



# wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 15, 2017 – 03:00 am GMT

PDB ID : 4JFG  
Title : Crystal structure of sfGFP-66-HqAla  
Authors : Wang, J.; Liu, X.; Li, J.; Zhang, W.; Hu, M.; Zhou, J.  
Deposited on : 2013-02-28  
Resolution : 3.00 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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

<http://wwpdb.org/validation/2016/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

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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  
Mogul : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
Refmac : 5.8.0135  
CCP4 : 6.5.0  
Ideal geometry (proteins) : Engh & Huber (2001)  
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)  
Validation Pipeline (wwPDB-VP) : recalc28949

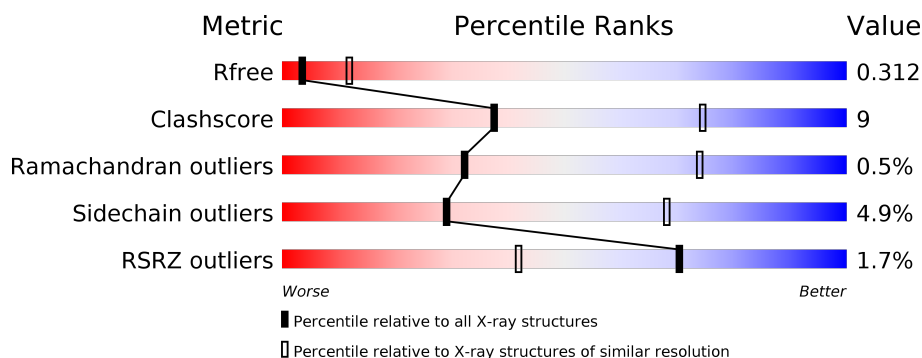
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 3.00 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))
$R_{free}$	100719	1692 (3.00-3.00)
Clashscore	112137	2037 (3.00-3.00)
Ramachandran outliers	110173	1973 (3.00-3.00)
Sidechain outliers	110143	1976 (3.00-3.00)
RSRZ outliers	101464	1716 (3.00-3.00)

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  $\geq 3$ , 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.

Mol	Chain	Length	Quality of chain
1	A	244	
1	B	244	
1	C	244	
1	D	244	
1	E	244	
1	F	244	

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Mol	Chain	Length	Quality of chain
1	G	244	
1	H	244	

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
2	HQY	C	301	-	-	-	X

## 2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 14241 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 Green fluorescent protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	226	Total	C	N	O	S	0	0	0
			1775	1122	306	342	5			
1	B	223	Total	C	N	O	S	0	0	0
			1746	1100	300	341	5			
1	C	226	Total	C	N	O	S	0	0	0
			1778	1123	307	343	5			
1	D	218	Total	C	N	O	S	0	0	0
			1698	1073	295	325	5			
1	E	226	Total	C	N	O	S	0	0	0
			1775	1120	306	344	5			
1	F	218	Total	C	N	O	S	0	0	0
			1710	1079	294	332	5			
1	G	222	Total	C	N	O	S	0	0	0
			1739	1097	300	337	5			
1	H	226	Total	C	N	O	S	0	0	0
			1771	1118	306	342	5			

There are 144 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-7	GLY	-	EXPRESSION TAG	UNP P42212
A	-6	SER	-	EXPRESSION TAG	UNP P42212
A	-5	HIS	-	EXPRESSION TAG	UNP P42212
A	-4	HIS	-	EXPRESSION TAG	UNP P42212
A	-3	HIS	-	EXPRESSION TAG	UNP P42212
A	-2	HIS	-	EXPRESSION TAG	UNP P42212
A	-1	HIS	-	EXPRESSION TAG	UNP P42212
A	0	HIS	-	EXPRESSION TAG	UNP P42212
A	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
A	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
A	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
A	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
A	105	THR	ASN	ENGINEERED MUTATION	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
A	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
A	153	THR	MET	ENGINEERED MUTATION	UNP P42212
A	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
A	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
A	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
B	-7	GLY	-	EXPRESSION TAG	UNP P42212
B	-6	SER	-	EXPRESSION TAG	UNP P42212
B	-5	HIS	-	EXPRESSION TAG	UNP P42212
B	-4	HIS	-	EXPRESSION TAG	UNP P42212
B	-3	HIS	-	EXPRESSION TAG	UNP P42212
B	-2	HIS	-	EXPRESSION TAG	UNP P42212
B	-1	HIS	-	EXPRESSION TAG	UNP P42212
B	0	HIS	-	EXPRESSION TAG	UNP P42212
B	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
B	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
B	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
B	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
B	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
B	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
B	153	THR	MET	ENGINEERED MUTATION	UNP P42212
B	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
B	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
B	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
C	-7	GLY	-	EXPRESSION TAG	UNP P42212
C	-6	SER	-	EXPRESSION TAG	UNP P42212
C	-5	HIS	-	EXPRESSION TAG	UNP P42212
C	-4	HIS	-	EXPRESSION TAG	UNP P42212
C	-3	HIS	-	EXPRESSION TAG	UNP P42212
C	-2	HIS	-	EXPRESSION TAG	UNP P42212
C	-1	HIS	-	EXPRESSION TAG	UNP P42212
C	0	HIS	-	EXPRESSION TAG	UNP P42212
C	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
C	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
C	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
C	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
C	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
C	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
C	153	THR	MET	ENGINEERED MUTATION	UNP P42212
C	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
C	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
C	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
D	-7	GLY	-	EXPRESSION TAG	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
D	-6	SER	-	EXPRESSION TAG	UNP P42212
D	-5	HIS	-	EXPRESSION TAG	UNP P42212
D	-4	HIS	-	EXPRESSION TAG	UNP P42212
D	-3	HIS	-	EXPRESSION TAG	UNP P42212
D	-2	HIS	-	EXPRESSION TAG	UNP P42212
D	-1	HIS	-	EXPRESSION TAG	UNP P42212
D	0	HIS	-	EXPRESSION TAG	UNP P42212
D	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
D	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
D	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
D	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
D	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
D	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
D	153	THR	MET	ENGINEERED MUTATION	UNP P42212
D	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
D	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
D	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
E	-7	GLY	-	EXPRESSION TAG	UNP P42212
E	-6	SER	-	EXPRESSION TAG	UNP P42212
E	-5	HIS	-	EXPRESSION TAG	UNP P42212
E	-4	HIS	-	EXPRESSION TAG	UNP P42212
E	-3	HIS	-	EXPRESSION TAG	UNP P42212
E	-2	HIS	-	EXPRESSION TAG	UNP P42212
E	-1	HIS	-	EXPRESSION TAG	UNP P42212
E	0	HIS	-	EXPRESSION TAG	UNP P42212
E	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
E	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
E	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
E	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
E	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
E	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
E	153	THR	MET	ENGINEERED MUTATION	UNP P42212
E	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
E	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
E	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
F	-7	GLY	-	EXPRESSION TAG	UNP P42212
F	-6	SER	-	EXPRESSION TAG	UNP P42212
F	-5	HIS	-	EXPRESSION TAG	UNP P42212
F	-4	HIS	-	EXPRESSION TAG	UNP P42212
F	-3	HIS	-	EXPRESSION TAG	UNP P42212
F	-2	HIS	-	EXPRESSION TAG	UNP P42212
F	-1	HIS	-	EXPRESSION TAG	UNP P42212

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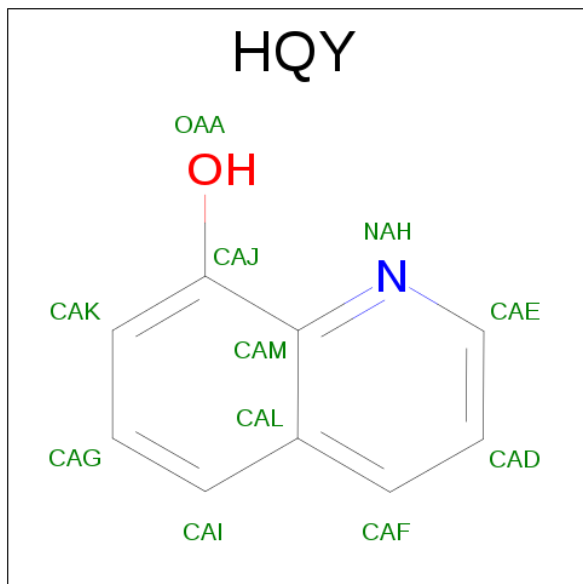
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F	0	HIS	-	EXPRESSION TAG	UNP P42212
F	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
F	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
F	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
F	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
F	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
F	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
F	153	THR	MET	ENGINEERED MUTATION	UNP P42212
F	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
F	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
F	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
G	-7	GLY	-	EXPRESSION TAG	UNP P42212
G	-6	SER	-	EXPRESSION TAG	UNP P42212
G	-5	HIS	-	EXPRESSION TAG	UNP P42212
G	-4	HIS	-	EXPRESSION TAG	UNP P42212
G	-3	HIS	-	EXPRESSION TAG	UNP P42212
G	-2	HIS	-	EXPRESSION TAG	UNP P42212
G	-1	HIS	-	EXPRESSION TAG	UNP P42212
G	0	HIS	-	EXPRESSION TAG	UNP P42212
G	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
G	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
G	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
G	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
G	105	THR	ASN	ENGINEERED MUTATION	UNP P42212
G	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
G	153	THR	MET	ENGINEERED MUTATION	UNP P42212
G	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
G	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
G	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212
H	-7	GLY	-	EXPRESSION TAG	UNP P42212
H	-6	SER	-	EXPRESSION TAG	UNP P42212
H	-5	HIS	-	EXPRESSION TAG	UNP P42212
H	-4	HIS	-	EXPRESSION TAG	UNP P42212
H	-3	HIS	-	EXPRESSION TAG	UNP P42212
H	-2	HIS	-	EXPRESSION TAG	UNP P42212
H	-1	HIS	-	EXPRESSION TAG	UNP P42212
H	0	HIS	-	EXPRESSION TAG	UNP P42212
H	30	ARG	SER	ENGINEERED MUTATION	UNP P42212
H	39	ASN	TYR	ENGINEERED MUTATION	UNP P42212
H	80	ARG	GLN	ENGINEERED MUTATION	UNP P42212
H	99	SER	PHE	ENGINEERED MUTATION	UNP P42212
H	105	THR	ASN	ENGINEERED MUTATION	UNP P42212

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Chain	Residue	Modelled	Actual	Comment	Reference
H	145	PHE	TYR	ENGINEERED MUTATION	UNP P42212
H	153	THR	MET	ENGINEERED MUTATION	UNP P42212
H	163	ALA	VAL	ENGINEERED MUTATION	UNP P42212
H	171	VAL	ILE	ENGINEERED MUTATION	UNP P42212
H	206	VAL	ALA	ENGINEERED MUTATION	UNP P42212

- Molecule 2 is QUINOLIN-8-OL (three-letter code: HQY) (formula: C<sub>9</sub>H<sub>7</sub>NO).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
2	A	1	Total	C	N	O	0	0
			11	9	1	1		
2	B	1	Total	C	N	O	0	0
			11	9	1	1		
2	C	1	Total	C	N	O	0	0
			11	9	1	1		
2	D	1	Total	C	N	O	0	0
			11	9	1	1		
2	E	1	Total	C	N	O	0	0
			11	9	1	1		
2	F	1	Total	C	N	O	0	0
			11	9	1	1		
2	G	1	Total	C	N	O	0	0
			11	9	1	1		
2	H	1	Total	C	N	O	0	0
			11	9	1	1		

- Molecule 3 is CESIUM ION (three-letter code: CS) (formula: Cs).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	G	5	Total Cs 5 5	0	0
3	D	3	Total Cs 3 3	0	0
3	E	2	Total Cs 2 2	0	0
3	H	2	Total Cs 2 2	0	0
3	B	4	Total Cs 4 4	0	0
3	C	4	Total Cs 4 4	0	0
3	A	6	Total Cs 6 6	0	0
3	F	5	Total Cs 5 5	0	0

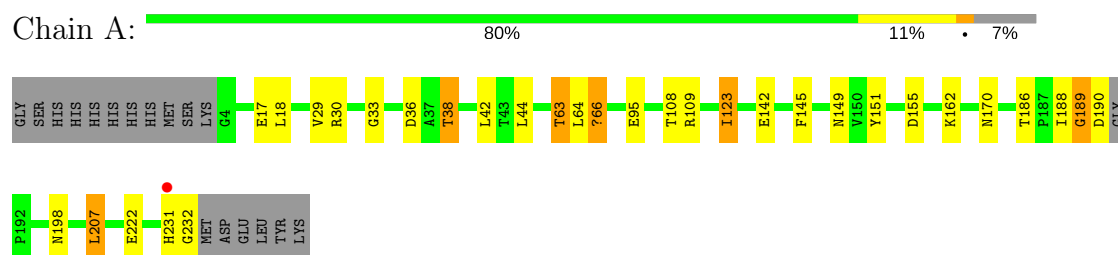
- Molecule 4 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	A	18	Total O 18 18	0	0
4	B	13	Total O 13 13	0	0
4	C	21	Total O 21 21	0	0
4	D	15	Total O 15 15	0	0
4	E	16	Total O 16 16	0	0
4	F	17	Total O 17 17	0	0
4	G	16	Total O 16 16	0	0
4	H	14	Total O 14 14	0	0

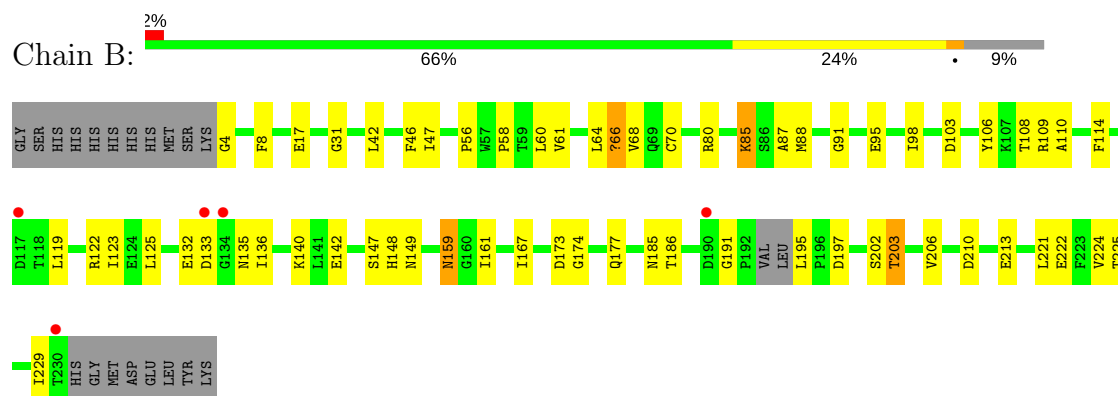
### 3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA 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.

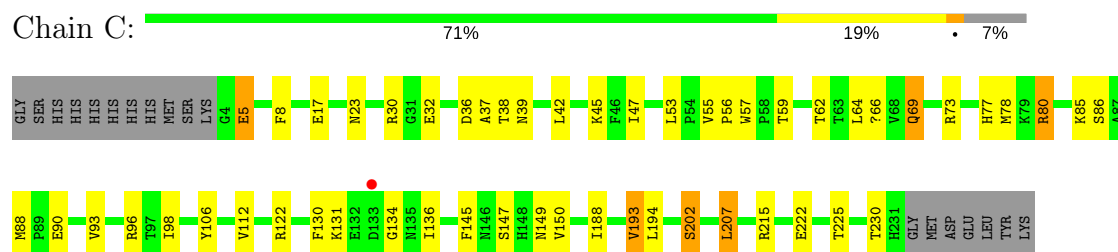
- Molecule 1: Green fluorescent protein



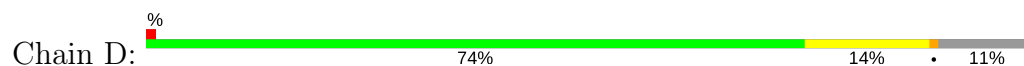
- Molecule 1: Green fluorescent protein

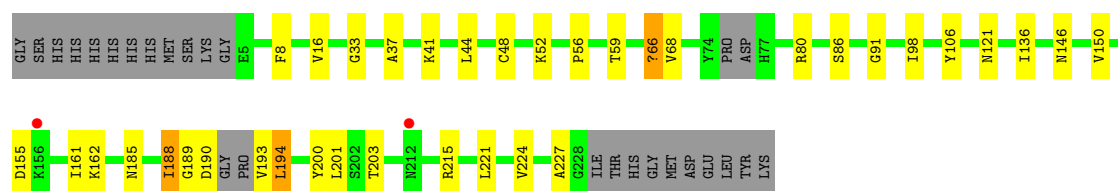


- Molecule 1: Green fluorescent protein

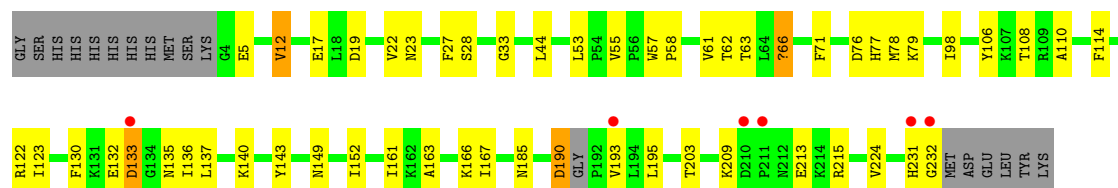


- Molecule 1: Green fluorescent protein

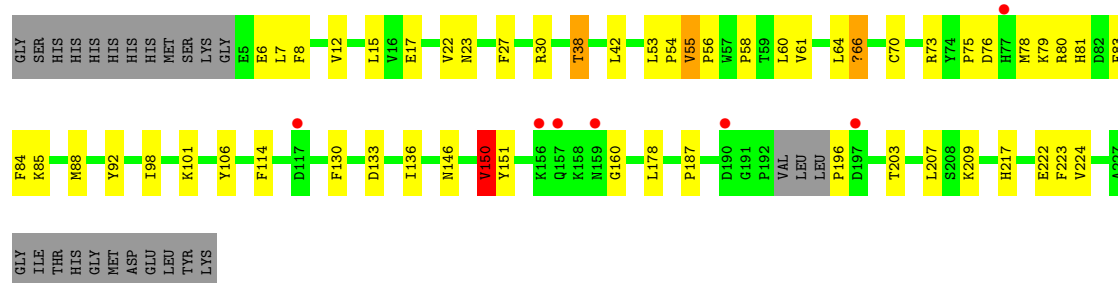




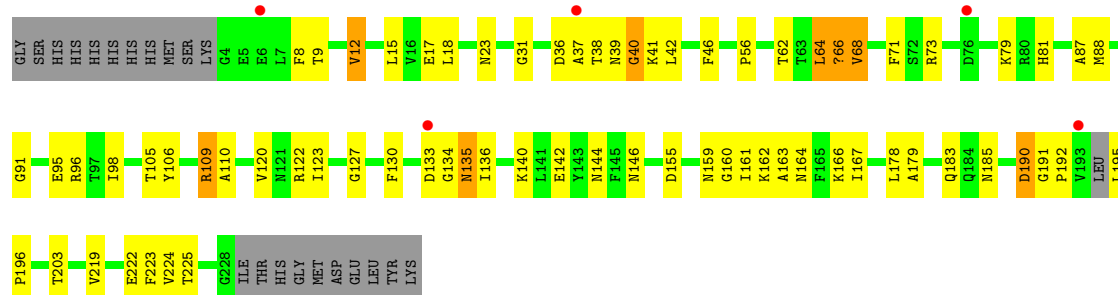
- Molecule 1: Green fluorescent protein



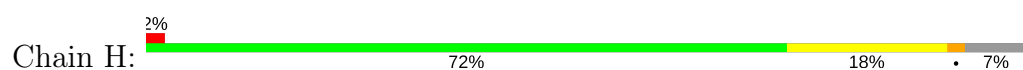
- Molecule 1: Green fluorescent protein

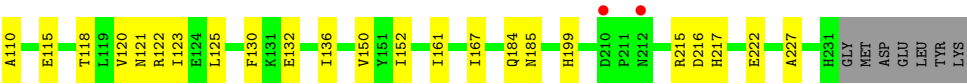


- Molecule 1: Green fluorescent protein



- Molecule 1: Green fluorescent protein





## 4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	88.17Å 148.90Å 161.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	21.84 – 3.00 21.84 – 3.00	Depositor EDS
% Data completeness (in resolution range)	79.7 (21.84-3.00) 84.2 (21.84-3.00)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	3.61 (at 2.99Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.8.1_1168)	Depositor
R, $R_{free}$	0.259 , 0.312 0.260 , 0.312	Depositor DCC
$R_{free}$ test set	1779 reflections (5.05%)	DCC
Wilson B-factor (Å <sup>2</sup> )	46.0	Xtriage
Anisotropy	0.027	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 58.1	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.63$ , $\langle L^2 \rangle = 0.49$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.87	EDS
Total number of atoms	14241	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.59% 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

### 5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CS, HQY, KWS

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	0.24	0/1798	0.44	0/2434
1	B	0.26	0/1768	0.46	0/2395
1	C	0.24	0/1802	0.44	0/2442
1	D	0.24	0/1717	0.44	0/2322
1	E	0.24	0/1798	0.47	0/2433
1	F	0.24	0/1732	0.45	0/2344
1	G	0.25	0/1761	0.46	0/2384
1	H	0.24	0/1795	0.45	0/2432
All	All	0.24	0/14171	0.45	0/19186

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	2
1	B	0	1
1	C	0	1
1	D	0	1
1	E	0	1
1	F	0	2
1	G	0	2
1	H	0	2
All	All	0	12

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

5 of 12 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	64	LEU	Mainchain
1	A	66	KWS	Mainchain
1	B	66	KWS	Mainchain
1	C	64	LEU	Mainchain
1	D	66	KWS	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	1775	0	1699	18	0
1	B	1746	0	1653	39	0
1	C	1778	0	1704	33	0
1	D	1698	0	1613	21	0
1	E	1775	0	1694	29	0
1	F	1710	0	1620	29	0
1	G	1739	0	1652	47	0
1	H	1771	0	1689	30	0
2	A	11	0	6	2	0
2	B	11	0	6	1	0
2	C	11	0	6	1	0
2	D	11	0	6	1	0
2	E	11	0	6	1	0
2	F	11	0	6	1	0
2	G	11	0	6	1	0
2	H	11	0	6	2	0
3	A	6	0	0	0	0
3	B	4	0	0	0	0
3	C	4	0	0	0	0
3	D	3	0	0	0	0
3	E	2	0	0	0	0
3	F	5	0	0	0	0
3	G	5	0	0	0	0
3	H	2	0	0	1	0
4	A	18	0	0	1	0
4	B	13	0	0	0	0
4	C	21	0	0	0	0
4	D	15	0	0	0	0
4	E	16	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	F	17	0	0	0	0
4	G	16	0	0	1	0
4	H	14	0	0	1	0
All	All	14241	0	13372	241	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 9.

The worst 5 of 241 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:H:184:GLN:HE22	3:H:303:CS:CS	1.68	1.03
1:F:61:VAL:O	1:F:66:KWS:OG1	1.93	0.85
1:H:47:ILE:HD11	1:H:215:ARG:HB2	1.64	0.77
1:B:148:HIS:NE2	1:B:203:THR:O	2.18	0.76
1:C:98:ILE:HB	1:C:106:TYR:HB2	1.67	0.75

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	221/244 (91%)	213 (96%)	7 (3%)	1 (0%)	32	74
1	B	218/244 (89%)	204 (94%)	13 (6%)	1 (0%)	32	74
1	C	223/244 (91%)	212 (95%)	11 (5%)	0	100	100
1	D	211/244 (86%)	200 (95%)	10 (5%)	1 (0%)	32	74
1	E	221/244 (91%)	212 (96%)	8 (4%)	1 (0%)	32	74
1	F	213/244 (87%)	203 (95%)	9 (4%)	1 (0%)	32	74
1	G	217/244 (89%)	202 (93%)	12 (6%)	3 (1%)	13	49

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	H	223/244 (91%)	216 (97%)	7 (3%)	0	100	100
All	All	1747/1952 (90%)	1662 (95%)	77 (4%)	8 (0%)	32	74

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	193	VAL
1	D	189	GLY
1	G	40	GLY
1	A	189	GLY
1	G	135	ASN

### 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	191/213 (90%)	186 (97%)	5 (3%)	51	83
1	B	187/213 (88%)	177 (95%)	10 (5%)	26	65
1	C	192/213 (90%)	183 (95%)	9 (5%)	30	69
1	D	180/213 (84%)	176 (98%)	4 (2%)	57	86
1	E	191/213 (90%)	182 (95%)	9 (5%)	30	69
1	F	183/213 (86%)	170 (93%)	13 (7%)	17	52
1	G	186/213 (87%)	175 (94%)	11 (6%)	23	60
1	H	190/213 (89%)	177 (93%)	13 (7%)	18	54
All	All	1500/1704 (88%)	1426 (95%)	74 (5%)	29	68

5 of 74 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	133	ASP
1	F	38	THR
1	H	43	THR
1	E	166	LYS

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Mol	Chain	Res	Type
1	F	6	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 6 such sidechains are listed below:

Mol	Chain	Res	Type
1	B	149	ASN
1	H	184	GLN
1	C	164	ASN
1	B	77	HIS
1	D	146	ASN

### 5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

## 5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

8 non-standard protein/DNA/RNA residues 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
1	KWS	A	66	1,2	14,15,16	2.13	4 (28%)	14,21,23	3.01	7 (50%)
1	KWS	B	66	1,2	14,15,16	2.01	1 (7%)	14,21,23	2.70	5 (35%)
1	KWS	C	66	1,2	14,15,16	2.05	2 (14%)	14,21,23	2.58	3 (21%)
1	KWS	D	66	1,2	14,15,16	3.37	6 (42%)	14,21,23	3.70	7 (50%)
1	KWS	E	66	1,2	14,15,16	2.06	2 (14%)	14,21,23	2.97	6 (42%)
1	KWS	F	66	1,2	14,15,16	2.25	4 (28%)	14,21,23	3.18	4 (28%)
1	KWS	G	66	1,2	14,15,16	2.16	1 (7%)	14,21,23	3.17	7 (50%)
1	KWS	H	66	1,2	14,15,16	2.05	2 (14%)	14,21,23	2.55	4 (28%)

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
1	KWS	A	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	B	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	C	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	D	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	E	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	F	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	G	66	1,2	-	0/8/27/28	0/1/1/1
1	KWS	H	66	1,2	-	0/8/27/28	0/1/1/1

The worst 5 of 22 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	66	KWS	CA3-C	-4.74	1.31	1.49
1	D	66	KWS	CA3-N3	-4.69	1.37	1.47
1	F	66	KWS	CA3-N3	-3.52	1.39	1.47
1	H	66	KWS	CA3-N3	-2.47	1.42	1.47
1	C	66	KWS	CA3-N3	-2.28	1.42	1.47

The worst 5 of 43 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	66	KWS	N3-C1-N2	-7.85	106.02	111.45
1	D	66	KWS	N3-C1-N2	-6.90	106.68	111.45
1	G	66	KWS	N3-C1-N2	-6.74	106.79	111.45
1	A	66	KWS	N3-C1-N2	-6.26	107.12	111.45
1	E	66	KWS	N3-C1-N2	-5.83	107.41	111.45

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 13 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	66	KWS	1	0
1	B	66	KWS	2	0
1	C	66	KWS	2	0
1	D	66	KWS	2	0
1	E	66	KWS	1	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	F	66	KWS	2	0
1	G	66	KWS	1	0
1	H	66	KWS	2	0

## 5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

## 5.6 Ligand geometry [i](#)

Of 39 ligands modelled in this entry, 31 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	$\# Z  > 2$
2	HQY	A	301	1	12,12,12	0.93	0	16,16,16	1.39	3 (18%)
2	HQY	B	301	1	12,12,12	0.95	0	16,16,16	1.37	2 (12%)
2	HQY	C	301	1	12,12,12	0.96	0	16,16,16	1.36	3 (18%)
2	HQY	D	301	1	12,12,12	0.97	0	16,16,16	1.41	3 (18%)
2	HQY	E	301	1	12,12,12	0.97	0	16,16,16	1.38	3 (18%)
2	HQY	F	301	1	12,12,12	0.98	0	16,16,16	1.44	2 (12%)
2	HQY	G	301	1	12,12,12	0.93	0	16,16,16	1.41	3 (18%)
2	HQY	H	301	1	12,12,12	1.01	0	16,16,16	1.38	3 (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
2	HQY	A	301	1	-	0/0/0/0	0/2/2/2
2	HQY	B	301	1	-	0/0/0/0	0/2/2/2
2	HQY	C	301	1	-	0/0/0/0	0/2/2/2

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	HQY	D	301	1	-	0/0/0/0	0/2/2/2
2	HQY	E	301	1	-	0/0/0/0	0/2/2/2
2	HQY	F	301	1	-	0/0/0/0	0/2/2/2
2	HQY	G	301	1	-	0/0/0/0	0/2/2/2
2	HQY	H	301	1	-	0/0/0/0	0/2/2/2

There are no bond length outliers.

The worst 5 of 22 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	D	301	HQY	CAL-CAM-NAH	-2.34	119.85	122.58
2	G	301	HQY	CAL-CAM-NAH	-2.30	119.91	122.58
2	F	301	HQY	CAL-CAM-NAH	-2.26	119.94	122.58
2	C	301	HQY	CAL-CAM-NAH	-2.18	120.04	122.58
2	B	301	HQY	CAL-CAM-NAH	-2.17	120.06	122.58

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

8 monomers are involved in 10 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	301	HQY	2	0
2	B	301	HQY	1	0
2	C	301	HQY	1	0
2	D	301	HQY	1	0
2	E	301	HQY	1	0
2	F	301	HQY	1	0
2	G	301	HQY	1	0
2	H	301	HQY	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 ⓘ

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	225/244 (92%)	-0.29	1 (0%) 92 77	12, 31, 60, 75	0
1	B	222/244 (90%)	-0.08	5 (2%) 61 31	10, 34, 69, 98	0
1	C	225/244 (92%)	-0.26	1 (0%) 92 77	13, 32, 54, 79	0
1	D	217/244 (88%)	-0.13	2 (0%) 84 61	17, 39, 76, 99	0
1	E	225/244 (92%)	-0.01	6 (2%) 55 26	20, 45, 68, 93	0
1	F	217/244 (88%)	0.02	7 (3%) 48 21	19, 43, 85, 108	0
1	G	221/244 (90%)	-0.15	5 (2%) 61 31	13, 37, 72, 105	0
1	H	225/244 (92%)	0.10	4 (1%) 69 40	27, 53, 76, 82	0
All	All	1777/1952 (91%)	-0.10	31 (1%) 70 42	10, 40, 72, 108	0

The worst 5 of 31 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	133	ASP	4.6
1	C	133	ASP	3.9
1	A	231	HIS	3.6
1	E	231	HIS	3.5
1	B	230	THR	3.5

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

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
1	KWS	F	66	15/16	0.87	0.31	-	34,38,40,41	0
1	KWS	B	66	15/16	0.96	0.25	-	28,33,34,36	0
1	KWS	H	66	15/16	0.92	0.31	-	46,50,52,54	0
1	KWS	G	66	15/16	0.93	0.24	-	32,40,46,50	0
1	KWS	E	66	15/16	0.94	0.27	-	34,38,42,44	0
1	KWS	C	66	15/16	0.94	0.23	-	35,39,45,48	0
1	KWS	A	66	15/16	0.92	0.23	-	14,25,26,27	0
1	KWS	D	66	15/16	0.91	0.26	-	38,43,46,47	0

### 6.3 Carbohydrates [i](#)

There are no carbohydrates in this entry.

### 6.4 Ligands [i](#)

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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. The B-factors column lists the minimum, median, 95<sup>th</sup> 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	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
2	HQY	C	301	11/11	0.91	0.25	2.29	52,53,56,56	0
2	HQY	H	301	11/11	0.90	0.26	1.67	48,51,58,58	0
2	HQY	D	301	11/11	0.89	0.25	1.57	51,53,55,57	0
2	HQY	B	301	11/11	0.87	0.29	0.91	54,55,56,56	0
2	HQY	G	301	11/11	0.88	0.25	0.72	53,54,55,55	0
2	HQY	A	301	11/11	0.93	0.21	0.45	34,36,40,42	0
2	HQY	F	301	11/11	0.90	0.22	0.45	55,58,59,60	0
2	HQY	E	301	11/11	0.95	0.16	-0.60	33,35,36,37	0
3	CS	C	302	1/1	0.90	0.08	-2.15	117,117,117,117	0
3	CS	G	302	1/1	0.99	0.04	-2.30	64,64,64,64	0
3	CS	F	305	1/1	0.87	0.08	-3.46	167,167,167,167	0
3	CS	A	306	1/1	0.98	0.04	-6.54	121,121,121,121	0
3	CS	F	304	1/1	0.96	0.09	-	121,121,121,121	0
3	CS	H	303	1/1	0.91	0.10	-	132,132,132,132	0
3	CS	E	302	1/1	0.90	0.04	-	110,110,110,110	0
3	CS	F	306	1/1	0.92	0.14	-	168,168,168,168	0
3	CS	C	304	1/1	0.97	0.04	-	109,109,109,109	0
3	CS	D	302	1/1	0.98	0.07	-	86,86,86,86	0
3	CS	A	303	1/1	0.95	0.05	-	122,122,122,122	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors( $\text{\AA}^2$ )	Q<0.9
3	CS	D	304	1/1	0.92	0.07	-	148,148,148,148	0
3	CS	A	307	1/1	0.81	0.23	-	167,167,167,167	0
3	CS	E	303	1/1	0.91	0.20	-	154,154,154,154	0
3	CS	A	305	1/1	0.91	0.05	-	111,111,111,111	0
3	CS	A	302	1/1	0.95	0.05	-	100,100,100,100	0
3	CS	G	306	1/1	0.92	0.05	-	162,162,162,162	0
3	CS	F	302	1/1	0.90	0.05	-	129,129,129,129	0
3	CS	G	305	1/1	0.79	0.08	-	161,161,161,161	0
3	CS	G	304	1/1	0.97	0.05	-	96,96,96,96	0
3	CS	B	303	1/1	0.97	0.04	-	110,110,110,110	0
3	CS	H	302	1/1	0.76	0.12	-	144,144,144,144	0
3	CS	D	303	1/1	0.93	0.08	-	154,154,154,154	0
3	CS	B	304	1/1	0.97	0.06	-	85,85,85,85	0
3	CS	G	303	1/1	0.84	0.31	-	202,202,202,202	0
3	CS	F	303	1/1	0.99	0.03	-	75,75,75,75	0
3	CS	B	302	1/1	0.97	0.05	-	100,100,100,100	0
3	CS	A	304	1/1	0.73	0.30	-	202,202,202,202	0
3	CS	B	305	1/1	0.94	0.06	-	146,146,146,146	0
3	CS	C	305	1/1	0.94	0.07	-	118,118,118,118	0
3	CS	C	303	1/1	0.98	0.04	-	85,85,85,85	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.