



# wwPDB X-ray Structure Validation Summary Report ⓘ

Jun 2, 2020 – 07:20 pm BST

PDB ID : 7GPB  
Title : STRUCTURAL MECHANISM FOR GLYCOGEN PHOSPHORYLASE  
CONTROL BY PHOSPHORYLATION AND AMP  
Authors : Barford, D.; Hu, S.-H.; Johnson, L.N.  
Deposited on : 1990-11-13  
Resolution : 2.90 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.

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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)  
Xtrriage (Phenix) : **NOT EXECUTED**  
EDS : **NOT EXECUTED**  
buster-report : 1.1.7 (2018)  
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : 2.11

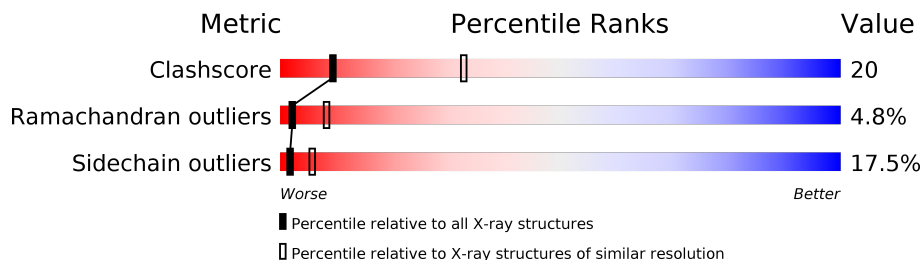
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.90 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	141614	2172 (2.90-2.90)
Ramachandran outliers	138981	2115 (2.90-2.90)
Sidechain outliers	138945	2117 (2.90-2.90)

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 on 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	842	
1	B	842	
1	C	842	
1	D	842	

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	SO4	A	901	-	-	X	-

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 26955 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 GLYCOGEN PHOSPHORYLASE B.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	824	6692	4264	1185	1213	30	0	0	1
1	B	824	6692	4264	1185	1213	30	0	0	1
1	C	824	6692	4264	1185	1213	30	0	0	1
1	D	824	6692	4264	1185	1213	30	0	0	1

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	380	ILE	LEU	CONFLICT	UNP P00489
B	380	ILE	LEU	CONFLICT	UNP P00489
C	380	ILE	LEU	CONFLICT	UNP P00489
D	380	ILE	LEU	CONFLICT	UNP P00489

- Molecule 2 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



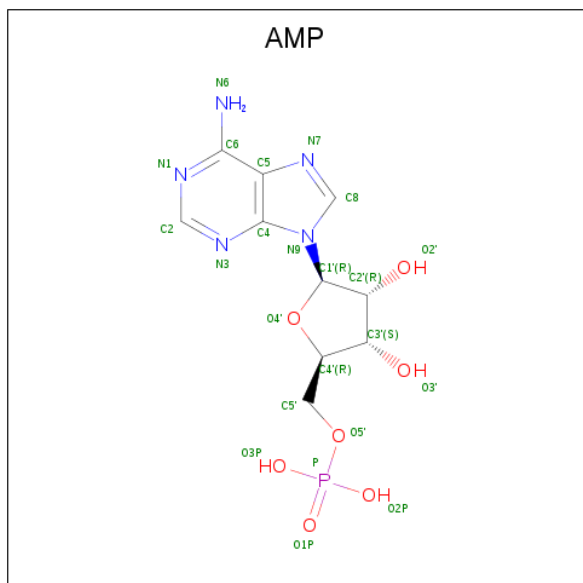
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	B	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	C	1	Total	O	S	0	0
			5	4	1		
2	D	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula: C<sub>8</sub>H<sub>10</sub>NO<sub>6</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
3	A	1	15	8	1	5	1	0	0
3	B	1	15	8	1	5	1	0	0
3	C	1	15	8	1	5	1	0	0
3	D	1	15	8	1	5	1	0	0

- Molecule 4 is ADENOSINE MONOPHOSPHATE (three-letter code: AMP) (formula:  $C_{10}H_{14}N_5O_7P$ ).



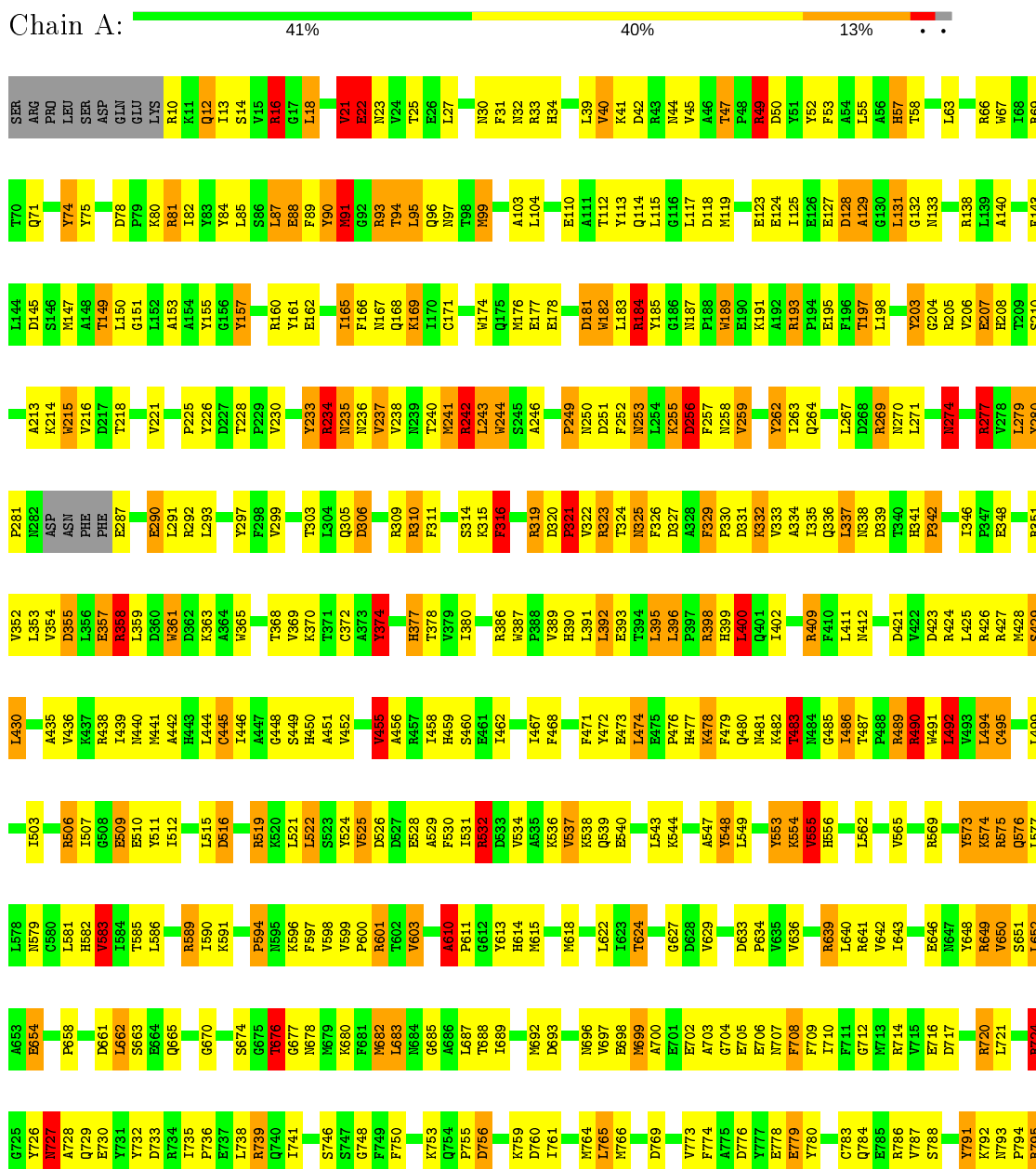
<b>Mol</b>	<b>Chain</b>	<b>Residues</b>	<b>Atoms</b>					<b>ZeroOcc</b>	<b>AltConf</b>
4	A	1	Total 23	C 10	N 5	O 7	P 1	0	0
4	B	1	Total 23	C 10	N 5	O 7	P 1	0	0
4	C	1	Total 23	C 10	N 5	O 7	P 1	0	0
4	D	1	Total 23	C 10	N 5	O 7	P 1	0	0

### 3 Residue-property plots

These plots are drawn for all protein, RNA and DNA 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.

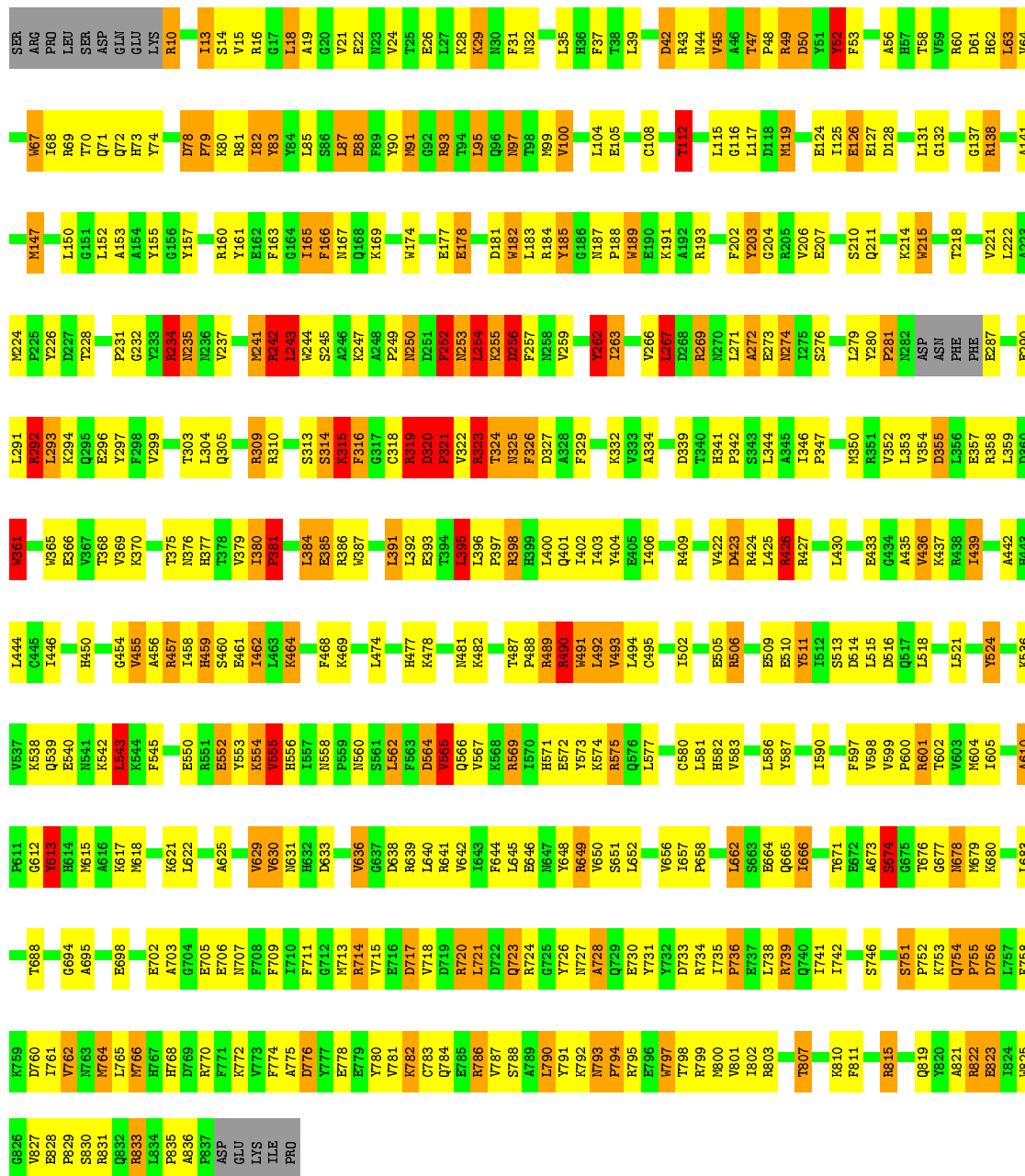
Note EDS was not executed.

- Molecule 1: GLYCOGEN PHOSPHORYLASE B

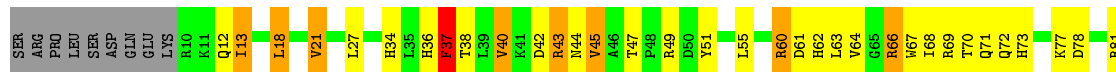




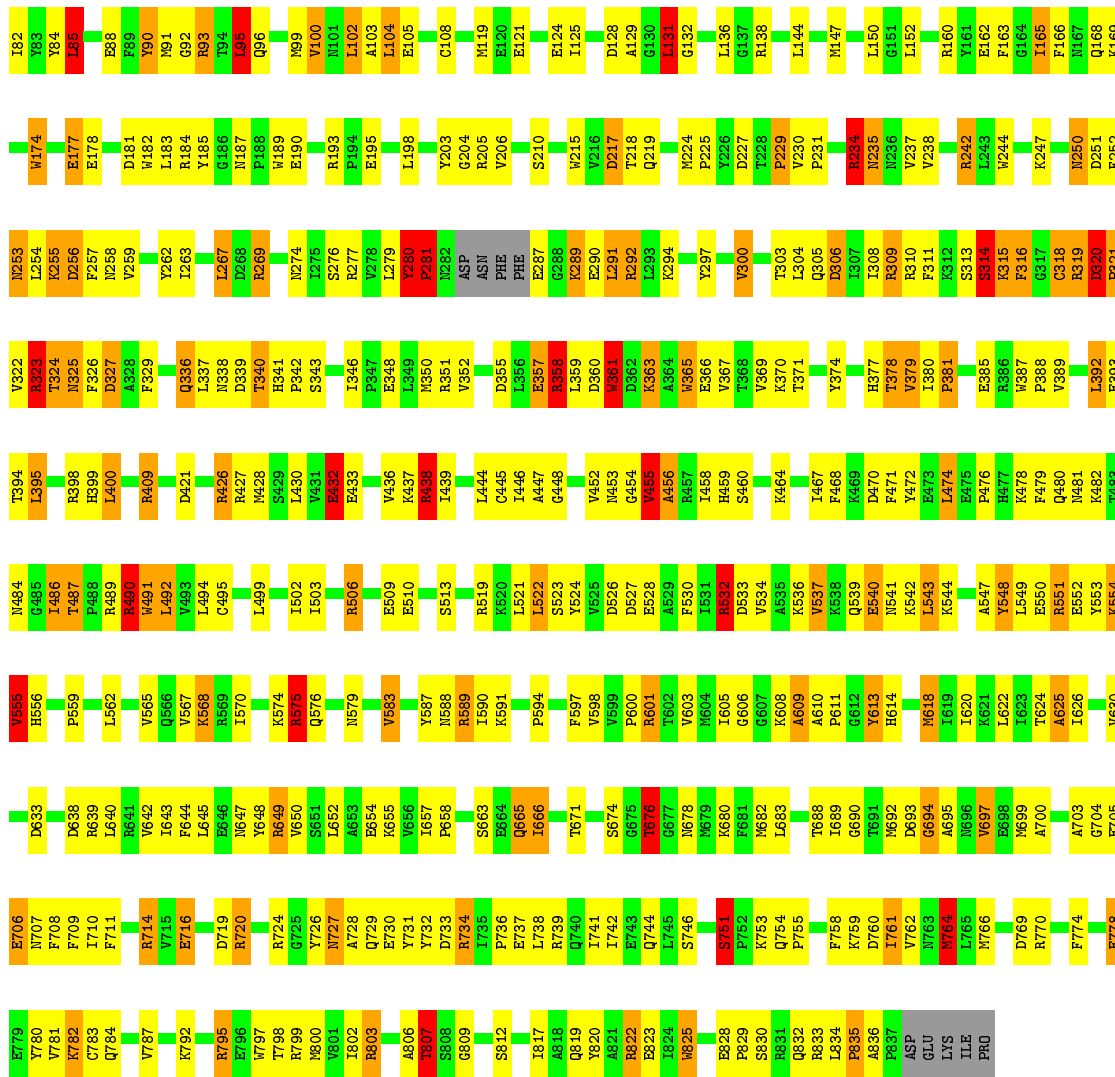
• Molecule 1: GLYCOGEN PHOSPHORYLASE B



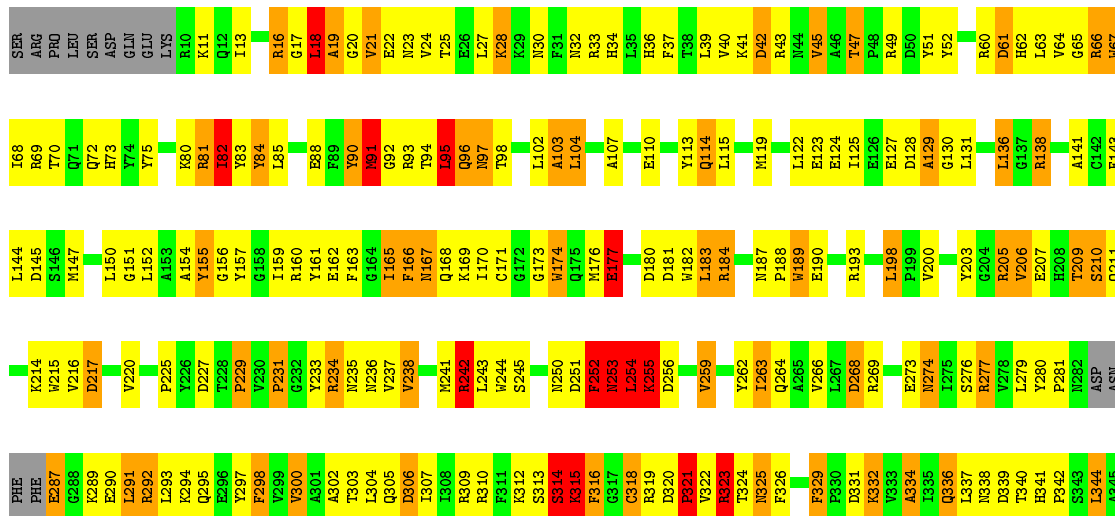
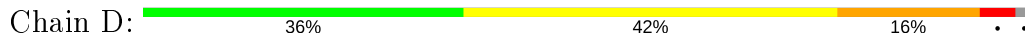
• Molecule 1: GLYCOGEN PHOSPHORYLASE B







• Molecule 1: GLYCOGEN PHOSPHORYLASE B



Residue	Residue	Residue	Residue	Residue	Residue
Y777	L494	Q566	L640	N707	Y777
E778	C495	V567	R641	F708	E778
E779	R496	K568	V642	F709	E779
Y780	R427	R569	I643	I710	Y780
Y781	M428	I570	F644	F711	Y781
K782	M350	L571	L645	G712	K782
C783	R351	A500	R646	M713	C783
R786	V352	E501	M647	D717	R786
V787	L356	I502	Y648	V718	V787
Y791	E357	I503	R649	D719	Y791
K792	R358	R506	V650	R720	K792
R795	I359	I507	S651	L721	R795
E796	D360	Y511	L652	R724	E796
Y797	M361	D514	R655	G725	Y797
T798	D362	L515	V656	Y726	T798
R799	K363	D516	I657	N727	R799
M800	M364	Y517	R658	A728	M800
I801	E366	L518	A659	Y732	I801
I802	V369	L519	A660	D733	I802
R803	K370	K520	L662	R734	R803
N804	A373	K521	S663	I735	N804
A806	Y374	L522	E664	I805	A806
T807	T375	Y524	Q665	A806	T807
S808	M376	Y525	I666	Q740	S808
G809	H377	V526	A669	I741	G809
K810	R377	D527	A673	Q744	K810
S813	I380	E528	S674	G748	S813
D814	P381	F529	G675	F749	D814
R815	E382	R464	I676	F750	R815
T816	R386	K465	G677	F751	T816
I817	M387	T466	M678	P752	I817
A818	R390	I467	K680	K753	A818
Q819	L391	F468	R681	Q754	Q819
I820	L392	K469	M682	P755	I820
A821	E393	D470	L683	D756	A821
R822	T394	L474	L687	L757	R822
I824	L395	E475	T688	F758	I824
M825	I396	P476	I689	K759	M825
G826	R397	H477	G690	D760	G826
E827	R398	K478	T691	I761	E827
E828	H399	F479	M692	V762	E828
P829	L400	Q480	D693	N763	P829
S830	Q401	N481	G694	M764	S830
R831	M407	K482	A695	L765	R831
Q832	Q408	T483	M696	M766	Q832
R833	R409	M484	V697	H767	R833
L834	F410	G485	E698	L768	L834
P835	F411	I486	M699	D769	P835
A836	V414	T487	P559	R770	A836
P837	W421	P488	D633	V773	P837
ASP	D421	R489	E702	F774	ASP
GLU	V422	R490	A703	A775	GLU
LYS	D423	W491	E704	L776	LYS
ILE	R424	V493	E706		ILE

## 4 Data and refinement statistics

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

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	119.00Å 190.00Å 88.20Å 90.00° 109.35° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.90	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.90)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, $R_{free}$	0.171 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	26955	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	33.0	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: AMP, SO4, PLP

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	1.00	6/6842 (0.1%)	2.02	223/9258 (2.4%)
1	B	1.00	5/6842 (0.1%)	1.90	186/9258 (2.0%)
1	C	1.00	2/6842 (0.0%)	1.96	190/9258 (2.1%)
1	D	0.99	2/6842 (0.0%)	2.00	203/9258 (2.2%)
All	All	1.00	15/27368 (0.1%)	1.97	802/37032 (2.2%)

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	6
1	B	0	6
1	C	0	5
1	D	0	8
All	All	0	25

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	323	ARG	CZ-NH1	8.57	1.44	1.33
1	B	100	VAL	CA-CB	7.53	1.70	1.54
1	B	319	ARG	CZ-NH1	7.05	1.42	1.33
1	B	323	ARG	CZ-NH2	6.47	1.41	1.33
1	A	323	ARG	NE-CZ	6.26	1.41	1.33

The worst 5 of 802 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	67	TRP	CG-CD2-CE3	-40.61	97.35	133.90
1	D	67	TRP	NE1-CE2-CZ2	-33.92	93.09	130.40
1	A	49	ARG	NE-CZ-NH2	-19.84	110.38	120.30
1	A	16	ARG	NE-CZ-NH2	14.98	127.79	120.30
1	D	490	ARG	NE-CZ-NH2	-14.37	113.11	120.30

There are no chirality outliers.

5 of 25 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	113	TYR	Sidechain
1	A	277	ARG	Sidechain
1	A	280	TYR	Peptide
1	A	47	THR	Peptide
1	A	49	ARG	Sidechain

## 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	6692	0	6653	248	1
1	B	6692	0	6653	244	0
1	C	6692	0	6653	246	0
1	D	6692	0	6653	337	1
2	A	10	0	0	2	0
2	B	10	0	0	1	0
2	C	10	0	0	1	0
2	D	5	0	0	0	0
3	A	15	0	6	2	0
3	B	15	0	7	1	0
3	C	15	0	7	1	0
3	D	15	0	7	3	0
4	A	23	0	12	3	0
4	B	23	0	12	1	0
4	C	23	0	12	1	0
4	D	23	0	12	2	0
All	All	26955	0	26687	1056	1

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 20.

The worst 5 of 1056 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:D:85:LEU:HD21	1:D:303:THR:HG21	1.43	1.00
1:D:251:ASP:HB3	1:D:255:LYS:HB3	1.46	0.98
1:D:707:ASN:HA	1:D:800:MET:SD	2.04	0.97
1:A:45:VAL:HG21	4:B:920:AMP:H3'	1.44	0.97
1:A:682:MET:SD	1:A:699:MET:HG2	2.09	0.92

All (1) 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:509:GLU:N	1:D:321:PRO:O[2_646]	2.18	0.02

## 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	820/842 (97%)	669 (82%)	116 (14%)	35 (4%)	2	10
1	B	820/842 (97%)	687 (84%)	92 (11%)	41 (5%)	2	7
1	C	820/842 (97%)	708 (86%)	82 (10%)	30 (4%)	3	13
1	D	820/842 (97%)	669 (82%)	100 (12%)	51 (6%)	1	4
All	All	3280/3368 (97%)	2733 (83%)	390 (12%)	157 (5%)	2	8

5 of 157 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	236	ASN

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Mol	Chain	Res	Type
1	A	321	PRO
1	A	358	ARG
1	A	553	TYR
1	A	674	SER

### 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	712/731 (97%)	589 (83%)	123 (17%)	2	6
1	B	712/731 (97%)	595 (84%)	117 (16%)	2	7
1	C	712/731 (97%)	592 (83%)	120 (17%)	2	6
1	D	712/731 (97%)	573 (80%)	139 (20%)	1	4
All	All	2848/2924 (97%)	2349 (82%)	499 (18%)	2	6

5 of 499 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	724	ARG
1	C	276	SER
1	D	591	LYS
1	B	766	MET
1	C	90	TYR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 58 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	678	ASN
1	C	459	HIS
1	D	588	ASN
1	C	36	HIS
1	C	336	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 carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

15 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
3	PLP	A	999	1	15,15,16	1.83	5 (33%)	20,22,23	1.06	1 (5%)
2	SO4	C	901	-	4,4,4	0.22	0	6,6,6	0.41	0
4	AMP	C	920	-	22,25,25	0.97	1 (4%)	25,38,38	1.00	0
2	SO4	A	901	-	4,4,4	0.24	0	6,6,6	0.40	0
3	PLP	B	999	1	15,15,16	1.58	1 (6%)	20,22,23	1.09	1 (5%)
3	PLP	D	999	1	15,15,16	1.09	1 (6%)	20,22,23	1.88	2 (10%)
4	AMP	D	920	-	22,25,25	0.93	0	25,38,38	0.97	0
2	SO4	C	900	-	4,4,4	0.28	0	6,6,6	0.35	0
2	SO4	D	900	-	4,4,4	0.12	0	6,6,6	0.32	0
2	SO4	B	900	-	4,4,4	0.36	0	6,6,6	0.46	0
3	PLP	C	999	1	15,15,16	1.11	1 (6%)	20,22,23	0.99	1 (5%)
4	AMP	A	920	-	22,25,25	0.96	2 (9%)	25,38,38	1.08	0
2	SO4	B	901	-	4,4,4	0.31	0	6,6,6	0.29	0
2	SO4	A	900	-	4,4,4	0.16	0	6,6,6	0.38	0
4	AMP	B	920	-	22,25,25	0.92	1 (4%)	25,38,38	0.98	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
4	AMP	C	920	-	-	3/6/26/26	0/3/3/3
3	PLP	D	999	1	-	0/6/6/8	0/1/1/1
3	PLP	B	999	1	-	0/6/6/8	0/1/1/1
4	AMP	D	920	-	-	3/6/26/26	0/3/3/3
4	AMP	B	920	-	-	2/6/26/26	0/3/3/3
4	AMP	A	920	-	-	3/6/26/26	0/3/3/3
3	PLP	C	999	1	-	0/6/6/8	0/1/1/1
3	PLP	A	999	1	-	0/6/6/8	0/1/1/1

The worst 5 of 12 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	999	PLP	C3-C2	-4.06	1.36	1.40
3	A	999	PLP	C3-C2	-4.00	1.36	1.40
3	C	999	PLP	C3-C2	-2.58	1.38	1.40
3	A	999	PLP	P-O2P	-2.49	1.45	1.54
3	A	999	PLP	C5-C4	-2.41	1.37	1.40

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	999	PLP	O4P-C5A-C5	7.37	123.39	109.35
3	C	999	PLP	C6-C5-C4	2.36	120.01	118.16
3	A	999	PLP	C5-C6-N1	-2.22	120.12	123.82
3	D	999	PLP	C5-C6-N1	-2.20	120.16	123.82
3	B	999	PLP	O4P-C5A-C5	2.19	113.52	109.35

There are no chirality outliers.

5 of 11 torsion outliers are listed below:

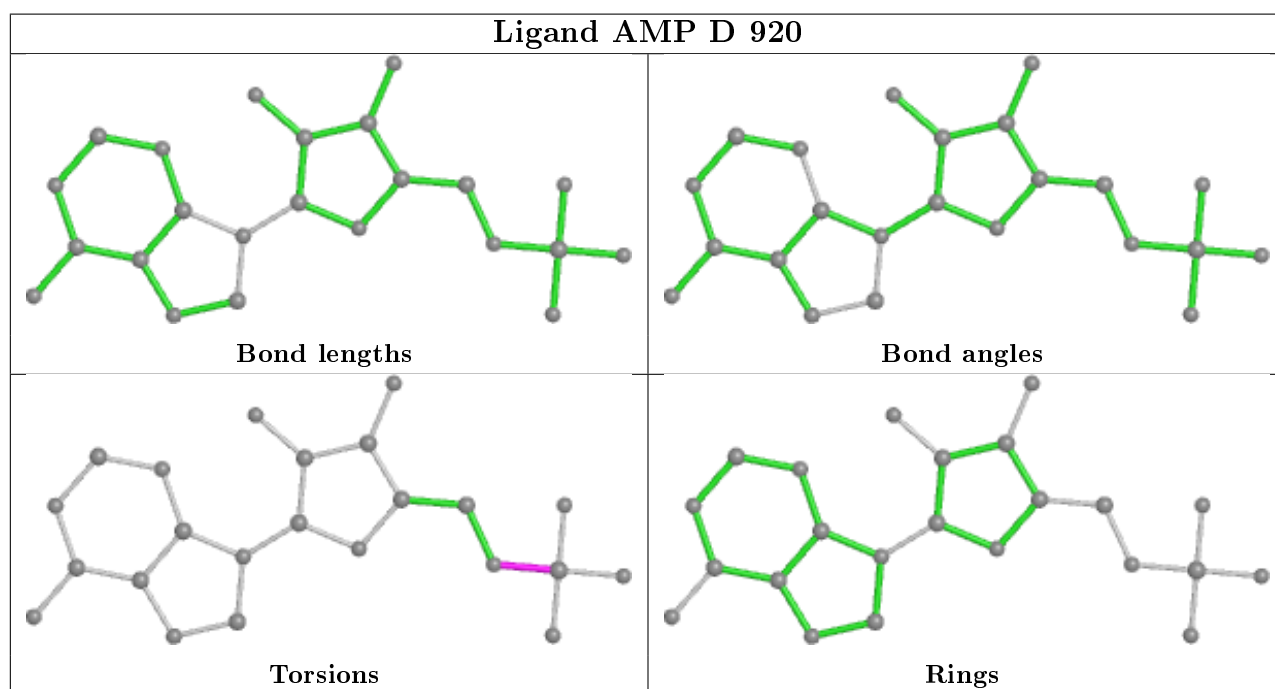
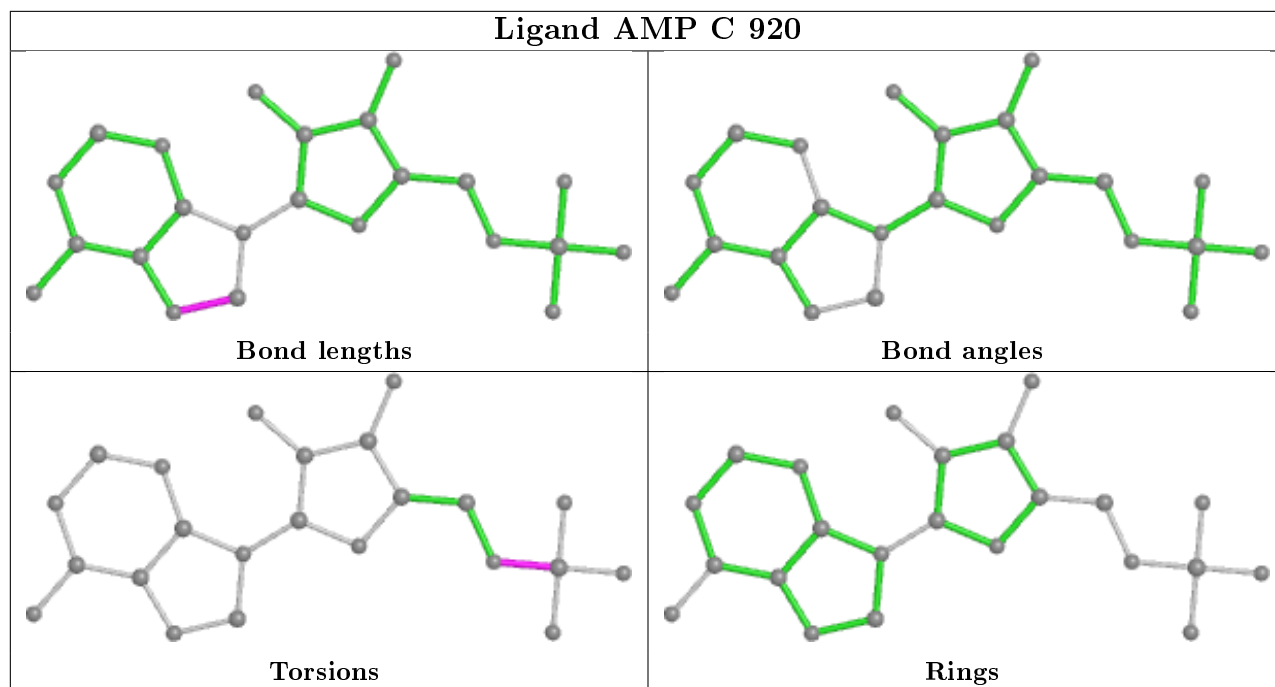
Mol	Chain	Res	Type	Atoms
4	C	920	AMP	C5'-O5'-P-O2P
4	C	920	AMP	C5'-O5'-P-O3P
4	D	920	AMP	C5'-O5'-P-O2P
4	A	920	AMP	C5'-O5'-P-O2P
4	A	920	AMP	C5'-O5'-P-O3P

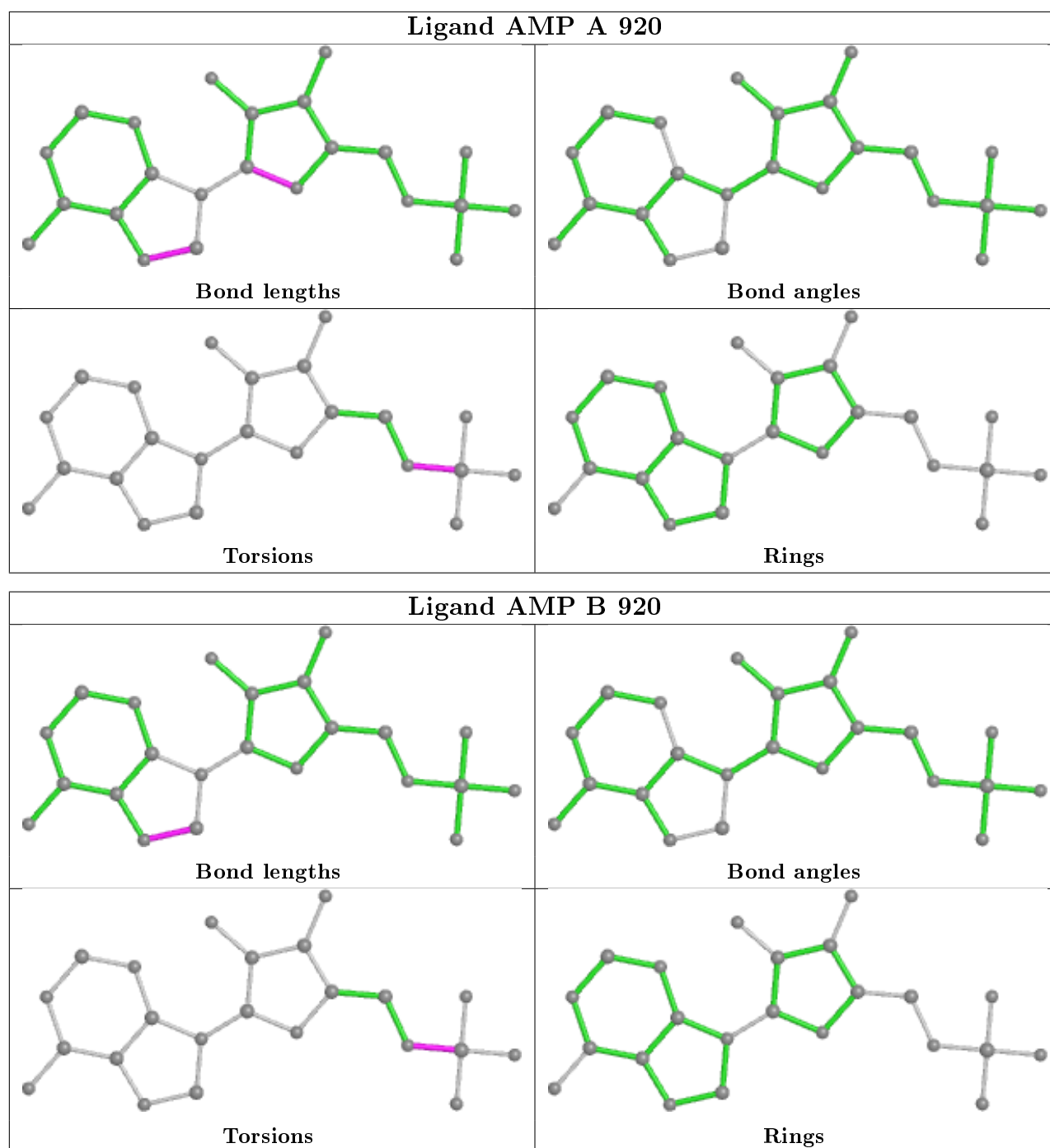
There are no ring outliers.

11 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	999	PLP	2	0
2	C	901	SO4	1	0
4	C	920	AMP	1	0
2	A	901	SO4	2	0
3	B	999	PLP	1	0
3	D	999	PLP	3	0
4	D	920	AMP	2	0
3	C	999	PLP	1	0
4	A	920	AMP	3	0
2	B	901	SO4	1	0
4	B	920	AMP	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

### 6.1 Protein, DNA and RNA chains

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

### 6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

### 6.4 Ligands

EDS was not executed - this section is therefore empty.

### 6.5 Other polymers

EDS was not executed - this section is therefore empty.