



# Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:27 PM UTC

PDB ID : 1MAP / pdb\_00001map  
Title : CRYSTAL STRUCTURES OF TRUE ENZYMATIC REACTION INTERMEDIATES: ASPARTATE AND GLUTAMATE KETIMINES IN ASPARTATE AMINOTRANSFERASE  
Authors : Malashkevich, V.N.; Jansonius, J.N.  
Deposited on : 1993-09-10  
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](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)
Xtriage (Phenix)	:	<b>NOT EXECUTED</b>
EDS	:	<b>NOT EXECUTED</b>
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

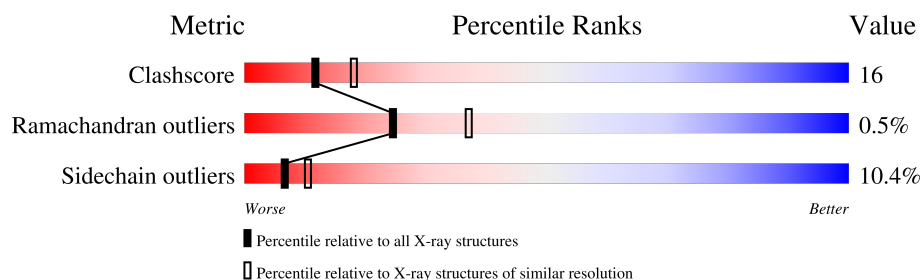
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.40 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))
Clashscore	190562	5391 (2.40-2.40)
Ramachandran outliers	187476	5320 (2.40-2.40)
Sidechain outliers	187428	5321 (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  $\geq 3$ , 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	401	

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	KET	A	412	X	-	-	-

## 2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 3491 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.

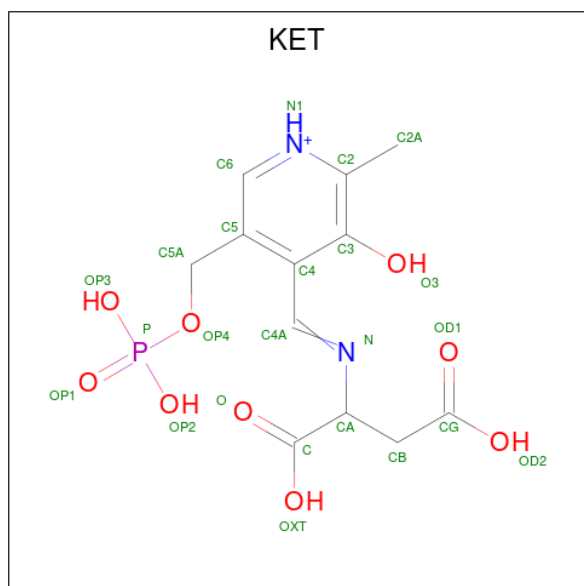
- Molecule 1 is a protein called ASPARTATE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	401	3161	2004	558	581	18	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	47	PRO	SER	conflict	UNP P00508

- Molecule 2 is 2-[(3-HYDROXY-2-METHYL-5-PHOSPHONOXYMETHYL-PYRIDIN-4-YLMETHYLENE)-AMINO]-SUCCINIC ACID (CCD ID: KET) (formula: C<sub>12</sub>H<sub>16</sub>N<sub>2</sub>O<sub>9</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	24	12	2	9	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	306	Total 306	O 306	0	0



## 4 Data and refinement statistics

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

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	70.20Å 91.60Å 129.80Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	8.00 – 2.40	Depositor
% Data completeness (in resolution range)	(Not available) (8.00-2.40)	Depositor
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
Refinement program	TNT	Depositor
R, $R_{free}$	0.169 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3491	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	23.0	wwPDB-VP

## 5 Model quality

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: KET

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	0.91	0/3231	1.54	40/4360 (0.9%)

There are no bond length outliers.

All (40) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	276	ASP	CB-CA-C	-8.75	92.73	111.11
1	A	363	THR	N-CA-C	8.20	121.26	111.33
1	A	101	VAL	N-CA-CB	7.44	123.64	111.58
1	A	87	ALA	CA-C-N	7.33	130.69	120.29
1	A	87	ALA	C-N-CA	7.33	130.69	120.29
1	A	233	ILE	N-CA-C	6.83	116.95	110.53
1	A	225	TYR	N-CA-C	6.73	121.36	111.87
1	A	51	ASN	CA-CB-CG	-6.70	105.90	112.60
1	A	408	VAL	N-CA-CB	-6.37	100.72	111.23
1	A	246	GLN	N-CA-C	-6.35	105.53	113.28
1	A	167	SER	N-CA-C	6.29	116.87	108.38
1	A	80	THR	CA-CB-OG1	6.09	118.74	109.60
1	A	88	LEU	N-CA-C	5.98	117.88	111.36
1	A	321	VAL	CA-C-N	5.95	128.25	120.28
1	A	321	VAL	C-N-CA	5.95	128.25	120.28
1	A	278	GLU	N-CA-CB	5.89	118.87	110.16
1	A	238	TRP	N-CA-C	5.86	118.16	111.02
1	A	298	PRO	N-CA-C	5.76	117.73	110.70
1	A	300	MET	N-CA-C	5.76	120.44	112.90
1	A	276	ASP	CA-CB-CG	5.76	118.36	112.60
1	A	251	VAL	N-CA-C	-5.70	100.22	108.89
1	A	301	ASN	N-CA-C	5.70	117.95	111.11
1	A	27	ASP	CA-CB-CG	5.68	118.28	112.60
1	A	90	GLU	N-CA-C	5.63	118.96	111.75

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	207	GLU	CA-C-N	5.58	128.21	120.29
1	A	207	GLU	C-N-CA	5.58	128.21	120.29
1	A	80	THR	CA-CB-CG2	5.50	119.84	110.50
1	A	10	GLU	N-CA-C	5.47	117.93	110.55
1	A	278	GLU	CB-CG-CD	5.34	121.69	112.60
1	A	250	VAL	N-CA-CB	-5.34	105.98	112.07
1	A	297	ASN	CB-CA-C	5.24	118.09	109.97
1	A	202	GLN	N-CA-C	5.23	117.66	111.33
1	A	91	ASN	CA-CB-CG	-5.22	107.38	112.60
1	A	78	ASP	N-CA-CB	-5.19	102.22	110.22
1	A	55	LYS	N-CA-CB	5.14	117.77	110.16
1	A	111	SER	CA-C-N	5.13	127.16	120.28
1	A	111	SER	C-N-CA	5.13	127.16	120.28
1	A	129	ARG	N-CA-CB	5.07	118.27	110.61
1	A	195	PRO	CB-CA-C	-5.06	99.35	112.00
1	A	136	PRO	CB-CA-C	-5.06	103.62	110.60

There are no chirality outliers.

There are no planarity outliers.

## 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	3161	0	3154	101	0
2	A	24	0	10	0	0
3	A	306	0	0	20	1
All	All	3491	0	3164	101	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 16.

All (101) 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:373:LEU:HD23	1:A:381:MET:HE1	1.49	0.95

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:366:LYS:H	1:A:369:GLN:NE2	1.65	0.94
1:A:91:ASN:H	1:A:91:ASN:HD22	1.16	0.89
1:A:91:ASN:H	1:A:91:ASN:ND2	1.71	0.83
1:A:366:LYS:H	1:A:369:GLN:HE21	1.25	0.81
1:A:165:THR:HG21	3:A:438:HOH:O	1.81	0.78
1:A:313:PRO:HB2	1:A:314:GLU:OE2	1.84	0.76
1:A:174:MET:HE1	1:A:207:GLU:HG3	1.68	0.76
1:A:94:ALA:HA	1:A:99:ARG:HD3	1.69	0.75
1:A:278:GLU:HG3	3:A:597:HOH:O	1.87	0.75
1:A:304:ARG:HD3	3:A:463:HOH:O	1.87	0.73
1:A:373:LEU:HD23	1:A:381:MET:CE	2.19	0.72
1:A:71:LEU:HD12	3:A:456:HOH:O	1.90	0.71
1:A:162:ASP:OD2	1:A:165:THR:HB	1.91	0.70
1:A:174:MET:CE	1:A:207:GLU:HG3	2.21	0.70
1:A:370:VAL:HG22	1:A:381:MET:HE3	1.72	0.70
1:A:80:THR:HG23	3:A:475:HOH:O	1.95	0.67
1:A:404:ILE:O	1:A:409:THR:HB	1.94	0.67
1:A:366:LYS:N	1:A:369:GLN:HE21	1.91	0.66
1:A:45:GLY:HA2	3:A:652:HOH:O	1.96	0.65
1:A:161:TYR:N	3:A:603:HOH:O	2.29	0.64
1:A:90:GLU:O	1:A:96:LYS:NZ	2.29	0.64
1:A:370:VAL:HA	1:A:381:MET:HE3	1.80	0.64
1:A:290:LEU:HD11	3:A:658:HOH:O	1.98	0.63
1:A:90:GLU:N	3:A:687:HOH:O	2.31	0.63
1:A:8:HIS:H	1:A:8:HIS:CD2	2.17	0.62
1:A:59:MET:O	1:A:63:LYS:HG3	1.99	0.62
1:A:97:SER:OG	1:A:99:ARG:HG3	1.99	0.61
1:A:235:ARG:O	3:A:635:HOH:O	2.16	0.60
1:A:52:CYS:HB3	1:A:318:GLU:HG2	1.83	0.60
1:A:182:GLU:HG2	1:A:215:ARG:O	2.03	0.58
1:A:219:ALA:HB3	1:A:250:VAL:HG12	1.86	0.58
1:A:84:ALA:O	1:A:88:LEU:HB2	2.05	0.57
1:A:366:LYS:N	1:A:369:GLN:NE2	2.45	0.56
1:A:387:ILE:O	1:A:387:ILE:HG13	2.04	0.55
1:A:120:GLN:NE2	3:A:442:HOH:O	2.40	0.55
1:A:316:ARG:NH2	3:A:581:HOH:O	2.40	0.54
1:A:374:THR:HG23	1:A:380:TYR:CZ	2.43	0.54
1:A:77:ALA:O	1:A:80:THR:HG22	2.07	0.54
1:A:366:LYS:HB3	1:A:367:PRO:CD	2.39	0.52
1:A:55:LYS:O	1:A:59:MET:HG3	2.08	0.52
1:A:235:ARG:O	1:A:235:ARG:HG3	2.00	0.51

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:137:LYS:O	1:A:160:TYR:HB3	2.11	0.51
1:A:231:GLY:O	1:A:324:LYS:HD2	2.11	0.51
1:A:340:ASN:HD22	1:A:343:LYS:NZ	2.09	0.50
1:A:233:ILE:HG13	1:A:234:ASN:N	2.27	0.50
1:A:21:THR:HG22	1:A:25:LYS:HD2	1.95	0.49
1:A:301:ASN:O	1:A:305:ILE:HG13	2.13	0.49
1:A:201:ARG:O	1:A:204:GLN:HB2	2.12	0.49
1:A:340:ASN:ND2	1:A:343:LYS:NZ	2.61	0.49
1:A:400:LEU:O	1:A:404:ILE:HG13	2.13	0.49
1:A:340:ASN:ND2	1:A:343:LYS:HZ3	2.13	0.47
1:A:340:ASN:HD22	1:A:343:LYS:HZ3	1.60	0.47
1:A:234:ASN:HD22	1:A:241:ARG:HH12	1.63	0.47
1:A:353:ILE:HG12	1:A:361:CYS:SG	2.55	0.47
1:A:334:ARG:HD3	1:A:353:ILE:O	2.15	0.46
1:A:43:ASP:O	1:A:393:ALA:HB1	2.16	0.46
1:A:144:THR:HB	1:A:145:PRO:CD	2.45	0.46
1:A:91:ASN:HB3	3:A:566:HOH:O	2.15	0.45
1:A:351:GLN:HE21	1:A:351:GLN:HB2	1.32	0.45
1:A:18:LEU:HD12	1:A:18:LEU:HA	1.78	0.45
1:A:46:LYS:NZ	3:A:700:HOH:O	2.50	0.45
1:A:242:HIS:HE1	3:A:548:HOH:O	1.99	0.45
1:A:317:LYS:NZ	3:A:586:HOH:O	2.31	0.45
1:A:64:LYS:HD2	1:A:64:LYS:HA	1.73	0.45
1:A:314:GLU:H	1:A:314:GLU:CD	2.25	0.45
1:A:366:LYS:HB3	1:A:367:PRO:HD2	1.98	0.45
1:A:96:LYS:HE2	3:A:551:HOH:O	2.16	0.45
1:A:292:ARG:HB3	1:A:293:PRO:HD3	1.99	0.45
1:A:380:TYR:HA	3:A:505:HOH:O	2.17	0.45
1:A:165:THR:O	1:A:165:THR:HG23	2.17	0.45
1:A:71:LEU:HD13	1:A:300:MET:HE3	1.99	0.44
1:A:50:LEU:N	1:A:50:LEU:HD12	2.32	0.44
1:A:55:LYS:HE3	1:A:318:GLU:OE1	2.17	0.44
1:A:208:LEU:O	1:A:212:VAL:HG23	2.16	0.44
1:A:90:GLU:HG2	3:A:687:HOH:O	2.18	0.44
1:A:203:GLU:CD	1:A:203:GLU:H	2.24	0.44
1:A:120:GLN:HG3	1:A:150:ALA:O	2.17	0.43
1:A:312:THR:HB	1:A:315:LEU:HB2	2.01	0.42
1:A:341:LEU:HD13	1:A:350:TRP:CG	2.54	0.42
1:A:91:ASN:ND2	1:A:91:ASN:N	2.47	0.42
1:A:315:LEU:HD23	1:A:315:LEU:HA	1.95	0.42
1:A:373:LEU:HD22	1:A:408:VAL:HG11	2.02	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:90:GLU:O	1:A:96:LYS:HD3	2.18	0.42
1:A:125:PHE:O	1:A:126:SER:HB2	2.19	0.42
1:A:129:ARG:HA	1:A:129:ARG:HE	1.83	0.42
1:A:326:MET:O	1:A:330:ILE:HG13	2.19	0.42
1:A:101:VAL:O	1:A:271:THR:HA	2.20	0.42
1:A:290:LEU:HD21	3:A:658:HOH:O	2.19	0.42
1:A:8:HIS:H	1:A:8:HIS:HD2	1.67	0.41
1:A:137:LYS:HG3	1:A:158:TYR:O	2.20	0.41
1:A:300:MET:O	1:A:304:ARG:HG3	2.20	0.41
1:A:34:ASN:ND2	1:A:36:GLY:H	2.19	0.41
1:A:314:GLU:CD	1:A:314:GLU:N	2.79	0.41
1:A:174:MET:HE2	1:A:207:GLU:CG	2.51	0.40
1:A:282:ARG:HH11	1:A:282:ARG:HD2	1.78	0.40
1:A:174:MET:HE2	1:A:207:GLU:HG3	1.98	0.40
1:A:173:ALA:O	1:A:177:ILE:HG13	2.21	0.40
1:A:41:ARG:HA	1:A:41:ARG:HD3	1.83	0.40
1:A:155:LEU:HD13	1:A:155:LEU:HA	1.95	0.40
1:A:370:VAL:HA	1:A:381:MET:CE	2.48	0.40

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)
3:A:637:HOH:O	3:A:637:HOH:O[3_655]	0.70	1.50

## 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	399/401 (100%)	382 (96%)	15 (4%)	2 (0%)	24 37

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	263	TYR
1	A	313	PRO

### 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	335/335 (100%)	300 (90%)	35 (10%)	<b>7</b> <b>10</b>

All (35) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3	SER
1	A	4	SER
1	A	18	LEU
1	A	46	LYS
1	A	71	LEU
1	A	80	THR
1	A	88	LEU
1	A	91	ASN
1	A	103	VAL
1	A	107	SER
1	A	112	LEU
1	A	148	ARG
1	A	155	LEU
1	A	165	THR
1	A	179	LYS
1	A	216	ASN
1	A	235	ARG
1	A	252	LEU
1	A	258	LYS
1	A	284	GLU
1	A	290	LEU
1	A	304	ARG
1	A	308	LEU
1	A	317	LYS
1	A	318	GLU

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Mol	Chain	Res	Type
1	A	324	LYS
1	A	343	LYS
1	A	347	SER
1	A	351	GLN
1	A	373	LEU
1	A	375	LYS
1	A	383	LYS
1	A	395	SER
1	A	408	VAL
1	A	409	THR

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	8	HIS
1	A	34	ASN
1	A	91	ASN
1	A	120	GLN
1	A	156	GLN
1	A	202	GLN
1	A	216	ASN
1	A	234	ASN
1	A	242	HIS
1	A	246	GLN
1	A	286	GLN
1	A	336	GLN
1	A	340	ASN
1	A	351	GLN
1	A	369	GLN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

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](#)

1 ligand is 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	KET	A	412	-	22,24,24	2.77	4 (18%)	21,34,34	3.04	7 (33%)

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	KET	A	412	-	1/1/4/5	9/18/19/19	0/1/1/1

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	412	KET	CA-N	-10.99	1.33	1.46
2	A	412	KET	C5A-C5	4.57	1.56	1.50
2	A	412	KET	CA-C	3.06	1.56	1.52
2	A	412	KET	P-OP3	-2.21	1.46	1.54

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	412	KET	CB-CA-N	9.64	124.16	109.56
2	A	412	KET	C-CA-N	5.92	122.81	108.22
2	A	412	KET	C2A-C2-N1	4.17	118.72	112.46
2	A	412	KET	C3-C2-N1	-3.81	117.53	122.58
2	A	412	KET	CA-N-C4A	3.71	125.08	117.01

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*Continued from previous page...*

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	412	KET	O3-C3-C2	-2.52	115.80	118.29
2	A	412	KET	O3-C3-C4	2.06	122.81	117.12

All (1) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
2	A	412	KET	CA

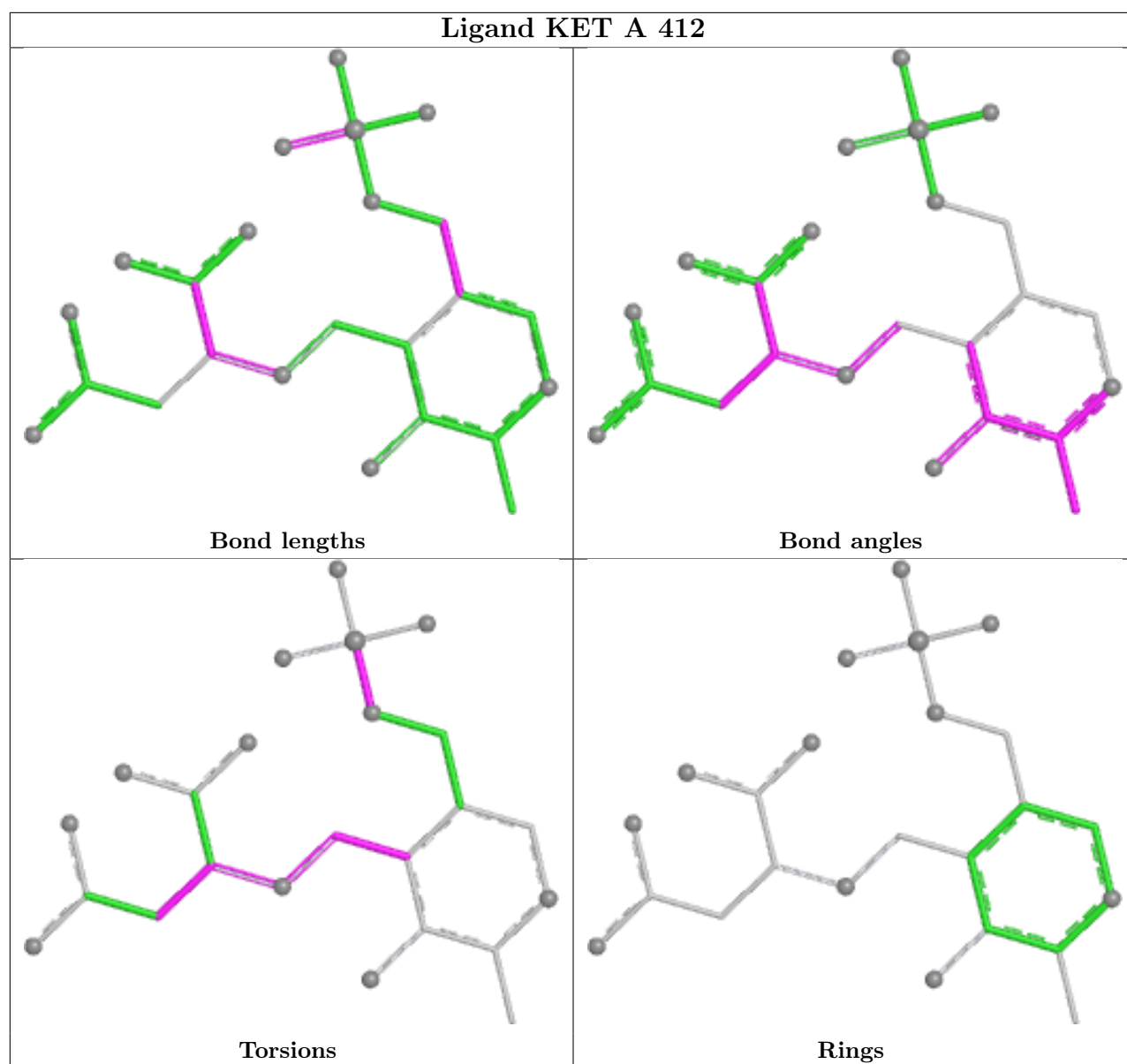
All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	412	KET	C3-C4-C4A-N
2	A	412	KET	C4-C4A-N-CA
2	A	412	KET	C5A-OP4-P-OP1
2	A	412	KET	C5A-OP4-P-OP2
2	A	412	KET	C5A-OP4-P-OP3
2	A	412	KET	CB-CA-N-C4A
2	A	412	KET	C-CA-N-C4A
2	A	412	KET	N-CA-CB-CG
2	A	412	KET	C5-C4-C4A-N

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.



## 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.