



Full wwPDB X-ray Structure Validation Report ⓘ

Jun 23, 2024 – 01:42 AM EDT

PDB ID : 6S6D
Title : Crystal structure of RagA-Q66L-GTP/RagC-S75N-GDP GTPase heterodimer complex
Authors : Anandapadamanaban, M.; Masson, G.R.; Perisic, O.; Kaufman, J.; Williams, R.L.
Deposited on : 2019-07-02
Resolution : 2.50 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 : 4.02b-467
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 1.20.1
EDS : 2.37.1
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.37.1

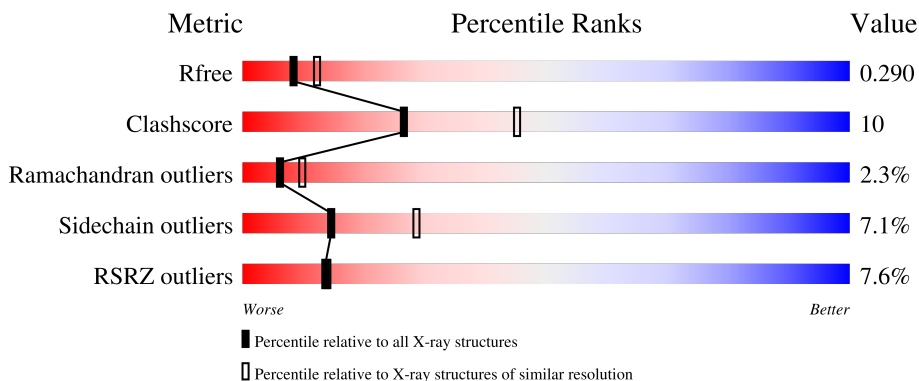
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION



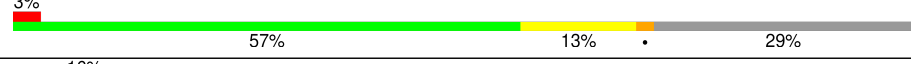
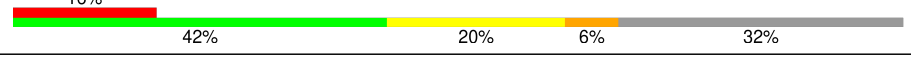
The reported resolution of this entry is 2.50 Å.

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}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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	313	
1	B	313	
2	C	399	
2	D	399	

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 9584 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 Ras-related GTP-binding protein A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	300	2462	1564	429	452	17	0	0	0
1	B	300	2461	1566	426	452	17	0	1	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	66	LEU	GLN	engineered mutation	UNP Q7L523
B	66	LEU	GLN	engineered mutation	UNP Q7L523

- Molecule 2 is a protein called Ras-related GTP-binding protein C.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	C	284	2288	1473	373	429	13	0	1	0
2	D	272	2185	1403	359	411	12	0	0	0

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	75	ASN	SER	engineered mutation	UNP Q9HB90
D	75	ASN	SER	engineered mutation	UNP Q9HB90

- Molecule 3 is GUANOSINE-5'-TRIPHOSPHATE (three-letter code: GTP) (formula: C₁₀H₁₆N₅O₁₄P₃) (labeled as "Ligand of Interest" by depositor).



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

- Molecule 4 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

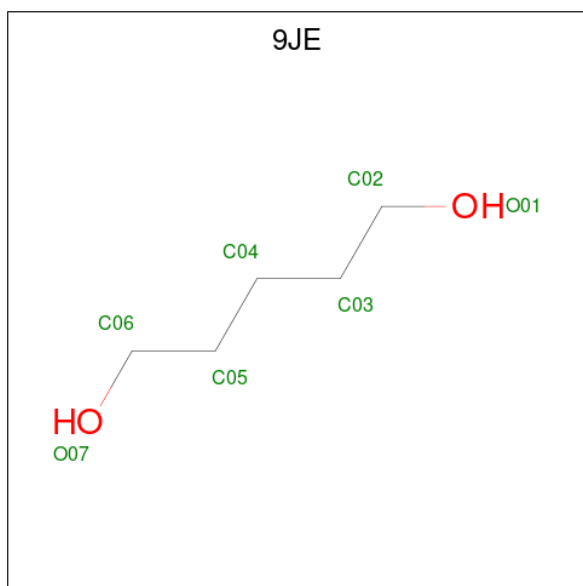
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		
4	B	1	Total	Mg	0	0
			1	1		

- Molecule 5 is GUANOSINE-5'-DIPHOSPHATE (three-letter code: GDP) (formula: C₁₀H₁₅N₅O₁₁P₂) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf		
			Total	C	N	O			P	
5	C	1	Total	28	10	5	11	2	0	0
5	D	1	Total	28	10	5	11	2	0	0

- Molecule 6 is pentane-1,5-diol (three-letter code: 9JE) (formula: $C_5H_{12}O_2$).



Mol	Chain	Residues	Atoms		ZeroOcc	AltConf	
			Total	C O			
6	B	1	Total	7 5	2	0	0
6	B	1	Total	7 5	2	0	0

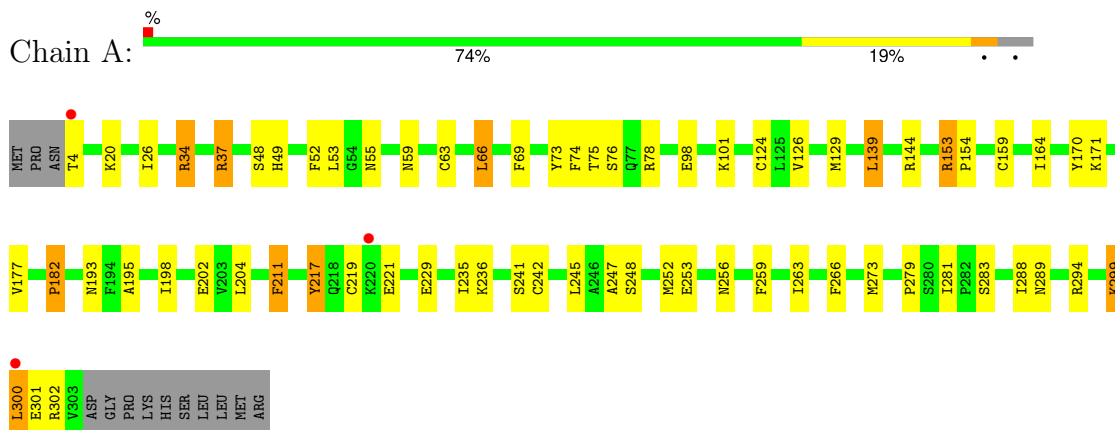
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	14	Total 14	O 14	0	0
7	C	15	Total 15	O 15	0	0
7	B	18	Total 18	O 18	0	0
7	D	5	Total 5	O 5	0	0

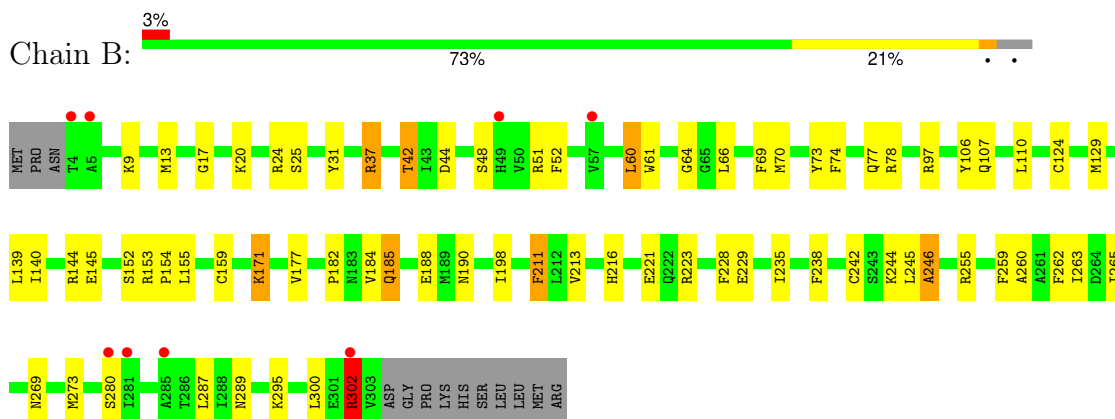
3 Residue-property plots [i](#)

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.

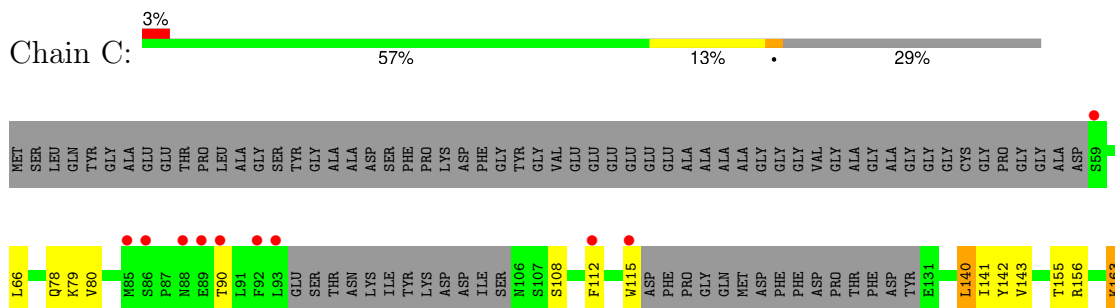
- Molecule 1: Ras-related GTP-binding protein A

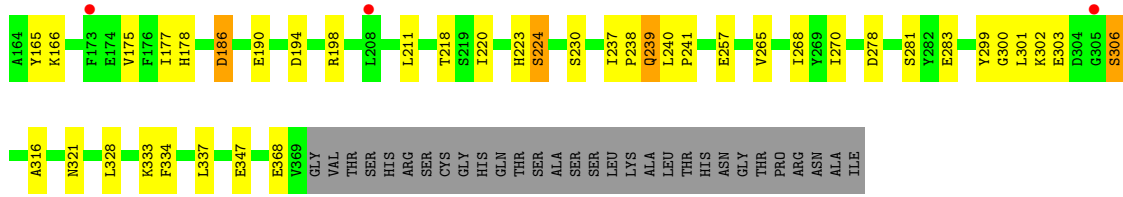


- Molecule 1: Ras-related GTP-binding protein A

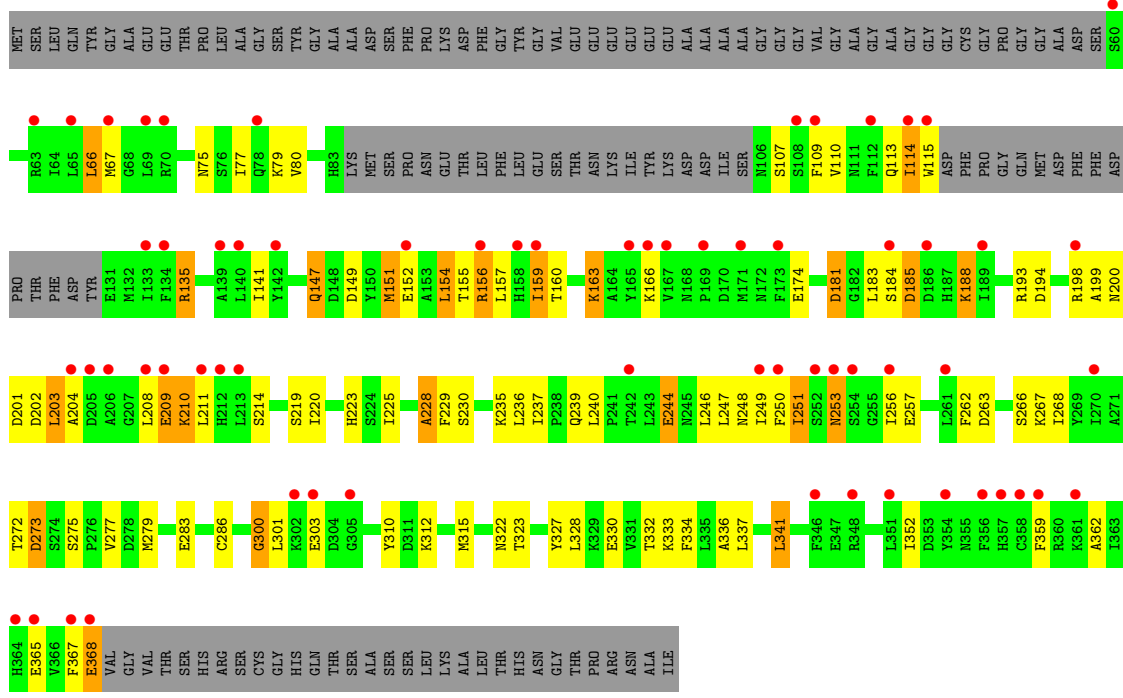
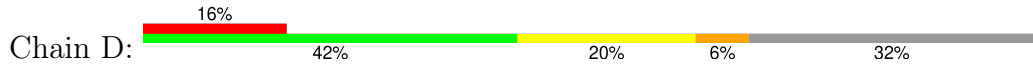


- Molecule 2: Ras-related GTP-binding protein C





● Molecule 2: Ras-related GTP-binding protein C



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	71.50Å 81.44Å 246.03Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.29 – 2.50 49.24 – 2.50	Depositor EDS
% Data completeness (in resolution range)	99.7 (49.29-2.50) 99.8 (49.24-2.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.71 (at 2.51Å)	Xtrriage
Refinement program	REFMAC 5.8.0238	Depositor
R, R_{free}	0.209 , 0.287 0.214 , 0.290	Depositor DCC
R_{free} test set	2458 reflections (4.86%)	wwPDB-VP
Wilson B-factor (Å ²)	64.6	Xtrriage
Anisotropy	0.113	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 50.2	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	9584	wwPDB-VP
Average B, all atoms (Å ²)	78.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.24% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: 9JE, GDP, 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	0.74	0/2507	0.92	0/3376
1	B	0.72	0/2509	0.93	0/3380
2	C	0.78	0/2335	0.91	1/3149 (0.0%)
2	D	0.73	0/2224	0.83	0/2997
All	All	0.74	0/9575	0.90	1/12902 (0.0%)

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	B	0	2
2	C	0	1
2	D	0	1
All	All	0	4

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	178	HIS	CB-CA-C	5.11	120.62	110.40

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	152	SER	Peptide
1	B	255	ARG	Peptide

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Mol	Chain	Res	Type	Group
2	C	306	SER	Peptide
2	D	262	PHE	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	2462	0	2462	53	0
1	B	2461	0	2463	45	0
2	C	2288	0	2279	38	0
2	D	2185	0	2182	66	0
3	A	32	0	12	1	0
3	B	32	0	12	2	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
5	C	28	0	12	0	0
5	D	28	0	12	0	0
6	B	14	0	0	2	0
7	A	14	0	0	4	0
7	B	18	0	0	2	0
7	C	15	0	0	2	0
7	D	5	0	0	2	0
All	All	9584	0	9434	196	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 10.

All (196) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:190:ASN:HD22	1:B:300:LEU:HD11	1.16	1.09
1:A:236:LYS:HE2	7:A:506:HOH:O	1.61	0.99
2:D:183:LEU:HB2	2:D:188:LYS:HE2	1.48	0.95
2:D:200:ASN:HA	2:D:203:LEU:HD21	1.53	0.89
1:A:217:TYR:HH	1:A:219:CYS:HG	1.11	0.84
2:C:186:ASP:O	2:C:190:GLU:HG3	1.86	0.75

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:183:LEU:CB	2:D:188:LYS:HE2	2.17	0.74
1:A:153:ARG:HB3	1:A:154:PRO:HD3	1.70	0.73
2:D:208:LEU:HA	2:D:210:LYS:HE3	1.71	0.73
1:A:153:ARG:CB	1:A:154:PRO:CD	2.67	0.72
2:D:322:ASN:O	2:D:323:THR:OG1	2.08	0.71
1:A:37:ARG:NH1	3:A:401:GTP:O2'	2.25	0.69
2:D:184:SER:C	2:D:188:LYS:HZ3	1.96	0.68
2:D:199:ALA:O	2:D:203:LEU:CD2	2.43	0.67
1:B:185:GLN:H	1:B:185:GLN:CD	1.96	0.67
1:A:252:MET:HE3	1:A:263:ILE:HD12	1.78	0.66
1:B:190:ASN:ND2	1:B:300:LEU:HD11	2.00	0.66
1:A:248:SER:CB	2:C:321:ASN:HD22	2.08	0.66
1:B:24:ARG:HD3	1:B:60:LEU:HD13	1.77	0.66
2:D:199:ALA:O	2:D:203:LEU:HD21	1.95	0.65
1:A:171:LYS:HB2	1:A:229:GLU:HG2	1.79	0.65
1:A:248:SER:HB3	2:C:321:ASN:HD22	1.61	0.64
1:A:75:THR:OG1	1:A:76:SER:N	2.29	0.64
1:A:49:HIS:CE1	1:A:59:ASN:OD1	2.51	0.64
1:B:211:PHE:CZ	1:B:235:ILE:HG21	2.33	0.64
1:A:144:ARG:HD2	7:A:514:HOH:O	1.97	0.63
1:B:302:ARG:HH11	1:B:302:ARG:HG2	1.63	0.63
2:D:79:LYS:HB2	7:D:505:HOH:O	1.98	0.63
1:B:24:ARG:CD	1:B:60:LEU:HD13	2.30	0.60
1:A:153:ARG:HB3	1:A:154:PRO:CD	2.30	0.60
1:A:52:PHE:CZ	1:A:177:VAL:HG11	2.36	0.60
1:B:107:GLN:NE2	6:B:403:9JE:C06	2.65	0.60
2:D:200:ASN:CA	2:D:203:LEU:HD21	2.30	0.59
2:D:203:LEU:HD22	7:D:504:HOH:O	2.02	0.59
1:A:153:ARG:HB2	1:A:154:PRO:HD2	1.84	0.59
1:A:198:ILE:HG13	1:A:289:ASN:HD22	1.68	0.59
2:D:194:ASP:OD1	2:D:198:ARG:NE	2.31	0.59
1:B:42:THR:HB	3:B:401:GTP:O1G	2.02	0.59
2:C:218:THR:HA	2:C:224:SER:HB2	1.86	0.58
1:B:302:ARG:HG2	1:B:302:ARG:NH1	2.18	0.58
2:C:165:TYR:CD2	2:C:211:LEU:HD12	2.39	0.58
2:D:185:ASP:N	2:D:188:LYS:HZ3	2.01	0.58
1:A:263:ILE:HG12	1:A:273:MET:HG3	1.86	0.58
1:A:281:ILE:HD12	1:A:281:ILE:O	2.04	0.57
2:D:183:LEU:HB2	2:D:188:LYS:CE	2.29	0.57
1:B:66:LEU:HB2	1:B:69:PHE:CD2	2.40	0.57
2:D:109:PHE:O	2:D:109:PHE:CG	2.58	0.57

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:299:LYS:HG3	1:A:300:LEU:HD12	1.87	0.57
2:C:347:GLU:HB3	1:B:185:GLN:HG3	1.87	0.57
1:B:213:VAL:HG21	1:B:228:PHE:HB3	1.86	0.57
2:D:300:GLY:O	2:D:301:LEU:HD12	2.06	0.56
1:A:211:PHE:CE2	1:A:235:ILE:HG21	2.41	0.56
2:D:251:ILE:CD1	2:D:273:ASP:HB3	2.36	0.55
2:D:80:VAL:HG21	2:D:220:ILE:HB	1.88	0.55
2:C:239:GLN:H	2:C:239:GLN:HE21	1.55	0.55
2:D:246:LEU:HA	2:D:249:ILE:HD12	1.89	0.55
1:A:217:TYR:OH	1:A:219:CYS:SG	2.39	0.55
1:A:195:ALA:HB1	1:A:217:TYR:CD1	2.42	0.54
1:A:202:GLU:OE2	1:A:204:LEU:HD21	2.07	0.54
1:A:126:VAL:HG12	1:A:129:MET:CE	2.38	0.54
1:A:170:TYR:OH	1:A:236:LYS:HG2	2.09	0.53
2:D:203:LEU:HB2	2:D:208:LEU:O	2.08	0.53
2:D:107:SER:HA	2:D:334:PHE:CE1	2.44	0.53
2:D:283:GLU:O	2:D:286:CYS:HB2	2.10	0.52
2:C:299:TYR:O	2:C:300:GLY:C	2.47	0.52
2:D:228:ALA:O	2:D:230:SER:N	2.43	0.52
2:C:79:LYS:CD	2:C:90:THR:HG22	2.40	0.52
2:D:249:ILE:O	2:D:253:ASN:HB2	2.09	0.52
1:A:144:ARG:CD	7:A:514:HOH:O	2.57	0.51
1:B:244:LYS:O	1:B:246:ALA:N	2.42	0.51
2:C:66:LEU:HD12	2:C:141:ILE:HB	1.91	0.51
1:B:302:ARG:NH1	1:B:302:ARG:O	2.37	0.51
2:C:163:LYS:O	2:C:166:LYS:HB3	2.11	0.51
1:A:153:ARG:HB2	1:A:154:PRO:CD	2.40	0.51
2:D:251:ILE:CD1	2:D:273:ASP:CB	2.89	0.51
1:A:124:CYS:O	1:A:159:CYS:HA	2.11	0.51
1:B:211:PHE:CE2	1:B:235:ILE:HG21	2.46	0.50
2:D:159:ILE:C	2:D:163:LYS:HE3	2.32	0.50
1:A:73:TYR:O	1:A:78:ARG:HA	2.11	0.50
2:D:310:TYR:OH	2:D:330:GLU:HA	2.12	0.50
1:A:248:SER:HB3	2:C:321:ASN:ND2	2.27	0.49
2:D:251:ILE:HG22	2:D:256:ILE:O	2.11	0.49
1:B:70:MET:HA	1:B:73:TYR:CD2	2.47	0.49
2:D:247:LEU:HD23	2:D:359:PHE:CE2	2.47	0.49
1:A:66:LEU:HB2	1:A:69:PHE:CD2	2.47	0.49
2:C:140:LEU:HD12	2:C:141:ILE:N	2.26	0.49
1:B:262:PHE:O	1:B:273:MET:HA	2.13	0.49
1:A:253:GLU:O	2:C:316:ALA:HA	2.13	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:C:79:LYS:HD3	2:C:90:THR:HG22	1.95	0.49
1:A:217:TYR:CD1	1:A:217:TYR:C	2.85	0.49
2:D:154:LEU:O	2:D:157:LEU:HB3	2.13	0.49
2:C:223[A]:HIS:CD2	2:C:283:GLU:HG3	2.48	0.48
2:C:223[B]:HIS:CD2	2:C:283:GLU:HG3	2.48	0.48
2:C:328:LEU:HA	2:C:337:LEU:O	2.13	0.48
2:D:184:SER:C	2:D:188:LYS:NZ	2.65	0.48
1:A:20:LYS:HE3	1:A:63:CYS:O	2.13	0.48
1:A:126:VAL:HG12	1:A:129:MET:HE3	1.95	0.48
1:B:245:LEU:O	1:B:246:ALA:CB	2.62	0.48
1:B:44:ASP:OD1	1:B:77:GLN:NE2	2.46	0.47
1:A:98:GLU:HB3	1:A:101:LYS:HB3	1.96	0.47
2:D:367:PHE:O	2:D:368:GLU:C	2.53	0.47
1:B:17:GLY:HA2	3:B:401:GTP:H5'	1.97	0.47
1:B:238:PHE:CE2	1:B:242:CYS:SG	3.08	0.47
2:D:263:ASP:HA	2:D:334:PHE:O	2.15	0.47
2:C:78:GLN:HE21	2:C:112:PHE:HE2	1.62	0.47
2:C:80:VAL:HG21	2:C:220:ILE:HB	1.96	0.47
1:B:66:LEU:HD12	1:B:69:PHE:HE2	1.80	0.47
2:C:211:LEU:HD23	2:C:211:LEU:O	2.16	0.46
2:D:113:GLN:O	2:D:114:ILE:HD12	2.16	0.46
2:D:203:LEU:O	2:D:208:LEU:N	2.49	0.46
2:D:201:ASP:O	2:D:204:ALA:N	2.48	0.46
2:C:238:PRO:HD2	2:C:239:GLN:NE2	2.31	0.46
2:D:152:GLU:O	2:D:156:ARG:HD3	2.15	0.46
1:B:74:PHE:O	1:B:78:ARG:HD2	2.16	0.45
1:B:110:LEU:HB3	1:B:155:LEU:CD1	2.47	0.45
2:D:141:ILE:HA	2:D:174:GLU:O	2.16	0.45
1:A:53:LEU:O	1:A:301:GLU:HB2	2.17	0.45
1:A:129:MET:HB2	1:A:129:MET:HE2	1.59	0.45
1:A:195:ALA:CB	1:A:217:TYR:CD1	2.98	0.45
1:A:55:ASN:ND2	1:A:182:PRO:HD2	2.31	0.45
1:A:74:PHE:O	1:A:78:ARG:NH1	2.49	0.45
2:C:140:LEU:HD12	2:C:140:LEU:C	2.37	0.45
2:D:230:SER:HA	2:D:268:ILE:HG23	1.98	0.45
1:A:256:ASN:HB2	1:A:259:PHE:CD1	2.52	0.45
1:A:266:PHE:O	1:A:294:ARG:HD3	2.17	0.45
2:C:301:LEU:HD12	2:C:301:LEU:HA	1.82	0.45
1:A:171:LYS:CB	1:A:229:GLU:HG2	2.46	0.44
1:B:52:PHE:CZ	1:B:177:VAL:HG11	2.52	0.44
2:D:239:GLN:NE2	2:D:239:GLN:H	2.15	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:216:HIS:HD2	6:B:404:9JE:O07	2.01	0.44
1:B:244:LYS:C	1:B:246:ALA:H	2.20	0.44
2:D:66:LEU:HD12	2:D:141:ILE:HB	1.99	0.44
2:D:114:ILE:CG2	2:D:115:TRP:N	2.80	0.44
2:D:322:ASN:C	2:D:323:THR:HG1	2.18	0.44
1:B:153:ARG:N	1:B:154:PRO:HD2	2.33	0.44
1:B:42:THR:HG22	1:B:64:GLY:CA	2.48	0.43
1:B:235:ILE:HD11	1:B:263:ILE:HD13	2.00	0.43
2:C:230:SER:HA	2:C:268:ILE:HG23	1.99	0.43
1:B:185:GLN:CD	1:B:185:GLN:N	2.68	0.43
2:D:256:ILE:HA	2:D:341:LEU:HB3	2.01	0.43
2:D:359:PHE:O	2:D:362:ALA:HB3	2.19	0.43
1:A:248:SER:HB2	2:C:321:ASN:HD22	1.82	0.43
2:C:211:LEU:HD23	2:C:211:LEU:C	2.38	0.43
2:C:220:ILE:HA	7:C:504:HOH:O	2.19	0.43
2:C:303:GLU:OE2	2:C:303:GLU:HA	2.18	0.43
1:B:259:PHE:CD2	1:B:260:ALA:N	2.87	0.43
2:D:193:ARG:O	2:D:194:ASP:C	2.56	0.43
1:B:221:GLU:OE2	1:B:221:GLU:HA	2.18	0.43
1:A:195:ALA:HB1	1:A:217:TYR:CE1	2.54	0.42
2:C:194:ASP:OD1	2:C:198:ARG:NE	2.43	0.42
1:B:171:LYS:HB2	1:B:229:GLU:HG2	2.01	0.42
1:B:185:GLN:H	1:B:185:GLN:NE2	2.17	0.42
2:C:240:LEU:HB3	2:C:241:PRO:HD3	2.01	0.42
2:C:278:ASP:O	2:C:281:SER:HB2	2.19	0.42
2:D:147:GLN:HE21	2:D:147:GLN:HB3	1.60	0.42
2:D:181:ASP:HB3	2:D:219:SER:OG	2.20	0.42
1:B:9:LYS:HE3	1:B:61:TRP:CE2	2.54	0.42
1:B:124:CYS:O	1:B:159:CYS:HA	2.20	0.42
1:B:188:GLU:HG3	7:B:509:HOH:O	2.19	0.42
1:A:139:LEU:HD23	1:A:139:LEU:HA	1.88	0.42
2:D:183:LEU:CB	2:D:188:LYS:CE	2.93	0.42
2:D:365:GLU:O	2:D:368:GLU:N	2.49	0.42
1:A:34:ARG:NH2	7:A:502:HOH:O	2.40	0.42
1:B:140:ILE:O	1:B:144:ARG:HG2	2.19	0.42
2:D:272:THR:HG21	2:D:277:VAL:HG21	2.02	0.42
1:A:241:SER:O	1:A:245:LEU:HG	2.19	0.42
2:D:77:ILE:HG23	2:D:225:ILE:HD11	2.00	0.42
1:A:26:ILE:CD1	1:A:164:ILE:HB	2.50	0.41
1:B:37:ARG:NE	7:B:505:HOH:O	2.53	0.41
1:B:198:ILE:HG13	1:B:289:ASN:HD22	1.85	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:D:163:LYS:H	2:D:163:LYS:HE2	1.83	0.41
1:B:106:TYR:CZ	1:B:110:LEU:HD11	2.54	0.41
2:C:142:TYR:O	2:C:175:VAL:HA	2.19	0.41
2:C:333:LYS:HE3	2:C:334:PHE:CZ	2.55	0.41
2:D:149:ASP:O	2:D:151:MET:N	2.54	0.41
2:D:240:LEU:HG	2:D:244:GLU:OE2	2.21	0.41
2:D:266:SER:O	2:D:267:LYS:HB2	2.20	0.41
1:A:242:CYS:HB3	1:A:247:ALA:O	2.20	0.41
2:D:237:ILE:HG23	2:D:239:GLN:HE21	1.86	0.41
2:C:142:TYR:CE1	2:C:143:VAL:O	2.74	0.40
2:D:247:LEU:O	2:D:251:ILE:HG13	2.21	0.40
2:D:310:TYR:OH	2:D:336:ALA:HB2	2.21	0.40
1:A:126:VAL:HG12	1:A:129:MET:HE1	2.04	0.40
1:B:13:MET:C	1:B:20:LYS:HD3	2.42	0.40
2:D:114:ILE:HG23	2:D:115:TRP:N	2.36	0.40
1:B:25:SER:HB2	1:B:31:TYR:CD1	2.57	0.40
2:D:214:SER:OG	2:D:235:LYS:NZ	2.55	0.40
2:D:244:GLU:O	2:D:248:ASN:ND2	2.54	0.40
2:C:220:ILE:CA	7:C:504:HOH:O	2.69	0.40
2:C:237:ILE:HD13	2:C:270:ILE:HB	2.03	0.40
2:C:301:LEU:O	2:C:302:LYS:HB2	2.21	0.40
2:D:250:PHE:CE2	2:D:256:ILE:CD1	3.04	0.40
2:D:328:LEU:HA	2:D:337:LEU:O	2.21	0.40
1:A:252:MET:CE	1:A:263:ILE:HD12	2.47	0.40
2:D:183:LEU:C	2:D:188:LYS:HE2	2.42	0.40
2:D:273:ASP:OD1	2:D:273:ASP:C	2.60	0.40

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	298/313 (95%)	274 (92%)	17 (6%)	7 (2%)	6	10
1	B	299/313 (96%)	270 (90%)	24 (8%)	5 (2%)	9	16
2	C	279/399 (70%)	261 (94%)	15 (5%)	3 (1%)	14	26
2	D	266/399 (67%)	216 (81%)	39 (15%)	11 (4%)	3	3
All	All	1142/1424 (80%)	1021 (89%)	95 (8%)	26 (2%)	6	10

All (26) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	153	ARG
1	A	299	LYS
1	B	48	SER
1	B	246	ALA
1	B	280	SER
2	D	135	ARG
2	D	185	ASP
2	D	229	PHE
1	A	279	PRO
2	D	159	ILE
1	A	182	PRO
1	A	221	GLU
1	A	300	LEU
2	C	163	LYS
2	C	368	GLU
2	D	257	GLU
2	D	202	ASP
2	D	228	ALA
1	A	193	ASN
2	C	177	ILE
2	D	209	GLU
2	D	211	LEU
1	B	302	ARG
1	B	182	PRO
2	D	110	VAL
2	D	300	GLY

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	275/287 (96%)	264 (96%)	11 (4%)	31	56
1	B	275/287 (96%)	257 (94%)	18 (6%)	17	33
2	C	258/340 (76%)	247 (96%)	11 (4%)	29	53
2	D	246/340 (72%)	211 (86%)	35 (14%)	3	6
All	All	1054/1254 (84%)	979 (93%)	75 (7%)	14	28

All (75) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	4	THR
1	A	34	ARG
1	A	37	ARG
1	A	48	SER
1	A	66	LEU
1	A	139	LEU
1	A	211	PHE
1	A	217	TYR
1	A	283	SER
1	A	288	ILE
1	A	302	ARG
2	C	108	SER
2	C	115	TRP
2	C	140	LEU
2	C	155	THR
2	C	156	ARG
2	C	186	ASP
2	C	224	SER
2	C	239	GLN
2	C	257	GLU
2	C	265	VAL
2	C	306	SER
1	B	37	ARG
1	B	42	THR
1	B	51	ARG
1	B	60	LEU
1	B	97	ARG
1	B	129	MET
1	B	139	LEU
1	B	145	GLU

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Mol	Chain	Res	Type
1	B	171	LYS
1	B	184	VAL
1	B	185	GLN
1	B	211	PHE
1	B	223	ARG
1	B	265	ILE
1	B	269	ASN
1	B	287	LEU
1	B	295	LYS
1	B	302	ARG
2	D	66	LEU
2	D	67	MET
2	D	75	ASN
2	D	114	ILE
2	D	135	ARG
2	D	147	GLN
2	D	151	MET
2	D	154	LEU
2	D	155	THR
2	D	156	ARG
2	D	160	THR
2	D	163	LYS
2	D	166	LYS
2	D	181	ASP
2	D	188	LYS
2	D	203	LEU
2	D	209	GLU
2	D	210	LYS
2	D	223	HIS
2	D	236	LEU
2	D	244	GLU
2	D	251	ILE
2	D	253	ASN
2	D	273	ASP
2	D	275	SER
2	D	279	MET
2	D	303	GLU
2	D	312	LYS
2	D	315	MET
2	D	327	TYR
2	D	332	THR
2	D	333	LYS

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Mol	Chain	Res	Type
2	D	341	LEU
2	D	352	ILE
2	D	368	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (22) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	49	HIS
1	A	216	HIS
1	A	218	GLN
1	A	289	ASN
2	C	78	GLN
2	C	239	GLN
2	C	321	ASN
1	B	49	HIS
1	B	185	GLN
1	B	186	GLN
1	B	190	ASN
1	B	216	HIS
1	B	256	ASN
1	B	269	ASN
1	B	289	ASN
2	D	75	ASN
2	D	78	GLN
2	D	147	GLN
2	D	187	HIS
2	D	234	GLN
2	D	239	GLN
2	D	253	ASN

5.3.3 RNA [i](#)

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](#)

Of 8 ligands modelled in this entry, 2 are monoatomic - leaving 6 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	B	401	4	29,34,34	1.24	4 (13%)	35,54,54	0.88	2 (5%)
3	GTP	A	401	4	29,34,34	1.05	2 (6%)	35,54,54	1.04	1 (2%)
6	9JE	B	404	-	6,6,6	0.35	0	5,5,5	0.52	0
5	GDP	C	401	-	25,30,30	0.95	0	30,47,47	1.54	6 (20%)
5	GDP	D	401	-	25,30,30	1.00	2 (8%)	30,47,47	1.46	4 (13%)
6	9JE	B	403	-	6,6,6	0.54	0	5,5,5	0.91	0

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	B	401	4	-	0/18/38/38	0/3/3/3
3	GTP	A	401	4	-	2/18/38/38	0/3/3/3
6	9JE	B	404	-	-	3/4/4/4	-
5	GDP	C	401	-	-	5/12/32/32	0/3/3/3
5	GDP	D	401	-	-	2/12/32/32	0/3/3/3
6	9JE	B	403	-	-	2/4/4/4	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	401	GTP	C5-C6	-3.14	1.41	1.47

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	401	GTP	C5-C6	-2.93	1.41	1.47
3	B	401	GTP	PA-O3A	2.69	1.62	1.59
5	D	401	GDP	PA-O3A	2.36	1.62	1.59
3	B	401	GTP	C8-N7	-2.24	1.31	1.34
3	B	401	GTP	C5-C4	-2.22	1.37	1.43
5	D	401	GDP	C6-N1	-2.11	1.34	1.37
3	A	401	GTP	C8-N7	-2.09	1.31	1.34

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	D	401	GDP	C4'-O4'-C1'	-3.62	106.61	109.92
5	C	401	GDP	O3B-PB-O3A	3.25	115.55	104.64
5	D	401	GDP	C8-N7-C5	2.98	107.62	102.55
5	C	401	GDP	O3'-C3'-C2'	-2.77	102.94	111.82
5	C	401	GDP	O3A-PA-O1A	-2.75	102.42	110.70
5	C	401	GDP	O4'-C4'-C5'	-2.74	100.57	109.33
5	C	401	GDP	C8-N7-C5	2.62	107.01	102.55
3	B	401	GTP	O3G-PG-O3B	2.55	113.17	104.64
3	A	401	GTP	O6-C6-C5	2.41	129.11	124.32
5	D	401	GDP	O6-C6-C5	-2.23	119.91	124.32
5	C	401	GDP	O2A-PA-O3A	2.15	113.08	107.27
5	D	401	GDP	O2A-PA-O1A	2.05	121.99	112.44
3	B	401	GTP	O6-C6-C5	2.03	128.34	124.32

There are no chirality outliers.

All (14) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	C	401	GDP	C5'-O5'-PA-O3A
5	D	401	GDP	PA-O3A-PB-O3B
5	C	401	GDP	O4'-C4'-C5'-O5'
6	B	404	9JE	C03-C04-C05-C06
5	C	401	GDP	C3'-C4'-C5'-O5'
6	B	404	9JE	C02-C03-C04-C05
3	A	401	GTP	PA-O3A-PB-O1B
5	C	401	GDP	C5'-O5'-PA-O1A
5	C	401	GDP	C5'-O5'-PA-O2A
6	B	403	9JE	C03-C04-C05-C06
6	B	403	9JE	C02-C03-C04-C05
6	B	404	9JE	C04-C05-C06-O07
3	A	401	GTP	PA-O3A-PB-O2B

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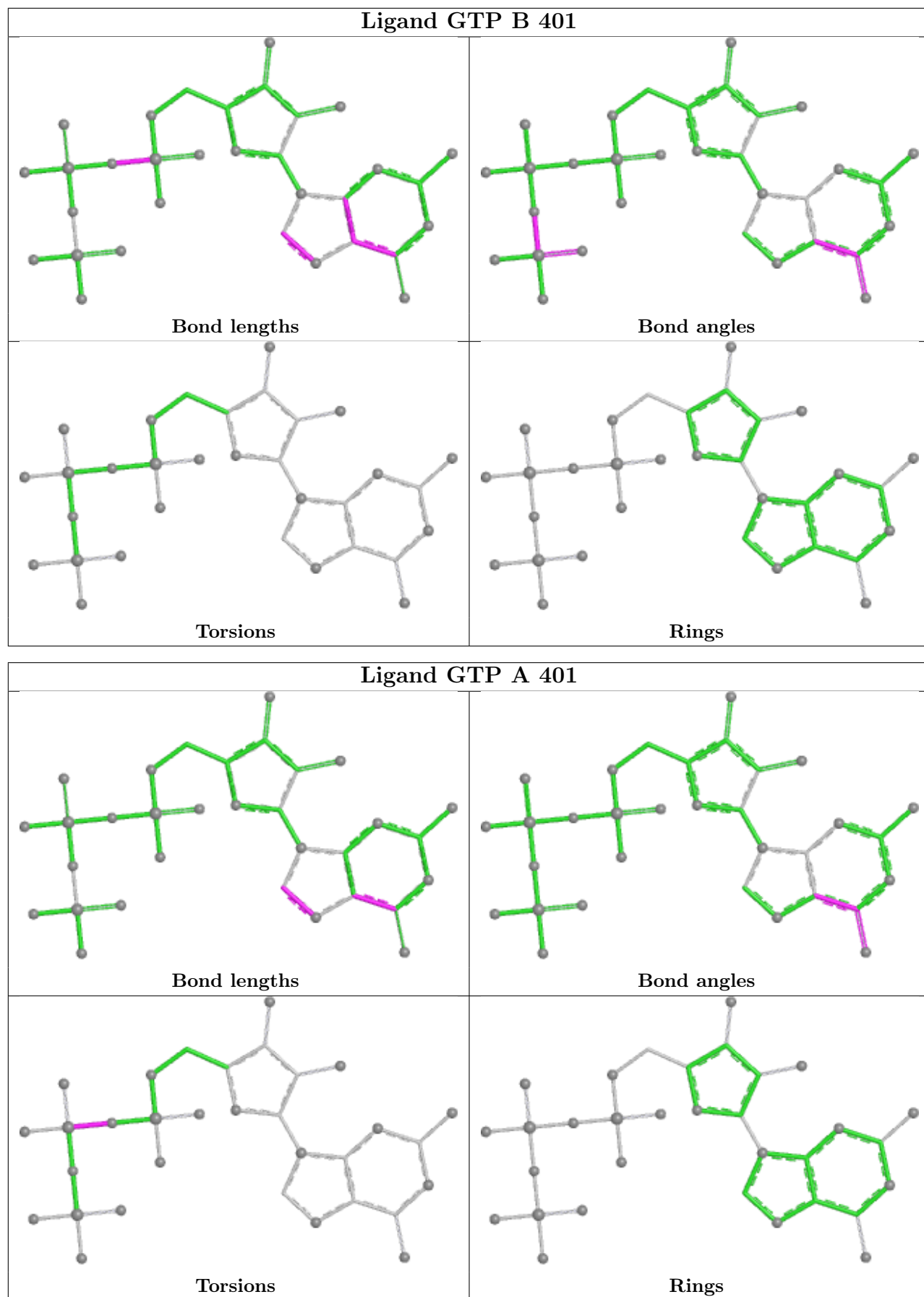
Mol	Chain	Res	Type	Atoms
5	D	401	GDP	PA-O3A-PB-O1B

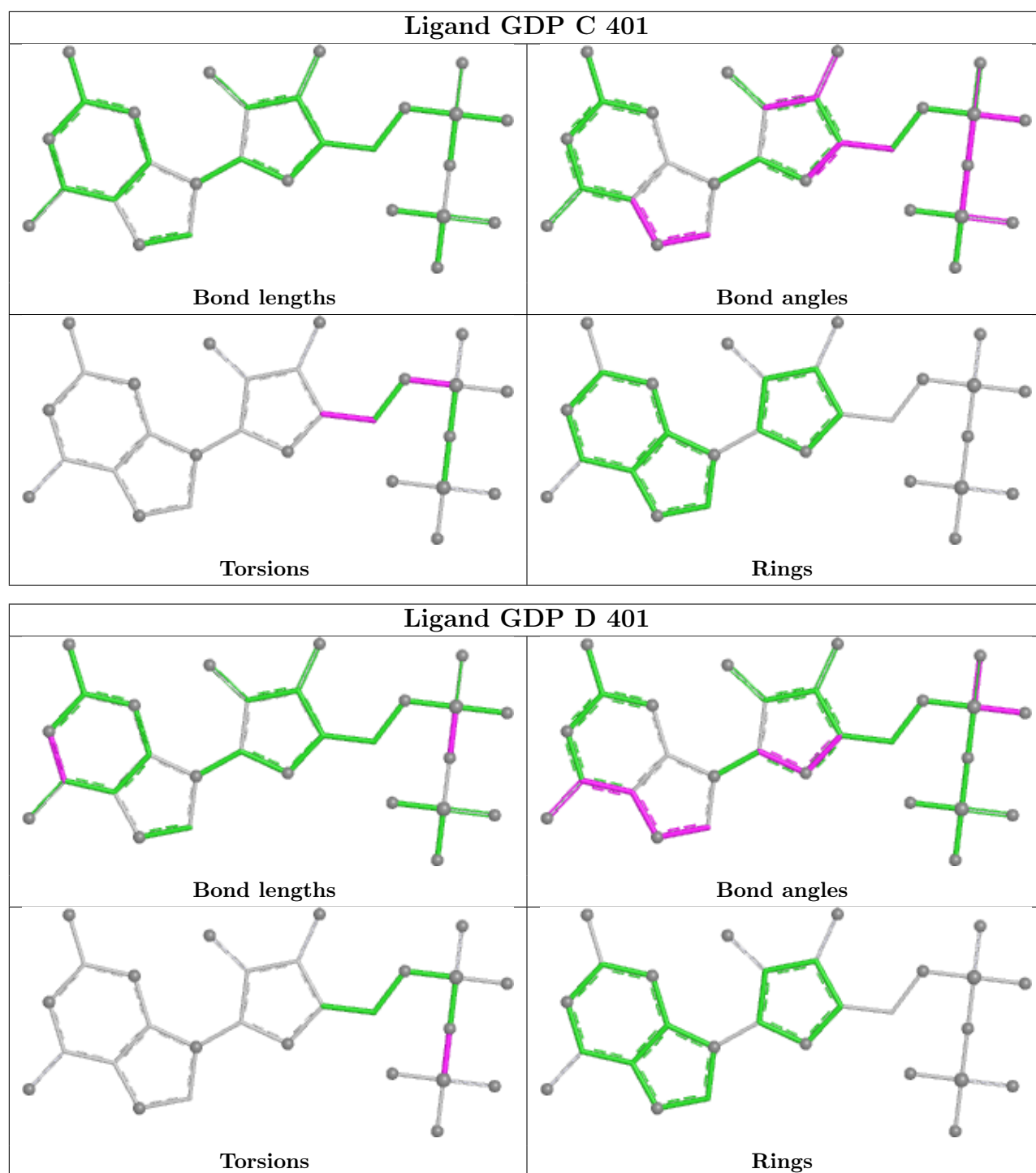
There are no ring outliers.

4 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	401	GTP	2	0
3	A	401	GTP	1	0
6	B	404	9JE	1	0
6	B	403	9JE	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.





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	300/313 (95%)	0.11	3 (1%) 82 84	40, 61, 103, 154	0
1	B	300/313 (95%)	0.26	8 (2%) 54 58	42, 65, 106, 149	0
2	C	284/399 (71%)	0.40	13 (4%) 32 34	38, 67, 114, 137	0
2	D	272/399 (68%)	1.24	64 (23%) 0 0	59, 110, 150, 167	0
All	All	1156/1424 (81%)	0.49	88 (7%) 13 14	38, 72, 130, 167	0

All (88) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	205	ASP	6.9
2	D	159	ILE	6.5
2	C	89	GLU	6.2
2	D	354	TYR	6.0
2	D	249	ILE	5.9
2	D	134	PHE	5.6
2	D	133	ILE	5.5
2	D	208	LEU	5.5
2	D	70	ARG	5.4
2	D	166	LYS	5.2
2	C	93	LEU	5.1
2	D	140	LEU	5.0
2	D	361	LYS	4.7
2	D	173	PHE	4.5
2	D	209	GLU	4.4
2	D	356	PHE	4.2
2	D	169	PRO	4.1
1	B	4	THR	4.1
2	D	156	ARG	3.9
2	D	250	PHE	3.7
2	D	167	VAL	3.7

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Mol	Chain	Res	Type	RSRZ
2	D	254	SER	3.7
1	A	4	THR	3.6
2	D	213	LEU	3.5
2	C	86	SER	3.4
2	D	65	LEU	3.4
2	D	351	LEU	3.3
2	D	63	ARG	3.3
2	D	253	ASN	3.3
2	D	184	SER	3.3
2	D	115	TRP	3.2
2	C	305	GLY	3.2
2	C	208	LEU	3.1
2	D	112	PHE	3.1
2	C	92	PHE	3.1
1	A	300	LEU	3.1
1	B	281	ILE	3.1
2	D	142	TYR	3.0
2	D	158	HIS	2.9
2	D	252	SER	2.8
2	D	204	ALA	2.8
2	D	358	CYS	2.8
2	C	173	PHE	2.8
2	D	346	PHE	2.8
2	D	212	HIS	2.8
2	D	109	PHE	2.7
2	D	365	GLU	2.7
2	C	59	SER	2.7
2	C	90	THR	2.7
2	D	206	ALA	2.7
2	D	303	GLU	2.6
2	C	85	MET	2.6
2	D	261	LEU	2.6
2	D	198	ARG	2.6
2	D	67	MET	2.6
2	D	152	GLU	2.6
1	A	220	LYS	2.6
2	D	189	ILE	2.5
1	B	280	SER	2.5
1	B	49	HIS	2.5
2	D	114	ILE	2.4
2	C	88	ASN	2.4
2	D	359	PHE	2.4

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Mol	Chain	Res	Type	RSRZ
2	D	364	HIS	2.4
1	B	5	ALA	2.4
2	D	186	ASP	2.4
2	D	165	TYR	2.4
2	D	69	LEU	2.3
2	D	108	SER	2.3
2	D	348	ARG	2.3
2	D	270	ILE	2.3
1	B	57	VAL	2.3
1	B	302	ARG	2.3
2	D	60	SER	2.2
2	D	302	LYS	2.2
2	D	357	HIS	2.2
2	D	171	MET	2.2
2	C	115	TRP	2.1
2	D	211	LEU	2.1
1	B	285	ALA	2.1
2	D	139	ALA	2.1
2	D	367	PHE	2.1
2	D	368	GLU	2.1
2	D	305	GLY	2.1
2	D	78	GLN	2.1
2	D	256	ILE	2.0
2	D	242	THR	2.0
2	C	112	PHE	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](#)

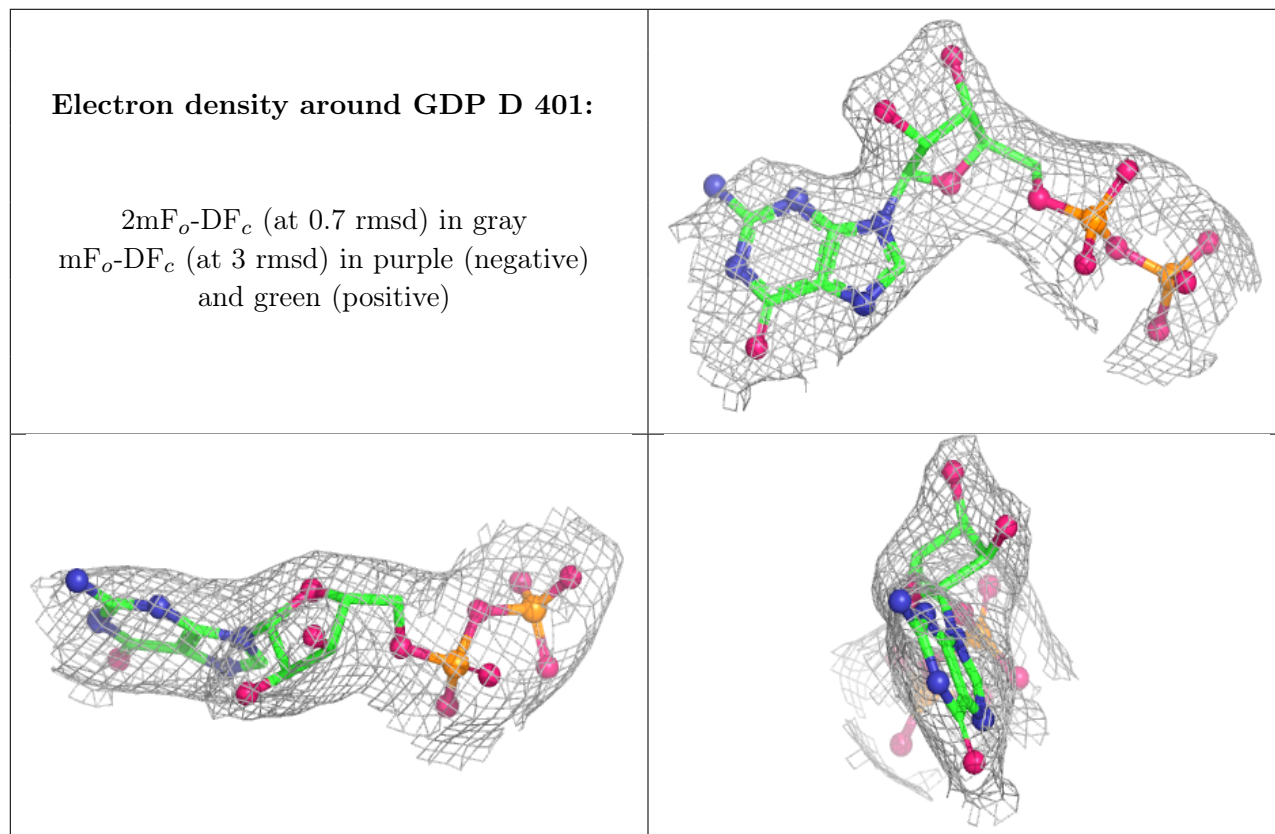
There are no monosaccharides in this entry.

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.

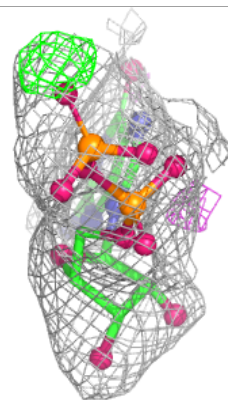
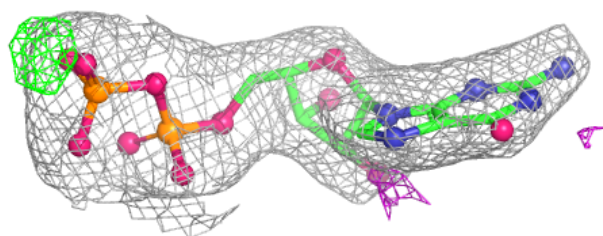
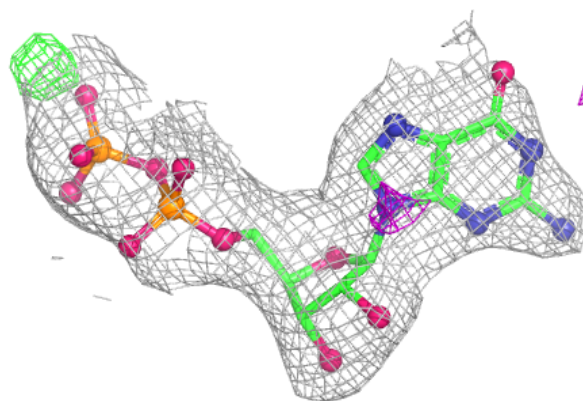
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
6	9JE	B	403	7/7	0.80	0.29	56,62,65,76	0
6	9JE	B	404	7/7	0.93	0.30	54,54,65,76	0
5	GDP	D	401	28/28	0.94	0.13	79,93,107,123	0
5	GDP	C	401	28/28	0.96	0.15	52,72,91,93	0
4	MG	B	402	1/1	0.97	0.13	58,58,58,58	0
3	GTP	B	401	32/32	0.98	0.14	45,59,69,80	0
3	GTP	A	401	32/32	0.98	0.16	33,42,45,56	0
4	MG	A	402	1/1	0.99	0.12	43,43,43,43	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.

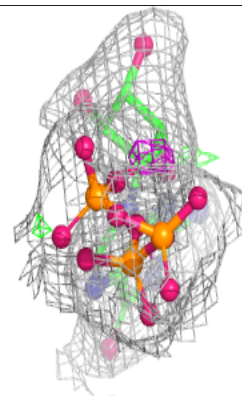
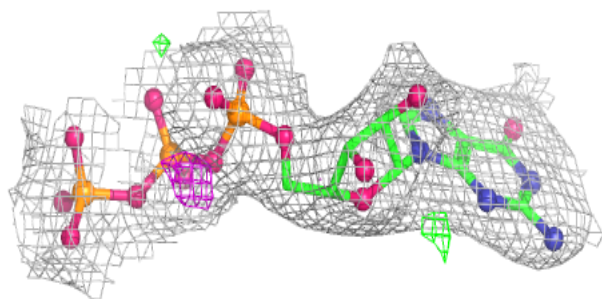
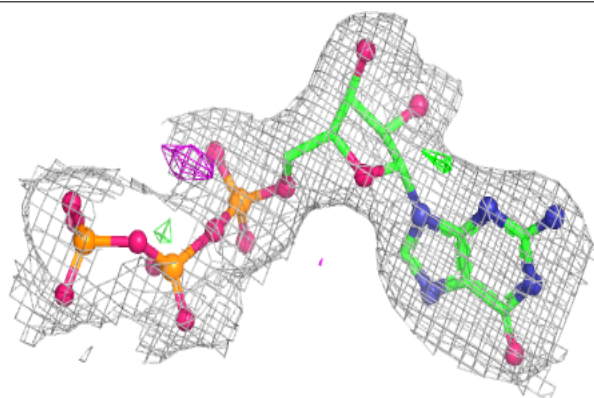


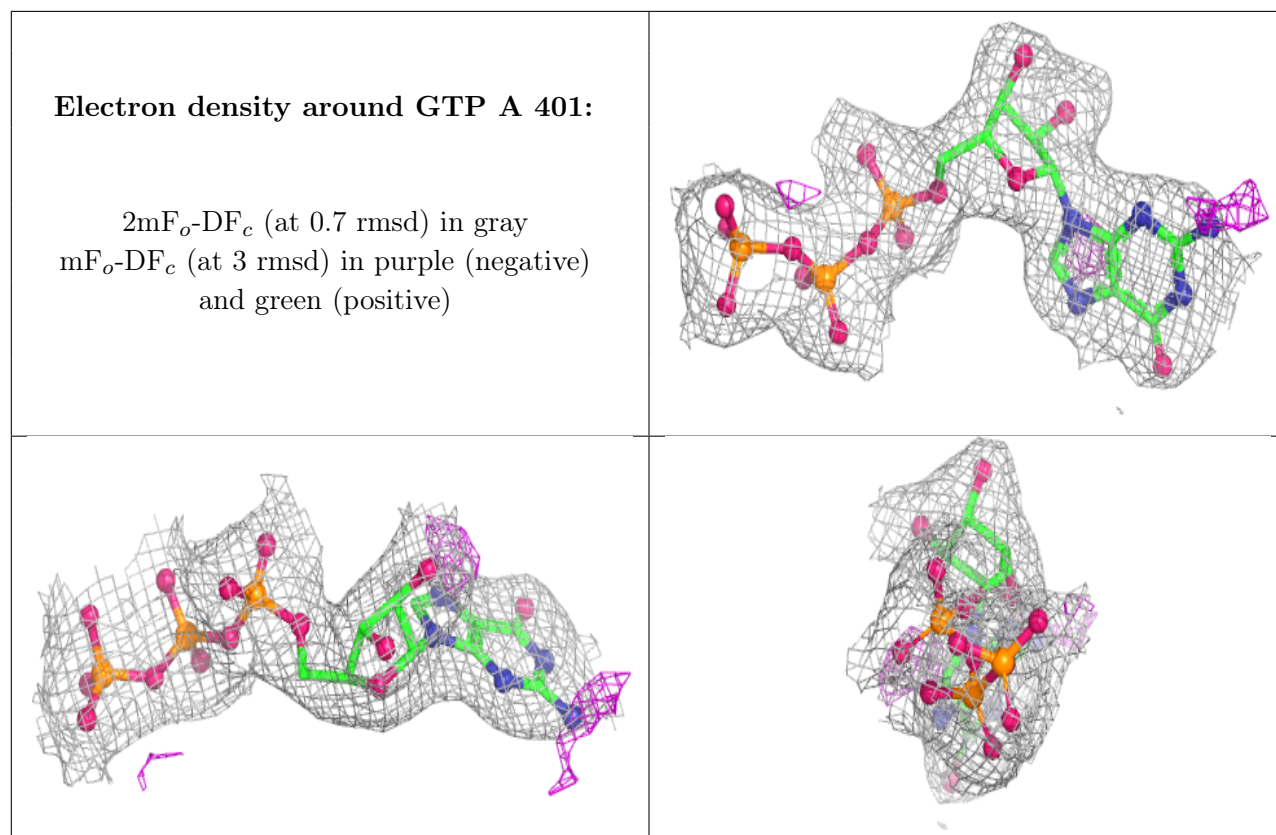
Electron density around GDP C 401:

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

**Electron density around GTP B 401:**

$2mF_o-DF_c$ (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.