	32	0	11	4	0
5	B	32	0	12	2	0
5	C	32	0	12	1	0
5	D	32	0	11	5	0
All	All	39366	0	38845	937	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 12.

The worst 5 of 937 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:G:34:THR:HG21	4:K:178:GLU:OE2	1.12	1.30
2:E:226:LEU:HD11	4:Y:146:ARG:CZ	1.62	1.28
2:G:34:THR:CG2	4:K:178:GLU:OE2	2.03	1.06
2:E:226:LEU:CD1	4:Y:146:ARG:NH1	2.20	1.05
2:E:226:LEU:HG	4:Y:146:ARG:HG3	1.38	1.05

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 PDB entries followed by that with respect to all EM entries.

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	451/473 (95%)	429 (95%)	22 (5%)	0	100	100
1	B	437/473 (92%)	416 (95%)	21 (5%)	0	100	100
1	C	441/473 (93%)	414 (94%)	27 (6%)	0	100	100
1	D	443/473 (94%)	418 (94%)	24 (5%)	1 (0%)	47	82
2	E	695/823 (84%)	666 (96%)	29 (4%)	0	100	100
2	G	700/823 (85%)	675 (96%)	25 (4%)	0	100	100
3	F	670/846 (79%)	638 (95%)	32 (5%)	0	100	100
3	H	670/846 (79%)	642 (96%)	28 (4%)	0	100	100
4	K	93/220 (42%)	91 (98%)	2 (2%)	0	100	100
4	U	40/220 (18%)	40 (100%)	0	0	100	100
4	X	40/220 (18%)	40 (100%)	0	0	100	100
4	Y	93/220 (42%)	88 (95%)	5 (5%)	0	100	100
All	All	4773/6110 (78%)	4557 (96%)	215 (4%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	288	CYS

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 PDB entries followed by that with respect to all EM entries.

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	404/421 (96%)	404 (100%)	0	100	100
1	B	393/421 (93%)	391 (100%)	2 (0%)	88	96
1	C	397/421 (94%)	397 (100%)	0	100	100
1	D	399/421 (95%)	398 (100%)	1 (0%)	92	97
2	E	663/766 (87%)	662 (100%)	1 (0%)	93	98
2	G	668/766 (87%)	667 (100%)	1 (0%)	93	98
3	F	628/787 (80%)	626 (100%)	2 (0%)	92	97
3	H	628/787 (80%)	627 (100%)	1 (0%)	93	98
4	K	89/206 (43%)	88 (99%)	1 (1%)	73	90
4	U	40/206 (19%)	39 (98%)	1 (2%)	47	79
4	X	40/206 (19%)	39 (98%)	1 (2%)	47	79
4	Y	89/206 (43%)	87 (98%)	2 (2%)	52	81
All	All	4438/5614 (79%)	4425 (100%)	13 (0%)	92	97

5 of 13 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	H	777	CYS
4	U	164	GLU
4	Y	165	ILE
4	X	164	GLU
4	Y	112	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 59 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	116	GLN
2	G	673	GLN
2	E	421	HIS
2	G	649	GLN
3	F	436	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains (i)

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

5.5 Carbohydrates (i)

There are no monosaccharides in this entry.

5.6 Ligand geometry (i)

4 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
5	GTP	B	501	-	26,34,34	1.12	2 (7%)	32,54,54	1.62	7 (21%)
5	GTP	D	501	1	26,34,34	1.16	2 (7%)	32,54,54	1.52	7 (21%)
5	GTP	C	501	1	26,34,34	1.14	2 (7%)	32,54,54	1.60	7 (21%)
5	GTP	A	501	1	26,34,34	1.14	2 (7%)	32,54,54	1.52	6 (18%)

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	GTP	B	501	-	-	6/18/38/38	0/3/3/3
5	GTP	D	501	1	-	3/18/38/38	0/3/3/3
5	GTP	C	501	1	-	6/18/38/38	0/3/3/3
5	GTP	A	501	1	-	6/18/38/38	0/3/3/3

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	501	GTP	C5-C6	-4.17	1.38	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	C	501	GTP	C5-C6	-4.09	1.39	1.47
5	A	501	GTP	C5-C6	-4.08	1.39	1.47
5	B	501	GTP	C5-C6	-3.95	1.39	1.47
5	D	501	GTP	C2-N3	2.31	1.38	1.33

The worst 5 of 27 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	B	501	GTP	PA-O3A-PB	-4.14	118.62	132.83
5	C	501	GTP	PB-O3B-PG	-3.79	119.83	132.83
5	C	501	GTP	PA-O3A-PB	-3.59	120.52	132.83
5	B	501	GTP	PB-O3B-PG	-3.47	120.93	132.83
5	D	501	GTP	PA-O3A-PB	-3.43	121.05	132.83

There are no chirality outliers.

5 of 21 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	B	501	GTP	C5'-O5'-PA-O2A
5	A	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	C5'-O5'-PA-O1A
5	C	501	GTP	C5'-O5'-PA-O2A
5	C	501	GTP	O4'-C4'-C5'-O5'

There are no ring outliers.

4 monomers are involved in 12 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	B	501	GTP	2	0
5	D	501	GTP	5	0
5	C	501	GTP	1	0
5	A	501	GTP	4	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 GTP B 501

Bond lengths

Bond angles

Torsions

Rings

Ligand GTP D 501

Bond lengths

Bond angles

Torsions

Rings

Ligand GTP C 501

Bond lengths

Bond angles

Torsions

Rings

Ligand GTP A 501

Bond lengths

Bond angles

Torsions

Rings
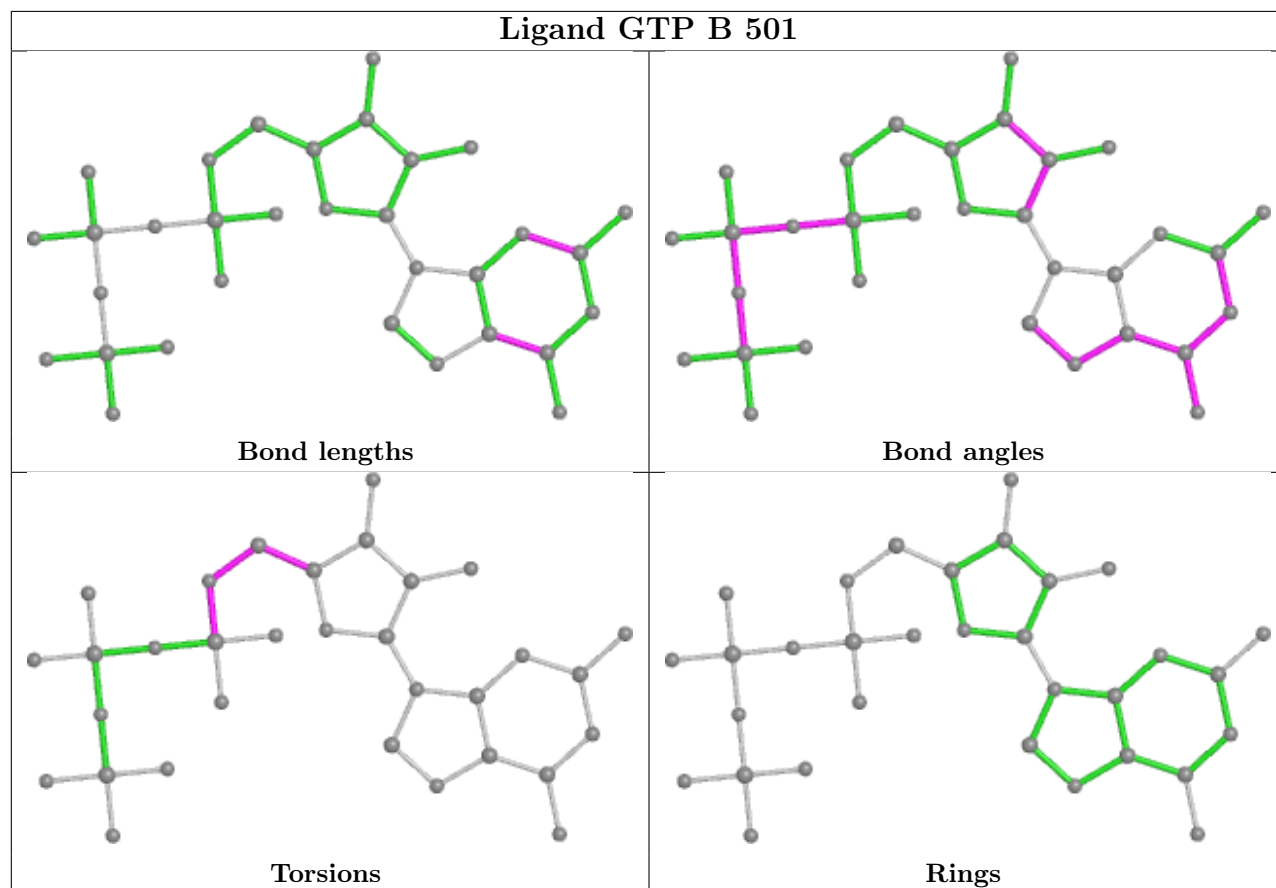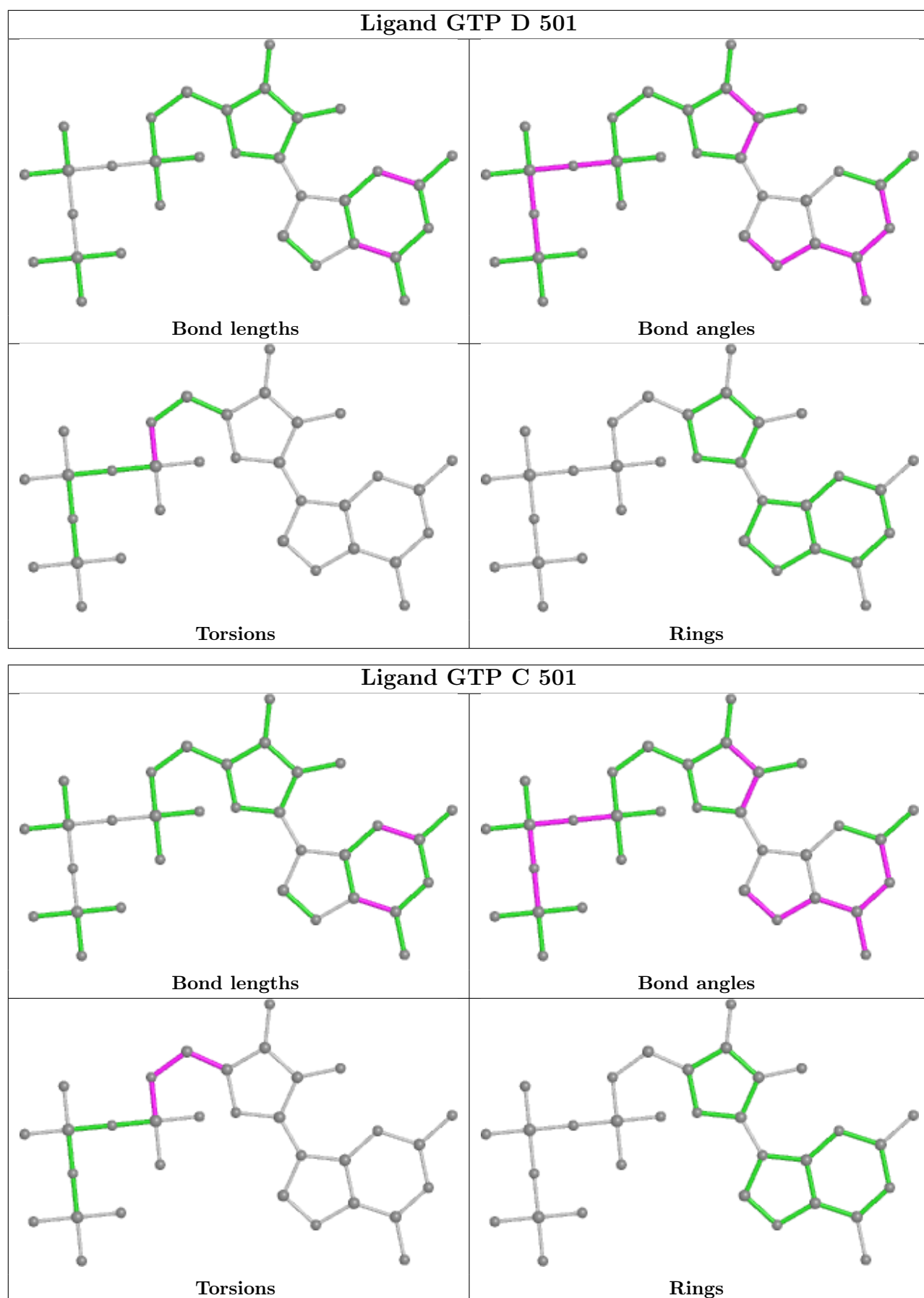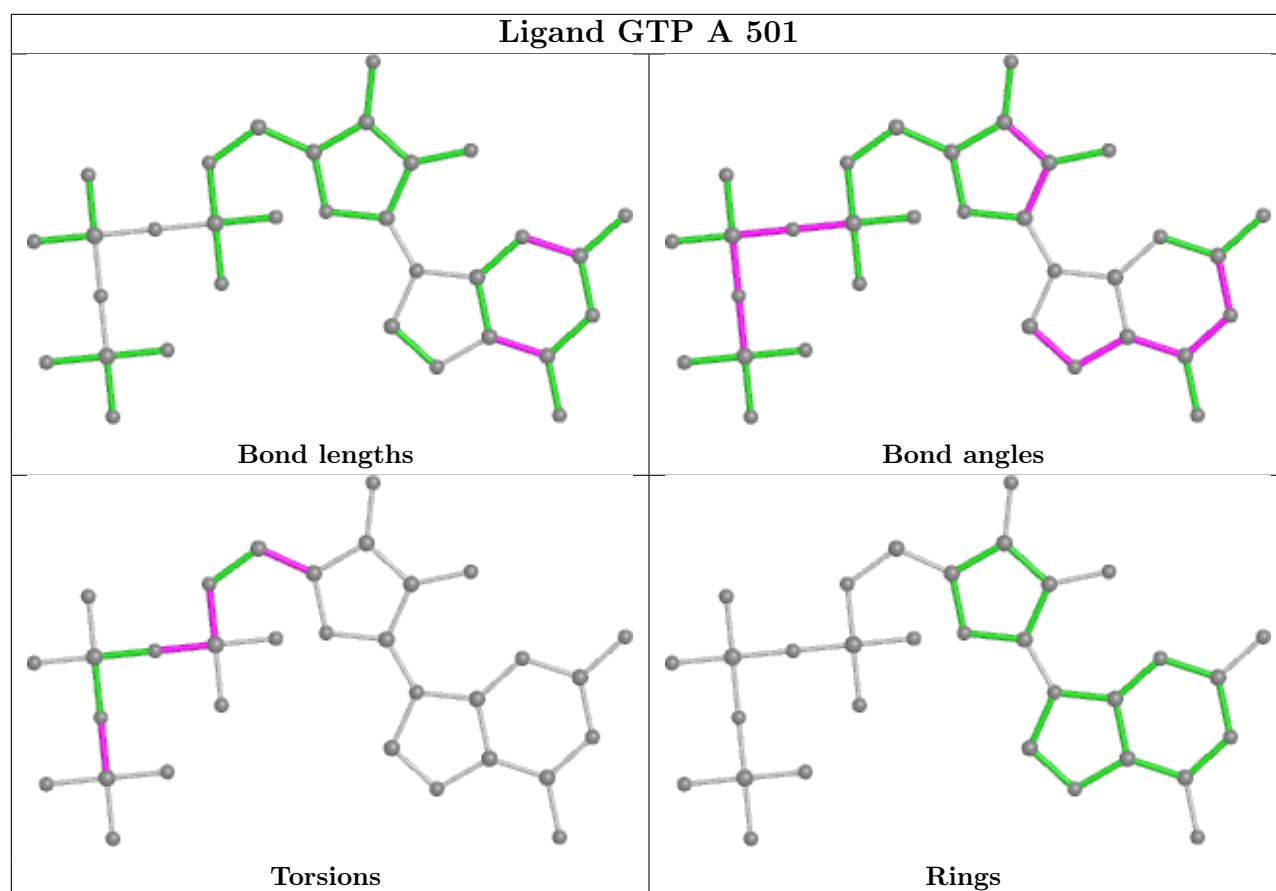
5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

6 Map visualisation ⓘ

This section contains visualisations of the EMDB entry EMD-23635. These allow visual inspection of the internal detail of the map and identification of artifacts.

Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections ⓘ

This section was not generated.

6.2 Central slices ⓘ

This section was not generated.

6.3 Largest variance slices ⓘ

This section was not generated.

6.4 Orthogonal surface views ⓘ

This section was not generated.

6.5 Mask visualisation ⓘ

This section was not generated. No masks/segmentation were deposited.

7   Map analysis ⓘ

This section contains the results of statistical analysis of the map.

7.1   Map-value distribution ⓘ

This section was not generated.

7.2   Volume estimate versus contour level ⓘ

This section was not generated.

7.3   Rotationally averaged power spectrum ⓘ

This section was not generated. The rotationally averaged power spectrum had issues being displayed.

8 Fourier-Shell correlation ⓘ

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit ⓘ

This section was not generated.