



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 9, 2026 – 06:24 PM UTC

PDB ID : 2GSA / pdb_00002gsa
Title : CRYSTAL STRUCTURE OF GLUTAMATE-1-SEMIALDEHYDE AMINO-MUTASE (AMINOTRANSFERASE, WILD-TYPE FORM)
Authors : Hennig, M.; Jansonius, J.N.
Deposited on : 1997-02-26
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

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
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

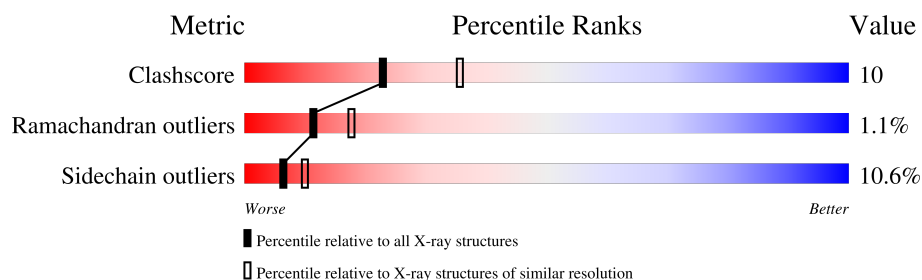
1 Overall quality at a glance

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 ≥ 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	432	
1	B	432	

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.

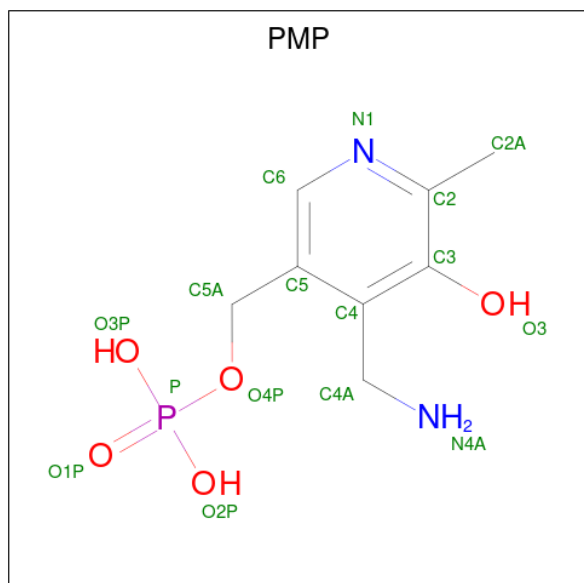
- Molecule 1 is a protein called GLUTAMATE SEMIALDEHYDE AMINOTRANSFERASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	427	Total 3201	C 2043	N 535	O 604	S 19	0	0	0
1	B	427	Total 3201	C 2043	N 535	O 604	S 19	200	0	0

There are 6 discrepancies between the modelled and reference sequences:

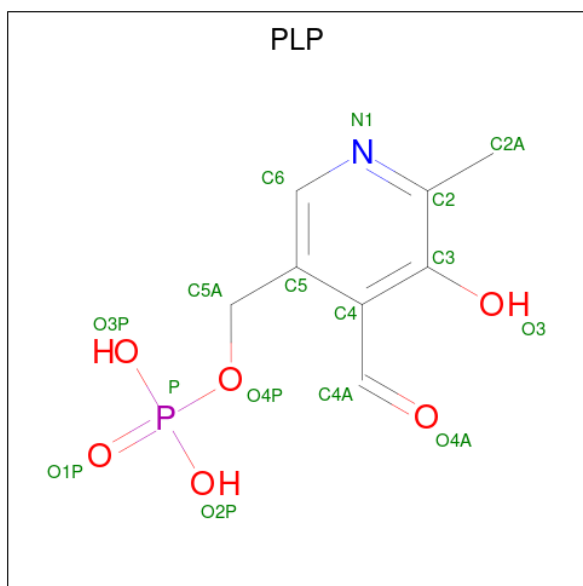
Chain	Residue	Modelled	Actual	Comment	Reference
A	51	TYR	ILE	conflict	UNP P24630
A	133	LEU	VAL	conflict	UNP P24630
A	134	MET	VAL	conflict	UNP P24630
B	51	TYR	ILE	conflict	UNP P24630
B	133	LEU	VAL	conflict	UNP P24630
B	134	MET	VAL	conflict	UNP P24630

- Molecule 2 is 4'-DEOXY-4'-AMINOPYRIDOXAL-5'-PHOSPHATE (CCD ID: PMP) (formula: $\text{C}_8\text{H}_{13}\text{N}_2\text{O}_5\text{P}$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			16	8	2	5	1		

- Molecule 3 is PYRIDOXAL-5'-PHOSPHATE (CCD ID: PLP) (formula: $C_8H_{10}NO_6P$).



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

- Molecule 4 is water.

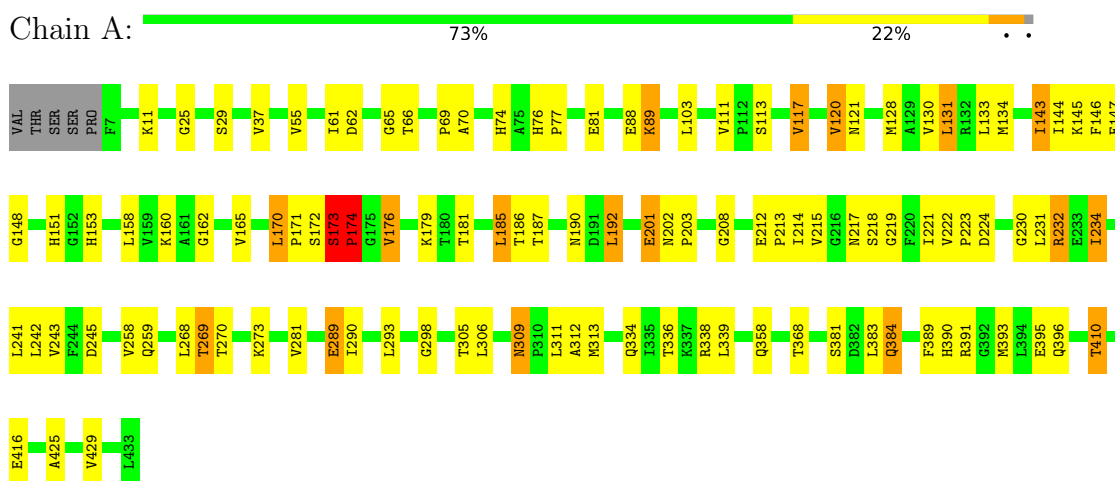
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	180	Total	O	0	0
			180	180		
4	B	167	Total	O	0	0
			167	167		

3 Residue-property plots

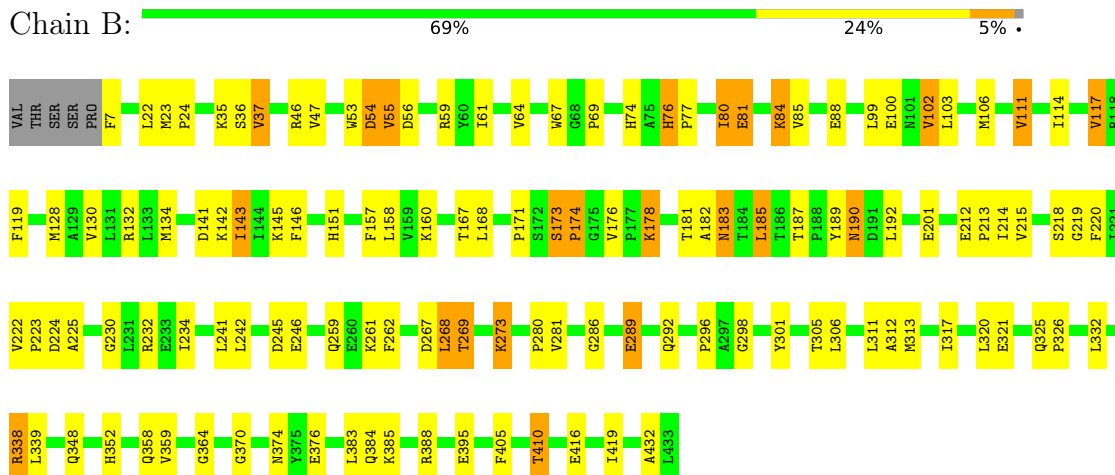
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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: GLUTAMATE SEMIALDEHYDE AMINOTRANSFERASE



• Molecule 1: GLUTAMATE SEMIALDEHYDE AMINOTRANSFERASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	68.62Å 108.60Å 122.43Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	10.00 – 2.40	Depositor
% Data completeness (in resolution range)	94.2 (10.00-2.40)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
Refinement program	X-PLOR 3.1	Depositor
R, R_{free}	0.183 , 0.250	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	6780	wwPDB-VP
Average B, all atoms (Å ²)	30.0	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: PLP, PMP

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	0.66	0/3270	1.51	30/4430 (0.7%)
1	B	0.61	1/3270 (0.0%)	1.12	24/4430 (0.5%)
All	All	0.64	1/6540 (0.0%)	1.33	54/8860 (0.6%)

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	B	111	VAL	CA-CB	5.04	1.60	1.54

All (54) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	173	SER	CA-C-N	47.61	179.35	119.84
1	A	173	SER	C-N-CA	47.61	179.35	119.84
1	A	173	SER	C-N-CD	-12.14	75.21	125.00
1	A	173	SER	N-CA-C	8.55	128.71	109.81
1	B	111	VAL	N-CA-C	8.50	117.29	107.77
1	B	218	SER	N-CA-C	-7.98	101.01	111.71
1	A	218	SER	N-CA-C	-7.45	102.17	112.30
1	B	76	HIS	CA-C-N	7.30	127.64	119.32
1	B	76	HIS	C-N-CA	7.30	127.64	119.32
1	B	219	GLY	N-CA-C	-7.28	100.46	112.83

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	64	VAL	N-CA-C	-7.22	104.73	111.45
1	A	201	GLU	N-CA-C	-7.08	105.56	114.56
1	B	173	SER	N-CA-C	7.01	125.30	109.81
1	A	29	SER	CA-C-N	6.99	128.58	119.84
1	A	29	SER	C-N-CA	6.99	128.58	119.84
1	A	212	GLU	N-CA-C	-6.97	99.56	109.24
1	A	61	ILE	N-CA-C	-6.71	98.92	108.58
1	A	309	ASN	CA-C-N	6.69	126.95	119.32
1	A	309	ASN	C-N-CA	6.69	126.95	119.32
1	B	61	ILE	N-CA-C	-6.68	98.24	107.99
1	B	212	GLU	N-CA-C	-6.67	99.97	109.24
1	A	219	GLY	N-CA-C	-6.61	102.31	111.76
1	A	131	LEU	N-CA-C	-6.59	104.01	111.07
1	A	111	VAL	N-CA-C	6.42	114.24	107.76
1	B	178	LYS	N-CA-C	-6.33	105.41	113.01
1	B	117	VAL	CB-CA-C	-6.33	101.78	110.90
1	A	298	GLY	CA-C-N	6.32	125.89	119.19
1	A	298	GLY	C-N-CA	6.32	125.89	119.19
1	A	117	VAL	CB-CA-C	-6.22	101.10	110.55
1	B	298	GLY	CA-C-N	6.04	125.74	119.64
1	B	298	GLY	C-N-CA	6.04	125.74	119.64
1	A	214	ILE	N-CA-C	-5.97	98.89	107.78
1	B	432	ALA	N-CA-C	-5.93	98.17	110.80
1	B	114	ILE	N-CA-C	5.92	117.28	108.23
1	B	55	VAL	N-CA-C	-5.92	105.59	112.98
1	B	157	PHE	N-CA-C	5.73	120.43	113.38
1	B	183	ASN	N-CA-C	-5.72	106.07	113.16
1	A	217	ASN	N-CA-C	5.62	120.25	113.17
1	B	214	ILE	N-CA-C	-5.55	97.80	109.34
1	A	70	ALA	N-CA-C	5.54	120.73	113.20
1	B	111	VAL	CA-C-N	5.51	126.73	119.84
1	B	111	VAL	C-N-CA	5.51	126.73	119.84
1	A	176	VAL	CA-C-N	5.48	125.49	119.90
1	A	176	VAL	C-N-CA	5.48	125.49	119.90
1	B	326	PRO	N-CA-C	5.44	119.63	111.14
1	A	165	VAL	N-CA-C	-5.37	105.29	110.72
1	B	174	PRO	CA-N-CD	-5.34	104.53	112.00
1	A	174	PRO	CA-N-CD	-5.25	104.65	112.00
1	B	305	THR	N-CA-C	5.21	116.65	111.07
1	A	174	PRO	N-CA-C	-5.17	101.82	112.47
1	A	76	HIS	CA-C-N	5.12	125.16	119.32
1	A	76	HIS	C-N-CA	5.12	125.16	119.32

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	111	VAL	CA-C-N	5.09	125.12	119.32
1	A	111	VAL	C-N-CA	5.09	125.12	119.32

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	173	SER	Mainchain

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	3201	0	3182	71	0
1	B	3201	0	3180	69	0
2	A	16	0	11	0	0
3	B	15	0	6	2	0
4	A	180	0	0	4	0
4	B	167	0	0	9	0
All	All	6780	0	6379	129	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.

All (129) 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:153:HIS:HD2	1:B:132:ARG:HH22	1.21	0.88
1:B:100:GLU:HA	1:B:313:MET:HE2	1.58	0.85
1:A:190:ASN:HD21	1:A:224:ASP:H	1.30	0.79
1:A:134:MET:SD	1:A:143:ILE:HD11	2.23	0.78
1:B:190:ASN:HD21	1:B:224:ASP:H	1.32	0.78
1:A:66:THR:HG23	1:A:69:PRO:HD2	1.70	0.73
1:A:281:VAL:HG22	1:A:312:ALA:HB1	1.70	0.73
1:A:179:LYS:HE2	1:B:182:ALA:HB3	1.69	0.72

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:54:ASP:HB3	1:B:56:ASP:H	1.57	0.70
1:B:85:VAL:O	1:B:88:GLU:HG2	1.92	0.69
1:A:190:ASN:ND2	1:A:224:ASP:H	1.90	0.69
1:A:146:PHE:CD1	1:A:187:THR:HG23	2.30	0.67
1:A:384:GLN:HE21	1:A:384:GLN:HA	1.59	0.67
1:A:130:VAL:O	1:A:134:MET:HG3	1.94	0.66
1:B:220:PHE:HB3	1:B:364:GLY:HA3	1.78	0.66
1:B:301:TYR:HD1	4:B:2172:HOH:O	1.78	0.66
1:A:153:HIS:HD2	1:B:132:ARG:NH2	1.94	0.66
1:A:259:GLN:HE22	1:A:269:THR:HG21	1.60	0.65
1:B:325:GLN:HG3	4:B:2218:HOH:O	2.00	0.62
1:A:306:LEU:HD13	1:B:280:PRO:HA	1.81	0.61
1:B:338:ARG:HG2	1:B:419:ILE:HG21	1.82	0.61
1:A:222:VAL:HG13	1:A:223:PRO:HD2	1.84	0.59
1:B:259:GLN:HE22	1:B:269:THR:HG21	1.67	0.59
1:A:74:HIS:HD2	4:B:2158:HOH:O	1.85	0.58
1:A:281:VAL:CG2	1:A:312:ALA:HB1	2.32	0.58
1:A:334:GLN:O	1:A:338:ARG:HG3	2.04	0.58
1:A:134:MET:CE	1:A:143:ILE:HD11	2.33	0.58
1:B:53:TRP:CZ2	1:B:59:ARG:HD2	2.39	0.57
1:A:153:HIS:CD2	1:B:132:ARG:HH22	2.13	0.57
1:A:170:LEU:HD12	1:A:171:PRO:HD2	1.86	0.57
1:B:384:GLN:HG3	1:B:388:ARG:NH1	2.19	0.57
1:B:232:ARG:O	1:B:232:ARG:HD3	2.05	0.57
1:B:268:LEU:HD12	1:B:286:GLY:HA3	1.87	0.56
1:B:332:LEU:HD22	1:B:410:THR:HG22	1.86	0.56
1:A:201:GLU:C	1:A:203:PRO:HD3	2.31	0.56
1:B:232:ARG:HD3	1:B:232:ARG:C	2.30	0.55
1:A:133:LEU:HD21	1:A:290:ILE:HG22	1.87	0.55
1:A:146:PHE:CE1	1:A:187:THR:HG23	2.43	0.55
1:B:134:MET:HG3	1:B:143:ILE:HD11	1.88	0.54
1:A:232:ARG:HD3	1:A:232:ARG:C	2.31	0.54
1:A:384:GLN:HA	1:A:384:GLN:NE2	2.21	0.54
1:A:145:LYS:O	1:A:186:THR:HA	2.08	0.54
1:A:62:ASP:HB3	4:A:2336:HOH:O	2.08	0.53
1:A:128:MET:SD	1:B:128:MET:HE3	2.48	0.53
1:A:232:ARG:HD3	1:A:232:ARG:O	2.09	0.52
1:A:179:LYS:CE	1:B:182:ALA:HB3	2.38	0.52
1:A:147:GLU:HG3	1:A:160:LYS:HG2	1.92	0.51
1:B:37:VAL:CG1	1:B:37:VAL:O	2.58	0.51
1:B:383:LEU:HD21	1:B:405:PHE:HE2	1.75	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:281:VAL:HG22	1:B:312:ALA:HB1	1.93	0.51
1:B:190:ASN:ND2	1:B:224:ASP:H	2.04	0.51
1:B:220:PHE:HZ	1:B:359:VAL:HG23	1.76	0.51
1:A:134:MET:HE1	1:A:143:ILE:HD11	1.92	0.51
1:A:215:VAL:HB	1:A:221:ILE:HB	1.92	0.51
1:B:142:LYS:HA	1:B:183:ASN:O	2.10	0.51
1:A:148:GLY:O	1:A:162:GLY:HA3	2.11	0.51
1:A:153:HIS:HE1	4:B:2340:HOH:O	1.93	0.51
1:B:281:VAL:CG2	1:B:312:ALA:HB1	2.42	0.49
1:B:232:ARG:HH22	1:B:267:ASP:CG	2.21	0.49
1:B:261:LYS:HG3	1:B:262:PHE:CE1	2.47	0.49
1:B:80:ILE:O	1:B:84:LYS:HG3	2.11	0.49
1:A:65:GLY:O	1:A:66:THR:HG22	2.13	0.49
1:A:202:ASN:N	1:A:203:PRO:HD3	2.27	0.49
1:A:62:ASP:OD2	1:A:74:HIS:HE1	1.96	0.48
1:A:11:LYS:CB	1:A:55:VAL:HG13	2.43	0.48
1:A:77:PRO:O	1:A:81:GLU:HG2	2.13	0.48
1:A:213:PRO:HB2	1:A:258:VAL:HG11	1.95	0.48
1:A:37:VAL:HG21	1:A:390:HIS:CG	2.49	0.48
1:A:389:PHE:O	1:A:393:MET:HG2	2.13	0.48
1:B:7:PHE:CD2	1:B:395:GLU:HG2	2.50	0.47
1:B:67:TRP:O	1:B:273:LYS:HD3	2.15	0.47
1:B:102:VAL:O	1:B:106:MET:HG3	2.15	0.47
1:B:222:VAL:CG1	1:B:223:PRO:HD2	2.45	0.47
4:A:2160:HOH:O	1:B:74:HIS:HD2	1.97	0.46
1:A:113:SER:OG	1:A:269:THR:CG2	2.62	0.46
1:A:133:LEU:CD2	1:A:290:ILE:HG22	2.46	0.46
1:A:425:ALA:O	1:A:429:VAL:HG23	2.16	0.46
1:A:11:LYS:HB3	1:A:55:VAL:HG13	1.98	0.46
1:A:179:LYS:HB2	4:A:2086:HOH:O	2.15	0.46
1:A:133:LEU:HD11	1:A:293:LEU:HB2	1.98	0.46
1:B:376:GLU:HG3	4:B:2285:HOH:O	2.16	0.46
1:A:192:LEU:HD11	1:A:230:GLY:HA3	1.97	0.46
1:B:37:VAL:O	1:B:37:VAL:HG12	2.14	0.46
1:B:76:HIS:HA	1:B:77:PRO:HD3	1.83	0.46
1:B:151:HIS:HD2	1:B:245:ASP:OD2	2.00	0.45
1:B:189:TYR:O	1:B:190:ASN:HB2	2.15	0.45
1:B:145:LYS:HG2	1:B:146:PHE:N	2.32	0.45
1:A:232:ARG:HA	1:A:242:LEU:HD22	1.98	0.45
1:B:142:LYS:HB3	1:B:185:LEU:CD2	2.46	0.45
1:B:81:GLU:HB2	4:B:2308:HOH:O	2.17	0.45

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:231:LEU:HA	1:A:234:ILE:HD12	1.99	0.44
1:A:151:HIS:HD2	1:A:245:ASP:OD2	2.01	0.44
1:A:89:LYS:HG2	1:B:46:ARG:HB3	1.98	0.44
1:A:179:LYS:HE2	1:B:182:ALA:CB	2.43	0.44
1:B:273:LYS:NZ	3:B:434:PLP:O3	2.52	0.43
1:A:289:GLU:H	1:A:289:GLU:CD	2.25	0.43
1:A:391:ARG:O	1:A:395:GLU:HG3	2.18	0.43
1:B:55:VAL:HG12	1:B:55:VAL:O	2.18	0.43
1:B:76:HIS:O	1:B:80:ILE:HG23	2.19	0.43
1:B:201:GLU:HG2	1:B:201:GLU:O	2.18	0.43
1:A:25:GLY:HA3	1:B:296:PRO:HG2	2.01	0.43
1:A:144:ILE:HA	1:A:185:LEU:O	2.19	0.43
1:B:119:PHE:CE2	1:B:313:MET:HE1	2.54	0.43
1:B:317:ILE:O	1:B:321:GLU:HG3	2.19	0.43
1:A:134:MET:HE1	1:A:143:ILE:CD1	2.49	0.42
1:A:172:SER:O	1:A:174:PRO:HD3	2.20	0.42
1:A:336:THR:OG1	1:A:410:THR:HG21	2.19	0.42
1:B:81:GLU:O	1:B:85:VAL:HG23	2.19	0.42
1:B:230:GLY:O	1:B:234:ILE:HG22	2.20	0.42
1:B:352:HIS:HD2	1:B:385:LYS:NZ	2.17	0.42
1:A:134:MET:CE	1:A:208:GLY:HA3	2.50	0.42
1:B:35:LYS:HB2	4:B:2144:HOH:O	2.20	0.42
1:A:309:ASN:O	1:A:313:MET:HG2	2.20	0.42
1:A:245:ASP:HA	1:A:270:THR:OG1	2.19	0.42
1:B:47:VAL:HB	1:B:74:HIS:CG	2.55	0.41
1:A:368:THR:HB	1:A:381:SER:HA	2.02	0.41
1:B:267:ASP:O	1:B:268:LEU:HD13	2.19	0.41
1:B:245:ASP:OD2	3:B:434:PLP:N1	2.54	0.41
1:B:289:GLU:H	1:B:289:GLU:CD	2.27	0.41
1:B:213:PRO:HG2	1:B:246:GLU:HG2	2.03	0.41
1:A:134:MET:HE3	1:A:243:VAL:CG2	2.51	0.41
1:B:141:ASP:O	1:B:183:ASN:HB3	2.21	0.41
1:B:222:VAL:HG13	1:B:223:PRO:HD2	2.02	0.41
1:B:23:MET:HA	1:B:24:PRO:HD3	1.95	0.40
1:B:370:GLY:HA2	4:B:2263:HOH:O	2.20	0.40
1:A:153:HIS:CE1	4:B:2340:HOH:O	2.71	0.40
1:A:305:THR:HG23	1:B:67:TRP:HB2	2.03	0.40
1:A:391:ARG:NH1	4:A:2164:HOH:O	2.49	0.40
1:A:120:VAL:HG13	1:A:121:ASN:N	2.36	0.40

There are no symmetry-related clashes.

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	425/432 (98%)	402 (95%)	20 (5%)	3 (1%)	18	28
1	B	425/432 (98%)	390 (92%)	29 (7%)	6 (1%)	9	13
All	All	850/864 (98%)	792 (93%)	49 (6%)	9 (1%)	11	18

All (9) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	173	SER
1	A	174	PRO
1	B	173	SER
1	B	174	PRO
1	B	225	ALA
1	B	171	PRO
1	B	273	LYS
1	A	273	LYS
1	B	167	THR

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	330/335 (98%)	302 (92%)	28 (8%)	10	16
1	B	330/335 (98%)	288 (87%)	42 (13%)	4	6
All	All	660/670 (98%)	590 (89%)	70 (11%)	6	10

All (70) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	88	GLU
1	A	89	LYS
1	A	103	LEU
1	A	117	VAL
1	A	120	VAL
1	A	131	LEU
1	A	143	ILE
1	A	158	LEU
1	A	170	LEU
1	A	174	PRO
1	A	176	VAL
1	A	181	THR
1	A	185	LEU
1	A	192	LEU
1	A	232	ARG
1	A	234	ILE
1	A	241	LEU
1	A	268	LEU
1	A	269	THR
1	A	289	GLU
1	A	311	LEU
1	A	339	LEU
1	A	358	GLN
1	A	383	LEU
1	A	384	GLN
1	A	396	GLN
1	A	410	THR
1	A	416	GLU
1	B	22	LEU
1	B	36	SER
1	B	37	VAL
1	B	54	ASP
1	B	69	PRO
1	B	80	ILE
1	B	81	GLU
1	B	84	LYS
1	B	99	LEU
1	B	102	VAL
1	B	103	LEU
1	B	111	VAL
1	B	117	VAL
1	B	130	VAL

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	143	ILE
1	B	158	LEU
1	B	160	LYS
1	B	168	LEU
1	B	176	VAL
1	B	178	LYS
1	B	181	THR
1	B	185	LEU
1	B	187	THR
1	B	190	ASN
1	B	192	LEU
1	B	215	VAL
1	B	241	LEU
1	B	242	LEU
1	B	268	LEU
1	B	269	THR
1	B	289	GLU
1	B	292	GLN
1	B	306	LEU
1	B	311	LEU
1	B	320	LEU
1	B	338	ARG
1	B	339	LEU
1	B	348	GLN
1	B	358	GLN
1	B	374	ASN
1	B	410	THR
1	B	416	GLU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (20) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	GLN
1	A	74	HIS
1	A	151	HIS
1	A	153	HIS
1	A	190	ASN
1	A	259	GLN
1	A	292	GLN
1	A	374	ASN
1	A	384	GLN
1	A	396	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	20	GLN
1	B	40	GLN
1	B	58	ASN
1	B	74	HIS
1	B	151	HIS
1	B	190	ASN
1	B	334	GLN
1	B	352	HIS
1	B	374	ASN
1	B	404	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

2 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	B	434	1	15,15,16	1.84	4 (26%)	21,22,23	1.61	5 (23%)
2	PMP	A	500	-	16,16,16	1.58	4 (25%)	22,23,23	1.69	4 (18%)

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	PLP	B	434	1	-	0/6/6/8	0/1/1/1
2	PMP	A	500	-	-	2/8/8/8	0/1/1/1

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	434	PLP	C3-C2	-4.45	1.36	1.41
2	A	500	PMP	C3-C2	-3.67	1.37	1.41
3	B	434	PLP	C6-N1	2.97	1.40	1.34
3	B	434	PLP	C2-N1	2.58	1.38	1.33
2	A	500	PMP	C5-C4	-2.45	1.37	1.40
3	B	434	PLP	P-O3P	-2.44	1.45	1.54
2	A	500	PMP	C2A-C2	2.15	1.53	1.50
2	A	500	PMP	P-O3P	-2.09	1.47	1.54

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	434	PLP	O4P-C5A-C5	4.30	117.42	109.36
2	A	500	PMP	C6-C5-C4	3.78	120.92	118.06
2	A	500	PMP	O3P-P-O2P	-3.50	94.67	107.80
2	A	500	PMP	O3P-P-O1P	3.36	123.94	110.83
2	A	500	PMP	C5-C6-N1	-2.73	119.39	123.83
3	B	434	PLP	O3P-P-O4P	2.62	113.50	106.67
3	B	434	PLP	O2P-P-O4P	-2.48	100.21	106.67
3	B	434	PLP	C2A-C2-C3	-2.16	118.27	120.80
3	B	434	PLP	C5-C6-N1	-2.02	120.54	123.83

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	A	500	PMP	C3-C4-C4A-N4A
2	A	500	PMP	C5-C4-C4A-N4A

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	B	434	PLP	2	0

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.