



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 29, 2026 – 03:25 PM UTC

PDB ID : 6XRC / pdb_00006xrc
Title : Apo NIS synthetase DesD variant R306Q
Authors : Hoffmann, K.M.
Deposited on : 2020-07-11
Resolution : 2.45 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 : **FAILED**
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

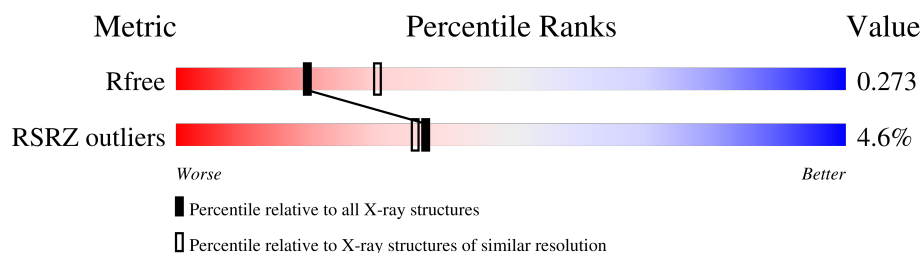
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.45 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	1190 (2.46-2.46)
RSRZ outliers	180081	1190 (2.46-2.46)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 18955 atoms, of which 8852 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.

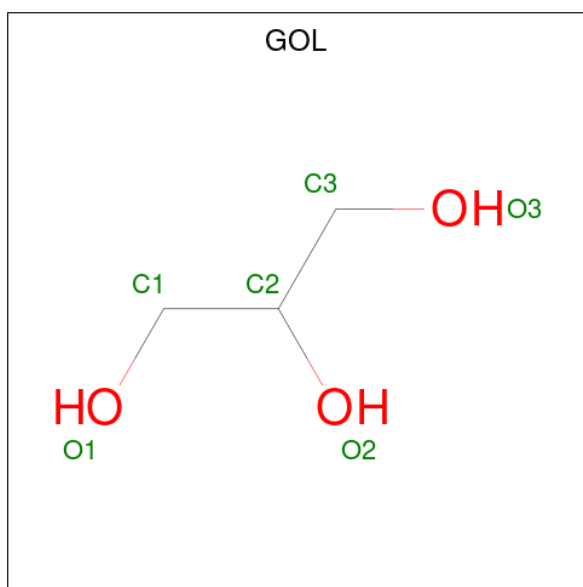
- Molecule 1 is a protein called Desferrioxamine E biosynthesis protein DesD.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	595	Total	C	H	N	O	S	0	2	0
			9093	2984	4407	811	876	15			
1	B	595	Total	C	H	N	O	S	0	3	0
			9105	2988	4411	812	879	15			

There are 18 discrepancies between the modelled and reference sequences:

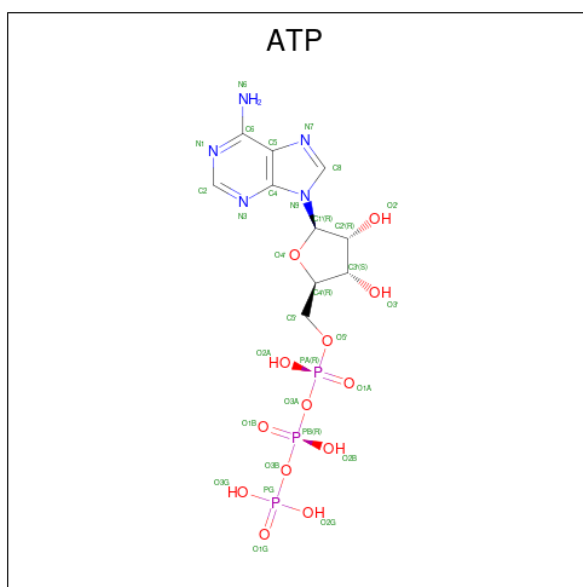
Chain	Residue	Modelled	Actual	Comment	Reference
A	306	GLN	ARG	engineered mutation	UNP Q9L069
A	596	LEU	-	expression tag	UNP Q9L069
A	597	GLN	-	expression tag	UNP Q9L069
A	598	HIS	-	expression tag	UNP Q9L069
A	599	HIS	-	expression tag	UNP Q9L069
A	600	HIS	-	expression tag	UNP Q9L069
A	601	HIS	-	expression tag	UNP Q9L069
A	602	HIS	-	expression tag	UNP Q9L069
A	603	HIS	-	expression tag	UNP Q9L069
B	306	GLN	ARG	engineered mutation	UNP Q9L069
B	596	LEU	-	expression tag	UNP Q9L069
B	597	GLN	-	expression tag	UNP Q9L069
B	598	HIS	-	expression tag	UNP Q9L069
B	599	HIS	-	expression tag	UNP Q9L069
B	600	HIS	-	expression tag	UNP Q9L069
B	601	HIS	-	expression tag	UNP Q9L069
B	602	HIS	-	expression tag	UNP Q9L069
B	603	HIS	-	expression tag	UNP Q9L069

- Molecule 2 is GLYCEROL (CCD ID: GOL) (formula: C₃H₈O₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total 12	C 3	H 6	O 3	0	0
2	A	1	Total 12	C 3	H 6	O 3	0	0
2	B	1	Total 12	C 3	H 6	O 3	0	0

- Molecule 3 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	P	0	0
			39	10	8	5	13	3		

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Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	B	1	Total	C	H	N	O	P	0	0
			39	10	8	5	13	3		

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Mg	0	0
			1	1		
4	B	2	Total	Mg	0	0
			2	2		

- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	323	Total	O	0	0
			323	323		
5	B	317	Total	O	0	0
			317	317		

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3 Data and refinement statistics

Property	Value	Source
Space group	P 2 ₁ 2 ₁ 2 ₁	Depositor
Cell constants a, b, c, α , β , γ	74.42Å 98.92Å 183.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	59.47 – 2.45 59.47 – 2.45	Depositor EDS
% Data completeness (in resolution range)	99.8 (59.47-2.45) 86.3 (59.47-2.45)	Depositor EDS
R_{merge}	0.15	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.39 (at 2.45Å)	Xtriage
Refinement program	REFMAC 5.8.0258	Depositor
R, R_{free}	0.200 , 0.270 0.206 , 0.273	Depositor DCC
R_{free} test set	2494 reflections (3.67%)	wwPDB-VP
Wilson B-factor (Å ²)	24.2	Xtriage
Anisotropy	1.018	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.42 , 47.9	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	18955	wwPDB-VP
Average B, all atoms (Å ²)	49.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 48.71 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 8.2717e-05. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

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4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

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4.3.2 Protein sidechains [i](#)

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4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

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

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

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 3 are monoatomic - leaving 5 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
3	ATP	B	702	4	32,33,33	0.65	0	48,52,52	0.59	0
2	GOL	B	701	-	5,5,5	0.22	0	5,5,5	0.74	0
2	GOL	A	701	-	5,5,5	0.07	0	5,5,5	0.28	0
2	GOL	A	702	-	5,5,5	0.14	0	5,5,5	0.43	0
3	ATP	A	703	4	32,33,33	0.79	1 (3%)	48,52,52	0.68	0

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	ATP	B	702	4	-	5/22/38/38	0/3/3/3
2	GOL	B	701	-	-	0/4/4/4	-
2	GOL	A	701	-	-	2/4/4/4	-
2	GOL	A	702	-	-	1/4/4/4	-
3	ATP	A	703	4	-	4/22/38/38	0/3/3/3

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	703	ATP	PB-O3B	2.51	1.62	1.59

There are no bond angle outliers.

There are no chirality outliers.

All (12) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	701	GOL	O1-C1-C2-O2
2	A	701	GOL	O1-C1-C2-C3
3	A	703	ATP	PB-O3B-PG-O2G
3	B	702	ATP	PB-O3B-PG-O3G
2	A	702	GOL	C1-C2-C3-O3
3	A	703	ATP	C4'-C5'-O5'-PA
3	B	702	ATP	C4'-C5'-O5'-PA
3	B	702	ATP	O4'-C4'-C5'-O5'

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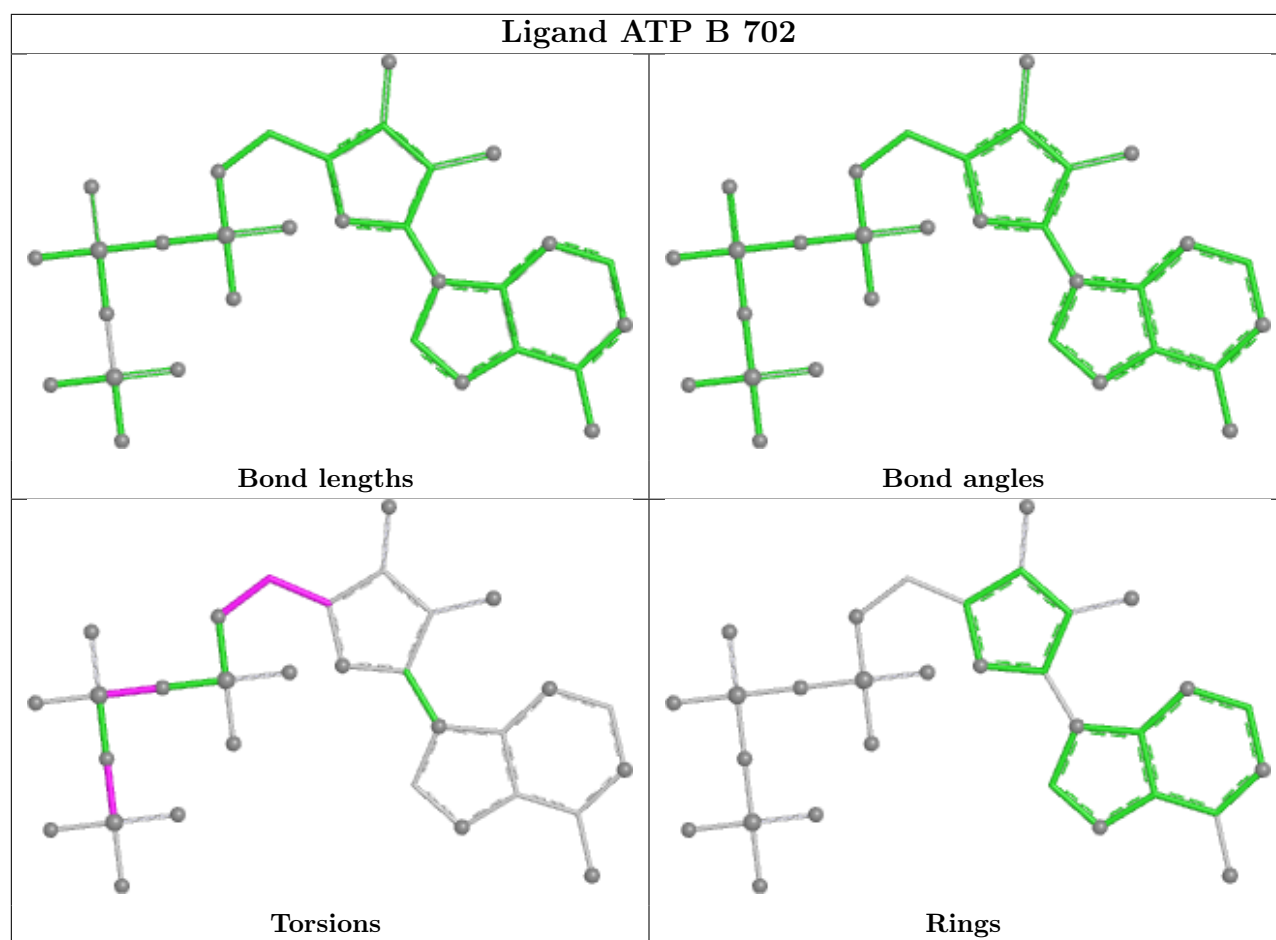
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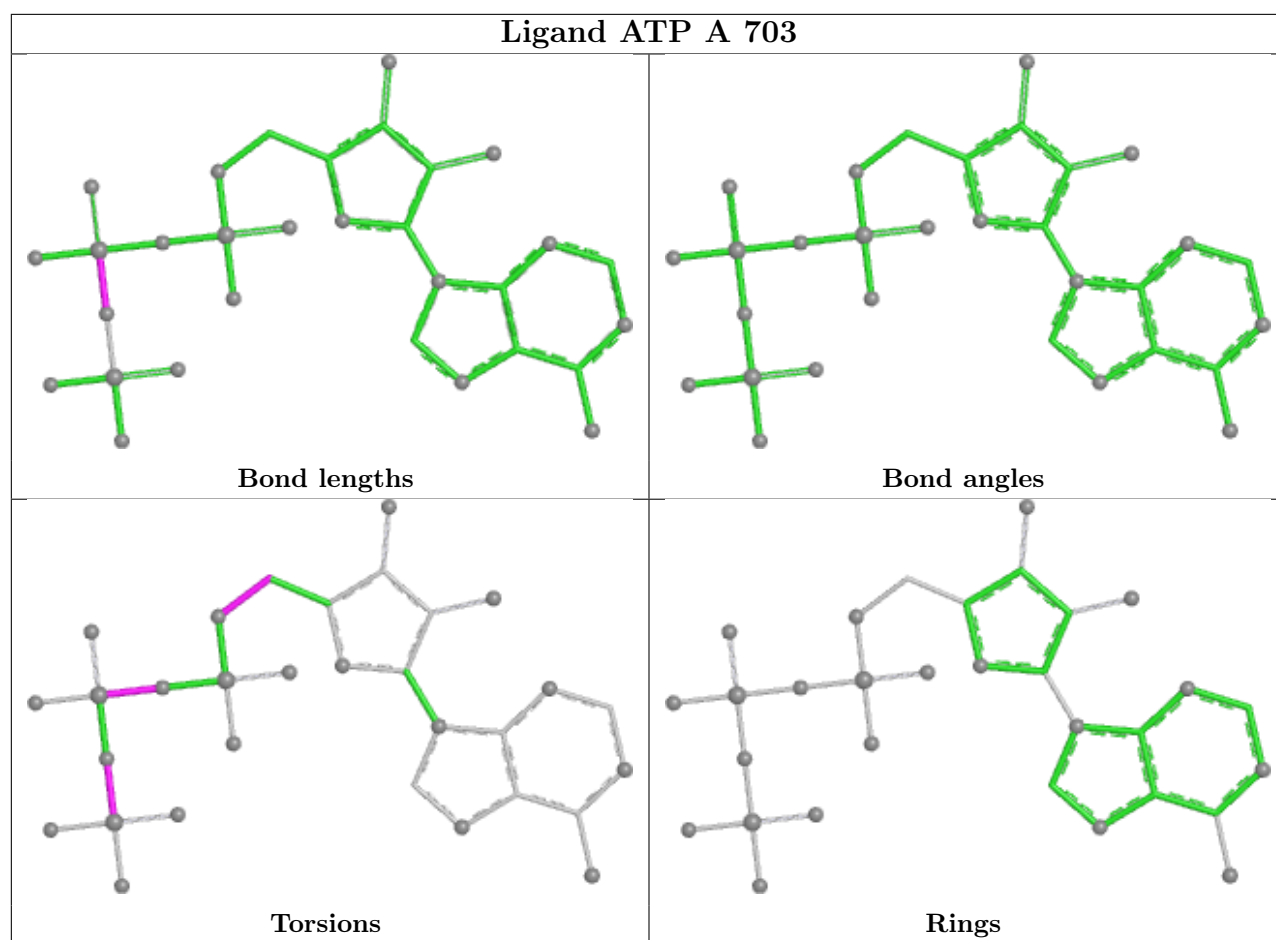
Mol	Chain	Res	Type	Atoms
3	A	703	ATP	PB-O3B-PG-O3G
3	B	702	ATP	PB-O3B-PG-O2G
3	A	703	ATP	PA-O3A-PB-O2B
3	B	702	ATP	PA-O3A-PB-O2B

There are no ring outliers.

No monomer is involved in short contacts.

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.





4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data

5.1 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	595/603 (98%)	0.36	25 (4%)	40 40	21, 47, 84, 135	2 (0%)
1	B	595/603 (98%)	0.36	30 (5%)	34 32	20, 46, 84, 146	3 (0%)
All	All	1190/1206 (98%)	0.36	55 (4%)	37 36	20, 47, 84, 146	5 (0%)

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	44	ASP	5.3
1	B	43	ASP	5.2
1	A	44	ASP	4.8
1	B	578	PRO	4.8
1	A	574	ASP	4.2
1	B	576	ALA	4.2
1	B	42	PRO	4.0
1	B	577	ASP	4.0
1	A	43	ASP	4.0
1	A	579	SER	3.9
1	A	312	TYR	3.9
1	A	48	GLN	3.8
1	A	578	PRO	3.8
1	B	45	GLY	3.6
1	B	46	GLY	3.6
1	B	596	LEU	3.6
1	A	47	GLY	3.5
1	B	569	ASN	3.4
1	B	573	VAL	3.4
1	B	579	SER	3.4
1	A	45	GLY	3.4
1	A	569	ASN	3.3
1	A	577	ASP	3.3
1	A	573	VAL	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	574	ASP	3.2
1	B	312	TYR	3.2
1	B	580	GLY	3.0
1	B	86	GLY	3.0
1	A	572	MET	2.9
1	B	572	MET	2.9
1	B	85	ASP	2.9
1	B	71	ASP	2.9
1	A	596	LEU	2.8
1	A	361	TYR	2.8
1	B	570	ARG	2.7
1	B	87	ALA	2.7
1	A	575	LEU	2.6
1	A	46	GLY	2.6
1	B	575	LEU	2.6
1	B	301	ASN	2.6
1	A	57	GLY	2.6
1	A	576	ALA	2.6
1	A	570	ARG	2.5
1	A	85	ASP	2.4
1	B	571	GLN	2.4
1	B	41	GLU	2.4
1	B	57	GLY	2.3
1	B	306	GLN	2.3
1	A	86	GLY	2.3
1	A	87	ALA	2.3
1	A	571	GLN	2.1
1	B	227	ARG	2.0
1	A	42	PRO	2.0
1	B	304	PHE	2.0
1	B	302	MET	2.0

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

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

5.3 Carbohydrates ⓘ

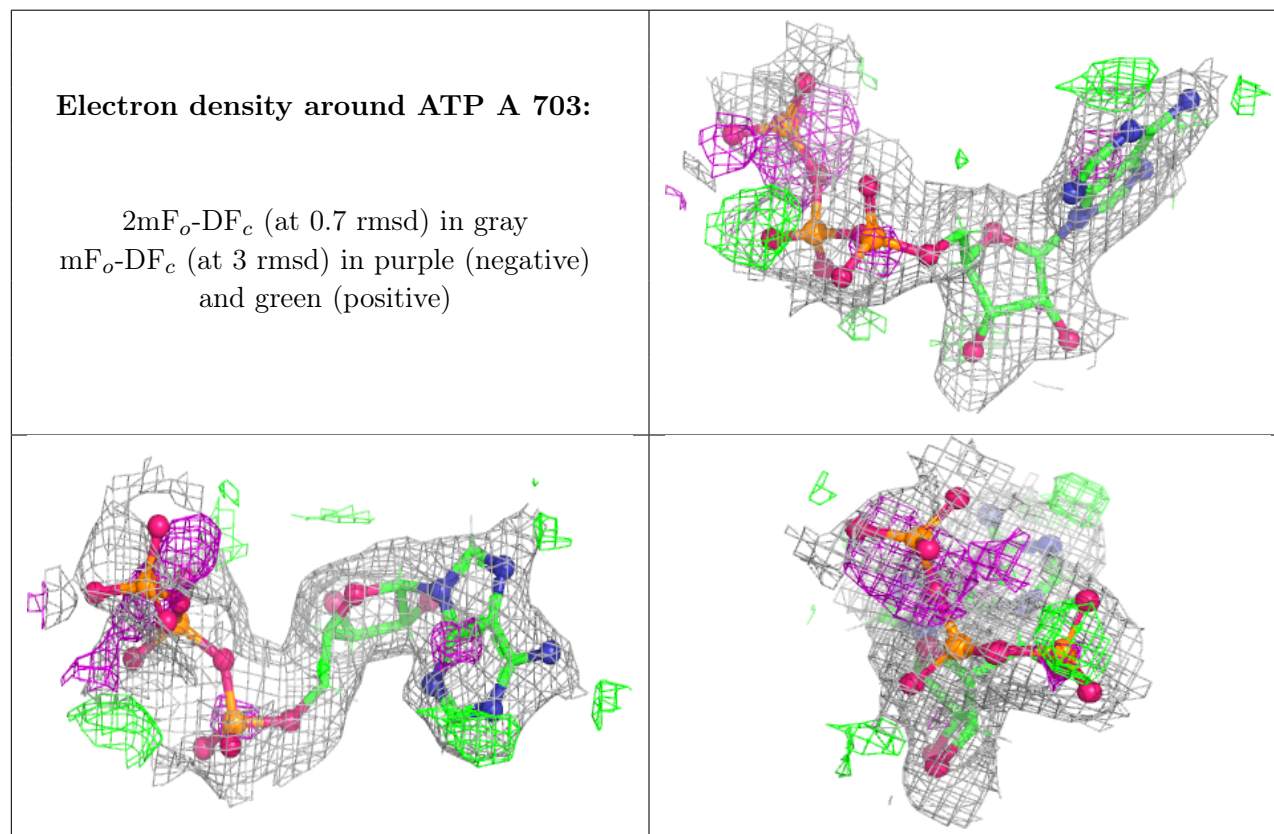
There are no oligosaccharides in this entry.

5.4 Ligands ⓘ

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.

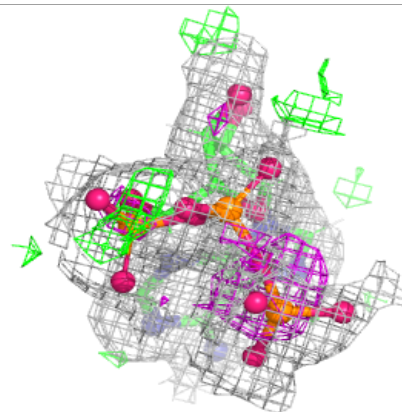
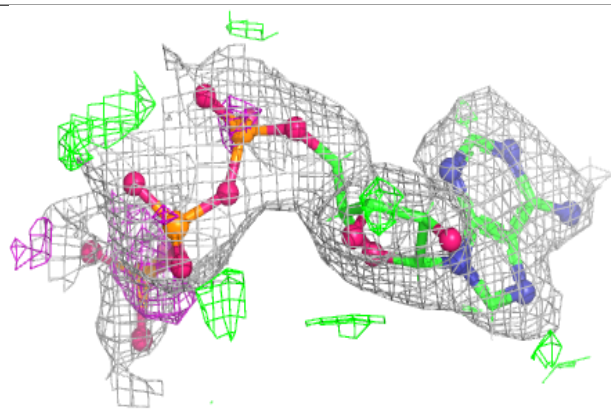
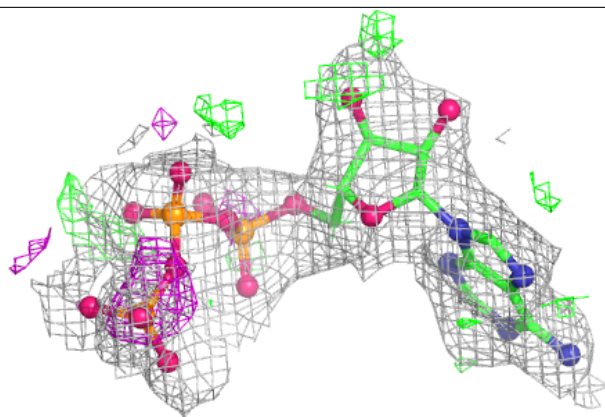
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
4	MG	B	704	1/1	0.73	0.15	55,55,55,55	0
3	ATP	A	703	31/31	0.82	0.15	40,50,97,107	0
4	MG	A	704	1/1	0.85	0.11	57,57,57,57	0
2	GOL	A	701	6/6	0.86	0.13	42,43,45,45	0
3	ATP	B	702	31/31	0.87	0.13	43,51,80,96	0
2	GOL	B	701	6/6	0.87	0.24	38,43,44,44	0
2	GOL	A	702	6/6	0.87	0.17	35,46,52,52	0
4	MG	B	703	1/1	0.94	0.06	46,46,46,46	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 B 702:

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



5.5 Other polymers [i](#)

There are no such residues in this entry.