W O R L D W I D E
wwPDB
P R O T E I N   D A T A   B A N K

wwPDB X-ray Structure Validation Summary Report ⓘ

Dec 16, 2023 – 07:41 PM EST

PDB ID	:	2OHI
Title	:	Crystal Structure of coenzyme F420H2 oxidase (FprA), a diiron flavoprotein, reduced state
Authors	:	Seedorf, H.; Warkentin, E.; Ermler, U.
Deposited on	:	2007-01-10
Resolution	:	2.30 Å(reported)

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

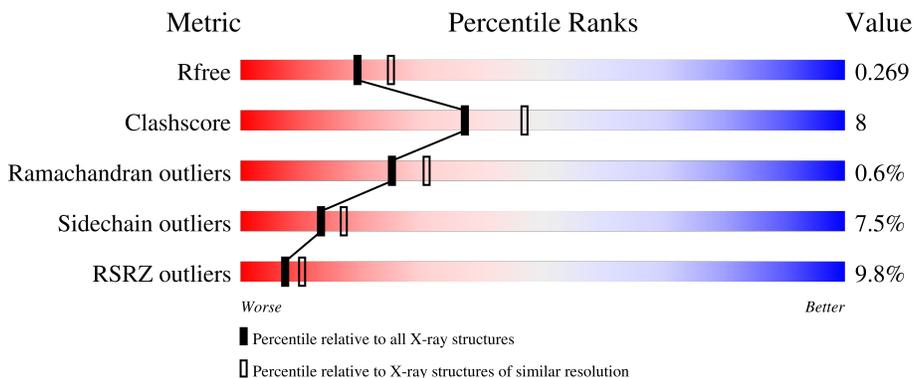|		
MolProbity	:	4.02b-467
Mogul	:	1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix)	:	1.13
EDS	:	2.36
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance ⓘ

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

The reported resolution of this entry is 2.30 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	Percentile Ranks	Value
Rfree		0.269
Clashscore		8
Ramachandran outliers		0.6%
Sidechain outliers		7.5%
RSRZ outliers		9.8%

Worse   *Better*

▌ Percentile relative to all X-ray structures

▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	5042 (2.30-2.30)
Clashscore	141614	5643 (2.30-2.30)
Ramachandran outliers	138981	5575 (2.30-2.30)
Sidechain outliers	138945	5575 (2.30-2.30)
RSRZ outliers	127900	4938 (2.30-2.30)

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% 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.

Mol	Chain	Length	Quality of chain
1	A	404	11% / 77% / 22% / •
1	B	404	6% / 80% / 17% / •
1	D	404	8% / 82% / 15% / •
1	E	404	12% / 73% / 25% / •
1	G	404	10% / 76% / 21% / •

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Mol	Chain	Length	Quality of chain
1	H	404	9% 76% 20%
1	I	404	14% 77% 21%
1	J	404	8% 80% 18%

2 Entry composition (i)

There are 5 unique types of molecules in this entry. The entry contains 25966 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 Type A flavoprotein fprA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	403	Total 3166	C 2014	N 526	O 604	S 22	0	1	0
1	B	403	Total 3162	C 2012	N 525	O 603	S 22	0	0	0
1	D	403	Total 3178	C 2022	N 530	O 604	S 22	0	3	0
1	E	403	Total 3168	C 2016	N 527	O 603	S 22	0	1	0
1	G	403	Total 3166	C 2014	N 526	O 604	S 22	0	1	0
1	H	403	Total 3162	C 2012	N 525	O 603	S 22	0	0	0
1	I	403	Total 3162	C 2012	N 525	O 603	S 22	0	0	0
1	J	403	Total 3169	C 2016	N 527	O 604	S 22	0	2	0

- Molecule 2 is FE (III) ION (three-letter code: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	2	Total 2	Fe 2	0	0
2	B	2	Total 2	Fe 2	0	0
2	D	2	Total 2	Fe 2	0	0
2	E	2	Total 2	Fe 2	0	0
2	G	2	Total 2	Fe 2	0	0
2	H	2	Total 2	Fe 2	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	I	2	Total Fe 2　　2		0	0
2	J	2	Total Fe 2　　2		0	0

- Molecule 3 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).
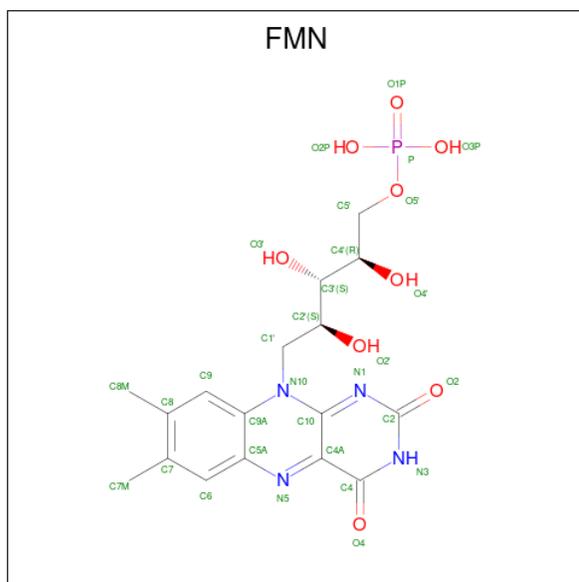
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	B	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	D	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	E	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	G	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	H	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	I	1	Total 31	C 17	N 4	O 9	P 1	0	0
3	J	1	Total 31	C 17	N 4	O 9	P 1	0	0

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	D	1	Total 1	Cl 1	0	0
4	H	1	Total 1	Cl 1	0	0
4	J	2	Total 2	Cl 2	0	0

- Molecule 5 is water.

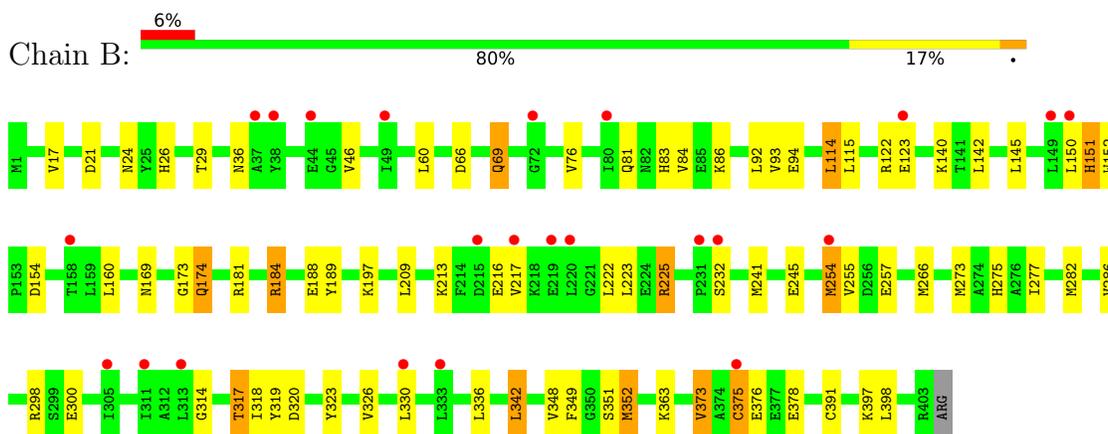| Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	46	Total 46	O 46	0	0
5	B	47	Total 47	O 47	0	0
5	D	57	Total 57	O 57	0	0
5	E	42	Total 42	O 42	0	0
5	G	50	Total 50	O 50	0	0
5	H	45	Total 45	O 45	0	0
5	I	33	Total 33	O 33	0	0
5	J	45	Total 45	O 45	0	0

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 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.
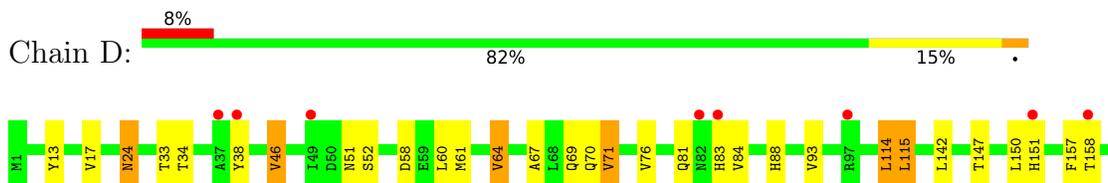
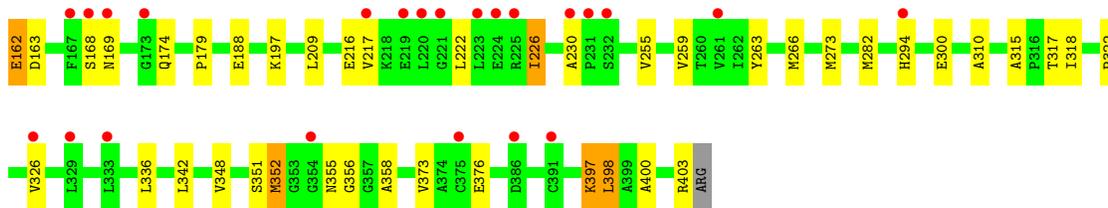- Molecule 1: Type A flavoprotein fprA
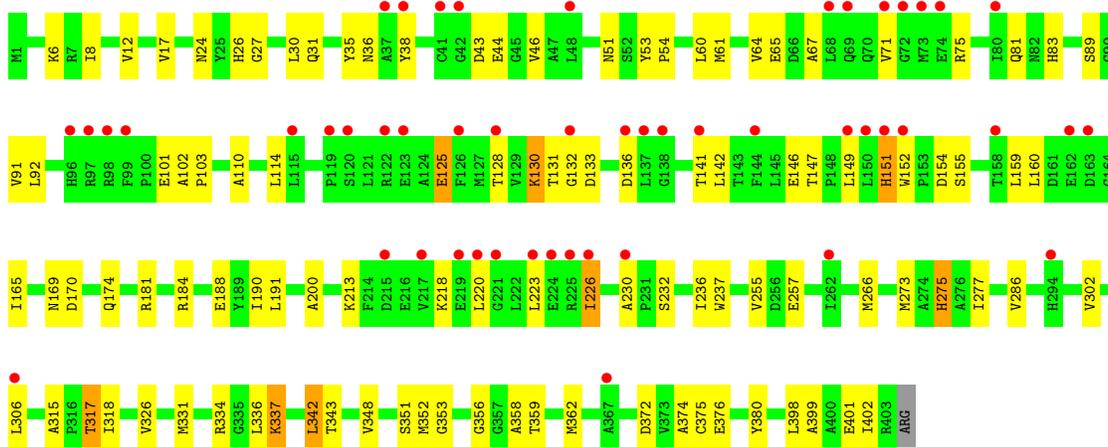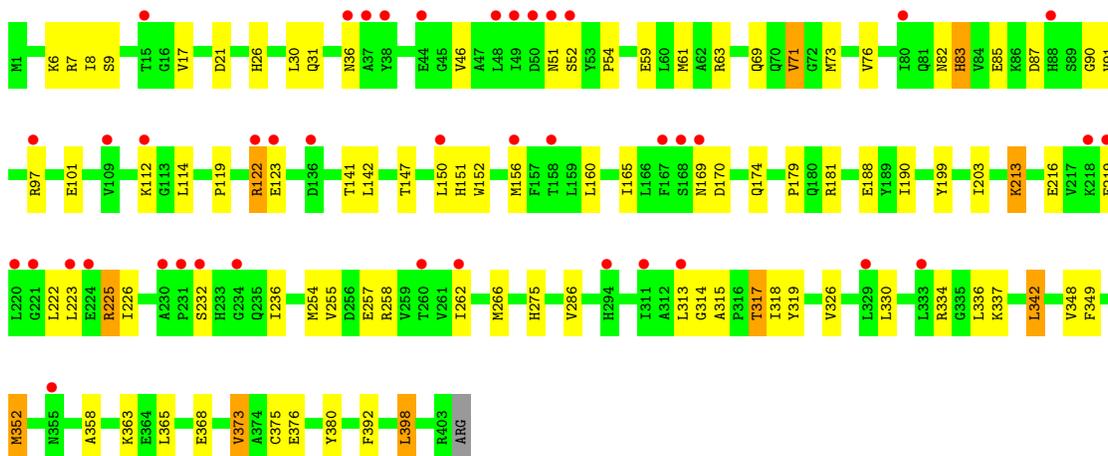

- Molecule 1: Type A flavoprotein fprA
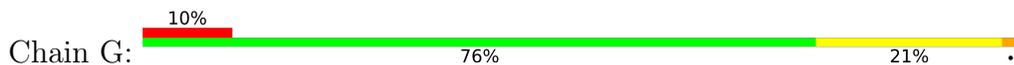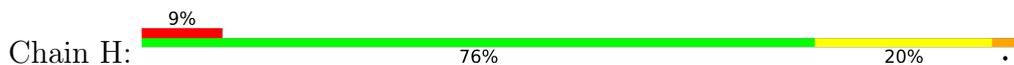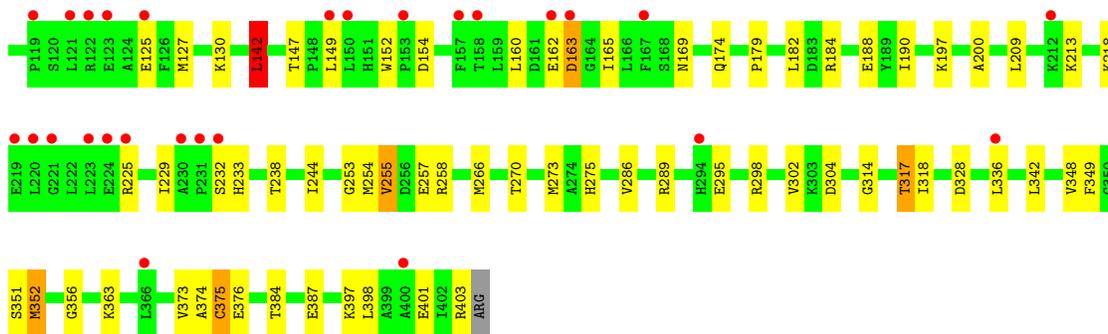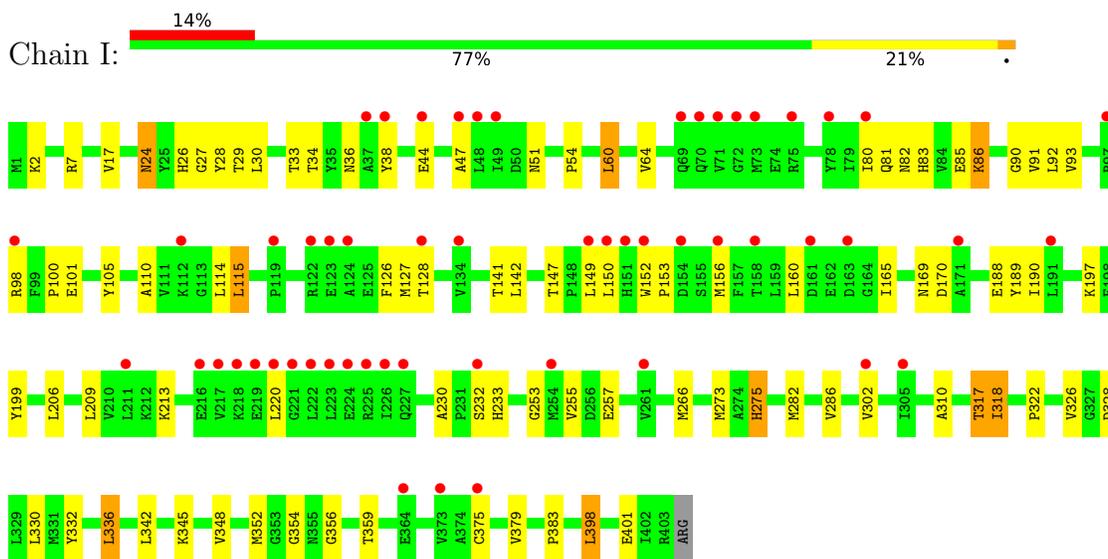

- Molecule 1: Type A flavoprotein fprA

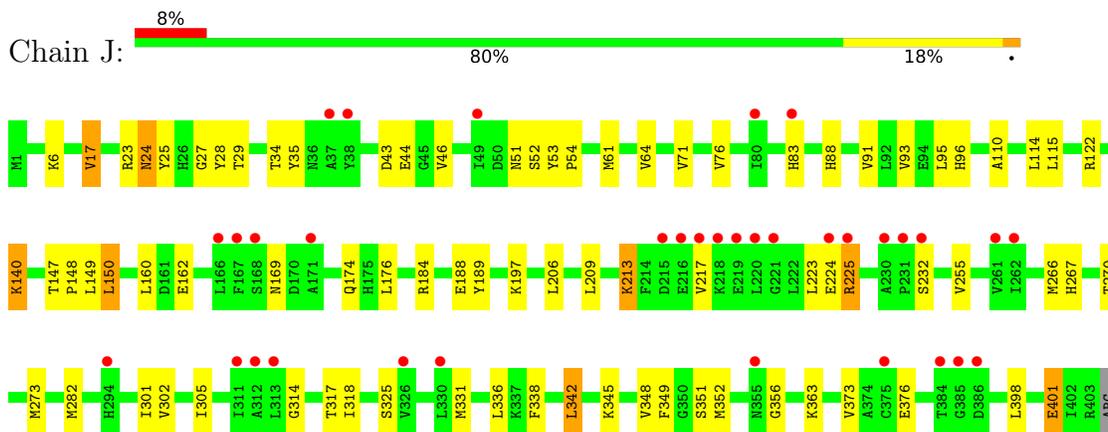E162 D163 F167 S168 N169 G173 Q174 P179 E188 K197 L209 E216 V217 K218 E219 L220 G221 L222 L223 E224 R225 I226 A230 P231 S232 V255 V259 T260 V261 I262 Y263 M266 M273 M282 H294 E300 A310 A315 P316 T317 I318 P322

V326 L329 L333 L336 L342 V348 S351 M352 G353 G354 N355 G356 G357 A358 V373 A374 C375 E376 D386 C391 K397 L398 A399 A400 R403 ARG

• Molecule 1: Type A flavoprotein fprA

Chain E:

12%

73% 25% •

M1 K6 R7 I8 V12 V17 N24 Y25 H26 G27 L30 Q31 Y35 N36 A37 Y38 C41 G42 D43 E44 G45 V46 A47 L48 N51 S52 Y53 P54 L60 M61 V64 E65 D66 A67 L68 Q69 Q70 V71 G72 M73 E74 R75 I80 Q81 N82 H83 S89 G90

V91 L92 H96 R97 R98 F99 P100 E101 A102 P103 A110 L114 L115 P119 S120 L121 R122 E123 A124 E125 F126 M127 T128 V129 K130 T131 G132 D133 D136 L137 G138 T141 L142 T143 F144 L145 E146 T147 P148 L149 L150 H151 W152 P153 D154 S155 T158 L159 L160 D161 E162 D163 G164

I165 N169 D170 Q174 R181 R184 E188 Y189 I190 L191 A200 K213 F214 D215 E216 V217 K218 E219 L220 G221 L222 L223 E224 R225 I226 A230 P231 S232 V255 D256 E257 I236 W237 I262 M266 M273 A274 H275 A276 I277 V286 H294 V302

L306 A315 P316 T317 I318 V326 M331 R334 G335 L336 K337 L342 T343 V348 S351 M352 G353 G356 G357 A358 T359 M362 A367 D372 V373 A374 C375 E376 Y380 L398 A399 A400 E401 I402 R403 ARG

• Molecule 1: Type A flavoprotein fprA

Chain G:

10%

76% 21% •

M1 K6 R7 I8 S9 T15 G16 V17 D21 H26 L30 Q31 N36 A37 Y38 E44 G45 V46 A47 L48 I49 D50 N51 S52 Y53 P54 E59 L60 M61 A62 R63 Q69 Q70 V71 G72 M73 V76 I80 Q81 N82 H83 V84 E85 K86 D87 H88 S89 G90 V91

R97 E101 V109 K112 G113 L114 P119 R122 E123 D136 T141 L142 T147 L150 H151 W152 M156 F157 T158 L159 L160 I165 L166 F167 S168 N169 D170 Q174 P179 Q180 R181 E188 Y189 I190 I199 I203 K213 E216 V217 K218 E219

L220 G221 L222 L223 E224 R225 I226 A230 P231 S232 H233 G234 Q235 I236 M254 V255 D256 E257 R258 V259 T260 V261 I262 M266 H275 V286 H294 I311 A312 L313 G314 A315 P316 T317 I318 Y319 V326 L329 L330 L333 R334 G335 L336 K337 L342 V348 F349

M352 N355 A358 K363 E364 L365 E368 V373 A374 C375 E376 Y380 F392 L398 R403 ARG

• Molecule 1: Type A flavoprotein fprA

Chain H:

9%

76% 20% •

M1 G16 V17 Y25 H26 G27 Y28 T34 Y35 Y38 D43 E44 G45 V46 I49 D50 N51 S52 F57 D58 M61 A67 V71 G72 R75 Q81 N82 H83 V84 H88 L92 L95 H96 R97 P100 E101 A102 P103 I104 Y105 L114 L115 K116

P119 S120 L121 R122 E123 A124 E125 F126 M127 K130 L142 T147 P148 L149 L150 H151 W152 P153 D154 F157 T158 L159 L160 D161 E162 D163 G164 I165 L166 F167 S168 N169 Q174 P179 L182 D183 R184 E188 Y189 I190 K197 A200 L209 K212 K213 K218

E219 L220 G221 L222 L223 E224 R225 I229 A230 P231 S232 H233 T238 I244 G253 M254 V255 D256 E257 R258 M266 T270 M273 A274 H275 V286 R289 H294 E295 R298 V302 K303 D304 G314 T317 I318 D328 L336 L342 V348 F349 G350

S351 M352 G356 K363 L366 V373 A374 C375 E376 T384 E387 K397 L398 A399 A400 E401 I402 R403 ARG

• Molecule 1: Type A flavoprotein fprA

14%

Chain I:
77%
21%

M1 K2 R7 V17 N24 Y25 H26 G27 Y28 T29 L30 T33 T34 Y35 N36 A37 Y38 E44 A47 L48 I49 D50 N51 P54 L60 V64 Q69 Q70 V71 G72 M73 E74 R75 Y78 I79 I80 Q81 N82 H83 V84 E85 K86 G90 V91 L92 V93 R97

R98 F99 P100 E101 Y105 A110 V111 K112 G113 L114 L115 P119 R122 E123 A124 E125 F126 M127 T128 V134 T141 L142 T147 P148 L149 L150 H151 W152 P153 D154 S155 M156 F157 T158 L159 L160 D161 E162 D163 G164 I165 N169 D170 A171 E188 Y189 I190 L191 K197 F198

Y199 L206 L209 V210 I211 K212 K213 E216 V217 K218 E219 L220 G221 L222 L223 E224 R225 I226 Q227 A230 P231 S232 H233 G253 M254 V255 D256 E257 V261 M266 M273 A274 H275 M282 V286 V302 I305 A310 T317 I318 P322 V326 G327 D328

L329 L330 M331 Y332 L336 L342 K345 V348 M352 G353 G354 N355 G356 T359 E364 V373 A374 C375 V379 P383 L398 E401 I402 R403 ARG

• Molecule 1: Type A flavoprotein fprA

8%

Chain J:
80%
18%

M1 K6 V17 R23 N24 Y25 H26 G27 Y28 T29 T34 Y35 N36 A37 Y38 D43 E44 G45 V46 I49 D50 N51 S52 Y53 P54 M61 V64 V71 V76 I80 H83 H88 V91 L92 V93 E94 L95 H96 A110 L114 L115 R122

K140 T147 P148 L149 L150 L160 D161 E162 L166 F167 S168 N169 D170 A171 Q174 H175 L176 R184 E188 Y189 K197 L206 L209 K213 F214 D215 E216 V217 K218 E219 L220 G221 L222 L223 E224 R225 A230 P231 S232 V255 V261 I262 M266 H267 T270

M273 M282 H294 I301 V302 I305 I311 A312 L313 G314 T317 I318 S325 V326 L330 M331 L336 K337 F338 L342 K345 V348 F349 G350 S351 M352 N355 G356 K363 V373 A374 C375 E376 T384 G385 D386 L398 E401 I402 R403 ARG

4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	97.80Å 123.11Å 135.86Å 90.00° 103.40° 90.00°	Depositor
Resolution (Å)	20.00 – 2.30 29.58 – 2.28	Depositor EDS
% Data completeness (in resolution range)	78.9 (20.00-2.30) 77.6 (29.58-2.28)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	6.60	Depositor
$< I/\sigma(I) >$ [1]	1.75 (at 2.29Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.203 , 0.269 0.203 , 0.269	Depositor DCC
R_{free} test set	6932 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å^2)	35.3	Xtriage
Anisotropy	0.370	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.37 , 59.5	EDS
L-test for twinning[2]	$< |L| > = 0.48$, $< L^2 > = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	25966	wwPDB-VP
Average B, all atoms (Å^2)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The analyses of the Patterson function reveals a significant off-origin peak that is 33.97 % of the origin peak, indicating pseudo-translational symmetry. The chance of finding a peak of this or larger height randomly in a structure without pseudo-translational symmetry is equal to 7.3444e-04. The detected translational NCS is most likely also responsible for the elevated intensity ratio.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, CL, FE

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	2/3237 (0.1%)	0.66	1/4386 (0.0%)
1	B	0.54	0/3229	0.69	2/4375 (0.0%)
1	D	0.52	0/3259	0.65	0/4416
1	E	0.92	9/3240 (0.3%)	0.73	8/4390 (0.2%)
1	G	0.52	0/3237	0.69	2/4386 (0.0%)
1	H	0.60	4/3229 (0.1%)	0.67	1/4375 (0.0%)
1	I	0.50	0/3229	0.63	0/4375
1	J	0.53	0/3246	0.68	1/4398 (0.0%)
All	All	0.61	15/25906 (0.1%)	0.67	15/35101 (0.0%)

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

The worst 5 of 15 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	E	125	GLU	CD-OE2	27.93	1.56	1.25
1	E	132	GLY	C-O	18.60	1.53	1.23
1	A	101	GLU	CD-OE1	17.32	1.44	1.25
1	A	101	GLU	CD-OE2	17.25	1.44	1.25
1	E	43	ASP	CG-OD2	11.48	1.51	1.25

The worst 5 of 15 bond angle outliers are listed below:

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Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
1	E	132	GLY	O-C-N	9.03	137.15	122.70
1	E	133	ASP	CB-CG-OD1	-8.86	110.33	118.30
1	E	43	ASP	CB-CG-OD2	-7.67	111.40	118.30
1	J	342	LEU	CA-CB-CG	6.39	129.99	115.30
1	G	398	LEU	CA-CB-CG	6.06	129.24	115.30

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	101	GLU	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	3166	0	3113	54	0
1	B	3162	0	3111	44	0
1	D	3178	0	3119	47	0
1	E	3168	0	3114	60	0
1	G	3166	0	3113	56	0
1	H	3162	0	3111	48	0
1	I	3162	0	3111	58	0
1	J	3169	0	3115	58	0
2	A	2	0	0	0	0
2	B	2	0	0	0	0
2	D	2	0	0	0	0
2	E	2	0	0	0	0
2	G	2	0	0	0	0
2	H	2	0	0	0	0
2	I	2	0	0	0	0
2	J	2	0	0	0	0
3	A	31	0	19	0	0
3	B	31	0	19	0	0
3	D	31	0	19	0	0
3	E	31	0	19	0	0
3	G	31	0	19	0	0
3	H	31	0	19	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	I	31	0	19	1	0
3	J	31	0	19	0	0
4	D	1	0	0	0	0
4	H	1	0	0	0	0
4	J	2	0	0	0	0
5	A	46	0	0	1	0
5	B	47	0	0	2	0
5	D	57	0	0	3	0
5	E	42	0	0	2	0
5	G	50	0	0	3	0
5	H	45	0	0	3	0
5	I	33	0	0	1	0
5	J	45	0	0	4	0
All	All	25966	0	25059	397	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 8.

The worst 5 of 397 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:E:130:LYS:CE	1:E:130:LYS:NZ	1.73	1.47
1:H:266:MET:SD	1:H:318:ILE:HD11	1.98	1.04
1:B:266:MET:SD	1:B:318:ILE:HD11	1.97	1.03
1:I:266:MET:SD	1:I:318:ILE:HD11	2.05	0.95
1:J:24:ASN:HD21	1:J:27:GLY:H	1.16	0.93

There are no symmetry-related clashes.

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	402/404 (100%)	384 (96%)	16 (4%)	2 (0%)	29	35
1	B	401/404 (99%)	382 (95%)	16 (4%)	3 (1%)	22	26
1	D	404/404 (100%)	388 (96%)	14 (4%)	2 (0%)	29	35
1	E	402/404 (100%)	377 (94%)	22 (6%)	3 (1%)	22	26
1	G	402/404 (100%)	386 (96%)	14 (4%)	2 (0%)	29	35
1	H	401/404 (99%)	381 (95%)	17 (4%)	3 (1%)	22	26
1	I	401/404 (99%)	374 (93%)	24 (6%)	3 (1%)	22	26
1	J	403/404 (100%)	388 (96%)	13 (3%)	2 (0%)	29	35
All	All	3216/3232 (100%)	3060 (95%)	136 (4%)	20 (1%)	25	31

5 of 20 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	255	VAL
1	B	375	CYS
1	D	255	VAL
1	J	150	LEU
1	B	255	VAL

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	336/336 (100%)	313 (93%)	23 (7%)	16	21
1	B	335/336 (100%)	306 (91%)	29 (9%)	10	12
1	D	338/336 (101%)	318 (94%)	20 (6%)	19	27
1	E	336/336 (100%)	308 (92%)	28 (8%)	11	14
1	G	336/336 (100%)	310 (92%)	26 (8%)	13	16
1	H	335/336 (100%)	303 (90%)	32 (10%)	8	10
1	I	335/336 (100%)	313 (93%)	22 (7%)	16	22
1	J	337/336 (100%)	316 (94%)	21 (6%)	18	25

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	2688/2688 (100%)	2487 (92%)	201 (8%)	13 17

5 of 201 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	G	174	GLN
1	H	163	ASP
1	J	398	LEU
1	G	275	HIS
1	H	51	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 64 such sidechains are listed below:

Mol	Chain	Res	Type
1	I	169	ASN
1	J	24	ASN
1	D	275	HIS
1	D	96	HIS
1	J	31	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 ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 28 ligands modelled in this entry, 20 are monoatomic - leaving 8 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	FMN	B	1701	-	33,33,33	1.11	2 (6%)	48,50,50	1.54	11 (22%)
3	FMN	E	3701	-	33,33,33	1.14	2 (6%)	48,50,50	1.29	6 (12%)
3	FMN	D	2701	-	33,33,33	1.16	2 (6%)	48,50,50	1.40	9 (18%)
3	FMN	A	701	-	33,33,33	1.16	2 (6%)	48,50,50	1.35	6 (12%)
3	FMN	G	702	-	33,33,33	1.13	2 (6%)	48,50,50	1.45	10 (20%)
3	FMN	H	1702	-	33,33,33	1.16	2 (6%)	48,50,50	1.34	8 (16%)
3	FMN	I	2702	-	33,33,33	1.17	2 (6%)	48,50,50	1.26	7 (14%)
3	FMN	J	3702	-	33,33,33	1.21	2 (6%)	48,50,50	1.32	7 (14%)

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	FMN	B	1701	-	-	3/18/18/18	0/3/3/3
3	FMN	E	3701	-	-	5/18/18/18	0/3/3/3
3	FMN	D	2701	-	-	3/18/18/18	0/3/3/3
3	FMN	A	701	-	-	2/18/18/18	0/3/3/3
3	FMN	G	702	-	-	0/18/18/18	0/3/3/3
3	FMN	H	1702	-	-	7/18/18/18	0/3/3/3
3	FMN	I	2702	-	-	0/18/18/18	0/3/3/3
3	FMN	J	3702	-	-	3/18/18/18	0/3/3/3

The worst 5 of 16 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	2701	FMN	C4A-N5	4.79	1.40	1.30
3	A	701	FMN	C4A-N5	4.74	1.40	1.30
3	G	702	FMN	C4A-N5	4.66	1.39	1.30
3	E	3701	FMN	C4A-N5	4.61	1.39	1.30
3	H	1702	FMN	C4A-N5	4.55	1.39	1.30

The worst 5 of 64 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
3	A	701	FMN	C4-C4A-N5	3.43	123.12	118.23
3	A	701	FMN	C4A-C10-N10	3.34	121.37	116.48
3	B	1701	FMN	C4-N3-C2	-3.33	119.49	125.64
3	B	1701	FMN	C4A-C10-N10	3.32	121.34	116.48
3	D	2701	FMN	C4-N3-C2	-3.28	119.59	125.64

There are no chirality outliers.

5 of 23 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
3	A	701	FMN	C5'-O5'-P-O1P
3	B	1701	FMN	C5'-O5'-P-O1P
3	B	1701	FMN	C5'-O5'-P-O2P
3	H	1702	FMN	C5'-O5'-P-O2P
3	J	3702	FMN	C5'-O5'-P-O1P

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	I	2702	FMN	1	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 FMN B 1701

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN E 3701

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN D 2701

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN A 701

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN G 702

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN H 1702

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN I 2702

Bond lengths

Bond angles

Torsions

Rings

Ligand FMN J 3702

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 ⓘ

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2			OWAB(Å^2)	Q<0.9
1	A	403/404 (99%)	0.79	44 (10%)	5	8	35, 43, 56, 64	0
1	B	403/404 (99%)	0.57	23 (5%)	23	30	35, 43, 56, 65	0
1	D	403/404 (99%)	0.60	31 (7%)	13	17	34, 42, 55, 64	0
1	E	403/404 (99%)	0.89	50 (12%)	4	5	35, 43, 55, 64	0
1	G	403/404 (99%)	0.67	42 (10%)	6	9	34, 42, 55, 65	0
1	H	403/404 (99%)	0.70	38 (9%)	8	11	35, 43, 55, 65	0
1	I	403/404 (99%)	0.85	55 (13%)	3	4	35, 43, 55, 63	0
1	J	403/404 (99%)	0.56	34 (8%)	11	15	34, 43, 56, 65	0
All	All	3224/3232 (99%)	0.70	317 (9%)	7	10	34, 43, 56, 65	0

The worst 5 of 317 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	223	LEU	7.5
1	E	151[A]	HIS	7.4
1	E	223	LEU	7.3
1	I	223	LEU	7.0
1	I	217	VAL	7.0

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

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates ⓘ

There are no monosaccharides in this entry.

WORLDWIDE
wwPDB
PROTEIN DATA BANK

6.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å^2)	Q<0.9
4	CL	J	3505	1/1	0.86	0.21	37,37,37,37	1
2	FE	I	2503	1/1	0.91	0.25	63,63,63,63	1
2	FE	J	3503	1/1	0.93	0.19	48,48,48,48	1
3	FMN	D	2701	31/31	0.93	0.13	37,40,43,44	0
2	FE	B	1503	1/1	0.93	0.08	45,45,45,45	1
2	FE	H	1503	1/1	0.95	0.08	44,44,44,44	1
2	FE	E	3503	1/1	0.96	0.26	58,58,58,58	1
3	FMN	G	702	31/31	0.96	0.11	29,32,34,35	0
3	FMN	I	2702	31/31	0.96	0.11	29,33,34,35	0
3	FMN	J	3702	31/31	0.96	0.11	38,41,42,42	0
4	CL	D	2504	1/1	0.96	0.05	41,41,41,41	1
4	CL	H	1504	1/1	0.96	0.12	47,47,47,47	1
4	CL	J	3504	1/1	0.96	0.06	36,36,36,36	1
3	FMN	B	1701	31/31	0.96	0.10	33,35,39,40	0
2	FE	D	2503	1/1	0.97	0.08	36,36,36,36	1
3	FMN	E	3701	31/31	0.97	0.10	29,32,33,34	0
3	FMN	A	701	31/31	0.97	0.10	24,33,34,35	0
3	FMN	H	1702	31/31	0.97	0.11	28,35,36,36	0
2	FE	A	503	1/1	0.97	0.07	47,47,47,47	1
2	FE	I	2501	1/1	0.98	0.05	48,48,48,48	0
2	FE	H	1501	1/1	0.98	0.05	47,47,47,47	0
2	FE	E	3501	1/1	0.98	0.05	44,44,44,44	0
2	FE	B	1501	1/1	0.99	0.04	36,36,36,36	0
2	FE	A	501	1/1	0.99	0.02	45,45,45,45	0
2	FE	D	2501	1/1	0.99	0.06	39,39,39,39	0
2	FE	G	501	1/1	0.99	0.05	37,37,37,37	0
2	FE	J	3501	1/1	0.99	0.04	37,37,37,37	0
2	FE	G	503	1/1	0.99	0.07	32,32,32,32	1

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around FMN D 2701:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
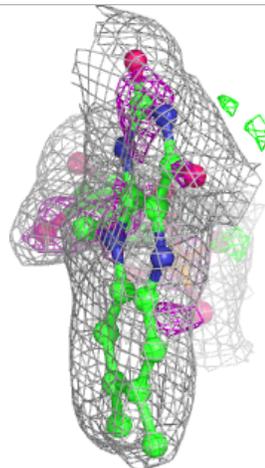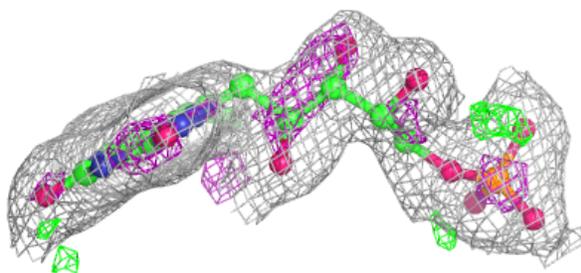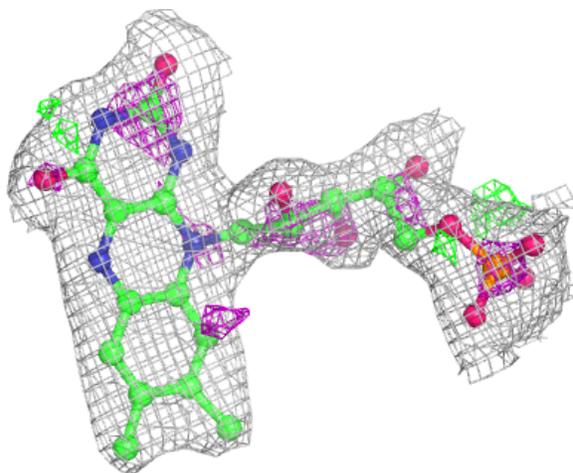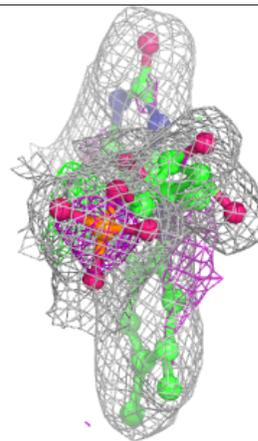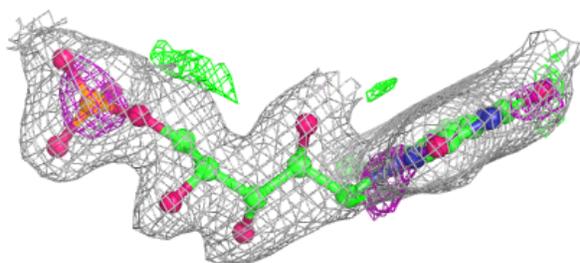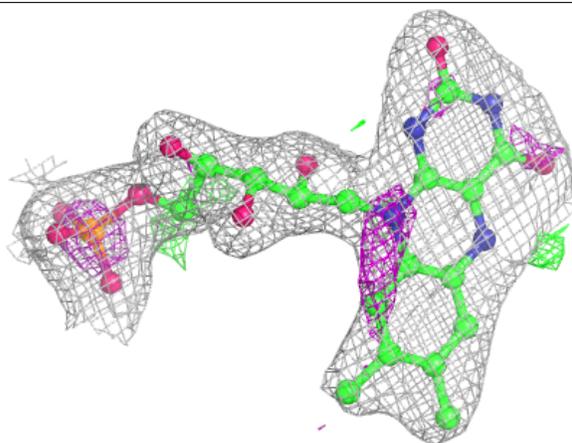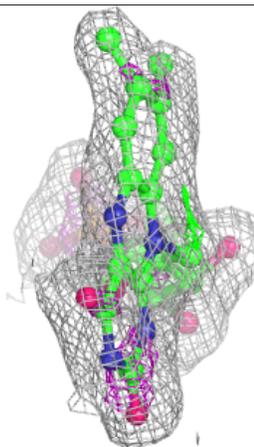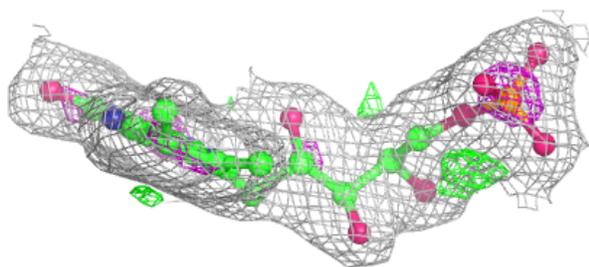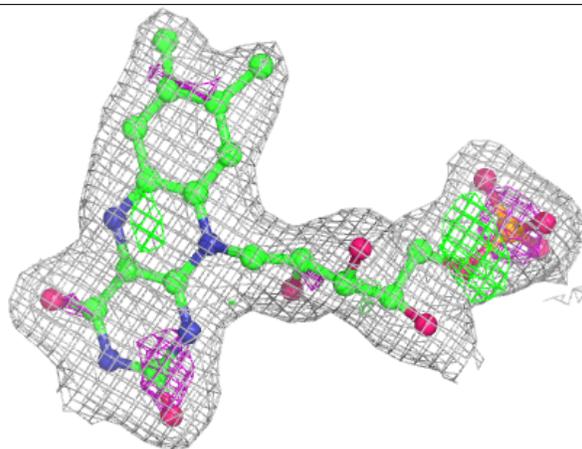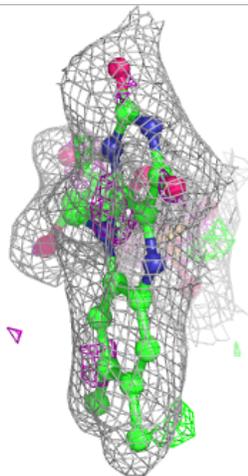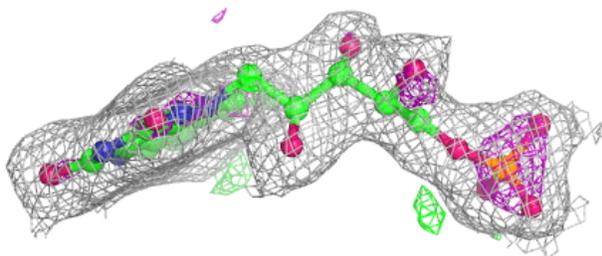mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
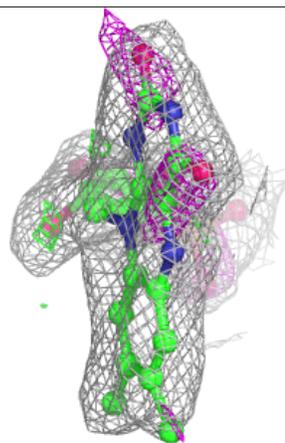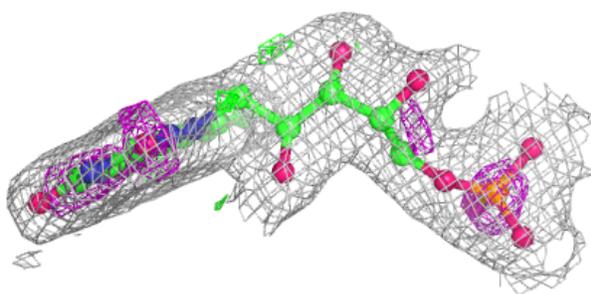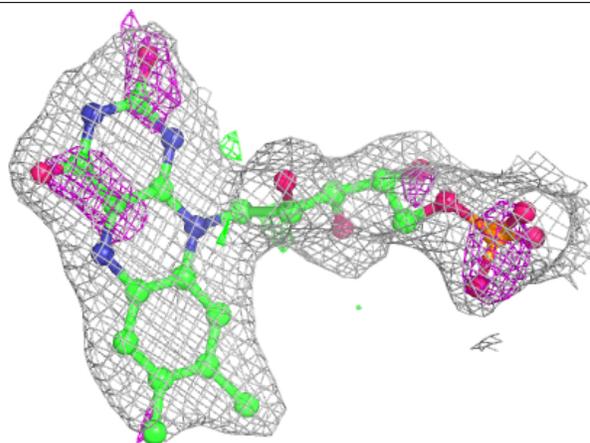
Electron density around FMN G 702:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)
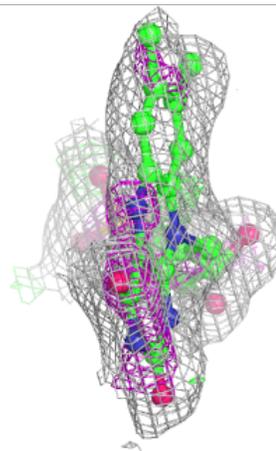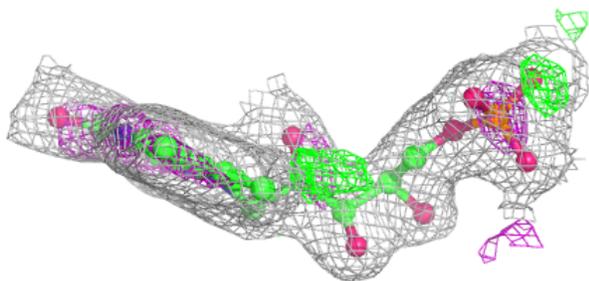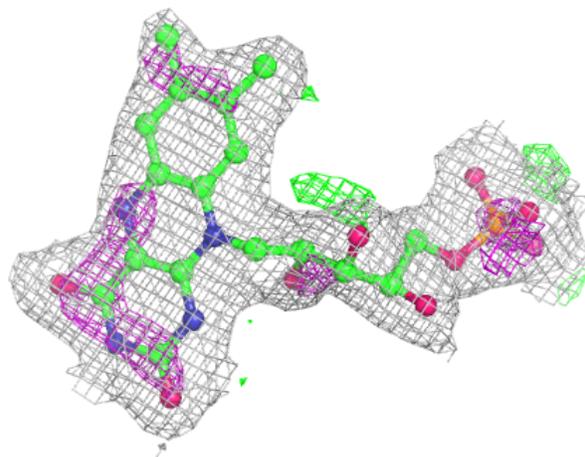
Electron density around FMN I 2702:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FMN J 3702:

$2mF_o$-DF_c (at 0.7 rmsd) in gray
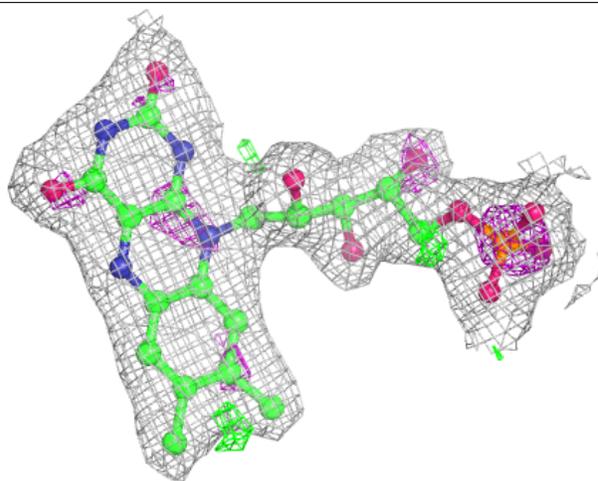mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)
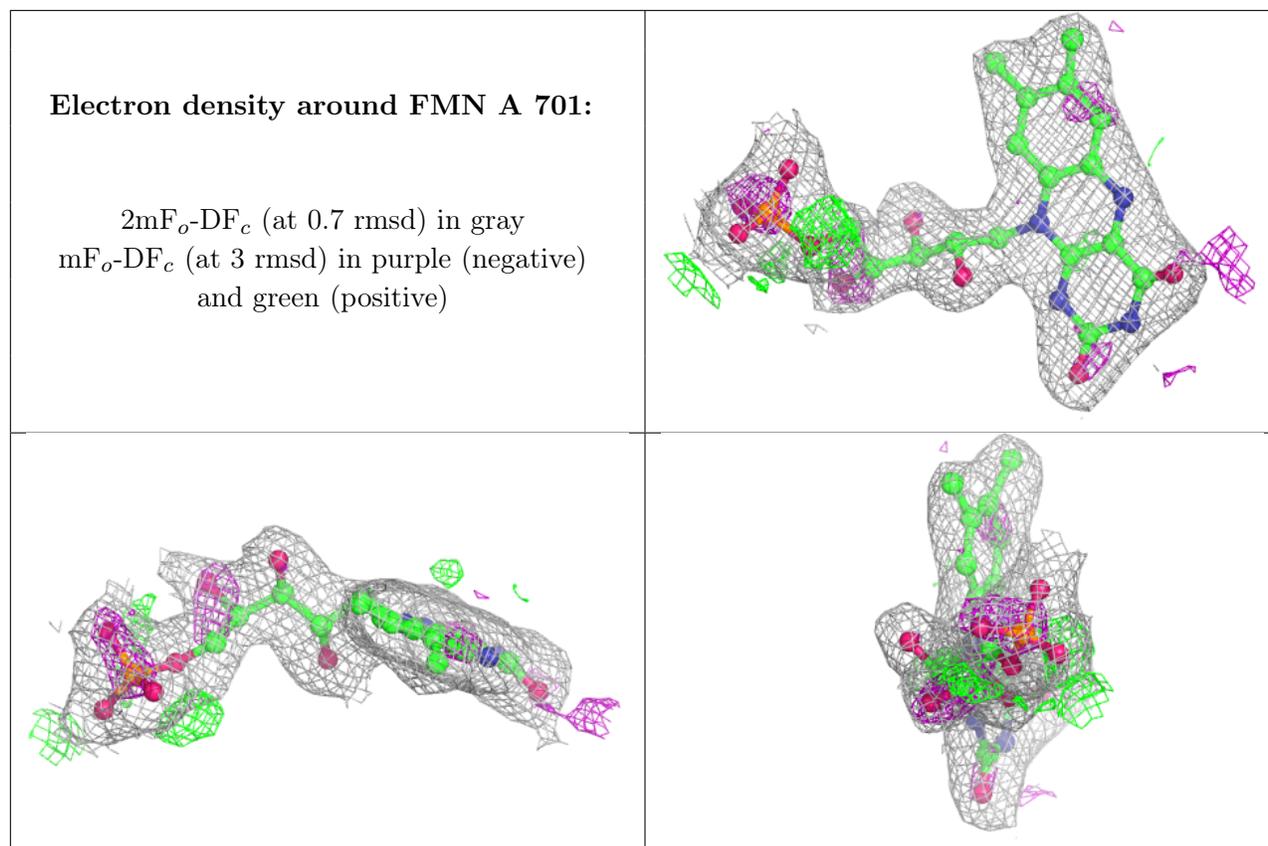
Electron density around FMN B 1701:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
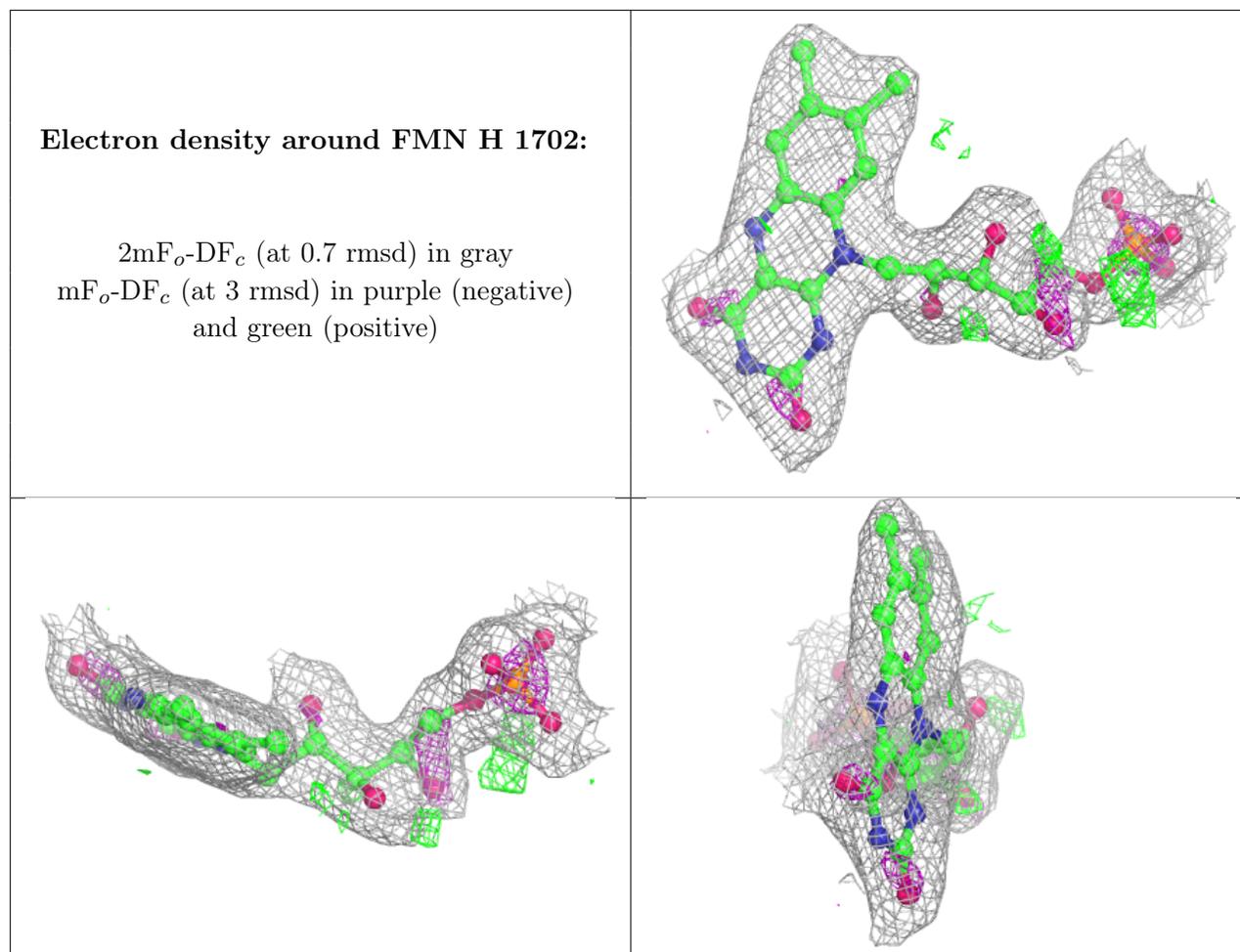$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FMN E 3701:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FMN A 701:

$2mF_o\text{-}DF_c$ (at 0.7 rmsd) in gray
$mF_o\text{-}DF_c$ (at 3 rmsd) in purple (negative)
and green (positive)

Electron density around FMN H 1702:

2mF$_o$-DF$_c$ (at 0.7 rmsd) in gray
mF$_o$-DF$_c$ (at 3 rmsd) in purple (negative)
and green (positive)

6.5 Other polymers ⓘ

There are no such residues in this entry.