



Full wwPDB X-ray Structure Validation Report ⓘ

May 13, 2024 – 10:43 am BST

PDB ID : 8BIK
Title : Crystal structure of human AMPK heterotrimer in complex with allosteric activator C455
Authors : Schimpl, M.; Mather, K.M.; Boland, M.L.; Rivers, E.L.; Srivastava, A.; Hemsley, P.; Robinson, J.; Wan, P.T.; Hansen, J.; Read, J.A.; Trevaskis, J.L.; Smith, D.M.
Deposited on : 2022-11-02
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](#) ①) were used in the production of this report:

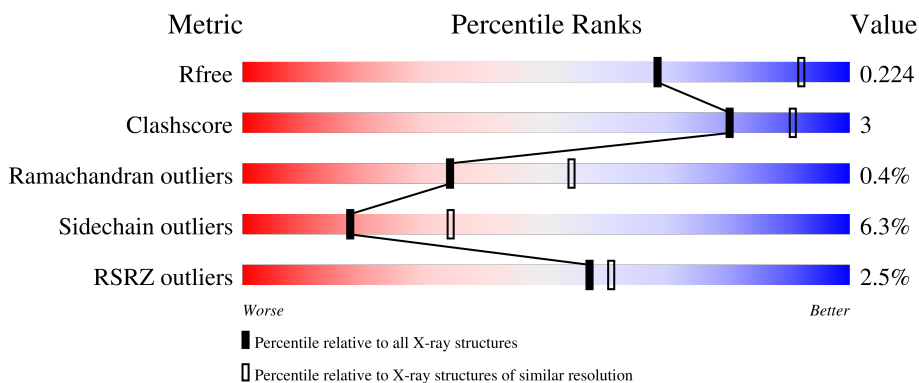
MolProbity : 4.02b-467
Mogul : 1.8.4, CSD as541be (2020)
Xtrriage (Phenix) : 1.13
EDS : 2.36.2
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.36.2

1 Overall quality at a glance i

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.



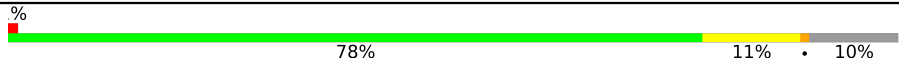
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	4661 (2.50-2.50)
Clashscore	141614	5346 (2.50-2.50)
Ramachandran outliers	138981	5231 (2.50-2.50)
Sidechain outliers	138945	5233 (2.50-2.50)
RSRZ outliers	127900	4559 (2.50-2.50)

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	559	 0% 72% 8% 19%
1	D	559	 4% 71% 8% 21%
2	B	270	 57% 9% 33%
2	E	270	 3% 56% 7% 36%
3	C	331	 78% 12% 9%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
3	F	331	 <p>A horizontal bar chart representing the quality of chain. The bar is divided into three segments: a green segment representing 78%, a yellow segment representing 11%, and a grey segment representing 10%. A small red square is at the beginning of the bar, and a small black dot is at the end of the grey segment. The percentage values are printed below the bar.</p>

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 15482 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 5'-AMP-activated protein kinase catalytic subunit alpha-2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	451	3607	2312	621	649	25	0	0	0
1	D	443	3528	2264	611	628	25	0	0	0

There are 14 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-6	MET	-	initiating methionine	UNP P54646
A	-5	HIS	-	expression tag	UNP P54646
A	-4	HIS	-	expression tag	UNP P54646
A	-3	HIS	-	expression tag	UNP P54646
A	-2	HIS	-	expression tag	UNP P54646
A	-1	HIS	-	expression tag	UNP P54646
A	0	HIS	-	expression tag	UNP P54646
D	-6	MET	-	initiating methionine	UNP P54646
D	-5	HIS	-	expression tag	UNP P54646
D	-4	HIS	-	expression tag	UNP P54646
D	-3	HIS	-	expression tag	UNP P54646
D	-2	HIS	-	expression tag	UNP P54646
D	-1	HIS	-	expression tag	UNP P54646
D	0	HIS	-	expression tag	UNP P54646

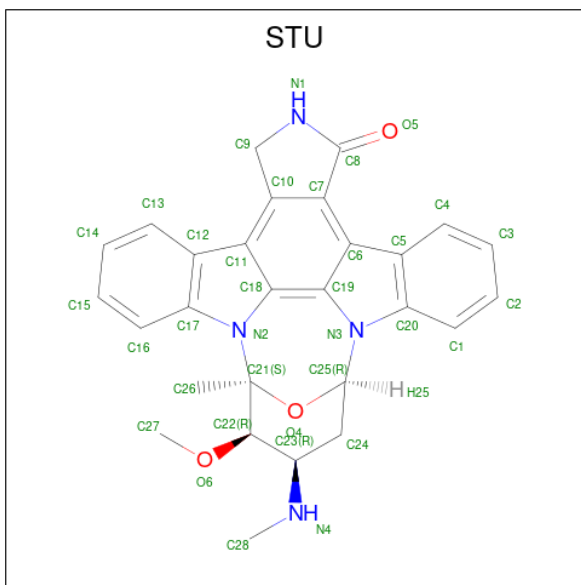
- Molecule 2 is a protein called 5'-AMP-activated protein kinase subunit beta-1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace	
			Total	C	N	O	P				S
2	B	181	1446	932	240	268	1	5	0	0	0
2	E	172	1365	885	230	244	1	5	0	0	0

- Molecule 3 is a protein called 5'-AMP-activated protein kinase subunit gamma-1.

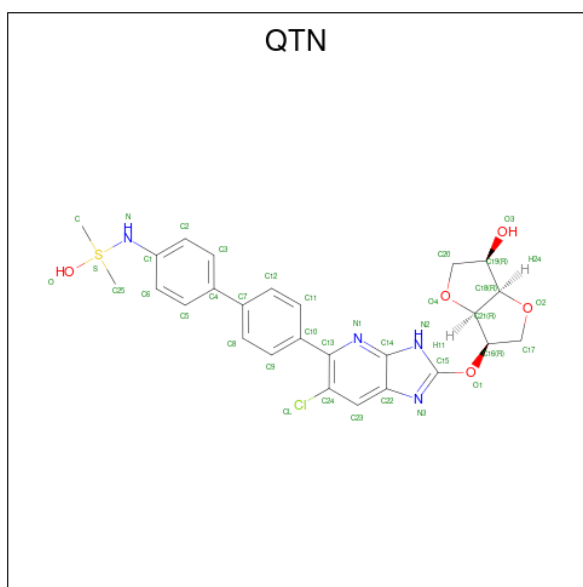
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	C	300	Total 2402	C 1561	N 401	O 433	S 7	0	0	0
3	F	299	Total 2393	C 1556	N 400	O 430	S 7	0	0	0

- Molecule 4 is STAUROSPORINE (three-letter code: STU) (formula: $C_{28}H_{26}N_4O_3$).



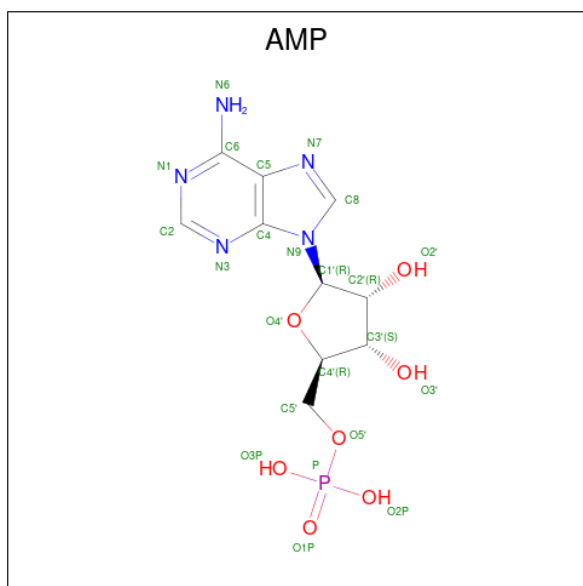
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
4	A	1	Total 35	C 28	N 4	O 3	0	0
4	D	1	Total 35	C 28	N 4	O 3	0	0

- Molecule 5 is (3 {R},3 {a} {R},6 {R},6 {a} {R})-6-[[6-chloranyl-5-[4-[4-[[dimethyl(oxidanyl)-\$l^{\wedge}\{4\}\$-sulfanyl]amino]phenyl]phenyl]-3 {H}-imidazo[4,5-b]pyridin-2-yl]oxy]-2,3,3 {a},5,6,6 {a}-hexahydrofuro[3,2-b]furan-3-ol (three-letter code: QTN) (formula: $C_{26}H_{27}ClN_4O_5S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	
			Total	C	Cl	N	O			S
5	A	1	37	26	1	4	5	1	0	0
5	D	1	37	26	1	4	5	1	0	0

- Molecule 6 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula: $C_{10}H_{14}N_5O_7P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
6	C	1	23	10	5	7	1	0	0
6	C	1	23	10	5	7	1	0	0

Continued on next page...

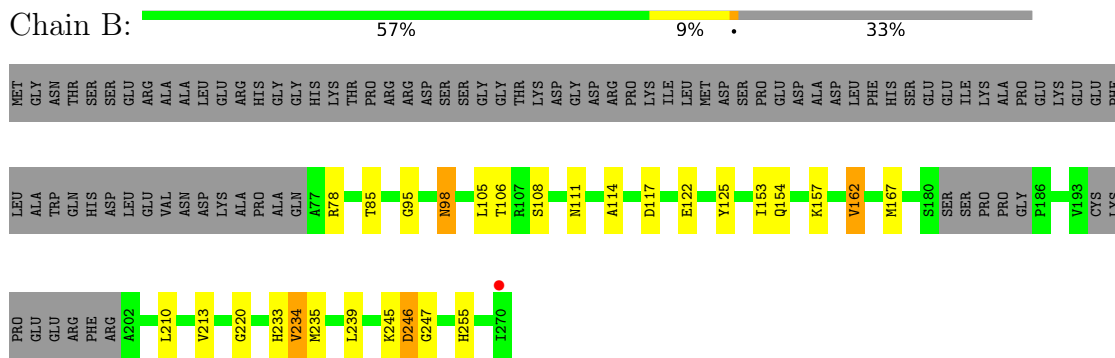
Continued from previous page...

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	F	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
6	F	1	Total	C	N	O	P	0	0
			23	10	5	7	1		
6	F	1	Total	C	N	O	P	0	0
			23	10	5	7	1		

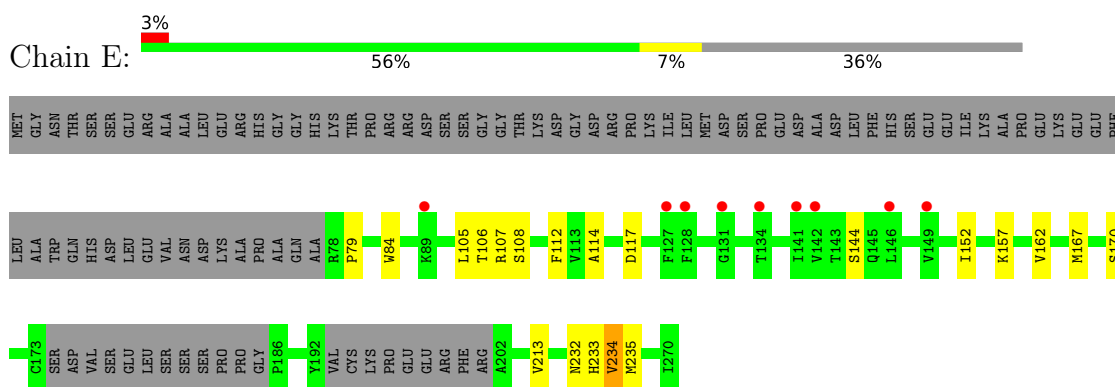
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	141	Total	O	0	0
			141	141		
7	B	67	Total	O	0	0
			67	67		
7	C	94	Total	O	0	0
			94	94		
7	D	93	Total	O	0	0
			93	93		
7	E	26	Total	O	0	0
			26	26		
7	F	61	Total	O	0	0
			61	61		

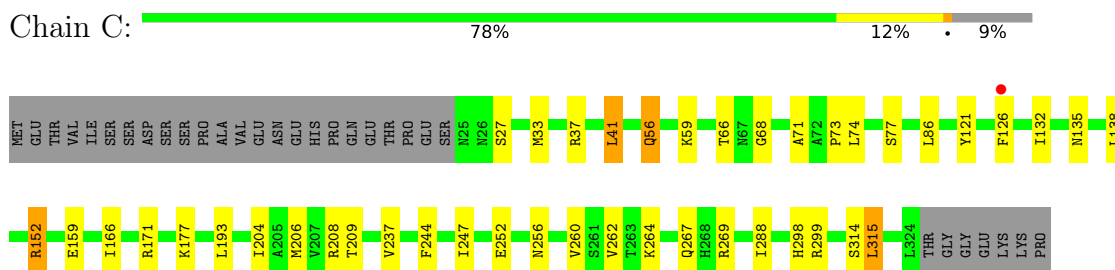
- Molecule 2: 5'-AMP-activated protein kinase subunit beta-1



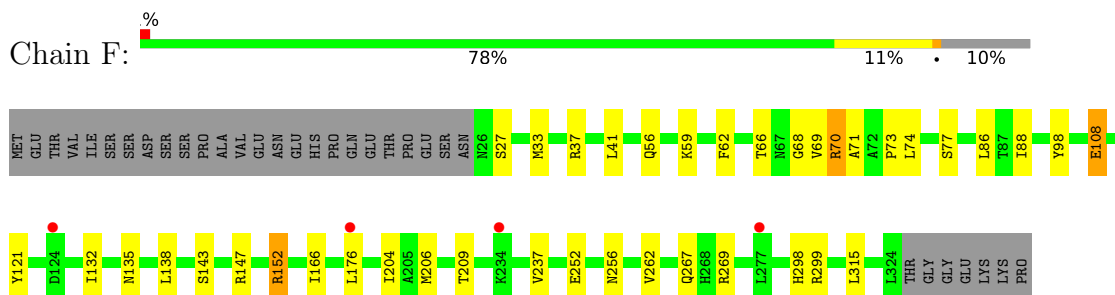
- Molecule 2: 5'-AMP-activated protein kinase subunit beta-1



- Molecule 3: 5'-AMP-activated protein kinase subunit gamma-1



- Molecule 3: 5'-AMP-activated protein kinase subunit gamma-1



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	75.31Å 127.97Å 139.22Å 90.00° 92.91° 90.00°	Depositor
Resolution (Å)	69.52 – 2.50 69.52 – 2.50	Depositor EDS
% Data completeness (in resolution range)	98.9 (69.52-2.50) 98.9 (69.52-2.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.81 (at 2.51Å)	Xtrriage
Refinement program	BUSTER 2.11.7	Depositor
R, R_{free}	0.181 , 0.215 0.189 , 0.224	Depositor DCC
R_{free} test set	4335 reflections (4.81%)	wwPDB-VP
Wilson B-factor (Å ²)	56.0	Xtrriage
Anisotropy	0.154	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 59.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtrriage
Estimated twinning fraction	0.025 for h,-k,-l	Xtrriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	15482	wwPDB-VP
Average B, all atoms (Å ²)	67.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.99% 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: QTN, SEP, AMP, STU

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	0/3691	0.70	0/4990
1	D	0.50	0/3608	0.69	0/4877
2	B	0.54	0/1476	0.74	0/2010
2	E	0.49	0/1394	0.69	0/1899
3	C	0.51	0/2453	0.69	0/3334
3	F	0.50	0/2443	0.69	0/3318
All	All	0.51	0/15065	0.70	0/20428

There are no bond length outliers.

There are no bond angle outliers.

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	3607	0	3577	17	0
1	D	3528	0	3508	15	0
2	B	1446	0	1423	18	0
2	E	1365	0	1350	8	0
3	C	2402	0	2456	17	0
3	F	2393	0	2461	17	0
4	A	35	0	26	2	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	D	35	0	26	1	0
5	A	37	0	0	1	0
5	D	37	0	0	1	0
6	C	46	0	24	0	0
6	F	69	0	36	0	0
7	A	141	0	0	1	0
7	B	67	0	0	3	0
7	C	94	0	0	0	0
7	D	93	0	0	1	0
7	E	26	0	0	0	0
7	F	61	0	0	0	0
All	All	15482	0	14887	82	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 3.

All (82) 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)
3:F:98:TYR:CG	3:F:108:GLU:HG3	2.05	0.92
1:A:530:PRO:HD2	1:A:535:HIS:HB2	1.52	0.89
3:C:41:LEU:CD2	3:C:171:ARG:HG3	2.09	0.81
3:F:41:LEU:HD13	3:F:138:LEU:HD21	1.63	0.81
3:C:41:LEU:HD12	3:C:138:LEU:HD21	1.64	0.79
1:A:370:MET:HG3	3:C:68:GLY:HA2	1.63	0.79
3:F:98:TYR:CD1	3:F:108:GLU:HG3	2.26	0.71
3:C:41:LEU:HD12	3:C:138:LEU:CD2	2.21	0.70
4:A:1001:STU:H261	4:A:1001:STU:H16	1.75	0.69
1:D:370:MET:HG3	3:F:68:GLY:HA2	1.75	0.69
2:B:220:GLY:HA2	7:B:347:HOH:O	1.93	0.68
3:C:56:GLN:HB3	3:C:59:LYS:HG2	1.76	0.67
3:C:298:HIS:HA	3:C:315:LEU:HD22	1.77	0.67
4:D:1001:STU:H261	4:D:1001:STU:H16	1.76	0.66
2:B:105:LEU:HD22	2:B:114:ALA:HB2	1.79	0.65
2:E:105:LEU:HD22	2:E:114:ALA:HB2	1.78	0.63
3:C:260:VAL:HG13	3:C:264:LYS:HB2	1.81	0.61
3:F:56:GLN:HB2	3:F:59:LYS:HG3	1.85	0.59
3:C:41:LEU:HD22	3:C:171:ARG:HG3	1.83	0.59
3:F:41:LEU:HD11	3:F:138:LEU:HD11	1.84	0.58
1:A:418:GLU:HG3	1:A:550:LEU:HD12	1.85	0.56
1:A:169:PHE:CZ	2:B:234:VAL:HG13	2.42	0.55

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:125:TYR:HE1	2:B:153:ILE:HG23	1.73	0.54
3:C:204:ILE:HG22	3:C:206:MET:HG3	1.90	0.54
3:C:244:PHE:O	3:C:247:ILE:HG22	2.08	0.54
3:F:70:ARG:HD3	3:F:88:ILE:HD12	1.90	0.53
1:D:374:ILE:HD12	3:F:252:GLU:HG2	1.92	0.52
3:C:73:PRO:HD3	3:C:166:ILE:HD11	1.92	0.52
3:F:204:ILE:HG22	3:F:206:MET:HG3	1.90	0.52
1:A:234:PRO:HD2	1:A:237:LEU:HD22	1.91	0.52
1:A:62:LYS:O	1:A:66:GLN:HG3	2.09	0.52
1:D:58:VAL:HG11	2:E:170:SER:HA	1.91	0.52
1:D:197:ILE:HD11	1:D:259:ILE:HG13	1.92	0.51
3:F:143:SER:O	3:F:147:ARG:HB2	2.10	0.51
5:A:1002:QTN:CL	5:A:1002:QTN:C9	2.95	0.51
1:D:234:PRO:HD2	1:D:237:LEU:HD22	1.92	0.51
3:C:71:ALA:HB2	3:C:152:ARG:HD2	1.92	0.51
1:D:179:TYR:CE1	1:D:202:VAL:HG22	2.46	0.51
1:D:62:LYS:O	1:D:66:GLN:HG3	2.11	0.50
1:A:15:HIS:O	1:A:36:GLN:HG2	2.11	0.50
3:F:73:PRO:HD3	3:F:166:ILE:HD11	1.93	0.50
2:B:95:GLY:H	2:B:98:ASN:HD21	1.61	0.49
2:B:233:HIS:HD2	7:B:334:HOH:O	1.95	0.49
2:E:84:TRP:HB3	2:E:112:PHE:HB2	1.94	0.49
7:D:1110:HOH:O	2:E:233:HIS:HE1	1.95	0.48
1:A:402:TRP:HB2	2:B:213:VAL:HG11	1.95	0.48
2:B:122:GLU:HG3	2:B:154:GLN:NE2	2.28	0.48
5:D:1002:QTN:CL	5:D:1002:QTN:C9	2.98	0.48
1:D:136:VAL:HG13	1:D:164:MET:SD	2.54	0.47
1:D:437:HIS:HE1	1:D:454:SER:OG	1.97	0.47
1:D:402:TRP:HB2	2:E:213:VAL:HG11	1.96	0.47
3:F:298:HIS:HA	3:F:315:LEU:HD22	1.97	0.46
2:B:95:GLY:H	2:B:98:ASN:ND2	2.15	0.45
1:D:416:MET:HE3	1:D:457:LEU:HD22	1.98	0.45
2:B:246:ASP:CG	2:B:247:GLY:H	2.20	0.45
2:B:255:HIS:HD2	7:B:315:HOH:O	1.99	0.44
1:A:319:GLN:H	1:A:319:GLN:HG2	1.56	0.44
1:A:404:LEU:HD22	2:B:210:LEU:HB3	2.00	0.44
3:C:74:LEU:HD21	3:C:86:LEU:HB2	2.00	0.44
3:F:37:ARG:HD3	3:F:135:ASN:HA	2.00	0.44
3:F:74:LEU:HD21	3:F:86:LEU:HB2	2.00	0.44
1:A:93:MET:HE3	4:A:1001:STU:H92	1.99	0.43
1:A:10:ARG:HB2	1:A:17:VAL:HG13	2.01	0.43

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:85:THR:HG22	2:B:111:ASN:OD1	2.18	0.43
1:A:374:ILE:HD12	3:C:252:GLU:HG2	2.01	0.42
7:A:1174:HOH:O	2:B:162:VAL:HG22	2.20	0.42
1:D:169:PHE:CZ	2:E:234:VAL:HG13	2.54	0.42
2:E:232:ASN:O	2:E:235:MET:HG3	2.18	0.42
1:D:47:LEU:HB3	1:D:52:ILE:HD11	2.00	0.42
3:F:71:ALA:HB2	3:F:152:ARG:HD2	2.01	0.41
1:A:471:SER:OG	2:B:255:HIS:HE1	2.03	0.41
2:B:245:LYS:O	2:B:246:ASP:HB3	2.19	0.41
1:D:85:THR:HG22	2:E:79:PRO:HG2	2.02	0.41
3:C:37:ARG:HD3	3:C:135:ASN:HA	2.02	0.41
3:F:41:LEU:CD1	3:F:138:LEU:HD11	2.47	0.41
2:B:125:TYR:CE1	2:B:153:ILE:HG23	2.53	0.41
1:A:469:PHE:HB2	2:B:239:LEU:HB3	2.03	0.40
3:F:62:PHE:O	3:F:66:THR:HG23	2.21	0.40
1:A:423:MET:HE1	1:A:438:LEU:HD13	2.03	0.40
3:C:193:LEU:HD13	3:C:288:ILE:HD13	2.02	0.40
1:A:374:ILE:HD12	3:C:252:GLU:HA	2.04	0.40
1:D:324:TYR:O	1:D:328:ILE:HG12	2.21	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	443/559 (79%)	428 (97%)	12 (3%)	3 (1%)	22 39
1	D	433/559 (78%)	418 (96%)	12 (3%)	3 (1%)	22 39
2	B	174/270 (64%)	168 (97%)	5 (3%)	1 (1%)	25 43
2	E	165/270 (61%)	159 (96%)	6 (4%)	0	100 100
3	C	298/331 (90%)	292 (98%)	6 (2%)	0	100 100

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	F	297/331 (90%)	287 (97%)	10 (3%)	0	100	100
All	All	1810/2320 (78%)	1752 (97%)	51 (3%)	7 (0%)	34	54

All (7) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	531	ARG
1	D	109	GLY
1	A	301	GLU
1	D	301	GLU
1	A	172	THR
2	B	246	ASP
1	D	172	THR

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	392/494 (79%)	367 (94%)	25 (6%)	17	33
1	D	381/494 (77%)	360 (94%)	21 (6%)	21	41
2	B	163/239 (68%)	154 (94%)	9 (6%)	21	41
2	E	151/239 (63%)	142 (94%)	9 (6%)	19	37
3	C	271/304 (89%)	249 (92%)	22 (8%)	11	23
3	F	270/304 (89%)	253 (94%)	17 (6%)	18	34
All	All	1628/2074 (78%)	1525 (94%)	103 (6%)	18	34

All (103) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	10	ARG
1	A	51	LYS
1	A	82	VAL
1	A	107	LYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	A	112	GLU
1	A	114	MET
1	A	162	ASN
1	A	168	GLU
1	A	194	GLU
1	A	235	GLU
1	A	270	GLN
1	A	290	ASP
1	A	303	THR
1	A	305	SER
1	A	308	MET
1	A	319	GLN
1	A	339	GLU
1	A	364	LYS
1	A	421	ARG
1	A	427	ASP
1	A	442	ARG
1	A	470	LYS
1	A	530	PRO
1	A	532	LEU
1	A	550	LEU
2	B	78	ARG
2	B	98	ASN
2	B	106	THR
2	B	117	ASP
2	B	157	LYS
2	B	162	VAL
2	B	167	MET
2	B	234	VAL
2	B	235	MET
3	C	27	SER
3	C	33	MET
3	C	41	LEU
3	C	56	GLN
3	C	66	THR
3	C	77	SER
3	C	121	TYR
3	C	126	PHE
3	C	132	ILE
3	C	152	ARG
3	C	159	GLU
3	C	177	LYS

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	C	208	ARG
3	C	209	THR
3	C	237	VAL
3	C	256	ASN
3	C	262	VAL
3	C	267	GLN
3	C	269	ARG
3	C	299	ARG
3	C	314	SER
3	C	315	LEU
1	D	10	ARG
1	D	60	LYS
1	D	72	ARG
1	D	82	VAL
1	D	108	HIS
1	D	114	MET
1	D	168	GLU
1	D	194	GLU
1	D	202	VAL
1	D	207	LEU
1	D	235	GLU
1	D	239	ARG
1	D	270	GLN
1	D	308	MET
1	D	339	GLU
1	D	421	ARG
1	D	425	GLN
1	D	442	ARG
1	D	464	SER
1	D	532	LEU
1	D	550	LEU
2	E	106	THR
2	E	107	ARG
2	E	117	ASP
2	E	144	SER
2	E	152	ILE
2	E	157	LYS
2	E	162	VAL
2	E	167	MET
2	E	234	VAL
3	F	27	SER
3	F	33	MET

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
3	F	69	VAL
3	F	70	ARG
3	F	77	SER
3	F	108	GLU
3	F	121	TYR
3	F	132	ILE
3	F	152	ARG
3	F	176	LEU
3	F	209	THR
3	F	237	VAL
3	F	256	ASN
3	F	262	VAL
3	F	267	GLN
3	F	269	ARG
3	F	299	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	98	ASN
2	B	124	GLN
2	B	135	HIS
2	B	150	ASN
2	B	154	GLN
2	B	255	HIS
3	C	271	HIS
1	D	36	GLN
1	D	66	GLN
1	D	437	HIS
3	F	36	HIS
3	F	271	HIS

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

2 non-standard protein/DNA/RNA residues are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul

statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# $ Z > 2$	Counts	RMSZ	# $ Z > 2$
2	SEP	E	108	2	8,9,10	1.07	0	8,12,14	3.47	3 (37%)
2	SEP	B	108	2	8,9,10	0.86	0	8,12,14	3.05	3 (37%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	SEP	E	108	2	-	3/5/8/10	-
2	SEP	B	108	2	-	4/5/8/10	-

There are no bond length outliers.

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	E	108	SEP	OG-CB-CA	7.29	115.24	108.14
2	B	108	SEP	O2P-P-OG	6.64	124.40	106.73
2	B	108	SEP	OG-CB-CA	-4.77	103.51	108.14
2	E	108	SEP	O3P-P-OG	4.71	119.27	106.73
2	E	108	SEP	P-OG-CB	-3.33	109.11	118.30
2	B	108	SEP	O3P-P-OG	-2.28	100.66	106.73

There are no chirality outliers.

All (7) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	B	108	SEP	CB-OG-P-O3P
2	E	108	SEP	CB-OG-P-O2P
2	B	108	SEP	CB-OG-P-O1P
2	B	108	SEP	CB-OG-P-O2P
2	B	108	SEP	N-CA-CB-OG
2	E	108	SEP	N-CA-CB-OG
2	E	108	SEP	CB-OG-P-O3P

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

9 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
6	AMP	F	402	-	22,25,25	0.76	1 (4%)	25,38,38	0.89	1 (4%)
6	AMP	C	402	-	22,25,25	0.63	0	25,38,38	1.07	2 (8%)
4	STU	A	1001	-	30,42,42	1.69	3 (10%)	31,68,68	0.84	2 (6%)
5	QTN	D	1002	-	36,42,42	0.65	0	44,63,63	0.91	2 (4%)
6	AMP	F	403	-	22,25,25	0.80	1 (4%)	25,38,38	1.12	2 (8%)
6	AMP	F	401	-	22,25,25	0.80	1 (4%)	25,38,38	0.90	2 (8%)
4	STU	D	1001	-	30,42,42	1.43	2 (6%)	31,68,68	0.82	3 (9%)
6	AMP	C	401	-	22,25,25	0.80	1 (4%)	25,38,38	1.07	3 (12%)
5	QTN	A	1002	-	36,42,42	0.68	0	44,63,63	0.92	1 (2%)

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
6	AMP	F	402	-	-	0/6/26/26	0/3/3/3
6	AMP	C	402	-	-	1/6/26/26	0/3/3/3
4	STU	A	1001	-	-	1/4/42/42	-
5	QTN	D	1002	-	-	0/12/39/39	0/6/6/6

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	AMP	F	403	-	-	0/6/26/26	0/3/3/3
6	AMP	F	401	-	-	3/6/26/26	0/3/3/3
4	STU	D	1001	-	-	1/4/42/42	-
6	AMP	C	401	-	-	1/6/26/26	0/3/3/3
5	QTN	A	1002	-	-	0/12/39/39	0/6/6/6

All (9) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	1001	STU	C8-N1	6.55	1.40	1.35
4	D	1001	STU	C8-N1	6.24	1.40	1.35
4	A	1001	STU	C9-N1	4.31	1.50	1.45
4	A	1001	STU	C9-C10	3.70	1.53	1.50
4	D	1001	STU	C9-N1	3.11	1.48	1.45
6	F	401	AMP	P-O1P	2.41	1.58	1.50
6	F	403	AMP	P-O3P	-2.30	1.46	1.54
6	C	401	AMP	P-O3P	-2.27	1.46	1.54
6	F	402	AMP	P-O2P	-2.05	1.46	1.54

All (18) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	F	403	AMP	P-O5'-C5'	3.79	128.73	118.30
6	C	402	AMP	P-O5'-C5'	3.71	128.52	118.30
5	D	1002	QTN	C23-C22-C14	-3.23	117.86	121.12
5	A	1002	QTN	C23-C22-C14	-3.19	117.91	121.12
6	C	401	AMP	P-O5'-C5'	2.51	125.20	118.30
6	F	403	AMP	C5-C6-N6	2.37	123.96	120.35
6	C	401	AMP	C5-C6-N6	2.34	123.91	120.35
6	F	401	AMP	P-O5'-C5'	2.33	124.72	118.30
6	F	402	AMP	C5-C6-N6	2.29	123.83	120.35
6	C	402	AMP	C5-C6-N6	2.28	123.82	120.35
4	A	1001	STU	C7-C10-C11	-2.15	119.52	122.42
6	C	401	AMP	O3P-P-O5'	2.14	112.43	106.73
4	D	1001	STU	C7-C10-C11	-2.14	119.53	122.42
4	D	1001	STU	C1-C20-N3	-2.08	129.76	132.25
4	A	1001	STU	C1-C20-N3	-2.07	129.77	132.25
6	F	401	AMP	C5-C6-N6	2.05	123.47	120.35
4	D	1001	STU	C16-C17-N2	-2.05	129.81	132.29
5	D	1002	QTN	C23-C24-C13	-2.01	120.18	122.00

There are no chirality outliers.

All (7) torsion outliers are listed below:

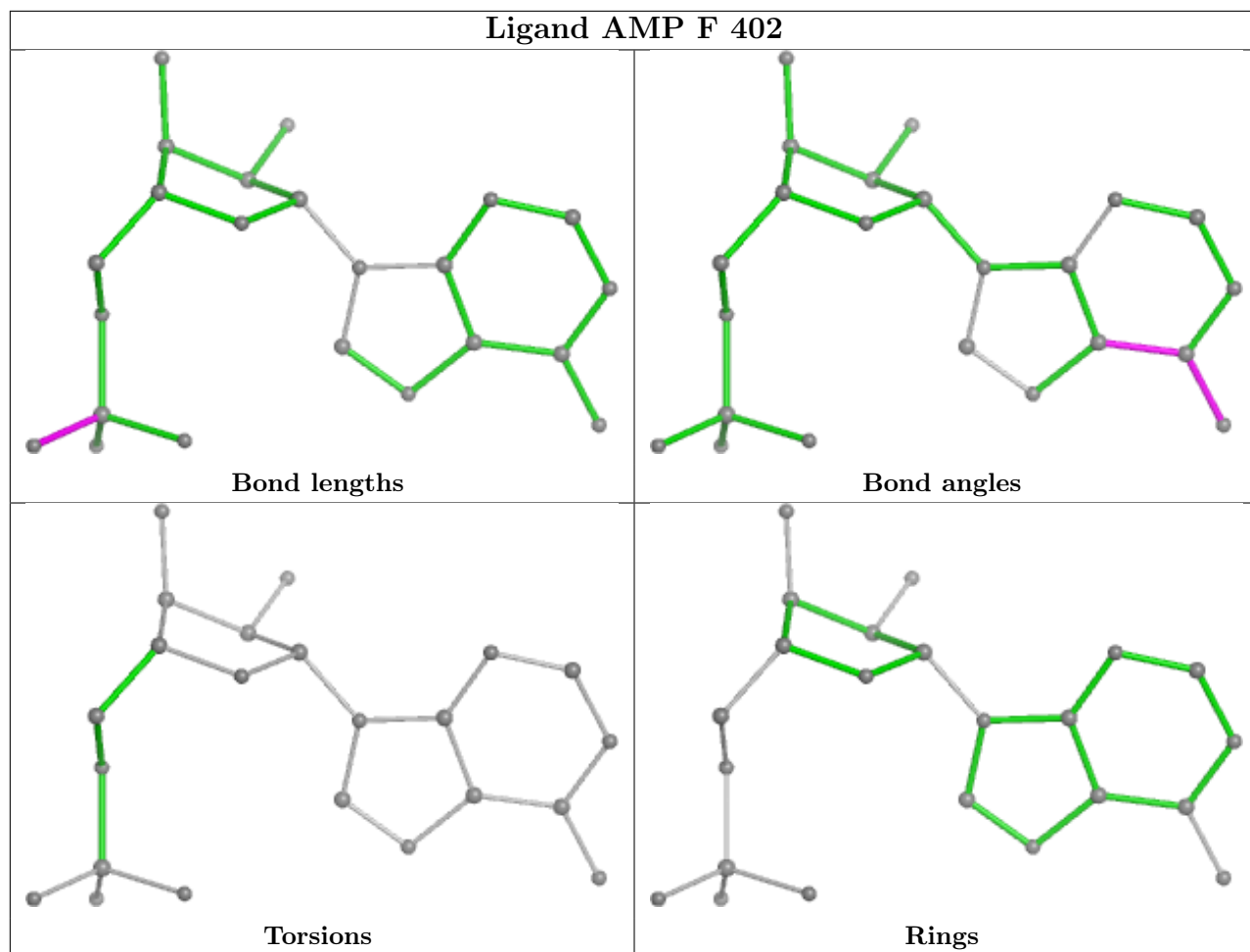
Mol	Chain	Res	Type	Atoms
6	C	401	AMP	C5'-O5'-P-O1P
6	F	401	AMP	C5'-O5'-P-O1P
6	F	401	AMP	C5'-O5'-P-O2P
6	F	401	AMP	C5'-O5'-P-O3P
4	A	1001	STU	C24-C23-N4-C28
6	C	402	AMP	C5'-O5'-P-O1P
4	D	1001	STU	C24-C23-N4-C28

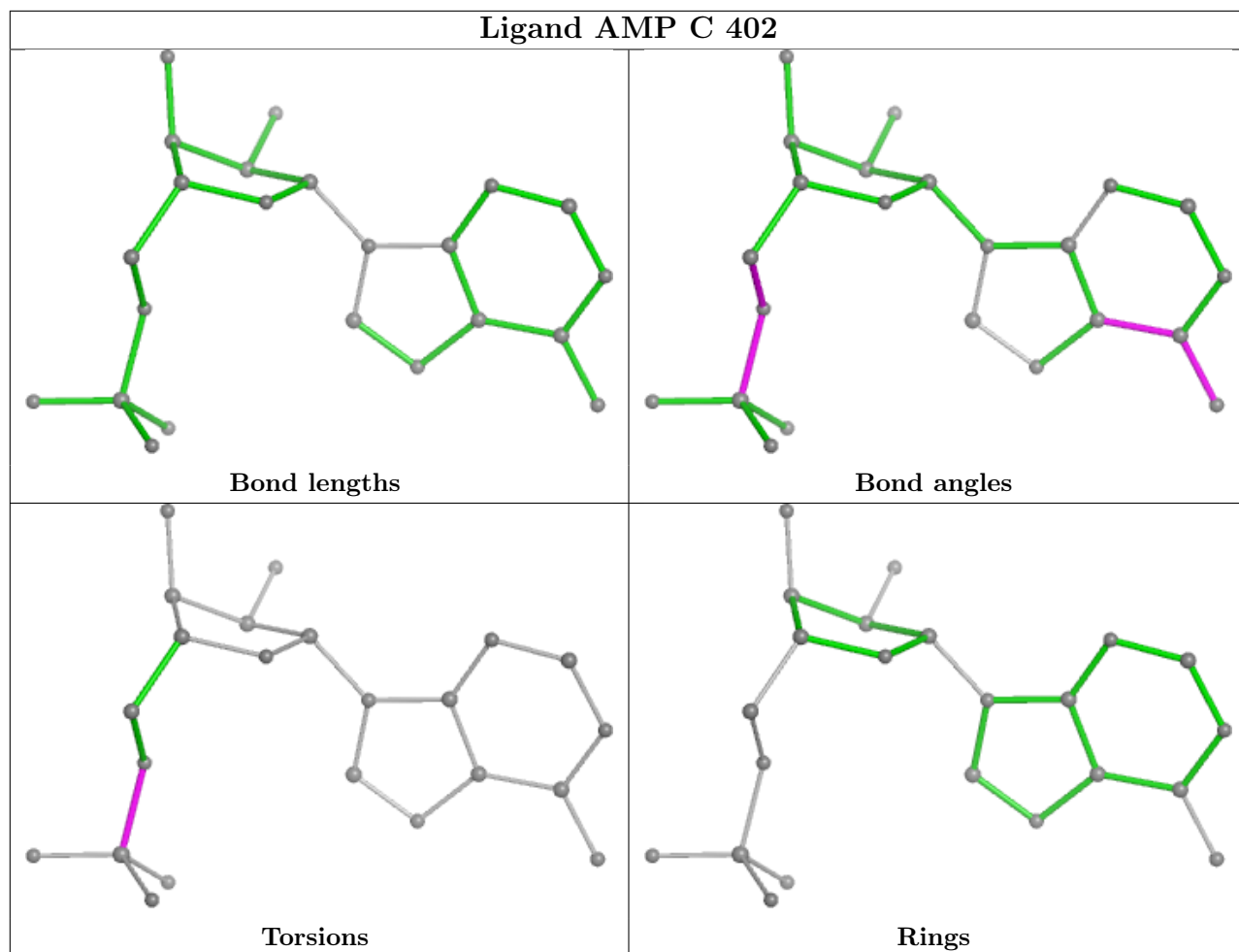
There are no ring outliers.

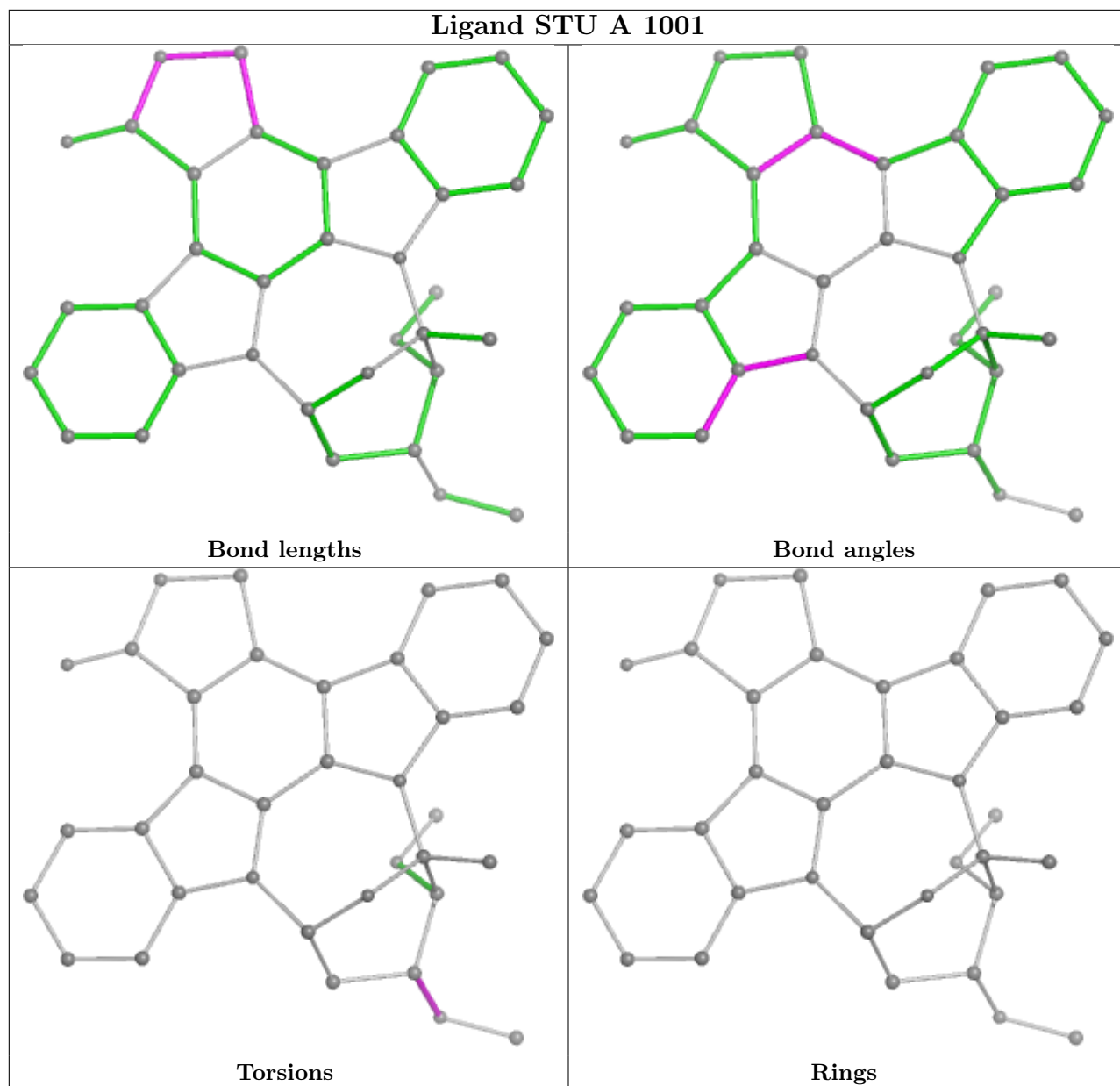
4 monomers are involved in 5 short contacts:

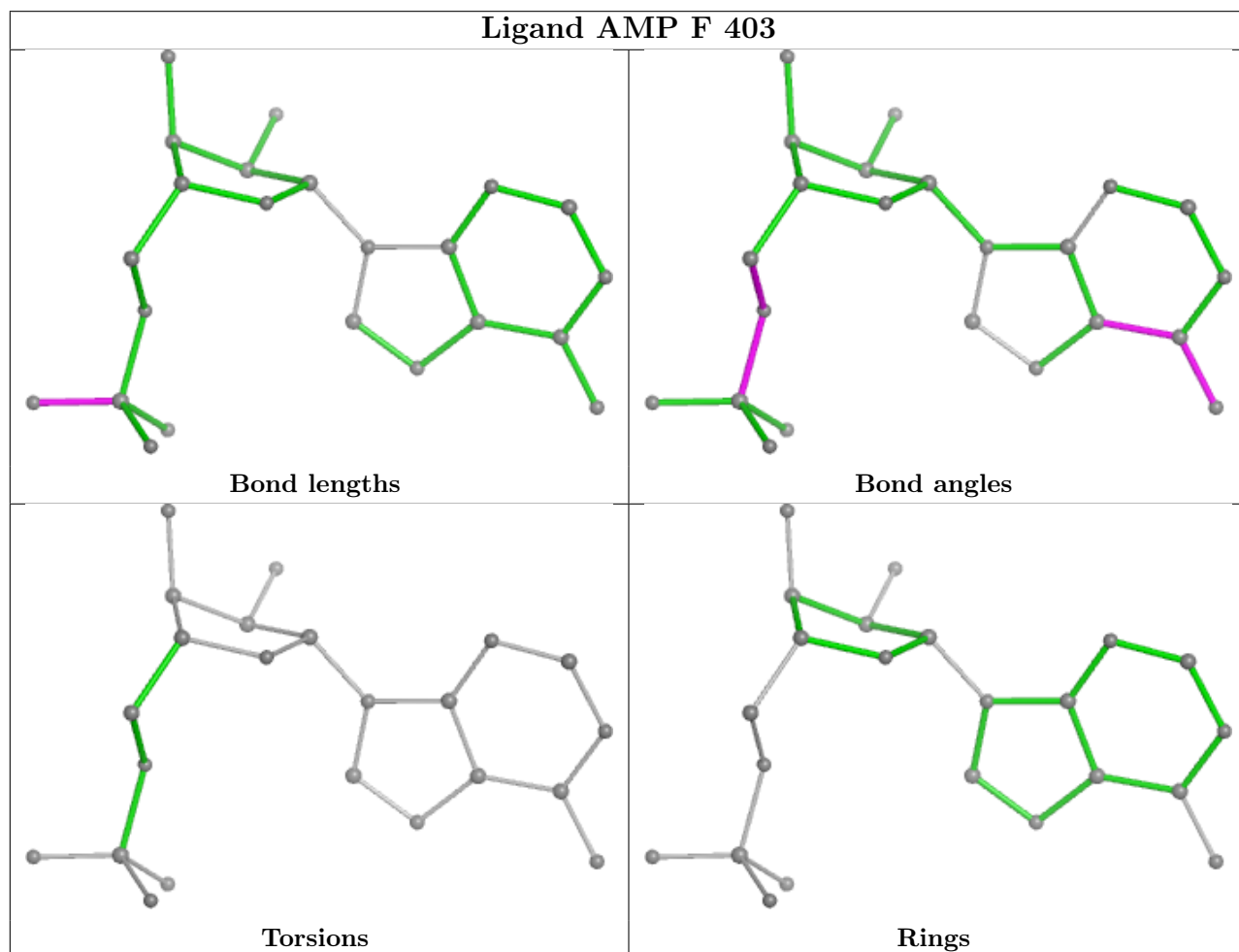
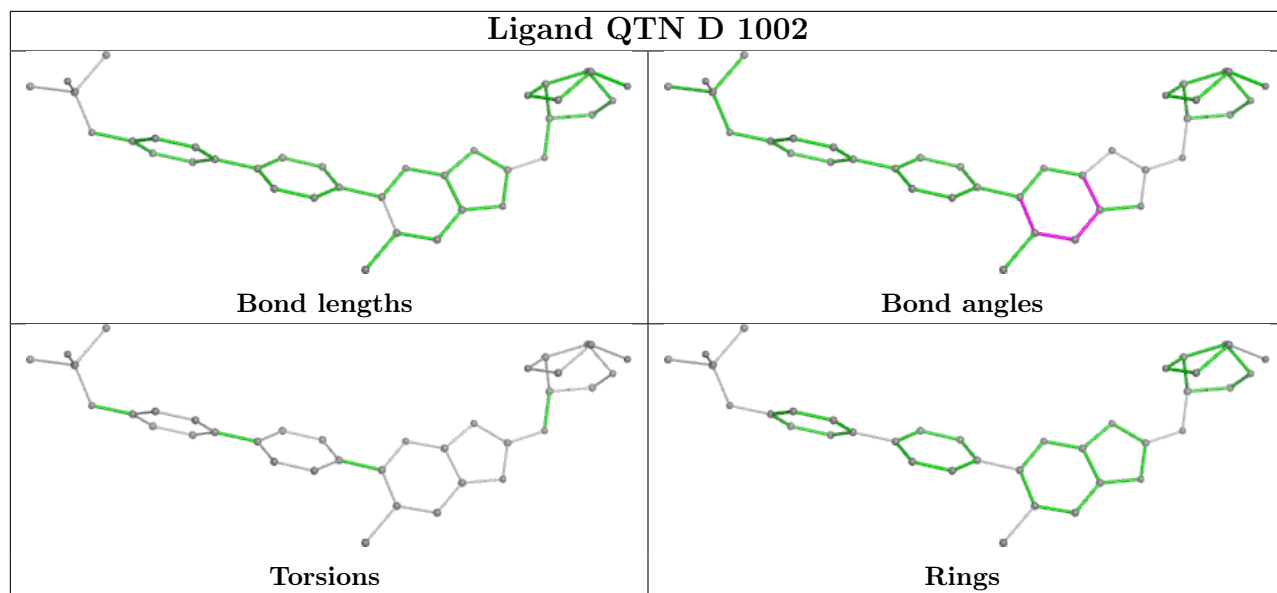
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	A	1001	STU	2	0
5	D	1002	QTN	1	0
4	D	1001	STU	1	0
5	A	1002	QTN	1	0

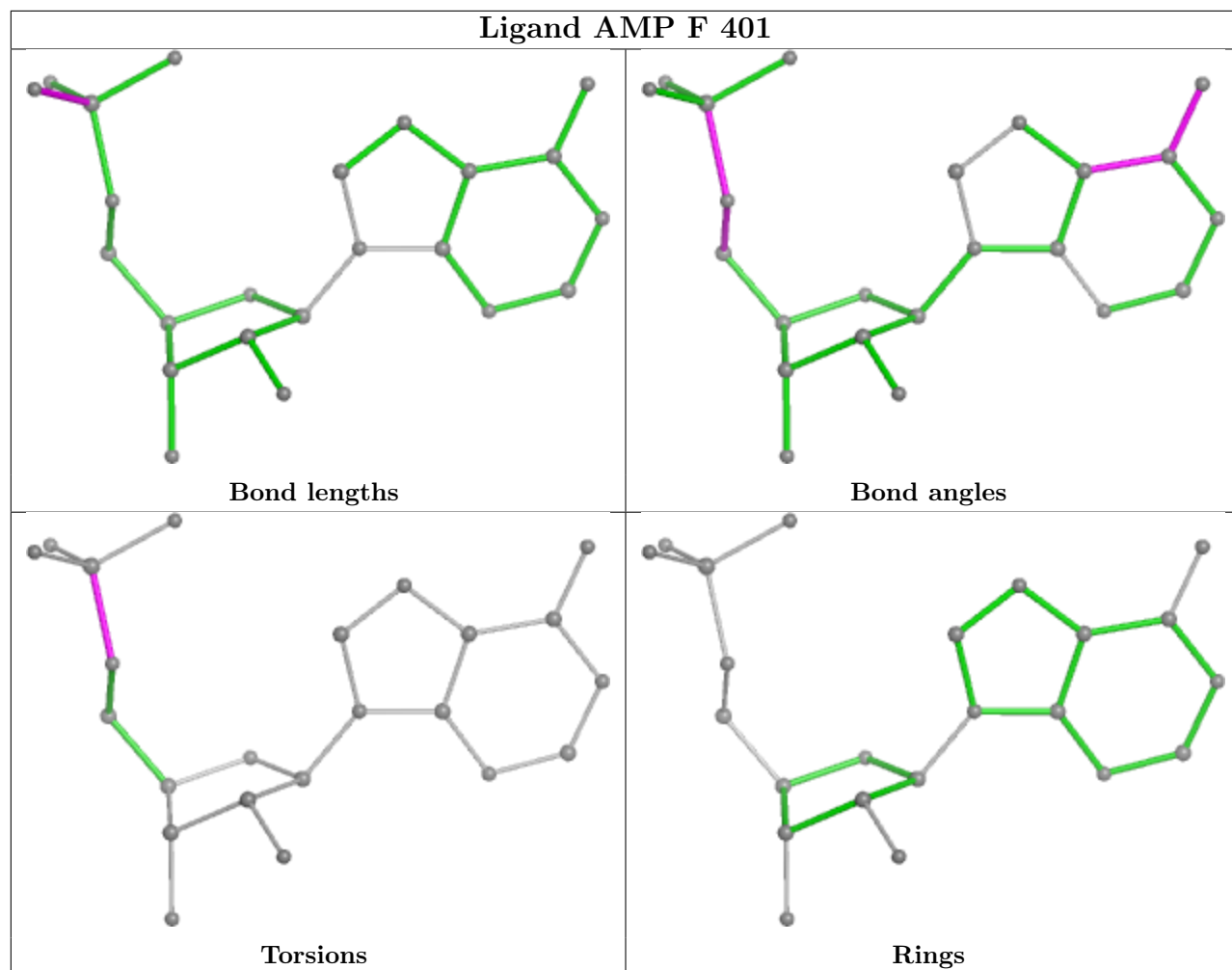
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. 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.

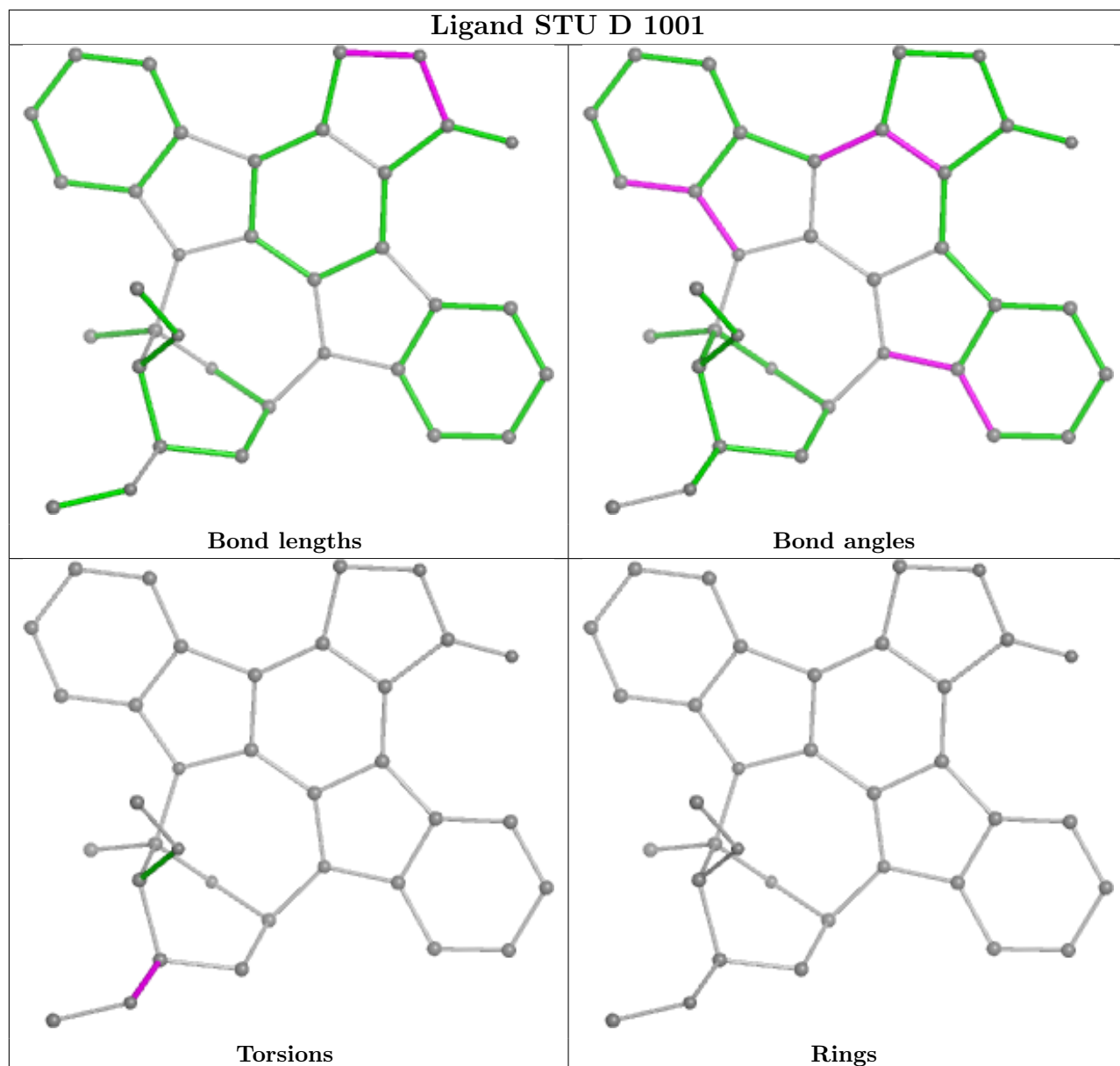


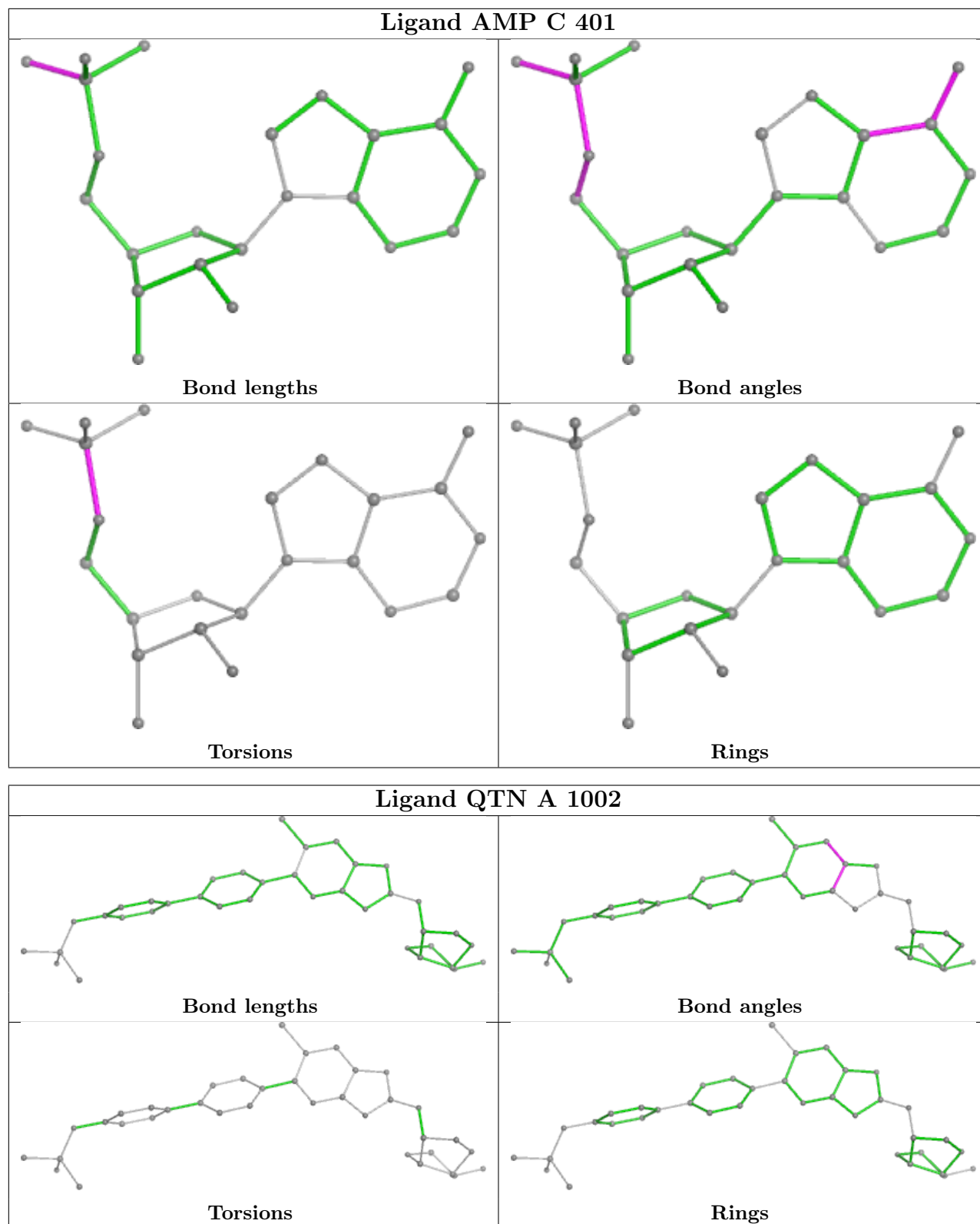












5.7 Other polymers [\(i\)](#)

There are no such residues in this entry.

5.8 Polymer linkage issues

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	451/559 (80%)	0.07	6 (1%) 77 79	37, 60, 94, 133	0
1	D	443/559 (79%)	0.33	25 (5%) 24 25	41, 68, 115, 150	0
2	B	180/270 (66%)	-0.00	1 (0%) 89 90	37, 56, 94, 132	0
2	E	171/270 (63%)	0.48	9 (5%) 26 28	41, 80, 161, 220	0
3	C	300/331 (90%)	0.02	1 (0%) 94 94	38, 58, 92, 131	0
3	F	299/331 (90%)	0.14	4 (1%) 77 79	39, 63, 101, 127	0
All	All	1844/2320 (79%)	0.17	46 (2%) 57 61	37, 63, 107, 220	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	142	VAL	6.1
2	E	141	ILE	5.6
1	A	530	PRO	4.3
1	D	320	LEU	3.8
1	D	296	VAL	3.8
1	D	328	ILE	3.7
3	C	126	PHE	3.6
1	D	321	ALA	3.5
1	D	307	VAL	3.5
2	E	149	VAL	3.5
3	F	234	LYS	3.4
1	D	286	ASN	3.4
2	E	134	THR	3.4
1	D	305	SER	3.3
1	D	312	TYR	3.1
1	D	327	ILE	3.1
1	D	374	ILE	2.9
1	D	287	VAL	2.9
1	D	304	GLU	2.9

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	D	280	ASP	2.9
1	D	297	CYS	2.8
1	D	310	SER	2.7
1	D	176	SER	2.6
1	A	376	ASP	2.6
2	E	127	PHE	2.5
2	E	146	LEU	2.5
1	A	174	CYS	2.5
2	E	131	GLY	2.5
1	D	311	LEU	2.4
2	B	270	ILE	2.4
1	A	300	PHE	2.4
2	E	128	PHE	2.4
1	D	322	VAL	2.3
1	D	308	MET	2.3
2	E	89	LYS	2.3
3	F	277	LEU	2.3
1	D	279	GLU	2.3
1	D	324	TYR	2.2
3	F	124	ASP	2.2
1	A	185	ILE	2.2
1	D	413	TYR	2.1
1	D	463	ARG	2.1
1	D	317	GLN	2.1
1	D	13	ILE	2.1
3	F	176	LEU	2.0
1	A	419	VAL	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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
2	SEP	E	108	10/11	0.95	0.16	80,88,91,91	0
2	SEP	B	108	10/11	0.98	0.13	59,60,67,67	0

6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

6.4 Ligands [i](#)

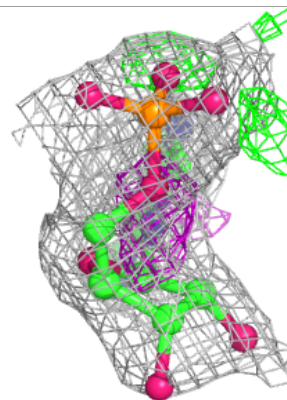
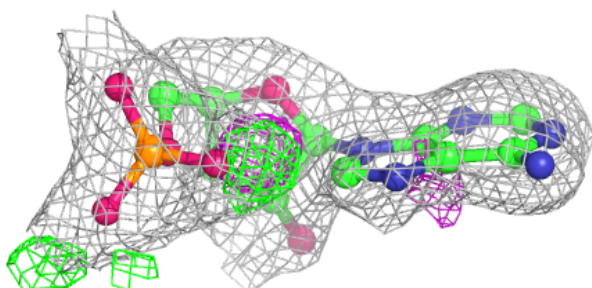
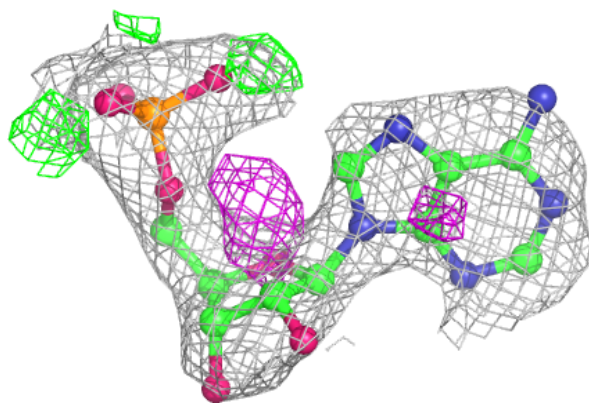
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists 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	AMP	F	401	23/23	0.77	0.24	108,116,118,119	0
5	QTN	D	1002	37/37	0.96	0.14	48,57,87,90	0
5	QTN	A	1002	37/37	0.97	0.14	40,53,79,81	0
4	STU	D	1001	35/35	0.98	0.15	33,44,47,48	0
6	AMP	C	401	23/23	0.98	0.15	45,48,53,56	0
6	AMP	C	402	23/23	0.98	0.14	49,54,56,63	0
4	STU	A	1001	35/35	0.98	0.15	32,39,46,47	0
6	AMP	F	402	23/23	0.98	0.15	60,65,69,70	0
6	AMP	F	403	23/23	0.98	0.14	50,58,62,64	0

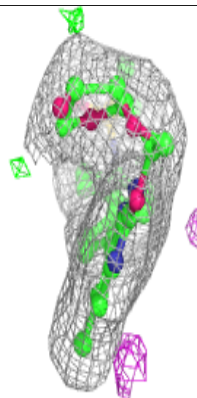
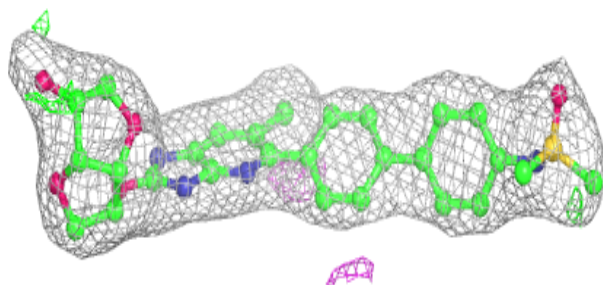
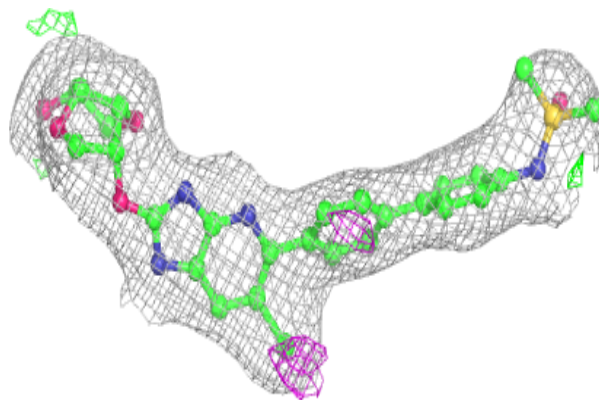
The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

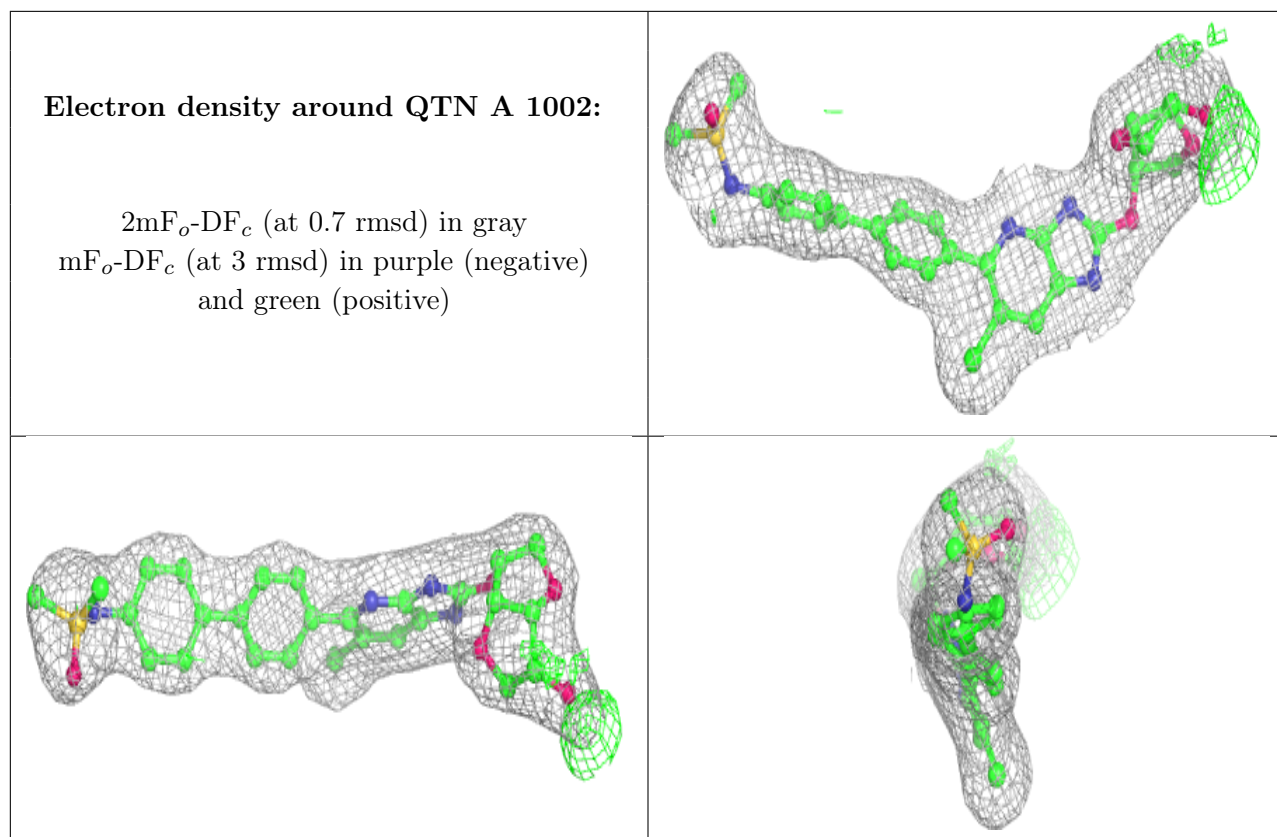
Electron density around AMP F 401:

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

**Electron density around QTN D 1002:**

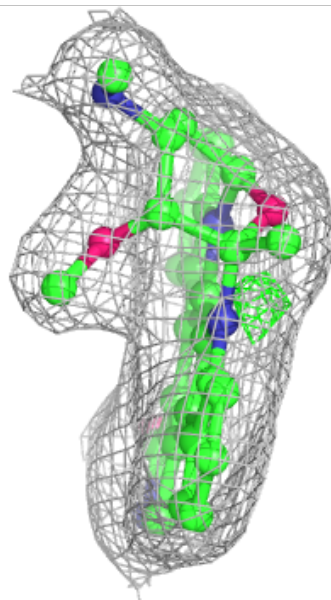
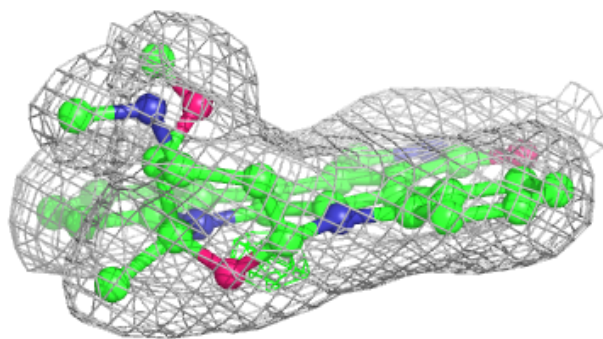
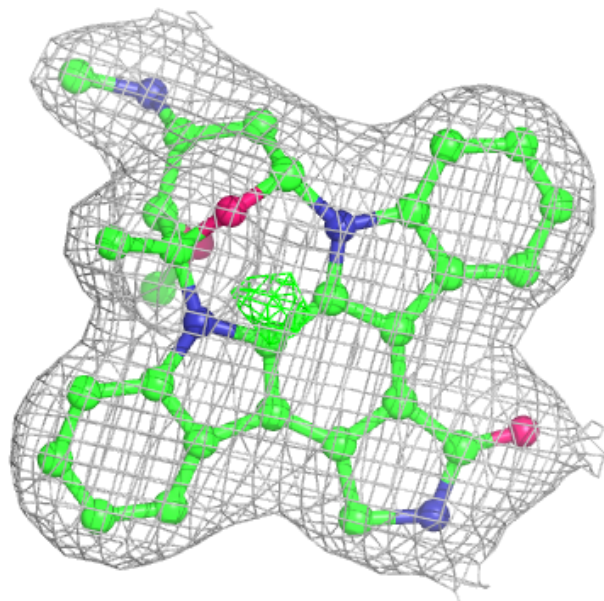
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





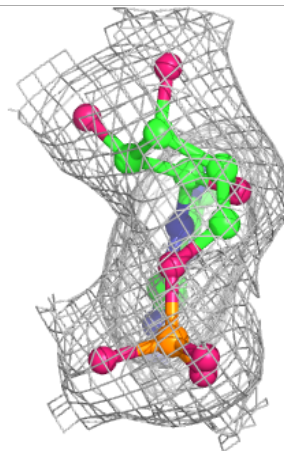
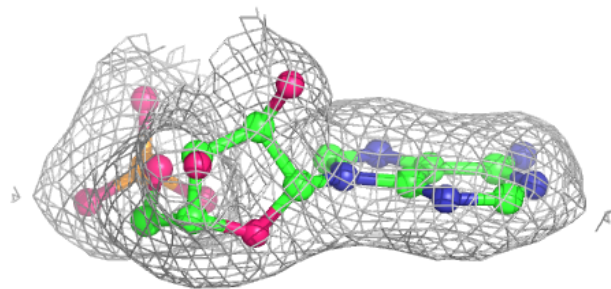
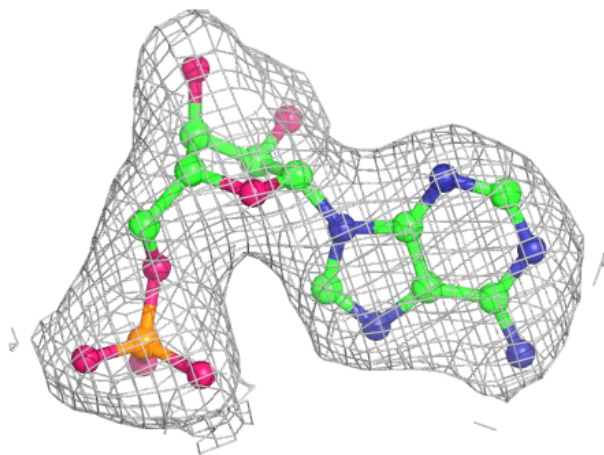
Electron density around STU D 1001:

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



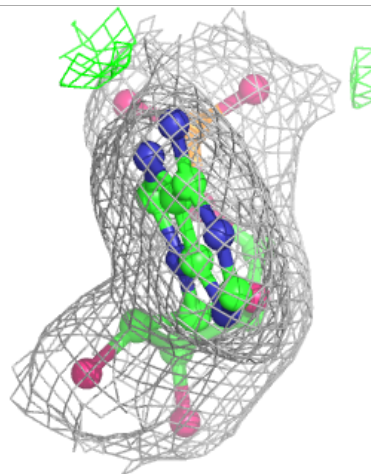
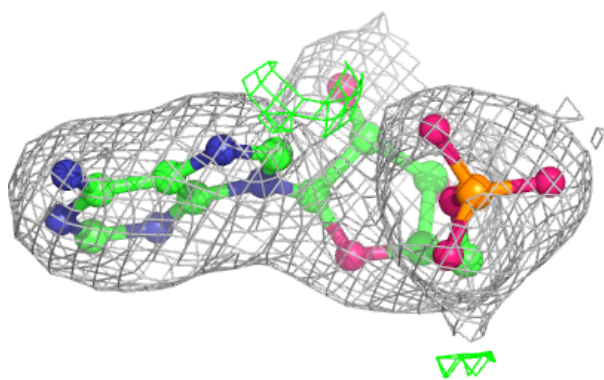
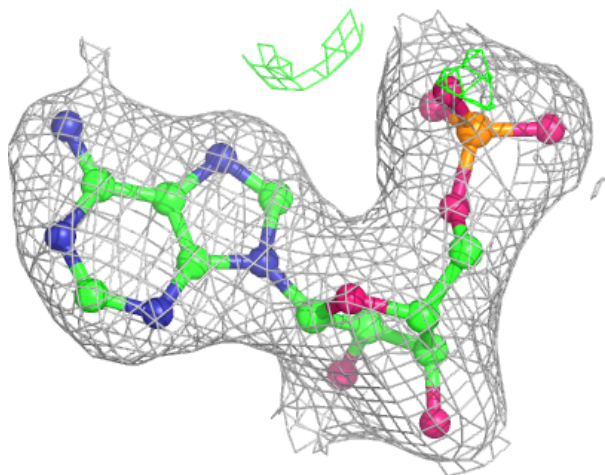
Electron density around AMP C 401:

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



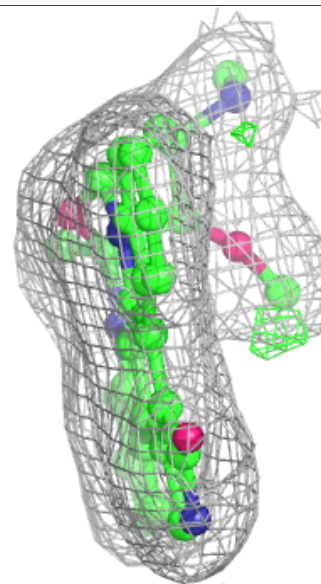
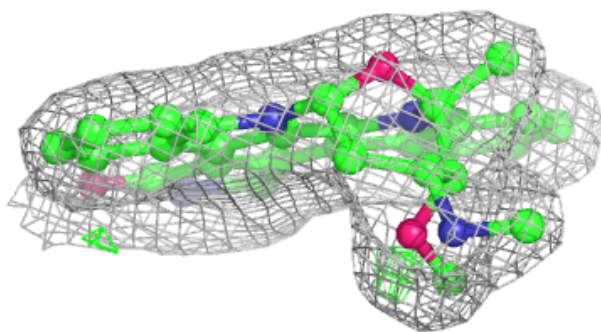
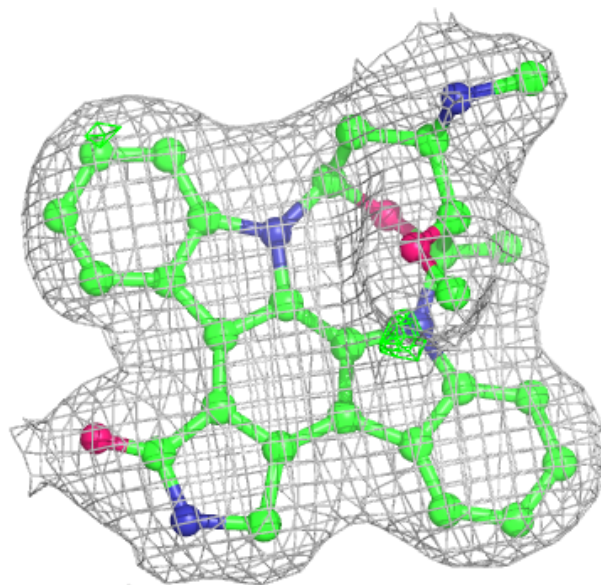
Electron density around AMP C 402:

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



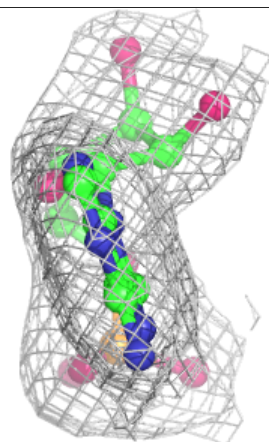
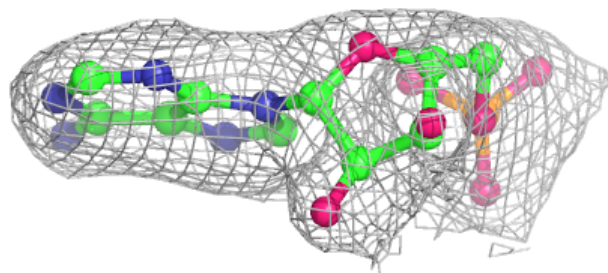
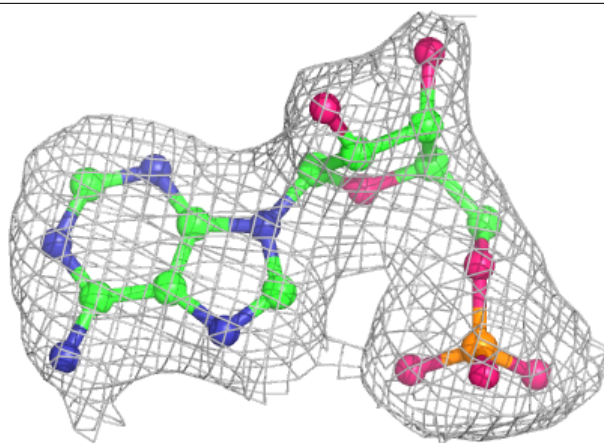
Electron density around STU A 1001:

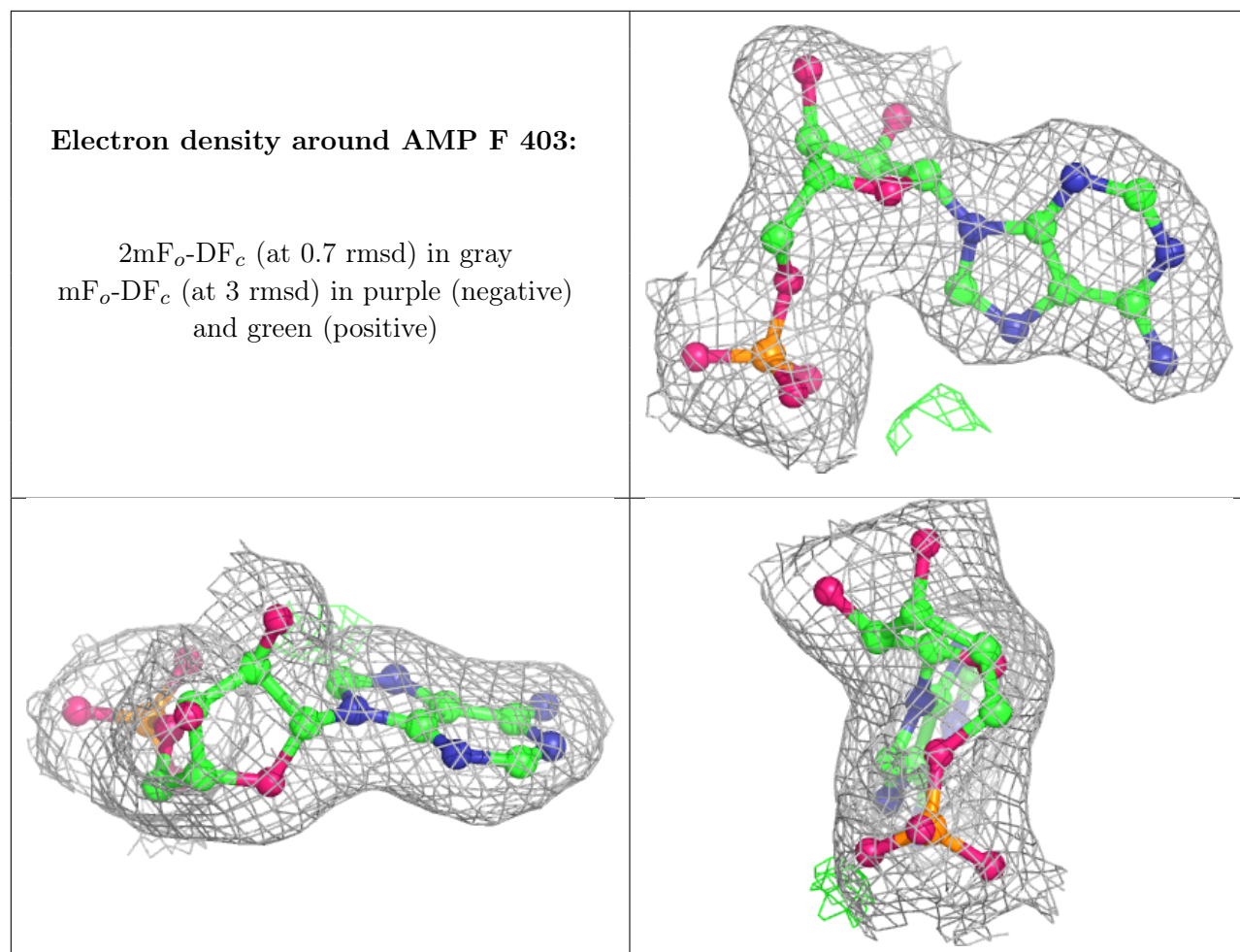
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)



Electron density around AMP F 402:

$2mF_o-DF_c$ (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.