



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 11:45 AM UTC

PDB ID : 1KSZ / pdb_00001ksz
Title : ENTRAPMENT OF 6-THIOPHOSPHORYL-IMP IN THE ACTIVE SITE OF CRYSTALLINE ADENYLOSUCCINATE SYNTHETASE FROM ESCHERICHIA COLI, DATA COLLECTED AT 298K
Authors : Poland, B.W.; Bruns, C.A.; Fromm, H.J.; Honzatko, R.B.
Deposited on : 1997-01-14
Resolution : 2.80 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 ⓘ 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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (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

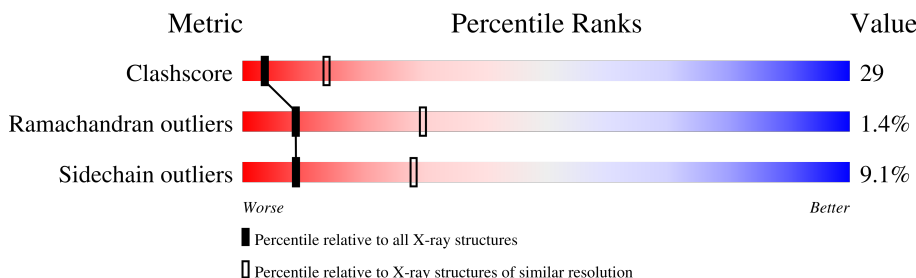
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.80 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))
Clashscore	190562	4276 (2.80-2.80)
Ramachandran outliers	187476	4196 (2.80-2.80)
Sidechain outliers	187428	4198 (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 ≥ 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	431	

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
4	HDA	A	437	-	-	X	-
5	PGS	A	440	-	-	X	-

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 4622 atoms, of which 1081 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.

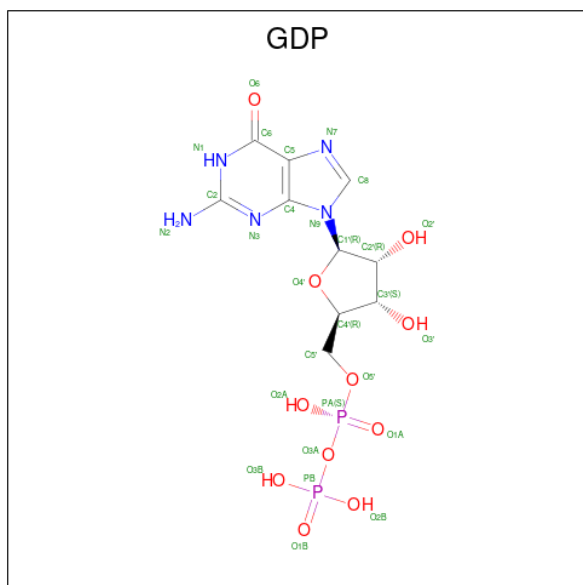
- Molecule 1 is a protein called ADENYLOSUCCINATE SYNTHETASE.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	431	Total	C	H	N	O	S	0	0	0
			4067	2092	746	576	640	13			

- Molecule 2 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

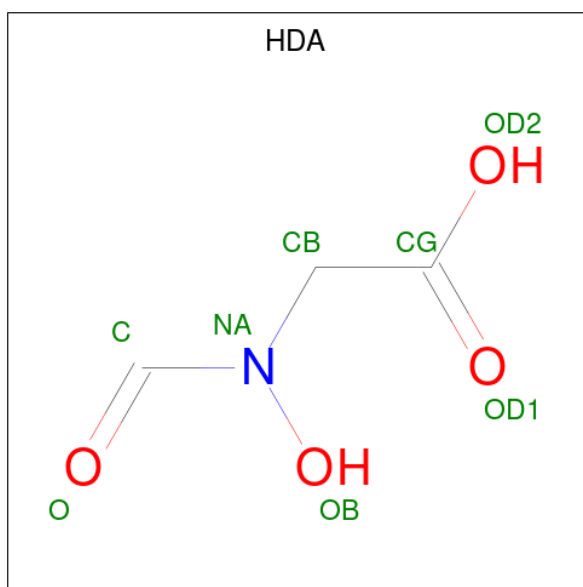
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Mg	0	0
			1	1		

- Molecule 3 is GUANOSINE-5'-DIPHOSPHATE (CCD ID: GDP) (formula: C₁₀H₁₅N₅O₁₁P₂).



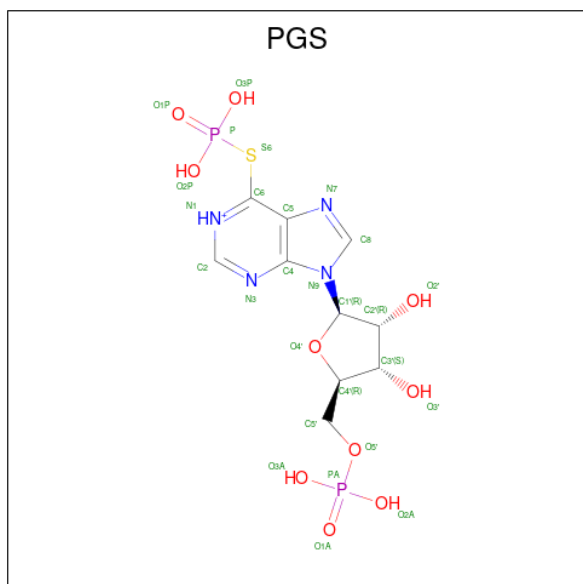
Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
3	A	1	Total	C	H	N	O	P	0	0
			40	10	12	5	11	2		

- Molecule 4 is HADACIDIN (CCD ID: HDA) (formula: C₃H₅NO₄).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	H	N	O	0	0
			9	3	1	1	4		

- Molecule 5 is 2-DEAZO-6-THIOPHOSPHATE GUANOSINE-5'-MONOPHOSPHATE (CCD ID: PGS) (formula: $C_{10}H_{15}N_4O_{10}P_2S$).



Mol	Chain	Residues	Atoms							ZeroOcc	AltConf
5	A	1	Total	C	H	N	O	P	S	0	0
			37	10	10	4	10	2	1		

- Molecule 6 is water.

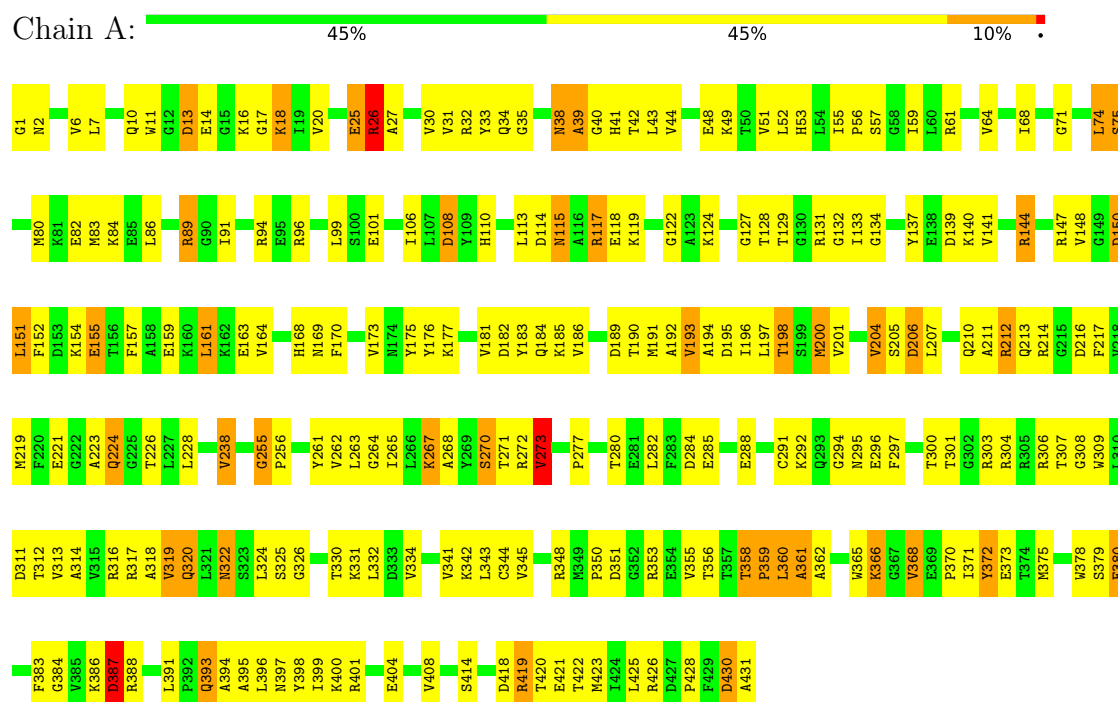
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	156	Total	H	O	0	0
			468	312	156		

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. 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: ADENYLOSUCCINATE SYNTHETASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 32 2 1	Depositor
Cell constants a, b, c, α , β , γ	81.63Å 81.63Å 159.22Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	5.00 – 2.80	Depositor
% Data completeness (in resolution range)	(Not available) (5.00-2.80)	Depositor
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	X-PLOR	Depositor
R, R_{free}	0.171 , 0.250	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4622	wwPDB-VP
Average B, all atoms (Å ²)	20.0	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: HDA, GDP, PGS, MG

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	0.90	0/3379	1.39	51/4577 (1.1%)

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

There are no bond length outliers.

All (51) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	74	LEU	N-CA-C	8.09	121.48	109.59
1	A	175	TYR	N-CA-C	7.95	119.85	111.03
1	A	193	VAL	N-CA-C	7.92	121.47	113.47
1	A	38	ASN	N-CA-C	-7.83	103.88	113.50
1	A	267	LYS	N-CA-C	7.56	122.34	113.20
1	A	420	THR	N-CA-C	7.45	120.27	111.71
1	A	380	GLU	N-CA-C	-7.41	100.75	110.53
1	A	10	GLN	N-CA-C	7.23	118.97	108.34
1	A	204	VAL	N-CA-C	7.12	117.63	110.23
1	A	134	GLY	CA-C-N	7.08	127.39	119.32
1	A	134	GLY	C-N-CA	7.08	127.39	119.32
1	A	319	VAL	CA-C-N	6.56	129.30	120.65
1	A	319	VAL	C-N-CA	6.56	129.30	120.65
1	A	25	GLU	N-CA-C	-6.35	104.27	111.07
1	A	196	ILE	CB-CA-C	-6.13	103.76	112.22
1	A	322	ASN	N-CA-C	6.07	120.68	113.28

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	96	ARG	N-CA-C	6.05	122.75	113.19
1	A	325	SER	N-CA-C	-6.04	104.99	112.90
1	A	373	GLU	N-CA-C	-5.96	99.30	109.24
1	A	320	GLN	N-CA-C	5.91	117.41	110.97
1	A	359	PRO	N-CA-C	-5.90	100.31	112.47
1	A	157	PHE	N-CA-C	5.85	118.13	111.11
1	A	155	GLU	N-CA-C	-5.84	104.54	111.03
1	A	151	LEU	N-CA-C	-5.75	105.76	112.89
1	A	39	ALA	N-CA-C	-5.71	102.45	110.50
1	A	408	VAL	CA-C-N	5.69	126.00	119.92
1	A	408	VAL	C-N-CA	5.69	126.00	119.92
1	A	331	LYS	N-CA-C	5.61	119.71	112.86
1	A	212	ARG	N-CA-C	5.54	117.40	111.36
1	A	59	ILE	N-CA-C	5.43	120.63	109.34
1	A	206	ASP	N-CA-C	5.37	116.81	111.07
1	A	370	PRO	N-CA-C	5.36	119.28	110.55
1	A	387	ASP	N-CA-C	5.36	117.91	108.75
1	A	332	LEU	N-CA-C	-5.34	105.35	111.07
1	A	31	VAL	N-CA-C	5.30	115.54	108.11
1	A	224	GLN	CA-C-N	-5.26	116.88	122.67
1	A	224	GLN	C-N-CA	-5.26	116.88	122.67
1	A	26	ARG	N-CA-C	5.26	119.39	112.92
1	A	358	THR	N-CA-C	5.23	117.11	109.84
1	A	163	GLU	N-CA-C	5.22	117.05	111.36
1	A	273	VAL	N-CA-C	-5.11	100.98	108.85
1	A	391	LEU	CA-C-N	5.08	124.98	119.85
1	A	391	LEU	C-N-CA	5.08	124.98	119.85
1	A	115	ASN	N-CA-C	5.04	116.78	111.28
1	A	238	VAL	N-CA-CB	-5.04	106.53	112.32
1	A	393	GLN	N-CA-C	5.04	117.43	111.33
1	A	18	LYS	CA-C-N	5.02	127.08	120.60
1	A	18	LYS	C-N-CA	5.02	127.08	120.60
1	A	255	GLY	CA-C-N	5.01	125.29	119.47
1	A	255	GLY	C-N-CA	5.01	125.29	119.47
1	A	270	SER	N-CA-C	5.00	117.56	109.40

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	372	TYR	Sidechain

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	3321	746	3326	193	1
2	A	1	0	0	0	0
3	A	28	12	12	7	0
4	A	8	1	4	5	0
5	A	27	10	11	10	0
6	A	156	312	0	16	0
All	All	3541	1081	3353	196	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 29.

All (196) 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)
4:A:437:HDA:HC	5:A:440:PGS:S6	1.90	1.11
1:A:426:ARG:HH21	1:A:431:ALA:HA	1.22	1.03
1:A:291:CYS:SG	1:A:304:ARG:CZ	2.49	1.00
1:A:80:MET:SD	6:A:603:HOH:O	2.29	0.90
1:A:128:THR:HG22	5:A:440:PGS:H5'2	1.55	0.89
1:A:291:CYS:SG	1:A:304:ARG:NE	2.46	0.88
1:A:263:LEU:HD22	1:A:326:GLY:O	1.77	0.84
1:A:20:VAL:HG21	1:A:221:GLU:HG3	1.59	0.83
1:A:301:THR:HG22	1:A:303:ARG:HG3	1.61	0.80
1:A:39:ALA:HA	5:A:440:PGS:S6	2.22	0.79
1:A:32:ARG:NE	1:A:56:PRO:HA	1.98	0.78
1:A:32:ARG:HE	1:A:56:PRO:HA	1.46	0.78
1:A:426:ARG:NH2	1:A:431:ALA:HA	2.00	0.76
1:A:44:VAL:HG22	1:A:49:LYS:HG3	1.68	0.75
1:A:267:LYS:O	1:A:267:LYS:HG2	1.87	0.73
1:A:131:ARG:HD2	6:A:640:HOH:O	1.88	0.72
1:A:137:TYR:O	1:A:140:LYS:HB3	1.89	0.72
1:A:89:ARG:HH11	1:A:89:ARG:HG3	1.55	0.71
1:A:271:THR:HA	1:A:306:ARG:O	1.91	0.71
1:A:191:MET:HA	1:A:191:MET:HE2	1.72	0.71
1:A:312:THR:HB	1:A:344:CYS:O	1.90	0.70

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:16:LYS:HE3	3:A:432:GDP:O2B	1.91	0.70
1:A:263:LEU:HD13	1:A:264:GLY:N	2.06	0.68
1:A:84:LYS:C	1:A:84:LYS:HD3	2.19	0.67
1:A:173:VAL:O	1:A:177:LYS:HA	1.95	0.67
1:A:34:GLN:NE2	1:A:223:ALA:H	1.94	0.65
1:A:80:MET:CE	1:A:83:MET:HE1	2.26	0.65
1:A:33:TYR:O	1:A:71:GLY:HA3	1.96	0.65
1:A:34:GLN:HE22	1:A:223:ALA:H	1.43	0.64
1:A:301:THR:CG2	1:A:303:ARG:HG3	2.27	0.64
1:A:291:CYS:SG	1:A:304:ARG:NH2	2.71	0.63
1:A:16:LYS:O	1:A:20:VAL:HG23	1.99	0.62
1:A:40:GLY:HA2	1:A:53:HIS:HD2	1.64	0.62
1:A:270:SER:O	1:A:307:THR:HA	1.98	0.62
1:A:330:THR:HA	1:A:414:SER:HB3	1.81	0.61
1:A:341:VAL:HG23	1:A:375:MET:HB2	1.82	0.61
1:A:284:ASP:C	1:A:284:ASP:OD1	2.43	0.61
1:A:82:GLU:HG3	6:A:587:HOH:O	2.00	0.61
1:A:161:LEU:HD12	1:A:183:TYR:CE2	2.37	0.60
1:A:263:LEU:HD22	1:A:326:GLY:C	2.26	0.59
1:A:41:HIS:CD2	3:A:432:GDP:O3B	2.55	0.59
1:A:41:HIS:O	1:A:51:VAL:HG13	2.01	0.59
1:A:55:ILE:HB	1:A:82:GLU:OE2	2.02	0.59
1:A:263:LEU:HD13	1:A:263:LEU:C	2.26	0.59
1:A:26:ARG:HG2	1:A:26:ARG:HH11	1.68	0.59
1:A:351:ASP:OD2	1:A:353:ARG:NH1	2.36	0.59
1:A:161:LEU:HD12	1:A:183:TYR:CD2	2.39	0.58
1:A:13:ASP:O	1:A:267:LYS:HE2	2.04	0.57
1:A:42:THR:HG23	1:A:51:VAL:HG22	1.86	0.57
1:A:361:ALA:O	1:A:365:TRP:HD1	1.88	0.57
1:A:422:THR:HG22	1:A:423:MET:N	2.19	0.57
1:A:44:VAL:CG2	1:A:49:LYS:HG3	2.35	0.56
1:A:318:ALA:O	1:A:322:ASN:HB2	2.06	0.56
1:A:35:GLY:HA2	6:A:518:HOH:O	2.06	0.55
1:A:350:PRO:HD2	6:A:601:HOH:O	2.06	0.55
1:A:383:PHE:C	1:A:383:PHE:CD1	2.84	0.55
1:A:210:GLN:O	1:A:211:ALA:C	2.50	0.55
1:A:13:ASP:HA	3:A:432:GDP:O1B	2.07	0.55
1:A:154:LYS:HG2	1:A:191:MET:SD	2.47	0.55
1:A:312:THR:HG22	1:A:316:ARG:NH2	2.22	0.54
1:A:14:GLU:OE1	1:A:16:LYS:HE2	2.08	0.54
1:A:84:LYS:HD3	1:A:84:LYS:O	2.07	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:282:LEU:HD11	1:A:309:TRP:CE2	2.43	0.54
5:A:440:PGS:H8	5:A:440:PGS:O3A	2.08	0.54
1:A:30:VAL:HG23	1:A:64:VAL:HG11	1.90	0.54
1:A:114:ASP:HB2	1:A:132:GLY:HA2	1.88	0.54
1:A:11:TRP:CG	1:A:272:ARG:HG3	2.43	0.54
1:A:300:THR:HB	4:A:437:HDA:CG	2.38	0.53
1:A:212:ARG:C	1:A:214:ARG:N	2.63	0.53
1:A:94:ARG:HA	1:A:200:MET:HE1	1.91	0.52
1:A:345:VAL:HG22	1:A:371:ILE:O	2.08	0.52
1:A:384:GLY:O	1:A:386:LYS:NZ	2.38	0.52
1:A:313:VAL:HG12	1:A:358:THR:HG23	1.91	0.52
1:A:267:LYS:O	1:A:268:ALA:HB3	2.09	0.52
1:A:16:LYS:N	3:A:432:GDP:O2B	2.43	0.52
1:A:49:LYS:HZ3	1:A:51:VAL:HG23	1.74	0.52
1:A:418:ASP:O	1:A:419:ARG:C	2.53	0.52
1:A:89:ARG:HG3	1:A:89:ARG:NH1	2.23	0.51
1:A:42:THR:HB	3:A:432:GDP:H3'	1.93	0.51
1:A:86:LEU:HD22	1:A:91:ILE:HD13	1.92	0.51
1:A:33:TYR:CD1	1:A:34:GLN:HG3	2.47	0.50
1:A:34:GLN:NE2	1:A:223:ALA:HB3	2.27	0.50
1:A:117:ARG:NH1	1:A:176:TYR:OH	2.42	0.50
1:A:173:VAL:O	1:A:177:LYS:CA	2.60	0.50
1:A:393:GLN:HG3	1:A:397:ASN:ND2	2.26	0.50
1:A:368:VAL:HG22	6:A:524:HOH:O	2.11	0.50
1:A:113:LEU:HD11	1:A:168:HIS:CD2	2.47	0.50
1:A:207:LEU:HA	1:A:210:GLN:HG2	1.94	0.50
1:A:312:THR:HG22	1:A:316:ARG:HH21	1.76	0.49
1:A:41:HIS:O	1:A:51:VAL:HA	2.12	0.49
1:A:34:GLN:HE22	1:A:223:ALA:N	2.10	0.49
1:A:169:ASN:O	1:A:170:PHE:C	2.56	0.49
1:A:395:ALA:O	1:A:396:LEU:C	2.52	0.49
1:A:212:ARG:C	1:A:214:ARG:H	2.21	0.48
1:A:74:LEU:HD12	1:A:75:SER:N	2.28	0.48
4:A:437:HDA:C	5:A:440:PGS:S6	2.83	0.48
1:A:101:GLU:HA	1:A:148:VAL:HB	1.96	0.48
1:A:124:LYS:HE3	1:A:124:LYS:HB2	1.65	0.48
1:A:271:THR:HG21	1:A:296:GLU:OE1	2.14	0.48
1:A:313:VAL:HG12	1:A:358:THR:CG2	2.44	0.48
1:A:341:VAL:C	1:A:342:LYS:HG3	2.39	0.48
1:A:27:ALA:HA	1:A:217:PHE:HB2	1.94	0.48
1:A:317:ARG:O	1:A:320:GLN:HB3	2.13	0.48

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:359:PRO:HD2	1:A:365:TRP:CE2	2.49	0.48
1:A:396:LEU:HA	1:A:399:ILE:HD12	1.95	0.47
1:A:365:TRP:O	1:A:368:VAL:HG13	2.14	0.47
1:A:131:ARG:NH1	6:A:640:HOH:O	2.39	0.47
1:A:182:ASP:OD2	1:A:184:GLN:HB3	2.14	0.47
1:A:422:THR:HG22	1:A:423:MET:H	1.79	0.47
1:A:1:GLY:N	1:A:431:ALA:O	2.47	0.47
1:A:34:GLN:OE1	1:A:223:ALA:HB3	2.15	0.47
1:A:106:ILE:CD1	1:A:133:ILE:HD13	2.45	0.47
1:A:317:ARG:HD3	1:A:358:THR:OG1	2.15	0.46
1:A:99:LEU:HD12	1:A:201:VAL:HA	1.97	0.46
1:A:297:PHE:CZ	1:A:304:ARG:CZ	2.98	0.46
1:A:292:LYS:NZ	6:A:653:HOH:O	2.47	0.46
1:A:17:GLY:O	1:A:18:LYS:C	2.57	0.46
1:A:25:GLU:OE1	1:A:61:ARG:NH2	2.49	0.46
1:A:386:LYS:HE3	1:A:421:GLU:HA	1.98	0.46
1:A:280:THR:HG22	1:A:372:TYR:CE1	2.51	0.46
1:A:34:GLN:CD	1:A:223:ALA:HB3	2.41	0.46
1:A:129:THR:HG22	4:A:437:HDA:OD2	2.15	0.46
1:A:127:GLY:O	5:A:440:PGS:H3'	2.16	0.46
1:A:360:LEU:O	1:A:361:ALA:HB2	2.16	0.46
1:A:387:ASP:O	1:A:388:ARG:C	2.57	0.46
1:A:206:ASP:CG	6:A:621:HOH:O	2.59	0.46
1:A:228:LEU:O	1:A:238:VAL:HB	2.15	0.46
1:A:263:LEU:C	1:A:263:LEU:CD1	2.89	0.45
1:A:267:LYS:NZ	1:A:271:THR:OG1	2.37	0.45
1:A:359:PRO:HB2	1:A:365:TRP:CD1	2.52	0.45
1:A:297:PHE:CZ	1:A:304:ARG:NE	2.84	0.45
1:A:262:VAL:HG12	1:A:324:LEU:HD23	1.98	0.45
1:A:282:LEU:HG	1:A:308:GLY:HA2	1.98	0.45
1:A:378:TRP:HE3	1:A:394:ALA:CB	2.30	0.45
1:A:139:ASP:OD2	1:A:168:HIS:HE1	1.99	0.45
1:A:214:ARG:NH2	1:A:216:ASP:OD2	2.50	0.45
1:A:273:VAL:HG12	5:A:440:PGS:N3	2.32	0.45
1:A:128:THR:HA	5:A:440:PGS:H3'	1.98	0.44
1:A:395:ALA:O	1:A:398:TYR:N	2.50	0.44
1:A:181:VAL:HA	6:A:532:HOH:O	2.17	0.44
1:A:210:GLN:HB3	1:A:214:ARG:NH1	2.33	0.44
1:A:423:MET:HB2	1:A:423:MET:HE3	1.61	0.44
1:A:49:LYS:NZ	1:A:51:VAL:HG23	2.32	0.43
1:A:311:ASP:HA	1:A:344:CYS:HB3	2.00	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:106:ILE:HA	1:A:110:HIS:ND1	2.33	0.43
1:A:159:GLU:CD	6:A:575:HOH:O	2.62	0.43
1:A:334:VAL:O	1:A:334:VAL:HG12	2.17	0.43
1:A:38:ASN:OD1	1:A:39:ALA:N	2.51	0.43
1:A:193:VAL:O	1:A:194:ALA:C	2.62	0.43
1:A:151:LEU:HD21	1:A:190:THR:CG2	2.48	0.43
1:A:189:ASP:O	1:A:192:ALA:HB3	2.18	0.43
1:A:204:VAL:O	1:A:205:SER:C	2.60	0.43
1:A:261:TYR:HE1	1:A:263:LEU:HB2	1.83	0.43
1:A:401:ARG:HD2	1:A:404:GLU:OE1	2.18	0.43
1:A:280:THR:CG2	1:A:344:CYS:HB2	2.49	0.43
1:A:84:LYS:NZ	6:A:566:HOH:O	2.52	0.42
1:A:185:LYS:O	1:A:186:VAL:C	2.61	0.42
1:A:226:THR:C	1:A:228:LEU:H	2.27	0.42
1:A:360:LEU:O	1:A:360:LEU:HD12	2.19	0.42
1:A:119:LYS:HE2	1:A:119:LYS:HB3	1.59	0.42
1:A:41:HIS:HD2	5:A:440:PGS:O3P	2.02	0.42
1:A:52:LEU:CD1	1:A:57:SER:HA	2.49	0.42
1:A:319:VAL:HA	1:A:324:LEU:HD12	2.00	0.42
1:A:99:LEU:HD12	1:A:99:LEU:C	2.44	0.42
1:A:140:LYS:HA	6:A:634:HOH:O	2.19	0.42
1:A:151:LEU:HD21	1:A:190:THR:HG22	2.01	0.42
1:A:6:VAL:HG13	1:A:265:ILE:HD11	2.01	0.42
1:A:41:HIS:CD2	5:A:440:PGS:O3P	2.73	0.42
1:A:144:ARG:NH1	1:A:144:ARG:HG2	2.34	0.42
1:A:155:GLU:H	1:A:155:GLU:CD	2.28	0.42
1:A:1:GLY:N	1:A:428:PRO:O	2.52	0.42
1:A:118:GLU:OE2	1:A:127:GLY:N	2.47	0.42
1:A:288:GLU:HG2	1:A:292:LYS:HD2	2.01	0.42
1:A:294:GLY:O	1:A:295:ASN:C	2.62	0.42
1:A:41:HIS:HA	3:A:432:GDP:O3B	2.20	0.42
1:A:147:ARG:N	1:A:150:ASP:OD1	2.49	0.42
1:A:80:MET:SD	1:A:83:MET:HE1	2.60	0.42
1:A:219:MET:HE3	1:A:219:MET:HB2	1.89	0.42
1:A:422:THR:CG2	1:A:423:MET:N	2.83	0.42
1:A:400:LYS:HE2	6:A:539:HOH:O	2.18	0.41
1:A:195:ASP:O	1:A:198:THR:HG22	2.20	0.41
1:A:358:THR:C	1:A:359:PRO:O	2.61	0.41
1:A:86:LEU:HG	6:A:642:HOH:O	2.20	0.41
1:A:82:GLU:HB2	6:A:639:HOH:O	2.21	0.41
1:A:151:LEU:CD2	1:A:190:THR:HG22	2.51	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:255:GLY:HA2	1:A:256:PRO:HD2	1.76	0.41
1:A:277:PRO:HG2	1:A:362:ALA:HA	2.02	0.41
1:A:300:THR:HB	4:A:437:HDA:HB2	2.03	0.41
1:A:414:SER:OG	3:A:432:GDP:O6	2.37	0.41
1:A:26:ARG:NH2	1:A:430:ASP:OD2	2.54	0.41
1:A:314:ALA:O	1:A:317:ARG:HB3	2.21	0.41
1:A:311:ASP:OD1	1:A:311:ASP:C	2.63	0.40
1:A:170:PHE:C	1:A:170:PHE:CD1	3.00	0.40
1:A:223:ALA:O	1:A:224:GLN:HB2	2.22	0.40
1:A:34:GLN:HE22	1:A:223:ALA:HB3	1.86	0.40
1:A:108:ASP:N	1:A:108:ASP:OD1	2.54	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)
1:A:48:GLU:OE1	1:A:348:ARG:HH12[2_664]	1.57	0.03

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	429/431 (100%)	388 (90%)	35 (8%)	6 (1%)	9 30

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	361	ALA
1	A	152	PHE
1	A	366	LYS
1	A	108	ASP
1	A	419	ARG

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Mol	Chain	Res	Type
1	A	122	GLY

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	353/353 (100%)	321 (91%)	32 (9%)	9	28

All (32) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	2	ASN
1	A	7	LEU
1	A	13	ASP
1	A	26	ARG
1	A	43	LEU
1	A	68	ILE
1	A	75	SER
1	A	89	ARG
1	A	115	ASN
1	A	117	ARG
1	A	141	VAL
1	A	144	ARG
1	A	150	ASP
1	A	161	LEU
1	A	164	VAL
1	A	197	LEU
1	A	198	THR
1	A	200	MET
1	A	213	GLN
1	A	273	VAL
1	A	285	GLU
1	A	343	LEU
1	A	355	VAL
1	A	356	THR
1	A	360	LEU

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Mol	Chain	Res	Type
1	A	366	LYS
1	A	368	VAL
1	A	379	SER
1	A	380	GLU
1	A	387	ASP
1	A	425	LEU
1	A	430	ASP

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (12) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	2	ASN
1	A	3	ASN
1	A	34	GLN
1	A	41	HIS
1	A	46	ASN
1	A	53	HIS
1	A	63	ASN
1	A	168	HIS
1	A	171	GLN
1	A	295	ASN
1	A	320	GLN
1	A	322	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](#)

Of 4 ligands modelled in this entry, 1 is monoatomic - leaving 3 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$
3	GDP	A	432	2	29,30,30	1.43	6 (20%)	45,47,47	1.60	9 (20%)
5	PGS	A	440	2	26,29,29	1.77	7 (26%)	35,45,45	1.93	10 (28%)
4	HDA	A	437	2	6,7,7	2.37	2 (33%)	5,8,8	1.13	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
3	GDP	A	432	2	-	2/16/32/32	0/3/3/3
5	PGS	A	440	2	-	3/10/31/31	0/3/3/3
4	HDA	A	437	2	-	0/3/6/6	-

All (15) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	437	HDA	C-NA	5.20	1.42	1.34
5	A	440	PGS	C5'-C4'	-4.58	1.37	1.51
3	A	432	GDP	C4-N3	3.61	1.42	1.34
5	A	440	PGS	P-O3P	-3.35	1.48	1.56
5	A	440	PGS	O5'-C5'	-3.32	1.32	1.44
3	A	432	GDP	C5'-C4'	3.30	1.61	1.51
3	A	432	GDP	C1'-N9	-3.22	1.38	1.47
5	A	440	PGS	C1'-N9	-2.78	1.39	1.47
5	A	440	PGS	PA-O3A	-2.39	1.45	1.54
5	A	440	PGS	P-O2P	-2.39	1.50	1.56
3	A	432	GDP	PB-O3B	-2.24	1.46	1.54
4	A	437	HDA	OD2-CG	-2.17	1.23	1.30
5	A	440	PGS	PA-O2A	-2.09	1.47	1.54
3	A	432	GDP	C8-N9	-2.06	1.32	1.37
3	A	432	GDP	PB-O2B	-2.05	1.47	1.54

All (19) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	440	PGS	O4'-C4'-C3'	5.21	115.50	105.15
3	A	432	GDP	O3'-C3'-C2'	-4.74	96.62	111.82
5	A	440	PGS	C2'-C3'-C4'	-4.49	93.94	102.61
3	A	432	GDP	O4'-C4'-C3'	-4.43	96.35	105.15
5	A	440	PGS	C4'-O4'-C1'	-3.29	102.20	109.47
5	A	440	PGS	O3'-C3'-C2'	-3.21	101.54	111.82
5	A	440	PGS	C5-C6-N1	-3.10	111.83	119.38
3	A	432	GDP	O2'-C2'-C3'	3.07	121.65	111.82
5	A	440	PGS	O4'-C4'-C5'	-3.00	99.72	109.33
3	A	432	GDP	C4'-O4'-C1'	2.90	115.87	109.47
5	A	440	PGS	C3'-C2'-C1'	2.83	106.82	101.46
3	A	432	GDP	O3'-C3'-C4'	-2.77	103.11	111.08
5	A	440	PGS	O4'-C1'-C2'	-2.72	100.80	106.62
5	A	440	PGS	N1-C2-N3	-2.62	123.92	128.84
5	A	440	PGS	C2'-C1'-N9	-2.58	106.06	113.25
3	A	432	GDP	O4'-C4'-C5'	2.55	117.52	109.33
3	A	432	GDP	C5'-C4'-C3'	2.53	124.31	115.21
3	A	432	GDP	C8-N7-C5	-2.14	100.45	104.26
3	A	432	GDP	O4'-C1'-C2'	-2.06	102.21	106.62

There are no chirality outliers.

All (5) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	440	PGS	C5'-O5'-PA-O3A
5	A	440	PGS	C5'-O5'-PA-O2A
5	A	440	PGS	C5'-O5'-PA-O1A
3	A	432	GDP	C4'-C5'-O5'-PA
3	A	432	GDP	O4'-C4'-C5'-O5'

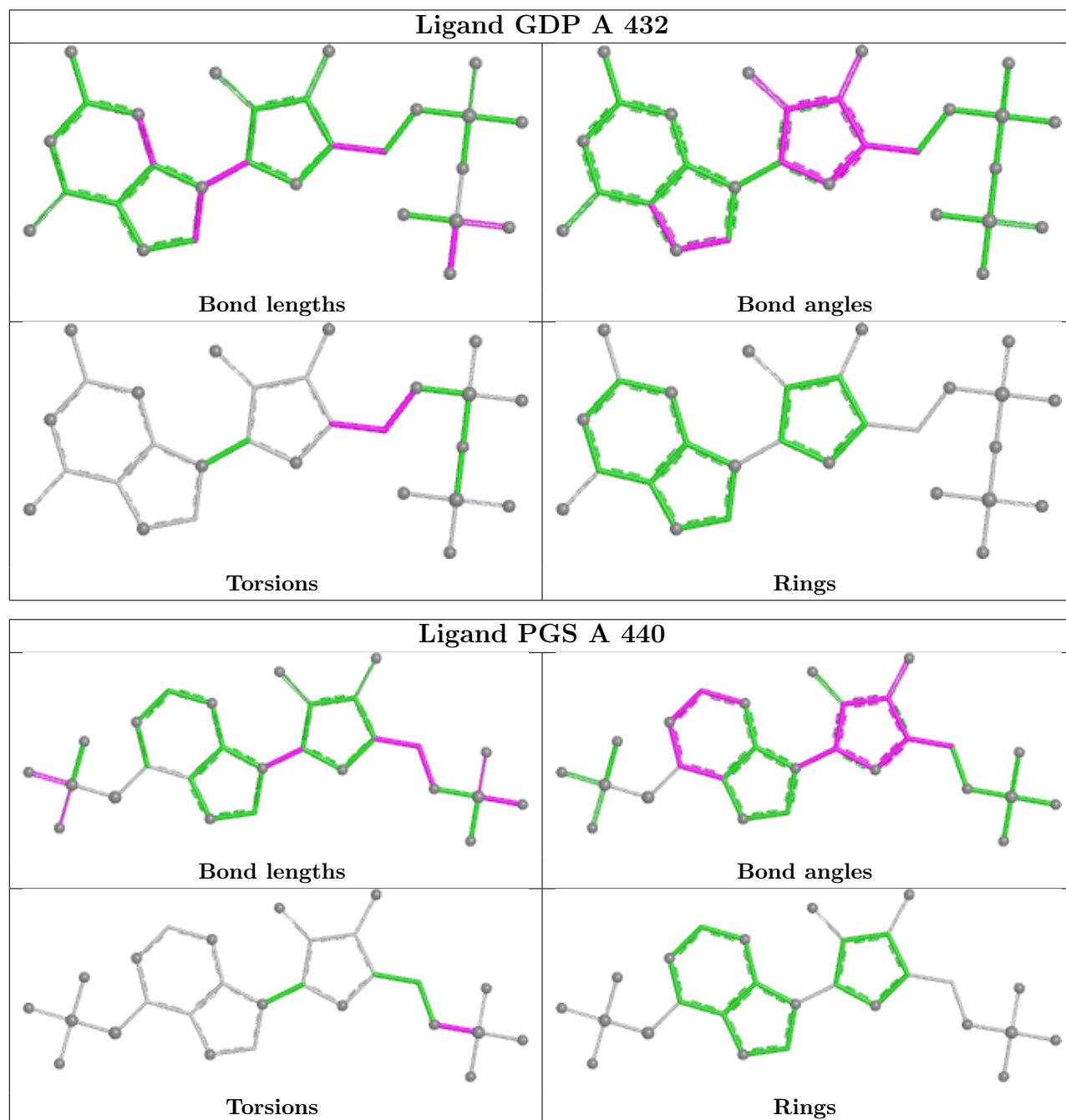
There are no ring outliers.

3 monomers are involved in 20 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	432	GDP	7	0
5	A	440	PGS	10	0
4	A	437	HDA	5	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

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.