



Full wwPDB X-ray Structure Validation Report ⓘ

Jan 31, 2016 – 08:22 PM GMT

PDB ID : 1K0J
Title : Pseudomonas aeruginosa phbh R220Q in complex with NADPH and free of p-OHB
Authors : Wang, J.; Ortiz-Maldonado, M.; Entsch, B.; Ballou, D.; Gatti, D.L.
Deposited on : 2001-09-19
Resolution : 2.20 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

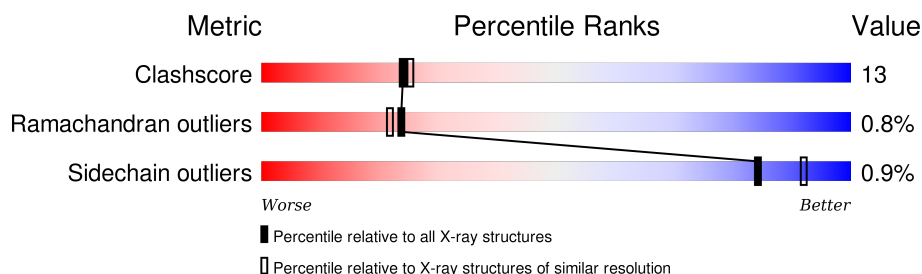
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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	102246	4477 (2.20-2.20)
Ramachandran outliers	100387	4404 (2.20-2.20)
Sidechain outliers	100360	4405 (2.20-2.20)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	394	 71% 28% .

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 3365 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 P-HYDROXYBENZOATE HYDROXYLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	394	Total	C	N	O	S	0	0	0
			3123	1974	561	577	11			

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	220	GLN	ARG	ENGINEERED	UNP P20586

- Molecule 2 is SULFATE ION (three-letter code: SO₄) (formula: O₄S).



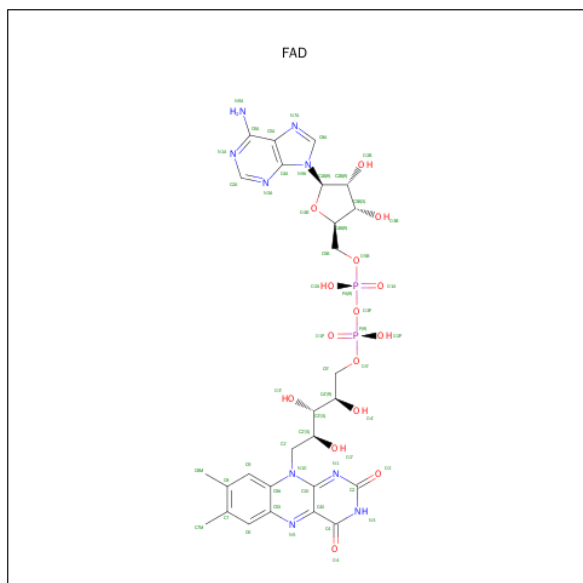
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		

Continued on next page...

Continued from previous page...

Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	O	S	0	0
			5	4	1		
2	A	1	Total	O	S	0	0
			5	4	1		

- Molecule 3 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	
			53	27	9	15	2	

- Molecule 4 is NADPH DIHYDRO-NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NDP) (formula: $C_{21}H_{30}N_7O_{17}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 5 is water.

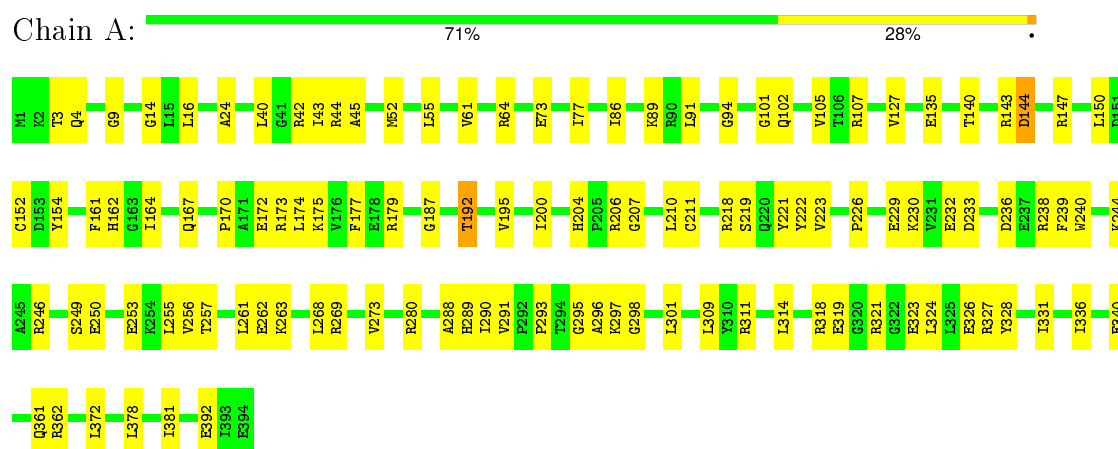
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	116	Total	O	0	0
			116	116		

3 Residue-property plots

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

Note EDS was not executed.

• Molecule 1: P-HYDROXYBENZOATE HYDROXYLASE



4 Data and refinement statistics

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

Property	Value	Source
Space group	C 2 2 21	Depositor
Cell constants a, b, c, α , β , γ	71.84Å 139.15Å 91.64Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	22.07 – 2.20	Depositor
% Data completeness (in resolution range)	86.6 (22.07-2.20)	Depositor
R_{merge}	0.13	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.222 , 0.275	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	3365	wwPDB-VP
Average B, all atoms (Å ²)	42.0	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: NDP, SO4, FAD

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	0.35	0/3188	0.60	0/4314

There are no bond length outliers.

There are no bond angle outliers.

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	3123	0	3115	84	0
2	A	25	0	0	1	0
3	A	53	0	31	1	0
4	A	48	0	26	3	0
5	A	116	0	0	4	0
All	All	3365	0	3172	84	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 13.

All (84) 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:77:ILE:HD12	1:A:372:LEU:HD21	1.50	0.94
1:A:361:GLN:HE22	1:A:362:ARG:HH21	1.28	0.80
1:A:43:ILE:HD12	1:A:43:ILE:O	1.86	0.75
1:A:174:LEU:HD13	1:A:273:VAL:HG21	1.69	0.72
1:A:226:PRO:HG2	1:A:229:GLU:HG2	1.73	0.71
1:A:167:GLN:HA	1:A:167:GLN:HE21	1.55	0.71
1:A:127:VAL:HG23	5:A:401:HOH:O	1.93	0.69
1:A:175:LYS:HD2	1:A:177:PHE:CZ	2.29	0.68
1:A:230:LYS:HB3	1:A:232:GLU:OE2	1.95	0.67
1:A:179:ARG:HG3	1:A:179:ARG:HH21	1.60	0.66
1:A:219:SER:HB3	1:A:221:TYR:CE2	2.34	0.63
1:A:195:VAL:HB	1:A:255:LEU:HD23	1.81	0.62
1:A:298:GLY:HA3	3:A:395:FAD:H1'2	1.80	0.62
1:A:167:GLN:NE2	1:A:167:GLN:HA	2.14	0.62
1:A:3:THR:O	1:A:152:CYS:HA	1.99	0.61
1:A:40:LEU:HD11	1:A:107:ARG:HB2	1.83	0.60
1:A:172:GLU:HB2	1:A:173:ARG:HH21	1.66	0.60
1:A:318:ARG:O	1:A:319:GLU:HG3	2.00	0.60
1:A:323:GLU:HG2	1:A:324:LEU:N	2.17	0.59
1:A:327:ARG:O	1:A:331:ILE:HG13	2.03	0.59
1:A:223:VAL:HG22	1:A:239:PHE:CE1	2.37	0.58
1:A:295:GLY:O	1:A:297:LYS:HG2	2.03	0.58
1:A:296:ALA:HB3	5:A:448:HOH:O	2.03	0.58
1:A:200:ILE:HB	1:A:211:CYS:HB2	1.86	0.57
1:A:175:LYS:HD2	1:A:177:PHE:HZ	1.69	0.57
1:A:323:GLU:O	1:A:326:GLU:HG3	2.05	0.57
1:A:44:ARG:HB2	5:A:513:HOH:O	2.05	0.57
1:A:204:HIS:CE1	1:A:206:ARG:HG3	2.40	0.57
1:A:173:ARG:HD2	1:A:173:ARG:N	2.19	0.56
1:A:232:GLU:H	1:A:232:GLU:CD	2.08	0.55
1:A:207:GLY:O	1:A:246:ARG:HD3	2.06	0.55
1:A:52:MET:O	1:A:52:MET:HE2	2.07	0.55
1:A:61:VAL:HG12	1:A:61:VAL:O	2.08	0.54
1:A:249:SER:O	1:A:253:GLU:HB2	2.07	0.54
1:A:143:ARG:HG2	1:A:144:ASP:N	2.22	0.54
1:A:86:ILE:HD13	1:A:381:ILE:HG21	1.88	0.54
1:A:3:THR:HG22	1:A:150:LEU:HD11	1.90	0.53
1:A:162:HIS:HE1	4:A:398:NDP:H52N	1.73	0.52
1:A:64:ARG:HD3	1:A:107:ARG:NH1	2.25	0.51
1:A:9:GLY:O	1:A:14:GLY:HA3	2.10	0.51
1:A:250:GLU:H	1:A:250:GLU:CD	2.13	0.51
1:A:44:ARG:HG3	1:A:102:GLN:HB3	1.93	0.51

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:311:ARG:HH12	1:A:392:GLU:HA	1.75	0.50
1:A:361:GLN:HE22	1:A:362:ARG:NH2	2.04	0.50
1:A:101:GLY:O	1:A:105:VAL:HG23	2.12	0.49
1:A:42:ARG:HD3	2:A:703:SO4:O1	2.12	0.49
1:A:291:VAL:HG12	1:A:340:GLU:CD	2.33	0.49
1:A:164:ILE:O	1:A:164:ILE:HG12	2.12	0.49
1:A:143:ARG:HH21	1:A:143:ARG:HG3	1.78	0.48
1:A:4:GLN:O	1:A:152:CYS:HB2	2.13	0.48
1:A:179:ARG:HG3	1:A:179:ARG:NH2	2.27	0.47
1:A:24:ALA:HB1	1:A:314:LEU:HD21	1.96	0.47
1:A:140:THR:CB	1:A:147:ARG:HH11	2.27	0.47
1:A:226:PRO:HG2	1:A:229:GLU:CG	2.43	0.46
1:A:204:HIS:HE1	1:A:206:ARG:HG3	1.80	0.46
1:A:289:HIS:CD2	1:A:336:ILE:HD13	2.51	0.46
1:A:135:GLU:HB3	1:A:280:ARG:NH1	2.30	0.46
1:A:187:GLY:O	1:A:263:LYS:HA	2.15	0.46
1:A:162:HIS:CE1	4:A:398:NDP:H52N	2.51	0.45
1:A:321:ARG:HH21	1:A:321:ARG:HG3	1.81	0.45
1:A:240:TRP:O	1:A:244:LYS:HG3	2.17	0.45
1:A:140:THR:HB	1:A:147:ARG:HH11	1.82	0.44
1:A:301:LEU:HA	1:A:301:LEU:HD23	1.77	0.44
1:A:170:PRO:HB2	1:A:173:ARG:HD3	2.00	0.44
1:A:233:ASP:O	1:A:238:ARG:NH2	2.49	0.44
1:A:73:GLU:CD	1:A:89:LYS:HD2	2.39	0.43
1:A:269:ARG:NH2	4:A:398:NDP:H3D	2.33	0.43
1:A:16:LEU:HD21	1:A:55:LEU:HD23	2.00	0.43
1:A:268:LEU:HG	1:A:293:PRO:HD2	1.99	0.43
1:A:154:TYR:CD1	1:A:280:ARG:HD2	2.53	0.43
1:A:167:GLN:CA	1:A:167:GLN:HE21	2.21	0.43
1:A:261:LEU:C	1:A:262:GLU:HG2	2.39	0.43
1:A:309:LEU:HB2	1:A:328:TYR:CE1	2.54	0.42
1:A:192:THR:CG2	1:A:256:VAL:HG12	2.49	0.42
1:A:161:PHE:HB2	1:A:290:ILE:HD11	2.02	0.42
1:A:361:GLN:NE2	1:A:362:ARG:HH21	2.07	0.42
1:A:3:THR:CG2	1:A:150:LEU:HD11	2.50	0.42
1:A:297:LYS:NZ	5:A:448:HOH:O	2.52	0.42
1:A:273:VAL:HG12	1:A:288:ALA:O	2.20	0.42
1:A:210:LEU:HB3	1:A:222:TYR:HB2	2.01	0.41
1:A:210:LEU:HD23	1:A:222:TYR:CD2	2.54	0.41
1:A:240:TRP:CE3	1:A:257:THR:HG22	2.56	0.41
1:A:336:ILE:O	1:A:340:GLU:HG2	2.21	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:91:LEU:HD11	1:A:378:LEU:HB3	2.02	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	392/394 (100%)	364 (93%)	25 (6%)	3 (1%)	24 22

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	45	ALA
1	A	94	GLY
1	A	144	ASP

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	325/325 (100%)	322 (99%)	3 (1%)	84 92

All (3) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	192	THR
1	A	218	ARG
1	A	236	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	50	GLN
1	A	130	HIS
1	A	162	HIS
1	A	167	GLN
1	A	361	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

7 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	FAD	A	395	-	48,58,58	1.89	9 (18%)	54,89,89	2.87	11 (20%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
4	NDP	A	398	-	42,52,52	2.06	12 (28%)	55,80,80	2.17	18 (32%)
2	SO4	A	700	-	4,4,4	0.20	0	6,6,6	0.07	0
2	SO4	A	701	-	4,4,4	0.31	0	6,6,6	0.11	0
2	SO4	A	702	-	4,4,4	0.21	0	6,6,6	0.08	0
2	SO4	A	703	-	4,4,4	0.19	0	6,6,6	0.11	0
2	SO4	A	704	-	4,4,4	0.19	0	6,6,6	0.11	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	FAD	A	395	-	-	0/30/50/50	0/6/6/6
4	NDP	A	398	-	-	0/30/77/77	0/5/5/5
2	SO4	A	700	-	-	0/0/0/0	0/0/0/0
2	SO4	A	701	-	-	0/0/0/0	0/0/0/0
2	SO4	A	702	-	-	0/0/0/0	0/0/0/0
2	SO4	A	703	-	-	0/0/0/0	0/0/0/0
2	SO4	A	704	-	-	0/0/0/0	0/0/0/0

All (21) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	398	NDP	C3B-C2B	-5.21	1.41	1.53
4	A	398	NDP	C4N-C5N	-3.43	1.41	1.49
4	A	398	NDP	P2B-O2X	-2.91	1.44	1.54
3	A	395	FAD	C8A-N7A	-2.84	1.29	1.34
3	A	395	FAD	C9-C9A	2.11	1.45	1.40
4	A	398	NDP	O3D-C3D	2.14	1.48	1.43
4	A	398	NDP	O4D-C1D	2.15	1.47	1.42
4	A	398	NDP	O3B-C3B	2.19	1.48	1.43
3	A	395	FAD	C4-N3	2.19	1.37	1.33
4	A	398	NDP	O4D-C4D	2.21	1.50	1.45
4	A	398	NDP	C1D-N1N	2.21	1.53	1.46
3	A	395	FAD	C6-C5X	2.24	1.45	1.41
4	A	398	NDP	C4A-N3A	2.42	1.39	1.35
4	A	398	NDP	O2D-C2D	2.47	1.48	1.43
3	A	395	FAD	C4X-N5	2.83	1.37	1.33
3	A	395	FAD	C8M-C8	3.25	1.57	1.51
3	A	395	FAD	C8-C7	3.75	1.51	1.41
4	A	398	NDP	C2N-C3N	5.05	1.47	1.34

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	395	FAD	C9A-N10	5.51	1.46	1.38
4	A	398	NDP	O4B-C4B	5.76	1.58	1.45
3	A	395	FAD	C10-N10	7.15	1.47	1.39

All (29) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	395	FAD	C4X-C10-N10	-9.65	114.83	120.52
3	A	395	FAD	C4X-C4-N3	-6.75	114.35	123.59
4	A	398	NDP	N3A-C2A-N1A	-6.53	123.90	128.89
4	A	398	NDP	C3N-C2N-N1N	-5.14	115.78	123.14
3	A	395	FAD	C5X-C9A-N10	-5.06	113.77	117.62
4	A	398	NDP	C4B-O4B-C1B	-4.66	104.60	109.72
4	A	398	NDP	O4D-C4D-C3D	-4.22	96.65	105.15
3	A	395	FAD	C4-C4X-N5	-3.80	114.10	118.72
3	A	395	FAD	C6-C5X-N5	-3.52	114.43	118.96
3	A	395	FAD	O4'-C4'-C5'	-3.48	102.60	110.19
4	A	398	NDP	O4B-C4B-C3B	-3.35	98.39	105.15
4	A	398	NDP	PN-O3-PA	-3.26	123.56	132.73
4	A	398	NDP	O4B-C1B-C2B	-2.70	101.72	106.60
4	A	398	NDP	C3B-C2B-C1B	-2.53	97.84	102.73
4	A	398	NDP	O4D-C1D-N1N	-2.39	103.03	108.07
3	A	395	FAD	C1B-N9A-C4A	-2.36	123.39	126.94
4	A	398	NDP	O4B-C4B-C5B	-2.34	100.94	109.32
3	A	395	FAD	C4-C4X-C10	-2.09	118.60	119.94
4	A	398	NDP	O3B-C3B-C2B	2.06	117.11	111.16
3	A	395	FAD	C7M-C7-C8	2.17	125.50	120.73
4	A	398	NDP	C2D-C3D-C4D	2.22	107.17	102.61
4	A	398	NDP	O2A-PA-O3	2.27	115.40	105.09
3	A	395	FAD	C9A-C5X-N5	2.33	125.80	122.36
4	A	398	NDP	O4B-C1B-N9A	2.44	113.20	108.10
4	A	398	NDP	O2B-P2B-O1X	2.70	113.84	107.11
4	A	398	NDP	C4A-C5A-N7A	2.73	111.99	109.48
4	A	398	NDP	C5N-C4N-C3N	3.01	120.82	112.52
4	A	398	NDP	C2D-C1D-N1N	3.05	121.59	113.34
3	A	395	FAD	C4-N3-C2	13.01	126.50	115.25

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	395	FAD	1	0
4	A	398	NDP	3	0
2	A	703	SO4	1	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 will therefore be empty.

6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates ⓘ

EDS was not executed - this section will therefore be empty.

6.4 Ligands ⓘ

EDS was not executed - this section will therefore be empty.

6.5 Other polymers ⓘ

EDS was not executed - this section will therefore be empty.