Full wwPDB X-ray Structure Validation Report (i)

Feb 5, 2024 – 07:31 AM EST

PDB ID	:	1SPA
Title	:	ROLE OF ASP222 IN THE CATALYTIC MECHANISM OF ESCHERICHIA COLI ASPARTATE AMINOTRANSFERASE: THE AMINO ACID RESIDUE WHICH ENHANCES THE FUNCTION OF THE ENZYME-BOUND COENZYME PYRIDOXAL 5'-PHOSPHATE
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Deposited on	:	1993-01-26
Resolution	:	2.00 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/XrayValidationReportHelp
with specific help available everywhere you see the (i) symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references (i)) were used in the production of this report:

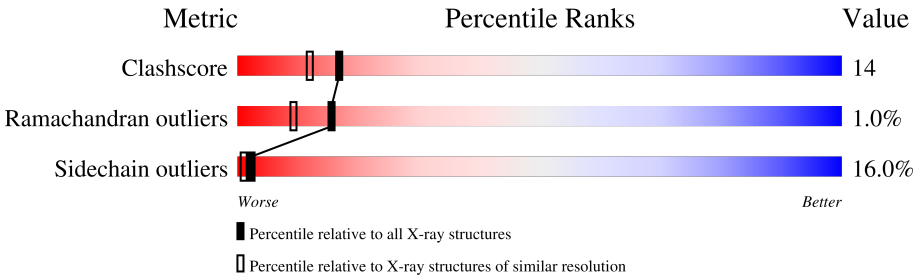
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.00 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	9178 (2.00-2.00)
Ramachandran outliers	138981	9054 (2.00-2.00)
Sidechain outliers	138945	9053 (2.00-2.00)

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 >=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 <=5%

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	396	63% 27% 10% ·

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 3183 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.

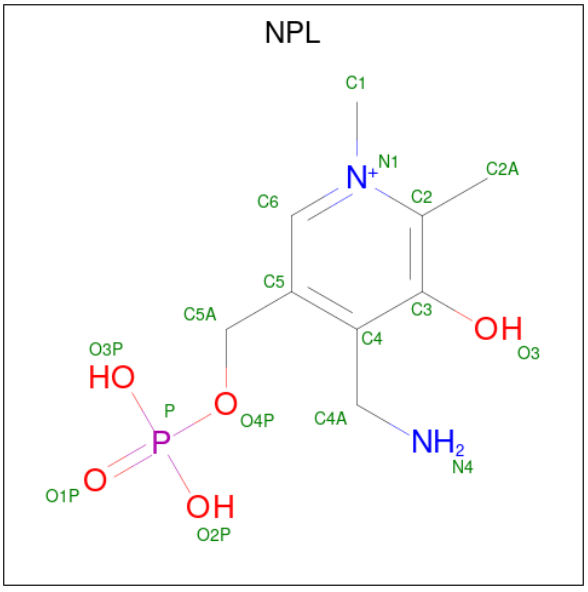
- Molecule 1 is a protein called ASPARTATE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	396	3066	1935	536	582	13	0	0	0

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	222	ALA	ASP	conflict	UNP P00509

- Molecule 2 is N-METHYL-4-DEOXY-4-AMINO-PYRIDOXAL-5-PHOSPHATE (three-letter code: NPL) (formula: $C_9H_{16}N_2O_5P$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	17	9	2	5	1	0	0

- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	100	Total	O	0	0
			100	100		

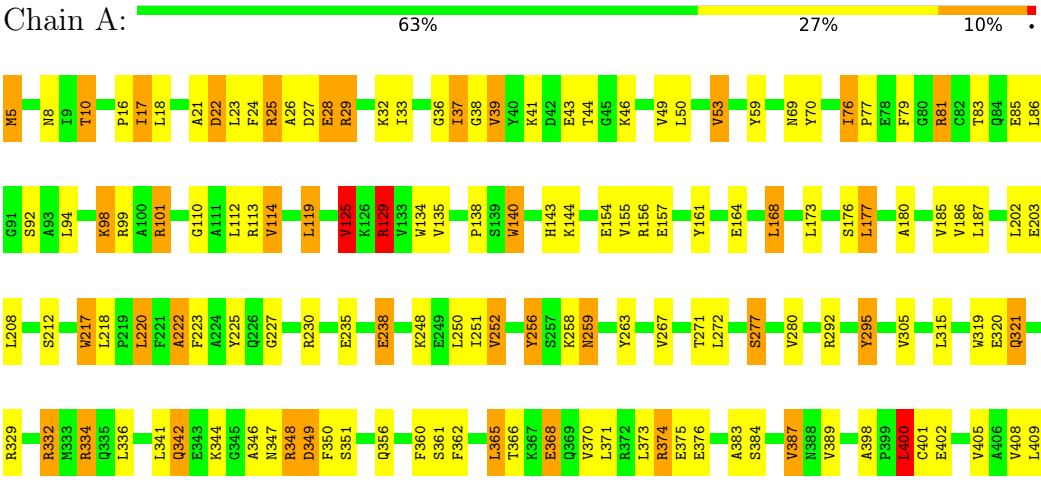
3 Residue-property plots (i)

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: ASPARTATE AMINOTRANSFERASE

Chain A:



4 Data and refinement statistics (i)

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, α, β, γ	154.80Å 86.20Å 79.10Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	(Not available) – 2.00	Depositor
% Data completeness (in resolution range)	(Not available) ((Not available)-2.00)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.209 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3183	wwPDB-VP
Average B, all atoms (Å^2)	28.0	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: NPL

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	1.02	5/3127 (0.2%)	1.73	60/4236 (1.4%)

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 (5) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	368	GLU	CA-CB	6.20	1.67	1.53
1	A	368	GLU	CG-CD	6.06	1.61	1.51
1	A	368	GLU	CB-CG	6.04	1.63	1.52
1	A	217	TRP	CG-CD2	-5.50	1.34	1.43
1	A	154	GLU	CB-CG	5.18	1.62	1.52

All (60) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	334	ARG	NE-CZ-NH2	-14.71	112.95	120.30
1	A	334	ARG	NE-CZ-NH1	14.58	127.59	120.30
1	A	374	ARG	NE-CZ-NH1	11.31	125.96	120.30
1	A	327	ARG	NE-CZ-NH1	9.75	125.18	120.30
1	A	230	ARG	NE-CZ-NH1	8.90	124.75	120.30
1	A	327	ARG	NE-CZ-NH2	-8.70	115.95	120.30
1	A	134	TRP	CD1-CG-CD2	8.68	113.24	106.30
1	A	368	GLU	CA-CB-CG	8.67	132.48	113.40

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	81	ARG	NE-CZ-NH1	8.59	124.59	120.30
1	A	374	ARG	NE-CZ-NH2	-8.43	116.09	120.30
1	A	205	TRP	CD1-CG-CD2	8.13	112.80	106.30
1	A	205	TRP	CE2-CD2-CG	-7.93	100.95	107.30
1	A	230	ARG	NE-CZ-NH2	-7.68	116.46	120.30
1	A	349	ASP	N-CA-C	-7.64	90.36	111.00
1	A	101	ARG	NE-CZ-NH2	-7.42	116.59	120.30
1	A	387	VAL	N-CA-CB	-7.37	95.29	111.50
1	A	319	TRP	CE2-CD2-CG	-7.35	101.42	107.30
1	A	319	TRP	CD1-CG-CD2	7.28	112.12	106.30
1	A	134	TRP	CE2-CD2-CG	-7.05	101.66	107.30
1	A	401	CYS	CA-CB-SG	-6.94	101.50	114.00
1	A	99	ARG	NE-CZ-NH1	6.84	123.72	120.30
1	A	374	ARG	CA-CB-CG	6.69	128.12	113.40
1	A	405	VAL	CA-CB-CG2	-6.68	100.88	110.90
1	A	375	GLU	CA-CB-CG	6.56	127.83	113.40
1	A	319	TRP	CG-CD2-CE3	6.54	139.79	133.90
1	A	161	TYR	CB-CG-CD2	-6.50	117.10	121.00
1	A	140	TRP	CE2-CD2-CG	-6.41	102.17	107.30
1	A	140	TRP	CD1-CG-CD2	6.33	111.36	106.30
1	A	387	VAL	CB-CA-C	6.32	123.41	111.40
1	A	10	THR	CA-CB-CG2	6.20	121.09	112.40
1	A	59	TYR	CB-CG-CD1	-6.18	117.29	121.00
1	A	217	TRP	CA-CB-CG	6.07	125.24	113.70
1	A	222	ALA	N-CA-C	-5.95	94.92	111.00
1	A	400	LEU	CA-CB-CG	5.93	128.95	115.30
1	A	125	VAL	CA-C-N	-5.80	104.44	117.20
1	A	113	ARG	NE-CZ-NH1	5.79	123.20	120.30
1	A	368	GLU	OE1-CD-OE2	-5.75	116.39	123.30
1	A	25	ARG	CA-C-N	-5.75	104.56	117.20
1	A	217	TRP	CE2-CD2-CG	-5.73	102.72	107.30
1	A	256	TYR	CB-CG-CD1	-5.70	117.58	121.00
1	A	10	THR	CA-CB-OG1	-5.68	97.06	109.00
1	A	119	LEU	CA-CB-CG	5.68	128.36	115.30
1	A	140	TRP	CG-CD2-CE3	5.67	139.00	133.90
1	A	129	ARG	NE-CZ-NH1	5.67	123.13	120.30
1	A	134	TRP	CG-CD1-NE1	-5.66	104.44	110.10
1	A	250	LEU	CA-CB-CG	5.61	128.20	115.30
1	A	238	GLU	N-CA-CB	-5.56	100.59	110.60
1	A	295	TYR	CB-CG-CD1	-5.50	117.70	121.00
1	A	319	TRP	CB-CG-CD1	-5.49	119.86	127.00
1	A	217	TRP	NE1-CE2-CD2	5.43	112.73	107.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	A	321	GLN	CG-CD-NE2	5.42	129.71	116.70
1	A	86	LEU	CA-CB-CG	5.41	127.74	115.30
1	A	205	TRP	CG-CD1-NE1	-5.32	104.78	110.10
1	A	332	ARG	CB-CA-C	-5.31	99.77	110.40
1	A	334	ARG	CG-CD-NE	-5.31	100.65	111.80
1	A	387	VAL	CG1-CB-CG2	5.26	119.31	110.90
1	A	347	ASN	CA-C-N	-5.24	105.68	117.20
1	A	81	ARG	CA-CB-CG	5.21	124.87	113.40
1	A	332	ARG	NE-CZ-NH2	-5.19	117.70	120.30
1	A	37	ILE	N-CA-C	5.03	124.57	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	295	TYR	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	3066	0	3019	86	2
2	A	17	0	14	2	0
3	A	100	0	0	3	0
All	All	3183	0	3033	86	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 14.

All (86) 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:348:ARG:HG3	1:A:350:PHE:CD2	2.06	0.88
1:A:28:GLU:HG3	1:A:29:ARG:HD2	1.58	0.84
1:A:258:LYS:HD3	1:A:263:TYR:HE1	1.43	0.83

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:50:LEU:HB2	1:A:53:VAL:HG13	1.61	0.82
1:A:43:GLU:HG2	1:A:329:ARG:HD2	1.62	0.80
1:A:22:ASP:HA	1:A:25:ARG:HG2	1.65	0.78
1:A:79:PHE:O	1:A:83:THR:HG23	1.87	0.74
1:A:37:ILE:HD13	1:A:41:LYS:HD2	1.70	0.72
1:A:258:LYS:HD3	1:A:263:TYR:CE1	2.30	0.66
1:A:173:LEU:HD23	1:A:177:LEU:HD23	1.78	0.66
1:A:90:LYS:H	1:A:90:LYS:HD2	1.63	0.64
1:A:320:GLU:O	1:A:324:THR:HG23	1.98	0.64
1:A:125:VAL:HG21	1:A:185:VAL:HG23	1.79	0.64
1:A:17:ILE:HD13	1:A:36:GLY:O	1.98	0.63
1:A:348:ARG:HG3	1:A:350:PHE:HD2	1.61	0.63
1:A:22:ASP:HA	1:A:25:ARG:CG	2.30	0.61
1:A:203:GLU:O	1:A:207:THR:HG23	2.00	0.61
1:A:235:GLU:O	1:A:238:GLU:HB3	2.01	0.60
1:A:373:LEU:HD13	1:A:408:VAL:HG21	1.84	0.59
1:A:110:GLY:O	1:A:114:VAL:HG13	2.03	0.57
1:A:252:VAL:HG13	1:A:271:THR:HB	1.88	0.56
1:A:212:SER:HA	1:A:217:TRP:CD1	2.42	0.55
1:A:227:GLY:O	1:A:327:ARG:HD3	2.07	0.55
1:A:21:ALA:O	1:A:24:PHE:HB3	2.08	0.54
1:A:251:ILE:HG12	1:A:272:LEU:HD23	1.90	0.54
1:A:356:GLN:NE2	1:A:361:SER:HB2	2.22	0.54
1:A:374:ARG:HG2	1:A:374:ARG:HH11	1.73	0.53
1:A:362:PHE:CE1	1:A:384:SER:HB2	2.44	0.53
1:A:37:ILE:CD1	1:A:41:LYS:HD2	2.38	0.52
1:A:346:ALA:H	1:A:348:ARG:NH1	2.07	0.52
1:A:341:LEU:HD13	1:A:350:PHE:CD2	2.45	0.51
1:A:38:GLY:HA2	1:A:360:PHE:CZ	2.45	0.51
1:A:98:LYS:HA	1:A:98:LYS:HZ2	1.75	0.51
1:A:334:ARG:HH22	1:A:361:SER:HB3	1.75	0.51
1:A:356:GLN:HE22	1:A:361:SER:HB2	1.75	0.51
1:A:83:THR:HG22	1:A:256:TYR:OH	2.11	0.50
1:A:140:TRP:HB3	1:A:143:HIS:CE1	2.47	0.50
1:A:344:LYS:NZ	1:A:398:ALA:HB1	2.25	0.50
1:A:144:LYS:HB3	1:A:144:LYS:NZ	2.27	0.50
1:A:187:LEU:HD21	1:A:222:ALA:HB2	1.93	0.50
1:A:53:VAL:HB	1:A:305:VAL:HG11	1.94	0.50
1:A:370:VAL:HG21	1:A:383:ALA:HA	1.94	0.49
1:A:38:GLY:HA2	1:A:360:PHE:HZ	1.78	0.49
1:A:256:TYR:HA	1:A:259:ASN:ND2	2.27	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:27:ASP:HB3	1:A:32:LYS:HD3	1.93	0.49
1:A:344:LYS:HZ1	1:A:398:ALA:HB1	1.78	0.49
1:A:129:ARG:NH2	1:A:156:ARG:HD3	2.28	0.48
1:A:185:VAL:HG11	1:A:220:LEU:HD12	1.95	0.48
1:A:256:TYR:HB2	1:A:267:VAL:HG13	1.96	0.48
1:A:256:TYR:HA	1:A:259:ASN:HD21	1.79	0.47
1:A:180:ALA:HB3	1:A:217:TRP:CH2	2.49	0.47
1:A:76:ILE:O	1:A:79:PHE:HB3	2.15	0.47
1:A:346:ALA:HB3	1:A:348:ARG:NH2	2.30	0.46
1:A:85:GLU:HB3	1:A:90:LYS:HE3	1.97	0.46
1:A:258:LYS:HE2	3:A:518:HOH:O	2.16	0.46
1:A:76:ILE:O	1:A:76:ILE:HG13	2.14	0.45
1:A:324:THR:HG22	3:A:421:HOH:O	2.16	0.45
1:A:129:ARG:HH21	1:A:156:ARG:HD3	1.81	0.45
1:A:222:ALA:HB1	2:A:413:NPL:H23	1.97	0.45
1:A:135:VAL:O	1:A:157:GLU:HA	2.16	0.45
1:A:366:THR:O	1:A:370:VAL:HG13	2.17	0.45
1:A:225:TYR:CE1	1:A:258:LYS:HG3	2.51	0.45
1:A:112:LEU:HD13	1:A:143:HIS:HD2	1.82	0.45
1:A:202:LEU:HD13	1:A:238:GLU:HG2	1.99	0.45
1:A:168:LEU:HD21	1:A:173:LEU:HD12	1.99	0.44
1:A:277:SER:HA	1:A:280:VAL:HG12	1.98	0.44
1:A:140:TRP:HE3	1:A:143:HIS:NE2	2.15	0.44
1:A:177:LEU:HD13	1:A:177:LEU:HA	1.79	0.44
1:A:344:LYS:HD3	1:A:344:LYS:HA	1.62	0.44
1:A:39:VAL:HG22	1:A:263:TYR:CE1	2.53	0.44
1:A:342:GLN:HE21	1:A:342:GLN:N	2.15	0.44
1:A:334:ARG:HG2	1:A:389:VAL:HG11	1.99	0.44
1:A:76:ILE:HA	1:A:77:PRO:HD3	1.88	0.43
1:A:33:ILE:HD13	1:A:400:LEU:HB2	2.00	0.43
1:A:186:VAL:HG12	1:A:217:TRP:HB3	2.01	0.43
1:A:356:GLN:NE2	1:A:361:SER:CB	2.82	0.42
1:A:321:GLN:NE2	3:A:424:HOH:O	2.52	0.42
1:A:144:LYS:HG2	1:A:155:VAL:HG11	2.02	0.41
1:A:342:GLN:HA	1:A:348:ARG:NH1	2.36	0.41
1:A:69:ASN:ND2	1:A:70:TYR:H	2.18	0.41
1:A:365:LEU:HD12	1:A:365:LEU:HA	1.80	0.40
1:A:90:LYS:HD2	1:A:90:LYS:N	2.33	0.40
1:A:334:ARG:HH22	1:A:361:SER:CB	2.35	0.40
1:A:88:PHE:O	1:A:92:SER:HB2	2.22	0.40
1:A:222:ALA:HB1	2:A:413:NPL:C2A	2.51	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:346:ALA:HB3	1:A:348:ARG:CZ	2.52	0.40

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:5:MET:SD	1:A:368:GLU:CB[6_555]	1.93	0.27
1:A:5:MET:N	1:A:368:GLU:OE1[6_555]	1.96	0.24

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	394/396 (100%)	369 (94%)	21 (5%)	4 (1%)	15 9

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	28	GLU
1	A	26	ALA
1	A	164	GLU
1	A	16	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	319/319 (100%)	268 (84%)	51 (16%)	2 1

All (51) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	MET
1	A	8	ASN
1	A	10	THR
1	A	17	ILE
1	A	18	LEU
1	A	22	ASP
1	A	23	LEU
1	A	29	ARG
1	A	39	VAL
1	A	44	THR
1	A	46	LYS
1	A	49	VAL
1	A	53	VAL
1	A	76	ILE
1	A	81	ARG
1	A	87	LEU
1	A	90	LYS
1	A	94	LEU
1	A	98	LYS
1	A	101	ARG
1	A	114	VAL
1	A	119	LEU
1	A	125	VAL
1	A	129	ARG
1	A	138	PRO
1	A	168	LEU
1	A	176	SER
1	A	177	LEU
1	A	208	LEU
1	A	218	LEU
1	A	220	LEU
1	A	223	PHE
1	A	248	LYS
1	A	252	VAL
1	A	259	ASN
1	A	277	SER
1	A	292	ARG
1	A	315	LEU

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Mol	Chain	Res	Type
1	A	332	ARG
1	A	336	LEU
1	A	342	GLN
1	A	348	ARG
1	A	349	ASP
1	A	351	SER
1	A	365	LEU
1	A	371	LEU
1	A	376	GLU
1	A	387	VAL
1	A	400	LEU
1	A	402	GLU
1	A	409	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (9) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	69	ASN
1	A	84	GLN
1	A	166	HIS
1	A	193	HIS
1	A	226	GLN
1	A	247	HIS
1	A	259	ASN
1	A	321	GLN
1	A	356	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 monosaccharides 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	NPL	A	413	-	17,17,17	1.32	3 (17%)	22,25,25	2.47	5 (22%)

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	NPL	A	413	-	-	3/8/8/8	0/1/1/1

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	413	NPL	C2-N1	2.71	1.40	1.36
2	A	413	NPL	P-O4P	-2.55	1.52	1.60
2	A	413	NPL	P-O2P	-2.33	1.45	1.54

All (5) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
2	A	413	NPL	C2A-C2-C3	-6.37	116.83	121.02
2	A	413	NPL	C3-C2-N1	5.69	121.35	118.32
2	A	413	NPL	O2P-P-O4P	-4.30	95.29	106.73
2	A	413	NPL	C2-C3-C4	-3.23	118.96	120.56
2	A	413	NPL	O4P-P-O1P	2.61	113.81	106.47

There are no chirality outliers.

All (3) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	413	NPL	C3-C4-C4A-N4
2	A	413	NPL	C5-C4-C4A-N4
2	A	413	NPL	C5A-O4P-P-O1P

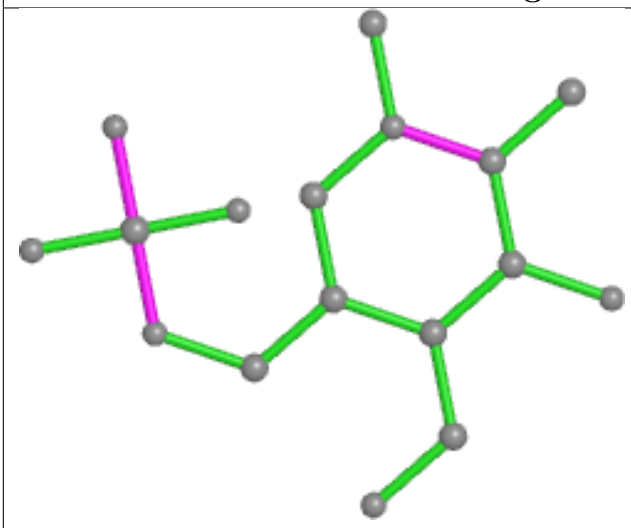
There are no ring outliers.

1 monomer is involved in 2 short contacts:

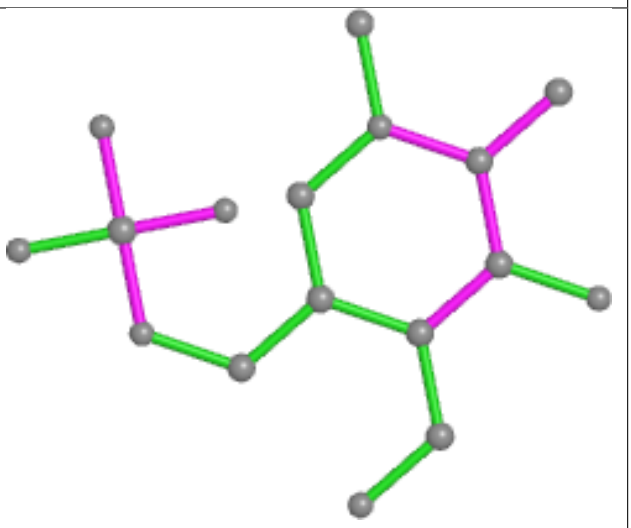
Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	413	NPL	2	0

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 then 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.

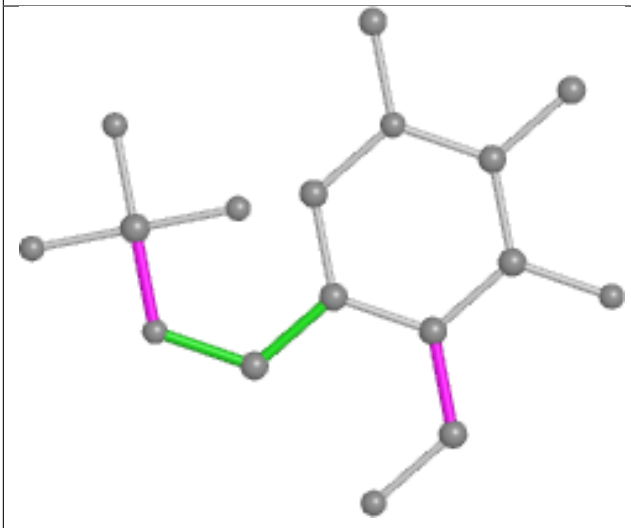
Ligand NPL A 413



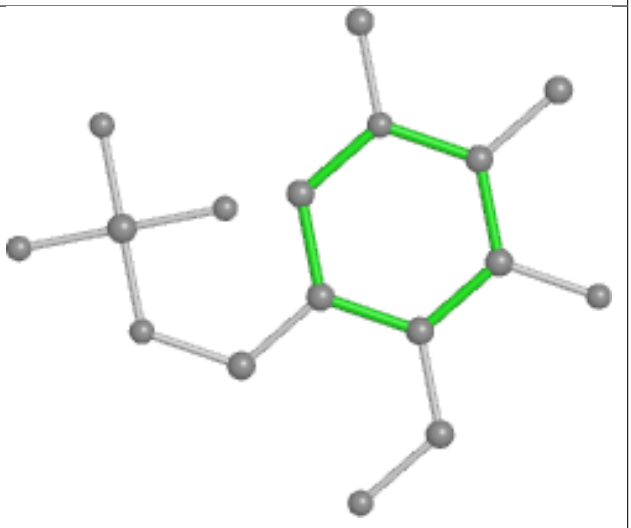
Bond lengths



Bond angles



Torsions



Rings

5.7 Other polymers

There are no such residues in this entry.

5.8 Polymer linkage issues

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.