



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 11:43 PM UTC

PDB ID : 3SI7 / pdb_00003si7
Title : The crystal structure of the NBD1 domain of the mouse CFTR protein, deltaF508 mutant
Authors : Brautigam, C.A.; Caspa, E.; Thomas, P.J.
Deposited on : 2011-06-17
Resolution : 2.25 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity : 4-5-2 with Phenix2.0
Mogul : 2022.3.0, CSD as543be (2022)
Xtriage (Phenix) : 2.0
EDS : 3.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4 : 9.0.010 (Gargrove)
Density-Fitness : 1.0.12
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

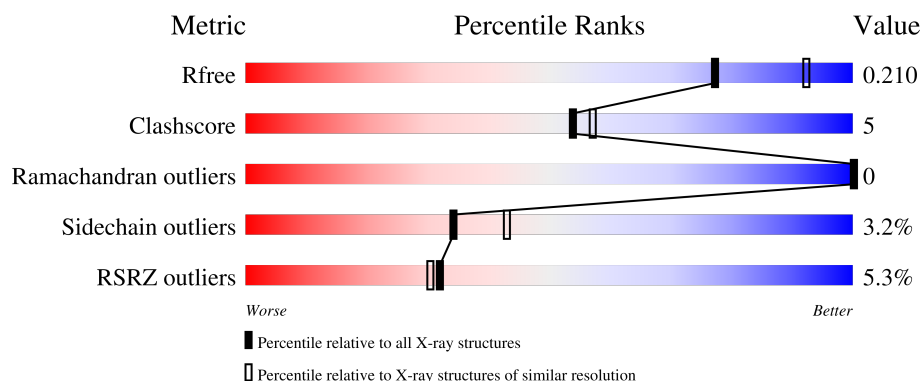
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.25 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	1898 (2.26-2.26)
Clashscore	190562	2005 (2.26-2.26)
Ramachandran outliers	187476	1965 (2.26-2.26)
Sidechain outliers	187428	1966 (2.26-2.26)
RSRZ outliers	180081	1898 (2.26-2.26)

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	285	5% 79% 12% 7%
1	B	285	6% 81% 12% 7%
1	C	285	2% 84% 8% 7%
1	D	285	7% 78% 14% 8%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard

residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
4	ACT	D	5	-	-	X	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 8796 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.

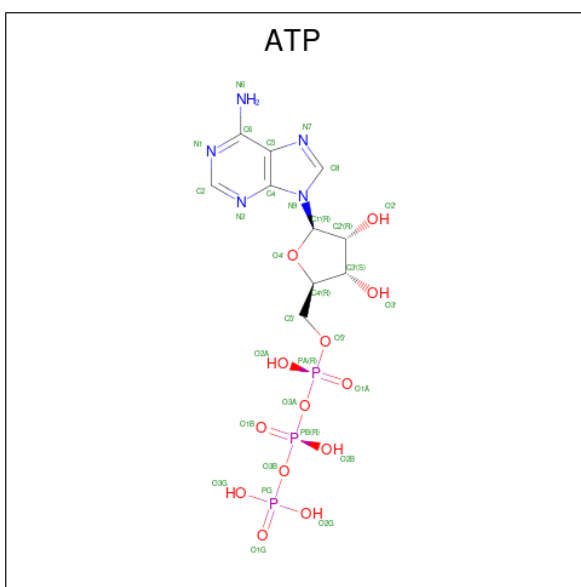
- Molecule 1 is a protein called Cystic fibrosis transmembrane conductance regulator.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	265	Total	C	N	O	S	0	0	0
			2087	1327	346	402	12			
1	B	266	Total	C	N	O	S	0	1	0
			2103	1336	349	406	12			
1	C	265	Total	C	N	O	S	0	1	0
			2092	1327	348	405	12			
1	D	261	Total	C	N	O	S	0	1	0
			2063	1310	343	398	12			

There are 8 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	388	SER	-	expression tag	UNP P26361
A	?	-	PHE	deletion	UNP P26361
B	388	SER	-	expression tag	UNP P26361
B	?	-	PHE	deletion	UNP P26361
C	388	SER	-	expression tag	UNP P26361
C	?	-	PHE	deletion	UNP P26361
D	388	SER	-	expression tag	UNP P26361
D	?	-	PHE	deletion	UNP P26361

- Molecule 2 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: C₁₀H₁₆N₅O₁₃P₃).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	B	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	C	1	Total	C	N	O	P	0	0
			31	10	5	13	3		
2	D	1	Total	C	N	O	P	0	0
			31	10	5	13	3		

- Molecule 3 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	2	Total	Mg	0	0
			2	2		
3	B	2	Total	Mg	0	0
			2	2		
3	C	2	Total	Mg	0	0
			2	2		
3	D	2	Total	Mg	0	0
			2	2		

- Molecule 4 is ACETATE ION (CCD ID: ACT) (formula: C₂H₃O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			4	2	2		
4	A	1	Total	C	O	0	0
			4	2	2		
4	B	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	C	1	Total	C	O	0	0
			4	2	2		
4	D	1	Total	C	O	0	0
			4	2	2		
4	D	1	Total	C	O	0	0
			4	2	2		

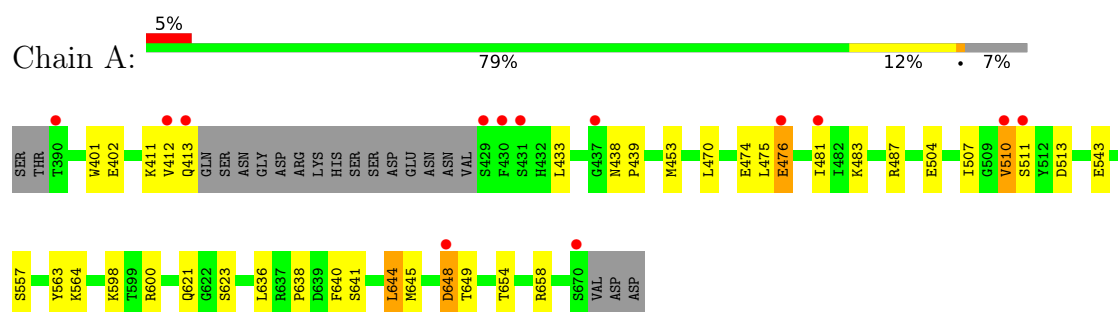
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	71	Total	O	0	0
			71	71		
5	B	73	Total	O	0	0
			73	73		
5	C	73	Total	O	0	0
			73	73		
5	D	74	Total	O	0	0
			74	74		

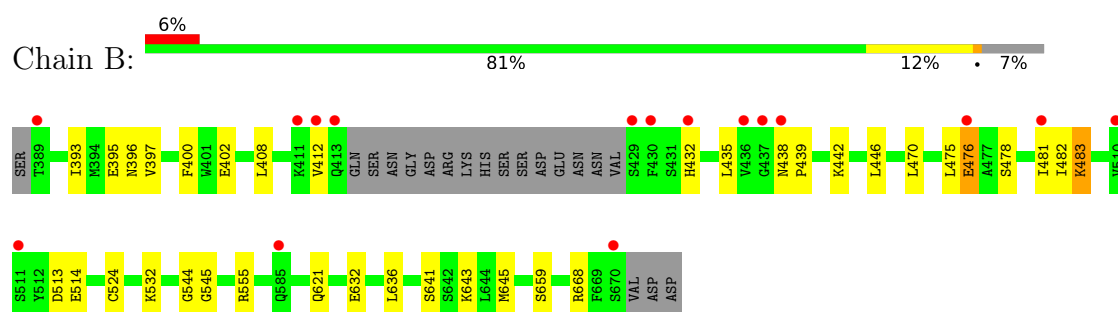
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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.

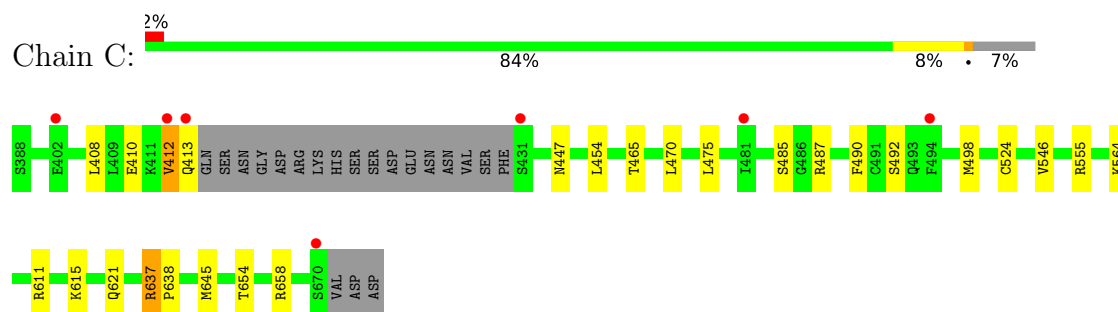
- Molecule 1: Cystic fibrosis transmembrane conductance regulator



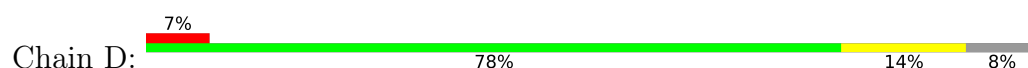
- Molecule 1: Cystic fibrosis transmembrane conductance regulator

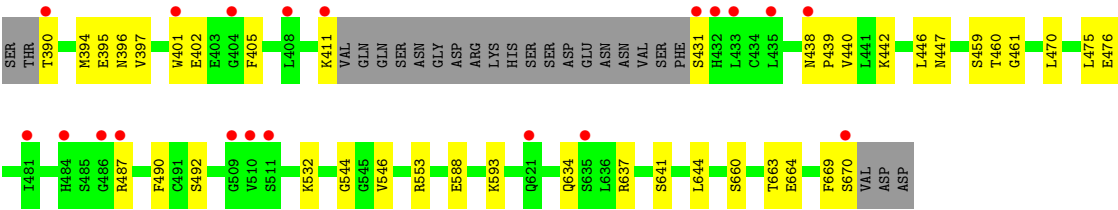


- Molecule 1: Cystic fibrosis transmembrane conductance regulator



- Molecule 1: Cystic fibrosis transmembrane conductance regulator





4 Data and refinement statistics

Property	Value	Source
Space group	P 4 21 2	Depositor
Cell constants a, b, c, α , β , γ	170.55Å 170.55Å 109.37Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.90 – 2.25 49.90 – 2.25	Depositor EDS
% Data completeness (in resolution range)	99.9 (49.90-2.25) 99.9 (49.90-2.25)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.14 (at 2.25Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.7_650)	Depositor
R, R_{free}	0.181 , 0.227 (Not available) , 0.210	Depositor DCC
R_{free} test set	3847 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	41.3	Xtriage
Anisotropy	0.014	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 47.0	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8796	wwPDB-VP
Average B, all atoms (Å ²)	52.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.38% 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: MG, ATP, ACT

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	0.47	0/2121	0.75	0/2852
1	B	0.45	0/2137	0.75	0/2874
1	C	0.51	0/2125	0.77	2/2858 (0.1%)
1	D	0.47	0/2096	0.78	2/2818 (0.1%)
All	All	0.48	0/8479	0.76	4/11402 (0.0%)

There are no bond length outliers.

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	637	ARG	CA-C-N	5.86	125.72	119.28
1	D	637	ARG	C-N-CA	5.86	125.72	119.28
1	C	637	ARG	CA-C-N	5.03	124.81	119.28
1	C	637	ARG	C-N-CA	5.03	124.81	119.28

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	2087	0	2087	26	0
1	B	2103	0	2101	24	0
1	C	2092	0	2092	15	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	D	2063	0	2063	22	0
2	A	31	0	12	0	0
2	B	31	0	12	0	0
2	C	31	0	12	0	0
2	D	31	0	12	3	0
3	A	2	0	0	0	0
3	B	2	0	0	0	0
3	C	2	0	0	0	0
3	D	2	0	0	0	0
4	A	8	0	6	0	0
4	B	4	0	3	0	0
4	C	8	0	6	0	0
4	D	8	0	6	2	0
5	A	71	0	0	1	0
5	B	73	0	0	1	0
5	C	73	0	0	1	0
5	D	74	0	0	0	0
All	All	8796	0	8412	83	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 5.

All (83) 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)
5:C:116:HOH:O	4:D:5:ACT:H1	1.77	0.82
1:C:487:ARG:HD3	1:C:564:LYS:HE2	1.67	0.75
1:A:453:MET:HG3	1:A:600:ARG:HG3	1.67	0.74
1:C:611:ARG:HH22	1:C:645:MET:HE2	1.54	0.72
1:D:487:ARG:HH21	1:D:487:ARG:HG3	1.56	0.70
1:C:412:VAL:HG11	1:C:465:THR:HG21	1.75	0.69
1:C:412:VAL:HG12	1:C:413:GLN:HG3	1.74	0.68
1:B:397:VAL:HG11	1:B:470:LEU:HD21	1.77	0.67
1:B:393:ILE:HB	1:B:483:LYS:HG3	1.77	0.67
1:C:611:ARG:HH22	1:C:645:MET:CE	2.11	0.63
1:A:510:VAL:HA	1:B:442:LYS:CD	2.28	0.63
1:A:510:VAL:HA	1:B:442:LYS:HD2	1.81	0.62
1:A:453:MET:HG3	1:A:600:ARG:CG	2.29	0.62
1:A:476:GLU:H	1:A:476:GLU:CD	2.09	0.61
1:D:405:PHE:CZ	1:D:475:LEU:HD22	2.38	0.59
1:B:641:SER:O	1:B:645:MET:HG2	2.03	0.58

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:640:PHE:CZ	1:A:644:LEU:HD13	2.39	0.57
1:A:402:GLU:HG3	1:A:476:GLU:OE1	2.05	0.55
1:A:636:LEU:C	1:A:638:PRO:HD3	2.32	0.55
1:D:532:LYS:NZ	4:D:5:ACT:H3	2.22	0.55
1:A:411:LYS:O	1:B:432:HIS:HE1	1.88	0.55
1:D:660:SER:O	1:D:664:GLU:HG3	2.08	0.54
1:D:402:GLU:HG3	1:D:476:GLU:OE1	2.08	0.53
1:A:411:LYS:O	1:B:432:HIS:CE1	2.62	0.53
1:D:588:GLU:HG2	1:D:593:LYS:HE2	1.91	0.52
1:B:513:ASP:C	1:B:513:ASP:OD2	2.53	0.52
1:B:402:GLU:HG3	1:B:476:GLU:OE1	2.10	0.51
1:B:524:CYS:O	1:B:555:ARG:HD2	2.10	0.51
1:D:490:PHE:CE2	1:D:492:SER:HB3	2.46	0.51
1:C:645:MET:HE3	1:C:645:MET:HA	1.92	0.51
1:A:474:GLU:HG3	1:B:435:LEU:HD11	1.94	0.50
1:B:395:GLU:HB2	1:B:481:ILE:HG22	1.93	0.50
1:C:412:VAL:CG1	1:C:465:THR:HG21	2.41	0.49
1:D:476:GLU:H	1:D:476:GLU:CD	2.20	0.49
1:B:476:GLU:H	1:B:476:GLU:CD	2.21	0.48
1:C:470:LEU:HD13	1:C:475:LEU:HD23	1.95	0.48
1:A:476:GLU:CD	1:A:476:GLU:N	2.71	0.48
1:A:507:ILE:HD12	1:A:563:TYR:CZ	2.49	0.48
1:A:412:VAL:HG23	1:A:413:GLN:HG3	1.94	0.47
1:A:654:THR:O	1:A:658:ARG:HG3	2.15	0.47
1:D:440:VAL:HG11	1:D:475:LEU:HD21	1.98	0.46
1:B:643:LYS:HE2	1:B:668:ARG:HH22	1.80	0.46
1:A:470:LEU:HD12	1:A:475:LEU:O	2.16	0.46
1:D:401:TRP:CZ2	2:D:1:ATP:H4'	2.50	0.45
1:C:412:VAL:HG11	1:C:465:THR:CG2	2.45	0.45
1:D:669:PHE:O	1:D:670:SER:HB3	2.16	0.45
1:D:394:MET:HB2	1:D:446:LEU:HG	1.98	0.45
1:A:598:LYS:HE3	5:A:127:HOH:O	2.16	0.45
1:A:648:ASP:CG	1:A:649:THR:H	2.24	0.45
1:D:487:ARG:HG3	1:D:487:ARG:NH2	2.27	0.45
1:A:513:ASP:OD1	1:A:513:ASP:C	2.61	0.44
1:C:498:MET:HE2	1:C:498:MET:HB2	1.71	0.44
1:A:487:ARG:HH12	1:A:564:LYS:HD2	1.83	0.44
1:D:634:GLN:HA	1:D:641:SER:OG	2.18	0.44
1:B:412:VAL:HG22	5:B:172:HOH:O	2.17	0.43
1:B:446:LEU:HD12	1:B:446:LEU:O	2.18	0.43
1:D:411:LYS:HE3	1:D:411:LYS:HB2	1.89	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:544:GLY:O	1:D:553:ARG:HD3	2.17	0.43
1:C:637:ARG:N	1:C:638:PRO:HD3	2.33	0.43
1:B:544:GLY:O	1:B:545:GLY:C	2.59	0.43
1:D:397:VAL:HG11	1:D:470:LEU:HD21	2.00	0.43
1:B:400:PHE:HD2	1:B:478:SER:OG	2.02	0.43
1:A:401:TRP:CE2	1:A:433:LEU:HD13	2.53	0.43
1:C:490:PHE:CE2	1:C:492:SER:HB3	2.54	0.43
1:B:470:LEU:HG	1:B:482:ILE:CD1	2.49	0.42
1:A:504:GLU:CD	1:B:621:GLN:HG3	2.43	0.42
1:B:632:GLU:HB3	1:B:636:LEU:HD12	2.01	0.42
1:D:461:GLY:O	2:D:1:ATP:H2'	2.19	0.42
1:A:438:ASN:HA	1:A:439:PRO:HD3	1.92	0.42
1:A:510:VAL:HG13	1:A:511:SER:H	1.85	0.42
1:C:454:LEU:HD12	1:C:615:LYS:O	2.19	0.41
1:C:524:CYS:O	1:C:555:ARG:HD2	2.20	0.41
1:C:654:THR:O	1:C:658:ARG:HG3	2.20	0.41
1:B:470:LEU:HD12	1:B:475:LEU:O	2.20	0.41
2:D:1:ATP:H2'	2:D:1:ATP:N3	2.35	0.41
1:D:459:SER:HB3	1:D:663:THR:HA	2.03	0.41
1:A:481:ILE:HG22	1:A:483:LYS:HG3	2.02	0.41
1:A:641:SER:O	1:A:645:MET:HG2	2.20	0.41
1:D:438:ASN:HA	1:D:439:PRO:HD3	1.85	0.41
1:B:438:ASN:HA	1:B:439:PRO:HD3	1.99	0.40
1:D:669:PHE:O	1:D:670:SER:CB	2.68	0.40
1:B:446:LEU:HD12	1:B:446:LEU:C	2.47	0.40
1:D:395:GLU:O	1:D:396:ASN:C	2.63	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	261/285 (92%)	252 (97%)	9 (3%)	0	100	100
1	B	263/285 (92%)	255 (97%)	8 (3%)	0	100	100
1	C	262/285 (92%)	254 (97%)	8 (3%)	0	100	100
1	D	258/285 (90%)	251 (97%)	7 (3%)	0	100	100
All	All	1044/1140 (92%)	1012 (97%)	32 (3%)	0	100	100

There are no Ramachandran outliers to report.

5.3.2 Protein sidechains ⓘ

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	211/251 (84%)	203 (96%)	8 (4%)	29	36
1	B	234/251 (93%)	227 (97%)	7 (3%)	36	45
1	C	233/251 (93%)	226 (97%)	7 (3%)	36	45
1	D	229/251 (91%)	222 (97%)	7 (3%)	35	44
All	All	907/1004 (90%)	878 (97%)	29 (3%)	34	43

All (29) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	476	GLU
1	A	510	VAL
1	A	543	GLU
1	A	557	SER
1	A	621	GLN
1	A	623	SER
1	A	644	LEU
1	A	648	ASP
1	B	396	ASN
1	B	408	LEU
1	B	476	GLU
1	B	483	LYS
1	B	514	GLU

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Mol	Chain	Res	Type
1	B	532	LYS
1	B	659	SER
1	C	408	LEU
1	C	410	GLU
1	C	412	VAL
1	C	447	ASN
1	C	485	SER
1	C	546	VAL
1	C	621	GLN
1	D	390	THR
1	D	431	SER
1	D	442	LYS
1	D	447	ASN
1	D	460	THR
1	D	546	VAL
1	D	644	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (10) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	538	ASN
1	B	432	HIS
1	B	484	HIS
1	C	396	ASN
1	C	413	GLN
1	C	438	ASN
1	C	484	HIS
1	D	396	ASN
1	D	443	ASN
1	D	527	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 19 ligands modelled in this entry, 8 are monoatomic - leaving 11 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
4	ACT	C	4	-	3,3,3	0.90	0	3,3,3	1.04	0
4	ACT	D	5	-	3,3,3	0.74	0	3,3,3	1.08	0
4	ACT	A	5	-	3,3,3	0.80	0	3,3,3	1.09	0
2	ATP	C	1	3	32,33,33	1.49	5 (15%)	48,52,52	1.75	8 (16%)
4	ACT	A	4	-	3,3,3	0.84	0	3,3,3	1.19	0
4	ACT	D	4	-	3,3,3	0.82	0	3,3,3	1.45	0
4	ACT	C	5	-	3,3,3	0.83	0	3,3,3	1.37	0
2	ATP	B	1	3	32,33,33	1.60	7 (21%)	48,52,52	1.75	11 (22%)
2	ATP	A	1	3	32,33,33	1.53	6 (18%)	48,52,52	1.79	8 (16%)
2	ATP	D	1	3	32,33,33	1.43	5 (15%)	48,52,52	1.81	9 (18%)
4	ACT	B	4	-	3,3,3	0.86	0	3,3,3	1.25	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
2	ATP	B	1	3	-	3/22/38/38	0/3/3/3
2	ATP	A	1	3	-	2/22/38/38	0/3/3/3
2	ATP	D	1	3	-	4/22/38/38	0/3/3/3
2	ATP	C	1	3	-	3/22/38/38	0/3/3/3

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	1	ATP	C5-C4	4.97	1.48	1.39
2	D	1	ATP	C5-C4	4.90	1.47	1.39
2	C	1	ATP	C5-C4	4.86	1.47	1.39
2	B	1	ATP	C5-C4	4.81	1.47	1.39
2	B	1	ATP	PB-O3B	3.40	1.63	1.59
2	B	1	ATP	PA-O3A	3.09	1.62	1.59
2	C	1	ATP	PB-O3B	3.03	1.62	1.59
2	A	1	ATP	PB-O3B	3.00	1.62	1.59
2	C	1	ATP	C5-C6	2.92	1.49	1.41
2	D	1	ATP	C5-C6	2.86	1.49	1.41
2	B	1	ATP	C5-C6	2.86	1.48	1.41
2	A	1	ATP	C5-C6	2.83	1.48	1.41
2	D	1	ATP	PB-O3B	2.59	1.62	1.59
2	A	1	ATP	PA-O3A	2.46	1.62	1.59
2	C	1	ATP	C8-N7	2.45	1.36	1.31
2	B	1	ATP	C8-N7	2.40	1.36	1.31
2	A	1	ATP	C8-N7	2.37	1.36	1.31
2	D	1	ATP	C8-N7	2.34	1.36	1.31
2	B	1	ATP	PB-O3A	2.34	1.62	1.59
2	A	1	ATP	C5-N7	-2.18	1.35	1.39
2	D	1	ATP	C5-N7	-2.17	1.35	1.39
2	B	1	ATP	C5-N7	-2.09	1.35	1.39
2	C	1	ATP	C5-N7	-2.09	1.35	1.39

All (36) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	1	ATP	C5-C4-N3	-6.24	118.13	126.72
2	A	1	ATP	C5-C4-N3	-6.12	118.30	126.72
2	C	1	ATP	C5-C4-N3	-5.77	118.77	126.72
2	B	1	ATP	C5-C4-N3	-5.66	118.92	126.72
2	D	1	ATP	N3-C4-N9	4.99	135.65	127.17
2	A	1	ATP	N3-C4-N9	4.80	135.33	127.17
2	B	1	ATP	N3-C4-N9	4.57	134.94	127.17
2	C	1	ATP	N3-C4-N9	4.49	134.80	127.17
2	D	1	ATP	C2-N3-C4	3.86	121.25	111.83
2	A	1	ATP	C2-N3-C4	3.76	121.02	111.83
2	C	1	ATP	C2-N3-C4	3.74	120.96	111.83
2	B	1	ATP	C2-N3-C4	3.68	120.82	111.83
2	C	1	ATP	C4-C5-N7	-3.56	106.51	110.58
2	A	1	ATP	C4-C5-N7	-3.51	106.57	110.58
2	D	1	ATP	C4-C5-N7	-3.49	106.59	110.58
2	B	1	ATP	C4-C5-N7	-3.40	106.70	110.58

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	1	ATP	N3-C2-N1	-3.33	123.55	128.58
2	C	1	ATP	N3-C2-N1	-3.27	123.63	128.58
2	D	1	ATP	N3-C2-N1	-3.21	123.73	128.58
2	A	1	ATP	N3-C2-N1	-3.11	123.87	128.58
2	D	1	ATP	C3'-C2'-C1'	2.84	106.83	101.46
2	B	1	ATP	C4-N9-C8	2.81	108.69	105.74
2	D	1	ATP	C5-N7-C8	2.60	107.53	103.45
2	B	1	ATP	C5-N7-C8	2.55	107.46	103.45
2	C	1	ATP	C5-N7-C8	2.53	107.43	103.45
2	C	1	ATP	C4-N9-C8	2.51	108.37	105.74
2	D	1	ATP	C4-N9-C8	2.49	108.35	105.74
2	A	1	ATP	C5-N7-C8	2.49	107.36	103.45
2	A	1	ATP	C3'-C2'-C1'	2.47	106.13	101.46
2	A	1	ATP	C4-N9-C8	2.32	108.17	105.74
2	C	1	ATP	C6-C5-N7	2.26	136.44	132.09
2	B	1	ATP	O2A-PA-O1A	2.19	122.61	112.44
2	B	1	ATP	C6-C5-N7	2.17	136.28	132.09
2	B	1	ATP	O3A-PB-O1B	-2.10	104.37	110.70
2	B	1	ATP	N9-C8-N7	-2.06	111.01	113.94
2	D	1	ATP	C6-C5-N7	2.02	135.98	132.09

There are no chirality outliers.

All (12) torsion outliers are listed below:

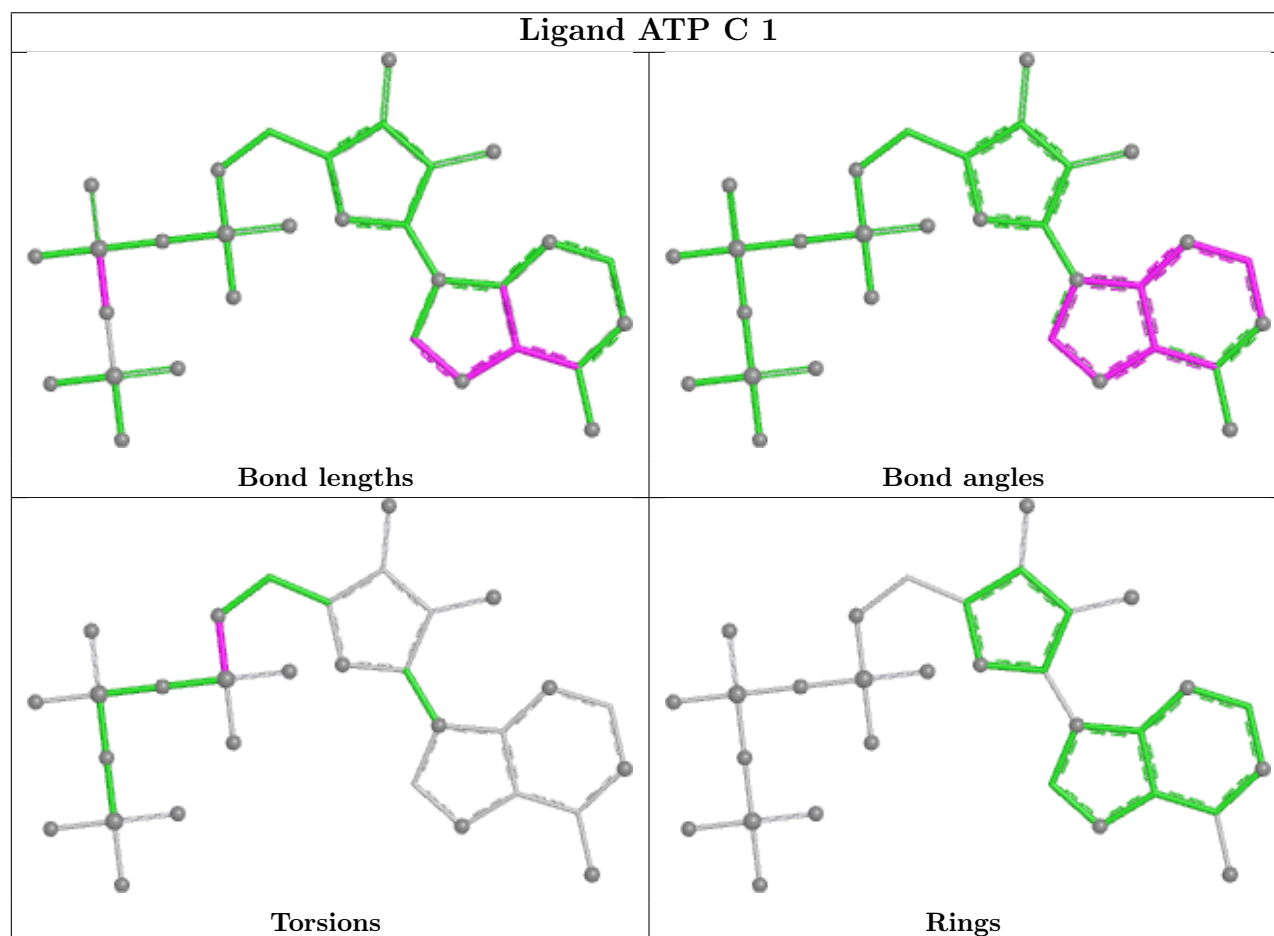
Mol	Chain	Res	Type	Atoms
2	A	1	ATP	C5'-O5'-PA-O2A
2	B	1	ATP	C5'-O5'-PA-O1A
2	B	1	ATP	C5'-O5'-PA-O2A
2	B	1	ATP	C5'-O5'-PA-O3A
2	C	1	ATP	C5'-O5'-PA-O1A
2	C	1	ATP	C5'-O5'-PA-O2A
2	C	1	ATP	C5'-O5'-PA-O3A
2	D	1	ATP	C5'-O5'-PA-O3A
2	D	1	ATP	C2'-C1'-N9-C4
2	A	1	ATP	C5'-O5'-PA-O3A
2	D	1	ATP	C5'-O5'-PA-O1A
2	D	1	ATP	C2'-C1'-N9-C8

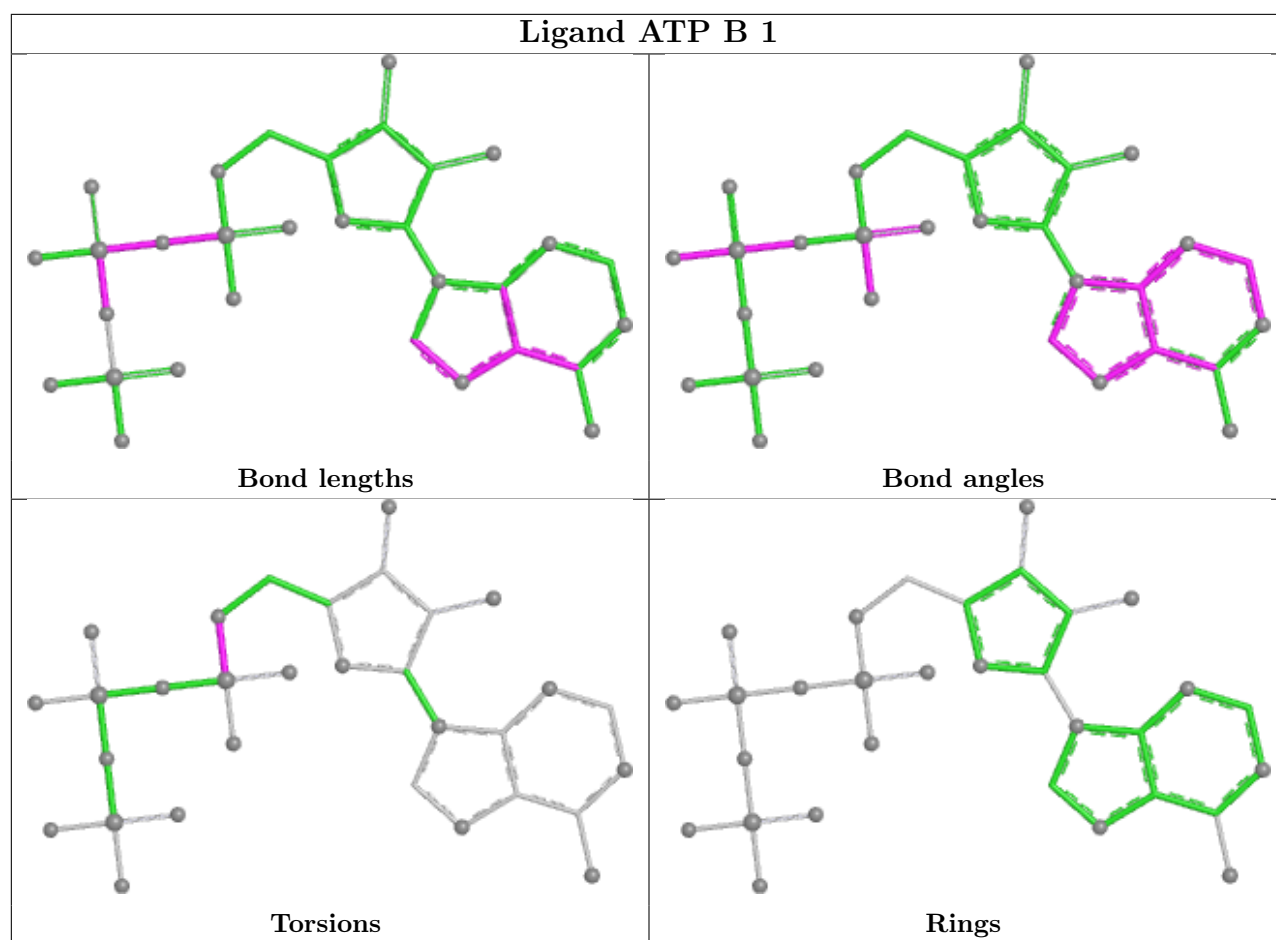
There are no ring outliers.

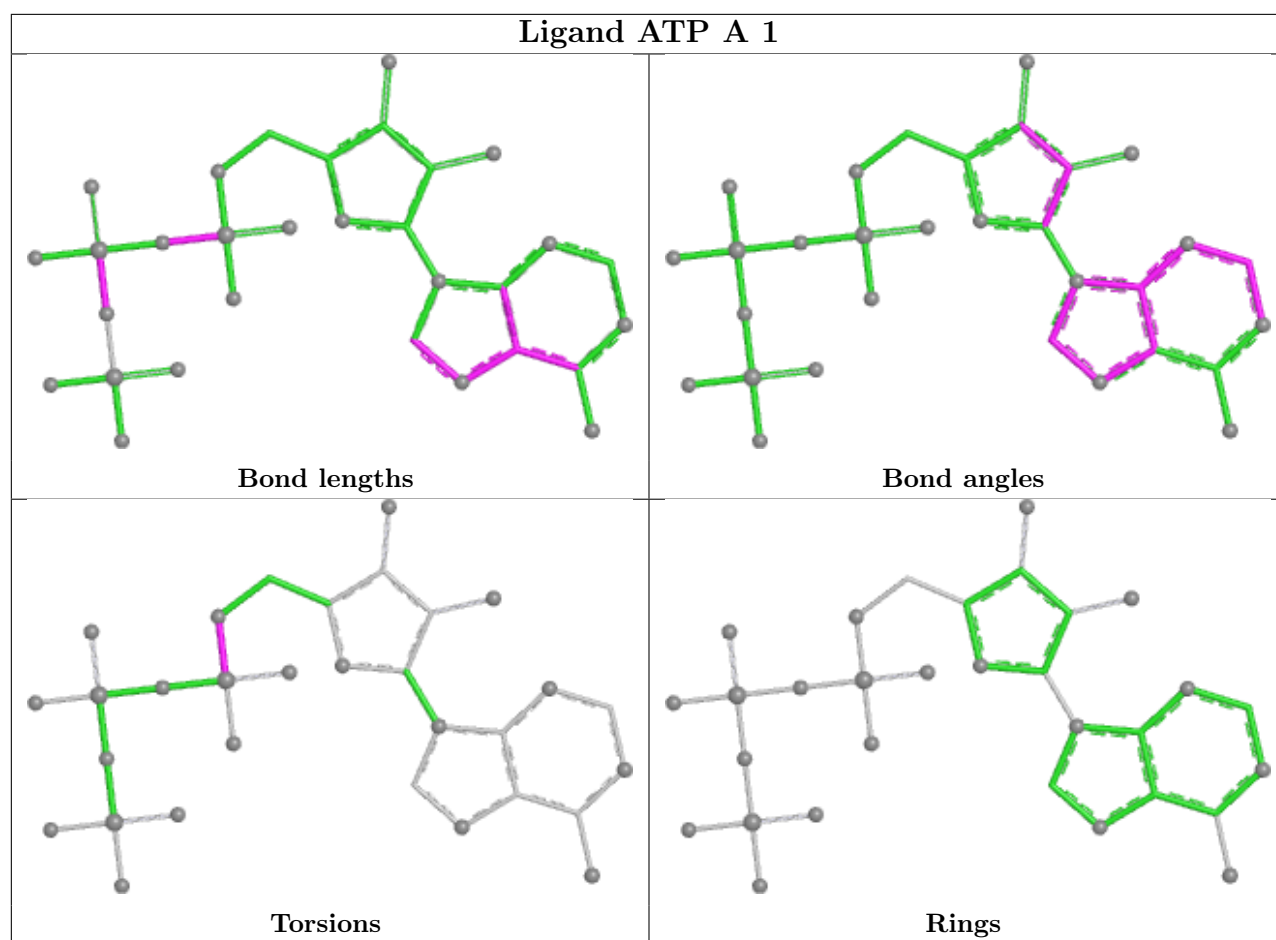
2 monomers are involved in 5 short contacts:

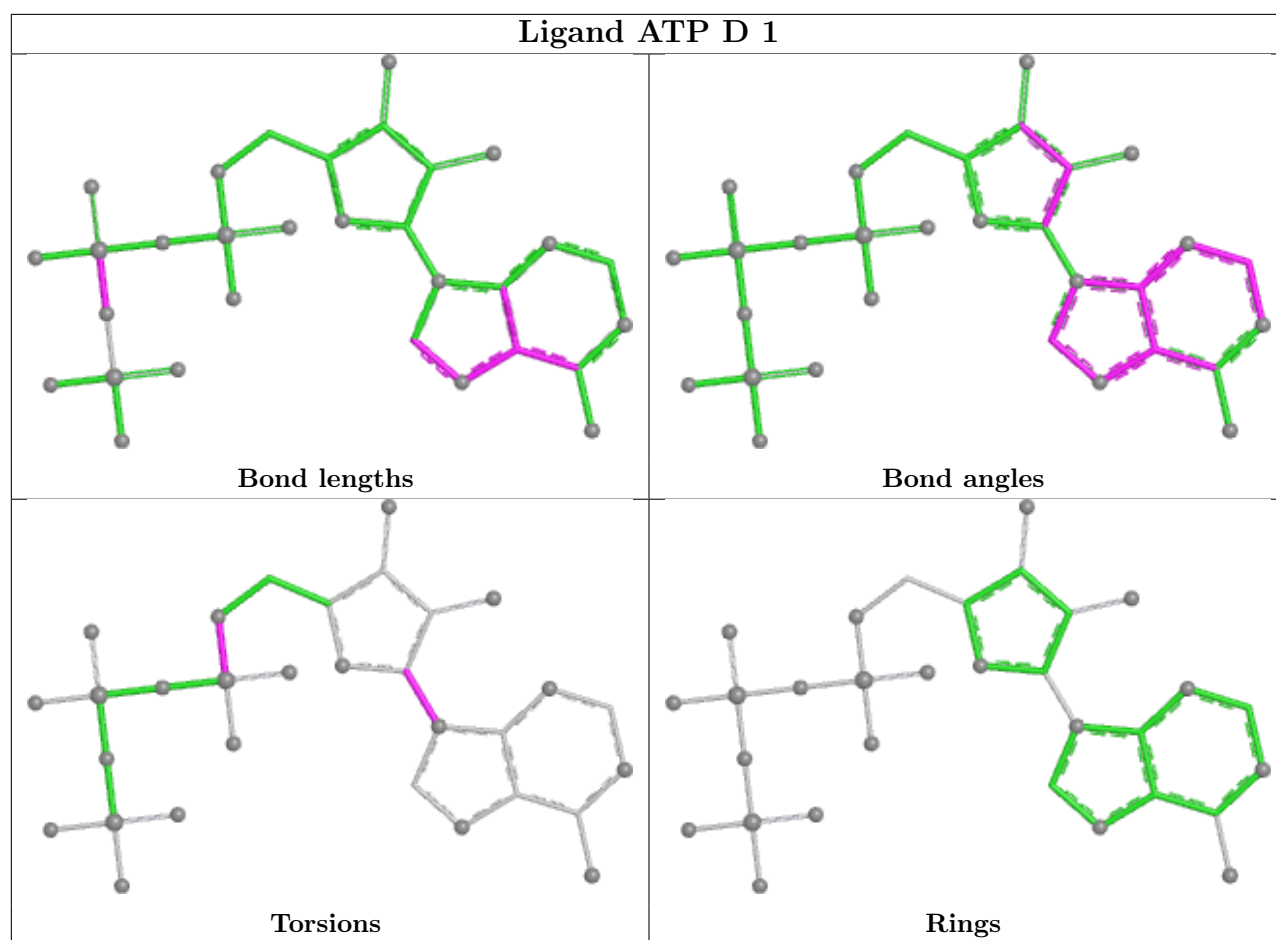
Mol	Chain	Res	Type	Clashes	Symm-Clashes
4	D	5	ACT	2	0
2	D	1	ATP	3	0

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	265/285 (92%)	-0.02	13 (4%) 35 34	25, 48, 88, 120	0
1	B	266/285 (93%)	0.15	16 (6%) 27 25	21, 50, 92, 147	1 (0%)
1	C	265/285 (92%)	-0.18	7 (2%) 57 58	17, 43, 77, 97	1 (0%)
1	D	261/285 (91%)	0.03	20 (7%) 19 17	18, 47, 93, 126	1 (0%)
All	All	1057/1140 (92%)	-0.01	56 (5%) 32 30	17, 47, 89, 147	3 (0%)

All (56) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	390	THR	6.7
1	A	429	SER	5.3
1	B	429	SER	4.8
1	A	510	VAL	4.6
1	C	431	SER	4.5
1	B	438	ASN	4.4
1	B	481	ILE	4.2
1	A	430	PHE	4.1
1	D	510	VAL	4.0
1	B	413	GLN	3.9
1	D	390	THR	3.8
1	D	431	SER	3.8
1	B	510	VAL	3.7
1	A	412	VAL	3.5
1	B	670	SER	3.4
1	A	413	GLN	3.4
1	B	412	VAL	3.3
1	A	670	SER	3.3
1	D	511	SER	3.1
1	B	437	GLY	3.1
1	B	436	VAL	3.1

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Mol	Chain	Res	Type	RSRZ
1	B	430	PHE	3.1
1	C	670	SER	2.9
1	D	484	HIS	2.9
1	D	433	LEU	2.9
1	D	670	SER	2.8
1	B	476	GLU	2.7
1	C	412	VAL	2.7
1	B	511	SER	2.6
1	D	435	LEU	2.6
1	D	432	HIS	2.5
1	D	481	ILE	2.5
1	D	408	LEU	2.5
1	D	411	LYS	2.5
1	D	621	GLN	2.4
1	B	585[A]	GLN	2.4
1	D	509	GLY	2.4
1	C	494	PHE	2.4
1	D	401	TRP	2.4
1	D	404	GLY	2.4
1	C	402	GLU	2.4
1	C	481	ILE	2.3
1	D	438	ASN	2.3
1	B	432	HIS	2.2
1	A	431	SER	2.2
1	D	635	SER	2.2
1	A	437	GLY	2.1
1	D	486	GLY	2.1
1	B	411	LYS	2.1
1	D	487	ARG	2.1
1	A	511	SER	2.1
1	A	481	ILE	2.1
1	A	476	GLU	2.0
1	C	413	GLN	2.0
1	B	389	THR	2.0
1	A	648	ASP	2.0

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

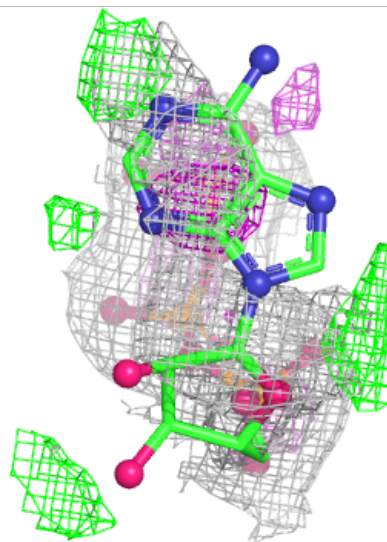
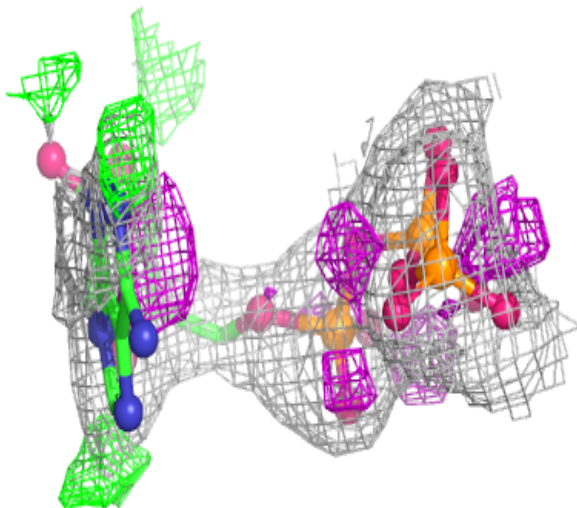
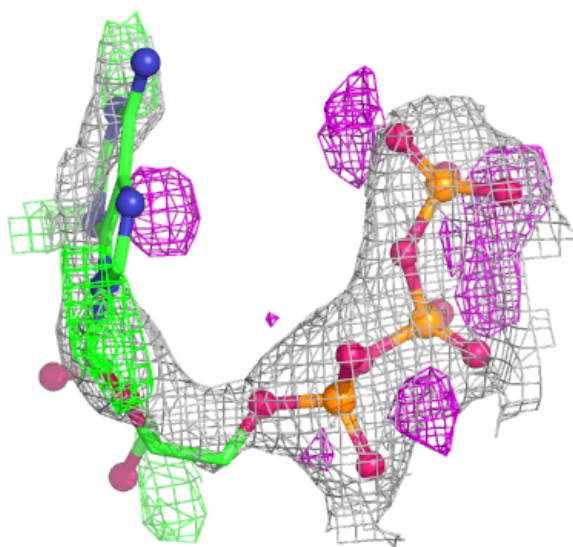
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q<0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ACT	C	5	4/4	0.68	0.23	74,79,81,81	0
3	MG	B	3	1/1	0.84	0.14	74,74,74,74	0
2	ATP	D	1	31/31	0.87	0.18	54,160,172,173	0
3	MG	A	2	1/1	0.89	0.11	74,74,74,74	0
2	ATP	A	1	31/31	0.92	0.14	55,138,155,155	0
2	ATP	B	1	31/31	0.93	0.13	40,97,136,139	0
3	MG	C	3	1/1	0.93	0.07	54,54,54,54	0
3	MG	D	3	1/1	0.93	0.06	51,51,51,51	0
2	ATP	C	1	31/31	0.93	0.12	49,101,125,125	0
3	MG	C	2	1/1	0.94	0.09	68,68,68,68	0
3	MG	B	2	1/1	0.94	0.10	62,62,62,62	0
4	ACT	D	5	4/4	0.94	0.09	42,52,53,54	0
3	MG	D	2	1/1	0.96	0.07	62,62,62,62	0
3	MG	A	3	1/1	0.96	0.07	61,61,61,61	0
4	ACT	C	4	4/4	0.97	0.09	40,42,44,44	0
4	ACT	A	4	4/4	0.97	0.08	40,42,44,47	0
4	ACT	D	4	4/4	0.97	0.07	39,47,50,55	0
4	ACT	A	5	4/4	0.97	0.09	44,53,58,60	0
4	ACT	B	4	4/4	0.98	0.09	45,46,48,52	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.

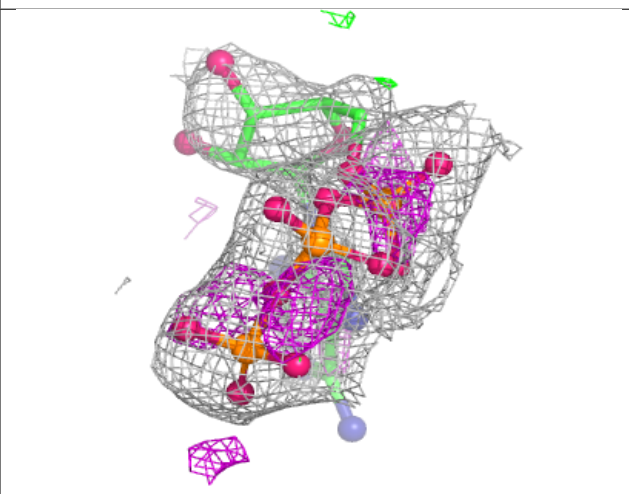
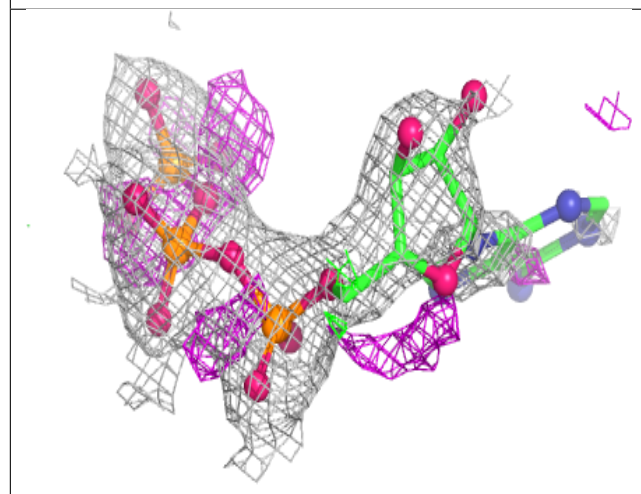
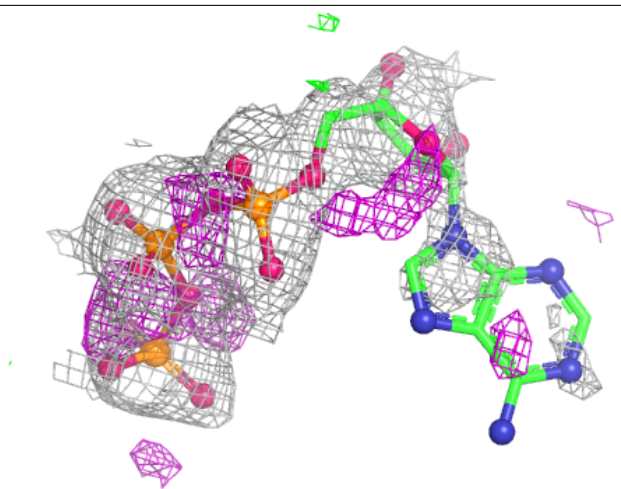
Electron density around ATP D 1:

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



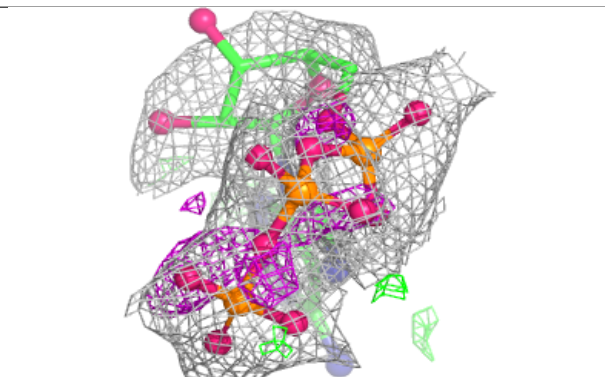
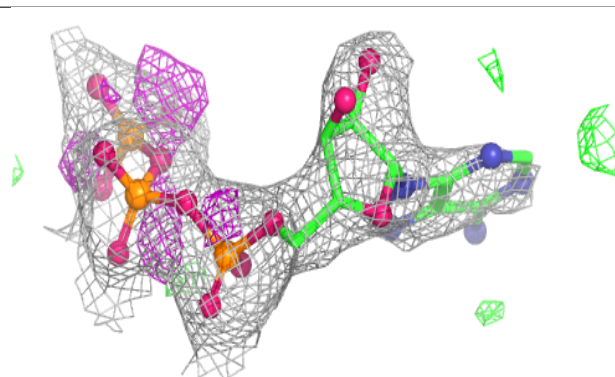
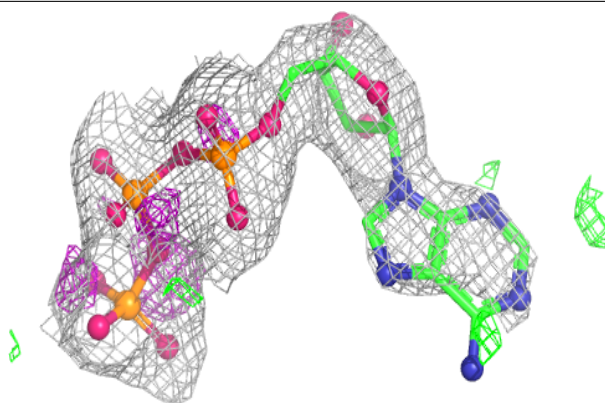
Electron density around ATP A 1:

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

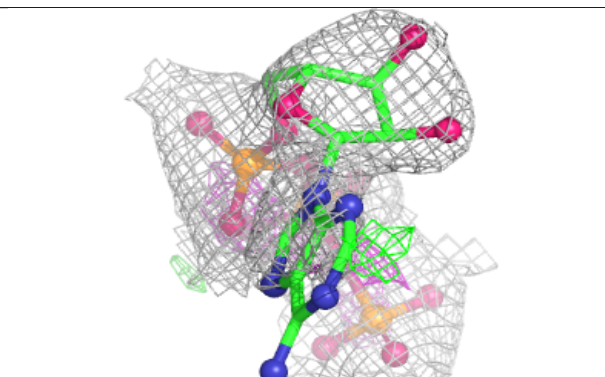
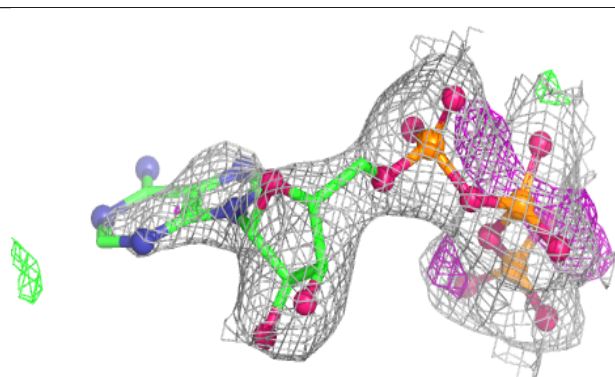
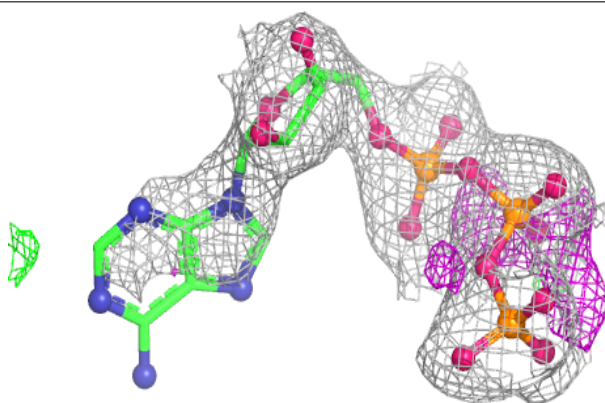


Electron density around ATP B 1:

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

**Electron density around ATP C 1:**

$2mF_o-DF_c$ (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.