



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 5, 2026 – 01:40 PM UTC

PDB ID : 8PWU / pdb_00008pwu
Title : PfrH5 bound to monoclonal antibody MAD10-255
Authors : Farrell, B.; Higgins, M.K.
Deposited on : 2023-07-21
Resolution : 3.15 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

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

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

MolProbity	:	4-5-2 with Phenix2.0
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

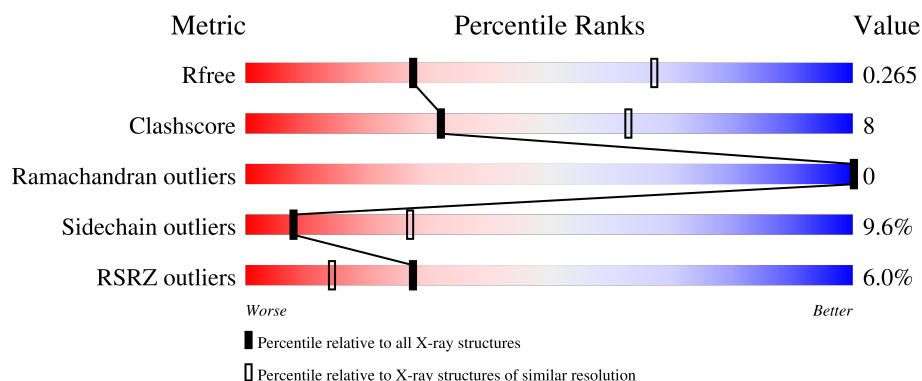
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.15 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}	180053	2351 (3.18-3.10)
Clashscore	190562	2452 (3.18-3.10)
Ramachandran outliers	187476	2324 (3.18-3.10)
Sidechain outliers	187428	2324 (3.18-3.10)
RSRZ outliers	180081	2351 (3.18-3.10)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. 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	338	3% 65% 18% • 15%
1	C	338	5% 61% 22% • 15%
1	E	338	5% 65% 17% • 15%
1	G	338	2% 66% 16% • 15%
1	I	338	7% 64% 18% • 15%

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Mol	Chain	Length	Quality of chain
1	K	338	11% 66% 17% 15%
2	B	250	3% 59% 26% 11%
2	D	250	4% 64% 22% 10%
2	F	250	2% 62% 25% 10%
2	H	250	2% 62% 25% 10%
2	J	250	12% 64% 22% 11%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 23363 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 Reticulocyte-binding protein homolog 5.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	288	Total	C	N	O	S	0	0	0
			2443	1575	411	442	15			
1	C	288	Total	C	N	O	S	0	0	0
			2443	1575	411	442	15			
1	E	287	Total	C	N	O	S	0	0	0
			2435	1571	409	440	15			
1	G	286	Total	C	N	O	S	0	0	0
			2424	1562	408	439	15			
1	I	288	Total	C	N	O	S	0	0	0
			2443	1575	411	442	15			
1	K	288	Total	C	N	O	S	0	0	0
			2443	1575	411	442	15			

There are 18 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	203	TYR	CYS	engineered mutation	UNP Q8IFM5
A	216	ALA	THR	engineered mutation	UNP Q8IFM5
A	299	ALA	THR	engineered mutation	UNP Q8IFM5
C	203	TYR	CYS	engineered mutation	UNP Q8IFM5
C	216	ALA	THR	engineered mutation	UNP Q8IFM5
C	299	ALA	THR	engineered mutation	UNP Q8IFM5
E	203	TYR	CYS	engineered mutation	UNP Q8IFM5
E	216	ALA	THR	engineered mutation	UNP Q8IFM5
E	299	ALA	THR	engineered mutation	UNP Q8IFM5
G	203	TYR	CYS	engineered mutation	UNP Q8IFM5
G	216	ALA	THR	engineered mutation	UNP Q8IFM5
G	299	ALA	THR	engineered mutation	UNP Q8IFM5
I	203	TYR	CYS	engineered mutation	UNP Q8IFM5
I	216	ALA	THR	engineered mutation	UNP Q8IFM5
I	299	ALA	THR	engineered mutation	UNP Q8IFM5
K	203	TYR	CYS	engineered mutation	UNP Q8IFM5
K	216	ALA	THR	engineered mutation	UNP Q8IFM5

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Chain	Residue	Modelled	Actual	Comment	Reference
K	299	ALA	THR	engineered mutation	UNP Q8IFM5

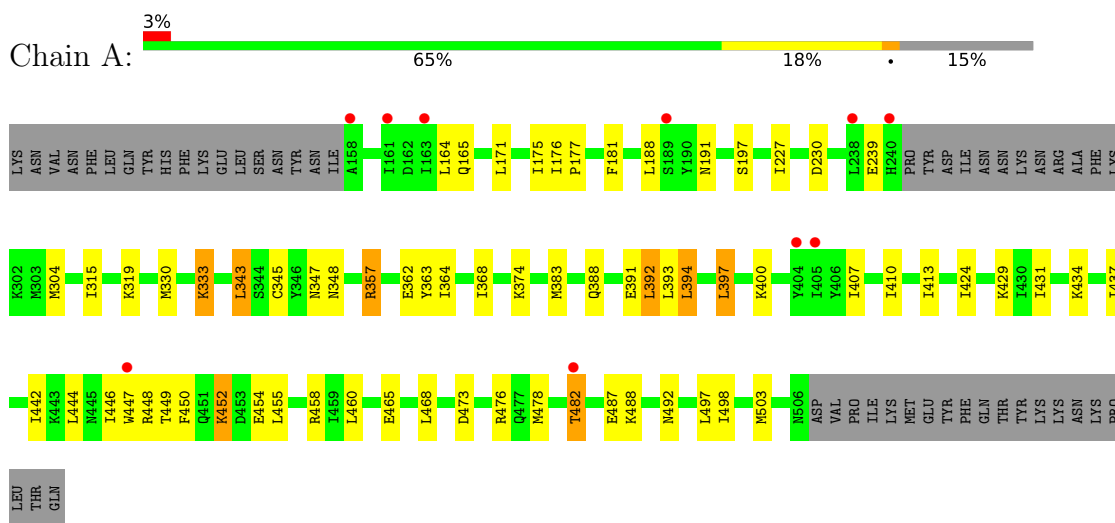
- Molecule 2 is a protein called monoclonal antibody MAD10-255.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	223	Total	C	N	O	S	0	1	0
			1736	1099	288	343	6			
2	D	226	Total	C	N	O	S	0	1	0
			1756	1109	291	350	6			
2	F	226	Total	C	N	O	S	0	1	0
			1756	1109	291	350	6			
2	H	226	Total	C	N	O	S	0	1	0
			1756	1109	291	350	6			
2	J	222	Total	C	N	O	S	0	1	0
			1728	1093	287	342	6			

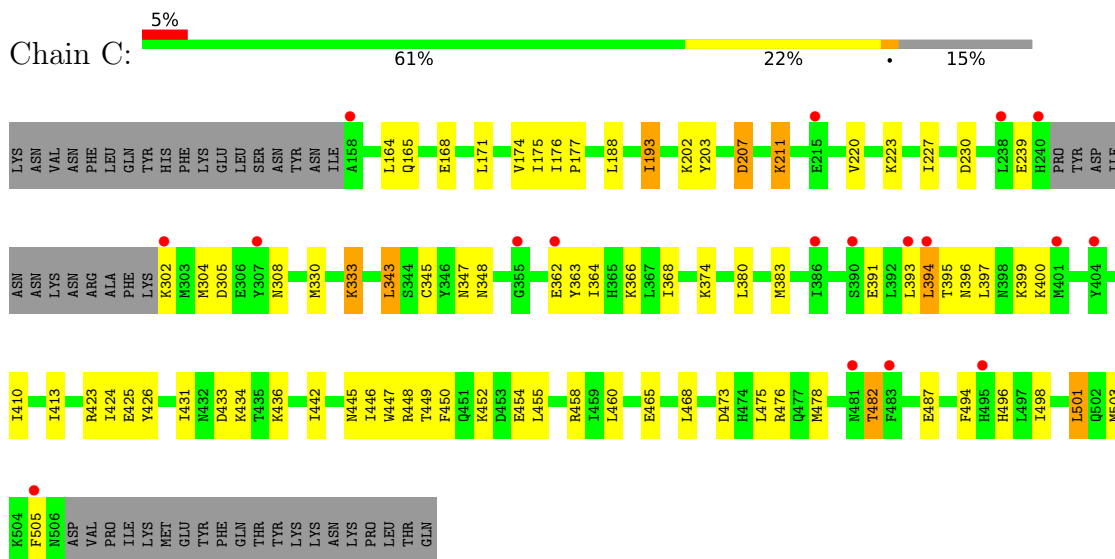
3 Residue-property plots

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: Reticulocyte-binding protein homolog 5

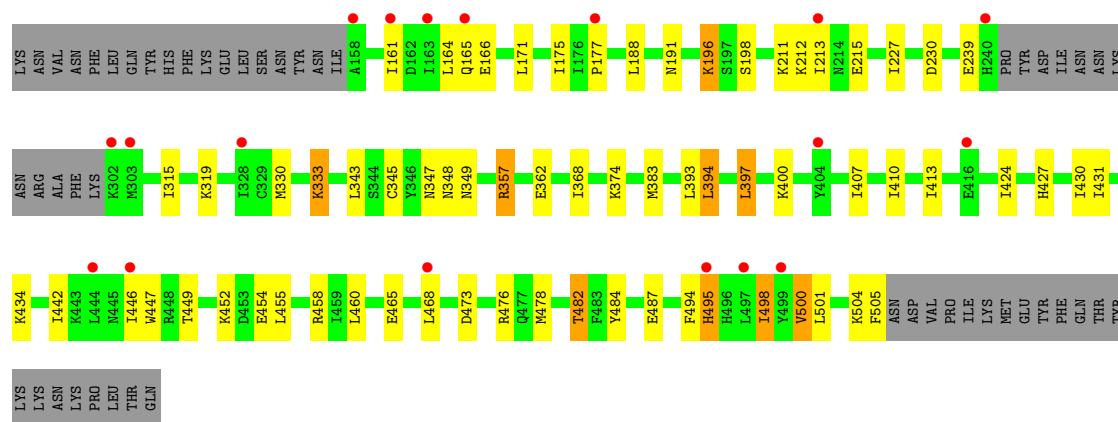


• Molecule 1: Reticulocyte-binding protein homolog 5

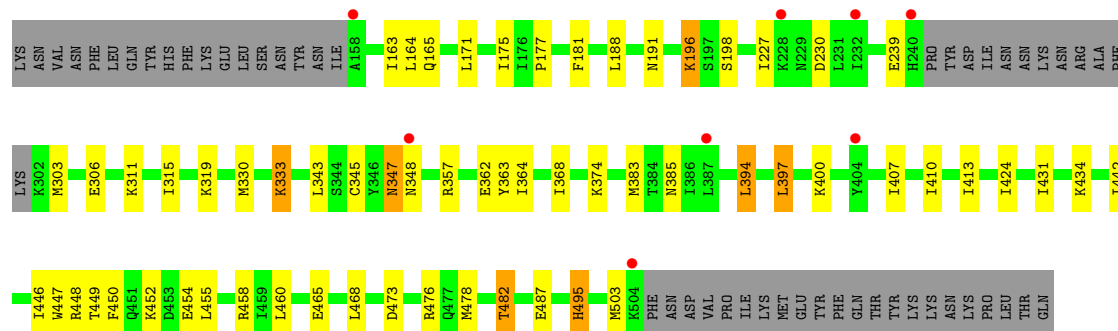


• Molecule 1: Reticulocyte-binding protein homolog 5

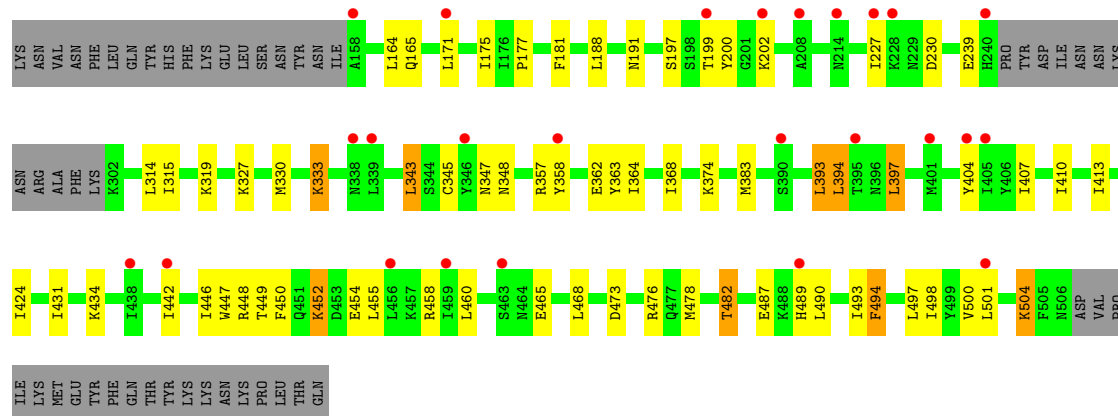




● Molecule 1: Reticulocyte-binding protein homolog 5

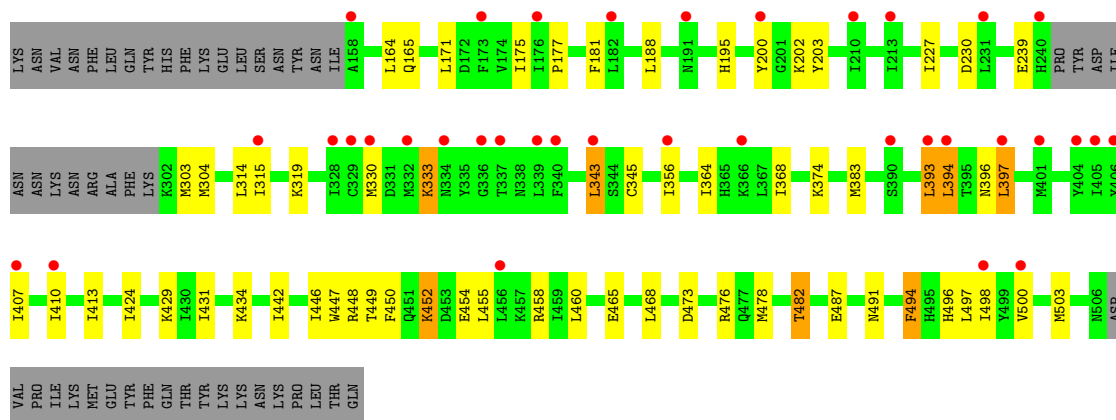


● Molecule 1: Reticulocyte-binding protein homolog 5

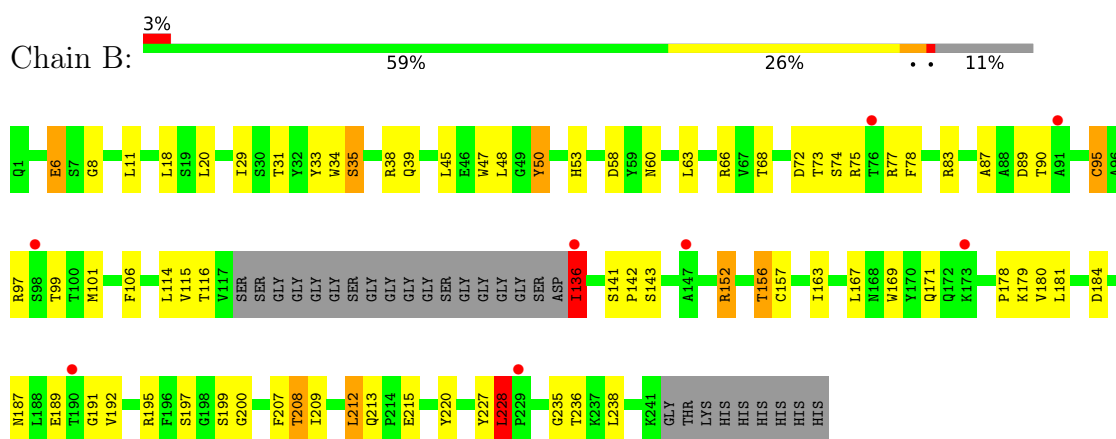


● Molecule 1: Reticulocyte-binding protein homolog 5

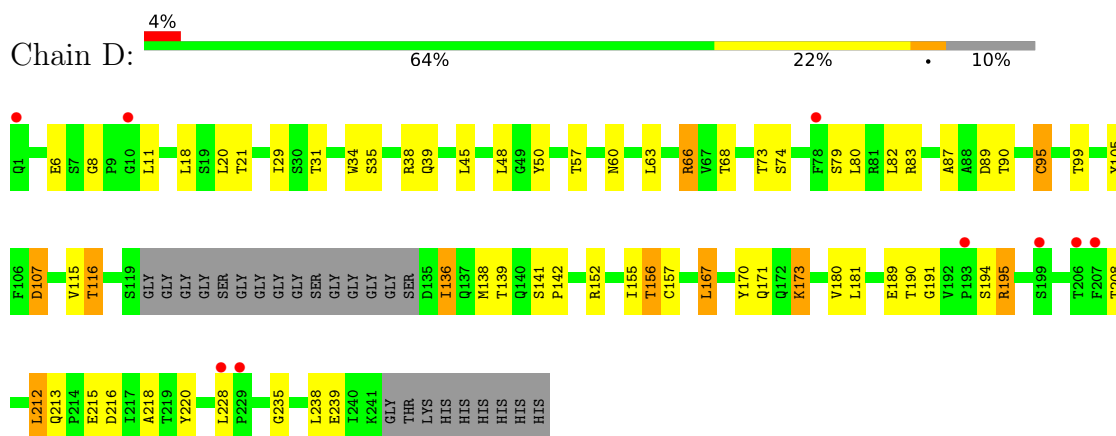




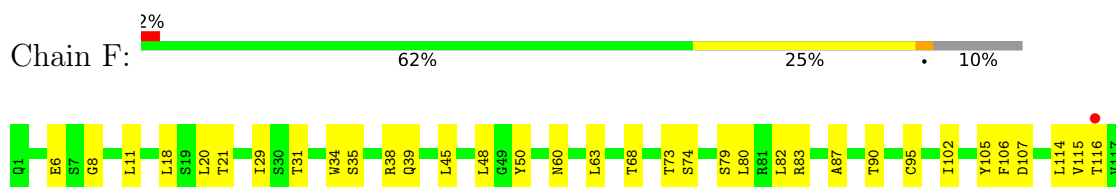
• Molecule 2: monoclonal antibody MAD10-255

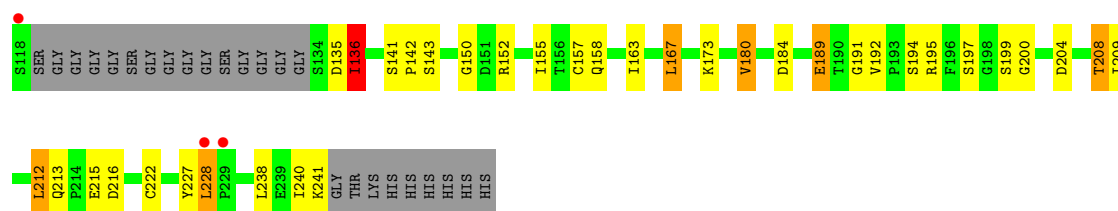


• Molecule 2: monoclonal antibody MAD10-255

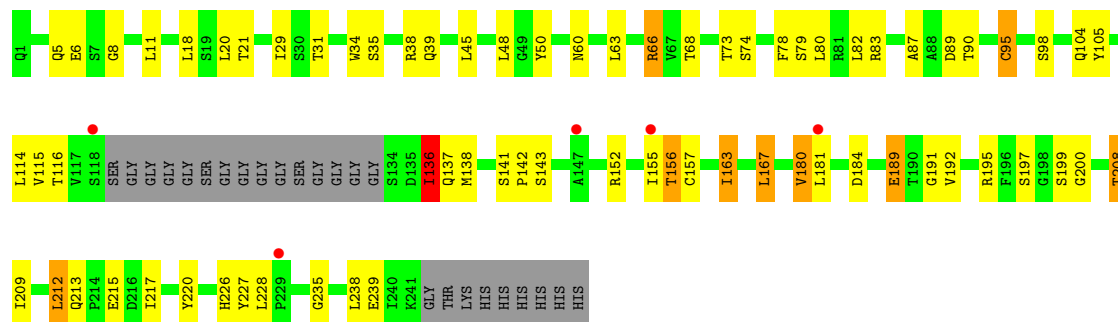


• Molecule 2: monoclonal antibody MAD10-255

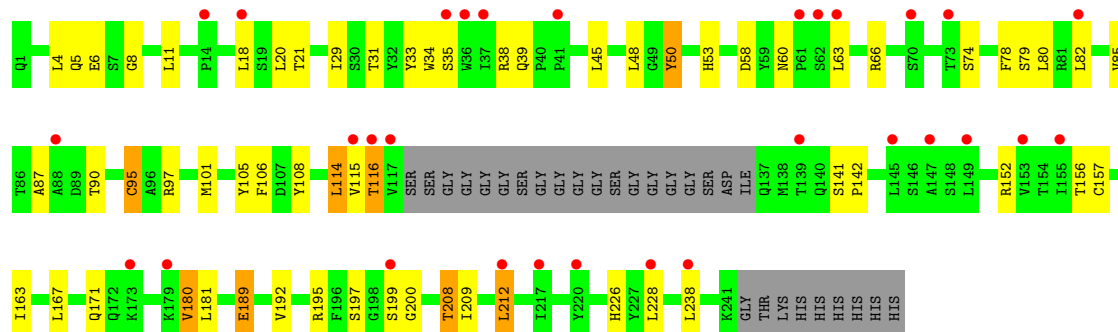




• Molecule 2: monoclonal antibody MAD10-255



• Molecule 2: monoclonal antibody MAD10-255



4 Data and refinement statistics

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α , β , γ	115.31Å 134.52Å 198.67Å 90.00° 93.56° 90.00°	Depositor
Resolution (Å)	87.45 – 3.15 87.45 – 3.15	Depositor EDS
% Data completeness (in resolution range)	99.8 (87.45-3.15) 99.8 (87.45-3.15)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.03 (at 3.13Å)	Xtriage
Refinement program	BUSTER 2.10.4 (20-OCT-2021)	Depositor
R, R_{free}	0.242 , 0.264 0.245 , 0.265	Depositor DCC
R_{free} test set	5254 reflections (5.00%)	wwPDB-VP
Wilson B-factor (Å ²)	102.5	Xtriage
Anisotropy	0.159	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 108.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	23363	wwPDB-VP
Average B, all atoms (Å ²)	136.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.82% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical 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

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	0.77	0/2493	1.21	6/3342 (0.2%)
1	C	0.77	1/2493 (0.0%)	1.23	8/3342 (0.2%)
1	E	0.76	0/2485	1.23	6/3331 (0.2%)
1	G	0.75	0/2473	1.21	5/3315 (0.2%)
1	I	0.65	0/2493	1.19	6/3342 (0.2%)
1	K	0.65	0/2493	1.18	4/3342 (0.1%)
2	B	0.85	1/1781 (0.1%)	1.19	12/2426 (0.5%)
2	D	0.85	2/1801 (0.1%)	1.16	6/2453 (0.2%)
2	F	0.83	1/1801 (0.1%)	1.16	10/2453 (0.4%)
2	H	0.82	1/1801 (0.1%)	1.18	9/2453 (0.4%)
2	J	0.67	0/1773	1.08	5/2415 (0.2%)
All	All	0.76	6/23887 (0.0%)	1.19	77/32214 (0.2%)

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	190	THR	CA-C	7.87	1.63	1.52
2	H	136	ILE	CG1-CD1	-6.43	1.26	1.51
2	F	136	ILE	CG1-CD1	-6.01	1.28	1.51
2	B	136	ILE	CG1-CD1	-5.65	1.29	1.51
2	D	136	ILE	CG1-CD1	-5.24	1.31	1.51

The worst 5 of 77 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	E	362	GLU	CB-CG-CD	8.53	127.10	112.60
1	C	362	GLU	CB-CG-CD	7.95	126.11	112.60
1	A	364	ILE	N-CA-C	6.93	117.77	111.81
1	G	362	GLU	CB-CG-CD	6.75	124.07	112.60
1	C	364	ILE	N-CA-C	6.65	117.53	111.81

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	2443	0	2465	47	0
1	C	2443	0	2465	46	0
1	E	2435	0	2459	41	0
1	G	2424	0	2450	45	0
1	I	2443	0	2465	39	0
1	K	2443	0	2465	32	0
2	B	1736	0	1690	37	0
2	D	1756	0	1704	33	0
2	F	1756	0	1704	31	0
2	H	1756	0	1704	32	0
2	J	1728	0	1679	33	0
All	All	23363	0	23250	375	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 375 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:G:163:ILE:HG23	1:G:171:LEU:HD21	1.22	1.10
2:D:29:ILE:HG23	2:D:34:TRP:NE1	1.83	0.93
1:E:196:LYS:NZ	1:E:198:SER:HB3	1.83	0.93
2:F:29:ILE:HG23	2:F:34:TRP:NE1	1.83	0.92
1:G:196:LYS:HZ2	1:G:198:SER:HB3	1.34	0.91

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	284/338 (84%)	269 (95%)	15 (5%)	0	100	100
1	C	284/338 (84%)	268 (94%)	16 (6%)	0	100	100
1	E	283/338 (84%)	271 (96%)	12 (4%)	0	100	100
1	G	282/338 (83%)	265 (94%)	17 (6%)	0	100	100
1	I	284/338 (84%)	264 (93%)	20 (7%)	0	100	100
1	K	284/338 (84%)	267 (94%)	17 (6%)	0	100	100
2	B	220/250 (88%)	201 (91%)	19 (9%)	0	100	100
2	D	223/250 (89%)	206 (92%)	17 (8%)	0	100	100
2	F	223/250 (89%)	202 (91%)	21 (9%)	0	100	100
2	H	223/250 (89%)	203 (91%)	20 (9%)	0	100	100
2	J	219/250 (88%)	202 (92%)	17 (8%)	0	100	100
All	All	2809/3278 (86%)	2618 (93%)	191 (7%)	0	100	100

There are no Ramachandran outliers to report.

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	278/327 (85%)	256 (92%)	22 (8%)	11	34
1	C	278/327 (85%)	257 (92%)	21 (8%)	12	35
1	E	277/327 (85%)	256 (92%)	21 (8%)	12	35
1	G	276/327 (84%)	257 (93%)	19 (7%)	14	38
1	I	278/327 (85%)	256 (92%)	22 (8%)	11	34
1	K	278/327 (85%)	257 (92%)	21 (8%)	12	35
2	B	195/208 (94%)	172 (88%)	23 (12%)	5	19
2	D	198/208 (95%)	169 (85%)	29 (15%)	3	12

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
2	F	198/208 (95%)	169 (85%)	29 (15%)	3	12
2	H	198/208 (95%)	172 (87%)	26 (13%)	4	16
2	J	194/208 (93%)	172 (89%)	22 (11%)	5	21
All	All	2648/3002 (88%)	2393 (90%)	255 (10%)	8	27

5 of 255 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	505	PHE
2	J	95	CYS
2	F	240	ILE
2	J	74	SER
1	K	303	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 37 such sidechains are listed below:

Mol	Chain	Res	Type
1	I	427	HIS
1	K	427	HIS
2	J	103	GLN
1	K	159	ASN
2	D	171	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 oligosaccharides 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 ⓘ

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	288/338 (85%)	0.53	10 (3%)	47	26	73, 111, 167, 193	0
1	C	288/338 (85%)	0.57	18 (6%)	26	13	78, 119, 171, 190	0
1	E	287/338 (84%)	0.62	18 (6%)	26	13	79, 123, 185, 212	0
1	G	286/338 (84%)	0.51	8 (2%)	55	33	72, 110, 184, 218	0
1	I	288/338 (85%)	0.75	25 (8%)	16	8	149, 177, 208, 225	0
1	K	288/338 (85%)	1.01	36 (12%)	8	4	173, 202, 226, 235	0
2	B	223/250 (89%)	0.31	8 (3%)	46	26	64, 103, 135, 149	1 (0%)
2	D	226/250 (90%)	0.33	9 (3%)	42	22	67, 103, 125, 136	1 (0%)
2	F	226/250 (90%)	0.25	4 (1%)	67	46	64, 103, 126, 138	1 (0%)
2	H	226/250 (90%)	0.36	5 (2%)	62	41	65, 104, 133, 145	1 (0%)
2	J	222/250 (88%)	0.95	30 (13%)	7	3	139, 207, 223, 227	1 (0%)
All	All	2848/3278 (86%)	0.58	171 (6%)	27	14	64, 124, 214, 235	5 (0%)

The worst 5 of 171 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	C	158	ALA	6.0
1	K	336	GLY	6.0
2	J	41	PRO	5.7
2	F	118	SER	5.7
1	E	158	ALA	5.3

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 [i](#)

There are no oligosaccharides 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.