



## Full wwPDB EM Validation Report ⓘ

Jan 23, 2024 – 08:09 PM JST

PDB ID : 8HWG  
EMDB ID : EMD-35057  
Title : D5 ATPrS-ADP-ssDNA form  
Authors : Li, Y.N.; Zhu, J.; Guo, Y.Y.; Yan, R.H.  
Deposited on : 2022-12-29  
Resolution : 3.00 Å (reported)

This is a Full wwPDB EM Validation Report for a publicly released PDB entry.

We welcome your comments at [validation@mail.wwpdb.org](mailto:validation@mail.wwpdb.org)

A user guide is available at

<https://www.wwpdb.org/validation/2017/EMValidationReportHelp>

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:

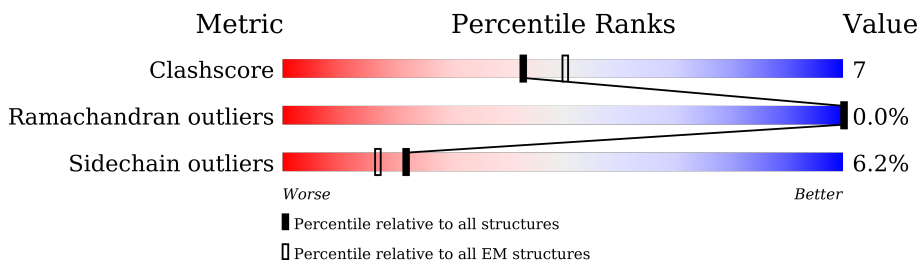
EMDB validation analysis : **FAILED**  
Mogul : 1.8.5 (274361), CSD as541be (2020)  
MolProbity : 4.02b-467  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
MapQ : **FAILED**  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.36

# 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	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  $\geq 3$ , 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  $\leq 5\%$

Mol	Chain	Length	Quality of chain
1	A	785	
1	B	785	
1	C	785	
1	D	785	
1	E	785	
1	F	785	
2	S	6	

## 2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 18110 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 Primase D5.

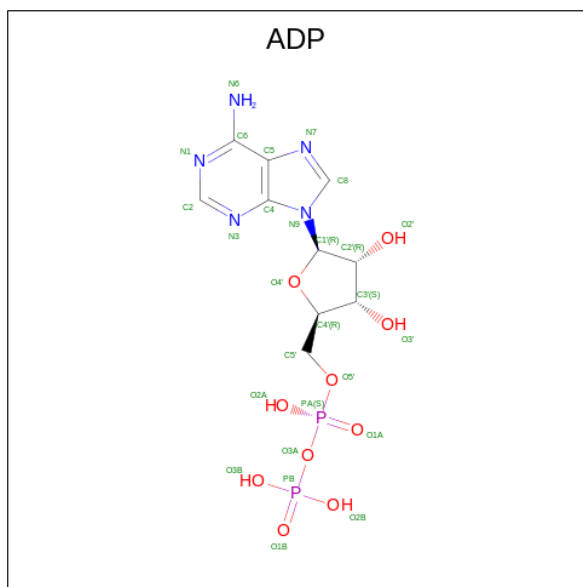
Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	C	372	2996	1905	512	563	16	0	0
1	B	369	2972	1889	509	558	16	0	0
1	D	378	3051	1945	518	572	16	0	0
1	A	369	2972	1889	509	558	16	0	0
1	F	352	2843	1808	486	535	14	0	0
1	E	369	2972	1889	509	558	16	0	0

- Molecule 2 is a DNA chain called DNA (5'-D(P\*TP\*TP\*TP\*TP\*TP\*T)-3').

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	P		
2	S	6	120	60	12	42	6	0	0

- Molecule 3 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (three-letter code: AGS) (formula: C<sub>10</sub>H<sub>16</sub>N<sub>5</sub>O<sub>12</sub>P<sub>3</sub>S) (labeled as "Ligand of Interest" by depositor).

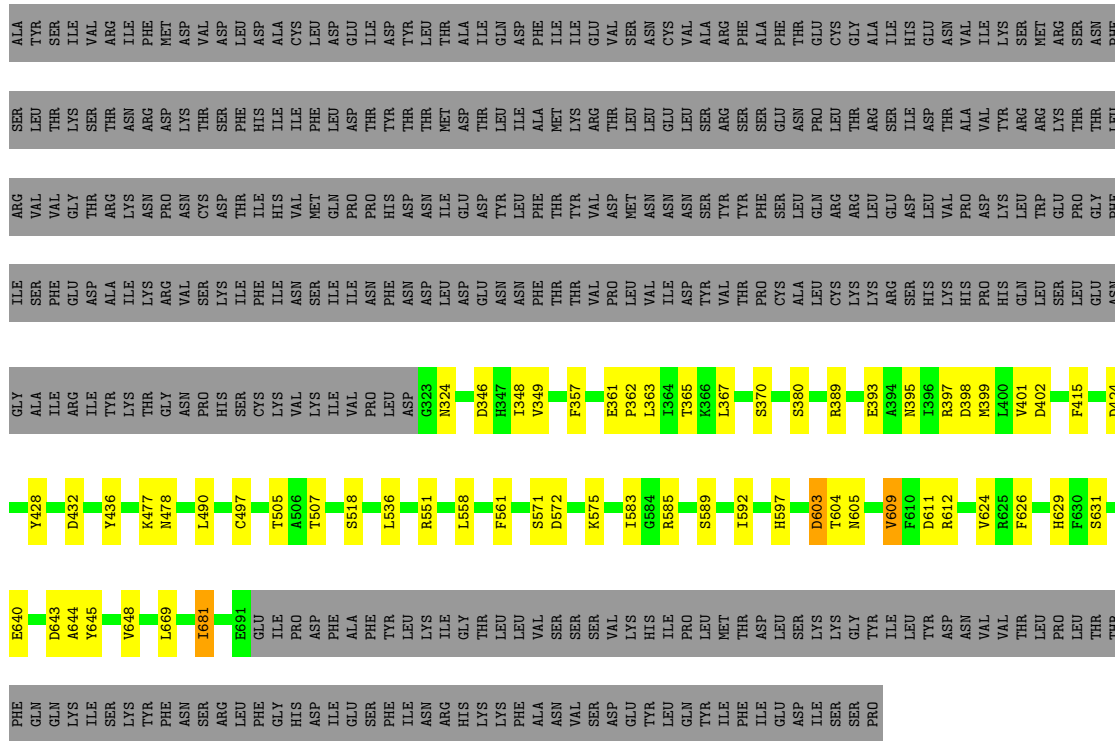




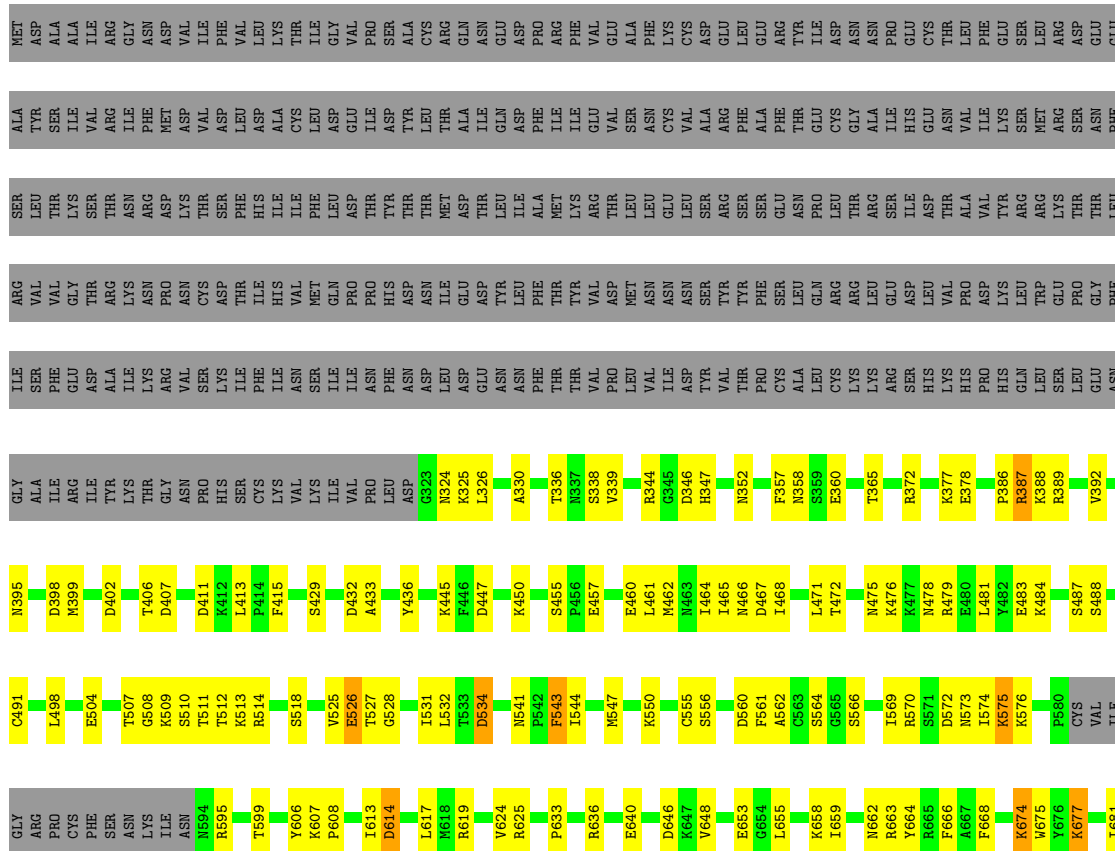
Mol	Chain	Residues	Atoms					AltConf
			Total	C	N	O	P	
5	F	1	27	10	5	10	2	0
5	E	1	27	10	5	10	2	0







• Molecule 1: Primase D5







## 4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	310318	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ( $e^-/\text{\AA}^2$ )	50	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	2200	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor

## 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: MG, AGS, ADP

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	0.27	0/3032	0.50	0/4093
1	B	0.28	0/3032	0.51	0/4093
1	C	0.27	0/3057	0.51	0/4128
1	D	0.27	0/3115	0.50	0/4207
1	E	0.29	0/3032	0.53	0/4093
1	F	0.27	0/2898	0.53	0/3908
2	S	0.66	0/131	1.44	0/200
All	All	0.28	0/18297	0.53	0/24722

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	2972	0	2990	30	0
1	B	2972	0	2990	35	0
1	C	2996	0	3014	33	0
1	D	3051	0	3061	38	0
1	E	2972	0	2991	41	0
1	F	2843	0	2860	83	0

*Continued on next page...*

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	S	120	0	73	6	0
3	A	31	0	12	3	0
3	B	31	0	12	2	0
3	C	31	0	12	4	0
3	D	31	0	12	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	F	1	0	0	0	0
5	E	27	0	12	0	0
5	F	27	0	12	2	0
All	All	18110	0	18051	256	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 7.

All (256) 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:F:527:THR:HB	1:F:543:PHE:CE2	2.09	0.87
1:C:612:ARG:HD2	1:B:563:CYS:SG	2.18	0.84
1:F:510:SER:HA	1:F:513:LYS:HG2	1.65	0.78
1:F:677:LYS:HA	1:F:681:ILE:HG13	1.64	0.77
1:F:572:ASP:HA	1:F:575:LYS:HZ2	1.51	0.76
1:B:474:GLU:OE1	1:B:474:GLU:N	2.18	0.72
1:F:572:ASP:HA	1:F:575:LYS:NZ	2.06	0.69
1:C:557:GLU:OE2	1:D:575:LYS:HB3	1.93	0.69
1:D:389:ARG:NH1	1:E:398:ASP:OD2	2.27	0.68
3:C:1001:AGS:O3G	1:D:619:ARG:NH1	2.26	0.68
1:E:656:ASP:OD1	1:E:657:GLY:N	2.27	0.67
1:E:647:LYS:HE2	1:E:649:LYS:HD2	1.75	0.67
1:A:585:ARG:NH2	2:S:6:DT:OP1	2.27	0.67
1:F:365:THR:HG23	1:F:389:ARG:HB3	1.78	0.66
1:E:563:CYS:SG	1:E:564:SER:N	2.68	0.66
1:A:348:ILE:HG22	1:A:357:PHE:HB3	1.76	0.66
1:C:398:ASP:OD2	1:B:389:ARG:NH1	2.29	0.65
1:F:461:LEU:HD12	1:F:464:ILE:HD13	1.79	0.65
1:A:398:ASP:OD2	1:F:389:ARG:NH2	2.30	0.64
1:A:361:GLU:HG3	1:A:362:PRO:HD2	1.78	0.64

Continued on next page...

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:398:ASP:OD2	1:A:389:ARG:NH1	2.31	0.64
1:A:558:LEU:HB2	1:A:604:THR:HG22	1.79	0.64
1:A:643:ASP:OD1	1:A:644:ALA:N	2.31	0.64
1:E:616:ALA:O	1:E:620:ARG:NH1	2.32	0.63
1:F:413:LEU:HD12	1:F:415:PHE:CE2	2.34	0.63
1:E:377:LYS:HE2	1:E:377:LYS:H	1.63	0.62
1:F:336:THR:HG1	1:F:338:SER:HG	1.47	0.62
1:D:389:ARG:NH2	1:E:395:ASN:OD1	2.33	0.61
1:A:490:LEU:O	1:A:551:ARG:NH1	2.34	0.60
3:C:1001:AGS:S1G	3:C:1001:AGS:O2B	2.59	0.60
1:C:592:ILE:HD12	1:C:592:ILE:O	2.02	0.60
1:F:613:ILE:HG23	1:F:617:LEU:HD22	1.84	0.60
1:C:389:ARG:NH1	1:D:398:ASP:OD2	2.36	0.59
1:F:360:GLU:OE2	1:F:360:GLU:N	2.35	0.59
1:E:416:LYS:HE3	1:E:445:LYS:HG3	1.84	0.59
1:D:325:LYS:HD2	1:D:382:GLU:OE2	2.03	0.58
1:F:572:ASP:OD2	1:F:572:ASP:N	2.36	0.58
1:F:478:ASN:ND2	1:F:625:ARG:O	2.37	0.58
1:F:450:LYS:HD2	1:F:666:PHE:HB2	1.85	0.58
1:F:527:THR:OG1	1:F:528:GLY:N	2.35	0.58
1:E:498:LEU:HD12	1:E:602:ILE:HD11	1.85	0.58
1:A:349:VAL:HB	1:A:367:LEU:HD22	1.84	0.57
1:E:372:ARG:HH11	1:E:384:LEU:HD21	1.69	0.57
1:F:507:THR:HG1	1:F:509:LYS:HZ2	1.51	0.56
1:F:518:SER:HB2	1:F:662:ASN:ND2	2.20	0.56
1:F:633:PRO:HA	1:F:636:ARG:HB2	1.87	0.56
1:F:402:ASP:OD1	1:F:402:ASP:N	2.36	0.56
1:D:693:ILE:HG13	1:D:696:PHE:CD2	2.41	0.56
1:A:605:ASN:ND2	3:A:1001:AGS:S1G	2.79	0.56
1:E:479:ARG:NH1	1:E:483:GLU:OE2	2.39	0.55
1:D:479:ARG:O	1:D:482:TYR:HB3	2.06	0.55
1:F:461:LEU:HD22	1:F:664:TYR:HB3	1.88	0.55
1:F:531:ILE:HG13	1:F:532:LEU:HG	1.89	0.55
1:F:570:ARG:NH2	1:F:573:ASN:OD1	2.39	0.55
1:C:585:ARG:HB3	1:C:592:ILE:HG22	1.87	0.55
1:F:467:ASP:OD2	5:F:1001:ADP:N6	2.39	0.55
3:C:1001:AGS:O2B	3:C:1001:AGS:O2A	2.25	0.55
1:C:372:ARG:HA	1:C:375:LEU:HD12	1.88	0.55
1:C:454:ASP:OD1	1:C:454:ASP:N	2.40	0.55
1:C:619:ARG:NH1	3:B:1001:AGS:O2G	2.38	0.54
1:F:346:ASP:OD1	1:F:346:ASP:N	2.35	0.54

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:395:ASN:O	1:A:399:MET:HG3	2.08	0.54
3:B:1001:AGS:O2B	3:B:1001:AGS:O3G	2.25	0.54
1:D:386:PRO:HG2	1:E:391:THR:HG23	1.88	0.54
1:D:498:LEU:HD22	1:D:574:ILE:HD12	1.90	0.54
1:F:483:GLU:HG2	1:F:675:TRP:CZ2	2.42	0.54
1:E:567:LYS:H	1:E:567:LYS:HZ3	1.56	0.54
1:C:633:PRO:HG3	1:C:650:LEU:HD11	1.90	0.54
1:E:663:ARG:HG3	1:E:663:ARG:HH11	1.73	0.54
1:D:365:THR:HG23	1:D:389:ARG:HB3	1.88	0.53
1:E:361:GLU:OE2	1:E:366:LYS:NZ	2.41	0.53
1:E:532:LEU:HD11	1:E:602:ILE:HG12	1.90	0.53
1:A:603:ASP:OD2	1:A:603:ASP:N	2.41	0.53
1:F:462:MET:HA	1:F:462:MET:CE	2.39	0.53
1:F:398:ASP:OD2	1:E:389:ARG:NH2	2.27	0.53
1:F:607:LYS:NZ	1:F:608:PRO:O	2.42	0.53
1:C:466:ASN:OD1	1:C:479:ARG:NH2	2.42	0.53
3:C:1001:AGS:O3G	1:D:620:ARG:NH2	2.42	0.53
1:F:460:GLU:OE2	1:F:663:ARG:NH2	2.42	0.52
1:B:338:SER:HB3	1:B:367:LEU:HD11	1.91	0.52
1:E:496:GLY:HA2	1:E:578:THR:HB	1.91	0.52
1:B:533:THR:O	1:B:533:THR:OG1	2.28	0.52
1:D:377:LYS:HD3	1:D:377:LYS:N	2.25	0.52
1:C:544:ILE:HD11	1:C:582:VAL:CG1	2.40	0.52
1:A:415:PHE:HZ	1:A:669:LEU:HD21	1.74	0.52
1:F:483:GLU:HG2	1:F:675:TRP:CH2	2.44	0.52
1:F:526:GLU:OE2	1:F:556:SER:OG	2.26	0.52
1:D:525:VAL:HG12	1:D:553:VAL:HG22	1.92	0.52
1:A:571:SER:O	1:A:575:LYS:HG2	2.10	0.52
1:B:479:ARG:NH1	1:B:483:GLU:OE2	2.43	0.51
1:F:572:ASP:O	1:F:576:LYS:HG2	2.10	0.51
1:D:360:GLU:HG2	1:D:361:GLU:N	2.26	0.51
1:F:543:PHE:HD1	1:F:543:PHE:O	1.93	0.51
1:D:649:LYS:NZ	1:D:650:LEU:O	2.43	0.51
1:D:658:LYS:HB3	1:D:663:ARG:HD3	1.93	0.51
1:C:614:ASP:OD1	1:C:614:ASP:N	2.42	0.51
1:F:513:LYS:HG3	1:F:514:ARG:N	2.25	0.51
1:C:586:PRO:HD2	1:C:589:SER:HB3	1.93	0.51
1:F:465:ILE:HD12	1:F:466:ASN:N	2.26	0.50
1:F:543:PHE:CD1	1:F:547:MET:HE1	2.47	0.50
1:D:531:ILE:HD12	1:D:531:ILE:O	2.11	0.50
1:F:462:MET:HA	1:F:462:MET:HE2	1.94	0.50

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:342:THR:OG1	1:B:346:ASP:OD1	2.25	0.50
1:F:407:ASP:O	1:F:595:ARG:NH2	2.45	0.50
1:F:614:ASP:OD1	1:F:614:ASP:N	2.45	0.50
1:E:585:ARG:HB3	1:E:592:ILE:HG22	1.93	0.50
1:C:386:PRO:HG2	1:D:391:THR:HG23	1.92	0.49
1:C:517:LYS:HG2	1:C:524:PHE:CD1	2.47	0.49
1:F:504:GLU:O	1:F:509:LYS:NZ	2.45	0.49
1:B:339:VAL:HG13	1:B:349:VAL:HG12	1.94	0.49
1:F:411:ASP:OD1	1:F:411:ASP:N	2.42	0.49
1:F:508:GLY:O	1:F:512:THR:HG23	2.12	0.49
1:B:348:ILE:HG22	1:B:357:PHE:HB3	1.94	0.49
1:F:447:ASP:HB3	1:F:666:PHE:CE2	2.47	0.49
1:D:560:ASP:O	1:D:566:SER:OG	2.26	0.49
1:E:365:THR:O	1:E:366:LYS:HB3	2.13	0.49
1:E:568:LYS:HE3	1:E:609:VAL:HG23	1.94	0.49
1:D:468:ILE:HG22	1:D:469:GLN:HG2	1.94	0.49
1:B:643:ASP:OD2	1:B:643:ASP:N	2.36	0.49
1:E:340:LEU:HD13	1:E:404:VAL:HG21	1.95	0.49
1:F:481:LEU:HB3	1:F:624:VAL:HG22	1.93	0.49
1:D:453:GLU:HA	1:D:458:MET:HE2	1.95	0.48
1:F:527:THR:HB	1:F:543:PHE:CD2	2.49	0.48
1:D:531:ILE:HG21	1:D:544:ILE:HG12	1.95	0.48
1:F:674:LYS:HD2	1:F:674:LYS:HA	1.58	0.48
1:F:525:VAL:HB	1:F:550:LYS:HE2	1.95	0.48
1:B:495:LYS:HE3	1:B:684:MET:HE2	1.96	0.48
1:F:507:THR:HG1	1:F:509:LYS:NZ	2.12	0.47
1:D:572:ASP:OD1	1:D:572:ASP:N	2.47	0.47
1:E:481:LEU:HD23	1:E:624:VAL:HG22	1.96	0.47
1:F:543:PHE:O	1:F:543:PHE:CD1	2.67	0.47
1:D:466:ASN:OD1	1:D:479:ARG:NH2	2.48	0.47
1:E:457:GLU:OE1	1:E:663:ARG:HG2	2.14	0.47
2:S:4:DT:H2''	2:S:5:DT:O4'	2.15	0.47
1:F:562:ALA:HB2	1:F:606:TYR:CZ	2.49	0.47
1:F:636:ARG:NH1	1:F:640:GLU:OE1	2.48	0.47
1:C:350:TRP:CZ2	1:C:353:ASN:HA	2.50	0.47
1:F:347:HIS:O	1:F:358:ASN:HB2	2.15	0.47
1:F:461:LEU:HD13	1:F:664:TYR:CG	2.49	0.47
1:B:677:LYS:HA	1:B:681:ILE:HG12	1.97	0.46
1:E:377:LYS:H	1:E:377:LYS:CE	2.28	0.46
1:B:533:THR:HG22	1:B:569:ILE:HA	1.98	0.46
1:B:689:THR:O	1:B:689:THR:OG1	2.27	0.46

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:362:PRO:HB2	1:A:365:THR:OG1	2.16	0.46
1:F:511:THR:N	5:F:1001:ADP:O2A	2.48	0.46
2:S:3:DT:H4'	2:S:4:DT:OP1	2.15	0.46
1:F:514:ARG:HE	1:F:659:ILE:HD11	1.80	0.46
1:C:385:CYS:SG	1:C:387:ARG:NH2	2.86	0.46
1:F:510:SER:OG	1:F:514:ARG:NH1	2.48	0.46
2:S:4:DT:H2''	2:S:5:DT:O5'	2.14	0.46
1:B:619:ARG:NH1	3:A:1001:AGS:O2G	2.49	0.46
1:A:681:ILE:H	1:A:681:ILE:HG13	1.46	0.46
1:F:395:ASN:O	1:F:399:MET:HG3	2.16	0.46
1:C:614:ASP:OD2	1:B:606:TYR:OH	2.34	0.45
1:B:627:ARG:NH2	1:B:646:ASP:OD1	2.49	0.45
1:D:348:ILE:HG22	1:D:357:PHE:HB3	1.98	0.45
1:E:455:SER:C	1:E:457:GLU:H	2.19	0.45
1:B:490:LEU:O	1:B:551:ARG:NH1	2.49	0.45
1:A:629:HIS:HB2	1:A:645:TYR:CD1	2.51	0.45
1:E:460:GLU:O	1:E:464:ILE:HG13	2.17	0.45
1:B:507:THR:HB	1:B:626:PHE:HB3	1.99	0.45
1:B:343:GLU:H	1:B:343:GLU:HG2	1.66	0.45
1:C:681:ILE:HG22	1:C:682:PRO:HD3	1.98	0.45
1:F:541:ASN:O	1:F:544:ILE:HG22	2.17	0.45
1:E:534:ASP:N	1:E:534:ASP:OD1	2.49	0.45
1:D:460:GLU:OE2	1:D:663:ARG:NH2	2.43	0.45
1:D:547:MET:HG3	1:D:547:MET:O	2.16	0.45
1:C:572:ASP:O	1:C:576:LYS:HG3	2.17	0.44
1:A:611:ASP:OD1	1:A:612:ARG:N	2.50	0.44
1:E:405:GLU:HA	1:E:405:GLU:OE1	2.17	0.44
1:A:428:TYR:HB3	1:A:432:ASP:HB3	1.99	0.44
1:F:607:LYS:HD2	1:F:607:LYS:HA	1.68	0.44
1:E:614:ASP:N	1:E:614:ASP:OD1	2.48	0.44
1:D:343:GLU:OE2	1:D:403:SER:OG	2.29	0.44
1:C:544:ILE:HD11	1:C:582:VAL:HG12	2.00	0.44
1:C:616:ALA:O	1:C:620:ARG:NH1	2.49	0.44
1:C:391:THR:HG23	1:B:386:PRO:HG3	1.99	0.44
1:F:467:ASP:OD1	1:F:468:ILE:HG13	2.17	0.44
1:A:561:PHE:CD2	1:A:609:VAL:HG13	2.53	0.44
1:F:432:ASP:OD1	1:F:433:ALA:N	2.51	0.44
1:E:477:LYS:HE2	1:E:477:LYS:HB3	1.77	0.44
1:F:325:LYS:O	1:F:326:LEU:HB2	2.17	0.44
1:F:378:GLU:CD	1:F:378:GLU:H	2.21	0.43
1:C:681:ILE:HD12	1:C:681:ILE:HA	1.79	0.43

*Continued on next page...*



*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:525:VAL:HB	1:B:550:LYS:HD2	1.99	0.43
1:A:629:HIS:HB2	1:A:645:TYR:CE1	2.53	0.43
1:A:583:ILE:HG23	1:A:592:ILE:HG22	2.00	0.43
3:A:1001:AGS:O3G	3:A:1001:AGS:O2B	2.35	0.43
1:F:573:ASN:HA	1:F:576:LYS:HG3	2.00	0.43
1:F:357:PHE:HD1	1:F:357:PHE:HA	1.76	0.43
1:F:386:PRO:C	1:F:388:LYS:H	2.22	0.43
1:E:504:GLU:O	1:E:507:THR:OG1	2.30	0.43
1:D:700:LEU:HD23	1:D:700:LEU:HA	1.83	0.43
1:F:406:THR:O	1:F:595:ARG:NH1	2.39	0.43
1:E:361:GLU:O	1:E:363:LEU:HD22	2.18	0.43
1:C:627:ARG:NH1	1:C:646:ASP:OD1	2.51	0.43
1:B:632:GLN:NE2	1:B:653:GLU:OE2	2.40	0.43
1:F:483:GLU:HA	1:F:675:TRP:CZ3	2.53	0.43
1:C:607:LYS:HG3	1:C:608:PRO:HD2	2.00	0.43
1:A:561:PHE:HD2	1:A:609:VAL:HG13	1.83	0.43
1:C:671:LEU:HD12	1:C:671:LEU:HA	1.88	0.43
1:A:629:HIS:NE2	1:A:631:SER:HB2	2.33	0.43
1:F:655:LEU:HA	1:F:658:LYS:HG2	2.01	0.43
1:F:658:LYS:HG3	1:F:664:TYR:HE2	1.84	0.43
1:F:560:ASP:OD1	1:F:561:PHE:N	2.52	0.42
1:B:325:LYS:HE3	1:B:325:LYS:HB2	1.80	0.42
1:D:358:ASN:HB3	1:D:361:GLU:O	2.19	0.42
1:A:477:LYS:HE2	1:A:477:LYS:HB3	1.91	0.42
1:F:472:THR:HG23	1:F:475:ASN:H	1.84	0.42
1:F:561:PHE:CZ	1:F:569:ILE:HD11	2.54	0.42
1:E:447:ASP:OD1	1:E:449:THR:OG1	2.29	0.42
1:E:568:LYS:HB2	1:E:611:ASP:OD1	2.19	0.42
2:S:2:DT:H2''	2:S:3:DT:O5'	2.18	0.42
1:B:612:ARG:HG3	1:B:613:ILE:N	2.33	0.42
2:S:5:DT:H2''	2:S:6:DT:H5'	2.01	0.42
1:C:689:THR:O	1:C:689:THR:OG1	2.35	0.42
1:D:660:GLN:OE1	1:D:660:GLN:N	2.53	0.42
1:A:349:VAL:HG22	1:A:363:LEU:HD12	2.02	0.42
1:A:640:GLU:HG2	1:A:648:VAL:HG21	2.02	0.42
1:F:534:ASP:OD1	1:F:534:ASP:N	2.53	0.42
1:B:350:TRP:CZ2	1:B:353:ASN:HA	2.54	0.42
1:B:629:HIS:HB2	1:B:645:TYR:CD1	2.55	0.42
1:B:685:LYS:NZ	1:B:685:LYS:HB3	2.35	0.42
1:D:385:CYS:HB3	1:D:388:LYS:HD2	2.02	0.42
1:D:529:GLN:O	1:D:529:GLN:HG2	2.20	0.42

*Continued on next page...*

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:484:LYS:HB3	1:B:484:LYS:HE2	1.69	0.42
1:A:507:THR:HB	1:A:626:PHE:HB3	2.00	0.42
1:E:478:ASN:ND2	1:E:625:ARG:O	2.51	0.42
1:B:593:ASN:OD1	1:B:593:ASN:N	2.51	0.41
1:A:575:LYS:HG2	1:A:575:LYS:H	1.69	0.41
1:C:360:GLU:CD	1:C:360:GLU:H	2.22	0.41
1:F:457:GLU:HG3	1:F:663:ARG:HH21	1.85	0.41
1:F:658:LYS:O	1:F:663:ARG:HG2	2.19	0.41
1:B:349:VAL:HB	1:B:367:LEU:HD13	2.02	0.41
1:D:358:ASN:ND2	1:D:360:GLU:OE1	2.53	0.41
1:D:650:LEU:HD12	1:D:651:LEU:H	1.86	0.41
1:A:393:GLU:O	1:A:397:ARG:HG3	2.20	0.41
1:E:478:ASN:HD21	1:E:625:ARG:H	1.68	0.41
1:E:629:HIS:HB2	1:E:645:TYR:CD1	2.56	0.41
1:C:411:ASP:OD1	1:C:411:ASP:N	2.51	0.41
1:B:535:VAL:HG22	1:B:537:ASP:H	1.84	0.41
1:F:387:ARG:O	1:F:387:ARG:HG2	2.20	0.41
1:F:677:LYS:HZ2	1:F:681:ILE:HG21	1.85	0.41
1:C:474:GLU:H	1:C:474:GLU:HG3	1.69	0.41
1:D:603:ASP:OD1	1:D:603:ASP:C	2.58	0.41
1:C:607:LYS:HG2	1:C:694:PRO:HD2	2.02	0.41
1:B:435:LYS:H	1:B:435:LYS:HG2	1.65	0.41
1:F:543:PHE:HD1	1:F:543:PHE:C	2.24	0.41
1:F:498:LEU:HD22	1:F:574:ILE:HG23	2.03	0.40
1:E:415:PHE:HZ	1:E:669:LEU:HD21	1.87	0.40
1:F:471:LEU:HD23	1:F:471:LEU:HA	1.82	0.40
1:F:330:ALA:HB2	1:F:392:VAL:HG13	2.03	0.40
1:E:656:ASP:O	1:E:660:GLN:NE2	2.52	0.40
1:B:547:MET:HA	1:B:550:LYS:HG3	2.04	0.40
1:D:411:ASP:OD1	1:D:411:ASP:N	2.38	0.40
1:E:325:LYS:C	1:E:327:PHE:H	2.25	0.40

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	367/785 (47%)	349 (95%)	18 (5%)	0	100	100
1	B	367/785 (47%)	354 (96%)	13 (4%)	0	100	100
1	C	370/785 (47%)	350 (95%)	20 (5%)	0	100	100
1	D	376/785 (48%)	355 (94%)	21 (6%)	0	100	100
1	E	367/785 (47%)	331 (90%)	36 (10%)	0	100	100
1	F	348/785 (44%)	323 (93%)	24 (7%)	1 (0%)	41	76
All	All	2195/4710 (47%)	2062 (94%)	132 (6%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	F	324	ASN

### 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 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	336/725 (46%)	316 (94%)	20 (6%)	19	53
1	B	336/725 (46%)	318 (95%)	18 (5%)	22	57
1	C	339/725 (47%)	321 (95%)	18 (5%)	22	58
1	D	344/725 (47%)	328 (95%)	16 (5%)	26	63
1	E	336/725 (46%)	318 (95%)	18 (5%)	22	57
1	F	320/725 (44%)	286 (89%)	34 (11%)	6	26
All	All	2011/4350 (46%)	1887 (94%)	124 (6%)	22	52

All (124) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	C	332	ARG

*Continued on next page...*

*Continued from previous page...*

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	C	334	LEU
1	C	336	THR
1	C	380	SER
1	C	429	SER
1	C	458	MET
1	C	479	ARG
1	C	488	SER
1	C	498	LEU
1	C	505	THR
1	C	518	SER
1	C	522	ASP
1	C	544	ILE
1	C	554	PHE
1	C	572	ASP
1	C	585	ARG
1	C	631	SER
1	C	684	MET
1	B	346	ASP
1	B	354	SER
1	B	367	LEU
1	B	370	SER
1	B	377	LYS
1	B	380	SER
1	B	381	SER
1	B	424	ASP
1	B	449	THR
1	B	518	SER
1	B	534	ASP
1	B	554	PHE
1	B	556	SER
1	B	572	ASP
1	B	581	CYS
1	B	612	ARG
1	B	614	ASP
1	B	624	VAL
1	D	351	ILE
1	D	462	MET
1	D	479	ARG
1	D	488	SER
1	D	525	VAL
1	D	566	SER
1	D	567	LYS

*Continued on next page...*

*Continued from previous page...*

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	D	589	SER
1	D	594	ASN
1	D	607	LYS
1	D	612	ARG
1	D	619	ARG
1	D	634	SER
1	D	685	LYS
1	D	693	ILE
1	D	695	ASP
1	A	324	ASN
1	A	346	ASP
1	A	370	SER
1	A	380	SER
1	A	401	VAL
1	A	402	ASP
1	A	424	ASP
1	A	436	TYR
1	A	478	ASN
1	A	497	CYS
1	A	505	THR
1	A	518	SER
1	A	536	LEU
1	A	572	ASP
1	A	589	SER
1	A	597	HIS
1	A	603	ASP
1	A	609	VAL
1	A	624	VAL
1	A	681	ILE
1	F	339	VAL
1	F	344	ARG
1	F	352	ASN
1	F	372	ARG
1	F	377	LYS
1	F	387	ARG
1	F	429	SER
1	F	436	TYR
1	F	445	LYS
1	F	455	SER
1	F	476	LYS
1	F	479	ARG
1	F	484	LYS

*Continued on next page...*

*Continued from previous page...*

<b>Mol</b>	<b>Chain</b>	<b>Res</b>	<b>Type</b>
1	F	487	SER
1	F	488	SER
1	F	491	CYS
1	F	526	GLU
1	F	534	ASP
1	F	543	PHE
1	F	555	CYS
1	F	564	SER
1	F	566	SER
1	F	575	LYS
1	F	599	THR
1	F	614	ASP
1	F	619	ARG
1	F	646	ASP
1	F	648	VAL
1	F	653	GLU
1	F	668	PHE
1	F	674	LYS
1	F	677	LYS
1	F	684	MET
1	F	685	LYS
1	E	331	GLN
1	E	360	GLU
1	E	363	LEU
1	E	377	LYS
1	E	380	SER
1	E	408	THR
1	E	436	TYR
1	E	452	VAL
1	E	479	ARG
1	E	487	SER
1	E	497	CYS
1	E	507	THR
1	E	534	ASP
1	E	558	LEU
1	E	589	SER
1	E	636	ARG
1	E	660	GLN
1	E	668	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	F	662	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 12 ligands modelled in this entry, 6 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$
5	ADP	E	1001	-	24,29,29	0.93	1 (4%)	29,45,45	1.46	4 (13%)
3	AGS	D	1001	4	26,33,33	0.74	1 (3%)	26,52,52	0.88	2 (7%)
5	ADP	F	1001	4	24,29,29	0.94	1 (4%)	29,45,45	1.49	4 (13%)
3	AGS	B	1001	4	26,33,33	0.73	1 (3%)	26,52,52	1.00	2 (7%)
3	AGS	A	1001	4	26,33,33	0.73	1 (3%)	26,52,52	0.94	2 (7%)
3	AGS	C	1001	4	26,33,33	0.73	1 (3%)	26,52,52	0.97	2 (7%)

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. '2' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	ADP	E	1001	-	-	6/12/32/32	0/3/3/3
3	AGS	D	1001	4	-	7/17/38/38	0/3/3/3
5	ADP	F	1001	4	-	3/12/32/32	0/3/3/3
3	AGS	B	1001	4	-	2/17/38/38	0/3/3/3
3	AGS	A	1001	4	-	7/17/38/38	0/3/3/3
3	AGS	C	1001	4	-	4/17/38/38	0/3/3/3

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	1001	ADP	C5-C4	2.48	1.47	1.40
5	E	1001	ADP	C5-C4	2.43	1.47	1.40
3	C	1001	AGS	C8-N7	-2.15	1.30	1.34
3	D	1001	AGS	PG-S1G	2.13	1.95	1.90
3	B	1001	AGS	PG-S1G	2.07	1.95	1.90
3	A	1001	AGS	PG-S1G	2.05	1.95	1.90

All (16) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	F	1001	ADP	PA-O3A-PB	-3.72	120.07	132.83
5	E	1001	ADP	PA-O3A-PB	-3.47	120.93	132.83
5	F	1001	ADP	C3'-C2'-C1'	3.35	106.02	100.98
5	E	1001	ADP	C3'-C2'-C1'	3.24	105.86	100.98
3	C	1001	AGS	PA-O3A-PB	-3.16	121.97	132.83
3	B	1001	AGS	PA-O3A-PB	-3.15	122.03	132.83
5	E	1001	ADP	N3-C2-N1	-3.14	123.77	128.68
5	F	1001	ADP	N3-C2-N1	-3.04	123.93	128.68
3	A	1001	AGS	PA-O3A-PB	-2.83	123.13	132.83
5	F	1001	ADP	C4-C5-N7	-2.60	106.69	109.40
3	C	1001	AGS	C5-C6-N6	2.33	123.89	120.35
3	D	1001	AGS	PA-O3A-PB	-2.33	124.84	132.83
5	E	1001	ADP	C4-C5-N7	-2.31	106.99	109.40
3	A	1001	AGS	C5-C6-N6	2.29	123.83	120.35
3	D	1001	AGS	C5-C6-N6	2.23	123.74	120.35
3	B	1001	AGS	C5-C6-N6	2.20	123.69	120.35

There are no chirality outliers.

All (29) torsion outliers are listed below:



Mol	Chain	Res	Type	Atoms
3	D	1001	AGS	PB-O3B-PG-O2G
3	D	1001	AGS	PB-O3B-PG-O3G
3	D	1001	AGS	C5'-O5'-PA-O1A
3	D	1001	AGS	C5'-O5'-PA-O2A
3	A	1001	AGS	PB-O3B-PG-O3G
3	A	1001	AGS	C5'-O5'-PA-O1A
3	A	1001	AGS	O4'-C4'-C5'-O5'
5	E	1001	ADP	C5'-O5'-PA-O1A
3	C	1001	AGS	O4'-C4'-C5'-O5'
3	D	1001	AGS	PG-O3B-PB-O1B
3	D	1001	AGS	O4'-C4'-C5'-O5'
3	A	1001	AGS	C5'-O5'-PA-O3A
5	E	1001	ADP	C5'-O5'-PA-O3A
3	C	1001	AGS	PA-O3A-PB-O1B
3	C	1001	AGS	PB-O3A-PA-O2A
3	A	1001	AGS	C5'-O5'-PA-O2A
3	B	1001	AGS	PA-O3A-PB-O2B
5	F	1001	ADP	O4'-C4'-C5'-O5'
3	A	1001	AGS	PB-O3B-PG-O2G
3	B	1001	AGS	PA-O3A-PB-O1B
5	E	1001	ADP	PB-O3A-PA-O2A
3	A	1001	AGS	C3'-C4'-C5'-O5'
3	D	1001	AGS	C5'-O5'-PA-O3A
5	F	1001	ADP	C5'-O5'-PA-O3A
3	C	1001	AGS	PB-O3A-PA-O1A
5	E	1001	ADP	PB-O3A-PA-O1A
5	F	1001	ADP	C5'-O5'-PA-O2A
5	E	1001	ADP	C5'-O5'-PA-O2A
5	E	1001	ADP	O4'-C4'-C5'-O5'

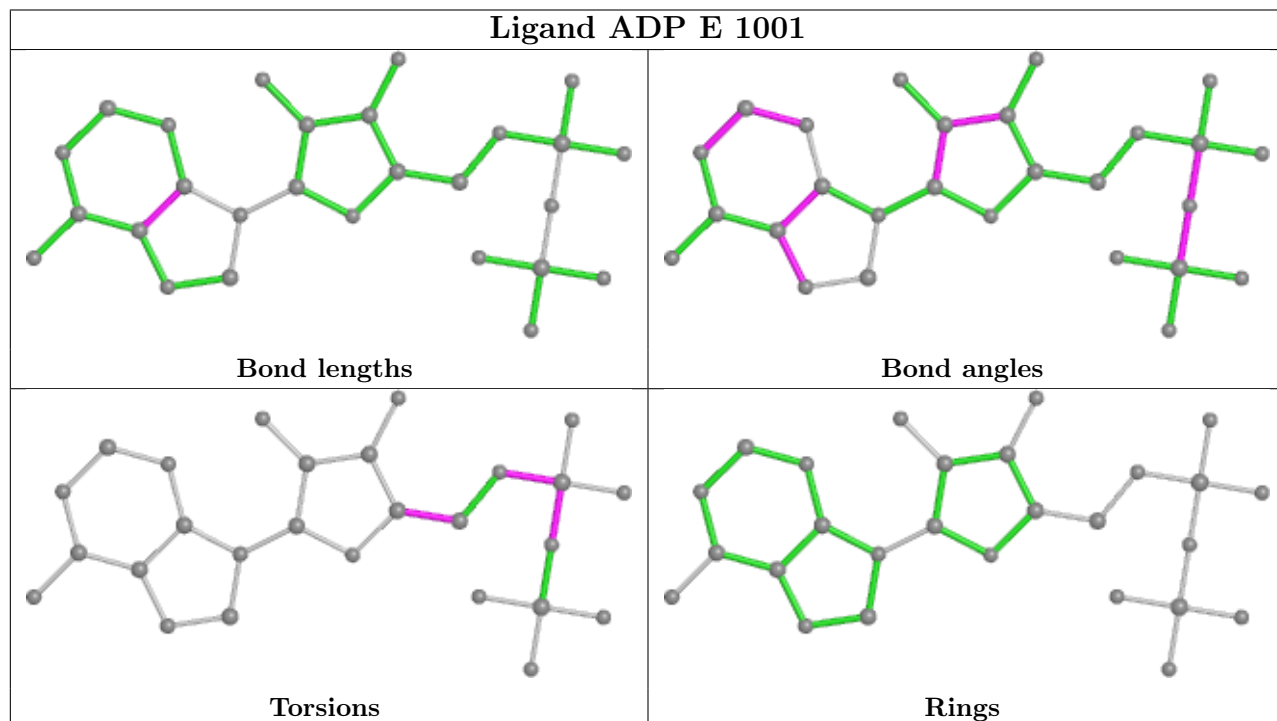
There are no ring outliers.

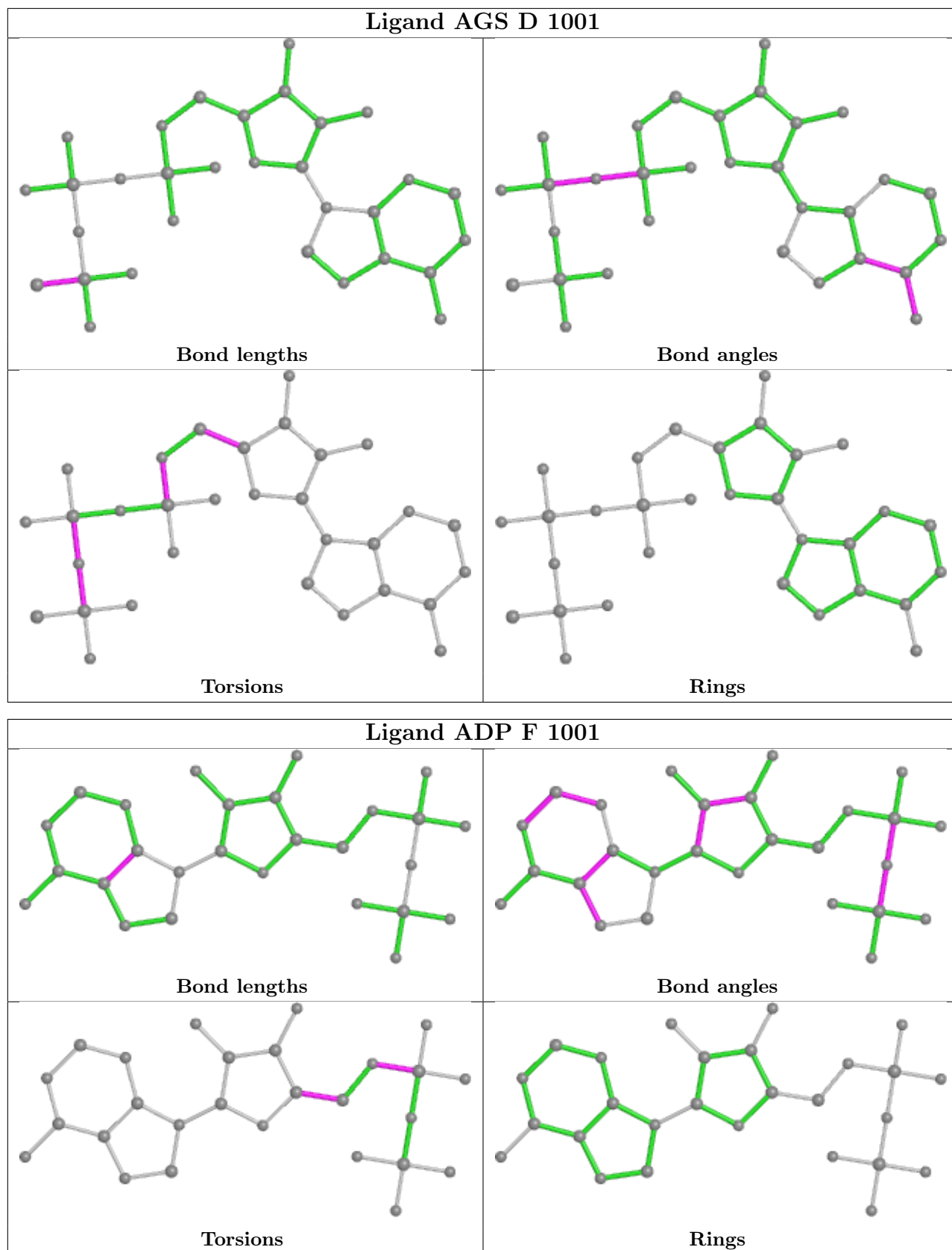
4 monomers are involved in 11 short contacts:

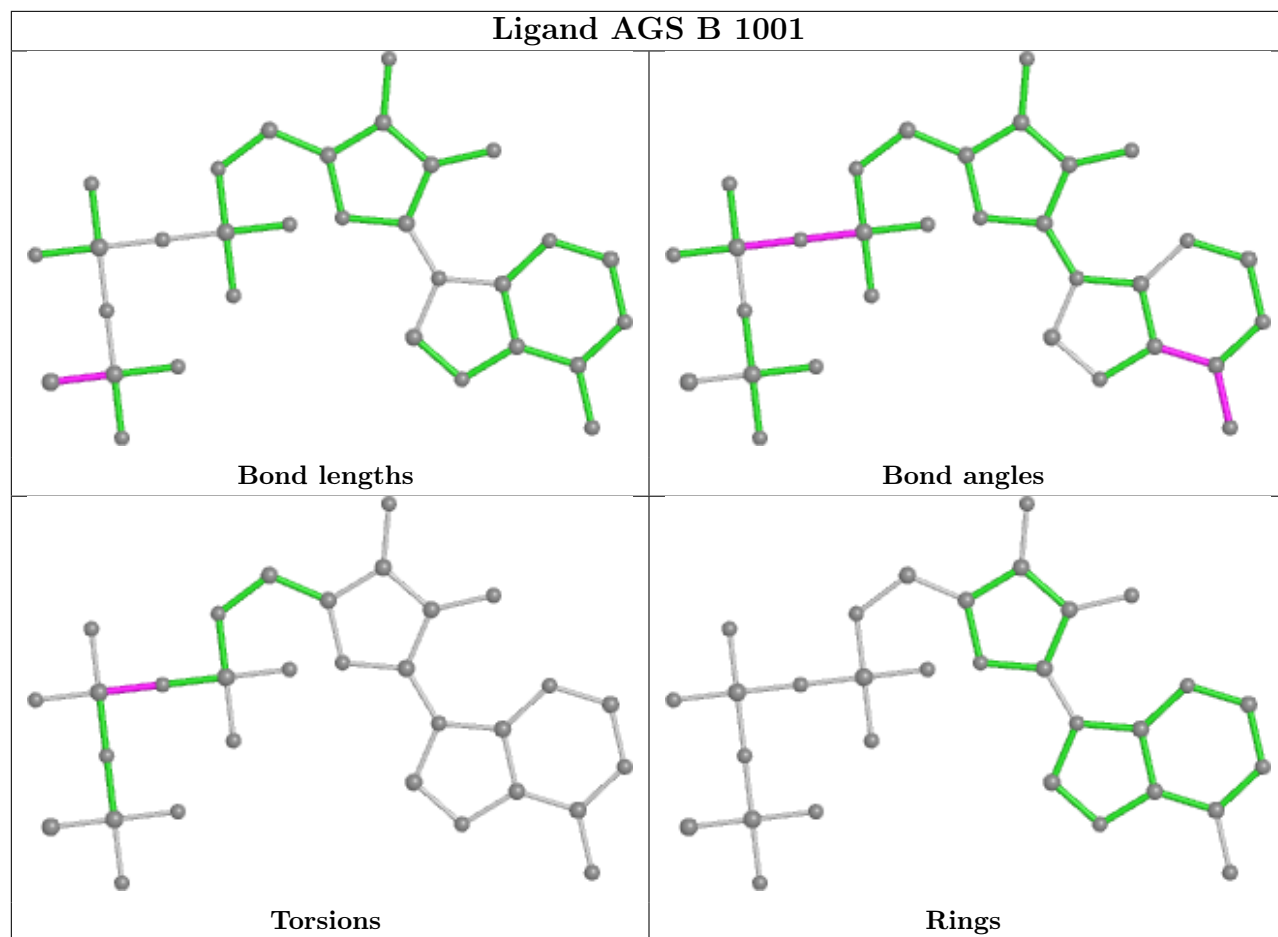
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	F	1001	ADP	2	0
3	B	1001	AGS	2	0
3	A	1001	AGS	3	0
3	C	1001	AGS	4	0

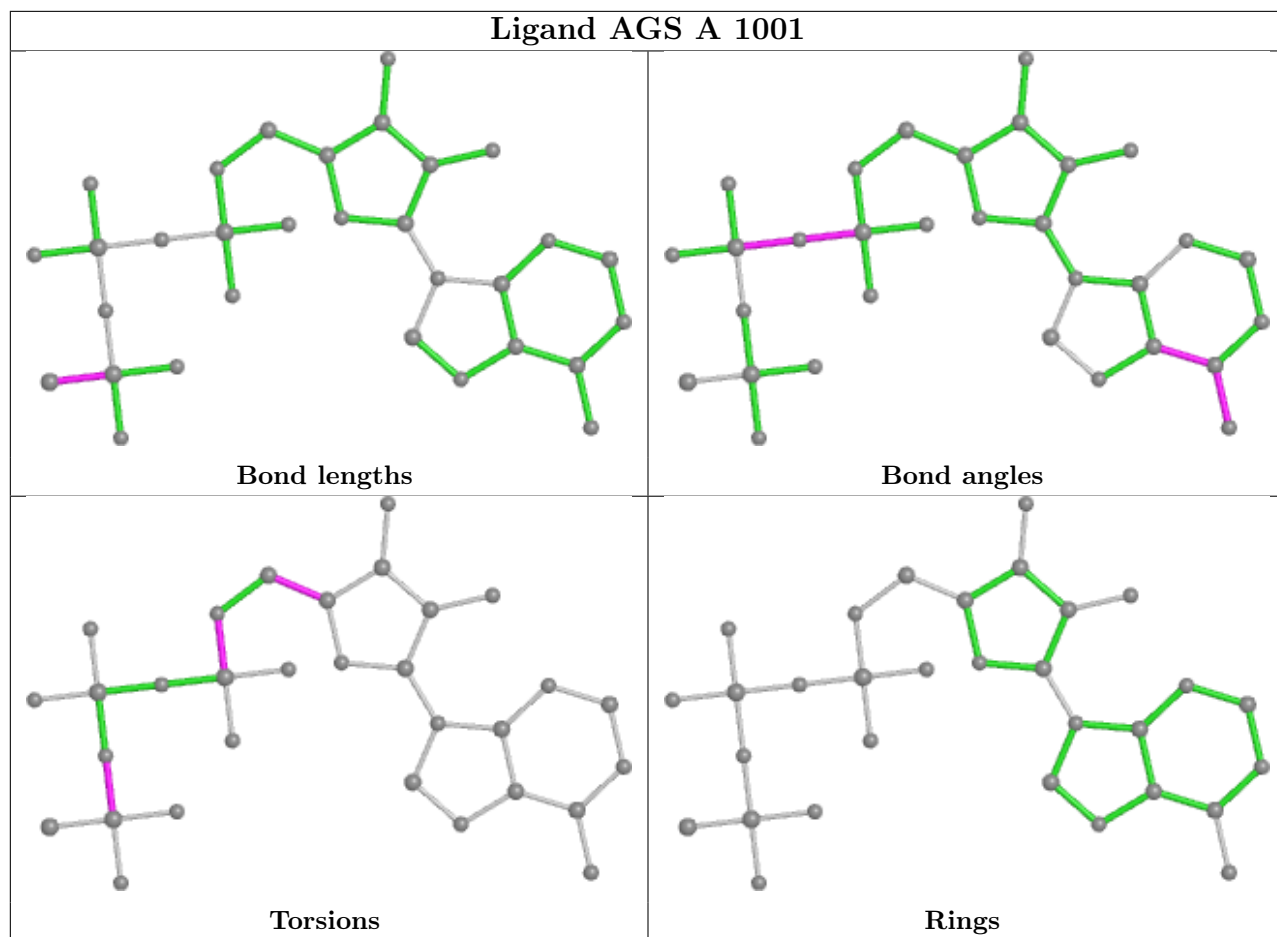
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is

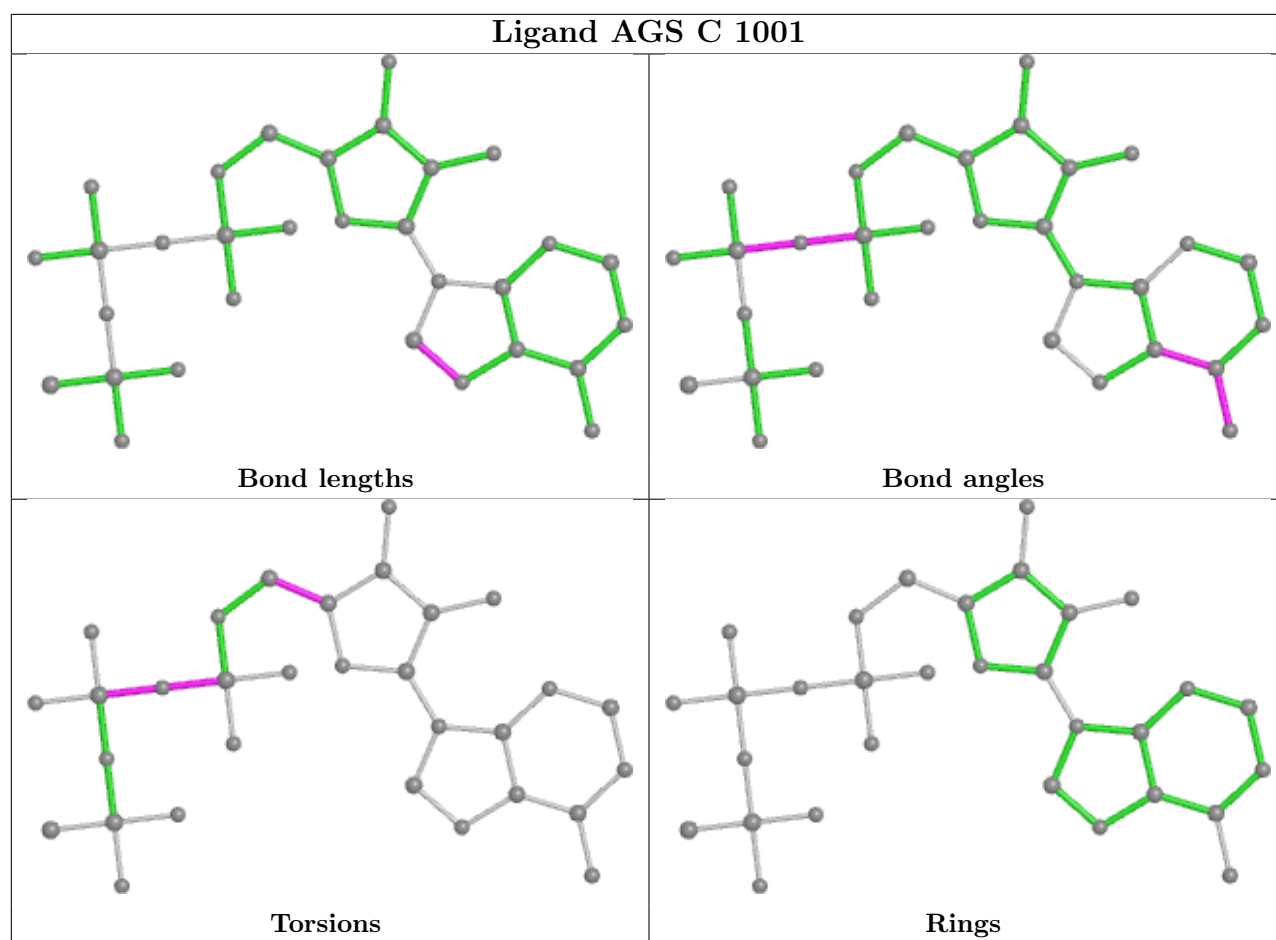
within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question 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.