



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 4, 2026 – 07:26 PM UTC

PDB ID : 1CE8 / pdb\_00001ce8  
Title : CARBAMOYL PHOSPHATE SYNTHETASE FROM ESCHERICHIS COLI  
WITH COMPLEXED WITH THE ALLOSTERIC LIGAND IMP  
Authors : Thoden, J.B.; Raushel, F.M.; Holden, H.M.  
Deposited on : 1999-03-18  
Resolution : 2.10 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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/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>.

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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)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
Buster-report : wwPDB partial adaption of 1.1.7 (2018)  
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.49

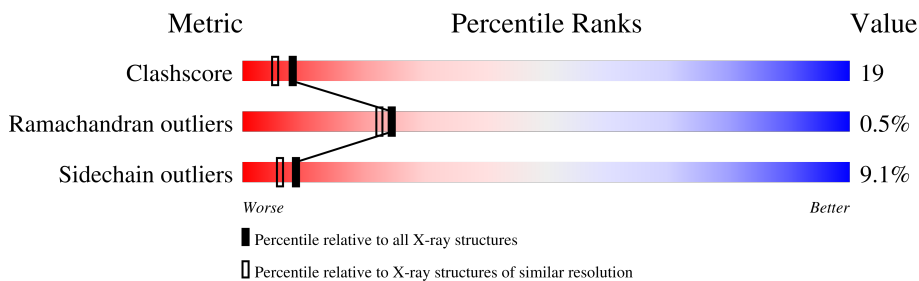
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.10 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))
Clashscore	190562	7164 (2.10-2.10)
Ramachandran outliers	187476	7099 (2.10-2.10)
Sidechain outliers	187428	7100 (2.10-2.10)

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

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	1073	63% 31% 5% .
1	C	1073	63% 30% 5% .
1	E	1073	64% 29% 5% .
1	G	1073	53% 37% 8% ..
2	B	382	50% 40% 8% ..
2	D	382	61% 34% . .
2	F	382	53% 39% 7% ..
2	H	382	35% 50% 12% ..

## 2 Entry composition [i](#)

There are 11 unique types of molecules in this entry. The entry contains 48888 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 PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	1058	8198	5143	1427	1583	45	0	8	0
1	C	1058	8167	5125	1426	1571	45	0	1	0
1	E	1058	8232	5165	1444	1578	45	0	12	0
1	G	1058	8170	5128	1424	1573	45	0	2	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	46	ASN	LEU	conflict	UNP P00968
C	46	ASN	LEU	conflict	UNP P00968
E	46	ASN	LEU	conflict	UNP P00968
G	46	ASN	LEU	conflict	UNP P00968

- Molecule 2 is a protein called PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE).

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	379	2902	1829	512	551	10	0	1	0
2	D	379	2899	1828	509	551	11	0	1	0
2	F	379	2900	1828	510	552	10	0	1	0
2	H	379	2895	1825	509	551	10	0	0	0

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	183	GLN	GLU	conflict	UNP P0A6F1
D	183	GLN	GLU	conflict	UNP P0A6F1
F	183	GLN	GLU	conflict	UNP P0A6F1
H	183	GLN	GLU	conflict	UNP P0A6F1

- Molecule 3 is MANGANESE (II) ION (CCD ID: MN) (formula: Mn).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	3	Total Mn 3 3	0	0
3	C	3	Total Mn 3 3	0	0
3	E	3	Total Mn 3 3	0	0
3	G	3	Total Mn 3 3	0	0

- Molecule 4 is POTASSIUM ION (CCD ID: K) (formula: K).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	6	Total K 6 6	0	0
4	B	1	Total K 1 1	0	0
4	C	6	Total K 6 6	0	0
4	D	1	Total K 1 1	0	0
4	E	6	Total K 6 6	0	0
4	F	1	Total K 1 1	0	0
4	G	6	Total K 6 6	0	0
4	H	1	Total K 1 1	0	0

- Molecule 5 is CHLORIDE ION (CCD ID: CL) (formula: Cl).

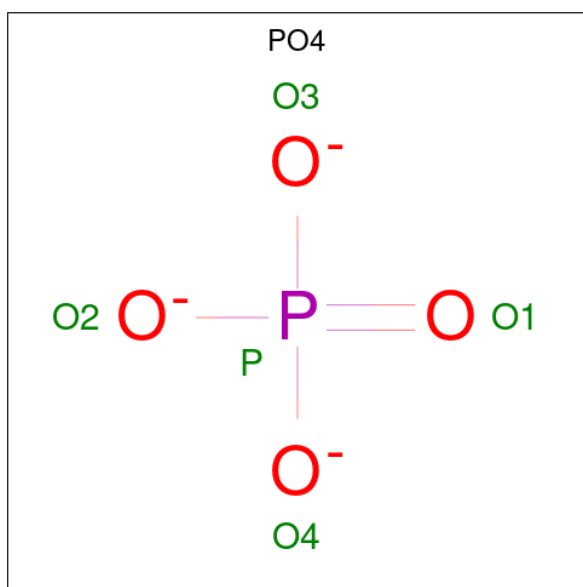
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	3	Total Cl 3 3	0	0

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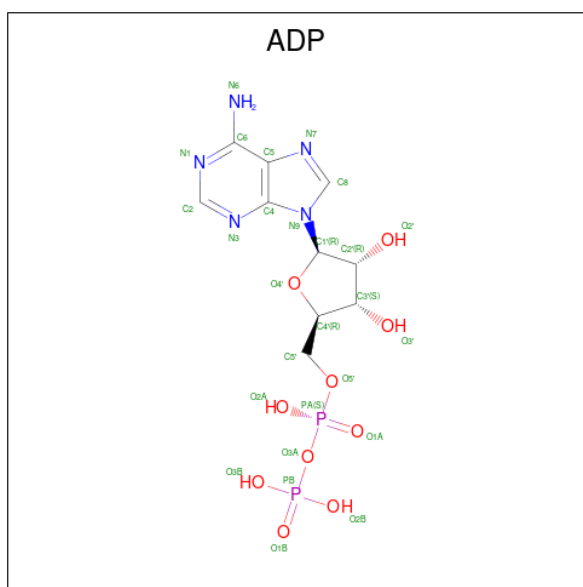
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	C	3	Total Cl 3 3	0	0
5	E	3	Total Cl 3 3	0	0
5	G	3	Total Cl 3 3	0	0

- Molecule 6 is PHOSPHATE ION (CCD ID: PO4) (formula: O<sub>4</sub>P).



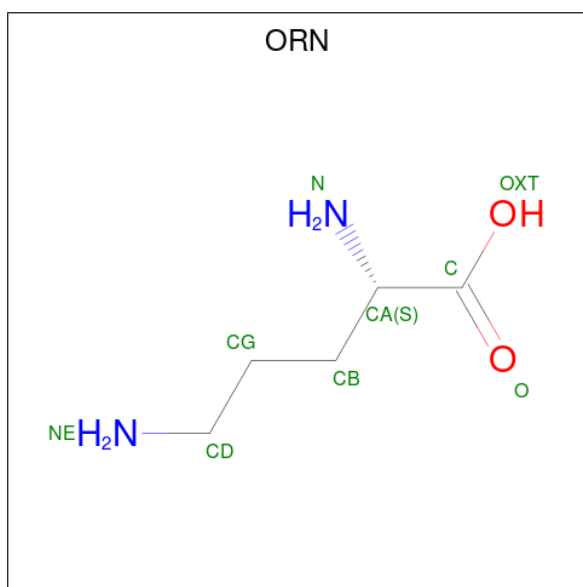
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
6	A	1	Total O P 5 4 1	0	0
6	C	1	Total O P 5 4 1	0	0
6	E	1	Total O P 5 4 1	0	0
6	G	1	Total O P 5 4 1	0	0

- Molecule 7 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C<sub>10</sub>H<sub>15</sub>N<sub>5</sub>O<sub>10</sub>P<sub>2</sub>).



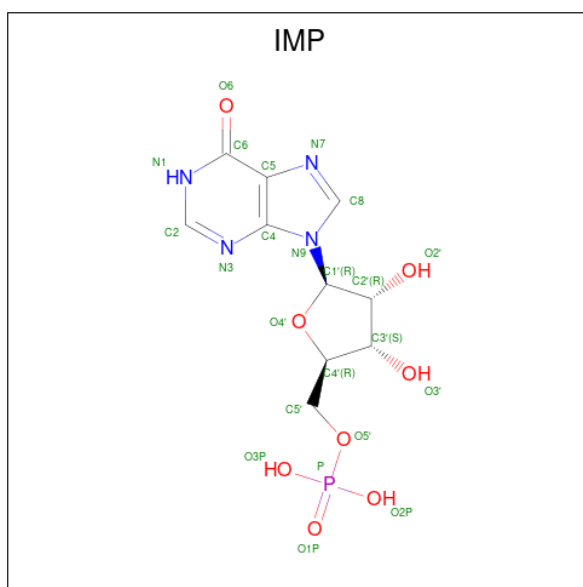
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
7	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	A	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	C	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	E	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	E	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	G	1	Total	C	N	O	P	0	0
			27	10	5	10	2		
7	G	1	Total	C	N	O	P	0	0
			27	10	5	10	2		

- Molecule 8 is L-ornithine (CCD ID: ORN) (formula: C<sub>5</sub>H<sub>12</sub>N<sub>2</sub>O<sub>2</sub>).



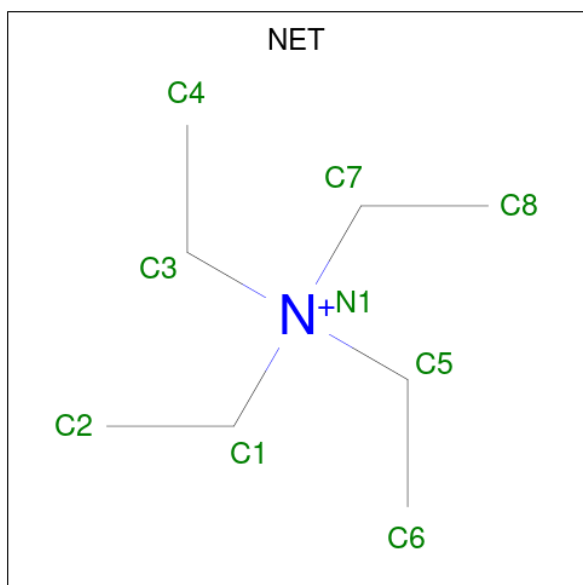
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
8	A	1	Total	C	N	O	0	0
			9	5	2	2		
8	A	1	Total	C	N	O	0	0
			9	5	2	2		
8	C	1	Total	C	N	O	0	0
			9	5	2	2		
8	C	1	Total	C	N	O	0	0
			9	5	2	2		
8	E	1	Total	C	N	O	0	0
			9	5	2	2		
8	E	1	Total	C	N	O	0	0
			9	5	2	2		
8	G	1	Total	C	N	O	0	0
			9	5	2	2		
8	G	1	Total	C	N	O	0	0
			9	5	2	2		

- Molecule 9 is INOSINIC ACID (CCD ID: IMP) (formula: C<sub>10</sub>H<sub>13</sub>N<sub>4</sub>O<sub>8</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
9	A	1	Total	C	N	O	P	0	0
			23	10	4	8	1		
9	C	1	Total	C	N	O	P	0	0
			23	10	4	8	1		
9	E	1	Total	C	N	O	P	0	0
			23	10	4	8	1		
9	G	1	Total	C	N	O	P	0	0
			23	10	4	8	1		

- Molecule 10 is TETRAETHYLAMMONIUM ION (CCD ID: NET) (formula:  $C_8H_{20}N$ ).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total	C	N	0	0
			9	8	1		
10	C	1	Total	C	N	0	0
			9	8	1		
10	E	1	Total	C	N	0	0
			9	8	1		
10	G	1	Total	C	N	0	0
			9	8	1		

- Molecule 11 is water.

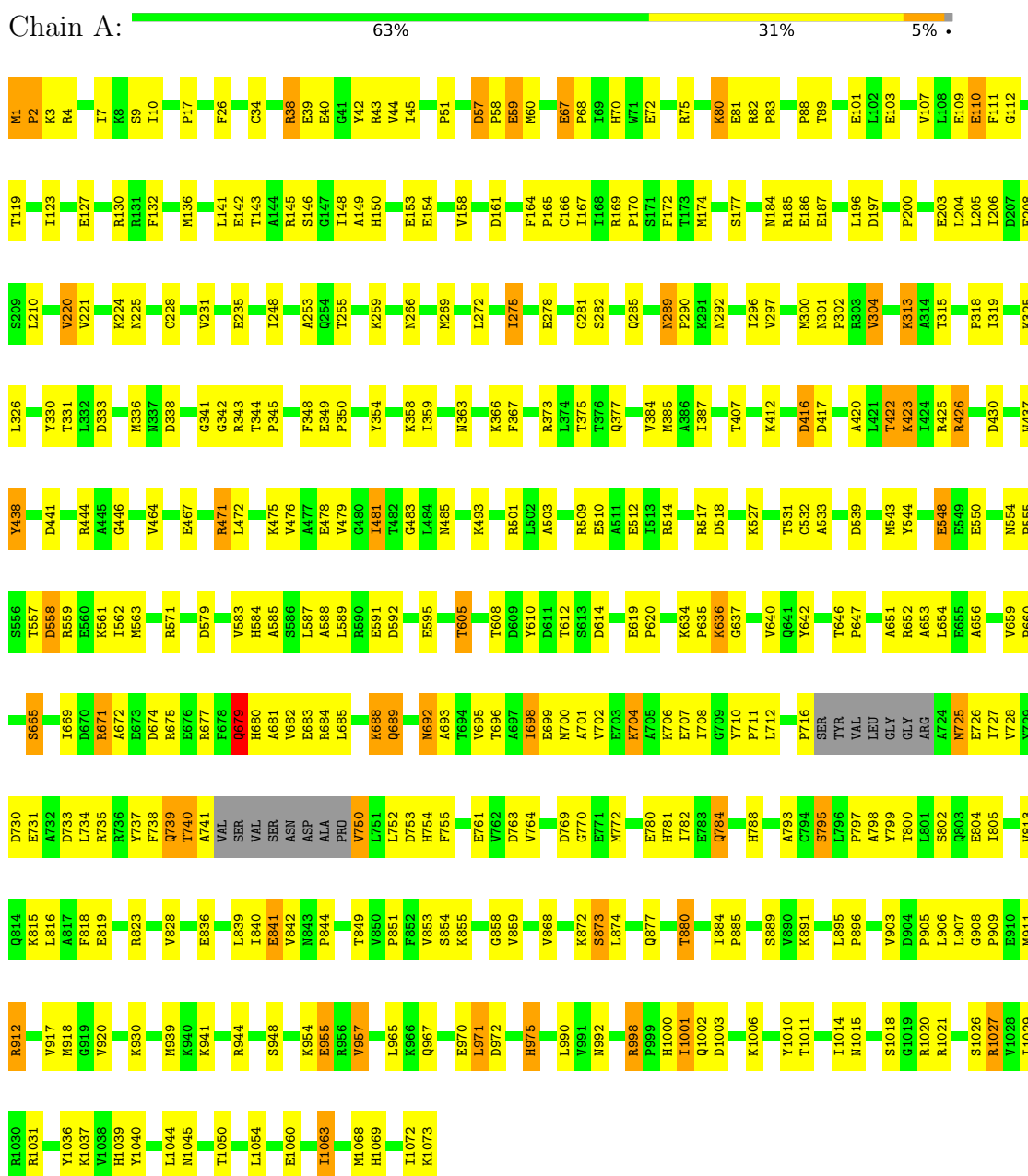
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
11	A	842	Total	O	0	0
			842	842		
11	B	190	Total	O	0	0
			190	190		
11	C	732	Total	O	0	0
			732	732		
11	D	193	Total	O	0	0
			193	193		
11	E	939	Total	O	0	0
			939	939		
11	F	233	Total	O	0	0
			233	233		
11	G	743	Total	O	0	0
			743	743		
11	H	165	Total	O	0	0
			165	165		

### 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. 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. 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.

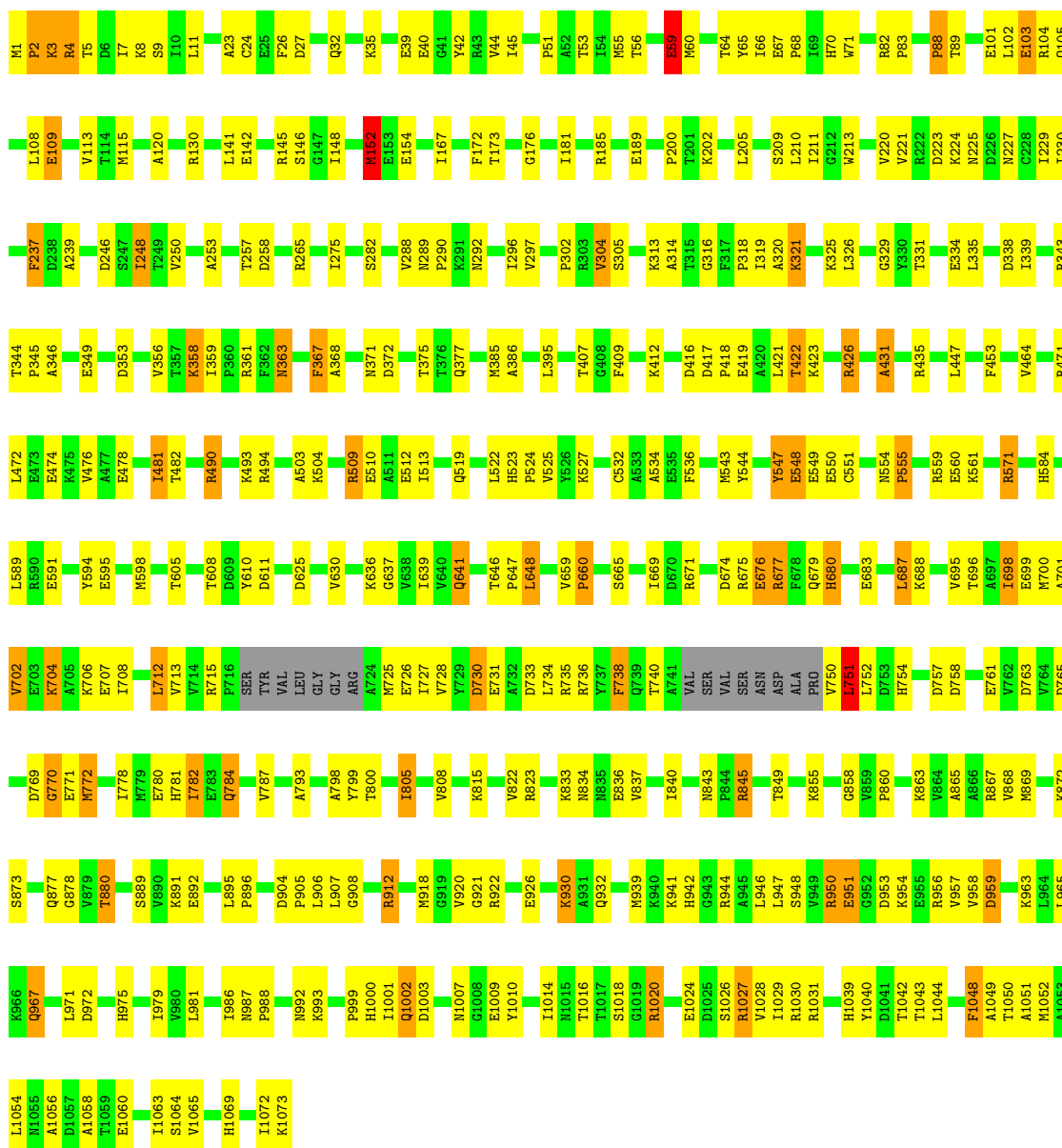
Note EDS was not executed.

- Molecule 1: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)



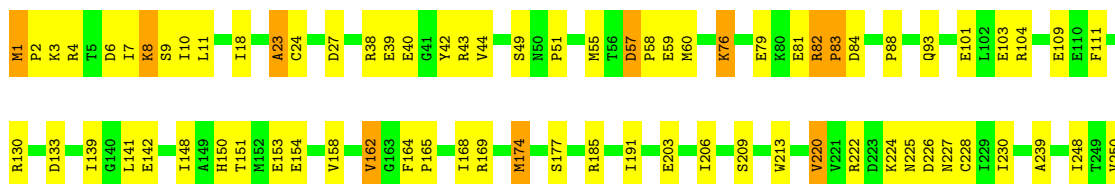
● Molecule 1: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)

Chain C:  63% 30% 5%

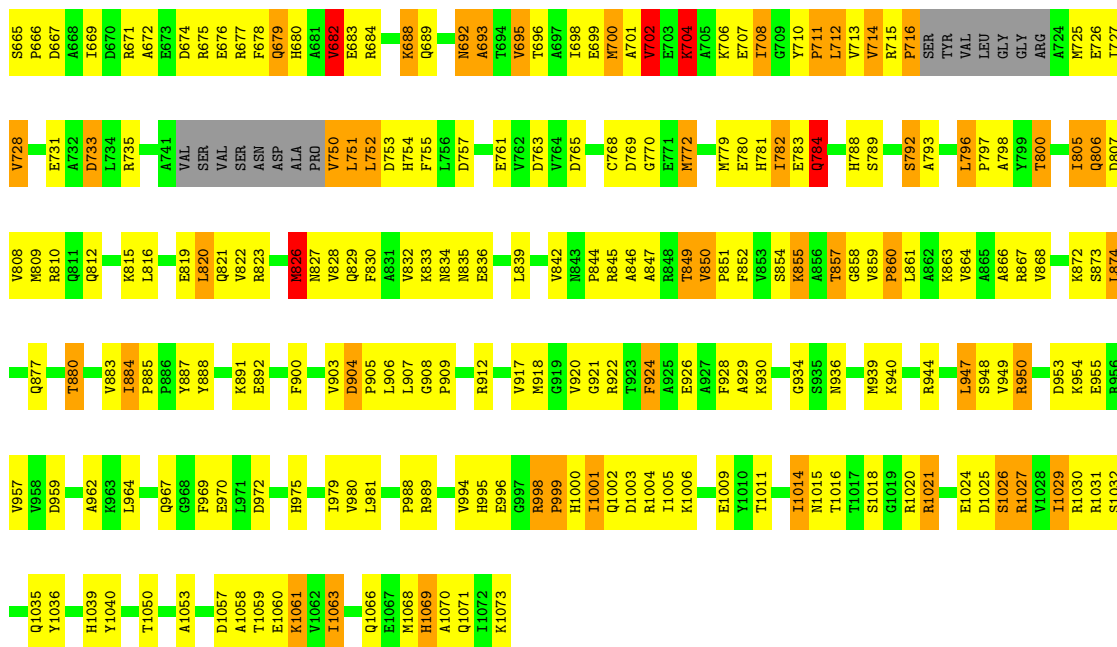


● Molecule 1: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)

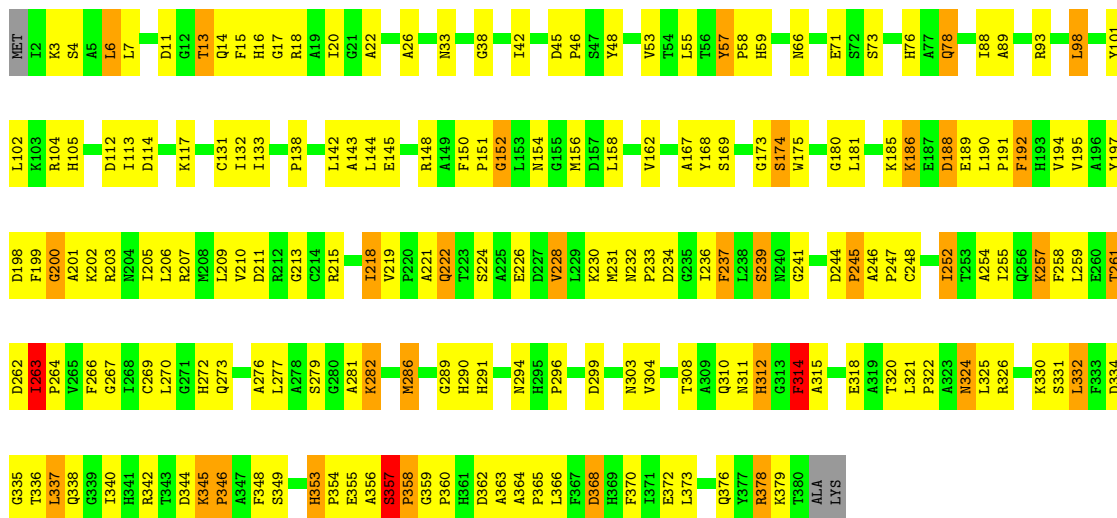
Chain E:  64% 29% 5%



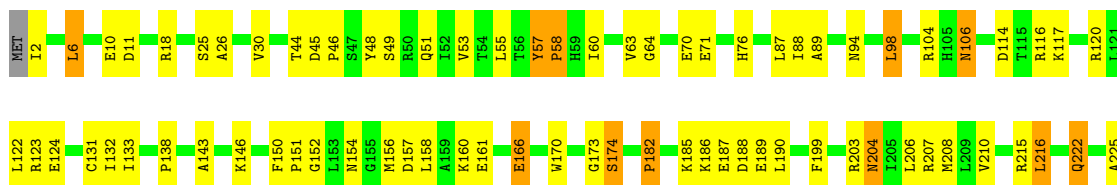


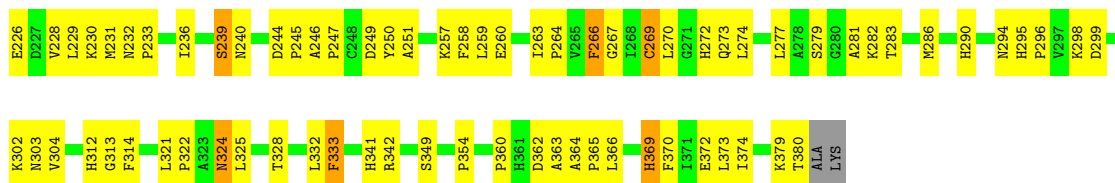


• Molecule 2: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)

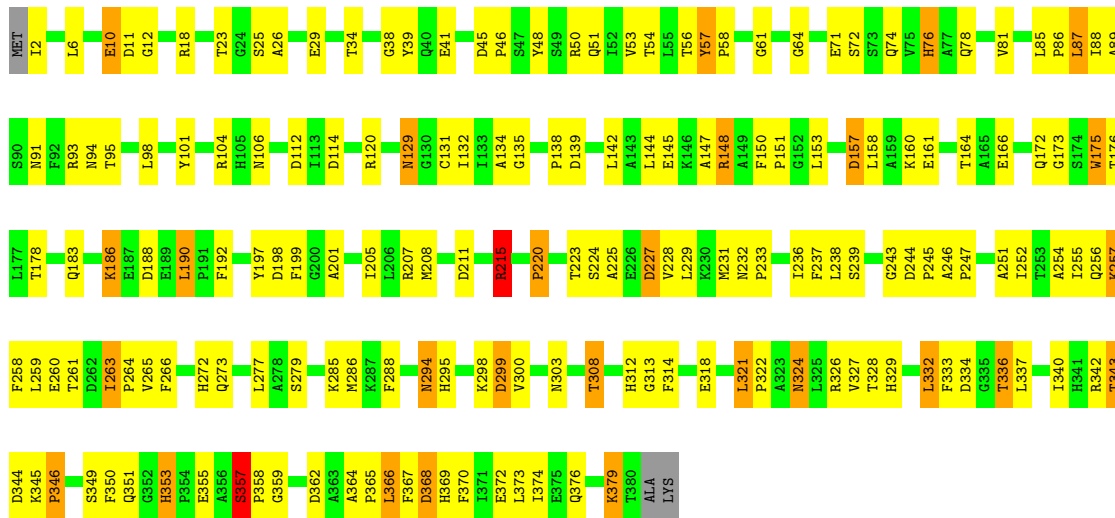


• Molecule 2: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)

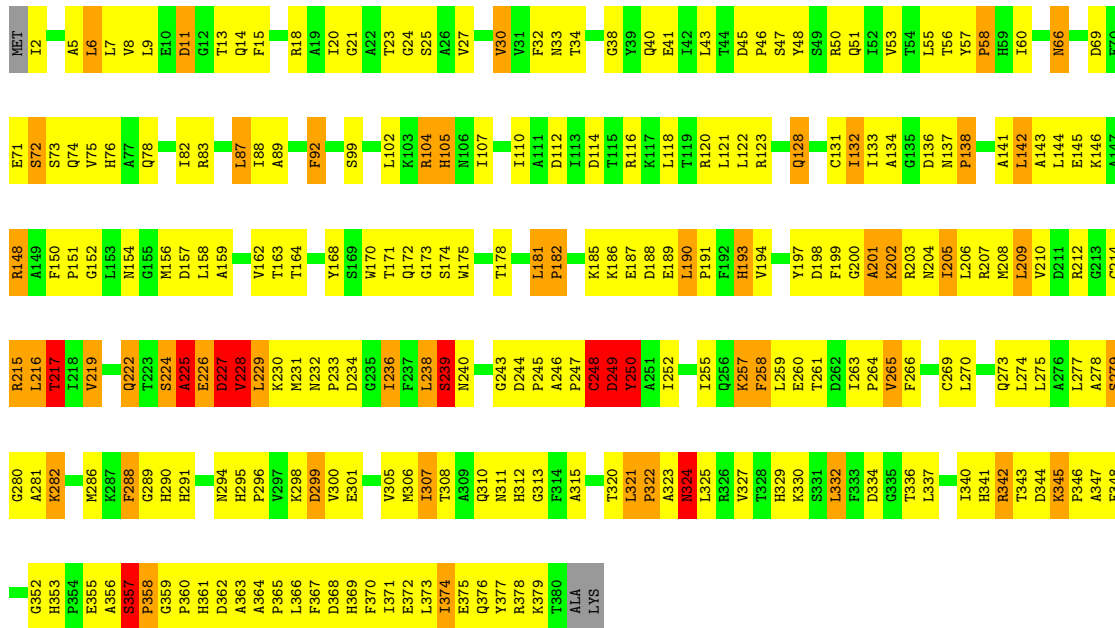
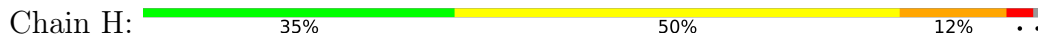




• Molecule 2: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)



• Molecule 2: PROTEIN (CARBAMOYL-PHOSPHATE SYNTHASE)



## 4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	152.10Å 163.90Å 331.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.10	Depositor
% Data completeness (in resolution range)	93.0 (30.00-2.10)	Depositor
$R_{merge}$	0.05	Depositor
$R_{sym}$	0.05	Depositor
Refinement program	TNT 5D	Depositor
R, $R_{free}$	0.193 , 0.250	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	48888	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	40.0	wwPDB-VP

## 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: MN, CL, ADP, IMP, PO4, ORN, NET, K

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	1.13	1/8356 (0.0%)	1.59	58/11295 (0.5%)
1	C	1.13	1/8297 (0.0%)	1.60	84/11216 (0.7%)
1	E	1.16	0/8406	1.64	109/11358 (1.0%)
1	G	1.14	2/8304 (0.0%)	1.71	125/11225 (1.1%)
2	B	1.07	2/2968 (0.1%)	1.67	36/4030 (0.9%)
2	D	1.10	1/2965 (0.0%)	1.62	30/4026 (0.7%)
2	F	1.13	6/2966 (0.2%)	1.68	41/4028 (1.0%)
2	H	1.20	6/2957 (0.2%)	1.77	59/4016 (1.5%)
All	All	1.14	19/45219 (0.0%)	1.65	542/61194 (0.9%)

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
2	B	0	2
2	H	0	2
All	All	0	4

The worst 5 of 19 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	H	227	ASP	CG-OD2	11.08	1.46	1.25
2	F	148	ARG	N-CA	-8.66	1.35	1.46
1	G	850	VAL	CA-CB	-7.80	1.50	1.54
1	A	841	GLU	CD-OE1	-7.56	1.10	1.25
2	H	324	ASN	CA-CB	7.52	1.64	1.53

The worst 5 of 542 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	357	SER	O-C-N	-17.94	100.69	121.32
2	H	357	SER	O-C-N	-16.69	102.13	121.32
2	F	357	SER	O-C-N	-16.68	102.14	121.32
1	G	50	ASN	CA-C-O	10.57	126.16	119.29
1	C	338	ASP	CA-CB-CG	10.04	122.64	112.60

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	314	PHE	Mainchain
2	B	357	SER	Peptide
2	H	250	TYR	Sidechain
2	H	357	SER	Peptide

## 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	8198	0	8215	279	1
1	C	8167	0	8201	257	0
1	E	8232	0	8274	256	0
1	G	8170	0	8204	358	0
2	B	2902	0	2872	154	0
2	D	2899	0	2868	98	0
2	F	2900	0	2867	122	1
2	H	2895	0	2863	241	0
3	A	3	0	0	0	0
3	C	3	0	0	0	0
3	E	3	0	0	0	0
3	G	3	0	0	0	0
4	A	6	0	0	0	0
4	B	1	0	0	0	0
4	C	6	0	0	0	0
4	D	1	0	0	0	0
4	E	6	0	0	0	0
4	F	1	0	0	0	0
4	G	6	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	H	1	0	0	0	0
5	A	3	0	0	0	0
5	C	3	0	0	0	0
5	E	3	0	0	1	0
5	G	3	0	0	2	0
6	A	5	0	0	0	0
6	C	5	0	0	0	0
6	E	5	0	0	0	0
6	G	5	0	0	0	0
7	A	54	0	24	2	0
7	C	54	0	24	1	0
7	E	54	0	24	5	0
7	G	54	0	24	4	0
8	A	18	0	22	4	0
8	C	18	0	22	3	0
8	E	18	0	21	4	0
8	G	18	0	22	4	0
9	A	23	0	11	0	0
9	C	23	0	11	1	0
9	E	23	0	11	2	0
9	G	23	0	11	1	0
10	A	9	0	20	0	0
10	C	9	0	20	0	0
10	E	9	0	20	3	0
10	G	9	0	20	1	0
11	A	842	0	0	26	1
11	B	190	0	0	3	0
11	C	732	0	0	12	0
11	D	193	0	0	3	0
11	E	939	0	0	30	0
11	F	233	0	0	5	1
11	G	743	0	0	20	0
11	H	165	0	0	4	0
All	All	48888	0	44671	1732	2

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.

The worst 5 of 1732 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:130[B]:ARG:NH2	1:A:130[B]:ARG:CZ	1.70	1.49
2:H:133:ILE:HD12	2:H:143:ALA:HB2	1.26	1.16
2:H:322:PRO:HB2	2:H:324:ASN:HD21	1.06	1.12
1:E:728:VAL:HG13	1:E:733:ASP:HB3	1.13	1.06
1:A:130[B]:ARG:CZ	1:A:130[B]:ARG:NH1	2.18	1.05

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:130[B]:ARG:NH1	11:F:3079:HOH:O[3_545]	1.65	0.55
2:F:10:GLU:OE1	11:A:5434:HOH:O[3_555]	2.15	0.05

## 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	1060/1073 (99%)	1010 (95%)	46 (4%)	4 (0%)	30	28
1	C	1053/1073 (98%)	1002 (95%)	48 (5%)	3 (0%)	36	36
1	E	1064/1073 (99%)	1011 (95%)	50 (5%)	3 (0%)	36	36
1	G	1054/1073 (98%)	981 (93%)	67 (6%)	6 (1%)	21	18
2	B	378/382 (99%)	358 (95%)	18 (5%)	2 (0%)	24	22
2	D	378/382 (99%)	362 (96%)	16 (4%)	0	100	100
2	F	378/382 (99%)	360 (95%)	17 (4%)	1 (0%)	36	36
2	H	377/382 (99%)	341 (90%)	27 (7%)	9 (2%)	4	2
All	All	5742/5820 (99%)	5425 (94%)	289 (5%)	28 (0%)	24	22

5 of 28 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	357	SER
1	C	368	ALA
2	F	357	SER
2	H	201	ALA
2	H	248	CYS

### 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	873/878 (99%)	802 (92%)	71 (8%)	11 8
1	C	866/878 (99%)	801 (92%)	65 (8%)	12 10
1	E	877/878 (100%)	804 (92%)	73 (8%)	10 8
1	G	867/878 (99%)	771 (89%)	96 (11%)	6 3
2	B	309/310 (100%)	274 (89%)	35 (11%)	5 3
2	D	309/310 (100%)	290 (94%)	19 (6%)	17 15
2	F	309/310 (100%)	280 (91%)	29 (9%)	8 6
2	H	308/310 (99%)	262 (85%)	46 (15%)	3 1
All	All	4718/4752 (99%)	4284 (91%)	434 (9%)	9 6

5 of 434 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	731	GLU
2	F	332	LEU
2	H	178	THR
1	E	772	MET
1	E	1029	ILE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 111 such sidechains are listed below:

Mol	Chain	Res	Type
1	E	679	GLN

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Mol	Chain	Res	Type
2	H	361	HIS
1	E	1000	HIS
2	H	351	GLN
1	G	1069	HIS

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

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

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 80 ligands modelled in this entry, 52 are monoatomic - leaving 28 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
10	NET	C	5033	-	8,8,8	0.64	0	10,10,10	0.53	0
7	ADP	C	5027	4,3	28,29,29	1.26	3 (10%)	43,45,45	0.90	2 (4%)
8	ORN	C	5031	-	7,8,8	0.91	0	6,9,9	1.05	0
8	ORN	E	5051	-	7,8,8	0.94	0	6,9,9	1.28	1 (16%)
6	PO4	E	5046	4,3	4,4,4	2.90	3 (75%)	6,6,6	0.66	0
9	IMP	A	5012	-	25,25,25	1.56	3 (12%)	37,38,38	1.52	6 (16%)
7	ADP	A	5000	3	28,29,29	1.11	4 (14%)	43,45,45	0.89	2 (4%)
8	ORN	G	5071	-	7,8,8	0.86	1 (14%)	6,9,9	1.10	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z  > 2	Counts	RMSZ	# Z  > 2
6	PO4	C	5026	4,3	4,4,4	2.59	3 (75%)	6,6,6	0.91	0
8	ORN	A	5011	-	7,8,8	1.21	1 (14%)	6,9,9	1.23	1 (16%)
7	ADP	A	5007	4,3	28,29,29	1.39	2 (7%)	43,45,45	0.99	2 (4%)
9	IMP	E	5052	-	25,25,25	1.37	2 (8%)	37,38,38	2.03	6 (16%)
10	NET	E	5053	-	8,8,8	0.86	0	10,10,10	0.39	0
10	NET	G	5073	-	8,8,8	0.73	0	10,10,10	0.51	0
6	PO4	A	5006	4,3	4,4,4	2.08	2 (50%)	6,6,6	1.33	1 (16%)
7	ADP	E	5040	3	28,29,29	1.13	3 (10%)	43,45,45	0.92	2 (4%)
8	ORN	A	5014	-	7,8,8	1.01	1 (14%)	6,9,9	0.90	0
10	NET	A	5013	-	8,8,8	0.73	0	10,10,10	0.62	0
7	ADP	C	5020	3	28,29,29	1.37	6 (21%)	43,45,45	1.02	4 (9%)
6	PO4	G	5066	4,3	4,4,4	1.86	2 (50%)	6,6,6	1.01	0
8	ORN	G	5074	-	7,8,8	1.09	1 (14%)	6,9,9	0.86	0
7	ADP	E	5047	4,3	28,29,29	1.08	2 (7%)	43,45,45	0.99	3 (6%)
7	ADP	G	5067	4,3	28,29,29	1.17	6 (21%)	43,45,45	1.16	4 (9%)
7	ADP	G	5060	3	28,29,29	1.23	3 (10%)	43,45,45	1.13	2 (4%)
8	ORN	E	5054	-	7,8,8	0.91	0	6,9,9	2.56	3 (50%)
9	IMP	C	5032	-	25,25,25	1.55	2 (8%)	37,38,38	1.44	6 (16%)
9	IMP	G	5072	-	25,25,25	1.30	3 (12%)	37,38,38	1.72	7 (18%)
8	ORN	C	5034	-	7,8,8	1.05	1 (14%)	6,9,9	0.99	1 (16%)

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
10	NET	C	5033	-	-	0/12/12/12	-
7	ADP	C	5027	4,3	-	4/16/32/32	0/3/3/3
8	ORN	C	5031	-	-	6/8/8/8	-
8	ORN	E	5051	-	-	5/8/8/8	-
9	IMP	A	5012	-	-	1/10/26/26	0/3/3/3
7	ADP	A	5000	3	-	2/16/32/32	0/3/3/3
8	ORN	G	5071	-	-	6/8/8/8	-
8	ORN	A	5011	-	-	6/8/8/8	-
7	ADP	A	5007	4,3	-	4/16/32/32	0/3/3/3
9	IMP	E	5052	-	-	3/10/26/26	0/3/3/3

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
10	NET	E	5053	-	-	3/12/12/12	-
10	NET	G	5073	-	-	3/12/12/12	-
7	ADP	E	5040	3	-	2/16/32/32	0/3/3/3
8	ORN	A	5014	-	-	6/8/8/8	-
10	NET	A	5013	-	-	0/12/12/12	-
7	ADP	C	5020	3	-	2/16/32/32	0/3/3/3
8	ORN	G	5074	-	-	4/8/8/8	-
7	ADP	E	5047	4,3	-	3/16/32/32	0/3/3/3
7	ADP	G	5067	4,3	-	2/16/32/32	0/3/3/3
7	ADP	G	5060	3	-	1/16/32/32	0/3/3/3
8	ORN	E	5054	-	-	2/8/8/8	-
9	IMP	C	5032	-	-	1/10/26/26	0/3/3/3
9	IMP	G	5072	-	-	1/10/26/26	0/3/3/3
8	ORN	C	5034	-	-	5/8/8/8	-

The worst 5 of 54 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
9	A	5012	IMP	O6-C6	5.93	1.34	1.23
9	C	5032	IMP	O6-C6	5.85	1.34	1.23
7	A	5007	ADP	PA-O3A	-4.66	1.54	1.59
9	E	5052	IMP	O6-C6	4.50	1.32	1.23
9	G	5072	IMP	O6-C6	4.10	1.31	1.23

The worst 5 of 53 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	E	5052	IMP	O3P-P-O5'	-6.43	89.90	106.67
9	E	5052	IMP	C2-N1-C6	-5.42	117.67	125.09
9	G	5072	IMP	C2-N1-C6	-5.00	118.24	125.09
9	A	5012	IMP	C2-N1-C6	-4.72	118.62	125.09
9	E	5052	IMP	C5-C6-N1	4.40	117.10	110.78

There are no chirality outliers.

5 of 72 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	A	5007	ADP	PA-O3A-PB-O3B
7	C	5027	ADP	PA-O3A-PB-O3B

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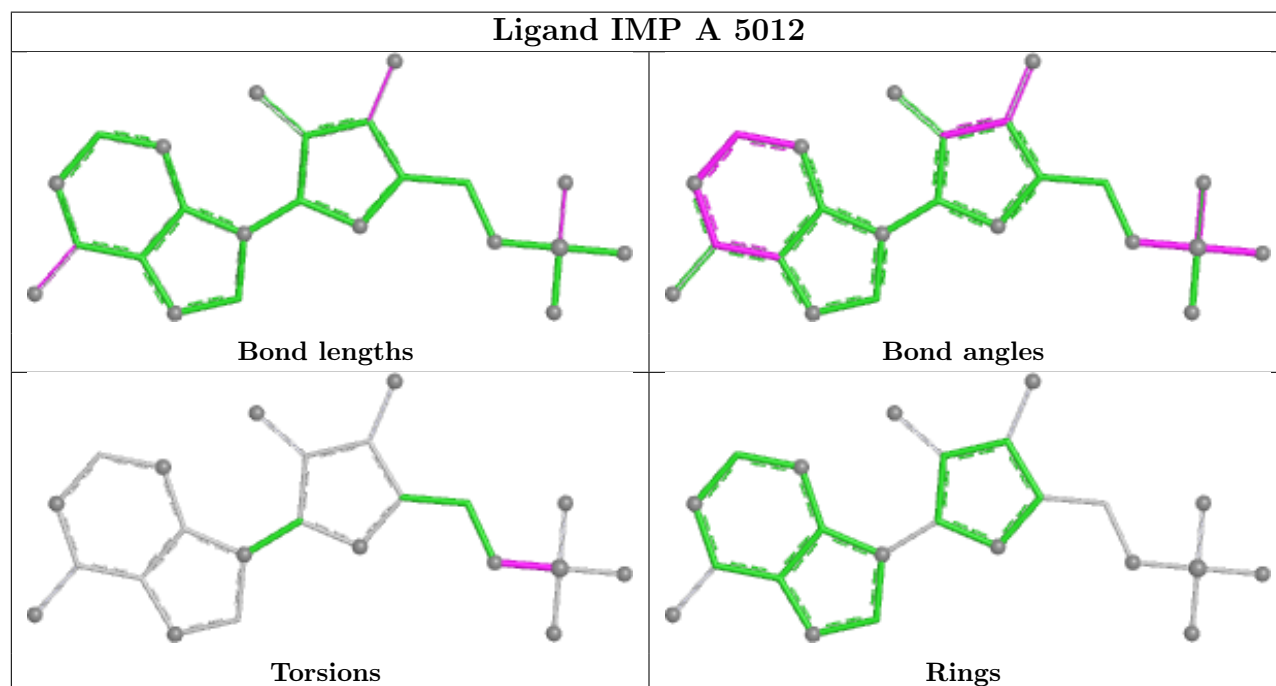
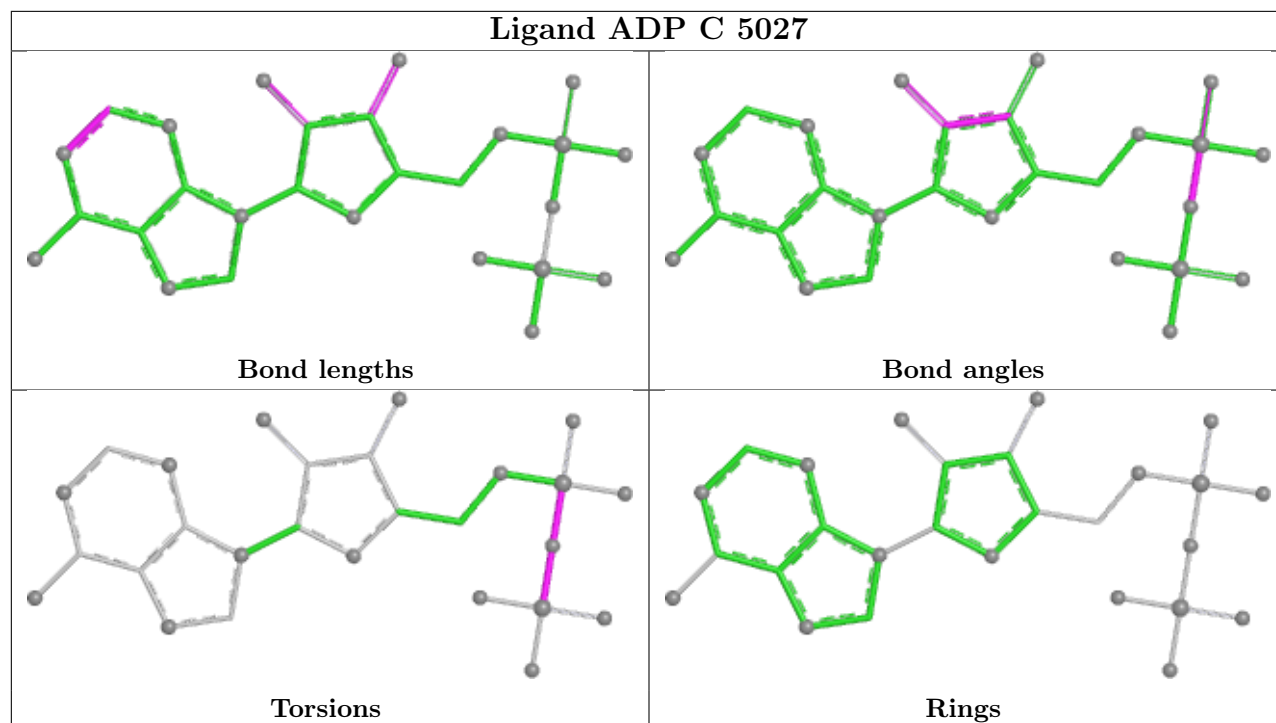
Mol	Chain	Res	Type	Atoms
7	E	5047	ADP	PA-O3A-PB-O3B
8	A	5011	ORN	N-CA-CB-CG
8	A	5011	ORN	C-CA-CB-CG

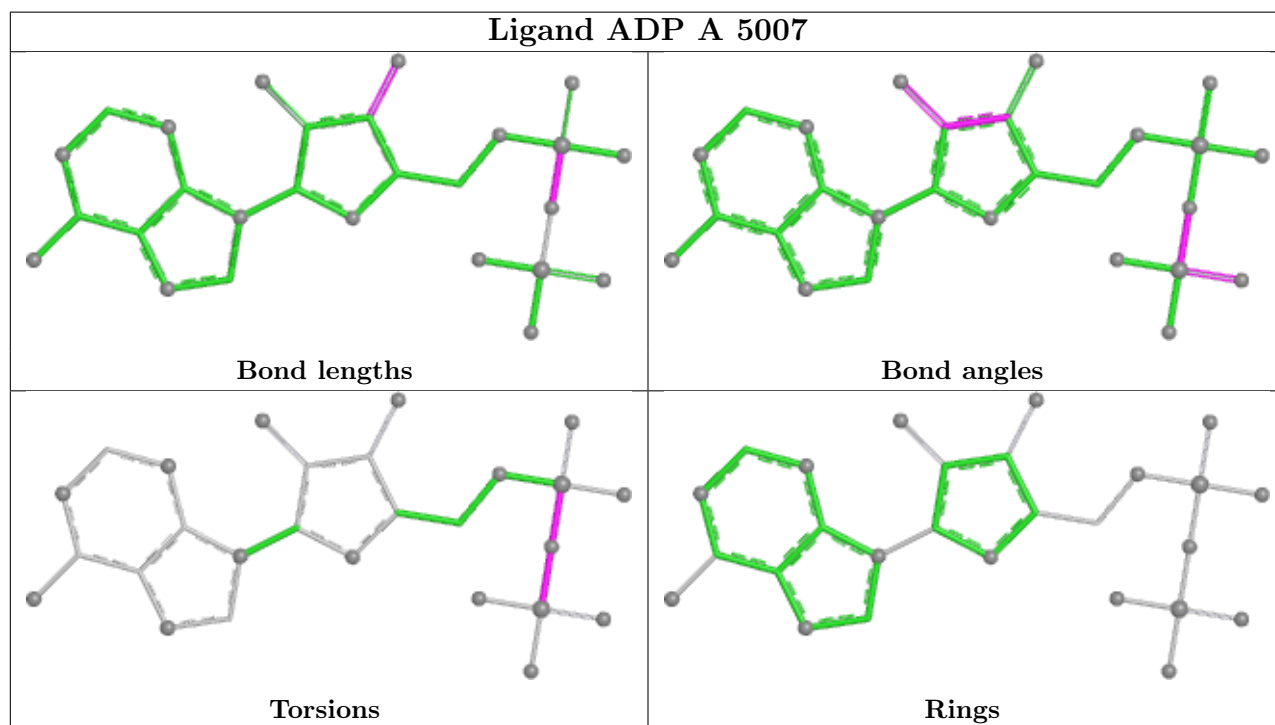
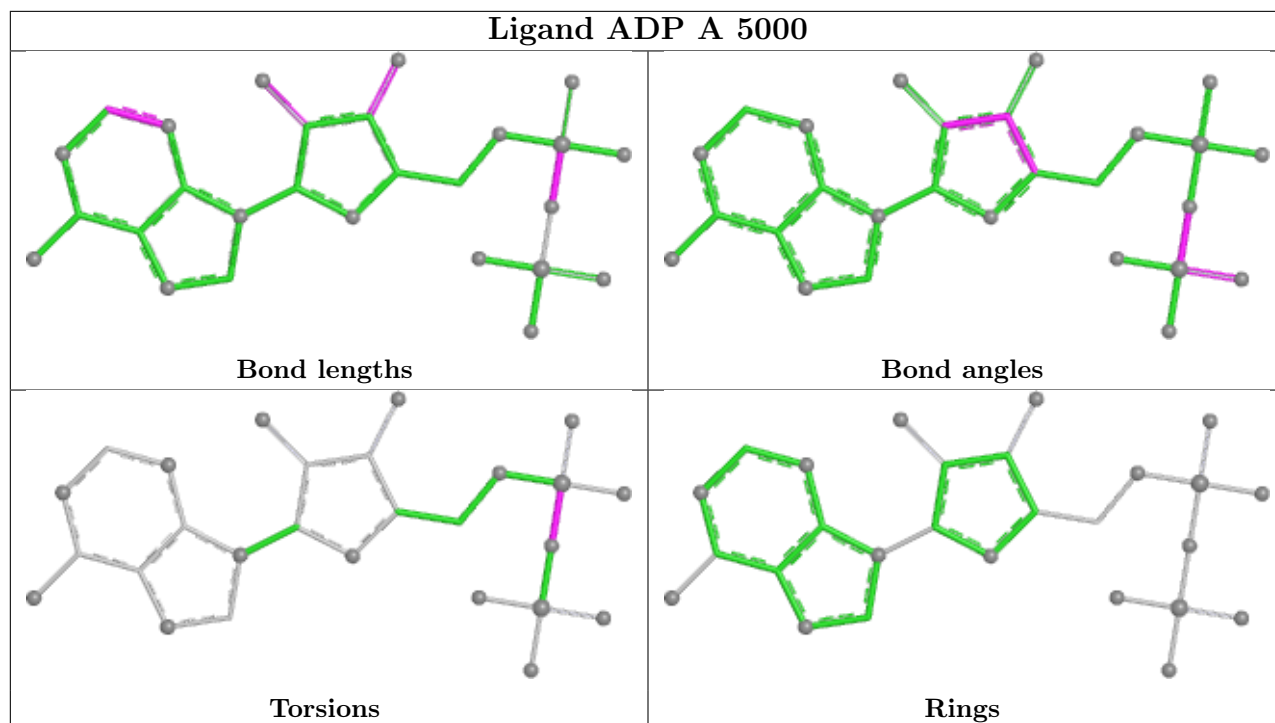
There are no ring outliers.

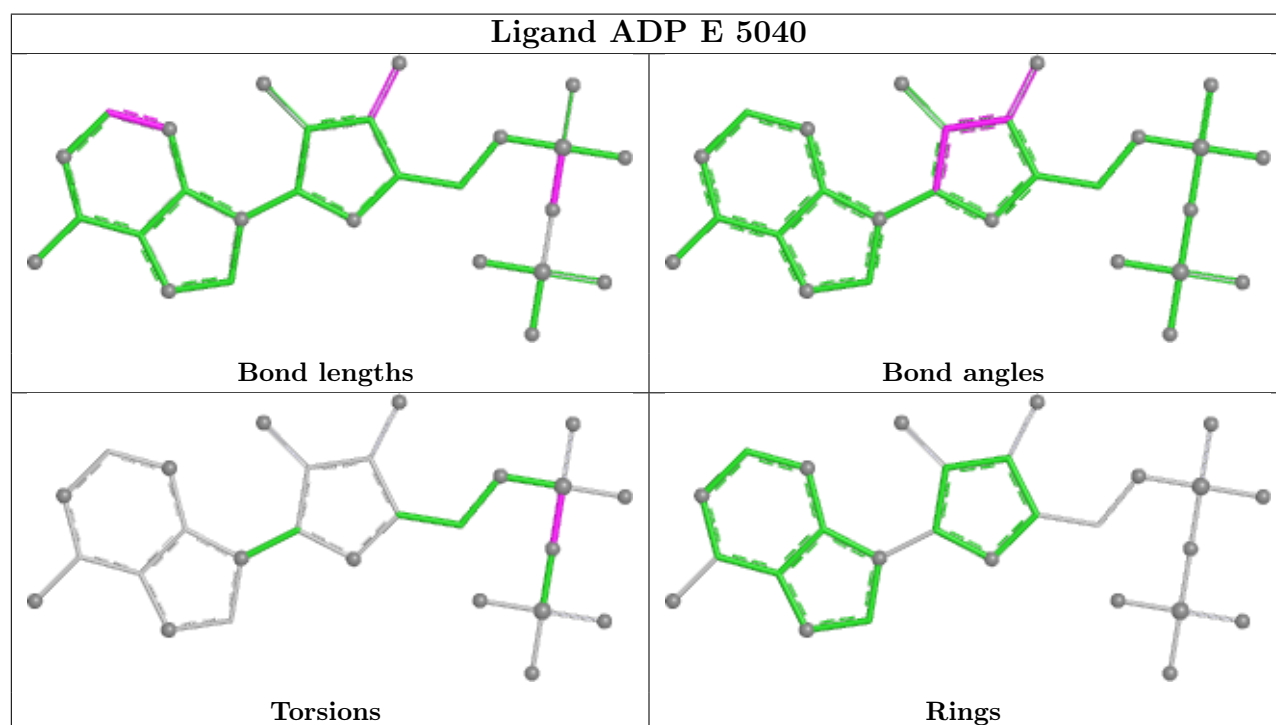
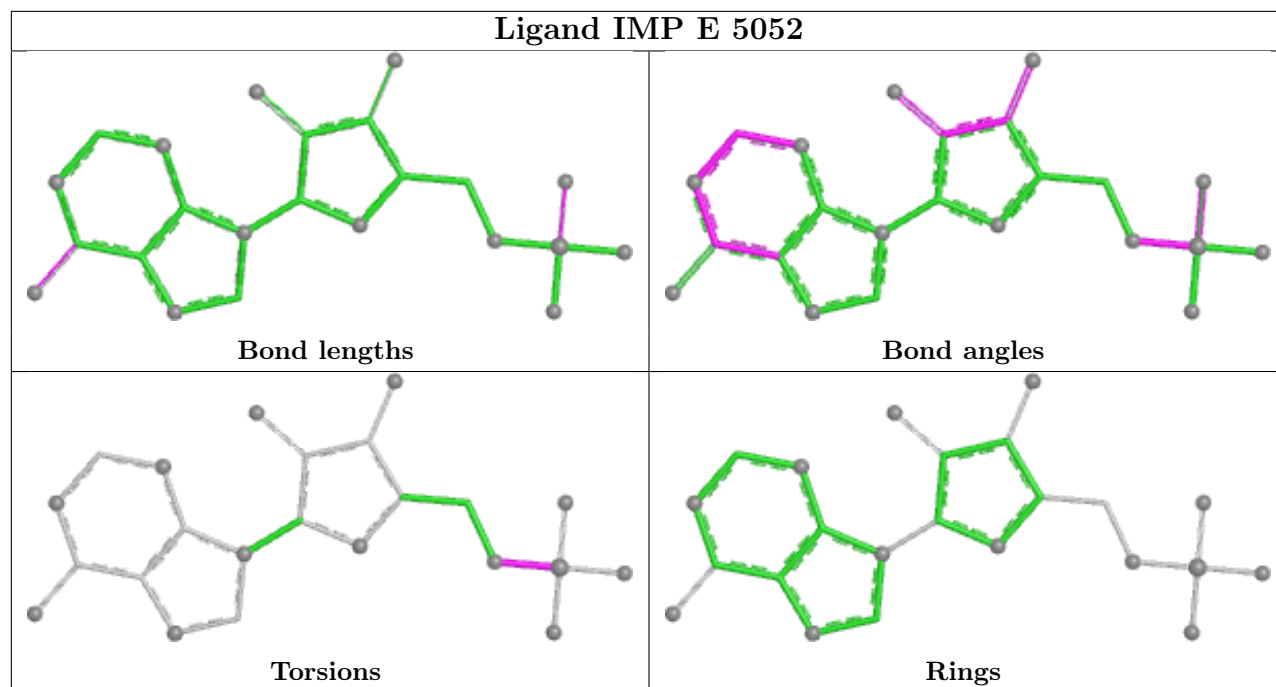
19 monomers are involved in 35 short contacts:

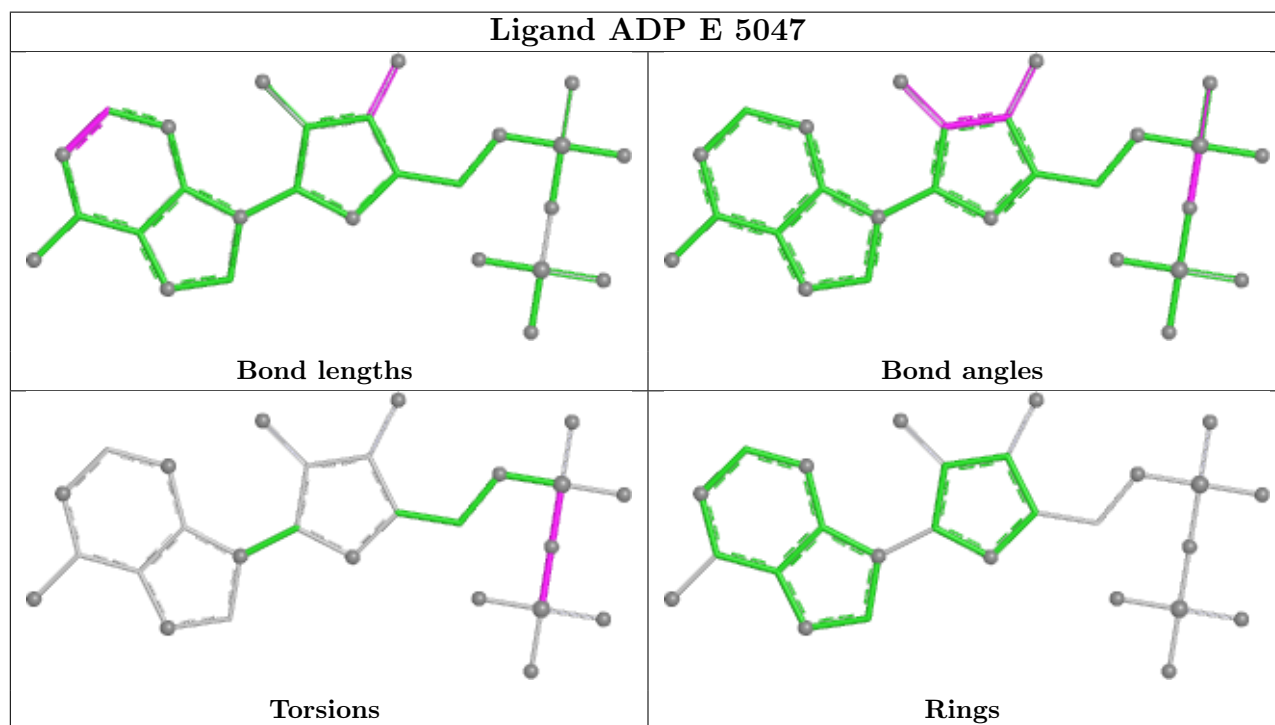
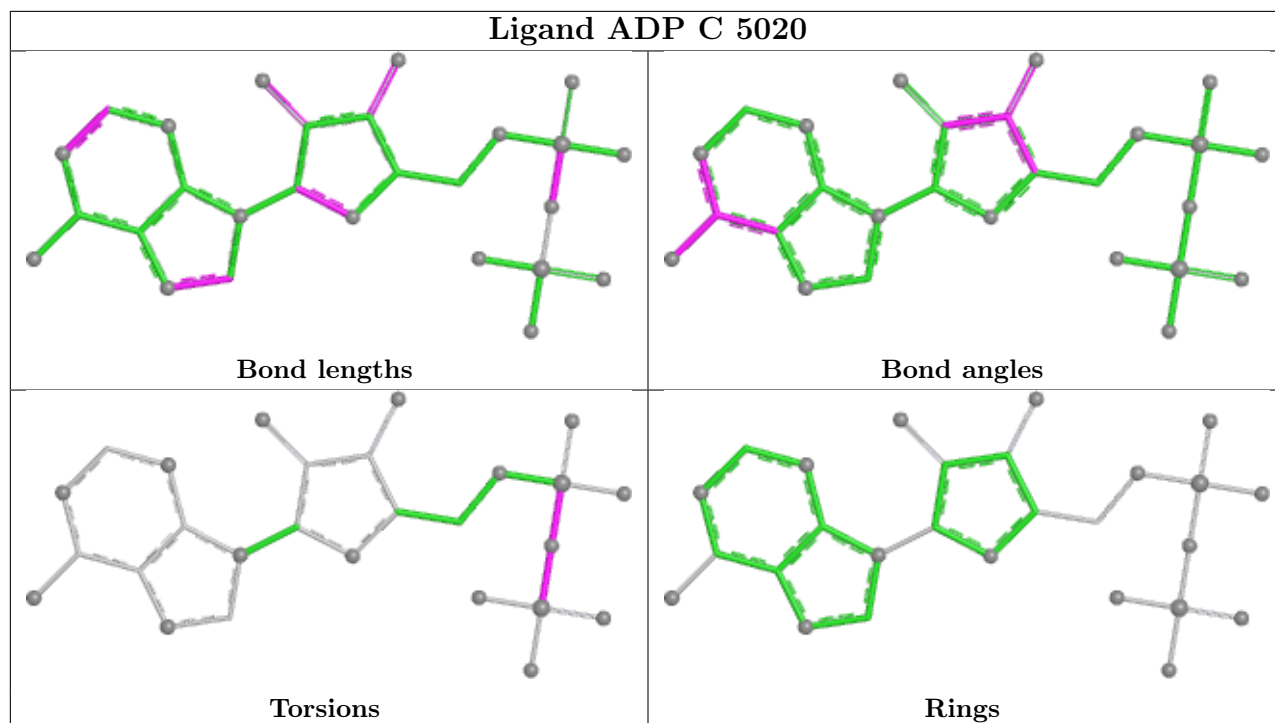
Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	C	5027	ADP	1	0
8	C	5031	ORN	2	0
8	E	5051	ORN	2	0
8	G	5071	ORN	1	0
8	A	5011	ORN	1	0
7	A	5007	ADP	2	0
9	E	5052	IMP	2	0
10	E	5053	NET	3	0
10	G	5073	NET	1	0
7	E	5040	ADP	1	0
8	A	5014	ORN	3	0
8	G	5074	ORN	3	0
7	E	5047	ADP	4	0
7	G	5067	ADP	3	0
7	G	5060	ADP	1	0
8	E	5054	ORN	2	0
9	C	5032	IMP	1	0
9	G	5072	IMP	1	0
8	C	5034	ORN	1	0

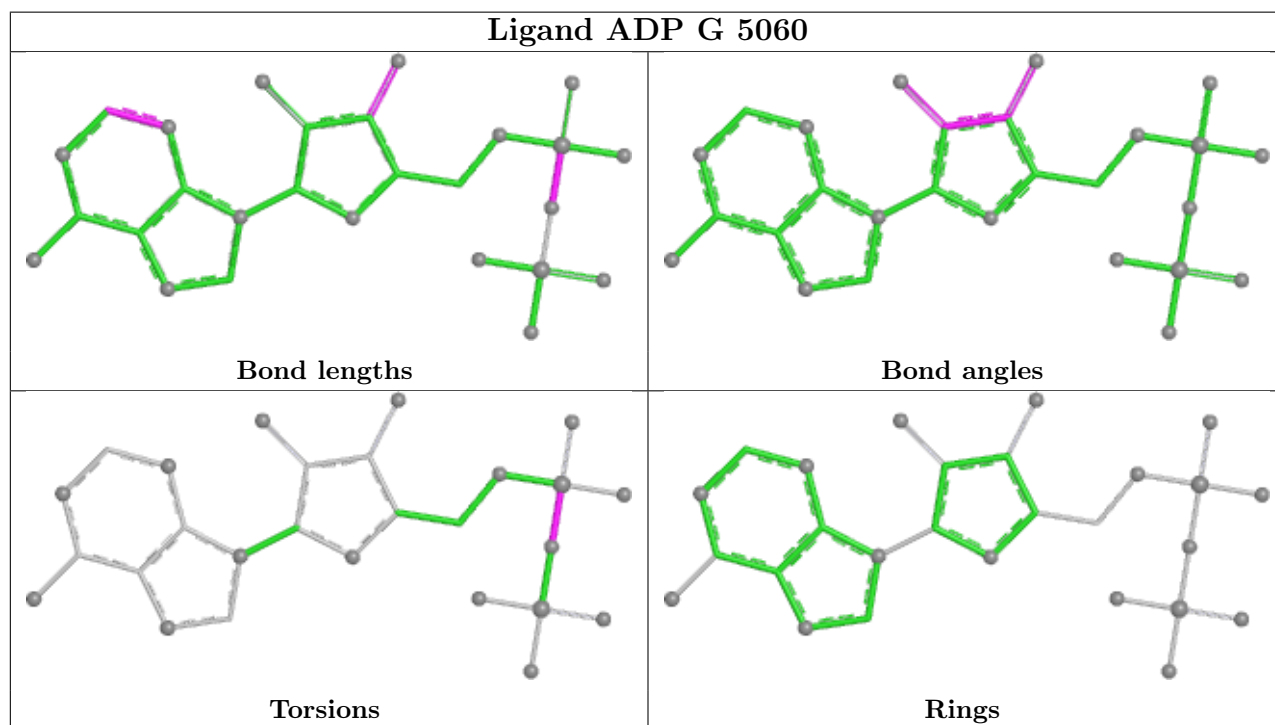
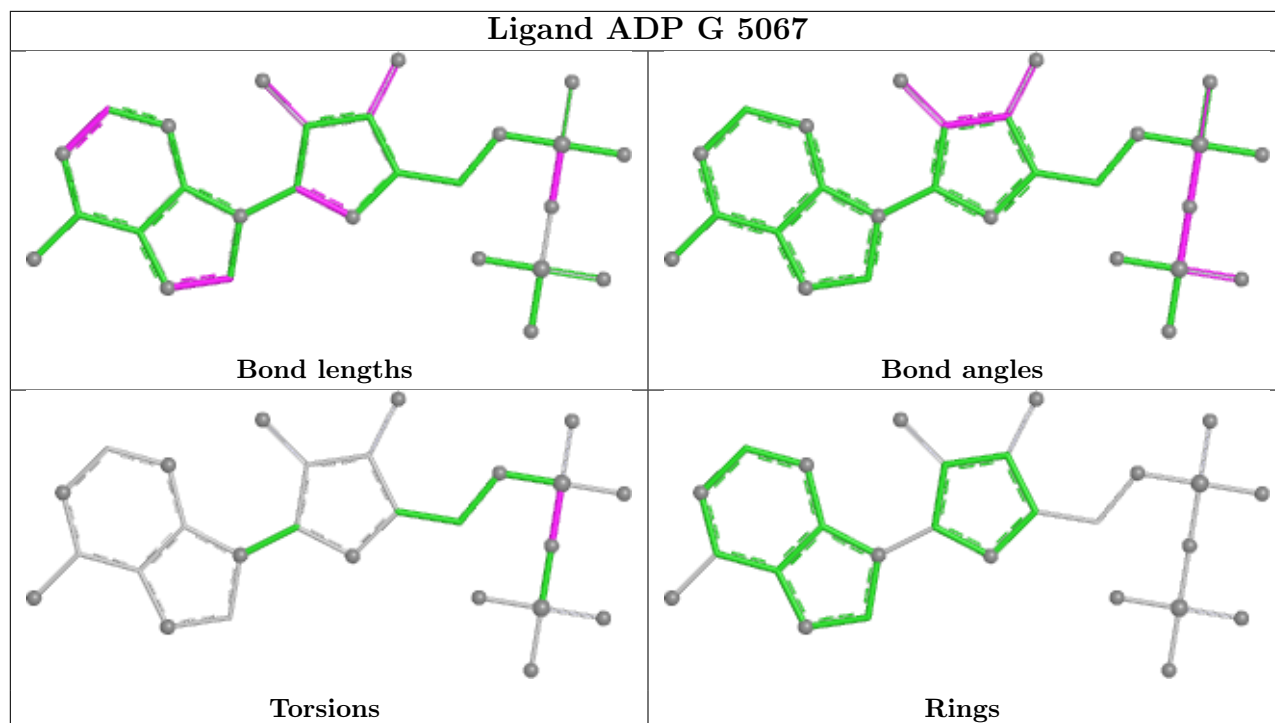
The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

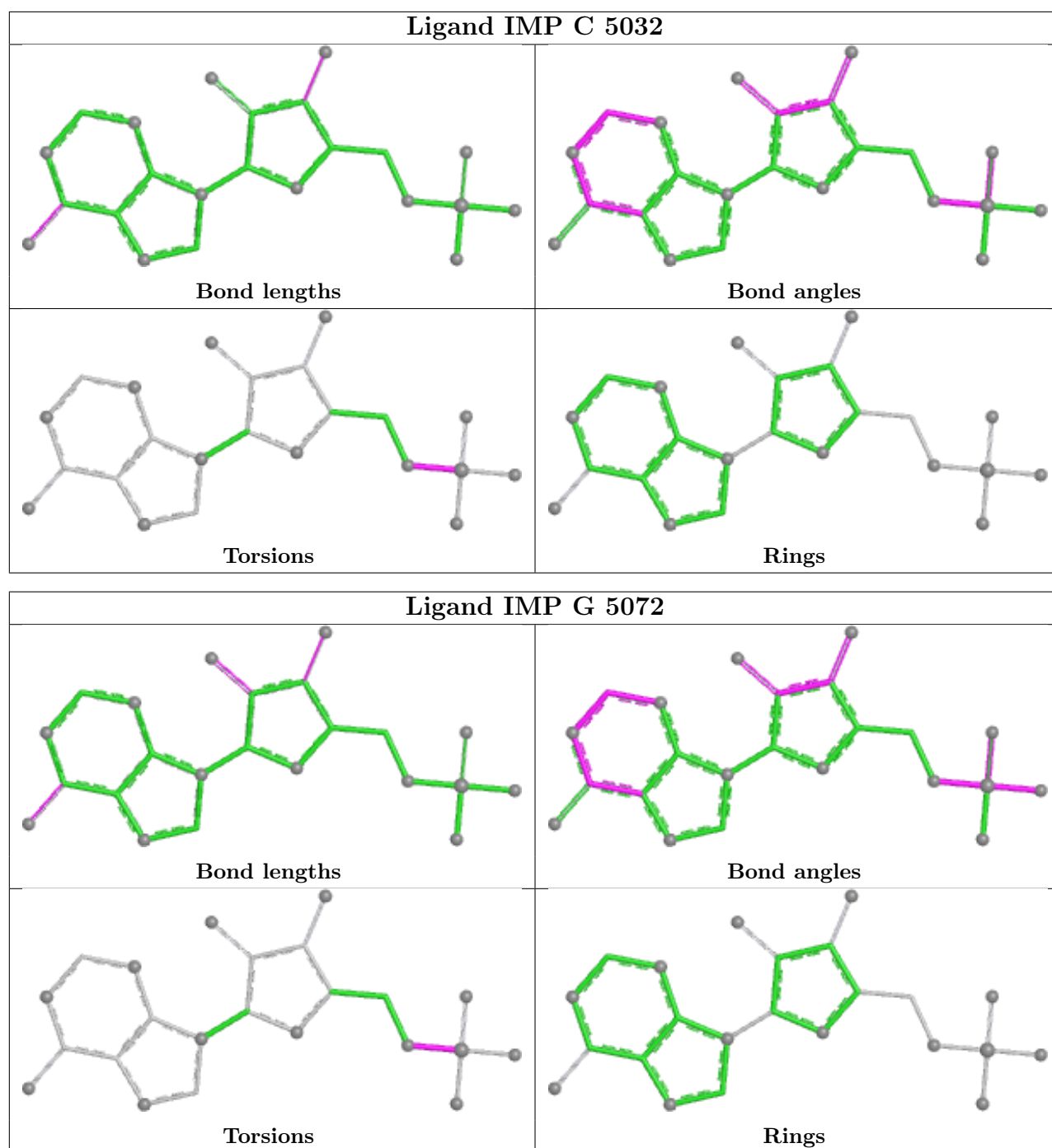












## 5.7 Other polymers [i](#)

There are no such residues in this entry.

## 5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

## 6 Fit of model and data [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates [i](#)

EDS was not executed - this section is therefore empty.

### 6.4 Ligands [i](#)

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers [i](#)

EDS was not executed - this section is therefore empty.