



# Full wwPDB X-ray Structure Validation Report ⓘ

Nov 16, 2023 – 06:42 AM JST

PDB ID : 6L4O  
Title : Crystal structure of API5-FGF2 complex  
Authors : Lee, B.I.; Bong, S.M.  
Deposited on : 2019-10-18  
Resolution : 2.60 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](mailto: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>.

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

MolProbity : 4.02b-467  
Xtrriage (Phenix) : 1.13  
EDS : 2.36  
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

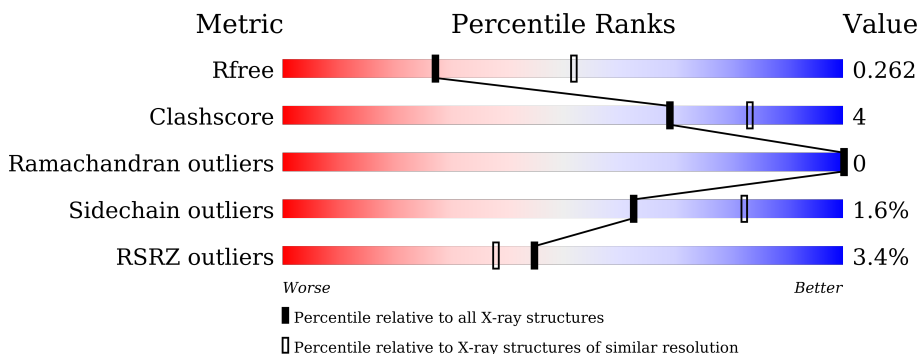
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 2.60 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))
$R_{free}$	130704	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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  $\geq 3$ , 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  $\leq 5\%$ . 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	544	 3% 70% 8% 21%
2	B	176	 64% 8% 28%

## 2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 4475 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 Apoptosis inhibitor 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	429	3426	2204	567	644	11	0	0	0

There are 20 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-19	MET	-	expression tag	UNP Q9BZZ5
A	-18	GLY	-	expression tag	UNP Q9BZZ5
A	-17	SER	-	expression tag	UNP Q9BZZ5
A	-16	SER	-	expression tag	UNP Q9BZZ5
A	-15	HIS	-	expression tag	UNP Q9BZZ5
A	-14	HIS	-	expression tag	UNP Q9BZZ5
A	-13	HIS	-	expression tag	UNP Q9BZZ5
A	-12	HIS	-	expression tag	UNP Q9BZZ5
A	-11	HIS	-	expression tag	UNP Q9BZZ5
A	-10	HIS	-	expression tag	UNP Q9BZZ5
A	-9	SER	-	expression tag	UNP Q9BZZ5
A	-8	SER	-	expression tag	UNP Q9BZZ5
A	-7	GLY	-	expression tag	UNP Q9BZZ5
A	-6	LEU	-	expression tag	UNP Q9BZZ5
A	-5	VAL	-	expression tag	UNP Q9BZZ5
A	-4	PRO	-	expression tag	UNP Q9BZZ5
A	-3	ARG	-	expression tag	UNP Q9BZZ5
A	-2	GLY	-	expression tag	UNP Q9BZZ5
A	-1	SER	-	expression tag	UNP Q9BZZ5
A	0	HIS	-	expression tag	UNP Q9BZZ5

- Molecule 2 is a protein called Fibroblast growth factor 2.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	B	126	1014	642	185	183	4	0	0	0

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	113	MET	-	expression tag	UNP P09038
B	114	HIS	-	expression tag	UNP P09038
B	115	HIS	-	expression tag	UNP P09038
B	116	HIS	-	expression tag	UNP P09038
B	117	HIS	-	expression tag	UNP P09038
B	118	HIS	-	expression tag	UNP P09038
B	119	HIS	-	expression tag	UNP P09038
B	120	GLY	-	expression tag	UNP P09038
B	121	SER	-	expression tag	UNP P09038
B	122	LEU	-	expression tag	UNP P09038
B	123	VAL	-	expression tag	UNP P09038
B	124	PRO	-	expression tag	UNP P09038
B	125	ARG	-	expression tag	UNP P09038
B	126	SER	-	expression tag	UNP P09038
B	127	GLU	-	expression tag	UNP P09038
B	128	ASN	-	expression tag	UNP P09038
B	129	LEU	-	expression tag	UNP P09038
B	130	TYR	-	expression tag	UNP P09038
B	131	PHE	-	expression tag	UNP P09038
B	132	GLN	-	expression tag	UNP P09038
B	133	GLY	-	expression tag	UNP P09038
B	134	SER	-	expression tag	UNP P09038
B	211	SER	CYS	engineered mutation	UNP P09038
B	229	SER	CYS	engineered mutation	UNP P09038

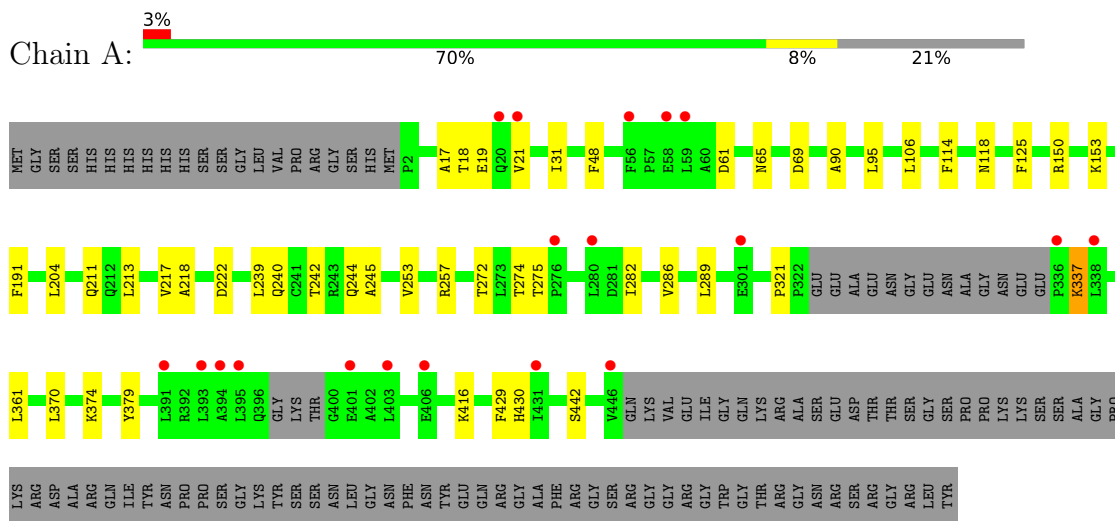
- Molecule 3 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	A	24	Total O 24 24	0	0
3	B	11	Total O 11 11	0	0

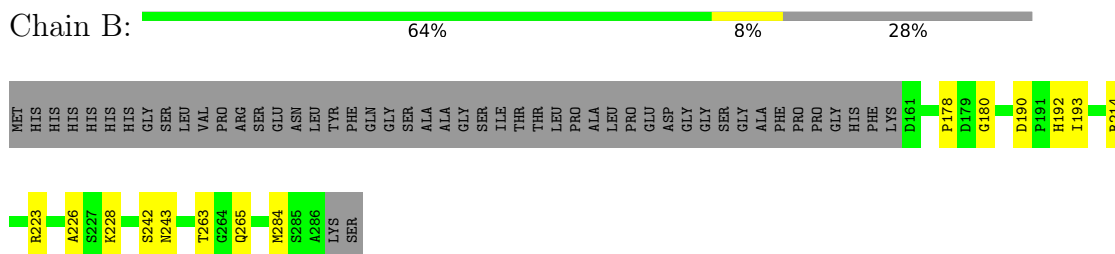
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry 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: Apoptosis inhibitor 5



- Molecule 2: Fibroblast growth factor 2



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	46.86Å 76.52Å 208.16Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	37.63 – 2.60 37.63 – 2.60	Depositor EDS
% Data completeness (in resolution range)	94.5 (37.63-2.60) 94.5 (37.63-2.60)	Depositor EDS
$R_{merge}$	0.10	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.15 (at 2.61Å)	Xtrriage
Refinement program	PHENIX 1.16_3549	Depositor
R, $R_{free}$	0.224 , 0.262 0.224 , 0.262	Depositor DCC
$R_{free}$ test set	1162 reflections (5.12%)	wwPDB-VP
Wilson B-factor (Å <sup>2</sup> )	45.4	Xtrriage
Anisotropy	0.104	Xtrriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 37.9	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.46$ , $\langle L^2 \rangle = 0.28$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
$F_o, F_c$ correlation	0.92	EDS
Total number of atoms	4475	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	52.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.31% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>Theoretical values of  $\langle |L| \rangle$ ,  $\langle L^2 \rangle$  for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

## 5 Model quality [i](#)

### 5.1 Standard geometry [i](#)

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	0.23	0/3482	0.37	0/4703
2	B	0.24	0/1035	0.41	0/1387
All	All	0.24	0/4517	0.38	0/6090

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 [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	3426	0	3531	23	0
2	B	1014	0	1022	11	0
3	A	24	0	0	0	0
3	B	11	0	0	0	0
All	All	4475	0	4553	33	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 4.

All (33) 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:217:VAL:HG21	1:A:245:ALA:HB2	1.73	0.71

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:178:PRO:O	2:B:214:ARG:NE	2.38	0.57
1:A:416:LYS:HE3	1:A:442:SER:HA	1.87	0.55
1:A:361:LEU:HB3	1:A:370:LEU:HD13	1.88	0.54
1:A:211:GLN:HG3	1:A:253:VAL:HG22	1.90	0.54
1:A:239:LEU:HD21	1:A:286:VAL:HG22	1.90	0.53
1:A:242:THR:HB	1:A:289:LEU:HD21	1.90	0.53
1:A:61:ASP:O	1:A:65:ASN:ND2	2.30	0.52
1:A:337:LYS:HD3	1:A:337:LYS:H	1.74	0.52
1:A:240:GLN:O	1:A:244:GLN:NE2	2.42	0.51
2:B:214:ARG:NH1	2:B:226:ALA:O	2.41	0.50
1:A:31:ILE:HD13	1:A:48:PHE:HB3	1.94	0.50
1:A:218:ALA:HB1	1:A:257:ARG:HH21	1.77	0.50
1:A:204:LEU:HD13	1:A:213:LEU:HD21	1.95	0.48
1:A:275:THR:HB	1:A:282:ILE:HB	1.97	0.47
1:A:17:ALA:HB3	1:A:21:VAL:HG22	1.97	0.46
1:A:191:PHE:HZ	1:A:217:VAL:HG12	1.80	0.46
1:A:114:PHE:O	1:A:118:ASN:ND2	2.45	0.46
2:B:180:GLY:HA2	2:B:226:ALA:HB3	1.97	0.46
1:A:106:LEU:O	1:A:150:ARG:NH1	2.50	0.45
1:A:222:ASP:OD2	2:B:223:ARG:NH2	2.41	0.44
1:A:90:ALA:HB1	1:A:95:LEU:HD12	2.00	0.44
2:B:242:SER:HA	2:B:243:ASN:HA	1.55	0.44
2:B:214:ARG:HH22	2:B:228:LYS:HE2	1.84	0.43
2:B:190:ASP:O	2:B:193:ILE:HG12	2.19	0.42
2:B:214:ARG:NH2	2:B:228:LYS:HE2	2.34	0.42
1:A:321:PRO:HB3	1:A:379:TYR:CD1	2.55	0.42
1:A:370:LEU:HD11	1:A:374:LYS:HE3	2.01	0.41
2:B:178:PRO:HD3	2:B:192:HIS:CD2	2.55	0.41
1:A:153:LYS:HE2	1:A:153:LYS:HB2	1.84	0.41
2:B:263:THR:HG23	2:B:265:GLN:H	1.86	0.41
1:A:18:THR:HB	1:A:19:GLU:H	1.68	0.41
2:B:190:ASP:HB3	2:B:193:ILE:HG23	2.03	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	423/544 (78%)	409 (97%)	14 (3%)	0	100	100
2	B	124/176 (70%)	117 (94%)	7 (6%)	0	100	100
All	All	547/720 (76%)	526 (96%)	21 (4%)	0	100	100

There are no Ramachandran outliers to report.

### 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	385/475 (81%)	378 (98%)	7 (2%)	59	80
2	B	108/147 (74%)	107 (99%)	1 (1%)	78	91
All	All	493/622 (79%)	485 (98%)	8 (2%)	62	82

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	69	ASP
1	A	125	PHE
1	A	272	THR
1	A	274	THR
1	A	337	LYS
1	A	429	PHE
1	A	430	HIS
2	B	284	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	198	GLN

### 5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

### 5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 5.6 Ligand geometry [i](#)

There are no ligands in this entry.

### 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 [i](#)

### 6.1 Protein, DNA and RNA chains [i](#)

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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	429/544 (78%)	0.14	19 (4%) 34 27	27, 48, 83, 108	0
2	B	126/176 (71%)	-0.02	0 100 100	34, 54, 77, 84	0
All	All	555/720 (77%)	0.11	19 (3%) 45 38	27, 50, 82, 108	0

All (19) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	393	LEU	4.1
1	A	431	ILE	4.0
1	A	403	LEU	3.4
1	A	406	GLU	3.4
1	A	336	PRO	3.3
1	A	56	PHE	3.3
1	A	395	LEU	3.2
1	A	446	VAL	3.2
1	A	391	LEU	3.1
1	A	338	LEU	2.8
1	A	21	VAL	2.6
1	A	276	PRO	2.5
1	A	58	GLU	2.5
1	A	394	ALA	2.4
1	A	301	GLU	2.4
1	A	20	GLN	2.3
1	A	59	LEU	2.1
1	A	401	GLU	2.1
1	A	280	LEU	2.0

### 6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

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

### 6.3 Carbohydrates [i](#)

There are no monosaccharides in this entry.

### 6.4 Ligands [i](#)

There are no ligands in this entry.

### 6.5 Other polymers [i](#)

There are no such residues in this entry.