



Full wwPDB X-ray Structure Validation Report ⓘ

Nov 1, 2023 – 03:02 AM EDT

PDB ID : 3I4L
Title : Structural characterization for the nucleotide binding ability of subunit A with AMP-PNP of the A1AO ATP synthase
Authors : Manimekalai, S.M.S.; Kumar, A.; Balakrishna, A.M.; Jeyakanthan, J.; Gruber, G.
Deposited on : 2009-07-01
Resolution : 2.40 Å(reported)

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

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

A user guide is available at

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

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

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

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

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.36
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

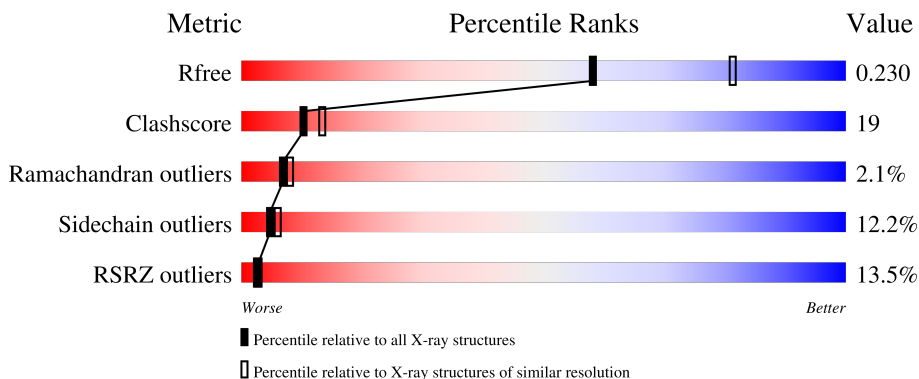
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.40 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	3907 (2.40-2.40)
Clashscore	141614	4398 (2.40-2.40)
Ramachandran outliers	138981	4318 (2.40-2.40)
Sidechain outliers	138945	4319 (2.40-2.40)
RSRZ outliers	127900	3811 (2.40-2.40)

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	588	

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
2	ANP	A	589	X	-	X	X
3	MPD	A	590	-	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4564 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.

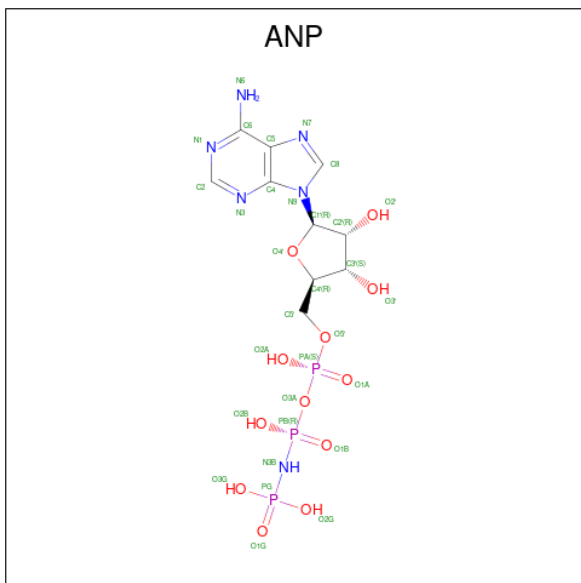
- Molecule 1 is a protein called A-TYPE ATP SYNTHASE CATALYTIC SUBUNIT A.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	524	4145	2650	707	771	17	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	79	ARG	GLY	engineered mutation	UNP O57728

- Molecule 2 is PHOSPHOAMINOPHOSPHONIC ACID-ADENYLATE ESTER (three-letter code: ANP) (formula: $C_{10}H_{17}N_6O_{12}P_3$).



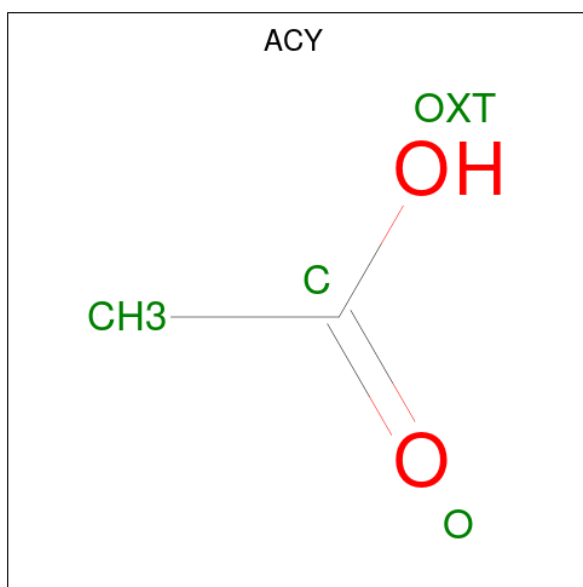
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	31	10	6	12	3	0	0

- Molecule 3 is (4S)-2-METHYL-2,4-PENTANEDIOL (three-letter code: MPD) (formula: $C_6H_{14}O_2$).



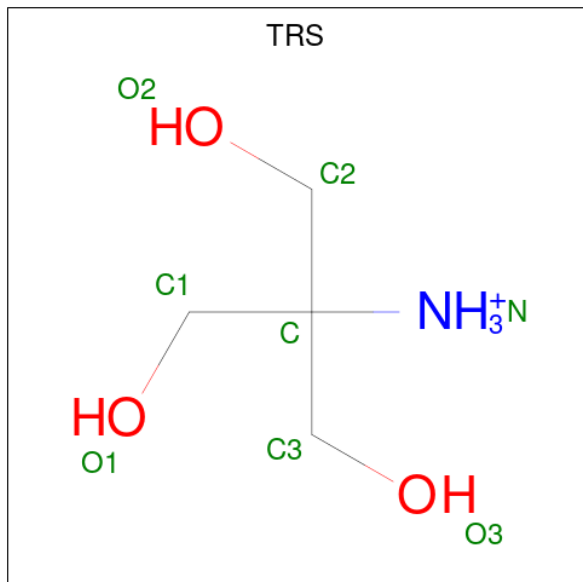
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	1	Total C O 8 6 2	0	0
3	A	1	Total C O 8 6 2	0	0
3	A	1	Total C O 8 6 2	0	0

- Molecule 4 is ACETIC ACID (three-letter code: ACY) (formula: C₂H₄O₂).



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

- Molecule 5 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (three-letter code: TRS) (formula: C₄H₁₂NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
			Total	C	N	O		
5	A	1	8	4	1	3	0	0

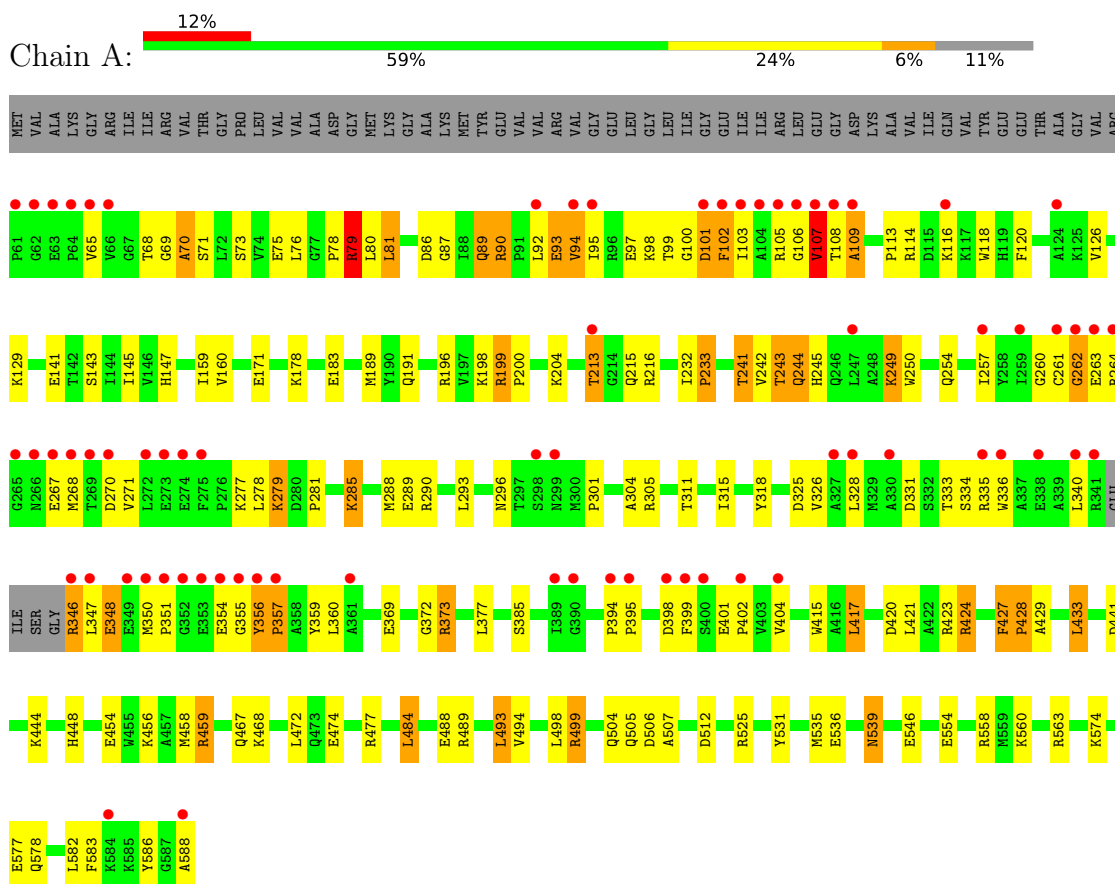
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	352	Total	O	0	0
			352	352		

3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

- Molecule 1: A-TYPE ATP SYNTHASE CATALYTIC SUBUNIT A



4 Data and refinement statistics

Property	Value	Source
Space group	P 43 21 2	Depositor
Cell constants a, b, c, α , β , γ	128.39Å 128.39Å 105.02Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	31.14 – 2.40 31.14 – 2.40	Depositor EDS
% Data completeness (in resolution range)	99.7 (31.14-2.40) 99.7 (31.14-2.40)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.33 (at 2.39Å)	Xtrriage
Refinement program	REFMAC	Depositor
R, R_{free}	0.219 , 0.249 0.220 , 0.230	Depositor DCC
R_{free} test set	1744 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	52.9	Xtrriage
Anisotropy	0.020	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 69.1	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	4564	wwPDB-VP
Average B, all atoms (Å ²)	64.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.23% 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: TRS, ANP, ACY, MPD

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	0.66	0/4236	0.79	9/5738 (0.2%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	A	0	3

There are no bond length outliers.

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
1	A	373	ARG	NE-CZ-NH2	-9.84	115.38	120.30
1	A	499	ARG	NE-CZ-NH2	-9.32	115.64	120.30
1	A	199	ARG	NE-CZ-NH2	-7.70	116.45	120.30
1	A	499	ARG	NE-CZ-NH1	6.59	123.60	120.30
1	A	459	ARG	CG-CD-NE	6.03	124.47	111.80
1	A	373	ARG	NE-CZ-NH1	5.53	123.07	120.30
1	A	199	ARG	NE-CZ-NH1	5.50	123.05	120.30
1	A	498	LEU	CB-CG-CD1	-5.29	102.01	111.00
1	A	94	VAL	N-CA-C	5.02	124.57	111.00

There are no chirality outliers.

All (3) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	233	PRO	Peptide

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Mol	Chain	Res	Type	Group
1	A	427	PHE	Peptide,Mainchain

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	4145	0	4194	154	0
2	A	31	0	13	33	0
3	A	24	0	42	10	0
4	A	4	0	3	0	0
5	A	8	0	12	0	0
6	A	352	0	0	14	0
All	All	4564	0	4264	159	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 19.

All (159) 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:A:428:PRO:HA	2:A:589:ANP:O2'	1.40	1.19
1:A:242:VAL:H	2:A:589:ANP:H1'	1.12	1.11
1:A:401:GLU:HB2	1:A:402:PRO:HD2	1.34	1.10
1:A:429:ALA:H	2:A:589:ANP:H3'	1.26	0.97
1:A:244:GLN:HE21	1:A:244:GLN:H	0.99	0.97
1:A:243:THR:CG2	2:A:589:ANP:H2'	1.96	0.94
1:A:242:VAL:N	2:A:589:ANP:H1'	1.83	0.93
3:A:590:MPD:H13	6:A:793:HOH:O	1.69	0.93
1:A:261:CYS:HA	1:A:296:ASN:HB2	1.53	0.91
1:A:507:ALA:H	2:A:589:ANP:HN62	1.17	0.90
1:A:243:THR:HG23	2:A:589:ANP:H2'	1.51	0.90
1:A:241:THR:CB	2:A:589:ANP:H4'	2.01	0.88
1:A:241:THR:HA	2:A:589:ANP:C4'	2.03	0.87
1:A:216:ARG:H	1:A:505:GLN:HE22	1.22	0.87
1:A:348:GLU:HG3	1:A:356:TYR:H	1.40	0.86
1:A:213:THR:HG23	1:A:215:GLN:HG2	1.56	0.85

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:433:LEU:HD22	3:A:590:MPD:CM	2.06	0.85
1:A:241:THR:HB	2:A:589:ANP:H4'	1.58	0.85
1:A:241:THR:HA	2:A:589:ANP:H4'	1.56	0.85
1:A:429:ALA:HB3	2:A:589:ANP:H5'1	1.57	0.85
1:A:428:PRO:HA	2:A:589:ANP:HO2'	1.39	0.84
1:A:79:ARG:HG3	1:A:118:TRP:HZ2	1.42	0.84
1:A:241:THR:CA	2:A:589:ANP:H4'	2.08	0.83
1:A:346:ARG:HA	1:A:357:PRO:HB3	1.58	0.83
1:A:428:PRO:HD3	2:A:589:ANP:C2	2.08	0.83
1:A:244:GLN:H	1:A:244:GLN:NE2	1.77	0.83
1:A:458:MET:CE	3:A:591:MPD:HM1	2.09	0.82
1:A:262:GLY:HA3	1:A:333:THR:OG1	1.81	0.80
1:A:454:GLU:HG3	6:A:936:HOH:O	1.79	0.80
1:A:241:THR:HG22	2:A:589:ANP:O5'	1.80	0.80
1:A:333:THR:HG22	1:A:334:SER:H	1.45	0.78
1:A:75:GLU:H	1:A:89:GLN:HE22	1.30	0.77
1:A:429:ALA:CB	2:A:589:ANP:H5'1	2.15	0.77
1:A:213:THR:HG22	1:A:215:GLN:H	1.48	0.76
1:A:433:LEU:HD22	3:A:590:MPD:HM3	1.70	0.74
1:A:147:HIS:HE1	1:A:318:TYR:OH	1.70	0.74
1:A:79:ARG:HD2	6:A:614:HOH:O	1.87	0.73
1:A:458:MET:HE3	3:A:591:MPD:HM1	1.68	0.73
1:A:507:ALA:N	2:A:589:ANP:HN62	1.87	0.73
1:A:241:THR:HA	2:A:589:ANP:O4'	1.87	0.73
1:A:254:GLN:HE22	1:A:325:ASP:H	1.36	0.73
1:A:346:ARG:HG2	1:A:357:PRO:HG3	1.71	0.73
1:A:245:HIS:HE1	6:A:689:HOH:O	1.72	0.72
1:A:433:LEU:HD22	3:A:590:MPD:HM2	1.70	0.72
1:A:191:GLN:OE1	1:A:199:ARG:NH2	2.21	0.72
1:A:79:ARG:CG	1:A:118:TRP:HZ2	2.02	0.71
1:A:395:PRO:HD2	1:A:401:GLU:HG3	1.72	0.71
1:A:120:PHE:HB2	1:A:189:MET:CE	2.21	0.71
1:A:448:HIS:HE1	1:A:456:LYS:H	1.39	0.70
1:A:78:PRO:O	1:A:79:ARG:HB2	1.93	0.69
1:A:468:LYS:HE2	6:A:656:HOH:O	1.94	0.68
1:A:87:GLY:HA3	1:A:304:ALA:O	1.92	0.68
1:A:114:ARG:NH1	1:A:171:GLU:OE2	2.26	0.68
1:A:506:ASP:HA	2:A:589:ANP:HN62	1.58	0.68
1:A:244:GLN:HE21	1:A:244:GLN:N	1.83	0.68
1:A:554:GLU:OE2	1:A:558:ARG:NH2	2.23	0.67
1:A:243:THR:HG22	2:A:589:ANP:H2'	1.78	0.66

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:198:LYS:HE3	1:A:369:GLU:OE2	1.94	0.66
1:A:254:GLN:NE2	1:A:325:ASP:H	1.93	0.65
1:A:261:CYS:SG	1:A:262:GLY:N	2.68	0.65
1:A:296:ASN:HB3	1:A:305:ARG:HE	1.62	0.65
1:A:399:PHE:C	1:A:404:VAL:HG11	2.17	0.65
1:A:401:GLU:HB2	1:A:402:PRO:CD	2.20	0.64
1:A:216:ARG:H	1:A:505:GLN:NE2	1.95	0.64
1:A:204:LYS:HD2	1:A:372:GLY:HA3	1.80	0.63
1:A:333:THR:HG22	1:A:334:SER:N	2.13	0.63
3:A:590:MPD:C1	6:A:793:HOH:O	2.38	0.62
1:A:241:THR:OG1	1:A:244:GLN:NE2	2.34	0.61
1:A:261:CYS:H	1:A:331:ASP:HB3	1.65	0.61
1:A:499:ARG:NH2	6:A:663:HOH:O	2.33	0.60
1:A:261:CYS:HB3	1:A:331:ASP:HB3	1.84	0.60
1:A:458:MET:HE2	1:A:525:ARG:HA	1.84	0.60
2:A:589:ANP:O2'	2:A:589:ANP:C4	2.48	0.59
1:A:86:ASP:OD2	1:A:90:ARG:HG3	2.02	0.59
1:A:100:GLY:C	1:A:102:PHE:H	2.06	0.59
1:A:143:SER:OG	1:A:289:GLU:OE2	2.20	0.59
1:A:288:MET:HE3	1:A:293:LEU:HG	1.84	0.58
1:A:129:LYS:HD3	6:A:733:HOH:O	2.03	0.58
1:A:394:PRO:HB3	1:A:401:GLU:CD	2.23	0.58
1:A:355:GLY:O	1:A:359:TYR:HB2	2.04	0.56
1:A:141:GLU:OE1	1:A:147:HIS:HD2	1.88	0.56
1:A:245:HIS:CE1	6:A:689:HOH:O	2.54	0.56
1:A:250:TRP:CH2	1:A:281:PRO:HB2	2.41	0.56
1:A:288:MET:CE	1:A:293:LEU:HG	2.35	0.56
1:A:458:MET:CE	1:A:525:ARG:HA	2.35	0.56
1:A:311:THR:O	1:A:315:ILE:HG13	2.06	0.55
1:A:257:ILE:HB	1:A:328:LEU:HD12	1.89	0.54
1:A:245:HIS:O	1:A:249:LYS:HG2	2.08	0.54
1:A:507:ALA:H	2:A:589:ANP:C6	2.20	0.54
1:A:290:ARG:NH2	6:A:651:HOH:O	2.39	0.53
1:A:261:CYS:O	1:A:263:GLU:HG3	2.09	0.52
1:A:147:HIS:CE1	1:A:318:TYR:OH	2.58	0.52
1:A:69:GLY:O	1:A:103:ILE:HA	2.11	0.51
1:A:242:VAL:HG22	2:A:589:ANP:C4	2.41	0.51
1:A:583:PHE:O	1:A:588:ALA:N	2.43	0.51
1:A:428:PRO:CA	2:A:589:ANP:O2'	2.34	0.51
1:A:213:THR:HG23	1:A:215:GLN:CG	2.36	0.51
2:A:589:ANP:O2'	2:A:589:ANP:N3	2.43	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:420:ASP:O	1:A:424:ARG:HD3	2.11	0.51
1:A:472:LEU:HD21	1:A:488:GLU:HG2	1.93	0.51
1:A:535:MET:O	1:A:539:ASN:HB2	2.11	0.51
1:A:69:GLY:O	1:A:70:ALA:CB	2.59	0.50
1:A:428:PRO:CA	2:A:589:ANP:HO2'	2.16	0.50
1:A:494:VAL:HG11	1:A:531:TYR:HB2	1.93	0.49
1:A:242:VAL:HG22	2:A:589:ANP:N9	2.26	0.49
1:A:394:PRO:HB3	1:A:401:GLU:OE2	2.12	0.49
1:A:95:ILE:O	1:A:301:PRO:HG3	2.12	0.48
1:A:279:LYS:HD3	1:A:279:LYS:HA	1.65	0.48
1:A:355:GLY:O	1:A:357:PRO:HD3	2.14	0.48
1:A:232:ILE:HG12	1:A:417:LEU:HD22	1.96	0.48
1:A:79:ARG:CG	1:A:118:TRP:CZ2	2.90	0.48
1:A:241:THR:OG1	1:A:244:GLN:CD	2.52	0.48
1:A:114:ARG:HH11	1:A:171:GLU:CD	2.17	0.48
1:A:348:GLU:HB3	1:A:351:PRO:HG3	1.96	0.48
1:A:106:GLY:O	1:A:107:VAL:HG13	2.14	0.47
1:A:507:ALA:N	2:A:589:ANP:N6	2.46	0.47
1:A:81:LEU:HB2	1:A:141:GLU:OE2	2.15	0.46
1:A:277:LYS:O	1:A:279:LYS:HE2	2.14	0.46
1:A:420:ASP:O	1:A:424:ARG:CD	2.63	0.46
1:A:574:LYS:O	1:A:578:GLN:HG3	2.15	0.46
1:A:143:SER:OG	1:A:285:LYS:HD3	2.15	0.46
1:A:97:GLU:HG2	1:A:98:LYS:N	2.31	0.46
1:A:79:ARG:HD3	1:A:113:PRO:HG3	1.99	0.45
1:A:120:PHE:HB2	1:A:189:MET:HE3	1.98	0.45
1:A:108:THR:O	1:A:109:ALA:HB2	2.17	0.45
1:A:261:CYS:H	1:A:331:ASP:CB	2.28	0.45
1:A:484:LEU:HB3	1:A:489:ARG:HG3	2.00	0.44
1:A:241:THR:HA	2:A:589:ANP:C1'	2.47	0.44
1:A:546:GLU:OE2	1:A:586:TYR:HE1	2.00	0.44
1:A:373:ARG:HG3	1:A:385:SER:HB3	1.99	0.44
1:A:75:GLU:H	1:A:89:GLN:NE2	2.05	0.44
1:A:213:THR:CG2	1:A:215:GLN:H	2.22	0.44
1:A:427:PHE:O	1:A:504:GLN:HA	2.16	0.44
1:A:512:ASP:OD2	1:A:560:LYS:HD3	2.18	0.44
1:A:264:ARG:HG2	6:A:902:HOH:O	2.18	0.43
1:A:216:ARG:N	1:A:505:GLN:HE22	2.02	0.43
1:A:160:VAL:HG11	1:A:178:LYS:HE3	1.98	0.43
1:A:126:VAL:HA	1:A:159:ILE:HG22	1.99	0.43
1:A:429:ALA:N	2:A:589:ANP:H3'	2.11	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:243:THR:CG2	2:A:589:ANP:C2'	2.85	0.43
1:A:441:ASP:HA	1:A:444:LYS:HD3	2.01	0.43
1:A:200:PRO:HG2	1:A:377:LEU:HD11	2.02	0.42
1:A:92:LEU:HB3	1:A:93:GLU:HG2	2.02	0.42
1:A:79:ARG:HG3	1:A:118:TRP:CZ2	2.35	0.42
1:A:113:PRO:HB2	1:A:116:LYS:HG2	2.02	0.41
1:A:493:LEU:HD22	6:A:896:HOH:O	2.20	0.41
1:A:69:GLY:O	1:A:70:ALA:HB3	2.21	0.41
1:A:76:LEU:HA	1:A:80:LEU:HD11	2.03	0.41
1:A:114:ARG:HD2	1:A:171:GLU:HG2	2.02	0.41
1:A:433:LEU:CD2	3:A:590:MPD:HM2	2.43	0.41
1:A:81:LEU:HD21	1:A:145:ILE:HB	2.03	0.41
1:A:399:PHE:N	1:A:401:GLU:OE2	2.54	0.41
1:A:102:PHE:HD1	1:A:103:ILE:H	1.68	0.40
1:A:360:LEU:H	1:A:360:LEU:HD12	1.87	0.40
1:A:433:LEU:CD2	3:A:590:MPD:CM	2.90	0.40
1:A:233:PRO:HD3	1:A:415:TRP:O	2.22	0.40
1:A:468:LYS:CE	6:A:656:HOH:O	2.61	0.40
1:A:429:ALA:HB2	2:A:589:ANP:H5'1	2.00	0.40
3:A:591:MPD:H13	6:A:610:HOH:O	2.22	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	520/588 (88%)	476 (92%)	33 (6%)	11 (2%)	7 8

All (11) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	79	ARG

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Mol	Chain	Res	Type
1	A	94	VAL
1	A	107	VAL
1	A	109	ALA
1	A	357	PRO
1	A	101	ASP
1	A	428	PRO
1	A	70	ALA
1	A	262	GLY
1	A	347	LEU
1	A	260	GLY

5.3.2 Protein sidechains [i](#)

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	A	444/493 (90%)	390 (88%)	54 (12%)	5 6

All (54) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	65	VAL
1	A	68	THR
1	A	71	SER
1	A	73	SER
1	A	79	ARG
1	A	81	LEU
1	A	89	GLN
1	A	90	ARG
1	A	93	GLU
1	A	99	THR
1	A	101	ASP
1	A	102	PHE
1	A	105	ARG
1	A	107	VAL
1	A	183	GLU
1	A	196	ARG

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Mol	Chain	Res	Type
1	A	213	THR
1	A	241	THR
1	A	243	THR
1	A	244	GLN
1	A	249	LYS
1	A	267	GLU
1	A	268	MET
1	A	270	ASP
1	A	271	VAL
1	A	278	LEU
1	A	279	LYS
1	A	285	LYS
1	A	326	VAL
1	A	335	ARG
1	A	336	TRP
1	A	340	LEU
1	A	346	ARG
1	A	348	GLU
1	A	350	MET
1	A	354	GLU
1	A	356	TYR
1	A	398	ASP
1	A	417	LEU
1	A	421	LEU
1	A	423	ARG
1	A	424	ARG
1	A	433	LEU
1	A	459	ARG
1	A	467	GLN
1	A	474	GLU
1	A	477	ARG
1	A	484	LEU
1	A	493	LEU
1	A	536	GLU
1	A	539	ASN
1	A	563	ARG
1	A	577	GLU
1	A	582	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	89	GLN
1	A	147	HIS
1	A	244	GLN
1	A	254	GLN
1	A	448	HIS
1	A	505	GLN

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](#)

6 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	$\# Z > 2$
2	ANP	A	589	-	29,33,33	2.00	8 (27%)	31,52,52	2.19	11 (35%)
3	MPD	A	590	-	7,7,7	0.33	0	9,10,10	0.35	0
3	MPD	A	592	-	7,7,7	0.28	0	9,10,10	0.51	0
5	TRS	A	594	-	7,7,7	0.33	0	9,9,9	0.37	0
3	MPD	A	591	-	7,7,7	0.34	0	9,10,10	0.35	0
4	ACY	A	593	-	3,3,3	0.80	0	3,3,3	0.74	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	ANP	A	589	-	1/1/7/8	3/14/38/38	0/3/3/3
3	MPD	A	590	-	-	0/5/5/5	-
3	MPD	A	592	-	-	1/5/5/5	-
5	TRS	A	594	-	-	0/9/9/9	-
3	MPD	A	591	-	-	0/5/5/5	-

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	589	ANP	PG-N3B	4.72	1.75	1.63
2	A	589	ANP	PB-N3B	4.65	1.75	1.63
2	A	589	ANP	PG-O1G	3.65	1.52	1.46
2	A	589	ANP	PB-O1B	3.52	1.51	1.46
2	A	589	ANP	C5-C4	2.70	1.48	1.40
2	A	589	ANP	PB-O3A	2.60	1.62	1.59
2	A	589	ANP	O4'-C1'	2.16	1.44	1.41
2	A	589	ANP	PG-O3G	-2.06	1.51	1.56

All (11) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	589	ANP	O1G-PG-N3B	-5.83	103.18	111.77
2	A	589	ANP	C3'-C2'-C1'	4.82	108.24	100.98
2	A	589	ANP	O1B-PB-N3B	-3.80	106.18	111.77
2	A	589	ANP	O2B-PB-O1B	3.76	117.81	109.92
2	A	589	ANP	N3-C2-N1	-3.74	122.83	128.68
2	A	589	ANP	PB-O3A-PA	-3.15	121.50	132.62
2	A	589	ANP	O4'-C4'-C5'	2.51	117.64	109.37
2	A	589	ANP	O4'-C1'-C2'	-2.46	103.33	106.93
2	A	589	ANP	O2'-C2'-C3'	-2.14	104.89	111.82
2	A	589	ANP	O2G-PG-O3G	2.11	113.25	107.64
2	A	589	ANP	O3'-C3'-C2'	-2.04	105.22	111.82

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	589	ANP	C2'

All (4) torsion outliers are listed below:

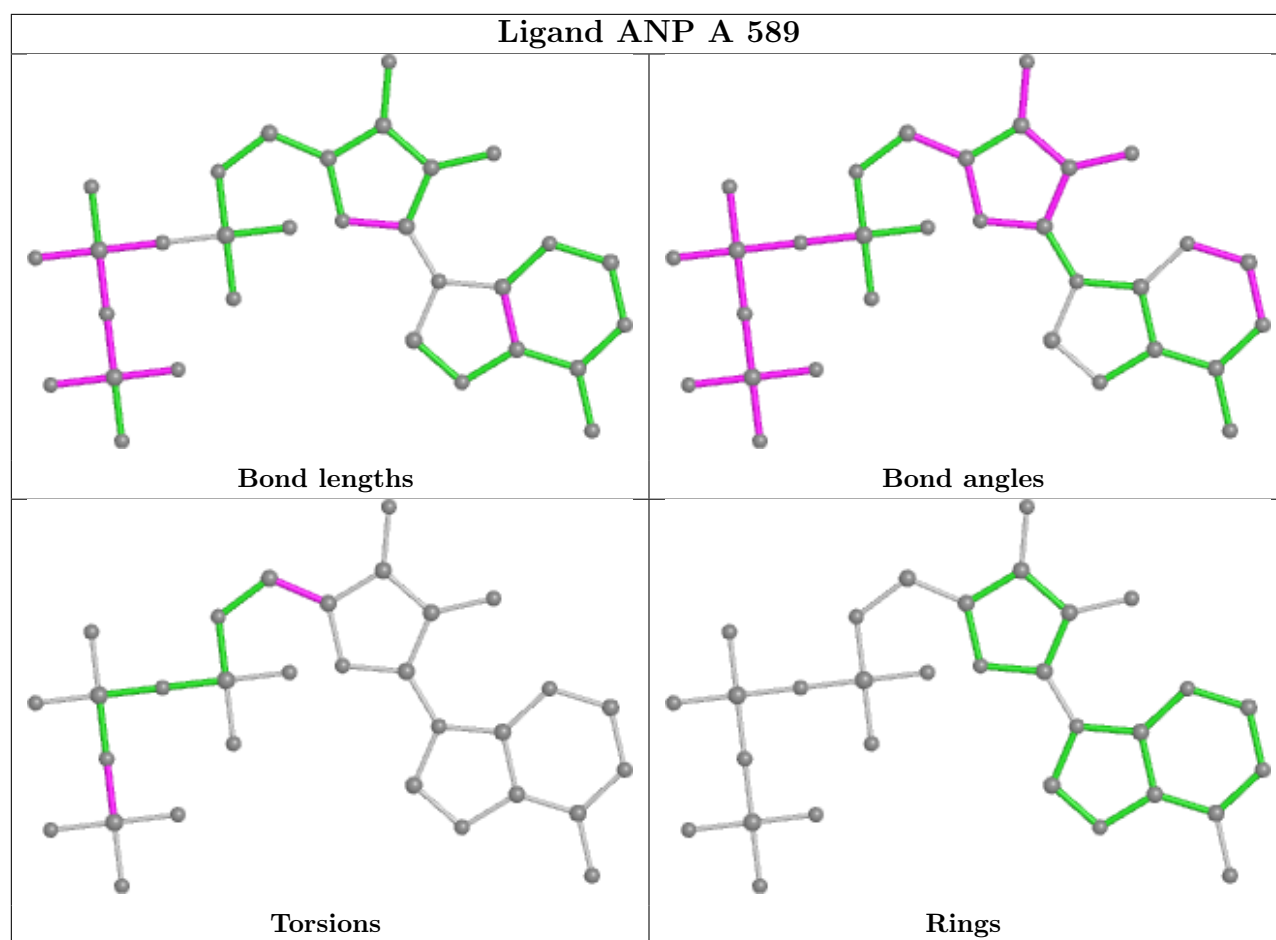
Mol	Chain	Res	Type	Atoms
2	A	589	ANP	PB-N3B-PG-O1G
2	A	589	ANP	O4'-C4'-C5'-O5'
2	A	589	ANP	C3'-C4'-C5'-O5'
3	A	592	MPD	C1-C2-C3-C4

There are no ring outliers.

3 monomers are involved in 43 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	589	ANP	33	0
3	A	590	MPD	7	0
3	A	591	MPD	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	524/588 (89%)	0.55	71 (13%) 3 2	32, 57, 120, 135	0

All (71) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	107	VAL	16.9
1	A	95	ILE	11.3
1	A	94	VAL	9.9
1	A	351	PRO	8.4
1	A	350	MET	8.2
1	A	102	PHE	6.7
1	A	264	ARG	6.5
1	A	108	THR	5.8
1	A	62	GLY	5.3
1	A	340	LEU	5.1
1	A	65	VAL	5.0
1	A	395	PRO	5.0
1	A	355	GLY	4.9
1	A	265	GLY	4.8
1	A	272	LEU	4.7
1	A	268	MET	4.7
1	A	64	PRO	4.6
1	A	266	ASN	4.4
1	A	262	GLY	4.4
1	A	273	GLU	4.3
1	A	347	LEU	4.3
1	A	354	GLU	4.2
1	A	106	GLY	4.2
1	A	61	PRO	4.1
1	A	275	PHE	4.0
1	A	404	VAL	4.0
1	A	66	VAL	3.9

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Mol	Chain	Res	Type	RSRZ
1	A	352	GLY	3.9
1	A	270	ASP	3.7
1	A	349	GLU	3.7
1	A	389	ILE	3.6
1	A	269	THR	3.6
1	A	400	SER	3.6
1	A	398	ASP	3.5
1	A	361	ALA	3.4
1	A	399	PHE	3.3
1	A	63	GLU	3.2
1	A	353	GLU	3.2
1	A	357	PRO	3.2
1	A	259	ILE	3.2
1	A	341	ARG	3.0
1	A	402	PRO	3.0
1	A	335	ARG	3.0
1	A	92	LEU	2.8
1	A	336	TRP	2.7
1	A	299	ASN	2.7
1	A	263	GLU	2.7
1	A	101	ASP	2.7
1	A	105	ARG	2.7
1	A	356	TYR	2.7
1	A	298	SER	2.6
1	A	274	GLU	2.6
1	A	588	ALA	2.5
1	A	104	ALA	2.5
1	A	257	ILE	2.5
1	A	394	PRO	2.5
1	A	330	ALA	2.5
1	A	116	LYS	2.4
1	A	346	ARG	2.4
1	A	261	CYS	2.4
1	A	328	LEU	2.4
1	A	390	GLY	2.3
1	A	213	THR	2.3
1	A	338	GLU	2.3
1	A	327	ALA	2.2
1	A	247	LEU	2.2
1	A	109	ALA	2.2
1	A	103	ILE	2.2
1	A	584	LYS	2.1

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Mol	Chain	Res	Type	RSRZ
1	A	124	ALA	2.0
1	A	267	GLU	2.0

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

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

6.3 Carbohydrates [i](#)

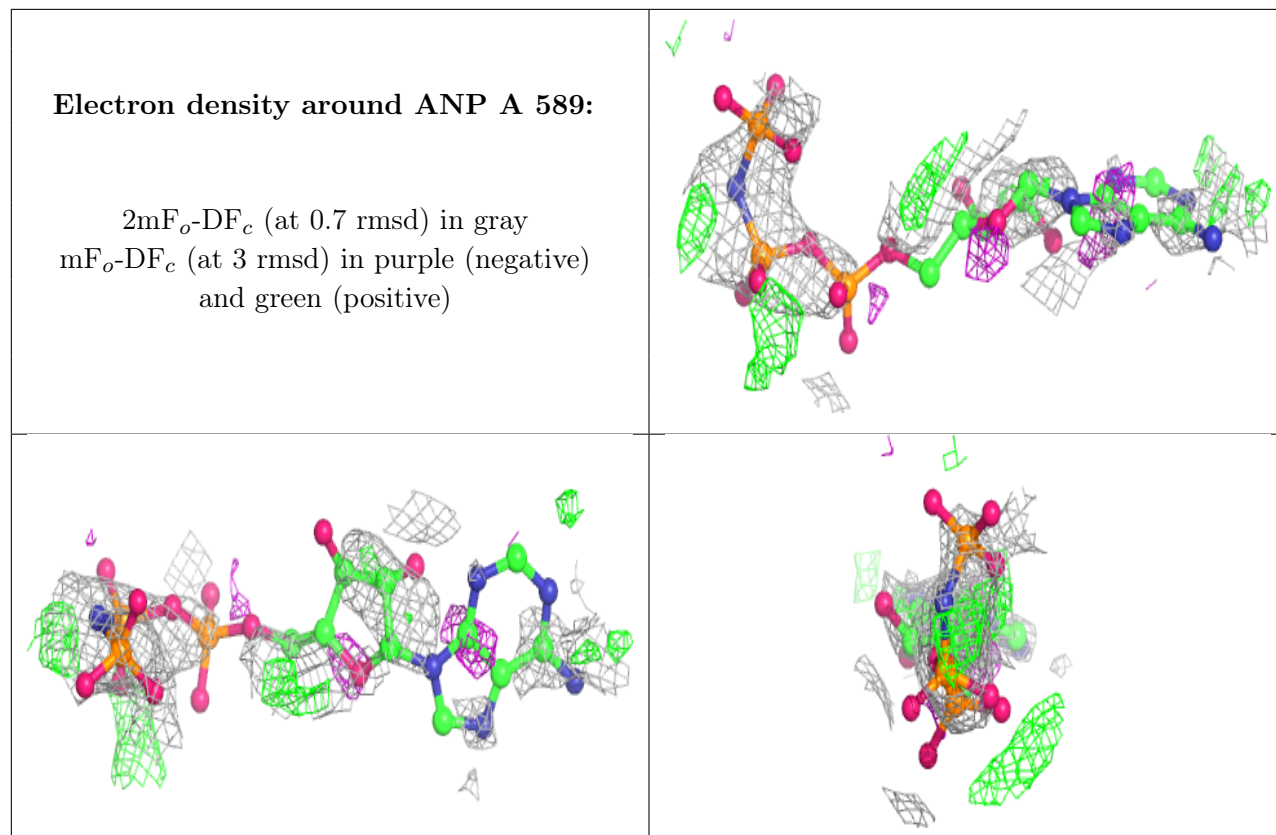
There are no monosaccharides in this entry.

6.4 Ligands [i](#)

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

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
2	ANP	A	589	31/31	0.66	0.48	62,69,83,84	31
4	ACY	A	593	4/4	0.79	0.33	100,100,100,100	0
3	MPD	A	591	8/8	0.83	0.26	78,81,83,84	0
5	TRS	A	594	8/8	0.85	0.20	104,105,105,105	0
3	MPD	A	590	8/8	0.87	0.34	72,74,80,82	0
3	MPD	A	592	8/8	0.95	0.21	73,74,75,75	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.