



# wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 18, 2025 – 03:25 PM EDT

PDB ID : 3CEH  
Title : Human liver glycogen phosphorylase (tense state) in complex with the allosteric inhibitor AVE5688  
Authors : Wendt, K.U.; Dreyer, M.K.; Anderka, O.; Klabunde, T.; Loenze, P.; Defossa, E.; Schmoll, D.  
Deposited on : 2008-02-29  
Resolution : 2.80 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	:	4.02b-467
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	1.21
EDS	:	3.0
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20231227.v01 (using entries in the PDB archive December 27th 2023)
CCP4	:	9.0.004 (Gargrove)
Density-Fitness	:	1.0.11
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.41.4

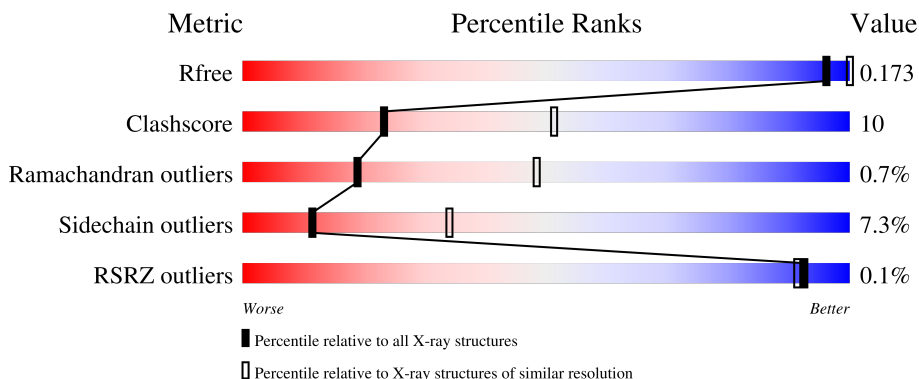
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*



The reported resolution of this entry is 2.80 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))
$R_{free}$	164625	3657 (2.80-2.80)
Clashscore	180529	4123 (2.80-2.80)
Ramachandran outliers	177936	4071 (2.80-2.80)
Sidechain outliers	177891	4073 (2.80-2.80)
RSRZ outliers	164620	3659 (2.80-2.80)

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  $\leq 5\%$ . 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	809	 71% 24% ..
1	B	809	 75% 21% ..

## 2 Entry composition [i](#)

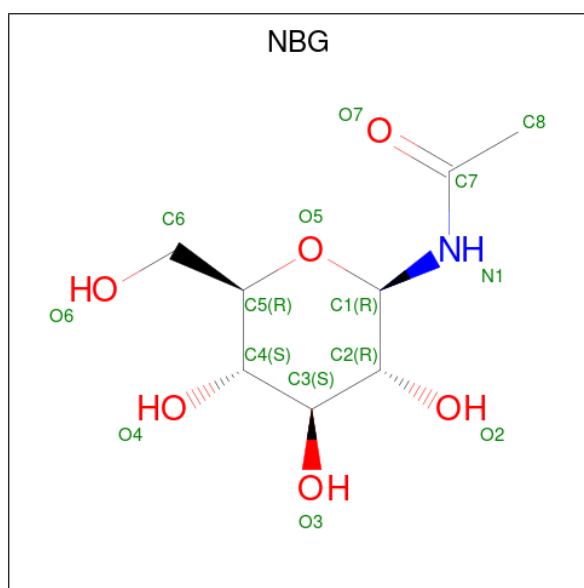
There are 7 unique types of molecules in this entry. The entry contains 13588 atoms, of which 0 are hydrogens and 0 are deuteriums.

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, liver form.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	794	Total	C	N	O	S	0	2	0
			6471	4156	1101	1185	29			
1	B	794	Total	C	N	O	S	0	2	0
			6467	4154	1097	1187	29			

- Molecule 2 is N-acetyl-beta-D-glucopyranosylamine (three-letter code: NBG) (formula:  $C_8H_{15}NO_6$ ).



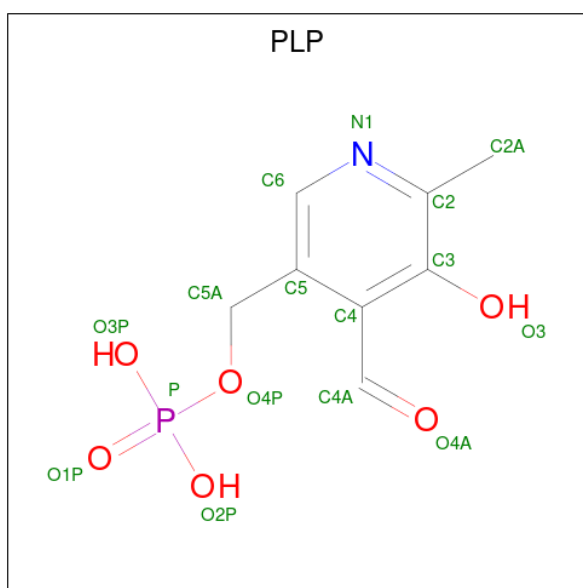
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			15	8	1	6		
2	B	1	Total	C	N	O	0	0
			15	8	1	6		

- Molecule 3 is PHOSPHATE ION (three-letter code: PO4) (formula:  $O_4P$ ).



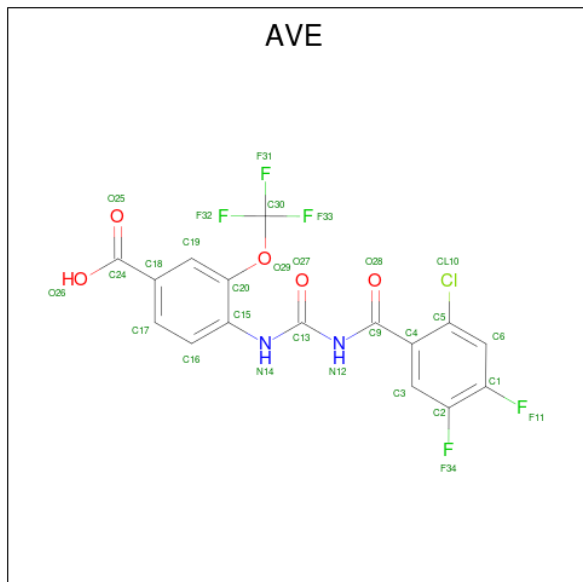
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	O	P		0	0
			5	4	1			
3	B	1	Total	O	P		0	0
			5	4	1			

- Molecule 4 is PYRIDOXAL-5'-PHOSPHATE (three-letter code: PLP) (formula:  $C_8H_{10}NO_6P$ ).



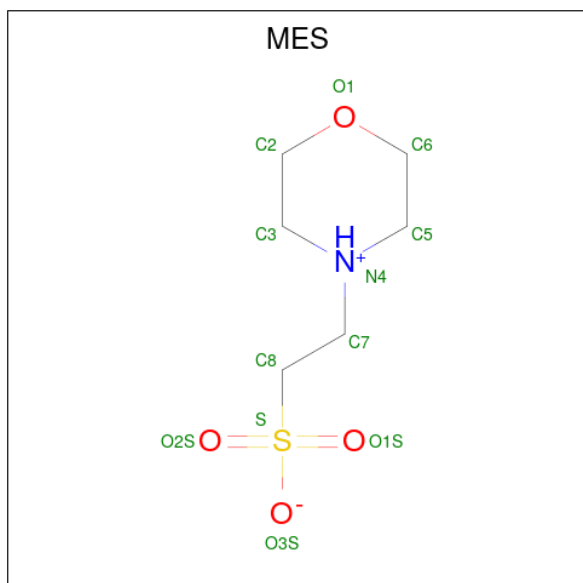
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0
			16	8	1	6	1	
4	B	1	Total	C	N	O	P	0
			16	8	1	6	1	

- Molecule 5 is 4-[3-(2-Chloro-4,5-difluoro-benzoyl)ureido]-3-trifluoromethoxybenzoic acid (three-letter code: AVE) (formula:  $C_{16}H_8ClF_5N_2O_5$ ).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
5	A	1	Total	C	Cl	F	N	O	0	0
			29	16	1	5	2	5		
5	B	1	Total	C	Cl	F	N	O	0	0
			29	16	1	5	2	5		

- Molecule 6 is 2-(N-MORPHOLINO)-ETHANESULFONIC ACID (three-letter code: MES) (formula:  $C_6H_{13}NO_4S$ ).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	B	1	Total	C	N	O	S	0	0
			12	6	1	4	1		

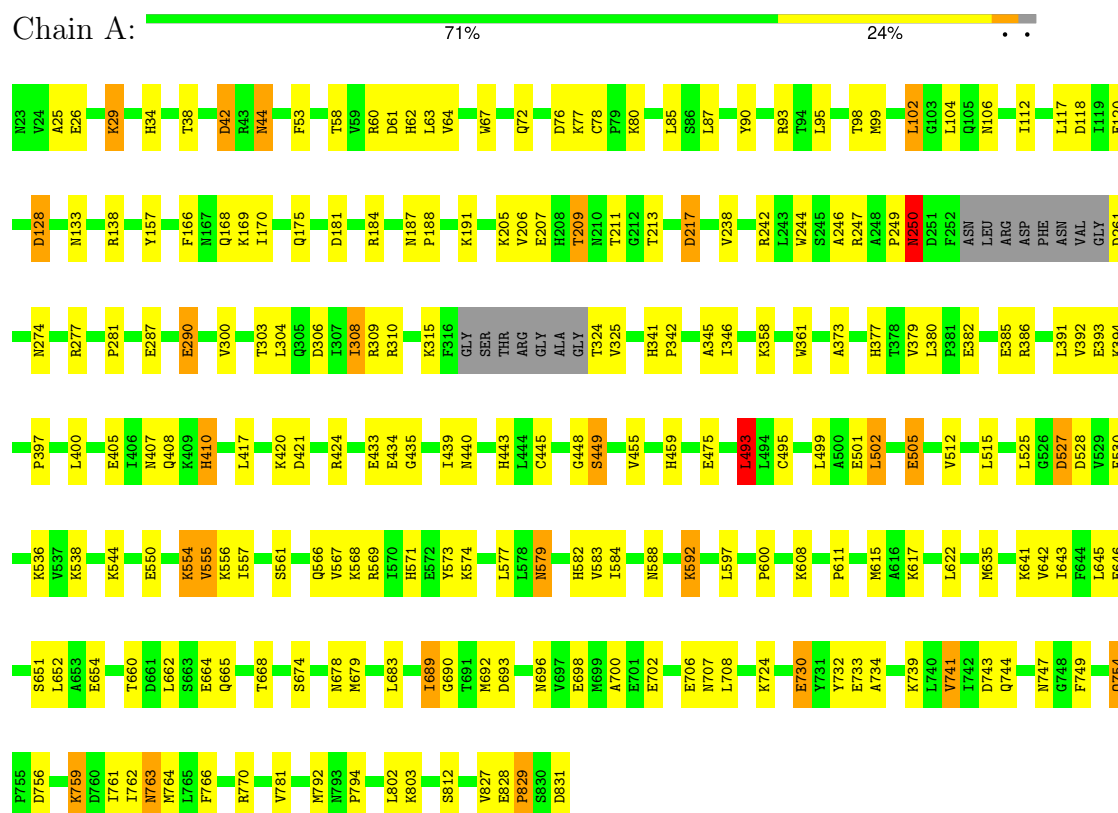
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	234	Total	O	0	0
			234	234		
7	B	274	Total	O	0	0
			274	274		

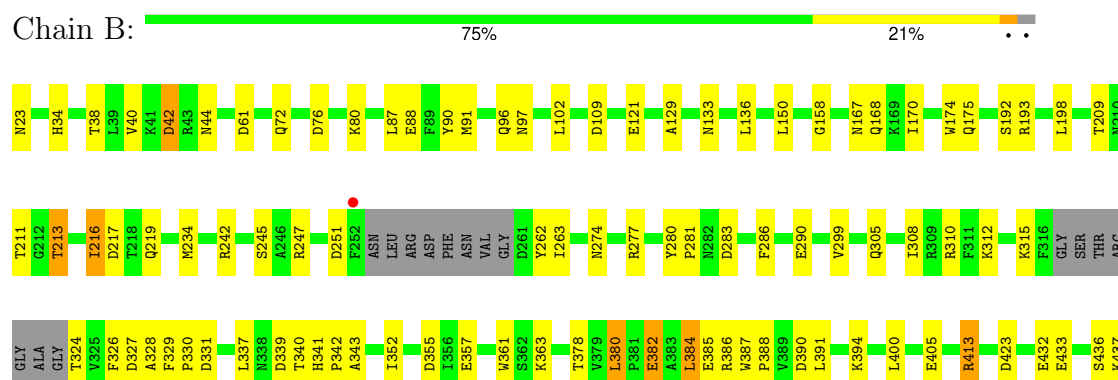
### 3 Residue-property plots

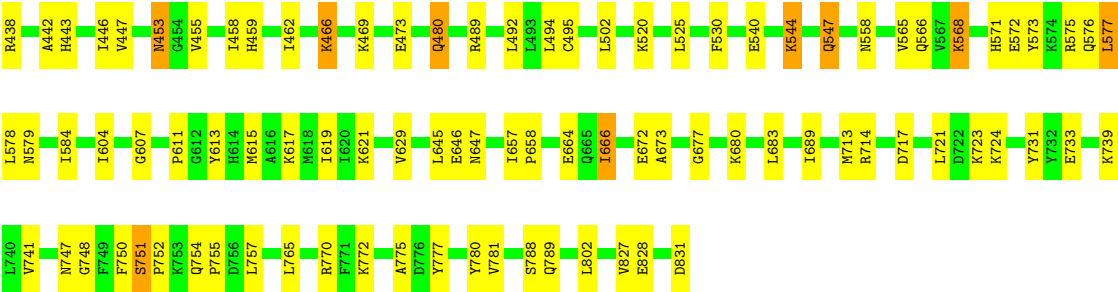
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density.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

- Molecule 1: Glycogen phosphorylase, liver form



- Molecule 1: Glycogen phosphorylase, liver form







## 4 Data and refinement statistics

Property	Value	Source
Space group	P 31	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	124.11Å 124.11Å 122.49Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	43.60 – 2.80 43.60 – 2.80	Depositor EDS
% Data completeness (in resolution range)	99.2 (43.60-2.80) 99.2 (43.60-2.80)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	1.78 (at 2.81Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, $R_{free}$	0.165 , 0.247 0.172 , 0.173	Depositor DCC
$R_{free}$ test set	2551 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	38.6	Xtriage
Anisotropy	0.170	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.36 , 61.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.28$	Xtriage
Estimated twinning fraction	0.026 for -h,-k,l 0.069 for h,-h-k,-l 0.037 for -k,-h,-l	Xtriage
$F_o, F_c$ correlation	0.94	EDS
Total number of atoms	13588	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.49% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: AVE, PO4, NBG, MES, 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	0.70	1/6616 (0.0%)	0.77	5/8945 (0.1%)
1	B	0.72	0/6613	0.79	3/8943 (0.0%)
All	All	0.71	1/13229 (0.0%)	0.78	8/17888 (0.0%)

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	1

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	78	CYS	CB-SG	-5.25	1.73	1.81

The worst 5 of 8 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	384	LEU	CA-CB-CG	7.62	132.84	115.30
1	A	770	ARG	NE-CZ-NH1	5.50	123.05	120.30
1	A	493	LEU	CA-CB-CG	5.41	127.74	115.30
1	A	770	ARG	NE-CZ-NH2	-5.22	117.69	120.30
1	B	310	ARG	NE-CZ-NH2	-5.20	117.70	120.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	249	PRO	Peptide

## 5.2 Too-close contacts

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	6471	0	6459	142	0
1	B	6467	0	6444	119	0
2	A	15	0	15	1	0
2	B	15	0	15	0	0
3	A	5	0	0	1	0
3	B	5	0	0	0	0
4	A	16	0	6	0	0
4	B	16	0	7	2	0
5	A	29	0	7	3	0
5	B	29	0	7	3	0
6	B	12	0	12	1	0
7	A	234	0	0	16	0
7	B	274	0	0	18	0
All	All	13588	0	12972	264	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 10.

The worst 5 of 264 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:B:274:ASN:ND2	1:B:277:ARG:HH11	1.40	1.20
1:A:274:ASN:ND2	1:A:277:ARG:HH11	1.38	1.18
1:B:413:ARG:HG2	1:B:413:ARG:HH11	1.14	1.13
1:B:217:ASP:HB3	7:B:1088:HOH:O	1.57	1.02
1:A:274:ASN:HD22	1:A:277:ARG:HH11	1.03	0.95

There are no symmetry-related clashes.

## 5.3 Torsion angles

### 5.3.1 Protein backbone

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	790/809 (98%)	718 (91%)	64 (8%)	8 (1%)	13	39
1	B	790/809 (98%)	737 (93%)	49 (6%)	4 (0%)	25	56
All	All	1580/1618 (98%)	1455 (92%)	113 (7%)	12 (1%)	19	44

5 of 12 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	250	ASN
1	B	315	LYS
1	A	435	GLY
1	A	410	HIS
1	A	568	LYS

### 5.3.2 Protein sidechains

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

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

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	698/706 (99%)	643 (92%)	55 (8%)	10	30
1	B	698/706 (99%)	652 (93%)	46 (7%)	14	39
All	All	1396/1412 (99%)	1295 (93%)	101 (7%)	11	34

5 of 101 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	109	ASP

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Mol	Chain	Res	Type
1	B	390	ASP
1	B	828	GLU
1	B	150	LEU
1	B	312	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 42 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	208	HIS
1	B	459	HIS
1	B	239	ASN
1	B	274	ASN
1	B	541	ASN

### 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](#)

9 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	PO4	A	3	-	4,4,4	1.21	0	6,6,6	1.06	0
6	MES	B	1	-	12,12,12	1.98	1 (8%)	15,16,16	2.46	8 (53%)
5	AVE	B	833	-	30,30,30	1.23	3 (10%)	43,44,44	1.77	7 (16%)
3	PO4	B	4	-	4,4,4	0.96	0	6,6,6	1.22	0
4	PLP	B	832	1	16,16,16	1.44	3 (18%)	20,23,23	1.73	4 (20%)
4	PLP	A	832	1	16,16,16	1.27	3 (18%)	20,23,23	1.73	5 (25%)
5	AVE	A	833	-	30,30,30	1.43	4 (13%)	43,44,44	1.24	3 (6%)
2	NBG	A	1	-	15,15,15	1.62	3 (20%)	21,21,21	1.51	1 (4%)
2	NBG	B	2	-	15,15,15	0.49	0	21,21,21	0.56	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
6	MES	B	1	-	-	2/6/14/14	0/1/1/1
5	AVE	B	833	-	-	3/21/21/21	0/2/2/2
4	PLP	B	832	1	-	3/8/8/8	0/1/1/1
4	PLP	A	832	1	-	4/8/8/8	0/1/1/1
5	AVE	A	833	-	-	0/21/21/21	0/2/2/2
2	NBG	A	1	-	-	0/6/26/26	0/1/1/1
2	NBG	B	2	-	-	0/6/26/26	0/1/1/1

The worst 5 of 17 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	1	MES	C8-S	-6.42	1.68	1.77
5	A	833	AVE	C18-C24	3.99	1.58	1.49
5	B	833	AVE	C15-N14	-3.54	1.34	1.41
5	A	833	AVE	C15-N14	-3.45	1.35	1.41
2	A	1	NBG	O5-C1	-3.39	1.38	1.43

The worst 5 of 28 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	B	833	AVE	C9-N12-C13	-6.35	122.11	128.13
6	B	1	MES	C5-N4-C3	5.45	120.58	108.84
4	B	832	PLP	C3-C4-C5	4.44	121.84	118.28
2	A	1	NBG	O5-C1-C2	-4.33	104.86	109.72

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	832	PLP	C3-C4-C5	4.00	121.49	118.28

There are no chirality outliers.

5 of 12 torsion outliers are listed below:

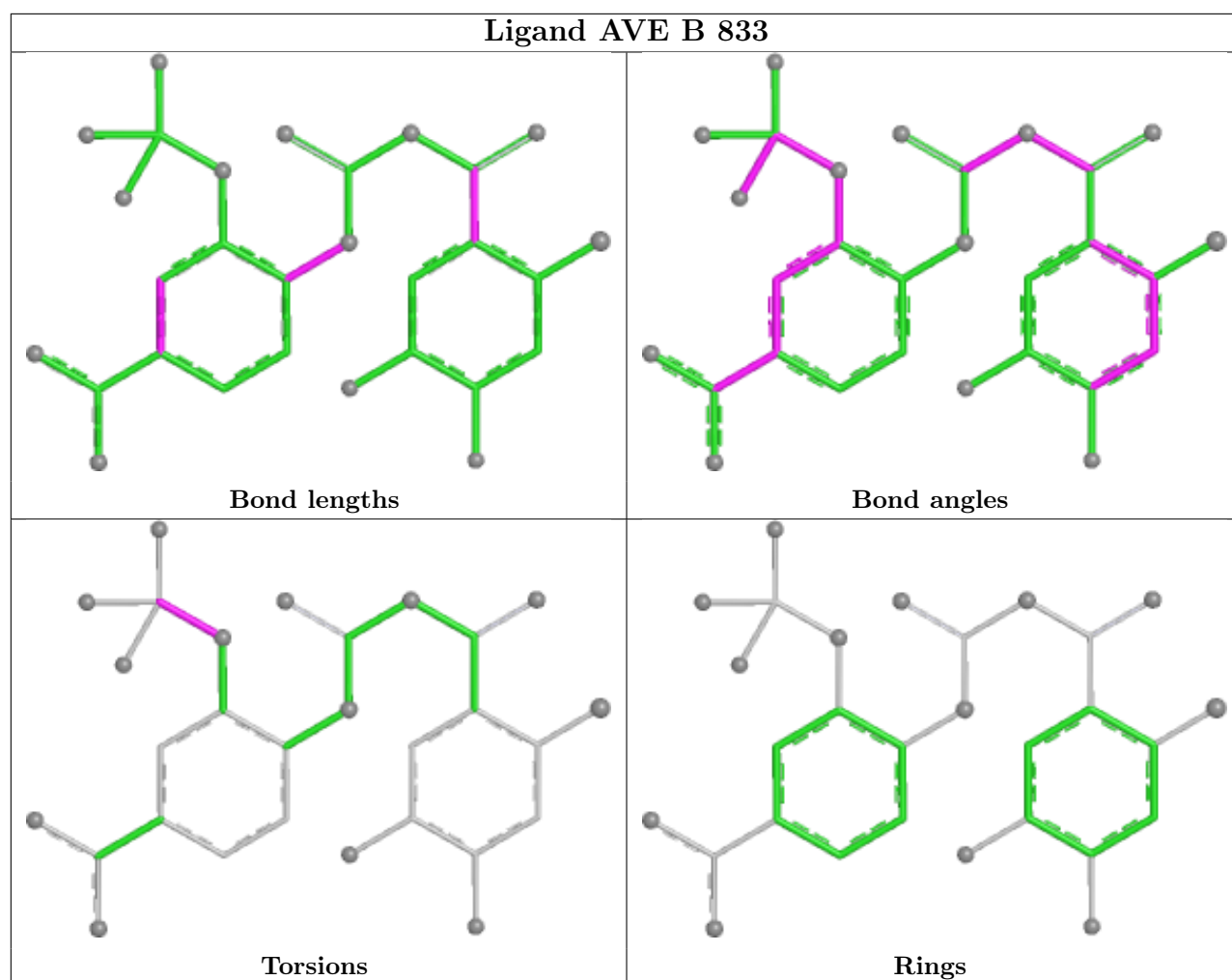
Mol	Chain	Res	Type	Atoms
4	A	832	PLP	C5A-O4P-P-O1P
6	B	1	MES	C8-C7-N4-C5
5	B	833	AVE	F33-C30-O29-C20
5	B	833	AVE	F32-C30-O29-C20
4	B	832	PLP	C3-C4-C4A-O4A

There are no ring outliers.

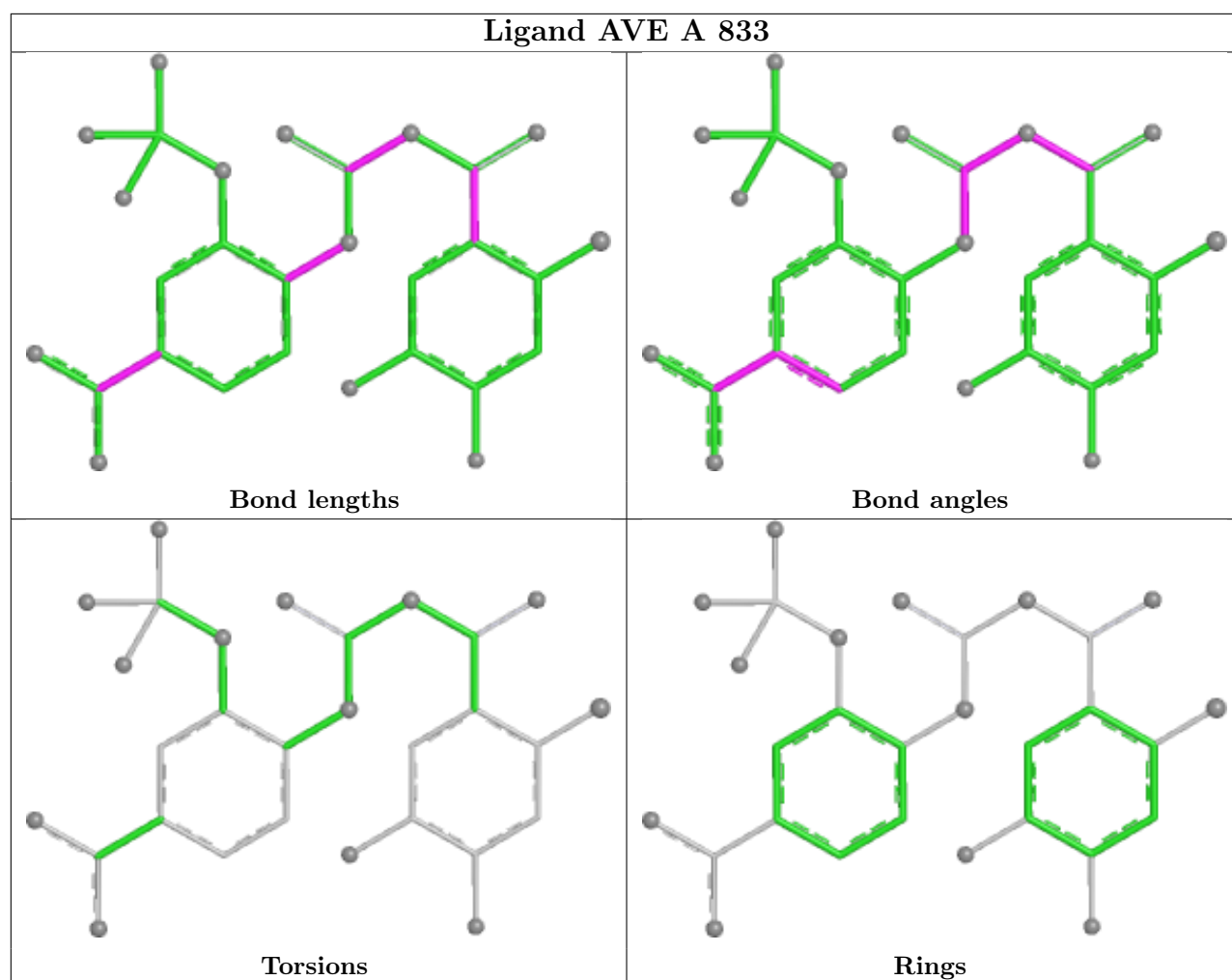
6 monomers are involved in 11 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	3	PO4	1	0
6	B	1	MES	1	0
5	B	833	AVE	3	0
4	B	832	PLP	2	0
5	A	833	AVE	3	0
2	A	1	NBG	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](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
1	A	794/809 (98%)	-0.73	0	100	100	12, 35, 61, 74	2 (0%)
1	B	794/809 (98%)	-0.87	1 (0%)	92	91	13, 31, 52, 70	2 (0%)
All	All	1588/1618 (98%)	-0.80	1 (0%)	92	91	12, 33, 58, 74	4 (0%)

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	252	PHE	3.1

### 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, 95<sup>th</sup> 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 <sup>2</sup> )	Q < 0.9
4	PLP	B	832	16/16	0.92	0.10	18,19,22,24	0
2	NBG	A	1	15/15	0.93	0.09	25,28,32,32	0
2	NBG	B	2	15/15	0.96	0.07	23,28,30,32	0
6	MES	B	1	12/12	0.96	0.09	48,51,58,58	0

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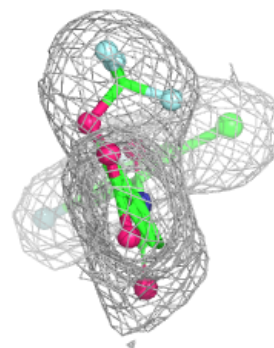
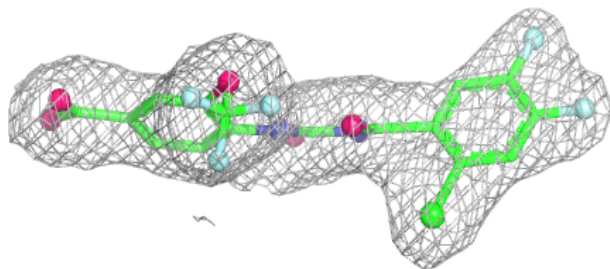
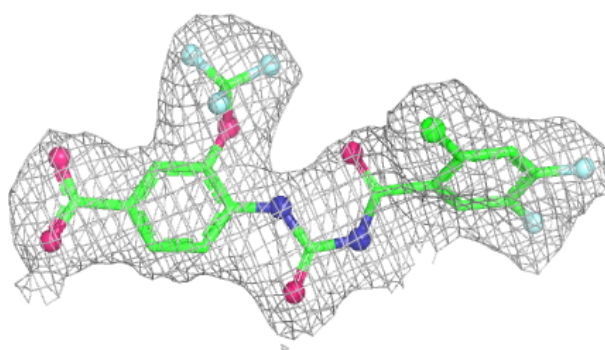
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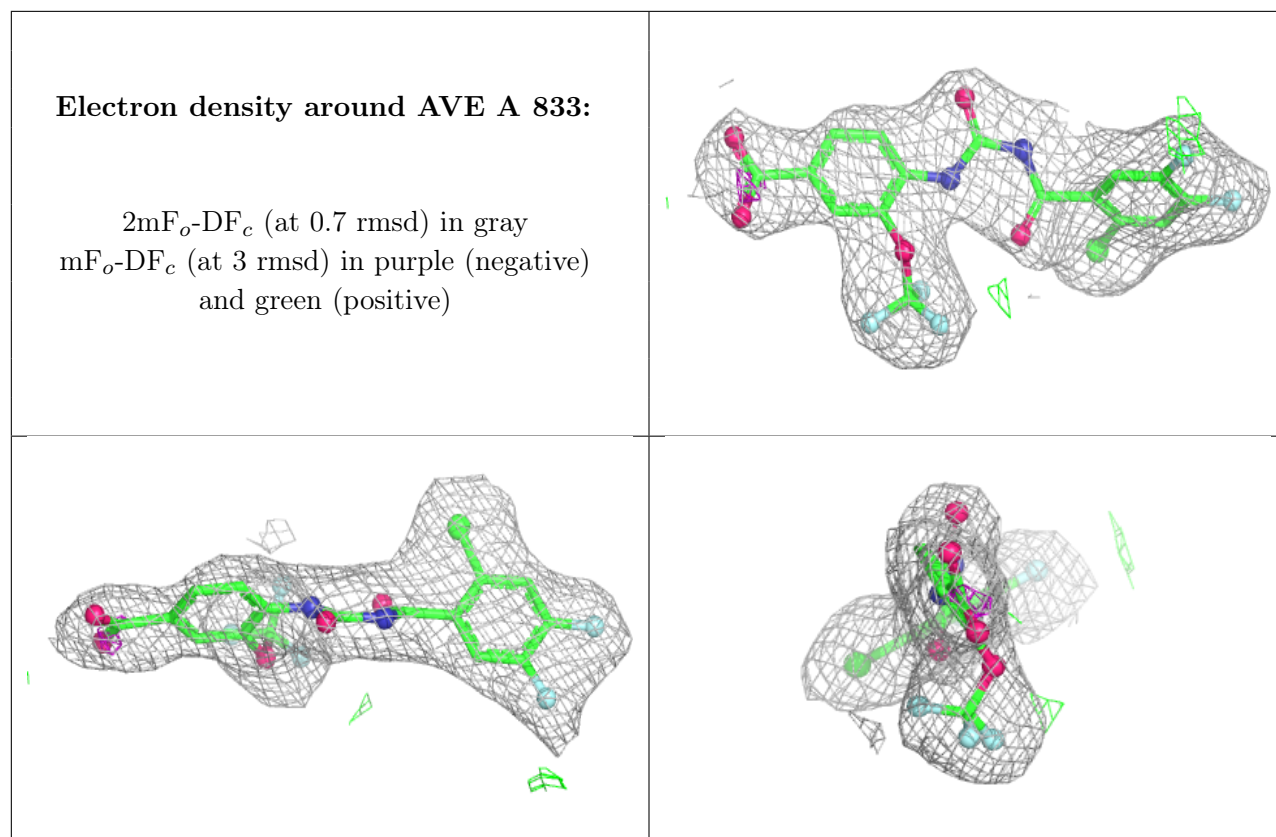
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors( $\text{\AA}^2$ )	Q<0.9
5	AVE	B	833	29/29	0.97	0.06	27,31,34,35	0
4	PLP	A	832	16/16	0.97	0.07	25,30,34,34	0
5	AVE	A	833	29/29	0.98	0.06	21,26,34,39	0
3	PO4	A	3	5/5	0.98	0.06	28,28,29,32	0
3	PO4	B	4	5/5	0.98	0.06	32,32,34,38	0

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 AVE B 833:**

2mF<sub>o</sub>-DF<sub>c</sub> (at 0.7 rmsd) in gray  
mF<sub>o</sub>-DF<sub>c</sub> (at 3 rmsd) in purple (negative)  
and green (positive)





## 6.5 Other polymers [i](#)

There are no such residues in this entry.